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Biological Opinion

for

Southwest Region
U.S. Forest Service

Ongoing Livestock Grazing Activities on Allotments

Final February 2, 1999

U.S. Fish and Wildlife Service
Region 2
Albuquerque, New Mexico

TABLE OF CONTENTS

In Reply Refer to:
Region 2/ES-SE

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Eleanor S. Towns, Regional Forester
USDA - U.S. Forest Service, Southwest Region
517 Gold Avenue SW, Room 6428
Albuquerque, New Mexico 87102-0084

Dear Ms. Towns:

The U.S. Fish and Wildlife Service (Service) has reviewed the biological assessments for ongoing livestock grazing management activities on 21 grazing allotments located on five national forests in the Southwestern Region of the Forest Service. The February 13, 1998, request for formal consultation was received on February 13, 1998. This document represents the Service's biological opinion on site-specific effects of those actions on nine species, and designated critical habitat for three species, in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). This document also includes Service concurrences with may affect, not likely to adversely affect determinations for two plant species on two National Forests and seven grazing allotments.

This biological opinion is based on information provided in the February 13, 1998, biological assessment, the supplemental biological assessment of May 1, 1998, individual allotment assessment forms provided for each allotment, and allotment review meetings conducted by an "Inter-agency Grazing Consultation Team" (see Consultation History) with each national forest, and other information available to the Service from our files, the National Forests, or other experts. Literature cited in this biological opinion does not represent a complete bibliography of literature available on the various species, the effects that livestock grazing activities can have on those species or their habitats, or on other subjects included within this opinion. A complete administrative record of this consultation is on file in the Service's Arizona Ecological Services Field Office, Phoenix.

The following list identifies the individual allotments under consultation, the species and critical habitat for which may affect, likely to adversely affect determinations have been made by the Forest Service, plant species for which may affect, not likely to adversely affect determinations were made (see Consultation History), and the Service's biological opinion or concurrence for each species or critical habitat by allotment considered in this document.

National Forest District Allotment	Species	Biological Opinion or Concurrence
Apache-Sitgreaves National Forests		
Alpine Ranger District		
Boneyard	Loach Minnow	Non-jeopardy
Bush Creek	Loach Minnow	Non-jeopardy
Cow Flat	Loach Minnow	Non-jeopardy
Foote Creek	Loach Minnow	Non-jeopardy
	Mexican Spotted Owl	Non-jeopardy
Nutrioso Summer	Loach Minnow	Non-jeopardy
Red Hill	Loach Minnow	Non-jeopardy
Williams Valley	Loach Minnow	Non-jeopardy
Clifton Ranger District		
Dark Canyon	Arizona Hedgehog Cactus	Concurrence
Double Circles	Arizona Hedgehog Cactus	Concurrence
East Eagle	Loach Minnow	Non-jeopardy
	Spikedace	Non-jeopardy
	Arizona Hedgehog Cactus	Concurrence
Hickey	Arizona Hedgehog Cactus	Concurrence
Mud Springs	Arizona Hedgehog Cactus	Concurrence
Pigeon	Loach Minnow	Non-jeopardy
	American Peregrine Falcon	Non-jeopardy
	Mexican Spotted Owl	Non-jeopardy
	Arizona Hedgehog Cactus	Non-jeopardy
Pleasant Valley	Loach Minnow	Non-jeopardy
	American Peregrine Falcon	Non-jeopardy
	Arizona Hedgehog Cactus	Non-jeopardy
Sardine	Arizona Hedgehog Cactus	Concurrence
Tule Springs	Arizona Hedgehog Cactus	Concurrence
Wildbunch	Loach Minnow	Non-jeopardy
	American Peregrine Falcon	Non-jeopardy
	Arizona Hedgehog Cactus	Non-jeopardy
Springerville Ranger District		
Colter Creek	Little Colorado River Spinedace	Non-jeopardy
Sheep Springs	Lesser Long-Nosed Bat	Non-jeopardy
South Escudilla	Little Colorado River Spinedace	Non-jeopardy

Apache-Sitgreaves National Forests (Continued)		
Chevelon/Heber Ranger Districts		
Limestone	Little Colorado River Spinedace	Non-jeopardy
	Mexican Spotted Owl	Non-jeopardy
Cibola National Forest		
Mt. Taylor Ranger District		
Wingate	Zuni Fleabance	Concurrence
Coconino National Forest		
Blue Ridge Ranger District		
Buck Springs	Little Colorado River Spinedace	Non-jeopardy
	and critical habitat	No adverse mod.
Coronado National Forest		
Nogales Ranger District		
Bear Valley	Sonora Chub	Non-jeopardy
	and critical habitat	No adverse mod.
	Lesser Long-Nosed Bat	Non-jeopardy
Montana	Sonora Chub	Non-jeopardy
	Lesser Long-Nosed Bat	Non-jeopardy
Gila National Forest		
Wilderness Ranger District		
Sapillo	Loach Minnow	Jeopardy
	Spikedace	Jeopardy
	Mexican Spotted Owl	Non-jeopardy
Tonto National Forest		
Globe Ranger District		
Chrysotile	Lesser Long-Nosed Bat	Non-jeopardy
Hicks/Pike Peak	Razorback Sucker	Non-jeopardy
	and critical habitat	No adv. mod.
	Lesser Long-Nosed Bat	Non-jeopardy
	Arizona Hedgehog Cactus	Non-jeopardy
Sears-Club/ Chalk Mountain	Gila topminnow	Non-jeopardy

DOCUMENT FORMAT

This document includes an allotment by allotment analysis of effects to listed species. The document is formatted to accommodate the multiple allotments under consultation, provide allotment specific biological opinions, and avoid unnecessary repetition. To accomplish this, the sections of a biological opinion that would be applicable to all individual allotment are provided once, either prior to or following the section of individual allotment biological opinions. Also, the biological opinion for each allotment has been presented so that it can be used with a minimum of cross-referencing to other sections of the document. Allotments are presented in alphabetical order. This includes all allotments, including those for which concurrences are provided. For each allotment analysis, any listed species is individually discussed in sequence, before going on to the next allotment.

The primary headings (in capital letters) of this document and a brief description of the type of information included within each are found in this document's appendix.

CONSULTATION HISTORY

Previous Consultations and Relationship to Ongoing Grazing Activities

Forest Service Land and Resource Management Plans (Forest Plans) provide guidance and direction for managing National Forests and Grasslands for a 10-15 year period. The plans establish goals, objectives, standards and guidelines for multiple-use and sustained-yield management of renewable resources. Standards and guidelines for the management and conservation of threatened, endangered, and proposed species, including proposed and designated critical habitat, are included in the Forest Plans. Forest Plans provide direction for the protection and enhancement of all threatened, endangered, and proposed species' populations, and habitat proposed or designated as critical, site-specific evaluation of all projects and activities, and initiation of consultation with the Service, as appropriate. These plans, as amended, also contain guidance specific to grazing actions and threatened and endangered species. Certain aspects related to ongoing grazing activities have been considered as part of previous consultations on the Plans and their amendments for the eleven National Forests and National Grasslands of the Forest Service's Southwestern Region. Forest Plan consultations did not include an evaluation of site-specific affects to listed species that may result from the continuation of ongoing domestic livestock grazing. However, the Forest Plans, as amended, and the resulting biological opinions issued by the Service, did provide general and species specific guidance to be incorporated into site-specific grazing management decisions.

A Region-wide Forest Plan amendment was adopted by the Regional Forester in the June 5, 1996 Record of Decision (ROD), to address the continuation of management direction provided through the Forest Plans. The amendment included standards and guidelines for managing the Mexican spotted owl, northern goshawk, old growth, grazing, and numerous forest-specific amendments. On June 2, 1997, additional management direction was provided by the Regional Forester for seven listed species of critical concern: loach minnow, Little Colorado River spinedace, spikedace, Sonora chub, cactus ferruginous pygmy-owl, southwestern willow flycatcher, and Pima pineapple cactus. The Service issued a non-jeopardy biological opinion dated December 19, 1997, on the Forest Plan amendment which included evaluations for listed species on National Forest System lands in the Southwestern Region. That biological opinion did not preclude the need for the Forest Service to review their actions and consult with the Service on future site-specific activities carried out under the guidance contained in Forest Plans.

To better understand the management context under which the site-specific analysis for the on-going grazing activities was conducted, the following summary of existing guidance is provided. This summary includes the general and species specific guidance related to grazing management activities contained in the amended Forest Plans (as supplemented with the seven species direction), and the Recovery Plan for the Mexican Spotted Owl, for those species considered in this consultation.

<u>Forest Plan</u> - Grazing Management Standards:

"Forage use by grazing ungulates will be maintained at or above a condition which assures recovery and continued existence of threatened and endangered species" (ROD p. 94).

<u>Mexican Spotted Owl</u>:

Maintain desirable owl habitat characteristics on allotment to include areas where vegetative growth is not being significantly retarded or inhibited by grazing activities. Upland foraging areas should have a sustaining presence of herbaceous ground cover, and should contain a <u>mixture</u> of both dense and sparse grass cover that allows for a diversity of prey species, e.g., deer mice, voles, jumping mice, and shrews. In riparian areas, there should be a sustaining presence of shrubs, trees, forbs, and grass cover.

<u>Seven Species Direction</u> (as described in the biological opinion dated December 19, 1997 (BO))
Little Colorado River Spinedace, loach minnow, spikedace:

"The management direction consists of long-term actions for the three fishes of concern that focus on general watershed conditions and riparian health within watersheds where they are found. The recommendations are primarily concentrated on direct effects from land management activities... emphasis should be given to maintenance and restoration of watersheds and riparian ecosystems through conformance with LRMP [Forest Plan] direction" (BO p. 6).

"Avoid all adverse effects (as determined by a biological assessment) on species habitats except when it is possible to compensate the adverse effects through alternatives identified in a biological opinion from the Service; when an exemption has been granted under the act; or when the Service biological opinion recognizes an incidental taking" (BO p. 8).

"Work to exclude livestock grazing from species habitat in stream courses with listed fish species or their habitat, require a journey-level fishery biologist review of the proposed grazing activity to determine if the grazing is appropriate to protect the fish, and if so at what level. If access to or crossing of species habitat is necessary, have a journey-level fishery biologist review the proposed action to determine appropriate location, timing, and mitigation measures" (BO p. 8).

"Conduct frequent inspections of riparian pastures and exclosures to detect livestock trespass. Remove trespass livestock immediately. Check fences frequently and repair as needed" (BO p. 9).

"Manage riparian areas with threatened and endangered fish species or their habitat to achieve proper functioning condition for riparian and aquatic ecological conditions" (BO p.9).

"In stream courses with these three species or their habitats, require a journey-level fishery biologist review the proposed grazing activity for suitability for threatened and endangered fish management and compliance with the programmatic biological assessment" (BO p.9).

"Projects impacting riparian areas shall be designed to protect the function and condition of riparian areas. Management objectives shall emphasize protection of soil, water, vegetation, and the wildlife and fish habitat" (BO p. 9).

"In species habitat [all occupied, unoccupied suitable, potential, or designated or proposed critical habitat] activities that restrict or slow achievement towards proper functioning riparian and aquatic habitat conditions should be discouraged. Modify the proposed action or mitigate impacts to accelerate attainment of ecological objectives" (BO p. 10).

"Permit no water diversion for Forest Service purposes from within or immediately above species habitat in order to avoid stream flow depletion. Exceptions can be made in situations benefitting listed species or their habitats. Such actions require the review by a journey-level fishery biologist" (BO p. 10).

Sonora Chub:

"Eliminate livestock grazing in the riparian corridor of Sycamore Canyon south of Ruby Road" (BO p. 12).

"Eliminate livestock grazing in the riparian corridor of California Gulch, south of private land there" (BO p. 12).

"Management considerations for the Sonora chub will be a primary issue in the allotment management plans development or ecosystem assessments for the grazing allotments including Sycamore Canyon and California Gulch, south of Ruby Road" (BO p. 12).

Biological Assessment and Consultation Process

In order to facilitate the consultation for ongoing grazing activities, the Forest Service and Service worked within the informal consultation process to develop species specific criteria for those listed species occurring on more than one National Forest, upon which site-specific grazing effects could be evaluated and standards established for effects determinations of: "no effect;" "may affect, not likely to adversely affect;" and "may affect, likely to adversely affect." Concurrences for species for which such criteria have not been developed are provided separately in this biological opinion within the section covering the applicable allotment.

On February 6, 1998, the Regional Director of the Service's Southwest Region and the Acting Regional Forester of the Forest Service Southwestern Region signed a consultation agreement that defined the process, products, actions, and schedule for completion of consultation for the ongoing site specific grazing activities on an allotment-by-allotment basis in the Forest Service Southwestern Region. The management of ongoing grazing is administered under Forest Plans, as amended, existing term grazing permits, allotment management plans, and annual operating plans. The primary focus of this consultation is the ongoing grazing on 158 allotments identified in civil cases: Forest Guardians v United States Forest Service and Daniel Glickman, U.S. Department of Agriculture, CIV97-2562 PHX-SMM, filed December 12, 1997, and Southwest Center for Biological Diversity, et. al. v U.S. Forest Service, and Apache-Sitgreaves, Coconino,Coronado, Gila, Prescott, and Tonto National Forests, CIV97-666 TUC-JMR, filed October 23, 1997. Ongoing grazing activities on additional allotments would be considered as time and resources were available (without compromising the time-line established in the consultation agreement for consultation on the 158 allotments.)

In a letter dated February 13, 1998, the Forest Service requested initiation of formal consultation. The consultation initiation package contained the basic information required to begin formal consultation and included the "Grazing Guidance Criteria for Preliminary effects Determinations for Species Listed as Threatened, Endangered, or Proposed for Listing" dated February 13, 1998. As provided for in the consultation agreement, additional information, including an allotment-by-allotment assessment of the effects to listed species and summary cumulative effects analysis would be provided in a supplemental biological assessment by May 1, 1998.

The Service responded (March 5,1998) with a concurrence on the use of the guidance criteria with conditions. These conditions included: additional criteria for evaluations of affects to listed fish, lesser long-nosed bat, and Mexican long-nosed bat; maintaining an administrative record for each allotment which supports the "may affect, not likely to adversely affect" determination; and that within six months, the Forest Service and Service would meet to review a sample of the determinations made using these criteria. The Service amended their concurrence letter March 31, 1998, to include a technical clarification. National Forests applying the Guidance Criteria are responsible for documenting how criteria have been met for "no effect" and "may affect, not likely to adversely affect" determinations. These individual allotments where the criteria have been met satisfy informal section 7 consultation requirements. More discussion of this process follows on page 10.

As provided for in the consultation agreement, the Forest Service and Service established a Federal "Interagency Grazing Consultation Team," including personnel from both agencies, to assess the affects to listed and proposed species and their critical habitats from ongoing grazing activities on an allotment-by-allotment basis, and develop the supplemental biological assessment. The team worked with each respective Forest Service staff to review allotment management, describe the effects of ongoing grazing on listed species, and arrive at final determinations of effect of grazing on an allotment-by-allotment basis.

The objectives of the Interagency Grazing Consultation Team were to assist each National Forest in:

1) applying the Guidance Criteria to individual allotments and making effects determinations in a manner consistent with all other National Forests;

2) developing a consistent administrative record for documenting the affects analysis across all National Forests;

3) identifying conflicts between the ongoing grazing activities and listed species conservation in order to:

a) take immediate action under Forest Service authority to reduce or eliminate these affects by modification to the project action, and provide the Forest an opportunity to adjust their proposed actions in a way to achieve a "may affect, not likely to adversely affect" determination; or

b) prepare the documentation necessary to submit to the Service for formal consultation on those allotments with "may affect, likely to adversely affect" determinations;

4) identify potential mitigation actions for incorporation into formal consultation, as necessary, and for future implementation which can be evaluated through the allotment management planning process and National Environmental Policy Act and;

5) expedite the preparation of the supplemental biological assessment, including a broad look at the effects to species across an entire National Forest and an analysis of summary and cumulative effects, to be provided to Service in accordance with the consultation agreement and as part of the requirements under section 7 of the Act for those allotments with a determination of "may affect, likely to adversely affect" for any listed species.

On May 1, 1998, a supplemental biological assessment was received by the Service. Subsequently, additional information was provided by the Forests for several allotments, two of these, Beaver Creek and Hackberry/Pivot Rock allotments (Coconino National Forest), were both brought within the standards of the "Guidance Criteria," and the Forest changed their previous effect determination to "may affect, not likely to adversely affect" for both allotments. These two allotments were withdrawn from the formal consultation. The Buck Springs Allotment (Coconino National Forest) had substantial project modifications to reduce adverse affects, although it remains in formal consultation. One additional allotment, Sears Club/Chalk Mountain (Tonto National Forest) was included in the formal consultation process after transmittal of the May 1 supplemental biological assessment. Of the 962 allotments identified for consultation, 619 were determined to have no effect on listed species and will not be considered further; 321 were determined to not likely adversely affect listed species, as described in the next paragraph (See Forest Service Biological Assessment, Appendix C, dated May 1, 1998 and Letter from Regional Forester, Forest Service to Regional Director, U.S. Fish and Wildlife Service, dated July 1, 1998). The 22 remaining allotments were found to have adverse affects on one or more listed species and are therefore subject to the formal section 7 review presented in this biological opinion.

Determinations of “not likely to adversely affect” were made for the 158 allotments considered under the pending litigation with the assistance of the Interagency Grazing Consultation Team (including members from the Fish and Wildlife Service), as described above. The Service’s March 5, 1998, concurrence letter on the Guidance Criteria stated that representatives of the two agencies would meet within 6 months to review a sample of determinations made using the criteria, and identify and correct any problems encountered in their application. After reviewing a sample of determinations made using the criteria, Service and Forest Service staff met on September 21 and 29, 1998, and discussed the results. In a letter dated October 1998, the Service formally identified some problems with documentation of effects and recommended corrective measures. That letter also requested the Forest Service review the remaining “not likely to adversely affect” determinations to ensure these problems did not occur in documentation for other allotments. The Forest Service’s letter of October 1998, identified the corrective measures that had been taken and clarified the status of specific allotments. The Service is satisfied through its involvement with allotment review on the Interagency Grazing Team and the Forest Service’s response to our review of a sample of the determinations that the application of the Guidance Criteria is having the desired result of identifying allotments that are not likely to adversely affect listed species or critical habitat. On those allotments that at first did not meet the criteria, modification of grazing procedures to meet the criteria has removed adverse impacts and provided a highly significant conservation benefit to the species. The Service concurs that allotments that meet the “not likely to adversely affect” Guidance Criteria satisfy informal consultation requirements for the species covered by those criteria.

On June 19, 1998, additional information was received by the Service from the Forest Service to include the individual utilization guidance for each of the allotments in this consultation as taken from each of the annual operating plans. This new information revealed that, with the exception of the Sapillo Allotment, all allotments in this consultation are in full compliance with Forest Plans, as amended.

PROPOSED ACTION

The proposed action that is the subject of this consultation is the continuation of ongoing livestock grazing activities authorized through annual operating plans on individual allotments within the Southwest Region of the Forest Service. The 22 allotments included in this consultation are those that did not meet the requirements for <u>may affect, not likely to adversely affect</u> determinations for affects to listed species as provided for in the "Guidance Criteria" (see Consultation History). The life of the project for each allotment is up to three years, beginning with the 1998 grazing season. For the purposes of this consultation, the annual operating plans are to be maintained as-is, or operated in a more restricted manner. In a letter to Service, dated June 19, 1998, the Forest Service stated that, "The utilization guidance in the annual operating plans, with the exception of the Sapillo Allotment, is in full compliance with the Forest Plans as amended."

The direction of the Forest Service is that within the next three years, for each of these allotments, a full allotment planning process will be completed, including development of the allotment management plan, compliance with the National Environmental Policy Act, and re-consultation under the Act, as necessary. If the annual operating plans are modified in the interim to the extent that the assumptions used in making the determinations and analyses of effects are no longer valid, National Forests would need to reinitiate consultation.

AFFECTED SPECIES

Discussions follow of the rangewide status of each listed species considered in this consultation which are presented by taxonomic group (fish, birds, mammals, plants). Within these groups, organization is by common name.

FISH

GILA TOPMINNOW (*Poeciliopsis o. occidentalis*)

Status of the Species (rangewide)

Gila topminnow belong to a group of live-bearing fishes within the family Poeciliidae. Males are smaller than females, rarely greater than 25 mm (1 inch), while females are larger, reaching 51 mm (2 inches). Body coloration is tan to olivaceous, darker above, lighter below, often white on the belly. Breeding males are usually blackened, with some golden coloration of the midline, and with orange or yellow at base of the dorsal fin.

Gila topminnow can tolerate a variety of physical and chemical conditions. In part, because of this tolerance to water conditions they are good colonizers. Also, a single 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. Simms and Simms (1992) found the densities of Gila topminnow in Cienega Creek, Pima County, Arizona, to be greater in pool, glide, and backwater habitats and less dense in marsh, riffle, chute, cascade, and fall habitats. They occurred more frequently over sand substrates than over other categories of substrates. Although Gila topminnow may occupy pools and ponds that are up to 2 meters (6 feet) deep, they are normally found in the upper one-third of the water column (Forrest 1992).

Gila topminnow is known to occur in streams fluctuating from 6 to 37^{o}C (43-99^{o} F), pH from 6.6 to 8.9, dissolved oxygen levels of 2.2 to 11 mg/l (2.2-11 ppm), and can tolerate salinities approaching those of sea-water (Meffe *et al.* 1983). Topminnow can burrow under mud or aquatic vegetation when water levels decline (Deacon and Minckley 1974, Meffe *et al.* 1983). Topminnow regularly inhabit springheads with high loads of dissolved carbonates and low pH (Meffe 1983, Meffe and Snelson 1989). This factor has helped protect small populations of topminnow from the nonnative mosquitofish (*Gambusia affinis*) that are usually rare or absent under these conditions (Meffe 1983).

The Gila topminnow was listed as endangered in 1967 without critical habitat (USFWS 1967). Only Gila topminnow populations in the United States, not in Mexico, are listed under the Endangered Species Act. The reasons for decline of this fish include past dewatering of rivers, springs, and marshlands; impoundments; channelization; diversions; regulation of flow; land management practices that promote erosion and arroyo formation; and the introduction of predacious and competing nonnative fishes (Miller 1961, Minckley 1985).

Gila topminnow are highly vulnerable to adverse effects from nonnative aquatic species (Johnson and Hubbs 1989). Predation and competition from nonnative fishes have been a major factor in their decline and continue to be a major threat to the remaining populations (Meffe *et al.* 1983, Brooks 1986, Marsh and Minckley 1990, Weedman and Young 1997). With the introduction of large numbers of predatory and competitive nonnative fish, frogs, crayfish, and other species, Gila topminnow could no longer survive in many of their former habitats, or the small pieces of those habitats that had not been lost to human alteration. Both large (Bestgen and Propst 1989) and small (Meffe *et al.* 1983, Minckley *et al.* 1977) nonnative fish cause problems for Gila topminnow as can nonnative crayfish (Fernandez and Rosen 1996) and bullfrogs.

Historically, the Gila topminnow was abundant in the Gila River drainage and was one of the most common fishes of the Colorado River basin, particularly in the Santa Cruz system (Hubbs and Miller 1941). Presently, only 12 of the 15 recent natural Gila topminnow populations are considered extant (Weedman and Young 1997). Only three (Cienega Creek, Monkey Spring, Cottonwood Spring) have no nonnative fish present and therefore can be considered relatively secure from nonnative fish threats. There have been at least 175 wild sites stocked with Gila topminnow; however, topminnow persist at only 18 of these localities. Of the 18, one site is outside topminnow historic range and four now contain nonnative fish (Weedman and Young 1997).

The status of the species is poor and declining. Gila topminnow has gone from being one of the most common fishes of the Gila basin to one that exists at not more than 30 localities (12 natural and 18 stocked). Many of these localities are small and highly threatened.

LITTLE COLORADO RIVER SPINEDACE (*Lepidomeda vittata*)

Status of the Species (rangewide)

Little Colorado River spinedace rarely exceed 100.0 mm (3.9 in.) in maximum length. The dorsal fin is moderately high and acute with a strong second spine (Minckley 1973). The sides are usually silvery, darker above and sometimes white below, with lateral blotches occurring rarely. The upper side and back is olivaceous, bluish, or lead grey (Miller 1963). The life span of spinedace is about three years (U.S. Fish and Wildlife Service 1998).

Little Colorado River spinedace characteristically occupy clear, flowing pools of medium depth, usually over fine gravel bottoms. The species seems to avoid deep, heavily shaded pools and relatively shallow open areas. Cover provided by undercut banks or boulders seems to favor the largest concentrations (Minckley 1984). Nisselson and Blinn (1989) found the spinedace occupying a wide range of physio-chemical conditions. Spinedace spawn prolifically in early summer and then sporadically throughout summer, and early autumn (Minckley and Carufel 1967, Minckley 1984, Blinn and Runck 1990). The bases of the paired fins of breeding males are watery-yellow to orange or red-orange, and parts of the belly are watery-yellow (Miller 1963, Minckley and Carufel 1967). Depending on the size of the female, the number of eggs present ranges up to 5,000. Spinedace engage in broadcast spawning over the bottom or on aquatic vegetation, and debris (Minckley 1973). Young of the year are most abundant on uniformly turbulent riffles 10 to 25 cm (3.9 to 9.8 in.) in depth (Minckley and Carufel 1967).

The diet of Little Colorado River spinedace varies seasonally and consists primarily of aquatic and terrestrial insects, with adult aquatic insects eaten preferentially (Runk and Blinn 1993). Laboratory studies and field collections revealed this species forages opportunistically, and is able to switch diets with food availability (Blinn and Runck 1990).

The Little Colorado River spinedace is listed as threatened with critical habitat (U.S. Fish and Wildlife Service 1987). Designated critical habitat includes 31 miles of East Clear Creek (Coconino County, Arizona) from its confluence with Leonard Canyon upstream to Blue Ridge Reservoir and from the upper end of Blue Ridge Reservoir to Potato Lake; eight miles of Chevelon Creek (Navajo County, Arizona) from the confluence with the Little Colorado River upstream to the confluence of Bell Cow

Canyon; and five miles of Nutrioso Creek (Apache County, Arizona) from the Apache-Sitgreaves National Forests boundary upstream to Nelson Reservoir Dam. Critical habitat designation includes only the stream course, and the constituent elements of critical habitat include clean, permanent flowing water, with pools and a fine gravel or silt-mud substrate. A recovery plan was finalized in 1998 (U.S. Fish and Wildlife Service 1998).

The Little Colorado River spinedace is endemic to the Little Colorado River basin (Miller 1963) and is native to most of the north-flowing tributaries and headwaters of the Little Colorado River. Declines in spinedace populations are thought to be due to changes in streamflow patterns (e.g., impoundments), reduced water quality and quantity, modifications of watersheds (e.g., timber harvest and livestock grazing), manipulation of fish populations (e.g., stream renovations/poisoning and introductions of sport and bait fish), and interaction with introduced non-native fishes (e.g., competition and predation) (U.S. Fish and Wildlife Service 1998). The known historical distribution is similar to the current distribution with the exception that the species may have possibly occurred in the Zuni River watershed south of Gallup, New Mexico (Sublette *et al.* 1990). In the mid-1980s Little Colorado River spinedace were taken from eleven localities in: the Little Colorado River mainstem, East Clear Creek, Chevelon Creek, and Nutrioso Creek (K. Young, Arizona Game and Fish Department, pers. comm., 1995). Additional sites (currently occupied and extirpated) have included Silver Creek, Show Low Creek, Leonard Canyon and tributaries, and Rudd Creek. Populations of spinedace fluctuate dramatically from year to year, and probably reflect cyclic periods of drought and/or increased rainfall.

LOACH MINNOW (*Rhinichthys* [=*Tiaroga*] *cobitis*)

Status of the Species (rangewide)

The loach minnow is a small, slender, elongate fish rarely exceeding 60 mm (2.4 inches) in length (Minckley 1973). The eyes are directed upward and the mouth is terminal with no barbels present. Loach minnow have an olivaceous background coloration highly blotched with darker pigment. Whitish spots are present at the origin and insertion of the dorsal fin as well as the dorsal and ventral portions of the caudal fin base. Breeding males develop bright red-orange coloration at the bases of paired fins, on adjacent fins, on the base of caudal opening, and often on abdomen. Breeding females become yellowish in color on their fins and lower body (Minckley 1973). The life span of a loach minnow is about two years (Britt 1982, Propst and Bestgen 1991).

Loach minnow are bottom-dwelling inhabitants of shallow, swift waters that flow over gravel, cobble, and rubble substrates in mainstream rivers and tributaries (Rinne 1989, Propst and Bestgen 1991). Loach minnow use the spaces between, and in the lee of, larger substrates for resting and spawning (Propst *et al.* 1988, Rinne 1989). The species is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). The first spawn occurs in their second year primarily during March through May (Britt 1982, Propst *et al.* 1988); however, under certain circumstances loach minnow also spawn in the autumn (Vives and Minckley 1990). Spawning occurs in the same riffles occupied by adults during the non-reproductive season. 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. The number of eggs per rock ranges from 5 to more than 250, with means of 52 to 63 (U.S. Fish and Wildlife Service 1991a). Eggs incubated at 18 to 20°C hatched in five to six days. Limited data indicate that the male loach minnow may guard the nest during incubation (Propst *et al.* 1988, Vives and Minckley 1990).

Loach minnow feed exclusively on aquatic insects (Abarca 1987). Loach minnow are opportunistic benthic insectivores, feeding mainly upon riffle-dwelling larval ephemeropterans, simulid, and chironomid dipterans. They actively seek their food among bottom substrates, rather than pursuing items in the drift.

The loach minnow was listed in 1986 as threatened (U.S. Fish and Wildlife Service 1986a) without critical habitat. Critical habitat was subsequently designated (U.S. Fish and Wildlife Service 1994a). Critical habitat for the loach minnow was set aside 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). Critical habitat was revoked by the Service (63 FR 14378; March 25, 1998). The loach minnow recovery plan was approved in 1991 (U.S. Fish and Wildlife Service 1991a).

The loach minnow is endemic to the Gila River basin of Arizona and New Mexico, and Sonora, Mexico. Historic range included the basins of the Verde, Salt, San Pedro, San Francisco, and Gila Rivers (Minckley 1973, Sublette *et al.* 1990). It is believed to be extirpated from Mexico. Competition and predation by nonnative fish and habitat destruction have reduced the historic range of the loach minnow by about 85 percent (Miller 1961, Williams *et al.* 1985, Marsh *et al.* 1989, U.S. Fish and Wildlife Service 1986a and 1994a). Present populations are geographically isolated and inhabit the upstream ends of their historic range.

In Arizona, the loach minnow is generally rare to uncommon where it is found in: Aravaipa Creek (Pinal and Graham counties), limited reaches of the White River (Gila County) and the North and East Forks of the White River (Navajo County), the Three Forks area of the Black River, throughout the Blue River, Campbell Blue Creek, sporadic in Eagle Creek, and in the San Francisco River between Clifton and the New Mexico border (Greenlee County) (Marsh *et al.* 1990, Velasco 1994, Bagley *et al.* 1995, Bagley *et al.* 1996). Historically in Arizona, the loach minnow occupied as much as 2,250 stream km (1,400 miles), but it is now found in less than 225 stream km (140 miles) (Propst *et al*. 1988).

In New Mexico, the loach minnow historically occupied approximately 330 stream km (205 miles); now it is found in about 258 stream km (160 miles), although the loach minnow has become very rare in substantial portions of this remaining range. The species still occurs in the upper Gila River, including the East, Middle, and West forks, the San Francisco and Tularosa rivers, and Dry Blue Creek.

Biochemical genetic work on loach minnow indicate there are 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.

Habitat destruction or alteration and interactions with non-native fishes have acted both independently and in concert to extirpate or deplete loach minnow populations (U.S. Fish and Wildlife Service 1991a). Both historic and present landscapes surrounding loach minnow habitats have been impacted to varying degrees by domestic livestock grazing, mining, agriculture, timber harvest, recreation, development, or impoundments (Hastings and Turner 1980, Hendrickson and Minckley 1985). These activities degrade loach minnow habitats by altering flow regimes, increasing watershed and channel erosion and thus sedimentation, and adding contaminants to streams and rivers. As a result, these activities may affect loach minnow through direct mortality, interference with reproduction, and reduction of invertebrate food supplies.

Non-native fishes such as channel catfish (*Ictalurus punctatus*) and flathead catfish (*Pylodictis olivaris*) frequent riffles occupied by loach minnow, especially at night when catfishes move onto riffles to feed. Largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), green sunfish (*Lepomis cyanellus*), and introduced trouts (Salmonidae) at higher locations, may also co-occur with loach minnow. These non-native fishes may impact loach minnow populations through predation.

SONORA CHUB (*Gila ditaenia*)

Status of the Species (rangewide)

The Sonora chub is a stream-dwelling member of the minnow family and endemic to streams of the Rio de la Concepcion drainage of Sonora and Arizona. Sonora chub may achieve total lengths to 200 mm (Hendrickson and Juarez-Romero 1990), although the species rarely exceeds 125 mm in the United States (Minckley 1973). The body is moderately chubby and dark-colored, with two prominent, black, lateral bands above the lateral line and a dark, oval basicaudal spot. Information on the ecology and biology of this species is incomplete. No data are available on preferred spawning sites, fecundity, larval survival and recruitment, growth, or dispersal.

The Sonora chub is a tenacious, desert-adapted species that exploits small, marginal habitats (Hendrickson and Juarez-Romero 1990), and is able to survive under severe environmental conditions. In most instances, Sonora chub is abundant to common within its occupied habitat (Hendrickson and Juarez-Romero 1990, Carpenter 1992). Within the United States, the habitat of Sonora chub is limited by areal extent (Minckley and Deacon 1968). In Sycamore Creek (Santa Cruz County, Arizona), Sonora chub is more likely to occupy the largest, deepest, most permanent pools (Carpenter 1992). The species is typically not randomly distributed, but concentrates in deeper areas and under cover (Hendrickson and Juarez-Romero 1990). Preferred cover is fallen logs, areas of dense aquatic vegetation, and undercut root masses.

Based on collection dates of young-of-the-year Sonora chub, spawning occurs in early spring (Minckley 1973). However, larval and juvenile Sonora chub found in Sycamore Creek and in a tributary to Rio Altar (Sonora, Mexico) in November indicate that breeding is apparently not limited by season (U.S. Fish and Wildlife Service 1992). Breeding individuals are brilliantly colored (Miller 1945). There is some indication that post-flood spawning occurs regardless of season (Bell 1984, Carpenter 1992), suggesting that spawning tied to spring and summer rains is an adaptation of this species to the harsh and unpredictable environments it occupies.

Examination of stomach contents from a few Sonora chub revealed aquatic and terrestrial insects and algae. Sonora chub is probably an opportunistic feeder that takes advantage of seasonally available resources (Minckley 1973).

The Sonora chub is listed as threatened with critical habitat (Fish and Wildlife Service 1986b). Critical habitat includes Sycamore Creek, extending downstream from and including Yanks Spring, to the International Border. Also designated was the lower 2.0 km of Penasco Creek, a tributary of Sycamore Creek, and the lower 0.4 km of an unnamed stream entering Sycamore Creek from the west, about 2.4 km downstream from Yanks (=Hank and Yanks) Spring. In addition to the aquatic environment, critical habitat includes a 12-meter-wide riparian area along each side of the stream channel. The species' recovery plan was completed in 1992 (U.S. Fish and Wildlife Service).

The present distribution of the Sonora chub appears to be similar to the species' historic range. In Mexico, it is limited in distribution to the rivers Magdalena and Altar drainages within the Rio de la Concepcion watershed (U.S. Fish and Wildlife Service 1992). Although it is considered relatively secure in Mexico (Hendrickson and Juarez-

Romero 1990), the Mexican government lists the Sonora chub as threatened where it is compromised by a variety of factors. In the United States, it is found only in Sycamore Creek and lower reaches of its tributary streams, and California Gulch, the upper Rio Altar drainage, Santa Cruz County, Arizona. The U.S. portion of the range of the species is entirely within the Coronado National Forest. The Sonora chub has remained locally abundant in Sycamore Creek where it is the only native fish in an 8.4 km reach (Minckley and Deacon 1968, Minckley 1973, Minckley 1985). The reach extends from about 0.1 km below Yanks Spring, downstream to about 1.0 km north of the International Border. In 1995, Sonora chub was discovered in California Gulch, in a reach extending 0.4 km upstream of the International Border. Stream flow within Sycamore Creek and California Gulch is intermittent, except during the rainy season; permanent water is restricted to isolated pools. Surface discharge from Sycamore Creek and California Gulch usually sinks into the stream bed before reaching Mexico. The distribution of Sonora chub within the United States is dependent upon the constancy of availability of pool habitats, and the quality of these habitats, through time.

Potential threats to the species include drought and human actions that affect water quality and quantity, activities which alter the hydrograph, and actions that affect streamside habitat, such as grazing, mining, and recreation (U.S. Fish and Wildlife Service 1986b). However, most of the occupied and designated critical habitat of the Sonora chub is within the Pajarito Wilderness and Goodding Research Natural Area; these areas are closed to mining and grazing (U.S. Fish and Wildlife Service 1992). Still, trespassing Mexican cattle often enter the area due to frequent cutting of the border fence (Carpenter 1992). The introduction of nonnative fish is also a threat (Hendrickson and Juarez-Romero 1990).

SPIKEDACE (*Meda fulgida*)

Status of the Species (rangewide)

Spikedace rarely exceed 75.0 mm (2.95 in.) in maximum length (Rinne and Minckley 1991). The eyes are large, the snout fairly pointed, and the mouth is slightly subterminal with no barbels present. The species is slender, somewhat compressed anteriorly. Scales are present only as small deeply embedded plates. The first spinous ray of the dorsal fin is the strongest and most sharp-pointed. Individuals are olive-gray to light brown above with brilliant silver sides and black specks and blotches on back and upper side. Breeding males have bright brassy yellow heads and fin bases, with yellow bellies and fins (Minckley 1973, Page and Burr 1991). Spikedace live about two years with reproduction occurring primarily in one-year old fish (Barber *et al.* 1970, Anderson 1978, Propst *et al.* 1986).

Spikedace occupy midwater habitats, usually less than one meter in depth, with slow to moderate water velocities over sand, gravel, or cobble substrates (Propst *et al.* 1986, Rinne and Kroeger 1988). Adults often aggregate in shear zones along gravel-sand bars where rapid water borders slower flow, quiet eddies on the downstream edges of riffles, and broad shallow areas above gravel-sand bars (Propst *et al.* 1986). Young spikedace are found in quiet water along stream margins over silt or fine-grained sand.

Spikedace spawn from March through May with some yearly and geographic variation (Barber *et al.* 1970, Anderson 1978, Propst *et al.* 1986). During courtship males patrol over shallow, sand-bottomed areas, where speed of flow is moderate. Females generally enter the area from downstream, and are immediately accosted by two or more males. The breeding attempt terminates when the female either strikes the bottom, or halts, in a flurry of males. All participants then float slowly with the current, then resume their previous activities (Minckley 1973). Females lay approximately 100-300 eggs or more depending on size. One year old females generally lay one brood per season, whereas two year old and older females may produce two (Minckley 1973). Spawning behavior indicates eggs are laid over gravel and cobble where they adhere to the substrate. The young produced grow rapidly, attaining a standard length of 35 to 40 mm by November of the year spawned.

Spikedace feed primarily on aquatic and terrestrial insects (Barber and Minckley 1983, Marsh *et al.* 1989). Diet composition is largely determined by type of habitat and time of year (Minckley 1973).

Spikedace was listed in 1986 as threatened (U.S. Fish and Wildlife Service 1986c) without critical habitat. Critical habitat was subsequently designated (U.S. Fish and Wildlife Service 1994a). Critical habitat for the spikedace was set aside 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). Critical habitat was revoked by the Service (63 FR 14378; March 25, 1998). The spikedace recovery plan was approved in 1991 (U.S. Fish and Wildlife Service 1991b).

Spikedace is endemic to the Gila River system of Arizona, New Mexico, and Sonora, Mexico. Habitat destruction, and competition and predation from introduced nonnative fish species are the primary causes of the species decline (Miller 1961, U.S. Fish and Wildlife Service 1991b). Its distribution was formerly widespread in large and moderate-sized rivers and streams of mid-elevation within the Gila River drainage, including the Gila, Salt, and Verde rivers and their major tributaries upstream of the present Phoenix metropolitan area, and the Agua Fria, San Pedro, and San Francisco river systems. In Arizona, spikedace now occurs only in Aravaipa Creek, Eagle Creek, the upper Verde River, and the mainstem Gila River in Pinal County; in New Mexico, it is now restricted to the mainstem Gila River and its East, Middle, and West forks

(Barber and Minckley 1966, Minckley 1973, Anderson 1978, Barrett *et al.* 1985, Bestgen 1985, Marsh *et al.* 1990, Sublette *et al.* 1990, Jakle 1992).

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 the Verde River are morphologically distinguishable from all other spikedace populations, being the most distinct from the spikedace in Aravaipa Creek, while spikedace from the upper Gila River and Eagle Creek populations have intermediate measurements. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets 1992).

RAZORBACK SUCKER (*Xyrauchen texanus*)

Status of the Species (rangewide)

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

The razorback sucker is adapted to widely fluctuating physical environments characteristic of rivers in the pre-settlement Colorado River Basin. Adult razorback sucker utilize most of the available riverine habitats, although there may be an avoidance of whitewater type habitats. Razorback sucker tend to use low velocity main channel habitats such as pools, eddies, near shore runs, and channels associated with sand or gravel bars (Bestgen 1990). Backwaters, oxbows, and sloughs are well-used habitat areas adjacent to the main channel; flooded bottomlands are important to the species in the spring and early summer (Bestgen 1990). 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 10º and 20º centigrade are appropriate for spawning (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). Fertilized eggs are deposited in the gravel substrate and hatch within several days. There is an increased use of higher velocity waters in the spring, although this is countered by the movements into warmer, shallower backwaters and inundated bottomlands in early summer (McAda and Wydoski 1980, Tyus and Karp 1989, Osmundson and Kaeding 1989).

Habitat needs of larval razorback sucker 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 sucker are nocturnal and hide during the day. Diet during this period is mostly plankton (Marsh and Langhorst 1988). Young fish grow fairly quickly, with growth slowing once adult size is reached (McCarty and Minckley 1987). Little is known about habitat preferences of juvenile razorback sucker.

The razorback sucker is listed as endangered (U.S. Fish and Wildlife Service 1991c) with critical habitat (U.S. Fish and Wildlife Service 1994b). Critical habitat has been designated in the following locations for Arizona and New Mexico. In Arizona: the Colorado River and its floodplain from the confluence with the Paria River to Hoover Dam, including Lake Mead to the full pool elevation (Coconino and Mohave counties); the Colorado River and its floodplain from Hoover Dam to Davis Dam, including Lake Mohave to the full pool elevation (Mohave County); the Colorado River and its 100-year floodplain from Parker Dam to Imperial Dam, including Imperial Reservoir to the full pool elevation or 100 year floodplain whichever is greater (La Paz and Yuma counties); the Gila River and its 100-year floodplain, from the Arizona-New Mexico border including the San Carlos Reservoir to the full pool elevation (Graham, Greenlee, Gila, and Pinal counties); the Salt River and its 100-year floodplain from the old U.S. Highway 60/State Route 77 bridge to Roosevelt Diversion Dam (Gila County); the Verde River and its 100-year floodplain from Perkinsville to Horseshoe Dam, including Horseshoe Lake to the full pool elevation (Yavapai County). In New Mexico: the San Juan River and its 100-year floodplain from the Hogback Diversion to the Utah-New Mexico border (San Juan County).

The primary constituent elements identified as necessary for the survival and recovery of the razorback sucker are (U.S. Fish and Wildlife Service 1994b):

> **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 that are inhabited or potentially habitable by razorback sucker 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.

The razorback sucker was once abundant in the Colorado River and its major tributaries throughout the Colorado River Basin, occupying 3,500 miles of river in the United States and Mexico. Records from the late 1800s and early 1900s indicated the species was abundant in the lower Colorado and Gila River drainages (Kirsch 1889, Gilbert and Scofield 1898, Minckley 1973, Bestgen 1990). The decline of the razorback sucker in the lower Colorado River basin is primarily attributable to the impoundment of large portions of the Colorado River and its tributaries. These impoundments greatly modified natural river flows and affected razorback sucker by significantly reducing flows in some reaches, and modifying temperature regimes in others (U.S. Fish and Wildlife Service 1991c). Recruitment of razorback sucker in impoundments, and in habitats with natural flows, is limited by extreme predation pressure from introduced, fish-eating predators. Present distribution in the lower basin includes extant populations in lakes Mohave and Mead and small numbers in the Grand Canyon and down river from Davis Dam to the Mexican border. Populations have been reintroduced in the San Juan, Gila, Salt, and Verde rivers, but their current status is poorly known.

BIRDS

AMERICAN PEREGRINE FALCON (*Falco peregrinus anatum*)

Status of the Species (rangewide)

The American peregrine falcon is a medium-sized raptor with various subspecies distributed world-wide. The peregrine falcon is slate blue-gray on the back and wings, and white on the underside. Its head is black with a vertical "bandit's mask" pattern over the eyes. The wings are long and pointed, allowing the bird to reach flight speeds of up to 320 kph (200 mph) while diving in pursuit of prey (Cade 1982).

The American peregrine falcon occurs across much of North America. In the Southwest, peregrines are currently found almost anywhere large ($ 100 meters) cliffs are available, with the exception of the hottest and driest desert regions (Tibbitts and Ward 1990a, Ward 1993). Large cliffs overlooking chaparral, pinyon/juniper woodland, conifer forest, and riparian vegetation apparently provide high-quality habitat. These areas typically occur between 1,072 to 2,745 meters (3,500 to 9,000 feet) in elevation. Currently, suitable cliffs are occupied by breeding pairs almost wherever they occur in the Southwest, even where surface water may be many miles distant (Ward 1993). Breeding pairs appear to be year-round residents. The birds also occur throughout Arizona and New Mexico as migrants, transients, and wintering individuals.

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). The presence of riparian vegetation, rivers, or other surface water may be a key feature in determining the presence of an adequate food supply. Although some individuals may become adept hunters, it is estimated that peregrines successfully acquire prey in only 10 to 40 percent of their attempts (Roalkvam 1985, Cade 1982). The falcons compensate for this inefficiency by traveling extensively when hunting. During the breeding season, a hunting range of 10 miles may be considered typical (Craig 1986). Because of this, the Peregrine Falcon Recovery Plan for the Southwest Population (U.S. Fish and Wildlife Service 1984) recommends against land-use practices which adversely alter or eliminate the character of hunting habitat or the prey base within ten miles of an eyre.

Breeding season for peregrine falcons in the southwest extends from March 1 to late June or early July (Ward and Siemens 1995). Following territory establishment and courtship, nesting begins in April. Three to four eggs are laid on cliff ledges. Both parents incubate the eggs and care for the young. Fledglings leave the area by the end of July.

The American peregrine falcon was listed as an endangered species in 1970 (U.S. Fish and Wildlife Service 1970). No critical habitat has been designated for this species. The recovery plan for the southwestern population of peregrine falcons was completed in 1984 (U.S. Fish and Wildlife Service 1984). The primary cause of the falcon's decline was reproductive failure due to incorporation of organochlorine pesticides (e.g., DDT) into eggshells. Although use of DDT was banned in the United States by the 1980's, it is still applied in many Latin American countries. Activities that may currently limit maximum productivity include human-induced disturbance to nests, shooting, collection of nestlings for falconry, and land management practices that reduce the available prey base (e.g., overgrazing) (U.S. Fish and Wildlife Service 1984).

The historic breeding range of the peregrine falcon is from Canada and Alaska south into Baja California, the central Mexican highlands, and northwest Mexico, including the continental U.S. (except the southeast corner of the country) (U.S. Fish and Wildlife Service 1970). Currently, most breeding populations are confined to the mountainous areas of the western United States and Canada. Most birds probably winter in Mexico and Central and South America, although birds from the Southwest may remain throughout the year, and some from the northern states may overwinter in the Southwest.

Recovery of the peregrine falcon in the Rocky Mountain/Southwest Recovery 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, Tibbitts and Bibles 1990, Tibbitts and Ward 1990a and 1990b, Enderson *et al*. 1991, 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).

The arid southwest supports the largest concentration of peregrines known in North America, excluding Alaska (Burnham and Enderson 1987, Hays and Tibbitts 1989, Tibbitts and Bibles 1990, Brown 1991). In Arizona, over 200 breeding pairs are distributed statewide in suitable habitat, except the low elevation deserts of the southwestern quarter of the State. Populations in New Mexico are sparser and more spotty in distribution. More than 50 breeding pairs occur on National Forest System lands in Arizona, and about 25 pairs are in New Mexico.

Because of the remarkable recovery of peregrines, the Service has published an advanced notice of intent to propose delisting the falcon (60 FR 34406).

MEXICAN SPOTTED OWL (*Strix occidentalis lucida*)

Status of the Species (rangewide)

The spotted owl is a moderate to large sized owl and mottled in appearance, with irregular white and brown spots on its abdomen, back, and head. Several thin white bands mark an otherwise brown tail. Unlike most owls, spotted owls have dark eyes. Adult male and female spotted owls are similar in plumage characteristics, exhibit reversed sexual dimorphism (females are larger than males), and can be readily distinguished by differences in voice pitch. Juveniles, subadults, and adults (>27 months of age) can be distinguished by plumage characteristics (Forsman 1981, Moen *et al.* 1991).

There are three recognized subspecies of spotted owls found in the United States: California spotted owl (*S.o. occidentalis*), northern spotted owl (*S. o. cuarina*), and Mexican spotted owl. The white spots of the Mexican spotted owl are typically larger and more numerous giving it a lighter appearance. The Mexican subspecies is also geographically isolated from the others. Electrophoretic analysis by Barrowclough and Gutierrez (1990) found allelic differences between the Mexican and other subspecies.

Mexican spotted owls breed sporadically and do not nest every year (Ganey 1988). In good years most of the population will nest; in other years only a small portion of pairs will nest, and fewer will be successful (Fletcher and Hollis 1994). Mexican spotted owl reproductive chronology varies somewhat across the range of the owl. In Arizona, courtship apparently begins in March with pairs roosting together during the day and calling to each other at dusk (Ganey 1988). Eggs are laid in late March or, more typically, early April. Incubation begins shortly after the first egg is laid, and is performed entirely by the female (Ganey 1988). The incubation period for the Mexican spotted owl is assumed to be 30 days (Ganey 1988). During incubation and the first half of the brooding period, the female leaves the nest only to defecate, regurgitate pellets, or to receive prey from the male, who does all or most of the foraging (Forsman *et al.* 1984, Ganey 1988). Eggs usually hatch in early May, with nestling owls fledging four to five weeks later, and then dispersing in mid September to early October (Ganey 1988).

Mexican spotted owls nest, roost, forage, and disperse in a diverse array of biotic communities. Nesting habitat is typically in areas with complex forest structure or rocky canyons, and contain mature or old-growth stands which are uneven-aged, multi-storied, and have high canopy closure (Skaggs and Raitt 1988, Ganey and Balda 1989a, 1994; McDonald *et al.* 1991). In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons. Elsewhere, the majority of nests appear to be in Douglas-fir trees (Fletcher and Hollis 1994, Seamans and Gutierrez 1995). A wider variety of tree species is used for roosting; however, Douglas-fir is the most commonly used species (Ganey 1988, Fletcher and Hollis 1994, Zwank *et al.* 1994). Foraging owls use a wider variety of forest conditions than for nesting or roosting. In northern Arizona, owls generally foraged slightly more than expected in unlogged forests, and less so in selectively logged forests (Ganey and Balda 1994). However, patterns of habitat use varied among study areas and individual birds, making generalizations difficult.

Seasonal movement patterns of Mexican spotted owls are variable. Some individuals are year-round residents within an area, some remain in the same general area but show shifts in habitat-use patterns, and some migrate considerable distances (20-50 kilometers / 12-31 miles) during the winter, generally migrating to more open habitats at lower elevations (Ganey and Balda 1989b, Ganey *et al.* 1992, Willey 1993). Home-range size of Mexican spotted owls appears to vary considerably among habitats and/or geographic areas (Ganey and Block 1995), ranging in size from 261 to 1,487 hectares for individual birds, and 381 to 1,551 hectares for pairs (Ganey and Balda 1989b, Willey 1993). Little is known about habitat use by juveniles during natal dispersal. However, owls apparently moved through a variety of habitats, including spruce-fir and mixed-conifer forests, pinyon-juniper woodland, mountain shrublands, desert scrublands, and desert grasslands in dispersal movements over distances of up to 145 kilometers (90 miles) (Willey 1993).

Mexican spotted owls consume a variety of prey throughout their range but commonly eat small and medium sized rodents such as woodrats (*Neotoma* spp.), peromyscid mice, and microtine voles. They may also consume bats, birds, reptiles, and arthropods (Ward and Block 1995). Habitat correlates of the owl's common prey emphasizes that each prey species uses a unique microhabitat. Deer mice (*Peromyscus maniculatus*) are ubiquitous in distribution in comparison to brush mice which are restricted to dry, rocky substrates, with sparse tree cover and a strong oak component. Mexican woodrats (*N. mexicana*) are typically found in areas with considerable shrub or understory tree cover and high log volumes. Mexican voles (*Micotus mexicanus*) are associated with high herbaceous cover, primarily grasses; whereas, long-tailed voles (*M. longicaudus*) are found in high herbaceous cover, primarily forbs, with many shrubs, and limited tree cover. A diverse prey base is dependant on the availability and quality of diverse habitats.

The Mexican spotted owl was listed as a threatened species on April 15, 1993 (U.S. Fish and Wildlife Service 1993). Two primary reasons were cited for listing: historical alteration of its habitat as a result of timber management practices, specifically the use of even-aged silviculture, plus the threat of these practices continuing, as provided in National Forest Plans. The danger of catastrophic wildfire was also cited as a potential threat for additional habitat loss. Riparian areas were also noted as an area of concern, both lower and mid-level elevations (Fish and Wildlife Service 1993). Critical habitat was designated for the species on June 6, 1995 (U.S. Fish and Wildlife Service 1995a). However, pending compliance with the National Environmental Policy Act, critical habitat for the Mexican spotted owl was 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). Critical habitat was revoked by the Service (63 FR 14378; March 25, 1998). The "Recovery Plan for the Mexican Spotted Owl" was approved in 1995 (U.S. Fish and Wildlife Service 1995b), and provides a detailed account of the taxonomy, biology, and reproductive characteristics of the owl, and identifies threats and recovery criteria.

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) provides for three levels of habitat management: protected areas, restricted areas, and other forest and woodland types. "Protected habitat" includes all known owl sites, and all areas in mixed conifer or pine-oak forests with slopes >40% where timber harvest has not occurred in the past 20 years, and all reserved lands. "Protected Activity Centers" (PACs) are delineated around known Mexican spotted owl sites. A PAC includes a minimum of 243 hectares (600 acres) designed to include the best nesting and roosting habitat in the area. The recommended size for a PAC includes, on average from available data, 75% of the foraging area of an owl. The management guidelines for protected areas from the recovery plan are to take precedence for activities within protected areas. "Restricted habitat" includes mixed conifer forest, pine-oak forest, and riparian areas; the recovery plan provides less specific management guidelines for these areas. The recovery plan provides no owl specific guidelines for "other habitat."

The range of the Mexican spotted owl extends from the southern end of the Mexican Plateau north, discontinuously through the Sierra Madre Occidental and Oriental, 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 the Mexican spotted owl occurs across a broad geographic area, it is fragmented in its distribution. The owl occurs in disjunct localities that correspond to isolated mountain systems and canyons in a physically diverse landscape in southwestern United States and Mexico. Owl surveys in the United States, conducted from 1990 through 1993, indicate that the species persists in most locations reported prior to 1989, with the major exception of riparian habitats in the lowlands of Arizona and New Mexico.

The range of the Mexican spotted owl in the United States has been divided into six recovery units as identified in the recovery plan (U.S. Fish and Wildlife Service 1995b, part II.B.). An additional five recovery units were designated in Mexico. The recovery plan identifies recovery criteria by recovery unit. The Upper Gila Mountain Recovery Unit has the greatest known concentration of owl sites in the United States. This unit is considered a critical nucleus for the owl because of its central location within the owl's range, and presence of over 50 percent of the known owls. The other recovery units in the United States, listed in decreasing order of known number of owls, are: Basin and Range-East, Basin and Range-West, Colorado Plateau, Southern Rocky Mountain-New Mexico, and Southern Rocky Mountain-Colorado.

The primary manager of lands supporting owls in the United States is the Forest Service, with approximately 90 percent of the Mexican spotted owls known to exist north of Mexico (Fish and Wildlife Service 1995b). At the end of the 1995 field season, the Forest Service reported a total of 866 management territories established in locations where at least a single owl had been identified (U.S. Forest Service, *in litt*. November 9, 1995). Other lands currently occupied by Mexican spotted owls in the United States include National Park Service, Bureau of Land Management, Tribal, and Department of Defense. Information on the status of the owl on these lands is typically local and/or unavailable. There are inadequate data at this time to estimate population trend.

Fletcher (1990) estimates that 1,037,000 acres of Mexican spotted owl habitat were converted from suitable (providing all requirements of the owl, such as nesting, roosting, and foraging) to capable (once suitable, but no longer so). Of this, about 80 percent, or 816,000 acres, was a result of human management activities, whereas the remainder was converted more or less naturally, primarily by wildfire. Little research has been conducted on the causes of mortality of the spotted owl. Contributing factors are attributed to: increased vulnerability of predation by great horned owls, northern goshawks, red-tailed hawks, and golden eagles due to habitat alteration; starvation; and accidents or collisions with vehicles or structures.

MAMMALS

LESSER LONG-NOSED BAT (*Leptonycteris curasoae yerbabuenae*)

Status of the Species (rangewide)

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 (*Cereus giganteus*) and organ pipe cactus (*Cereus thurberi*) and from paniculate agaves, such as Palmer's agave (*Agave palmeri*) and Parry's agave (*A. paryi*) (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 odor, and high levels of pollen protein with relatively low levels of nectar sugar concentrations (Slauson 1996). Parry's agave demonstrates many (although 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, although 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. 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) and cannot withstand prolonged exposure to cold. 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. Litter size is one. After the young are weaned these colonies disband in July and August; some females and young move to higher elevations, ranging up to 5,500 feet, 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 (U.S. Fish and Wildlife Service 1997). Throughout the night between foraging bouts both sexes will rest in temporary night roosts (Hoffmeister 1986).

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, capable of flight speeds up to 14 miles per hour. 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 (V. Dalton, Tucson, Arizona, pers. comm. 1997; Y. Petryszyn, University of Arizona, Tucson, pers. comm. 1997). A substantial portion of the lesser long-nosed bats at the Pinacate Cave in Sonora are suspected to fly 25 to 31 miles each night to foraging areas in Organ Pipe Cactus National Monument (U.S. Fish and Wildlife Service 1997). Lesser long-nosed bats have been recorded visiting individual blooming Palmer's agaves in excess of 1,000 visits per night (R. Sidner, Tucson, Arizona, pers.comm. 1997), while other agaves may not be visited at all (L. 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 (Y. Petryszyn, pers. comm. 1997).

The lesser long-nosed bat was listed (originally, as *Leptonycteris sanborni*; Sanborn's long-nosed bat) as endangered in 1988 (U.S. Fish and Wildlife Service 1988). No critical habitat has been designated for this species. The recovery plan was completed in 1997 (U.S. Fish and Wildlife Service). 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 (U.S. Fish and Wildlife Service 1997). 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.

Considerable evidence exists suggesting an interdependence of the *Leptonycteris* bat species and certain agaves and cacti. Activities that adversely affect the density and productivity of saguaros and paniculate agaves may adversely affect populations of lesser long-nosed bats (Abouhalder 1992, U.S. Fish and Wildlife Service 1997). Excess harvest of agaves in Mexico, collection of cacti in the United States, and the conversion of habitat due to urban expansion, agricultural uses, livestock grazing, and other development may contribute to the decline of long-nosed bat populations (U.S. Fish and Wildlife Service 1988). Livestock grazing in areas with agaves may effect the long-nosed bat, particularly under high intensity use. Intense grazing could result in trampling of young agaves and cacti, soil compaction, erosion, alteration of the plant community species composition and abundance, and changes in the natural fire regime. Activities that directly or indirectly promote invasion or increased density of nonnative grasses, particularly Lehmann lovegrass (*Eragrostis lehmanniana*), species of *Bromus*, and Mediterranean grass (*Schismus barbatus*), may result in increased fire frequency and intensity (Minnich 1994, Rogers and Steele 1980) which in turn may have related impacts to paniculate agave and columnar cacti populations. Grasses are probably the strongest competitor of agave seedlings (L. Slauson, pers. comm. 1997). Livestock also feed on flower stalks, which are a primary nectar source for foraging bats.

Food requirements of the lesser long-nosed bat are very specific. Adequate numbers of flowers and/or fruit are required within foraging range of day roosts and along migration routes to support large numbers of this bat. Locations of good feeding sites therefore play an important role in determining availability of potential roosting sites, and roost/food requirements must be considered jointly when discussing the habitat requirements of this bat. A suitable day roost is probably the most important habitat requirement, but potentially suitable roosts must be within reasonable foraging distances of sufficient amounts of required foods before they will be used by this bat. It seems evident that the lesser long-nosed bat forages over wide areas and that large roosts require extensive stands of cacti or agaves for food. Therefore, destruction of food plants many kilometers from a roost could have a negative impact on this bat (U.S. Fish and Wildlife Service 1997).

The lesser long-nosed bat recovery plan (U.S. Fish and Wildlife Service 1997) identifies the need to protect foraging areas and food plants. Columnar cacti and agaves provide critical food resources for this bat. Populations of these plants need continued protection to sustain nectar-feeding bat populations. A critical need in this area is information about the size of the foraging areas around roosts so that adequate areas can be protected. This information will indicate the minimum area needed to support a roost of nectar- and fruit-eating bats.

Known major roost sites include 16 large roosts in Arizona and Mexico (U.S. Fish and Wildlife Service 1997). 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.

PLANTS

ARIZONA HEDGEHOG CACTUS (*Echinocereus triglochidiatus* var. *arizonicus*)

Status of the Species (rangewide)

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. Stems arise from the base of the plant and are large, typically nine to 16 inches high and three to four in diameter. Specimens as large as approximately 24 inches 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 inches 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 1982) 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 (U.S. Bureau of Land Management 1996). 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.* 1979, Fish and Wildlife Service 1979, Fish and Wildlife Service 1991d). 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^{o}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.* 1979).

The Arizona hedgehog cactus (*Echinocereus triglochidiatus* Engelmann var. *arizonicus* (Rose *ex* Orcutt) L. Benson), was listed as an endangered species on November 26, 1979 (U.S. Fish and Wildlife Service 1979). 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 Endangered Species Act. If the cactus in east-central Arizona is verified as Arizona hedgehog cactus, this would constitute a significant range expansion and would require a reassessment of abundance and threats.

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.

Arizona hedgehog cactus habitat is managed by the Globe Ranger District of the Tonto National Forest, Arizona State Land Department, Safford Field Office of the Bureau of Land Management, 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. Threats to the Arizona hedgehog cactus include habitat destruction by mining, mineral exploration, road construction, power-line construction and utility corridors, off-highway vehicle 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 (U.S. Fish and Wildlife Service 1979 and 1991d, Arizona Game and Fish Department 1994, Tonto National Forest 1996).

ALLOTMENT-BY-ALLOTMENT ANALYSIS AND BIOLOGICAL OPINIONS

Individual allotment biological opinions follow. These are presented in alphabetical order according to the name of the allotment.

BEAR VALLEY ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Coronado National Forest, Nogales Ranger District

Allotment Acres:
- 22,710 total
- 15,575 full/potential capacity range

Projected Stocking Density
- 4,200 animal months
- 3.7 acres per animal month

Permitted Use:
- 350 cow/calf, 1/1-12/31

Projected Use:
- 160 cow/calf, 1/1-12/31, 1998
- 180 cow/calf, 1/1-12/31, 1999
- 200 cow/calf, 1/1-12/31, 2000

Major Vegetation Type:
- Desert grassland, broadleaf woodland

Major Drainages:
- Sycamore Creek

Elevation:
- 3,500 to 6,500 feet

Type of Grazing System:
- 7 pasture deferred /rest rotation

Allotment Condition:
- Watershed analysis indicates that half of the allotment is in satisfactory and half of the allotment is in impaired soil condition.
- 1997 range condition data indicate that most of the allotment is in good condition.
- 100% of the Sycamore Creek riparian area south of Ruby Road is in satisfactory condition.

Listed Species Adversely Affected:

- Sonora chub and critical habitat
- Lesser long-nosed bat

Ecological condition and/or management action that contributes to adverse effects:

- Grazing occurs on areas of impaired soils condition within the Sycamore Creek watershed.
- Livestock grazing occurs in pastures during the time agaves are producing flower stalks, and information on the abundance and distribution of agaves on the allotment is lacking.

Consultation Period:

- 3 Years

SONORA CHUB AND DESIGNATED CRITICAL HABITAT ON THE BEAR VALLEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The most reliable habitat for Sonora chub in the United States is Sycamore Creek. All livestock use is excluded from Sycamore Creek south of Ruby Road. Most pools within Sycamore Creek are ephemeral in time and space, depending on movement and deposition of bedload during flooding. There are only a few pools that can be considered permanent, and even these can vary considerably in volume and surface extent of water depending on the amount of sediment deposition and erosion, precipitation, and base flow of the stream. Seasonally, during high streamflow events, Sonora chub may disperse widely.

The presence of nonnative fish species in Sycamore Creek is likely limited due to the severity of environmental conditions. The last nonnative fish recorded in Sycamore Creek was the green sunfish, more than ten years ago (J. Stefferrud, Coronado National Forest, pers. comm., 1998).

EFFECTS OF THE ACTION

Livestock have been excluded from Sycamore Creek south of Sycamore Corals, north of Ruby Road, throughout the Pajarito Wilderness and Goodding Research Natural Area. This, with other modifications to livestock management, have resulted in recent improvements in range conditions. However, ongoing livestock grazing activities on the

Bear Valley Allotment continue to contribute to the overall degradation of the channel and aquatic habitat conditions in Sycamore Creek and adversely affect the Sonora chub and its designated critical habitat. The Sycamore Creek watershed is naturally fragile and highly sensitive to disturbance, the soils are shallow and rocky, productivity is low, precipitation can be intense, and the valley bottom has little floodplain to dissipate flood energy. All of these factors contribute to the flashiness of the hydrograph and movement and deposition of sediments.

The effects that livestock grazing can have on riparian and aquatic habitats, both directly and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Fleischner 1994). Livestock grazing activities can contribute to changes in surface runoff quantity and intensity, sediment transport, and water holding capabilities of the watershed. Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation. Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying. Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass.

Livestock grazing in the Sycamore Creek watershed has been on-going over many decades, occurs throughout the watershed, and thus has the greatest overall impact on watershed/ecological status. Twenty percent of the watershed has slopes less than 15 percent. Within this portion, soil conditions are impaired or unsatisfactory, with low vegetative ground cover, and encroachment of woody tap-rooted vegetation. These conditions on the more gently-sloping areas which are immediately adjacent to the channel system of Sycamore Creek can be attributed to cattle grazing. The most recent range production/utilization study is more than 20 years old. The effects of livestock grazing activities can be additive, exacerbating the naturally fragile and highly sensitive watershed conditions. These factors likely contribute to degrading pool habitat quality for Sonora chub or even hastening the surface desiccation of these pools.

The potential of nonnative fish species invasion is a persistent threat. A sequence of wet years and the permanent habitats provided by livestock water sources could provide nonnative fish contamination sources, which, once these fishes become established, may be very difficult to eliminate.

The Bear Valley Allotment, together with the adjacent Montana Allotment, contains the entire United States distribution of Sonora chub. Sonora chub in the United States are at the edge of the species' range, are isolated from other populations, and persist in marginal habitats. A series of environmental perturbations made worse by degraded watershed/ecological conditions could cumulatively result in extirpation of the species from the United States. Therefore, any actions which contribute to reducing the probability of survival of the Sonora chub in the United States is viewed very seriously, and every possible effort must be taken to protect the Sycamore Creek population of Sonora chub.

CUMULATIVE EFFECTS

All habitat occupied by Sonora chub within Sycamore Creek on the Bear Valley Allotment is protected from grazing by fencing. However, trespass cattle from Mexico range into the lower end of Sycamore Canyon. The International Border fence is remote and difficult to maintain. Other activities within the watershed that decrease ground cover or increase soil instability accelerate erosional processes. The 24-mile road network in the watershed collects and concentrates runoff, which increases rilling and gullying. The Ruby Road crossing of Sycamore Creek is a wet crossing that requires maintenance by heavy equipment following the occurrence of floods. During runoff, the Ruby Road crossing may be inhabited by Sonora chub. Recreation and vehicle use around the Hank and Yank Spring site has compacted soils and denuded surface vegetation. While no specific data are available for the Sycamore drainage, degradation of soil and water caused by mining is well documented in adjacent watersheds. During times of drought the population of Sonora chub is most vulnerable to both natural and human-induced impacts (e.g., predation, disease, low dissolved oxygen, high water temperatures, pollution, and sedimentation).

CONCLUSION

After reviewing the current status of the Sonora chub, the environmental baseline in the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Bear Valley Allotment are not likely to jeopardize the continued existence of Sonora chub, and are not likely to destroy or adversely modify designated critical habitat.

INCIDENTAL TAKE STATEMENT
Sonora Chub on the Bear Valley Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of Sonora chub expected to result from the ongoing grazing activities on the Bear Valley Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support the fish. The Service anticipates, however, that incidental take of the Sonora chub associated with the proposed action will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of Sonora chub from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve or maintain good or better status, under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the Sycamore Creek watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Sonora chub or 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:

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Sycamore Creek watershed.

2. Reduce direct impacts to stream course and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the Sonora chub. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status, morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of Sycamore Creek. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. By September 30, 2000, evaluate the distribution of nonnative fishes in the Sycamore Creek watershed, including stock tanks, waters used by livestock, and potential sources of nonnative fishes. In cooperation with the Service and Arizona Game and Fish Department, develop a schedule and begin implementation of periodic fisheries inspections of these sites and, as appropriate, the reduction or elimination of nonnative fishes within the Sycamore Creek watershed using methods which do not harm the Sonora chub.

2. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of livestock exclosures established for protection of Sonora chub habitat in the Sycamore Creek watershed south of Ruby Road.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Sycamore Creek watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the Sonora chub (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) construction and repair of fences for protection of Sonora chub habitat; 6) progress made toward completion of multi-year Terms and Conditions; and 7) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the Sycamore Creek exclosure, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Sonora Chub on the Bear Valley Allotment

1. In cooperation with appropriate parties, design a program to eliminate trespass Mexican cattle into Sonora chub habitat in the lower end of Sycamore Canyon.

2. To assess the long-term threats associated with nonnative fishes in the watershed, develop a database (GIS-based) that includes locations of all stock tanks, reservoirs, and stream reaches within the watershed (including those on private land), their potential for supporting nonnative fishes, their history of supporting nonnative fishes, and their history of maintenance, improvements, and renovation activities.

3. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

4. Implement the Sonora chub recovery plan, as appropriate.

LESSER LONG-NOSED BAT ON THE BEAR VALLEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the Action Area)

Lesser long-nosed bats require suitable forage plants (paniculate agaves and saguaros) and suitable roost sites. It is unknown whether the bat actually roosts within or adjacent to the Bear Valley Allotment. Mines and caves occurring throughout the allotment could potentially provide suitable roost sites. Any potential roosts in the area would probably be transitory (non-maternity) roosts used by adults and/or young bats in summer or fall. Agaves, and to a lesser extent saguaros, occur in considerable numbers throughout much of the allotment. The closest known lesser long-nosed bat roost site is approximately 40 miles.

Based on known distances lesser long-nosed bats have traveled from roost sites to foraging areas, potential foraging habitat may extend in a 40-mile radius from roosts. Because of the presence of potential roost sites and the availability of suitable forage plants, the Bear Valley Allotment is considered lesser long-nosed bat foraging habitat.

EFFECTS OF THE ACTION

Direct effects to lesser long-nosed bats as a result of grazing activities are not expected because these activities are unlikely to affect roosts and no roosts are known from the Bear Valley Allotment. However, it is possible that undetected roosts occur within the allotment.

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. Saguaros occur on slopes, bajadas, and in valleys. Impacts due to livestock grazing activities 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). 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.

No long-term investigation has documented the influence of grazing on agave mortality or flowering stalk herbivory. Individual paniculate agave plants only bloom once in their life cycle, about 20 years. However, agave stalks as they begin to bolt are particularly palatable to domestic livestock and wild herbivores, including deer, javelina, rodents, and rabbits (M. Hawks, University of Arizona, Tucson, pers. comm. 1997; W. Hodgson, pers. comm. 1997). Cattle probably trample young agaves, and have been known to "walk down" agave flowering stalks (T. Cordery, Arizona Ecological Services Field Office, pers. comm., 1998). Agave germination and seedling establishment may be influenced by degraded ecological conditions such as soil compaction, erosion, reduced infiltration, and altered plant species diversity and abundance. Effects to bat forage plants 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 generally 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).

The 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 area to reproduction, survival, and growth of the bat. The Bear Valley Allotment is considered to be foraging habitat. Areas with high densities of paniculate agaves and saguaros may be particularly important to the bat, especially if those high density sites are in close proximity to roosts. The distribution and abundance of paniculate agaves on the

Bear Valley Allotment, relative to the distribution of livestock during the agave bolting period (April 15 through September 15), has not been evaluated. The presence of roost sites on the allotment are not known and thorough surveys are lacking.

CUMULATIVE EFFECTS

On a landscape level, paniculate agave populations appear to be well dispersed. However, the percentage of the agave population which successfully produces flowering stalks is unknown. Large segments of the range of the lesser long-nosed bat and its forage plants are exposed to federal, state, tribal, and private livestock grazing management activities. The overall affects of grazing (herbivory, trampling, and ecosystem changes affecting plant reproduction, recruitment, and establishment) on bat forage plants is unknown. Lesser long-nosed bat foraging ecology and energy budget are largely unknown. This, combined with potential disturbance of roost sites and loss of habitat due to urbanization and other activities on large tracts of State and private lands within the range of the bat, contributes to negative impacts on the species. The impacts due to mining activities in the vicinity of the Bear Valley Allotment are unknown. The effects of all these actions are considered cumulative to the proposed action.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Bear Valley Allotment are not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species, therefore none will be affected.

INCIDENTAL TAKE STATEMENT
Lesser Long-nosed Bat on the Bear Valley Allotment

See also section at end of this document called "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take expected to result from the ongoing grazing activities on the Bear Valley Allotment is harm, which occurs through the effects to habitat that alters the availability of food plants, affecting the suitability of the habitat to support the lesser long-nosed bat. The Service anticipates, however, that incidental take of the lesser long-nosed bat associated with the proposed action will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and it is difficult to detect and analyze the results of changes in bat foraging behavior and distribution, and reduced foraging efficiency. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, and trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity) within the natural capabilities of the landscape within all pastures on the allotment with high density agave or saguaro sites.

2. Livestock herbivory of agave flowering stalks contributes to limiting the abundance or distribution of lesser long-nosed bat food plants (*Agave palmeri*, *A. paryi*, and *A. deserti*).

3. Required monitoring and reporting of livestock utilization levels are not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the lesser long-nosed bat.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, and range conditions) on the allotment in pastures with high density agave or saguaro sites.

2. Livestock grazing does not contribute to limiting the food resources (*A. palmeri*, *A. paryi*, and *A. deserti*) available to the lesser long-nosed bat by reducing the distribution or abundance of flowering agaves below the natural capabilities of the landscape.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

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

1a. By April 15, 1999, evaluate the abundance and distribution of lesser long-nosed bat food plants (*A. palmeri*, *A. paryi*, *A. deserti* and saguaro) on the Bear Valley Allotment, identify high density agave sites, and protect these sites to prevent livestock herbivory of agave flowering stalks. One method would be to preclude livestock access to high density agave sites during the agave bolting period from April 15 through September 15.

<u>or</u>

1b. By April 15, 1999, conduct a landscape level analysis (Forest wide) of lesser long-nosed bat food plant (*A. palmeri*, *A. paryi*, and *A. deserti*) abundance and distribution, and livestock use patterns during the agave bolting period (April 15 through September 15). With this information and in cooperation with the Service, reassess if/how/where livestock may be contributing to limiting the food resources available to the lesser long-nosed bat. By April 15, 1999, develop and initiate a monitoring/research plan to evaluate the relationship between livestock grazing and paniculate agave distribution, abundance, flowering, recruitment, and ecology.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) in pastures within the allotment with high density agave or saguaro sites during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the lesser long-nosed bat (e.g., high density agave sites). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) progress made toward completion of multi-year Terms and Conditions; and 5) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Lesser Long-nosed Bat on the Bear Valley Allotment

1. Continue cooperative efforts to survey for lesser long-nosed bat roosts, and protect and monitor these sites.

2. Implement the lesser long-nosed bat recovery plan, as appropriate.

BONEYARD ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:
- 4,478 total
- 3,645 full/potential capacity range

Projected Stocking Density
- 795 animal months
- 4.6 acres per animal month

Permitted Use:
- 159 cow/calf, 6/1-10/31

Projected Use:
- 159 cow/calf, 6/1-10/31

Major Vegetation Type:
- Ponderosa pine, mixed conifer, grassland/meadow

Major Drainages:
- Boneyard Creek
- Coyote Creek

Elevation:
- 8,400 to 9,100 feet

Type of Grazing System:
- 3 pastures, deferred rotation

Allotment Condition:
- 1987 TES indicates that 70% of the allotment is in satisfactory soil condition.
- 1998 inspection indicates that most of the allotment is in poor condition and active erosion is occurring.

Listed Species Adversely Affected:
- Loach minnow

Ecological condition and/or management action that contributes to adverse effects:
- Livestock grazing in the Boneyard, Middle and Grassy Hollow pastures generates sediments that enter occupied loach minnow habitat in the North Fork of the East Fork of the Black River.

Consultation Period:
- 3 Years

LOACH MINNOW ON THE BONEYARD ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Boneyard Allotment is a rather small allotment (4,478 acres) in the upper watershed of the Black River drainage. Within an elevation range of 8,400 to 9,100 feet, the vegetation communities are ponderosa pine and mixed conifer forests, and large areas of open grassland or meadow. There are three pastures on the allotment: Boneyard, Middle, and Grassy Hollow. These lie within the watershed of Coyote and Boneyard creeks.

Coyote Creek crosses through the lower portion of the allotment within the Grassy Hollow Pasture, about 3 miles upstream from its confluence with the East Fork of the Black River, just downstream of the area known as Three Forks of the Black River. Most of the Grassy Hollow and Middle Pasture are within the Coyote Creek watershed. Coyote Creek is typically perennial in much of the reach through the allotment. Livestock have direct access to Coyote Creek and the defined ephemeral drainages that feed from both pastures. Within the meadows, the stream channel is incised with sloughing banks. No in-stream structures exist that might capture sediments from the runoff from these pastures. Because the soil condition for this allotment is generally satisfactory (71%), even though range condition is poor, some opportunity exists for filtration of sediments by vegetation. However, once sediments reach a defined drainage channel, transport directly into the East Fork of the Black River is possible. With direct access by livestock to the stream channels, it is likely that soils disturbed along the channels contribute a measurable amount of sediments downstream.

The Boneyard Pasture and part of the Middle Pasture are within the Boneyard Creek watershed. About half of the Boneyard Pasture appears to drain into Sierra Blanca

Lake, an impoundment created by the construction of an earthen dam that empties directly into Boneyard Creek approximately 3 miles above Three Forks. It is likely that this reservoir functions to trap sediments and nutrients that might be generated through livestock grazing on that portion of Boneyard Pasture, and precludes their entry into Boneyard Creek. The balance of the Boneyard Pasture and a small section of Middle Pasture drain into a portion of Williams Valley that, in turn drains into Boneyard Creek without first flowing through Sierra Blanca Lake. Runoff in this portion of the allotment travels overland or in a highly eroded channel from 1 to about 4 miles prior to reaching perennially flowing water at the Boneyard Springs complex. Much of this flow is through the Nutrioso Summer Allotment (Boneyard and Sulzberger pastures) which may provide some opportunity for the filtration of sediments when the flow is spread overland across the wide, relatively low-gradient Williams Valley. Sediments flowing into the incised channel on the east end of the Boneyard and Middle pastures of the Boneyard Allotment are likely to travel into Boneyard Creek and then to the North Fork of the East Fork of the Black River, although "XE" Tank (an in-channel earthen stock tank) may provide some measure of sediment control. Boneyard Creek appears to be heavily embedded and is characterized by incised channels.

On the Boneyard Allotment, there has been poor distribution of livestock which has contributed to ongoing erosion problems. Areas easily accessible to livestock have been overgrazed, and less accessible areas have been ungrazed. Overall, range condition on the allotment is mostly poor with low plant vigor. The Forest Service believes the allotment may be over-stocked. Elk contribute to heavy forage utilization on the allotment, and often use areas before livestock enter the allotment.

The Forest Service has implemented several erosion control structures to reduce sediment transport into the North Fork of the East Fork of the Black River and East Fork of the Black River from Boneyard and Coyote creeks.

Loach minnow do not occur within the boundary of the Boneyard Allotment. However, in 1996, the species was discovered in the North Fork of the East Fork of the Black River, near Three Forks of the Black River. This population is at the highest known elevation for loach minnow, approximately 8,200 feet. Based on additional sampling in 1997, it appears that the population of loach minnow in the East Fork of the Black River extends from about 1 mile downstream of the Coyote Creek confluence (approximately at the confluence with Open Draw), and upstream in the North Fork of the East Fork of the Black River to about the confluence with Boneyard Creek (about 2.5 miles total). Potential loach minnow habitat may extend downstream in the East Fork of the Black River an unknown distance; upstream, potential habitat includes Boneyard Creek perhaps up to the Boneyard Springs complex, and lower Coyote Creek.

Populations of loach minnow in the North Fork of the East Fork of the Black River and East Fork of the Black River are considered within the action area of ongoing livestock grazing within the entire Boneyard Allotment. Nonnative aquatic species within the East Fork of the Black River may impact the loach minnow. Brown trout and brook trout are active fish predators, fathead minnow may compete for habitat with the loach minnow, and crayfish add to sedimentation problems. Degraded watershed conditions due to roads and livestock management, and nonnative species appear to be the greatest threats to this small population of loach minnow. Periodic flooding that cleans riffles of embedding sediments is important to the survival of loach minnow.

EFFECTS OF THE ACTION

Ongoing livestock grazing activities on the Boneyard, Middle, and Grassy Hollow pastures of the Boneyard Allotment generates sediments and/or nutrients that degrade occupied loach minnow habitat in the North Fork of the East Fork of the Black River and the East Fork of the Black River. Degraded watersheds due to over-stocking of livestock, over-utilization of forage by livestock and wildlife, and active erosion of stream channels exacerbated by the presence of livestock in the streams, may contribute to altering the hydrologic regime (water quality, quantity, intensity, duration, and pattern) of Boneyard and Coyote creeks, thereby increasing erosion and sedimentation into occupied loach minnow habitat in the North Fork of the East Fork of the Black River, and East Fork of the Black River, respectively. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Sediment deposition may eliminate the under-cobble pockets needed by loach minnow, making potential habitat unsuitable. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the East Fork of the Black River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993).

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species and small population in the East Fork of the Black River, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods, especially during the spawning season. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function.

Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The loach minnow population in the East Fork, and North Fork of the East Fork of the Black River, is small and may be highly sensitive to environmental perturbations (e.g., altered stream flow, sedimentation, water temperatures). This is the highest elevation site known for the species. In order to interpret the ramification of management actions, ecological/biological information on the species is needed, especially related to spawning periods. Any direct monitoring of the loach minnow population must be undertaken very cautiously.

The combined affects of livestock management activities associated with the Boneyard, Nutrioso Summer, Williams Valley, Black River, and other allotments in the watershed, contribute to a serious concern regarding the viability of the loach minnow population in the East Fork of the Black River. The management of these allotments in sum, results in alteration of the hydrologic regime and contributes to deterioration of the ecosystem. There have been recent efforts by the Forest Service to ameliorate some of the erosion and sedimentation problems aggravated by ongoing livestock grazing activities on these allotments. The Forest Service is developing plans for the construction of sediment traps and erosion control structures. In addition, the Black River Allotment, which includes occupied loach minnow habitat at Three Forks, has been rested pending future consultation with the Service. These actions are a good start, have potential for success, and need to be monitored to determine their effectiveness. Continued assertive management by the Forest Service is necessary in order to not further risk the survival and recovery of the loach minnow in the East Fork of the Black River.

CUMULATIVE EFFECTS

The majority of the East Fork of the Black River watershed is administered by the Forest Service. Several past factors are likely to have affected the watershed and tributary streams, including Coyote and Boneyard creeks, such as roads, timber harvest, livestock grazing, fire occurrence, fire suppression, recreation, prairie dog eradication, past CCC Camp activities at Three Forks, invasion of nonnative Kentucky bluegrass (*Poa pratensis*) in the wet bottoms, and the presence of nonnative aquatic species that may compete with or feed on loach minnow. Elk may have some affect on the water quality. Numerous small, private inholdings within the Forest also affect watershed conditions. The Boneyard Springs complex is on private land. However, many of the private inholdings are managed as part of a Federal livestock permit. With the exception of some actions associated with private inholdings, most activities within the East Fork of the Black River watershed would fall under Federal authority.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Boneyard Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Boneyard Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Boneyard Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the East Fork of the Black River watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the East Fork of the Black River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the East Fork of the Black River watershed to determine factors affecting stream flow (water quality,

quantity, intensity, channel morphology, etc.) in the East Fork of the Black River and in the North Fork of the East Fork of the Black River. The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status, morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of East Fork of the Black River watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the exclusion of livestock from the tributaries of the East Fork of the Black River.

2. Continue the fish monitoring program established by the Forest Service, expand to include surveys for loach minnow downstream of occupied habitat in the East Fork of the Black River, and upstream in Coyote and Boneyard creeks. All work is to be accomplished by a journey-level fishery biologist (or equivalent). As necessary, assess the status of the loach minnow population at Three Forks, work to ascertain spawning season information, and coordinate with other fish survey efforts. This is a small population of loach minnow and may be susceptible to adverse affects from over sampling.

3. For 1999, protect the riparian/stream corridors of Boneyard and Coyote creeks from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

4. Before livestock turn-out in 1999, exclude livestock access to the riparian/stream corridor of Coyote Creek and main tributary channels through the Boneyard Allotment (Grassy Hollow and Middle pastures).

5. Before livestock turn-out in 1999, exclude livestock access to the riparian/stream corridor of the incised, unnamed tributary of Boneyard Creek, within the Boneyard Pasture, which does not enter Sierra Blanca Lake.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the East Fork of the Black River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Boneyard Allotment

1. Exclude all livestock use from Coyote Creek in 1998.

2 Consider resting Grassy Hollow Pasture and/or Middle Pasture in the Coyote Creek drainage until raw stream channels and banks are healed.

3. Implement the loach minnow recovery plan, as appropriate.

BUCK SPRINGS ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Coconino National Forest, Blue Ridge Ranger District

Allotment Acres:
- 70,310 total
- 55,715 full/potential capacity range

Projected Stocking Density
- 997 animal months
- 55.9 acres per animal month

Permitted Use:
- 746 cow/calf, 5/15-10/15
- 8 horses, 5/15-10/15

Projected Use:
- 215 yearlings 5/30-10/10
- 8 horses 5/30-10/10

Major Vegetation Type:
- Ponderosa pine

Major Drainages:
- Leonard Canyon
- East Clear Creek

Elevation:
- 6,400 to 7,800 feet

Type of Grazing System:
- 11 pastures, deferred/rest/rotation, with time in pasture limited by utilization level of 25%.

Allotment Condition:
- 1991 TES indicates that 55% of the allotment is in satisfactory soil condition and 44% is in impaired soil condition.
- Various years of range data indicate that most of the allotment is in fair condition, with a stable trend.

Listed Species Adversely Affected:

- ! Little Colorado River spinedace and critical habitat

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded soil conditions in mountain meadows and riparian areas.
- ! High utilization in headwater meadows due to additive affects of livestock and elk.
- ! Livestock have limited access to East Clear Creek in the McCarty Pasture.

Consultation Period:

- ! 3 Years

LITTLE COLORADO RIVER SPINEDACE AND CRITICAL HABITAT ON THE BUCK SPRINGS ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

There are numerous problems for the spinedace within the East Clear Creek watershed. Stream alteration and introduction of non-native fishes pose an increasing threat to the species (U.S. Fish and Wildlife Service 1998). Fire suppression, timber management, domestic livestock and wildlife grazing, roads, and other factors affecting forest health and watershed conditions have all contributed to the existing degraded status of Little Colorado River spinedace habitat in the East Clear Creek watershed. Problems associated with unsatisfactory soil conditions and dysfunctional riparian conditions include increases in sedimentation into the streams, compaction and poor water infiltration that alter the natural hydrograph by increasing runoff spikes and decreasing baseflows, and poor ground cover that increases rain impacts. These factors contribute to stream conditions which may decrease the quality and quantity of spinedace habitat. Ungulate grazing tends to amplify many of the existing watershed problems, and may slow or inhibit watershed improvements. Three additional range allotments (Bar-T-Bar, Hackberry/Pivot Rock, and Limestone) lie within the upper portion of the East Clear Creek watershed. Past operations on these allotments contribute to additive impacts to watershed and riparian condition. Forest Service allotments affecting spinedace habitat have implemented many range improvements; however, due to the imperiled condition of the species in the East Clear Creek watershed, additional considerations are being developed, and many are being implemented.

Activities that impair water infiltration and summer baseflows may affect spinedace populations, especially during dry years. Soil compaction may result from roads, timber harvest activities, recreational development, and dispersed recreation. The impacts of dispersed recreation on the Buck Springs Allotment are most pronounced along East Clear Creek in the vicinity of Jones Crossing.

Concerns over the size and impact of the elk herd have been conveyed to Arizona Game and Fish Department by the Forest Service. Forage removal by elk is the only grazing that occurs along large portions of the Mogollon Rim. Use by elk alone often exceeds maximum utilization levels in some key areas. The Forest Service is working with Arizona Game and Fish Department to determine the carrying capacity for elk and appropriate adjustment of elk numbers. Recent efforts to reduce the elk population have had some success although riparian areas and headwater meadows continue to have high utilization levels by elk. Reductions in allowable forage use by livestock recently implemented by the Forest Service on various allotments should improve some watershed and riparian conditions and elk distribution. However, continuous grazing by elk at existing levels will likely preclude substantive improvements in stream conditions.

Impoundments at Blue Ridge Reservoir (on East Clear Creek) and Knoll Canyon Lake on Leonard Canyon are stocked with nonnative sport fish and other nonnative aquatic species, have the potential to seriously impact the Little Colorado River spinedace, its habitat, and designated critical habitat within the Buck Springs Allotment.

Of the stream reaches in the Buck Springs Allotment, based on 1998 survey data, 74% are classified functional, and another 20% are "at risk." The smaller, shallow canyon habitats that are more accessible by both livestock and wild ungulates are generally classified as "at risk." Dysfunctional areas comprise about 6% of the streams, and are in the flatter, southern (higher elevation) portions of the drainage, especially in meadow areas (Hydro Science 1993). These areas are heavily grazed by both livestock and elk and exhibit compacted soils and downcut banks. The Jones Crossing vicinity is considered "dysfunctional," and is additionally impacted by roads and recreation. Exclosures in four meadows show that areas grazed only by elk are only slightly less utilized than areas grazed by both elk and livestock. Areas without grazing ungulates have a much higher production of grasses (Coconino National Forest 1997). In 1997, utilization ranged from 20 to 40%, depending on the pasture. Across the entire allotment, utilization averaged approximately 30%.

Little Colorado River spinedace is extremely rare in the East Clear Creek watershed and faces the potential of extirpation. The recovery plan (U.S. Fish and Wildlife Service 1998) lists the East Clear Creek population of spinedace as second in order of those populations in imminent danger (behind the Silver Creek population which is possibly extinct). The loss of any population of spinedace significantly increases the risk of extinction (U.S. Fish and Wildlife Service 1998). Therefore, any impacts to this species in this watershed are considered extremely serious and warrant careful monitoring. Surveys for the occurrence of the spinedace are insufficient in the East Clear Creek watershed (U.S. Fish and Wildlife Service 1998), and without regular surveys and habitat assessments by a fishery biologist, the effects of management actions are uncertain given the dramatic fluctuation in abundance and dispersal of this fish and its habitat.

Little Colorado River spinedace have been observed at six locations within the Buck Springs Allotment in recent years. Within critical habitat on the allotment, sites where spinedace were found in the 1990s include Jones Crossing (in 1993, 1994, 1995), near the mouth of Miller Canyon (in 1994), and below Blue Ridge Reservoir (in 1995, 1996). Not included within critical habitat, Leonard Canyon and its major tributaries are considered spinedace habitat where three sites have been recently documented: Dines Tank, Sandstone Canyon, and at the mouth of Buck Springs Canyon. Spinedace have not been found at several other sites since the 1960s.

The majority (98%) of the Buck Springs Allotment is within the East Clear Creek watershed. Approximately 1% is in the West Clear Creek watershed and 1% is within the East Verde watershed. All pastures in the allotment include portoins of the East Clear Creek watershed, encompassing most of the middle reaches of East Clear Creek (approximately 14 miles). Within the allotment, about 8 creek miles lie above Blue Ridge Reservoir, while about 6 miles lie downstream. Steep topography and fencing exclude livestock from East Clear Creek below Blue Ridge Reservoir. East Clear Creek bisects the McCarty and North Battleground pastures. Leonard Canyon borders the allotment on the east side of the North, Dines, and Knolls Pastures, while Middle Leonard Canyon is completely within the Knolls Pasture. Approximately 10 miles of stream provides potential habitat for the spinedace.

EFFECTS OF THE ACTION

The National Forest, in cooperation with the permittee, amended the 1998 Annual Operating Plan to incorporate many very important considerations and project modifications for the Little Colorado River spinedace. Animal unit months (AUMs) approved for 1998 is 997 (215 head). Partial nonuse of 4,485 AUMs is applied for resource protection and economic consideration by the permittee. Maximum forage utilization levels of herbaceous forage is set at 25% (including wildlife use). The net result of these reductions for the conservation of spinedace and its critical habitat is very significant.

Occupied and suitable habitat for the Little Colorado River spinedace occurs in Leonard Canyon and East Clear Creek which border the Buck Springs Allotment, and a few of their tributaries. Access by livestock into Leonard Canyon and associated drainages is obstructed by topography and fencing. In addition, riders are present, approximately 75% of the time livestock are on the allotment, to ensure complete exclusion of livestock from Leonard Canyon. The Dines Tank occupied site is within a five acre exclosure. Two other recently occupied sites are located within the Knolls Pasture in tributaries to Leonard Canyon. The Knolls Pasture is monitored for sufficient feed and water on the uplands to keep livestock there. Monitoring in 1996 and 1997 showed that riders were able to keep livestock from moving into the drainages. If livestock begin drifting into the drainages and canyons, they will be moved.

Livestock access to East Clear Creek is excluded through resting pastures where access to the canyon is possible, and by topography and fencing in other areas. A crossing of East Clear Creek will occur at one location, preferably when the section is dry. The McCarty Pasture will only be used to move livestock between South Battleground, North Battleground, and Jumbo Pastures in order to eliminate access to the Jones Crossing area, until further analysis and mitigation is completed. A new waterlot will be constructed prior to livestock moving through the pasture. If livestock cannot be moved completely through the pasture in one day, they will overnight in the waterlot, to ensure they do not return to the creek. These measures will keep livestock from accessing the Jones Crossing location. Livestock cross the creek at one location in the McCarty Pasture to move to the Jumbo Pasture. Consultation on the 1997 AOP resulted in a Reasonable and Prudent Measure that specifies that livestock crossings of East Clear Creek must first be surveyed to ensure that there are no pools with spinedace in the crossing area. Crossings are to occur at dry creek locations, if possible, or at temporarily fenced crossings.

Indirect effects to spinedace may occur due to grazing in the uplands and within intermittent drainages. Problems associated with unsatisfactory soil conditions and dysfunctional riparian conditions include increases in sedimentation into the streams, compaction and poor water infiltration that alter the natural hydrograph by increasing runoff spikes and decreasing baseflows, and poor ground cover that increases rain impacts. These factors contribute to stream conditions which may decrease the quality and quantity of spinedace habitat. Watershed condition is an important factor that contributes to conditions for spinedace dispersal. The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Watersheds that are in satisfactory condition can extend runoff events that may expand the window of opportunity for the spinedace attempting to re-inhabit previously occupied habitat as well as increasing the permanence of pool habitats during dry periods.

Impacts to spinedace may occur due to livestock grazing in headwater meadows of East Clear Creek. The mountain meadows are considered to be in unsatisfactory soil condition. Meadows are located in the valley plains in the headwaters between the ridges. Due to concerns on the condition of meadows, several livestock exclosures have been constructed and maximum forage utilization levels have been established. Pasture moves for livestock will occur when utilization reaches 25%, which is intended to help improve watershed conditions and extend the duration of streamflows. However, elk will continue to graze after livestock have been moved from pastures and total utilization will likely reach 60 to 70%. In the McClintock Pastures, livestock have potential access to approximately 80 acres of headwater meadows which are considered potential spinedace habitat. Riders will work to distribute livestock and utilization in the meadows will be monitored closely.

Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition (Marlow and Pogacnik 1985). The effects to spinedace are based on the potential for direct (streams/tributaries) and indirect (uplands/watershed) effects on spinedace habitat from grazing in the East Clear Creek watershed.

The adverse affects to spinedace and its critical habitat on the Buck Springs Allotment are based primarily on indirect effects through the influence of livestock on watershed conditions and the subsequent affects to stream habitats. In addition, cattle have limited access to East Clear Creek and potentially to Leonard Canyon and tributaries. However, the allotment is currently being operated under very reduced stocking levels, forage utilization levels are being applied, pasture rotations avoid conflict areas, and riders are present 75% of the time livestock are on the allotment. The streams and meadows in the allotment are protected by riders dispersing the cattle and keeping them from the creeks and canyons.

Little Colorado River spinedace are extremely rare in the East Clear Creek watershed and face the potential of extirpation. Therefore, any impacts to this species in this watershed are considered extremely serious and warrants careful monitoring. Implementation of the Buck Springs Allotment grazing strategy is expected to continue the improvement of watershed conditions, but will likely also contribute to some additive indirect effects associated with other grazing allotments and activities in the East Clear Creek watershed.

CUMULATIVE EFFECTS

The majority of the higher elevation portions of the East Clear Creek watershed are under the administration of the Forest Service, by both the Coconino and Apache-Sitgreaves National Forests. The rest of the watershed is occupied by small private inholdings within the National Forests, and by State and private land north (downstream) of the National Forests. Therefore, most all activities that occur within the watershed have Federal involvement and are subject to section 7 consultation.

However, State controlled wildlife management activities (including elk and exotic fish management), and certain aspects of dispersed recreation are not managed under the direct authorities of the Forest Service. Recreational activities, including developments and dispersed recreation, are having localized impacts within the watershed, and roads contribute to soil compaction and sediment transfer. Any activities which would impair water infiltration and summer baseflows may affect spinedace populations.

CONCLUSION

After reviewing the current status of the Little Colorado River spinedace, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Buck Springs Allotment are not likely to jeopardize the continued existence of Little Colorado River spinedace. Critical habitat for this species within the allotment; however, this action is not likely to result in its destruction or adverse modification

INCIDENTAL TAKE STATEMENT
Little Colorado River Spinedace on the Buck Springs Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of Little Colorado River spinedace is expected to result from the ongoing grazing activities on the Buck Springs Allotment. Harassment occurs through effects to individual fish from livestock accessing pools occupied by spinedace. Harm occurs through the effects to habitat that alters the suitability of the habitat to support Little Colorado River spinedace. The Service anticipates, however, that incidental take of Little Colorado River spinedace associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of Little Colorado River spinedace from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in

watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions) and channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the East Clear Creek watershed.

2. Livestock access pools, the riparian corridors, or cross stream channels (excepted for monitored crossing) associated with Leonard Canyon, East Clear Creek, or their tributaries.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Little Colorado River spinedace.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the East Clear Creek watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. Before any increases in livestock use above 1998 levels are approved through the Annual Operating Plan, and by, September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of at least the Coconino National Forest portion of the East Clear Creek watershed (and perferrably in coordination with the Apache-Sitgreaves National Forest to include the entire upper East Clear Creek drainage) to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing), to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the Little Colorado River spinedace. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the East Clear Creek watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Livestock are precluded from Leonard Canyon and East Clear Creek (except for monitored crossing). When livestock are scheduled to be present in pastures adjacent to Leonard Canyon or East Clear Creek monitor for livestock use or

their sign in the canyon bottoms at least once every two weeks. If livestock access Leonard Canyon or East Clear Creek (except the monitored crossing), the pasture will be vacated until such time that physical barriers (fencing and topography) completely restrict livestock access.

2. To the extent practicable, use herding to keep cattle out of wet meadows and riparian areas.

3. Wet meadows on the Buck Springs Allotment, especially those in the upper reaches of East Clear Creek in the McClintock Pastures, are to be protected from over use.

4. The North Battleground Pasture will not be used pending completion of fencing to preclude livestock from East Clear Creek. The Knolls Pasture will not be used pending further analysis and consultation. Cattle will only use the McCarty Pasture as a pass-through pasture, pending further analysis and consultation, or until East Clear Creek is excluded from livestock. Waterlots should be constructed around one tank to allow cattle to be held overnight, if necessary, while they are being trailed from the South Battleground Pasture and North Battleground Pasture to the Jumbo Pasture, and vice versa.

5. A journey-level biologist is to survey the designated crossing on East Clear Creek to determine if the crossing area is dry and has no pools that may potentially support spinedace before cattle cross over from the McCarty Pasture to the Jumbo Pastures. If pools are present, a journey-level fishery biologist is to survey all pools that may be impacted by livestock for spinedace. If spinedace are present, this crossing will not be used.

6. To begin in 1998 and be completed by September 30, 1999, a journey-level fishery biologist (or equivalent) is to assess spinedace habitat conditions on the allotment at sites determined by the biologist to be crucial to the species, as well as those sites believed to be vulnerable to impacts (direct or indirect) due to livestock management.

7. Establish annual fish monitoring stations within the East Clear Creek drainage. Fish monitoring is to be conducted by a journey-level fishery biologist (or equivalent) and coordinated with other fish survey/monitoring programs to avoid redundancy of effort, as these populations of spinedace may be susceptible to adverse affects from over sampling.

8. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of livestock exclosures established for

protection of Little Colorado River spinedace habitat in East Clear Creek, Leonard Canyon, and tributaries.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the East Clear Creek watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the Little Colorado River spinedace (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. Determine the effectiveness of fencing and herding through reliable and frequent monitoring for the presence of livestock in East Clear Creek and Leonard Canyon and its main tributaries.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule, livestock access East Clear Creek or Leonard Canyon) report these findings and any corrective actions taken to the Service within 15 days.

4. The National Forest is to coordinate with the Service following each year’s grazing period to reconsider effects and possible management opportunities for the spinedace, even if there is no change to the AOP.

CONSERVATION RECOMMENDATIONS - Little Colorado River Spinedace on the Buck Springs Allotment

1. Consider long-term rest for all high elevation wet meadows, especially in the McClintock North and South pastures. Exclosures for livestock and wildlife should be considered.

2. Implement the Little Colorado River spinedace recovery plan, as appropriate.

BUSH CREEK ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:

- 750 total
- 653 full/potential capacity range

Projected Stocking Density

- 19 animal months
- 34.3 acres per animal month

Permitted Use:

- 4 horses, 12/1-4/20

Projected Use:

- 4 horses, 12/1-4/20

Major Vegetation Type:

- Pinyon/juniper

Major Drainages:

- Blue River

Elevation:

- 6,000 to 6,500 feet

Type of Grazing System:

- 2 pasture, deferred rotation

Allotment Condition:

- 1987 TES indicates that most of the allotment is in impaired or unsatisfactory soil condition.
- 1997 range condition data indicate very poor conditions; soil stability rated as poor.

Listed Species Adversely Affected:

- Loach minnow

Ecological condition and/or management action that contributes to adverse effects:

- Degraded soil condition (possible increase in sedimentation) on the entire allotment.
- Livestock have come onto the pastures prior to appropriate range-readiness condition.

Consultation Period:

- 3 Years

LOACH MINNOW ON THE BUSH CREEK ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Blue River is a seriously degraded ecosystem. Aldo Leopold in 1921 called the Blue River "ruined" and cited it as an "extreme example" of human-caused erosion in the Southwest (Leopold 1921, Leopold 1946). Human uses of the river and its watershed in combination with natural flood flow events have resulted in extensive changes within the watershed and river channel. Miller (1961) indicated that as European settlement of the Blue River occurred around 1885 or 1886, the floor of the Blue River canyon was "well sodded and covered with grama grass, hardwoods, and pine," and the banks were "lined with willows and the river abounded with trout" (Leopold 1921). Olmstead (1919) refers to devastating floods that occurred from 1900 to 1906, which followed and contributed to the loss of floodplain terrains and other major changes to the elevation of the river by 1916. Periodic floods continue to erode remaining fields, homes, and roads (Coor 1992).

Flood destruction resulting in channel erosion was enabled and exacerbated by human activities on the watershed and streambanks (Chamberlain 1904, Olmstead 1919, Leopold 1924a and 1924b, Bryan 1925, Leopold 1946, Miller 1961, Dobyns 1981, Coor 1992). Overgrazing depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation, increasing the volume of high flows, and decreasing the volume of low flows. Timber harvest, fuelwood, and railroad tie cutting removed vegetative cover of the watershed, often resulted in eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing riparian vegetation, and irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river contributed to erosional degradation, often resulting in new channels or widening of the existing channel. Cattle drives along the river broke down streambank soils and damaged riparian vegetation. The resulting stream channel is characterized by a wide, shallow channel profile, high levels of sediment, eroding banks, braided shifting channels, and depauperate, sparse riparian vegetation (Chamberlain 1904, Leopold 1921, Leopold 1924a and 1924b, Dobyns 1981, Coor 1992).

The Blue River has a bimodal high flow pattern: a snow-melt hydrograph with high flows in late-winter and spring, and a second high flow period associated with monsoon rains in later summer. The river is "flashy" with high discharge following summer storms. Erosion, channel width, and channel migration increase gradually in a downstream direction, while riparian vegetation becomes less dense and aquatic habitat diversity decreases, becoming mostly riffles and runs, with pools scarce and generally associated with bedrock walls. Increased flashiness of flood flows and depletion of base flows are results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation (Ffolliott and Throud 1975, Dunne and Leopold 1978, DeBano and Schmidt 1989, Gebhardt *et al.* 1989, Meehan 1991, Gordon *et al.* 1992, Naiman 1992, Belsky and Blumenthal 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River.

Today, much of the Blue River channel is a wide unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.* 1989, Bagley *et al.* 1995). River terraces or benches are small eroding remnants of former river banks. Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow (*Baccharis salicifolia*), and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Plantanus wrighti*) are present, with willow increasingly common in the upper reaches where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* spp.), which are a key element in stable streambanks, are uncommon along much of the river.

The Blue River, like all streams in the Gila River basin, has been subject to introduction of a number of nonnative fish and other aquatic species. Nonnatives adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh and Brooks 1989, Marsh *et al.* 1989, Propst *et al.* 1992, Blinn *et al.* 1993, Carmichael *et al.* 1993, Douglas *et al.* 1994). Nonnative species reported in the Blue River during recent survey efforts include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Earlier surveys also found channel catfish (*Ictalurus punctatus*) (Anderson and Turner 1977, J.M.Montgomery Consulting Engineers 1985).

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river. Timber harvest, roads, recreation, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Private lands in the system are concentrated in the upper 30 miles of river bottom. Some cropping and irrigated agriculture continues on remaining river terraces that have natural protection from flood erosion. There are a number of small diversion structures and irrigation canals. A private fish hatchery is operated along the upper Blue River at Bush Creek and a substantial proportion of the base flow is diverted into the hatchery. Subdividing of ranch lands and construction of residences or summer homes has occurred at a fairly low level. The Blue River Road is a continuous source of bank and channel damage and erosion. Numerous low-water crossings exist in the upper Blue River and contribute to localized destabilization. Road maintenance results in significant modifications and impacts to the river. In the lower Blue, unauthorized off-road-vehicle use in the river bottom continues to occur. Livestock grazing in the valley bottom continues on private lands in the upper Blue. On the Clifton Ranger District, the river corridor is excluded from authorized livestock grazing. Grazing is permitted on the river on some Forest Service allotments in the Alpine Ranger District, although livestock have been excluded from the river on others.

The Bush Creek Allotment is located at 6,000 feet in elevation at the confluence of Bush Creek, the Blue River, and an ephemeral drainage, Steeple Creek. The allotment is characterized by steep, rugged, rocky terrain with the lower positions of the landscape along the Blue River bottom in private ownership. There are two pastures within this small allotment. Each is used in alternate years during winter/spring. The range condition class within the Mountain Pasture was rated as very poor with a downward trend in 1997. The soil stability rating was poor with a stable or no apparent trend. As a result, the Mountain Pasture was assigned a maximum allowable use level of 25% on grass species. No assessment of the current conditions on the Steeple pasture is available. Reconstruction of a private land boundary fence in 1998 has eliminated livestock access to the occupied loach minnow habitat on the Blue River.

For many years, information on the fish of the Blue River was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain 1904, Anderson and Turner 1977, Silvey and Thompson 1978, J.M.Montgomery Consulting Engineers 1985, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor 1992). Recently, surveys of the Blue River system were conducted by Arizona Game and Fish Department in 1994 on the upper Blue River and by Arizona State University during 1995 and 1996, under funding from the Apache-Sitgreaves National Forests, on the lower river and tributaries (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). These surveys found loach minnow distributed throughout the Campbell Blue and Blue River system. In addition to loach minnow, the Blue River continues to support four other native fishes, the speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), and Sonora sucker (*Catostomus insignis*). Based on historical records, the Service concludes that up to nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century.

The loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). The only earlier fish survey was in 1904 (Chamberlain) which did not find loach minnow. Several efforts since then have located loach minnow distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the Blue River (Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Hendrickson 1987, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989, Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Loach minnow were not found in any tributaries other than Campbell Blue Creek and in KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Even where the densities are highest in the Blue River, loach minnow is still relatively scarce, rarely constituting more than 10%, and often less than 5%, of the fish population (Arizona Game and Fish Department 1994, Bagley *et al.* 1995).

Alteration of the Blue River watershed and simplification of the geomorphology of the Blue River affects loach minnow habitat in many ways. Discharge, velocity, instream water volume, water temperature, nutrient cycling, sedimentation, availability of larval backwater habitats and cobble/gravel riffles, food availability, and other factors have been altered.

On the Bush Creek Allotment, approximately one mile of the Blue River is located along or within the southeastern portion of allotment. Loach minnow is known to occupy this river segment.

EFFECTS OF THE ACTION

Increases in sedimentation to the Blue River from Bush and Steeple creeks on the Bush Creek Allotment is expected as a result of ongoing livestock grazing under the existing unsatisfactory soil and range conditions and degraded status of the tributary streams. Poor watershed and range conditions within the allotment, combined with continued livestock grazing, may contribute to altering the hydrologic regime (water quantity, quality, intensity, duration, and pattern) within Bush and Steeple creeks and the Blue River drainage, thereby increasing erosion and sedimentation into the Blue River. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Some riffle habitats in the Blue River that may otherwise be suitable loach minnow habitat may be unsuitable due to sediment deposition that eliminates the under-cobble pockets needed by loach minnow. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the Blue River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993a). On much of the Blue River, the riparian vegetation is sparse and mostly lacking in herbaceous cover. Therefore, there is limited opportunity for riparian buffering of sediments from degraded upland watershed conditions.

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

As with many short-lived species, populations of loach minnow undergo substantial fluctuations in abundance between years (Propst *et al.* 1988). When population numbers are at or near the high end of the cycle, the loach minnow may be able to withstand substantial adverse effects. The same effects, if they occur at the low point of the population cycle, may be much more serious and could potentially result in extirpation of the species from the affected area. Most adverse affects are increasingly detrimental when they occur during the spawning period.

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include the entire Blue River population of loach minnow. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The National Forest has been working to improve conditions along the Blue River corridor and has precluded livestock from the river channel on many allotments. However, the currently degraded ecological conditions of the Blue River watershed intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. Even though the Bush Creek Allotment is small in size with few head of livestock, it is one of many in the watershed with high proportions of impaired soils, poor to very poor range condition, and unsatisfactory riparian areas. The naturally fragile status of the watershed makes the Blue River even more sensitive to the affects of livestock management activities. The watershed level analysis of ecosystem functions may provide the necessary information to assess the additive affects of individual allotments and the challenges to recovery of the system.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the loach minnow, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation allows access of predatory nonnative fish species into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the effects of the proposed action, and available information on cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Bush Creek Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Bush Creek Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Bush Creek Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the Blue River watershed.

2. Permitted livestock access the Blue River stream channel.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian conditions, and stream channel conditions) on the allotment within the Blue River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. Before any increases in livestock use above 1998 levels are approved through the Annual Operating Plan, and by September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. Continue the fish monitoring program for the Blue River established by the National Forest.

3. By March 1, 1999, initiate a watershed analysis of the Blue River watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing), to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of Blue River. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Before livestock enter any pasture check and repair all fences bordering the Blue River.

2. Protect the riparian/stream corridors in Bush and Steeple creeks from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Blue River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the river corridor; monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Bush Creek Allotment

1. Consider excluding all livestock use from the riparian/stream corridors of Bush and Steeple creeks.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Implement the loach minnow recovery plan, as appropriate.

CHRYSOTILE ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Tonto National Forest, Globe Ranger District

Allotment Acres:
- 53,125 total
- 41,480 full/potential capacity range

Projected Stocking Density
- 3,561 animal months
- 11.6 acres per animal month

Permitted Use:
- 380 cow/calf, 1/1-12/31

Projected Use:
- 253 cow/calf, 1/1-12/31
- 105 yearlings for 5 months

Major Vegetation Type:
- Pinyon/juniper, upper Sonoran desert, interior chaparral

Major Drainages:
- Salt River
- Ash Creek

Elevation:
- 3,000 to 6,400 feet

Type of Grazing System:
- 2 pasture 6 month deferred rotation

Allotment Condition:
- 1984 range condition data (and more recent visual inspections) indicate that most of the uplands are in very poor condition and have a downward trend.
- Riparian areas are rated in poor condition.
- Active gullying is occurring around livestock concentration areas (e.g., waters).

Listed Species Adversely Affected:

- ! Lesser long-nosed bat

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded ecological conditions.
- ! Livestock grazing occurs in pastures during the time the agaves are producing flower stalks.

Consultation Period:

- ! 3 Years

LESSER LONG-NOSED BAT ON THE CHRYSOTILE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Lesser long-nosed bats require suitable forage plants (paniculate agaves and saguaros) and suitable roost sites. It is unknown whether the bat actually roosts within or adjacent to the Chrysotile Allotment. Mines and caves occurring in the allotment could potentially provide suitable roost sites. Any potential roosts in the area would probably be transitory (non-maternity) roosts used by adults and/or young bats in summer or fall. Saguaros occur at lower elevations within the allotment; paniculate agaves extend into higher elevation areas (±6,000 feet). Agaves are likely scattered, although may occur in localized concentrations. Palmer's agave (*Agave palmer*)is not known to occur on the Chrysotile Allotment, although other paniculate agaves may (e.g., Parry's agave, *A. paryi*, desert agave), *A. deserti*). The Chrysotile Allotment is considered to be on the periphery of the lesser long-nosed bat's range. The closest known roost site is south of the Gila River, approximately 70 miles away. However, lesser long-nosed bats have been recorded from scattered localities north of the Gila River. No concerted effort at surveys for lesser long-nosed bats north of the Gila River has been undertaken.

Based on known distances lesser long-nosed bats have traveled from roost sites to foraging areas, potential foraging habitat may extend in a 40-mile radius from roosts. With the lack of bat survey information, the presence of potential roost sites, and the availability of suitable forage plants, the Chrysotile Allotment is considered lesser long-nosed bat foraging habitat.

EFFECTS OF THE ACTION

Direct effects to lesser long-nosed bats as a result of grazing activities are not expected because these activities are unlikely to affect roosts and no roosts are known from the Chrysotile Allotment. However, it is possible that undetected roosts occur within the allotment.

Indirect effects to lesser long-nosed bats may occur through adverse affects to forage plants. Saguaros may be affected both directly and indirectly by grazing activities. Saguaros occur on slopes, bajadas, and in valleys. Impacts due to livestock grazing activities may occur from trampling of young saguaros, grazing of nurse plants that results in reduction or removal of protective cover, or grazing of the young saguaros themselves (Abouhalder 1992). 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.

No long-term investigation has documented the influence of grazing on agave mortality or flowering stalk herbivory. Individual paniculate agave plants only bloom once in their life cycle, about 20 years. However, agave stalks as they begin to bolt are particularly palatable to domestic livestock and wild herbivores, including deer, javelina, rodents, and rabbits (M. Hawks, University of Arizona, Tucson, pers. comm. 1997; W. Hodgson, pers. comm. 1997). Cattle probably trample young agaves, and have been known to "walk down" agave flowering stalks (T. Cordery, Arizona Ecological Services Field Office, pers. comm., 1998). Agave germination and seedling establishment may be influenced by degraded ecological conditions such as soil compaction, erosion, reduced infiltration, and altered plant species diversity and abundance. Effects to bat forage plants 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 generally relatively light. Parry's agave is typically found on rocky slopes, at somewhat moderate to high elevations (4,900 to 8,200 ft) (Gentry 1982).

The 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 area to reproduction, survival, and growth of the bat. The Chrysotile Allotment is considered to be foraging habitat. Areas with high densities of paniculate agaves and saguaros may be particularly important to the bat, especially if those high density sites are in close proximity to roosts. The distribution, abundance, and species of paniculate agaves on the Chrysotile Allotment, relative to the distribution of livestock during the agave bolting period (April 15 through September 15), has not been evaluated.

Although there have been many actions taken in the last several years to improve livestock management on the Chrysotile Allotment, the ecological conditions remain severely degraded. Cool season grasses have been all but eliminated from the allotment. The proposed range utilization levels exceed that identified in the Amended Forest Plan Record of Decision for pastures in poor to very poor condition operated under a six month "flip-flop" rotation.

CUMULATIVE EFFECTS

On a landscape level, paniculate agave populations appear to be well dispersed. However, the percentage of the agave population which successfully produces flowering stalks is unknown. Large segments of the range of the lesser long-nosed bat and its forage plants are exposed to Federal, State, Tribal, and private livestock grazing management activities. The overall affects of grazing (herbivory, trampling, and ecosystem changes affecting plant reproduction, recruitment, and establishment) on bat forage plants is unknown. Lesser long-nosed bat foraging ecology and energy budget are largely unknown. This, combined with potential disturbance of roost sites and loss of habitat due to urbanization and other activities on large tracts of State and private lands within the range of the bat, contributes to negative impacts on the species. The effects of all these actions are considered cumulative to the proposed action.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Chrysotile Allotment are not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Lesser Long-nosed Bat on the Chrysotile Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take expected to result from the ongoing grazing activities on the Chrysotile Allotment is harm, which occurs through the effects to habitat that alters the availability of food plants, affecting the suitability of the habitat to support the lesser long-nosed bat. The Service anticipates, however, that incidental take of the lesser long-nosed bat associated with the proposed action will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and it is difficult to detect and analyze the results of changes in bat foraging behavior and distribution, and reduced foraging efficiency. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, and trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity) within the natural capabilities of the landscape within all pastures on the allotment with high density agave or saguaro sites.

2. Livestock herbivory of agave flowering stalks contributes to limiting the abundance or distribution of lesser long-nosed bat food plants (*Agave palmeri*, *A. paryi*, and *A. deserti*).

3. Required monitoring of livestock utilization levels is not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the lesser long-nosed bat.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, and range conditions) on the allotment in pastures with high density agave or saguaro sites.

2. Livestock grazing does not contribute to limiting the food resources (*A. palmeri*, *A. paryi*, and *A. deserti*) available to the lesser long-nosed bat by reducing the distribution or abundance of flowering agaves below the natural capabilities of the landscape.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

> NOTE: The Tonto National Forest is developing stubble height/utilization coefficients and other methods to determine the amount of forage use in an ecologically relevant, and repeatable manner. The Forest Service and the Service will jointly evaluate these techniques as a possible substitute for the traditional utilization standards and monitoring.

1. Before any increases in livestock use above 1998 levels are approved through the Annual Operating Plan, and by September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

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

1a. By April 15, 1999, evaluate the abundance and distribution of lesser long-nosed bat food plants (*A. palmeri*, *A. paryi*, *A. deserti* and saguaro) on the Chrysotile Allotment, identify high density agave sites, and protect these sites to prevent livestock herbivory of agave flowering stalks. One method would be to preclude livestock access to high density agave sites during the agave bolting period from April 15 through September 15.

<u>or</u>

1b. By April 15, 1999, conduct a landscape level analysis (Forest wide) of lesser long-nosed bat food plant (*A. palmeri*, *A. paryi*, and *A. deserti*) abundance and distribution, and livestock use patterns during the agave bolting period (April 15 through September 15). With this information and in cooperation with the Service, reassess if/how/where livestock may be contributing to limiting the food resources available to the lesser long-nosed bat. By April 15, 1999, develop and initiate a monitoring/research plan to evaluate the relationship between livestock grazing and paniculate agave distribution, abundance, flowering, recruitment, and ecology.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures with high density agave or saguaro sites during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the lesser long-nosed bat (e.g., areas of high density agave or saguaro). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) progress made toward completion of multi-year Terms and Conditions; and 5) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Lesser Long-nosed Bat on the Chrysotile Allotment

1. Join in cooperative efforts to survey for lesser long-nosed bat roosts, and protect and monitor these sites.

2. Develop and initiate a study plan to survey for foraging lesser long-nosed bats north of the Gila River. This study would be conducted over a minimum of a two year period and in cooperation with other management entities (e.g., Apache-Sitgreaves National Forest, Bureau of Land Management, Arizona Game and Fish Department) in order to address the issue on a landscape level.

3. Implement the lesser long-nosed bat recovery plan, as appropriate.

COLTER CREEK ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:

- 11,588 total
- 10,875 full/potential capacity range

Projected Stocking Density

- 950 animal months
- 11.4 acres per animal month

Permitted Use:

- 190 cow/calf, 6/1-10/31

Projected Use:

- 190 cow/calf, 6/1-10/31

Major Vegetation Type:

- Pinyon/juniper, ponderosa pine, mixed conifer

Major Drainages:

- Colter Creek
- Riggs Creek
- Nutrioso Creek

Elevation:

- 7,500 to 9,400 feet

Type of Grazing System:

- 4 pastures, deferred rotation
- Trailing occurs through the Picnic, Murray Basin, and Rudd Creek Allotments coming to and leaving the allotment.

Allotment Condition:

- 1987 TES indicates that 77% of the allotment is in satisfactory soil condition.
- 1997 range condition data indicate that most of the allotment is in very poor and poor range condition.

Listed Species Adversely Affected:

- Little Colorado River spinedace

Ecological condition and/or management action that contributes to adverse effects:

- Degraded soil and range conditions on the allotment (possible increase in sedimentation).
- Direct access to Nutrioso Creek in North Pasture, and to Rudd Creek while livestock are trailed to and from the allotment.

Consultation Period:

- 2 Years

LITTLE COLORADO RIVER SPINEDACE ON THE COLTER CREEK ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Stream alteration, watershed modification, and introduction of non-native fishes pose an increasing threat to the Little Colorado River spinedace (U.S. Fish and Wildlife Service 1998). Problems associated with unsatisfactory soil conditions and dysfunctional riparian conditions include increases in sedimentation into the streams, compaction and poor water infiltration that alter the natural hydrograph by increasing runoff spikes and decreasing baseflows, and poor ground cover that increases rain impacts. These factors contribute to stream conditions which may decrease the quality and quantity of spinedace habitat. Ungulate grazing tends to amplify many of the existing watershed problems, and may slow or inhibit watershed improvements. Forest Service allotments affecting spinedace habitat have implemented some range improvements, however, overstocking and high levels of range utilization, in combination with wildlife use, appear to effect watershed conditions and reduce the quality and quantity of spinedace habitat and potential of perennial flow in Nutrioso Creek and its tributaries.

Nutrioso Creek is a north flowing tributary of the Little Colorado River; their confluence is at the town of Springerville. The headwaters of Nutrioso Creek begins at the Alpine Divide. Paddy, Milk/Hulsey, Auger, Colter, and Riggs creeks join Nutrioso Creek above Nelson Reservoir. Stream flow is basically perennial from Paddy Creek to Nelson Reservoir. From approximately Milk Creek above the town of Nutrioso to Nelson Reservoir, Nutrioso Creek has been classified as "functional at risk" and courses through a broad bottom, which is primarily in private ownership. There are several water diversions associated with the private land, and the stream channel in the lower valley is incised up to approximately 2 meters. The National Forest recently acquired property which included Nutrioso Creek immediately above Nelson Reservoir. Below the impoundment, Rudd Creek joins, and US Highway 180 closely parallels Nutrioso Creek until Correjo Crossing. There are numerous unvegetated, steep angled road cuts which contribute large amounts of sediment to Nutrioso Creek. After Nutrioso Creek exits the National Forest and enters private land, there are several water diversions and the creek only flows seasonally.

A large elk population resides within the Nutrioso Creek watershed and contributes to grazing pressures, especially on riparian habitats. Elk populations may have an affect on riparian areas and functions. Fire suppression has probably also had an effect on the hydrology of the watershed, resulting in pine forests with more trees and dense canopies.

The Little Colorado River spinedace population in the Nutrioso Creek watershed is dependable and fairly common only within a portion of Nutrioso Creek. An occupied site in Rudd Creek, a tributary of Nutrioso Creek, has been recently lost due to drought conditions. Spinedace habitat is limited by lack of perennial flows and non-native aquatic species in the tributaries of Nutrioso Creek.

Little Colorado River spinedace are found in Nutrioso Creek from about the Milk Creek/town of Nutrioso area to Nelson Reservoir. Downstream of Nelson Reservoir, critical habitat has been designated from the dam to the National Forest boundary, a distance of 5 miles. Relatively few individuals persist at scattered sites in this reach of Nutrioso Creek. Water quality and quantity is affected by the dam and close proximity of the highway and roadcuts. Spinedace occurred in Rudd Creek on the Sipes White Mountain Ranch until the drought in 1996, when the known site dried completely.

Occupied Little Colorado River spinedace habitat in Nutrioso Creek is approximately 0.75 miles downstream of Riggs Creek in North Pasture and approximately 1.5 miles downstream of Colter Creek in Middle Pasture. Prior to livestock turnout in 1998, a 50-yard section of Nutrioso Creek will be fenced in the North Pasture to preclude livestock access. There is no critical habitat in the action area of this allotment.

All upper elevation meadows and grasslands in the allotment receive disproportionately high use by both livestock and elk. Both Colter and Riggs creeks in middle elevations receive concentrated livestock use along the riparian corridor. The allotment is generally in poor condition. It is believed that the allotment is overstocked, turn-out dates are too early, and grazing durations are too long. The allowable utilization rates were established for 1998 at 25% of herbaceous forage in key areas.

In 1994, habitat conditions in Colter Creek were satisfactory on four of nine reaches evaluated, and riparian conditions were satisfactory on five of nine reaches. Embeddedness ratings were high in eight of the nine reaches surveyed.

Livestock are trailed from the St. Johns area to the allotment near Nelson Reservoir. Livestock cross the Little Colorado River on a bridged highway crossing, and cross Rudd Creek on the Sipes White Mountain Ranch. The Rudd Creek crossing is in an area occupied by spinedace prior to the 1996 drought, and upstream of currently occupied habitat in Nutrioso Creek.

EFFECTS OF THE ACTION

This allotment contains most of the watersheds of both Colter and Riggs creeks. For these two streams, both range and watershed conditions are mostly poor and there is some concern for riparian/aquatic conditions. Riggs Creek is an intermittent stream that has never been surveyed for spinedace. Its channel has been incised, and several active headcuts exist within the North Pasture.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993).

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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Effects of sedimentation from tributary canyons and streams leading to Nutrioso Creek contribute to increased embeddedness downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers, or deleterious sediment conduits, between upland impacts and the perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981; Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). Spinedace are not unduly sensitive to moderate amounts of sediment, although during the spawning period egg viability may be reduced due to high embeddedness and sediment loads.

Increased sedimentation can result in habitat alterations. Sedimentation may impact the prey base of Little Colorado River spinedace as well as various aspects of their reproduction. Problems associated with poor watershed and range conditions in the upper reaches of Colter and Riggs creeks include increases in sedimentation into the streams, compaction and poor water infiltration that alter the natural hydrograph (water quantity, quality, and intensity) by increasing runoff spikes and decreasing baseflows, and poor ground cover that increases rain impacts. These factors contribute to stream conditions which may decrease the quality and quantity of spinedace habitat.

Livestock trail across Rudd Creek, to the north of the allotment, to access pastures in the spring. Crossing Rudd Creek could result in direct impacts to spinedace when the site is recolonized, physical damage to streambanks, and increased sedimentation in both Rudd Creek and downstream in Nutrioso Creek.

CUMULATIVE EFFECTS

Activities that impair water infiltration and summer baseflows may affect spinedace populations, especially during dry years. Soil compaction may result from roads, timber harvest activities, recreational development, and dispersed recreation. Water diversions, roads, and other developments are associated with private lands on Riggs, Colter, and Nutrioso creeks.

CONCLUSION

After reviewing the current status of the Little Colorado River spinedace, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Colter Creek Allotment are not likely to jeopardize the continued existence of Little Colorado River spinedace. Critical habitat for this species has been designated downstream of the action area in Nutrioso Creek below Nelson Reservoir; however, this action does not affect that area and no destruction or adverse modification of critical habitat is anticipated.

INCIDENTAL TAKE STATEMENT
Little Colorado River Spinedace on the Colter Creek Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of Little Colorado River spinedace is expected to result from the ongoing grazing activities on the Colter Creek Allotment. Harassment occurs through effects to individual fish which could occur when livestock cross stream channels. Harm occurs through the effects to habitat that alter the suitability of the habitat to support Little Colorado River spinedace. The Service anticipates, however, that incidental take of Little Colorado River spinedace associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of Little Colorado River spinedace from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the Nutrioso Creek watershed.

2. Livestock access the Nutrioso Creek riparian corridor, or cross within the stream channels of Nutrioso or Rudd creeks, or the Little Colorado River.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Little Colorado River spinedace.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Nutrioso Creek watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. No crossing through the stream channels of the Little Colorado River, Nutrioso Creek, or Rudd Creek is permitted.

2. Surveys are to be conducted by a journey-level fishery biologist (or equivalent) on Riggs Creek for Little Colorado River spinedace and assess habitat potential.

3. Establish annual fish monitoring stations within the Nutrioso Creek drainage. Fish monitoring is to be conducted by a journey-level fishery biologist (or equivalent) and coordinated with other fish survey/monitoring programs.

4. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of livestock exclosures established for protection of Little Colorado River spinedace habitat in the Nutrioso Creek watershed.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within Nutrioso Creek, especially in the Pat Knoll and Middle pastures, at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the Little Colorado River spinedace (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished

(e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Little Colorado River Spinedace on the Colter Creek Allotment

1. Work with Arizona Department of Transportation and Federal Highway Administration to address high levels of sediments entering Nutrioso Creek from road cuts along the highway below Nelson Reservoir.

2. Implement the Little Colorado River spinedace recovery plan, as appropriate.

COW FLAT ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:
- 22,592 total
- 14,402 full/potential capacity range

Projected Stocking Density
- 1,148 animal months
- 12.5 acres per animal month

Permitted Use:
- 164 cow/calf, 11/1-5/31

Projected Use:
- 164 cow/calf, 10/15-5/14

Major Vegetation Type:
- Pinyon/juniper, ponderosa pine

Major Drainages:
- Largo Creek
- Lamphier Creek
- Cow Creek
- Blue River

Elevation:
- 5,660 to 8,550 feet

Type of Grazing System:
- 2 pasture, rest rotation

Allotment Condition:
- 1987 TES indicates that approximately two-thirds of the allotment is in impaired or unsatisfactory soil condition.
- 1997 range condition data indicate that 59% of the allotment is in poor or very poor condition; the remaining area is in fair condition.

Listed Species Adversely Affected:

- ! Loach minnow

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded soil and range condition in Lamphier and Cow Canyon pastures (possible increase in sedimentation).
- ! Livestock have direct access to the Blue River (occupied loach minnow habitat) in the Cow Canyon and Lamphier pastures, and two holding pastures. Also, livestock cross the Blue River while being moved onto the allotment, between pastures, and off of the allotment.

Consultation Period:

- ! 3 Years

LOACH MINNOW ON THE COW FLAT ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Blue River is a seriously degraded ecosystem. Aldo Leopold in 1921 called the Blue River "ruined" and cited it as an "extreme example" of human-caused erosion in the Southwest (Leopold 1921, Leopold 1946). Human uses of the river and its watershed in combination with natural flood flow events have resulted in extensive changes within the watershed and river channel. Miller (1961) indicated that as European settlement of the Blue River occurred around 1885 or 1886, the floor of the Blue River canyon was "well sodded and covered with grama grass, hardwoods, and pine," and the banks were "lined with willows and the river abounded with trout" (Leopold 1921). Olmstead (1919) refers to devastating floods that occurred from 1900 to 1906, which followed and contributed to the loss of floodplain terrains and other major changes to the elevation of the river by 1916. Periodic floods continue to erode remaining fields, homes, and roads (Coor 1992).

Flood destruction resulting in channel erosion was enabled and exacerbated by human activities on the watershed and streambanks (Chamberlain 1904, Olmstead, 1919, Leopold 1924a and 1924b, Bryan 1925, Leopold 1946, Miller 1961, Dobyns 1981, Coor 1992). Overgrazing depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation, increasing the volume of high flows, and decreasing the volume of low flows. Timber harvest, fuelwood, and railroad tie cutting removed vegetative cover of the watershed, often resulted in eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water.

Development of fields on river terraces removed stabilizing riparian vegetation, and irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river contributed to erosional degradation, often resulting in new channels or widening of the existing channel. Cattle drives along the river broke down streambank soils and damaged riparian vegetation. The resulting stream channel is characterized by a wide, shallow channel profile, high levels of sediment, eroding banks, braided shifting channels, and depauperate, sparse riparian vegetation (Chamberlain 1904, Leopold 1921, Leopold 1924a and 1924b, Dobyns 1981, Coor 1992).

The Blue River has a bimodal high flow pattern: a snow-melt hydrograph with high flows in late-winter and spring, and a second high flow period associated with monsoon rains in later summer. The river is "flashy" with high discharge following summer storms. Erosion, channel width, and channel migration increase gradually in a downstream direction, while riparian vegetation becomes less dense and aquatic habitat diversity decreases, becoming mostly riffles and runs, with pools scarce and generally associated with bedrock walls. Increased flashiness of flood flows and depletion of base flows are results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation (Ffolliott and Throud 1975, Dunne and Leopold 1978, DeBano and Schmidt 1989, Gebhardt *et al.* 1989, Meehan 1991, Gordon *et al.* 1992, Naiman 1992, Belsky and Blumenthal 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River.

Today, much of the Blue River channel is a wide unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.* 1989, Bagley *et al.* 1995). River terraces or benches are small eroding remnants of former river banks. Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow (*Baccharis salicifolia*), and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Plantanus wrighti*) are present, with willow increasingly common in the upper reaches where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* spp.), which are a key element in stable streambanks, are uncommon along much of the river.

The Blue River, like all streams in the Gila River basin, has been subject to introduction of a number of nonnative fish and other aquatic species. Nonnatives adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh and Brooks 1989, Marsh *et al.* 1989, Propst *et al.* 1992, Blinn *et al.* 1993, Carmichael *et al.* 1993, Douglas *et al.* 1994). Nonnative species reported in the Blue River during recent survey efforts include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Arizona Game and Fish

Department 1994, Bagley *et al.* 1995). Earlier surveys also found channel catfish (*Ictalurus punctatus*) (Anderson and Turner 1977, J.M.Montgomery Consulting Engineers 1985).

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river. Timber harvest, roads, recreation, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Private lands in the system are concentrated in the upper 30 miles of river bottom. Some cropping and irrigated agriculture continues on remaining river terraces that have natural protection from flood erosion. There are a number of small diversion structures and irrigation canals. A private fish hatchery is operated along the upper Blue River at Bush Creek and a substantial proportion of the base flow is diverted into the hatchery. Subdividing of ranch lands and construction of residences or summer homes has occurred at a fairly low level. The Blue River Road is a continuous source of bank and channel damage and erosion. Numerous low-water crossings exist in the upper Blue River and contribute to localized destabilization. Road maintenance results in significant modifications and impacts to the river. In the lower Blue, unauthorized off-road-vehicle use in the river bottom continues to occur. Livestock grazing in the valley bottom continues on private lands in the upper Blue. On the Clifton Ranger District, the river corridor is excluded from authorized livestock grazing. Grazing is permitted on the river on some Forest Service allotments in the Alpine Ranger District.

The Cow Flat Allotment is a relatively large allotment (22,592 acres), located on the east side of the Blue River drainage. It is primarily within the Blue Range Primitive Area. The topography is mostly steep slopes with scattered flat to moderately sloped benches. Major portions of the allotment burned due to the "S" Canyon Fire in 1994, and the Rhett Fire in 1995. Grazing occurs in winter and early spring, and occurs in the narrow canyon bottoms, ridge tops, and gentler slopes and benches. Due to the overall rugged topography, there is some compensatory use by cattle in areas that would not normally be considered available to cattle. Major drainages on the allotment include Cow and Largo creeks, and Lamphier and Sawmill canyons. The previous year-long management system was switched to winter use due to poor and very poor range conditions. Although range conditions are in an upward trend since the change in management system, 1987 Terrestrial Ecosystem Survey indicates that approximately two-thirds of the allotment is in impaired or unsatisfactory soil condition. Browse species receive heavy use and exhibit poor age class diversity; cool season grasses are grazed too early in the season. Following the fires on the allotment, there has been some browse resprouting, although the herbaceous vegetation is dominated by annual species. Degraded soil and range conditions persist in the Lamphier and Cow Canyon pastures, the two main pastures of the allotment. Three small holding pastures are adjacent to the Blue River.

For many years, information on the fish of the Blue River was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain 1904, Anderson and Turner 1977, Silvey and Thompson 1978, J.M.Montgomery Consulting Engineers 1985, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor 1992). Recently, surveys of the Blue River system were conducted by Arizona Game and Fish Department in 1994 on the upper Blue River and by Arizona State University during 1995 and 1996, under funding from the Apache-Sitgreaves National Forests, on the lower river and tributaries (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). These surveys found loach minnow distributed throughout the Campbell Blue and Blue River system. In addition to loach minnow, the Blue River continues to support four other native fishes, the speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), and Sonora sucker (*Catostomus insignis*). Based on historical records, the Service concludes that up to nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century.

The loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). The only earlier fish survey was in 1904 (Chamberlain) which did not find loach minnow. Several efforts since then have located loach minnow distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the Blue River (Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Hendrickson 1987, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989, Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Loach minnow were not found in any tributaries other than Campbell Blue Creek and in KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Even where the densities are highest in the Blue River, loach minnow is still relatively scarce, rarely constituting more than 10%, and often less than 5%, of the fish population (Arizona Game and Fish Department 1994, Bagley *et al.* 1995).

Alteration of the Blue River watershed and simplification of the geomorphology of the Blue River affects loach minnow habitat in many ways. Discharge, velocity, instream water volume, water temperature, nutrient cycling, sedimentation, availability of larval backwater habitats and cobble/gravel riffles, food availability, and other factors have been altered.

The Blue River passes through or adjacent to approximately 3.5 miles of the Cow Flat Allotment; 1.75 miles of this is on private land. This segment of the Blue River is considered occupied loach minnow habitat.

EFFECTS OF THE ACTION

Ongoing grazing activities on the Cow Flat Allotment result in adverse affects to loach minnow due to degraded upland soil and range conditions, potential direct access to the Blue River, and crossings of the river by livestock. Increases in sedimentation to the Blue River from Largo and Steeple creeks, and Cow, S, Lamphier, and Sawmill canyons, and other tributary streams, are expected as a result of grazing in pastures with existing unsatisfactory watershed, soil, and range conditions, and the preferential use by livestock of these riparian corridors. Due to the rugged topography, trails through the pastures are often limited to the riparian corridor, and result in hoof shear and trampling of vegetation, especially in the steep drainages. This situation may additionally contribute to altering the hydrologic regime (water quantity, quality, intensity, duration, and pattern) within the tributary streams and the Blue River drainage, thereby further increasing erosion and sedimentation into the Blue River. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

To preclude direct access to the Blue River by livestock from the holding pastures along the river, existing fences along the river will be re-aligned and/or repaired as necessary. No livestock will be allowed in any of the river pastures that allow direct access to the Blue River. Livestock in Lamphier and Cow Canyon pastures are not physically precluded from the Blue River corridor. While livestock are in these pastures, the permittee will herd the cattle so they do not access the river. When livestock are trailed in or out of the pastures, they will cross the Blue River, but only on the existing road crossing or at other locations designated unsuitable loach minnow habitat by a journey-level fishery biologist. No crossing will occur during the period March 1 through May 31, the primary spawning season for loach minnow.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Some riffle habitats in the Blue River that may otherwise be suitable loach minnow habitat may be unsuitable due to sediment deposition in the under-cobble pockets needed by loach minnow. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the Blue River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993). On much of the Blue River, the riparian vegetation is sparse and mostly lacking in herbaceous cover. Therefore, there is limited opportunity for riparian buffering of sediments from degraded upland watershed conditions.

The short life span of the loach minnow, coupled with the comparatively low fecundity of the species, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988). Most adverse affects are increasingly detrimental when they occur during the spawning period.

Loach minnow are adversely affected by activities which contribute to altering the (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include the entire Blue River population of loach minnow. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The National Forest has been working to improve conditions along the Blue River corridor and has precluded livestock from the river channel on many allotments. However, the currently degraded ecological conditions of the Blue River watershed intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. The upland range and watershed conditions on the Cow Flat Allotment and the livestock related impacts to tributary drainages may have contributed to altering the hydrologic regime of tributary streams and the Blue River. The Cow Flat Allotment is one of many allotments in the watershed with high proportions of impaired soils, poor range condition, and unsatisfactory riparian areas. The naturally fragile status of the watershed makes the Blue River even more sensitive to the affects of livestock management activities. A watershed level analysis of ecosystem functions may provide the necessary information to assess the additive affects of individual allotments and the challenges for recovery of the system.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the loach minnow, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation allows access of predatory nonnative fish species into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Cow Flat Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Cow Flat Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of loach minnow is expected to result from the ongoing grazing activities on the Cow Flat Allotment. Harassment occurs through effects to individual fish which could occur when livestock access the stream. Harm occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding a dead or impaired specimen is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the Blue River watershed.

2. Permitted livestock access the Blue River stream channel at times other than during monitored stream crossings.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Blue River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. Continue the fish monitoring program for the Blue River established by the National Forest.

3. By March 1, 1999, initiate a watershed analysis of the entire Blue River watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status, morphology, and function (e.g., T-walk, proposer functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the Blue River watershed. The watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Livestock will cross the Blue River only on the existing road crossing, or at other locations designated unsuitable loach minnow habitat by a journey-level fishery biologist (or equivalent). No crossing will occur during the period March 1 through May 31, the primary spawning season for loach minnow. Provide a map of all livestock crossing sites used to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

2. Protect the riparian/stream corridors in Largo and Steeple creeks, and Cow, S, Lamphier, and Sawmill canyons from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

3. When livestock enter any of the "river pastures," check and repair as necessary all fences required to exclude livestock from the Blue River.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Blue River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. Monitor access by livestock to the Blue River corridor on the Cow Flat Allotment while they are present within the Lamphier or Cow Canyon pastures. While present in these pastures, monitor for presence of livestock or their sign within the river corridor at least once every 10 days. If livestock or their sign are detected, take immediate action to remove livestock from the river corridor, notify the Service, and identify management steps to be taken to preclude any further livestock access. Provide a summary report of this monitoring which is to include dates of monitoring and results, to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) monitoring summary of livestock access to the Blue River corridor; 6) maps of livestock crossing sites on the Blue River; 7) progress made toward completion of multi-year Terms and Conditions; and 8) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the Blue River corridor; monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Cow Flat Allotment

1. Place priority on excluding all livestock use from the riparian/stream corridors of Largo and Steeple creeks to improve stream and riparian conditions. Also

consider excluding livestock use from and Cow, S, Lamphier, and Sawmill canyons.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Implement the loach minnow recovery plan, as appropriate.

DARK CANYON ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- 18,266 total
- 3,938 full/potential capacity range

Projected Stocking Density
- 180 animal months
- 21.9 acres per animal month

Permitted Use:
- 47 cow/calf 1/1-12/31
- 10 horses 1/1-12/31

Projected Use:
- 10 horses 1/1-12/31

Major Vegetation Type:
- Pinyon/juniper, interior chaparral, Arizona cypress

Major Drainages:
- Eagle Creek
- Dark Canyon
- White Water Canyon

Elevation:
- 3,400 to 7,400 feet

Type of Grazing System:
- 3 pastures, deferred rotation, with a separate horse pasture
- 15 horses are being run in the Coronado pasture this year.
- No cattle are on this allotment in 1998 (personal convenience non-use).

Allotment Condition:
- 1987 TES indicates 30% satisfactory, 50% impaired, and 20% unsatisfactory soil condition.

- ! 1972 range condition data indicate that most of the allotment is in fair condition.

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded ecological conditions.
- ! Future management of the allotment is currently being assessed under a separate consultation process .

Consultation Period:

- ! 1 Year

ARIZONA HEDGEHOG CACTUS ON THE DARK CANYON ALLOTMENT

ENVRONMENTAL BASELINE

Status of the Species (in the action area)

Cacti tentatively identified as the Arizona hedgehog cactus have been observed within the allotment. Although no surveys have been conducted, the cactus has the potential to be widespread across this allotment. The topography of the no capacity range is generally that in which the cactus has a greater likelihood of being found.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Dark Canyon Allotment <u>may affect, not likely to adversely affect</u> the Arizona hedgehog cactus. The Service here concurs with this determination for the following reasons: the Dark Canyon Allotment is managed, in part, under a Memorandum of Understanding for resource protection providing for non-use of a portion of the permitted livestock numbers; all cattle allocations are in non-use; future stocking of permitted livestock is correlated with range improvement construction and maintenance, livestock management, improvement in range conditions, and is below estimated capacity of the range; and utilization levels by horses are believed to be within appropriate limits, most of the allotment range condition is rated fair and good, there has been some recent improvement, and expectations are that improvements will continue.

DOUBLE CIRCLES ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- 36,272 total
- 22,689 full/potential capacity range

Projected Stocking Density
- 4,866 animal months
- 4.6 acres per animal month

Permitted Use:
- 392 cow/calf 1/1-12/31
- 8 horses 1/1-12/31

Projected Use:
- 392 cow/calf 1/1-12/31
- 8 horses 1/1-12/31

Major Vegetation Type:
- Pinyon/juniper, grassland

Major Drainages:
- Eagle Creek
- Smith Canyon
- Miller Canyon

Elevation
- 5,000 to 7,000 feet

Type of Grazing System:
- 9 pastures, deferred, rotation (summer)
- 3 pastures, deferred, rotation (winter)
- Bee Springs and Big Dry allotments have been combined into this allotment.

Allotment Condition:

- 1950 Range condition data indicate that most of the allotment is in very poor to fair condition.

Ecological condition and/or management action that contributes to adverse effects:

- Degraded ecological conditions.

Consultation Period:

- 3 Years

ARIZONA HEDGEHOG CACTUS ON THE DOUBLE CIRCLE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Cacti tentatively identified as the Arizona hedgehog cactus have been observed near Forest Service Road 217 within the allotment. Although no surveys have been conducted, the cactus has the potential to be widespread across 33,178 acres of this 36,272 acre allotment. Authorized stocking levels are significantly below revised capacity estimates and large areas of the allotment are no capacity range (13,583 acres) which were not used in calculations of range capacity. The topography of the no capacity range is generally that in which the cactus has a greater likelihood of being found.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Double Circles Allotment <u>may affect, not likely to adversely affect</u> the Arizona hedgehog cactus. The Service here concurs with this determination for the following reasons: the Double Circles Allotment is stocked below estimated capacity of the range, and utilization levels are believed to be within appropriate limits, and most of the allotment range condition is rated poor to fair, there have been some recent improvement, and expectations are that improvements will continue.

EAST EAGLE ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:

- 37,259 total
- 14,329 full/potential capacity range

Projected Stocking Density

- 4,137 animal months
- 3.5 acres per animal month

Permitted Use:

- 410 cow/calf, yearlong
- 10 horses, yearlong

Projected Use:

- 250 cow/calf, 12 horses, yearlong 1998
- 300 cow/calf, 12 horses, yearlong 1999
- 328 cow/calf, 12 horses, yearlong 2000

Major Vegetation Type:

- Pinyon/juniper, interior chaparral

Major Drainages:

- Eagle Creek
- East Eagle Creek
- Salt House Canyon
- Chitty Canyon
- Crabtree Canyon

Elevation:

- 5,000 to 8,500 feet

Type of Grazing System:

- 4 pastures, deferred rotation

Allotment Condition:

- 1973 range condition data indicate that most of the allotment is in poor to fair condition; recent visual inspections report improved conditions.
- 1987 TES indicates that 70% of the allotment is in satisfactory soil condition.

Listed Species Adversely Affected:

- Loach minnow
- Spikedace

Ecological condition and/or management action that contributes to adverse effects:

- Livestock have limited access to Eagle and East Eagle Creeks during pasture moves.

Consultation Period:

- 3 Years

LOACH MINNOW AND SPIKEDACE ON THE EAST EAGLE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Two Species (in the action area)

Eagle Creek, with its major headwater tributaries including Dry Prong, Middle Prong, and East Eagle Creek, is an 83 mile tributary of the Gila River in Greenlee County, Arizona. Of this length, about 50% is normally perennial flow, including about 1 mile of the Middle Prong and 1 mile of East Eagle Creek, both on National Forest lands. The remainder is a spatially and temporally intermittent stream. Approximately 31 miles (75%) of the perennial flow reaches are on non-National Forest lands. The East Eagle Allotment includes 21% of the Eagle Creek watershed, most of which is in the headwaters.

Grazing by livestock has been the primary use within the Eagle Creek watershed for the past 150 years, with substantial alteration of watershed vegetation, soil, erosion, and hydrologic characteristics (Leopold 1946). Water development and interbasin water transfers have altered the volume and timing of flow in the creek. In 1945, Phelps Dodge Corporation constructed a diversion from the Black River (Salt River basin) into Willow Creek, a tributary of middle Eagle Creek, downstream of the project area. This diversion augments flow in Eagle Creek, where downstream at a diversion dam, it is piped from the creek to the Phelps Dodge copper mine. In addition, residential and ranch operations, groundwater pumping, irrigated croplands, and roads along the Eagle Creek floodplain have had substantial impacts to the stream (Marsh *et al.* 1990).

Human-caused impacts and episodic high flow events have altered hydrologic conditions within the Eagle Creek watershed resulting in an unstable, braided stream channel throughout much of the upper, non-canyon, reach of Eagle Creek. Destabilization of the stream channel the entire length of the system has exacerbated flood damage with loss of riparian vegetation, unstable streambanks, and a wide, braided, cobble/gravel floodplain. In addition to habitat alterations, at least twelve nonnative aquatic species have been introduced into Eagle Creek and have adversely affected spikedace, loach minnow, and other native fishes through predation and competition (Marsh *et al.* 1990). Native species still form the majority of the fish community in Eagle Creek above the Phelps Dodge diversion dam, but nonnatives predominate below the dam.

Changes in streamflow and hydrologic cycles have caused reduction in the presence of large riparian trees and loss of recruitment along Eagle Creek overall. However, on the East Eagle Allotment, maintenance of riparian species is occuring along Eagle Creek and several age classes of cottonwoods and willows are present and considered in very good riparian condition. Aquatic habitat diversity in Eagle Creek is low with few pools and a dominant habitat of shallow runs and riffles over unstable cobble-gravel-boulder substrate (Marsh *et al.* 1990, Arizona Game and Fish Department 1994, Knowles 1994). Although Eagle Creek supports a relatively intact native fish community, the past and present impacts to the stream and its fish are substantial. The rarity of both spikedace and loach minnow is indicative of the existing habitat degradation and increased presence of detrimental nonnative species. The continued existence of spikedace and loach minnow in Eagle Creek is seriously imperiled. Any actions which contribute to further degradation of the habitat are cumulative to this existing environmental baseline and are therefore of greater consequence to these species.

Nonnative fishes introduced for sport, forage, bait, as part of inter-basin water transfers, or accidentally may impact loach minnow and spikedace populations. Many species continue to persist within the Eagle Creek drainage. Channel catfish (*Ictalurus punctatus*) and flathead catfish (*Pylodictis olivaris*) frequent riffles occupied by spikedace, especially at night when catfishes move onto riffles to feed. Largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieui*), green sunfish (*Lepomis cyanellus*), and introduced trouts (Salmonidae) at higher locations, may also co-occur with loach minnow and spikedace. The red shiner (*Cyprinella lutrensis*) may be particularly important in influencing spikedace distribution.

The East Eagle Allotment is managed under a Term Grazing Permit that includes a Memorandum of Understanding for resource protection, non-use of a portion of the permitted livestock numbers, and resting of Eagle Creek from Sawmill to the southern allotment boundary. With the exception of crossing and trailing of Eagle Creek during pasture moves, Eagle Creek on the allotment has been excluded from year-long grazing. Livestock are to be excluded from Robinson Canyon riparian areas. Stocking of permitted livestock is correlated with range improvement construction and maintenance, livestock management, and improvement in range conditions. Proactive livestock management, including riparian fencing and development of off-stream watering sites, have resulted in improved ecological conditions of both uplands and riparian corridors, especially where perennial flows occur within the allotment. Preliminary capacity calculations indicate estimated livestock capacity under a rest rotation grazing schedule 1 in every 2 years at 328 head of cattle (cow/calf). Current stocking is 250 head of cattle (cow/calf).

Loach minnow was first found in Eagle Creek in 1950 (Marsh *et al.* 1990). Despite several sampling efforts after than, it was not again found in Eagle Creek until 1994 (Marsh *et al.* 1990, Knowles 1994). The 1994, 1995, 1996, and 1997 records of loach minnow in Eagle creek were near Smelly Crossing about three miles downstream from the East Eagle Allotment southern boundary on Eagle Creek, and one mile south of the boundary on the Middle Prong Eagle Creek. The distribution of loach minnow within Eagle Creek is not presently known, but is presumed to include suitable habitat throughout the length of the creek and major tributaries.

On the East Eagle Allotment, loach minnow has not been documented. Potential loach minnow habitat may occur within Eagle Creek, portions of East Eagle and Dry Prong creeks, and in Robinson Canyon; a total of approximately three to four miles. However, 1998 surveys on the allotment suggest that these perennial reaches do not currently provide loach minnow habitat.

Spikedace was first reported from Eagle Creek in 1985 when it was collected as larval fish from lower Eagle Creek (Bestgen 1985). Earlier surveys, including Miller's 1950 sample which documented loach minnow, did not find spikedace (Kynard 1976; Minckley and Sommerfeld 1979; Marsh *et al.* 1990). In 1987, an intensive survey of Eagle Creek found spikedace common in the stretch from near Sheep Wash downstream to the Phelps Dodge diversion dam (Marsh *et al.* 1990). No spikedace have been found in several sampling efforts in Eagle Creek since 1987 (Marsh *et al.* 1990, Marsh 1993, Arizona Game and Fish Department 1994; Knowles 1994). Although limited intensive fish surveys have been conducted above Honeymoon Campground on the allotment, 1998 fish surveys by National Forest personnel did not reveal the presence of spikedace. However, potential habitat was determined to be present where beaver activity was creating larger, and possibly warmer pools which spikedace might inhabit. Spikedace tend to be found in warmer waters, like those downstream. When spikedace populations are at low levels they can be very difficult to locate. Large fluctuations in numbers and distribution is a common pattern in short-lived, highly fecund fish species, particularly in marginal or deteriorated habitat and may be indicative of increased vulnerability to extinction (Minckley *et al.* 1991b). The failure of the spikedace population in Eagle Creek to rebound to the levels seen in 1987 may indicate habitat deterioration or may reflect sampling limitations. The Eagle Creek population is isolated from its nearest spikedace population by a distance of approximately 100 river miles.

On the East Eagle Allotment, spikedace has not been documented. The nearest known occupied spikedace habitat is near the Sheep Wash confluence with Eagle Creek, approximately twelve miles downstream. Potential spikedace habitat within the allotment occurs within Eagle Creek, possibly portions of East Eagle and Dry Prong creeks, and in Robinson Canyon; a total of approximately three to four miles.

EFFECTS OF THE ACTION: Loach Minnow and Spikedace

Livestock use within loach minnow and spikedace habitat on the East Eagle Allotment is limited to trailing cattle along, through, and across the stream course while moving cattle among pastures and for shipping. Due to the rugged topography and limited access points within the allotment, trailing of livestock along the canyon bottoms is the only practical logistics available to the operator. Livestock trail through approximately 3 miles of Eagle and East Eagle creeks two or three separate occasions each year during the period May through October. Livestock cross the creek approximately 12 to 15 times. Approximate width of the directly disturbed area is about 15 feet per crossing. Total directly disturbed area is about 300 feet within a distance of about 3 miles. About 9 of these stream crossings are on vehicular trails. This includes part of the loach minnow and spikedace spawning season. Although there exists no site-specific documentation of direct take of loach minnow or spikedace on the allotment, potential effects of livestock within the stream corridor include: stepping on fish and larvae (loach minnow are especially vulnerable because they occupy the streambottom and do not move when there is a disturbance), stepping on eggs deposited by loach minnow on the underside of rocks, or of eggs of spikedace deposited among the sediments, suffocating these eggs due to increases in sediment, removal of riparian vegetation which may influence water temperatures and impact insect populations, and sloughing off and trampling of streambanks which may increase embeddedness and sedimentation and influence changes in stream morphology.

Upstream watershed conditions can have serious effects on downstream aquatic habitats. The East Eagle Allotment is in the headwaters of Eagle Creek, an extremely important native fish stream. However, while being managed under the resource protection Memorandum of Understanding and reduced stocking rates, there have been recent improvements in range condition on the allotment with almost 90% of capacity acres (37% of allotment acres) rated in fair condition. Riparian fencing, development of offsite water, active cattle management on the allotment, and livestock exclusion immediately downstream on National Forest and private lands, has resulted in improvement in the regeneration of riparian areas. Watershed conditions within the capacity acres are 60% in satisfactory condition, and assessed range conditions are generally fair in full and potential capacity acres. The watershed and range conditions of the 62% of the allotment rated as no capacity acres have not been assessed. These conditions, although improving, may impact loach minnow, spikedace, and aquatic habitats by increased sedimentation and alterations in the hydrograph. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. On the East Eagle Allotment sediment may be flushed regularly due to high stream flows. Spikedace are not unduly sensitive to moderate amounts of sediment, although during the spawning period egg viability may be reduced due to high embeddedness and sediment loads, and larval habitat may be lost due to filling of shallow waters with sediment.

The loach minnow is much more sensitive than spikedace to adverse effects from excess sediment in the aquatic ecosystem. Loach minnow may suffer loss of basic habitat from inundation by sediment. The interstices of rocks on the stream bottom, which form the primary habitat for adult loach minnow and their eggs, quickly fill up when excess sediment is present (Propst and Bestgen 1991). The amount of fine sediments in Eagle Creek appear to vary substantially depending upon the stretch of stream and the length of time since major flooding. Some surveys have noted large amounts (Kynard, 1976) and others have noted little (Marsh *et al.* 1990). Recent thalwag watershed link transects (T-Walk) indicate several levels of water quality degradation from sedimentation within Eagle Creek. Baseline data has been established on the East Eagle Allotment above Honeymoon Campground, and additional transects have been established downstream off the allotment. As noted by other research, turbidity and bedload sediment varies by location, and strongly suggest influence of other activities such as road maintenance and travel.

Indirect effects from modification of the watershed, stream channel, streambanks, and riparian zone result in short- and long-term adverse effects to loach minnow and spikedace. The physical damage caused by livestock to streambanks and stream channels due to trailing often results in increased channel width to depth ratios which increases riffle habitat, but may decrease the amount of "shear zones," the transitional habitat between fast and slow water favored by adult spikedace (Propst *et al.* 1986). A wider, shallower stream would have reduced velocities in riffle/run/glide habitat which would result in a decrease in the amount of loach minnow habitat. Bank configuration, soil type, and soil moisture content influence the amount of damage, with moist soil being more vulnerable to damage (Marlow and Pogacnik, 1985, Platts 1990). The potential adverse effects of the ongoing livestock management activities on the East Eagle Allotment are not restricted to loach minnow and spikedace habitat on those creeks where trailing occurs, but also extends downstream. Effects of sedimentation from tributary canyons and streams leading to Eagle Creek, and the upstream condition of Eagle Creek, contributes to the condition of Eagle Creek downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). The extent and magnitude of the potential impacts to loach minnow and spikedace from the East Eagle Allotment is uncertain. Recent inspections conducted by National Forest personnel indicated that impacts to streambanks and associated vegetation from trailing along East Eagle Creek are being minimized by herding livestock along an existing two-track road which traverses the canyon bottom. While stream channel stabilization and rebuilding stream banks may be affected by the recurrent trailing of livestock, more of the observed impacts have been attributed to vehicle travel along the two-track roads in East Eagle and Eagle creeks.

Although riparian vegetation is improving within East Eagle Allotment, documentation is generally lacking to substantiate current aquatic and vegetation conditions. However, livestock foraging within the riparian zones are limited to the times during trailing. Limited impacts are expected to occur to riparian vegetation from herbivory, provided livestock are trailed efficiently and not allowed to loaf in the canyon bottoms. Continued improvement in riparian condition within the allotment is expected.

Habitat destruction or alteration and interactions with nonnative fishes have acted both independently and in concert to extirpate or deplete loach minnow and spikedace populations (U.S. Fish and Wildlife Service 1986a and 1986c). Both historic and present landscapes surrounding loach minnow and spikedace habitats have been impacted to varying degrees by domestic livestock grazing, mining, agriculture, timber harvest, recreation, or development (Hastings and Turner 1965, Hendrickson and Minckley 1984). These activities degrade loach minnow and spikedace habitats by altering flow regimes, increasing watershed and channel erosion, and thus sedimentation, and adding contaminants to streams and rivers. As a result, these activities may affect loach minnow and spikedace through direct mortality, interference with reproduction, and reduction of invertebrate food supplies.

Effects of livestock grazing on the East Eagle Allotment are only a small part of the total additive and cumulative impacts to loach minnow and spikedace in the Eagle Creek drainage. However, as a part of the whole, its contribution to the deteriorated status of the watershed, riparian zone, stream channel, and fish community must be determined and continue to be ameliorated to provide for the overall protection and recovery of loach minnow and spikedace and the ecosystem.

CUMULATIVE EFFECTS

A large proportion of the Eagle Creek stream channel downstream from the East Eagle Allotment is on private inholdings within the National Forest. Ongoing activities occurring on these private lands that would be cumulative to the proposed action include residential use, roads, livestock grazing, and irrigated cropping. No data are available at this time to estimate the level of impacts from those activities on Eagle Creek and its fish. However, it is probable that these activities contribute substantially to the degraded condition of the stream channel and fish habitat in Eagle Creek and to the intermittency of stream flow.

The East Eagle Allotment comprises about 21% of the Eagle Creek watershed. Land use practices in the remainder of the watershed, including those of the State, Bureau of Land Management, San Carlos Apache Indian Reservation, and private lands may impact loach minnow and spikedace within Eagle Creek. Stream channelization, bank stabilization, or other instream management for water diversion may impact loach minnow and spikedace habitat within Eagle Creek. Phelps Dodge activities, including water discharges from deep well ground pumping result in water level fluctuations that could impact the quality and quantity of loach minnow and spikedace habitats. Several roads and trails intersect the main fork and tributaries of Eagle Creek. Road 217A travels for about ½ mile directly up the perennial portion of the Middle Prong until it crosses into the Reservation. Road 217 crosses Eagle Creek three miles below Honeymoon Campground and the southern boundary of the allotment. Road 8369 crisscrosses Eagle Creek and Dry Prong over 15 times before it leaves the drainage to Saunders cabin. East Eagle Trail 33, a two-track travelway for vehicles, junctions with the Dry Prong about 1.5 miles above Honeymoon and continues up East Eagle Creek six miles to Sawmill cabin. These roads and trails have their subsequent impacts to loach minnow and spikedace and potential habitats.

CONCLUSION

After reviewing the current status of the loach minnow and spikedace, the environmental baseline for the project are, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the East Eagle Allotment are not likely to jeopardize the continued existence of loach minnow or spikedace. No critical habitat is designated for these species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow and Spikedace on the East Eagle Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of loach minnow and spikedace is expected to result from the ongoing grazing activities on the East Eagle Allotment. Harassment occurs through effects to individual fish which could occur when livestock enter the stream. Harm occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow and spikedace. The Service anticipates, however, that incidental take of loach minnow and spikedace associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow and spikedace from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve or maintain good or better status, under the proposed livestock management. Improved conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the Eagle Creek watershed.

2. The riparian corridors along Eagle, East Eagle, and lower Dry Prong creeks receive more than incidental impacts by livestock (utilization or streambank alteration).

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the spikedace.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Eagle Creek watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. Continue to correlate stocking of permitted livestock with range improvement construction and maintenance, livestock management, and improvement in range conditions.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Prevent decline in riparian habitat conditions in Robinson Canyon riparian area that result from livestock.

2. Restrict all livestock access to Eagle, East Eagle, and lower Dry Prong creeks to the minimum periods necessary for trailing cattle among pastures and for shipping. Trailing of the herd will occur no more than three times each year, and only once during May/June (the loach minnow and spikedace spawning period). Livestock may be trailed in small groups if monitoring shows this to minimize impacts.

3. Livestock crossings of Eagle, East Eagle, and lower Dry Prong creeks are to be evaluated by a fishery biologist to ensure crossings occur in areas least likely to impact loach minnow, spikedace, or their habitats.

4. Trailing of cattle along Eagle, East Eagle, and lower Dry Prong creeks, shall be conducted so that: 1) cattle are present for the shortest period of time possible in riparian/aquatic habitats; 2) livestock are not present overnight along the stream course; 3) the shortest route across the stream is taken; 4) trailing across streams is conducted as infrequently as possible; and 5) whenever possible, trailing is conducted when bankline soil moisture is relatively low. While trailing along East Eagle Creek, herd livestock along the two-track road whenever possible.

5. Survey in 1998, riparian habitats (vegetation, stream bank condition, water quality and quantity) before and after livestock pasture moves in Eagle Creek and East Eagle Creek pastures to determine livestock effects. Submit a report on these findings to the Service by December 31, 1998. In coordination with the Service, following the 1998 analysis of impacts, determine if continued monitoring is needed in 1999 and 2000.

6. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of livestock exclosures established for protection of potential spikedace and loach minnow habitat in the Eagle Creek watershed.

7. Establish at least two fish monitoring sites above Honeymoon Campground to determine fish species occurrence and habitat suitability within the East Eagle Allotment (at a minimum, one site within Eagle Creek and one site within East Eagle Creek). Fish monitoring is to be conducted by a journey-level fishery biologist (or equivalent) and coordinated with other fish survey/monitoring programs.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Eagle Creek watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the

loach minnow and spikedace (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow and Spikedace on the East Eagle Allotment

1. Evaluate the affects to loach minnow and spikedace habitat due to the road in the bottom of East Eagle Creek, and if appropriate and in cooperation with appropriate parties, consider reducing the number of stream crossings or closing the road.

2. Consider possible ways of excluding all livestock access, including trailing, from Eagle, East Eagle, and Dry Prong creeks to provide maximum protection and recovery potential for loach minnow and spikedace.

3. By March 1, 1999, initiate a watershed analysis of the upper Eagle Creek watershed (sixth code watershed level; not the entire Eagle Creek watershed) to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow and spikedace. The analysis will be developed in coordination with the Service. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This

analysis should consider including: Terrestrial Ecosystem Surveys TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status, morphology, and function (e.g., T-Walk, proper functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the upper Eagle Creek watershed (sixth code). This watershed analysis may be incorporated into the NEPA process for grazing authorization.

4. Develop sediment traps in Dry Prong and Middle Prong to capture sediment coming from the Reservation.

5. Evaluate closing one mile of National Forest Road 217A (Middle Prong Road), and a seasonal closure of Road 8369 and Lower East Eagle Trail #33, to compliment ongoing grazing practices designed to improve riparian conditions and reduce sediments.

6. Identify main sources of sediment input and develop programs to mitigate those impacts.

7. Implement the loach minnow and spikedace recovery plans, as appropriate.

ARIZONA HEDGEHOG CACTUS ON THE EAST EAGLE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Arizona hedgehog cactus has not been located within the allotment but known locations are two miles south. Surveys have not been conducted on the allotment. The cactus has a potential to be widespread across 28,184 acres of this 37,259 acre allotment.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the East Eagle Allotment <u>may affect, not likely to adversely affect</u> the Arizona hedgehog cactus. The Service here concurs with this determination for the following reasons: the East Eagle Allotment is managed, in part, under a Memorandum of Understanding for resource protection providing for non-use of a portion of the permitted livestock numbers; stocking of permitted livestock is correlated with range improvement construction and maintenance, livestock management, improvement in range conditions, and is within estimated capacity of the range; and although most of the allotment range condition is rated fair, there has been some recent improvement, and expectations are that improvements will continue.

FOOTE CREEK ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:

- 24,282 total
- 13,733 full/potential capacity range

Projected Stocking Density

- 1190 animal months
- 11.5 acres per animal month

Permitted Use:

- 42 cow/calf, 11/1-5/31
- 154 cow/calf, 6/1-10/31

Projected Use:

- 60 cow/calf, 10/15-5/14
- 154 cow/calf, 5/2-10/14

Major Vegetation Type:

- Pinyon/juniper, ponderosa pine, mixed conifer

Major Drainages:

- Willow Creek
- Thomas Creek
- Hannagan Creek
- Foote Creek (Blue River)

Elevation:

- 6,300 to 9,300 feet

Type of Grazing System:

- 1 pasture, season-long (winter); 3 pastures, deferred (summer)
- Allotment used with Cow Flat and PS allotments

Allotment Condition:

- 1987 TES indicates that most of the allotment is in satisfactory soil condition.

- 1997 range condition data indicate that most of the allotment is in very poor (64% of allotment) to fair condition.

Listed Species Adversely Affected:
- Loach minnow
- Mexican spotted owl

Ecological condition and/or management action that contributes to adverse effects:
- Poor range condition (Foote Creek Winter Pasture has a virtual lack of herbaceous and browse vegetation).
- Livestock have direct access to stream channels which drain into the Blue River while in Foote Creek Winter and South Castle pastures (possible increase in sedimentation).

Consultation Period:
- 3 Years

LOACH MINNOW ON THE FOOTE CREEK ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Blue River is a seriously degraded ecosystem. Aldo Leopold in 1921 called the Blue River "ruined" and cited it as an "extreme example" of human-caused erosion in the Southwest (Leopold 1921, Leopold 1946). Human uses of the river and its watershed in combination with natural flood flow events have resulted in extensive changes within the watershed and river channel. Miller (1961) indicated that as European settlement of the Blue River occurred around 1885 or 1886, the floor of the Blue River canyon was "well sodded and covered with grama grass, hardwoods, and pine," and the banks were "lined with willows and the river abounded with trout" (Leopold 1921). Olmstead (1919) refers to devastating floods that occurred from 1900 to 1906, which followed and contributed to the loss of floodplain terrains and other major changes to the elevation of the river by 1916. Periodic floods continue to erode remaining fields, homes, and roads (Coor 1992).

Flood destruction resulting in channel erosion was enabled and exacerbated by human activities on the watershed and streambanks (Chamberlain 1904, Olmstead, 1919, Leopold 1924a and 1924b, Bryan 1925, Leopold 1946, Miller 1961, Dobyns 1981, Coor 1992). Overgrazing depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation, increasing the volume of high flows, and decreasing the volume of low flows. Timber harvest, fuelwood, and railroad tie cutting removed vegetative cover of the watershed, often resulted in eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing riparian vegetation and irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river contributed to erosional degradation, often resulting in new channels or widening of the existing channel. Cattle drives along the river broke down streambank soils and damaged riparian vegetation. The resulting stream channel is characterized by a wide, shallow channel profile, high levels of sediment, eroding banks, braided shifting channels, and depauperate, sparse riparian vegetation (Chamberlain 1904, Leopold 1921, Leopold 1924a and 1924b, Dobyns 1981, Coor 1992).

The Blue River has a bimodal high flow pattern: a snow-melt hydrograph with high flows in late-winter and spring, and a second high flow period associated with monsoon rains in later summer. The river is "flashy" with high discharge following summer storms. Erosion, channel width, and channel migration increase gradually in a downstream direction, while riparian vegetation becomes less dense and aquatic habitat diversity decreases, becoming mostly riffles and runs, with pools scarce and generally associated with bedrock walls. Increased flashiness of flood flows and depletion of base flows are results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation (Ffolliott and Throud 1975, Dunne and Leopold 1978, DeBano and Schmidt 1989, Gebhardt *et al.* 1989, Meehan 1991, Gordon *et al.* 1992, Naiman 1992, Belsky and Blumenthal 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River.

Today, much of the Blue River channel is a wide, unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.* 1989, Bagley *et al.* 1995). River terraces or benches are small eroding remnants of former river banks. Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow (*Baccharis salicifolia*), and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Plantanus wrighti*) are present, with willow increasingly common in the upper reaches where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* spp.), which are a key element in stable streambanks, are uncommon along much of the river.

The Blue River, like all streams in the Gila River basin, has been subject to introduction of a number of nonnative fish and other aquatic species. Nonnatives adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh and Brooks 1989, Marsh *et al.* 1989, Propst *et al.* 1992, Blinn *et al.* 1993, Carmichael *et al.* 1993, Douglas *et al.* 1994). Nonnative species reported in the Blue River during recent survey efforts include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Earlier surveys also found channel catfish (*Ictalurus punctatus*) (Anderson and Turner 1977, J.M.Montgomery Consulting Engineers 1985).

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river. Timber harvest, roads, recreation, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Private lands in the system are concentrated in the upper 30 miles of river bottom. Some cropping and irrigated agriculture continues on remaining river terraces that have natural protection from flood erosion. There are a number of small diversion structures and irrigation canals. A private fish hatchery is operated along the upper Blue River at Bush Creek and a substantial proportion of the base flow is diverted into the hatchery. Subdividing of ranch lands and construction of residences or summer homes has occurred at a fairly low level. The Blue River Road is a continuous source of bank and channel damage and erosion. Numerous low-water crossings exist in the upper Blue River and contribute to localized destabilization. Road maintenance results in significant modifications and impacts to the river. In the lower Blue, unauthorized off-road-vehicle use in the river bottom continues to occur. Livestock grazing in the valley bottom continues on private lands in the upper Blue. On the Clifton Ranger District, the river corridor is excluded from authorized livestock grazing. Grazing is permitted on the river on some Forest Service allotments in the Alpine Ranger District.

The Foote Creek Allotment ranges in elevation from 6,300 to 9,300 feet. The topography is mostly steep slopes with scattered flat to moderately sloped benches. This is a year long grazing operation, with one pasture, Foote Creek Winter, used in the winter and early spring. Livestock stocking rates are believed to exceed estimated capacity of the range, especially for the Foote Creek Winter Pasture which appears to be too high in elevation to be an appropriate winter use pasture. Grazing is generally limited to the narrow canyon bottoms, ridge tops and gentler slopes and benches. Due to the overall rugged topography there is some compensatory use by cattle in areas that would not normally be considered available to cattle. The Foote Creek Winter Pasture contains Foote Creek and associated drainages. This is the only winter use pasture and is used each year. Wildlife use this area heavily, also. The understory cover of litter and grasses on the Foote Creek Winter portion of the allotment is conspicuously lacking and the browse component has almost been eliminated. What browse remains is unavailable, severely hedged, exhibits no age class diversity and is unlikely to reproduce. Many of the soils are exposed and unproductive, and on steep slopes which may often preclude revegetation.

For many years, information on the fish of the Blue River was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain 1904, Anderson and Turner 1977, Silvey and Thompson 1978, J.M.Montgomery Consulting Engineers 1985, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor 1992). Recently, surveys of the Blue River system were conducted by Arizona Game and Fish Department in 1994 on the upper Blue River and by Arizona State University during 1995 and 1996, under funding from the Apache-Sitgreaves National Forests, on the lower river and tributaries (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). These surveys found loach minnow distributed throughout the Campbell Blue and Blue River system. In addition to loach minnow, the Blue River continues to support four other native fishes, the speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), and Sonora sucker (*Catostomus insignis*). Based on historical records, the Service concludes that up to nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century.

The loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). The only earlier fish survey was in 1904 (Chamberlain) which did not find loach minnow. Several efforts since then have located loach minnow distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the Blue River (Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Hendrickson 1987, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989, Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Loach minnow were not found in any tributaries other than Campbell Blue Creek and in KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Even where the densities are highest in the Blue River, loach minnow is still relatively scarce, rarely constituting more than 10%, and often less than 5%, of the fish population (Arizona Game and Fish Department 1994, Bagley *et al.* 1995).

Alteration of the Blue River watershed and simplification of the geomorphology of the Blue River affects loach minnow habitat. Discharge, velocity, instream water volume, water temperature, nutrient cycling, sedimentation, availability of larval backwater habitats and cobble/gravel riffles, food availability, and other factors have been altered.

Loach minnow are not known to occur within the boundary of the Foote Creek Allotment. Occupied or potentially occupied habitat occurs approximately three miles downstream of the allotment in the Blue River. Foote Creek, a tributary to the Blue River, is mostly intermittent on the allotment but becomes perennial downstream. The confluence of Foote Creek and the Blue River is within a private land parcel. No

General Aquatic Wildlife Survey data has been collected for Foote Creek. The riparian area is characterized as intact.

EFFECTS OF THE ACTION

Livestock do not have direct access to any known occupied or potential loach minnow habitat on the Foote Creek Allotment. Increases in sedimentation to the Blue River from Foote Creek on the allotment are expected as a result of ongoing livestock grazing within the Foote Creek Winter and South Castle pastures. Poor watershed and range conditions (especially within the Foote Creek Winter Pasture), combined with continued livestock grazing, may contribute to altering the hydrologic regime (water quantity, quality, intensity, duration , and pattern) within Foote Creek and the Blue River drainage, thereby increasing erosion and sedimentation into the Blue River. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Some riffle habitats in the Blue River that may otherwise be suitable loach minnow habitat may be unsuitable due to sediment deposition that eliminates the under-cobble pockets needed by loach minnow. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the Blue River contribute to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993). On much of the Blue River, the riparian vegetation is sparse and mostly lacking in herbaceous cover. Therefore, there is limited opportunity for riparian buffering of sediments from degraded upland watershed conditions.

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

As with many short-lived species, populations of loach minnow undergo substantial fluctuations in abundance between years (Propst *et al.* 1988). When population numbers are at or near the high end of the cycle, the loach minnow may be able to withstand substantial adverse effects. The same effects, if they occur at the low point of the population cycle, may be much more serious and could potentially result in extirpation of the species from the affected area. Most adverse affects are increasingly detrimental when they occur during the spawning period.

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and

Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include the entire Blue River population of loach minnow. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The National Forest has been working to improve conditions along the Blue River corridor and has precluded livestock from the river channel on many allotments. However, the currently degraded ecological conditions of the Blue River watershed intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. The Foote Creek Winter Pasture includes a large part of the Foote Creek watershed, a significant tributary of the Blue River. Upland range and watershed conditions may have contributed to altering the hydrologic regime of Foote Creek, thereby reducing its potential for perennial flow and supporting loach minnows. The Foote Creek Allotment is one of many allotments in the watershed with high proportions of impaired soils, poor to very poor range condition, and unsatisfactory riparian areas. The allotment is suspected to be overstocked, turn-out dates too early, and grazing durations too long. The naturally fragile status of the watershed makes the Blue River even more sensitive to the affects of livestock management activities. A watershed level analysis of ecosystem functions may provide the necessary information to assess the additive affects of individual allotments and the challenges for recovery of the system.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the loach minnow, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation allows access of predatory nonnative fish species into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline in the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Foote Creek Allotment are not likely to jeopardize the continued existence of loach minnow. No designated critical habitat for this species exists, therefore none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Foote Creek Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Foote Creek Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the Blue River watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian conditions, and stream conditions) on the allotment within the Blue River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By, September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. Continue the fish monitoring program for the Blue River established by the National Forest.

3. By March 1, 1999, initiate a watershed analysis of the Blue River watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the Blue River watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

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

1. Surveys are to be conducted by a journey-level fishery biologist (or equivalent) on Foote Creek for loach minnow and assess habitat potential.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Blue River watershed at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until the livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Foote Creek Allotment

1. Consider excluding all livestock use from the Foote Creek Winter pasture.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Implement the loach minnow recovery plan, as appropriate.

MEXICAN SPOTTED OWL ON THE FOOTE CREEK ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Foote Creek Allotment is located within the Upper Gila Mountains Recovery Unit for the Mexican spotted owl, as defined by the recovery plan (U.S. Fish and Wildlife Service 1995b). This recovery unit is a relatively narrow band bounded on the north by the Colorado Plateau Recovery Unit and to the south by the Basin and Range West Recovery Unit. The southern boundary of the Upper Gila Mountains Recovery Unit includes the drainages below the Mogollon Rim in central and eastern Arizona. The eastern boundary extends to the Black, Mimbres, San Mateo, and Magdalena Mountain ranges of New Mexico. The northern and western boundaries extend to the San Francisco Peaks and Bill Williams Mountain north and east of Flagstaff, Arizona. This is a topographically complex area consisting of steep foothills and high plateaus dissected by deep forested drainages. This recovery unit can be considered a "transition zone," because it is an interface between two major biotic regions: the Colorado Plateau and Basin and Range Provinces (Wilson 1969). Habitat within this recovery unit is administered by the Kaibab, Coconino, Apache-Sitgreaves, Tonto, Cibola, and Gila national forests. The north half of the Fort Apache and northeast corner of the San Carlos Indian Reservations are located in the center of this recovery unit and contain an important habitat link between owl subpopulations at the western and eastern ends of the recovery unit and the subpopulations directly south within the Basin and Range West Recovery Unit.

The Upper Gila Mountains Recovery Unit consists of deep forested drainages on the Mogollon Plateau. Vegetation generally consists of pinyon/juniper woodland, ponderosa pine/mixed conifer forest, some spruce/fir forest, and deciduous riparian forest in mid and lower elevation canyon habitat. Climate is characterized by cold winters and over half the precipitation falls during the growing season. Much of the mature stand component on the gentle slopes surrounding the canyons has been partially or completely harvested. Most of the forest habitat on steeper ground that may serve as Mexican spotted owl nesting habitat is in suitable condition. Spotted owls are widely distributed and use a variety of habitats within this recovery unit. Owls most commonly nest and roost in mixed-conifer forests dominated by Douglas-fir and/or white fir and canyons with varying degrees of forest cover (Ganey and Balda 1989a, U.S. Fish and Wildlife Service 1995b). Owls also nest and roost in ponderosa pine-Gamble oak forest, where they are typically found in stands containing well-developed understories of Gamble oak (U.S. Fish and Wildlife Service 1995b).

The Upper Gila Mountains Recovery Unit contains the largest known concentration of Mexican spotted owls, with approximately 55% of known owl territories U.S. Fish and Wildlife Service 1995b). This recovery unit is located near the center of the Mexican spotted owl's range within the United States and is contiguous to four of the other five recovery units within the United States. Because of its central location and its large and relatively continuous spotted owl population, the Mexican spotted owl recovery plan recommends that the owl population in this recovery unit could be uniquely important to the overall stability and persistence of the Mexican spotted owl population in the United States. Specifically, this population could serve as the source population, providing immigrants to smaller, more isolated populations in other recovery units. Although no data on dispersal patterns or movements between recovery units is available, the recovery plan recommends that this population should be maintained at current levels and with at least the current level of connectivity within the recovery unit. Significant discontinuities that develop in the Mexican spotted owl's distribution within this recovery unit, and the loss of habitat to support the local sub-populations, may compromise the recovery of the species.

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) lists the primary threats to the species in the Upper Gila Mountains Recovery Unit as timber harvest and catastrophic fire; it also includes overgrazing as a threat to the owl.

The Foote Creek Allotment ranges in elevation from 6,300 to 9,300 feet. The topography is mostly steep slopes with scattered flat to moderately sloped benches. This is a year-long grazing operation, with one pasture, Foote Creek Winter, used in the winter and early spring each year. Livestock stocking rates are believed to exceed estimated capacity of the range, especially for the Foote Creek Winter Pasture which appears to be too high in elevation to be an appropriate winter use pasture. Grazing is generally limited to the narrow canyon bottoms, ridge tops and gentler slopes and benches. Due to the overall rugged topography there is some compensatory use by cattle in areas that would not normally be considered available to cattle. The Foote Creek Winter Pasture contains Foote Creek and associated drainages. This is the only winter use pasture and is used each year. Wildlife also use this area heavily. The understory cover of litter and grasses on the Foote Creek Winter portion of the allotment is conspicuously lacking and the browse component has almost been eliminated. What browse remains is unavailable, severely hedged, exhibits no age class diversity and is unlikely to reproduce. Many of the soils are exposed and unproductive, occupying slope positions on the landscape that preclude revegetation.

There are nine Mexican spotted owl protected activity centers (PACs) either entirely or partially contained within the Foote Creek Allotment. These PACs are dispersed across the allotment and are typically in higher elevations and/or steep canyons and slopes. Although the PACs have been identified and delineated for management purposes, several years have lapsed since the last occupancy monitoring. Of the nine PACs, dates of last monitoring are: 1990 for two PACs, 1992 for two PACs, 1994 for four PACs, and 1995 for one PAC.

Five PACs, East Castle, Thomas Creek, Willow Creek, Horton Creek, and Hannagan Creek, are primarily on north facing slopes. They are in dense mixed conifer with some aspen, especially in the upper ends of the drainages that bisect the PACs. Most of the length of Hannagan Creek on the allotment is fenced from livestock for protection of Apache trout, including that portion that goes through the Hannagan Creek PAC. East Castle is on north slopes too steep for livestock. With current livestock numbers and season, the lower slopes of three PACs, Thomas Creek, Willow Creek, and Horton Creek, are receiving livestock use. Horton PAC has small riparian stringers in the lower end, and Thomas Creek PAC has a road in the lower end. These small areas of forage can be over-utilized with current livestock numbers and grazing season, especially in the years when West Thomas and Willow pastures are used before the July rains.

There are four PACs in the Foote Creek Winter Pasture. Two of these, Foote Creek PAC and Right Fork Foote Creek PAC, include very steep canyons which have a substantial amount of ponderosa pine, pinyon pine, and live oak. North slopes are mixed conifer, and canyon bottoms have riparian hardwoods. In these PACs, the canyon bottoms in the winter portion of the allotment are avoided by livestock due to their cold air drainage. The other two PACs in the Foote Creek Winter Pasture, Castle Rock PAC and Oliver PAC, are on the upper rim of Foote Creek on east facing slopes at elevation above 8,000 feet, and livestock do not work up into these in the winter due to snow.

When livestock are gathered off the Foote Creek Winter Pasture in May during the spotted owl breeding season, they are herded in small groups (up to about 25 head) on trails that bisect five PACs. There are no alternate routes due to topography.

EFFECTS OF THE ACTION

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) summarizes the effects of grazing to spotted owls in four broad categories: 1) altered prey availability, 2) altered susceptibility to fire, 3) degeneration of riparian plant communities, and 4) impaired ability of plant communities to develop into spotted owl habitat. The recovery plan goes on to provide explicit goals for managing grazing in protected and restricted spotted owl habitat:

- Monitor grazing use by livestock and wildlife in "key grazing area." Key areas are primarily riparian areas, meadows, and oak types.

- The intent is to maintain good to excellent range conditions in key areas while accommodating the needs of the owl and its prey.

- Implement and enforce grazing utilizations standards that would attain good to excellent range conditions within the key grazing area.

- Establish maximum allowable use levels that are conservative and that will expedite attaining and maintaining good to excellent range conditions.

- Ensure that the allowable use of plant species will maintain plant diversity, density, vigor, and regeneration over time.

- Restore adequate levels of residual plant cover, fruits, seeds, and regeneration to provide for the needs of prey species.

- Restore good conditions to degraded riparian communities

The Forest Service Record of Decision for the Amendments of the Forests Plan incorporated the recommendations for Mexican spotted owl management into National Forest direction in the form of standards and guidelines and suggested utilization levels, for combined use by livestock and wildlife, based on range conditions and allotment management strategy.

The Mexican spotted owl recovery plan specifically identifies overgrazing as a threat to the owl in the Upper Gila Mountain Recovery Unit.

> "Overgrazing is suspected to be detrimental in some areas and can affect both habitat structure and the prey base. Effects on the prey base are difficult to quantify, but removal of herbaceous vegetation can reduce both food and cover available to small mammals (Ward and Block 1995). This is especially true with respect to voles, which are often associated with dense grass cover. Direct effects on habitat occurs with livestock browsing on Gambel oak [(*Quercus gambeli*)]. In some areas, oak is regenerating well but unable to grow beyond the sapling stage because of this browsing... Grazing effects on habitat are also potentially significant in canyon-bottom riparian areas. We do not attribute these effects solely to livestock. Forage resources are shared by livestock and wild ungulates" (U.S. Fish and Wildlife Service 1995b, p. 101).

Diet studies conducted on Mexican spotted owls have indicated that prey species of the owl include woodrats (*Neotoma* spp.), white-footed mice (*Peromyscus* spp.), voles (*Microtus* and *Cleithrionomys* spp.), rabbits and hares (*Sylvilagus* and *Lepus* spp.), pocket gophers (*Thomomys* spp.), other mammals including a variety of bats, birds, insects, and reptiles. Ward and Block (1995) report that rangewide, 90% of an "average" Mexican spotted owl diet would contain 30% woodrats; 28% peromyscid mice; 13% arthropods; 9% microtine voles; 5% birds; and 4% medium-sized rodents, mostly diurnal sciurids. These rangewide patterns, however, are not consistent among spotted owl recovery units as data indicates significant differences in owl diets among geographic location (Ward and Block 1995). Ganey (1992) conducted a Mexican spotted owl prey study between 1984-1990 in mixed conifer habitat of the San Francisco Peaks. He found the following percentages of prey biomass in the diet of the owl: 49.1% woodrats; 15% voles; 12.5% peromyscid mice; 9.1% pocket gophers; 6.7% rabbits; 4.4% other medium mammals; 3.1% birds; and 0.1% arthropods.

The effects that livestock and wildlife grazing can have on Mexican spotted owl prey species and their habitat is also a complex issue. Impacts can vary according to grazing species (domestic or wild), degree of use, including stocking density, grazing intensity, grazing frequency, and timing of grazing, habitat type and structure, and plant and prey species composition (Ward and Block 1995). It is well documented that repetitive, excessive grazing of plant communities by livestock can significantly alter plant species density, composition, vigor, regeneration, above or below ground phytomass, soil properties, nutrient flow, and water quality, especially when uncontrolled (Belsky and Blumenthal 1997; Ward and Block 1995). These effects have both direct and indirect adverse impacts on animal species that are dependent on plants for food and cover. However, moderate to light grazing can benefit some plant and animal species under certain conditions and in certain environments, maintain communities in certain seral stages, and may increase primary productivity (Ward and Block 1995). No studies document the direct and indirect effects of livestock and wildlife grazing on the Mexican spotted owl or its prey (U.S. Fish and Wildlife Service 1995b). However, Ward and Block (1995) indicate that there exists some knowledge regarding the effects that livestock grazing can have on small mammals frequently consumed by spotted owls, and regarding mesic or montane plant communities inhabited by the owl's prey. Based on studies conducted in other areas of the United States, Ward and Block (1995) indicate that, under heavy grazing, decreases in populations of voles would be expected, and this would improve conditions for deer mice in meadow habitat. Increases in deer mouse abundance in meadows would not offset decreases in vole numbers because voles provide greater biomass per individual and per unit of area. Such decreases could negatively influence spotted owls (Ward and Block 1995).

Ward and Block (1995) examined correlates between the Mexican spotted owl's diet and reproduction. Their results suggested that the owl's reproductive success was not influenced by a single prey species, but by many species in combination. None of the specific prey groups significantly influenced owl reproductive success, but rather, they concluded it was more likely that the owl's reproductive success was influenced by total prey biomass consumed in a given year, rather than by a single prey species. More young were produced when moderate to high amounts of the three most common prey groups (woodrats, peromyscid mice, and voles) were consumed.

Grazing by livestock can alter the vegetation community. Canyon bottoms and meadows are often preferred foraging sites by both livestock and wildlife, and grazing contributes significantly to degradation of these habitats. Within conifer forests, grazing can remove or greatly reduce grasses and forbs, thereby allowing large numbers of conifer seedlings to become established because of reduced competition for water and nutrients. Establishment of seedling conifers coupled with the reduction in light ground fuels (e.g., grasses and forbs) may act with fire suppression to contribute to building of fuels in the forest, alter forest structure, and decrease the potential for beneficial low-intensity ground fires while increasing the risk of catastrophic fire (U.S. Fish and Wildlife Service 1995b).

Many of these effects are occurring, to some degree, on the Foote Creek Allotment due to ongoing livestock grazing activities within protected and restricted Mexican spotted owl habitat. Many of these effects are evident through the degraded status of range; other effects are more subtle. Through time and in combination with other factors, livestock overgrazing may be contributing to altering many ecosystem functions and processes associated with the Foote Creek Allotment.

Based on existing data on the foraging behavior of Mexican spotted owls, a PAC would include on average only 75% of the bird’s foraging range. Therefore, prey species abundance and habitat suitability on, and adjacent to a PAC is important in assessing affects to the owl from livestock grazing activities. With past livestock numbers and management, and seasonal use on Foote Creek Winter Pasture, over-utilization of forage and browse occurred throughout the Foote Creek allotment. On the Foote Creek Winter Pasture, grasses, forbs, and shrubs were severely impacted. Any use by wild ungulates is additive to grazing effects on plant vigor and diversity, and related watershed degradation. Application of the grazing utilization standards and guidelines should meet the intent of the *Mexican Spotted Owl Recovery Plan* to maintain habitat conditions for the owl prey base.

Based on available information and the experience of Forest Service district biologists, it does not appear there are adverse effects to spotted owls associated with trailing small bunches of livestock through PACs during the breeding season. Noises and other disturbance related aspects of this trailing are considered to be below background levels.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the Mexican spotted owl, such as grazing and timber harvest, involve Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. The resulting impacts to the riparian community may have an effect on the potential use of this area by spotted owls as wintering habitat and/or dispersal corridors.

CONCLUSION

After reviewing the current status of the Mexican spotted owl, the environmental baseline in the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Foote Creek Allotment are not likely to jeopardize the continued existence of Mexican spotted owl. No critical habitat for this species exists, therefore none will be affected.

INCIDENTAL TAKE STATEMENT
Mexican Spotted Owl on the Foote Creek Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The Service anticipates that take of Mexican spotted owl will be difficult to detect because finding a dead or impaired specimen is unlikely. However, the level of incidental take can be anticipated by the loss of essential elements in the habitat that would affect the reproductive success of the species. The primary type of take expected to result from the ongoing grazing activities on the Foote Creek Allotment is through harm by the reduction of suitability of the habitat for prey species, thus limiting the availability of prey for owls. This would impair the ability of Mexican spotted owl adults to successfully raise young. The Service anticipates that incidental take will occur to three pairs of Mexican spotted owls associated with the Thomas Creek PAC, the Willow Creek PAC, and the Horton Creek PAC. The Service has defined incidental take in terms of habitat characteristics, and has used surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of Mexican spotted owl from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), and riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions) within the natural capabilities of the landscape on all pastures of the allotment with Mexican spotted owl PACs.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Mexican spotted owl. Reasonable and Prudent Measures and Terms and conditions have been transmitted in draft form to the Forest Service. This final biological opinion will be amended upon review and adoption of the Terms and Conditions.

HICKEY ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- ! Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- ! 24,226 total
- ! 14,475 full/potential capacity range

Projected Stocking Density
- ! 4,014 animal months
- ! 3.6 acres per animal month

Permitted Use:
- ! 398 cow/calf 1/1-12/31
- ! 15 horses 1/1-12/31

Projected Use:
- ! 315, cow/calf 1/1-12/31
- ! 15 horses 1/1-12/31

Major Vegetation Type:
- ! Interior chaparral, grassland

Major Drainages:
- ! San Francisco River
- ! Blue River
- ! Hickey Canyon

Elevation:
- ! 4,000 to 7,000 feet

Type of Grazing System:
- ! 2 pasture, winter and 2 pasture summer, deferred rotation

Allotment Condition:
- ! 1987 TES indicates that over one half of the allotment is in unsatisfactory soil condition.
- ! 1967 Range condition data indicate that most of the allotment is in fair condition.

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded ecological conditions.

Consultation Period:

- ! 3 Years

ARIZONA HEDGEHOG CACTUS ON THE HICKEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Arizona hedgehog cactus is not known from the Hickey Allotment but no surveys have been conducted and the cactus has been found 8 miles to the northwest on the Double Circles Allotment. The cactus has a potential to occur somewhere on 23,428 acres of the allotment. Some 10,647 acres of the allotment are no capacity and would tend not to have extensive livestock use. It is also these acres that have the highest likelihood for presence of the cactus. Proposed stocking levels for the next three years are within the estimated capacity. Some 11,329 of the acres used in determining capacity are in fair range condition.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Hickey Allotment <u>may affect, not likely to adversely affect</u> the Arizona hedgehog cactus. The Service here concurs with this determination for the following reasons: (1) the Hickey Allotment is managed, in part, under a Memorandum of Understanding for resource protection providing for non-use of a portion of the permitted livestock numbers (since 1993); (2) approximately half of the allotment is currently being rested pending construction of fences; (3) stocking of permitted livestock is correlated with range improvement construction and maintenance, livestock management, improvement in range conditions, and is (almost) within estimated capacity of the range; (4) utilization levels are believed to be within appropriate limits, and although most of the allotment range condition is rated fair, there has been some recent improvements, and expectations are that improvements will continue.

HICKS/PIKE PEAK ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Tonto National Forest, Globe Ranger District

Allotment Acres:
- 62,967 total
- 50,360 full/potential capacity range

Projected Stocking Density
- 6,055 animal months
- 8.3 acres per animal month

Permitted Use:
- 850 cow/calf, 1/1-12/31

Projected Use:
- 490 cow/calf, 1/1-12/31
- 35 yearlings, 5 months

Major Vegetation Type:
- Pinyon/juniper, Sonoran desert scrub, interior chaparral

Major Drainages:
- Salt River

Elevation:
- 2,400 to 5,400 feet

Type of Grazing System:
- 4 herds, 4 unit rest rotation

Allotment Condition:
- 1977 range condition data indicate that 90% of the allotment is in very poor to poor condition.

Listed Species Adversely Affected:
- Razorback sucker and critical habitat
- Lesser long-nosed bat
- Arizona hedgehog cactus

Ecological condition and/or management action that contributes to adverse effects:

- Degraded ecological conditions.
- Livestock grazing occurs in pastures during agave bolting period.
- Livestock have direct access to Salt River in Lower Spring, Lower Redmond, and Ortega pastures.

Consultation Period:

- 3 Years

RAZORBACK SUCKER AND DESIGNATED CRITICAL HABITAT ON THE HICKS/PIKE PEAK ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Salt River in this reach is little affected by upstream diversions, and flows are not significantly different from historic patterns or levels. The natural hydrograph is largely unmodified. The river is confined to a deep canyon above and through the reach. High gradients have resulted in many rapids. Interspersed throughout the river are slow moving runs, pools, and eddies. Substrates vary but are primarily boulders, cobble, and gravels. Few, if any, backwaters are found; and riparian communities are limited. At bends in the river, the channel can widen out, and shallow, slow-moving waters, floodplains, and gravel bars can form (Maddux *et al.* 1993). Although floodplains are rare in the reach, occurring mostly at bends in the river, sand and gravel bars are common, and may provide razorback sucker spawning habitat. Nursery habitat may be limited to areas near floodplains or behind sand or gravel bars, especially in wider areas of the river where the channel may divide and create shallow, quiet water areas (Maddux *et al.* 1993). The Salt River through the Salt River Canyon has the fewest changes due to human development of any critical habitat reach for the razorback sucker in the Lower Basin of the Colorado River.

Critical habitat for the razorback sucker on the Salt River includes the river channel and the 100-year floodplain from the US60/SR77 bridge to the Roosevelt Diversion Dam; a distance of 55 miles through the Salt River Canyon. The Hicks/Pike Peak Allotment includes approximately 18 miles of the Salt River which forms the northern boundary of the allotment in Salt River Canyon. There are no records for the razorback sucker from the Salt River Canyon. However, historically the Salt River supported a population of razorback sucker (Minckley 1973), which were abundant in the lower Salt River and in lower Tonto Creek (Hubbs and Miller 1953). Roosevelt Dam was constructed in 1911, and razorback sucker persisted in Roosevelt Reservoir into the 1950s and later in the lower Salt River reservoirs (Minckley 1973). These records provide evidence that razorback sucker populations probably occurred historically in the Salt River Canyon (Minckley 1973, Maddux *et al.* 1993). The razorback sucker was not reported in the Salt River or mainstem reservoirs during the period 1967 through 1977 (Minckley *et al.* 1991a).

Beginning in 1981, the razorback sucker was stocked into the Salt River in a cooperative effort to reintroduce the species in its historic range. The stocking continued through the mid-1990s, and again in 1997. Larger fish were stocked by the Arizona Game and Fish Department to increase chances of survival. Although few fish have been recaptured from the Salt River, surveys have not conclusively determined its absence because of the size and complexity of the river.

Predation on and competition with razorback sucker by nonnative fish species is a persistent threat in this reach of the Salt River. This predation is likely a significant restriction on expansion of the razorback sucker population. Overuse of the watershed may have contributed to degradation of riparian communities and perhaps an increase in sediment loads.

EFFECTS OF THE ACTION

The northern boundary of the Hicks/Pike Peak Allotment is delineated by approximately 18 miles of the Salt River. Livestock have access to the Salt River from three pastures: Lower Shute Spring Pasture, Lower Redmond Pasture, and Ortega Pasture. Livestock use occurs in only one of these pastures each year for a period of 90 days, between November 1 and March 1. Although cattle are only in these pastures during the winter months, bank trampling and riparian vegetation utilization is likely to occur. Razorback sucker spawning begins in late winter, during the time period in which livestock have access to the river. Livestock concentration and access areas along the river and razorback sucker spawning sites may tend to be in the same locations (e.g., tributary inflow sites, broad bends in the river). Livestock impacts to upland watershed conditions and access to the Salt River on the Hicks/Pike Peak Allotment could potentially adversely affect the razorback sucker and its designated critical habitat through disturbance and degradation of areas necessary for spawning, nursery, rearing, feeding, and resting.

The National Forest suggests that excluding cattle from the Salt River will be difficult on the Hicks/Pike Peak Allotment because of steep and rugged topography, difficult access, and the total length of fencing required. The National Forest also suggests that fencing will have little conservation benefit. During the winter period, livestock tend to avoid the river corridor, only going to the river to drink; livestock use within the river corridor would be limited to the broad sandy bends in the river.

Although razorback sucker currently occur very rarely in the project area, the population size is small. Any losses to this population caused by grazing activities would have an impact on the survival of this very endangered species. Also of importance is how habitat alteration may affect the recovery potential of this species. As designated critical habitat, the Salt River is one of several reaches of Southwestern rivers that the Service believes is critical to the survival and recovery of the razorback sucker. No critical habitat reach currently supports viable, self-sustaining razorback sucker populations. Apparently, multiple factors have rendered these habitats largely unsuitable for razorback sucker recruitment. Habitat alteration attributable to grazing activities has contributed to these deteriorated habitat conditions.

Indirect effects to razorback sucker include alteration of habitat that may affect fish survival, reproduction, or other life history characteristics. Such effects could occur either in the aquatic habitats occupied by the species or in the watershed. The effects that livestock grazing can have on riparian and aquatic habitats, both directly and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Fleischner 1994).

Livestock grazing activities within the riparian/aquatic zone may contribute to physical destruction and alteration of stream banks, stream channels, and the water column (Armour 1977, Platts and Nelson 1985, Platts 1990, Meehan 1991), and the alteration of the riparian vegetation community. Reduction in aquatic habitat complexity increases vulnerability of native species to nonnative fishes (Bestgen 1986, Rinne and Minckley 1991, Baltz and Moyle 1993, Douglas *et al.* 1994).

Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, and water holding capabilities of the watershed. Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation. Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Menke 1988). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

The above effects occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase

(Marlow and Pogacnik 1985). Livestock grazing and its attendant reduction in habitat complexity may make razorback sucker more vulnerable to death and displacement from flooding, at the same time that livestock effects on the watershed and stream banks may contribute to increased flood volume, velocity, and abrasive power. However, the way in which these factors would be manifested and the magnitude of their effect in the watershed would depend on local site conditions such as soils, vegetation communities, precipitation, and slope. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high and rangelands are in fair, poor, or very poor condition.

Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Based on the most recent range data collected in 1977, the Hicks/Pike Peak Allotment is in seriously degraded condition, with 90% of the rangeland rated very poor or poor. Cool season grasses have been all but eliminated from the range. The allotment is heavily stocked and the Forest Service considers it unlikely that conditions have improved since the last analysis, and due to recent drought, believes conditions may have declined. The proposed grazing utilization levels within Sonoran desert scrub and pinyon/juniper habitats are 50% of the plants biomass for herbaceous vegetation and 50% of leaders browsed for woody vegetation; and on the Salt River, 40% of the biomass of herbaceous vegetation, and 40% of the leaders browsed. The Tonto National Forest is developing stubble height/utilization coefficients and other methods to determine the amount of forage use in an ecologically relevant, and repeatable manner. The Forest Service will evaluate these techniques as a possible substitute for the traditional utilization standards and monitoring. The watershed within the Hicks/Pike Peak Allotment is directly adjacent to almost one-third of the designated critical habitat on the Salt River, and livestock have direct access to the river. The effects from this allotment are more immediate and less buffered than allotments located in a remote portion of the watershed and/or with no direct access to the Salt River.

The decline of the razorback sucker has been so extensive that it now occupies only a small fraction of its historic range and is threatened with extinction (Minckley *et al.* 1991a). Continuing decline is expected for the near future because there is virtually no recruitment to wild populations. Within the Salt River Canyon critical habitat reach, the razorback sucker population is extremely small, with very limited habitat for spawning and nursery areas (e.g., backwaters, braided channels, tributary inflows). Livestock have access to 18 miles of the Salt River through three pastures during the winter period, although only one pasture is used each year. Access by livestock to river habitats is at the beginning of the late winter spawning period of the razorback sucker. Ecological conditions on the Hicks/Pike Peak Allotment are seriously degraded. The allotment is heavily stocked and there has been little or no improvement in range condition in recent years.

CUMULATIVE EFFECTS

The Salt River is subject to the effects of Federal, State, Tribal, and private actions. Impacts of human activities on the Salt River and its watershed have had profound effects on the river and associated riparian areas. Livestock grazing, timber harvest, recreational activities, and possible changes in annual flows due to off-stream uses of water have impaired the ability of the aquatic habitats to support native fish. Tribal lands occupy much of the upper watershed of the Salt River and approximately 30% of the river shoreline within designated critical habitat.

Introduced nonnative fishes are the most important biological threat to the razorback sucker. Other impacts to the species include environmental contaminants which may be introduced from municipal or industrial point source discharges, or from nonpoint sources associated with agricultural activity or resource extraction. Water development projects within the lower Salt River have fragmented razorback sucker habitat. Widespread, grazing activities within the Salt River watershed have affected watershed conditions and ecological function. Important backwater and low-velocity shoreline habitats have been eliminated through siltation and subsequent vegetative growth (Wick *et al.* 1982).

CONCLUSION

After reviewing the current status of the razorback sucker, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Hicks/Pike Peak Allotment are not likely to jeopardize the continued existence of razorback sucker, and are not likely to destroy or adversely modify designated critical habitat.

INCIDENTAL TAKE STATEMENT
Razorback Sucker on the Hicks/Pike Peak Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of razorback sucker is expected to result from the ongoing grazing activities on the Hicks/Pike Peak Allotment. Harassment occurs through effects to individual fish due to the impacts of grazing in the riparian/aquatic zones of the Salt River. Harm occurs through the effects to habitat that alter the suitability of the habitat to support razorback sucker due to watershed degradation and subsequent changes in sedimentation rates, riparian vegetation, and hydrology. The Service anticipates, however, that incidental take of the razorback sucker associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: presumed very low numbers of razorback sucker in the Salt River; finding dead or impaired individuals is unlikely; changes in instream habitat distribution over time; and losses may be masked by seasonal fluctuations in environmental conditions and fish population numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of razorback sucker from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improved conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the Salt River watershed.

2. The Salt River riparian corridor receives more than incidental use by livestock (utilization or streambank alteration levels are exceeded), or livestock use is not restricted to a period of 90 days or less (includes livestock transit time among pastures) between November 1 and March 1.

3. Required monitoring of livestock utilization levels, streambank alteration, and livestock access and use along the Salt River is not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the razorback sucker or 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:

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on all allotment pastures within the Salt River watershed.

2. Limit the impacts from livestock management activities to the stream course, and riparian and aquatic habitats.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Apply forage utilization levels to key areas and key species in all pastures with access to the Salt River: annual utilization in the riparian corridor of 20% maximum of available herbaceous forage; and 20% maximum browsed leaders on woody species. When these levels are met, livestock are moved from the pasture.

2. Monitor river access and use by livestock while they are present within the Lower Shute Spring Pasture, Lower Redmond Pasture, or Ortega Pasture. Monitor forage utilization within the riparian corridor for the active river pasture at least once during the grazing season (e.g., approximately mid-point) and within one week after livestock are moved from the pasture. Use grazing cages to help define baseline conditions for forage production. Apply established and replicable methods to measure utilization. The final monitoring will be done by a team (e.g., journey-level: fishery biologist, range specialist, riparian ecologist).

Provide field data sheets, maps of livestock access points and trails, and analysis summaries to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

3. Monitor streambank alteration along the Salt River for the active river pasture once during the grazing season (e.g., approximately mid-point) and within one week after livestock are moved from the pasture. Apply replicable methods to measure streambank alteration. Streambank alteration is limited to less than 20% of the alterable bank impacted by livestock. The final monitoring will be done by a team (including a journey-level fishery biologist). Provide field data sheets, maps of altered bank sites, and analysis summaries to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Salt River watershed at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until the livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the razorback sucker (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) monitoring summary of livestock access to the Salt River corridor; 6) maps of livestock access points to the Salt River; 7) summary of bank alteration monitoring; 8) progress made toward completion of multi-year Terms and Conditions; and 9) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule, livestock presence on the

Salt River is more than incidental), report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Razorback Sucker on the Hicks/Pike Peak Allotment

1. Remove all livestock grazing from Forest Service lands in the 100-year floodplain of the Salt River, from Canyon Creek to the Roosevelt diversion dam.

2. Coordinate with appropriate entities to identify sources of trespass livestock within the Salt River corridor, and work to remove trespass livestock.

3. Evaluate the Salt River corridor and Coon Creek for habitat potential for the southwestern willow flycatcher.

LESSER LONG-NOSED BAT ON THE HICKS/PIKE PEAK ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Lesser long-nosed bats require suitable forage plants (paniculate agaves and saguaros) and suitable roost sites. It is unknown whether the bat actually roosts within or adjacent to the Hicks/Pike Peak Allotment. Mines and caves occurring in the allotment could potentially provide suitable roost sites. Any potential roosts in the area would probably be transitory (non-maternity) roosts used by adults and/or young bats in summer or fall. Saguaros occur at lower elevations within the allotment; paniculate agaves extend into higher elevation areas (±6,000 feet). Agaves are likely scattered, although they may occur in localized concentrations. Palmer's agave (*Agave palmeri*) is not known to occur on the Hicks/Pike Peak Allotment, although other paniculate agaves may (e.g., Parry's agave, *A. paryi*, desert agave(?), *A. deserti*). The Hicks/Pike Peak Allotment is on the periphery of the lesser long-nosed bat's range. The closest known roost site is south of the Gila River, approximately 70 miles away. However, lesser long-nosed bats have been recorded from scattered localities north of the Gila River. No concerted effort at surveys for lesser long-nosed bats north of the Gila River has been undertaken.

Based on known distances lesser long-nosed bats have traveled from roost sites to foraging areas, potential foraging habitat may extend in a 40-mile radius from roosts. With the lack of bat survey information, the presence of potential roost sites, and the availability of suitable forage plants, the Hicks/Pike Peak Allotment is considered lesser long-nosed bat foraging habitat.

EFFECTS OF THE ACTION

Direct effects to lesser long-nosed bats as a result of grazing activities are not expected because these activities are unlikely to affect roosts and no roosts are known from the Hicks/Pike Peak Allotment. However, it is possible that undetected roosts occur within the allotment.

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. Saguaros occur on slopes, bajadas, and in valleys. Impacts due to livestock grazing activities 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). 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.

No long-term investigation has documented the influence of grazing on agave mortality or flowering stalk herbivory. Individual paniculate agave plants only bloom once in their life cycle, about 20 years. However, agave stalks as they begin to bolt are particularly palatable to domestic livestock and wild herbivores, including deer, javelina, rodents, and rabbits (M. Hawks, University of Arizona, Tucson, pers. comm. 1997; W. Hodgson, pers. comm. 1997). Cattle probably trample young agaves, and have been known to "walk down" agave flowering stalks (T. Cordery, Arizona Ecological Services Field Office, pers. comm., 1998). Agave germination and seedling establishment may be influenced by degraded ecological conditions such as soil compaction, erosion, reduced infiltration, and altered plant species diversity and abundance. Effects to bat forage plants 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 generally relatively light. Parry's agave is typically found on rocky slopes, at somewhat moderate to high elevations (4,900 to 8,200 ft) (Gentry 1982).

The 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 area to reproduction, survival, and growth of the bat. The Hicks/Pike Peak Allotment is considered to be foraging habitat. Areas with high densities of paniculate agaves and saguaros may be particularly important to the bat, especially if those high density sites are in close proximity to roosts. The distribution, abundance, and species of paniculate agaves on the Hicks/Pike Peak Allotment, relative to the distribution of livestock during the agave bolting period (April 15 through September 15), has not been evaluated.

Ecological conditions on the Hicks/Pike Peak Allotment are severely degraded. The allotment is heavily stocked and little or no improvement in range condition has been realized. The proposed range utilization levels exceed that identified in the Amended Forest Plan Record of Decision for pastures in poor to very poor condition.

CUMULATIVE EFFECTS

On a landscape level, paniculate agave populations appear to be well dispersed. However, the percentage of the agave population which successfully produces flowering stalks is unknown. Large segments of the range of the lesser long-nosed bat and its forage plants are exposed to Federal, State, Tribal, and private livestock grazing management activities. The overall affects of grazing (herbivory, trampling, and ecosystem changes affecting plant reproduction, recruitment, and establishment) on bat forage plants is unknown. Lesser long-nosed bat foraging ecology and energy budget is largely unknown. This, combined with potential disturbance of roost sites and loss of habitat due to urbanization and other activities on large tracts of State and private lands within the range of the bat, contributes to negative impacts on the species. The effects of all these actions are considered cumulative to the proposed action.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Hicks/Pick Peak Allotment are not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Lesser Long-nosed Bat on the Hicks/Pike Peak Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take expected to result from the ongoing grazing activities on the Hicks/Pike Peak Allotment is harm, which occurs through the effects to habitat that alters the availability of food plants, affecting the suitability of the habitat to support the lesser long-nosed bat. The Service anticipates, however, that incidental take of the lesser long-nosed bat associated with the proposed action will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and it is difficult to detect and analyze the results of changes in bat foraging behavior and distribution, and reduced foraging efficiency. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, and trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity) within the natural capabilities of the landscape within all pastures on the allotment with high density agave or saguaro sites.

2. Livestock herbivory of agave flowering stalks contributes to limiting the abundance or distribution of lesser long-nosed bat food plants (*Agave palmeri*, *A. paryi*, and *A. deserti*).

3. Required monitoring of livestock utilization levels is not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the lesser long-nosed bat.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, and range conditions) on the allotment in pastures with high density agave or saguaro sites.

2. Livestock grazing does not contribute to limiting the food resources (*A. palmeri*, *A. paryi*, and *A. deserti*) available to the lesser long-nosed bat by reducing the distribution or abundance of flowering agaves below the natural capabilities of the landscape.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

> NOTE: The Tonto National Forest is developing stubble height/utilization coefficients and other methods to determine the amount of forage use in an ecologically relevant, and repeatable manner. The Forest Service and the Service will jointly evaluate these techniques as a possible substitute for the traditional utilization standards and monitoring.

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

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

1a. By April 15, 1999, evaluate the abundance and distribution of lesser long-nosed bat food plants (*A. palmeri*, *A. paryi*, *A. deserti* and saguaro) on the Hicks/Pike Peak Allotment, identify high density agave sites, and protect these sites to prevent livestock herbivory of agave flowering stalks. One method would be to preclude livestock access to high density agave sites during the agave bolting period from April 15 through September 15.

<u>or</u>

1b. By April 15, 1999, conduct a landscape level analysis (Forest wide) of lesser long-nosed bat food plant (*A. palmeri*, *A. paryi*, and *A. deserti*) abundance and distribution, and livestock use patterns during the agave bolting period (April 15 through September 15). With this information and in cooperation with the Service, reassess if/how/where livestock may be contributing to limiting the food resources available to the lesser long-nosed bat. By April 15, 1999, develop and initiate a monitoring/research plan to evaluate the relationship between livestock grazing and paniculate agave distribution, abundance, flowering, recruitment, and ecology.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) within each pasture on the allotment at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until the livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the lesser long-nosed bat (e.g., high density agave or saguaro). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) progress made toward completion of multi-year Terms and Conditions; and 5) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Lesser Long-nosed Bat on the Hicks/Pike Peak Allotment

1. Join in cooperative efforts to survey for lesser long-nosed bat roosts, and protect and monitor these sites.

2. Develop and initiate a study plan to survey for foraging lesser long-nosed bats north of the Gila River. This study would be conducted over a minimum of a two

year period and in cooperation with other management entities (e.g., Apache-Sitgreaves National Forest, Bureau of Land Management, Arizona Game and Fish Department) in order to address the issue on a landscape level.

3. Implement the lesser long-nosed bat recovery plan, as appropriate.

ARIZONA HEDGEHOG CACTUS ON THE HICKS/PIKE PEAK ALLOTMENT

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Hicks/Pike Peak Allotment <u>may affect, not likely to adversely affect</u> the Arizona hedgehog cactus. The Service does not concur with this determination. The following biological opinion details the reasons for this non-concurrence.

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Cedar Creek Associates (1994, and *in* Tonto National Forest 1996) has estimated that there are over 250,000 individual Arizona hedgehog cacti within the area considered to be the main distribution (type locality) of the species in the vicinity of Globe/Miami, Arizona. However, this estimate does not include up to several thousand known plants and potentially many more occurring in satellite populations disjunct from the main distribution, or cacti that may be Arizona hedgehog cactus in east-central and southeastern Arizona.

The Bureau of Land Management reports finding cacti that appear to be Arizona hedgehog in east-central and southeastern Arizona, and that there is over 300,000 acres of potential habitat on Bureau lands (Bureau of Land Management 1996). Potential habitat for this cactus also extends across the southern portion of the Clifton Ranger District, Apache-Sitgreaves National Forest. The cactus appears to be widespread in this area, although very limited surveys have been conducted. For the purpose of consultation, these cacti are considered to be the listed variety.

A population of Arizona hedgehog cactus is known to occur near Apache Peaks, north of Globe. This population is considered a satellite population disjunct from the main cactus population near Globe/Miami. The Sycamore Pasture of the Hicks/Pike Peak Allotment is adjacent to Apache Peaks. The cactus may be found on this pasture, although no surveys have been conducted.

EFFECTS OF THE ACTION

Livestock grazing may affect Arizona hedgehog cactus through trampling of plants and/or habitat degradation. However, due to the microhabitat in which Arizona hedgehog cactus are typically found - boulders, rock crevices, steep-walled canyons, and rocky slopes - physical damage to cacti and habitat degradation due to grazing are less likely than in habitats more accessible to cattle. 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. Heavy grazing and high stocking rates increase the probability of trampling, especially of younger specimens, 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 increase under poor range conditions as livestock seek forage in more rugged areas.

To what extent grazing may directly or indirectly effect Arizona hedgehog cactus due to habitat degradation has not been studied. However, grazing practices can change vegetation composition and abundance, cause soil erosion and compaction, damage cryptobiotic crusts, and reduce water infiltration rates and increase surface runoff (Klemmedson 1956, Ellison 1960, Arndt 1966, and Gifford and Hawkins 1978, Belnap 1992), leaving less water available for plant production (Dadkah and Gifford 1980). The relatively large proportion of potential Arizona hedgehog cactus habitat in east-central and southeastern Arizona on Forest Service and Bureau of Land Management administered grazing allotments in fair, poor, or very poor range condition with degraded watersheds, suggests current grazing practices contributes to adverse affects on vegetation communities and the structure and function of ecosystems.

The potential for adverse affects to Arizona hedgehog cactus and its habitat due to ongoing livestock grazing activities increases as stocking rates increase, and range conditions decrease. The Hicks/Pike Peak Allotment is currently believed to be overstocked, range conditions are rated poor to very poor, and these appear to continue to decline. The lack of Arizona hedgehog cactus survey information makes the extent of potential trampling impossible to determine.

CUMULATIVE EFFECTS

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 a 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 Federal involvement may also adversely affect the cactus.

CONCLUSION

After reviewing the current status of the Arizona hedgehog cactus, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Hicks/Pike Peak Allotment are 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 - Arizona Hedgehog Cactus on the Hicks/Pike Peak Allotment

1. Determine the appropriate livestock stocking level for the Hicks/Pike Peak Allotment; apply forage utilization standards appropriate to the vegetation type and range conditions (not to exceed annual maximum of 25% during the growing season; 30% during the dormant season), monitor livestock use, and move livestock from pastures when indicated.

2. Continue cooperative efforts to determine the taxonomic status of the Arizona hedgehog cactus throughout its range, and provide funding for genetic studies.

3. Determine the distribution and status of the Arizona hedgehog cactus on the Hicks/Pike Peak Allotment, especially survey potential habitat in the vicinity of livestock concentration areas (e.g., tanks, drinkers, salt licks), and monitor the population status and potential impacts due to livestock management.

4. Identify and protect as appropriate, high density Arizona hedgehog cactus sites.

5. Any range improvement or maintenance activities in potential Arizona hedgehog cactus habitat requires site specific surveys. Avoid impacts to the cactus from these activities.

LIMESTONE ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Chevelon/Heber Ranger District

Allotment Acres:
- 56,155 total
- 49,879 full/potential capacity range

Projected Stocking Density
- 1,932 animal months
- 25.8 acres per animal month

Permitted Use:
- 915 yearlings, 5/16-10/15

Projected Use:
- 420 yearlings, 6/1-10/15

Major Vegetation Type:
- Pinyon/juniper, ponderosa pine, mixed conifer

Major Drainages:
- Leonard Canyon
- Willow Creek
- East Clear Creek

Elevation:
- 6,800 to 7,840 feet

Type of Grazing System:
- 5 pastures, deferred/rest, rotation. 3 pastures used each year.

Allotment Condition:
- 1979 Range condition data indicate that most of the allotment is in poor to fair condition.

Listed Species Adversely Affected:
- Little Colorado River spinedace
- Mexican spotted owl

Ecological condition and/or management action that contributes to adverse effects:

- Elk/livestock competition for forage causes utilization of forage plants that is above prescribed levels throughout the allotment.
- Livestock have direct access to Leonard Canyon when they are in Double Cabin and O'Haco pastures, and direct access to Willow Canyon when they are in the 5-Mile Pasture.
- Unsatisfactory watershed conditions in Double Cabin, 5-Mile, and O'Haco pastures (possible increase in sedimentation).

Consultation Period:

- 3 Years

LITTLE COLORADO RIVER SPINEDACE ON THE LIMESTONE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

There are numerous problems for the spinedace within the East Clear Creek watershed. Stream alteration and introduction of non-native fishes pose an increasing threat to the species (U.S. Fish and Wildlife Service 1998). Fire suppression, timber management, domestic livestock and wildlife grazing, roads, and other factors affecting forest health and watershed conditions have all contributed to the existing degraded status of Little Colorado River spinedace habitat in the East Clear Creek watershed. Problems associated with unsatisfactory soil conditions and dysfunctional riparian conditions include increases in sedimentation into the streams, compaction and poor water infiltration that alter the natural hydrograph by increasing runoff spikes and decreasing baseflows, and poor ground cover that increases rain impacts. These factors contribute to stream conditions which may decrease the quality and quantity of spinedace habitat. Ungulate grazing tends to amplify many of the existing watershed problems, and may slow or inhibit watershed improvements. Three additional range allotments (Bar-T-Bar, Hackberry/Pivot Rock, and Buck Springs) lie within the upper portion of the East Clear Creek watershed. Past operations on these allotments contribute to additive impacts to watershed and riparian condition. Forest Service allotments effecting spinedace habitat have implemented many range improvements; however, due to the imperiled condition of the species in the East Clear Creek watershed, additional considerations are being developed, and many are being implemented.

Concerns over the size and impact of the elk herd have been conveyed to Arizona Game and Fish Department by the National Forest. Forage removal by elk is the only grazing that occurs along large portions of the Mogollon Rim. Use by elk alone often exceeds maximum utilization levels in some key areas. The National Forest is working with Arizona Game and Fish Department to determine the carrying capacity for elk and appropriate adjustment of elk numbers. Recent efforts to reduce the elk population have had some success although riparian areas and headwater meadows continue to have high utilization levels by elk. Reductions in allowable forage use by livestock recently implemented by the Forest Service on various allotments should improve some watershed and riparian conditions and elk distribution.

Impoundments at Knoll and Bear Canyon lakes and their stocking of nonnative sport fish, and other nonnative aquatic species, have potentially serious impacts to the Little Colorado River spinedace and its habitat within the Limestone Allotment.

Harvesting of the Gentry Timber Sale began in 1998. At the request of the Service, the Forest Service analyzed the potential affects to the spinedace. The Forest Service completed the analysis and made a "no effect" determination for the spinedace.

On the Limestone Allotment, the best potential and existing streamside riparian habitat is excluded from livestock grazing. However, livestock use continues in riparian areas in the headwaters and tributaries of Willow Creek. Headcuts and streambank trampling is evident in some drainages (Hydro Science 1993). Livestock are believed to be overstocked by as much as 50%; forage utilization levels by livestock and wildlife have been very high, especially in some broad bottoms and wet meadows, and range conditions are mostly poor and riparian conditions are functional at risk. New utilization standards (25%) are expected to bring some improvements, although elk use remains high; new analyses are expected to demonstrate downward trends.

Little Colorado River spinedace is extremely rare in the East Clear Creek watershed and faces the potential of extirpation. The recovery plan (U.S. Fish and Wildlife Service 1998) lists the East Clear Creek population of spinedace as second in order of those populations in imminent danger (behind the Silver Creek population which is possibly extinct). The loss of any population of spinedace significantly increases the risk of extinction (U.S. Fish and Wildlife Service 1998). Therefore, any impacts to this species in this watershed are considered extremely serious and warrant careful monitoring. Surveys for the occurrence of the spinedace are insufficient in the East Clear Creek watershed (U.S. Fish and Wildlife Service 1998), and without regular surveys and habitat assessments by a fishery biologist, the effects of management actions are uncertain given the dramatic fluctuation in abundance and dispersal of this fish and its habitat.

No permanent streams are found on the Limestone Allotment. However, several streams are considered intermittent. Stream flows within Leonard and Willow canyons, and portions of East Clear Creek decrease in most years such that only individual pools remain. Under the most severe drought conditions many pools will go completely dry, as occurred in 1996. Intermittent pools provide potential habitat for Little Colorado River spinedace. Spinedace have been documented from isolated pools in Leonard Canyon, East Leonard Canyon, Sandstone Canyon, and East Clear Creek. Dines Tank, in Leonard Canyon, is the only known long-term permanent pool in Leonard or Willow canyons, and is inhabited by spinedace. It is probable that spinedace disperse from Dines Tank and West Leonard Canyon when conditions are favorable to re-populate streams throughout the East Clear Creek watershed (Denova and Abarca 1992).

Approximately 40 miles of intermittent stream habitat occur on the allotment of which approximately 70% is excluded from livestock grazing. The 0.5 miles of occupied habitat at Dines Tank are completely excluded from livestock use. Approximately 10 miles of intermittent stream provides potential habitat for the spinedace of which 10% is excluded from livestock use.

Leonard Canyon was surveyed by the Arizona Game and Fish Department in 1983, 1990, 1991, and 1997. Spinedace were detected between Knoll Lake and Dines Tank, and in Dines Tank. Spinedace have been detected in past surveys at Hamilton Crossing further downstream in Leonard Canyon, but were not found in the most recent survey there in 1991. Surveys in Willow Creek in 1992 and 1997 did not detect spinedace even though they had been documented at Wiggins Crossing, Mule Crossing, and Bear Canyon during the mid-1960s.

Although the best potential and existing stream habitat is excluded from livestock grazing, livestock use continues in riparian areas in the headwaters and tributaries of Willow Creek. Headcuts and streambank trampling is evident in some drainages (Hydro Science 1993). The allotment may be overstocked by as much as 50% and use by livestock and elk has been high in some riparian and most meadow areas. Allowable use standards by combined livestock and wildlife use are set at 25% beginning with the 1998 season.

EFFECTS OF THE ACTION

Livestock are precluded by fencing and steep topography from accessing Leonard Canyon in most areas and so have limited direct effects to riparian vegetation along the stream. The fence around Dines Tank was reconstructed in 1997. There are short sections of the fence line in the Double Cabin and O'Haco pastures that cross Leonard Canyon and extend onto the Coconino National Forest. It is not known whether topography completely prevents livestock from accessing the canyon along these stretches.

Condition of these riparian areas is rated as functioning at risk, due to current head cutting and low density of woody riparian species. Additional surveys were conducted in riparian areas throughout the allotment in the spring of 1998 to better evaluate condition.

The vegetative and topographic characteristics of Willow Canyon below the Five Mile Pasture are similar to those in Leonard Canyon. The canyon is less steep and more accessible to livestock near its headwaters in the Five Mile Pasture but still contains a significant amount of dense tree cover on the side-slopes that limits forage growth. The bottom of Willow Canyon in the Five Mile Pasture, and the bottom of other drainages that flow through the Double Canyon, Five Mile, and O'Haco pastures, are favored foraging areas by livestock. It is not known if these stream courses could support spinedace populations but grazing of these areas does have an effect on potentially occupied habitat downstream.

Watershed condition is an important factor that contributes to conditions for spinedace dispersal. The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Watersheds that are in satisfactory condition can extend runoff events that may expand the window of opportunity for the spinedace attempting to re-inhabit previously occupied habitat as well as increasing the permanence of pool habitats during dry periods. Points of unsatisfactory watershed are at the north end of the Limestone allotment in the Wilkins Pasture, and along stream courses within other pastures. Several problem areas such as portions of Open Draw, Double Cabin Draw, and Beaver Park that exhibit headcutting and raw streambanks have been fenced to eliminate grazing by livestock and elk. These areas are beginning to show improvement.

Pasture moves for livestock will occur when utilization reaches 25%, which is intended to help improve watershed conditions and extend the duration of streamflows. However, elk will continue to graze after livestock have been moved from pastures and total utilization will likely reach 60-70% by November in some key areas, as it has in the recent past (in 1996, 1997). Because combined utilization by livestock and elk will remain high for at least the next 2-3 years, areas that are not fenced are not expected to improve much. Stocking rates are believed to exceed capacity by as much as 50 percent, and 1977 range condition data rates the allotment as mostly poor; the National Forest expects new analysis to reveal that conditions are improving. Flow events will probably not change in duration beyond fluctuations in the weather, and there will most likely not be any improvement in opportunities for spinedace to colonize new reaches of streams within the allotment.

Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition (Marlow and Pogacnik 1985). The effects to spinedace are based on the potential for direct (streams/tributaries) and indirect (uplands/watershed) effects on spinedace habitat from grazing in the East Clear Creek watershed.

Little Colorado River spinedace faces the potential of extirpation from the East Clear Creek watershed. Therefore, any impacts to this species in this watershed are considered extremely serious and warrant careful monitoring. Implementation of the Limestone Allotment grazing strategy is expected to work toward the improvement of some watershed conditions, but will likely also contribute to cumulative indirect effects associated with other grazing allotments and activities in the watershed. Cattle have access to portions of the Leonard Canyon drainage although Dines Tank is excluded from livestock access. Mountain meadows that contain the headwaters for creeks that support spinedace populations and habitat are classified as unsatisfactory soils, and as dysfunctional riparian systems. There remains the potential for some direct and various indirect effects (sedimentation and alteration of stream flow) to spinedace habitat from grazing within the East Clear Creek watershed and especially in canyon bottoms and Leonard and Willow canyons and their tributaries, until overall range, soil, and watershed conditions show significant improvement. Regular assessments by a fishery biologist are essential given the dramatic fluctuation in abundance and dispersal of this fish and its habitat.

CUMULATIVE EFFECTS

The entire East Clear Creek watershed is under the administration of the Forest Service (Coconino and Apache-Sitgreaves National Forests). Therefore, most all activities that occur within the watershed have Federal involvement and are subject to section 7 consultation. Recreational activities, including developments and dispersed recreation, are having localized impacts within the watershed, and roads contribute to soil compaction and sediment transfer. Any activities which would impair water infiltration and summer baseflows may affect spinedace populations.

CONCLUSION

After reviewing the current status of the Little Colorado River spinedace, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Limestone Allotment are not likely to jeopardize the continued existence of Little Colorado River spinedace, and are not likely to destroy or adversely modify designated critical habitat. Critical habitat for this species has been designated on East Clear Creek, upstream of where tributary drainages from the project area join East Clear Creek.

INCIDENTAL TAKE STATEMENT
Little Colorado River Spinedace on the Limestone Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of Little Colorado River spinedace is expected to result from the ongoing grazing activities on the Limestone Allotment. Harassment occurs through effects to individual fish from livestock entering pools occupied by spinedace. Harm occurs through the effects to habitat that alters the suitability of the habitat to support Little Colorado River spinedace. The Service anticipates, however, that incidental take of Little Colorado River spinedace associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of Little Colorado River spinedace from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions) and channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the East Clear Creek watershed.

2. Livestock access pools, the riparian corridor, or cross stream channels associated with Leonard Canyon or its tributaries.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Little Colorado River spinedace.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the East Clear Creek watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of at least the Apache-Sitgreaves National Forest portion of the East Clear Creek watershed (and preferrably in coordination with the Coconino National Forest to include the

entire upper East Clear Creek drainage) to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the Littler Colorado River spinedace. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the East Clear Creek watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

3. In 1998, complete proper functioning condition surveys in riparian areas throughout the allotment.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Livestock are precluded from Leonard Canyon. When livestock are present in pastures adjacent to Leonard Canyon (especially Double Cabin and O'Haco), monitor for livestock use in the canyon bottom. If livestock access Leonard Canyon, the pasture will be vacated until such time that physical barriers (fencing and topography) completely restrict livestock access.

2. Before cattle enter pastures adjacent to Leonard Canyon, check and repair as necessary all fences bordering Leonard Canyon and the exclosure at Dines Tank.

3. To the extent practicable, use herding to keep cattle out of meadows, riparian areas, and Leonard Canyon.

4. Wet meadows on the Limestone Allotment, especially those in the upper reaches of Leonard and Willow canyons and Double Cabin Draw, are to be protected from over use. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

5. By September 30, 1999, a journey-level fishery biologist (or equivalent) is to assess spinedace habitat conditions on the allotment at sites determined by the biologist to be crucial to the species or where the status of spinedace and potential habitat is unknown (e.g. Wilkins Canyon), as well as those sites believed to be vulnerable to impacts (direct or indirect) due to livestock management (e.g., Leonard Canyon).

6. Establish annual fish monitoring stations within the East Clear Creek drainage. Fish monitoring is to be conducted by a journey-level fishery biologist (or equivalent) and coordinated with other fish survey/monitoring programs to avoid redundancy of effort, as these populations of spinedace may be susceptible to adverse affects from over sampling.

7. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of livestock exclosures established for protection of Little Colorado River spinedace habitat in the East Clear Creek watershed.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) within the East Clear Creek watershed at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until the livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the Little Colorado River spinedace (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish

monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule, livestock access Leonard Canyon) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Little Colorado River Spinedace on the Limestone Allotment

1. Consider long-term rest for all high elevation wet meadows.

2. Implement the Little Colorado River spinedace recovery plan, as appropriate.

MEXICAN SPOTTED OWL ON THE LIMESTONE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Limestone Allotment is located within the Upper Gila Mountains Recovery Unit for the Mexican spotted owl, as defined by the recovery plan (U.S. Fish and Wildlife Service 1995b). This recovery unit is a relatively narrow band bounded on the north by the Colorado Plateau Recovery Unit and to the south by the Basin and Range West Recovery Unit. The southern boundary of the Upper Gila Mountains Recovery Unit includes the drainages below the Mogollon Rim in central and eastern Arizona. The eastern boundary extends to the Black, Mimbres, San Mateo, and Magdalena Mountain ranges of New Mexico. The northern and western boundaries extend to the San Francisco Peaks and Bill Williams Mountain north and east of Flagstaff, Arizona. This is a topographically complex area consisting of steep foothills and high plateaus dissected by deep forested drainages. This recovery unit can be considered a "transition zone," because it is an interface between two major biotic regions: the Colorado Plateau and Basin and Range Provinces (Wilson 1969). Habitat within this recovery unit is administered by the Kaibab, Coconino, Apache-Sitgreaves, Tonto, Cibola, and Gila national forests. The north half of the Fort Apache and northeast corner of the San Carlos Indian Reservations are located in the center of this recovery unit and contain an important habitat link between owl subpopulations at the western and eastern ends of the recovery unit and the subpopulations directly south within the Basin and Range West Recovery Unit.

The Upper Gila Mountains Recovery Unit consists of deep forested drainages on the Mogollon Plateau. Vegetation generally consists of pinyon/juniper woodland, ponderosa pine/mixed conifer forest, some spruce/fir forest, and deciduous riparian forest in mid and lower elevation canyon habitat. Climate is characterized by cold winters and over half the precipitation falls during the growing season. Much of the mature stand component on the gentle slopes surrounding the canyons has been partially or completely harvested. Most of the forest habitat on steeper ground that may serve as Mexican spotted owl nesting habitat is in suitable condition. Spotted owls are widely distributed and use a variety of habitats within this recovery unit. Owls most commonly nest and roost in mixed-conifer forests dominated by Douglas fir and/or white fir and canyons with varying degrees of forest cover (Ganey and Balda 1989a, U.S. Fish and Wildlife Service 1995b). Owls also nest and roost in ponderosa pine-Gamble oak forest, where they are typically found in stands containing well-developed understories of Gamble oak (U.S. Fish and Wildlife Service 1995b).

The Upper Gila Mountains Recovery Unit contains the largest known concentration of Mexican spotted owls, with approximately 55% of known owl territories (U.S. Fish and Wildlife Service 1995b). This recovery unit is located near the center of the Mexican spotted owl's range within the United States and is contiguous to four of the other five recovery units within the United States. Because of its central location and its large and relatively continuous spotted owl population, the Mexican spotted owl recovery plan recommends that the owl population in this recovery unit could be uniquely important to the overall stability and persistence of the Mexican spotted owl population in the United States. Specifically, this population could serve as the source population, providing immigrants to smaller, more isolated populations in other recovery units. Although no data on dispersal patterns or movements between recovery units is available, the recovery plan recommends that this population should be maintained at current levels and with at least the current level of connectivity within the recovery unit. Significant discontinuities that develop in the Mexican spotted owl's distribution within this recovery unit, and the loss of habitat to support the local sub-populations, may compromise the recovery of the species.

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) lists the primary threats to the species in the Upper Gila Mountains Recovery Unit as timber harvest and catastrophic fire; it also includes overgrazing as a threat to the owl.

On the Limestone Allotment, livestock are believed to be overstocked by as much as 50%; forage utilization levels by livestock and wildlife have been very high, especially in broad bottoms and wet meadows; new utilization standards (25%) are expected to bring some improvements, although elk use remains high; and range conditions are mostly poor, riparian conditions are functional at risk, and new analyses are expected to demonstrate downward trends.

Mexican spotted owls are well represented throughout the area of the Limestone Allotment. There are currently 12 protected activity centers (PACs) either partially or completely within the boundaries of the allotment. Several PACs are associated Leonard or Willow canyons and have steep slopes and dense tree canopies and so receive very limited use by livestock. However, several PACs extend above the canyon walls into the adjacent forest where ongoing livestock grazing activities occur. The PACs associated with the O'Haco, Double Cabin, and Five-mile pastures include broad drainage bottoms and wet meadow and riparian habitat. Unoccupied suitable mixed conifer and pine/oak restricted habitat exists throughout the Limestone Allotment. No livestock salting or holding corrals are within any PAC. Most water sources are outside of PAC boundaries, although the broad drainage bottoms in O'Haco, Double Cabin, and Five-mile pastures may provide water and are grazed.

EFFECTS OF THE ACTION

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) summarizes the effects of grazing to spotted owls in four broad categories: 1) altered prey availability, 2) altered susceptibility to fire, 3) degeneration of riparian plant communities, and 4) impaired ability of plant communities to develop into spotted owl habitat. The recovery plan goes on to provide explicit goals for managing grazing in protected and restricted spotted owl habitat:

! Monitor grazing use by livestock and wildlife in "key grazing area." Key areas are primarily riparian areas, meadows, and oak types.

! The intent is to maintain good to excellent range conditions in key areas while accommodating the needs of the owl and its prey.

! Implement and enforce grazing utilizations standards that would attain good to excellent range conditions within the key grazing area.

! Establish maximum allowable use levels that are conservative and that will expedite attaining and maintaining good to excellent range conditions.

! Ensure that the allowable use of plant species will maintain plant diversity, density, vigor, and regeneration over time.

! Restore adequate levels of residual plant cover, fruits, seeds, and regeneration to provide for the needs of prey species.

! Restore good conditions to degraded riparian communities

The Forest Service 1996 Record of Decision for the Amendments of the Forest Plans incorporated the recommendations for Mexican spotted owl management into National Forest direction in the form of standards and guidelines and suggested utilization levels, for combined use by livestock and wildlife, based on range conditions and allotment management strategy.

The Mexican spotted owl recovery plan specifically identifies overgrazing as a threat to the owl in the Upper Gila Mountain Recovery Unit.

> "Overgrazing is suspected to be detrimental in some areas and can affect both habitat structure and the prey base. Effects on the prey base are difficult to quantify, but removal of herbaceous vegetation can reduce both food and cover available to small mammals (Ward and Block 1995). This is especially true with respect to voles, which are often associated with dense grass cover. Direct effects on habitat occurs with livestock browsing on Gambel oak [(*Quercus gambeli*)]. In some areas, oak is regenerating well but unable to grow beyond the sapling stage because of this browsing... Grazing effects on habitat are also potentially significant in canyon-bottom riparian areas. We do not attribute these effects solely to livestock. Forage resources are shared by livestock and wild ungulates" (U.S. Fish and Wildlife Service 1995b, p. 101).

Diet studies conducted on Mexican spotted owls have indicated that prey species of the owl include woodrats (*Neotoma* spp.), white-footed mice (*Peromyscus* spp.), voles (*Microtus* and *Cleithrionomys* spp.), rabbits and hares (*Sylvilagus* and *Lepus* spp.), pocket gophers (*Thomomys* spp.), other mammals including a variety of bats, birds, insects, and reptiles. Ward and Block (1995) report that rangewide, 90% of an "average" Mexican spotted owl diet would contain 30% woodrats; 28% peromyscid mice; 13% arthropods; 9% microtine voles; 5% birds; and 4% medium-sized rodents, mostly diurnal sciurids. These rangewide patterns, however, are not consistent among spotted owl recovery units as data indicates significant differences in owl diets among geographic location (Ward and Block 1995). Ganey (1992) conducted a Mexican spotted owl prey study between 1984-1990 in mixed conifer habitat of the San Francisco Peaks. He found the following percentages of prey biomass in the diet of the owl: 49.1% woodrats; 15% voles; 12.5% peromyscid mice; 9.1% pocket gophers; 6.7% rabbits; 4.4% other medium mammals; 3.1% birds; and 0.1% arthropods.

The effect livestock and wildlife grazing can have on Mexican spotted owl prey species and their habitat is also a complex issue. Impacts can vary according to grazing species (domestic or wild), degree of use, including stocking density, grazing intensity, grazing frequency, and timing of grazing, habitat type and structure, and plant and prey species composition (Ward and Block 1995). It is well documented that repetitive, excessive grazing of plant communities by livestock can significantly alter plant species density, composition, vigor, regeneration, above or below ground phytomass, soil properties, nutrient flow, and water quality, especially when uncontrolled (Belsky and Blumenthal 1997; Ward and Block 1995). These effects have both direct and indirect adverse impacts on animal species that are dependent on plants for food and cover.

However, moderate to light grazing can benefit some plant and animal species under certain conditions and in certain environments, maintain communities in certain seral stages, and may increase primary productivity (Ward and Block 1995). No studies document the direct and indirect effects of livestock and wildlife grazing on the Mexican spotted owl or its prey (U.S. Fish and Wildlife Service 1995b). However, Ward and Block (1995) indicate that there exists some knowledge regarding the effects that livestock grazing can have on small mammals frequently consumed by spotted owls, and regarding mesic or montane plant communities inhabited by the owl's prey. Based on studies conducted in other areas of the United States, Ward and Block (1995) indicate that, under heavy grazing, decreases in populations of voles would be expected, and this would improve conditions for deer mice in meadow habitat. Increases in deer mouse abundance in meadows would not offset decreases in vole numbers because voles provide greater biomass per individual and per unit of area. Such decreases could negatively influence spotted owls (Ward and Block 1995).

Ward and Block (1995) examined correlates between the Mexican spotted owl's diet and reproduction. Their results suggested that the owl's reproductive success was not influenced by a single prey species, but by many species in combination. None of the specific prey groups significantly influenced owl reproductive success, but rather, they concluded it was more likely that the owl's reproductive success was influenced by total prey biomass consumed in a given year, rather than by a single prey species. More young were produced when moderate to high amounts of the three most common prey groups (woodrats, peromyscid mice, and voles) were consumed.

Grazing by livestock can alter the vegetation community. Canyon bottoms and meadows are often preferred foraging sites by both livestock and wildlife, and grazing contributes significantly to degradation of these habitats. Within conifer forests, grazing can remove or greatly reduce grasses and forbs, thereby allowing large numbers of conifer seedlings to become established because of reduced competition for water and nutrients. Establishment of seedling conifers coupled with the reduction in light ground fuels (e.g., grasses and forbs) may act with fire suppression to contribute to building of fuels in the forest, alter forest structure, and decrease the potential for beneficial low-intensity ground fires while increasing the risk of catastrophic fire (U.S. Fish and Wildlife Service 1995b).

Many of these effects are occurring to some degree on the Limestone Allotment due to ongoing livestock grazing activities within protected and restricted Mexican spotted owl habitat. These effects are additionally exacerbated by the large elk population and high utilization levels attributable to elk, especially in meadow habitats and riparian areas. Many of these effects are evident through the degraded status of range; other effects are more subtle. Through time and in combination with other factors, livestock overgrazing may be contributing to altering many ecosystem functions and processes associated with the Limestone Allotment.

Based on existing data on the foraging behavior of Mexican spotted owls, a PAC would include on average only 75% of the bird's foraging range. Therefore, prey species abundance and habitat suitability on, and adjacent to a PAC is important in assessing affects to the owl from livestock grazing activities. With past livestock numbers and management on the Limestone Allotment, over-utilization of forage and browse occurred. This is in part, due to grazing by wild ungulates which results in an additive effect on plant vigor and diversity, and related watershed effects. The Forest Service's application of the grazing utilization standards and guidelines should meet the intent of the *Mexican Spotted Owl Recovery Plan* to maintain habitat conditions for the owl prey base.

CUMULATIVE EFFECTS

The entire East Clear Creek watershed is under the administration of the Forest Service, by both the Coconino and Apache-Sitgreaves National Forests. Therefore, most all activities that occur within the watershed have Federal involvement and subject to section 7 consultation. Recreational activities, including developments and dispersed recreation, are having localized impacts within the watershed, and roads contribute to soil compaction and sediment transfer.

CONCLUSION

After reviewing the current status of the Mexican spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Limestone Allotment are not likely to jeopardize the continued existence of the Mexican spotted owl. No critical habitat for this species exists, therefore none will be affected.

INCIDENTAL TAKE STATEMENT
Mexican Spotted Owl on the Limestone Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The Service anticipates that take of Mexican spotted owl will be difficult to detect because finding a dead or impaired specimen is unlikely. However, the level of incidental take can be anticipated by the loss of essential elements in the habitat that would affect the reproductive success of the species. The primary type of take expected to result from the ongoing grazing activities on the Limestone Allotment is through harm by the reduction of suitability of the habitat for prey species, thus limiting the availability of prey for owls. This would impair the ability of Mexican spotted owl adults to successfully raise young. The Service anticipates that incidental take will occur to three pairs of Mexican spotted owls associated with the O'Haco Pasture, the Five-mile Pasture, and the Double Cabin Pasture. The Service has defined incidental take in terms of habitat characteristics, and has used surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of Mexican spotted owl from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), and riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions) within the natural capabilities of the landscape on all pastures of the allotment with Mexican spotted owl PACs.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Mexican spotted owl.

REASONABLE AND PRUDENT MEASURES

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

1. Maintain desirable owl habitat characteristics on allotment to include areas where vegetative growth is not being significantly retarded or inhibited by grazing activities. Upland foraging areas should have a sustaining presence of herbaceous ground cover, and should contain a <u>mixture</u> of both dense and sparse grass cover that allows for a diversity of prey species, e.g., deer mice, voles, jumping mice, and shrews. In riparian areas, there should be a sustaining presence of shrubs, trees, forbs, and grass cover.

2. Monitor grazing activities and resulting incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. Identify key areas and key plant species for all pastures within Mexican spotted owl PACs. Key areas are to include the most ecologically sensitive areas for the Mexican spotted owl (e.g., PACs, riparian areas, stringer meadows). Provide a list of key species and a map of key areas to the Service by March 1, 1999.

2. Implement a grazing management strategy that produces good to excellent range conditions in protected and restricted Mexican spotted owl habitat. By March 1, 1999, provide to the Service a written verification supported by data that the management strategy will result in the desired conditions shown in RPM #1.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Monitor forage utilization within each active pasture on the allotment which include portions of the Mexican spotted owl PACs associated with the Ohaco, 5-mile, and Double Cabin pastures. Monitor utilization on designated key areas before turnout (this can be accomplished through the joint National Forest/Arizona Game and Fish Department grazing monitoring efforts), at the mid-point of cattle use, and within one week after livestock are moved from the pasture. Apply established and replicable methods to measure utilization. Provide field data sheets and analysis summaries to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) progress made toward completion of multi-year Terms and Conditions; and 5) any suggestions for improving how Terms and Conditions are to be applied. If, at

any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service as soon as possible, and within 15 days.

CONSERVATION RECOMMENDATIONS
Mexican Spotted Owl on the Limestone Allotment

1. Conduct formal or informal monitoring of all Mexican spotted owl PACs within the Limestone Allotment prior to September 30, 2000.

2. Implement the Mexican spotted owl recovery plan, as appropriate.

MONTANA ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- ! Coronado National Forest, Nogales Ranger District

Allotment Acres:
- ! 27,940 total
- ! 21,950 full/potential capacity range

Projected Stocking Density
- ! 6,372 animal months
- ! 3.4 acres per animal month

Permitted Use:
- ! 531 cow/calf, yearlong

Projected Use:
- ! 531 cow/calf, yearlong

Major Vegetation Type:
- ! Desert grassland, broadleaf woodland, desert shrub

Major Drainages:
- ! California Gulch

Elevation:
- ! 3,500 to 5,376 feet

Type of Grazing System:
- ! 4 pasture rest rotation

Allotment Condition:
- ! Watershed analysis indicates that half of the allotment is in satisfactory and half of the allotment is in impaired soil condition.
- ! 1997 range condition data indicate that most of the allotment is in good condition.
- ! Riparian condition in California Gulch is on an upward trend, with 70% classified as unsatisfactory.

Listed Species Adversely Affected:

- Sonora chub
- Lesser long-nosed bat

Ecological condition and/or management action that contributes to adverse effects:

- Livestock grazing on impaired condition soils on the allotment may be contributing to a modified hydrograph and increased sedimentation.
- Livestock grazing occurs in pastures during the time agaves are producing flower stalks and information on the abundance and distribution of agaves on the allotment is lacking.

Consultation Period:

- 3 Years

SONORA CHUB ON THE MONTANA ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

All Sonora chub habitat within the Montana Allotment is located within California Gulch. No designated critical habitat occurs within the allotment. A 40-acre grazing exclosure protects several pools in a 0.25 mile reach immediately north of the International Border. The California Gulch population was discovered in March 1995 by Arizona Game and Fish Department surveyors. At that time the fish were inhabiting a 0.5 mile reach above the International Border and flow was documented as plentiful and continuous. Several other pools, believed to be more than two stream miles north of the border, have been reported to contain Sonora chub and nonnative fish species. Surveys during 1996 found pools upstream of the International Boundary to be dry; surveys in 1997 discovered pools had been re-occupied by Sonora chub.

Above the grazing exclosure, water flow in California Gulch goes subsurface probably every year. However, short stream reaches within the Schumaker Pasture may retain surface water. During periods of runoff with sustained instream flow, Sonora chub have been found for a considerable distance upstream of the exclosure. Following periods of drought, Sonora chub are believed to recolonize California Gulch from permanent pools located downstream in Mexico, although the fish may also be dispersing from pools located further upstream in California Gulch. A few miles upstream from the border is a dam and impoundment, Apache Lake. Given the remarkable dispersal capabilities of the Sonora chub, there is a potential that these fish could reach almost any perennial or intermittent water upstream from the currently occupied habitat to Apache Lake.

Water contamination of California Gulch and adjacent Ruby Mine ponds remains a threat to the Sonora chub. The Arizona Department of Environmental Quality and Arizona Game and Fish Department investigated water quality concerns in 1990 and concluded that the reported death of one cow in this area may have been related to surface water contamination. Transport of metals (cadmium, copper, manganese, lead, and zinc) within the stream bed was demonstrated by analysis of sediment samples.

EFFECTS OF THE ACTION

Although there have been recent improvements in range conditions in most of the pastures within the Montana Allotment, ongoing livestock grazing activities continue to contribute to the overall degradation of the channel and aquatic habitat conditions in California Gulch within the Schumaker Pasture and adversely affect the Sonora chub. California Gulch and the Rio Altar watershed is naturally fragile and highly sensitive to disturbance, the soils are shallow and rocky, productivity is low, precipitation can be intense, and the valley bottom has little floodplain to dissipate flood energy. All of these factors contribute to the flashiness of the hydrograph and movement and deposition of sediments.

The effects that livestock grazing can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Fleischner 1994). Livestock grazing activities can contribute to changes in surface runoff quantity and intensity, sediment transport, and water holding capabilities of the watershed. Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation. Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying. Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass.

Under the currently approved allotment management plan grazing will not occur within the Schumaker Pasture until July 1, 2000. Forest Service 1998 summer reports and those of private consultants have documented range conditions with an upward trend, along with improved soil and riparian area conditions. Problems continue with livestock distribution on the allotment with livestock use concentrated in the bottoms. This is especially the case in Schumaker Pasture which is the lowest elevation pasture and used during the summer months. Over the allotment, range condition is generally good; with an upward trend. The latest production/utilization study from which stocking rates are determined was completed in 1983. The effects of livestock grazing activities can be additive, exacerbating the naturally fragile and highly sensitive watershed conditions. These factors contribute to degraded pool habitat quality for Sonora chub, or even hastening the surface desiccation of these pools.

Livestock currently have direct access to the stream channel immediately upstream of the exclosure. A livestock holding corral appears to be adjacent to the exclosure and may even include a portion of the stream channel. Livestock contribute to degraded riparian and stream channel conditions within California Gulch, and facilitate sediment transport into the exclosure. During periods of high instream flow and fish dispersal, livestock may directly impact fish in the stream channel. The presence of livestock in the stream channel may reduce the longevity of water in the stream and adversely influence the formation of deep pool habitat due to the lack of channel formation and degraded riparian conditions. This situation may reduce potential connectivity among permanent water sites.

The Montana Allotment, together with the adjacent Bear Valley Allotment, contains the entire United States distribution of Sonora chub. Sonora chub in the United States are at the edge of the species' range, are isolated from other populations, and persist in marginal habitats. Therefore, any actions which contribute to reducing the probability of survival of the Sonora chub in the United States is viewed very seriously, and every possible effort must be taken to protect the California Gulch population of Sonora chub.

CUMULATIVE EFFECTS

With the exception of the site known as the “tinaja”, the livestock exclosure immediately above the International Border includes all habitat currently believed to be continuously occupied by Sonora chub within California Gulch on the Montana Allotment. However, trespass cattle from Mexico may range into the lower end of California Gulch. The International Border fence is remote and difficult to maintain. Other activities within the watershed that decrease ground cover or increase soil instability accelerate erosional processes. During times of drought the population is most vulnerable to both natural and human-induced impacts (e.g., predation, disease, low dissolved oxygen, high water temperatures, pollution, and sedimentation). California Gulch watershed has an extensive network of roads built to facilitate mining activities with recent road construction to advance mine exploration. A portion of the main access road into California Gulch has recently been moved out of the channel bottom to reduce impact on riparian resources. However, the road still runs through the channel and there are a number of stream crossings. Some mining has been conducted in the past that has removed riparian vegetation to facilitate construction of access roads. The potential remains for contamination of surface water by chemicals used in mining activities or from discharge from mine adits. Ponds associated with mining operations and on private property contain nonnative fishes, and provide a persistent source of nonnatives into Sonora chub habitat when environmental conditions are suitable for those species. A series of environmental perturbations exacerbated by degraded watershed conditions could cumulatively result in the extirpation of Sonora chub from the United States.

CONCLUSION

After reviewing the current status of the Sonora chub, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Montana Allotment are not likely to jeopardize the continued existence of Sonora chub. Critical habitat for this species has been designated at Sycamore Creek, Santa Cruz County, Arizona; however, this action does not affect that area.

INCIDENTAL TAKE STATEMENT
Sonora Chub on the Montana Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of Sonora chub is expected to result from the ongoing grazing activities on the Montana Allotment. Harassment occurs through effects to individual fish and could occur as fish disperse into portions of the stream that flow seasonally outside the livestock exclosure. Harm occurs through the effects to habitat that alter the suitability of the habitat to support Sonora chub. The Service anticipates, however, that incidental take of Sonora chub associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of Sonora chub from the proposed action will be considered to be exceeded if any the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the California Gulch watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Sonora chub.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the California Gulch watershed.

2. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the California Gulch watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will

have the greatest benefit to the Sonora chub. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the California Gulch watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization. Until completion of the NEPA process, continue to rest the Schumaker Pasture, as planned.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. By December 31, 1998, evaluate the location of the livestock holding corral immediately upstream of the California Gulch exclosure and how the corral is being used. If this corral is within or immediately adjacent to the stream channel, or directly contributing sediments into the exclosure, the National Forest, in coordination with the Service, will implement appropriate corrective actions relative to the affects attributable to federally permitted livestock.

2. The Forest Service will evaluate the entire California Gulch stream channel, canyon bottom, and associated riparian conditions from the International Border north to Apache Dam. This evaluation is to determine if changes in livestock management could be made which would accelerate the improvement of habitat conditions for the Sonora chub. Consideration should be given to season of use, level or amount of use, timing and duration of livestock access, and if appropriate, exclusion of livestock. In coordination with the Service and Arizona Game and Fish Department, evaluate the options for nonnative fish control in any perennial or intermittent stream reach or pool within the California Gulch stream channel, and the possibility of establishing Sonora chub at these sites.

3. By September 30, 2000, evaluate the distribution of nonnative fishes in the California Gulch watershed, including stock tanks, waters used by livestock, and other potential sources of nonnative fishes. In cooperation with the Service and Arizona Game and Fish Department, develop a schedule and begin implementation of periodic fisheries inspections of these sites and, as appropriate, the reduction or elimination of nonnative fishes within the California Gulch watershed.

4. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of livestock exclosures established for protection of Sonora chub habitat in the California Gulch watershed.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the California Gulch watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the Sonora chub (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) construction and repair of fences for protection of Sonora chub habitat; 6) progress made toward completion of multi-year Terms and Conditions; and 7) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the California Gulch exclosure, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Sonora Chub on the Montana Allotment

1. Reduce trespassing Mexican cattle into Sonora chub habitat in the lower end of California Gulch.

2. To assess the long-term threats associated with nonnative fishes in the watershed, develop a database (GIS-based) that includes locations of all stock

tanks, reservoirs, and stream reaches within the watershed (including those on private land), their potential for supporting nonnative fishes, their history of supporting nonnative fishes, and their history of maintenance, improvements, and renovation activities.

3. Evaluate the effects of a small concrete dam structure located in the area known as the “tinaja” as to how it affects the current distribution of Sonora chub within California Gulch. In cooperation with the Service and Arizona Game and Fish Department, consider developing a fish passage structure to facilitate upstream movement of Sonora chub to currently unoccupied perennial habitat.

4. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

5. Evaluate the affects to Sonora chub from the road in the bottom of California Gulch. Seek alternatives to maintaining this road and its numerous stream crossings.

6. Implement the Sonora chub recovery plan, as appropriate.

LESSER LONG-NOSED BAT ON THE MONTANA ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Lesser long-nosed bats require suitable forage plants (paniculate agaves and saguaros) and suitable roost sites. It is unknown whether the bat actually roosts within or adjacent to the Montana Allotment. Mines and caves occurring throughout the allotment could potentially provide suitable roost sites. Any potential roosts in the area would probably be transitory (non-maternity) roosts used by adults and/or young bats in summer or fall. Agaves, and to a lesser extent saguaros, occur in considerable numbers throughout much of the allotment. The closest known lesser long-nosed bat roost site is approximately 40 miles.

Based on known distances lesser long-nosed bats have traveled from roost sites to foraging areas, potential foraging habitat may extend in a 40-mile radius from roosts. Because of the presence of potential roost sites and the availability of suitable forage plants, the Montana Allotment is considered lesser long-nosed bat foraging habitat.

EFFECTS OF THE ACTION

Direct effects to lesser long-nosed bats as a result of grazing activities are not expected because these activities are unlikely to affect roosts and no roosts are known from the Montana Allotment. However, it is possible that undetected roosts occur within the allotment.

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. Saguaros occur on slopes, bajadas, and in valleys. Impacts due to livestock grazing activities 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). 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.

No long-term investigation has documented the influence of grazing on agave mortality or flowering stalk herbivory. Individual paniculate agave plants only bloom once in their life cycle, about 20 years. However, agave stalks as they begin to bolt are particularly palatable to domestic livestock and wild herbivores, including deer, javelina, rodents, and rabbits (M. Hawks, University of Arizona, Tucson, pers. comm. 1997; W. Hodgson, pers. comm. 1997). Cattle probably trample young agaves, and have been known to "walk down" agave flowering stalks (T. Cordery, Arizona Ecological Services Field Office, pers. comm., 1998). Agave germination and seedling establishment may be influenced by degraded ecological conditions such as soil compaction, erosion, reduced infiltration, and altered plant species diversity and abundance. Effects to bat forage plants 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 generally 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).

The 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 area to reproduction, survival, and growth of the bat. The Montana Allotment is considered foraging habitat. Areas with high densities of paniculate agaves and saguaros may be particularly important to the bat, especially if those high density sites in close proximity to roosts. The distribution and abundance of paniculate agaves on the Montana

Allotment, relative to the distribution of livestock during the agave bolting period (April 15 through September 15), has not been evaluated. The presence of roost sites on the allotment are not known and thorough surveys are lacking.

CUMULATIVE EFFECTS

On a landscape level, paniculate agave populations appear to be well dispersed. However, the percentage of the agave population which successfully produces flowering stalks is unknown. Large segments of the range of the lesser long-nosed bat and its forage plants are exposed to Federal, State, Tribal, and private livestock grazing management activities. The overall affects of grazing (herbivory, trampling, and ecosystem changes affecting plant reproduction, recruitment, and establishment) on bat forage plants is unknown. Lesser long-nosed bat foraging ecology and energy budget is largely unknown. This, combined with potential disturbance of roost sites and loss of habitat due to urbanization and other activities on large tracts of State and private lands within the range of the bat, contributes to negative impacts on the species. The impacts due to mining activities in the vicinity of the Montana Allotment are unknown.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Montana Allotment are not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Lesser Long-nosed Bat on the Montana Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take expected to result from the ongoing grazing activities on the Montana Allotment is harm, which occurs through the effects to habitat that alters the availability of food plants, affecting the suitability of the habitat to support the lesser long-nosed bat. The Service anticipates, however, that incidental take of the lesser long-nosed bat associated with the proposed action will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and it is difficult to detect and analyze the results of changes in bat foraging behavior and distribution, and reduced foraging efficiency. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, and trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity) within the natural capabilities of the landscape within all pastures on the allotment with high density agave or saguaro sites.
2. Livestock herbivory of agave flowering stalks contributes to limiting the abundance or distribution of lesser long-nosed bat food plants (*Agave palmeri*, *A. paryi*, and *A. deserti*).

3. Required monitoring and reporting of livestock utilization levels are not completed within designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the lesser long-nosed bat.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, and range conditions) on the allotment in pastures with high density agave or saguaro sites.

2. Livestock grazing does not contribute to limiting the food resources (*A. palmeri*, *A. paryi*, and *A. deserti*) available to the lesser long-nosed bat by reducing the distribution or abundance of flowering agaves below the natural capabilities of the landscape.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. Before any increases in livestock use above 1998 levels are approved through the Annual Operating Plan, and by September 30, 2000, determine livestock capacity on capable acres, with consideration for wild ungulates, using a proper use level based on existing condition. Use production/utilization studies or other capacity determination methods. In addition, assess riparian condition, watershed, and soil condition for all pastures on the allotment with high density agave or saguaro sites. Identify areas of livestock use/nonuse, assess proper season of use, adjust acreage of full/potential capacity range, and recalculate stocking levels, as appropriate.

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

1a. By April 15, 1999, evaluate the abundance and distribution of lesser long-nosed bat food plants (*A. palmeri*, *A. paryi*, *A. deserti* and saguaro) on the Montana Allotment, identify high density agave sites, and protect these sites to prevent livestock herbivory of agave flowering stalks. One method would be to preclude livestock access to high density agave sites during the agave bolting period from April 15 through September 15.

<u>or</u>

1b. By April 15, 1999, conduct a landscape level analysis (Forest wide) of lesser long-nosed bat food plant (*A. palmeri*, *A. paryi*, and *A. deserti*) abundance and distribution, and livestock use patterns during the agave bolting period (April 15 through September 15). With this information and in cooperation with the Service, reassess if/how/where livestock may be contributing to limiting the food resources available to the lesser long-nosed bat. By April 15, 1999, develop and initiate a monitoring/research plan to evaluate the relationship between livestock grazing and paniculate agave distribution, abundance, flowering, recruitment, and ecology.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization within each pasture on the allotment with high density agave or saguaro sites. Monitor utilization on designated key areas before turnout, at the mid-point of livestock use, and within one week after livestock are moved from the pasture. It is preferable to use grazing cages to protect plant growth for determining utilization. Apply established and replicable methods to measure utilization. Provide field data sheets and analysis summaries to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) progress made toward completion of multi-year Terms and Conditions; and 5) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Lesser Long-nosed Bat on the Montana Allotment

1. Continue cooperative efforts to survey for lesser long-nosed bat roosts, and protect and monitor these sites.

2. Implement the lesser long-nosed bat recovery plan, as appropriate.

MUD SPRINGS ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- ! Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- ! 25,182 total
- ! 13,135 full/potential capacity range

Projected Stocking Density
- ! 3,334 animal months
- ! 3.9 acres per animal month

Permitted Use:
- ! 360 cow/calf 1/1-12/31
- ! 5 horses 1/1-12/31

Projected Use:
- ! 274 cow/calf 1/1-12/31

Major Vegetation Type:
- ! Pinyon/juniper, interior chaparral

Major Drainages:
- ! Eagle Creek
- ! Mud Spring Canyon

Elevation:
- ! 5,000 to 7,500 feet

Type of Grazing System:
- ! 3 pastures, deferred rotation during summer: winter pasture used each year

Allotment Condition:
- ! 1987 TES indicates that approximately one-half of the allotment is in unsatisfactory soil condition.
- ! 1963 range condition data indicate that the full-capacity range is in fair to good condition.

Ecological condition and/or management action that contributes to adverse effects:

- Degraded ecological conditions.

Consultation Period:

- 3 Years

ARIZONA HEDGEHOG CACTUS ON THE MUD SPRINGS ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Although the Arizona hedgehog cactus has been tentatively identified at one location within the allotment, no surveys have been conducted. The cactus has a potential to be widespread across 20,939 acres of this 25,251 acre allotment. Some 12,047 acres of the allotment were not used to estimate capacity including some 9,548 acres of no capacity which has topographic features with a higher likelihood of having the cactus. Livestock stocking is within revised capacity estimates with 6,128 acres in fair condition and 7,007 acres reported to be in good condition.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Mud Springs Allotment <u>may affect, not likely to adversely affect</u> the Arizona hedgehog cactus. The Service here concurs with this determination for the following reasons: the Mud Springs Allotment is managed, in part, under a Memorandum of Understanding for resource protection providing for non-use of a portion of the permitted livestock numbers; stocking of permitted livestock is correlated with range improvement construction and maintenance, livestock management, improvement in range conditions, and is below estimated capacity of the range; and utilization levels are believed to be within appropriate limits, most of the allotment range condition is rated good, there has been some recent improvement, and expectations are that improvements will continue.

NUTRIOSO SUMMER ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:

- 15,096 total
- 13,465 full/potential capacity range

Projected Stocking Density

- 1,441 animal months
- 9.3 acres per animal month

Permitted Use:

- 262 cow/calf/horse, 5/16-10/31

Projected Use:

- 262 cow/calf, 5/16-10/31

Major Vegetation Type:

- Ponderosa pine, mixed conifer, grassland/meadow

Major Drainages:

- Boneyard Creek
- Nutrioso Creek
- Auger Creek

Elevation:

- 7,600 to 8,200 feet

Type of Grazing System:

- 3 pastures, deferred rotation

Allotment Condition:

- 1984-1986 watershed data indicates that most of the allotment is in satisfactory condition.
- 1998 inspection indicates that the entire allotment is in poor condition and active erosion is occurring.

Listed Species Adversely Affected:

- Loach minnow

Ecological condition and/or management action that contributes to adverse effects:

- Livestock grazing in North Springs, Boneyard, Sulzberger pastures and Pace Draw Trap generate sediments that enter Boneyard Creek.

Consultation Period:

- 3 Years

LOACH MINNOW ON THE NUTRIOSO SUMMER ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Nutrioso Summer Allotment is in the upper watershed of the Black River drainage. Within an elevation range of 7,600 to 8,200 feet, the vegetation communities are ponderosa pine and mixed conifer forests, with scattered tracts of open grassland or meadow. Three pastures of the Nutrioso Summer Allotment (North Springs, Boneyard, and Sulzberger) lie partially or entirely within the upper watershed of Boneyard Creek, about 3 to 4 miles upstream from its confluence with the North Fork of the East Fork of the Black River. The Pace Draw Trap, apparently a component of this allotment, also lies in the Boneyard Creek watershed.

The Nutrioso Summer Allotment within Boneyard and Sulzberger pastures may provide some opportunity for the filtration of sediments when the flow is spread overland across the wide, relatively low-gradient Williams Valley. Sediments flowing into the incised channel on the east end of the Boneyard and Middle pastures of the Boneyard Allotment are likely to travel into Boneyard Creek and then to the North Fork of the East Fork of the Black River. Boneyard Creek appears to be heavily embedded and is characterized by incised channels.

On the Nutrioso Summer Allotment, range condition in all areas of the allotment is poor, with low plant vigor. Elk contribute to heavy forage utilization on the allotment. Active erosion is occurring, although the soil condition is satisfactory across 87% of the allotment. The satisfactory soil condition may reflect the overall forested conditions of the allotment and the resulting presence of pine needles on the soil surface, which provide certain erosion resistance characteristics. However, much of the runoff from these pastures (especially in the southwest portion of Boneyard Pasture and a portion of the Sulzberger Pasture) eventually flows across the wide, relatively low-gradient grasslands of Williams Valley. Although these grass meadows may provide some opportunity for filtering overland runoff, the runoff eventually must flow through degraded, ephemeral drainage channels that offer little filtering capability. It is likely that the banks of these channels, because of direct access to them by livestock, contribute a measurable amount of sediments downstream. Once these sediments enter the degraded channels, they are transported directly into the North Fork of the East Fork of the Black River, and downstream into the East Fork of the Black River.

The National Forest has implemented several erosion control structures to reduce sediment transport into the North Fork of the East Fork of the Black River from Boneyard Creek, and provided gap fencing for Miller Pasture.

Loach minnow do not occur within the boundary of the Nutrioso Summer Allotment. However, in 1996, the species was discovered in the North Fork of the East Fork of the Black River, near Three Forks of the Black River. This population is at the highest known elevation for loach minnow, approximately 8,400 feet. Based on additional sampling in 1997, it appears that the population of loach minnow in the East Fork of the Black River extends from about 1 mile downstream of the Coyote Creek confluence (approximately at the confluence with Open Draw), and upstream in the North Fork of the East Fork of the Black River to about the confluence with Boneyard Creek (about 2.5 miles total). Potential loach minnow habitat may extend downstream in the East Fork of the Black River an unknown distance; upstream, potential habitat includes lower Boneyard Creek and lower Coyote Creek.

The population of loach minnow in the North Fork of the East Fork of the Black River and East Fork of the Black River is considered within the action area of ongoing livestock grazing within the three pastures and associated trap of the Nutrioso Summer Allotment. Nonnative aquatic species within the East Fork of the Black River may impact the loach minnow. Brown trout and brook trout are active fish predators, fathead minnow may compete for habitat with the loach minnow, and crayfish add to sedimentation problems. Degraded watershed conditions due to roads and livestock management, and nonnative species appear to be the greatest threats to this small population of loach minnow. Periodic flooding that cleans riffles of embedding sediments is important to the survival of loach minnow.

EFFECTS OF THE ACTION

Ongoing livestock grazing activities on the North Springs, Boneyard, and Sulzberger pastures (and Pace Draw Trap) on the Nutrioso Summer Allotment generates sediments and/or nutrients that degrade occupied loach minnow habitat in the North Fork of the East Fork of the Black River and the East Fork of the Black River. Degraded watersheds due to over-utilization of forage by livestock and wildlife, and active erosion of stream channels exacerbated by the presence of livestock in the channel, may contribute to altering the hydrologic regime (water quality, quantity, intensity, duration, and pattern) of Boneyard Creek, thereby increasing erosion and sedimentation into occupied loach minnow habitat in the North Fork of the East Fork of the Black River and downstream into the East Fork of the Black River. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Sediment deposition may eliminate the under-cobble pockets needed by loach minnow, making potential habitat unsuitable. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the East Fork of the Black River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993).

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species and small population in the East Fork of the Black River, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods, especially during the spawning season. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The loach minnow population in the East Fork, and North Fork of the East Fork of the Black River is small, and may be highly sensitive to environmental perturbations (e.g., altered stream flow, sedimentation, water temperatures). This is the highest elevation site known for the species. In order to interpret the ramification of management actions, ecological/biological information on the species is needed, especially related to spawning periods. Any direct monitoring of the loach minnow population must be undertaken very cautiously.

The combined affects of livestock management activities associated with the Boneyard, Nutrioso Summer, Williams Valley, Black River, and other allotments in the watershed, contribute to a very serious situation regarding the viability of the loach minnow population in the East Fork of the Black River. The management of these allotments in sum, results in alteration of the hydrologic regime and contributes to deterioration of the ecosystem. There have been recent efforts by the National Forest to ameliorate some of the erosion and sedimentation problems aggravated by ongoing livestock grazing activities on these allotments. The National Forest is developing plans for the construction of sediment traps and erosion control structures. In addition, the Black River Allotment, which includes occupied loach minnow habitat at Three Forks, has been rested pending future consultation with the Service. These actions are a good start, have the potential to measurably benefit the ecosystem, but need to be monitored to determine their effectiveness. Continued assertive management by the National Forest is necessary in order to not further risk the survival and recovery of the loach minnow in the East Fork of the Black River.

CUMULATIVE EFFECTS

The majority of the East Fork of the Black River watershed is administered by the Forest Service. Several past factors are likely to have affected the watershed and tributary streams, including Coyote and Boneyard creeks; they include roads, timber harvest, livestock grazing, fire occurrence, fire suppression, recreation, prairie dog eradication, past CCC Camp activities at Three Forks, invasion of nonnative Kentucky bluegrass (*Poa pratensis*) in the wet bottoms, and the presence of nonnative aquatic species that may compete with or feed on loach minnow. Elk may have some affect on the water quality. Numerous small, private inholdings within the National Forest also affect watershed conditions. The Boneyard Springs complex is on private land. However, many of the private inholdings are associated with a Federal livestock permit. With the exception of some actions associated with private inholdings, most activities within the East Fork of the Black River watershed would have some Federal involvement requiring section 7 consultation.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Nutrioso Summer Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Nutrioso Summer Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Nutrioso Summer Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the East Fork of the Black River watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the East Fork of the Black River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the East Fork of the Black River watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.) In the East Fork of the Black River and in the North Fork of the East Fork of the Black River. The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the East Fork of the Black River watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the exclusion of livestock from the tributaries of the North Fork of the East Fork of the Black River.

2. Continue the fish monitoring program established by the National Forest, expand to include surveys for loach minnow downstream of occupied habitat in the East Fork of the Black River, and upstream in Coyote and Boneyard creeks. All work is to be accomplished by a journey-level fishery biologist (or equivalent). As necessary, assess the status of the loach minnow population at Three Forks, work to ascertain spawning season information, and coordinate with other fish survey efforts. This is a small population of loach minnow and may be susceptible to adverse affects from over sampling.

3. For 1999, protect the riparian/stream corridors of Boneyard Creek and its main tributaries from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

4. Before livestock turn-out in 1999, exclude livestock access to the riparian/stream corridor of Boneyard Creek and main tributary channels in Boneyard and North Springs pastures on the Nutrioso Summer Allotment.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the East Fork of the Black River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and

submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Nutrioso Summer Allotment

1. Excluding all livestock use from Boneyard Creek and main tributaries.
2 Consider resting Boneyard Pasture in the Boneyard Creek drainage until raw stream channels and banks are healed.
3. Implement the loach minnow recovery plan, as appropriate.

PIGEON ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- 32,383 total
- 8,326 full/potential capacity range

Projected Stocking Density
- 3,954 animal months
- 2.1 acres per animal month

Permitted Use:
- 499 cow/calf, 1/1-12/31
- 10 horses, 1/1-12/31

Projected Use:
- 305 cow/calf, 1/1-12/31
- 20 horses, 1/1-12/31

Major Vegetation Type:
- Pinyon/juniper, interior chaparral

Major Drainages:
- Pigeon Creek
- Turkey Creek
- Juan Miller Creek
- Blue River

Elevation:
- 4,500 to 7,000 feet

Type of Grazing System:
- 3 pastures, deferred rotation

Allotment Condition:
- 1987 TES indicates that approximately 70% of the allotment is in satisfactory soil condition.
- 1997 range condition data indicate that most of the full-capacity acres are in poor to fair condition.

Listed Species Adversely Affected:

- Loach minnow
- American peregrine falcon
- Arizona hedgehog cactus

Ecological condition and/or management action that contributes to adverse effects:

- Stocking of the allotment is above estimated capacity.
- Possible trampling of endangered cactus due to presence of livestock.
- Lack of implemented forage use guidelines.
- Degraded soil conditions (possible increase in sedimentation) in pastures adjacent to Blue and San Francisco rivers.

Consultation Period:

- 2 Years

LOACH MINNOW ON THE PIGEON ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Pigeon Allotment is bordered by the Blue River on the east and by the San Francisco River on the south. The Blue River joins the San Francisco at the southeast corner of the allotment. Approximately 90 percent of the allotment (28,819 acres) is within the Blue River watershed; 10 percent (3,510 acres) within the San Francisco watershed. The allotment borders 5 miles of the Blue River and 5 miles of the San Francisco River. The rivers are adjacent to, but not part of the allotment. Livestock are excluded from both rivers. Of the eight pastures on the Pigeon Allotment, three border the river corridors and are rested. Both the Blue and San Francisco rivers adjacent to the allotment are in some state of impairment and have moderate levels of embeddedness and bank cutting. Riparian conditions are considered at risk. However, there has been some regeneration of riparian species.

The Pigeon Allotment encompasses 31 percent of the lower Blue River watershed with the major perennial tributaries from the allotment being Pigeon and Turkey/Bear creeks. Approximately 2 percent of the lower San Francisco watershed is within the allotment.

The Pigeon Allotment is considered to be overstocked by as much as 65 percent. Range condition data (1967) indicate almost two-thirds of the allotment is in fair condition, with areas of poor, very poor, and good. Shrubs are in a clubbed condition, showing the effects from past overuse. Grazing management is deferred rotation, 1 year in every 3. Utilization often exceeds 60 percent in many areas. Soils are very shallow, and degraded soil conditions persist on the allotment. Watershed and range conditions are currently most severe in Pat Mesa and Pigeon pastures. Continuing improvements to aid livestock management on the Pigeon Allotment include building a fence to correct livestock drift in the Orejana Pasture (Orejana Creek is a tributary to the San Francisco River), and water lot fence construction around stock tanks in the Pigeon Pasture to improve livestock distribution and use patterns within the pasture.

<u>Blue River.</u> The Blue River is a seriously degraded ecosystem. Aldo Leopold in 1921 called the Blue River "ruined" and cited it as an "extreme example" of human-caused erosion in the Southwest (Leopold 1921, Leopold 1946). Human uses of the river and its watershed in combination with natural flood flow events have resulted in extensive changes within the watershed and river channel. Miller (1961) indicated that as European settlement of the Blue River occurred around 1885 or 1886, the floor of the Blue River canyon was "well sodded and covered with grama grass, hardwoods, and pine," and the banks were "lined with willows and the river abounded with trout" (Leopold 1921). Olmstead (1919) refers to devastating floods that occurred from 1900 to 1906, which followed and contributed to the loss of floodplain terrains and other major changes to the elevation of the river by 1916. Periodic floods continue to erode remaining fields, homes, and roads (Coor 1992).

Flood destruction resulting in channel erosion was enabled and exacerbated by human activities on the watershed and streambanks (Chamberlain 1904, Olmstead, 1919, Leopold 1924a and 1924b, Bryan 1925, Leopold 1946, Miller 1961, Dobyns 1981, Coor 1992). Overgrazing depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation, increasing the volume of high flows and decreasing the duration (e.g., big and fast), and decreasing the volume of low flows while increasing the duration (e.g., small longer). Timber harvest, fuelwood, and railroad tie cutting removed vegetative cover of the watershed, often resulted in eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing riparian vegetation and irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river contributed to erosional degradation, often resulting in new channels or widening of the existing channel. Cattle drives along the river broke down streambank soils and damaged riparian vegetation. The resulting stream channel is characterized by a wide, shallow channel profile, high levels of sediment, eroding banks, braided shifting channels, and depauperate, sparse riparian vegetation (Chamberlain 1904, Leopold 1921, Leopold 1924a and 1924b, Dobyns 1981, Coor 1992).

The Blue River has a bimodal high flow pattern: a snow-melt hydrograph with high flows in late-winter and spring, and a second high flow period associated with monsoon rains in later summer. The river is "flashy" with high discharge following summer storms. Erosion, channel width, and channel migration increase gradually in a downstream direction, while riparian vegetation becomes less dense and aquatic habitat diversity decreases, becoming mostly riffles and runs, with pools scarce and generally associated with bedrock walls. Increased flashiness of flood flows and depletion of base flows are results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation (Ffolliott and Throud 1975, Dunne and Leopold 1978, DeBano and Schmidt 1989, Gebhardt *et al.* 1989, Meehan 1991, Gordon *et al.* 1992, Naiman 1992, Belsky and Blumenthal 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River.

Today, much of the Blue River channel is a wide unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.* 1989, Bagley *et al.* 1995). River terraces or benches are small eroding remnants of former river banks. Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow (*Baccharis salicifolia*), and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Plantanus wrighti*) are present, with willow increasingly common in the upper reaches where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* spp.), which are a key element in stable streambanks, are uncommon along much of the river.

The Blue River, like all streams in the Gila River basin, has been subject to introduction of a number of nonnative fish and other aquatic species. Nonnatives adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh and Brooks 1989, Marsh *et al.* 1989, Propst *et al.* 1992, Blinn *et al.* 1993, Carmichael *et al.* 1993, Douglas *et al.* 1994). Nonnative species reported in the Blue River during recent survey efforts include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Earlier surveys also found channel catfish (*Ictalurus punctatus*) (Anderson and Turner 1977, J.M. Montgomery Consulting Engineers 1985).

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river. Timber harvest, roads, recreation, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Private lands in the system are concentrated in the upper 30 miles of river bottom. Some cropping and irrigated agriculture continues on remaining river terraces that have natural protection from flood erosion. There are a number of small diversion structures and irrigation canals. A private fish hatchery is operated along the upper Blue River at Bush Creek and a substantial proportion of the base flow is diverted into the hatchery. Subdividing of ranch lands and construction of residences or summer homes has occurred at a fairly low level. The Blue River Road (Forest Road 281) is a continuous source of bank and channel damage and erosion. Numerous low-water crossings exist in the upper Blue River and contribute to localized destabilization. Road maintenance results in significant modifications and impacts to the river. In the lower Blue, unauthorized off-road-vehicle use in the river bottom continues to occur. Livestock grazing in the valley bottom continues on private lands in the upper Blue. On the Clifton Ranger District, the river corridor is excluded from authorized livestock grazing. Grazing is permitted on the river on some Forest Service allotments in the Alpine Ranger District.

San Francisco River. 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 (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). 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, affected by conditions on upstream allotments, including the Pigeon Allotment, is in much the same condition as the Blue River: channel width is generally too wide, with large expanses of unvegetated sand and rock cobble. The channel is continually subject to shifting, especially during periods of high flows. However, the lower portion of the San Francisco River on the Apache-Sitgreaves National Forest has been excluded from livestock use for several years. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), cottonwood seedlings and saplings, and the nonnative salt cedar (*Tamarix* sp.). Sedges (*Carex* spp.), rushes (*Juncus* spp.), bullrush (*Scirpus* spp.), and cattails (*Typha* sp.), which are a key elements to stablize streambanks, are present and increasing within the 22 mile portion of the San Francisco River corridor from the New Mexico stateline until leaving the National Forest. This includes about 9 miles of river corridor downstream from the confluence of the Blue River. Improved riparian function of these critical downstream elements have been documented in 1998 with the narrowing of channel and sediments trapped by bank vegetation. Present uses within the San Francisco River watershed, particularly in New Mexico, continue to contribute to adverse impacts within the riverine corridor, especially during periods of high flows.

The San Francisco River, like the Blue River and other streams in the Gila River basin, has also been subject to introduction of a number of nonnative fish and other aquatic species. Unlike the Blue River, the San Francisco has a larger number of nonnative species, the most notable of which is flathead catfish. However, native fishes still dominate in the San Francisco River.

Timber harvest, road, and grazing activities within the watershed continue to contribute to 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). A four-wheel drive road exists through a portion of the lower San Francisco River bottom, with numerous low-water crossings.

Loach minnow are known to occur in relatively low to moderate numbers throughout in rivers adjacent to the Pigeon Allotment; an approximate 5 mile reach of the Blue River, and a 5 mile reach of the San Francisco River (J.M. Montgomery Consulting Engineers 1985, Bagley *et al.* 1995). Relative abundance of the loach minnow appears to be lower in the San Francisco River compared to the Blue River. Pigeon and Turkey creeks, perennial tributaries of the Blue River, have not been inventoried for loach minnow occupancy or suitability of habitats.

<u>Blue River.</u> For many years, information on the fish of the Blue River was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain 1904, Anderson and Turner 1977, Silvey and Thompson 1978, J.M.Montgomery Consulting Engineers 1985, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor 1992). Recently, surveys of the Blue River system were conducted by Arizona Game and Fish Department in 1994 on the upper Blue River and by Arizona State University during 1995 and 1996 under funding from the Apache-Sitgreaves National Forests, on the lower river and tributaries (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). These surveys found loach minnow distributed throughout the Campbell Blue and Blue River system. In addition to loach minnow, the Blue River continues to support five other native fishes, the speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), Sonora sucker (*Catostomus insignis*), and razorback sucker (*Xyrauchen texanus*). Based on historical records, the Service concludes that up to nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century.

The loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). The only earlier fish survey was in 1904 (Chamberlain) which did not find loach minnow. Several efforts since then have located loach minnow distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the Blue River (Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Hendrickson 1987, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989, Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Loach minnow were not found in any tributaries other than Campbell Blue Creek and in KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Even where the densities are highest in the Blue River, loach minnow is still relatively scarce, rarely constituting more than 10%, and often less than 5%, of the fish population (Arizona Game and Fish Department 1994, Bagley *et al.* 1995).

Alteration of the Blue River watershed and simplification of the geomorphology of the Blue River affects loach minnow habitat in many ways. Discharge, velocity, instream water volume, water temperature, nutrient cycling, sedimentation, availability of larval backwater habitats and cobble/gravel riffles, food availability, and other factors have been altered.

<u>San Francisco River.</u> 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 minnow 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 (approximately 2.5 miles downstream of the confluence with the Blue River) (Bagley *et al.* 1995). 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.

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 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, Papoulias *et al.* 1989, Bagley *et al.* 1995). Eight native fishes (60%) have been extirpated from the San Francisco River over the past century and one-half. 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 conditions have prevailed, their occurrence is irregular and fragmented (Propst *et al.* 1988).

EFFECTS OF THE ACTION

Stocking of the Pigeon Allotment, while currently 65% of permitted numbers, remains almost two-thirds above estimated capacity. Although rested, degraded soil conditions persist in pastures adjacent to the Blue and San Francisco rivers. Both the Blue and San Francisco rivers are in some state of impairment, both hydrologically and by habitat condition. Sedimentation and alteration of runoff patterns into the Blue and San Francisco rivers from the allotment is expected as a result of ongoing livestock grazing activities. Degraded watershed and soil conditions, overstocking, over-utilization, and downstream sedimentation impacts continue to be of concern. These existing conditions, exacerbated by continued livestock grazing, may contribute to altering the hydrologic regime (water quantity, quality, intensity, duration, and pattern) of tributaries of the Blue and San Francisco rivers, thereby increasing erosion and sedimentation into the rivers. Current management of the allotment is expected to continue to contribute to the degraded conditions of these rivers and loach minnow habitat.

Cattle have access to Turkey Creek and upper Pigeon Creek. Information describing the potential for loach minnow occupancy of these perennial streams is either lacking or incomplete.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Both past and recent fish surveys of Turkey Creek, while documenting native fish such as the longfin dace, did not reveal the presence of loach minnow. These surveys suggest that Turkey Creek does not currently support loach minnows. Surveys of upper Pigeon Creek have not found loach minnow. Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), alter stream flow, change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Some riffle habitats in the Blue River, and also in the San Francisco, that may otherwise be suitable loach minnow habitat may be unsuitable due to sediment deposition that eliminates the under-cobble pockets needed by loach minnow. The San Francisco River has a relatively higher embeddedness rating than the Blue River, especially above the confluence with the Blue (T. Myers, Apache-Sitgreaves National Forests, pers. comm. 1998). 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the Blue River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993), to increase storage of water in streambanks, and to dissipate the erosive energy of floodwaters (Dunne and Leopold 1978). Streams channels on the Pigeon Allotment, such as the perennial Turkey and Pigeon creeks, all drain to the Blue River, have livestock access to at least portions of the stream channels, and are conduits for transport of sediments from degraded uplands. On much of the Blue and San Francisco rivers, the riparian vegetation is sparse and mostly lacking in herbaceous cover. Therefore, there is limited opportunity for riparian buffering of sediments and flood energy from degraded upland watershed conditions.

Loach minnow is adversely affected by activities which contribute to altering the hydrologic regime, degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include the loach minnow throughout the lower Blue River as well as the San Francisco River below the confluence with the Blue. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The National Forest has been working to improve conditions along the Blue River corridor and has precluded livestock from the river channel on many allotments. However, the currently degraded ecological conditions of the Blue River watershed intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. On the Pigeon Allotment, upland range and watershed conditions have contributed to altering the hydrologic regime of the Blue River system. The Pigeon Allotment is one of many allotments in the watershed with high proportions of impaired soils, fair to poor to very poor range condition, and unsatisfactory riparian areas. The allotment is suspected to be overstocked and grazing durations too long. The Pigeon Allotment, together with the Wildbunch Allotment which has much the same ecological status and management problems as the Pigeon Allotment, encompass 48% of the lower Blue River watershed. The naturally fragile status of the watershed makes the Blue River even more sensitive to the affects of livestock management activities.

The Blue River is an extremely important native fish stream, and is a crucial part in the recovery of several species. Long-term conservation of the Blue River ecosystem and the loach minnow requires more than just the maintenance of status quo for the river. It may require restoring the system to the point where river flows return to a more natural hydrograph, floodplains rebuild with fine-soiled banks and terraces which provide habitat for dense riparian vegetation, and the base-flow channel narrows with steeply sloping or overhanging banks. Reversing the accumulation of affects of many Federal and private actions within the watershed, including livestock use, requires long-term commitments.

The environmental baseline for loach minnow in the lower San Francisco River is highly degraded. The watershed of the San Francisco River is naturally fragile due to erosive soils, arid climate, and a naturally flashy hydrograph. Superimposed on that natural fragility are a number of human uses that exacerbate the problem by denuding vegetation, severely increasing erosion, and substantially increasing the flashiness of the hydrograph. These uses include timber harvest, water diversion, irrigated agriculture, residential and urban development, groundwater pumping, and roadbuilding, but the primary and widespread influence on the watershed has been livestock grazing. In livestock grazing allotments encompassing 70% of the area occupied by loach minnow in the San Francisco and Tularosa rivers, range and watershed indicators demonstrate poor vegetative and soil conditions, and of the 39 miles of the river for which condition data is available, 35% is rated as nonfunctional or at risk. As a result of these watershed disturbances, the San Francisco River has become unstable and the natural channel geography and aquatic habitats have become highly altered in any areas where the river is not confined by rock. In conjunction with the introduction of nonnative aquatic species, the instability and altered channel morphology of the river have changed aquatic habitats to the point that eight native fish species, 60% of the original community, have been extirpated. Most of the remaining native fishes have declined and loach minnow have become quite rare in many parts of the river.

The Forest Service is initiating conservation measures within the San Francisco River watershed: that ensure appropriate standards are applied to all Forest Service allotments for protection of stream habitats and upland watershed conditions; that appropriate forage utilization standards are applied; and that stocking rates are brought in-line with grazing capacity, along with measures to study, monitor, evaluate, and manage for recovery of listed fish species. These measures address major concerns about the health of riparian habitats of the loach minnow.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the loach minnow, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation allows access of predatory nonnative fish species into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

Lands along the San Francisco River are a mix of National Forest, Bureau of Land Management, State, and private lands. However, most of the river in Arizona is administered by the Apache-Sitgreaves National Forest. Upstream in New Mexico, the river crosses through the Gila National Forest. Substantial reaches of the San Francisco River in New Mexico are on private land. Non-Federal activities such as grazing, irrigated agriculture, and road construction and maintenance, occur on 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.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pigeon Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat for this species exists, therefore none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Pigeon Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of loach minnow is expected to result from the ongoing grazing activities on the Pigeon Allotment. Harassment occurs through effects to individual fish which could occur while livestock enter the stream during periods when fencing along the river is damaged and incidental livestock use occurs in the Blue and San Francisco rivers. Harm occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the Blue River watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Blue River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the exclusion of livestock from the Blue and San Francisco rivers. When livestock are present on pastures which are adjacent to the river, survey for livestock presence at least once every two weeks until such time that annual permitted numbers are in line with capacity determinations, and immediately after high flows or other events which may compromise the integrity of the exclosure, to detect and remove livestock from within the river.

2. Protect the riparian/stream corridors in Turkey and Pigeon creeks from overuse by appropriate livestock management practices, including actions such as herding by a range rider, salting away from access points, fencing, seasonal use, etc.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Continue and expand the fish monitoring program established by the National Forest to include the San Francisco River (below the mouth of the Blue) and the lower couple of miles of Pigeon Creek. This work is to be done by a journey-level fishery biologist (or equivalent) and coordinated with the Arizona Game and Fish Department and the Service, and provide each with annual reports.

2. By March 1, 1999, initiate a watershed analysis of the entire Blue River watershed and San Francisco River watershed to include at least that portion of the watershed within Arizona (and preferably to be coordinated with, and include the San Francisco River watershed within the Gila National Forest in New Mexico), to determine factors affecting stream flow (water quality, quantity,

intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the Blue and San Francisco watersheds. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

3. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Blue River and San Francisco River watershed at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

4. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded,

livestock access the river corridors, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Pigeon Allotment

1. Consider excluding all livestock use from Turkey and Pigeon creeks.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Implement the loach minnow recovery plan, as appropriate.

PEREGRINE FALCON ON THE PIGEON ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Recovery of the peregrine falcon in the Rocky Mountain/Southwest Recovery Region has had great success. Within the Arizona portion of the recovery area, the population has been expanding with high rates of site occupancy and high reproductive success (Burnham and Enderson 1987, Tibbitts and Bibles 1990, Tibbitts and Ward 1990a and 1990b, Enderson *et al*. 1991, Ward 1993). Recognizing the recovery of this species, the Service has published an advanced notice of intent to propose delisting the falcon (60 FR 34406).

The Pigeon Allotment is bordered by the Blue River on the east and by the San Francisco River on the south. The allotment borders 5 miles of the Blue River and 5 miles of the San Francisco River. The rivers are adjacent to, but not part of the allotment. Livestock are excluded from both rivers. Of the eight pastures on the Pigeon Allotment, three border the river corridors and are rested. Both the Blue and San Francisco rivers adjacent to the allotment are in some state of impairment and have moderate levels of embeddedness and bank cutting. Riparian conditions are considered at risk. However, there has been some regeneration of riparian species. The area is very rugged with many steep canyons. The major perennial tributaries from the allotment are Pigeon and Turkey/Bear creeks. Both the Blue and lower San Francisco rivers are seriously degraded, with wide, shifting river channels and largely unvegetated substrates of cobble, gravel, boulder, and sand. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), cottonwood seedlings and saplings, and the nonnative salt cedar (*Tamarix* sp.).

The Pigeon Allotment has been overstocked by as much as 65 percent. Initial capacity estimates completed for the preparation of this biological opinion indicated that capacity for livestock on the Pigeon Allotment to be 36 percent of the current permitted numbers. Present stocking of the allotment is 35 percent below permitted numbers of livestock, but still above estimated capacity. Range condition data (1967) indicate almost two-thirds of the allotment is in fair condition, with areas of poor, very poor, and good. Shrubs are in a clubbed condition, showing the effects from past overuse. Allowable use guidelines have been established, but they have not been enforced. Utilization has often exceeded 60 percent in many areas. Soils are very shallow, and degraded soil conditions persist on the allotment. Watershed and range conditions are currently most severe in Pat Mesa and Pigeon pastures.

Several active peregrine falcon eyries are known to occur in the vicinity of the Blue and San Francisco river corridors. The closet known nest to the Pigeon Allotment is along the San Francisco River, upstream approximately 9 miles. Also, peregrines were observed during the breeding season 2 to 3 miles upstream along the Blue River, but no nest was located. Another potential nest site is at Eagle Creek, approximately ten miles to the west. The National Forest estimated that as many as 95 different potential peregrine nest sites are spread out within the Blue River corridor. These sites are defined, in part, as having vertical cliffs over 100 feet tall (J. Copeland, Apache-Sitgreaves National Forests, pers. com., April-May 1997). No peregrine falcons, breeding or otherwise, have been observed in the Pigeon Allotment. Mountainous terrain with apparently suitable nesting cliffs are found within the allotment along the major river corridors, and perhaps in tributary canyons of Pigeon and Turkey creeks. Potential peregrine prey species (e.g., songbirds) occur throughout the allotment, with highest densities associated with canyon riparian areas. Limited surveys for peregrine falcon have been conducted in the general vicinity and none on the allotment. Therefore, there is a potential that breeding peregrine falcons may occur on the Pigeon Allotment, and peregrines from upstream on the Blue and San Francisco rivers may forage in the vicinity of the Pigeon Allotment.

EFFECTS OF THE ACTION

Grazing may affect avian abundance and species composition (e.g., falcon prey) in various vegetation types, depending on the intensity of grazing and how much the plant community is altered. Grazing can improve conditions for some species and decrease habitat quality for others (Bock *et al.* 1993). Peregrine falcons are prey generalists and do not depend on a small group of bird species for food. Furthermore, falcons forage over a large area (e.g., 10 miles) (Enderson *et al.* 1991). Therefore, livestock grazing can negatively affect peregrine falcons if the existing mosaic of vegetative attributes (e.g., structure and species composition) are simplified across the landscape. This could reduce the number of species and their abundance in the area, and reduce the prey base for the falcon.

Falcons hunt in both riparian and upland areas, although riparian areas may be used disproportionately higher than their availability due to the greater densities and numbers of potential prey (Carothers 1974). Three pastures within the allotment are immediately adjacent to, but are fenced from, portions of the Blue and San Francisco rivers. No other pastures are adjacent to or include either river. The three pastures are not scheduled for livestock use during the consultation period. This should provide an effective buffer against unauthorized livestock access to these rivers. Therefore, the associated riparian areas will be protected from the direct effects of grazing.

Other riparian areas are found along Pigeon and Turkey creeks. These areas are not fenced from livestock, and may be subject to high utilization of woody and herbaceous plants. The resulting simplification of vegetation structure and/or composition could eliminate or decrease the quality of habitat for bird species that require riparian vegetation to survive or reproduce (e.g., summer tanagers, yellow warblers). It probably would not attract species that would otherwise be found on the allotment, although it could provide sufficient habitat for generalist species that are present within adjacent vegetation types (e.g., mourning dove). All this considered, it is possible that the prey base for falcons could decrease as a result of heavy utilization along Pigeon and Turkey creeks.

Upland vegetation types constitute the majority of the allotment as well as the majority of the foraging area likely to be used by a falcon. Historically heavily grazed areas (such as are found on the Pigeon Allotment) probably provide fewer food and cover sources for most species of birds than lightly grazed or ungrazed areas. However, some generalist avian species may be relatively unaffected by this condition (e.g., mourning dove). Most of the uplands on the allotment are in degraded condition and are not expressing a mosaic of habitats. Poor upland watershed conditions alter surface runoff and subsequent changes to tributary and stream hydrologic patterns and loss of riparian vegetation diversity (e.g., structural and species). Implementation of grazing utilization standards and guidelines should improve vegetation conditions for the peregrine falcon’s prey base.

Falcons could be disturbed by a variety of human actions that occur in close proximity to an eyre. Surveys have not been conducted on the allotment, so it is unknown whether or not the proposed fence construction or other activities would disturb nesting falcons. Most of the suitable nesting cliffs occur within the Blue and San Francisco river canyons. Pastures adjacent to or containing these canyons are not scheduled for construction activities or livestock use, so it is unlikely any eyre, if present, would be disturbed.

CUMULATIVE EFFECTS

Most of the land within the Blue and San Francisco river watersheds is under the jurisdiction of the U.S. Forest Service, and activities affecting the peregrine falcon would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the rivers. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River and San Francisco. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system and its associated affects to riparian habitats.

The Pigeon Allotment occurs in rough and relatively remote country. Very few activities other than grazing occur on the allotment. Recreational use is very low, and consequently, disturbance to falcons (if they occur on the allotment) is expected to be uncommon or non-existent.

CONCLUSION

After reviewing the current status of the peregrine falcon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pigeon Allotment are not likely to jeopardize the continued existence of the peregrine falcon. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Peregrine Falcon on the Pigeon Allotment

The Service does not anticipate that the proposed action will take any American peregrine falcons.

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

CONSERVATION RECOMMENDATIONS - Peregrine Falcon on the Pigeon Allotment

1. Consider undertaking a larger scale approach to surveys for peregrine falcons. Evaluate potential nesting habitat within the Blue River watershed and then survey these potential sites (this could provide additional support for the upcoming delisting proposal).

2. Implement the peregrine falcon recovery plan, as appropriate.

MEXICAN SPOTTED OWL ON THE PIGEON ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Pigeon Allotment lies within the Basin and Range-West Recovery Unit for the Mexican spotted owl, as defined by the recovery plan (U.S. Fish and Wildlife Service 1995b). This recovery unit 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 owl occurs in widely distributed territory clusters of varying sizes. The sky islands subpopulation of the Mexican spotted owl may represent an important demographic link between the Mogollon Plateau demes (Upper Gila Mountains Recovery Unit) and those in the Sierra Madre Occidental (Mexico recovery units). Demographic persistence and connectivity within and between recovery units may be hindered by the compounding factors of naturally disjunct habitat, long dispersal distances, and human caused habitat fragmentation, especially of low-elevation riparian forests--critical linkage habitat among mountain ranges.

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) lists the primary threats to the species and its habitat in the Basin and Range-West Recovery Unitas catastrophic fire. In the past four years in this recovery unit, the Noon, Arcadia, Clark Peak and Lone Peak fires have resulted in the loss of Mexican spotted owl habitat. Although the Coronado National Forest does not have an active timber program, localized projects such as road construction, fuelwood harvest, mining, and other construction may adversely affect individual protected activity centers (PACs) established for known owl sites, other Mexican spotted owl protected habitat, and restricted habitat, as defined by the recovery plan (U.S. Fish and Wildlife Service 1995b).

Within the Basin and Range-West Recovery Unit, spotted owls are found in rocky canyons or in several forest types at elevations ranging from 3,690 to 9,610 feet, in the Atascosa-Pajarito, Santa Rita, Santa Catalina, Patagonia, Whetstone, Galiuro, Huachuca, Chiricahua, Pinaleno, Superstition, Sierra Ancha, Mazatzal, and Bradshaw Mountains, Arizona. Below 4,264 feet, spotted owls may occur in steep canyons containing cliffs and stands of live oak, Mexican pine, and broad-leaved riparian vegetation (Ganey and Balda 1989). Above 5,904 feet, 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 (U.S. Fish and Wildlife Service 1995b).

The Pigeon Allotment is considered to be overstocked by as much as 65 percent. Range condition data (1967) indicate almost two-thirds of the allotment is in fair condition, with areas of poor, very poor, and good. Shrubs are in a clubbed condition, showing the effects from past overuse. Grazing management is deferred rotation, 1 year in every 3. Utilization often exceeds 60 percent in many areas. Soils are very shallow, and degraded soil conditions persist on the allotment. Watershed and range conditions are currently most severe in Pat Mesa and Pigeon pastures. Pat Mesa Pasture includes part of, and is adjacent to, the Pigeon Creek complex of steep canyons. Livestock are excluded from the Blue and San Francisco river corridors. Continuing improvements to aid livestock management on the Pigeon Allotment include building a fence to correct livestock drift in the Orejana Pasture (Orejana Creek is a tributary to the San Francisco River), and water lot fence construction around stock tanks in the Pigeon Pasture to improve livestock distribution and use patterns within the pasture.

Much of the Pigeon Allotment consists of pinyon/juniper woodland and grassland communities which does not meet the criteria established within the Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) to be considered protected or restricted owl habitat. However, potential owl nesting and foraging habitat on the allotment includes the canyon and riparian habitat along the Blue and San Francisco rivers and the Pigeon/Turkey creeks canyon complex (tributary to the Blue River). In addition, Turkey Creek connects to pine and mixed conifer habitats to the north, and may be used as a travel corridor by the owl. The nearest known occurrence of a spotted owl is 7 miles to the southwest, in the Eagle Creek drainage. No owl surveys have been conducted within the Pigeon Allotment.

No acreage figures for restricted spotted owl habitat were provided by the National Forest. Examination of topographic maps in the area of Pigeon and Turkey creeks and the associated canyon complex indicates a potential for one pair of owls. Therefore, in the absence of survey information, and for the purposes of this consultation, it is presumed that there is one pair of owls within the project areas.

EFFECTS OF THE ACTION

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) summarizes the effects of grazing to spotted owls in four broad categories: 1) altered prey availability, 2) altered susceptibility to fire, 3) degeneration of riparian plant communities, and 4) impaired ability of plant communities to develop into spotted owl habitat. The recovery plan goes on to provide explicit goals for managing grazing in protected and restricted spotted owl habitat:

! Monitor grazing use by livestock and wildlife in "key grazing area." Key areas are primarily riparian areas, meadows, and oak types.

! The intent is to maintain good to excellent range conditions in key areas while accommodating the needs of the owl and its prey.

! Implement and enforce grazing utilizations standards that would attain good to excellent range conditions within the key grazing area.

! Establish maximum allowable use levels that are conservative and that will expedite attaining and maintaining good to excellent range conditions.

! Ensure that the allowable use of plant species will maintain plant diversity, density, vigor, and regeneration over time.

! Restore adequate levels of residual plant cover, fruits, seeds, and regeneration to provide for the needs of prey species.

! Restore good conditions to degraded riparian communities

The 1996 Forest Service Record of Decision for the Amendments of the Forests Plan incorporates the recommendations for Mexican spotted owl management into Forest direction in the form of standards and guidelines and suggested utilization levels, for combined use by livestock and wildlife, based on range conditions and allotment management strategy.

The Mexican spotted owl recovery plan specifically identifies overgrazing as a threat to the owl in the Upper Gila Mountain Recovery Unit.

> "Overgrazing is suspected to be detrimental in some areas and can affect both habitat structure and the prey base. Effects on the prey base are difficult to quantify, but removal of herbaceous vegetation can reduce both food and cover available to small mammals (Ward and Block 1995). This is especially true with respect to voles, which are often associated with dense grass cover. Direct effects on habitat occurs with livestock browsing on Gambel oak [(*Quercus gambeli*)]. In some areas, oak is regenerating well but unable to grow beyond the sapling stage because of this browsing... Grazing effects on habitat are also potentially significant in canyon-bottom riparian areas. We do not attribute these effects solely to livestock. Forage resources are shared by livestock and wild ungulates" (U.S. Fish and Wildlife Service 1995b, p. 101).

Diet studies conducted on Mexican spotted owls have indicated that prey species of the owl include woodrats (*Neotoma* spp.), white-footed mice (*Peromyscus* spp.), voles (*Microtus* and *Cleithrionomys* spp.), rabbits and hares (*Sylvilagus* and *Lepus* spp.), pocket gophers (*Thomomys* spp.), other mammals including a variety of bats, birds, insects, and reptiles. Ward and Block (1995) report that rangewide, 90% of an "average" Mexican spotted owl diet would contain 30% woodrats; 28% peromyscid mice; 13% arthropods; 9% microtine voles; 5% birds; and 4% medium-sized rodents, mostly diurnal sciurids. These rangewide patterns, however, are not consistent among spotted owl recovery units as data indicates significant differences in owl diets among geographic location (Ward and Block 1995). Ganey (1992) conducted a Mexican spotted owl prey study between 1984-1990 in mixed conifer habitat of the San Francisco Peaks. He found the following percentages of prey biomass in the diet of the owl: 49.1% woodrats; 15% voles; 12.5% peromyscid mice; 9.1% pocket gophers; 6.7% rabbits; 4.4% other medium mammals; 3.1% birds; and 0.1% arthropods.

The effect livestock and wildlife grazing can have on Mexican spotted owl prey species and their habitat is also a complex issue. Impacts can vary according to grazing species (domestic or wild), degree of use, including stocking density, grazing intensity, grazing frequency, and timing of grazing, habitat type and structure, and plant and prey species composition (Ward and Block 1995). It is well documented that repetitive, excessive grazing of plant communities by livestock can significantly alter plant species density, composition, vigor, regeneration, above or below ground phytomass, soil properties, nutrient flow, and water quality, especially when uncontrolled (Belsky and Blumenthal 1997; Ward and Block 1995). These effects have both direct and indirect adverse impacts on animal species that are dependent on plants for food and cover. However, moderate to light grazing can benefit some plant and animal species under certain conditions and in certain environments, maintain communities in certain seral stages, and may increase primary productivity (Ward and Block 1995). No studies document the direct and indirect effects of livestock and wildlife grazing on the Mexican spotted owl or its prey (U.S. Fish and Wildlife Service 1995b). However, Ward and Block (1995) indicate that there exists some knowledge regarding the effects that livestock grazing can have on small mammals frequently consumed by spotted owls, and regarding mesic or montane plant communities inhabited by the owl's prey. Based on studies conducted in other areas of the United States, Ward and Block (1995) indicate that, under heavy grazing, decreases in populations of voles would be expected, and this would improve conditions for deer mice in meadow habitat. Increases in deer mouse abundance in meadows would not offset decreases in vole numbers because voles provide greater biomass per individual and per unit of area. Such decreases could negatively influence spotted owls (Ward and Block 1995).

Ward and Block (1995) examined correlates between the Mexican spotted owl's diet and reproduction. Their results suggested that the owl's reproductive success was not influenced by a single prey species, but by many species in combination. None of the specific prey groups significantly influenced owl reproductive success, but rather, they concluded it was more likely that the owl's reproductive success was influenced by total prey biomass consumed in a given year, rather than by a single prey species. More young were produced when moderate to high amounts of the three most common prey groups (woodrats, peromyscid mice, and voles) were consumed.

Grazing by livestock can alter the vegetation community. Canyon bottoms and meadows are often preferred foraging sites by both livestock and wildlife, and grazing contributes significantly to degradation of these habitats.

Many of these effects are occurring to some degree on the Pigeon Allotment due to ongoing livestock grazing activities within protected and restricted Mexican spotted owl habitat. Many of these effects are evident through the degraded status of range; other effects are more subtle.

With past livestock numbers and management on the Pigeon Allotment, over-utilization of forage and browse occurred at a high level throughout the allotment. The Forest Service's application of the grazing utilization standards and guidelines should meet the intent of the *Mexican Spotted Owl Recovery Plan* to maintain habitat conditions for the owl prey base.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the Mexican spotted owl, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. The resulting impacts to the riparian community may have an effect on the potential use of this area by spotted owls as wintering habitat and/or dispersal corridors.

CONCLUSION

After reviewing the current status of the Mexican spotted owl, the environmental baseline in the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pigeon Allotment are not likely to jeopardize the continued existence of Mexican spotted owl. No critical habitat for this species is designated, therefore none will be affected.

INCIDENTAL TAKE STATEMENT
Mexican Spotted Owl on the Pigeon Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The Service anticipates that take of Mexican spotted owl will be difficult to detect because finding a dead or impaired specimen is unlikely. However, the level of incidental take can be anticipated by the loss of essential elements in the habitat that would affect the reproductive success of the species. The primary type of take expected to result from the ongoing grazing activities on the Pigeon Allotment is through harm by the reduction of suitability of the habitat for prey species, thus limiting the availability of prey for owls. This would impair the ability of Mexican spotted owl adults to successfully raise young. The Service anticipates that, in the absence of survey, incidental take will occur to one pair of Mexican spotted owls on the Pigeon Allotment. The Service has defined incidental take in terms of habitat characteristics, and has used surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of Mexican spotted owl from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), and riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions) within the natural capabilities of the landscape on all pastures of the allotment with Mexican spotted owl PACs.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Mexican spotted owl.

REASONABLE AND PRUDENT MEASURES

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

1. Maintain desirable owl habitat characteristics on allotment to include areas where vegetative growth is not being significantly retarded or inhibited by grazing activities. Upland foraging areas should have a sustaining presence of herbaceous ground cover, and should contain a <u>mixture</u> of both dense and sparse grass cover that allows for a diversity of prey species, e.g., deer mice,

voles, jumping mice, and shrews. In riparian areas, there should be a sustaining presence of shrubs, trees, forbs, and grass cover.

2. Monitor grazing activities and resulting incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. Identify key areas and key plant species for all pastures within Mexican spotted owl PACs. Key areas are to include the most ecologically sensitive areas for the Mexican spotted owl (e.g., PACs, riparian areas, stringer meadows). Provide a list of key species and a map of key areas to the Service by March 1, 1999.

2. Implement a grazing management strategy that produces good to excellent range conditions in protected and restricted Mexican spotted owl habitat. By March 1, 1999, provide to the Service a written verification supported by data that the management strategy will result in the desired conditions shown in RPM #1.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Monitor forage utilization within each pasture on the allotment with Mexican spotted owl PACs. Monitor utilization on designated key areas before turnout, at the mid-point of cattle use, and within one week after livestock are moved from the pasture. Apply established and replicable methods to measure utilization. Provide field data sheets and analysis summaries to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

2. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of

direct take, if any; 3) utilization monitoring summary and analysis; 4) progress made toward completion of multi-year Terms and Conditions; and 5) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service as soon as possible, and within 15 days.

CONSERVATION RECOMMENDATIONS
Mexican Spotted Owl on the Pigeon Allotment

1. Conduct formal or informal monitoring of all Mexican spotted owl PACs within the Pigeon Allotment prior to September 30, 2000.

2. Implement the Mexican spotted owl recovery plan, as appropriate.

ARIZONA HEDGEHOG CACTUS ON THE PIGEON ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Cedar Creek Associates (1994, and *in* Tonto National Forest 1996) has estimated that there are over 250,000 individual Arizona hedgehog cacti within the area considered to be the main distribution (type locality) of the species in the vicinity of Globe/Miami, Arizona. However, this estimate does not include up to several thousand known plants and potentially many more occurring in satellite populations disjunct from the main distribution, or cacti that may be Arizona hedgehog cactus in east-central and southeastern Arizona.

The Bureau of Land Management reports finding cacti that appear to be Arizona hedgehog in east-central and southeastern Arizona, and that there is over 300,000 acres of potential habitat on Bureau lands (Bureau of Land Management 1996). Potential habitat for this cactus also extends across the southern portion of the Clifton Ranger District, Apache-Sitgreaves National Forest. The cactus appears to be widespread in this area, although only very limited surveys have been conducted.

Although the Arizona hedgehog cactus has been tentatively identified within the Pigeon Allotment, no surveys have been conducted. Potential habitat within the allotment may include as many as 32,132 acres, based on vegetation type and topography but not verified by survey.

EFFECTS OF THE ACTION

Livestock grazing may affect Arizona hedgehog cactus through trampling of plants and/or habitat degradation. However, due to the microhabitat in which Arizona hedgehog cactus are typically found - boulders, rock crevices, steep-walled canyons, and rocky slopes - physical damage to cacti and habitat degradation due to grazing are less likely than in habitats more accessible to cattle. 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. Heavy grazing and high stocking rates increase the probability of trampling, especially of younger specimens, 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 increase under poor range conditions as livestock seek forage in more rugged areas.

To what extent grazing may directly or indirectly effect Arizona hedgehog cactus due to habitat degradation has not been studied. However, grazing practices can change vegetation composition and abundance, cause soil erosion and compaction, damage cryptobiotic crusts, and reduce water infiltration rates and increase surface runoff (Klemmedson 1956, Ellison 1960, Arndt 1966, and Gifford and Hawkins 1978, Belnap 1992), leaving less water available for plant production (Dadkah and Gifford 1980).

The potential for adverse affects to Arizona hedgehog cactus and its habitat due to ongoing livestock grazing activities increases as stocking rates increase, and range conditions decrease. The Pigeon Allotment is currently overstocked by as much as 65%, range conditions are variable but mostly fair, and forage utilization levels exceeds 60% in many areas. The lack of Arizona hedgehog cactus survey information makes the extent of potential trampling impossible to determine.

CUMULATIVE EFFECTS

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 a separate permit and 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 Federal involvement may also adversely affect the cactus.

CONCLUSION

After reviewing the current status of the Arizona hedgehog cactus, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pigeon Allotment are 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 - Arizona Hedgehog Cactus on the Pigeon Allotment

1. Determine the appropriate livestock stocking level for the Pigeon Allotment; apply forage utilization standards appropriate to the vegetation type and range conditions; monitor livestock use, and move livestock from pastures when indicated.

2. Continue cooperative efforts to determine the taxonomic status of the apparent Arizona hedgehog cactus on Clifton Ranger District allotments, and provide funding for genetic studies.

3. If genetic and morphological studies demonstrate that cacti on the allotments are *Echinocereus triglochiadiatus* var. *arizonicus*, the National Forest should determine the distribution and monitor the status of the cactus on Forest Service lands.

PLEASANT VALLEY ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- 13,222 total
- 5,671 full/potential capacity range

Projected Stocking Density
- 3.002 animal months
- 1.9 acres per animal month

Permitted Use:
- 310 cow/calf/yearlings, 11/1-5/31
- 220 cow/calf/yearlings, 6/1-10/31
- 10 horses, 6/1-10/31

Projected Use:
- 271 cow/calf/yearlings, 11/1-5/31
- 211 cow/calf/yearlings, 6/1-10/31
- 10 horses, 6/1-10/31

Major Vegetation Type:
- Pinyon/juniper, interior chaparral, grassland

Major Drainages:
- San Francisco River
- Dix Creek

Elevation:
- 4,000 to 6,000 feet

Type of Grazing System:
- Deferred rotation grazing schedule 1 year in every 3 years

Allotment Condition:
- 1987 TES indicates that approximately half of the allotment is in unsatisfactory soil condition.
- Very old (1959) range condition data indicate poor to fair conditions.

Listed Species Adversely Affected:

- Loach minnow
- American peregrine falcon
- Arizona hedgehog cactus

Ecological condition and/or management action that contributes to adverse effects:

- Stocking of the allotment is above estimated capacity.
- Possible trampling of endangered cactus due to presence of livestock.
- Livestock have direct access to the San Francisco River and lower Dix Creek in the San Francisco and Red Flat pastures (these pastures rested and/or all access to river is fenced).
- Degraded range condition and possible overuse of forage plants.

Consultation Period:

- 2 Years

LOACH MINNOW ON THE PLEASANT VALLEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Pleasant Valley Allotment is bordered by approximately 3.5 miles of the San Francisco River on the north. The allotment is entirely within the lower San Francisco watershed. The Blue River joins the San Francisco just downstream from the allotment. The San Francisco River is included within the San Francisco Pasture. Dix Creek, a perennial stream and major riparian area, passes through the San Francisco and Red Flat pastures. These two pastures are rested in 1998; however there are no fences or major geographical boundaries to keep all livestock from accessing the river or creek from other pastures. The San Francisco River adjacent to the allotment is in some state of impairment and has moderate levels of embeddedness and bank cutting. Riparian conditions are considered at risk. However, there has been some regeneration of riparian species and stand structure diversity.

The Pleasant Valley Allotment is considered to be overstocked by as much as 85 to 135 percent. Initial capacity estimates completed for the preparation of this biological opinion indicated that capacity for livestock on this allotment is 43 percent of the current permitted animal unit months. The most recent range condition data, from 1959, indicates that 85 percent of the allotment is in fair to poor condition, with areas of good and very poor. Shrubs are in a clubbed condition, showing the effects from past overuse. Grazing management is deferred rotation, deferred 1 year in every 3. Soils are very shallow, and degraded soil conditions persist on the allotment; watershed is currently 51% in unsatisfactory condition.

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 (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). 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, affected by conditions on upstream allotments, including the Pleasant Valley Allotment, is in much the same condition as the Blue River: channel width is generally too wide, with large expanses of unvegetated sand and rock cobble. The channel is continually subject to shifting, especially during periods of high flows. However, the lower portion of the San Francisco River on the Apache-Sitgreaves National Forest has been excluded from livestock use for several years. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), cottonwood seedlings and saplings, and the nonnative salt cedar (*Tamarix* sp.). Sedges (*Carex* spp.), rushes (*Juncus* spp.), bullrush (*Scirpus* spp.), and cattails (*Typha* sp.), which are a key elements to stablize streambanks, are present and increasing within the 22 mile portion of the San Francisco River corridor from the New Mexico stateline until leaving the National Forest. This includes about 9 miles of river corridor downstream from the confluence of the Blue River. Improved riparian function of these critical downstream elements have been documented in 1998 with the narrowing of channel and sediments trapped by bank vegetation. Present uses within the San Francisco River watershed, particularly in New Mexico, continue to contribute to adverse impacts within the riverine corridor, especially during periods of high flows.

The San Francisco River, like the Blue River and other streams in the Gila River basin, has also been subject to introduction of a number of nonnative fish and other aquatic species. 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 (*Cyprinella lutrensis*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), western mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas*), 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). However, native fishes still dominate in the San Francisco River.

Timber harvest, road, and grazing activities within the watershed continue to contribute to 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). A four-wheel drive road exists through a portion of the lower San Francisco River bottom, with numerous low-water crossings.

Loach minnow are known to occur in relatively low numbers in the 3.5 mile segment of the San Francisco River within the Pleasant Valley Allotment (J.M. Montgomery consulting Engineers 1985, Bagley *et al.* 1995). The fish is also known to inhabit the San Francisco River both upstream and downstream of the allotment. Relative abundance of the loach minnow appears to be lower in the San Francisco River compared to the nearby Blue River. Dix Creek, a perennial stream on the allotment, was surveyed in 1983, 1984, and 1996, and no loach minnow were located.

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 minnow 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 (approximately 2.5 miles downstream of the confluence with the Blue River) (Bagley *et al.* 1995). 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.

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 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, Papoulias *et al.* 1989, Bagley *et al.* 1995). Eight native fishes (60%) have been extirpated from the San Francisco River over the past century and one-half. 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 conditions have prevailed, their occurrence is irregular and fragmented (Propst *et al.* 1988).

EFFECTS OF THE ACTION

Any direct access by livestock to the San Francisco River and occupied loach minnow habitat, when considered in context of the severely degraded condition of the allotment and the environmental baseline of the San Francisco River watershed, would be an extremely serious situation. The National Forest has previously committed to resting the San Francisco Pasture on the Pleasant Valley Allotment; however, there are no fences or major geographical boundaries to keep all livestock from accessing the river while in other pastures, including during the loach minnow spawning season. Potential effects include: disrupting breeding; suffocating eggs due to increases in sediment; removal of riparian vegetation which may influence water temperatures and impact insect populations; and sloughing off and trampling of streambanks which may increase embeddedness and sedimentation, changes instream morphology, and watershed alteration which increases sedimentation and alters the hydrologic regime.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration; and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), alter streamflow, change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Increases in sedimentation to the San Francisco River are expected as a result of ongoing livestock grazing activities on upland areas on the Pleasant Valley Allotment. Poor watershed, soil, and range conditions may contribute to altering the hydrologic regime (water quantity, quality, intensity, duration, and pattern) within Dix Creek and the San Francisco River, thereby increasing erosion and sedimentation into occupied loach minnow habitat.

Sediment deposition may eliminate the under-cobble pockets needed by loach minnow, making potential habitat unsuitable. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

The quantity and pattern of sediment and flow from tributary canyons and streams leading to the San Francisco River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993), to increase storage of water in streambanks, and to dissipate the erosive energy of floodwaters (Dunne and Leopold 1978). On much of the San Francisco River, the riparian vegetation is sparse and mostly lacking in herbaceous cover. There is, therefore, limited opportunity for riparian buffering of sediments and flood energy from degraded upland watershed conditions.

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods, especially during the spawning season. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

As with many short-lived species, populations of loach minnow undergo substantial fluctuations in abundance between years (Propst *et al.* 1988). When population numbers are at or near the high end of the cycle, the loach minnow may be able to withstand substantial adverse effects. The same effects, if they occur at the low point of the population cycle, may be much more serious and could potentially result in extirpation of the species from the affected area. Most adverse affects are increasingly detrimental when they occur during the spawning period.

Livestock grazing, trailing, and crossing of streams within the riparian/aquatic zone may contribute to physical destruction and alteration of stream banks, stream channels, and the water column resulting in wider and shallower stream channels (Armour 1977, Platts and Nelson 1985, Platts 1990, Meehan 1991). Bank configuration, vegetative cover, soil type, and soil moisture content influence the amount of damage to stream banks, with moist soil being more vulnerable to damage (Marlow and Pogacnik 1985, Platts 1990). These impacts further alter the configuration of pools, runs, riffles, and backwaters; elevates levels of fine sediments and substrate embeddedness (Rosgen 1994); and reduces availability of instream cover which is an important factor in the ability of fish species to avoid adverse effects from flooding (Bulkley and Pimentel 1983, Meffe 1984). Reduction in aquatic habitat complexity increases vulnerability of native species to nonnative fishes by decreasing opportunities for habitat partitioning and avoidance of predators (Bestgen 1986, Rinne and Minckley 1991, Baltz and Moyle 1993, Douglas *et al.* 1994). Cattle trampling and grazing of the riparian corridor makes banks and vegetation more susceptible to severe damage during catastrophic flooding (Platts *et al.* 1985).

Loach minnow are adversely affected by activities which contribute to altering the water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include loach minnow throughout the San Francisco River below the Pleasant Valley allotment. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The currently degraded ecological conditions of the San Francisco River watershed and the river channel intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. The upland range and watershed conditions on the Pleasant Valley Allotment has contributed to altering the hydrologic regime of the San Francisco River and tributary streams. The Pleasant Valley Allotment is one of many allotments in the watershed with high proportions of impaired soils, poor range condition, and unsatisfactory riparian areas. Data needed for management decisions has been recently collected and compared to the only previous data available from a 1959 analysis, but is not available in finalized and approved format. Initial capacity assessments using both old and new data indicate that the allotment stocking rates are above the allotment capacity, and grazing durations are too long. The naturally fragile status of the watershed makes the San Francisco River even more sensitive to the affects of livestock management activities.

Aquatic conditions and riparian habitat function in the lower San Francisco River, although showing substantial improvement, remains unstable, at risk, and with past degradation evident. These conditions contribute to a reduced environmental baseline for the loach minnow in the river. The watershed of the San Francisco River is naturally fragile due to erosive soils, arid climate, and a naturally flashy hydrograph. Superimposed on that natural fragility are a number of human uses that exacerbate the problem by denuding vegetation, severely increasing erosion, and substantially increasing the flashiness of the hydrograph. These uses include timber harvest, water diversion, irrigated agriculture, residential and urban development, groundwater pumping, and roadbuilding, but the most primary and widespead influence on the watershed has been livestock grazing. In livestock grazing allotments encompassing 70% of the area occupied by loach minnow in the San Francisco and Tularosa rivers, range and watershed indicators demonstrate poor vegetative and soil conditions, and of the 39 miles of the river for which condition data is available, 35% is rated as nonfunctional or at risk. As a result of these watershed disturbances, the San Francisco River has become unstable and the natural channel geography and aquatic habitats have become highly altered in any areas where the river is not confined by rock. In conjunction with the introduction of nonnative aquatic species, the instability and altered channel morphology of the river have changed aquatic habitats to the point that eight native fish species, 60% of the original community, have been extirpated. Most of the remaining native fishes have declined and loach minnow have become quite rare in many parts of the river.

The Forest Service is initiating conservation measures within the San Francisco River watershed: that ensure appropriate standards are applied to all Forest Service allotments for protection of stream habitats and upland watershed conditions; that appropriate forage utilization standards are applied; and that stocking rates are brought in-line with grazing capacity, along with measures to study, monitor, evaluate, and manage for recovery of listed fish species. These measures address major concerns about the health of the riparian habitat of the loach minnow.

CUMULATIVE EFFECTS

Lands along the San Francisco River are a mix of National Forest, Bureau of Land Management, State, and private lands. However, most of the river in Arizona is administered by the Apache-Sitgreaves National Forest. Upstream in New Mexico, the river crosses through the Gila National Forest. Substantial reaches of the San Francisco River in New Mexico are on private land. Non-Federal activities such as grazing, irrigated agriculture, and road construction and maintenance, occur on 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, and are managed in association with grazing Federal allotments.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pleasant Valley Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Pleasant Valley Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of loach minnow is expected to result from the ongoing grazing activities on the Pleasant Valley Allotment. Harassment occurs through effects to individual fish which could occur when livestock enter the stream. Harm occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the San Francisco River watershed.

2. Permitted livestock access the San Francisco River stream channel.

3. Required monitoring and reporting of livestock utilization levels and livestock access to the San Francisco River is not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the San Francisco watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the San Francisco River watershed to include at least that portion of the watershed within Arizona (and preferably to be coordinated with, and include the San Francisco watershed within the Gila National Forest) to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the San Francisco River

watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. Rest the San Francisco and Lower Sycamore pastures for the life of the project, with the intent of excluding livestock to the San Francisco River and Dix Creek on Forest Service administered lands.

2. Exclude livestock from the riparian/stream corridor of Dix Creek, including Left Prong and Right Prong canyons, San Francisco River, and Lower Sycamore Pasture, if not isolated from the river.

3. As livestock rotate among pastures, check and repair as necessary all fences required to control the movement of livestock to the San Francisco River and Dix Creek corridor and/or evaluate the effectiveness of topographic or other means of controlling livestock access to aquatic habitats.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor access by livestock to the San Francisco River and Dix Creek corridors on the Pleasant Valley Allotment until such time that physical barriers will preclude all livestock access. While livestock are present in any pastures from which they can gain access to the San Francisco River or Dix Creek, monitor for presence of livestock or their sign within the river and creek corridor at least once every 14 days. If livestock or their sign are detected, take immediate action to remove livestock from the river corridor, notify the Service, and identify management steps to be taken to preclude any further livestock access. Provide a summary report of this monitoring which is to include dates of monitoring and results, to the Service annually, at least 30 days prior to issuance of the Annual Operating Plan.

2. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the San Francisco River watershed at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for

the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

3. Continue and expand the fish monitoring program established by the National Forest to include the San Francisco River (below the mouth of the Blue) and Dix Creek. This work is to be done by a journey-level fishery biologist (or equivalent), and coordinated with the Arizona Game and Fish Department and the Service, and provide each with annual reports. On the San Francisco River, establish permanent photopoints to document stream channel condition and trend and, at the same sites, establish cross-channel transects to monitor condition and trend for stream channel morphology. A minimum of 2 photopoints and 2 transects are to be established on each stream. Photopoints and transects are to be read annually at the same time of year. Coordinate with the Arizona Game and Fish Department and Service, provide a report.

4. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) monitoring summary of livestock access to the San Francisco River and Dix Creek corridors; 6) progress made toward completion of multi-year Terms and Conditions; and 7) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the San Francisco River or Dix Creek corridors; monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Pleasant Valley Allotment

1. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

2. Implement the loach minnow recovery plan, as appropriate.

PEREGRINE FALCON ON THE PLEASANT VALLEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Recovery of the peregrine falcon in the Rocky Mountain/Southwest Recovery Region has had great success. Within the Arizona portion of the recovery area, the population has been expanding with high rates of site occupancy, and high reproductive success (Burnham and Enderson 1987, Tibbitts and Bibles 1990, Tibbitts and Ward 1990a and 1990b, Enderson *et al*. 1991, Ward 1993). Recognizing the recovery of this species, the Service has published an advanced notice of intent to propose delisting the falcon (60 FR 34406).

The Pleasant Valley Allotment is bordered by approximately 3.5 miles of the San Francisco River on the north. The Blue River joins the San Francisco just downstream from the allotment. The San Francisco River is included within the San Francisco Pasture. Dix Creek, a perennial stream and major riparian area, passes through the San Francisco and Red Flat pastures. These two pastures are rested in 1998; however there are no fences or major geographical boundaries to keep all livestock from accessing the river or creek from other pastures. The San Francisco River adjacent to the allotment is in some state of impairment and has moderate levels of embeddedness and bank cutting. Riparian conditions are considered at risk. However, there has been some regeneration of riparian species and stand structure diversity. The lower San Francisco River is in much the same condition as the Blue River: wide, shifting river channel and largely unvegetated substrates of cobble, gravel, boulder, and sand. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), cottonwood (*Populus fremontii*) seedlings and saplings, and the nonnative salt cedar (*Tamarix* sp.).

The Pleasant Valley Allotment has been overstocked by as much as 85 to 135 percent. The most recent range condition data, from 1959, indicates that 85 percent of the allotment is in fair to poor condition, with areas of good and very poor. Shrubs are in a clubbed condition, showing the effects from past overuse. Allowable use guidelines have been set, but they have not been enforced. Soils are very shallow, and degraded soil conditions persist on the allotment; watershed is currently 51% in unsatisfactory condition.

Several active peregrine falcon eyries are known to occur in the vicinity of the Blue and San Francisco river corridors. The closet known nest to the Pleasant Valley Allotment is along the San Francisco River, upstream approximately 5 miles. Also, peregrines were observed during the breeding season 7 to 8 miles upstream along the Blue River, but no nest was located. Another potential nest site is at Eagle Creek, approximately ten miles to the west. The National Forest estimated that as many as 95 different potential peregrine nest sites are spread out within the Blue River corridor. These sites are defined, in part, as having vertical cliffs over 100 feet tall (J. Copeland, Apache-Sitgreaves National Forests, pers. com., April-May 1997). No peregrine falcons, breeding or otherwise, have been observed in the Pleasant Valley Allotment. Mountainous terrain with apparently suitable nesting cliffs are found within the allotment along the major river corridors, and perhaps in tributary canyons such as Dix Creek. Potential peregrine prey species (e.g., songbirds) occur throughout the allotment, with highest densities associated with canyon riparian areas. Limited surveys for peregrine falcon have been conducted in the general vicinity and none on the allotment. Therefore, there is a potential that breeding peregrine falcons may occur on the Pleasant Valley Allotment, and peregrines from upstream on the Blue and San Francisco rivers may forage in the vicinity of the Pleasant Valley Allotment.

EFFECTS OF THE ACTION

Grazing may affect avian abundance and species composition (e.g., falcon prey) in various vegetation types, depending on the intensity of grazing and how much the plant community is altered. Grazing can improve conditions for some species and decrease habitat quality for others (Bock *et al.* 1993). Peregrine falcons are prey generalists and do not depend on a small group of bird species for food. Furthermore, falcons forage over a large area (e.g., 10 miles) (Enderson *et al.* 1991). Therefore, livestock grazing can negatively affect peregrine falcons if the existing mosaic of vegetative attributes (e.g., structure and species composition) are simplified across the landscape. This could reduce the number of species and their abundance in the area, and reduce the prey base for the falcon.

Falcons hunt in both riparian and upland areas, although riparian areas may be used disproportionately higher than their availability due to the greater densities and numbers of potential prey (Carothers 1974). The San Francisco River and lower Dix Creek are to be rested during this consultation period, but there are no fences or major geographical boundaries to keep all livestock from accessing the river. Therefore, it is possible that riparian areas along the San Francisco River will be grazed to some unknown extent. The resultant simplification of vegetation structure and/or composition could eliminate or decrease the quality of habitat for bird species that require riparian vegetation to survive or reproduce (e.g., summer tanagers, yellow warblers). It probably would not attract species that otherwise would not be found on the allotment, although it could provide sufficient habitat for generalist species that are present within adjacent vegetation types (e.g., mourning dove). All this considered, it is possible that the prey base for falcons could decrease as a result of unauthorized utilization along the San Francisco River and Dix Creek.

Upland vegetation types constitute the majority of the allotment as well as the majority of the foraging area likely to be used by a falcon. Historically heavily grazed areas (such as are found on the Pleasant Valley Allotment) probably provide fewer food and cover sources for most species of birds than lighter or ungrazed areas. However, some generalist avian species may be relatively unaffected by this condition (e.g., mourning dove). Most of the uplands on the allotment are in degraded condition and are not expressing a mosaic of habitats. Poor upland watershed conditions alter surface runoff and subsequent changes to tributary and stream hydrologic patterns and loss of riparian vegetation diversity (e.g., structural and species). Implementation of grazing utilization standards and guidelines should improve vegetation conditions for the peregrine falcon's prey base.

Falcons could be disturbed by a variety of human actions that occur in close proximity to an eyre. Surveys have not been conducted on the allotment, so it is unknown whether or not the proposed fence maintenance or other activities would disturb nesting falcons.

CUMULATIVE EFFECTS

Most of the land within the Blue and San Francisco river watersheds is under the jurisdiction of the U.S. Forest Service, and activities affecting the peregrine falcon would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the rivers. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River and San Francisco. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system and its associated affects to riparian habitats.

The Pleasant Valley Allotment occurs in rough and relatively remote country. Very few activities other than grazing occur on the allotment. Recreational use is very low, and consequently, disturbance to falcons (if they occur on the allotment) is expected to be uncommon or non-existent.

CONCLUSION

After reviewing the current status of the peregrine falcon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pleasant Valley Allotment are not likely to jeopardize the continued existence of the peregrine falcon. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Peregrine Falcon on the Pleasant Valley Allotment

The Service does not anticipate that the proposed action will take any American peregrine falcons.

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

CONSERVATION RECOMMENDATIONS - Peregrine Falcon on the Pleasant Valley Allotment

1. Consider undertaking a larger scale approach to surveys for peregrine falcons. Evaluate potential nesting habitat within the Blue River watershed and then survey these potential sites (this could provide additional support for the upcoming delisting proposal).

2. Implement the peregrine falcon recovery plan, as appropriate.

ARIZONA HEDGEHOG CACTUS ON THE PLEASANT VALLEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Cedar Creek Associates (1994, and *in* Tonto National Forest 1996) has estimated that there are over 250,000 individual Arizona hedgehog cacti within the area considered to be the main distribution (type locality) of the species, in the vicinity of Globe/Miami, Arizona. However, this estimate does not include up to several thousand known plants and potentially many more occurring in satellite populations disjunct from the main distribution, or cacti that may be Arizona hedgehog cactus in east-central and southeastern Arizona.

The Bureau of Land Management reports finding cacti that appear to be Arizona hedgehog in east-central and southeastern Arizona, and that there are over 300,000 acres of potential habitat on Bureau lands (Bureau of Land Management 1996). Potential habitat for this cactus also extends across the southern portion of the Clifton Ranger District, Apache-Sitgreaves National Forest. The cactus appears to be widespread in this area, although only very limited surveys have been conducted.

Although the Arizona hedgehog cactus has been tentatively identified within the Pleasant Valley Allotment, no surveys have been conducted. Potential habitat within the allotment may include as many as 13,096 acres, based on vegetation type and topography, but this has not been verified by survey.

EFFECTS OF THE ACTION

Livestock grazing may affect Arizona hedgehog cactus through trampling of plants and/or habitat degradation. However, due to the microhabitat in which Arizona hedgehog cactus are typically found - boulders, rock crevices, steep-walled canyons, and rocky slopes - physical damage to cacti and habitat degradation due to grazing are less likely than in habitats more accessible to cattle. 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. Heavy grazing and high stocking rates increase the probability of trampling, especially of younger specimens, 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 increase under poor range conditions as livestock seek forage in more rugged areas.

To what extent grazing may directly or indirectly effect Arizona hedgehog cactus due to habitat degradation has not been studied. However, grazing practices can change vegetation composition and abundance, cause soil erosion and compaction, damage cryptobiotic crusts, and reduce water infiltration rates and increase surface runoff (Klemmedson 1956, Ellison 1960, Arndt 1966, and Gifford and Hawkins 1978, Belnap 1992), leaving less water available for plant production (Dadkah and Gifford 1980). The relatively large proportion of potential Arizona hedgehog cactus habitat in east-central and southeastern Arizona on Forest Service and Bureau of Land Management administered grazing allotments in fair, poor, or very poor range condition with degraded watersheds, suggests current grazing practices contributes to adverse affects on vegetation communities and the structure and function of ecosystems.

The potential for adverse affects to Arizona hedgehog cactus and its habitat due to ongoing livestock grazing activities increases as stocking rates increase, and range conditions decline. The Pleasant Valley Allotment is currently overstocked by as much as 85 to 135%, range conditions are poor to fair, watershed conditions are unsatisfactory, and forage utilization standards have not been applied to the allotment. The lack of Arizona hedgehog cactus survey information makes the extent of potential trampling difficult to determine.

CUMULATIVE EFFECTS

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 landsdo not require a 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 Federal involvement may also adversely affect the cactus.

CONCLUSION

After reviewing the current status of the Arizona hedgehog cactus, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Pleasant Valley Allotment are 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 - Arizona Hedgehog Cactus on the Pleasant Valley Allotment

1. Determine the appropriate livestock stocking level for the Pleasant Valley Allotment; apply forage utilization standards appropriate to the vegetation type and range conditions; monitor livestock use, and move livestock from pastures when indicated.

2. Continue cooperative efforts to verify the taxonomic status of the Arizona hedgehog cactus on Clifton Ranger District allotments, and provide funding for genetic studies.

3. If genetic and morphological studies demonstrate that cacti on the allotments are *Echinocereus triglochiadiatus* var. *arizonicus*, the National Forest should determine the distribution and monitor the status of the cactus on Forest Service lands.

RED HILL ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:
- 7,337 total
- 1,436 full/potential capacity range

Projected Stocking Density
- 685 animal months
- 2.0 acres per animal month

Permitted Use:
- 90 cow/calf, 11/1-5/31

Projected Use:
- 90 cow/calf, 11/1-5/31
- 11 yearlings, 6/1-10/31

Major Vegetation Type:
- Pinyon/juniper, ponderosa pine

Major Drainages:
- Tutt Creek
- Bush Creek
- Blue River

Elevation:
- 6,000 to 7,700 feet

Type of Grazing System:
- 1 pasture, season-long (summer); 3 pastures, deferred (winter)

Allotment Condition:
- 1987 TES indicates that most of the allotment is in impaired soil condition.
- 1997 range condition data indicate that 90% of the allotment is in poor or very poor condition.

Listed Species Adversely Affected:

- Loach minnow

Ecological condition and/or management action that contributes to adverse effects:

- All pastures on the allotment allow livestock to concentrate within either Bush, Tutt, or Foote Creek.
- Degraded soil and range conditions (lack of adequate ground cover).

Consultation Period:

- 3 Years

LOACH MINNOW ON THE RED HILL ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Blue River is a seriously degraded ecosystem. Aldo Leopold in 1921 called the Blue River "ruined" and cited it as an "extreme example" of human-caused erosion in the Southwest (Leopold 1921, Leopold 1946). Human uses of the river and its watershed in combination with natural flood flow events have resulted in extensive changes within the watershed and river channel. Miller (1961) indicated that as European settlement of the Blue River occurred around 1885 or 1886, the floor of the Blue River canyon was "well sodded and covered with grama grass, hardwoods, and pine," and the banks were "lined with willows and the river abounded with trout" (Leopold 1921). Olmstead (1919) refers to devastating floods that occurred from 1900 to 1906, which followed and contributed to the loss of floodplain terrains and other major changes to the elevation of the river by 1916. Periodic floods continue to erode remaining fields, homes, and roads (Coor 1992).

Flood destruction resulting in channel erosion was enabled and exacerbated by human activities on the watershed and streambanks (Chamberlain 1904, Olmstead, 1919, Leopold 1924a and 1924b, Bryan 1925, Leopold 1946, Miller 1961, Dobyns 1981, Coor 1992). Overgrazing depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation, increasing the volume of high flows, and decreasing the volume of low flows. Timber harvest, fuelwood, and railroad tie cutting removed vegetative cover of the watershed, often resulted in eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing riparian vegetation, and irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river contributed to erosional degradation, often resulting in new channels or widening of the existing channel. Cattle drives along the river broke down streambank soils and damaged riparian vegetation. The resulting stream channel is characterized by a wide, shallow channel profile, high levels of sediment, eroding banks, braided shifting channels, and depauperate, sparse riparian vegetation (Chamberlain 1904, Leopold 1921, Leopold 1924a and 1924b, Dobyns 1981, Coor 1992).

The Blue River has a bimodal high flow pattern: a snow-melt hydrograph with high flows in late-winter and spring, and a second high flow period associated with monsoon rains in later summer. The river is "flashy" with high discharge following summer storms. Erosion, channel width, and channel migration increase gradually in a downstream direction, while riparian vegetation becomes less dense and aquatic habitat diversity decreases, becoming mostly riffles and runs, with pools scarce and generally associated with bedrock walls. Increased flashiness of flood flows and depletion of base flows are results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation (Ffolliott and Throud 1975, Dunne and Leopold 1978, DeBano and Schmidt 1989, Gebhardt *et al.* 1989, Meehan 1991, Gordon *et al.* 1992, Naiman 1992, Belsky and Blumenthal 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River.

Today, much of the Blue River channel is a wide unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.* 1989, Bagley *et al.* 1995). River terraces or benches are small eroding remnants of former river banks. Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow (*Baccharis salicifolia*), and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Plantanus wrighti*) are present, with willow increasingly common in the upper reaches where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* spp.), which are a key element in stable streambanks, are uncommon along much of the river.

The Blue River, like all streams in the Gila River basin, has been subject to introduction of a number of nonnative fish and other aquatic species. Nonnatives adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh and Brooks 1989, Marsh *et al.* 1989, Propst *et al.* 1992, Blinn *et al.* 1993, Carmichael *et al.* 1993, Douglas *et al.* 1994). Nonnative species reported in the Blue River during recent survey efforts include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Earlier surveys also found channel catfish (*Ictalurus punctatus*) (Anderson and Turner 1977, J.M.Montgomery Consulting Engineers 1985).

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river. Timber harvest, roads, recreation, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Private lands in the system are concentrated in the upper 30 miles of river bottom. Some cropping and irrigated agriculture continues on remaining river terraces that have natural protection from flood erosion. There are a number of small diversion structures and irrigation canals. A private fish hatchery is operated along the upper Blue River at Bush Creek and a substantial proportion of the base flow is diverted into the hatchery. Subdividing of ranch lands and construction of residences or summer homes has occurred at a fairly low level. The Blue River Road is a continuous source of bank and channel damage and erosion. Numerous low-water crossings exist in the upper Blue River and contribute to localized destabilization. Road maintenance results in significant modifications and impacts to the river. In the lower Blue, unauthorized off-road-vehicle use in the river bottom continues to occur. Livestock grazing in the valley bottom continues on private lands in the upper Blue. On the Clifton Ranger District, the river corridor is excluded from authorized livestock grazing. Grazing is permitted on the river on some Forest Service allotments in the Alpine Ranger District.

The Red Hill Allotment is a small allotment (7,337 acres), the majority of which lies within the Blue Range Primitive Area. With the exception of the area on, and adjacent to, the Blue River bottom the terrain is generally steep, rough, and broken. Large portions of the allotment are not suitable for grazing due to steep slopes and erodible soils. Bush and Tutt creeks bisect the Bush Creek pasture and Foote Creek drains the northwest corner of the Foote Creek pasture. Because of the past management practice of year-long grazing, the cool season grass component is not well expressed. The allotment can be characterized as browse range and has experienced heavy past and present use. Hedging, lack of age class diversity, and few seedlings for recruitment raises concern for the long-term viability of the shrub component that is currently supplying a major portion of the cattle dietary requirement (est. 50%). Winter and spring use has improved the vigor of warm season species in the uplands.

Due to the steep and rugged nature of the terrain, cattle preferentially use the stream bottom of Tutt and Bush creeks in the Bush Creek Pasture, and Foote Creek in the Foote Creek Pasture. The cattle also concentrate use on the less steep slopes, benches, saddles, and Foote Creek Mesa. Because of the limited amount of gentle terrain, there is some compensatory use of slopes that normally would not be considered suitable for cattle. Management concerns for this allotment are related to rates of riparian recovery, browse condition and age class diversity, proper stocking rates, length of grazing periods, and providing adequate cool season rest.

For many years, information on the fish of the Blue River was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain 1904, Anderson and Turner 1977, Silvey and Thompson 1978, J.M.Montgomery Consulting Engineers 1985, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor 1992). Recently, surveys of the Blue River system were conducted by Arizona Game and Fish Department in 1994 on the upper Blue River and by Arizona State University during 1995 and 1996 under funding from the Apache-Sitgreaves National Forests, on the lower river and tributaries (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). These surveys found loach minnow distributed throughout the Campbell Blue and Blue River system. In addition to loach minnow, the Blue River continues to support four other native fishes, the speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), and Sonora sucker (*Catostomus insignis*). Based on historical records, the Service concludes that up to nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century.

The loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). The only earlier fish survey was in 1904 (Chamberlain) which did not find loach minnow. Several efforts since then have located loach minnow distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the Blue River (Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Hendrickson 1987, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989, Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Loach minnow were not found in any tributaries other than Campbell Blue Creek and in KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Even where the densities are highest in the Blue River, loach minnow is still relatively scarce, rarely constituting more than 10%, and often less than 5%, of the fish population (Arizona Game and Fish Department 1994, Bagley *et al.* 1995).

Alteration of the Blue River watershed and simplification of the geomorphology of the Blue River affects loach minnow habitat in many ways. Discharge, velocity, instream water volume, water temperature, nutrient cycling, sedimentation, availability of larval backwater habitats and cobble/gravel riffles, food availability, and other factors have been altered.

The Blue River passes through or adjacent to approximately 2.8 miles of the Red Hill Allotment; one mile of this is on private land. This segment of the Blue River is considered occupied loach minnow habitat.

EFFECTS OF THE ACTION

Any direct access by livestock to the Blue River and occupied loach minnow habitat, when considered in context of the severely degraded condition of the allotment and the environmental baseline of the Blue River watershed, would pose an extremely serious situation. The National Forest has previously committed to no use of the "river" pastures, construction of 1.5 miles of new fence, and repairing other fences so as to totally preclude livestock from access to the Blue River and occupied loach minnow habitat from Forest Service administered lands.

Although both direct and indirect effects to loach minnow have been reduced by fencing the Blue River corridor, livestock continue to concentrate within Bush, Tutt, and Foote creeks. Increases in sedimentation to the Blue River from the Red Creek Allotment is expected as a result of ongoing livestock grazing activities. Poor watershed, soil, and range conditions, combined with continued livestock grazing and severe use within tributary channels, may contribute to altering the hydrologic regime (water quantity, quality, intensity, duration, and pattern) within Bush, Tutt, and Foote creeks, and the Blue River drainage, thereby increasing erosion and sedimentation into the Blue River and occupied loach minnow habitat. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Some riffle habitats in the Blue River that may otherwise be suitable loach minnow habitat may be unsuitable due to sediment deposition that eliminates the under-cobble pockets needed by loach minnow. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the Blue River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993). On much of the Blue River, the riparian vegetation is sparse and mostly lacking in herbaceous cover. Therefore, there is limited opportunity for riparian buffering of sediments from degraded upland watershed conditions.

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

As with many short-lived species, populations of loach minnow undergo substantial fluctuations in abundance between years (Propst *et al.* 1988). When population numbers are at or near the high end of the cycle, the loach minnow may be able to withstand substantial adverse effects. The same effects, if they occur at the low point of the population cycle, may be much more serious and could potentially result in extirpation of the species from the affected area. Most adverse affects are increasingly detrimental when they occur during the spawning period.

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include the entire Blue River population of loach minnow. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The National Forest has been working to improve conditions along the Blue River corridor and has precluded livestock from the river channel on many allotments. However, the currently degraded ecological conditions of the Blue River watershed intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. The upland range and watershed conditions on the Red Hill Allotment may have contributed to altering the hydrologic regime of tributary streams. The Red Hill Allotment is one of many allotments in the watershed with high proportions of impaired soils, poor range condition, and unsatisfactory riparian areas. The allotment is suspected to be overstocked and grazing durations too long. The naturally fragile status of the watershed makes the Blue River even more sensitive to the affects of livestock management activities.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the loach minnow, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation allows access of predatory nonnative fish species into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Red Hill Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Red Hill Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Red Hill Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the Blue River watershed.

2. Permitted livestock access the Blue River stream channel.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Blue River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the Blue River watershed to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects

(individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the Blue River watershed. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the integrity of the exclosure fencing bordering the Blue River.

2. Protect the riparian/stream corridors in Bush, Tutt, and Foote creeks from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Blue River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. Continue the fish monitoring program for the Blue River established by the National Forest.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) presence of livestock within Blue River corridor; 6) progress made toward completion of multi-year Terms and Conditions; and 7) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the river corridors, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Red Hill Allotment

1. Consider excluding all livestock use from the riparian/stream corridors of Bush, Tutt, and Foote creeks.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Implement the loach minnow recovery plan, as appropriate.

SAPILLO ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit

- Gila National Forest, Wilderness Ranger District

Allotment Acres:

- 65,066 total
- 54,677 full/potential capacity range

Projected Stocking Density

- 7373 animal months
- 7.4 acres per animal month

Permitted Use:

- 808 cow/calf, 1/1-12/31
- 10 horses, 1/1-12/31

Projected Use:

- 596 cow/calf, 1/1-12/31
- 10 horses, 1/1-12/31

Major Vegetation Type:

- Pinyon/juniper, ponderosa pine

Major Drainages:

- East Gila River
- Black Canyon
- Sapillo Creek

Elevation:

- 6,000 to 8,000 feet

Type of Grazing System:

- 2 pasture rest rotation

Allotment Condition:

- Comparison of 1977 range transect data with 1996 data indicates a decrease in forage-plant density by 75% and an increase in bare soil by 16%.
- Recent TES indicate that most of the allotment is in unsatisfactory condition.

- Riparian conditions are rated unsatisfactory.

Listed Species Adversely Affected:
- Loach minnow
- Spikedace
- Mexican spotted owl

Ecological condition and/or management action that contributes to adverse effects:
- Poor range condition (lack of herbaceous vegetation).

Consultation Period:
- 3 Years

LOACH MINNOW AND SPIKEDACE ON THE SAPILLO ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Sapillo Allotment is a large allotment (65,006 acres) within the upper Gila watershed. Individual pastures are larger than many Forest Service allotments. Of the five large pastures and eight smaller ones, several have been combined forming two very large pastures. The Sapillo Allotment is managed under a two pasture rest rotation grazing system; one pasture is grazed each year and the other rested. The elevation ranges from 6,000 feet to over 8,000 feet, with ponderosa pine forest the primary vegetation community; also with pinyon/juniper forest and scattered areas of grassland which are being encroached on by ponderosa pine and alligator juniper. The terrain within the allotment is very rugged and broken, with many canyons, mountains, and areas of inaccessible range. Approximately 95 percent of the allotment is within the Gila and Aldo Leopold wilderness areas.

The watershed of the upper Gila River contains 234,672 acres of which approximately 65,000 acres (28%) are grazed within the Wilderness District of the Gila National Forest. The Sapillo Allotment encompasses 46,000 acres (24%) of the upper Gila watershed. The watershed within the Sapillo Allotment drains to the upper Gila River through two major tributaries: Sapillo Creek and Black Canyon/Apache Creek. Evaluation of watershed conditions within the Sapillo Allotment indicates overall watershed conditions are unsatisfactory. Elk numbers are fairly low within the upper Gila River watershed and are not believed to be contributing to unsatisfactory watershed conditions.

Overall watershed conditions are thought to be severely degraded from conditions that would exist under a more natural fire regime. Many fires, including both wild and prescribed natural, have occurred within Wilderness non-grazed portions of the upper Gila River watershed. Existing conditions within the Sapillo Allotment are thought to be severely inhibiting the occurrence of prescribed natural fire.

The north edge of the Sapillo Allotment is adjacent to the 0.5 miles of the East Fork of Gila River, at the confluence with Black Canyon. In 1996, the East Fork was fenced to preclude livestock access, although in the past the river has been over-utilized by livestock. The East Fork, including the area within the Sapillo Allotment, is in degraded condition: streamflow in most years is wide and shallow, the channel is incised, bank stability is poor, and embeddedness is high. The riparian condition is characterized as unsatisfactory due to the lack of species diversity, age classes, bank cover, and shade, and continued channel cutting. The upper Gila River and East Fork are listed by the State of New Mexico as impaired waters.

In 1996, range vegetation transects in key areas were read and compared with data collected in 1977. The results of this data indicate that forage plant density has decreased by 75%. Bare soil has increased by 16%, and litter, most notably juniper and pine needles, has increased by 25%. The data clearly indicate watershed problems associated with the condition of soils and vegetation. To date, no forage utilization standards have been developed for the allotment.

In the upper Gila watershed within New Mexico, over the 10 years of monitoring loach minnow and spikedace populations, a downward trend is indicated for both species. Both are found in the East, Middle, and West forks of the Gila River as well as in the mainstem Gila River below the confluence of the three forks. Declines in loach minnow and spikedace numbers in the West Fork were even more severe than in the East Fork, even though there has been no grazing activity in or adjacent to the West Fork since the early 1950s. Approximately 0.5 miles of the East Fork borders the Sapillo Allotment near the confluence with Black Canyon. Both loach minnow and spikedace are found in this reach of the East Fork, and their populations extend both upstream and downstream of the Sapillo Allotment. However, at the monitoring station on the East Fork (above the Sapillo Allotment) no spikedace have been recorded since 1993. No inventories for loach minnow, spikedace or their habitats have been conducted within Black Canyon and Apache Creek. In 1996, a fence was constructed to preclude livestock from direct access to the East Fork of the Gila River for the Sapillo Allotment.

Non-native fishes, introduced for sport, forage, bait, or accidentally, may have impacts to loach minnow and spikedace. Rainbow (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) occur within the East, West, and Middle forks and their tributaries of the upper Gila watershed. Stocking of rainbow trout has been terminated in the East Fork, but a self-sustaining population persists. In addition, smallmouth bass (*Micropterus* *dolomieui*), western mosquitofish (*Gambusia affinis*) and channel catfish (*Ictalurus punctatus*) occur throughout the East Fork. Yellow bullhead (*Ameirus natalis*), common carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas*), flathead catfish (*Pvlodictis olivaris*), bluegill (*Lepomis macrochirus*), and green sunfish (*Lepomis cyanellus*) occur in the Gila River mainstem and may enter the lower East Fork.

EFFECTS OF THE ACTION

Ongoing livestock grazing activities on the Sapillo Allotment contribute to the overall degradation of the stream channel and aquatic habitat conditions in the East Fork of the Gila River and the mainstem of the upper Gila River. Although the East Fork has been excluded from grazing since 1996, and livestock do not have direct access to occupied loach minnow or spikedace habitat from the Sapillo Allotment, cattle historically over-utilized the East Fork. Degraded conditions within the East Fork include an incised channel, poor bank stability, and high embeddedness. The effectiveness of this new exclosure is unknown; however, given the poor stream conditions, any cattle use inside the exclosure is probably seriously detrimental.

The 75% decrease in forage plant density and 16% increase in bare soil on the Sapillo Allotment over the last twenty years indicate watershed problems associated with the condition of soils and vegetation. Loss of herbaceous vegetation reduces the sediment filtering and water storage capabilities of the uplands and tributary channels. Current grazing management on the allotment allows cattle direct access to Black Canyon and Apache Creek. Poor range conditions resulting from over-utilization of forage by livestock contribute to poor watershed conditions. Active erosion of stream channels exacerbated by the presence of livestock in tributary channels may contribute to altering hydrologic regimes (water quality, quantity, intensity, duration, and pattern), thereby increasing erosion and sedimentation. It is highly probable that the absence of reliable perennial flow within Black Canyon and Apache Creek is directly correlated to historic and ongoing grazing practices. Sediments and/or nutrients generated from the Sapillo Allotment and transported via Black Canyon and Sapillo Creek to the upper Gila drainage, degrades loach minnow and spikedace occupied habitat in the East Fork of the Gila River and in the mainstem Gila River downstream from the confluence with Sapillo Creek.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs *et al.* 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Spikedace are not unduly sensitive to moderate amounts of sediment, although during the spawning period egg viability may be reduced due to high embeddedness and sediment loads, and larval habitat may be lost due to filling of shallow waters with sediment.

The loach minnow is much more sensitive than spikedace to adverse effects from excess sediment in the aquatic ecosystem. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988). The interstices of rocks on the stream bottom, which form the primary habitat for adult loach minnow and their eggs, quickly fill up when excess sediment is present (Propst and Bestgen 1991).

Sedimentation from tributary canyons and streams leading to the Gila River drainages contributes to the condition of the river downstream. The amount of sediment in the stream system is a major force in determining the size and shape of the stream channel. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993).

The short life span of the loach minnow, coupled with the comparatively low fecundity of the species, make it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988). Most adverse affects are increasingly detrimental when they occur during the spawning period.

Loach minnow and spikedace are adversely affected by activities which contribute to the alteration of the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream. The way in which the effects of livestock grazing are manifested, and the magnitude of the effects in the watershed, are dependant on local site conditions. Range conditions, considered together with soil, watershed, and riparian condition, are assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

Livestock grazing within the Sapillo Allotment is ongoing, occurs throughout the watershed, and thus has the greatest overall impact on watershed condition. Continued livestock grazing, as outlined in the proposed action, has and will continue to degrade the upper Gila River watershed. As a result, off-site sediment movement into the East Fork and upper Gila rivers severely exceeds a level that would be expected to exist without livestock, and hydrologic patterns are significantly altered from that which would be expected without livestock grazing, with consequent effects on the quantity and quality of habitat available to loach minnow and spikedace. The extensive removal of herbaceous vegetation precludes the application of prescribed natural fire from large areas of the landscape. Ultimately, the beneficial affects of non-catastrophic fire provides the greatest opportunity for restoring severely degraded terrestrial ecosystems. The restoration of terrestrial watersheds is vital to the long-term recovery of riverine ecosystems.

The lack of application of any livestock grazing utilization standards or other means of regulating the use of livestock on the ecosystem across a very large area, has lead to extremely degraded range and watershed conditions and an extremely serious situation for these fish.

CUMULATIVE EFFECTS

Although the majority of the upper Gila River watershed is managed by the Forest Service, management of private land along the East Fork, Taylor Creek, and Wall Lake upstream of the Sapillo Allotment contributes to the degradation of loach minnow and spikedace habitat. Riparian vegetation has been severely compromised with consequent effects on loach minnow and spikedace habitat quality and quantity. Persistence of non-native fishes in the East, Middle, and West Forks and their tributaries continues to impact loach minnow and spikedace populations.

CONCLUSION

After reviewing the current status of the loach minnow and spikedace, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Sapillo Allotment are likely to jeopardize the continued existence of loach minnow and spikedace. All remaining populations of spikedace and loach minnow extant in the Gila River drainage and its major tributaries are necessary for both the survival and recovery of these species. The recovery plan for each species is very clear on the requirement to maintain each population. Any proposed action which would compromise the recovery and survival of any one population therefore compromises the integrity of the species. Continued livestock grazing, as outlined in the proposed action for the Sapillo Allotment, is expected to reduce appreciably the likelihood of survival and recovery of spikedace and loach minnow in the upper Gila River by reducing reproductive success, numbers, and limiting the distribution of these species. No critical habitat has been designated for these species; therefore; none will be affected.

REASONABLE AND PRUDENT ALTERNATIVE

Regulations implementing section 7 (50 CFR §402.02) define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

One reasonable and prudent alternative has been identified below. If the following alternative (including all components) is implemented as a reasonable and prudent alternative, the proposed project is not likely to jeopardize the continued existence of the loach minnow or spikedace:

1a. Apply forage utilization standards to the Sapillo Allotment immediately upon receipt of this biological opinion. Due to the severe rangeland degradation, annual utilization levels in key areas on key plant species shall not exceed 25% maximum (includes both livestock and wildlife) on herbaceous forage. Key areas will be selected and monitored for all pastures on the allotment within the upper Gila River watershed. When forage use levels are met, livestock are to be moved from the pasture.

1b. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

1c. For 1999, protect the riparian/stream corridors of Black Canyon, Apache Creek, Sapillo Creek and its main tributaries and ephemeral drainages from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or by fencing.

1d. As soon as possible, but no later than March 1999 (the start of the loach minnow and spikedace spawning periods), exclude all livestock from Black Canyon, and the stream corridors of Sapillo Creek, Apache Creek, and their main tributary stream channels on the Sapillo Allotment. This can be accomplished by pasture rest, herding by a range rider, and/or fencing.

1e. When livestock are present on pastures which are adjacent to the exclosure on the East Fork of the Gila River, the exclosure must be surveyed at least once every four weeks, and within two days following floods or other events which may compromise the integrity of the exclosure, to detect and remove livestock from within the exclosure.

Because this biological opinion has found jeopardy, the Forest Service is required to notify the Service of its final decision on the implementation of this reasonable and prudent alternative.

INCIDENTAL TAKE STATEMENT
Loach Minnow and Spikedace on the Sapillo Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Take of loach minnow and spikedace is expected to result from the ongoing grazing activities on the Sapillo Allotment. Harassment is anticipated to occur through affects on individual fish (primarily loach minnow) when livestock enter the East Fork of the Gila River during periods when the exclosure fence is damaged. Harm is anticipated through the affects on habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow and spikedace associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of loach minnow and spikedace from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the upper Gila River watershed.

2. Livestock use occurs within the exclosure on the East Fork of the Gila River for more than 5 days in a 365 day period.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to loach minnow or spikedace when the reasonable and prudent alternative is implemented.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the upper Gila River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. Identify key areas and key plant species for all pastures on the allotment within the upper Gila River watershed. Due to the size of the pastures within the Sapillo Allotment multiple key areas are required. Key areas include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide a list of key species and a map of key areas to the Service by March 1, 1999.

2. On the East Fork of the Gila River, Black Canyon, and Apache and Sapillo creeks, establish permanent photopoints to document stream channel condition and trend and, at the same sites, establish cross-channel transects to monitor condition and trend for stream channel morphology. A minimum of 2 photopoints and 2 transects are to be established on each system. Photo points and

transects are to be read annually, at the same time of year, the same time each year. A report of the year's transect data, copies of the photos, and an analysis of condition and trend are to be provided to the Service annually.

The following Term and Condition implements reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the exclusion of livestock from any exclosure established for the protection of loach minnow or spikedace.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Establish a fish monitoring program and conduct surveys and habitat suitability assessments for loach minnow and spikedace in the East Fork of the Gila River, Sapillo Creek, Black Canyon, Apache Creek, and any other potential habitat on the Sapillo Allotment. Fish monitoring is to be conducted by a journey-level fishery biologist (or equivalent) and coordinated with other fish survey/monitoring programs. These populations of loach minnow and spikedace may be susceptible to adverse affects from over sampling. Monitoring protocols and habitat suitability criteria is to be coordinated with the New Mexico Department of Game and Fish for consistency of technique and to avoid redundancy of effort. These are subject to approval by the Service prior to implementation.

2. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Upper Gila River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels of 25% maximum on herbaceous forage, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow and spikedace (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the New Mexico Ecological Services Field Office at least 30 days prior to the issuance of the Annual

Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

4. Due to the serious nature of the potential affects of the management of the Sapillo Allotment to the loach minnow and spikedace, the National Forest is to coordinate with the New Mexico Ecological Services Field Office prior to the issuance of the Annual Operating Plan to reconsider effects and possible management opportunities for these fish, even if there is no change to the Annual Operating Plan.

CONSERVATION RECOMMENDATIONS - Loach Minnow and Spikedace on the Sapillo Allotment

1. Exclude all livestock use from Black Canyon, Apache Creek, Sapillo Creek, and their main tributaries beginning in 1999.

2. Extend the fish monitoring program to other areas of loach minnow and spikedace habitat on the National Forest. Provide annual reports of efforts and findings to the Service. These efforts should be closely coordinated with New Mexico Department of Game and Fish and the Service.

3. Implement the loach minnow recovery plan, as appropriate.

MEXICAN SPOTTED OWL ON THE SAPILLO ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Sapillo Allotment is located within the Upper Gila Mountains Recovery Unit for the Mexican spotted owl, as defined by the recovery plan (U.S. Fish and Wildlife Service 1995b). This recovery unit is bounded on the north by the Colorado Plateau Recovery Unit and to the south by the Basin and Range West Recovery Unit. The southern boundary of the Upper Gila Mountains Recovery Unit includes the drainages below the Mogollon Rim in central and eastern Arizona. The eastern boundary extends to the

Black, Mimbres, San Mateo, and Magdalena Mountain ranges of New Mexico. The northern and western boundaries extend to the San Francisco Peaks and Bill Williams Mountain north and east of Flagstaff, Arizona. This is a topographically complex area consisting of steep foothills and high plateaus dissected by deep forested drainages. This recovery unit can be considered a "transition zone," because it is an interface between two major biotic regions: the Colorado Plateau and Basin and Range Provinces (Wilson 1969). Habitat within this recovery unit is administered by the Kaibab, Coconino, Apache-Sitgreaves, Tonto, Cibola, and Gila national forests. The north half of the Fort Apache and northeast corner of the San Carlos Indian Reservations are located in the center of this recovery unit and contain an important habitat link between owl subpopulations at the western and eastern ends of the recovery unit and the subpopulations directly south within the Basin and Range West Recovery Unit.

The Upper Gila Mountains Recovery Unit consists of deep forested drainages on the Mogollon Plateau. Vegetation generally consists of pinyon/juniper woodland, ponderosa pine/mixed conifer forest, some spruce/fir forest, and deciduous riparian forest in mid and lower elevation canyon habitat. Climate is characterized by cold winters and over half the precipitation falls during the growing season. Much of the mature stand component on the gentle slopes surrounding the canyons has been partially or completely harvested. Most of the forest habitat on steeper ground that may serve as Mexican spotted owl nesting habitat is in suitable condition. Spotted owls are widely distributed and use a variety of habitats within this recovery unit. Owls most commonly nest and roost in mixed-conifer forests dominated by Douglas fir and/or white fir and canyons with varying degrees of forest cover (Ganey and Balda 1989a, U.S. Fish and Wildlife Service 1995b). Owls also nest and roost in ponderosa pine-Gamble oak forest, where they are typically found in stands containing well-developed understories of Gamble oak (U.S. Fish and Wildlife Service 1995b).

The Upper Gila Mountains Recovery Unit contains the largest known concentration of Mexican spotted owls, with approximately 55% of known owl territories (U.S. Fish and Wildlife Service 1995b). This recovery unit is located near the center of the Mexican spotted owl's range within the United States and is contiguous to four of the other five recovery units within the United States. Because of its central location and its large and relatively continuous spotted owl population, the Mexican spotted owl recovery plan recommends that the owl population in this recovery unit could be uniquely important to the overall stability and persistence of the Mexican spotted owl population in the United States. Specifically, this population could serve as the source population, providing immigrants to smaller, more isolated populations in other recovery units. Although no data on dispersal patterns or movements between recovery units is available, the recovery plan recommends that this population should be maintained at current levels and with at least the current level of connectivity within the recovery unit. Significant discontinuities that develop in the Mexican spotted owl's distribution within this recovery unit, and the loss of habitat to support the local sub-populations, may compromise the recovery of the species.

The Mexican spotted owl recovery plan (U.S. Fish and Wildlife Service 1995b) lists the primary threats to the species in the Upper Gila Mountains Recovery Unit as timber harvest and catastrophic fire; it also includes overgrazing as a threat to the owl.

The upper Gila River watershed, and East Fork Gila River sub-basin is within the current and historic range of the Mexican spotted owl, and the population is well represented throughout this watershed. The Gila National Forest has the most known Mexican spotted owls of any of the national forests; as of the end of the 1995 breeding season, 197 territories were known on the Gila National Forest with approximately 50 percent of suitable habitat surveyed (U.S. Forest Service, *in litt.*, January 22, 1996).

There is conflicting information presented by the National Forest regarding the presence of Mexican spotted owls on the Sapillo Allotment. The supplemental biological assessment for this project reports "there are four PACs either partially or completely within the boundaries of the allotment." No other information was given on location, status, or occupancy data. However, other documents provided by the Forest Service state: "Potential spotted owl habitat occurs near Apache Creek and Black Canyon. No PACs are established within the allotment. Ninety-five percent of the allotment is wilderness."

No acreage figures for suitable spotted owl habitat was provided by the National Forest. However, wilderness areas, as administratively reserved lands, are considered protected habitat. Examination of topographic maps in the area of Black Canyon and Apache Creek indicates there is the potential for several pairs of owls associated with each drainage. However, maps alone give little information on the quality of habitat for spotted owls on these canyon slopes. Therefore, for the purposes of this consultation, and in the absence of survey information, it is presumed that owls occur near Black Canyon and Apache Creek.

EFFECTS OF THE ACTION

The Mexican Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service 1995b) summarizes the effects of grazing to spotted owls in four broad categories: 1) altered prey availability, 2) altered susceptibility to fire, 3) degeneration of riparian plant communities, and 4) impaired ability of plant communities to develop into spotted owl habitat. The recovery plan goes on to provide explicit goals for managing grazing in protected and restricted spotted owl habitat:

- Monitor grazing use by livestock and wildlife in "key grazing areas." Key areas are primarily riparian areas, meadows, and oak types.

- The intent is to maintain good to excellent range conditions in key areas while accommodating the needs of the owl and its prey.

- Implement and enforce grazing utilizations standards that would attain good to excellent range conditions within the key grazing area.

- Establish maximum allowable use levels that are conservative and that will expedite attaining and maintaining good to excellent range conditions.

- Ensure that the allowable use of plant species will maintain plant diversity, density, vigor, and regeneration over time.

- Restore adequate levels of residual plant cover, fruits, seeds, and regeneration to provide for the needs of prey species.

- Restore good conditions to degraded riparian communities

The 1996 Forest Service Record of Decision for the Amendments of the Forests Plan incorporated the recommendations for Mexican spotted owl management into Forest direction in the form of standards and guidelines and suggested utilization levels, for combined use by livestock and wildlife, based on range conditions and allotment management strategy.

The Mexican spotted owl recovery plan specifically identifies overgrazing as a threat to the owl in the Upper Gila Mountain Recovery Unit.

> "Overgrazing is suspected to be detrimental in some areas and can affect both habitat structure and the prey base. Effects on the prey base are difficult to quantify, but removal of herbaceous vegetation can reduce both food and cover available to small mammals (Ward and Block 1995). This is especially true with respect to voles, which are often associated with dense grass cover. Direct effects on habitat occurs with livestock browsing on Gambel oak [(*Quercus gambeli*)]. In some areas, oak is regenerating well but unable to grow beyond the sapling stage because of this browsing... Grazing effects on habitat are also potentially significant in canyon-bottom riparian areas. We do not attribute these effects solely to livestock. Forage resources are shared by livestock and wild ungulates" (U.S. Fish and Wildlife Service 1995b, p. 101).

Diet studies conducted on Mexican spotted owls have indicated that prey species of the owl include woodrats (*Neotoma* spp.), white-footed mice (*Peromyscus* spp.), voles (*Microtus* and *Cleithrionomys* spp.), rabbits and hares (*Sylvilagus* and *Lepus* spp.), pocket gophers (*Thomomys* spp.), other mammals including a variety of bats, birds, insects, and reptiles. Ward and Block (1995) report that rangewide, 90% of an "average" Mexican spotted owl diet would contain 30% woodrats; 28% peromyscid mice; 13% arthropods; 9% microtine voles; 5% birds; and 4% medium-sized rodents, mostly diurnal sciurids. These rangewide patterns, however, are not consistent among spotted owl recovery units as data indicates significant differences in owl diets among geographic location (Ward and Block 1995). Ganey (1992) conducted a Mexican spotted owl prey study between 1984-1990 in mixed conifer habitat of the San Francisco Peaks. He found the following percentages of prey biomass in the diet of the owl: 49.1% woodrats; 15% voles; 12.5% peromyscid mice; 9.1% pocket gophers; 6.7% rabbits; 4.4% other medium mammals; 3.1% birds; and 0.1% arthropods.

The effect livestock and wildlife grazing can have on Mexican spotted owl prey species and their habitat also is a complex issue. Impacts can vary according to grazing species (domestic or wild), degree of use, including stocking density, grazing intensity, grazing frequency, and timing of grazing, habitat type and structure, and plant and prey species composition (Ward and Block 1995). It is well documented that repetitive, excessive grazing of plant communities by livestock can significantly alter plant species density, composition, vigor, regeneration, above or below ground phytomass, soil properties, nutrient flow, and water quality, especially when uncontrolled (Belsky and Blumenthal 1997, Ward and Block 1995). These effects have both direct and indirect adverse impacts on animal species that are dependent on plants for food and cover. However, moderate to light grazing can benefit some plant and animal species under certain conditions and in certain environments, maintain communities in certain seral stages, and may increase primary productivity (Ward and Block 1995). No studies document the direct and indirect effects of livestock and wildlife grazing on the Mexican spotted owl or its prey (U.S. Fish and Wildlife Service 1995b). However, Ward and Block (1995) indicate that there exists some knowledge regarding the effects that livestock grazing can have on small mammals frequently consumed by spotted owls, and regarding mesic or montane plant communities inhabited by the owl's prey. Based on studies conducted in other areas of the United States, Ward and Block (1995) indicate that, under heavy grazing, decreases in populations of voles would be expected, and this would improve conditions for deer mice in meadow habitat. Increases in deer mouse abundance in meadows would not offset decreases in vole numbers because voles provide greater biomass per individual and per unit of area. Such decreases could negatively influence spotted owls (Ward and Block 1995).

Ward and Block (1995) examined correlates between the Mexican spotted owl's diet and reproduction. Their results suggested that the owl's reproductive success was not influenced by a single prey species, but by many species in combination. None of the specific prey groups significantly influenced owl reproductive success, but rather, they concluded it was more likely that the owl's reproductive success was influenced by total prey biomass consumed in a given year, rather than by a single prey species. More young were produced when moderate to high amounts of the three most common prey groups (woodrats, peromyscid mice, and voles) were consumed.

Grazing by livestock can alter the vegetation community. Canyon bottoms and meadows are often preferred foraging sites by both livestock and wildlife, and grazing contributes significantly to degradation of these habitats. Within conifer forests, grazing can remove or greatly reduce grasses and forbs, thereby allowing large numbers of conifer seedlings to become established because of reduced competition for water and nutrients. Establishment of seedling conifers coupled with the reduction in light ground fuels (e.g., grasses and forbs) may act with fire suppression to contribute to building of fuels in the forest, alter forest structure, and decrease the potential for beneficial low-intensity ground fires while increasing the risk of catastrophic fire (U.S. Fish and Wildlife Service 1995b).

Many of these effects are occurring to some degree on the Sapillo Allotment are a result of past livestock grazing activities. Many of these effects are evident through the degraded status of range; other effects are more subtle. Through time and in combination with other factors, livestock overgrazing may have contributed to altering many ecosystem functions and processes associated with the Sapillo Allotment.

With current livestock numbers and management on the Sapillo Allotment, over-utilization of forage and browse is occurring at a severe level throughout the allotment. Currently, forage use by livestock is exceeding Forest Service guidelines. Whether there are established PACs, unsurveyed restricted habitat, or surveyed unoccupied restricted habitat, these existing conditions on the Sapillo Allotment are such that there is little herbaceous residual cover and reduced development of grass seedheads necessary to provide cover or food for rodent species. The opportunities for prescribed natural fires are greatly limited. This ecological situation leads to adverse effects to Mexican spotted owls--those potentially present on the allotment or as habitat for population expansion. The Forest Service conservation measures to apply forage utilization standards to the Sapillo Allotment and to exclude livestock from Black Canyon and the majority of Apache Creek will address these adverse effects.

CUMULATIVE EFFECTS

Although the majority of the upper Gila River watershed is managed by the Forest Service, management of private land along the East Fork, Taylor Creek, and Wall Lake upstream of the Sapillo Allotment contributes to the degradation of riparian systems in the upper Gila River watershed and downstream. Riparian corridors may provide important habitat linkages among Mexican spotted owl subpopulations throughout the Basin and Range West Recovery Unit. Throughout the recovery unit, the upper Gila watershed, and on and adjacent to the Sapillo Allotment, riparian vegetation has been severely compromised with effects on the potential use of these areas by spotted owls as wintering habitat and/or dispersal corridors.

CONCLUSION

After reviewing the current status of the Mexican spotted owl, the environmental baseline in the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Sapillo Allotment are not likely to jeopardize the continued existence of Mexican spotted owl. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Mexican Spotted Owl on the Sapillo Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The Service anticipates that take of Mexican spotted owl will be difficult to detect because finding a dead or impaired specimen is unlikely. However, the level of incidental take can be anticipated by the loss of essential elements in the habitat that would affect the species. The primary type of take expected to result from the ongoing grazing activities on the Sapillo Allotment is through harm by the reduction of suitability of the habitat for prey species, thus limiting the availability of prey for owls. This would impair the ability of Mexican spotted owl adults to successfully raise young. The Service anticipates that, in the absence of survey, incidental take will occur to two pairs of Mexican spotted owls associated with Black Canyon and Apache Creek on the Sapillo Allotment. The Service has defined incidental take in terms of habitat characteristics, and has used surrogate measures to identify when take has been exceeded. The Service concludes that incidental take of Mexican spotted owl from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), and riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions) within the natural capabilities of the landscape on all pastures of the allotment with Mexican spotted owl PACs.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Mexican spotted owl. Reasonable and Prudent Measures and Terms and conditions have been transmitted in draft form to the Forest Service. This final biological opinion will be amended upon review and adoption of the Terms and Conditions.

SARDINE ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- 6,879 total
- 1,381 full/potential capacity range

Projected Stocking Density
- 365 animal months
- 3.8 acres per animal month

Permitted Use:
- 53 cow/calf 1/1-12/31
- 3 horses 1/1-12/31

Projected Use:
- 30 cow/calf 1/1-12/31

Major Vegetation Type:
- Pinyon/juniper, interior chaparral

Major Drainages:
- San Francisco River
- Sardine Canyon

Elevation:
- 4,000 to 6,700 feet

Type of Grazing System:
- 3 pastures, winter/summer, deferred rotation

Allotment Condition:
- 1987 TES indicates that most of the allotment is in satisfactory soil condition.
- 1997 range condition data indicate that most of the allotment is in poor to fair condition.

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded ecological conditions.

Consultation Period:

- ! 3 Years

ARIZONA HEDGEHOG CACTUS ON THE SARDINE ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Although the Arizona hedgehog cactus is not known from the Sardine allotment, the cactus has been found on the Tule allotment about four miles to the west. The cactus has the potential to be widespread across the 6,881 acre allotment. However, only 1,381 acres on the allotment were used in calculations for estimated capacity and the current stocking is 30 head of cattle, the approximate estimated capacity.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Sardine Allotment may affect, not likely to adversely affect the Arizona hedgehog cactus. The Service herein concurs with this determination for the following reasons: the Sardine Allotment is managed, in part, under a Memorandum of Understanding for resource protection providing for non-use of a portion of the permitted livestock numbers; stocking of permitted livestock is correlated with range improvement construction and maintenance, livestock management, improvement in range conditions, and is at estimated capacity of the range; and utilization levels are believed to be within appropriate limits, most of the allotment range condition is rated poor to fair, there has been some recent improvement, and improvements are expected to continue.

SEARS-CLUB/CHALK MOUNTAIN ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Tonto National Forest, Cave Creek Ranger District

Allotment Acres:
- 129,300 total

Projected Stocking Density
- 8,163 animal months

Permitted Use:
- 669 adult cattle, yearlong

Projected Use:
- 400 yearlings, 1/1-5/31

Major Vegetation Type:
- Sonoran desertscrub
- Juniper grassland

Major Drainages:
- Verde River
- Davenport Wash
- Deadman Wash
- Sycamore Creek
- Horse Creek
- Corral Camp Creek
- Sheep Creek

Elevation:
- 1,700 to 7,000 feet

Type of Grazing System:
- 5 pasture rotation

Allotment Condition:
- 1981/1984 range condition data indicate that approximately 80% of the combined allotments are in very poor or poor condition.
- Recent visual monitoring suggests range conditions have improved somewhat.

Listed Species Adversely Affected:
- ! Gila topminnow

Ecological condition and/or management action that contributes to adverse effects:
- ! Direct access by livestock to spring habitat.

Consultation Period:
- ! 1 Year

GILA TOPMINNOW ON THE SEARS-CLUB/CHALK MOUNTAIN ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Dutchman Grave Spring (T9N R7E Sec16 SE) occurs on the Sears-club/Chalk Mountain Allotment near the boundary with the Red Creek Allotment. The spring was stocked with Gila topminnow in 1983, and is one of eight sites on Tonto National Forest that retains Gila topminnow. Dutchman Grave Spring consists of upper and lower reaches separated by about 1000 feet of dry channel. An allotment boundary fence places the upper (easterly) reach into Sears-Club/Chalk Mountain Allotment, Upper Chalk Pasture, and the lower (westerly) reach into Red Creek Allotment. Stocking records from Arizona Game and Fish Department show that Gila topminnow were originally stocked into both reaches, and topminnows were present in both portions in 1989 and 1991, but not in the upper portion in 1996 (D. Weedman, Arizona Game and Fish Department, unpublished data).

Dutchman Grave Spring was evaluated for stocking with Gila topminnow on April 29, 1982. Field notes prepared by Ken Byford (Tonto National Forest) for that stocking noted that the spring was separated into two portions. In the upper portion were adult *Rana* sp., tadpoles, *Carex* sp., *Typha* sp., sycamore, and cottonwood. The area was shaded by a riparian overstory. Byford described the area as having good amount of pools ranging from 4 feet in diameter and 8 to 10 inches deep, to 10 to 12 feet in diameter and 4 to 5 feet deep. Larger pools were noted to have cattails in shallow areas with gravel and smaller material present. No fish species were present. Flow rate was estimated at 5 to 10 gallons-per-minute. Byford noted in the lower portion the presence of cottonwood, sycamore, mesquite, hackberry, wild grape, *Typha* sp., and *Carex* sp. Pools present were 3 to 4 feet in diameter and 10 to 20 inches deep. Mature and larval stage aquatic insects were present. No fish species were observed. This portion of Dutchman Grave Spring does not have the same water flow as the upper portion of the spring complex. The lower spring does not have as extensive a riparian vegetation zone and does not have the quantity of water that is present at the upper portion.

Dutchman Grave Spring was stocked on June 3, 1983, by representatives of the Tonto National Forest and Arizona Game and Fish Department, with 1,000 Gila topminnow from Boyce Thompson Arboretum. The stocking notes referred to a riparian area situated in desert where a portion of the drainage is perennial as the spring-flow sinks and then resurfaces. Gila topminnow have been present at Dutchman Grave Spring since the 1983 stocking, but available reports do not indicate how long the fish occupied both portions of the spring (Brooks 1986, Simons 1987, Bagley *et al.* 1991, Brown and Abarca 1992, Weedman and Young 1997).

Bagley *et al.* (1991) reported: "Water is present in 5 pools over a 200 meter stretch of intermittent stream. The largest pool is 4 meters long by 3 meters wide and 1.2 meters deep. The site has large populations of Gila topminnows and garter snakes. The area contains dense riparian vegetation; about half the available water has aquatic vegetation. Since this site is more than 5 miles into the Mazatzal Wilderness Area and contains a large Gila topminnow population, it is a Category #1 site."

The spring was checked on April 27, 1991, and Brown and Abarca (1992) recorded that "Dutchman Grave Spring is a 500 meter stretch of intermittent stream with five 1 to 2 meter deep pools. Moderate numbers of Gila topminnow were present. No recent reproduction was evident, although black males were following large females. Areas approximately 1/4 and 1/2 mile downstream of this site are suitable for further topminnow introduction. Although canyon tree frogs (*Hyla arenicolor*) were common, no leopard frogs or tadpoles were found. This is a “category one site."

Gila topminnow were recorded present on May 15, 1996, when Weedman and Young (1997) noted "Dutchman Grave Spring is a spring-fed stream in the Mazatzal Wilderness Area. It has supported a large population of topminnows since its stocking. The area is surrounded by a mature riparian forest and has abundant water with many large pools." This report erroneously placed the spring in southeast portion of section 21.

Several field trips to Dutchman Grave Spring in 1998 documented that Gila topminnow are presently restricted to the lower portion of the spring, which is in the Red Creek allotment (Stefferud 1998, Fenner 1998). No definite reason for loss of Gila topminnow from the upper portion of the spring has been raised, although there is speculation that either scouring floods in 1993 and 1995 could have eliminated the individuals there (Stefferud 1998). There is also at least a partial barrier restricting upstream movement of Gila topminnow into the upper portion from the lower spring during times of greater discharge (D. Weedman, unpublished data). The channel at the partial barrier site is split, with one side having a 36 inch vertical drop, and the other side with two nearly vertical drops of 18 inches and 28 inches in height. Both of the shorter drops have a shallow pool at the bottom (L. Bizios, Tonto National Forest, unpublished data). Upstream fish movement over these barriers could be possible during some flows.

In July 1998, the amount of surface water at the spring appeared considerably reduced from that reported during previous field checks, and discolored rocks and debris lines indicated that surface water is usually more extensive. Using paced measurements, the upper reach had two portions with shallow pools and runs that totaled less than 300 feet in length, and the lower reach consisted of about 400 feet of narrow trench and scour pools in bedrock. The upper reach may have gone dry earlier in 1998. The deepest pool in the upper reach was less than 0.5 feet deep, and in the lower reach, less than 1.5 feet deep. Aquatic vegetation included cattails and bulrushes. Gila topminnow were common in the lower reach where reproduction had occurred in 1998, and black (reproductively dominant) males were evident (Stefferud 1998). Larval and adult leopard frogs were abundant in both portions of the spring (L. Bizios, unpublished data).

Steep topography restricts cattle from accessing lower Dutchman Grave Spring from the Red Hills pasture and the permittee does not push livestock there (P. Fenner, Tonto National Forest, pers. comm.); the riparian vegetation and aquatic habitat there is in good condition. In the upper portion, most of the stream channel is protected from grazing by boulders and tree roots, but in those areas where cattle can access water, the streambanks are chiseled and trampled. In July 1998, use on riparian vegetation appeared light to moderate; there were few clumps of cattails or bulrushes present. In addition, the mature and large trees at the upper reach appeared under stress with many dying or dead, perhaps due to recent drought conditions (Stefferud 1998).

Cattle have direct access to upper Dutchman Grave Spring in the Sears-Club/Chalk Mountain allotment. Grazing utilization at the upper spring reached near 40% by September 1998, and use of the Upper Chalk Pasture is scheduled to continue through December 15, 1998. The permittee is attempting to keep cattle out of the area of the spring. The watershed above the spring is also grazed. An early 1980s analysis showed 40% of the allotment in very poor condition, 43% in poor condition, 16% in fair condition, and 1% in good condition. The condition of the Upper Chalk pasture is unknown, but is assumed to be like the rest of the allotment. An upland condition and utilization transect was done on October 8, 1998, on an easily accessible slope 1/4 mile south of the Upper Spring. The Parker 3-step condition rating was moderate poor, with a good ground cover of curly mesquite and use was less than 50 percent.

EFFECTS OF THE ACTION

The Forest Service proposed to graze approximately 300 head of cattle during the period 4/1/98 to 12/15/98 in Upper Chalk Pasture, the pasture that includes Dutchman

Grave Spring--habitat for Gila topminnow. Originally, part of the proposed action included fencing Dutchman Grave Spring prior to putting cattle in the Upper Chalk Pasture; this would have precluded the spring from being grazed in 1998. The allotment permittee was notified of plans to fence Dutchman Grave Spring (Lopez 1997), and on-the-ground flagging of the fence location was begun on June 18, 1998 (Fenner 1998). Livestock entered Upper Chalk Pasture on April 1, 1998, where they were scheduled to remain till mid-December. Complications prevented construction of the fence, and cattle accessed Dutchman Grave Spring. Use on vegetation at the spring was about 40% by September 1998. The permittee was aware of the need to avoid cattle use at the spring, and assigned riders to regularly patrol the area and move cattle away from the spring and into other areas on the pasture. To date, as reported by the National Forest, this action was successful in reducing utilization of vegetation and alteration of the streambanks and channel morphology at the spring site. The National Forest has visually evaluated vegetative conditions at the site three times since mid-July and will continue regular monitoring using established National Forest protocols.

As of October 25, 1998, cattle were moved out of the eastern portion of the Upper Chalk Pasture. As of November 1, the grazing permittee was in the process of moving cattle out of the pasture. A NEPA analysis to implement a long-term management plan on the allotment was expected to be completed prior to the end of 1998.

Continued management of livestock in Upper Chalk Pasture as proposed is likely to adversely affect Gila topminnow at Dutchman Grave Spring. A comparison of riparian and aquatic conditions between the upper portion of the spring which has been exposed to livestock use, and the lower portion of the spring which has been excluded from livestock due the topography, demonstrates some of these effects. However, Gila topminnow currently occur only in the lower portion of the spring, approximately 1,000 feet downstream of the upper portion that is accessed by livestock. Effects of grazing at the upper spring could preclude the reestablishment of topminnow in the short-term, and perhaps contributed to their loss from the upper reach. Although regular herding of livestock away from the spring has reduced the amount of time livestock spend there, the animals continued to drift back to the spring site and stay at the spring.

The status of the topminnow in the subwatershed is degraded from natural conditions as a result, in part, of livestock grazing. Riparian and aquatic conditions at the upper portion of Dutchman Grave Spring are poorer than that described in the last 10 years ("...surrounded by a mature riparian forest and has abundant water with many large pools"), probably resulting from a combination of grazing and drought conditions. On the uplands, range condition from an analysis conducted in the early 1980's shows 83% of the allotment in very poor or poor condition.

Grazing at the spring and in the watershed may impact Gila topminnow and their habitat through changes in quality and quantity of water, changes in watershed hydrology, removal of vegetation, increases in sedimentation and nutrient loading, changes in flooding regimes, and changes in channel geomorphology. Reduced condition at the upper spring will affect the suitability of that site for the future reintroduction of topminnow, or recolonization of topminnow from the lower portion of the spring. Less than potential natural condition can effect the flooding and sedimentation at the lower spring. Higher than normal flood peaks could cause excess erosion and remove fish. Excess sedimentation can remove or reduce available habitat. Grazing in the watershed can indirectly effect both the upper and lower spring through these same effects. Livestock grazing contributes to adverse affects through removal of vegetation and litter, reduction in plant vigor, soil compaction, and chiseling of streambanks.

Grazing at Dutchman Grave Spring in 1998, from April to September, resulted in forage utilization of about 40%, and trampling and chiseling of some streambanks. Livestock were scheduled to remain in the pasture until mid-December but were moved out by the end of October. The majority of the allotment is in poor or very poor conditions. When the level of livestock use within a pasture is based on existing ecological conditions, the maximum utilization of vegetation would be approximately 20% during the growing season. Livestock would then rotate from the pasture when the threshold utilization limits were met. On the Sears-Club/Chalk Mountain Allotment, these utilization limits were exceeded. The adverse affects of ongoing livestock management (including 40% vegetation utilization limits) have been evaluated based on the one year time-frame (1998 grazing season) of the proposed action and the fact that this utilization has occurred and livestock have been removed from the pasture and will not return until a full NEPA analysis is completed. In addition, thorough surveys of upper Dutchman Grave Spring have demonstrated topminnow are not currently present at the upper spring where livestock have (had) direct access, and so the probability of direct “take” of topminnow due to the proposed action is greatly diminished. The adverse effects are considered to be short-term, and provides opportunity for evaluation of the best long-term management of Dutchman Grave Spring within the context of the NEPA analysis.

CUMULATIVE EFFECTS

Dutchman Grave Spring is fully under the jurisdiction of the U.S. Forest Service, and activities affecting the Gila topminnow, such as grazing, would constitute a Federal action which is subject to section 7 consultation. Any activity at the spring or in the uplands that would affect water quality and quantity at the spring or contribute to the introduction of exotic fish species would be deleterious to the topminnow.

CONCLUSION

After reviewing the current status of the Gila topminnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Sears-Club/Chalk Mountain Allotment are not likely to jeopardize the continued existence of Gila topminnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Gila Topminnow on the Sears-Club/Chalk Mountain Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of Gila topminnow result from ongoing grazing activities on the Sears-club/Chalk Mountain Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support topminnow. The Service anticipates, however, that incidental take of topminnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; losses may be masked by seasonal fluctuations in environmental conditions and fish numbers; and affects of the action may preclude topminnow from occupying portions of Dutchman Grave Spring. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of Gila topminnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Access to Dutchman Grave Spring by permitted livestock occurs prior to the completion of full allotment NEPA analysis and reconsultation with the Service, as appropriate.

2. Utilization in uplands within the watershed of Dutchman Grave Spring is greater than 40%, the current level already reached at the time of consultation.

3. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Gila topminnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) at Dutchman Grave Spring and within the watershed above the spring on the Sears-Club/Chalk Mountain Allotment.

2. Provide protection to Dutchman Grave Spring from the impacts of livestock management.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. Prior to the NEPA analysis decision, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. Within the context of the NEPA analysis, provide as an alternative to be considered how to best manage Dutchman Grave Spring for the benefit of Gila topminnow.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to exclude livestock from Dutchman Grave Springs and the Upper Chalk Pasture.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) at Dutchman Grave Spring and the uplands above the spring during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service at the completion of the 1998 grazing season and at least 30 days prior to the issuance of the next Annual Operating Plan.

2. Continue monitoring for Gila topminnow at the upper portion of Dutchman Grave Spring.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) presence of livestock at the lower portion of Dutchman Grave Spring; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the lower spring area, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Gila Topminnow on the Sears-Club/Chalk Mountain Allotment

1. Consider excluding all livestock use from Dutchman Grave Spring permanently.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Apply livestock vegetation utilization limits of 20% throughout the Sears-Club/Chalk Mountain Allotment.

4. Work with the Arizona Game and Fish Department to further evaluate known and potential topminnow sites on the allotment; consider transferring topminnow from lower to upper Dutchman Grave Spring, if appropriate.

5. Work with the Arizona Game and Fish Department to actively seek out additional suitable sites for topminnow throughout the National Forest.

SHEEP SPRINGS ALLOTMENT/HEBER-RENO SHEEP DRIVEWAY

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- ! Apache-Sitgreaves National Forest, Springerville Ranger District Tonto National Forest, Tonto Basin Ranger District

Authorized use on the Sheep Springs Allotment and the Heber-Reno Sheep Driveway is permitted under a Term Grazing Permit issued on the Springerville Ranger District, Apache-Sitgreaves National Forest. Administration and monitoring of the portion of the Heber-Reno Sheep Driveway that is located on the Tonto National Forest is conducted by the Mesa, Tonto Basin, and Pleasant Valley Ranger Districts.

Driveway Acres:

- ! 68,209 total
- ! 68,209 full/potential capacity range

Projected Stocking Density

- ! 8,598 animal months
- ! 7.9 acres per animal month

Permitted Use:

- ! 4,590 sheep, 4/20-5/14 and 9/8-10/8
- ! 16 horse/burro, 4/20-5/14 and 9/8-10/8

Projected Use:

- ! 4,590 sheep, 4/20-5/14 and 9/8-10/8
- ! 16 horse/burro, 4/20-5/14 and 9/8-10/8

Major Vegetation Type:

- ! Sonoran desert, interior chaparral, pinyon/juniper, ponderosa pine

Major Drainages:

- ! Salt River
- ! Tonto Creek

Elevation:

- ! 1,500 to 6,600 feet

Type of Grazing System:

- Herding with designated bed grounds and watering locations. The driveway is not used by cattle on the Mesa and Pleasant Valley Ranger Districts.

Allotment Condition:

- 13,040 acres very poor, 23,440 acres poor, and 31,72 acres fair range condition.

Listed Species Adversely Affected:

- Lesser long-nosed bat

Ecological condition and/or management action that contributes to adverse effects:

- Trampling of young plants by the large, concentrated number of sheep as they are herded.

Consultation Period:

- 3 Years

LESSER LONG-NOSED BAT ON THE SHEEP SPRINGS ALLOTMENT/HEBER-RENO SHEEP DRIVEWAY

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Sheep Springs Allotment is at high elevations in the White Mountains. The lesser long-nosed bat does not occur in these habitats. However, the sheep which stock this allotment are herded/driven from Chandler, Arizona, through National Forest lands (Tonto and Apache-Sitgreaves National Forests). Potential foraging habitat for the lesser long-nosed bat occurs throughout the lower elevations of the Heber-Reno Sheep Driveway, primarily on three districts of Tonto National Forest.

Lesser long-nosed bats require suitable forage plants (paniculate agaves and saguaros) and suitable roost sites. It is unknown whether the bat actually roosts within or adjacent to the Heber-Reno Sheep Driveway. Mines and caves occurring in the vicinity of the driveway could potentially provide suitable roost sites. Any potential roosts in the area would probably be transitory (non-maternity) roosts used by adults and/or young bats in summer or fall. Saguaros occur at lower elevations; paniculate agaves extend into higher elevation areas (±6,000 feet). Saguaros and agaves are likely scattered, although they may occur in localized concentrations. Palmer's agave (*Agave palmeri*) is not known to occur in the vicinity of the driveway, although other paniculate agaves may (e.g., Parry's agave, *A. paryi*, desert agave, *A. deserti*). The Heber-Reno Sheep Driveway is considered to be on the periphery of the lesser long-nosed bat's range. The closest known roost site is south of the Gila River. However, lesser long-nosed bats have been recorded from scattered localities north of the Gila River. No concerted effort at surveys for lesser long-nosed bats north of the Gila River has been undertaken.

Based on known distances lesser long-nosed bats have traveled from roost sites to foraging areas, potential foraging habitat may extend in a 40-mile radius from roosts. With the lack of bat survey information, the presence of potential roost sites, and the availability of suitable forage plants, the Heber-Reno Sheep Driveway is considered lesser long-nosed bat foraging habitat.

EFFECTS OF THE ACTION

Direct effects to lesser long-nosed bats as a result of sheep herding and grazing activities are not expected because these activities are unlikely to affect roosts and no roosts are known from the Heber-Reno Sheep Driveway. However, it is possible that undetected roosts occur within the driveway.

Indirect effects to lesser long-nosed bats may occur through adverse affects to forage plants. Saguaros may be affected both directly and indirectly by herding and grazing activities. Saguaros occur in low elevations on slopes, bajadas, and in valleys. Impacts due to grazing activities may occur from trampling of young saguaros, grazing of saguaro nurse plants that results in reduction or removal of protective cover, or grazing of the young saguaros themselves (Abouhalder 1992).

Impacts to agave flowering stalks due to sheep herbivory may occur. Agave stalks as they begin to bolt are particularly palatable to domestic livestock and wild herbivores, including deer, javelina, rodents, and rabbits (M. Hawks, University of Arizona, Tucson, pers. comm. 1997; W. Hodgson, pers. comm. 1997). Parry's agave is typically found on rocky slopes, at somewhat moderate to high elevations (4,900 to 8,200 ft) (Gentry 1982).

Agave and cacti germination and seedling establishment may be influenced by degraded ecological conditions such as soil compaction, erosion, reduced infiltration, and altered plant species diversity and abundance. Effects to bat forage plants due to sheep herding and grazing activities are expected to be more intense where livestock congregate near water sources and bedding grounds, and less intense on steep slopes or among rocks where grazing is generally relatively light.

Sheep are herded and bedded in dense bands. The principle effects to bat foraging plants on the sheep driveway are expected to occur from trampling and perhaps herbivory of seedling and small agaves and cacti. Areas with high densities of paniculate agaves and saguaros may be particularly important to the bat, especially if those high density sites are in close proximity to roosts. The distribution, abundance, and species composition of paniculate agaves on the Heber-Reno Sheep Driveway has not been evaluated.

CUMULATIVE EFFECTS

On a landscape level, paniculate agave populations appear to be well dispersed. However, the percentage of the agave population which successfully produces flowering stalks is unknown. Large segments of the range of the lesser long-nosed bat and its forage plants are exposed to Federal, State, Tribal, and private livestock grazing management activities. The overall affects of grazing (herbivory, trampling, and ecosystem changes affecting plant reproduction, recruitment, and establishment) on bat forage plants is unknown. Lesser long-nosed bat foraging ecology and energy budget is largely unknown. This, combined with potential disturbance of roost sites and loss of habitat due to urbanization and other activities on large tracts of State and private lands within the range of the bat, contributes to negative impacts on the species.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Sheep Springs Allotment/Heber-Reno Sheep Driveway are not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Lesser Long-nosed Bat on the Sheep Springs Allotment/Heber-Reno Sheep Driveway

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take expected to result from the ongoing grazing activities on the Sheep Springs Allotment/Heber-Reno Sheep Driveway is harm, which occurs through the effects to habitat that alters the availability of food plants, affecting the suitability of the habitat to support the lesser long-nosed bat. The Service anticipates, however, that incidental take of the lesser long-nosed bat associated with the proposed action will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and it is difficult to detect and analyze the results of changes in bat foraging behavior and distribution, and reduced foraging efficiency. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Sheep grazing and herding contribute to limiting the abundance or distribution of lesser long-nosed bat food plants (*Agave palmeri*, *A. paryi*, *A. deserti*, and saguaro).

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the lesser long-nosed bat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take:

1. Provide protection to high density areas of agaves and saguaros so that sheep grazing and herding activities does not contribute to limiting the food resources (*A. palmeri*, *A. paryi*, *A. deserti*, and saguaro) available to the lesser long-nosed bat by reducing the distribution or abundance of flowering agaves or reducing germination and establishment of agaves or saguaros below the natural capabilities of the landscape.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By April 15, 1999, the Tonto National Forest will evaluate the abundance and distribution of lesser long-nosed bat food plants (*A. palmeri*, *A. paryi*, *A. deserti*, and saguaro) on the Mesa Ranger District portion of the Heber-Reno Sheep

Driveway, identify high density saguaro and agave sites, and protect these sites from sheep herding and bedding to prevent herbivory of agave flowering stalks and disruption of saguaro and agave germination/recruitment sites. Provide a map to the permittee and herders of areas to avoid.

2. The Springerville Ranger District will include in the Annual Operating Plan (AOP) for the Sheep Springs Allotment those instructions to the permittee that apply to the Heber-Reno Sheep Driveway, for the herders to avoid areas of relatively high saguaro and agave density, and not to harvest any agave bolts.

CONSERVATION RECOMMENDATIONS - Lesser Long-nosed Bat on the Sheep Springs Allotment/Heber-Reno Sheep Driveway

1. The Tonto National Forest could join in cooperative efforts to survey for lesser long-nosed bat roosts, and protect and monitor these sites.

2. The Tonto National Forest could develop and initiate a study plan to survey for foraging lesser long-nosed bats north of the Gila River. This study would be conducted over a minimum of a two year period and in cooperation with other management entities (e.g., Apache-Sitgreaves National Forest, Bureau of Land Management, Arizona Game and Fish Department) in order to address the issue on a landscape level.

3. Implement the lesser long-nosed bat recovery plan, as appropriate.

SOUTH ESCUDILLA ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:
- 16,673 total
- 13,707 full/potential capacity range

Projected Stocking Density
- 522 animal months
- 26.2 acres per animal month

Permitted Use:
- 116 cow/calf, 6/1-10/31

Projected Use:
- 116 cow/calf, 6/15-10/31

Major Vegetation Type:
- Pinyon/juniper, ponderosa pine, spruce fir

Major Drainages:
- Nutrioso Creek
- Paddy Creek
- Milk Creek

Elevation:
- 7,700 to 10,900 feet

Type of Grazing System:
- 3 pastures, deferred rotation

Allotment Condition:
- 1987 TES indicates that 70% of the allotment is in satisfactory soil condition.
- No recent range data exist.

Listed Species Adversely Affected:
- Little Colorado River spinedace

Ecological condition and/or management action that contributes to adverse effects:

- ! Degraded soil conditions within Nutrioso South pasture (possible increase in sedimentation of Milk, Paddy, and Hulsey creeks).

Consultation Period:

- ! 3 Years

LITTLE COLORADO RIVER SPINEDACE ON THE SOUTH ESCUDILLA ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Stream alteration, watershed modification, and introduction of non-native fishes pose an increasing threat to the Little Colorado River spinedace (U.S. Fish and Wildlife Service 1998). Problems associated with unsatisfactory soil conditions and dysfunctional riparian conditions include increases in sedimentation into the streams, compaction and poor water infiltration that alter the natural hydrograph by increasing runoff spikes and decreasing baseflows, and poor ground cover that increases rain impacts. These factors contribute to stream conditions which may decrease the quality and quantity of spinedace habitat. Ungulate grazing tends to amplify many of the existing watershed problems, and may slow or inhibit watershed improvements. Forest Service allotments affecting spinedace habitat have implemented some range improvements; however, overstocking and high levels of range utilization, in combination with wildlife use, appear to effect watershed conditions and reduce the quality and quantity of spinedace habitat and potential of perennial flow in Nutrioso Creek and its tributaries.

Nutrioso Creek is a north flowing tributary of the Little Colorado River; their confluence is at the town of Springerville. The headwaters of Nutrioso Creek begins at the Alpine Divide. Paddy, Milk/Hulsey, Auger, Colter, and Riggs creeks join Nutrioso Creek above Nelson Reservoir. Stream flow is basically perennial from Paddy Creek to Nelson Reservoir. From approximately Milk Creek above the town of Nutrioso to Nelson Reservoir, Nutrioso Creek has been classified as "functional at risk" and courses through a broad bottom, which is primarily in private ownership. There are several water diversions associated with the private land, and the stream channel in the lower valley is incised up to approximately 2 meters. The National Forest recently acquired property which included Nutrioso Creek immediately above Nelson Reservoir. Below the impoundment, Rudd Creek joins, and US Highway 180 closely parallels Nutrioso Creek until Correjo Crossing. There are numerous unvegetated, steep angled road cuts which contribute large amounts of sediment to Nutrioso Creek. After Nutrioso

Creek exits the National Forest and enters private land, there are several water diversions and the creek only flows seasonally.

A large elk population resides within the Nutrioso Creek watershed and contributes to grazing pressures, especially on riparian habitats. Elk populations may have an affect on riparian areas and functions. Fire suppression has probably also had an effect on the hydrology of the watershed, resulting in pine forests with more trees and dense canopies.

The Little Colorado River spinedace population in the Nutrioso Creek watershed is dependable and fairly common only within a portion of Nutrioso Creek. Spinedace habitat is limited by perennial flows and non-native aquatic species in the tributaries of Nutrioso Creek.

Little Colorado River spinedace are found in Nutrioso Creek from about the Milk Creek/town of Nutrioso area to Nelson Reservoir. Downstream of Nelson Reservoir, critical habitat has been designated from the dam to the National Forest boundary, a distance of 5 miles. Relative few individuals persist at scattered sites in this reach of Nutrioso Creek. Water quality and quantity is affected by the dam and close proximity of the highway and roadcuts. Spinedace occurred in Rudd Creek on the Sipes White Mountain Ranch until the drought in 1996, when the known site dried completely.

Occupied Little Colorado River spinedace habitat occurs less than 0.25 miles off the South Escudilla Allotment at the confluence of Milk Creek and Nutrioso Creek. Nutrioso Creek is not on the allotment. Milk and Hulsey creeks and Paddy Creek bisect the west side of South Nutrioso Pasture. Milk and Hulsey creeks pass through dattle soils which contribute high levels of sediments into the system. Paddy Creek is located 3 miles above occupied spinedace habitat and is occupied by trout species. No spinedace have been recorded in Paddy Creek.

It is believed that no Little Colorado River spinedace occupied or suitable habitat occurs on this allotment. No critical habitat is within the action area of this allotment.

EFFECTS OF THE ACTION

Little Colorado River spinedace suitable habitat off the South Escudilla Allotment is being impacted from four streams within the Allotment; these are all primarily within the Nutrioso South Pasture. In 1994 a General Aquatic Wildlife System survey was completed on Paddy Creek, and on Milk Creek in 1995. Riparian conditions were mostly satisfactory, while habitat conditions were not. Embeddedness ratings were high in all the reaches surveyed, and these streams are contributing sediments downstream into Nutrioso Creek. No range condition data is available. Increased sedimentation can result in habitat alterations and impact the prey base and various aspects of reproduction for the spinedace.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Effects of sedimentation from tributary canyons and streams leading to Nutrioso Creek contributes to increased embeddedness downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers, or deleterious sediment conduits, between upland impacts and the perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). Spinedace are not unduly sensitive to moderate amounts of sediment, although during the spawning period egg viability may be reduced due to high embeddedness and sediment loads.

CUMULATIVE EFFECTS

Activities that impair water infiltration and summer baseflows may affect spinedace populations, especially during dry years. Soil compaction may result from roads, timber harvest activities, recreational development, and dispersed recreation. Water diversions, roads, and other developments are associated with private lands on Riggs, Colter, and Nutrioso creeks.

CONCLUSION

After reviewing the current status of the Little Colorado River spinedace, the environmental baseline, the effects of the proposed action, and available information on cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the South Escudilla Allotment are not likely to jeopardize the continued existence of Little Colorado River spinedace. Critical habitat for this species has been designated downstream of the action area in Nutrioso Creek below Nelson Reservoir, however, this action does not affect that area and no destruction or adverse modification of that critical habitat is anticipated.

INCIDENTAL TAKE STATEMENT
Little Colorado River Spinedace on the South Escudilla Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF TAKE

The primary type of take of Little Colorado River spinedace expected to result from the ongoing grazing activities on the South Escudilla Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support Little Colorado River spinedace. The Service anticipates, however, that incidental take of Little Colorado River spinedace associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding a dead or impaired specimen is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of Little Colorado River spinedace from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not continue to improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape on all pastures of the allotment in the Nutrioso Creek watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Little Colorado River spinedace.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the Nutrioso Creek watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Required monitoring and reporting of livestock utilization levels are not complete within the designated time frames.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

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

1. Restrict livestock from Milk and Hulsey creeks. For the 1998 grazing season, evaluate if herding or other behavioral management options will be effective. If livestock still access the creek bottom, then fencing should be considered prior to the 1999 grazing season.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Nutrioso Creek watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the Little Colorado spinedace (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. Establish annual fish monitoring stations within the Nutrioso Creek drainage. Fish monitoring is to be conducted by a journey-level fishery biologist (or equivalent) and coordinated with other fish survey/monitoring programs.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually (calendar year or grazing year), and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule, livestock gain access to Milk or Hulsey creeks) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Little Colorado River Spinedace on the South Escudilla Allotment

1. Work with Arizona Department of Transportation and Federal Highway Administration to address high levels of sediments entering Nutrioso Creek from road cuts along the highway below Nelson Reservoir.

2. Implement the Little Colorado River spinedace recovery plan, as appropriate.

TULE ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- ! Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- ! 14,149 total
- ! 3,125 full/potential capacity range

Projected Stocking Density
- ! 170 animal months
- ! 18.4 acres per animal month

Permitted Use:
- ! 14 cow/calf 1/1-12/31

Projected Use:
- ! 14 cow/calf 1/1-12/31

Major Vegetation Type:
- ! Pinyon/juniper, interior chaparral

Major Drainages:
- ! Eagle Creek

Elevation:
- ! 4,500 to 7,000 feet

Type of Grazing System:
- ! 3 pasture rest rotation, with 2 smaller pastures available if needed

Allotment Condition:
- ! 1987 TES indicates 60% of allotment in satisfactory soil condition.
- ! 1975 range condition data show most of allotment in fair condition.

Ecological condition and/or management action that contributes to adverse effects:
- ! Degraded ecological condition.

Consultation Period:
- ! 3 Years

ARIZONA HEDGEHOG CACTUS ON THE TULE SPRINGS ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Some plants tentatively identified as the Arizona hedgehog cactus were observed on the allotment during 1997 surveys, at which time samples were taken for DNA analysis from the northeast portion of the allotment. The cactus has a potential to be widespread across 11,498 acres of this 14,194 acre allotment. Some 11,069 acres of the allotment are no capacity and were not used in calculations of estimated capacity. The topography of the no capacity area is such that the cactus has a higher potential of occurring in that area. Livestock stocking is significantly below revised capacity estimates.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Tule Springs Allotment may affect, not likely to adversely affect the Arizona hedgehog cactus. The Service here concurs with this determination for the following reasons: the Tule Springs Allotment is stocked below estimated capacity of the range, and utilization levels are believed to be within appropriate limits, most of the allotment range condition is rated fair, there has been some recent improvement, and expectations are that improvements will continue.

WILDBUNCH ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Apache-Sitgreaves National Forest, Clifton Ranger District

Allotment Acres:
- 23,085 total
- 6,663 full/potential capacity range

Projected Stocking Density
- 2,820 animal months
- 2.4 acres per animal month

Permitted Use:
- 311 cow/calf, 1/1-12/31
- 8 horses, 1/1-12/31
- 48 yearlings, 1/1-5/31
- 35 yearlings, 1/1-10/31

Projected Use:
- 225 cow/calf, 1/1-12/31
- 10 horses, 1/1-12/31

Major Vegetation Type:
- Pinyon/juniper, interior chaparral

Major Drainages:
- Blue River
- San Francisco River

Elevation:
- 4,500 to 8,000 feet

Type of Grazing System:
- 1 pasture, season-long (winter); 3 pastures, deferred (summer), depending on available water

Allotment Condition:
- 1987 TES indicates that approximately 60% of the allotment is in satisfactory soil condition.
- 1997 range condition data indicate that most of the full-capacity acres are in fair condition with a downward trend.

Listed Species Adversely Affected:

- Loach minnow
- American peregrine falcon
- Arizona hedgehog cactus

Ecological condition and/or management action that contributes to adverse effects:

- Stocking of the allotment is above estimated capacity.
- Possible trampling of endangered cactus due to presence of livestock.
- Lack of implemented forage use guidelines.
- Degraded soil conditions (possible increase in sedimentation).

Consultation Period:

- 3 Years

LOACH MINNOW ON THE WILDBUNCH ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Wildbunch Allotment is bordered by the Blue River on the west and by the San Francisco River on the south. The Blue River joins the San Francisco at the southwest corner of the allotment. Approximate 68 percent of the allotment (15,789 acres) is within the Blue River watershed; 32 percent (7,281 acres) within the San Francisco watershed. All of the 7.5 miles of the Blue River within the Wildbunch Allotment is excluded from livestock; the San Francisco River is adjacent to, but not part of the allotment. Both rivers have been rested since 1994. On and adjacent to the allotment, embeddedness and bank cutting are moderate within the two rivers, and riparian conditions are considered at risk. However, regeneration of riparian species and stand structure diversity are improving since the exclusion of livestock. Mud Springs Canyon, Wildbunch Canyon, and Fritz Canyon are major drainages within the allotment, each a tributary of the Blue River. None of these canyons have substantial riparian areas within the allotment. The Wildbunch Allotment encompasses 17 percent of the lower Blue River watershed and 3 percent of the lower San Francisco watershed.

The Wildbunch Allotment is considered to be overstocked by as much as 50 percent. The latest range condition data is from 1967, when almost 90 percent of the allotment was rated in fair condition. Current range and watershed conditions are believed to be worse than indicated by the old data. Shrubs are in a clubbed condition, showing the effects from past overuse. Grazing management has been continuous year-long, with grassland areas receiving highest use. Utilization exceeds 60 percent in many areas, although in other portions of the allotment utilization appears to be within appropriate limits. Soils are very shallow, and degraded soil conditions persist on the allotment.

Blue River. The Blue River is a seriously degraded ecosystem. Aldo Leopold in 1921 called the Blue River "ruined" and cited it as an "extreme example" of human-caused erosion in the Southwest (Leopold 1921, Leopold 1946). Human uses of the river and its watershed in combination with natural flood flow events have resulted in extensive changes within the watershed and river channel. Miller (1961) indicated that as European settlement of the Blue River occurred around 1885 or 1886, the floor of the Blue River canyon was "well sodded and covered with grama grass, hardwoods, and pine," and the banks were "lined with willows and the river abounded with trout" (Leopold 1921). Olmstead (1919) refers to devastating floods that occurred from 1900 to 1906, which followed and contributed to the loss of floodplain terrains and other major changes to the elevation of the river by 1916. Periodic floods continue to erode remaining fields, homes, and roads (Coor 1992).

Flood destruction resulting in channel erosion was enabled and exacerbated by human activities on the watershed and streambanks (Chamberlain 1904, Olmstead, 1919, Leopold 1924a and 1924b, Bryan 1925, Leopold 1946, Miller 1961, Dobyns 1981, Coor 1992). Overgrazing depleted herbaceous cover of the watershed and streambanks thus increasing sedimentation, increasing the volume and decreasing the duration (e.g., big and fast) of high flows, and decreasing the volume while increasing the duration (e.g., small and long) of low flows. Timber harvest, fuelwood, and railroad tie cutting removed vegetative cover of the watershed, often resulted in eroding roads and tracks, and damaged the river channel when logs were rafted downstream during high water. Development of fields on river terraces removed stabilizing riparian vegetation and irrigation canals and headworks destabilized the channel and funneled floodwaters onto terraces causing them to erode. Roads and trails along the river contributed to erosional degradation, often resulting in new channels or widening of the existing channel. Cattle drives along the river broke down streambank soils and damaged riparian vegetation. The resulting stream channel is characterized by a wide, shallow channel profile, high levels of sediment, eroding banks, braided shifting channels, and depauperate, sparse riparian vegetation (Chamberlain 1904, Leopold 1921, Leopold 1924a and 1924b, Dobyns 1981, Coor 1992).

The Blue River has a bimodal high flow pattern: a snow-melt hydrograph with high flows in late-winter and spring, and a second high flow period associated with monsoon rains in later summer. The river is "flashy" with high discharge following summer storms. Erosion, channel width, and channel migration increase gradually in a downstream direction, while riparian vegetation becomes less dense and aquatic habitat diversity decreases, becoming mostly riffles and runs, with pools scarce and generally associated with bedrock walls. Increased flashiness of flood flows and depletion of base flows are results of reduction of vegetative and soil cover from the watershed, loss of floodplain terraces and soils, and reduction of riparian vegetation

(Ffolliott and Throud 1975, Dunne and Leopold 1978, DeBano and Schmidt 1989, Gebhardt *et al.* 1989, Meehan 1991, Gordon *et al.* 1992, Naiman 1992, Belsky and Blumenthal 1997). It is likely that these phenomena are partially responsible for the low base flow that currently exists in the upper Blue River.

Today, much of the Blue River channel is a wide, unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting, wide, shallow low-flow channel (Papoulias *et al.* 1989, Bagley *et al.* 1995). While most river terraces or benches are remnants of former river banks, recent improvement and healing of banks is evident in the lower reaches of the Blue River, including that portion of the river included within the Wildbunch Allotment. Riparian vegetation has responded to varying years of livestock exclusion ranging from 5 to 15 years, and no large flood events since 1993. There have been recent improvements in riparian vegetation composition and structural diversity. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), and cottonwood (*Populus fremontii*) seedlings and saplings. Some large cottonwoods and sycamore (*Plantanus wrighti*) are present, with willow increasingly common in the upper reaches where ponderosa pine (*Pinus ponderosa*) also enters the riparian corridor. Sedges (*Carex* spp.), which are a key element in stable streambanks, are increasing along much of the river.

The Blue River, like all streams in the Gila River basin, has been subject to introduction of a number of nonnative fish and other aquatic species. Nonnatives adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh and Brooks 1989, Marsh *et al.* 1989, Propst *et al.* 1992, Blinn *et al.* 1993, Carmichael *et al.* 1993, Douglas *et al.* 1994). Nonnative species reported in the Blue River during recent survey efforts include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Earlier surveys also found channel catfish (*Ictalurus punctatus*) (Anderson and Turner 1977, J.M. Montgomery Consulting Engineers 1985).

Present uses of the Blue River watershed and valley bottom continue to contribute to the deteriorated condition of the river. Timber harvest, roads, recreation, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Private lands in the system are concentrated in the upper 30 miles of river bottom. Some cropping and irrigated agriculture continues on remaining river terraces that have natural protection from flood erosion. There are a number of small diversion structures and irrigation canals. A private fish hatchery is operated along the upper Blue River at Bush Creek and a substantial proportion of the base flow is diverted into the hatchery. Subdividing of ranch lands and construction of residences or summer homes has occurred at a fairly low level. The Blue River Road (Forest Road 281) is a continuous source of bank and channel damage and erosion. Numerous low-water crossings exist in the upper Blue River and contribute to localized destabilization. Road maintenance results in significant modifications and impacts to the river. In the lower Blue, unauthorized off-road-vehicle use in the river bottom continues to occur. Livestock grazing in the valley bottom continues on private lands in the upper Blue. On the Clifton Ranger District, the river corridor is excluded from authorized livestock grazing. Grazing is permitted on the river on some Forest Service allotments in the Alpine Ranger District.

San Francisco River. 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 (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). 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, affected by conditions on upstream allotments, including the Wildbunch Allotment, is in much the same condition as the Blue River: channel width is generally too wide, with large expanses of unvegetated sand and rock cobble. The channel is continually subject to shifting, especially during periods of high flows. However, the lower portion of the San Francisco River on the Apache-Sitgreaves National Forest has been excluded from livestock use for several years. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), cottonwood seedlings and saplings, and the nonnative salt cedar (*Tamarix* sp.). Sedges (*Carex* spp.), rushes (*Juncus* spp.), bullrush (*Scirpus* spp.), and cattails (*Typha* sp.), which are a key elements to stablize streambanks, are present and increasing within the 22 mile portion of the San Francisco River corridor from the New Mexico stateline until leaving the National Forest. This includes about 9 miles of river corridor downstream from the confluence of the Blue River. Improved riparian function of these critical downstream elements have been documented in 1998 with the narrowing of channel and sediments trapped by bank vegetation. Present uses within the San Francisco River watershed, particularly in New Mexico, continue to contribute to adverse impacts within the riverine corridor, especially during periods of high flows.

The San Francisco River, like the Blue River and other streams in the Gila River basin, has also been subject to introduction of a number of nonnative fish and other aquatic species. Unlike the Blue River the San Francisco has a larger number of nonnative species, the most notable of which is the flathead catfish. However, native fishes still dominate in the San Francisco River.

Timber harvest, road, and grazing activities within the watershed continue to contribute to 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). A four-wheel drive road exists through a portion of the lower San Francisco River bottom, with numerous low-water crossings.

Loach minnow are known to occur in relatively low to moderate numbers throughout the 7.5 miles of Blue River within the Wildbunch Allotment (Bagley *et al.* 1995). The species is also present in the 6 miles of San Francisco River adjacent to the allotment, but relative abundance appears to be lower in comparison to the Blue River (J.M. Montgomery Consulting Engineers 1985, Bagley *et al.* 1995).

<u>Blue River.</u> For many years, information on the fish of the Blue River was poorly known. Surveys were few and tended to concentrate on the tributary streams (Chamberlain 1904, Anderson and Turner 1977, Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989). Anecdotal accounts from area residents recall that the Blue River formerly had "a lot" of fish, but now no longer does (Coor 1992). Recently, surveys of the Blue River system were conducted by Arizona Game and Fish Department in 1994 on the upper Blue River and by Arizona State University during 1995 and 1996 under funding from the Apache-Sitgreaves National Forests, on the lower river and tributaries (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). These surveys found loach minnow distributed throughout the Campbell Blue and Blue River system. In addition to loach minnow, the Blue River continues to support four other native fishes, the speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus* [*Pantosteus*] *clarki*), razorback sucker (*Xyrauchen texanus*), and Sonora sucker (*Catostomus insignis*). Based on historical records, the Service concludes that up to nine species, or 65% of the native fish species, have been extirpated from the Blue River in the past century.

The loach minnow was first documented from the Blue River in 1977 (Anderson and Turner 1977). The only earlier fish survey was in 1904 (Chamberlain) which did not find loach minnow. Several efforts since then have located loach minnow distributed in suitable habitat from the middle reaches of Campbell Blue Creek downstream to the confluence with the Blue River (Silvey and Thompson 1978, J.M. Montgomery Consulting Engineers 1985, Hendrickson 1987, Sheldon and Hendrickson 1988, Marsh *et al.* 1989, Papoulias *et al.* 1989, Arizona Game and Fish Department 1994, Bagley *et* *al.* 1995). Loach minnow were not found in any tributaries other than Campbell Blue Creek and in KP Creek just above its confluence with the Blue River. Recent surveys have found loach minnow to be relatively common, although it is not present at all sites and is the least abundant of the five native species (Arizona Game and Fish Department 1994, Bagley *et al.* 1995). Even where the densities are highest in the Blue River, loach minnow is still relatively scarce, rarely constituting more than 10%, and often less than 5%, of the fish population (Arizona Game and Fish Department 1994, Bagley *et al.* 1995).

Alteration of the Blue River watershed and simplification of the geomorphology of the Blue River affects loach minnow habitat in many ways. Discharge, velocity, instream water volume, water temperature, nutrient cycling, sedimentation, availability of larval backwater habitats, cobble/gravel riffles, food availability, and other factors have been altered.

<u>San Francisco River.</u> 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 minnow 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 (approximately 2.5 miles downstream of the confluence with the Blue River) (Bagley *et al.* 1995). 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.

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 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, Papoulias *et al.* 1989, Bagley *et al.* 1995). Eight native fishes (60%) have been extirpated from the San Francisco River over the past century and one-half. 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 conditions have prevailed, their occurrence is irregular and fragmented (Propst *et al.* 1988).

EFFECTS OF THE ACTION

Livestock do not have direct access to any known occupied or potential loach minnow habitat on the Wildbunch Allotment. Increases in sedimentation into the Blue and San Francisco rivers from the allotment are expected as a result of ongoing livestock grazing and alterations of runoff patterns. Stocking of the Wildbunch Allotment, while currently 50 percent of permitted numbers, remains 50 percent above estimated capacity. The major canyons within the Wildbunch Allotment feed into the Blue River; the Blue River into the San Francisco. Both the Blue and San Francisco rivers are in some state of impairment, both hydrologically and by habitat condition. Areas of unsatisfactory watershed and soil conditions, degraded range conditions, and over-utilization by livestock (and lack of current condition data) persist, and may be increasing on the allotment. These existing conditions, combined with continued livestock grazing, may contribute to altering the hydrologic regime (water quantity, quality, intensity, duration, and pattern) of tributaries of the Blue and San Francisco rivers, thereby increasing erosion and sedimentation into the rivers.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs et al. 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), alter streamflow, change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Some riffle habitats in the Blue River, and also in the San Francisco, that may otherwise be suitable loach minnow habitat may be unsuitable due to sediment deposition that eliminates the under-cobble pockets needed by loach minnow. The San Francisco River has a relatively higher embeddedness rating than the Blue River, especially above the confluence with the Blue (T. Myers, Apache-Sitgreaves National Forests, pers. comm. 1998). 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the Blue River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993), to increase storage of water in streambanks, and to dissipate the erosive energy of floodwaters (Dunne and Leopold 1978). The larger tributary streams on the Wildbunch Allotment, Mud Springs Canyon, Wildbunch Canyon, and Fritz Canyon, all drain to the Blue River. The canyons have limited riparian development, and are conduits for transport of sediments from degraded uplands. Although improvements in bank and riparian vegetation that traps and holds sediment from uplands has occurred on both riverine systems of the Blue and San Francisco rivers within and below the Wildbunch Allotment, these systems are functioning at risk. Continued improvement for riparian buffering of sediments from degraded upland watersheds needs to occur.

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Some effects to loach minnow and their habitat may be restricted within a small area, other effects extend downstream and may include loach minnow throughout the lower Blue River as well as the lower San Francisco River. The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The National Forest has been working to improve conditions along the Blue River corridor and has precluded livestock from the river channel on many allotments. However, the currently degraded ecological conditions of the Blue River watershed intensifies the significance of the additive deleterious affects from small actions that do not individually threaten the river, but cumulatively result in deterioration of the ecosystem. On the Wildbunch Allotment, upland range and watershed conditions have contributed to altering the hydrologic regime of the Blue River system. The Wildbunch Allotment is one of many allotments in the watershed with high proportions of impaired soils, fair to poor to very poor range condition, and unsatisfactory riparian areas. The allotment is suspected to be overstocked and grazing durations too long. The naturally fragile status of the watershed makes the Blue River even more sensitive to the affects of livestock management activities.

The Blue River is an extremely important native fish stream, and is a crucial part in the recovery of several species. Long-term conservation of the Blue River ecosystem and the loach minnow is more than the maintenance of status quo for the river. It may require restoring the system to the point where river flows return to a more natural hydrograph, floodplains rebuild with fine-soiled banks and terraces which provide habitat for dense riparian vegetation, and the base-flow channel narrows with steeply sloping or overhanging banks. Reversing the accumulation of affects of many Federal and private actions within the watershed, including ongoing livestock use, requires long-term commitments.

Aquatic conditions and riparian habitat function in the lower San Francisco River, although improving, remains unstable, at risk, and with past degradation evident. These conditions contribute to a reduce environmental baseline for loach minnow in the lower San Francisco River. The watershed of the San Francisco River is naturally fragile due to erosive soils, arid climate, and a naturally flashy hydrograph. Superimposed on that natural fragility are a number of human uses that exacerbate the problem by denuding vegetation, severely increasing erosion, and substantially increasing the flashiness of the hydrograph. These uses include timber harvest, water diversion, irrigated agriculture, residential and urban development, groundwater pumping, and roadbuilding, but the primary and widespread influence on the watershed has been livestock grazing. In livestock grazing allotments encompassing 70% of the area occupied by loach minnow in the San Francisco and Tularosa rivers, range and watershed indicators demonstrate poor vegetative and soil conditions, and of the 39 miles of the river for which condition data is available, 35% is rated as nonfunctional or at risk. As a result of these watershed disturbances, the San Francisco River has become unstable and the natural channel geography and aquatic habitats have become highly altered in any areas where the river is not confined by rock. In conjunction with the introduction of nonnative aquatic species, the instability and altered channel morphology of the river have changed aquatic habitats to the point that eight native fish species, 60% of the original community, have been extirpated. Most of the remaining native fishes have declined and loach minnow have become quite rare in many parts of the river.

The Forest Service is initiating conservation measures within the San Francisco River watershed: that ensure appropriate standards are applied to all Forest Service allotments for protection of stream habitats and upland watershed conditions; that appropriate forage utilization standards are applied; and that stocking rates are brought in-line with grazing capacity, along with measures to study, monitor, evaluate, and manage for recovery of listed fish species. These measures address major concerns about the health of riparian habitats of the loach minnow.

CUMULATIVE EFFECTS

Most of the land within the Blue River watershed is under the jurisdiction of the U.S. Forest Service and activities affecting the loach minnow, such as grazing and timber harvest, would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the river in the project area. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system. An aquaculture operation allows access of predatory nonnative fish species into the Blue River, diverts water from the river, and adds to the nutrient load of the river.

Lands along the San Francisco River are a mix of National Forest, Bureau of Land Management, State, and private lands. However, most of the river in Arizona is administered by the Apache-Sitgreaves National Forest. Upstream in New Mexico, the river crosses through the Gila National Forest. Substantial reaches of the San Francisco River in New Mexico are on private land. Non-Federal activities such as grazing, irrigated agriculture, and road construction and maintenance, occur on 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, and are associated with Federal allotments grazing.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Wildbunch Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Wildbunch Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Wildbunch Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding dead or impaired individuals is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions),and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the Blue River watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian conditions, and stream conditions) on the allotment within the Blue River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

The following Terms and Conditions implement reasonable and prudent measure number 1:

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

2. By March 1, 1999, initiate a watershed analysis of the entire Blue River watershed and at least that portion of the San Francisco River watershed within Arizona (and preferably to be coordinated with, and include the San Francisco

watershed within the Gila National Forest in New Mexico) to determine factors affecting stream flow (water quality, quantity, intensity, etc.). The purpose of this analysis is to better understand and disclose the effects (individual and cumulative) of ongoing human activities (including grazing) to existing resource conditions, identify information needed for future management decisions, and to identify and prioritize work activities which will have the greatest benefit to the loach minnow. The analysis will be developed in coordination with the Service and will be completed by September 30, 2000. The watershed analysis may be attained through an interdisciplinary team review of the best available information on various uses/activities and resource conditions within the watershed, with the focus on the status and effects to the listed species. This analysis should consider including: Terrestrial Ecosystem Surveys (TES); an activities analysis (evaluation of all program areas such as roads, recreation, livestock management, etc.); watershed, soil, range, and riparian condition assessment; and stream channel status and morphology (e.g., T-walk, proposed functioning condition, cross section transects, and any other tools as appropriate) to determine affects to the ecological condition of the Blue and San Francisco river watersheds. This watershed analysis may be incorporated into the NEPA process for grazing authorization.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary, any fences required to maintain the exclusion of livestock from the Blue and San Francisco rivers.

2. Protect the riparian/stream corridors in Mud Springs Canyon, Wildbunch Canyon, and Fritz Canyon from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the Blue River and San Francisco River watershed at the mid-point of livestock use, and until stocking rates are in line with capacity, at least every 10 days thereafter until livestock are removed from the pasture. Apply established and replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels,

source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. Continue the fish monitoring program for the Blue River established by the National Forest.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, livestock access the river corridors; monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Wildbunch Allotment

1. Consider excluding all livestock use from Mud Springs Canyon, Wildbunch Canyon, and Fritz Canyon.

2. In determination of available/capable grazing acreage, consider removing all impaired soil acres in calculating stocking levels. Given the broad range of the definition of impaired soils, certain areas may not be compatible with livestock use.

3. Implement the loach minnow recovery plan, as appropriate.

PEREGRINE FALCON ON THE WILDBUNCH ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Recovery of the peregrine falcon in the Rocky Mountain/Southwest Recovery Region has had great success. Within the Arizona portion of the recovery area, the population has been expanding with high rates of site occupancy, and high reproductive success (Burnham and Enderson 1987, Tibbitts and Bibles 1990, Tibbitts and Ward 1990a and 1990b, Enderson *et al*. 1991, Ward 1993). Recognizing the recovery of this species, the Service has published an advanced notice of intent to propose delisting the falcon (60 FR 34406).

The Wildbunch Allotment is bordered by the Blue River on the west and by the San Francisco River on the south. The Blue River joins the San Francisco at the southwest corner of the allotment. All of the 7.5 miles of the Blue River within the Wildbunch Allotment is excluded from livestock; the San Francisco River is adjacent to, but not part of the allotment. Both rivers have been rested since 1994. On and adjacent to the allotment, bank cutting is moderate within the two rivers, and riparian conditions are considered at risk. However, regeneration of riparian species and stand structure diversity are improving since the exclusion of livestock. The area is very rugged with many steep canyons. Mud Springs Canyon, Wildbunch Canyon, and Fritz Canyon are major drainages within the allotment, each a tributary to the Blue River. None of these canyons have substantial riparian areas within the allotment. Both the Blue and lower San Francisco rivers are seriously degraded, with wide, shifting river channels and largely unvegetated substrates of cobble, gravel, boulder, and sand. Riparian vegetation consists primarily of seep willow (*Baccharis salicifolia*), cottonwood seedlings and saplings, and the nonnative salt cedar (*Tamarix* sp.).

The Wildbunch Allotment has been overstocked by as much as 50 percent. The latest range condition data is from 1967, when almost 90 percent of the allotment was rated in fair condition. Current range and watershed conditions are believed to be worse than indicated by the old data. Grazing management has been continuous year-long, with grassland areas receiving highest use. Shrubs are in a clubbed condition, showing the effects from past overuse. Allowable use guidelines have been set but not enforced. Utilization has exceeded 60 percent in many areas, although in other portions of the allotment utilization appears to be within appropriate limits. Soils are very shallow, and degraded soil conditions persist on the allotment.

Several active peregrine falcon eyries are known to occur in the vicinity of the Blue and San Francisco river corridors. The closet known nest to the Wildbunch Allotment is along the San Francisco River, upstream approximately 3 miles. Also, peregrines were observed during the breeding season 2 to 3 miles upstream along the Blue River, but no nest was located. Another potential nest site is at Eagle Creek, approximately ten miles to the west. The National Forest estimated that as many as 95 different potential peregrine nest sites are spread out within the Blue River corridor. These sites and are defined, in part, as having vertical cliffs over 100 feet tall (J. Copeland, Apache-Sitgreaves National Forests, pers. com., April-May 1997). No peregrine falcons, breeding or otherwise, have been observed in the Wildbunch Allotment. Mountainous terrain with apparently suitable nesting cliffs are found within the allotment along the major river corridors, and perhaps in tributary canyons. Potential peregrine prey species (e.g., songbirds) occur throughout the allotment, with highest densities associated with canyon riparian areas. Limited surveys for peregrine falcon have been conducted in the general vicinity and none on the allotment. Therefore, there is a potential that breeding peregrine falcons may occur on the Wildbunch Allotment, and peregrines from upstream on the Blue and San Francisco rivers may forage in the vicinity of the Wildbunch Allotment.

EFFECTS OF THE ACTION

Grazing may affect avian abundance and species composition (e.g., falcon prey) in various vegetation types, depending on the intensity of grazing and how much the plant community is altered. Grazing can improve conditions for some species and decrease habitat quality for others (Bock *et al.* 1993). Peregrine falcons are prey generalists, and do not depend on only a small group of bird species for food. Furthermore, falcons forage over a large area (e.g., 10 miles) (Enderson *et al.* 1991). Therefore, livestock grazing can negatively affect peregrine falcons if the existing mosaic of vegetative attributes (e.g., structure and species composition) are simplified across the landscape. This could reduce the number of bird species and their abundance in the area, and reduce the prey base for the falcon.

Falcons hunt in both riparian and upland areas, although riparian areas may be used disproportionately more than their availability due to the greater densities and numbers of potential prey (Carothers 1974). The pasture containing the Blue River has been rested since 1994, and it will continue to be excluded from livestock use during this consultation period. The San Francisco River is just beyond the allotment's southern boundary, and it is fenced to exclude livestock from the Wildbunch Allotment. No other pastures are adjacent to or include either river. Therefore, the associated riparian areas will be protected from the direct effects of grazing.

No other substantial riparian areas occur within the allotment, but isolated pockets may occur within Mud Springs, Wildbunch Canyon, and Fritz Canyon drainages. These areas are not protected from livestock, and heavy grazing may occur in the absence of enforced utilization standards. The resultant simplification of vegetation structure and/or composition could eliminate or decrease the quality of habitat for bird species that require riparian vegetation to survive or reproduce (e.g., summer tanagers, yellow warblers). It probably would not attract species that otherwise would not be found on the allotment, although it could provide sufficient habitat for generalist species that are present within adjacent vegetation types (e.g., mourning dove). All this considered, it is possible that the prey base for falcons could decrease as a result of heavy utilization along these drainages.

Upland vegetation types constitute the majority of the allotment as well as the majority of the foraging area likely to be used by a falcon. Historically heavily grazed areas (such as are found on the Wildbunch Allotment) probably provide fewer food and cover sources for most species of birds than lighter or ungrazed areas. However, some generalist avian species may be relatively unaffected by this condition (e.g., mourning dove). Most of the uplands on the allotment are in degraded condition and are not expressing a mosaic of habitats. Poor upland watershed conditions alter surface runoff and subsequent changes to tributary and stream hydrologic patterns and loss of riparian vegetation diversity (e.g., structural and species). Implementation of grazing utilization standards and guidelines should improve vegetation conditions for the peregrine falcon's prey base.

Falcons could be disturbed by a variety of human actions that occur in close proximity to an eyre. Surveys have not been conducted on the allotment, so it is unknown whether or not the proposed fence maintenance or other activities would disturb nesting falcons.

CUMULATIVE EFFECTS

Most of the land within the Blue and San Francisco river watersheds is under the jurisdiction of the U.S. Forest Service, and activities affecting the peregrine falcon would be Federal actions which are subject to section 7 consultation. Recreation in the area is light to moderate and has localized impacts on the rivers. The primary cumulative effects come from private land use in the valley bottom on the upper Blue River and San Francisco. Livestock grazing, cropping and residential development on the floodplain terraces remove water from the river and add to the instability of the river system and its associated affects to riparian habitats.

The Wildbunch Allotment occurs in rough and relatively remote country. Very few activities other than grazing occur on the allotment. Recreational use is very low, and consequently, disturbance to falcons (if they occur on the allotment) is expected to be uncommon or non-existent.

CONCLUSION

After reviewing the current status of the peregrine falcon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the

Service's biological opinion that the ongoing grazing activities on the Wildbunch Allotment are not likely to jeopardize the continued existence of the peregrine falcon. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Peregrine Falcon on the Wildbunch Allotment

The Service does not anticipate that the proposed action will take any American peregrine falcons.

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

CONSERVATION RECOMMENDATIONS - Peregrine Falcon on the Wildbunch Allotment

1. Consider undertaking a larger scale approach to surveys for peregrine falcons. Evaluate potential nesting habitat within the Blue River watershed and then survey these potential sites (this could provide additional support for the upcoming delisting proposal).

2. Implement the peregrine falcon recovery plan, as appropriate.

ARIZONA HEDGEHOG CACTUS ON THE WILDBUNCH ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Cedar Creek Associates (1994, and *in* Tonto National Forest 1996) has estimated that there are over 250,000 individual Arizona hedgehog cacti within the area considered to be the main distribution (type locality) of the species in the vicinity of Globe/Miami, Arizona. However, this estimate does not include up to several thousand known plants and potentially many more occurring in satellite populations disjunct from the main distribution, or cacti that may be Arizona hedgehog cactus in east-central and southeastern Arizona.

The Bureau of Land Management reports finding cacti that appear to be Arizona hedgehog in east-central and southeastern Arizona, and that there is over 300,000 acres of potential habitat on Bureau lands (Bureau of Land Management 1996).

Potential habitat for this cactus also extends across the southern portion of the Clifton Ranger District, Apache-Sitgreaves National Forest. The cactus appears to be widespread in this area, although only very limited surveys have been conducted.

Although the Arizona hedgehog cactus has been tentatively identified within the Wildbunch Allotment, no surveys have been conducted. Potential habitat within the allotment may include as many as 22,762 acres, based on vegetation type and topography; but not verified by survey.

EFFECTS OF THE ACTION

Livestock grazing may affect Arizona hedgehog cactus through trampling of plants and/or habitat degradation. However, due to the microhabitat in which Arizona hedgehog cactus are typically found - boulders, rock crevices, steep-walled canyons, and rocky slopes - physical damage to cacti and habitat degradation due to grazing are less likely than in habitats more accessible to cattle. 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. Heavy grazing and high stocking rates increase the probability of trampling, especially of younger specimens, 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 increase under poor range conditions as livestock seek forage in more rugged areas.

To what extent grazing may directly or indirectly effect Arizona hedgehog cactus due to habitat degradation has not been studied. However, grazing practices can change vegetation composition and abundance, cause soil erosion and compaction, damage cryptobiotic crusts, and reduce water infiltration rates and increase surface runoff (Klemmedson 1956, Ellison 1960, Arndt 1966, and Gifford and Hawkins 1978, Belnap 1992), leaving less water available for plant production (Dadkah and Gifford 1980). The relatively large proportion of potential Arizona hedgehog cactus habitat in east-central and southeastern Arizona on Forest Service and Bureau of Land Management administered grazing allotments in fair, poor, or very poor range condition with degraded watersheds, suggests current grazing practices contributes to adverse affects on vegetation communities and the structure and function of ecosystems.

The potential for adverse affects to Arizona hedgehog cactus and its habitat due to ongoing livestock grazing activities increases as stocking rates increase, and range conditions decrease. The Wildbunch Allotment is currently overstocked by as much as 50%, range conditions are fair with a downward trend, and forage utilization levels exceeds 60% in many areas. The lack of Arizona hedgehog cactus survey information makes the extent of potential trampling impossible to determine.

CUMULATIVE EFFECTS

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 a 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 Federal involvement may also adversely affect the cactus.

CONCLUSION

After reviewing the current status of the Arizona hedgehog cactus, the environmental baseline, the effects of the proposed action, and available information on cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Wildbunch Allotment are 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 - Arizona Hedgehog Cactus on the Wildbunch Allotment

1. Determine the appropriate livestock stocking level for the Wildbunch Allotment; apply forage utilization standards appropriate to the vegetation type and range conditions; monitor livestock use, and move livestock from pastures when indicated.

2. Continue cooperative efforts to determine the taxonomic status of the apparent Arizona hedgehog cactus on Clifton Ranger District allotments, and provide funding for genetic studies.

3. If genetic and morphological studies confirm that cacti on the allotments are *Echinocereus triglochiadiatus* var. *arizonicus*, the National Forest should determine the distribution and monitor the status of the cactus on Forest Service lands.

WILLIAMS VALLEY ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:

- Apache-Sitgreaves National Forest, Alpine Ranger District

Allotment Acres:

- 13,139 total
- 11,951 full/potential capacity range

Projected Stocking Density

- 1,025 animal months
- 11.6 acres per animal month

Permitted Use:

- 205 cow/calf, 6/1-10/31

Projected Use:

- 205 cow/calf, 6/1-10/31

Major Vegetation Type:

- Ponderosa pine, grassland/meadow

Major Drainages:

- East Fork of the Black River
- Coyote Creek
- San Francisco River

Elevation:

- 8,000 to 9,600 feet

Type of Grazing System:

- 4 pasture deferred rotation
- Cattle trailed across Boneyard Allotment to Addition Pasture

Allotment Condition:

- 1987 TES indicates that most of the allotment is in satisfactory soil condition.
- 1998 inspection indicates that all of the allotment is in poor range condition.

Listed Species Adversely Affected:

- Loach minnow

Ecological condition and/or management action that contributes to adverse effects:

- Livestock grazing in the Addition Pasture generates sediments that enter Coyote Creek, which flows into the East Fork of the Black River.

Consultation Period

- 2 Years

LOACH MINNOW ON THE WILLIAMS VALLEY ALLOTMENT

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Although loach minnow do not occur within the boundary of the Williams Valley allotment, almost the entire allotment is within watersheds of rivers that, at some point, are inhabited by the species. The eastern portion of the allotment, including the Tal-wi-wi, Noble Mountain, and Williams Valley pastures, essentially forms the upper-most headwaters of the San Francisco River. Loach minnow occur in the San Francisco River about 35 miles downstream from the allotment, in the vicinity of Reserve, New Mexico. Luna Lake, a man-made reservoir on the San Francisco River, is located about 5 miles downstream of the allotment (about 30 miles upstream of the occupied habitat near Reserve) and likely functions to collect most of the sediments that may originate from the allotment. Because of this, populations of loach minnow in the San Francisco River are not considered within the action area of the Williams Valley allotment.

The disjunct western portion of this allotment (Addition Pasture) includes the downstream portion of the Coyote Creek watershed, which drains into occupied habitat in the East Fork of the Black River just downstream of the area known as Three Forks of the Black River. Coyote Creek, as it leaves the Addition pasture, is about 0.7 miles from the East Fork of the Black River. An unnamed tributary of the East Fork of the Black River drains a portion of the Addition Pasture, joining the East Fork of the Black River downstream of Coyote Creek and above Open Draw.

On the Williams Valley Allotment, range condition in all areas is poor, with low plant vigor. Elk contribute to heavy forage utilization on the allotment. Active erosion is occurring, although the soil condition is satisfactory across 91% of the allotment. The satisfactory soil condition may reflect the overall forested nature of the allotment and the resulting presence of pine needles on the soil surface. On the Addition Pasture, sediments in overland runoff may be filtered somewhat by the litter accumulated in forested areas. Tanks located in small drainages on the pasture may capture some sediments and prevent them from entering the East Fork of the Black River. However, livestock are not restricted from accessing Coyote Creek or any of the other drainage bottoms within the Addition Pasture. In addition, about half of the approximately 2 miles of Coyote Creek on the Addition Pasture is an incised channel running through a heavily impacted grassland/meadow and likely does not function as an effective sediment filter/buffer. Sediments generated from the cutbanks directly enter the drainage channel. Sediments generated in these areas would have little opportunity to be removed from runoff prior to entering the East Fork of the Black River.

The National Forest has implemented several erosion control structures to reduce sediment transport into the East Fork of the Black River from Coyote Creek.

Loach minnow do not occur within the boundary of the Williams Valley Allotment. However, in 1996, the species was discovered in the North Fork of the East Fork of the Black River, near Three Forks of the Black River. This population is at the highest known elevation for loach minnow, approximately 8,400 feet. Based on additional sampling in 1997, it appears that the population of loach minnow in the East Fork of the Black River extends from about 1 mile downstream of the Coyote Creek confluence (approximately at the confluence with Open Draw), and upstream in the North Fork of the East Fork of the Black River to about the confluence with Boneyard Creek (about 2.5 miles total). Potential loach minnow habitat may extend downstream in the East Fork of the Black River an unknown distance; upstream, potential habitat includes lower Boneyard Creek and lower Coyote Creek.

The population of loach minnow in the East Fork of the Black River is considered within the action area of ongoing livestock grazing within the Addition Pasture of the Williams Valley Allotment. Occupied loach minnow habitat in the East Fork of the Black River is 0.7 miles from the allotment boundary down Coyote Creek. Approximately 1.7 miles of occupied loach minnow habitat is considered to be affected by the Addition Pasture; from the confluence area with Coyote Creek, downstream. Nonnative aquatic species within the East Fork of the Black River may impact the loach minnow. Brown trout and brook trout are active fish predators, fathead minnow may compete for habitat with the loach minnow, and crayfish add to sedimentation problems. Degraded watershed conditions due to roads and livestock management, and nonnative species appear to be the greatest threats to this small population of loach minnow. Periodic flooding that cleans riffles of embedding sediments is important to the survival of loach minnow.

EFFECTS OF THE ACTION

Ongoing livestock grazing activities on the Addition Pasture of the Williams Valley Allotment generates sediments and/or nutrients that degrade occupied loach minnow habitat in the East Fork of the Black River. If effectively implemented, the allowable use level of 25% may increase the capability of the herbaceous ground cover to filter sediments in the future. Degraded watersheds due to over-utilization of forage by livestock and wildlife, and active erosion of stream channels exacerbated by the presence of livestock in the channel, may contribute to altering the hydrologic regime (water quality, quantity, intensity, duration, and pattern) of Coyote Creek, thereby increasing erosion and sedimentation into occupied loach minnow habitat in the East Fork of the Black River and downstream. The accumulation of sediments in the interstitial spaces of cobbles and gravels in riffle habitats is especially detrimental to successful reproduction of loach minnow, and impacts the invertebrate food base.

The effects that livestock management activities can have on riparian and aquatic habitats, both direct and through upland/watershed effects, have been well documented and discussed in recent years (Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994). Livestock grazing activities in the uplands can contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown *et al.* 1974, Gifford and Hawkins 1978, Johnson 1992). Reduced herbaceous vegetation leads to accelerated soil loss due to increased exposure of soils to downpour events and reduced sediment filtering capabilities of the vegetation (Erman *et al.* 1977, Mahoney and Erman 1992, Osborne and Kovacic 1993). Hoof action can cause loss of cryptobiotic soil crusts, soil compaction, erosion, and gullying (Harper and Marble 1988, Marrs et al. 1989, Orodho *et al.* 1990, Schlesinger *et al.* 1990, Bahre 1991, Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). Overuse of vegetation by livestock can cause changes to plant root structures, and alter plant species composition and overall biomass (Martin 1975, Menke 1988, Vallentine 1990, Popolizio *et al.* 1994). These conditions may increase sediment delivery into the stream (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994), change the way in which flood flows interact with the stream channel, and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation.

Sediment deposition may eliminate the under-cobble pockets needed by loach minnow, making potential habitat unsuitable. 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, Waters 1995, Newcombe and Jensen 1996). Excessive sediment may smother invertebrates, reducing fish food production and availability. Excessive sediment buries gravel, cobble, and coarse sand substrates. Loach minnow and their eggs are particularly vulnerable to substrate sedimentation that reduces available habitat and smothers eggs (Propst *et al.* 1988).

Sedimentation from tributary canyons and streams leading to the East Fork of the Black River contributes to the condition of the river downstream. The riparian vegetation and streambank condition in tributaries, including intermittent and ephemeral channels, form important buffers between upland impacts and the mainstem or perennial stream. A healthy riparian zone with substantial herbaceous cover is a very effective buffer for filtering sediment and pollutants before they can reach the stream (Erman *et al.* 1977, Mahoney and Erman 1981, Lowrance *et al.* 1984, Bisson *et al.* 1992, Osborne and Kovacic 1993). The riparian vegetation also serves to reduce streambank erosion (Thomas *et al.* 1979, Heede 1985, Stromberg 1993).

The short lifespan of the loach minnow, coupled with the comparatively low fecundity of the species and small population in the East Fork of the Black River, makes it vulnerable to serious adverse effects from activities which may only impact the species' habitat for relatively short time periods, especially during the spawning season. Any situation that eliminated or greatly reduced a year-class would severely deplete recruitment to a population. For example, excessive sedimentation during the spawning season might suffocate a large portion of that year's reproductive effort. In the succeeding year, total reproductive effort would be diminished. The net effect would be a major reduction in population size (Propst *et al.* 1988).

Loach minnow are adversely affected by activities which contribute to altering the flow regime (water quality, quantity, intensity, and duration), degrading the stream channel, and modifying the floodplain and riparian vegetation structure and diversity. These impacts occur at all levels of cattle presence, regardless of season, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). The way in which the effects of livestock grazing are manifested and the magnitude of the effects in the watershed, is dependant on local site conditions. Range condition, considered together with soil, watershed, and riparian condition, is assumed to be closely correlated with ecological condition and function. Watershed/ecological effects of grazing are generally expected to be more evident where stocking levels are high, soils are impaired, and/or rangelands are in fair, poor, or very poor condition.

The loach minnow population in the East Fork, and North Fork of the East Fork of the Black River is small, and may be highly sensitive to environmental perturbations (e.g., altered stream flow, sedimentation, water temperatures). This is the highest elevation site known for the species. In order to interpret the ramification of management actions, ecological/biological information on the species is needed, especially related to spawning periods. Any direct monitoring of the loach minnow population must be undertaken very cautiously.

The combined affects of livestock management activities associated with the Boneyard, Nutrioso Summer, Williams Valley, Black River, and other allotments in the watershed, contribute to a very serious situation regarding the viability of the loach minnow population in the East Fork of the Black River. The historic management of these allotments in sum, has resulted in alteration of the hydrologic regime and contributes to deterioration of the ecosystem. There have been recent efforts by the National Forest to ameliorate some of the erosion and sedimentation problems aggravated by ongoing livestock grazing activities on these allotments. The National Forest is developing plans for the construction of sediment traps and erosion control structures. In addition, the Black River Allotment, which includes occupied loach minnow habitat at Three Forks, has been rested pending future consultation with the Service. These actions are a good start, have the potential to measurably benefit the ecosystem, but need to be monitored to determine their effectiveness. Continued assertive management by the National Forest is necessary in order to not further risk the survival and recovery of the loach minnow in the East Fork of the Black River.

CUMULATIVE EFFECTS

The majority of the East Fork of the Black River watershed is administered by the Forest Service. Several past factors are likely to have affected the watershed and tributary streams, including Coyote and Boneyard creeks; they include roads, timber harvest, livestock grazing, fire occurrence, fire suppression, recreation, prairie dog eradication, past CCC Camp activities at Three Forks, invasion of nonnative Kentucky bluegrass (*Poa pratensis*) in the wet bottoms, and the presence of nonnative aquatic species that may compete with or feed on loach minnow. Elk may have some affect on the water quality. Numerous small, private inholdings within the National Forest also affect watershed conditions. The Boneyard Springs complex is on private land. However, many of the private inholdings are associated with a Federal livestock permit. With the exception of some actions associated with private inholdings, most activities within the East Fork of the Black River watershed would have some Federal involvement requiring section 7 consultation.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the ongoing grazing activities on the Williams Valley Allotment are not likely to jeopardize the continued existence of loach minnow. No critical habitat is designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT
Loach Minnow on the Williams Valley Allotment

See also the following section called, "Continuation of Incidental Take Statement," for background, definitions, and implementation and review requirements of incidental take.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The primary type of take of loach minnow expected to result from the ongoing grazing activities on the Williams Valley Allotment is harm, which occurs through the effects to habitat that alter the suitability of the habitat to support loach minnow. The Service anticipates, however, that incidental take of loach minnow associated with the proposed action cannot be directly quantified and will be difficult to detect for the following reasons: finding a dead or impaired specimen is unlikely; and losses may be masked by seasonal fluctuations in environmental conditions and fish numbers. Therefore, the Service defines incidental take in terms of habitat characteristics, and is using this surrogate measure to identify when take has been exceeded. The Service concludes that incidental take of loach minnow from the proposed action will be considered to be exceeded if any of the following conditions are met:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through improvements in watershed, soil condition, trend and condition of rangelands (e.g., vegetative litter, plant vigor, and native species diversity), riparian conditions (e.g., vegetative and geomorphologic: bank, terrace, and flood plain conditions), and stream channel conditions (e.g., channel profile, embeddedness, water temperature, and base flow) within the natural capabilities of the landscape in all pastures on the allotment within the East Fork of the Black River watershed.

2. Required monitoring and reporting of livestock utilization levels are not completed within the designated time frames.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the loach minnow.

REASONABLE AND PRUDENT MEASURES

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

1. Actions will be taken to improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the allotment within the East Fork of the Black River watershed.

2. Reduce direct impacts to stream courses and aquatic habitats from livestock management activities.

3. Monitor grazing activities resulting in incidental take. Report findings to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Forest Service must comply with the following Terms and Conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions are nondiscretionary.

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

1. By September 30, 2000, determine the livestock capacity for the allotment using an agency approved method of capacity determination. Capable rangeland should take into account slope, distance to water, existing range conditions, production of palatable forage, and accessibility by livestock. The capacity determination should clearly address wild ungulate use and needs, and range, riparian, watershed, and soil condition. If ongoing monitoring does not continue to show improvement or maintenance of good or better status during the period covered by this consultation, evaluate the on-going grazing management and identify and implement changes as appropriate.

The following Terms and Conditions implement reasonable and prudent measure number 2:

1. As livestock rotate among pastures, check and repair as necessary all fences required to maintain the exclusion of livestock from the tributaries of the East Fork of the Black River.

2. For 1999, protect the riparian/stream corridors of Coyote Creek and its main tributaries from overuse. This can be accomplished through close monitoring of utilization levels, herding by a range rider, or fencing.

3. Before livestock turn-out in 1999, exclude livestock access to the riparian/stream corridor of Coyote Creek and main tributary channels in the Addition Pasture on the Williams Valley Allotment.

The following Terms and Conditions implement reasonable and prudent measure number 3:

1. Monitor forage utilization (or equivalent, e.g., stubble height) on pastures within the East Fork of the Black River watershed during the grazing season and within three weeks after the livestock grazing season ends. Apply established and

replicable methods to measure utilization. Design forage utilization monitoring so that the effects of grazing on key areas and key species can be measured. When forage utilization levels, based on amended Forest Plan direction, are met, livestock are moved from the pasture. Apply turnout (range readiness) criteria prior to pasture entry. Key areas are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment). Provide field data sheets, key species monitored, locations of key areas, analysis summaries, turnout criteria, and target utilization limits to the Service annually at least 30 days prior to issuance of the Annual Operating Plan.

2. Continue the fish monitoring program established by the National Forest, expand to include surveys for loach minnow downstream of occupied habitat in the East Fork of the Black River, and upstream in Coyote and Boneyard creeks. All work is to be accomplished by a journey-level fishery biologist (or equivalent). As necessary, assess the status of the loach minnow population at Three Forks, work to ascertain spawning season information, and coordinate with other fish survey efforts. This is a small population of loach minnow and may be susceptible to adverse affects from over sampling.

3. All monitoring required as part of this incidental take statement, and reporting of the effectiveness of the Terms and Conditions shall be completed annually, and submitted to the Arizona Ecological Services Field Office at least 30 days prior to the issuance of the Annual Operating Plan. This report shall summarize for the previous calendar year: 1) application and effectiveness of the Terms and Conditions; 2) documentation of direct take, if any; 3) utilization monitoring summary and analysis; 4) fish monitoring data; 5) progress made toward completion of multi-year Terms and Conditions; and 6) any suggestions for improving how Terms and Conditions are to be applied. If, at any time, expected monitoring results are not accomplished (e.g., utilization levels exceeded, monitoring is not completed on schedule) report these findings and any corrective actions taken to the Service within 15 days.

CONSERVATION RECOMMENDATIONS - Loach Minnow on the Williams Valley Allotment

1. Excluding all livestock use from Coyote Creek and main tributaries.

2 Consider resting Addition Pasture within the Coyote Creek drainage until raw stream channels and banks are healed.

3 Coordinate with the Arizona Game and Fish Department to consider ways to address high utilization levels of elk.

4. Implement the loach minnow recovery plan, as appropriate.

WINGATE ALLOTMENT

DESCRIPTION OF THE PROPOSED ACTION

Administration Unit:
- Cibola National Forest, Mt. Taylor Ranger District

Allotment Acres:
- 29,443 total
- 13,688 full/potential capacity range

Projected Stocking Density
- 615 animal months
- 22.2 acres per animal month

Permitted Use:
- 123 cow/calf, 5/16-10/15

Projected Use:
- 123 cow/calf, 5/16-10/15

Major Vegetation Type:
- Pinyon/juniper, ponderosa pine

Major Drainages:
- South Fork Puerco

Elevation:
- 6,000 to 8,500 feet

Type of Grazing System:
- 3 pasture deferred rotation

Allotment Condition:
- 1977 Range condition data indicate that most of the allotment is in very poor to poor condition.

Ecological condition and/or management action that contributes to adverse effects:
- Possible use of listed plant species when other more palatable forage is lacking.

Consultation Period:

- 3 Years

ZUNI FLEABANE ON THE WINGATE ALLOTMENT

STATUS OF THE SPECIES (rangewide)

The Zuni mountain populations of the Zuni fleabane (*Erigeron rhizomastus*) reside within watersheds that drain into the Little Colorado River. There are unconfirmed reports of the plant's occurrence near Window Rock, Arizona, on the Navajo Nation. The Zuni population is found on Chinle shales where the potential for disturbance by uranium prospecting is not as high as on the Baca formation in the Sawtooth and Datil mountains to the south. While the numbers of the fleabane are not as large in the Zuni Mountains as those in the Sawtooth and Datil mountains, their populations can be described as vigorous and healthy.

Mountain biking/off road bike racing and extreme mountain biking have become popular in the west end of the Zuni Mountains. ATV use and off-road vehicle driving are increasing in intensity. The steep, vegetation-free areas associated with this plant are attractive to bikers and ATV operators. Management of deer areas and for other threatened species designed to minimize impacts has met with great resistance by groups associated with these uses.

Unless a price increase in uranium creates a resurgence in uranium prospecting, threats due to disturbance from this activity will remain only a potential.

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

The Zuni fleabane has been known from the Wingate Allotment since it was first collected by Rupert Barneby in 1943. Little was known of the extent of the populations until surveys in the late 1970s but it is now expected that few new locations will be found on lands within the National Forest. The Wingate Allotment contains the fleabane population where livestock were noted to have grazed on a small number of plants near a windmill in 1989. The plants were subsequently fenced in the early 1990s. A total of 123 mixed class livestock graze in a deferred rotation system from mid-May to mid-October each year. Use levels within the allotment were analyzed in depth in 1997 and were found to be within Cibola Land and Resource Management Plan standards for upland areas. These levels should be more than adequate to provide protection for the unfenced fleabane within the allotment, particularly since it is normally unpalatable.

CONCURRENCE

Section 7 regulations at 50 CFR 402.14(b) provide that a Federal agency need not initiate formal consultation if the agency determines, with the written concurrence of the Service, that the proposed action is not likely to adversely affect listed species or critical habitat. The Forest Service made a determination that the ongoing grazing activities on the Wingate Allotment may affect, not likely to adversely affect the Zuni fleabane. The Service herein concurs with this determination for the following reasons: stocking of the Wingate Allotment appears to be within estimated capacity of the range; and utilization levels are within appropriate limits; a portion of the Zuni fleabane population is fenced, and the fleabane is considered unpalatable under most circumstances.

CONTINUATION OF INCIDENTAL TAKE STATEMENTS

General Incidental Take Provisions

Sections 4(d) and 9 of the Endangered Species Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding 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 an applicable incidental take statement.

Sections 7(b)(4) and 7(o)(2) of the Endangered Species Act do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the Act requires a Federal permit for removal or reduction to possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of violation of a State criminal trespass law.

Migratory Bird Treaty Act

To the extent that this incidental take statement concludes that take of any threatened or endangered species of migratory bird will result from the agency action for which consultation is being conducted, 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 USC sec.s 703-712) or the Bald Eagle Protection Act of 1940, as amended (16 USC sec.s 668-668d), if such take is in compliance with the Terms and Conditions (including amount and/or number) specified herein.

CONTINUATION OF CONSERVATION RECOMMENDATIONS

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

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 of the conservation recommendations.

CONCLUSION

After reviewing the current status of the species affected, the environmental baseline for the action area, the effects of the proposed ongoing livestock grazing management activities on 22 grazing allotments, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is likely to jeopardize the continued existence of the spikedace and the loach minnow. No critical habitat is designated for these species; therefore, none will be affected. This conclusion of jeopardy is based on the impacts associated with ongoing management of the Sapillo Allotment. The summed effects to these species from the proposed action on the other 21 allotments do not reach jeopardy.

It is also the Service's biological opinion that the proposed action will not jeopardize the continuing existence of the Little Colorado River spinedace, Sonora chub, razorback sucker, American peregrine falcon, Mexican spotted owl, lesser long-nosed bat, and Arizona hedgehog cactus, or destroy or adversely modify designated critical habitat for any species. The conclusion of the preceding analyses for each species considered for each individual allotment was that the proposed action is not likely to jeopardize the continued existence of the species or destroy or adversely modify any designated critical habitat. This same conclusion applies to the summed effects of all of the actions considered in this biological opinion.

Because this biological opinion has found jeopardy for the spikedace and loach minnow, the Forest Service is required to notify the Service of the agency's final decision on the implementation of the reasonable and prudent alternatives.

REINITIATION STATEMENT

This concludes formal consultation on the actions outlined in the request for initiation of consultation. As provided in 40 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates your consideration of threatened and endangered species, and the significant work which has been accomplished in removing and/or ameliorating adverse affects from ongoing livestock grazing activities throughout the Southwest Region of the Forest Service. Please refer to consultation number 000091RO in future correspondence referencing this consultation.

Sincerely,

Regional Director

cc: Field Supervisor, Ecological Services Field Office, Albuquerque, NM
Field Supervisor, Ecological Services Field Office, Phoenix, AZ
Chief, Endangered Species, Region 2, Albuquerque, New Mexico
Director, New Mexico Department of Game and Fish, Santa Fe, NM
Director, Arizona Game and Fish Department, Phoenix, AZ

Appendix

Primary Headings of This Document and Brief Description of Each

CONSULTATION HISTORY AND BACKGROUND

PREVIOUS CONSULTATIONS AND RELATIONSHIP TO ONGOING GRAZING

This describes aspects of previous section 7 consultations with the Forest Service on Forest Plans and amendments regarding the grazing program. This provides the management context under which the site-specific consultation was conducted.

BIOLOGICAL ASSESSMENT AND CONSULTATION PROCESS

This documents the of exchange of information between the Service and Forest Service, including time lines, process, and procedures.

STATUS OF THE SPECIES

For each species considered within this document, background information is provided, including description of the species, life history information, and range-wide distribution and status.

ALLOTMENT BY ALLOTMENT ANALYSIS AND BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Summary descriptions of the specific management actions and the action area included as part of the ongoing grazing activities on the allotment.

SPECIES ON THE ALLOTMENT

Each species on the allotment for which there has been an individual determination of effect is treated separately, followed by the next species (as necessary) on the allotment.

ENVIRONMENTAL BASELINE

Status of the Species (in the action area)

Information on the local distribution and status of the species is presented. 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.

EFFECTS OF THE ACTION

Analysis of how the proposed action affects the species is provided.

CUMULATIVE EFFECTS

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

CONCLUSION

The Service's opinion regarding whether the aggregate effects of the environmental baseline, effects of the action, and cumulative effects in the action area, when viewed against the status of the species, are likely to jeopardize the continued existence of the species or result in adverse modification of critical habitat.

REASONABLE AND PRUDENT ALTERNATIVES (as necessary)

Under a jeopardy opinion, this is a nondiscretionary project alternative necessary to avoid the likelihood of jeopardy to the species or destruction or adverse modification of critical habitat.

INCIDENTAL TAKE STATEMENT (animals only)

Provides exemption from section 9 of the Act, which prohibits "take" of listed species, for incidental take associated with the action. Implementation of Terms and Conditions to minimize take is nondiscretionary. See "Continuation of Incidental Statements" for background, definitions, and implementation and review requirements of incidental take. The components of the take statement are: Amount of Take, Effect of Take, Reasonable and Prudent Measures, and Terms and Conditions.

CONSERVATION RECOMMENDATIONS

Recommendations by the Service to the action agency on furthering the conservation of listed species. Implementing these recommendations are discretionary on the part of the action agency. See "Continuation of Conservation Recommendations."

CONCURRENCES (as needed)

The agreement by the Service with the action agencies' determination that the proposed action <u>may affect, not likely to adversely affect</u> a listed species. Under a Service concurrence, the above components of a biological opinion are not required.

CONTINUATION OF INCIDENTAL TAKE STATEMENTS

A continuation of incidental take statements found in the biological opinions of each allotment.

CONTINUATION OF CONSERVATION RECOMMENDATIONS

A continuation of conservation recommendations found in the biological opinions of each allotment.

REINITIATION/CLOSING STATEMENT

Requirements for reconsultation with the Service.

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