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In Reply Refer To:
AESO/SE
2-21-01-F-189 November 30, 2001

Mr. John C. Bedell
Forest Supervisor
Apache/Sitgreaves National Forest
P.O. Box 640
Springerville, Arizona 85938-0640

Dear Mr. Bedell:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion and conference opinion based on our review of the proposed reauthorization of livestock grazing on the Pleasant Valley Allotment, Clifton Ranger District, Apache-Sitgreaves National Forest located in Greenlee County, Arizona, and its effects on loach minnow (*Tiaroga cobitis*), spikedace (*Meda fulgida*), Mexican spotted owl (*Strix occidentalis lucida*), Southwestern willow flycatcher (*Empidonax trailii extimus*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Arizona hedgehog cactus (*Echinocereus triglochiadatus* var. *arizonicus*), razorback sucker (*Xyrauchen texanus*), bald eagle (*Haliaeetus leucocephalus*), Mexican gray wolf (*Canis lupus baileyi*), and Chiricahua leopard frog (*Rana chiricahuensis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your February 26, 2001, request for formal consultation was received on February 27, 2001.

This biological opinion is based on information provided in the February 23, 2001, Biological Assessment and Evaluation (BAE) (USFS 2001a), Proper Functioning Condition (PFC) Standard Checklists, a February 21, 2001, in-service memorandum provided by the Forest Service, the March 16, 2001, updated razorback sucker information provided via e-mail by Terry Myers, the May 3, 2001, Pre-decisional Environmental Assessment (PEA) (USFS 2001b), telephone conversations and/or electronic mail transmissions with Randall Chavez, Range Conservationist for the Clifton Ranger District, field investigations conducted on September 13, 2001 by Service personnel, comments provided by the Forest Service on the draft opinion, dated August 10, 2001, additional information provided by the Forest Service relevant to the southwestern willow flycatcher dated October 4, 2001, Proper Functioning and Condition assessment summaries provided by the Forest Service on November 6, 2001, and other sources of information. A complete administrative record of this consultation is on file at this office.

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CONSULTATION HISTORY

The Forest Service initially consulted on this Allotment in Biological Opinion 000089RO as part of a larger consultation on 21 allotments. The Service and Forest Service concluded, with respect to loach minnow, that take would occur but would be unquantifiable, and that it would not jeopardize the continued existence of the species. Additional species were consulted on as well. The Forest Service was subsequently ordered by a Federal judge to reconsult with the Service on the effects of grazing on the spikedace and loach minnow on six allotments in Arizona and New Mexico, including the Pleasant Valley Allotment (Center for Biological Diversity v. U.S. Forest Service, 97-666 TUC JMR). As noted above, the initial request for consultation was received on February 27, 2001, and included the BAE (USFS 2001a). The Service subsequently requested additional maps for the proposed project area. These maps were received on March 15, 2001. Consultation was initiated on February 28, 2001, as noted in our March 16, 2001, 30-day letter. The Forest Service notified the Service on March 5, 2001, that the Pleasant Valley Allotment allottees, Abelardo R. and Lydia G. Martinez, have been granted applicant status for purposes of this section 7 consultation. Additional information was provided in the PEA, dated May 3, 2001, which was received by the Service on May 7, 2001. After further review of the information provided on southwestern willow flycatcher, the Service notified the Forest Service on June 4, 2001, that we could not concur with their determination of "is not likely to adversely affect". The Forest Service replied on June 14, 2001, indicating that the Service should proceed with formal consultation on the southwestern willow flycatcher if we were still unable to concur with a "not likely to adversely affect" determination.

It should be noted that information presented in the BAE, the PEA, and the February 21, 2001, memorandum often conflict. Additionally, the August 10, 2001, comments from the Forest Service on the first draft opinion presented new information not previously reviewed by the Service, and also, in some instances, conflicted with information in the BAE.

Following release of the first draft biological opinion on July 10, 2001, the Service received comments from the Applicant and the Forest Service. A meeting was held on September 25, 2001 with the Forest Service. Following that meeting, the Forest Service submitted additional comments dated October 2, 2001, regarding the reasonable and prudent measures and terms and conditions in the first draft biological opinion. The primary concerns of the Forest Service were with whether or not the recommended reasonable and prudent measures constituted more than a minor change to the action as proposed. Additionally, the Forest Service was concerned that the use of utilization rates as a criteria for assessing when take had been exceeded did not accurately depict the relationship between upland watershed conditions and riparian or aquatic health. The Forest Service stated in their October 2, 2001, letter that implementation of the reasonable and prudent measures and terms and conditions would result in "...predicted unnecessary reductions in livestock numbers which will have serious economic impacts on the permittee while not resulting in substantially different recovery rates in uplands and riparian corridors" and that "Shortened seasons of use essentially will shift this allotment from a yearlong to seasonal permit, substantially changing the cow/calf operation to more of a yearling program." The Forest

Service additionally noted that implementation of the reasonable and prudent measures and terms and conditions would "...require daily riding and herding of cattle, and increase overhead costs significantly."

The Service is directed to develop reasonable and prudent measures that cause only minor changes to the project. For this reason, and because the Forest Service informed the Service that it is their view that the first draft opinion as written would result in more than minor changes, the Service developed a second draft opinion. The second draft biological opinion was issued on October 18, 2001. A subsequent meeting was held on November 6, 2001, to receive comments from the Forest Service, the Applicants, and their attorneys.

CONCURRENCES

Bald Eagle

The BAE notes that no formal surveys have been conducted on the Allotment to detect breeding bald eagles. Breeding birds are known to occur at Becker Lake near Springerville and at Luna Lake near Alpine. Becker Lake is approximately 65 miles north and west of the northern boundary of the Allotment, while Luna Lake is approximately 40 miles north.

The BAE notes that bald eagles are common winter visitors along the Blue and San Francisco rivers, and that eagles probably roost along the Blue River in areas to the immediate west of the Allotment, and in the upland areas of the Allotment along the San Francisco River. Additionally, the BAE notes that potential nest sites occur along both rivers and Dix Creek.

The grazing guidance criteria for bald eagle conclude that an action may affect, but is not likely to adversely affect bald eagles if:

1. Livestock grazing that occurs in the riparian areas is not reducing long-term roost and nesting tree regeneration, and

2. Livestock management activities (beyond presence of livestock) that occur within 0.25 miles of a bald eagle roost or nest site do not constitute a disturbance to the eagle(s).

With respect to the first criteria, an evaluation of Allotment condition information shows that soils conditions within the Dix Mesa and Dix Saddle pastures, which surround Dix Creek, are either satisfactory, satisfactory/untreatable, or unsatisfactory. Range conditions for these pastures are either fair, or no condition (due to steep slopes). The majority of the vegetation within these two pastures is open pinyon/juniper savannah, which makes up 16 percent of the Allotment. This vegetation community has been rated as being in fair condition, limited by species diversity in the understory. Dix Saddle and Dix Mesa are both used as shipping pastures.

As noted above, the Forest Service completed a PFC assessment for the four miles of the San Francisco River within the allotment boundaries. The PFC assessment rated both reaches at

Functional at Risk - Upward Trend. Functional At Risk means that the riparian area is in functional condition, but an existing soil, water, or vegetation attributes makes it susceptible to degradation (USBLM 1998). A PFC analysis was also completed for Dix Creek. A thorough discussion follows in the opinion below. In summary, 29 percent of Dix Creek is *Nonfunctional*, with an additional 42 percent being classified as *Functional at Risk*. Twenty-nine percent is categorized as being in *Proper Functioning Condition*. For those reaches that did not attain proper functioning condition, the common problems were a lack of riparian vegetation, a lack of age class diversity in riparian vegetation with only younger age classes present, a channel that was out of balance with the landscape, and a lack of floodplain development (USFS 2001c).

The BAE states that, because both river systems are excluded from livestock grazing and utilization standards will be applied in Dix Creek, long-term roost and nesting tree regeneration will not be reduced. The Service believes that riparian areas that are rated as *Functional at Risk* would benefit from a lower utilization standard than the proposed 40 to 45 percent. The lack of large trees in many of the reaches that were assessed indicates that roost sites are limited for bald eagles in this system. Regeneration of vegetation to a size class capable of providing adequate roost sites for bald eagles will take many years.

With respect to the second criteria, a determination of may affect not likely to adversely affect is appropriate if livestock management activities that occur within 0.25 miles of a bald eagle roost or nest site do not constitute a disturbance to the eagle(s). At this time, the Forest Service does not know if roost sites for bald eagle exist. Additionally, use of the Dix Creek pastures would occur during the winter months, when wintering eagles would be present.

Because of the potential for wintering bald eagles to occur along the San Francisco River, and the lack of surveys, the Service is only able to provide concurrence with the following condition. The condition provided with this concurrence is also in compliance with the grazing guidance criteria. The Service is providing concurrence contingent upon the following condition:

- If any livestock management activities, including placement of salt, water, or corrals, loading or unloading of cattle, use of mechanized equipment, or other activities that would create noise disturbances, should occur within Dix Mesa or Dix Saddle pastures, the Forest Service will first determine that no bald eagle roosts occur within 0.25 miles of the proposed management activities.

Razorback Sucker

Razorback suckers have not been historically documented in the San Francisco River basin. Razorback suckers are known historically from most of the Gila River drainage, and may have been common upstream nearly to the New Mexico border (USFWS 1998a). Razorback may have been present at the Gila/San Francisco rivers confluence.

Beginning in 1981 and continuing until 1989, 778,000 razorback suckers were stocked in the Gila River both up and downstream of the San Francisco River confluence. Additionally,

167,000 razorback suckers were introduced to the Blue River in the late 1980s. No razorbacks have been recaptured from the Blue River since 1987; however, by agreement with the Service, the Forest Service considers the Blue River and those portions of the San Francisco River downstream from the Blue River to be occupied by introduced razorback suckers. The BAE notes that, for purposes of section 7 consultation, the Forest Service considers the San Francisco River to be occupied beginning approximately one mile downstream from the Pleasant Valley Allotment. No critical habitat has been identified within the allotment boundaries (USFS 2001a).

The BAE notes that introduced, relict individuals may still occur within the 4th-code watershed, but have not been detected since the late 1980s. Cattle on the allotment presently have access to portions of the Blue and San Francisco rivers on private lands; however, proposed fencing would eliminate direct access from Federal lands. The BAE concludes that the proposed action may impact relict razorback suckers in the San Francisco River indirectly through livestock-caused alterations of edaphic and vegetative components in the San Francisco watershed within the allotment. These impacts may affect various parameters of razorback habitat in the San Francisco River, including the level of base flows and peak flows, the amount of sediment entering and transported through the aquatic habitat, which may in turn affect the frequency of riffle, run, and pool habitats, and the abundance and distribution of nonnative fish species and food sources of razorback suckers. The Service has noted the same concerns above, with respect to the effects of grazing in upland areas and overall allotment conditions.

The BAE concludes that take is not likely to occur directly or indirectly because if any razorback suckers are present in the San Francisco River, they exist where habitat is suitable to permit their survival as individuals, and that conditions do not exist for successful reproduction or persistence of the species. This argument is not, in itself, sufficient to justify a finding of not likely to adversely affect. Any change in habitat condition that adversely affects an individual razorback sucker can constitute incidental take. There is no requirement that the population be self-sustaining within the action area.

A determination of "may affect, not likely to adversely affect" indicates that effects on listed species are expected to be discountable, insignificant, or beneficial. Insignificant effects relate to the size of the impact. Discountable effects are those effects which are extremely unlikely to occur, or are not able to be meaningfully measured, detected, or evaluated. The level of either insignificant or discountable effects must be such that no take, direct or incidental, is likely to occur. The size of the razorback sucker population in the San Francisco river is unknown, but is likely to be very small. This reduces the risk of death or injury to an individual occurring as a result of livestock grazing on the allotment to a very slight risk. The amount of damage to razorback sucker habitat in the river itself is also an important component to the assessment of significance. Because of the levels of use, watershed condition, and other protective measures included in the proposed action, the amount of damage to the riverine habitats used by the razorback sucker are small enough to be considered indeterminable. Combining the degree of risk to individuals and habitat, the effects of the action qualify as insignificant. The effects are also discountable, because they are very unlikely to occur (due to the low population levels) and

are not able to be meaningfully measured. For these reasons, the Service concurs with the Forest Service's determination of not likely to adversely affect.

Mexican Gray Wolf

Historically, Mexican gray wolves were found in the eastern and central portions of Arizona. Wolves were known to occur on the Coronado National Forest, and on portions of the Apache National Forest as well. Wolves are most commonly associated with Madrean evergreen forests and woodlands, including pine, oak woodlands, pinyon-juniper forests, riparian areas, and grasslands above 4,500 feet. Mexican gray wolves were extirpated from the wild in the U.S. by private and government control campaigns, and were listed as an endangered species in 1976. It is generally believed that naturally-occurring Mexican gray wolves no longer inhabit the United States (McBride 1980, Hoffmeister 1986).

A recovery plan, developed in 1982, recommended re-establishment of a wild population and maintenance of a captive population of wolves (USFWS 1982). Wolves were reintroduced on the Apache National Forest in March 1998. Reintroduced wolves are designated as an experimental non-essential population under the Act, which allows for greater management flexibility than would be possible if the wolves were classified as fully endangered. There are currently 19 adults, nine yearlings/ juveniles, and an unknown number of pups.

Since resident Mexican gray wolves, other than reintroduced wolves, are no longer believed to occur in the United States, there will be no direct effects to naturally occurring wolves from the proposed action and the numbers and reproduction of naturally occurring wolves will not be affected. Introduced wolves may be disturbed when proposed activities occur in areas they occupy. The BAE notes that this disturbance is anticipated to be of short duration. The proposed activities will likely result in the modification of historic wolf habitat and habitat of its prey species. Wolves prey on various species, some of which prefer open habitat and others that prefer dense habitat. Because of this, project implementation will benefit some prey species while negatively affecting others.

The Blue Range Wolf Recovery Area includes all of the Apache National Forest, and is divided into primary and secondary recovery zones. The Pleasant Valley Allotment falls within portions of the primary and secondary zones. In 1998, a pack of wolves was released in Turkey Creek, approximately 8 - 10 miles north of the allotment. However, this pack has since been relocated to New Mexico. While no wolves are known to range within the allotment, it is possible that natural colonization from the experimental population could occur there. The BAE notes that cover, travel corridors, and denning areas are not limiting factors within the allotment. It is possible that the action could result in a declining prey species population, and the BAE notes that the loss of the herbaceous understory, from both successional trends in all habitats as well as ineffective livestock management, most likely has contributed to declining habitat conditions for most prey species.

Because of their status as an experimental, non-essential population, wolves found in Arizona are treated as though they are proposed for listing for section 7 consultation purposes. By definition, an experimental non-essential population is not essential to the continued existence of the species. Therefore, no proposed action impacting a population so designated could lead to a jeopardy determination for the entire species. Therefore, the Service concurs with the Forest Service's determination of "not likely to jeopardize" the continued existence of the species.

BIOLOGICAL OPINION

Description of the Proposed Action

The proposed action is to implement an Allotment Management Plan (AMP) for livestock grazing on the Pleasant Valley Allotment. Within the PEA, the proposed action is the preferred alternative, or Alternative D. Adoption of Alternative D would result in modification of the existing 10-year Term Grazing Permit.

The proposed action area consists of the footprint of the action and all areas that would be directly or indirectly affected by the proposed action. The Pleasant Valley Allotment encompasses 13,173 acres of National Forest land, as well as 137 acres of private land, and is located in the southeastern portion of the Clifton Ranger District, Greenlee County, Arizona. Elevation within the allotment ranges from 3,800 feet at the San Francisco River to 6,500 feet near the allotment's southern boundary. The allotment consists of several mesas, including Dix, Lightning, Hamilton, and Pleasant Valley, separated by steep canyons. The allotment falls within several slope classes, with 6,418 acres in the 0 - 30% slope class, 2,085 acres in the 31 - 40% slope class, 3,086 acres in the 41-60% slope class, and 1,716 acres in the 61+% slope class (USFS 2001a, USFS 2001b). In addition to the allotment, the Service is defining the proposed action area to include areas affected by indirect effects which are anticipated to occur approximately 25 miles downstream from the western boundary of the allotment.

Alternative D entails the implementation of an AMP and modification of the existing term grazing permit for livestock use of forage on the allotment. Alternative D would change the livestock management strategy, modify the number of animals permitted, incorporate appropriate forest plan standards and guidelines as terms and conditions with the Term Grazing Permit, and install fencing in the San Francisco Pasture.

The management strategy involves a summer rest-rotation strategy and a deferred winter or slow growth period strategy. The number of animals permitted annually during the winter grazing period (November 1 to April 30) would be reduced to 210 head of cattle (adult/dry), or 1,267 Animal Unit Months (AUMs) from the current 250 head of cattle (cow/calf). The number of animals permitted annually during the summer grazing period (May 1 to October 31), would be 154 head (cow/calf), or 1,247 AUMs, reduced from the current 220 head of cattle (cow/calf). The AMP would establish allowable utilization of forage resources by domestic livestock at 35 to 40 percent during the growing season and 40 to 45 percent during the dormant season. However,

the PEA also notes that while targeted herbaceous forage use in summer pastures is 40 percent, it is likely that some sites will receive moderately heavy use of approximately 45 to 50 percent. Key areas will be used to monitor utilization.

The AMP would involve a combination of rest rotation with deferment for summer pastures, and deferred rotation with summer rest for winter pastures. The Dix Mesa, Dix Saddle, San Francisco, Mesquite Flat, Johnnie, and Red Tank pastures would be used during the winter grazing period (See Appendix B, Map 1). Grazing would occur concurrently within Dix Mesa/Dix Saddle and Mesquite Flat/Johnnie during the fall and spring shipping periods. Animals would then be consolidated for deferred grazing during the primary dormant season and early spring green-up periods. All winter pastures would be rested through the late spring-summer-late fall growing seasons, with a minimum of 27 months and a maximum of 33 months rest in a given 36-month grazing cycle.

During the summer grazing period, livestock would be placed in the Pleasant Valley, Lightning Mesa, and Hamilton Mesa pastures. Livestock would use two of the three pastures under a deferred-rotation grazing schedule, with complete rest for the third pasture. The summer grazing schedule would result in an average of 30 months of rest for each pasture during a 36-month grazing cycle, and would include spring rest in two out of three years.

Dix Mesa and Dix Saddle pastures are essentially holding/shipping pastures, and would be used for one month each in November and May of each year. The San Francisco Pasture would be used as a "swing" pasture, used during the month of December each year when cattle are essentially moved through the pasture from the Dix Mesa and Dix Saddle pastures and on to the Mesquite Pasture where they will remain for January, February, and half of March. Cattle would then spend the last half of March and April in the Johnny (or Red Flats) Pasture before moving on to the Lightning Pasture or the Hamilton Pasture (depending on the year) for May, June and July. Cattle would then spend the remaining months of August, September, and October in either the Pleasant Valley or Lightning pastures, depending on the year. Table 1 in Appendix A illustrates the usage patterns within these allotments during a 36-month period.

The AMP dictates that the San Francisco River be excluded from livestock access and grazing. Livestock would have limited access to the lower perennial reaches of Dix Creek during winter dormant seasons (December - January), with access rotated annually. The principal management tools for distributing livestock include salt, water, drift fences, and herding. The proposed action involves the construction of 0.5 miles of drift fence, which would connect with natural barriers and existing fences. The drift fence would be located across the main stem of Dix Creek, and would be designed to prevent livestock from accessing the San Francisco River corridor. No large tree removal would occur, and no openings would be created in the canopy layer. The fencing would be completed during the winter months, across the mouth of Dix Creek, and up the side of one bluff currently supporting juniper (F. Hayes, pers. comm., Forest Service, 2001).

With respect to range condition, the PEA notes that implementation of the preferred alternative will result in significantly increased rest in all pastures. In the summer pastures, spring

deferment, followed by yearlong rest, is expected to substantially increase the vigor and productivity of all soil sites, resulting in increased cover from litter, and residual standing crops over an 18-month period of rest. For winter pastures, implementation of the preferred alternative is expected to improve vigor. The goals stated in the PEA are for poor conditions to change one full condition class within the project life, and possibly as quickly as within five years following implementation. Most notable changes are expected in the San Francisco Pasture, where concentrated late fall/winter use and complete spring/summer rest each year will provide for annual forb and grass establishment followed by grazing and trampling. Perennial seedling establishment is expected within three to five years, with a shift in vegetation condition by the end of the five year period.

With respect to water and soil condition, the Forest Service anticipates that implementation of the preferred alternative will generally maintain or improve soil conditions to satisfactory or a trend towards satisfactory on most impaired and unsatisfactory areas within the project timeframe of 10 years, based on careful implementation and adjustments made based on monitoring results. The PEA notes that annual implementation monitoring of forage production, use, and vigor is necessary to evaluate and adjust stocking within pastures and on the allotment as a whole.

With respect to riparian condition, the Forest Service anticipates that the intensity of livestock use is expected to decrease. The goals of the AMP are for herbaceous understory, streambank vegetation, and riparian shrubby species to increase, providing coarse woody material to aid in bank protection. The PEA notes that riparian systems currently in *Proper Functioning Condition* will move towards maximum potential, while *Functional At Risk* systems in an upward trend will continue to improve. The San Francisco River, which will not be grazed, should continue its upward trend at an increased pace, while *Functional At Risk* sections of Dix Creek should show signs of recovery. It is noted that more than 10 years may be required to affect recovery in some areas. For this reason, *Nonfunctional* reaches may not see improvement within the project lifespan.

The PEA also includes information on effectiveness monitoring that is considered part of the proposed action. According to Chapter 3 of the PEA, the following actions will be taken as part of effectiveness monitoring:

1. The effects of grazing on herbaceous and woody species production will be measured through production estimates and photo points to be taken after the applied growing season rest. Production estimates and photo points will be used to document annual success at recovery and regrowth following grazing.

2. The effects of grazing on soil health (i.e., litter, plant density) and ecological trend (i.e., composition and vigor) will be accomplished through the use of range analysis cluster or pace transects. The USFS will reread pace transects at the end of the 5th year of implementation, and all transects at the end of the 10th year.

3. The effects of grazing on the riparian corridor will be monitored through the use of the PFC methodology at the end of the project period in stream reaches. PFC will be used to assess effects of grazing, recovery, and trend in condition. Photo points will be established and retaken every five to ten years during the growing season. Ocular observations and photo points will also be used to document apparent and visible changes, and to remeasure before the end of the project period if significant changes occur (floods, fire, or other watershed events). Permanent pebble count monitoring sites will be established on the right and left prongs of Dix Creek, as well as lower Dix Creek and the San Francisco River, and zig-zag pebble counts will be conducted every two years.

According to the PEA, the following best management practices (BMPs) water quality issues would be addressed by:

1. Preparing a livestock operating plan to manage for current and projected pasture conditions by allowing for removal of appropriate forage levels to maintain and improve physiological plant condition and soil health.

2. Implementing a controlled livestock management program that addresses resource concerns and provides for improved livestock distribution patterns. Livestock management takes into consideration frequency and amount of rest, allowable use, and season of use per pasture.

3. Using existing range improvements such as pasture fences (and natural barriers where possible), riparian pasture fences, and spring developments to address resource concerns.

4. Implementing a monitoring plan to insure consistency of application and the effectiveness of the program.

Future action items are found within Appendix C of the PEA (USFS 2001). Appendix C itemizes those specific BMPs that may be used to mitigate impacts from grazing including:

1. Brush or woodland management treatments;
2. Prescribed fire treatments;
3. Seeding projects;
4. Planning and construction of access roads for the maintenance of grazing improvements.

No details on the use of these four BMPs were included within the proposed action. Should brush or woodland treatments, prescribed fire treatments, seeding projects, or access roads be required, additional section 7 consultation would be necessary. This biological opinion does not evaluate the effects of these actions on listed species. Additionally, the PEA and BA do not address maintenance needs of the approximately 20 stock tanks, wells, or springs. The effects of these actions are therefore not evaluated here.

Status of the Species/Critical Habitat

Spikedace

Spikedace was listed as a threatened species on July 1, 1986 (USFWS 1986a). Critical habitat was designated on April 25, 2000 (USFWS 2000a). Critical habitat includes portions of the Verde, middle Gila, San Pedro, San Francisco, Blue, and upper Gila rivers and Eagle, Bonita, Tonto, and Aravaipa creeks and several tributaries of those streams.

Spikedace is a small silvery fish whose common name alludes to the well-developed spine in the dorsal fin (Minckley 1973). Spikedace historically occurred throughout the mid-elevations of the Gila River drainage, but is currently known only from the Verde, middle Gila, and upper Gila rivers, and Aravaipa and Eagle creeks (Barber and Minckley 1966, Minckley 1973, Anderson 1978, Marsh *et al*. 1990, Sublette *et al*. 1990, Jakle 1992, Knowles 1994, Rinne 1999). Habitat destruction along with competition and predation from introduced nonnative species are the primary causes of the species decline (Miller 1961, Williams *et al*. 1985, Douglas *et al*. 1994).

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

When critical habitat was designated, the Service determined the primary constituent elements for spikedace. Constituent elements include those habitat features required for the physiological, behavioral, and ecological needs of the species. For spikedace, these include permanent, flowing, unpolluted water; living areas for adult spikedace with slow to swift flow velocities in shallow water with shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at downstream riffle edges; living areas for juvenile spikedace with slow to moderate flow velocities in shallow water with moderate amounts of instream cover; living areas for larval spikedace with slow to moderate flow velocities in shallow water with abundant instream cover; sand, gravel, and cobble substrates with low to moderate amounts of fine sediment and substrate embeddedness; pool, riffle, run, and backwater components present in the aquatic habitat; low stream gradient; water temperatures in the approximate range of 35 to 65 degrees Fahrenheit; abundant aquatic insect food base; periodic natural flooding; a natural, unregulated hydrograph or, if the flows are modified or regulated, then a hydrograph that demonstrates an ability to support a native fish

community, and; habitat devoid of nonnative aquatic species detrimental to spikedace or habitat in which detrimental nonnative species are at levels that allow the persistence of spikedace.

The constituent elements are generalized descriptions and ranges of selected habitat factors that are critical for the survival and recovery of spikedace. The appropriate and desirable level of these factors may vary seasonally and is highly influenced by site-specific circumstances. Therefore, assessment of the presence/absence, level, or value of the constituent elements must include consideration of the season of concern and the characteristics of the specific location. The constituent elements are not independent of each other and must be assessed holistically, as a functioning system, rather than individually. In addition, the constituent elements need to be assessed in relation to larger habitat factors, such as watershed, floodplain, and streambank conditions, stream channel geomorphology, riparian vegetation, hydrologic patterns, and overall aquatic faunal community structure.

Recent taxonomic and genetic work on spikedace indicate there are substantial differences in morphology and genetic makeup between remnant spikedace populations. Remnant populations occupy isolated fragments of the Gila basin and are isolated from each other. Anderson and Hendrickson (1994) found that spikedace from Aravaipa Creek is morphologically distinguishable from spikedace from the Verde River, while spikedace from the upper Gila River and Eagle Creek have intermediate measurements and partially overlap the Aravaipa and Verde populations. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets 1992, Tibbets 1993).

The status of spikedace is declining rangewide. Although it is currently listed as threatened, the Service has found that a petition to uplist the species to endangered status is warranted. A reclassification proposal is pending, however, work on it is precluded due to work on other higher priority listing actions (USFWS 1994a).

Loach Minnow

Loach minnow was listed as a threatened species on October 28, 1986 (USFWS 1986b). Critical habitat was designated for loach minnow on April 25, 2000 (USFWS 2000a). Critical habitat includes portions of the Verde, Black, middle Gila, San Pedro, San Francisco, Tularosa, Blue, and upper Gila rivers and Eagle, Bonita, Tonto, and Aravaipa creeks, and several tributaries of those streams. Within the proposed project area, the northern boundary of the allotment overlaps critical habitat for loach minnow on the San Francisco River (See Map 2, Appendix B).

Loach minnow is a small, slender, elongate fish with markedly upwardly-directed eyes (Minckley 1973). Historic range of loach minnow included the basins of the Verde, Salt, San Pedro, San Francisco, and Gila rivers (Minckley 1973, Sublette *et al.* 1990). Habitat destruction plus competition and predation by nonnative species have reduced the range of the species by about 85 percent (Miller 1961, Williams *et al*. 1985, Marsh *et al*. 1989). Loach minnow remains in limited portions of the upper Gila, San Francisco, Blue, Black, Tularosa, and White rivers and

Aravaipa, Turkey, Deer, Eagle, Campbell Blue, Dry Blue, Pace, Frieborn, Negrito, Whitewater and Coyote creeks in Arizona and New Mexico (Barber and Minckley 1966, Silvey and Thompson 1978, Propst *et al*. 1985, Propst *et al*. 1988, Marsh *et al*. 1990, Bagley *et al*. 1995, USBLM 1995, Bagley *et al*. 1996, Miller 1998).

Loach minnow is a bottom-dwelling inhabitant of shallow, swift water over gravel, cobble, and rubble substrates (Rinne 1989, Propst and Bestgen 1991). Loach minnow uses the spaces between, and in the lee of, larger substrate for resting and spawning (Propst *et al*. 1988; Rinne 1989). It is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). Some studies have indicated that the presence of filamentous algae may be an important component of loach minnow habitat (Barber and Minckley 1966). Loach minnow feeds exclusively on aquatic insects (Schrieber 1978, Abarca 1987). Spawning occurs in March through May (Britt 1982, Propst *et al*. 1988); however, under certain circumstances loach minnow also spawn in the autumn (Vives and Minckley 1990). The eggs of loach minnow are attached to the underside of a rock that forms the roof of a small cavity in the substrate on the downstream side. Limited data indicate that the male loach minnow may guard the nest during incubation (Propst *et al*. 1988, Vives and Minckley 1990).

When critical habitat was designated for loach minnow, the Service determined the primary constituent elements for loach minnow. These elements include permanent, flowing, unpolluted water; living areas for loach minnow adults, juveniles, and larvae with appropriate flow regimes and substrates; spawning areas; low amounts of fine sediment and substrate embeddedness; riffle, run, and backwater components; low to moderate stream gradients; approrpate water temperatures; periodic natural flooding; an unregulated hydrograph, or, if flows are modified, a hydrograph that demonstrates an ability to support a native fish community; and, habitat devoid of non-native aquatic species detrimental to loach minnow, or habitat where such nonnative species are at levels which allow persistence of loach minnow. These constituent elements are generalize descriptions and ranges of selected habitat factors that are critical for the survival and recovery of loach minnow.

As noted under spikedace, the appropriate and desirable level of these factors may vary seasonally and is highly influenced by site-specific circumstances. Therefore, assessment of the presence/absence, level, or value of the constituent elements must include consideration of the season of concern and the characteristics of the specific location. The constituent elements are not independent of each other and must be assessed holistically, as a functioning system, rather than individually. In addition, the constituent elements need to be assessed in relation to larger habitat factors, such as watershed, floodplain, and streambank conditions, stream channel geomorphology, riparian vegetation, hydrologic patterns, and overall aquatic faunal community structure.

Recent biochemical genetic work on loach minnow indicate that there are substantial differences in genetic makeup between remnant loach minnow populations (Tibbets 1993). Remnant populations occupy isolated fragments of the Gila River basin and are isolated from each other. Based upon her work, Tibbets (1992, 1993) recommended that the genetically distinctive units of loach minnow should be managed as separate units to preserve the existing genetic variation.

The status of loach minnow is declining rangewide. Although it is currently listed as threatened, the Service has found that a petition to uplist the species to endangered status is warranted. A reclassification proposal is pending, however, work on it is precluded due to work on other higher priority listing actions (USFWS 1994c).

Southwestern Willow Flycatcher

The flycatcher is a small grayish-green passerine bird (Family Tyrannidae) measuring approximately 5.75 inches. It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark, and the lower is light yellow grading to black at the tip. The song is a sneezy fitz-bew or a fit-a-bew, and the call is a repeated whitt.

The flycatcher is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migrant that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historic breeding range of the flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

The Service listed flycatcher as endangered, without critical habitat on February 27, 1995 (USFWS 1995a). The Service designated critical habitat on July 22, 1997 (USFWS 1997a), and has since been remanded.

Declining flycatcher numbers have been attributed to loss, modification, and fragmentation of riparian breeding habitat, loss of wintering habitat, and brood parasitism by the brown-headed cowbird (Sogge *et al.* 1997, McCarthey *et al.* 1998). Urban, recreational, agricultural development, water diversion, and groundwater pumping, channelization, dams, and livestock grazing have caused habitat loss and degradation. Fire is an increasing threat to willow flycatcher habitat (Paxton *et al.* 1996), especially near monotypic saltcedar vegetation (DeLoach 1991) and where water diversions and/or groundwater pumping desiccates riparian vegetation (Sogge *et al.* 1997). Brown-headed cowbirds (*Molothrus ater*) parasitize flycatcher nests by laying their eggs in the flycatcher's nest. Livestock and range improvements such as waters and corrals, agriculture, urban areas, golf courses, bird feeders, and trash areas enhance feeding sites for cowbirds. When in close proximity to flycatcher breeding habitat, and especially when coupled with habitat fragmentation, these feeding areas facilitate cowbird parasitism of flycatcher nests (Hanna 1928, Mayfield 1977a, Mayfield 1977b, Tibbitts *et al.* 1994).

Habitat

The flycatcher breeds in dense riparian habitats from sea level in California to around 8000 feet in Arizona and southwestern Colorado. Historic egg/nest collections and species' descriptions throughout its range describe the flycatcher's widespread use of willow for nesting (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987, T. Huels *in litt.* 1993, San Diego Natural History Museum 1995). Currently, flycatchers primarily use Geyer willow, Goodding's willow, boxelder (*Acer negundo*), saltcedar, Russian olive (*Elaeagnus angustifolio*) and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). A recent study on the Gila River found that 76 percent of nesting southwestern willow flycatchers were found in boxelder trees. Other trees in the study area included willow, Russian olive, Arizona elder, seepwillow, Fremont cottonwood, salt cedar, and Arizona sycamore. This site occurs at an elevation of 3,937 feet (Stoleson and Finch 1999). Based on the diversity of plant species composition and complexity of habitat structure, the four basic habitat types that can be described for the flycatcher rangewide are monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge *et al.*1997).

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of flycatcher territories and nests. Flycatchers sometimes nest in areas where nesting substrates were in standing water (Maynard 1995, Sferra *et al.* 1995, Sferra *et al.* 1997). However, hydrological conditions at a particular site can vary remarkably in the arid Southwest within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). The total absence of water or visibly saturated soil has been documented at several other sites where the river channel has been modified (e.g. creation of pilot channels), where modification of subsurface flows has occurred (e.g. agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer *et al.* 1996).

Diet

The flycatcher is an insectivore, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. The bird typically perches on a branch and makes short direct flights, or sallies, to capture flying insects. Drost *et al.* (1998) found that the major prey items of the flycatcher (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera); and true bugs (Hemiptera). Other insect prey taxa included leafhoppers (Homoptera: Cicadellidae); dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey included spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

Breeding Biology

Throughout its range the flycatcher arrives on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, Maynard 1995, Sferra *et al.* 1995, Sferra *et al*. 1997). Nesting begins in late May and early June and young fledge from late June through mid-August (Willard 1912, Ligon 1961, Brown 1988a, Brown 1988b, Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995). Southwestern willow flycatchers typically lay three to four eggs per clutch (range = 2 to 5). Eggs are laid at one-day intervals and are incubated by the female for approximately 12 days (Bent 1960, Walkinshaw 1966, McCabe 1991). Young fledge approximately 12 to 13 days after hatching (King 1955, Harrison 1979). Typically one brood is raised per year, but birds have been documented raising two broods during one season and renesting after a failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, Whitfield 1994, Whitfield and Strong 1995). The entire breeding cycle, from egg laying to fledging, is approximately 28 days.

Brown-headed cowbird parasitism of flycatcher broods has been documented throughout its range (Brown 1988a, Brown 1988b, Whitfield 1990, Muiznieks *et al.* 1994, Whitfield 1994, Hull and Parker 1995, Maynard 1995, Sferra *et al.* 1995, Sogge 1995b). Where studied, high rates of cowbird parasitism coincided with flycatcher population declines (Whitfield 1994, Sogge 1995a, Sogge 1995c, Whitfield and Strong 1995) or, at a minimum, resulted in reduced or complete nesting failure at a site for a particular year (Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995, Sferra *et al.* 1995, Sogge 1995a, Sogge 1995c, Whitfield and Strong 1995).

Territory Size

Southwestern willow flycatcher territory size likely fluctuates with population density, habitat quality, and nesting stage. Estimated territory sizes are 0.59 to 3.21 acres for monogamous males and 2.72 to 5.68 acres for polygynous males at the Kern River (Whitfield and Enos 1996), 0.15 to 0.49 acres for birds in a 1.48 to 2.22 acre patch on the Colorado River (Sogge 1995c), and 0.49 to 1.24 acres in a 3.71 acre patch on the Verde River (Sogge 1995a). Territories are established within a larger patch of appropriate habitat sufficient to contain several nesting pairs of flycatchers. These birds appear to be semi-colonial nesters.

Rangewide Distribution and Abundance

Unitt (1987) documented the loss of more than 70 flycatcher breeding locations rangewide (peripheral and core drainage within its range) estimating the rangewide population at 500 to 1,000 pairs. There are currently 182 known flycatcher breeding sites (in California, Nevada, Arizona, Utah, New Mexico, and Colorado) holding approximately 915 territories. Sampling errors may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology, natural population fluctuation, and random events) and it is likely that the total breeding population of flycatchers

fluctuates. Following the 2000 survey season, 586 resident willow flycatchers were documented with 238 territories at 47 sites (Paradzick *et al*. 2001).

The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances (e.g. in Arizona, approximately 55 miles straight-line distance between breeding flycatchers at Roosevelt Lake, Gila County, and the next closest breeding groups known on either the San Pedro River, Pinal County, or Verde River, Yavapai County). To date, survey results reveal a consistent pattern rangewide in which the flycatcher population is comprised of extremely small, widely-separated breeding groups including unmated individuals.

Arizona Distribution and Abundance

As reported by Paradzick *et al.* (2000), the greatest concentrations of willow flycatchers in Arizona in 1999 were near the confluence of the Gila and San Pedro rivers (236 flycatchers, 134 territories); at the inflows of Roosevelt Lake (140 flycatchers, 76 territories); between Fort Thomas and Solomon on the middle Gila River (9 flycatchers, 6 territories); at Topock Marsh on the Lower Colorado River (30 flycatchers, 16 territories); along the Verde River at Camp Verde (7 flycatchers, 5 territories); near Alpine/Greer on the San Francisco River/Little Colorado River (11 flycatchers, 8 territories); at Alamo Lake on the Bill Williams River (includes Santa Maria and Big Sandy river sites) (43 flycatchers, 23 territories); and in the Lower Grand Canyon on the Colorado River (21 flycatchers, 11 territories).

Unitt (1987) concluded that "...probably the steepest decline in the population level of *E.t. extimus* has occurred in Arizona..." Historic records for Arizona indicate the former range of the flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. As of 1999, 289 territories were known from 47 sites along 12 drainage statewide (Appendix A, Table 2). The lowest elevation where territorial pairs were detected was 197 feet at Adobe Lake on the Lower Colorado River; the highest elevation was at the Greer town site (8,300 feet). The majority of breeding groups in Arizona are extremely small. Of the 47 sites where flycatchers have been documented, 70 percent (n=33) contain five or fewer territorial flycatchers.

To date, survey results reveal a consistent pattern rangewide in that the flycatcher population, as a whole, is comprised of extremely small, widely-separated breeding groups including unmated individuals. The current distribution of breeding groups is highly fragmented, with groups often separated by considerable distances. This reduces meta-population stability and increases the risks of local extirpation due to stochastic events, predation, cowbird parasitism, and other factors.

Because of the bird's low numbers, the effects of management and research activities are a concern. Survey and nest monitoring activities, and handling and banding procedures are regulated by Federal and State permitting processes to remove and reduce effects to the bird.

Trapping, handling, banding, determining the nest's status, and removing cowbird eggs can, even with the most careful biologist, result in injury or death to a bird. Specific training in standardized survey and monitoring procedures (Sogge *et al.* 1997) are required throughout its range.

Mexican Spotted Owl

The Mexican spotted owl was listed as threatened on March 16, 1993 (USFWS 1993). The Service designated critical habitat for the MSO on February 1, 2001 (USFWS 2001).

The Mexican spotted owl was originally described from a specimen collected at Mount Tancitaro, Michoacan, Mexico, and named *Syrnium occidentale lucidum*. The spotted owl was later assigned to the genus *Strix*. Specific and subspecific names were changed to conform to taxonomic standards and the subspecies became *S.o. lucida*. The American Ornithologists' Union currently recognizes three spotted owl subspecies, including the California (*S.o. occidentalis*), Mexican (*S.o. lucida*), and Northern (*S.o. caurina*). Using starch-gel electrophoresis to examine genetic variability among the three subspecies of spotted owls, Barrowclough and Gutierrez (1990) found the Mexican spotted owl to be distinguishable from the other two subspecies by a significant variation, suggesting prolonged geographic isolation of the Mexican subspecies and indicating that the Mexican spotted owl may represent a species distinct from the California and Northern spotted owls.

The Mexican spotted owl is 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. The Mexican spotted owl is distinguished from the California and northern subspecies chiefly by plumage and geographic distribution. The spots of the Mexican spotted owl are larger and more numerous than in the other two subspecies, giving it a lighter appearance. The Mexican spotted owl has the largest geographic range of the three subspecies. The range extends from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah southward through Arizona and New Mexico, and discontinuously through the Sierra Madre Occidental and Oriental to the mountains at the southern end of the Mexican Plateau. While there are no estimates of the owl's historic population size, its historic range and present distribution are thought to be similar.

The current known range of the Mexican spotted owl extends north from Aguascalientes, Mexico through the mountains of Arizona, New Mexico, and western Texas, to the canyons of southern Utah and southwestern Colorado, and the Front Range of central Colorado (USFWS 1995c). Although this range covers a broad area of the southwestern United States and Mexico, much remains unknown about the species' distribution within this range. This is especially true in Mexico where much of the owl's range has not been surveyed. Information gaps also appear in the species' distribution within the United States, however, it is apparent that the owl occupies a fragmented distribution throughout its United States range corresponding to the availability of forested mountains and canyons, and in some cases, rocky canyon lands.

The Forest Service is the primary administrator of lands occupied by owls in the United States. According to the Mexican Spotted Owl Recovery Plan (Recovery Plan) (USFWS 1995c), 91 percent of owls known to exist in the United States between 1990 and 1993 occur on land administered by the Forest Service. The majority of known owls have been found within Region 3 of the Forest Service, which includes 11 National Forests in Arizona and New Mexico. Forest Service Regions 2 and 4, which include two National Forests in Colorado and three National Forests in Utah, support fewer owls.

A reliable estimate of the numbers of owls throughout its entire range is not currently available. Owl surveys conducted from 1990 through 1993 indicate that the species persists in most of the locations reported prior to 1989, with the exception of riparian habitats in the lowlands of Arizona and New Mexico, and all previously occupied areas in the southern states of Mexico. Increased survey efforts have resulted in additional sightings for all recovery units. Fletcher (1990) calculated that 2,074 owls existed in Arizona and New Mexico in 1990 using information gathered by Region 3 of the Forest Service. Modifying Fletcher's calculations, the Service estimated that there were a total of 2,160 owls in the United States (USFWS 1991). While the number of owls throughout its range is not currently available, the Recovery Plan (USFWS 1995c) reports an estimate of owl sites based on 1990 - 1993 data. An owl "site" is defined as "a visual sighting of at least one adult owl or a minimum of two auditory detections in the same vicinity in the same year." Surveys from 1990 through 1993 indicate one or more owls have been observed at a minimum of 758 sites in the United States and 19 sites in Mexico. At best, total numbers in the United States range from 777 individuals (assuming one owl per site) to 1,554 individuals (assuming one pair of owls per site).

Past, current, and future timber-harvest practices in Region 3 of the Forest Service, in addition to catastrophic wildfire, were cited as the primary factors leading to listing of the Mexican spotted owl as a threatened species. Fletcher (1990) estimates that 1,037,000 acres of habitat were converted from suitable (providing all requirements of the owl, e.g., nesting, roosting, and foraging) to capable (once suitable, but no longer so). Of this, about 78.7 percent, or 816,000 acres, was a result of human management activities, whereas the remainder was converted more or less naturally, primarily by wildfire.

Mexican spotted owls breed sporadically and do not nest every year. Mexican spotted owls' 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. 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).

Little is known about the reproductive output of the Mexican spotted owl. It varies both spatially and temporally (White *et al.*1995), but the subspecies demonstrates an average annual rate of 1.001 young per pair. There is inadequate data at this time to estimate population trend. Little confidence in initial estimates has been expressed due to its reliance on juvenile survival rates which are believed to be biased low, and due to the insufficient time period over which studies have been conducted.

Based on short-term population and radio-tracking studies, and longer-term monitoring studies, the probability of an adult Mexican spotted owl surviving from one year to the next is 0.8 to 0.9. Juvenile survival is considerably lower at 0.06 to 0.29, although it is believed these estimates may be artificially low due to the high likelihood of permanent dispersal from the study area and the lag of several years before marked juveniles reappear as territory holders and are detected as survivors through recapture efforts (White *et al*. 1995). Little research has been conducted on the causes of mortality of the Mexican spotted owl, but starvation, accidents or collisions, and predation by great horned owls, northern goshawks, red-tailed hawks, and golden eagles may all be contributing factors.

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 that contain mature or old-growth stands which are uneven-aged, multi-storied, and have high canopy closure (Ganey and Balda 1989, USFWS 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). 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 logged 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 (12-31 miles) during the winter, generally migrating to more open habitats at lower elevations (Ganey and Balda 1989, Willey 1993, Ganey et al. 1998).

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 (*P. boylei*) which are restricted to drier, rockier substrates with sparse tree cover. Mexican woodrats (*N. mexicana*) are typically found in areas with considerable shrub or

understory tree cover and high log volumes or rocky outcrops. Mexican voles (*Microtus mexicanus*) are associated with herbaceous cover, primarily grasses, whereas long-tailed voles (*M. longicaudus*) are found in dense 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.

Prey availability is determined by the distribution, abundance, and diversity of prey and by the owl's ability to capture it. 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 *Clethrionomys* spp.), rabbits and hares (*Sylvilagus* and *Lepus* spp.), pocket gophers (*Thomomys* spp.), and other animals including a variety of bats, birds, insects, and reptiles. Ward and Block (1995) reported that rangewide, 90 percent of an "average" Mexican spotted owl diet would contain 30 percent woodrats, 28 percent peromyscid mice, 13 percent arthropods, nine percent microtine voles, five percent birds, and four percent medium-sized rodents, mostly diurnal sciurids. These rangewide patterns are not consistent among RUs.

Prey that positively influence Mexican spotted owl survival, reproduction, or numbers may increase the likelihood of persistence of spotted owl populations (USDI 1995). Male owls must provide enough food to their female mates during incubation and brooding to prevent abandonment of nests or young; accordingly, ecologists suspect that spotted owls select habitats partially because of the availability of prey (Ward and Block 1995). In two studies in Arizona and New Mexico, Ward and Block (1995) found that the owl's food is most abundant during the summer months when young are being raised. Decreases in prey biomass occur from late fall through the winter. Seasonal decreases like these are typical of small mammal populations. Ward and Block (1995) state that conditions that increase winter food resources will likely improve conditions for the owl because this will increase the likelihood of egg laying and decrease the rate of nest abandonment. Thus, food availability in the winter as well as in the summer is important for owl reproduction.

The Recovery Plan (USFWS 1995c) 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 greater than 40 percent where timber harvest has not occurred in the past 20 years, and all reserved lands. Protected Activity Centers, or PACs, are delineated around known Mexican spotted owl sites. A PAC includes a minimum of 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 percent 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 in the United States has been divided into six recovery units (RUs) as identified in the Recovery Plan (USFWS 1995c, Part II.B.). An additional five

RUs were designated in Mexico. The recovery plan identifies recovery criteria by RU. The upper Gila Mountain RU has the greatest known concentration of owls sites in the United States. This RU is considered a critical nucleus for the owl because of its central location within the owl's range, and the presence of over 50 percent of the known owls. The other RUs 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.

At the end of the 1995 field season, the Forest Service reported a total of 866 management territories (MTs) established in locations in Arizona and New Mexico where at least a single Mexican spotted owl had been identified (U.S. Forest Service, *in litt*. November 9, 1995). The information provided at that time also included a summary of territories and acres of suitable habitat in each RU. Subsequently, a summary of all territory and monitoring data for the 1995 field season on Forest Service lands was provided to the Service on January 22, 1996. There were minor discrepancies in the number of MTs reported in the November and January data. For the purposes of this analysis we are using the more recent information. Table 2, Appendix A, displays the number of MTs and percentage of the total number of each Forest (U.S. Forest Service, *in litt*., January 22, 1996).

The Forest Service has converted some MTs into PACs following the recommendations of the Draft Mexican Spotted Owl Recovery Plan released in March 1995. The completion of these conversions has typically been driven by project-level consultations with the Service and varies by National Forest.

Critical habitat for the Mexican spotted owl was designated on February 1, 2001 (USFWS 2001). In Arizona, a total of 11 critical habitat units totaling 830,803 acres were designated as critical habitat. The Service elected to exclude from critical habitat designation those lands where adequate special management considerations or protection are provided by a legally operative plan or agreement that addresses the maintenance and improvement of the primary constituent elements important to the species, and manages for the long-term conservation of the species. The Service determined that the Southwest Region of the Forest Service amended their Forest Plans in Arizona and New Mexico in 1996 to incorporate the Mexican Spotted Owl Recovery Plan guidelines as management direction, and, as a result, is providing adequate special management for the Mexican spotted owl. Based on this conclusion, the Service excluded National Forest lands in Arizona and New Mexico from final critical habitat designation. Therefore, no critical habitat for the Mexican spotted owl occurs within the proposed project area.

Lesser Long-nosed Bat

The lesser long-nosed bat was listed (originally as *Leptonycteris sandborni*; Sanborn's long-nosed bat) as endangered in 1988 (USFWS 1988). No critical habitat has been designated for this species. A recovery plan was completed in 1997 (USFWS 1997c). 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.

The adult lesser long-nosed bat is a medium-sized bat with a forearm measuring 2.0 - 2.2 inches and weighing 0.7 - 0.9 ounces. Adult fur is grayish to reddish-brown, while juveniles have gray fur. Its elongated rostrum bears a small, triangular noseleaf, its ears are relatively small and simple in structure, and its tail is minute. It is generally smaller in external and cranial measurements than Mexican long-nosed bats (*L. nivalis).* Lesser long-nosed bats can be distinguished from the Mexican long-tongued bat (*Choeronycteris mexicana*), with which it co-occurs in Arizona, by its larger size, less elongated snout, and a tiny tail.

The lesser long-nosed bat is one of four members of the tropical bat family Phyllostomidae found in the United States. It was formally separated from the Mexican long-nosed bat (*L. nivalis)* as a distinct species by Hoffmeister (1957). *L. nivalis* is a monotypic species that occurs in Mexico and southwestern New Mexico and Texas. Arita and Humphrey (1988) reviewed the taxonomic status of bats of the genus *Leptonycteris* and concluded that *L. sanborni* is conspecific with *L. curasoae* of northern Venezuela and the Dutch Antilles. They recognized two subspecies of *L. curasoae*; a northern subspecies (*L. c. yerbabuenae* = *L. sanborni*) found in Mexico, southern Arizona, and southwestern New Mexico; and a southern subspecies (*L.c. curasoae*) found in northern South America. Wilkinson and Fleming (1995) confirmed the genetic distinctiveness of the two subspecies of *L. curasoae* and the specific distinction between *L. curasoae* and *L. nivalis* using molecular data.

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. In southern Arizona lesser long-nosed bat roosts have been found from the Picacho Mountains (Pinal County) southwest to the Agua Dulce Mountains (Pima County), southeast to the Chiricahua Mountains (Cochise County) and south to the international boundary. Individuals have also been observed from the vicinity of the Pinaleño Mountains (Graham County) and as far north as Phoenix and Glendale (Maricopa County) (AGFD Heritage Data Management System). This bat is also known from far southwestern New Mexico in the Animas and Peloncillo Mountains (Hidalgo County). It is a seasonal resident in Arizona, arriving in early April, and leaving in mid-September to late October (Cockrum and Petryszyn 1991, Sidner 1999). The bat has only rarely been recorded outside of this time period in Arizona (USFWS 1997c, Hoffmeister 1986). It resides in New Mexico only from mid-July to early September (Hoyt *et al*. 1994).

Known major roost sites include 17 large roosts in Arizona and Mexico (USFWS 1997c, USFWS files). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy 16 of the 17 sites was greater than 200,000. A recently discovered roost may support several thousand additional bats. Twelve major maternity roost sites are known from Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by a total of more than 150,000 lesser long-nosed bats. The numbers above indicate that, although many 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.

Roosts in Arizona are occupied from April to October (Cockrum and Petryszyn 1991, Sidner 1999). In spring, adult females, most of which are pregnant, arrive in Arizona and gather in maternity colonies in southwestern Arizona. These roosts are typically at low elevations near concentrations of flowering columnar cacti. Litter size is one young. After the young are weaned, these colonies disperse in July and August. Some females and young move to higher elevations, ranging up to more than 6,000 feet, primarily in the southeastern parts of Arizona near concentrations of blooming paniculate agaves. Actual dates of these seasonal movements by lesser long-nosed bats are rather variable from one year to the next (Cockrum and Petryszyn 1991, Fleming *et al*. 1993). 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 (USFWS 1997c). Throughout the night between foraging bouts, both sexes will rest in temporary night roosts (Hoffmeister 1986).

Lesser long-nosed bats appear to be opportunistic foragers and efficient fliers, capable of flight speeds up to 14 miles per hour (Sahley *et al*. 1993), and often foraging in flocks. 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, one-way from maternity colonies to flowering columnar cacti, have been documented in Arizona at 15 miles, and in Mexico at 25 miles and 38 miles (Dalton *et al*. 1994; V. Dalton, Tucson, pers. comm. 1997, Y. Petryszyn, University of Arizona, pers. comm. 1997). A substantial portion of the lesser long-nosed bats at the Pinacate Cave in Sonora, a maternity colony, fly 25 - 31 miles each night to foraging areas in Organ Pipe Cactus National Monument (USFWS 1997c). Horner *et al.* (1990) found that lesser long-nosed bats commuted 30 - 36 miles round trip between an island maternity roost and the mainland in Sonora. The authors suggested these bats regularly flew at least 50 - 62.5 miles each night. Lesser long-nosed bats have been observed feeding at hummingbird feeders many miles from the closest potential roost site (Petryszyn, pers. comm. 1997).

Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial for the lesser long-nosed bat (USFWS 1997c). Caves and mines are used as day roosts. The factors that make roost sites usable have not yet been identified. Whatever the factors are that determine selection of roost locations, the species seems sensitive to human disturbance. Single brief visits to an occupied roost are sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. It is possible that most of the disturbed bats return to their preferred roost in a few days. However, this sensitivity also suggests that the presence of an alternate roost may be critical when disturbance does occur. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

Lesser long-nosed bats have very specific food requirements. 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. In Arizona, four species of agave and two cacti are the main food plants (Hayward and Cockrum 1971, Wilson 1985). The agaves include Palmer's agave (*Agave palmeri*), Parry's agave (*A. parryi*), desert agave (*A. deserti*), and amole (*A. schotti*). Amole is considered to be an incidental food source. The cacti include saguaro and organ pipe cactus. 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 is only seasonally available. Cacti flowers and fruit are available during the spring and early summer; blooming agaves are available through the summer, primarily from July through early October, though Parry's agave blooms earlier. 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 mountains.

Special adaptations, including a long muzzle, a long tongue, and hover flight capabilities, allow the bat to feed on nectar from the flowers of columnar cacti such as the saguaro (*Carnegiea giganteus*) and organ pipe cactus (*Stenocereus thurberi*), as well as the agaves listed above (Brown 1994) (Martin *et al.* 1998). Palmer's agave exhibits many characteristics indicating that they are pollinated by bats, including nocturnal pollen dehiscence and nectar production, light colored and erect flowers, strong floral order, and high levels of pollen protein with relatively low levels of nectar sugar concentrations (Slauson 1996). Parry's agave demonstrate many (although not all) of these same morphological features (Gentry 1982). Slauson (1999) demonstrated that there was a mutualistic relationship between Palmer's agave and the lesser long-nosed bat, although this relationship was asymmetric in that the bat is quite dependent on the agave for food during a certain period while the agave has other pollinator options.

Considerable evidence exists suggesting a dependence of *Leptonycteris* on certain agaves and cacti. Activities that adversely affect the density and productivity of columnar cacti and paniculate agaves may adversely affect populations of lesser long-nosed bats (Abouhalder 1992, USFWS 1997c). Excess harvest of agaves in Mexico, collection of cacti in the United States, and conversion of habitat due to urban expansion, agricultural uses, livestock grazing, and other development may contribute to the decline of long-nosed bat populations (USFWS 1988). Livestock grazing in areas with agaves may affect the long-nosed bat, particularly under high intensity use. Intense grazing can 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. Agaves are monocarpic, flowering only once and then dying. Livestock and wild herbivores feed on young agave stalks, which precludes the plant from flowering. Saguaros are also affected by livestock activity. Saguaros are dependent on nurse plants to provide cover during their sensitive seedling stage. Livestock grazing may affect the density and distribution of nurse plants, increasing the mortality of saguaro seedlings. Young cacti may also be trampled, and compaction and reduced infiltration may adversely alter germination sites. Activities that directly or indirectly promote invasions or increased density of nonnative grasses, particularly Lehmann lovegrass (*Eragrostis lehmanniana*), *Bromus* species, and Mediterranean grass (*Schismus barbatus*), may increase fire frequency and intensity (Minnich 1994), which in turn may have related impacts to paniculate agave and columnar cacti populations. In addition,

grasses are probably the strongest competitors of agave seedlings (L. Slauson, Desert Botanical Gardens, Phoenix, pers. comm. 1997).

The Lesser Long-nosed Bat Recovery Plan (USFWS 1997c) identifies the need to protect foraging areas and food plants. There is a critical need for information about the size of the foraging areas around roosts so that adequate areas can be protected. This information will show the minimum area needed to support a roost of nectar- and fruit-eating bats, provided that the roost locations are known.

The Lesser Long-Nosed Bat Recovery Plan (USFWS 1997c) provides specific discussion and guidance for management and information needs regarding bat foraging resources. The Recovery Plan specifies that lesser long-nosed bats forage over wide areas and that large roosts require extensive stands of cacti or agave for food. Therefore, destruction of food plants many miles from roost sites could have a negative impact on the species. However, in order to protect forage plant species adequately, it is necessary to have an understanding of how the lesser long-nosed bat is using these resources, including assessment of: 1) economical flight distances; 2) suitable distribution of forage plants around the roost sites and along migratory paths; and 3) landscape features of suitable foraging habitat, including forage plant densities, spatial relations between forage areas, and timing of food availability. The Recovery Plan includes as delisting criteria the need for sufficient progress in the protection of both roosts and forage plant habitats that support those roosts from disturbance or destruction. According to the Recovery Plan, there are no new threats to the species, but currently known threats to its roosts and foraging habitat have not decreased significantly. Effects to foraging areas around roosts and along migratory paths should both be considered in this evaluation.

No critical habitat has been designated for the lesser long-nosed bat.

Arizona Hedgehog Cactus

The Arizona hedgehog cactus *(Echinocereus triglochidiatus* var. *arizonicus*), was listed as endangered by the U. S. Fish and Wildlife Service in 1979 (USFWS 1979). Although it seems that protection of this taxon was limited to the "known population " (i.e., those near the type locality near US Highway 60 and the Gila and Pinal County line), according to 50 CFR 17.12, listing for this species is rangewide. Factors contributing to this species' listing include habitat destruction through mining activities, demand by collectors, and insect damage.

At the time of listing, some confusion existed between experts regarding the taxonomic separation of several varieties of the species *Echinocereus triglochidiatus*. Consequently, "populations showing extensive variation but with some affinities toward var. *arizonicus* are not to be considered classical var. *arizonicus* and therefore will not be subject to the protection and restrictions of the Endangered Species Act" (USFWS 1979).

Echinocereus triglochidiatus var. *arizonicus* was first described as *E. arizonicus* (Orcutt 1926). After some treatment as a synonym of *E. polyacanthus,* all the robust red-flowered hedgehog

cacti in the sections of Pinal and Gila Counties adjacent to the type locality of Miami/Superior were described as *E. t.* var. *arizonicus (*Benson 1969) and this circumscription is the classic presentation that was accepted by the Service for listing the taxon in 1979. David Ferguson (1989) reexamined the various members of the *E. triglochidiatus* group and realigned several varieties of claret-cup hedgehog cacti into two species in the United States, including *E. triglochidiatus* and *E. coccineus*, treating *E. arizonicus* as a variety of *E. coccineus* rather than *E. triglochidiatus*. He also circumscribed the variety *arizonicus* to include *E. neomexicanus* and *E. polyacanthus* previously separated by Standley (1908).

Chromosomal studies have since established that *arizonicus* could not be a member of the *E. coccineus* group (Parfitt and Christy 1991). If differences between *arizonicus* and *neomexicanus* are so minute that differentiation would be based entirely on trivial factors, a case could be made for adopting Ferguson's (1989) broad circumscription of *arizonicus*. However, Parfitt (pers. comm. 1993) indicated that *E. neomexicanus* seemed to be confined to southeastern Arizona and thus is "probably" geographically separate from *arizonicus*. Both Zimmerman and Parfitt have indicated that they would not finalize recommendations without further investigation (Zimmerman, pers. comm. 1992, Parfitt, pers. comm. 1993). Parfitt (pers. comm. 1993) stated that, contrary to Ferguson's treatment, he accepted *E. arizonicus* as a full species distinct from both *E. triglochidiatus* and *E. coccineus*. He concurred with Ferguson that *E. triglochidiatus* has two varieties; *triglochidiatus* and *mojavensis*, and that *melanacanthus* is a synonym of *Echinocereus coccineus*. Research by Parfitt and Zimmerman (pers. comm. 1992) indicated that "old *polyacanthus*" populations are distinct from both *E. triglochidiatus* and *E. coccineus,* and that the old *polyacanthus* assemblage may be split into several species including: 1) *E. polyacanthus,* 2) the "limestone endemic", and 3) *E. arizonicus*. However, this exact relationship warrants additional study before conclusions can be proffered. Furthermore, care must be taken regarding identification of this taxon due to taxonomic confusion. Identification has been largely based upon morphological characteristics such as stem diameter and rib numbers (Earle 1963, Bensen 1982, Cedar Creek Associates, Inc. 1994). Spine length, number, or diameter are not considered good characteristics for identification of this taxon.

Robert Bellsey and David Mount, University of Arizona, compared *Echinocereus ttriglochidiatus* var. *arizoncus* from the type locality with *E. triglochidiatus* and *E. coccineus* from other localities in Arizona, New Mexico, Texas, and Colorado by way of sequencing a 450 nucleotide region of chloroplast DNA. In a preliminary report, Bellsey and Mount (1999) find that results are insufficient to make an unambiguous classification of plants by species and variety. However, three genotypes emerged: 1) type A, including plants from the *arizonicus* type locality; Gunnison Hills, Chiricahua Mountains, and Dos Cabezas Mountains in Cochise County; Kingman, Mojave County; five sites on the Clifton Ranger District of the Apache-Sitgreaves National Forest; Bonita Creek and Markham Creek in the jurisdiction of the Safford Field Office; 20 miles west of Carlsbad, New Mexico; and near Marfa, Texas; 2) type T from several sites in New Mexico; and 3) type M from New Mexico and the Santa Rita Mountains, Arizona.

Bellsey and Mount's work provides evidence that plants from the *arizonicus* type locality are closely related to plants at other sites, including Bureau lands at Bonita and Markham creeks, but

whether they are the same taxonomic entity is unclear. If Bellsey and Mount's type A genotype is the *arizonicus* variety, then the status of the species is much enhanced over that evaluated in the final rule listing the species as endangered (44 FR 61557). In that rule, we found that the variety is only known from a few localities near the boundary between Gila and Pinal counties (the area of the type locality).

The Arizona hedgehog cactus occurs in the Upper Sonoran Life Zone within the Interior Chaparral community of Pinal and Gila Counties, Arizona (Benson 1982). The species is known from elevations between 3,300 and 5,700 feet (Cedar Creek Associates, Inc. 1994). Until recently, the distribution of Arizona hedgehog cactus was known only as occurring "in a narrow corridor between Miami and Superior, Arizona", generally parallel to US Highway 60 (Fletcher 1983). Direct and incidental observation has since resulted in a refined distribution of the Arizona hedgehog cactus that occupies an area of about 18,900 acres, or nearly 30 square miles. The Arizona hedgehog cactus is known from at least three locations external to the main distribution area. Within the Superstition Wilderness Area, at least two areas near the West Fork of Pinto Creek were identified as habitat occupied by Arizona hedgehog cactus. Another second satellite (disjunct) population has been identified along the east flank of Apache Peak about 10 miles northeast of Globe, Arizona. These populations are under the jurisdiction and management of the Tonto National Forest as well. A third satellite population of Arizona hedgehog cactus was identified near the crest of El Capitan mountain 14 miles south of Globe (Bingham, pers. comm. 1993). This subpopulation is under the jurisdiction of the Bureau of Land Management (BLM).

According to Crosswhite (1992), the vast majority of specimens are found on relatively open, rocky slopes and steep, fissured cliffs. Some few isolated individuals have been found in the moderately dense climax stands of interior chaparral. Parent materials of preferred habitat are Schultze Granite and Apache Leap Tuff (Dacite), both igneous in origin. Also, Pinal Schist and the Pioneer Formation located in proximity to the Dacite and Schultze Granite also provided habitat for the Arizona hedgehog cactus, but only where these formations expressed themselves as exposed bedrock. Although, *E. t. arizonicus* seems clearly and strongly associated with chaparral (Crosswhite 1992), it extends into lower Madrean evergreen woodland as well.

The best Arizona hedgehog cactus habitat is formed of resistant stable rock, either bedrock or entrenched boulders. Moderate habitat is composed of significant but often unstable rock; and poor habitat consists of a shallow but stable soil matrix with occasional scattered surficial rock. Non-habitat includes very colluvially active rock and either erodible or deeper, more productive soils. Crosswhite (1992) indicated this cactus thrives best on slopes of 20 to 90 degrees in rocky, bouldery terrain, but it can often be encountered on flatter and more open slopes (Cedar Creek Associates, Inc. 1994). It appears the Arizona hedgehog cactus prefers a resistant stable rock matrix primarily in the form of exposed bedrock, or secondarily-stabilized boulder and rock fields as opposed to a true soil matrix. Its roots invade cracks in exposed rock or narrow soil pockets between boulders and within bedrock. Shallow soil pockets and cracks seem to provide the roots with the necessary anchoring medium, periodic moisture, and shelter from the higher

temperatures of exposed and moist soils. Warm moist soils harbor pathogenic bacteria and fungi which are proven to be a leading cause of death in cacti (Crosswhite 1992).

Climatic variables for this species included an average annual precipitation of approximately 19 inches and an average frost-free period of 245 days (Phillips *et al.* 1979). Anthesis has been documented to occur during the last two weeks of April during average years. Arizona hedgehog cactus prefer at least some shade during the day and on average exhibit only 50 percent exposure to direct sunlight. Arizona hedgehog cactus can tolerate both complete shade and complete exposure to direct sun. Observations by knowledgeable personnel indicate Arizona hedgehog cactus can tolerate some competition given the correct combination of other habitat variables and sufficient moisture availability. This cactus prefers a more open environment with only scattered shrubs or herbaceous material in close competition.

The taxon is an obligate outcrosser and pollination can variably occur with the aid of hummingbirds, carpenter bees, solitary bees, and introduced honeybees (Crosswhite 1992). Ferguson (1989) indicated the entire group of red-flowered hedgehog cacti are adapted to hummingbird pollination, but scientific observation for this is lacking. Because the fruits are sweet and their spines fall away at fruit maturation, seed dispersal would seem to be primarily due to fruit-eating birds and mammals; although careful scientific observation is lacking. According to Crosswhite (1992), pollination or seed dispersal by bats seems unlikely, especially owing to the brilliant crimson color of the flowers. However, Ferguson (1989) noted some members of the *Echinocereus* genus are unique because their flowers remain open at night.

Cedar Creek Associates, Inc. (1994) and other knowledgeable investigators collected a substantial amount of density data for the Arizona hedgehog cactus. Cedar Creek surveyed extensive amounts of Dacite and Schultze Granite habitat. Density was directly provided or calculated from three other investigations: 1) a survey parallel to Highway 60 by Southwestern Field Biologists (Reichenbacher, pers comm. 1993); 2) direct density data provided in Fletcher (1979) in reference to Phillips *et al*. (1979); and 3) general Arizona hedgehog cactus data collected by Tonto National Forest Service personnel, September, 1991. Given these sources of data, the average density of Arizona hedgehog within the Schultze Granite and Dacite formations is 64.05 and 5.72 individuals per acre, respectively. These values should be considered "low-end" since a few cacti, especially seedlings and small juveniles, may have been missed by investigators during the "one-pass" survey of density transects. These calculations do not take into account the hundreds, or more likely thousands, of Arizona hedgehog cacti in the three satellite populations. Given acreage estimates of the "realistic" distribution of the Arizona hedgehog cactus, population values would be 163,862 and 93,646 for Schultze Granite and Dacite portions of the distribution, respectively, for a total realistic population estimate of 257,508 cacti as of 1993.

At present, known and suspected mortality and deleterious factors operating upon the population include: 1) illegal removal by humans (for horticultural practices, illegal export or sale, or the belief that *E. t.* var. *arizonicus* is a source of the hallucinogen dimethyltryptamine (Crosswhite

1992); 2) decimation of individual plants by sucking and boring insects; 3) spread of the disease "soft-rot of cactus" *(Erwinia carnegieana)*; 4) disturbance and trampling by grazing animals; 5) land use changes from undisturbed conditions within occupied habitats (e.g., mineral exploration, road and facility development, highway construction, powerline construction, etc.); 6) consumption by javelina; and 7) freeze loss.

Mining in the Globe and Miami/Superior area is considered by the Service to be a primary threat to the species due to the extensiveness of current ground disturbances and the potential for expansion into the occupied habitat of the Arizona hedgehog cactus. Past construction of corridors and roads suggest that this type of activity may bisect the population distribution of the Arizona hedgehog cactus. However, specific deleterious effects to population viability are not known.

Illegal collection of Arizona hedgehog cacti continues to be a threat to the species. Cacti are collected illegally for landscaping, and because the plant is perceived as a source of a hallucinogen. If in fact *Echinocereus triglochidiatus* var. *arizonicus* is a species containing hallucinogenic alkaloids, the evolutionary history may be linked to trading by the prehistoric Salado culture, implying that the species may actually be an early cultivar (Crosswhite 1992).

Most recreational activities do not conflict with the Arizona hedgehog cactus because of its remoteness and its rocky, barren, preferred habitat. However, the occasional organized activity such as off-road vehicle activity and motorcycle races are a cause for concern. If such activity were to occur in the typical habitat type for this species, negative impacts could be expected.

Past observations have noted apparent direct impacts on individual Arizona hedgehog cacti resulting from sucking and boring insects, or indirect impacts by the introduction of pathenogenic bacteria and fungi due to insect activity. This threat was identified in the language of the Federal Register when the cacti was formally listed as endangered. Crosswhite (1990) states that plant-sucking coreid bugs of the genus *Chelinidia* left evidence (feeding marks) on *E.t.* var. *arizonicus* specimens across nearly the entire known distribution of the cactus. This feeding activity appeared to occasionally result in the death of the meristem and subsequent re-growth of a new shoot. In addition, chewing by *Monellema* beetles also damages stems through boring and introduction of pathogenic bacteria and fungi (including "soft-rot of cactus"), which likely results in the occasional death of an *E.t.* var. *arizonicus* stem (Crosswhite 1992). Other natural mortality agents such as consumption by javelina or freeze loss were determined to be of greater significance to the species. Large scars left by freeze cracking were observed on many more Arizona hedgehog cacti than moderate borer insect scarring. These large cracks could more readily facilitate the introduction of pathenogenic agents into individual cacti than might occur with boring insects.

Livestock grazing can be a detrimental factor for Arizona hedgehog cactus populations due to the physical damage from trampling (Cedar Creek Associates, Inc. 1994; Crosswhite 1990, Parfitt and Christy 1991). Cedar Creek Associates, Inc. (1994) observed physical damage to individual

cacti due to cattle at an estimated rate of about one trampled cactus specimen in 400 to 500 observations. These observations occurred throughout the range of the species during seasons when cattle were present at allowable stocking rates for the allotment. Observations occurred only in those topographic circumstances which facilitate grazing by cattle regardless of underlying substrate. These cacti tend to grow in circumstances unfavorable for passage or grazing activity by cattle, due to steepness of slope and/or the fact that specimens are usually situated within cracks and crevices within bedrock. Only those few individuals which grow within a soil matrix (presumably less than 3 percent of the population) on slopes less than 60 percent are at risk to physical damage from livestock. By comparison, damage caused by javelina may be more frequent and problematic.

Due to the preferred rocky habitats of the Arizona hedgehog cactus, a typical wildfire would not be expected to impact this species with near the severity that an atypical, or "hot" wildfire would. Individuals growing in proximity to fuel sources (dry grasses, resinous or dry shrubs) would be subject to injury or death; however, the majority of cacti exist where fuel sources are more distant or unavailable, such as on cliff faces. Although wildfire of any intensity would cause a short-term loss of cacti, it could possibly release much of the habitat to colonization by the Arizona hedgehog cactus by reducing or eliminating competition. The extent to which such wildfire would be beneficial to the population in the long-term is speculative and future research into fire and this species is needed.

Environmental Baseline

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

The BAE classifies vegetation on the National Forest lands as one of five types, including browse, woodland, pinyon/juniper savannah, juniper savannah disclimax, or riparian. Acreages and descriptions of these vegetation communities follow. All acreage figures were generated by a Geographic Information System (USFS 2001a, USFS 2001b).

Browse vegetation on the allotment is found on 5,922 acres (44 percent of the Allotment area), and is comprised of both browse and shrub species. Browse species include Emory oak (*Quercus emoryi*), desert ceanothus (*Ceanothus greggii*), mountain mahogany (*Cercocarpus montanus*), squawbush (*Rhus trilobata*), and Wright silktassel (*Garrya wrightii*), with dominant shrubs including mesquite (*Prosopis glandulosa*), catclaw acacia (*Acacia greggii*), snakeweed (*Gutierrezia* sp.), and beargrass (*Nolina microcarpa*). Perennial herbaceous cover species include side-oats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), deer muhly (*Muhlenbergia rigens*), bottlebrush squirreltail (*Sitanion hystrix*), curly mesquite (*Hilaria*

belangeri), and wolftail (*Lycurus phleoides*). Browse vegetation is mainly found on south-facing slopes, steep ridges, and canyon side slopes (USFS 2001b).

The woodland vegetation community occurs on 2,358 acres (18 percent of the Allotment area), and is characterized by pinyon pine (*Pinus edulis*), one-seed juniper (*Juniperus monosperma*), and scattered alligator juniper (*Juniperus deppeana*), with areas of old growth gray oak (*Quercus grisea*) dominance. Other species within this community include desert ceanothus, Wright silktassel, mountain mahogany, manzanita (*Arctostaphylos* sp.), silverleaf oak (*Quercus hypoleucoides*), and shrub live oak (*Quercus turbinella*). The understory consists of blue grama (*Bouteloua gracilis*), side-oats grama, hairy grama, curly mesquite, silver bluestem (*Andropogon* sp.), wolftail, plains lovegrass (*Eragrostis intermedia*), june grass (*Koeleria pyramidata*), bottlebrush squirreltail, bullgrass (*Muhlenbergia emersleyi*), deer grass, green sprangletop (*Leptochloa dubia*), and mutton grass (*Poa fendleriana*). The woodland vegetation community occurs adjacent to savannah mesas, serving as a transition zone between open pinyon/juniper savannahs and browse associations (USFS 2001b).

The open pinyon/juniper savannah association is found on 2,098 acres (16 percent of the Allotment area) of areas with slopes of 0 - 30 percent, and on mesa tops including Dix Mesa, Lightning Mesa, Pleasant Valley, and a small portion of Hamilton Mesa. Savannahs support a very low density of overstory species, and resemble open grassland associations. The dominant herbaceous species in this vegetation community are blue grama, hairy grama, and curly mesquite, with tobosa (*Hilaria mutica*) and side-oats grama also present. Other species present include black grama (*Bouteloua eriopoda*), plains lovegrass, three-awn (*Aristida* sp.), silver bluestem, wolftail, bottlebrush squirreltail, june grass, green sprangletop (*Leptochloa dubia*), bullgrass, deer grass, vine mesquite (*Panicum obtusum*), and mutton grass (USFS 2001b).

The juniper savannah disclimax community encompasses 2,603 acres (20 percent of the Allotment area), and is dominated by mesquite, catclaw acacia, and one-seed juniper. Lower elevation portions of this community have a disproportionately high percentage of mesquite, catclaw acacia, snakeweed, and one-seed juniper. Overstory species within this area include honey mesquite (*Prosopis glandulosa* var. *glandulosa*), one-seed juniper, alligator juniper, desert ceanothus, catclaw mimosa (*Mimosa biuncifera*), catclaw acacia, cacti, ocotillo (*Fouquieria splendens*), and snakeweed. Forbs are a major component of the understory (USFS 2001b).

Riparian habitat is found on 364 acres (one percent of the Allotment area) along the San Francisco River and Dix Creek. Portions of the San Francisco River form the northern border of the allotment. The San Francisco River originates near Alpine, Arizona, and flows for approximately 93 miles into western New Mexico and back into Arizona, connecting with the Gila River below Clifton, Arizona. The San Francisco River is the largest riparian stream system within the allotment's boundaries. Vegetation within the riparian plant community along the San Francisco includes Arizona sycamore (*Platanus wrightii*), Fremont cottonwood (*Populus fremontii*), Arizona alder (*Alnus oblongifolia*), Arizona walnut (*Juglans major*), netleaf hackberry (*Celtis reticulata*), shortleaf baccharis (*Baccharis brachyphylla*), gray oak, Emory oak,

bermudagrass (*Cynodon dactylon*), and sedge species (species unknown). Upland species include one-seed juniper, mesquite, catclaw acacia, yucca (*Yucca* sp.), desert ceanothus, sideoats grama, blue grama, and bullgrass (USFS 2001b).

The right and left prongs of Dix Creek are also present on the allotment. Riparian vegetation along Dix Creek includes Arizona alder, Arizona walnut, Arizona sycamore, willow (*Salix* sp.), box elder, shortleaf baccharis, netleaf hackberry, water hemlock (*Cicuta douglasii*), vetch (*Vicia* sp.), bedstraw (*Galium* sp.), white sweet clover (*Trifolium ripens*), and sedges. Upland species near Dix Creek include mesquite, catclaw acacia, gray oak, Emory oak, blue grama, sideoats grama, and curly mesquite (USFS 2001b).

The Pleasant Valley Allotment lies entirely within the Lower Middle and Lower San Francisco 5th Code watersheds. Major drainages on the allotment include the San Francisco River, the left and right prongs of Dix Creek, Red Tank Canyon, Hamilton Canyon, and Oak Canyon. The San Francisco River provides a surface hydrologic connection between the Gila River and all of the tributaries of the watershed. The Pleasant Valley Allotment contributes 13,173 acres, or seven percent, of the total watershed of the Lower Middle San Francisco 5th code watershed, and only 58 acres (slightly more than 0.1 percent) of the Lower San Francisco 5th code watershed. The watershed encompasses approximately 217,860 acres from the New Mexico/ Arizona State Line to the southwestern forest boundary.

Table 3 in Appendix A provides a summary of past consultations occurring on the Apache National Forest on other allotments. Consultations have occurred on a variety of action types, with varying effects to listed species. Past projects have included grazing, reservoir or barrier construction, timber sales, trail construction, powerlines, habitat improvement, prescribed burns, and species reintroductions. No commercial timber or fuel wood is produced on the allotment, but the entire allotment, with the exception of riparian corridors, is open to dead and down fuel wood collecting. Recreational uses include fishing, sight-seeing, and hunting. Rafting and kayaking occur when snow pack conditions in the high country create sufficient water flows during snow melt. Unauthorized off-highway vehicle (OHV) use by the public occurs along the San Francisco River from the private land west towards the town of Clifton, traversing and following the river channel and adjacent benches.

Road development in the area includes Forest Road 212 from State Highway 78 to the allotment boundary at the Burnt Stump Corral holding pens. Forest Road 215 extends south through the allotment, bisecting the Mesquite and Pleasant Valley pastures for about five miles, before leaving the allotment. The portion of Forest Road 212 from Martinez Ranch down the San Francisco River to the Blue River is not maintained, and is traveled only intermittently by OHVs by the public when flows allow. FR 212 runs from the highway (78) to the San Francisco River at Martinez Ranch, and then to the mouth of the Blue River where it ends at road closures on both the Blue and San Francisco rivers corridors. There is an ongoing problem with unauthorized OHV use by the public beyond the end of the road.

The Forest Service has taken proactive actions, in cooperation with several partners including the Pleasant Valley allottees, to allow for recovery of riparian areas along the San Francisco River. These include significant reductions in maintenance actions on Forest Road 212 in the San Francisco River corridor, and rest from livestock grazing in the San Francisco River since 1993.

Recovery projects with beneficial impacts to listed species include barrier construction (Apache trout), and species reintroductions (Apache trout and Mexican gray wolf).

San Francisco River

To understand the existing conditions, and the effects of past and present actions on listed species within the proposed project area, it is necessary to understand the history of the 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 was described as having thick borders of flags (*Iris* sp.) and willows with some larger cottonwood, and beaver dams in "great numbers" (Emory 1848). Beavers were abundant along the San Francisco River in the 1800s (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 wood harvest 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 the water diversion, wood harvest, roads, and toxic discharges resulting from the 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 watershed and stream resulting in a river channel similar to that present today.

Because of canyon influences, the San Francisco River upstream from the Blue River remains relatively well-defined and moderately vegetated with cottonwood, willow, ash, walnut, sycamore, and seep willow (*Baccharis salicifolia*). The substrate is boulder, cobble, gravel, and sand. After joining with the Blue River downstream of the Pleasant Valley Allotment, the lower San Francisco River channel becomes progressively wider, and is a sparsely vegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting wide, shallow, low-flow channel. River terraces, which were only moderately eroded above the mouth of the Blue River become small, eroding remnants of former river banks. Riparian vegetation consists primarily of seep willow, cottonwood, and nonnative salt cedar (*Tamarix* sp.) and is lacking in structural diversity. The Forest Service notes that limited new floodplain development is occurring, and is accompanied in some areas by willow, cottonwood, and boxelder.

A stream discharge gauge is located on the San Francisco River at Clifton. The period of record of that gauge is continuous from 1927 to present, with sporadic records from 1910 to 1927. The San Francisco River shows a bimodal discharge pattern: a snow-melt hydrograph with high flows in late winter and spring and a second high flow period associated with monsoon rains in

late summer. At the gauge, the maximum instantaneous discharge for the period of record is 90,900 cubic feet per second (cfs) from October 1983; the minimum daily discharge is 6.1 cfs from June 1971; the monthly mean discharges range from 57 cfs in June to 454 in March; and the 50 percent exceedance level is 76 cfs (USGS 1999). The San Francisco River is "flashy" with storm discharges substantially larger than mean daily discharge on the day of the storm (USGS records).

Present uses of the San Francisco River watershed and valley bottom continue to contribute to the deteriorated condition of the river, although at a level reduced from that of the late 1800s to early 1900s. Timber harvest, road, and grazing activities within the watershed continue to contribute to erosion, vegetation change, and alteration of the hydrologic regime. Although there is little private land along the river in Arizona, there are substantial areas of private land on the river in New Mexico. Near the towns of Glenwood, Pleasanton, and Reserve there are farms, ranches, and towns along the river bottom as well as pastures and irrigated agriculture. There are a number of small diversion structures and irrigation canals. The river is completely diverted near Glenwood and Pleasanton during the low flow periods and substantial nutrient loads are added in irrigation return flows (Propst *et al*. 1988). Although the lower San Francisco River above Martinez Ranch was closed to vehicle use in 1987, some unauthorized use by the public continues. On the road below Martinez Ranch there are several low-water crossings. On the road from the RU Ranch to Clifton, there are 26 low-water crossings within 8.7 miles. Forest Service lands along the San Francisco River in Arizona have been excluded from livestock grazing, although occasional trespass use occurs. Livestock grazing in the river continues on BLM and State Lands.

Factors Affecting the Species Environment Within the Action Area

On-going Management

As currently managed, the existing term grazing permit for the Pleasant Valley Allotment authorizes 250 head of cattle (cow/calf operation) from November 1 to May 31; 220 head of cattle (cow/calf) from June 1 to October 31; 60 head of cattle (yearlings) from January 1 to May 31; and 10 horses year-round. The allotment currently contains a total of seven pastures or grazing areas, including the Dix Mesa, Dix Saddle, Pleasant Valley, San Francisco, Johnnie (Red Flat), Hamilton Mesa, and Lightning Mesa pastures. The San Francisco River and Dix Creek portions of the Red Tanks pasture have been rested since 1998. An additional pasture, the Dix Saddle Pasture, is primarily used for shipping. Distribution of cattle within pastures is accomplished through a combination of natural barriers, short stretches of drift fences, and livestock relocation to specific areas within larger pastures.

Salt and water are additionally used to distribute livestock. The allotment includes 20 stock tanks, one well, and various springs. Pipelines transport water from the well and storage at Red Tanks to troughs and additional storage tanks within the Johnnie Tank Pasture, Hamilton Mesa Pasture, and the southwest portion of the Lightning Mesa Pasture.

Livestock grazing has been managed under a deferred/rest rotation system AMP since 1967. Under this plan, small herds of livestock totaling 50 to 75 head are located within three or four pastures at any time. Each pasture receives 12 months of livestock grazing, followed by six months of rest or deferment. Two pastures are annually deferred from summer and fall grazing, and two from winter and spring grazing. Each one of these pastures can be deferred from grazing for up to a year, as needed (USFS 2001a). Forty adult cattle can be removed from the allotment during the summer months and placed on private lands. In exchange, yearlings are grazed on public lands within the adult livestock herd during the dormant season months of October through March.

The Forest Service conducted an intensive inspection in 1995, and documented severe and extensive forage use levels of 60 to 70 percent over most of the allotment. The PEA notes that adjustments in management, combined with normal rainfall in 1996/1997 and above normal rainfall in 1998 resulted in substantial improvement in vigor and production over most of the allotment. Subsequent inspections revealed forage use that was moderately heavy (45 to 50 percent), and those pastures were identified for complete rest or summer deferment. Inspections in 1999 and 2000 documented moderate forage use of 25 to 35 percent in those pastures that received growing or seasonal deferment in 1998.

Average AUMs of grazing for the four-year period between 1991 - 1994 was 3,218. Between 1995 and 2000, average AUMs was 2,928. The ten year average was 3,166 AUMs (including horses).

Watershed

The total watershed that contributes to the condition of the San Francisco River at the Pleasant Valley Allotment is 1,446,400 acres (USGS 1999). The BAE notes that 49 percent of the Pleasant Valley Allotment is considered to be within satisfactory watershed condition, while 51 percent is in unsatisfactory watershed condition. The PFC Assessment, discussed in greater detail below, indicates that upland watershed problems are contributing to riparian conditions, and recommend improvement of those conditions. Photographs in Appendix C show general range conditions within some of the pastures on the Pleasant Valley Allotment.

Soils

The assessment of soil condition follows a classification scheme which divides soils by condition into satisfactory, impaired, unsatisfactory, or satisfactory/untreatable. Satisfactory means that indicators signify that soil function is being sustained and soil is functioning properly and normally. Impaired or unsatisfactory soils are those for which there has been a reduction of soil function or a loss of soil function. Satisfactory/untreatable means soils that are inherently unstable and/or unstable due to past activities of man. These areas are generally classified as “no allowable capacity” meaning they are considered untreatable with respect to livestock grazing. This includes all soils with slopes greater than 40 percent, or those with lesser slopes but having

certain unstable soil conditions. Of the estimated 13,173 acres in the allotment, the Forest Service classified 7,028 acres as having capacity for livestock. Of these 7,028 acres, 2,526 (36 percent) are in satisfactory condition, 3,371 (48 percent) are in impaired condition, and 659 (nine percent) are in unsatisfactory condition.

Range

The Forest Service Range Analysis handbook provides guidelines for assessing range conditions using various classes of good, fair, poor, or very poor. The BAE classifies acreages within the allotment, following this classification scheme. Of the 13,173 acres in the allotment, the majority of the acreage (6,937 acres, or 52 percent) is classified as having no condition, meaning it has no grazing capability, has a slope greater than 40 percent, or is on private lands. If these acres are deducted from the total, and the percentages are calculated for areas actually grazed (6,394 acres), then the range condition percentages are as follows: less than one percent in good condition, 80 percent in fair condition, 13 percent in poor condition, and seven percent in very poor condition. It should be noted that range condition ratings are relative indicators of how well the range would support livestock, and are based on plant vigor, composition, desirability, and density.

Table 2 in Appendix A summarizes previous consultations on livestock grazing on Forest Service Lands in the San Francisco Watershed. Table 2 also provides summary information on range condition, soil/watershed condition, and PFC by allotment for those allotments for which this information was furnished in earlier section 7 consultations. Although the information from these 21 allotments only encompasses 32.3 percent of the total watershed it provides at least a larger picture of the aggregate effects of livestock grazing on the fish community of the San Francisco River on the Pleasant Valley Allotment. The 21 allotments are generally those on, or with a close connection to, the River.

With respect to range, cumulative range condition results showed that eight percent of the range for all allotments along the San Francisco River are in very poor condition, 48 percent in poor condition, 44 percent in fair condition, 4 percent in good condition, and none in excellent condition (43 percent are categorized as non-capacity). With respect to soil and watershed condition, 36 percent of the allotments along the San Francisco River are in unsatisfactory condition, 17 percent are in impaired condition, 28 percent are in satisfactory condition, one percent are classified as unsuited, and 18 percent were classified as unknown.

Upland Vegetation Communities

There are four upland vegetation communities present on the allotment in varying condition. The PEA notes that, within the browse community (44 percent of the allotment acreage), soil stability is fair to high in the upper elevation areas, with fair to good herbaceous understory and litter cover. Within the woodland community (18 percent of the allotment acreage), range condition is described as fair to poor, and limited by encroachment of invader species such as snakeweed

and juniper. Herbaceous plant vigor and density are low in the woodland community. Soil conditions are listed as poor, with erosion occurring and evident, particularly in areas with high juniper and pinyon canopy. Within the open pinyon/juniper savannah community (16 percent of the allotment acreage), range conditions are fair with high plant vigor, but are limited by a lack of species diversity within the herbaceous understory. Invader species are also present. In the juniper savannah disclimax community (20 percent of the allotment acreage), soil stability is fair, with a decreasing herbaceous understory due to the influence of encroaching tree and shrub species. Root are exposed, indicating sheet erosion. Range condition is poor (USFS 2001b).

Landscape Patterns in Soil, Range, and Vegetation Conditions

GIS maps provided with the consultation request illustrate landscape patterns in slope, soil condition, range condition, vegetation communities, capability, and capability by soil type. The slope map illustrates the steep topography present between mesa tops. These steep areas, frequently reaching slopes of 41 to 61 percent and higher, are classified as "no capacity" when assessing range condition, and generally receive limited livestock use during winter months.

Range condition can be classified as good, fair, poor, very poor, or no condition. Only one small area (less than one percent of the allotment) is rated in good condition. This area occurs in an area within the 0 - 30 percent slope class, within the Johnny/Curly Tank and Hamilton Mesa pastures. However, this area is well isolated by natural barriers and allotment boundary fencing.

For the remaining areas with a slope between 0 and 40 percent, range condition appears to be less tied to slope, and more tied to proximity to the private lands and the San Francisco River to the North, and also tied to the topography of the Johnny (or Red Flats) Pasture. The Allotment is shaped roughly like an upside down funnel. Within the narrow "neck" of the funnel, where slope is 0 to 30 percent, conditions are described as poor or very poor. The topography essentially funnels cattle through a narrow, flat area in Johnny (or Red Flats) Pasture, which serves as the primary connecting corridor between private lands and the Hamilton Mesa, Lightning Mesa, Johnny/Curly Tank, Red Tank, and Pleasant Valley pastures.

With respect to soil capability, the GIS maps illustrate a relationship between range condition and capability. There are no areas of full capability in the Johnny (or Red Flats) Pasture, where range conditions are rated as poor and very poor. The rating within this pasture is entirely "potential capability" or "no capability and over 40 percent slope". This is also the case for the San Francisco Pasture, where conditions are rated as poor. However, there are areas along the San Francisco River where a "full capability" rating was assessed. These are areas which have not been grazed for several years, and will not be grazed under the proposed action. Areas in fair condition throughout the remainder of the Allotment were rated as having either "full capability" or "potential capability".

Riparian Vegetation

Table 2, Appendix A, provides summary information on range condition, soil/watershed condition, and PFC by allotment. For PFC assessments, the Forest Service rated 11 percent of the allotments along the length of the San Francisco River as non-functional, five percent as functioning at risk, and 29 percent as functioning properly. No data is available for the remaining 55 percent.

The PEA describes the San Francisco River as flowing for approximately 93 miles, originating near Alpine, and continuing downstream to its confluence with the Gila River. Of these 93 miles, four miles flow through the allotment. The PEA notes that diminished watershed conditions have likely been the greatest impact to the system. In addition, the PEA notes that cyclic peak flows or flood events occur every 10 years, with the most significant flooding occurring in 1906, 1972, 1983, and 1992-1993. Loss of a middle-age class of cottonwoods, sycamores, and alders is attributed to flooding. The riparian vegetation community is described as dominated by annuals, seedlings, saplings, and remnant old-growth classes. The Forest Service describes the channel as unstable during peak flow events, and notes that the channel lacks woody materials, and has experienced alteration of its structure, complexity, pool numbers, and pool volumes (USFS 2001b).

At the Pleasant Valley Allotment, the Forest Service completed a PFC assessment on perennial riparian systems along Dix Creek and the San Francisco River. The PFC assessment was conducted by an interdisciplinary team of Forest Service employees. For the PFC assessment, the Forest Service divided the four miles of the San Francisco River within the allotment boundaries into two reaches. The first reach occurs from Harden Cienega east to the private property boundary, and the second reach occurs from the private property boundary west to the Hickey Allotment boundary and the Blue River confluence. The PFC assessment rated both reaches at *Functional at Risk - Upward Trend*. The PEA notes that poor watershed conditions occur as far upstream as Luna, New Mexico, and that private agricultural lands and roads along the channel bottom also limit riparian recovery. No livestock grazing has occurred on the San Francisco River since 1998, and there have been no significant flood events since 1993. The PEA concludes that the system appears to be improving. The Service notes that the three years that have elapsed since grazing was removed, while beneficial to initial re-establishment of vegetation, is an inadequate amount of time for recovery of channel morphology.

A site visit to the area indicates that riparian vegetation is abundant along many portions of the river channel (Appendix C - Photograph 1). A complete review of the information provided in the PFC assessment indicates that the vegetation present is what would be expected given several years since the last major rainfall event (i.e., 1993). Removal of grazing from the San Francisco River has also promoted regrowth. Both reaches of the San Francisco River achieved “yes” ratings for a diversity of riparian plant age-classes and species, indicating that two or more age classes are present and two or more species are present. Additionally, while it was noted that the streambank vegetation is comprised of those plants or communities that have root masses

capable of withstanding high streamflow events (criterion 9), it was determined that the amount of those types of vegetation are inadequate to protect banks and dissipate energy during high flows (criterion 11). While vegetation is currently present, it would likely be largely removed or altered during the next high flow event.

Of greater concern for suitable fish habitat is the stability of the channel over the long-term. The PFC assessment is not a tool for determining the suitability of an area for fish habitat. However, some of the criterion addressed under a PFC assessment provide information that may be useful in assessing an area's suitability for fish habitat. The PFC assessment indicates that the channel would not necessarily be considered stable. These reaches received "no" ratings for several key criteria, indicating that adequate vegetative cover is not present to protect banks and dissipate energy during high flows (criteron 11), that floodplain and channel characteristics are not adequate to dissipate energy (criterion 13), and that the stream is not in balance with the water and sediment being supplied by the watershed (criterion 17). Photograph 2 in Appendix C shows "blow out" areas along the San Francisco River, which have little sediment deposition and vegetation, and that are not inundanted during relatively frequent events.

Finally, the PFC assessment indicates that the upland watershed is contributing to riparian degradation (criterion 5). On the back side of the form, the ID Team from the Forest Service indicated that current grazing is one of the problems contributing to current riparian conditions, and makes the recommendation that watershed conditions be improved. Additional information provided in the San Francisco River PFC summary indicates that "Diminished watershed conditions have likely been the greatest impact to this system (USFS 2001d).

The Forest Service assessed the right prong of Dix Creek as one reach. It is intermittent from its headwaters to Lone Sycamore Canyon, and perennial from Lone Sycamore Canyon to the mainstem of Dix Creek. The PEA notes that vigorous and diverse age classes of riparian vegetation are represented along the entire stream channel. Coarse woody debris, rock, and vegetation are present in amounts they believe are adequate to dissipate energy during high flow events. The right prong of Dix Creek was evaluated as being in *Proper Functioning Condition*. This reach received "yes" ratings for all but three criteria. Those criteria were given responses of "not applicable". The right prong of Dix Creek appears to be in good overall condition, based on the PFC assessment.

The Forest Service evaluated Dix Creek in four reaches. The Forest Service rated the first reach, extending 1.0+ miles from the allotment boundary downstream, as functional at risk - no trend apparent. The hydrologic function is partially stable, with a width/depth ratio and gradient in balance with the landscape setting. Riparian vegetation, however, is marked as both present and not present in adequate densities to protect banks and dissipate energy during high flows (criterion 11). Species diversity is adequate, but only younger age classes are present. Additionally, riparian plants do not exhibit vigor, but are small and with limited reproduction (criterion 10), and plant communities are not serving as a source of coarse and/or large woody debris, with a lack of larger trees (criterion 12). Floodplain and channel characteristics are

described as inadequate to dissipate energy, with the ID Team noting that there is no large woody debris present, and "everything" is "rushing through" (criterion 13). The stream is described as being out of balance with water and sediment being supplied by the watershed, with the ID Team noting that there is "too much water going through, not depositing any fines to allow any vegetation to get going" (criterion 17). The ID Team notes that problems include the flashy, localized storms, the steep watershed that contributes to accelerated runoff, and a lack of roughness which also causes accelerated runoff. They note that there are no factors outside of the Forest Service's control which are contributing to the unacceptable conditions (USFS 2001b).

The second reach of Dix Creek extending 1.5 miles to the spring is linear. The PFC assessment notes that there is low age-class diversity, and that the species present do not indicate that riparian soil moisture characteristics are being maintained (criterion 8). This means that more xeric species are present in the riparian area, indicating insufficient moisture to maintain riparian species. Additionally, streambank vegetation present is not comprised of plant communities with root masses capable of withstanding high streamflow events (criterion 9). There is inadequate vegetation present to protect banks and dissipate the energy associated with high flows (criterion 11). Finally, the stream is not in balance with the water and sediment being supplied by the watershed (criterion 17), and the upland watershed is contributing to riparian degradation (criterion 5). With respect to criterion 5, the ID Team notes that there are "...excess flows." Similarly, comments by the ID Team in criterion 17 indicate that there is "...way too much volume and velocity coming through, moving large cobbles, no deposition of fines (USFS 2001b)."

The third reach of Dix Creek continues for 0.5 miles from the old corral downstream. The Forest Service rated this reach as functional at risk - upward trend. The ID Team notes that the floodplain is still in the process of building, but needs more woody material to facilitate fines deposition. The Creek is described as "still not in balance, too straight." The comments indicate that some vegetation is present, interspersed with bare patches 100+ yards in length. Vegetation is young, with no older growth present. Vegetation present is inadequate to protect banks and dissipate energy during high flows, and plant communities in the riparian area are not providing adequate coarse and/or large woody debris. The floodplain and channel characteristics are also inadequate to dissipate energy. The ID Team identified a lack of coarse woody debris as being a problem in this reach, and did not identify any factors contributing to unacceptable conditions as being outside of the agency's control or management (USFS 2001b).

The fourth reach of Dix Creek begins from the four wheel drive road and continues upstream for 1.5 miles. The Forest Service rated this reach as in proper functioning condition. This reach received primarily "yes" ratings , with three "not applicable" ratings for floodplain inundation (criterion 1) (as this reach occurs through a canyon), beaver dams (criterion 2), and point bar revegetation (criterion 14). The ID Team describes this reach as "...lush, very shaded" (USFS 2001b).

The left prong of Dix Creek was also evaluated, and divided into two reaches. The first reach begins at the confluence of the right and left prongs and continues downstream to the Dix

diversion. This reach attained "yes" ratings for 13 criterion, a "not applicable" rating for beaver dams (criterion 2), and "yes/no" ratings for criteria 11, 16, and 17, leaving it unclear as to whether or not adequate vegetation is present to protect banks and dissipate energy during high flows, whether or not the system is vertically stable, and whether or not the stream is in balance with the water and sediment being supplied by the watershed. Subsequent comments provided by the Forest Service indicate that this hydrologic function is "partially stable" (USFS 2001c). This reach was rated as functional at risk - upward trend (USFS 2001b).

The second reach of the left prong of Dix Creek, from the diversion dam to the San Francisco River, has been mechanically modified, and was described as nonfunctional with a downward trend. A dike was constructed within the Creek from below the diversion dam south to the San Francisco River. The dike provides flood protection for the road, irrigation pipeline, and private land. According to the PEA, the dike has "...greatly altered the function and configuration of the riparian system." Water flow is forced into a smaller channel, eliminating the flood plain. High flow events subsequently result in severe scouring and removal of riparian vegetation. The substrate consists of rock and cobble. The reach is out of balance with water and sediment being supplied by the watershed, and is unstable. The ID Team notes that: 1) this reach is channelized, having no floodplain, 2) is lacking a riparian zone; 3) has little vegetation regenerating; 4) has reduced soil moisture; 5) has bare banks and few mature trees; 6) is downcutting; and 7) lacks adequate sediment. The ID Team concludes that the "entire area is drying out" with a resultant "type change to catclaw, mesquite, hackberry". The Forest Service rated this reach as nonfunctional (USFS 2001b).

Status of the Species Within the Action Area

Spikedace and Loach Minnow

For many years, the fish fauna of the San Francisco River was poorly known. The fish fauna of the lower San Francisco River is depauperate in species and in numbers. In 1904, Chamberlain found no fish of any species during surveys from the mouth of the San Francisco River up to the Blue River. He reports local stories of previously abundant fish and speculates that the loss of those fish is due to flooding, heavy silt loads, mining effluent, and extensive water diversion.

Chamberlain found no fish in the lower San Francisco River in 1904 during three hauls just below the mouth of "Blue Creek", and stated in his report that natives of the area indicated there were no fish. The next documented fish survey in the Arizona portion of the river was by Anderson and Turner in 1977. This was the first survey to document loach minnow in the Arizona portion of the river, although it had been recorded in the upstream New Mexico portion since the early 1940s (LaBounty and Minckley 1972). Since 1977, loach minnow have been found throughout the Arizona portion of the San Francisco River upstream of Clifton, although in low numbers (Minckley and Sommerfeld 1979, J.M. Montgomery Consulting Engineers 1984, Papoulias *et al*. 1989, Bagley *et al*. 1995). In 1979, surveys found the lower San Francisco to support "few individual fishes and little biomass" (Minckley and Sommerfeld 1979).

Spikedace have never been found in the San Francisco River in Arizona. Given Chamberlain's 1904 report, it is likely that several native species, including spikedace, were extirpated form this portion of the river in the early part of this century due to human activities, although they continued to be present in the New Mexico portion of the river until at least 1950 (Anderson 1978).

In addition to loach minnow, the San Francisco River continues to support five other native species, including razorback sucker, speckled dace (*Rhinicthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus [Pantosteus] clarki*), and Sonora sucker (*Catostomus insignis*). Gila chub (*Gila intermedia*) are found in two tributaries of the San Francisco River (Bagley *et al*. 1995). The San Francisco River, like all streams remaining in the Gila River basin, has 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, March *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 rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*), red shiner (*Cyprinella lutrensis*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictus olivaris*), carp (*Cyprinus carpio*), smallmouth bass (*Micropterus doloneiui*), softshell turtles (*Trionyx spiniferus*), and crayfish (*Orconectes virilus*) (Anderson and Turner 1977, Minckley and Sommerfeld 1979, J.M. Montgomery Consulting Engineers 1985, Papoulias *et al*. 1989, Bagley *et al*., 1995).

Historic records of the Blue and San Francisco rivers, as well as those from the San Francisco River upstream and the Gila River downstream of the Blue River, can be used to construct a list of 14 native fish species that are likely to have historically occupied the Blue and San Francisco rivers. This information can be combined with early descriptions of the rivers and their valley bottom (e.g. Chamberlain 1904, Olmstead 1919, Leopold 1921, Emory 1948, Dobyns 1981, Coor 1992), from which it appears that the rivers were much narrower with more distinct streambanks and floodplain and wider, denser riparian cover and that the aquatic habitats were much more varied and complex. From this information, it can be concluded that eight species of native fish, or 60 percent of the native fish species, have been extirpated from the San Francisco River.

Historically, loach minnow were known to occur on several drainages occurring within the proposed project vicinity including White River, East Fork White River, San Francisco River, Blue River, and Eagle Creek, as well as some of their tributaries (Minckley 1973, Minckley 1980). Within this same area, loach minnow persists only in limited reaches in the White River, East Fork White River, the Black and San Francisco rivers, the Blue River and its tributaries Dry Blue, Campbell Blue, Little Blue, and Pace, Frieborn, and Eagle creeks. The status of the species within occupied areas ranges from common to very rare. At present, the species is common within the project vicinity only in the Blue River and limited portions of the San Francisco River. The San Francisco River is considered occupied by loach minnow for approximately 126 miles of its length from its confluence with Ash Creek in Arizona to The Box in New Mexico. Loach minnow have been located in those portions of the San Francisco River which run through the

northern boundary of the Allotment (J.M. Montgomery Consulting Engineers 1985, Papoulias *et al*. 1989).

No loach minnow have been detected in Dix Creek. However, the BAE notes that the Dix Creek drainage on the Pleasant Valley allotment provides perennially flowing water that supports five species of native fish, and that recent discoveries of loach minnow in very small streams in the upper Blue River watershed (e.g. Frieborn Canyon, Pace Creek) may indicate the potential suitability of Dix Creek for loach minnow. It should be noted that the perennial portions of Dix Creek are disconnected from the San Francisco River by water diversion and altered channel conditions, so that natural ingress of loach minnow by upstream movement from the San Francisco River is precluded except during high water.

As noted in the Status of the Species section, critical habitat for spikedace was designated on streams on the Apache National Forest as well, including the Black River, Eagle Creek, San Francisco River, the Blue River, Campbell Blue Creek, and Little Blue Creek. Within the proposed project area, the northern boundary of the allotment overlaps critical habitat for both spikedace and loach minnow on the San Francisco River. Critical habitat for loach minnow was designated on portions of streams on the Apache National Forest including the North Fork and East Fork Black River, Beyond Creek, Coyote Creek, West Fork Black River, Eagle Creek, the San Francisco River, Blue River, Campbell Blue Creek, Dry Blue Creek, Pace Creek, Frieborn Creek, and Little Blue Creek (Appendix B, Map 2).

Existing habitat conditions for spikedace and loach minnow within the lower San Francisco River are 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 have exacerbated the problem by denuding vegetation, severely increasing erosion, altering channel geomorphology, and substantially increasing the flashiness of the hydrograph. These uses have historically included, and in some cases continue to include**,** timber harvest, water diversion, irrigated agriculture, residential and urban development, mining, groundwater pumping, and roadbuilding. Timber harvests were discontinued 75 years ago. At present, water diversions are limited to one from the San Francisco River immediately above the Martinez headquarters and one on Dix Creek. Vehicular travel in the San Francisco River is primarily OHV travel by the public within the river corridor itself. However, the most pervasive and widespread influence on the watershed has been livestock grazing. In livestock grazing allotments paralleling 70 percent 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 percent is rated as nonfunctional or at risk (see Table 2, Appendix A).

As noted by the National Riparian Service Team (NRST 2001), “legacy effects” of these historic activities “...while long since abandoned never-the-less are responsible for effects which are still occurring.” 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, or 60 percent 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.

Given this highly deteriorated environmental baseline, any actions which would adversely affect the river, spikedace or loach minnow, or their habitat must be viewed as incremental contributions increasing the existing serious threat to the survival and recovery of these species. Survival and recovery of loach minnow depends upon cumulative improvement in the aquatic habitats in which it remains. Survival and recovery of spikedace depends upon improving critical habitat areas to the point that repatriation of spikedace can successfully occur. Those improvements depend, in turn, upon cumulative improvement of the watershed conditions, channel geomorphology, and hydrologic regimes or the river systems, including the San Francisco River, which is a large portion of the loach minnow's remaining range.

Riverine systems in the southwest are generally flashy, having patterns of low flow punctuated by dramatic flood events at semi-regular, multi-year intervals. Native fish have adapted to this cycling within riverine systems. However, disturbance of channel hydrology, geomorphology, and vegetation leads to changes in this riverine cycle. These changes are addressed and documented within the "Effects of the Action" section.

Southwestern Willow Flycatcher

The BAE notes that surveys were conducted for flycatchers during 1995 on Pigeon Creek and the Blue River, and in 1996 on the lower San Francisco River. No flycatchers were detected, and it was determined that no suitable habitat existed within the allotment. Forest Service personnel conducted an additional assessment of habitat in the allotment in 1998, and concluded that no suitable habitat existed within the allotment.

Flycatchers are known to occur on the Apache National Forest at two locations, one each on the Little Colorado and San Francisco rivers. The nearest known nesting flycatchers on the Apache National Forest are those located along the San Francisco River, with multiple territories documented each year as follows: five each in 1993 and 1994, four in 1995, three in 1996, two in 1997, three each in 1998 and 1999, and two in 2000. In 2000, detections at the Alpine Horse Pasture included three resident adults occupying two nest sites (Paradzick *et al*. 2001). This site is approximately 35 miles north of the allotment. Additionally, flycatchers are known to occur approximately 20 air miles to the south, on the Gila River. Habitat at this site is more similar to potential habitat on the Allotment than to the habitat 35 miles to the north, which is 3,000 feet higher in elevation.

Additional surveys were conducted in 1994 at the Blue River Crossing, Blue School, Upper Blue River Campground, and Bobcat Flat-Blue River, with no detections. Surveys were conducted in

1997 on the San Francisco River south of Clifton and at Sycamore Gulch, with no detections. Additional surveys with negative results occurred on the Lower San Francisco River in 1996, on the Upper San Francisco in 1995, at Pheasant Farm in 1993 and 1995, and south of Alpine in 1993.

The surveys conducted during 1995 and 1996 by the Arizona Game and Fish Department concluded that potential habitat may develop within the Blue and San Francisco rivers in a minimum of five years. Additionally, the Forest Service provided new information regarding habitat suitability surveys on October 4, 2001. This information, including a map that is incorporated herein by reference, noted that no suitable habitat is currently present within the allotment, but that suitable habitat is present approximately 0.62 miles downstream of the allotment. Potential habitat was identified throughout the length of the San Francisco River within the allotment. Information from the Forest Service indicates that that portion of the San Francisco River between Martinez Ranch and the confluence with the Blue River contains a valley which has "...the potential to develop substantial acreage of native riparian woodland - in Arizona probably only second to that on the upper San Pedro in terms of area and quality (Stoleson 2001)." Livestock grazing will not be permitted within the Blue or San Francisco river corridors as part of the proposed action, therefore, cattle will not be permitted to graze in potential habitat.

No critical habitat will be affected by the proposed action.

Mexican Spotted Owl

The BAE notes that no surveys have been completed for Mexican spotted owl on or adjacent to the allotment. Three hundred and sixty-four acres of restricted habitat have been identified along Dix Creek and the San Francisco River. This acreage figure was included in the PEA and provided via correspondence with Forest Service personnel, who indicated that the habitat meets the definition of restricted, and is similar to habitats in the Alpine District of the Apache National Forest where owls have been located (J. Copeland, pers. comm. 2001). This habitat is characterized as riparian habitat, with steep to vertical rock-walled canyons and riparian hardwood galleries. The San Francisco River is excluded from livestock grazing, and Dix Creek is not expected to have extensive livestock use. This type of riparian habitat has been classified as "no capacity" for livestock.

The PEA also states that 364 acres of restricted habitat are present on the Allotment, indicating that these riparian areas are "...characterized by steep to vertical rock-walled canyons with riparian hardwood galleries in the bottoms." The PEA notes that these areas provide the only potential nesting, foraging, and dispersal habitat in the Allotment. In a subsequent memo from the District Ranger, dated February 21, 2001, the Forest Service states that, while 364 acres of habitat meet the definition of restricted habitat in the Mexican Spotted Owl Recovery Plan, only 100 acres of this riparian habitat are suitable for owl occupancy. Forest Service personnel have indicated that owls are known to occupy similar habitat in other areas within the Forest and, in

two cases, are occupying areas with less than 200 acres of their PACs classified as suitable (J. Copeland, Forest Service, pers. comm. 2001). Because of this information, the Service considers the area to be suitable for, and may be occupied by, MSO.

The BAE notes that, because occupancy of the allotment has not been assessed, it is possible for human disturbance and construction actions associated with the grazing allotment to occur within occupied habitat during the breeding season. Additionally, the BAE notes that current authorized stocking levels are significantly above capacity, and that both woody and herbaceous cover for rodent species is less than desirable. Further, the BAE notes that the Clifton District has not provided any supporting documentation indicating that the proposed action would allow the allotment to attain good to excellent range and ecological condition.

A total of 522 projects have undergone formal consultation for the owl in Arizona and New Mexico. Of that aggregate, 255 projects resulted in a total anticipated incidental take of 490 owls plus an additional unquantifiable number of owls. These consultations have primarily dealt with actions proposed by the Forest Service, Region 3, but have also addressed the impacts of actions proposed by the Bureau of Indian Affairs, Department of Defense (including Air Force, Army, and Navy), Department of Energy, National Park Service, and Federal Highway Administration. These proposals have included timber sales, road construction, fire/ecosystem management projects (including prescribed natural and management ignited fires), livestock grazing, recreation activities, utility corridors, military and sightseeing overflights, and other construction activities.

The Pleasant Valley Allotment is located within the Basin and Range-West RU, according to the Recovery Plan. The Basin and Range-West RU is dominated by Madrean elements. Vegetation ranges from desert scrubland and semi-desert grassland in the valleys upwards to montane forests. Montane vegetation includes interior chaparral, encinal woodlands, and Madrean pine-oak woodlands at low and middle elevations, with ponderosa pine, mixed-conifer, and spruce-fir forests at higher elevations (Brown *et al*. 1980). Mexican spotted owls occupy a wide variety of habitat types within this RU, with the majority of them occurring in isolated mountain ranges where they inhabit encinal oak woodlands, mixed-conifer and pine-oak forests, and rocky canyons (Ganey and Balda 1989, Duncan and Taiz 1992, Ganey *et al*. 1992).

This RU supports the third largest known concentration of Mexican spotted owl (USFWS 1995c). This RU is located at the southern portion of the Mexican spotted owls range within the United States, and is contiguous to the Colorado Plateau, Upper Gila Mountain, and Basin and Range-East RUs. It is also contiguous with the Sierra Madre Occidental Norte RU in the Republic of Mexico.

Lesser Long-nosed Bat

Surveys were conducted on the allotment in 1996, using mist nets and night vision glasses. No lesser long-nosed bats were captured. The BAE notes that the proposed project area is possibly

outside the range of the species, as the nearest known occurrence of the bat is 80 miles southwest of the allotment on the south end of Mount Graham in the Pinaleno Mountains near Wilcox, Arizona.

Arizona Hedgehog Cactus

The Pleasant Valley Allotment is not located within the boundaries established for the type locality for Arizona hedgehog cactus. Cacti outside the type locality area have not been confirmed as E.t. var. *arizonicus*; therefore protected populations of Arizona hedgehog cactus are not considered to exist in the proposed action area.

Effects of the Action

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

The PEA notes that the Forest Service anticipates that the reduced overall stocking will result in less forage removed annually, as well as expanded forage use but with improved, effective livestock distribution. The goal of the AMP is to have livestock graze further from water sources during both the summer and winter months, and to more effectively use herbaceous and woody forage in both seasons. The Forest Service believes that livestock will avoid colder drainage areas, such as riparian areas, during winter months, and will tend to take a larger percentage of browse production rather than herbaceous production. The AMP is intended to allow for annual deferment during grazing followed by yearlong rest in summer pastures in order to ensure recovery for cool season growers, including browse and grasses.

Analysis of the effects of livestock grazing on fish and wildlife species and their habitats requires looking at long-term, incremental changes in watershed functions, riparian and aquatic communities, and stream channel morphology. Extrapolations of general hydrologic and biologic principles and site-specific research data provide a large body of evidence linking degradation of watersheds, stream channels, aquatic and riparian communities, and fish habitat and populations in western North America to past grazing and grazing management (Leopold 1924, Leopold 1951, York and Dick-Preddie 1969, Hastings and Turner 1980, Dobyns 1981, Kauffman and Krueger 1984, Skovlin 1984, Kinch 1989, Chanel *et al*. 1990, Platts 1990, Armour *et al.* 1991, Bahre 1991, Meehan 1991, Fleischner 1994).

It is unlikely that any grazing scheme will improve a local hydrologic circumstance over that found under ungrazed conditions (Platts 1990, Belsky *et al*. 1999). Platts (1990) indicates that

the two primary reasons why grazing strategies of any type have not protected riverine-riparian systems in the past is because streamside areas are generally incorporated into the larger pastures and not identified as distinct areas needing specialized management, and because the range is generally overstocked.

The effects to the San Francisco River and Dix Creek, as well as upland portions of the allotment, from the proposed livestock grazing and its management on the Pleasant Valley Allotment would occur through five mechanisms: 1) watershed alteration; 2) physical destruction and alteration of streambanks, stream channels, and water column; 3) alteration of the riparian vegetation community; 4) alteration of the faunal community; and 5) effects from non-grazing and structural elements. These mechanisms have varying effects on spikedace, loach minnow, Mexican spotted owl, and southwestern willow flycatchers.

Watershed Alteration

Livestock grazing may cause long-term changes to the watershed and its functions. The extent of these changes to the watershed varies with watershed characteristics, grazing history, and cumulative effects from other human uses and natural watershed processes. Watershed changes due to grazing are more difficult to document than direct livestock impacts to the riparian and aquatic communities due to their long-term, incremental nature, the time lag and geographic distance between cause and effect, and numerous variables. Despite this, the relationship between livestock grazing in a watershed and effects to river systems is widely recognized and documented (Leopold 1946, Blackburn 1984, Skovlin 1984, Chaney *et al*. 1990, Platts 1990, Bahre 1991, Meehan 1991, Fleischner 1994, Myers and Swanson 1995). Sayre (2001) notes that the emphasis in livestock grazing should be on "managing for the whole", and that "What gets eaten by livestock is a function of numerous processes involving water, soils, decomposers, other plants, and so on." Similarly, Naiman (1992) also notes the connectivity of the watershed with riverine and riparian conditions, indicating that water flows down through the watershed, "...integrating influences of natural and human disturbances within the catchment," as denoted by Figure 1 in Appendix D. Although watershed effects vary depending upon the number and type of livestock, the length and season of use, and the type of grazing management, the mechanisms remain the same and the effects vary only in extent of area and severity (Blackburn 1984, Johnson 1992).

Livestock grazing may alter the vegetative composition of the watershed (Savory 1988, Vallentine 1990, Popolizio *et al.* 1994). It may cause soil compaction and erosion, alter soil chemistry, and cause loss of cryptobiotic soil crusts (Harper and Marble 1988, Marrs *et al*. 1989, Orodho *et al.* 1990, Schleisnger *et al.* 1990, Bahre 1991). Cumulatively, these alterations contribute to increased erosion and sediment input into streams (Johnson 1992, Weltz and Wood 1994). They also contribute to changes in infiltration and runoff patterns, thus increasing the volume of flood flows while decreasing their duration and decreasing the volume of low flows while increasing their duration (Brown *et al*. 1974, Gifford and Hawkins 1978, Johnson 1992). Groundwater levels may decline and surface flows may decrease or cease (Chaney *et al*. 1990, Elmore 1992).

The PEA contained Table 16, for assessing appropriate utilization rates based on season of use and range conditions. The Forest Service has indicated that this table should be used only as a conservative measure, and only when no site specific information is available. According to Table 16, the recommended utilization rate for winter pastures in good range condition is 45 percent, while that for fair is 40 percent, and that for poor condition is 20 percent. The Forest Service has indicated that Table 16 was used as a reference for how capacity was determined rather than as a tool for determining utilization rates. The Dix Mesa and Dix Saddle pastures received "good" ratings in 2000, while the Mesquite Flat pasture received a "fair" rating, and the Johnnie Pasture received ratings of "fair" and "good". The San Francisco Pasture received a "poor" range condition rating, while the Pleasant Valley Pasture received a poor rating and the Lightning Mesa Pasture received a "fair" rating. The Hamilton Mesa Pasture received a "poor" rating.

Holechek *et al*. (1998) indicate that a combination of grazing capacity, utilization, condition, and trend data are needed for sound range management decisions, noting that grazing capacity is dynamic and can show great fluctuations with climatic trend. The Forest Service has concluded that the increased amount of rest time, compared to previous grazing management of the allotment, will be sufficient to allow for recovery of the uplands. The Service does not conclude that rest alone will be sufficient to mitigate the effects of overuse, as supported by various authors (Mueggler 1975, Trlica *et al*. 1977).

It should be noted that overutilization is not uncommon, even in areas with established utilization criteria. Galt *et al*. (2000) note that "Consistently, actual measured use has been 10 - 15 percent higher than the intended use. We attribute this to livestock trampling, wildlife consumption, and weathering." Information in a December 29, 2000, memorandum from the Forest Service, entitled "Pleasant Valley Allotment Inspection" indicates that some pastures, such as Lightning Tank and Lower Bull Tank had utilization equal to or greater than 45 percent. The PEA notes that while targeted herbaceous forage use in summer pastures is 40 percent, it is likely that some sites will receive moderately heavy use of approximately 45 to 50 percent. Overutilization is expected to result in continuation of impaired watersheds. In desert rangelands, researchers recommend that range be stocked for around 30 - 35 percent use of average forage production, with some destocking in drought years (Holechek *et al*. 1999). While this number was developed for desert ranges, it is consistent with the findings of other researchers who indicate that a harvest coefficient of 35 percent is suitable for arid and semi-arid areas (Galt *et al*. 2000).

Aquatic and Riparian Habitats

The effects of livestock grazing on riparian and aquatic habitats have been well documented and discussed in recent years (Platts 1990, Fleischner 1994, Belsky *et al*. 1999). Potential effects can be categorized into upland/watershed effects, streambank effects, streamflow and channel effects, water column effects, and effects to riparian vegetation. Changes in the upland or watershed can include removal of vegetation, alteration of species composition of vegetation communities, decreased soil stability and porosity, decreased water infiltration, and increased soil erosion and compaction. Grazing can reduce the roughness coefficient of watersheds, which in turn results in

more surface runoff, soil erosion, and flooding, which have effects on the water column, as discussed below. Resulting changes to watercourses can include changes in the hydrograph such as decreased base flows, increased flood flows, and increased sediment (Gifford and Hawkins 1978, Kauffman and Krueger 1984, Chaney *et al*. 1990, Platts 1990, Fleischner 1994).

The potential effects of grazing on streambanks include the shearing or sloughing of streambank soils by either hoof or head action; elimination of streambank vegetation; erosion of streambanks following exposure to water, ice, or wind due to loss of vegetative cover; and an increased streambank angle which increases water width and decreases stream depth. In other areas, damage begins to occur almost immediately upon entry of the cattle onto the streambanks and use of riparian zones may be highest immediately following entry of cattle into a pasture (Platts and Nelson 1985, Goodman *et al*. 1989). Vegetation and streambank recovery from long rest periods may be lost within a short period following grazing reentry (Duff 1979). Bank configuration, soil type, and soil moisture content influence the amount of damage with moist soil being more vulnerable to damage (Marlow and Pogacnik 1985, Platts 1990).

Following streambank alteration, potential effects to the channel itself can include changes in channel morphology and altered sediment transport processes (Platts 1990). Within the stream itself, there can be changes to pools, riffles, runs, and the distribution of backwater areas, a reduction in cover for fishes, elevated water temperatures, changes in nutrient levels, and increased sedimentation (Platts 1990, Belsky *et al*. 1999).

Effects to riparian vegetation can include changes in plant species composition, such as a transition from brush to grass to forbs; a reduction of floodplain and streambank vegetation, including vegetation which overhangs banks or is found within the water column; decreases in plant vigor; alteration of plant growth form, such as lateral branching; changes in the timing and amount of organic energy leaving the riparian zone, and; elimination of riparian plant communities, which may occur as a result of lowering of the water table so that xeric plants replace riparian plants (Platts 1990, Fleischner 1994).

Livestock will continue to directly alter streamside vegetation by trampling, rubbing, and grazing on herbaceous plants and browsing on shrubs within Dix Creek. Impacts to vegetation can be classified as utilization of herbaceous vegetation, and utilization of woody vegetation. Use and removal of herbaceous vegetation leads to changes in species composition, species diversity, and biomass while use and removal of woody vegetation can lead to changes in foliage cover, structural height diversity, and stand reproduction. Livestock may also have indirect effects on riparian vegetation by compacting the soils and causing increased runoff and decreased water availability to plants, and by increasing soil temperatures which can lead to increased evaporation due to the removal of vegetation (Kauffman and Krueger 1984).

Changes to the water column within the stream itself can be many and varied. Water column alterations can be caused by changes in the magnitude and timing of organic and inorganic energy inputs to the stream; increases in fecal contamination; changes in water temperatures due to removal of vegetation; changes in water column morphology, including increases in stream

width and decreases in stream depth, as well as reduction of stream shore water depth; changes in timing and magnitude of streamflow events from changes in watershed vegetative cover; and increases in stream temperature (Platts 1990, Fleischner 1994).

The effects of grazing in the uplands on riparian systems have been addressed above. To generate and maintain riparian habitat, a healthy watershed (uplands, tributaries, ranges, etc.) is a key component (Elmore and Kauffman 1994, Briggs 1996). Elmore and Kauffman (1994) note that "simply excluding the riparian area (from grazing) does not address the needs of upland vegetation or the overall condition of the watershed. Unless a landscape-level approach is taken, important ecological linkages between the uplands and aquatic systems can not be restored and riparian recovery will be limited." Continuing to graze in uplands where the soil conditions and riparian habitat in upland tributaries are unsatisfactory will continue to delay recovery and result in unnatural flooding. The Service recognizes that the proposed action will result in a decrease in cattle use which may improve upland conditions; however, the Service believes utilization rates are still high, and anticipates that utilization rates will be exceeded in some localized areas.

Physical Riparian Destruction and Alteration

Cattle presence on streambanks, as will occur along Dix Creek, destabilizes streambanks through chiseling, sloughing, compaction, and collapse, and results in wider and shallower stream channels (Amour 1977, Platts and Nelson 1985b, Platts 1990, Meehan 1991). This may change the way in which flood flows interact with the stream channel and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation. These impacts occur at all levels of cattle presence, but increase as the number of livestock and the time the cattle are present increase (Marlow and Pogacnik 1985).

Cattle grazing in and on riparian vegetation may cause changes in the structure, function, and composition of the riparian community (Szaro and Pase 1983, Warren and Anderson 1987, Platts 1990, Schulz and Leininger 1990, Schulz and Leininger 1991, Stromberg 1993). Species diversity and structural diversity may be substantially reduced and nonnative species may be introduced through spread in cattle feces. Reduction in riparian vegetation quantity and health and shifts from deep-rooted to shallow-rooted vegetation contribute to bank destabilization and collapse and production of fine sediment (Meehan 1991). Loss of riparian shade results in increased fluctuation in water temperatures with higher summer and lower winter temperatures (Karr and Schlosser 1977, Platts and Nelson 1989). Litter is reduced by trampling and churning into the soil thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). The capacity of the riparian vegetation to filter sediment and pollutants to prevent their entry into the river and to build streambanks is reduced (Lowrance *et al*. 1984, Elmore 1992). Channel erosion in the form of downcutting or lateral expansion may result (Heede *et al.* 1990, USBLM 1990).

Within the Pleasant Valley Allotment, Dix Creek exhibits many aspects of degradation caused by livestock presence on the streambanks and grazing in the riparian zone. Although no quantitative data exist on trends in streambank and channel condition, observational data reported in the BAE and PEA indicate aspects of livestock damage including a lack of riparian vegetation, limited

vegetation regeneration, presence of riparian vegetation in densities inadequate to dissipate energy during high flows, absence of mature vegetation, inadequate deposition of fines, and linear channel configurations. Portions of Dix Creek are classified as in Proper Functioning Condition; however, they only account for 29 percent of the riparian areas classified.

Dix Creek is a tributary to the San Francisco River, and the condition of its streambanks and riparian vegetation contributes to the condition of the San Francisco River as Dix Creek is connected to the San Francisco River during high flow events. These effects are mostly seen as a part of the overall watershed effects. However, the riparian vegetation and streambank conditions along Dix Creek are important as buffers between upland impacts and the mainstem (Erman *et al*. 1977, Mahoney and Erman 1981, Osborne and Kovacic 1993). Deteriorated riparian and streambank conditions cannot adequately perform this buffering function. Benefits from the reduction in AUMs may not be seen for several years.

The riparian vegetation community makes up less than one percent of the allotment. PFC assessments in riparian areas indicated that 11 percent of the allotments along the San Francisco River attained ratings as non-functional, five percent are classified as functioning at risk, 29 percent were considered to be functioning properly. No data are available for the remaining 55 percent. It should be noted that the data are of varying age. The PEA (USFS 2001b) notes that diminished watershed conditions have likely been the greatest impact to the system. In addition, the PEA (USFS 2001b) notes that cyclic peak flows or flood events occur every 10 years, with the most significant flooding occurring in 1906, 1972, 1983, and 1992-1993. Flooding removed a large percentage of the woody component, leaving coarse woody debris in short supply. Loss of a middle-age class of cottonwoods, sycamores, and alders will continue to affect flooding.

Fifty-seven percent of the soils, or more than half of the allotment, are impaired or in unsatisfactory condition. Twenty percent of the range is in poor or very poor condition, with 80 percent in fair condition, and less than one percent in good condition. Soil stability ranges from fair to high in the upper elevations of the browse community, which is the dominant vegetation community on the allotment, and is rated fair to poor in the Juniper Savannah Disclimax community. The riparian community is rated as functional, but at risk. While 80 percent of the range that would be grazed is in fair condition, less than one percent is in good condition. While the PFC analysis indicates riparian areas are *Functional at Risk - Upward Trend*, the BAE indicates that continued grazing on degraded and unstable soils present in the allotment will prevent the attainment of proper functioning condition and the restoration of potential habitat to suitable habitat for southwestern willow flycatcher.

The Forest Service has subsequently provided additional information indicating that potential habitat exists upstream of the Martinez Ranch at the diversion impoundment, through portions of the Martinez Ranch private property, and between the Martinez Ranch and the Blue River confluence. Additionally, the Forest Service believes there is approximately 164 to 218 yards of suitable habitat downstream from the western boundary of the Martinez Ranch (Stoleson 2001).

The GIS maps provided with the consultation request indicate that those portions of the allotment closest to the San Francisco River are in the Juniper Savannah Disclimax community, where soils are in fair condition, and range condition is rated as poor. Slope is 0 - 30 percent in large areas, with intervening, narrow strips of slope between 31 - 61+ percent. The large areas, which are relatively flat, and consequently more likely to be heavily grazed, correspond with poor range condition and impaired soil conditions. These large areas of lower slope and impaired soils are surrounded by areas with satisfactory soil condition, but having no condition, indicating it has no grazing capability, has a slope greater than 40 percent, or is on private lands for range.

Under the proposed action, the San Francisco Pasture, which is the pasture closest to the San Francisco River, would be classified as a winter use pasture. All winter pastures would be rested through the late spring-summer-late fall growing seasons, with a minimum of 27 months and maximum of 33 months rest in a 36 month grazing cycle. Winter pastures would be grazed between November 1 to April 30 by 210 head of cattle (adult/dry), or 1,267 AUMs. Utilization would be 40 - 45 percent. Only a small fraction on the southernmost end of the San Francisco Pasture is in good condition, with the majority classified as having "no condition" due to slope, or being in poor condition. Again, researchers recommend a utilization rate of 30 to 35 percent (Holecheck *et al.* 1999, Galt *et al.* 2000).

Faunal Alteration

Livestock use of the riparian corridor causes change in species composition and community structure of the aquatic and riparian fauna, in addition to floral changes already addressed. The aquatic invertebrate community may change from its baseline because of altered stream channel characteristics, because of sediment deposition, or because of nutrient enrichment (Rinne 1988, Meehan 1991, Li *et al*. 1994). This change in the food base of many aquatic vertebrates, particularly fish, may contribute to loss of or change in the vertebrate community. In addition, the structure and diversity of the fish community may shift due to changes in availability and suitability of habitat types (Storch 1979, Van Velson 1979). Livestock grazing may lead to loss of aquatic habitat complexity, thus reducing diversity of habitat types available and altering fish communities (Li *et al.* 1987).

Effects from Non-grazing and Structural Elements

Construction of fencing in the San Francisco Pasture is not expected to have noticeable effects on loach minnow or its habitat, as it would be constructed outside of the river channel. Spikedace have been extirpated from the San Francisco River. Mexican spotted owls will not be disturbed by construction activities that cross into restricted habitat (i.e., riparian areas), as the Forest Service has indicated that fencing activities will occur outside of the breeding season. Because no southwestern willow flycatchers are known to occur on the allotment, no disturbance to them is anticipated.

Summary of Effects

With the information available, it is not possible to differentiate watershed alteration effects caused by current livestock grazing on the Pleasant Valley Allotment from those caused by past grazing, private lands use, agriculture, roads, or other human activities. However, the following should be noted:

1) The overall condition of the upland vegetation is generally only in fair condition; 51 percent of the watershed is in unsatisfactory condition; and 57 percent of the soils are impaired or in unsatisfactory condition. While 80 percent of the range is in fair condition, 20 percent is in poor or very poor condition, with less than one percent in good or excellent condition. These conditions are likely to persist for at least the next 10 years.

2) Riparian conditions along the San Francisco River and Dix Creek varied, including some significant improvements along the San Francisco River, and are not likely to change significantly during the life of this project. The four miles of the San Francisco River within allotment boundaries were rated as functional at risk - upward trend. Of the seven miles of Dix Creek, including the right and left prongs, 42 percent were rated as functional at risk, 29 percent were nonfunctional, and 29 percent were in proper functioning condition. The majority of riparian habitat within the allotment is therefore classified as functional at risk or nonfunctional.

3) Livestock grazing has been the predominant, and will likely continue to be the most pervasive, land use on the Allotment and surrounding area.

4) Livestock are known to adversely impact vegetation condition, erosion levels, soil compaction, streambank stability, and stream channel characteristics (see preceding and following discussion) and are likely to continue contributing to these conditions on the Allotment in the future;

We therefore conclude that livestock grazing on the Pleasant Valley Allotment has contributed, and continues to contribute, to the overall degradation of the allotments and the San Francisco River and to sub-optimum watershed conditions and functions within and downstream of the Allotment.

Spikedace

As previously noted, spikedace have never been documented in the San Francisco River in Arizona. However, early sampling of fish in the area was almost nonexistent. It is likely that several native species, including spikedace, were extirpated from this portion of the river in the early part of this century due to human activities, although they continued to be present in the New Mexico portion of the river until at least 1950 (Anderson 1978).

Critical habitat for spikedace has been designated along portions of the San Francisco River, including those portions of the river which flow through the Allotment. No livestock from the

Pleasant Valley Allotment will be permitted to access spikedace critical habitat. However, as noted in the PEA and in the discussion above, indirect effects from livestock to critical habitat may occur through impacts of cattle on upland soils, vegetation, and watershed conditions. The Forest Service notes in the BAE that use of the allotment by cattle likely has some influence on critical habitat in the San Francisco River downstream of the Allotment for "...some unknown distance." Direct access by livestock to approximately 0.5 miles of critical habitat on the San Francisco River will continue from the permittee's private land at Martinez Ranch, and may, as part of the proposed action, cross the river in this area to access private lands north of the River.

Critical habitat includes 113.2 miles of the San Francisco River, extending from the confluence with the Gila River upstream to the confluence with the Tularosa River in New Mexico. Within the Allotment, there are four miles of critical habitat along the San Francisco River, which accounts for approximately four percent of all the critical habitat on the San Francisco River. Indirect effects to critical habitat on the San Francisco River would occur downstream of the Allotment to the Clifton area where mining and urban impacts occur.

The BAE states the following, with respect to upland conditions on the Allotment, and their effects on critical habitat:

> "Upland (soils, watershed) conditions on the Pleasant Valley Allotment may qualitatively and quantitatively impact spikedace critical habitat in the San Francisco River by influencing the hydrological function of the watershed. Parameters of spikedace critical habitat that are affected by upland watershed conditions in the allotment may include the extent of perennial flows, the level of base flows and peak flows in the river, and the amount of sediments entering and transported through the aquatic habitats."

The Forest Service further concludes within the BAE that the proposed action may affect, and is likely to adversely affect, spikedace critical habitat in the San Francisco River.

In summary, because of the degraded range conditions, and because of the proposal to use utilization levels of up to 40 percent, the Service believes that degradation of the watershed, and ultimately the San Francisco River, will continue. The Service believes that the effects of the grazing action on the Pleasant Valley Allotment will continue downstream, and potentially upstream, of the Allotment. The San Francisco River constitutes approximately six percent of the total critical habitat designated for spikedace. The Services does not believe the action, as proposed, will destroy or adversely modify critical habitat for the spikedace. Although the Pleasant Valley Allotment affects only a portion of that stream or six percent, it is important to consider the level of degradation on this and other allotments adjacent to the San Francisco River, and their cumulative effects on critical habitat for spikedace in the Pleasant Valley Allotment.

Loach Minnow

As noted in the Environmental Baseline, loach minnow are common within the project vicinity in the Blue River and limited portions of the San Francisco River. The San Francisco River is considered occupied by loach minnow for approximately 126 miles of its length from its confluence with Ash Creek in Arizona to The Box in New Mexico, and loach minnow have been located in those portions of the San Francisco River which run through the northern boundary of the Allotment (J.M. Montgomery Consulting Engineers 1985, Papoulias *et al*. 1989). Critical habitat for loach minnow includes 126 miles of the San Francisco River extending from its confluence with the Gila River upstream to the mouth of The Box, a canyon above the town of Reserve, New Mexico. As noted under the Environmental Baseline, no loach minnow have been detected in Dix Creek. Perennial portions of Dix Creek are disconnected from the San Francisco River by water diversions and altered channel conditions, except during high flow events. Perennial portions of Dix Creek which may be suitable for loach minnow do occur within the allotment, according to the BAE.

The San Francisco River is part of Complex 6 of critical habitat. The Federal Register notice (USFWS 2000a) notes that most of the complex is occupied by loach minnow, and that the Blue River system and adjacent portions of the San Francisco River are the longest stretch of occupied loach minnow habitat unbroken by large areas of unsuitable habitat. As such, it is unique within the range of loach minnow. The constituent elements of critical habitat for loach minnow can be found in the Federal Register notice (USFWS 2000a), and are incorporated herein by reference.

The direct and indirect effects of grazing on aquatic habitat are discussed above. The Service believes the proposed action is likely to adversely affect the fish themselves, as well as their biological needs. Necessary habitat elements for loach minnow include those elements that provide for primary biological needs of foraging, sheltering, dispersal, and reproduction. Table 1 below lists the effects of grazing, the resulting effects on biological needs of the fish, and the cause of the potential harm or harassment of the fish themselves. This discussion is based on fundamental principles of stream ecology, fish habitat, and grazing literature (Barber *et al*. 1970, Karr and Schlosser 1977, Anderson 1978, Gifford and Hawkins 1978, Duff 1979, Dobyns 1981, Barber and Minckley 1983, Blackburn 1984, Kauffman and Krueger 1984, Skovlin 1984, Platts and Nelson 1985, Abarca 1987, Chaney *et al*. 1990, Orodho *et al*. 1990, Platts 1990, Armour *et al* 1991, Propst and Bestgen 1991, Elmore 1992, Naiman 1992, Elmore and Kauffman 1994, Rosgen 1994, Myers and Swanson 1995, Fleischner 1994, Belsky and Blumenthal 1997, Belsky *et al.* 1999, Briggs 1996, Sayre 2001). While additional effects may also be possible, Table 1 lists those the Service believes are possible as a result of this grazing action.

The proposed action will include construction of a fence to prevent cattle from grazing within the San Francisco River which should contribute to an improvement in the aquatic community. No large tree removal would occur, and no openings would be created in the canopy layer. The fencing would be completed during the winter months, across the mouth of Dix Creek, and up the side of one bluff currently supporting juniper (F. Hayes, pers. comm., Forest Service, 2001). Cattle will continue to have access to Dix Creek during November and May, and to the San

Table 1. The effects of grazing, resulting effects on biological needs of the fish, and potential harm or harassment of the fish themselves.

Grazing Effect	Results In	Which May Harm or Kill Fish by
Decrease in roughness in the uplands, with increase in velocities and amounts of water coming off of the watershed	an increase in turbulence within the river	resulting in too little or too much oxygen in the water.
	An increase in the volume of flood flows with a decrease in their duration, leading to entrainment of fish in deep or rapidly flowing water	causing physical damage to the fish themselves.
Decrease in overhanging vegetation which shades the water, either directly by grazing, or indirectly by causing channel instability and changes in substrate that prevent riparian vegetation regeneration and persistence	an increase in insolation	resulting in too little or too much oxygen in the water.
	a decrease in channel shading	changing temperatures outside of the tolerance zone of fish.
Increase in turbidity in the water when excess sediments are transported into the stream system off of the watershed due to removal of vegetation in upland areas	a decrease in ability to locate prey items	starvation.
	a decrease in the number or type of prey items	starvation.
	a decrease in the ability to locate a mate	delay in or prevention of reproduction
Changes to temperature regimes, flow patterns, and/or oxygen levels due to changes in flow patterns, amount of water in the channel, and alteration of riparian vegetation	a decrease in the number of type of prey items	starvation.
Addition of excess sediment to the channel, which fills in crevices in the rocks used by fish	a decrease in available crevices for suitable cover	predation.

Grazing Effect	Results In	Which May Harm or Kill Fish by
	a decrease in suitable sites/surfaces for egg deposition	prevention of successful reproduction.
	a decrease in successful hatching due to smothering of deposited eggs	prevention of successful reproduction.
Alteration of the channel morphology, resulting in fewer shallow riffle complexes	entrainment of fish in deep or rapidly flowing water	causing physical damage to the fish themselves.
	a decrease in abundance of suitable habitat	delay in or prevention of successful reproduction.

Francisco River through the Martinez Ranch property. With respect to critical habitat for loach minnow, the Service believes that the proposed action is likely to adversely affect critical habitat, both directly and indirectly, by degrading bank conditions through trampling and removal of vegetation in Dix Creek, increasing soil compaction and thereby decreasing infiltration at the stream and within the uplands, decreasing the ability of the stream system to handle high energy flows by removing essential vegetation, and increasing the instability of the river system.

The Service believes that take may occur through harm and/or harassment and concurs with the Forest Service's BAE, which states that take may occur through harm, which includes actions resulting in habitat modification or degradation that significantly impairs essential behavioral patterns of listed species including breeding, feeding, or sheltering. The BAE concludes that:

> "Livestock activities on the Pleasant Valley allotment under the proposed action may indirectly alter or disrupt aquatic conditions within the San Francisco River that support essential behavioral patterns of loach minnows associated with breeding, feeding, or sheltering. The proposed action is likely to result in alterations to already degraded soil and watershed conditions that either quantitatively or qualitatively affect permanent flowing water, low amounts of fine sediment and substrate embeddedness, periodic natural flooding, and a natural, unregulated hydrograph in occupied loach minnow habitat in the San Francisco River, all of which are identified as essential habitat components for loach minnow."

In summary, the Service believes that utilization levels exceed those that would promote healthy rangelands given current range conditions. The BAE acknowledges that guidance criteria, developed specifically to determine if adverse effects may occur for both loach minnow and its critical habitat, are not met. Because of the degraded range conditions and proposed utilization levels, the Service believes that degradation of the watershed, and ultimately the San Francisco

River, will continue. The Service additionally believes that the effects of the grazing action on the Pleasant Valley Allotment will continue (downstream, and potentially upstream, of the Allotment). The importance of the San Francisco River, as the longest stretch of unbroken occupied habitat for loach minnow, must also be considered. The entire portion of the San Francisco River designated as critical habitat constitutes approximately seven percent of the total habitat designated. The Service does not believe the proposed action will destroy or adversely modify critical habitat for loach minnow, or jeopardize the continued existence of the species. Although the Pleasant Valley Allotment affects only a portion of that stream (seven percent), it is important to consider the current level of degradation on this and other allotments adjacent to the San Francisco River, and their cumulative effects on critical habitat for loach minnow.

Southwestern Willow Flycatcher

Grazing is presently one of the most significant stressors on rehabilitation and maintenance of flycatcher habitat in the action area, and increases in flycatcher populations have been observed in other areas when grazing has been reduced, modified, or eliminated from riparian areas.

The BAE notes that surveys were conducted for flycatchers during 1995 on Pigeon Creek and the Blue River, and in 1996 on the lower San Francisco River. No flycatchers were detected, and it was determined that no suitable habitat existed within the allotment. Additional surveys, as summarized in the Environmental Baseline, found no southwestern willow flycatchers. Forest Service personnel conducted an additional assessment of habitat in the allotment in 1998, and concluded that no suitable habitat existed within the allotment; however, surveys conducted during 1995 and 1996 concluded that potential habitat may develop within the Blue and San Francisco rivers in a minimum of five years. Livestock grazing will not be permitted within the Blue or San Francisco river corridors as part of the proposed action; therefore, cattle will not be permitted to graze in potential habitat. However, the BAE notes that cattle will be permitted to graze other riparian portions of the allotment during both the dormant (November) and growing (May) seasons in the Dix Creek and Dix Mesa pastures.

The San Francisco River is one of the larger drainages on the Apache National Forest and has potential for supporting southwestern willow flycatchers. However, the Service also believes that smaller tributaries, such as Dix Creek, offer potential nesting habitat and play a crucial role in controlling unnatural flooding on larger streams. The upland range and riparian habitat along these tributaries also plays a crucial role in reducing the energy of water flowing to the mainstem San Francisco River. As a result, tributaries are important in providing potential nesting habitat and in protecting riparian habitat on larger streams from unnatural flooding. Additionally, flycatchers have used off-river locations with adequate stands of riparian habitat in other areas (i.e., along the San Pedro River at Cook's Seep, Dudleyville, and Indian Hills) for nesting while mainstem rivers recover from flooding and other disturbances (G. Beatty, USFWS, pers.comm. 2000).

We believe that, due in part to high utilization levels, the proposed grazing strategy will delay improvement of the environmental baseline for flycatchers. Cows would graze in the Dix Mesa

and Dix Saddle pastures in both the dormant (November) and growing (May) season at a proposed utilization rate of 40 to 45 percent. Range conditions in these pastures is fair. Additionally, range conditions in the San Francisco and Mesquite Pasture are poor. Portions of the Mesquite and Johnny pastures are in very poor condition.

The effects of grazing in the uplands on riparian systems have been addressed above. The Service stresses that to generate and maintain riparian habitat, a healthy watershed (uplands, tributaries, ranges, etc.) is a key component (Elmore and Kauffman 1994, Briggs 1996). Elmore and Kauffman (1994) note that "simply excluding the riparian area (from grazing) does not address the needs of upland vegetation or the overall condition of the watershed. Unless a landscape-level approach is taken, important ecological linkages between the uplands and aquatic systems can not be restored and riparian recovery will be limited." Continuing to graze in upland areas where the soil conditions and riparian habitat in upland tributaries are unsatisfactory will continue to delay recovery and result in unnatural flooding. Unnatural flooding subsequently topples existing trees, and shallow rooted saplings and poles, and continues to erode rivers.

The PFC narrative provided by the Forest Service notes that "Diminished watershed conditions have likely been the greatest impact to this system." While the San Francisco River has shown improvement in riparian vegetation, the PFC analysis still notes that many areas are non-functional or functioning at risk. The Service is particularly concerned with negative responses on criteria indicating long-term stream stability, including the lack of large woody debris and adequate vegetation cover to dissipate energy during high flows, as well as comments made in PFC field notes indicating that the stream is not in balance with the water and sediment being supplied to it by the watershed.

The effects of the proposed action on southwestern willow flycatchers, as described in the BAE (USFS 2001a), relies on the Grazing Guidance Criteria (USFS 1998a). The guidance criteria (USFS 1998a) for may affect, not likely to adversely affect determinations for southwestern willow flycatcher in areas with potential habitat provides that a not likely to adversely affect determination is only appropriate where grazing in potential habitat does not slow the progression of potential towards suitable in that:

1. Regeneration or maintenance of woody vegetation is not impaired by trampling, bedding, or feeding, and
2. Livestock grazing occurs during the dormant season only, and
3. Monitoring is in place and the results show that suitability is being maintained or enhanced and that potential habitat is progressing towards suitable.

While the PFC assessment indicates that those portions of the San Francisco River within the allotment boundary are *Functional at Risk - Upward Trend*, the BAE states that "No documentation exists indicating that the proposed action will contribute to the restoration of soil conditions or prevent further degradation of soils on the allotment. Given the preponderance of degraded and unstable soils across this allotment, implementation of the proposed action is likely to impede the restoration of aquatic and riparian conditions (proper functioning condition) of the

Blue and San Francisco rivers that currently provide potential habitat for the Southwestern willow flycatcher."

The following excerpts of the criteria primarily address the effects of grazing on the flycatcher, and development and/or maintenance of its habitat:

1. Livestock are permitted on the allotment.
2. Livestock grazing reduces habitat suitability.
3. Grazing in potential habitat slows the progression of habitat to suitable, because regeneration or maintenance of woody vegetation is impaired by trampling, bedding, and feeding.
4. Soil conditions in upland areas with livestock are classified, at least in part, as unsatisfactory in watersheds that contain potential habitat.
5. Livestock use occurs in riparian areas upstream from potential habitat where it results in the reduction of the quality of the riparian habitat.

The status of the species and the effects of the proposed grazing action can be summarized in the following points:

1. The flycatcher is endangered, and loss of riparian habitat is the primary cause;
2. Potential habitat exists within the action area on portions of the San Francisco River;
3. The environmental baseline throughout the action area is degraded, with grazing being a significant contributor to poor riparian conditions;
4. Riparian habitat is, at least in part, unsatisfactory within the action area;
5. Upland range conditions are, at least in part, in unsatisfactory condition;
6. Poor range conditions can lead to larger, unnatural flooding, which in turn leads to erosion of streambanks and loss of riparian habitat.

These conditions are likely to continue throughout the life of this project. Past and current grazing on the Apache National Forest have resulted in conditions on the allotment that are poor in some areas. The Service recognizes the importance of tributaries as potential flycatcher habitat, but finds there is still some uncertainty as to the extent to which Dix Creek may be used by flycatchers in the future. Surveys have not documented any flycatchers within the Pleasant Valley Allotment. Therefore, the extent to which grazing in the riparian areas has been eliminated along the San Francisco River, and the uncertainty of flycatcher use leads us to conclude that the project is not likely to jeopardize the continued existence of the flycatcher.

No critical habitat for flycatchers currently exists; therefore, none will be affected by the proposed action.

<u>Mexican Spotted Owl</u>

No surveys have been conducted for Mexican spotted owls within the Pleasant Valley Allotment, or within five miles of the Allotment. No protected habitat has been identified; however, 364 acres of restricted habitat have been identified. The Recovery Plan (USDI 1995) notes that

restricted habitat provisions were made because it is recognized that owls may occur in areas other than protected habitat. Guidelines for riparian habitat, which falls within the restricted category, were developed to maintain healthy riparian ecosystems where they exist and to initiate restoration measures to return degraded areas to healthy conditions. All restricted habitat on the Pleasant Valley Allotment occurs within riparian areas along the San Francisco River and Dix Creek. The BAE notes that these riparian areas are characterized by steep to vertical rock-walled canyons with riparian hardwood galleries in the bottoms and are considered "no capacity" for livestock.

The riparian areas identified in the 364 acres are described as being "very similar to habitats on the Alpine District where owls have been located" (J. Copeland, pers. comm. 2001). Those areas occupied by Mexican spotted owls on the nearby Alpine District contain less than 200 acres of actual nest/roost habitat, but have habitat components of nest/roost habitat that allow the owls to persist there. Wildlife Staff with the Forest Service have indicated that these acres can not be considered unoccupied because they haven't been surveyed, and because they are of similar quality and characteristics of occupied habitat in other areas on the Forest (J. Copeland, pers. comm. 2001). Additionally, because of the lack of surveys, the proposed action does not meet the Grazing Guidance Criteria (USFS 1998) adopted by both the Service and Forest Service that would allow it to be classified as a "no effect" or "not likely to adversely affect". The BAE concludes that "The District has not provided any supporting information that the proposed grazing levels would provide the woody and herbaceous vegetation necessary for good to excellent range and ecological conditions in the foreseeable future. In fact, the range, soil, and watershed condition data provided by the District portrays an ecological condition that may not benefit from any livestock grazing."

The Service anticipates that degraded watershed conditions will continue due to the proposed utilization rates, and will adversely affect habitat used by Mexican spotted owls. A thorough description of upland range conditions and riparian conditions, as assessed through the Proper Functioning Conditioning methodology, is described above. The Recovery Plan 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.

With respect to prey base, Belsky and Blumenthal (1997) note that livestock grazing can reduce the amount of biomass available to be converted into litter, and therefore increase the proportion of bare ground. The Apache National Forest falls within the Upper Gila Mountain, Basin and Range-West, and Colorado Plateau Recovery Units for the Mexican Spotted Owl, as identified in the Recovery Plan. The Recovery Plan notes for the Upper Gila Mountain RU that:

> "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 may be especially true with respect to voles, which are often associated with dense grass cover. Direct effects on habitat are obvious in some

> places, particularly with respect to browsing on Gambel oak (*Quercus gambelii*). In some areas, oak is regenerating well but unable to grow beyond the sapling stage because of this browsing...We do not attribute these effects solely to livestock. Forage resources are shared by livestock and wild ungulates (USDI 1995)."

For the Basin and Range-West RU, the Recovery Plan notes that grazing primarily affects canyon stringers of pine-oak, mixed conifer, and riparian forests. The Recovery Plan notes that grazing is a threat in the southeastern portion of the Colorado Plateau RU as well (USDI 1995).

The effects of livestock and wild ungulate grazing on the habitat of spotted owl prey species is a complex issue. Impacts can vary according to grazing species, degree of use, including numbers of grazers, grazing intensity, grazing frequency, and timing of grazing, habitat type and structure, and plant or prey species composition (USDI 1995). Livestock can affect small mammals directly by trampling burrows, compacting soil, and competing for food, or indirectly by altering the structure or species composition of the vegetation in a manner that influences habitat selection by small mammals. Vegetation cover is often greatly reduced on grazed relative to ungrazed areas, and vegetation typically appears more dense in ungrazed areas. In one study, the total abundance of small mammals differed significantly between grazed and ungrazed plots, with the mean abundance of small mammals per census about 50 percent higher on plots from which livestock were excluded (Hayward *et al*. 1997). Bock and Bock (1994) reported that small mammal species that prefer habitats with substantial ground cover were more abundant on an ungrazed site, whereas species that prefer open habitats were more abundant on a grazed in their study area in southern Arizona.

With respect to altered susceptibility to fire, Belsky and Blumenthal (1997) note that livestock grazing alters forest dynamics by reducing the biomass and density of understory grasses and sedges, which otherwise outcompete conifer seedlings and prevent dense tree recruitment, and by reducing the abundance of fine fuels, which formerly carried low-intensity fires through forests. Fires susceptibility is not likely to change during the life of this project.

Belsky and Blumenthal (1997) note that grazing can lead to compacted soils, which results in increased runoff and decreased water storage; and can also lead to increased erosion and runoff due to reduced plant cover and compacted soils. Both of these factors, which lead to the degeneration of riparian plant communities and impair the ability of plant communities to develop into spotted owl habitat, are expected to continue during the life of the project.

To minimize these impacts, the Recovery Plan (USDI 1995) recommends that grazing by livestock and wildlife be monitored in key areas, including riparian areas, meadows, and oak types. The Recovery Plan (USDI 1995) further recommends implementing and enforcing grazing utilization standards that would attain good to excellent range conditions within the key grazing areas. To do this, the Recovery Plan (USDI 1995) recommends incorporating allowable use levels based on current range condition, key species, and the type of grazing system. The Recovery Plan (USDI 1995) further recommends implementing management strategies that will restore good conditions to degraded riparian communities as soon as possible. Strategies to

accomplish this may include reductions in grazing levels and increased numbers of exclosures, complete rest, as required, limited winter use, or other methods. The Service believes the proposed action will not result in jeopardy to the MSO.

Lesser Long-nosed Bat

Suitable habitat for lesser long-nosed bat may occur in grassland, browse, chaparral, and riparian vegetation communities within the allotment. However, as noted in the BE, the nearest known roost location for lesser long-nosed bats is approximately 80 miles to the south, and the proposed project area is outside the range of the species. While both *Agave palmeri* and *A. schotti*, which serve as primary and incidental food sources for lesser long-nosed bat, are found on the allotment, they are not found in any concentrated areas, and are likely widely dispersed and small in size. For these reasons, the Service believes that the proposed action will not result in jeopardy to lesser long-nosed bat.

Arizona Hedgehog Cactus

In the final rule, we acknowledged that cacti existed outside of the type locality area that were difficult to classify. However, the rule found that "Different varieties within the species *Echinocereus triglochidiatus* intergrade extensively with one another. Mixed populations showing extensive variation but with some affinities toward var. *arizonicus* are not to be considered classical var. *arizonicus* and therefore will not be subject to the protection and restrictions of the Endangered Species Act." Given the language in the rule and that cacti outside of the type locality area have not been confirmed as *arizonicus*, the Forest Service's proposed action does not affect the Arizona hedgehog cactus because the Pleasant Valley Allotment is not located in the type locality area. However, it should be noted that the Service does not have the authority to list distinct population segments of plants. Therefore, if plants outside of the type locality area are found to be of the variety *arizonicus*, then they would be protected by the Act.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Environmental Baseline addresses many on-going actions, which are also considered to contribute to cumulative effects. These non-Federal actions are expected to continue during the life of the project.

Conclusion

Spikedace

After reviewing the current status of the spikedace, the environmental baseline for the action area, the effects of the proposed reauthorization of livestock grazing on the Pleasant Valley

Allotment, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the spikedace, and is not likely to destroy or adversely modify designated critical habitat.

Loach Minnow

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the effects of the proposed reauthorization of livestock grazing on the Pleasant Valley Allotment, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the loach minnow, and is not likely to destroy or adversely modify designated critical habitat.

Southwestern Willow Flycatcher

After reviewing the current status of the Southwestern willow flycatcher, the environmental baseline for the action area, the effects of the proposed reauthorization of livestock grazing on the Pleasant Valley Allotment, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Southwestern willow flycatcher. Critical habitat for this species has been remanded.

Mexican Spotted Owl

After reviewing the current status of the Mexican spotted owl, the environmental baseline for the action area, the effects of the proposed reauthorization of livestock grazing on the Pleasant Valley Allotment, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl. Critical habitat for this species has been designated; however, this action does not affect any areas of critical habitat and no destruction or adverse modification of that critical habitat is anticipated.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent 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 defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Forest Service so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (1) fails to assume and implement the terms and conditions or (2) fails to require the Applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest Service must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Amount or Extent of Take Anticipated

Spikedace

As stated above, spikedace have never been located in the San Francisco River, but it is believed that it is likely they occurred there historically and have since been extirpated. The Service believes that potential spikedace occupation of this area is possible in the future. However, the proposed project area is currently unoccupied by spikedace; therefore, the Service anticipates that no take of individual spikedace will result from the proposed action.

Loach Minnow

As stated above, loach minnow are known to occur in those portions of the San Francisco River running through the northern portions of the Allotment. The Service anticipates that the action, as proposed, will result in incidental take of loach minnow. Take of loach minnow is anticipated to occur from the ongoing grazing activities on the Pleasant Valley Allotment in the form of harm and/or harassment, which occurs through the effects to habitat that are likely to injure the species by altering the suitability of the habitat for loach minnow including loss of spawning areas, smothering of eggs, alteration of temperature regimes, decrease in available shelter, and other items, as summarized in Table 1 above in the Effects of the Action section. 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 exceeded under any of the following conditions:

1. If measurable improvements in watershed condition, soil condition, trend and condition of rangelands, riparian conditions, and stream channel conditions within the natural capabilities of the landscape in all representative reaches on the Pleasant Valley Allotment do not occur.

2. If livestock access any portion of the riparian/stream corridor of the San Francisco River due to exclosure failure for more than one week during any given year.

Southwestern Willow Flycatcher

The allotment contains potential habitat that should develop into suitable habitat with proper management. Southwestern willow flycatchers are known to occur both to the south and north of the Allotment and, for this reason, the Service believes that potential use of this area in the future is possible. However, the proposed action area has been surveyed, and no southwestern willow flycatchers have been located. Therefore, the Service anticipates that no take of individual flycatchers will result from the proposed action. If flycatchers are documented in the action area, adverse effects should be re-evaluated.

Mexican Spotted Owl

The Service anticipates that no take of Mexican spotted owls will result from the proposed action.

Effect of the Take

Loach Minnow

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

Reasonable and Prudent Measures - Loach Minnow

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental take on loach minnows:

1. Protect riverine and riparian habitat affected by grazing within the Pleasant Valley Allotment.

2. Implement the proposed action in a manner that will result in an upward trend for all pastures within the allotment. Verify the upward trend through monitoring.

3. Monitor aquatic and riparian conditions, including constituent elements of critical habitat.

4. Monitor the allotment grazing strategy as it may result in incidental take, and report results to the Service.

Terms and Conditions - Loach Minnow

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

The Terms and Condition required to implement Reasonable and Prudent Measure 1 are:

1.1 The Forest Service shall prevent overuse of riparian areas by livestock through the following measures:

1.1.1. Constructing an exclusion fence in the San Francisco Pasture within one year of the date of the final decision.

1.1.2. Closely monitoring utilization and physical damage levels to banks and existing vegetation within Dix Creek. Monitoring will be completed as outlined in Term and Condition 4.1 - 4.3.

The Terms and Conditions required to implement Reasonable and Prudent Measure 2 are:

2.1 In year one of the permit, establish key areas and grazing exclosures of 50 feet by 50 feet within each pasture. A minimum of two key areas and two exclosures per pasture should be developed. As supported by Holechek (1998), key areas shall be located on those portions of the range which serve as an indicative example of range conditions, trend, or degree of seasonal use, and shall not include those areas remote from waters, steep slopes, or with poor accessibility as they are not representative of the areas used by cattle.

2.2 Beginning in year three, demonstrate a five percent or more improvement over the previous year's watershed or environmental condition for each pasture, with half or more of the key areas showing this change. This five percent improvement may be averaged over the seven years of the monitoring. Soil/watershed or ecological condition, at a minimum, will be assessed by evaluating plant density, crown and litter cover, stubble height, and other soil stability characteristics. Monitoring to document changes in watershed and soil health will be conducted in a manner consistent with the mutually developed monitoring plan.

2.2.1 The monitoring plan shall be developed and finalized within one year of the date of the final decision.

2.2.2 The monitoring plan shall be developed by a team consisting of representatives of, at a minimum, the Forest Service and Fish and Wildlife Service. Additional members can and should include the Applicants, as well as a representative of the Arizona Game and Fish Department, and others.

2.3 Annual reports detailing measurements taken, methods used, and results of the quantitative measurements shall be made to the Service.

2.4 Severe grazing use (>70 percent) in any key area in any year shall result in notification to the Service within 30 days and a change in management.

The Terms and Conditions required to implement Reasonable and Prudent Measure 3 are:

3.1 Monitoring of aquatic and riparian conditions, including all constituent elements of critical habitat, shall be conducted at year 3, 6, and 9. Monitoring actions shall be in adherence with an established monitoring protocol developed within two years of the final decision, and the Forest Service shall have Service approval of that protocol prior to implementation. The following criteria will be met:

3.1.1 Aquatic and riparian corridor site inspections shall be conducted by a journey-level fish biologist.

3.1.2 The biologist will survey stream habitats for suitability, occupancy, and overall condition with respect to bank stability, stream morphology, and embeddedness. An interdisciplinary team, including a journey-level biologist, will evaluate monitoring data and assess the effect to federally listed species and/or habitats. The Applicant or their representative should be asked to participate in these reviews.

3.1.3 The biologist will evaluate riparian vegetation, upland conditions, watershed and soil survey results, and provide a determination of whether or not these data support the absence of any measurable on-going effect on the species or its habitat.

3.1.4 Key areas for completing this assessment should be those that are ecologically relevant to the species, and will be identified during establishment of the protocol.

The Terms and Conditions required to implement Reasonable and Prudent Measure 4 are:

4.1 Monitor forage utilization on pastures within all allotments within three weeks after livestock exit each pasture.

4.2 Forage use monitoring will be completed for at midpoint of pasture use and on exit from pasture. Monitoring will be completed using applicable Forest Service standards as outlined in the Range Analysis handbook, or other established Forest Service techniques. Ocular observations shall be supported by physical measurements (i.e., clip and weigh, grazed plants, stubble height, etc.). Monitoring shall occur in key areas, which are to include the most ecologically sensitive areas for the loach minnow (e.g., riparian areas, tributary channels, source areas of sediment).

4.3 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 AESO within 15 days.

Disposition of Dead or Injured Listed Animals

Upon finding a dead or injured threatened or endangered animal, initial notification must be made to the Service's Division of Law Enforcement, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona (480/835-8289) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, and any other pertinent information. Care must be taken in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition. If feasible, the remains of intact specimens of listed animal species shall be submitted as soon as possible to this office or the nearest AGFD office, educational, or research institutions (e.g., Arizona State University in Tempe) holding appropriate State and Federal permits.

Arrangements regarding proper disposition of potential museum specimens shall be made with the institution before implementation of the action. A qualified biologist should transport injured animals to a qualified veterinarian. Should any treated listed animal survive, the Service should be contacted regarding the final disposition of the animal.

CONFERENCE REPORT - CHIRICAHUA LEOPARD FROG

Status of the Species

The Chiricahua leopard frog was proposed for listing as a threatened species without critical habitat in a Federal Register notice dated June 14, 2000 (USFWS 2000b). The rule included a

proposed special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. The frog is distinguished from other members of the *Rana pipiens* complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background; dorsolateral folds that are interrupted and deflected medially; stocky body proportions; relatively rough skin on the back and sides; and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of one to two seconds in duration (Davidson 1996, Platz and Mecham 1979). Snout-vent lengths of adults range from approximately 2.1 to 5.4 inches (Stebbins 1985, Platz and Mecham 1979). The Ramsey Canyon leopard frog (*R. subaquavocalis*) is similar in appearance to the Chiricahua leopard frog, but it often grows to a larger size and has a distinct call that is typically given under water (Platz 1993).

The Chiricahua leopard frog is an inhabitant of cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northern Sonora, and the Sierra Madre Occidental of Chihuahua, northern Durango and northern Sinaloa (Platz and Mecham 1984, Degenhardt *et al*. 1996, Sredl *et al.* 1997). The distribution of the species in Mexico is unclear due to limited survey work and the presence of closely related taxa (especially *R. montezumae)* in the southern part of the range of the Chiricahua leopard frog. In New Mexico, of sites occupied by Chiricahua leopard frogs from 1994-1999, 67 percent were creeks or rivers, 17 percent were springs or spring runs, and 12 percent were stock tanks (Painter 2000). In Arizona, slightly more than half of known historic localities are natural lotic systems, a little less than half are stock tanks, and the remainder are lakes and reservoirs (Sredl *et al.* 1997). Sixty-three percent of currently extant populations in Arizona occur in stock tanks (Sredl and Saylor 1998).

Populations of the Mogollon Rim are disjunct from those in southeastern Arizona. Based on preliminary analysis of allozymes, the Rim populations may represent a taxon distinct from the southern populations (James Platz, Creighton University, pers. comm. 2000). However, mitochondrial DNA work at the University of Denver does not support this conclusion (N. Benedict, pers. comm. 1999). Additional work is needed to clarify the genetic relationship among Chiricahua leopard frog populations.

Die-offs of Chiricahua leopard frogs were first noted in former habitats of the Tarahumara frog (*R. tarahumarae*) in Arizona at Sycamore Canyon in the Pajarito Mountains (1974) and Gardner Canyon in the Santa Rita Mountains (1977-1978) (Hale and May 1983). From 1983-1987, Clarkson and Rorabaugh (1989) found Chiricahua leopard frogs at only two of 36 Arizona localities that had supported the species in the 1960s and 1970s. Two new populations were reported. During extensive surveys from 1995-2000, primarily by Arizona Game and Fish Department (AGFD) personnel, Chiricahua leopard frogs were observed at 60 localities in Arizona (Sredl *et al*. 1997, Rosen *et al*. 1996, Service files). In New Mexico, the species was found at 41 sites from 1994-1999; eight of 31 of those were verified extant during 1998-1999 (Painter 2000). During May - August 2000, the Chiricahua leopard frog was found extant at only eight of 34 sites where the species occurred in New Mexico during 1994-1999 (C. Painter, pers.

comm. 2000). The species has been extirpated from about 75 percent of its historic localities in Arizona and New Mexico. The status of the species in Mexico is unknown.

Based on Painter (2000) and the latest information for Arizona, the species is still extant in all major drainages in Arizona and New Mexico where it occurred historically; however, it has not been found recently in many rivers, valleys, and mountain ranges, including the following in Arizona: East Clear, West Clear, Silver, Sonoita, Aravaipa, or Tonto creeks, the White, San Francisco or San Carlos rivers, the mainstem of the Verde, upper San Pedro, Santa Cruz, or Babocomari rivers, the Sulphur Springs Valley, or the Pinaleno, Peloncillo, or Huachuca Mountains. In many of these regions Chirichaua leopard frogs were not found for a decade or more despite repeated surveys. Recent surveys suggest the species may have recently disappeared from some major drainages in New Mexico (C. Painter, pers. comm. 2000).

Threats to this species include predation by nonnative organisms, especially bullfrogs, fish, and crayfish; disease; drought; floods; degradation and destruction of habitat; water diversions and groundwater pumping; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination. Numerous studies indicate that declines and extirpations of Chiricahua leopard frogs are at least in part caused by predation and possibly competition by nonnative organisms, including fish in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs (*R. catesbeiana*), tiger salamanders (*Ambystoma tigrinum mavortium*), crayfish (*Oronectes virilis* and possibly others), and several other species of fish (Fernandez and Rosen 1988, Rosen *et al*. 1996, 1994; Snyder *et al.* 1996; Fernandez and Bagnara 1995; Sredl and Howland 1994; Clarkson and Rorabaugh 1989). For instance, in the Chiricahua region of southeastern Arizona, Rosen *et al*. (1996) found that almost all perennial waters investigated that lacked introduced predatory vertebrates supported Chiricahua leopard frogs. All waters except three that supported introduced vertebrate predators lacked Chiricahua leopard frogs. Sredl and Howland (1994) noted that Chiricahua leopard frogs were nearly always absent from sites supporting bullfrogs and nonnative predatory fish. Rosen *et al*. (1996) suggested further study was needed to evaluate the effects of mosquitofish, trout, and catfish on frog presence.

Disruption of metapopulation dynamics is likely an important factor in regional loss of populations (Sredl *et al*. 1997, Sredl and Howland 1994). Chiricahua leopard frog populations are often small and habitats are dynamic, resulting in a relatively low probability of long-term population persistence. Historically, populations were more numerous and closer together. If populations winked out due to drought, disease, or other causes, extirpated sites could be recolonized via immigration from nearby populations. However, as numbers of populations declined, populations became more isolated and were less likely to be recolonized if extirpation occurred. Also, most of the larger source populations along major rivers have disappeared.

Fire frequency and intensity in the mountain ranges of southeastern Arizona and southwestern New Mexico are much altered from historic conditions. Before 1900, surface fires generally occurred at least once per decade in montane forest with a pine component. Beginning about 1870-1900, these frequent ground fires ceased to occur due to intensive livestock grazing that

removed fine fuels, followed by effective fire suppression in the mid to late 20th century (Swetnam and Baisan 1996). Absence of ground fires allowed a buildup of woody fuels that precipitated infrequent but intense crown fires (Danzer *et al*. 1997, Swetnam and Baisan 1996). Absence of vegetation and forest litter following intense crown fires exposes soils to surface and rill erosion during storms, often causing high peak flows, sedimentation, and erosion in downstream drainages (DeBano and Neary 1996). Following the 1994 Rattlesnake fire in the Chiricahua Mountains, Arizona, a debris flow filled in Rucker Lake, a historic Chiricahua leopard frog locality. Leopard frogs (either Chiricahua or Ramsey Canyon leopard frogs) apparently disappeared from Miller Canyon in the Huachuca Mountains, Arizona, after a 1977 crown fire in the upper canyon and subsequent erosion and scouring of the canyon during storm events (Tom Beatty, Miller Canyon, pers. comm. 2000). Leopard frogs were historically known from many localities in the Huachuca Mountains; however, natural pool and pond habitat is largely absent now and the only breeding leopard frog populations occur in man-made tanks and ponds. Crown fires followed by scouring floods are a likely cause of this absence of natural leopard frog habitats. Bowers and McLaughlin (1994) list six riparian plant species they believed might have been eliminated from the Huachuca Mountains as a result of floods and debris flow following destructive fires.

Recent evidence suggests a chytridiomycete skin fungi is responsible for observed declines of frogs, toads, and salamanders in portions of Central America (Panama and Costa Rica), South America (Atlantic coast of Brazil, Ecuador, and Uruguay), Australia (eastern and western States), New Zealand (South Island), Europe (Spain and Germany), Africa (South Africa, "western Africa", and Kenya), Mexico (Sonora), and the United States (eight States) (Speare and Berger 2000, Longcore *et al.* 1999, Berger *et al*. 1998, S. Hale pers. comm. 2000). Ninety-four species of amphibians have been diagnosed as infected with the chytrid *Batrachochytrim dendrobatidis*. In Arizona, chytrid infections have been reported from four populations of Chiricahua leopard frogs (M. Sredl, pers. comm. 2000), as well as populations of Rio Grande leopard frog (*R. berlandieri*), Plains leopard frog (*R. blairi*), lowland leopard frog (*R. yavapaiensis*), Tarahumara frog, canyon treefrog (*Hyla arenicolor*), and Sonora tiger salamander (*A.t. stebbinsi*) (Davidson *et al*. 2000, Sredl and Caldwell 2000, Morrell 1999, S. Hale pers. comm. 2000). The disease was recently reported from a metapopulation of Chiricahua leopard frogs from New Mexico which may have been subsequently extirpated (C. Painter, pers. comm. 2000). The proximal cause of extinctions of two species of Australian gastric brooding frogs and the golden toad (*B. periglenes*) in Costa Rica was likely chytridiomycosis. Another species in Australia with diseased individuals may now be extinct (Daszak 2000).

The role of the fungi in the population dynamics of the Chiricahua leopard frog is as yet undefined; however, it may well prove to be an important contributing factor in observed population decline. Rapid death of recently metamorphosed frogs in stock tank populations of Chiricahua leopard frogs in New Mexico was attributed to post-metamorphic death syndrome (Declining Amphibian Populations Task Force 1993). Hale and May (1983) and Hale and Jarchow (1988) believed toxic airborne emissions from copper smelters killed Tarahumara frogs and Chiricahua leopard frogs in Arizona and Sonora. However, in both cases, symptoms of moribund frogs matched those of chytridiomycosis. Chytrids were recently found in a specimen

of Tarahumara frog collected during a die off in 1974 in Arizona. This earliest record for chytridiomycosis corresponds to the first observed mass die-offs of ranid frogs in Arizona. The origin of the disease is unknown, but disease outbreak data from Central America and Australia (high mortality rates, wave-like spread of declines, wide host range) suggest introduction of the disease into native populations with the disease subsequently becoming restricted geographically in some areas. Alternatively, the fungus may be a widespread organism that has emerged as a pathogen because of either higher virulence or an increased host susceptibility caused by other factors such as environmental changes (Berger *et al.* 1998), including global climate change (Daszak 2000, Pounds and Crump 1994). If it is a new introduction, its rapid colonization could be attributable to humans. The fungus does not have an airborne spore, so it must spread via other means. Amphibians in the international pet trade (Europe and the United States), outdoor pond supplies (United States), zoo trade (Europe and the United States), laboratory supply houses (United States), and species recently introduced (*B. marinus* in Australia and bullfrog in the United States) have been found infected with chytrids, suggesting human-induced spread of the disease (Daszak 2000). Chytrids could also be spread by tourists or fieldworkers sampling aquatic habitats (Halliday 1998). The fungus can exist in water or mud and thus could be spread by wet or muddy boots, vehicles, cattle, and other animals moving among aquatic sites, or during scientific sampling of fish, amphibians, or other aquatic organisms. The Service and the AGFD are employing preventative measures to ensure the disease is not spread by aquatic sampling.

Additional information about the Chiricahua leopard frog can be found in Sredl *et al.* (1997), Jennings (1995), Degenhardt *et al.* (1996), Rosen *et al.* (1996, 1994), Sredl and Howland (1994), Platz and Mecham (1984, 1979), and Painter (2000).

Environmental Baseline

The range of the Chiricahua leopard frog in Arizona can be divided into two general areas: (1) the southeastern part of the state and (2) centered along the Mogollon Rim. Populations occurring on the Clifton Ranger District of the Apache-Sitgreaves National Forests occur within the northern portion of the species' range. Threats to the species occur throughout its range, but the populations above the Mogollon Rim in Arizona appear to be have relatively poor persistence (J. Rorabaugh, USFWS, pers. comm. 2001).

Chiricahua leopard frogs have been documented from aquatic habitats across the Apache-Sitgreaves National Forests. In the Blue River watershed, they were reported during the early 1970s and early 1980s from sites upstream of the allotment along the mainstem of the Blue River and its upper tributaries. Recently, Chiricahua leopard frogs were collected approximately 17 miles upstream of the confluence with the San Francisco River along the mainstem of the Blue River. In 1997, leopard frogs were located six miles above the confluence of the Blue and San Francisco rivers. Chiricahua leopard frogs were reported in the mainstem of the San Francisco River prior to 1995, and continue to occur in the San Francisco River in New Mexico, upstream of the Allotment. The occupancy status of the Pleasant Valley Allotment is unknown, but suitable habitat exists in the action area.

An understanding of the dispersal abilities of Chiricahua leopard frogs is key to determining the likelihood that suitable habitats will be colonized from a nearby extant population of frogs. As a group, leopard frogs are surprisingly good at dispersal. In Michigan, young northern leopard frogs (*Rana pipiens*) commonly move up to 2,625 feet from their place of metamorphosis, and three young males established residency up to 3.23 miles from their place of metamorphosis (Dole 1971). Both adults and juveniles wander widely during wet weather (Dole 1971). In the Cypress Hills, southern Alberta, young-of-the year northern leopard frogs successfully dispersed to downstream ponds 1.3 miles from the source pond, upstream 0.62 miles, and overland 0.25 miles. At Cypress Hills, a young-of-the-year northern leopard frog moved approximately five miles in one year (Seburn et al. 1997). The Rio Grande leopard frog *(Rana berlandieri*) in southwestern Arizona has been observed to disperse at least one mile from any known water source during the summer rainy season (Rorabaugh in press). After the first rains in the Yucatan Peninsula, Rio Grande leopard frogs have been collected several kilometers from water (Campbell 1998). In New Mexico, Jennings (1987) noted collections of Rio Grande leopard frogs from intermittent water sources and suggested these were frogs that had dispersed from permanent water during wet periods.

Dispersal of leopard frogs away from water in the arid Southwest may occur less commonly than in mesic environments in Alberta, Michigan, or the Yucatan Peninsula during the wet season. However, there is evidence of substantial movements even in Arizona. In August, 1996, Rosen and Schwalbe (1998) found up to 25 young adult and subadult Chiricahua leopard frogs at a roadside puddle in the San Bernardino Valley, Arizona. They believed that the only possible origin of these frogs was a stock tank located 3.4 miles away. Rosen *et al.* (1996) found small numbers of Chiricahua leopard frogs at two locations in Arizona that supported large populations of nonnative predators. The authors suggested these frogs could not have originated at these locations because successful reproduction would have been precluded by predation. They found that the likely source of these animals were populations 1.25 - 4.35 miles distant. In the Dragoon Mountains, Arizona, Chiricahua leopard frogs breed at Halfmoon Tank, but frogs occasionally turn up at Cochise Spring (0.8 miles down canyon in an ephemeral drainage from Halfmoon Tank) and in Stronghold Canyon (one mile down canyon from Halfmoon Tank). There is no breeding habitat for Chiricahua leopard frogs at Cochise Spring or Stronghold Canyon, thus it appears observations of frogs at these sites represent immigrants from Halfmoon Tank. In the Chiricahua Mountains, a population of Chiricahua leopard frogs disappeared from Silver Creek stock tank after the tank dried up; but frogs then began to appear in Cave Creek, which is about 0.62 miles away, again, suggesting immigration. Movements away from water do not appear to be random. Streams are important dispersal corridors for young northern leopard frogs (Seburn *et al.* 1997). Displaced northern leopard frogs will return home, and apparently use olfactory and auditory cues, and possibly astronomic cues, as guides (Dole 1968, 1972). Rainfall or humidity may be an important factor in dispersal because odors carry well in moist air, making it easier for frogs to find other wetland sites (Sinsch 1991).

Effects of the Action

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

The effects of livestock grazing on ranid frog populations are not well-studied. Munger *et al*. (1994) found that sites with adult Columbia spotted frogs (*Rana luteiventris*) had significantly less grazing pressure than sites without spotted frogs. However, in a subsequent survey he found no differences (Munger *et al.*1996). Bull and Hayes (2000) evaluated reproduction and recruitment of the Columbia spotted frog in 70 ponds used by cattle and 57 ponds not used by cattle. No significant differences were found in the number of egg masses or recently metamorphosed frogs in grazed and ungrazed sites. Seventeen percent of the sites were livestock tanks. The California red-legged frog (*Rana aurora draytonii*) coexists with managed livestock grazing in many places in California. Ponds created as livestock waters have created habitats for red-legged frogs and livestock may help maintain habitat suitability by reducing coverage by cattails, bulrush, and other emergent vegetation (USFWS 2000). On the other hand, exclusion of cattle from the Simas Valley, Contra Costa County, corresponded with reestablishment of native trees and wetland herbs, reestablishment of creek pools, and expansion of red-legged frog populations (Dunne 1995).

Maintenance of viable populations of Chiricahua leopard frogs is thought to be compatible with well-managed livestock grazing. Grazing occurs in most of the habitats occupied by this frog. For instance, a large and healthy population of Chiricahua leopard frogs coexists with cattle and horses on the Tularosa River, New Mexico (Randy Jennings, Western New Mexico University, pers. comm. 1995). Effects of grazing on Chiricahua leopard frog habitat probably include both creation of habitat and loss and degradation of habitats. Construction of tanks for livestock has created important leopard frog habitat, and in some cases has replaced destroyed or altered natural wetland habitats (Sredl and Saylor 1998). Sixty-three percent of extant Chiricahua leopard frog localities in Arizona are stock tanks, versus only 35 percent of extirpated localities (Sredl and Saylor 1998), suggesting Arizona populations of this species have fared better in stock tanks than in natural habitats. Stock tanks provide small patches of habitat, which are often dynamic and subject to drying and elimination of frog populations. However, Sredl and Saylor (1998) also found that stock tanks are occupied less frequently by nonnative predators (with the exception of bullfrogs) than natural sites.

Adverse effects to the Chiricahua leopard frog and its habitat as a result of grazing may occur under certain circumstances. These effects include facilitating dispersal of nonnative predators; trampling of egg masses, tadpoles, and frogs; deterioration of watersheds; erosion and/or siltation

of stream courses; elimination of undercut banks that provide cover for frogs; loss of wetland and riparian vegetation and backwater pools; and spread of disease (USFWS 2000, Belsky *et al.* 1999, Ohmart 1995, Hendrickson and Minckley 1984, Arizona State University 1979, Jancovich *et al.* 1997). Creation of livestock waters in areas without aquatic habitats may provide the means for nonnative predators, such as bullfrogs and crayfish, to move across arid landscapes that would otherwise serve as a barrier to their movement. Increased erosion in the watershed caused by grazing can accelerate sedimentation of deep pools used by frogs (Gunderson 1968). Sediment can alter primary productivity and fill interstitial spaces in streambed materials with fine particulates that impede water flow, reduce oxygen levels, and restrict waste removal (Chapman 1988).

Eggs, tadpoles, and metamorphosing Chiricahua leopard frogs are probably trampled by cattle on the perimeter of stock tanks and in pools along streams (USFWS 2000). Juvenile and adult frogs can probably avoid trampling when they are active. However, leopard frogs are known to hibernate on the bottom of ponds (Harding 1997), where they may be subject to trampling during the winter months. Cattle can remove bankline vegetation cover that provides escape cover for frogs and a source of insect prey. However, dense shoreline or emergent vegetation in the absence of grazing may favor some predators, such as garter snakes (*Thamnophis* sp.), and the frogs may benefit from some open ground for basking and foraging. At a tank in the Chiricahua Mountains, Sredl *et al.* (1997) documented heavy cattle use at a stock tank that resulted in degraded water quality, including elevated hydrogen sulfide concentrations. A die off of Chiricahua leopard frogs at the site was attributed to cattle-associated water quality problems, and the species has been extirpated from the site since the die off.

Chytrid fungus can survive in wet or muddy environments, and could conceivably be spread by cattle carrying mud on their hooves and moving among frog habitats. The disease could also be spread by ranch hands working at an infected tank or aquatic site and then traveling to another site with mud or water from the first site. Chytrids could be carried inadvertently in mud clinging to wheel wells or tires, or on shovels, boots, or other equipment. Chytrids cannot survive complete drying, thus, if equipment is allowed to thoroughly dry, the likelihood of disease transmission is much reduced. Bleach or other disinfectants can also be used to kill chytrids (Longcore 2000). Chytrids, if not already present, could immigrate to the allotments naturally via frogs or other animals. Chytridiomycosis is not known to occur within the Pleasant Valley Allotment, but it is known to occur within the vicinity of the allotment (M. Sredl, Arizona Game and Fish Department, pers. comm. 2001) at Juan Miller crossing on the Blue River. Thus, if chytrids are not already present, there may be a high probability of immigration to the action area.

Maintenance of roads and tanks needed for the grazing program could provide fishing opportunities and facilitate access by anglers, hunters, or other recreationists, who may inadvertently introduce chytrids or may intentionally introduce nonnative predators for angling or other purposes. Chytrids could be moved among aquatic sites during intentional introductions of fish or other aquatic organisms. Anglers commonly move fish, tiger salamanders, and

crayfish among tanks and other aquatic sites to establish a fishery or a source of bait, or in some cases bait is released at an aquatic site during angling. Water, salamanders, or perhaps fish and crayfish could all be carriers of chytrids. In addition to possibly introducing chytrids, such activities would also facilitate introduction of nonnative predators with which the Chiricahua leopard frog cannot coexist.

Stock tank maintenance typically occurs when tanks are dry or nearly dry. At that time, dams could be repaired or silt could be dredged out of the tanks. During drought, many leopard frogs probably disperse from drying tanks or are killed by predators as waters recede. However, some frogs persist in cracks in the mud of pond bottoms (M. Sredl, Arizona Game and Fish Department, pers. comm. 1999) or in clumps of emergent vegetation. Halfmoon Tank in the Dragoon Mountains went dry during June 1996 for 30 days or more. On July 21, 1996, 29 frogs of several different size classes were counted after the tank refilled with the summer monsoons (J. Rorabaugh, USFWS, pers. comm.). Frogs probably took refuge in thick mats of cattails around the tank, but may have also stayed in cracks in the drying mud of the pond bottom, in rodent burrows, or other retreats that stayed moist. Frogs present in mud or in emergent vegetation could be killed or injured during silt removal or berm repair. If not killed, they may be flushed from moist retreats and die of exposure or dessication, or be killed by predators. If remaining wetted soils and emergent vegetation are completely disturbed or removed during cleaning out of a tank, a frog population could possibly be eliminated.

The Forest Service has not conducted any systematic evaluation of habitats in the riparian systems within the Pleasant Valley Allotment. The PEA notes that there are at least 20 stock tanks, one well, and various springs within the Allotment; however, no assessment of Chiricahua leopard frog occupancy has been conducted in these areas. Because of the lack of surveys, the direct effects of cattle grazing within riparian areas and stock tanks or springs can not be fully assessed. As described, the proposed action would allow livestock to have direct access to Dix Creek from the Dix Saddle and Dix Mesa pastures. In addition to the mechanical damage (trampling) associated with livestock grazing in riparian areas, livestock trampling along drainages and in the upper watershed may generate sediments and/or nutrients that could enter potentially occupied leopard frog habitat along Dix Creek. Sediments and/or nutrients may impact this species in the following ways: (1) sediments and/or nutrients may influence the invertebrate food base in some undefined manner by impacting the physical and vegetative characteristics of the aquatic habitat and (2) sediments may be detrimental to successful reproduction by smothering egg masses and early larval stages. In addition, eggs and tadpoles of Chiricahua leopard frogs may be trampled by domestic livestock along the perimeters of stock tanks and in pools along streams. Cattle can also contribute to degraded water quality at stock tanks, including elevated hydrogen sulfide concentrations, which are toxic to frogs (Sredl et. al 1997).

In summary, the effects to the Chiricahua leopard frog from the proposed action primarily occur in the riparian areas (in or associated with wetter areas), wetland communities, and stock tanks within the Pleasant Valley Allotment. Grazing effects also result from the trampling of egg

masses, tadpoles, and frogs from livestock having direct access to aquatic habitat or stock tanks. Diseases such as chytrids can be moved among aquatic sites by cattle and operations.

Conclusion

Although the Chiricahua leopard frog is known to be extant in the Blue River and, as recently as 1995, in the San Francisco River, grazing is not proposed along the San Francisco River. The Chiricahua leopard frog occurs over a large area of eastern Arizona, western New Mexico and portions of northwestern Mexico. The proposed action affects a very small portion of the species' range. After reviewing the current status of the Chiricahua leopard frog, the environmental baseline for the action area, the anticipated effects of proposed livestock grazing activities on the Pleasant Valley Allotment, it is the Service's conference opinion that the proposed action is not likely to jeopardize the continued existence of the Chiricahua leopard frog. No critical habitat has been proposed, thus none would be affected.

Amount of Extent of Take

The prohibitions against taking the species found in section 9 of the Act do not apply until the species is listed. However, the Service advises agencies to consider implementing reasonable and prudent measures where given. If a conference opinion is adopted as a biological opinion following a listing or designation, reasonable and prudent measure, and implementing term and condition, become non-discretionary.

The occurrence of Chiricahua leopard frogs in the project area is uncertain, and the BAE concludes that it cannot be concluded that Chiricahua leopard frogs do not occur within the Allotment. Also, because the status of the species could change over time through immigration, emigration, and loss or creation of habitats, the precise level of take resulting from this action cannot be quantified. However, given the presence of Chiricahua leopard frogs within the San Francisco River, and the Blue River, and the presence of suitable habitat within the action area, Chiricahua leopard frogs are likely to occur during the life of the project (10 years). We estimate that take could occur in the following fashion:

A. Mortality of all frogs at numerous livestock tanks due to maintenance activities.

B. Trampling and destruction of egg masses, small tadpoles, and metamorphs.

C. Mortality of recently metamorphosed frogs at one locality (livestock tanks, streams, or springs) due to unintentional introduction of chytridiomycosis resulting from cattle moving among frog populations or unintentional transport of water or mud among aquatic sites by ranch hands, biologists conducting surveys, or others.

D. Mortality and lost productivity due to sedimentation of pools, loss of bankline and emergent cover, and other forms of habitat degradation in sites where Chiricahua leopard frogs may occur.

In cases where the extent of anticipated take cannot be quantified accurately in terms of number of individuals, the Service may anticipate take in terms of loss of a surrogate species, food, cover, or other essential habitat elements, such as water quality or quantity. Thus, incidental take will be exceeded if any of the following conditions occur:

1. Ecological conditions do not improve under the proposed livestock management. Improving conditions can be defined through measurable improvements in watershed condition, soil condition, trend and condition of rangelands, riparian conditions, and stream channel conditions within the natural capabilities of the landscape in all representative reaches on the Pleasant Valley Allotment.

2. Any time trespass livestock access any portion of the riparian/stream corridor of the San Francisco River for ore than one week during the year.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If the Chiricahua leopard frog is listed and this conference opinion is subsequently accepted by the Service as a biological opinion, the following conditions apply: 1) If incidental take anticipated in the preceding paragraphs is met, the Forest should immediately notify the Service in writing; 2) If, during the course of the action, the level of anticipated incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation. In the interim, the Forest must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species; 3) The Forest must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures, and; 4) This conference opinion does not authorize any form of take not incidental to the Forest's proposed action as described herein.

Effect of Take

In this conference opinion, the Service finds the anticipated level of take is not likely to jeopardize the continued existence of the Chiricahua leopard frog.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize take of the Chiricahua leopard frog:

1. Improve ecological conditions (watershed, soil, range, riparian, and stream channel conditions) on the Pleasant Valley Allotment.

2. Reduce impacts to stream courses and aquatic habitats from the impacts of livestock use.

3. Determine where suitable habitat for Chiricahua leopard frogs exists, and assess the occupancy of those areas.

4. Measures shall be implemented to reduce trampling of egg masses, tadpoles, and metamorph frogs.

5. Personnel education programs and well-defined operational procedures shall be implemented.

Terms and Conditions

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

Term and Conditions under Reasonable and Prudent Measure 2 for loach minnow implement reasonable and prudent measure one for the Chiricahua leopard frog.

Term and Conditions under Reasonable and Prudent Measure 3 for loach minnow implements reasonable and prudent measure two for the Chiricahua leopard frog.

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

3.1 After a final listing of the species, the Forest shall, in coordination with the Service and Arizona Game and Fish Department, identify potential habitat within the Pleasant Valley Allotment and survey[1] those sites in the spring for the presence of Chiricahua leopard frogs. If frogs are found, the Forest shall work with the Service to evaluate effects of the action on the frog and its habitat, and shall develop a plan with the Service within 90 days to minimize the effects of the action on the frog. The plan shall be approved by the Service.

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

4.1 If new leopard frog occurrences are found within the Pleasant Valley Allotment, the Forest shall inform the Service within 10 calendar days and shall work with the Service to develop plans within 90 days for minimizing take of leopard frogs at those sites. The plan shall be approved by the Service.

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

5.1 Live fish, crayfish, bullfrogs, leopard frogs, salamanders, or other aquatic organisms shall not be moved among livestock tanks or other aquatic sites.

5.2 Where new or existing sites occupied by Chiricahua leopard frogs occur, water shall not be hauled to the site from another aquatic site or tank that supports leopard frogs, bullfrogs, crayfish, or fish.

5.3 Where new or existing sites occupied by Chiricahua leopard frogs occur on the Pleasant Valley Allotment, the Allottee shall be required to clean any equipment, boots, etc. used at an aquatic site and treat with a 10 percent bleach solution, or allow such equipment, boots, etc. to dry thoroughly, before using the same equipment, boots, etc. at another aquatic site on the allotment.

5.4 All ranch hands, construction personnel, and others implementing the proposed action shall be given a copy of these terms and conditions, and informed of the need to comply with them.

5.5 At least 45 days prior to maintaining or cleaning out livestock tanks, the permittee shall inform the Forest of planned activities. The Forest shall survey the tank for Chiricahua leopard frogs[1] and if frogs are found, shall work with the Service to develop and implement a plan to minimize take of frogs. Measures to minimize take should include salvage and temporary holding of frogs, limiting disturbance and work areas to the minimum area practicable, leaving stands of emergent vegetation in place, and/or measures to minimize that likelihood of disease transmission. Plans to minimize take shall be approved by the Service.

An incidental take statement provided in a conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion through formal consultation. At that time, the project will be reviewed to determine whether any take of the Chiricahua leopard frog has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the frog may occur between the listing of the frog and the adoption of the conference through formal consultation, or the completion of a subsequent formal consultation.

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

[1]Surveys shall include a night visit to prospective habitat during which all or at least 1,200 feet of the best habitat along creeks and the entire perimeter of tanks are searched for frogs. Surveys shall be carried out with flashlights/headlamps, and a dip net shall be used to sample for tadpoles and frogs concealed in undercut banks or at the base of emergent vegetation. Surveyors shall also listen for the distinctive call of the Chiricahua leopard frog (Davidson 1996) and watch for egg masses. Surveys shall be carried out from April-September when frogs are most active.

minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following:

Southwestern Willow Flycatcher

1. Substantiate the suitability and occupancy of riparian corridors for southwestern willow flycatchers on the Pleasant Valley Allotment. Conduct habitat suitability and occupancy assessments.

Mexican Spotted Owl

1. Conduct surveys, according to established protocols, to determine the occupancy status of the restricted habitat within the allotment, and on other areas within the Forest that contain similar habitat to determine whether or not Mexican spotted owls are present.

2. Substantiate the suitability and occupancy of riparian corridors for Mexican spotted owls on the Pleasant Valley Allotment. Conduct habitat suitability and occupancy assessments.

3. Reduce any possible effects of grazing on the prey base by improving upland range conditions in pastures adjacent to restricted habitat.

4. Ensure the continued recovery of riparian areas, which constitute restricted habitat, and which may be occupied by Mexican spotted owls.

Loach Minnow

5. Implement a basin-wide program for monitoring of loach minnow and its accompanying native fish community. Descriptive linear habitat mapping should be conducted along all occupied, suitable, or potential habitat to identify suitability or capability for loach minnow and other components of the native fish community. Surveys and monitoring should be conducted by journey-level fish biologists with expertise in southwestern fishes and desert stream habitats. The monitoring program should be coordinated with any existing monitoring or surveying efforts to avoid over sampling. Monitoring protocols and habitat suitability criteria should be agreed upon with the New Mexico and Arizona Game and Fish Department and the Service to ensure consistency and validity, and to avoid redundancy of effort.

6. Implement a basin-wide baseline study and long-term monitoring of the geomorphology of the San Francisco and Blue Rivers to obtain information on existing conditions and future trends of the rivers and their floodplains. These studies would characterize (using Rosgen IV or similar methods) both rivers throughout their lengths, with reevaluation every five years. Annual photopoints should be established and read, placed for sufficient documentation of

yearly changes throughout all selected "reference reaches" and at other appropriate locations. This work should be completed by journey-level hydrologists with expertise in arid land river systems.

Chiricahua Leopard Frog

We recommend implementation of 2 and 3 below, whether or not the species is listed.

1. If listed, assist the Service in development and implementation of a recovery plan for the species.

2. Work with the Service and the Arizona Game and Fish Department to reintroduce the Chiricahua leopard frog to suitable habitats.

3. Work with the Service and the Arizona Game and Fish Department to begin an aggressive program to control nonnative aquatic organisms on the Forest, particularly bullfrogs, fish, and crayfish.

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

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the consultation request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in 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 efforts and interest in conserving endangered and threatened species, and species proposed for listing. If you have any questions regarding this consultation, please contact Debra Bills (x239). Please reference our file number 2-21-01-F-189 in all future correspondence.

Sincerely,

/s/ David L. Harlow
Field Supervisor

cc: Regional Director, U.S. Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
Field Supervisor, U.S. Fish and Wildlife Service, Albuquerque, NM
Regional Forester, U.S. Forest Service, Albuquerque, NM
Forest Supervisor, U.S. Forest Service, Apache National Forest, Springerville, AZ
District Ranger, U.S. Forest Service, Apache National Forest, Clifton Ranger District, Duncan, AZ

John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Applicants, Abelardo and Lydia Martinez, Safford, AZ

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APPENDIX A - TABLES

Table 1. Pasture usage for a 36-month period, Pleasant Valley Allotment (R. Chavez, pers. comm., Apache National Forest 2001).

PASTURE NAME	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Year 1												
Dix Mesa	X						X					
Dix Saddle	X						X					
San Francisco		X										
Mesquite			X	X	X							
Johnny						X	X					
Lightning							X	X	X			
Pleasant Valley										X	X	X
Hamilton												
Year 2												
Dix Mesa	X						X					
Dix Saddle	X						X					
San Francisco		X										
Mesquite			X	X	X							
Johnny						X	X					
Lightning										X	X	X
Pleasant Valley												
Hamilton							X	X	X			
Year 3												
Dix Mesa	X						X					
Dix Saddle	X						X					
San Francisco		X										
Mesquite			X	X	X							
Johnny						X	X					
Lightning												
Pleasant Valley										X	X	X
Hamilton							X	X	X			

Table 2. Environmental Baseline - Previous Consultations on Livestock Grazing on Forest Service Lands in the San Francisco Watershed in the Clifton and Glenwood Ranger Districts.[1]

Allotment	% of San Francisco Watershed	Miles of San Francisco River	% Loach Minnow Range in San Francisco/ Tularosa Rivers	Range Condition[3] of full/potential capacity (year of data collection)	Soil/Watershed Condition[3] (year of data collection)	PFC Rating for Riparian	Other Information[4]
Pueblo Creek	4.1	0	0	2% very poor 122% poor[5] 40% fair 2% good 67% noncapacity (1995)	40% unsatisfactory 40% impaired 20% satisfactory (1997)	NA	1 major tributary
Kelly	1.7	9.0	7.0	9% very poor 86% poor 5% fair 0% good 0% excellent 33% noncapacity (1976)	60% unsatisfactory 30% impaired 10% satisfactory (data unknown)	non-functional	much gullying, cut banks on river, few sedges, riparian mostly sparse, 2 major tributaries
Devil's Park	1.4	3.0	2.5	20% very poor 50% poor 30% fair 0% good 0% excellent 27% noncapacity (1963)	35% unsatisfactory 32% satisfactory 33% unsuited (1971)	functional, at risk	poor grass cover, soil condition poor over 50% of allotment, riparian sparse, poor woody riparian recruitment, some sedges
Whiterocks	0.4	0.4	0	12% very poor 70% poor 18% fair 0% good 0% excellent 24% noncapacity (1981)	40% unsatisfactory 30% impaired 30% satisfactory (estimated)	non-functional	"concern about trend", few woody riparian with scattered regeneration, riparian habitat condition unsatisfactory

Allotment	% of San Francisco Watershed	Miles of San Francisco River	% Loach Minnow Range in San Francisco/ Tularosa Rivers	Range Condition[3] of full/potential capacity (year of data collection)	Soil/Watershed Condition[3] (year of data collection)	PFC Rating for Riparian	Other Information[4]
Deep Creek	2.0	0	0	0% very poor 60% poor 40% fair 0% good 0% excellent 48% noncapacity (1960)	no information available	NA	major tributary, range condition improving
Copper Creek	1.8	0	0	20% very poor 75% poor 3% fair 0% good 0% excellent 62% noncapacity (1958, 67, 74, and 75)	70% unsatisfactory 20% impaired 10% satisfactory (estimated)	functional, at risk for Mineral Creek	11 miles of Mineral Creek, 1 mile of Indian Creek, range/vegetation trends are down, poor groundcover, willow regeneration poor on Mineral Creek. Will Construct "sediment structures" in Indian Creek using heavy equipment. Erosion on Indian Creek.
Alma	1.2	2.25	1.5	7% very poor 52% poor 39% fair 0% good 0% excellent 11% noncapacity (1955)	6% unsatisfactory 45% satisfactory 28% unsuited (1985)	no data available	most range at or near potential, sedges present, riparian vegetation improving and satisfactory

Allotment	% of San Francisco Watershed	Miles of San Francisco River	% Loach Minnow Range in San Francisco/ Tularosa Rivers	Range Condition[3] of full/potential capacity (year of data collection)	Soil/Watershed Condition[3] (year of data collection)	PFC Rating for Riparian	Other Information[4]
Cedar Breaks	0.8	1.25	0.75	7% very poor 75% poor 18% fair 0% good 0% excellent 0% noncapacity	15% unsatisfactory 40% impaired 45% satisfactory (estimated)	functional, at risk	range conditions stable, "water locations" in downward trend, riparian vegetation "blown out"
Citizen	1.5	0	0	10% very poor 40% poor 50% fair 0% good 0% excellent 16% noncapacity (1956 and 1994)	5% unsatisfactory 20% impaired 75% satisfactory (1985)	NA	range conditions in upward trend
Roberts Park	1.2	3	2.5	20% very poor 30% poor 50% fair 0% good 0% excellent 0% noncapacity (1995)	57% unsatisfactory 36% impaired 7% satisfactory (1965)	no data available	range condition upward, portions of the river are dry in early summer
Harve Gulch	0.7	4.7	4	2% very poor 46% poor 30% fair 0% good 0% excellent 36% noncapacity (1976)	30% unsatisfactory 20% impaired 50% satisfactory (1995)	no data available	range condition upward, portions of the river are dry in early summer

Allotment	% of San Francisco Watershed	Miles of San Francisco River	% Loach Minnow Range in San Francisco/ Tularosa Rivers	Range Condition[3] of full/potential capacity (year of data collection)	Soil/Watershed Condition[3] (year of data collection)	PFC Rating for Riparian	Other Information[4]
Hot Gulch/Shelton Canyon	1.1	0	0	10% very poor 70% poor 20% fair 0% good 0% excellent 34% noncapacity (1953, 56, and 59)	no information available	NA	range condition upward, little potential for improvement of range and watershed conditions
Pleasanton/ Lightning Mesa	2.0	18.4	15	2% very poor 15% poor 83% fair 1% good 25% noncapacity (1969)	no information available	no data available	range condition trend static, scattered woody riparian, limited sedges
Dry Creek	3.2	3	2.5	10% very poor 35% poor 55% fair 0% good 0% excellent 53% noncapacity (1969 and 1994)	84% unsatisfactory 11% impaired 5% satisfactory (1970)	no data available	range condition upward, thick stands of willows on river
Potholes	0.5	7.4	6	29% very poor 18% poor 53% fair 0% good 0% excellent 37% noncapacity (1981)	20% unsatisfactory 30% impaired 50% satisfactory	properly functioning	range trend static or downward, illows “line river”, sedges present, 1 major tributary

Allotment	% of San Francisco Watershed	Miles of San Francisco River	% Loach Minnow Range in San Francisco/ Tularosa Rivers	Range Condition[3] of full/potential capacity (year of data collection)	Soil/Watershed Condition[3] (year of data collection)	PFC Rating for Riparian	Other Information[4]
Tennessee	0.2	0	0	0% very poor 20% poor 80% fair 0% good 0% excellent 8% noncapacity (1969)	10% unsatisfactory 10% impaired 70% satisfactory (date unknown)	NA	
Harden Cienega	2.5	18	15	10% very poor 25% poor 35% fair 30% good 0% excellent 28% noncapacity (1969-70)	30% unsatisfactory 30% impaired 40% satisfactory (1968)	properly functioning	range condition upward, willows "line" banks, scattered sedges, 1 major tributary
Wildbunch	1.6	0	0	0% very poor 0% poor 87% fair 13% good 0% excellent 72% noncapacity (date unknown)	41% unsatisfactory 59% satisfactory (date unknown)	no data available	riparian condition unsatisfactory but improving, 3 major tributaries, river in some state of impairment
Pigeon	2.2	5	4	3% very poor 29% poor 66% fair 0.6% good 0% excellent 74% noncapacity (date unknown)	31% unsatisfactory 69% satisfactory (date unknown)	no data available	riparian condition unsatisfactory but improving, 7 major tributaries, river in some state of impairment
Hickey	1.7	12	10	0.5% very poor 15% poor 83% fair 1% good 0% excellent 44% noncapacity (date unknown)	56% unsatisfactory 44% satisfactory (date unknown)	no data available	riparian condition unsatisfactory but improving, 1 major tributary river in some state of impairment

Allotment	% of San Francisco Watershed	Miles of San Francisco River	% Loach Minnow Range in San Francisco/ Tularosa Rivers	Range Condition[3] of full/potential capacity (year of data collection)	Soil/Watershed Condition[3] (year of data collection)	PFC Rating for Riparian	Other Information[4]
Sardine	0.5	0	0	0% very poor 72% poor 28% fair 0% good 0% excellent 80% noncapacity (date unknown)	20% unsatisfactory 80% satisfactory (date unknown)	no data available	riparian condition unsatisfactory but improving, 1 major tributary, river in some state of impairment
TOTAL	**32.3**	**87.4**	**71**	**8% very poor 48% poor 44% fair 4% good 0% excellent 43% noncapacity**	**36% unsatisfactory 17% impaired 28% satisfactory 1% unsuited 18% unknown**	**11% non-functional 5% functioning at risk 29% properly functioning, 55% no data**	

[1]The outcome of section 7 consultation for all of these allotments was "is not likely to adversely affect." Other "is not likely to adversely affect" findings may have been made on livestock grazing within the San Francisco River watershed under the 1995 "Non-site specific biological assessment for threatened, endangered, and proposed species on more than one Forest," however, under that agreement, no notifications of findings were made to the Service. In addition, a large number of allotments on the Alpine, Luna, and Reserve Ranger Districts have had section 7 consultation findings. Information on the findings and conditions for those allotments was not available for this analysis.

[2]Based on USGS data for discharge gauge at Clifton (2,766 miles^2) minus the Blue River drainage above the USGS gauge at Juan Miller crossing (506 mi^2).

[3]The Service recognizes that range, soil, and watershed condition ratings have limitations in their application to overall ecological conditions. However, taken together with the "proper functioning" condition ratings and other factors listed, they give a reasonably adequate index to the overall ecological condition of the watershed and aquatic ecosystem.