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October 28, 1997

Mr. Fred Trevey  
Forest Supervisor  
Coconino National Forest  
2323 East Greenlaw Lane  
Flagstaff, Arizona 86004

Dear Mr. Trevey:

The U.S. Fish and Wildlife Service has reviewed the Biological Assessments and Evaluations for the Windmill Grazing Allotment located on the Coconino National Forest. Your April 24, 1997, request for formal consultation was received on April 24, 1997. This document represents the Service's biological opinion on the effects of the preferred alternative F on the Arizona cliffrose (*Purshia subintegra*), and razorback sucker (*Xyrauchen texanus*) and its designated critical habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C.1531 *et seq.*).

According to the April 24, 1997, Biological Assessment and Evaluation (BAE), the Forest Service has determined that preferred Alternative F "may effect, but is not likely to adversely affect" Arizona cliffrose, and the razorback sucker and its designated critical habitat. The Service is unable to concur with the Forest Service's determination of effect for these species.

The Forest Service has determined that the preferred alternative "may effect, but is not likely to adversely affect" the following species: Southwestern willow flycatcher (*Empidonax traillii extimus*); Mexican spotted owl (*Strix occidentalis lucida*)(MSO); spikedace (*Meda fulgida*); loach minnow (*Tiaroga cobitis*); and Gila trout (*Oncorhynchus gilae*). In addition, the Forest Service has determined that the preferred alternative "may effect, but is not likely to adversely affect" critical habitat for the spikedace, MSO, and southwestern willow flycatcher. Since critical habitat for the spikedace and the MSO has been enjoined by New Mexico District Court (Coalition of Arizona-New Mexico Counties for Stable Economic Growth versus USFWS, No. 95-1285-M Civil, filed March 4, 1997), no conferencing or consultation is required for critical

habitat for these two species. The Service is able to concur with the Forest Service effect determinations for the spikedace, loach minnow, and Gila trout. In addition, this document provides concurrence for the southwestern willow flycatcher, its critical habitat, and the MSO, given the implementation of specific measures.

This biological opinion is based on information provided in the BAE (April 24, 1997); Draft Environmental Impact Statement (DEIS) (August 19, 1997); telephone conversations with personnel from Coconino National Forest; and a letter of clarification provided to the Service from the Mormon Lake Ranger District dated October 7, 1997. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, the effects of grazing, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file in this office.

It is the Service's biological opinion that the proposed Windmill Grazing Allotment is not likely to jeopardize the continued existence of Arizona cliffrose or the razorback sucker or adversely modify razorback sucker designated critical habitat in the Verde River.

## CONCURRENCES

### Southwestern Willow Flycatcher and Designated Critical Habitat

The Forest Service determined that the preferred alternative "may effect, but is not likely to adversely affect" the flycatcher (BAE April 24, 1997). The Forest Service also determined that the preferred alternative would have "no effect" on flycatcher proposed critical habitat (BAE April 24, 1997). During consultation, the Service informed the Forest Service that we did not agree with the "no effect" determination for what is now finalized critical habitat (FR62: 39129). The Forest Service responded on October 7, 1997, with a letter of clarification on several issues, as well as a change in determination to "may affect, not likely to adversely affect" for final critical habitat.

There are no known southwestern willow flycatchers on the Windmill Allotment. The Tuzigoot site, within 1.2 miles of the allotment boundary, was occupied until 1996. Surveys conducted in 1997 indicated that this site was not occupied this year (pers. comm. Chuck Paradzick, Arizona Game and Fish Department). Tavasci Marsh, owned by Phelps Dodge Corporation, was occupied by two breeding pairs in 1996 but was unoccupied prior to that. This site is within 0.2 miles of the Windmill Allotment boundary. Tapco is a small one acre patch of unoccupied suitable habitat along the Verde River under the jurisdiction of the Prescott National Forest, 1.25 miles from the Windmill Allotment boundary. There is an unoccupied area, Dry Beaver Creek at Stagestop, slightly over one mile from the boundary of the allotment that has suitable habitat and has a historical sighting. Approximately 1/4 mile south of Stagestop is one acre of suitable habitat referred to as Winter Cabin with no historical sightings. Within the Windmill Allotment, there is one area of suitable habitat on Sheepshead Spring drainage and another on Oak Creek

near Red Rock Crossing. The three areas of potential habitat are on Spring Creek, Mormon Crossing on Oak Creek and near the junction of Sycamore Creek and the Verde River. Mescal Gulch is an area of potential habitat off the allotment near Clarkdale. Proposed critical habitat adjacent to the Windmill Allotment occurs along the Verde River from S.O.B. Canyon confluence down to the Oak Creek confluence.

Formal surveys for the southwestern willow flycatcher within and adjacent to the Windmill Allotment began in 1993 and have continued through 1997 with negative results. Surveys were conducted in compliance with the Survey Protocol for the Southwestern Willow Flycatcher (Tibbetts *et al.* 1994). Surveys in 1993 were conducted in Dry Beaver Creek, Spring Creek, West Fork Oak Creek, and Sheepshead Canyon. In 1994, surveys were conducted on the Windmill Allotment along Sheepshead, Tapco, Sycamore, Dry Beaver Creek, Spring Creek, and West Fork Oak Creek. Surveys in 1995 were conducted along Dry Beaver Creek, Tapco, Sycamore and Sheepshead Canyon. In 1996, the suitable habitat at Red Rock Crossing on Oak Creek, Tapco (Prescott NF) on the Verde River, Stagestop on Dry Beaver Creek and Sheepshead were surveyed. Potential habitat in the first three miles of Sycamore Creek, Spring Creek and Mormon Crossing on Oak Creek was also inventoried in 1996. Surveys in 1997 were conducted at Tapco, Dry Beaver, Sheepshead and Redrock. Again, no responses were elicited from southwestern willow flycatchers during any of the surveys (October 7, 1997, letter of clarification).

Activities on Federal and non-Federal lands which could affect the southwestern willow flycatcher include livestock grazing, cowbird parasitism, heavy recreational use in some areas, water diversions, allotment improvements, and attraction of predators. Following is a discussion of potential effects to the southwestern willow flycatcher that may occur from Windmill, other federal, and non-federal activities. The effects are discussed for suitable and potential habitat, and proposed critical habitat. A 4.2-mile radius has been drawn around suitable habitat and potential habitat that could become suitable during the life of the permit. The radius areas provide a format in which to evaluate the complex jurisdictions and associated actions in the vicinity of flycatcher habitat, including the potential for cowbird parasitism. The 4.2-mile radius is based on the maximum distance that one male cowbird traveled from roost to forage based on California research (Rothstein *et al.* 1984).

Southwestern willow flycatcher critical habitat is present along 21.2 miles of the Verde River adjacent to the Windmill Allotment. The Verde River is excluded from grazing by Windmill livestock due to either fences or topographical barriers such as cliffs.

The Forest Service indicates that they will survey the following areas for occupancy every year for the life of the permit: Sheepshead, Stagestop, Red Rock Crossing, Winter Cabin and any potential habitat (probably Mormon Crossing) that becomes suitable during the life of the permit. The Service will be contacted if surveys cannot be conducted. The Forest Service indicates that they will assist and cooperate as possible with monitoring and will contact the Service as to status of monitoring as quickly as possible. Arizona Game and Fish Department is the lead

agency for monitoring. They will be contacted if any of these sites become occupied and will either have available personnel and be able to monitor the sites quickly or not have personnel available and not be able to monitor the site in that given year. The Forest Service will attempt to coordinate with personnel conducting ongoing research regarding monitoring as well. If these sites are determined to have breeding flycatchers, the Forest Service will consult with the Service as to status of cowbird trapping. The Forest Service states they will cooperate as possible with other groups for trapping at occupied sites. The Forest Service indicates that they will follow Regional Forester direction on projects required to remove immediate threats to species in the 7 Species Project.

For non-Forest suitable habitat, the Forest Service indicates they will cooperate and assist as possible with survey efforts within the Windmill Allotment. If site(s) become occupied, the Forest Service will work cooperatively with other entities for monitoring and for trapping if needed. If surveys, monitoring or trapping does not occur, the Forest Service will consult with the Service. The Forest Service believes that the presence of cattle within 4.2 miles of critical habitat during the breeding season may influence the ability of critical habitat to successfully support breeding flycatchers by facilitating cowbird parasitism (October 7, 1997, letter of clarification).

Annual maintenance of fences will occur within the radius of the Tuzigoot site but outside of suitable habitat and will not affect habitat or be a source of disturbance to potential nests. Maintenance of fences throughout the Allotment is essential to ensure livestock remain in scheduled pastures in order to achieve desired vegetative and watershed conditions.

Present and future water pipelines for cattle occur within Duff Flat North and South pastures. The closest water trough will occur 2.75 miles from this site in Duff Flat South pasture. The creation of this small watering area could attract cowbirds and facilitate parasitism. There will be a total of two miles of pipeline and three drinkers in Duff Flat South, 2.75 miles of fence to split Duff Flat pasture and 2.25 miles of fence to create the Purshia pasture within this 4.2 mile radius. The Forest Service indicates that there are no cattle concentration sites, such as water lots, corrals, etc. within the 4.2 mile radius of potential flycatcher habitat (pers. comm. Heather Green, Mormon Lake Ranger District).

It is unknown how livestock grazing on the winter range of the Windmill Allotment is contributing to local brown-headed cowbird populations. Although the riparian areas within the Allotment are fenced to exclude livestock grazing, effects to the flycatcher from management practices in upland areas adjacent to potential flycatcher habitat have not been documented and are poorly understood. Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield 1994, Sogge 1995a, Sogge 1995b, Whitfield and Strong 1995), or at a minimum, resulted in reduced or complete elimination of nesting success (Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995, Sferra *et al.* 1995, Sogge 1995a, Sogge 1995b, Whitfield and Strong 1995). Radio-tracking studies have shown that cowbirds in the Sierra Nevada, Missouri Ozarks, and southern Illinois forests commuted on a

daily basis between morning breeding ranges and afternoon feeding sites up to 7 km away (Rothstein *et al.* 1984, Thompson *et al.* 1994). In a study of cowbird movement in Grand Canyon National Park, Drost (1996) found that long-distance movements (greater than 1 km) averaged 18.7 km (11.6 miles) and ranged from 5.3 km (3.3 miles) to 28.3 km (17.6 miles).

In order for the Service to concur with a determination of "may effect, not likely to adversely affect," breeding flycatcher sites must have a grazing buffer of 5 miles. The 2-mile buffer preferred by the Forest Service (October 7, 1997, letter of clarification) is derived as a mean commuting distance based on Rothstein *et al.* (1984); thus it can be expected that 50% of the cowbird commuting distances were less than 2 miles, but 50% were greater. The Service believes that the use of the 2-mile buffer would protect only 50% of the flycatchers if the Windmill Allotment area becomes occupied. The Service does not believe that potential parasitism of 50% is an insignificant or discountable effect to the flycatcher and its habitat. There may be situations when even 5 miles would not be a large enough radius, but these should be considered on a case by case basis.

The Service can concur with the Forest Service's determinations that the preferred alternative "may affect, but is not likely to adversely affect" the southwestern willow flycatcher or its designated critical habitat given the implementation of the following:

- 1) If yearly surveys conducted by the Forest or other entities locate breeding southwestern willow flycatchers within 5 miles of the allotment, the Forest Service will do one of the following:
  - a) Initiate cowbird trapping for any flycatcher locations(s) as outlined in the Service's September 27, 1995, Windmill Biological Opinion for the current or following breeding season regardless of whether assistance can be gained from Arizona Game and Fish Department; or
  - b) Immediately remove livestock from the Windmill pasture(s) located within a 5-mile radius of Southwestern willow flycatcher location(s) during the critical season (April 1 through July 31) and reinitiate consultation with the Service to determine an adequate site-specific solution. This solution will take into account new information regarding cowbird commuting distances and agency direction.
- 2) The results of Southwestern willow flycatcher surveys (conducted to the most recent Arizona Game and Fish Department protocol), as well as the trapping program if initiated, will be reported to the Service and to the Arizona Game and Fish Department each year.
- 3) All fencing that excludes livestock from designated flycatcher critical habitat will be inspected and repaired prior to releasing cattle in those pastures, as well as following any flood events.



### Mexican Spotted Owl

There are 36 MSO territories on the allotment. These are associated with the Mormon Lake, Long Valley, Beaver Creek and Peaks Ranger Districts and the rugged north portion of the Sedona District. PACs have been delineated for all territories and were based on known owl locations such as nests, roosts, visual locations and suitability of habitat.

There are 912 acres of riparian habitat on the allotment with 677 acres on the winter range: 165 acres on the Peaks District portion of the allotment and 70 acres on the Mormon Lake District. An estimated 20-30% of the Munds Pocket/Foxboro Division on the Mormon Lake District is restricted habitat (other than riparian). There is an estimated 35% of the Mill Park Division in restricted habitat. The amounts of restricted habitat on the Beaver Creek and Sedona portions of the allotment is unknown.

The estimated acres of protected habitat are (BAE 1997):

PACs: 24,667 acres, some of these are included in the wilderness acres

Wilderness: 40,471 acres

RNA's: 2341 acres

Steep slopes: extremely small percentage outside of PACs

Grazing and related activities that could affect Mexican spotted owls or their habitat include grazing protected and restricted habitat, fencing, road closures, and activities that facilitate concentration of cattle such as trailing, gathering, and placement of water lots and salt and nutrient supplements.

Grazing will occur in MSO habitat in areas both known and not known to be occupied by MSO. The Forest Service indicates that the effects of grazing will be variable and dependent on soil conditions, climate, rotation schedule, number and type of livestock (breed, age, sex), timing of grazing, past timber harvest history, prior seeding, proximity to water, stand structure, fire history and species composition among other factors. Grazing can impact the ability of an area to move towards future owl habitat, influence the quality and quantity of prey habitat, and can influence how and to what degree a fire moves through an area.

In general, PACs are expected to receive the lightest utilization by livestock because canopy closure tends to be high (limiting understory production), multistoried conditions and high basal area likewise limits vegetation and some PACs are associated with steep slopes, cliffs, lack of water or distance from large meadows which would discourage cattle use in the area. Openings often are small and scattered which likewise do not facilitate concentrated grazing. Pockets of moderate to heavy grazing may occur in PACs due to proximity to good forage, the presence of orchard grass (a preferred forage frequently seeded following timber sales prior to 1990), proximity to water, or presence of openings.

Other protected habitat such as steep slopes and wilderness areas are expected to receive light to heavy grazing pressure. Utilization on steep slopes is expected to be light due to presence of rock and rugged topography although heavier grazing may occur in more accessible portions. The only grazing that occurs in wilderness is associated with the trailing of cattle up and back the Mooney and Jacks Point trails between summer and winter ranges. Cattle remain in these areas for approximately 5 days (includes both trailing and gathering activities) in the spring and again in the fall.

Forested restricted habitat would produce light to moderate amounts of forage due to stand structure and canopy closure. Depending on physical factors and proximity to water, meadows, or orchard grass, cattle utilization could range from light to heavy. Elk/livestock monitoring in other areas of the Forest suggests that utilization in moderate canopy closures ranges from 20-40% by both wildlife and cattle. Unfenced riparian or wetland habitat will experience 60-80% utilization when areas are accessible to cattle and wildlife with negative effects to soils, vigor, and vegetative regeneration.

The Forest Service indicates that light grazing by cattle will maintain current species composition, density, and vigor and will have little to no effect to prey habitat and should allow sufficient fine material for nutrient cycling and to carry fires. In areas where grazing intensity increases and length of grazing periods exceed 20 days, plant species density is expected to decrease, shifts in species composition could occur, prey that favor disturbed systems and short understory could thrive, and prey that rely on dense or tall understory vegetation may not do well and the ability of the area to carry a fire with fine fuels would be less.

The BAE indicates that the majority of fence and cattleguard building and maintenance will occur outside of MSO habitat. On-the-ground layout of fences will be coordinated with range and wildlife so that fence construction will not occur in or near known heavy MSO use areas. The intent is to minimize the short duration disturbance associated with fence building and maintenance and mitigate or avoid the inevitable trailing that occurs along fence boundaries. Fence construction will not occur in occupied PACs during the breeding season to minimize disturbance.

Road closures in the Fain Mountain area are specifically proposed to reduce the road density in PAC #040410. Effects from these road closures could include erosion reduction, reduction of dispersed camping in the PAC, soil and vegetation stabilization, and some reduction in fuelwood gathering. This will be done outside breeding season if the PAC is occupied.

Elk/livestock forage monitoring on the Peaks and Mormon Lake portions of the Windmill Allotment will continue for the life of the permit. This monitoring is designed to assess forage utilization levels by cattle and elk during the year and from year to year throughout Coconino National Forest. There are 126 cages above the Mogollon Rim. Additional monitoring will include: four 25 x 25 foot exclosures to be placed in pine-oak restricted habitat with permanent

photopoints. This will give a relative gauge of utilization and species use in areas of moderate forage production.

Riparian habitat will be improved by fencing and change will be monitored with associated permanent photo points. The exclosures associated with T-6 Spring, Fain and Willard Springs should result in increased density, vigor, and reproduction of vegetation in area with indirect effect of improving habitat for MSO prey. Fencing along Oak Creek, Dry Creek, Coffee Creek, Roger's Lake and Jack's Canyon will likewise improve vegetative conditions and reduce direct impacts to regeneration, soil and understory from cattle. Although these are not in direct proximity to known occupied owl habitat, it is possible these drainages could play a role in dispersal, annual movements or other behavior.

PAC 040225 is near trailing/gathering activities. Cattle are trailed between summer and winter range on the Mooney Trail which passes along portions of the northwest boundary of the 040225 PAC. It takes 2-3 days to move cows between winter and summer range. Around June 1, 635 head are driven by cowboys on horseback partway up Mooney Canyon. The following day they are driven to the top of the rim and through Buck Ridge pasture into either Lockwood or West Barney pastures. It may take an additional day to drive remnant cattle out of Buck Ridge pasture into the more traditional summer pastures. The drive to the winter range is essentially the reverse of the spring and starts around October 15. No other PACs are affected by trailing of cattle under this permit.

MT 040225 is one of several territories associated with the Secret Mountain Wilderness. Most of its 600-acre PAC is accessible to cattle. Few meadows exist and most of these are two acres or less in size. There are no tanks in the PAC. Only the spring cattle drive has the potential to affect owls since the fall drive is outside the breeding season. Disturbance impacts (if any) to nesting owls would be minimal. Nests for MT 040225 have not been located but potential nest sites are associated with nearby drainages which at their closest point are 1/4 mile from the trail with the furthest being one mile. Potential nests would be topographically and vegetatively buffered from trail activities. Potential layover sites in Mooney Canyon are one mile from the PAC.

A portion of the Beaverhead/Grief Hill Sheep Driveway crosses five PACs (040515, 040525, 040536, 040543, and 040211). Two bands of sheep are trailed across the Prescott, Coconino and Kaibab National Forests in route to these allotments on the Coconino and Kaibab National Forests. One band (1645 head) graze while they area being trailed between May 1 to May 31. The other band (2240 head) trails up separately but during the same time frame. The magnitude of the effects of sheep trailing to the respective territories is expected to be small because the sheep pass any particular point along the trail in a matter of hours. The most impact may occur with nightly bedding grounds or the noon rest stop. Physical extent of bedding is expected to be at 5-10 acres; however, these will be specified and varied annually based on resource conditions and needs. The cumulative effects of sheep trailing on owls in the Windmill allotment are small because they pass through so quickly and layover sites are designed to avoid PACs.

Maintenance of existing range structures may occur in some owl habitat. Cattleguard and fence maintenance generally involves a small field crew with trucks working in a small area for a few hours to a day. Locations cannot be specified but rather are identified annually while doing routine inspections. Hand tools, winches and occasionally backhoes (for the cleaning of cattleguards) are used. The duration of these activities is short, the magnitude is small and scope is restricted to widely separated areas. No modification to owl habitat is expected and disturbance to known owls is expected to be minimal (if any).

Construction of new range structures, waters, and horse gates will not occur in known MSO nest stands. Timing restrictions on new fence construction, waterlots, road closures and cattleguards in occupied PACs. The following improvements will occur in MSO PACs:

PAC #	Pasture	Improvement
040220	W. Barney/Rattlesnake	new fence
040221	W. Barney	waterlot, edge of PAC
040209	Rattlesnake	waterlot, edge of PAC
040220	Rattlesnake	waterlot
040219	E. Barney	waterlot, edge of PAC
040505	Little T-Six	cattleguard
040538	Little T-Six	cattleguard, edge of PAC
040516	Little T-Six	cattleguard, edge of PAC
040540	Luke Mtn/Woods Canyon	new fence and cattleguard
040519	Woods Canyon/Lee Butte	cattleguard
040104	Lee Butte	road closures

Mineral supplements are usually placed in flatter areas of good forage production but low utilization. The intent is to encourage animal use away from riparian and other sensitive areas. The Forest Service indicates that salt placement and the avoidance of PACs will be discussed in the annual meetings with the permittee.

The Red/Hog Hill 10-year prescribed fire is ongoing in the Turkey Butte and Fry Park areas within the Windmill Allotment. Grazing an area in the growing seasons following a fire can reduce the vigor of remaining plants and could result ultimately in negative effects to herbaceous cover, seed production, and species composition. The Forest Service indicates that grazing by Windmill cattle in recently burned pastures will be timed as much as possible to avoid or minimize grazing in the growing season following the burns with seed head production as one of the keys that will drive this on-the-ground management. This will minimize reduced vigor resulting from cumulative effects of burning and grazing by cattle, however, reduced vigor and other effects will be expected to varying degrees where wildlife graze this area following the burns. At least two MSO PACs are located in the Red/Hog Hill Prescribed Burn area (numbers 040224 and 040212).

The Service can concur with the Forest Service's determination that the Windmill Grazing Allotment "may effect, but is not likely to adversely affect" the MSO given implementation of the following:

- 1) Livestock concentrations associated with gathering or mineral supplement sites will not occur within MSO PACs during the breeding season.
- 2) Grazing will not occur within any portion of the Red Hill (040224) or Upper West Fork PACs (040212) located in the Lockwood Pasture for which prescribed fire has been introduced as part of the Red Hill/Hog Prescribed Fire Project, until such a time as forage plants are deemed mature based upon a pre-grazing visit; mature means that forage plants exhibit the presence of multiple leaves, seedheads are present for cool season species, and the health of the plants are such that there is reasonable certainty that root reserves have been recharged.
- 3) No improvements involving the use of heavy equipment/chainsaws or road closures will occur during the breeding season in MSO PACs unless monitoring determines that MSO are non-nesting in a given year. To determine this, the following must be determined:
  - a) A continually used day roost is located;
  - b) The male and female MSO are repeatedly located in that location; and
  - c) Repeated monitoring indicates non-nesting behavior such as the taking of multiple mice without delivery to young or flight to a possible nest. To determine the MSO are not nesting, monitoring should continue through June 15. If the above behavior is evidenced after this date, then it is highly likely that MSO are not nesting that year (pers. comm. Joe Ganey, Rocky Mountain Research Station, Flagstaff, AZ).

The Service must review the finding of the monitoring and agree that the conditions of a, b, and c above are met prior to actions in the PAC(s). Concurrence on this point can be given to the Forest Service either verbally or via electronic mail, so that project operations are not unduly delayed.

#### Spikedace, Loach Minnow and Gila Trout

Historically, spikedace were widespread in the Gila River basin including samples taken from the Verde River, Wet Beaver Creek, and West Clear Creek in the 1930's (Minckley 1973). Today, spikedace are primarily found in the upper Verde River above the Coconino boundary. Within the project area, a short stretch of the Verde River mainstem, in the immediate vicinity of the

confluence of Sycamore Creek, continues to support spikedace. Below the confluence of Sycamore Creek, the fish community begins to be dominated by non-native species.

The affected reach of spikedace habitat on or adjacent to the Windmill Allotment includes the Verde River mainstem from the confluence of Sycamore Creek downstream approximately 1/2 mile. The affected habitat is adjacent to Duff Mesa pasture which is scheduled to receive a maximum of 675 head for 20-35 days during the winter grazing period (10/16 - 5/31). Duff Mesa pasture will be rested one year in six years. Cattle using this pasture are excluded from the Verde River and Sycamore Creek which border the western and northern portions of this pasture. No direct impacts associated with grazing on the Windmill Allotment are anticipated in the affected reach. Grazing impacts are evident in this reach due to allotments on the Prescott National Forest.

Indirect effects of the preferred alternative on spikedace habitat are also anticipated to be minimal. Indirect effects on the affected reach can occur from management activities in the upper Verde watershed which is above the Windmill planning area and from activities in the Sycamore Creek watershed. Under the preferred alternative, a number of pastures within the Sycamore Creek watershed will not be grazed. These include Upper Sycamore, Lower Sycamore, Black Mountain and Casner. Indirect effects in the Sycamore Creek watershed will also be reduced if the objectives of improving watershed conditions on the Windmill Allotment are met.

In 1938, C. L. Hubbs collected loach minnow in Beaver Creek and the Verde River mainstem near Camp Verde. This is the only known collection of loach minnow from the upper Verde River system and they have not been reported since (Minckley 1973). Although loach minnow are thought to be extirpated from the Verde River drainage, recent rediscoveries of loach minnow in other areas where they were thought to be extirpated have brought into question assumptions regarding extirpation of this species. Loach minnow inhabit the interstitial spaces of stream substrates and are difficult to capture using ordinary sampling techniques. Their absence may also be a result of mistaken identity. Loach minnow resemble speckled dace that can be abundant in streams of the Verde drainage. It is conceivable that loach minnow have been misidentified as speckled dace when numerous speckled dace are collected. Until an extensive inventory is conducted that targets loach minnow and confirms their absence in the Verde River watershed, potential habitat for loach minnow will be evaluated in the Windmill Allotment planning area. This cautious approach seems warranted considering loach minnow in Eagle Creek on the Apache-Sitgreaves National Forest have recently been collected after several years of "absence" and despite fairly regular sampling efforts.

Although loach minnow were only collected in the Verde River mainstem near Camp Verde and in Beaver Creek near its confluence with the Verde, the potential habitat for loach minnow in the Windmill Allotment planning area is considered to be the Verde River mainstem from the confluence of Sycamore Creek to the confluence of Oak Creek, and the mainstem of Oak Creek from its mouth upstream to Slide Rock. The affected reach in Oak Creek is approximately 35

miles long with mixed ownership patterns. Private lands are primarily concentrated around Cornville, Sedona and within Oak Creek Canyon. Above Sedona, Oak Creek has the characteristics of a cold water stream, has a relatively narrow floodplain and a cobble/boulder substrate. Below Sedona, the floodplain widens, the stream has a lower gradient and slower velocities, receives more sunlight and the dominant substrate is sand and cobble (Sullivan and Richardson 1993). Threats to habitat quality on public lands include grazing, recreation, and increased sedimentation from management activities within the watersheds. Loach minnow are also threatened by the presence of non-native species in Oak Creek and impacts to habitat on private lands such as stream diversions.

Loach minnow prefer to inhabit relatively shallow, swift water with gravel-cobble substrates. Protection and maintenance of streambank stability and riparian vegetation is important for maintaining the stream channel morphology and reducing the amount of sediment generated from bank erosion. Management activities that reduce bank stability and riparian vegetation can increase bank erosion during flood events and result in altered channel characteristics detrimental to loach minnow habitat. Grazing and recreation activities on public lands have been identified as threats to maintaining bank and riparian conditions along the Verde River and Oak Creek. Management activities in the watersheds that increase sedimentation may also affect loach minnow habitat by filling the interstitial spaces of the gravel-cobble substrates that loach minnow prefer.

Indirect effects of the preferred alternative on loach minnow habitat are also anticipated to be minimal. Indirect effects on the affected reach can occur from management activities in the upper Verde watershed which is above the Windmill planning area and from activities in the Sycamore Creek watershed. Under the preferred alternative, a number of pastures within the Sycamore Creek watershed will not be grazed. These include Upper Sycamore, Lower Sycamore, Black Mountain and Casner. Indirect effects in the Sycamore Creek watershed will also be reduced if the objectives of improving watershed conditions on the Windmill Allotment are met.

Historically, Gila trout inhabited the upper Gila River and San Francisco River in New Mexico and tributaries to the Verde River drainage in Arizona. Collections from Oak Creek prior to 1890 and in 1913 were determined to be Gila trout. It is likely that trout samples taken from Oak Creek and West Clear Creek in 1892 and 1894, and which were later misplaced, were also Gila trout (Minckley 1973). Today, Gila trout are only found in New Mexico and have been extirpated from the waters of Arizona. Habitat modifications and the introduction of rainbow trout and other non-native species probably led to the disappearance of Gila trout from the waters on the Coconino National Forest shortly after the turn of the century. Reductions in the distribution and numbers of Gila trout throughout their historic range led to its listing as an endangered species in 1967.

The affected habitat for Gila trout is considered to be the mainstem of Oak Creek from Sterling Springs to Grasshopper Point and the West Fork of Oak Creek. These reaches are addressed in

the Forest Plan as management areas (MA)12 - Riparian and Open Water, MA 1 - Wilderness, and MA 14 - Oak Creek Canyon. Implementation of the preferred alternative will have no direct effects on Gila trout habitat. Pastures are located above the Mogollon Rim, so livestock cannot access Oak Creek Canyon or the perennial portions of the West Fork of Oak Creek. Indirect effects of the preferred alternative on Gila trout habitat can occur through changes in the condition of the Oak Creek watershed, including the West Fork of Oak Creek. The indirect effects of grazing will most likely influence runoff patterns and sediment movement through the watershed.

In order to minimize the indirect effects of grazing on the Windmill Allotment, the objective of the preferred alternative is to improve watershed conditions through greater control of cattle. The preferred alternative incorporates rest into most pastures over a four to five-year period, improves cattle distribution through fencing and water developments, reduces grazing periods within pastures, and generally excludes riparian areas in the winter portion of the allotment. The shorter grazing periods and resting of pastures in the preferred alternative are expected to improve watershed conditions in the short and long term.

The change in grazing management on the Windmill Allotment is an acknowledgement of the cumulative effects past and present activities have had on the riparian and aquatic communities in the planning area. Given the cumulative actions that have occurred on public and private land that contributed to the decline in aquatic ecosystems and native fish communities, the recovery of these areas will likely be through cumulative improvements as well. Specific to grazing, elk populations above the Mogollon Rim and livestock use of the Verde River corridor due to allotments on the Prescott National Forest will continue to have direct and indirect impacts on spikedace habitat in the Verde River. The confluence of Sycamore Creek and the Verde River is the site of Packard Ranch and is also a popular trailhead to access Sycamore Canyon and the Sycamore Wilderness areas. Increased use of this area could impact riparian and aquatic habitats.

The Service concurs with the Forest Service's determination that the proposed Windmill Allotment "may effect, but is not likely to adversely affect" spikedace, loach minnow, and Gila trout.

## **CONSULTATION HISTORY**

A non-jeopardy biological opinion for the implementation of the Windmill Allotment Management Plan on the Sedona Ranger District of the Coconino National Forest was completed on December 30, 1992, for effects to Arizona cliffrose (*Purshia subintegra*) (2-21-92-F-732). Additional consultation for the Arizona cliffrose as well as for the MSO and the southwestern willow flycatcher was completed on February 3, 1995 (2-21-92-F-500). Consultation for the spikedace, Gila topminnow (*Poeciliopsis occidentalis*), Gila trout, Colorado squawfish (*Ptychocheilus lucius*), and razorback sucker occurred on June 6, 1995 (2-21-92-F-500). A biological opinion for effects to the southwestern willow flycatcher and concurrence for the MSO

for the issuance of a two-year grazing permit for the Windmill Allotment was completed on September 27, 1995.

Formal consultation for the proposed 10-year Windmill Allotment Management Plan was requested on April 24, 1997, although the Forest Service determined that the preferred alternative "may effect, but was not likely to adversely affect" seven listed species. A rough draft of the biological opinion was provided to Heather Green, wildlife biologist, Mormon Lake Ranger District, on September 23, 1997, in order for the Forest Service to review draft terms and conditions for the razorback sucker as well as conditions for concurrence for the southwestern willow flycatcher and MSO. The Forest Service responded with a letter of clarification dated October 7, 1997. This letter provided additional details on proposed Arizona cliffrose monitoring, as well as further discussion regarding the flycatcher.

## **DESCRIPTION OF THE PROPOSED ACTION**

The Windmill Allotment Management Plan was updated in 1982 to improve the distribution of areas scheduled for cattle use. In 1988 the Allotment Plan for the Winter Division was updated to change the grazing system to improve the growth of cool-season *Stipa* grasses and overall range conditions. The purpose of proposed changes to grazing management on the Windmill Allotment as outlined in preferred alternative F are to make improvements and adjust grazing schedules to improve watershed condition, improve condition of mountain meadows and riparian areas, and improve management for rare wildlife and plant species. These changes will result in a 10-year Allotment Management Plan.

The Windmill Range Allotment consists of 248,792 acres. These acres lie within three Ranger Districts of the Coconino National Forest and 16,926 acres of Arizona State Trust lands. This allotment is made up of the following community types: ponderosa pine (including pine oak) (104,166 acres), pinyon/juniper (27,941 acres), mountain meadow (3,745 acres), transitional type between ponderosa pine and pinyon-juniper (7,281 acres), chaparral (6,498 acres), desert grassland (87,526) acres, and desert shrub (11,635 acres and riparian (910 acres).

Alternative F, will permit cattle and/or horses to graze year-round. There will be a maximum of 1,252 cattle permitted on Forest lands (155 of which will also be permitted on State land) on the winter range division near Cottonwood and Sedona. During the summer, there will be a maximum 1,257 cattle permitted on Forest lands (160 of which will also be permitted on State land) on the summer divisions above the Mogollon Rim. Preferred Alternative F is designed to address the grazing capacity issues in the Foxboro summer range and watershed issues in Mill Park winter range. Alternative F proposes the following: 1) splitting Luke Mountain pasture a third time for the Foxboro Summer herd, 2) maximizing watershed improvement by grazing within the 4.2 southwestern willow flycatcher radius during the breeding season two of six years. Splitting the Luke Mountain pasture a third time within the Foxboro summer area reduces grazing periods in Little T-Six from 20 to 10 days and Highway Camp from 14-20 days to 10 days. The Forest Service analyzed effects to the southwestern willow flycatcher and its critical

habitat from brown-headed cowbird parasitism using a 4.2-mile radius from all previously occupied habitat as well as potential breeding habitat. The 4.2-mile radius is based on research completed by Rothstein *et al.* (1984) which indicated that brown-headed cowbirds commuted up to 7 kilometers between disjunct feeding and breeding areas in California. The Forest Service indicates that grazing within the 4.2-mile flycatcher radius during the breeding season maximizes flexibility with the grazing rotations. This is done by allowing for year-long rest one year in six in Gyberg, Duff Flat, Duff Mesa and Skeleton Bone pastures and better grazing deferment in Mill Park and Munds Pocket herds winter pastures from year to year.

The following is a description of the grazing divisions within the Allotment:

Mormon Lake Ranger District: Munds Pocket/Foxboro Division of the summer range: The Mormon Lake portion of the Windmill Range Allotment consists of 52,303 acres. This area is called the Munds Pocket/Foxboro Division and is grazed during the summer. The area extends north to south from James Canyon to the Coconino County line. The northern portion is referred to as the Munds Pocket area, and the southern portion as the Foxboro area. The area extends east to west from the rim of Oak Creek Canyon to the Fain Mountain, Casner Park and Pinewood areas. The Munds Pocket portion is grazed by a maximum of 250 cattle between June 1 and October 15. The Foxboro portion is grazed by a separate herd of a maximum of 250 cattle between June 1 and December 1.

Peaks Ranger District - Mill Park Division of the summer range: The Peaks District portion is called the Mill Park Division and consists of 66,648 acres, grazed during the summer. The area extends north to south from the southern portions of Rogers lake into the Sycamore Canyon and Red Rock/Secret Mountain Wilderness Areas. Its western boundary is near Mooney Mountain, and its eastern boundary follows U.S. Highway 89 south to the rim of Oak Creek Canyon. The northern portions of this division contain 9,467 acres of Arizona State Trust lands. State lands are interspersed with Coconino National Forest lands in a checkerboard configuration. A maximum of 675 cattle will graze this division between June 1 and October 31.

Sedona Ranger District - Winter Range Division: The Sedona District portion of the Windmill Range Allotment consists of 129,842 acres. This area is called the Winter Range Division and is grazed during the winter. The area extends north to south from the Peaks Ranger District boundary to the Beaver Creek Ranger District boundary. The area's eastern boundary meets Secret Mountain, Lost Mountain, Bear Mountain, the Boynton Canyon Range Allotment, the Sedona Range Allotment, the western portion of Munds Mountain, the western rim of Horse Mesa, and Jacks Point. Its western boundary meets Sycamore Canyon and the Verde River. The southwestern portions of the Winter Range Division contain 8,023 acres of Arizona State Trust lands. These lands lie approximately 4 miles northeast of Cottonwood, Arizona and are bisected by US Highway 89A. It is grazed by three separate herds. There are a maximum of 250 cattle in the Foxboro winter herd between December 1 and May 31. Up to 100 bulls can utilize the area between June 1 and March 15. The Munds Pocket winter herd can use up to 250 cattle between October 15 and June 1 in this area.

Non-Use Pastures: The following areas/pastures will not be used by Windmill Allotment cattle for the next 10-years in all action alternatives: Sycamore Canyon, Casner Mountain, Black Mountain, Secret Mountain, Munds Mountain, Black Springs, Turkey Basin, Oak Creek proper, Verde River proper, Spring Creek, Section 1 pasture, Section 36 pasture, Bell pasture, Sheepshead Spring and Purshia pasture. Wilderness areas will only be used as travel routes to and from summer and winter range.

The following grazing schedules are guides that will be used to set the grazing management as the associated improvements (fences, cattleguards, etc.) are put in place:

**Mill Park Herd Winter:** Maximum numbers 675, 10/16 - 5/31. This herd uses 15 pastures in a six-year rest/deferred rotation grazing system. Grazing periods range from two to 40 days, 20 days during a projected two month fast plant growth period normally from mid-March to mid-May. Year-long rest is incorporated in each pasture in a two to six-year rotation. To maximize flexibility during the winter, grazing is scheduled within the flycatcher 4.2-mile nest radius from April 1 to July 31, two out of six years. However, cowbird trapping will occur at the occupied site to mitigate possible effects (trapping would occur regardless of grazing within the flycatcher radius). This flexibility allows for year-long rest in Gyberg, Duff Flat, Skeleton Bone, and Duff Mesa pastures one in six years and increased variation in times that the pastures are grazed from year to year.

**Mill Park Herd Summer:** Maximum numbers 675, 6/1 - 10/15. This herd uses 12 pastures in a five-year rest/deferred rotation grazing system. Grazing periods range from four to 30 days, 20 days during a projected 1.5 month fast plant growth period normally from mid-July through August. When days become available during a given year, the large meadow pastures will receive less use than the 10 days projected. Two to three pastures receive year-long rest each year. Each large pasture is rested at least once during this five-year time frame.

**Munds-Pocket Winter:** Maximum numbers 250, 10/15 - 6/1. This herd uses 10 pastures in a six-year rest deferred rest rotation grazing system. The heifers use a rested pasture from the Mill Park Herd, either Greasy West, Greasy East, Wheatfield or White Flat. This use gives these four pastures rest one in six years. Grazing periods range from three to 85 days, 30 days during a projected two month fast plant growth period normally from mid-March to mid-May. The 85-day grazing period in reality is 40-45 days because the pastures will be split using water instead of a fence.

**Munds-Pocket Summer:** Maximum numbers 250, 6/1 - 10/15. This herd uses eight pastures in a three-year deferred rotation grazing system. No pasture rest is scheduled. However, pastures will be rested during the year if graze periods can be extended in early and/or mid-season pastures (projected one pasture rest two years in three). Grazing periods range from five to 30 days, 20 days during a projected 1.5 month fast plant growth period normally from mid-July through August.

**Foxboro Summer:** Maximum numbers 250, 6/1 - 12/1. This herd uses 15 pastures in a four-year rest/deferred rotation grazing system. Grazing periods range from two to 35 days, 20 days during a projected 1.5 month fast plant growth period normally from mid-July through August. T-Six, Goofy, Little T-Six, Highway Camp-South Geronimo, Woods and Jack's Point pastures will be rested one year in four years.

**Bulls:** Maximum numbers 100, 6/1 - 3/15 (with the cows 3/15 - 6/1). This herd uses six pastures in a six-year rest/deferred rotation grazing system. Each pasture receives rest one year in six. Grazing periods range from 30 to 75 days, 30 days during a projected 1.5 month fast plant growth period normally from mid-July through August.

The following is a list of structural improvements proposed to implement Alternative F:

**Gyberg Pasture:** Construction of 2.25 miles of barbwire fence to improve control of cattle movements in this pasture. Closure of FR 9538A to vehicular traffic at Last Chance Tank. Construction of three self-closing horse gates and/or alternative bike gates where trails cross this new fence.

**White Flat Pasture:** Construction of two miles of barbwire fence to improve control of cattle movements in this pasture. Installation of one cattleguard where this new fence crosses FR 216. Construction of one mile of pipeline and three drinkers to improve control of cattle movements in this pasture.

**Black Tank Pasture:** Construction of two waterlots, black tank pasture tanks, and split pastures, if needed, to control of cattle movements in this pasture.

**Cornville Pasture:** Construction of 1.25 miles of barbwire or electric fence to improve control of cattle movements in this pasture. Installation of two cattleguards where this new fence crosses FR 9806 and 9806A.

**Holly Springs Pasture:** Construction of 1.25 miles of barbwire fence to improve control of cattle movements in this pasture.

**Page Springs Pasture:** Construction of three miles of barbwire fence to improve control of cattle movements in this pasture. Installation of two cattleguards where this new fence crosses FR 9822.

**Duff Flat Pasture:** Construction of two miles of pipeline and three drinkers to improve control of cattle movements in this pasture. Construction of 2.75 miles of barbwire or electric fence, if necessary, and one cattleguard to improve control of cattle movements in this pasture.

**Greasy East Pasture:** Construction of two miles of pipeline and two drinkers to improve control of cattle movements in this pasture.

Malapais Pasture: Construction of two miles of pipeline and two drinkers to improve control of cattle movements in this pasture.

Dutch Kid Pasture: Installation of 0.5 miles of barbed wire fence around existing cottonwoods/incipient riparian in Coffee Creek to protect from livestock and recreationists.

West Barney/Rattlesnake Pasture: Construction of 2.25 miles of barbwire or electric fence to improve control of cattle movements in this area. Installation of one cattleguard where this new fence will cross Forest Roads (FR) 539. Installation of eight waterlots throughout these pastures to improve control of cattle movements in this area.

East Barney Pasture: Construction of three waterlots to improve control of cattle movements in this area.

Fry Pasture: Construction of 1.5 miles of barbwire or electric fence to improve control of cattle movements in this area. Installation of two cattleguards where this new fence will cross Forest Roads (FR) 535 and 536. Construction of one mile of barbwire fence to protect five acres of Casner Draw meadow from livestock. Construction of a barbwire fence waterlot around Casner Draw tank, so it can be opened and closed to control cattle movements within this pasture. Construction of a barbwire fence waterlot around Fry Park Tank to control cattle movements in this pasture.

Mill Park Pasture: Construction of three miles of barbwire or electric fence to improve control of cattle movements in this area. Installation of three cattleguards where this new fence will cross Forest Roads (FR) 535, 536 and 6330. Construction of a barbwire fence around Mill Park Tank to create a waterlot that will be used to control cattle movements in this pasture.

Rogers Lake Pasture: Construction of 0.25 miles of barbwire fence to exclude Windmill cattle from Rogers Lake.

Harding Pasture: Building a roadside tank to improve control of cattle movements in this area.

Luke Mountain Pasture: Construction of seven miles of fence to split the current Luke Mountain pasture in three separate pastures. This will result in cattle utilizing a higher percentage of a given pasture but at a lower overall utilization level and with less impacts to riparian areas and small meadows. Three cattleguards will be installed where this new fence crosses FR 239 twice and FR 127. Closure or obliteration of 0.5 miles of road on FR 9470 and 0.2 miles of road on FR 9470A on Fain Mountain to protect wildlife habitat, reduce soil loss, and reduce road densities. Installation of 10 cattleguards on Forest Roads 741B, 9467X, 127E, 9464B, 127B, 127Ba, 127A, 9464T, 9464J and 80. Building an eight-foot fence to protect five acres of Fain Spring from cattle and elk.

Jacks Point/HA Pasture: Construction of 1.25 miles of barbwire fence to improve control of cattle movements in this area. Installation of four cattleguard where this new fence will cross Forest Roads (FR) 9495G, 9499G, and two on 9494F. Building one roadside tank to improve control of cattle movements in this area.

Mud Lake Pasture: Construction of 3.5 miles of barbwire or electric fence to improve control of cattle movements in this area. Installation of four cattleguards where this new fence will cross Forest Roads (FR) 78A, 9463Y, 9463X and 9495A. Building two roadside tanks to improve control of cattle movements in this area. Construction of an eight-foot fence to protect five acres of Willard Spring from cattle and elk. Installation of a pipeline or drinker to pipe water outside of enclosure for use by cattle and wildlife. Closure or obliteration of one mile of road to reduce erosional impacts to spring area.

T-Six, Goofy and Little T-Six Pastures: Construction of 1.75 miles of barbwire or electric fence to improve control of cattle movements in this area. Installation of nine cattleguards where this new fence will cross Forest Roads (FR) 226, 228, 226C, 9468G, 9491L, 9467Y, 2471S, 226F and 9468P. Building an eight-foot fence to protect five acres of T6 Spring from elk, cattle, and ORV use.

Crazy Park Pastures: Construction of three miles of barbwire or electric fence to improve control of cattle movements in this area. Installation of two cattleguards where this new fence will cross Forest Roads (FR) 9459S and 9459T. Removal of Crazy Park Tank from its present location in the middle of a meadow to reduce cattle and livestock concentrations from this sensitive area to alleviate soil compaction and loss of soil and vegetation.

**Monitoring:** Elk/livestock forage utilization monitoring would continue. Monitoring of Arizona cliffrose (*Purshia subintegra*) populations during livestock graze periods in Gyberg and Duff Flat South Pastures would occur. Four 25' x 25' cages would be created to use as baseline photopoint monitoring in pine-oak Mexican spotted owl habitat. Permanent photo points would be established at T6 and Fain Mountain enclosures to monitor improvements in riparian and Mexican spotted owl habitat. Potential flycatcher habitat would be monitored for progress towards suitable habitat. Suitable flycatcher habitat will be monitored for occupancy annually. Assistance with monitoring and cowbird trapping at occupied flycatcher sites, either on or off Windmill, but potentially affected by Windmill grazing, would occur in partnership with other organizations and parties.

Monitoring and enforcing compliance with the permit's terms and conditions would occur, including livestock grazing scheme, contingencies for drought conditions, monitoring agreements, and cost-sharing arrangements for structural range improvements or grazing effects.

#### **STATUS OF THE SPECIES**

### Arizona Cliffrose

Arizona cliffrose was listed as endangered under the Endangered Species Act on May 29, 1984 (USDI 1984). Critical habitat has not been designated. The Arizona Cliffrose Recovery Plan was completed in 1994 (U.S. Fish and Wildlife Service 1994b). This species has narrow habitat requirements and occurs in four widely separated areas in central Arizona: near Bylas (Graham County), the Horseshoe Lake vicinity (Maricopa County), near Burro Creek (Mohave County), and near Cottonwood in the Verde Valley (Yavapai County) (Rutman 1992a). These sites differ slightly in elevation and associated vegetation, but all sites have limestone soils (generally white but also reddish in color) derived from Tertiary lakebed deposits, and at each site Arizona cliffrose is part of a locally unique vegetative community (Anderson 1993).

Each of the four populations of Arizona cliffrose are genetically variable (Mount and Logan 1992). The prevalence of certain morphological characteristics, especially the frequency and degree of leaf lobing and the density of leaf and flower stipitate glands, differ among the populations (Reichenbacher 1992). As leaf lobing and glandularity increases, distinguishing Arizona cliffrose from the commonly occurring *Purshia stansburiana* may present some difficulty (Schaack and Morefield 1985; Phillips and Phillips 1987; Reichenbacher 1987 and 1989). Problems concerning the definition and morphological separation of Arizona cliffrose from *P. stansburiana* have been attributed to putative hybridization between these two species (Schaack and Morefield 1985). Studies have been conducted on Arizona cliffrose morphometrics by Reichenbacher (Southwestern Field Biologists, Tucson) and an analysis of Arizona cliffrose DNA using the RAPD marker method was undertaken by Mount (University of Arizona, Tucson). These studies (Reichenbacher 1992; Mount and Logan 1992) are consistent with the observations of others (Denham 1992; Reichenbacher 1987 and 1989; J. Hendrickson, California State University in Rutman 1992b) and demonstrate that species of the genus *Purshia* tend to be phenotypically plastic, and can respond to long-term and seasonal changes in climate by producing leaves and shoots that have adapted to local or seasonal climatic conditions. This type of phenotypic plasticity does not mean that the plants are hybrids or of hybrid origin (Reichenbacher 1987; Rutman 1992b; USFWS 1994b).

The longest known population of Arizona cliffrose and the type locality is the Burro Creek population which occurs on Bureau of Land Management (BLM) administered lands. The draft Kingman Resource Management Plan (U.S. Bureau of Land Management 1990) included within the preferred management alternative the establishment of the 1,113 acre Clay Hills Area of Critical Environmental Concern (ACEC). This proposed ACEC contains the largest subpopulation of Arizona cliffrose in the Burro Creek area, but not two smaller, more recently discovered, subpopulations. In 1989, BLM constructed a fence that excludes cattle and burros from approximately 700 acres of the ACEC. Approximately 310 acres of the enclosure includes occupied Arizona cliffrose habitat and encompasses the larger subpopulation.

Little is known of the Arizona cliffrose population near Bylas on the San Carlos Apache Indian Reservation. However, based on the presumed extent of appropriate habitat, this population may

be rather large. The Horseshoe Lake population includes several subpopulations and is found on the Tonto National Forest. No special land management designations or other special protections are afforded either the Bylas or Horseshoe Lake populations. No section 7 consultation has been conducted concerning either of these populations.

All Arizona cliffrose populations have experienced declines due to human-caused actions. Grazing by livestock, feral animals, and wildlife threatens the long-term survival of Arizona cliffrose (Phillips 1986; Phillips *et al.* 1980; Rutman 1992a; USDI 1984; U.S. Fish and Wildlife Service 1994b). This relatively palatable shrub often receives moderate to heavy grazing pressure when exposed to ungulate herbivores, particularly in the vicinity of water sources and frequently used trails (Bingham 1976; Phillips *et al.* 1980; Reichenbacher 1987). Tender seedlings, new growth, and branches with flowers and developing fruit are preferentially selected (Bingham 1976; Denham 1992). Observations and preliminary data analysis of BLM enclosure studies on the Burro Creek population indicate that consistent yearly browsing pressure may have reduced the vigor and/or form-size class of the remaining plants. Reduced vigor may result in less than optimal reproductive success. The extent to which browsing has altered successful reproduction in any Arizona cliffrose population has never been quantified.

Mining and mining-related activities are a serious threat to the long-term survival of this species, particularly in the Burro Creek area. Arizona cliffrose habitat at Burro Creek has a high potential for bentonite (U.S. Bureau of Land Management 1990), a type of clay used for cosmetics and pharmaceuticals. Mining and exploration activities have reduced the number of cliffrose plants and the amount of occupied, available, and undisturbed habitat. The BLM estimates that 14% of Arizona cliffrose habitat in the Burro Creek area has been lost due to mining. Evidence from past small-scale mining activities can be found within the Verde Valley population of Arizona cliffrose. Other than at Burro Creek, no known mining activities are presently occurring or have been proposed.

Construction of roads and utility corridors has caused losses across the range of Arizona cliffrose (Phillips *et al.* 1980). All Arizona cliffrose populations have roads and/or utility right-of-ways within or near them. The Burro Creek population is divided by a graded dirt road paralleled by the Southern Union Gas Company pipeline and Arizona Electric Power Cooperative Incorporated high voltage power line (Butterwick 1979). No estimate of the amount of habitat lost to these developments in the Burro Creek area has been made. Arizona Highway SR 70 bisects the Bylas population and has impacted Arizona cliffrose plants and habitat, as demonstrated by Arizona cliffrose occurring on both sides of the road within the highway right-of-way.

The Arizona cliffrose site near Burro Creek is a well-known destination for rock collecting enthusiasts. Increased recreational activity may occur within the Clay Hills ACEC when the Burro Creek campground is developed (U.S. Bureau of Land Management 1990). These visitors may affect Arizona cliffrose by turning over rocks and disturbing seedling establishment microsites. They also may occasionally drive short distances across country to reach collecting

sites and crush plants. The amount or proportion of Arizona cliffrose habitat lost to recreational activities throughout the range of the species has not been estimated.

## **STATUS OF THE SPECIES**

### **Razorback Sucker**

The razorback sucker was listed as endangered on October 23, 1991 (USFWS 1991). Critical habitat was designated for razorback sucker on March 21, 1994 (USFWS 1994a). Within the Gila River basin, critical habitat includes portions of the Gila and Salt Rivers as well as the Verde River from just below Perkinsville downstream to Horseshoe Dam. Critical habitat includes the river and its 100-year floodplain. Razorback sucker grows to over two feet in length and has a distinctive abrupt, sharp-edged dorsal ridge behind the head (Minckley 1973). The species was once common throughout the Colorado River basin, but is now rare, occurring sporadically in about 750 miles of the upper basin (Bestgen 1990). In the lower basin a substantial population exists only in Lake Mohave. Upstream from Lake Mohave, the razorback sucker occurs in Lake Mead and Grand Canyon. Downstream from Lake Mohave, it occurs sporadically in the mainstem and associated impoundments and canals (USFWS 1991). Habitat alteration and destruction along with competition and predation from introduced nonnative fish species are responsible for the species' decline (Marsh and Brooks 1989; Minckley *et al.* 1991). As part of the recovery program, reintroduction of razorback sucker has been attempted through stocking into numerous locations in the Gila, Salt, and Verde River basins (Creef *et al.* 1992; Hendrickson 1993).

Adult razorback sucker inhabit a wide variety of riverine habitats including mainstream and backwater areas such as slow runs, deep eddies, pools, and sloughs (Bestgen 1990). It also inhabits reservoirs. Larval and juvenile razorback sucker habitat use is poorly understood, but is thought to be shallow, slow moving areas, backwaters and littoral zones (Langhorst and Marsh 1986; Bestgen 1990). Razorback sucker spawns from January to May and initiation of spawning appears to be tied to water temperature (Langhorst and Marsh 1986; Tyus and Karp 1990). Spawning occurs in shallow water over large gravel, cobble, or coarse sand with little or no fine sediment on wave-washed lakeshores or riverine riffles (Minckley *et al.* 1991). Razorback sucker lives up to about 50 years (McCarthy 1987). It feeds on plankton, algae and detritus in reservoirs, with riverine populations also consuming a large amount of benthic invertebrates (Bestgen 1990).

Razorback sucker was historically found in the Verde River at least as far upstream as Perkinsville (Minckley and Alger 1968). Due to habitat alterations and losses and introduction and spread of nonnative species, razorback sucker was extirpated from the Verde River, with the last record at Peck's Lake in 1954 (Wagner 1954; Minckley 1973). Beginning in 1981, razorback sucker was reintroduced into the Verde River using hatchery stock originating from Lake Mohave (Hendrickson 1993). Stockings were made from near the mouth of Granite Creek downstream to Childs. Evaluations of stocking success from 1986 to 1990 indicate that few of

the fish survived more than one year (Hendrickson 1993). Predation by nonnative species was thought to be a major cause of stocked fish loss (Minckley 1983; Marsh and Brooks 1989). Therefore, recent stockings have been of larger fish that are more immune to predation, which appears to increase post-stocking survival (Clarkson *et al.* 1993; Arizona Game and Fish Department 1995). Monitoring studies have shown that reintroduced razorback sucker in the Verde River use pools, glides and backwaters with some use of runs and eddies (Creef *et al.* 1992; Hendrickson 1993).

The affected reach of razorback sucker habitat on or adjacent to the Windmill Allotment includes 21 miles of the Verde River mainstem from the confluence of Sycamore Creek to the confluence of Oak Creek. The Coconino National Forest and the Windmill Allotment are situated along the eastern side of the Verde River, and the Prescott National Forest lies to the west.

### Critical Habitat

The Verde River and its 100-year floodplain through the project area was designated as critical habitat for the razorback sucker. Not all lands within the designated boundaries is considered to meet the criteria for critical habitat, that is, meeting one or more of the constituent elements that were deemed essential to species conservation. Constituent elements include water, physical habitat, and biological environment. Additional selection criteria were also developed during the designation process to address the special needs of the razorback sucker. These criteria were (1) the presence of known or suspected wild spawning populations, (2) areas where juvenile razorback suckers had been collected or which could provide suitable nursery habitats, (3) areas presently or historically occupied that had the potential for establishment of a population, (4) areas required to maintain rangewide distribution under a diversity of physical, chemical and biological conditions, and (5) areas in need of special management to provide for the survival and recovery of the razorback sucker.

Although the historic conditions in the Verde River have been altered by water and land uses in the watershed, the river continues to have flows and physical habitat conditions that are suitable for the development of a razorback sucker population. Suitable habitat for all life stages appears to be present. Normal spring flooding in the Verde River occurs during the spawning period of the razorback sucker, thereby providing flooded bottomlands that have been shown to be important to young fish.

It is in the area of biological environment that the Verde River, like most rivers within the historic range of the razorback sucker, has significant deficiencies. The lower portion of the Verde River is dominated by non-native fish species that have been implicated in the declines of the razorback sucker populations throughout the historic range. In addition, the introduction of these non-native fish species is likely also responsible for the introduction of the parasitic copepod *Lernaea* to the river. The presence of this copepod may have an effect on the survival of sub-adult and adult razorback suckers (Clarkson *et al.* 1993).

## ENVIRONMENTAL BASELINE

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

### Arizona Cliffrose

The largest population of Arizona cliffrose occurs in the Verde Valley (Anderson 1986; Denham 1992, qualifying Schaack and Morefield 1985, and Phillips *et al.* 1987). Arizona cliffrose habitat in the Verde Valley is restricted to an area of approximately three miles long by one mile wide (Denham 1992; Phillips *et al.* 1987). This population includes the largest and most robust individuals of Arizona cliffrose currently known (Denham 1992). Reproductive output has successfully produced seedlings and young plants of various age cohorts. This is the only Arizona cliffrose population where successful seedling establishment leading to population recruitment is currently known. Land ownership includes the U.S. Forest Service, Arizona State Parks, Arizona State Trust, and numerous private parcels. There are hybrid swarms of *Purshia subintegra* and *Purshia stansburiana* in the Verde Valley. The Service considers these plants to be outside the definitions of *Purshia subintegra*.

Current land management practices in the Verde Valley often conflict with long-term conservation goals for Arizona cliffrose. The Coconino National Forest established the 472-acre Verde Valley Botanical Area (VVBA) in 1987 (U.S. Forest Service 1987) to emphasize management practices needed to protect and preserve the unique desert community which includes Arizona cliffrose. The VVBA includes an estimated 50% to 60% of the Arizona cliffrose plants in the Verde Valley (Denham 1992, modifying Phillips *et al.* 1987). Seasonal livestock grazing occurred within the VVBA in 1994 and 1995 which was not in compliance with direction in the Recovery Plan (BAE April 24, 1997). An additional 10% to 20% of Arizona cliffrose plants in the Verde Valley are found on Forest Service lands not included in the VVBA.

A draft management plan has been developed for the VVBA (Ward n.d.). The draft VVBA management guidelines preclude certain land management actions within the VVBA, including road development, ORV driving, mining, and land exchanges. The Forest is currently evaluating Arizona cliffrose habitat that was not included in the VVBA for possible inclusion. Part of this evaluation consists of the identification and survey of potential Arizona cliffrose habitat. Forest soil scientists are studying the unique soils which support Arizona cliffrose to better understand the distribution of potential habitat in the Verde Valley. Surveys were conducted in 1994 and 1995 and located additional plants. Additional land management planning is underway by the Forest. However, the VVBA management plan remains to be completed.

Arizona State Parks at Dead Horse Ranch State Park manages a relatively small area of Arizona cliffrose habitat contiguous with populations on the Coconino National Forest and within the VVBA. A proposed campground at Dead Horse Ranch is immediately adjacent to this population. State Parks has coordinated the planning of this campground with the Forest Service and Service so not to affect Arizona cliffrose. Dead Horse State Park also is working with the Forest Service regarding trail development and use in this area (pers. comm. Barbara Phillips, botanist, Coconino National Forest). Arizona State Trust manages one section of land within Arizona cliffrose habitat in the Verde Valley (T. 15 N., R. 3 E., section 36). This section includes high density and robust plants and is immediately south of the designated VVBA. With private lands to the west of section 36 and no Arizona cliffrose habitat extending east of the section, the management of contiguous Arizona cliffrose habitat on Forest Service lands is precluded. The management of section 36 for the conservation of Arizona cliffrose is crucially important to maintain the ecological integrity of this Arizona cliffrose population and to provide for the recovery of the species.

Section 7 consultation with the Coconino National Forest on livestock grazing in the Verde Valley for the issuance of a 2-year permit for the Windmill Allotment was completed in December 1992, and for the Apache Maid Allotment in February 1995. Arizona cliffrose habitat in the vicinity of Rocking Chair Road and US 89A have been fenced to excluded livestock (permitted and trespass). Arizona cliffrose in these pastures were seriously browsed prior to fencing. Positive effects to cliffrose following fencing were evident during the November 1992 field review of the Windmill Allotment and VVBA. The Apache Maid Allotment includes potential Arizona cliffrose habitat. The BLM Kingman Resource Area completed consultation in August 1993 for the Bagdad Allotment at the Burro Creek cliffrose population.

Formal section 7 consultation was completed with the Federal Highway Administration on July 1, 1996, for improvement of SR 89A (Segment 2) east of Cottonwood Arizona (MP 356.1 to MP 357.1). Plants and habitat have been lost from the Verde Valley population and additional destruction of habitat may result from road construction, roadway expansions, and land exchanges which are currently under evaluation. Expanding urbanization within the Verde Valley has led to direct loss of habitat and plants. No estimates of the amount or proportion of total habitat lost to these threats is available.

Recreational activities and off-road vehicle (ORV) use has contributed to significant habitat loss and degradation in all but the Bylas population (Bingham 1976; Phillips *et al.* 1980; U.S. Fish and Wildlife Service 1994b). The importance of these threats to the continuing survival of Arizona cliffrose, especially in the Verde Valley, is likely to increase as human populations increase and the nearby urban areas expand. Within the Verde Valley population there have been informal parking-lots, illegal dump sites, target shooting range, ORV activity areas, numerous "party" sites, and the development of mountain bike trails. The Coconino National Forest has initiated several protective measures for the Arizona cliffrose population in the Verde Valley. Fencing to delineate the parking area at the intersection of US 89A and Rocking Chair Road has been completed. Additional barrier fences have been constructed by the Forest along part of

Rocking Chair Road to restrict off-road vehicle activities. Several two-track roads crossing Arizona cliffrose habitat have been closed and rehabilitated by the Forest, and the shooting range has been relocated out of Arizona cliffrose habitat.

### Razorback Sucker

Because of their spring originations, the Verde River and many of its tributaries have an unusual watershed configuration and an unusual hydrograph. About 30% of the watershed of the Verde River lies upstream from the beginning of perennial flow in the river. Although perennial flow occurs in headwater tributaries, perennial flow in the Verde River itself originates from mildly thermal, relatively constant flow springs near the mouth of Granite Creek. These springs provide an unusually flat base flow hydrograph over which are superimposed flood events originating from surface runoff due to precipitation and reflecting in volume the large watershed area. The flood events are highly variable in volume and timing.

In most Southwestern river systems, the headwaters, or beginning of perennial flow, are located in the uppermost parts of the watershed, generally in hill or mountain areas that have little upstream human development. Because of its spring origin, the headwaters of the Verde River are well downstream from the upper reaches of the watershed and are also downstream from major human activity. The Big and Little Chino Valleys and Williamson Wash are located upstream from the headwaters of the Verde River and support substantial urban and suburban areas as well as agricultural activity including irrigated croplands. The towns of Prescott and Chino Valley are among the fastest growing urban areas in Arizona with growth rates of 9.64% and 16.7% in the 1990-94 period (Arizona Department of Economic Security).

These upstream activities have a wide variety of direct, indirect, and cumulative adverse effects on the Verde River and its native fish community, including razorback sucker. Substantial areas of the watershed have been subject to vegetation reduction or removal, soil disturbance or compaction, or covering with impermeable surfaces, which alter runoff, infiltration, and groundwater recharge patterns (Esposito *et al.* 1979; Platts 1990; Naiman 1992; Ewing *et al.* 1994). Under these types of watershed alterations, flood volume generally increases while flood duration decreases and infiltration and groundwater recharge decreases (Leopold 1994). Erosion is increased and results in larger sediment input into the Verde River. While unquantified, elevated fine sediment levels or substrate embeddedness in the upper Verde River have been noted by several workers (Schuhardt 1989; Kuntz 1992; USFWS unpublished data).

Watershed degradation includes many adverse effects within the watershed such as vegetation reduction, removal, or alteration, alteration of the structure and composition of floral and faunal communities, soil loss, soil compaction or disturbance, cryptobiotic soil losses, soil nutrient reduction, infiltration changes, hydrological regime alteration, and many others. Depletion of beaver populations throughout the Verde River system has also played an important role in the loss of cienega-type habitats and alteration of the hydrologic regime of the river.

Although groundwater pumping in the upper Verde basin has decreased since 1970 due to declines in irrigated agriculture in the Big Chino Valley, it is again increasing. Rapidly growing urban and suburban development in the Chino Valley and Paulden areas are based on groundwater use and the city of Prescott is acquiring groundwater wells in the Big Chino/Williamson Valley area for use as city water supply (Prescott Daily Courier, 1994). Groundwater use in the Verde Valley is also increasing, with 293 wells in the six contiguous sections in and near Cottonwood, and 821 wells in the six contiguous sections in and near Camp Verde (Arizona Department of Water Resources Wells Registration files). Groundwater pumping in the upper watershed of the Verde River is expected to adversely affect the spring flow which forms the Verde River (Owen-Joyce and Bell 1983; Ewing *et al.* 1994).

In addition to exacerbating the adverse effects detailed above, the rapidly growing population in the Prescott, Chino Valley, and Cottonwood areas places increasing demands on the Verde River for recreation. Recreation use is presently causing adverse impacts to the river in the form of bank degradation and erosion, primarily from roads and off-road vehicles (Schuhardt 1989; Sullivan and Richardson 1993). Areas of the river on the Windmill Allotment have been identified as particularly impacted by recreational uses.

The Windmill Allotment contains about 1,500 acres of riparian habitat. Information on the riparian area conditions and trends in the winter range of the Windmill Allotment provided in the DEIS indicate that conditions are currently "fair" in all pastures with the exception of the Sheepshead Spring pasture which is in "good" condition. Trends range from "downward", to "static", and even "upward" in few pastures.

It is extremely difficult to quantify the changes to the Verde River that have resulted from past and ongoing activities on the watershed and in the river itself. Sufficient information for a pre-effect analysis is lacking. The large size of the watershed area also means that there are many on the ground actions taking place, and while the effects of one may not appear to be significant, the combined effects often are. Segregating out one effect, in one area, from the background of combined effects is not possible within the scope of this biological opinion. That should not be construed to say that the effects of any individual action are not important, merely that it is difficult to isolate the specific effects.

In addition to habitat alterations, various nonnative aquatic species have been introduced by humans into the Verde River system and have adversely affected razorback sucker and other native fishes through predation and competition (Marsh and Brooks 1989; Marsh *et al.* 1989; Rinne 1991; Douglas *et al.* 1994). Nonnative species currently reported to exist within the upper Verde River include mosquitofish (*Gambusia affinis*), yellow bullhead (*Ameiurus natalis*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), red shiner (*Cyprinella lutrensis*), carp (*Cyprinus carpio*), smallmouth bass (*Micropterus dolomeiui*), green sunfish (*Lepomis cyanellus*), fathead minnow (*Pimephales promelas*), and crayfish (*Oronectes virilis*) (Hendrickson 1989; USFWS 1988; USFWS 1989; AGFD 1993; Stefferud 1995; AGFD unpublished data; J. Rinne and J. Stefferud, USFS unpublished data). While native species form

the majority of the fish community in the Verde River above Sycamore Creek, nonnative fish now predominate downstream from Sycamore Creek. Upstream from Sycamore Creek, the Verde River is less disturbed and retains enough of its natural condition and hydrograph to prevent significant displacement of the native fish community by nonnatives. The long-term trend in the native/nonnative species balance is toward more nonnatives and less natives; however, available data are too limited to determine the present rate of that trend.

Although the upper Verde River supports one of the best remaining native fish communities in the Gila River basin, the past and present adverse impacts to the river and fish are substantial. This past and ongoing degradation along with the increasing presence of detrimental nonnative species results in a tenuous status for the Verde River native fish community, including razorback sucker, and has already resulted in the extirpation of several native fish species (Minckley 1973). The point at which habitat loss and degradation resulted in elimination of the razorback sucker occurred in the 1950's, and it is not yet clear from reintroduction efforts if habitat loss and degradation and nonnative species pressures have abated sufficiently to allow long-term reestablishment of a self-sustaining razorback sucker population.

The razorback sucker population in the Verde River is the most successful of the three reintroduced Gila River basin populations of the species (Hendrickson 1993). Loss or serious impairment of this population would substantially reduce the probability of successful reestablishment of the species in the Gila River basin. Downward trends in the species in all other portions of its range and the lack of recruitment in mainstem Colorado River populations in Arizona make reintroduction efforts an important key to the survival and recovery of this species throughout its range.

## **EFFECTS OF THE ACTION**

### Arizona Cliffrose

The survival and recovery of listed species depends upon management and protection of diversity at the genetic, population, species, community, and ecosystem levels. The survival and recovery of Arizona cliffrose will depend upon the successful management and protection of all four known populations and the ecosystems upon which they depend. Survival and recovery of each of these populations is needed to ensure the preservation of the species' genetic diversity, the evolutionary history of each population and the species, and the unique communities and ecosystems of which Arizona cliffrose is a part. To achieve this goal, the recovery plan (USFWS 1994b) identified Arizona cliffrose "recovery units" that are analogous to the Cottonwood, Burro Creek, Bylas, and Horseshoe Lake populations. The establishment of recovery units provide for the analysis of the effects of a proposed action on a listed species to be completed based upon the status of the species within the impacted recovery unit. The jeopardy threshold is therefore assessed for each recovery unit. The effects of the preferred alternative for the Windmill Grazing Allotment to Arizona cliffrose is based on the Arizona Cliffrose Cottonwood Recovery Unit.

With the expanding development within the Verde Valley, all Arizona cliffrose habitat under Federal land management is increasingly crucial for the survival and recovery of the species and the protection of the unique plant community found on the special limestone soils. These soils and their unique edaphic properties are a finite resource. On the Windmill Allotment, Arizona cliffrose (*Purshia subintegra*) as well as the hybrid form (*Purshia subintegra* and *Purshia stansburiana*) occurs in the following pastures: Section 1, Section 36, Gyberg, Duff Flat North and South, and the *Purshia* pasture (BAE 1997).

The Recovery Plan (USFWS 1994b) states that stocking rates and grazing systems should be applied to prevent moderate to heavy grazing within Arizona cliffrose habitat. The majority of Arizona cliffrose populations will be excluded from grazing due to the placement of 2.25 miles of fence in the Gyberg pasture. This will create the new *Purshia* pasture which will result in the exclusion of large populations of Arizona cliffrose from grazing. The fencing needed to create the *Purshia* pasture has not yet been completed; it is estimated that it is likely to be constructed by March or April 1998, dependent upon funding (pers. comm. Jerry Bradley, wildlife biologist, Coconino National Forest). The populations in the Section 1 and Section 36 Pastures have been excluded from grazing since 1989, although some livestock grazing has occurred in these pastures due to off road vehicle vandalism to fences. These fences have been repaired (pers. comm. Barbara Phillips). The Section 1 and Section 36 Pastures will continue to be excluded from grazing.

There are several small and scattered *Purshia* populations in the Duff Flat South Pasture and the Gyberg Pasture which will be vulnerable to livestock grazing. In addition, there is the possibility that the Duff Flat North Pasture may contain cliffrose, as the pasture has not been thoroughly surveyed to date (pers. comm. Barbara Phillips). The Duff Flat South Pasture will be grazed approximately eight days each year as follows: Year 1 - February 11-18; Year 2 - January 26 - February 3; Year 3 - March 28 - April 4; Year 4 - January 26-February 3; Year 5 - February 11-18, and; Year 6 - rested. The Gyberg Flat South Pasture will be grazed for 20-35 days as follows: Year 1 - December 2 - January 5; Year 2 - March 10 - April 3; Year 3 -rested; Year 4 - March 10 - 29; Year 5 - December 2 - January 5, and; Year 6 - February 18 -March 24.

The Forest Service states that the proposed grazing schedule in the Duff Flat South and Gyberg Pastures is expected to meet the "intent" of the Recovery Plan because little to no utilization on these plants is anticipated. The Recovery Plan states that combined use by livestock and wildlife should not exceed 20% of current year's growth for any individual if livestock utilization is permitted. Utilization monitoring should be measured each year livestock are within pastures containing Arizona cliffrose. The intent of these recommendations is to prevent moderate to heavy grazing within Arizona cliffrose habitat. The Forest Service indicates that annual use is predicted to be very light (<10%) on some, but not all, individual plants and probably not detectable on the rest. The plants are widely scattered and are located in remote portions of these pastures. The plants occur on sparsely vegetated areas and are not located near water, salt or mineral supplements, loading chutes or concentrations of palatable forage that would attract or concentrate cattle. The monitoring conducted in the Geyberg and Duff Flat Pastures for the 1993

grazing season found that grazing on *Purshia* was generally minimal and non-measurable (BAE, April 24, 1997). The monitoring in 1993 also indicated that several plants showed signs of browsing but that use was less than 10%.

Annual monitoring will be conducted by the Forest Service to validate this prediction. If annual monitoring indicates that individual plants are being utilized more or more frequently than predicted above, then the Forest Service indicates consultation will be re-initiated and protective measures will be taken. These measures might include fencing of individual plants or populations. In their letter of clarification, the Forest Service (October 7, 1997) reconfirmed their commitment to protecting Arizona cliffrose. The Forest Service provided more detailed information on their proposed Arizona cliffrose monitoring plan. The Arizona cliffrose monitoring will consist of a minimum of five visits with the objective of detecting early use, mid-use, and utilization of the cliffrose after cows have left one pasture and before they have entered another. If greater than 20 percent use (cattle and wildlife) on individual plants is detected or if use on the plants by cattle occurs more frequently than every other year, cows will be removed from the pastures or temporary fencing will be installed to prevent further use. In addition, the Service will be notified. The Forest Service indicated that more than five visits may be appropriate depending on local climatic conditions or local vegetation growth rates.

The Recovery Plan (USFWS 1994b) recommends that livestock should be permitted within pastures containing Arizona cliffrose only during the fall and early winter months (October through January). In both the Duff Flat South and Gyberg Pastures, grazing will occur in February through early April, outside the timing constraints recommended in the Recovery Plan. *Purshia* begins blooming in late March and continues through early May. Most seedlings in the Cottonwood population emerge during early February to early spring (USFWS 1994b). In addition, if the necessary fencing to create the *Purshia* Pasture is not constructed within the Gyberg Pasture by March 1999 (Year 2), grazing will also occur in the *Purshia* Pasture outside the timing constraints of the Recovery Plan during the months of March and April 1999. The Service believes grazing that occurs when cliffrose is actively growing and contains the current year's growth, and grazing that occurs when seedlings are emerging, may result in adverse effects to the populations through affecting seed production and recruitment. The Recovery Plan also states that livestock should not be permitted to use pastures containing Arizona cliffrose more frequently than once every 2 years. The preferred alternative proposes to allow livestock grazing in the Duff Flat South Pasture to occur for five consecutive years, and in the Geyberg Pasture for two consecutive years, one year of rest, and then 3 more consecutive years.

The Recovery Plan (USFWS 1994b) states that no loading areas, salt blocks, mineral or nutrient supplements, or watering facilities for cattle should be located within 0.5 miles of a *Purshia* population. The Forest Service indicates that no such items will be placed within 0.75 miles of known populations, except in the case of Mesa Blanca Tank, which is located within 0.5 miles of some of the scattered populations.

The Forest Service states that there will be minimal and discountable direct effects to individual *Purshia* plants as a result of the installation of fences, cattleguards or road closures.

## **EFFECTS OF THE ACTION**

### Razorback Sucker

Analysis of the effects of livestock grazing on fish and fish habitat requires looking at subtle, long-term, incremental changes in watershed functions, riparian and aquatic communities, and stream channel morphology. The long-term, cumulative aspect of grazing impacts, in combination with the short-term, limited data available on range condition and fish and fish habitat, make a purely empirical analysis of the effects of grazing and grazing management difficult and often misleading, particularly on an allotment by allotment basis. However, extrapolations of general hydrologic and biologic principles and site-specific research data provide evidence linking degradation of watersheds, stream channels, aquatic and riparian communities, and fish habitat and populations in western North America to grazing and grazing management (Leopold 1924; Leopold 1951; York and Dick-Peddie 1969; Hastings and Turner 1980; Dobyns 1981; Kauffman and Krueger 1984; Skovlin 1984; Kinch 1989; Chaney *et al.* 1990; Platts 1990; Armour *et al.* 1991; Bahre 1991; Meehan 1991; Fleischer 1994).

Livestock grazing has an effect on watershed function, stream conditions and vegetative communities. In the overall project area, these effects have occurred for at least 125 years. The effects of all the various human activities on the watershed and streams in the overall project area contribute to the final suite of effect that can be documented. The interaction of the effects of these may reduce, magnify, or conceal the effects of each individual action. Analysis of changes to a particular project becomes difficult in the face of the interactive whole. The inability to identify the specific effects of an action under consultation makes analysis difficult. Direct effects to the razorback will be limited as no grazing along the Verde River will occur due to fencing of the river and topographic features. The Forest Service has minimized indirect effects of grazing on the Windmill Allotment through incorporating rest into most pastures over a 4 to 5 year period. In addition, cattle distribution will be improved through fencing and water developments and reduced grazing periods within pastures. According to the DEIS, the range improvements necessary to improve the cattle distribution will take 10 years to complete and the benefits may take several years to be realized.

The effects to the Verde River and its populations of razorback sucker from the proposed livestock grazing and its management on the Windmill Allotment generally would occur through the mechanisms of watershed alteration. Livestock grazing may cause long-term changes to the watershed and its functions. The extent of these changes varies with watershed characteristics, grazing history, and cumulative effects from other human uses and natural watershed processes. Unsatisfactory range and watershed conditions due to past overgrazing contribute to changes in overland flows and sediment transport to the river. Soil compaction, changes to root structures in overused plants, changes in plant species composition and overall biomass and loss of soil from

erosion can result from overuse by livestock. In some cases, restoration of the historic condition may not be possible.

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 the numerous confounding 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). 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 (Martin 1975; Savory 1988; Vallentine 1990; Papolizio *et al.* 1994). It may cause soil compaction and erosion, alter soil chemistry, and cause loss of cryptobiotic soil crusts (Harper and Marble 1988; Marrs *et al.* 1989; Orodho *et al.* 1990; Schlesinger *et al.* 1990; Bahre 1991). Cumulatively, these alterations contribute to increased erosion and sediment input into streams (Johnson 1992; Weltz and Wood 1994). They also contribute 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). Development of livestock waters may alter surface flows by impoundment, spring capture, or runoff capture.

With the information available, it is not possible to differentiate watershed alteration effects caused by current livestock grazing on the Windmill Allotment from those caused by past grazing, current grazing on upslope allotments, upslope urban and suburban development, agriculture, roads, or other human activities. Information presented in the DEIS states that the watershed condition in those pastures nearest to the river have significant areas in unsatisfactory condition. The Service recognizes the limitations in the applicability of this soil condition data, but directly applicable data were not available. Additionally, the range conditions for the desert grassland and desert shrub vegetation types that make up most of these winter use pastures are mostly in poor and fair condition, with some areas achieving good condition. The pinyon pine-juniper vegetation type within this area varies in condition; however, this variability is from very poor to fair and the long-term trend has been downward. Overland flows off the pinyon pine-juniper type carry sediments through the lower elevation vegetation types and if the conditions there are less than satisfactory, any amelioration of the flow rate or the sediment load will not occur. Additionally, very erosive soils are found in the general Sycamore Creek watershed that drain to the river. Without proper vegetative conditions, these erosive soils are less stable. Winter use of the range removes vegetation and thus reduces litter. Winter rains may find more bare soil that then contributes to sediment loads carried to the river. Overland flows and the subsequent timing and stage of riverine flows are also influenced.

The effects of other actions occurring within the watershed are also relevant. A healthy riparian area can act as a buffer between watersheds and the river. Flow and sediment transport effects may be lessened and that affects changes to channel morphology. Riparian areas that are not healthy cannot perform this function with the same degree of effectiveness. The riparian areas along the Verde River are in fair condition with a downward trend (DEIS, August 1997). While this may not be due to the operation of the Windmill Allotment, it does mean that the benefits of healthy riparian areas is not available to offset the level of existing degradation of watershed conditions. The implementation of the preferred alternative will not eliminate this degradation but proposes to reduce it to some other level over the 10-year length of the permit. The condition of the riparian area may be improved by reducing watershed degradation, but unless other agents of effect are addressed, the change may not be measurable.

The decision to continue to allow livestock use on the allotment requires that roads and fences in and accessing the allotment be maintained. Roads are of special concern since they are often contributors of sediment to stream courses, and allow access to the area. The construction of additional waterlots, as well as continued use and maintenance of existing waterlots and stocktanks within the Windmill Allotment, increases the potential for both authorized and unauthorized stocking of non-native fish. This is of concern because flood events may cause breaches in these water developments and allow non-native fish to enter tributaries and major waterways. In addition, if these water developments are utilizing existing surface water flows, then depletion of the Verde River and its tributaries will result. The Service is not aware of the source of water for these developments.

Although the entire riparian area on the Verde River within the Allotment is excluded from livestock use due through fencing and topographic features, there will inevitably be some use of the riparian area due to cows getting through broken fences. Fence maintenance is imperative to improving the watershed and reducing direct impacts to the razorback sucker and its critical habitat.

#### Critical Habitat

Effects to the constituent elements and special selection criteria have largely been described in the preceding discussion. Continuation of the livestock grazing on the allotment allows for some degree of continued degradation of the watershed.

#### **CUMULATIVE EFFECTS**

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in 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 ESA.

As the Cottonwood area continues to expand, proactive management of the Forest Service's Verde Valley Botanical Area will need to be undertaken to ensure the ecological integrity of this "unique desert community" and maintenance of the "existing conditions and natural processes" upon which Arizona cliffrose depends and for which this special management area was originally established. Posting boundaries and signing the area notifying persons of the ecological sensitivity of the area and access and use restrictions may be needed as impacts from recreation and urbanization encroach into the VVBA and onto other Federal, State, and private Arizona cliffrose habitat.

Outdoor recreational activities, especially off-road vehicle driving and "party sites," have produced severe direct and indirect impacts to Arizona cliffrose in the Verde Valley. The connected Lime Kiln Trail, Buckboard Trail, and Thumper Trail, occurring on both Federal land and on the Dead Horse State Park, are of concern. Expanding urbanization in the Bridgeport area has eliminated or reduced Arizona cliffrose habitat on private property for home sites, roads, and other associated activities (e.g. illegal dumping; parking areas). These human related impacts are serious threats to Arizona cliffrose in the Verde Valley and will continue to escalate as the human population expands.

Livestock grazing on Arizona State Trust Lands within Arizona cliffrose habitat in the Verde Valley (T. 16 N., R. 3 E. section 36) is managed as part of the Windmill Allotment (Coconino National Forest, Sedona Ranger District, formal Consultation completed December 30, 1992) but is not specifically addressed in the Windmill Allotment Management Plan environmental documentation. Stocking rates have been higher on this section than permitted on neighboring Forest Service lands (Ward 1992). Though the Arizona cliffrose on State Land currently appear vigorous and are successfully reproducing (Rutman 1992b), there are no assurances of the future management direction on State Land. There is a potential for a land exchange of Section 36 into federal ownership. The time frame associated with this process is unknown.

Other potential projects which may impact Arizona cliffrose, and may or may not have a Federal nexus, are currently under consideration. A proposed extension of Mingus Avenue in Cottonwood would require new construction of a bridge over the Verde River north of SR 89A and construction of a roadway within or adjacent to Arizona cliffrose habitat. Cottonwood Unified School District has proposed the construction of a high school in this vicinity on or adjacent to Arizona cliffrose habitat but at a yet undetermined date.

In 1991, the American Fisheries Society adopted a position statement regarding cumulative effects of small modifications to fish habitat (Burns 1991). That statement concludes that accumulation of localized or small impacts, often from unrelated human actions, pose a serious threat to fisheries. It also points out that some improvement efforts to fish habitat may not result in cumulative increases in status of the species, but instead may simply mitigate cumulative habitat alterations from other activities. Amelioration of existing grazing impacts to and/or habitat improvements for razorback sucker on the Windmill Allotment may meet this description and may only partially mitigate increases in cumulative habitat alterations in the upper Verde

River watershed. Many of these cumulative effects are not subject to Forest Service authority. Therefore, in light of the following cumulative effects, efforts to alleviate effects to razorback sucker from livestock grazing on the Windmill Allotment must be greater than those which would be needed in the absence of such cumulative effects.

Several parcels of private land occur within and adjacent to the boundaries of the Windmill Allotment. Activities occurring on these private lands that would be cumulative to the proposed action include residential use, roads, and livestock grazing. The majority of these activities constitute only minor alterations of the overall watershed condition.

There are numerous non-Federal activities within the upper Verde River watershed that are cumulative to the proposed action. It is not possible under the time-frame of this consultation to delineate all of these activities or even all categories of these activities. The primary non-Federal activities contributing to cumulative impacts are the rapid urban and suburban growth in the area of Prescott, Chino Valley, and Cottonwood and agricultural activities in the Verde Valley. Because they are both past and future actions, the effects of these have already been described in the Environmental Baseline section of this opinion and are also included in the cumulative effects analysis. These activities have the potential to deplete the flow in the upper Verde River and alter flooding and low flow patterns.

Livestock grazing on private lands in the watershed of the Verde River upstream from the Windmill Allotment contributes to the cumulative effects. The effect of these activities would be similar to the watershed effects described from the proposed action.

Sandstone quarries and other mining activities exist in the Verde River watershed. The primary contribution of these activities is the contribution of additional sediment to the Verde River, including mine operations themselves and use of unsurfaced roads by large trucks hauling sandstone to the townsite of Drake. Some modification of flow or flow pattern may also occur due to water use and/or infiltration capacity changes. Although no data are available for these particular mining operations, mine operations can result in introduction of toxic materials into stream channels.

Recreational use on private lands within the Verde River watershed above the Windmill Allotment may contribute to cumulative effects. Although the greatest recreational use is likely located on public lands, use also occurs on private lands and includes road construction, camping areas, user-built roads, and off-road vehicle use. Recreational use on the Verde River banks contributes to erosion and destabilization of the stream channel. Recreational use in the uplands contributes to sediment production, erosion, and reduction in infiltration capacity.

## CONCLUSION

The Verde Valley population of Arizona cliffrose is the largest and most robust of the four populations known. However, despite the designation of the Verde Valley Botanical Area by the Coconino National Forest, the long-term conservation status of this population is very insecure. Due to land ownership patterns and the expanding communities of Cottonwood, Clarkdale, and Bridgeport, the ecological integrity of the Arizona cliffrose population is threatened by urban encroachment, dispersed recreation, and public and private developments.

The Verde River system and its fish community are an ecosystem in peril. Nine species of native fish have already been extirpated from the river system, although three are being reintroduced with limited success. The razorback sucker which was extirpated in the Verde River is the most successful of the three Gila River basin reintroduction populations. This population is essential to the recovery of this species but effects from the Windmill Allotment are expected to be minor.

The effects of permitting livestock grazing on the Windmill Allotment include effects to the watershed condition. The effects of the proposed action are difficult to identify from the combined effects from other actions in the watershed of the Verde River. The combined effects may have a considerable influence on the flows and flow patterns of the Verde River and the sediment loads. There is no question that the proposed action is a significant improvement over past livestock management on the Allotment. However, the continued commitment of livestock grazing on the Allotment results in slower watershed and stream improvement and continues to cause sediment input above the natural "background" levels.

After reviewing the current status of Arizona cliffrose and the razorback sucker and its designated critical habitat, the environmental baseline for the action area, the effects of the preferred alternative of the Windmill Grazing Allotment, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Arizona cliffrose, the razorback sucker or adversely modify razorback sucker designated critical habitat in the Verde River. No critical habitat has been designated for the Arizona cliffrose; therefore, none will be affected.

## INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding and sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the

applicant. Under the terms of section 7(b)(4) and section 7 (o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement. The measures described below are non-discretionary and must be undertaken by the agency or made a binding condition of any grant or permit issued to the applicant, as appropriate.

#### Amount or extent of take

Take resulting from the proposed action is in the form of harm through effects to habitats that alter their suitability to support individual fish. The small size of the razorback sucker population in the Verde River makes any estimate of this type of take difficult to determine. Take in the action area is the result of effects of the proposed action. In addition, take downstream of the proposed action area is influenced by effects of the action.

Because the type and extent of take for this proposed action is difficult to define and measure, the Service has determined that a surrogate measure is needed to define the take and when it has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if the following condition is met:

1. That watershed conditions do not continue to improve to a satisfactory condition under the proposed livestock management. Improving watershed conditions can be defined through improvements shown in trend and/or condition of rangelands on the winter range of the Windmill Allotment.

If, during project activities, the amount of extent of take is exceeded, the Forest Service must reinitiate consultation with the Service immediately to avoid violation of section 9. Operations must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible or adverse impact on the species, as required by 50 CFR 402.14(i). An explanation of the causes of the taking will be provided to the Service.

#### Effect of the take

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

### Reasonable and prudent measures

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize the take of the razorback sucker:

1. Measures will be taken to improve watershed conditions.

### Terms and conditions

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

The following terms and conditions are necessary to implement the reasonable and prudent measure:

1. Efforts to improve watershed conditions through improving cattle distribution (fencing and water developments) in the winter portion of the Windmill Allotment will receive the highest priority. These improvements should be completed as quickly as is reasonably possible, preferably in the first 5 years.
2. If watershed conditions do not improve under the proposed grazing management, the Forest Service will review the management and develop new management that does result in improvement to watershed conditions.

### Review requirements

The Forest Service will provide the Service with a yearly report on the livestock management and monitoring done for this proposed action.

## **CONSERVATION RECOMMENDATIONS**

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Permit livestock in the Duff Flat South and Geyberg Pastures during October through January only, when *Purshia* are not actively growing and when most seedlings are not emerging, as recommended in Recovery Action 3b.1 of the Arizona Cliffrose Recovery Plan (USFWS 1994b).

2. Permit livestock to use the Duff Flat South and Geyberg Pastures no more than once every two years, to minimize effects to *Purshia* as recommended in Recovery Action 3b.1 of the Arizona Cliffrose Recovery Plan (USFWS 1994b).
3. Continue monitoring of *Purshia* as outlined in the BAE (April 24, 1997). Consultation should be reinitiated if livestock utilization of *Purshia* exceeds 20 percent of current year's growth.
4. Complete the Verde Valley Botanical Area Management Plan.
5. Total forage allocation should also consider other wildlife use in the Windmill Allotment. In situations where poor and declining range conditions exist, forage allocation levels should be further reduced.

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 this biological opinion. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may 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 that was 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.

If we can be of further assistance, please contact Michele James or Bruce Palmer.

Sincerely,

/s/ Sam F. Spiller  
Field Supervisor

Mr. Fred Trevey

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cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ES)  
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