

231A to Morristown at Station WMXX(FM)'s existing site at coordinates North Latitude 36-13-40 and West Longitude 83-19-58; and Channel 252A to Whitley City at Station WHAY(FM)'s existing site at North Latitude 36-44-39 and West Longitude 84-28-37.

This is a summary of the Commission's *Memorandum Opinion and Order*, MM Docket No. 93-28, adopted December 13, 1996 and released December 20, 1996. The full text of this Commission decision is available for inspection and copying during normal business hours in Commission's Reference Center (Room 239), 1919 M Street, NW., Washington, DC 20554. The complete text of this decision may also be purchased from the Commission's copy contractor, International Transcription Services, 2100 M Street, NW., Suite 140, Washington, DC 20037, (202) 857-3800.

List of Subjects in 47 CFR Part 73

Radio broadcasting.

#### 47 CFR PART 73—[AMENDED]

1. The authority citation for Part 73 reads as follows:

Authority: Secs. 303, 48 Stat., as amended, 1082; 47 U.S.C. 154, as amended.

##### § 73.202 [Amended]

2. Section 73.202(b), the Table of FM Allotments, under Tennessee, is amended by removing Channel 290C3 at Colonial Heights and adding Channel 240C2; by removing Channel 231A at Tazewell and adding Channel 290A; and by removing Channel 240A at Morristown and adding Channel 231A.

3. Section 73.202(b), the Table of FM Allotments, under Kentucky, is amended by removing Channel 290A at Whitley City and adding Channel 252A.

Federal Communications Commission.

Douglas W. Webbink,

Chief, Policy and Rules Division, Mass Media Bureau.

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## DEPARTMENT OF THE INTERIOR

### Fish and Wildlife Service

#### 50 CFR Part 17

RIN 1018-AD11

#### Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Three Wetland Species Found in Southern Arizona and Northern Sonora, Mexico

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

**SUMMARY:** The Fish and Wildlife Service (Service) determines endangered status for the Canelo Hills ladies-tresses (*Spiranthes delitescens*), the Huachuca water umbel (*Lilaeopsis schaffneriana* ssp. *recurva*), and the Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) pursuant to the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). These species occur in a limited number of wetland habitats in southern Arizona and northern Sonora, Mexico. They are threatened by one or more of the following—collecting, disease, predation, competition with nonnative species, and degradation and destruction of habitat resulting from livestock overgrazing, water diversions, dredging, and groundwater pumping. All three taxa also are threatened with extirpations or extinction from naturally occurring climatic and other environmental events, such as catastrophic floods and drought, a threat that is exacerbated by habitat alteration and small numbers of populations or individuals. This rule implements Federal protection provided by the Act for these three taxa.

**EFFECTIVE DATE:** February 5, 1997.

**ADDRESSES:** The complete file for this rule is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, 2321 West Royal Palm Road, Suite 103, Phoenix, Arizona 85021, telephone (602/640-2720), or facsimile (602/640-2730).

**FOR FURTHER INFORMATION CONTACT:** Jim Rorabaugh or Angie Brooks (see **ADDRESSES** section).

#### SUPPLEMENTARY INFORMATION:

##### Background

Cienegas in southern Arizona and northern Sonora, Mexico, are typically mid-elevation wetland communities often surrounded by relatively arid environments. These communities are usually associated with perennial

springs and stream headwaters, have permanently or seasonally saturated highly organic soils, and have a low probability of flooding or scouring (Hendrickson and Minckley 1984). Cienegas support diverse assemblages of animals and plants, including many species of limited distribution, such as the three taxa addressed in this final rule (Hendrickson and Minckley 1984, Lowe 1985, Ohmart and Anderson 1982, Minckley and Brown 1982). Although *Spiranthes delitescens* (*Spiranthes*), *Lilaeopsis schaffneriana* ssp. *recurva* (*Lilaeopsis*), and the Sonora tiger salamander typically occupy different microhabitats, they all occur or once occurred in cienegas. *Lilaeopsis* is also found along streams and rivers and occurs at mid-elevations, from 1,148–2,133 meters (m) (3,500–6,500 feet (ft)). The Sonora tiger salamander occurs mostly in cattle tanks and impounded cienegas, but presumably was associated primarily with natural cienegas and other wetlands prior to human settlement.

Cienegas, perennial streams, and rivers in the desert southwest are extremely rare. The Arizona Game and Fish Department (AGFD)(1993) recently estimated that riparian vegetation associated with perennial streams comprises about 0.4 percent of the total land area of Arizona, with present riparian areas being remnants of what once existed. The State of Arizona (1990) estimated that up to 90 percent of the riparian habitat along Arizona's major desert watercourses has been lost, degraded, or altered. *Spiranthes*, *Lilaeopsis*, and the Sonora tiger salamander occupy small portions of these rare habitats.

*Spiranthes* is a slender, erect, terrestrial orchid that, when in flower, reaches approximately 50 centimeters (cm) (20 inches (in.)) tall. Five to 10, linear-lanceolate, grass-like leaves, 18 cm (7.1 in.) long and 1.5 cm (0.6 in.) wide, grow basally on the stem. The fleshy, swollen roots are approximately 5 mm (0.2 in.) in diameter. The top of the flower stalk contains up to 40 small white flowers arranged in a spiral. This species is presumed to be perennial, but mature plants rarely flower in consecutive years and, in some years, have no visible above ground structures (McClaran and Sundt 1992, Newman 1991).

Martin first collected *Spiranthes delitescens* in 1968 at a site in Santa Cruz County, Arizona (Sheviak 1990). This specimen was initially identified as *Spiranthes graminea*, a related Mexican species. Sheviak (1990) found that the *Spiranthes* specimens in Arizona, previously thought to be *S.*

*graminea*, displayed a distinct set of morphological and cytological characteristics and named them *S. delitescens*.

This species is known from five sites at about 1,525 m (5,000 ft.) elevation in the San Pedro River watershed in Santa Cruz and Cochise Counties, southern Arizona (Newman 1991). The total amount of occupied habitat is less than 81 hectares (ha) (200 acres (ac)). Four of the populations are on private land less than 37 kilometers (km) (23 miles (mi)) north of the U.S./Mexico border; one additional small site containing four individuals was discovered on public land in 1996 (Mima Falk, Coronado National Forest, pers. comm. 1996). This site is located near a previously known population. Potential habitat in Sonora, Mexico, has been surveyed but no *S. delitescens* populations have been found (Sheviak 1995, Newman 1991).

The dominant vegetation associated with *Spiranthes* includes grasses, sedges (*Carex* spp.), rushes (*Juncus* spp.), spike rush (*Eleocharis* spp.), cattails (*Typha* spp.), and horsetails (*Equisetum* spp.) (Cross 1991, Warren *et al.* 1991). Associated grass species include bluegrass (*Poa pratensis*), Johnson grass (*sorghum halepense*), *Muhlenbergia asperifolia*, and *Muhlenbergia utilis* (Fishbein and Gori 1994). The surrounding vegetation is semidesert grassland or oak savannah.

All *Spiranthes* populations occur where scouring floods are very unlikely (Newman 1991). Soils supporting the populations are finely grained, highly organic, and seasonally or perennially saturated. Springs are the primary water source, but a creek near one locality contributes near-surface groundwater (McClaran and Sundt 1992). As with most terrestrial orchids, successful seedling establishment probably depends on the successful formation of endomycorrhizae (a symbiotic association between plant root tissue and fungi) (McClaran and Sundt 1992). The time needed for subterranean structures to produce above ground growth is unknown. Plants may remain in a dormant, subterranean state or remain vegetative (nonflowering) for more than one consecutive year. Plants that flower one year can become dormant, vegetative, or reproductive the next year (McClaran and Sundt 1992, Newman 1991). The saprophytic/autotrophic state of orchid plants may be determined by climatic fluctuations and edaphic factors, such as pH, temperature, and soil moisture (Sheviak 1990).

Estimating *Spiranthes* population size and stability is difficult because nonflowering plants are very hard to

find in the dense herbaceous vegetation, and yearly counts underestimate the population because dormant plants are not counted. McClaran and Sundt (1992) twice monitored marked individuals in a *Spiranthes* population during 2–3 year periods. They concluded that both monitored sites were stable between 1987 and 1989, although Newman (1991) later reported that one monitored site was reduced to one nonflowering plant in 1991. Due to the propensity of *Spiranthes* to enter and remain in a vegetation state and the lack of new flowering plants at one monitoring site, overall population numbers are believed to be declining. McClaran and Sundt (1992) also speculated that population numbers may be declining.

*Lilaeopsis schaffneriana* spp. *recurva* is an herbaceous, semiaquatic perennial plant with slender, erect leaves that grow from creeping rhizomes. The leaves are cylindrical, hollow with no pith, and have septa (thin partitions) at regular intervals. The yellow-green or bright green leaves are generally 1–3 millimeters (mm) (0.04–0.12 in.) in diameter and often 3–5 centimeters (cm) tall (1–2 in.), but can reach up to 20 cm (8 in.) tall under favorable conditions. Three to 10 very small flowers are borne on an umbel that is always shorter than the leaves. The fruits are globose, 1.5–2 mm (0.06–0.08 in.) in diameter, and usually slightly longer than wide (Affolter 1985). The species reproduces sexually through flowering and asexually from rhizomes, the latter probably being the primary reproductive mode. An additional dispersal opportunity occurs as a result of the dislodging of clumps of plants, which then may reroot in a different site along aquatic systems.

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

*Lilaeopsis* has been documented from 22 sites in Santa Cruz, Cochise, and Pima counties, Arizona, and in adjacent Sonora, Mexico, west of the continental divide (Saucedo 1990, Warren *et al.* 1989, Warren *et al.* 1991, Warren and Reichenbacher 1991). The plant has been extirpated from 6 of the 22 sites. The 16 extant sites occur in 4 major watersheds—San Pedro River, Santa Cruz River, Rio Yaqui, and Rio Sonora. All sites are between 1,148–2,133 m (3,500–6,500 ft) elevation.

Nine *Lilaeopsis* populations occur in the San Pedro River watershed in Arizona and Sonora, on sites owned or managed by private landowners, Fort Huachuca Military Reservation, the Coronado National Forest, and the Bureau of Land Management's (BLM) Tucson District. Two extirpated populations in the upper San Pedro watershed occurred at Zinn Pond in St. David and the San Pedro River near St. David. Cienega-like habitats were probably common along the San Pedro River prior to 1900 (Hendrickson and Minckley 1984, Jackson *et al.* 1987), but these habitats are now largely gone. Surveys conducted for wildlife habitat assessment have found several discontinuous clumps of *Lilaeopsis* within the upper San Pedro River where habitat was present in 1996 prior to recent flooding (Mark Fredlake, Bureau of Land Management, pers. comm. 1996).

The four *Lilaeopsis* populations in the Santa Cruz watershed probably represent very small remnants of larger populations, which may have occurred in the extensive riparian and aquatic habitat formerly along the river. Before 1890, the spatially intermittent, perennial flows on the middle Santa Cruz River most likely provided a considerable amount of habitat for *Lilaeopsis* and other aquatic plants. The middle section of the Santa Cruz River mainstem is about a 130 km (80 mi) reach that flowed perennially from the Tubac area south to the U.S./Mexico border and intermittently from Tubac north to the Tucson area (Davis 1986). Davis (1982) quotes from the July 1855, descriptive journal entry of Julius Froebel while camped on the Santa Cruz River near Tucson: “\* \* \* rapid brook, clear as crystal, and full of aquatic plants, fish, and tortoises of various kinds, flowed through a small meadow covered with shrubs. \* \* \*” This habitat and species assemblage no longer occurs in the Tucson area. In the upper watershed of the middle Santa Cruz River, the species is now represented only by a single population in two short reaches of Sonoita Creek. A population at Monkey Spring in the upper watershed of the middle Santa Cruz River has been extirpated, although suitable habitat exists (Warren *et al.* 1991).

Two *Lilaeopsis* populations occur in the Rio Yaqui watershed. The species was recently discovered at Presa Cuquiarichi, in the Sierra de los Ajos, several miles east of Cananea, Sonora (Tom Deecken, Coronado National Forest, pers. comm. 1994). The species remains in small areas (generally less than 1 m<sup>2</sup> (10.8 ft<sup>2</sup>) in Black Draw,

Cochise County, Arizona. Transplants from Black Draw have been successfully established in nearby wetlands and ponds. Recent renovation of House Pond on private land near Black Draw extirpated the *Lilaeopsis* population. A population in the Rio San Bernardino in Sonora was also recently extirpated (Gori *et al.* 1990). One *Lilaeopsis* population occurs in the Rio Sonora watershed at Ojo de Agua, a cienega in Sonora at the headwaters of the river (Saucedo 1990).

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

In stream and river habitats, *Lilaeopsis* can occur in backwaters, side channels, and nearby springs. After a flood, *Lilaeopsis* can rapidly expand its population and occupy disturbed habitat until interspecific competition exceeds its tolerance. This response was recorded at Sonoita Creek in August 1988, when a scouring flood removed about 95 percent of the *Lilaeopsis* population (Gori *et al.* 1990). One year later, *Lilaeopsis* had recolonized the stream and was again co-dominant with watercress (*Rorippa nasturtium-aquaticum*) (Warren *et al.* 1991). The expansion and contraction of *Lilaeopsis* populations appears to depend on the presence of "refugia" where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel. Two patches of *Lilaeopsis* on the San Pedro River were lost during a winter flood in 1994 and had still not recolonized that area as of May of 1995, demonstrating the dynamic and often precarious nature of occurrences within a riparian system (Al Anderson, Grey Hawk Ranch, *in litt.* 1995).

Density of *Lilaeopsis* plants and size of populations fluctuate in response to both flood cycles and site characteristics. Some sites, such as Black Draw, have a few sparsely distributed clones, possibly due to the dense shade of the even-aged overstory of trees and deeply entrenched channel. The Sonoita Creek population occupies 14.5 percent of a 500.5 m<sup>2</sup> (5,385 ft<sup>2</sup>) patch of habitat (Gori *et al.* 1990). Some populations are as small as 1–2 m<sup>2</sup> (11–22 ft<sup>2</sup>). The Scotia Canyon population, by contrast, has dense mats of leaves. Scotia Canyon contains one of the larger *Lilaeopsis* populations, occupying about 57 percent of the 1,450 m (4,756 ft) perennial reach (Gori *et al.* 1990; Jim Abbott, Coronado National Forest, *in litt.* 1994).

While the extent of occupied habitat can be estimated, the number of individuals in each population is impossible to determine because of the intermeshing nature of the creeping rhizomes and the predominantly asexual mode of reproduction. A population of *Lilaeopsis* may be composed of one or many individuals.

Introduction of *Lilaeopsis* into ponds on the San Bernardino National Wildlife Refuge (Refuge) appears to be successful (Warren 1991). In 1991, *Lilaeopsis* was transplanted from Black Draw into new ponds and other Refuge wetlands. Transplants placed in areas with low plant density expanded rapidly (Warren 1991). In 1992, *Lilaeopsis* naturally colonized a pond created in 1991. However, as plant competition increased around the perimeter of the pond, the *Lilaeopsis* population decreased. This response seems to confirm observations (Kevin Cobble, San Bernardino National Wildlife Refuge, pers. comm. 1994; and Peter Warren, Arizona Nature Conservancy, pers. comm. 1993) that other species such as *Typha* sp. will outcompete *Lilaeopsis*.

The Sonora tiger salamander is a large salamander with a dark venter and light colored blotches, bars, or reticulation on a dark background. Snout/vent lengths of metamorphosed individuals vary from approximately 6.7 to 12.5 cm (2.6–4.9 in.) (Jones *et al.* 1988, Lowe 1954). Larval salamanders are aquatic with plume-like gills and well-developed tail fins (Behler and King 1980). Larvae hatched in the spring are large enough to metamorphose into terrestrial salamanders from late July to early September, but only an estimated 17 to 40 percent metamorphose annually. Remaining larvae mature into branchiataes (aquatic and larval-like, but sexually mature salamanders that remain in the breeding pond) or over-

winter as larvae (Collins and Jones 1987; James Collins, Arizona State University, pers. comm. 1993).

The Sonora tiger salamander was discovered in 1949 at the J.F. Jones Ranch stock tank in Parker Canyon, San Rafael Valley, Arizona (Reed 1951). Based on color patterns of metamorphosed animals, Lowe (1954) described the Sonora tiger salamander from southern Santa Cruz County, Arizona, as the subspecies *stebbinsi* of the broad-ranging tiger salamander (*Ambystoma tigrinum*). However, again based on color patterns, Gelhbach (1965, 1967) synonymized *Ambystoma tigrinum stebbinsi* and *Ambystoma tigrinum tahense* (from the Rocky Mountains region) with *Ambystoma tigrinum nebulosum* (from northern Arizona and New Mexico). Nevertheless, *Ambystoma tigrinum stebbinsi* continued to be recognized in the scientific literature (Jones *et al.* 1988).

Jones *et al.* (1988) found that Lowe's description of color patterns in *Ambystoma tigrinum stebbinsi* was only accurate for recently metamorphosed individuals. About 40 percent of metamorphosed adults exhibit a unique reticulate pattern, while 60 percent are marked with light colored blotches, spots, or bars on a dark background that is indistinguishable from *Ambystoma tigrinum mavortium*, found in the central United States and adjacent portions of Mexico (Jones *et al.* 1995). Starch gel electrophoresis of 21 presumptive gene loci of *Ambystoma tigrinum stebbinsi* were compared with gene loci of *Ambystoma rosaceum* (from Sonora), *Ambystoma tigrinum mavortium*, and *Ambystoma tigrinum nebulosum* (Jones *et al.* 1988). Based on this analysis, distinctive reticulate color patterns, low heterozygosity, and apparent geographic isolation, subspecific designation of *Ambystoma tigrinum stebbinsi* was considered warranted by Collins and Jones (1987) and Jones *et al.* (1988). Further analysis of mitochondrial DNA reaffirmed subspecific designation (Collins *et al.* 1988). Color pattern and allozyme data suggests that *Ambystoma tigrinum stebbinsi* is closely related to *Ambystoma tigrinum mavortium*; however, the *Ambystoma tigrinum stebbinsi* haplotype is derived from *Ambystoma tigrinum nebulosum*. The most likely explanation for these observations is that *Ambystoma tigrinum stebbinsi* arose from a hybridization between *Ambystoma tigrinum mavortium* and *Ambystoma tigrinum nebulosum* (Jones *et al.* 1995).

The grassland community of the San Rafael Valley and adjacent montane

slopes, where all extant populations of *Ambystoma tigrinum stebbinsi* occur, may represent a relict grassland and therefore a refugium for grassland species. Tiger salamanders in this area became isolated and, over time, genetically distinct from ancestral *Ambystoma tigrinum mavortium* and *Ambystoma tigrinum nebulosum* (Jones *et al.* 1995).

Based on color patterns and electrophoretic analysis, *Ambystoma* collected in Mexico at one site in Sonora and 17 sites in Chihuahua were all *Ambystoma rosaceum*, not *Ambystoma tigrinum stebbinsi* (Jones *et al.* 1988). Reanalysis of reported *Ambystoma tigrinum stebbinsi* collected in Sonora (Hansen and Tremper 1979) and at Yepomera, Chihuahua (Van Devender 1973) revealed that these specimens were actually *Ambystoma tigrinum rosaceum* (Jones *et al.* 1988).

Collins *et al.* (1988) list 18 sites for the Sonora tiger salamander. Additional extensive survey work from 1993 through 1996 revealed another 18 sites, for a total of 36 (Collins 1996; James Collins, Arizona State University, pers. comm. 1996). Salamanders tentatively identified as Sonora tiger salamanders also have been found at Portrero del Alamo at the Los Fresnos cienega in the headwaters of the San Pedro River, San Rafael Valley, Sonora, Mexico (Sally Stefferud, U.S. Fish and Wildlife Service, pers. comm. 1993) and at the lower Peterson Ranch Tank in Scotia Canyon, Cochise County, Arizona. No salamanders have been observed in recent visits to Scotia Canyon (Service files, Phoenix, AZ; James Collins, pers. comm. 1996); thus, this population may be extirpated. A single terrestrial Sonora tiger salamander was found near Oak Spring in Copper Canyon of the Huachuca Mountains (Jeff Howland, Arizona Game and Fish Department pers. comm. 1993). This individual likely moved to this site from a population at the "Game and Fish Tank" located approximately 1 km (0.6 mi) to the southwest.

All sites where Sonora tiger salamanders have been found are located in the Santa Cruz and San Pedro river drainages, including sites in the San Rafael Valley and adjacent portions of the Patagonia and Huachuca mountains in Santa Cruz and Cochise counties, Arizona. All confirmed historical and extant aquatic populations are found in cattle tanks or impounded cienegas within 31 km (19 mi) of Lochiel, Arizona. If the Los Fresnos population is the subspecies, *stebbinsi*, it is the only population known to occur in a cienega. Historically, the Sonora tiger

salamander probably inhabited springs, cienegas, and possibly backwater pools where permanent or nearly permanent water allowed survival of mature branchiataes.

A total of 79 aquatic sites in the San Rafael Valley and adjacent slopes of the Huachuca and Patagonia mountains have been surveyed for salamanders (Collins and Jones 1987, Collins 1996, James Collins, pers. comm. 1996). These include most potential aquatic habitats on public lands. However, private lands in the center of the San Rafael Valley have not been surveyed intensively.

Thirty sites in northeastern Sonora and 26 sites in northwestern Chihuahua, Mexico, were surveyed by Collins and Jones (1987). No Sonora tiger salamanders were found at these sites. *Ambystoma rosaceum* and *Ambystoma tigrinum velasci* occur at localities in Sonora and Chihuahua to the south and east of the extant range of the Sonora tiger salamander (Collins 1979, Collins and Jones 1987, Van Devender and Lowe 1977). *Ambystoma tigrinum mavortium* occurs at scattered localities to the east in the San Pedro, Sulphur Springs, and San Simon valleys of Arizona (Collins and Jones 1987), but at least some of these populations were introduced by anglers and bait collectors (Collins 1981, Lowe 1954, Nickerson and Mays 1969).

Populations are dynamic. In particular, drought and disease periodically extirpate or greatly reduce populations. Several tanks supporting aquatic populations went dry during drought in 1994 and again in 1996. As tanks dry out, some larval and branchiate salamanders metamorphose and leave the tanks; others desiccate and die. Disease killed all aquatic salamanders at least three sites in 1985 (Collins *et al.* 1988), and also was evident in aquatic populations at seven tanks in 1995–1996 (James Collins, pers. comm. 1996). Tanks in which salamanders have been eliminated may be recolonized through reproduction by terrestrial metamorphs. Drying of tanks also may eliminate nonnative predators and create sites suitable for salamander colonization.

Because populations are dynamic, the number and location of extant aquatic populations change over time, as exhibited by the differences between survey results in 1985 and 1993–1996 (Collins and Jones 1987; Collins 1996; James Collins, pers. comm. 1996). Determining whether a population is extant is problematic. If numbers are low, salamanders may not be detected during sampling. Also, aquatic salamanders may have been recently eliminated due to drought or disease,

but terrestrial salamanders may be present in the area. Of the 36 sites where aquatic Sonora tiger salamanders were recorded since the mid or early 1980's and no salamanders have been found at 4 tanks during the last 3 visits from 1993 to 1996. Salamanders were probably extirpated from these sites. Salamanders also were found to be extirpated from the J.F. Jones Ranch Tank, the type locality (Collins and Jones 1987). Salamanders have not been found during the last three visits from 1993 through 1996 at five other tanks. Salamanders may be extirpated from these sites. Another three sites where salamanders were found from 1980 to 1983 have not been surveyed since that time. The status of populations at these tanks is unknown. At the remaining 23 tanks, salamanders have been found during 1 or more of the last 3 visits from 1993 through 1996. These populations are probably extant.

Populations of aquatic salamanders include as many as several hundred individuals. However, 10 or more salamanders in any 1 visit were found at only 16 of 32 occupied sites examined by Collins from 1993 through 1996 (James Collins, pers. comm. 1996). Large, reproducing populations of Sonora tiger salamanders were more concentrated in the southeastern portion of the San Rafael Valley in the 1990's as compared to the 1980's. Sampling during 1993–1996 revealed few populations and low numbers of salamanders in the northern portion of the valley (Collins 1996).

A variety of factors threaten the Sonora tiger salamander. Disease and predation by introduced nonnative fishes and bullfrogs (*Rana catesbeiana*) are probably the most serious and immediate threats, both of which have been implicated in the elimination of aquatic populations (Collins and Jones 1987, Collins 1996). Tiger salamanders also are widely used in Arizona as fishing bait, and this use poses additional threats. Other subspecies of tiger salamander introduced into habitats of the Sonora tiger salamander for bait propagation or by anglers could, through interbreeding, genetically swamp distinct *Ambystoma tigrinum stebbinsi* populations (Collins and Jones 1987, Collins 1996). Collecting Sonora tiger salamanders for bait could extirpate or greatly reduce populations. Furthermore, moving of salamanders among tanks by anglers or bait collectors also could transmit disease. Additional threats include habitat destruction, reduced fitness resulting from low genetic heterozygosity, and increased probability of chance extirpation characteristic of small populations.

### Previous Federal Actions

Federal government action on *Spiranthes delitescens*, *Lilaeopsis schaffneriana* ssp. *recurva*, and Sonora tiger salamander began with their inclusion in various Service notices of review for listing as endangered or threatened species. The Sonora tiger salamander was included as a category 2 candidate in the first notice of review of vertebrate wildlife (December 30, 1982; 47 FR 58454), and in subsequent notices published September 18, 1985 (50 FR 37958) and January 6, 1989 (54 FR 554). Category 2 candidates were those species for which the Service had some evidence of vulnerability, but for which there was insufficient scientific and commercial information to support a proposed rule to list them as threatened or endangered. In notices of review published November 21, 1991 (56 FR 58804) and November 15, 1994 (59 FR 58982), the Sonora tiger salamander was included as a category 1 candidate. Category 1 includes those taxa for which the Service has sufficient information to support proposed rules to list them as threatened or endangered.

*Lilaeopsis schaffneriana* ssp. *recurva*, then under the name *L. recurva*, was included as a category 2 candidate in the November 28, 1983 (45 FR 82480) and September 27, 1985 (50 FR 39526) plant notices. It was included as a category 1 candidate in the February 21, 1990 (55 FR 6184) and September 30, 1993 (58 FR 51144) notices. *Spiranthes delitescens* was included as a category 1 candidate in the September 30, 1993, plant notice.

On June 3, 1993, the Department of the Interior, Washington, D.C., received three petitions, dated May 31, 1993, from a coalition of conservation organizations (Suckling et al. 1993). The petitioners requested the listing of *Spiranthes*, *Lilaeopsis*, and the Sonora tiger salamander as endangered species pursuant to the Act. On December 14, 1993, the Service published a notice of three 90-day findings that the petitions presented substantial information indicating that listing these three species may be warranted, and requested public comments and biological data on the status of the species (58 FR 65325). On April 3, 1995, the Service published a proposal (60 FR 16836) to list *Spiranthes*, *Lilaeopsis*, and the Sonora tiger salamander as endangered species, and again requested public comments and biological data on their status.

The processing of this final listing rule conforms with the Service's Final Listing Priority Guidance for Fiscal Year

1997, published on December 5, 1996 (61 FR 64475). The guidance clarifies the order in which the Service will process rulemakings following two related events, the lifting on April 26, 1996, of the moratorium on final listings imposed on April 10, 1995 (Public Law 104-6), and the restoration of significant funding for listing through passage of the omnibus budget reconciliation law on April 26, 1996, following severe funding constraints imposed by a number of continuing resolutions between November 1995 and April 1996. The guidance calls for giving highest priority to handling emergency situations (Tier 1) and second highest priority (Tier 2) to resolving the listing status of the outstanding proposed listings. This final rule falls under Tier 2.

### Summary of Comments and Recommendations

In the April 3, 1995, proposed rule (60 FR 16836) and associated notifications, all interested parties were requested to submit factual reports or information that might contribute to development of a final rule. The original comment period closed June 2, 1995, then was reopened from June 24, 1995, to July 24, 1995 (60 FR 32483), and again from September 11, 1995, to October 27, 1995 (60 FR 47340). Appropriate State agencies and representatives, County and City governments, Federal agencies and representatives, scientific organizations, and other interested parties were contacted and requested to comment. Newspaper/media notices inviting public comment were published in the following newspapers—Arizona Daily Star, Arizona Republic, Bisbee Daily Review, Eastern Arizona Courier, Environmental Network News, Green Valley News/Sun, Nogales International, Sierra Vista Herald-Dispatch, The Phoenix Gazette, The Weekly Bulletin, Tombstone Tumbleweed, and Tucson Citizen. The inclusive dates of publications were April 20 and 21, 1995, for the initial comment period; and June 28 to July 4, 1995, and September 15, 1995, to September 20, 1995, for the first and second public hearings and reopening of the comment period, respectively.

In response to requests from the public, the Service held two public hearings. Notices of hearing dates and locations were published in the Federal Register on June 22, 1995 (60 FR 32483) and September 12, 1995 (60 FR 47340). Appropriate State agencies and representatives, County and City governments, Federal agencies and representatives, scientific organizations, and other interested parties were

contacted regarding the hearings. Approximately 790 people attended the hearings, including approximately 90 people at a July 13, 1995, hearing in Patagonia, Arizona; and 700 at a September 27, 1995, hearing in Sierra Vista, Arizona. Transcripts of these hearings are available for inspection (see ADDRESSES).

A total of 229 written comment letters were received—40 supported the proposed listing, 164 opposed listing, and 25 others commented on information in the proposed rule but expressed neither support nor opposition, provided additional information only, or were nonsubstantive or irrelevant to the proposed listing. Oral comments were received from 51 parties at the hearings—11 supported listing, 20 opposed listing, and 20 expressed neither support nor opposition, provided additional information only, or were nonsubstantive or irrelevant to the listing. In total, oral or written comments were received from 4 Federal and State agencies and officials, 14 local officials, and 262 private organizations, companies, and individuals. All comments, both oral and written, received during the comment period are addressed in the following summary. Comments of a similar nature are grouped into a number of general issues. The Service's response to each comment is discussed below.

Issue 1: Other processes, especially conservation agreements in lieu of listing, could be more effective at protecting these species, and would impose fewer regulations and restrictions on land use as compared to Federal listing. Also, additional steps or processes, particularly closer working relationships among the Service, local governments, and landowners, should be incorporated into the listing process.

*Comment:* Several commenters suggested preparing a conservation agreement among the Service, other Federal agencies, State agencies, local governments, and private landowners, in lieu of listing one or more of the three species. Environmental education is needed to raise local awareness of the plight of these species. A cooperative research and conservation program should be developed. Possible components of the cooperative effort could include conservation easements, or landowners could apply for membership in Oregon Stronghold, a corporation dedicated to conservation practices on private land.

*Service Response:* The Service considered conservation agreements in lieu of listing for all three species. Discussions with the Coronado National

Forest, Fort Huachuca, and AGFD on development of a conservation agreement for the Sonora tiger salamander began in September 1995. Meetings were held November 28, 1995 and January 24, 1996, among landowners, Fort Huachuca, the Coronado National Forest, experts on the salamander, and the Service to discuss development of the agreement. The participants in the meetings and discussions, including the Service, generally agreed that a properly crafted and promptly-implemented conservation agreement could provide for the long-term viability of the species.

In May 1996, the Service wrote all 13 private landowners within the range of the salamander to solicit their participation. Only two landowners have agreed to participate, and only one is known to have salamander populations on their property. These populations are on lands proposed for exchange to the Coronado National Forest. The Service estimates that approximately 31 percent of the range of the salamander are owned by individuals not currently interested in participating in a conservation agreement. Because a limited conservation agreement would not protect the species throughout its range, and because no conservation actions have actually been developed or implemented, these efforts are inadequate to preclude listing. However, the Service will continue to work with and encourages the participation of any interested parties in the conservation of this species.

No interest in the development of a conservation agreement for *Spiranthes* was expressed by the owners of the species' habitat. Some interest in the development of a conservation agreement for *Lilaeopsis* was expressed; however, only a few sites would have been protected leaving the majority of the populations unprotected. Additionally, the complex nature of the water issues involving *Lilaeopsis* made it difficult for the Service to assure the few interested parties that listing would necessarily be precluded through a conservation plan. This lack of assurance was unacceptable to one of the Federal agencies. Currently, Fort Huachuca is the only Federal entity working on a conservation plan for *Lilaeopsis*. This plan would be part of a larger land use plan.

*Comment:* One commenter stated that the Service was trying to coerce private landowners into compliance with the Act through the use of conservation agreements. This commenter also stated that the Service was, through the use of conservation agreements, attempting to

halt all ranching, farming, mining, logging, surface water diversion, groundwater pumping, and urban development, without the due process of listing the species. This commenter believed this was an attempt by the Service to gain greater control over activities on private lands. This commenter also stated that the purpose for the inclusion of the Sonora tiger salamander in the cienega species listing package was to provide a means for regulatory action on private lands for the two plants.

*Service Response:* Conservation agreements are voluntary plans for the conservation and recovery of species. They can preclude the need to list species by removing threats. However, any actions developed and implemented are a result of discussion and concurrence of all parties to the agreement. If decisions were made to halt or limit ranching, groundwater pumping, or other activities, these commitments would be made by the property owners and managers where these activities occur. If such commitments were unacceptable to one or more parties, they would have the option not to sign the agreement and not implement such activities. The Service characterizes conservation agreements as positive opportunities for landowners and managers to voluntarily take actions to conserve species being considered for listing and alleviate the need for listing and any resulting regulatory requirements.

The Service and other possible agencies in conservation agreements administer programs to fund and assist landowners in the implementation of conservation actions. The salamander is not known to occur with *Lilaeopsis* or *Spiranthes*, with the possible exceptions of Scotia Canyon and Los Fresnos. However, the salamanders at these sites have not been identified to subspecies. Because the salamander generally does not occur with the plants, regulatory protection afforded the salamander would have no effect on the plants.

*Comment:* Several commenters recommended that the Service comply with a resolution adopted by the National Association of Counties and the Arizona County Supervisors Association in regard to implementation of the Act. The "Resolution on Amending the Endangered Species Act" recommends increased participation of counties in species conservation, prelisting activities, listing and recovery decisions; analysis of economic, social and cultural impacts of listing; consultation with and compensation to affected landowners; and other provisions. Local governments should

decide if species should be listed. Listing should be decided by a vote of the residents of Cochise County.

*Service Response:* Section 4(a) of the Act clearly assigns the responsibility of making listing decisions to the Secretaries of the Interior and Commerce, not to local governments or a voting body. However, in making those decisions, the Secretaries are required to take into account conservation actions (section 4(b)(1)(A)), notify and invite comment from states, counties, and others on the proposed rules (section 4(b)(5)), hold one public hearing on the proposed rule, if requested (section 4(b)(5)(E)), and take other steps to ensure that the concerns of local governments, citizens, and others are considered in the listing decision. The Service appreciates the concern of local governments and citizens of southeastern Arizona in regard to this and other listings. The Service will work closely with residents and officials in the management and recovery of these species.

*Comment:* One commenter stated that beaver reintroduction on the upper San Pedro River, proposed by AGFD and the BLM, would create pond and marsh habitat for *Lilaeopsis* and make listing unnecessary.

*Service Response:* The potential effects of beaver reintroduction on the upper San Pedro River have not been fully analyzed as yet; however, it is possible that a successful reintroduction could create pond and marsh habitats. While a successful reintroduction may provide increased habitat for *Lilaeopsis*, this action alone does not remove the complex threats necessitating listing *Lilaeopsis* as endangered. Water issues on the San Pedro River are discussed later in this rule. Additionally, *Lilaeopsis* has not shown an ability to successfully compete with many aquatic plant species. *Lilaeopsis* may be able to opportunistically colonize such habitats early in their development; however, other plant species may dominate the habitat at later stages in the absence of some mild disturbance holding the system in an early seral stage.

*Comment:* One commenter suggested planning efforts for the San Rafael Valley could be used to conserve these species.

*Service Response:* The Coronado National Forest has produced a draft Lone Mountain Ecosystem Plan and discussions are underway to develop ecosystem plans for other portions of the San Rafael Valley. The Service has participated in these planning efforts and believes that they have a potential to contribute to recovery of the Sonora tiger salamander, *Lilaeopsis*, and

perhaps *Spiranthes*. However, these plans have yet to be finalized and potential benefits of these planning efforts have not yet been realized. Thus, these efforts have not yet affected the status of the species. The Service will continue to work with landowners and managers in the San Rafael Valley on conservation actions. These actions are expected to contribute to recovery.

*Comment:* One commenter stated that *Spiranthes* is and can be propagated in botanical gardens. Growing the species in gardens should be pursued, rather than Federal listing. It might be more cost-effective to propagate the species and introduce them into a beneficial environment. Another commenter stated that *Lilaeopsis* could not be an endangered species since it could be successfully transplanted.

*Service Response:* The Service places priority on conservation of species in the wild rather than pursuing horticultural programs for species. The cultivation of plants with subsequent outplanting may be done for reintroduction purposes; however, that type of activity alone does not provide for conservation or recovery of a species, nor does it address the habitat modification or destruction threats to a species. The listing of a species is not evaluated on cost-effectiveness, but on the best available scientific and commercial data available. The ability to transplant a species has no bearing as to whether or not that species warrants listing.

*Comment:* One commenter stated that Arizona Department of Water Resources (1991) found that 50 percent of the water available in the San Pedro basin is used by riparian vegetation. The commenter stated that if the BLM would remove 60 percent of the trees in the basin, there would be ample water to supply the needs of these three species and many others.

*Service Response:* Clearing of riparian vegetation would be counter to the purposes of the San Pedro River Riparian National Conservation Area. In the legislation establishing the Conservation Area, the BLM was charged with conservation, protection, and enhancement of the riparian area. To clear the riparian vegetation for water salvage would counter a Congressional mandate. As noted in Stromberg *et al.* (1996), Bock and Bock (1986), McQueen and Miller (1972), Yavitt and Smith (1983), and Dawson (1993), trees in a riparian system provide for increased soil fertility and increased soil moisture as a result of hydraulic lift and serve to temper environmental extremes such as temperature. This function of the

overstory in a riparian system is likely to benefit *Lilaeopsis*. Therefore, the removal of this system component could result in the loss of *Lilaeopsis* from the riparian area once the soil fertility and moisture levels drop and temperature extremes occur. In addition, riparian ecosystems are extremely important to numerous other species. Removal of large numbers of trees would damage other species' habitat and would not be a viable conservation measure.

*Comment:* One commenter asked why the Service placed plants on the Endangered Species list if the Act does not apply to plants on private lands.

*Service Response:* Under the Act private landowners have essentially no responsibilities regarding conservation or management of endangered plants located on their property; however, the Act provides for consultation by Federal entities under section 7 of the Act if their actions may affect a listed plant, regardless of whether that plant occurs on private or Federal lands. Therefore, while a private landowner may not have responsibility to protect, conserve, or manage for a listed plant, a Federal action agency is responsible if an action it authorizes, funds, or carries out may affect a listed species or its critical habitat.

Issue 2: Critical habitat should be proposed and designated for one or more of the three species. The Service did not comply with its own regulations when proposal of critical habitat was found to be not determinable for the Sonora tiger salamander and *Lilaeopsis*. Critical habitat designation is necessary to protect the habitat of these species.

*Comment:* Several commenters stated that the Service failed to follow its own regulations by not proposing critical habitat for all three species in the proposed rule. Another commenter requested we reissue the proposed rule with critical habitat proposed for all three species, all areas known to be occupied by the species, all historical habitat, and all areas that could be restored and reoccupied by the species.

*Service Response:* The Service's position on critical habitat for these species is detailed in the "Critical Habitat" section of this final rule.

*Comment:* One commenter stated that collecting is a relatively minor threat compared to other factors that threaten the survival and recovery of *Spiranthes*; thus the benefits of critical habitat outweigh the costs and critical habitat should be proposed. Another commenter was concerned that protection of *Spiranthes* and its habitat would be impossible without critical habitat designation. This commenter was concerned that there would be a

potential threat to *Spiranthes* from continued livestock grazing of cienega habitats.

*Service Response:* The Service does not believe this potential benefit of critical habitat designation outweighs the threat of collection given the extreme rarity of this orchid. Due to this species' cryptic nature, potential threats or impacts to its habitat would be addressed within the consultation process. As this is a plant species provided with a different, and lesser protection than an animal, pursuant to section 9 of the Act, the Service would not address continued use of a cienega as part of a livestock operation, except through the consultation process, regardless of whether critical habitat were designated or not. Additionally, preliminary indications are that *Spiranthes* may benefit from a responsible land management plan involving light disturbance from grazing.

*Comment:* Several commenters stated that habitat and species protection and recovery afforded through consultation in accordance with section 7 of the Act would be inadequate without critical habitat designation.

*Service Response:* Section 7(a)(2) of the Act requires Federal agencies, in consultation with the Secretaries of the Interior and Commerce, to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. It is the opinion of the Service that the designation of critical habitat for these three species would not be beneficial and therefore, not prudent.

Issue 3: Economic, social, and cultural impacts of listing need to be evaluated and considered in the listing process.

*Comment:* Several commenters requested that the Service study the indirect and direct economic, social, and/or cultural effects of listing these three species. Concern was expressed that listing of the species would affect use and value of private property, result in increased taxes and reduced investment in the local community, and adversely affect grazing permittees on state and Federal lands. Some commenters stated that the results of this analysis should be weighed with threats, status, and other listing factors in determining whether these species should be listed.

*Service Response:* 50 CFR 424.11(b) requires the Secretaries of the Interior and Commerce to make decisions on listing based on "the best available scientific and commercial information regarding a species' status, without



reference to possible economic or other impacts of such determination." The Service has determined that the designation of critical habitat for these three species is not prudent.

*Comment:* One commenter stated that the listing and establishment of critical habitat would give the Federal government control over water use where the species occur. This commenter also stated that the species and their critical habitat would be given a higher priority than humans in a drought situation.

*Service Response:* Federal actions, such as groundwater use by Fort Huachuca or actions by the BLM that may alter San Pedro River flows or hydrology, would be subject to the section 7 consultation process, which may result in changes to proposed actions to avoid jeopardizing the continued existence of a listed species. (For further discussion, see the "Available Conservation Measures" section of this final rule.) Private actions would generally be exempt from the regulatory provisions of the Act, unless Federal funds or authorization are needed, or if the action would result in the taking of a Sonora tiger salamander. In the latter case, a private party could seek a section 10(a)(1)(B) incidental take permit to legally take salamanders incidental to otherwise lawful activities. The Service is not proposing or designating critical habitat in this rule. Designation of critical habitat for these three species was determined to be not prudent (see "Critical Habitat" section).

*Comment:* One commenter stated that the listing of these species would eliminate mineral exploration and exploitation in the unique and rare Cananea geologic trend.

*Service Response:* The Service assumes the commenter refers to mineralization, particularly copper deposits, in the quartz/monzonite/porphyry/copper deposit belt in southeastern Arizona, southwestern New Mexico, and adjacent portions of Mexico, including the copper deposits near Cananea, Sonora. As discussed elsewhere herein, if mining activities involved a discretionary Federal action, that action would be subject to section 7 consultation. For instance, consultation could result in modifications to mining plans of operation. Prospecting and mining of hardrock minerals, such as copper, on Federal lands is governed by the Mining Act of 1872 (16 U.S.C. 21 *et seq.*). Under this law, Federal agencies have limited discretion over mining activities. Thus, many activities would not be subject to section 7 consultation. If mining might result in the taking of a Sonora tiger

salamander, this take could be permitted through the incidental take statement in a section 7 consultation for Federal actions, or through a section 10(a)(1)(B) permit for private actions. The listing would not affect mining activities in Mexico. The Service is unaware of any current or proposed copper mines or other mineral mines in the quartz/monzonite/porphyry/copper deposit belt in Arizona or New Mexico that may affect any of the three species. These listings would not eliminate mineral exploration and exploitation of the quartz/monzonite/porphyry/copper deposit belt.

*Comment:* One commenter stated that the impact of this listing would decimate the Babacomari Ranch's historical livestock operation along the Babacomari River and would eliminate this viable agricultural enterprise.

*Service Response:* Involvement with the Service regarding operation of this ranch would only occur within the context of the consultation process if a Federal action agency were to fund, authorize, or carry out an activity related to the operation of the ranch, or if the ranch owners wished to work with the Service on voluntary conservation actions. While the Service does not analyze economic effects of a listing action, it is not anticipated that the listing of *Spiranthes* will have an adverse effect on the ranching operations.

*Comment:* Commenters stated that the Service intends to close Fort Huachuca and undermine the local economy and well-being of citizens with these listings. The listings will result in a cessation of Federal highway funds and home mortgages in Sierra Vista. Another commenter stated that the proposed listing of these three species was an attempt to halt growth, grazing, and multiple use of public and private lands. One commenter reported hearsay that it was the intent of the Service to control the water and lives of the people with this listing, which is an inappropriate purpose of the listing process.

*Service Response:* The purpose of these listings is to extend the protection of the Act to the Sonora tiger salamander, *Lilaopsis*, and *Spiranthes*. This protection does not authorize the Service to close Fort Huachuca or assert jurisdiction over water rights, and the Service does not anticipate significant impacts to local economies or to the well-being of citizens. As described in "Available Conservation Measures" herein, with the promulgation of this rule, Federal agencies, including Fort Huachuca and those that administer Federal highway funds and Federal

loans, will be required to comply with section 7 of the Act to ensure their activities do not jeopardize the continued existence of these species. Consultations with Federal agencies, such as the Coronado National Forest, Fort Huachuca, and others, may result in changes to proposed actions that are at the discretion of the action agency. For instance, in accordance with section 7, the Coronado National Forest has conferred with the Service on proposed reissuance of several grazing permits within the range of the Sonora tiger salamander. The Service has recommended that the Forest develop and implement stock tank management plans for tanks supporting salamanders. These plans would include timing maintenance activities to reduce effects to salamanders, minimizing removal or damage to bankline cover, adding brush and logs for cover, restricting access by cattle to selected tanks or portions of tanks, public information, and monitoring and periodic removal of nonnative predators. Similar outcomes are expected from future formal section 7 consultations for all three species. Further discussion of water issues are addressed in the following comments.

*Comment:* One commenter stated that a moratorium on the pumping of groundwater would be financially devastating to families.

*Service Response:* As discussed elsewhere, pumping of groundwater or other actions by private individuals on private lands would not be affected by this listing, with the possible exception of groundwater pumping that would drain a stock tank occupied by Sonora tiger salamanders and result in taking, or other activities that might result in the taking of salamanders. The Service is unaware of any planned or ongoing groundwater pumping anywhere within the range of the Sonora tiger salamander that would result in taking. If such an action were proposed, the proponent could seek authorization from the Service for an incidental take permit. If groundwater pumping involves a Federal authorization, funding, or other discretionary Federal action, that pumping would be subject to section 7 consultation if the action may affect a listed species.

*Comment:* One commenter noted that the listing of these species will complicate the issues surrounding the general adjudication. In particular, this commenter believed it would add another obstacle to reaching a negotiated settlement of some water rights with Federal agencies.

*Service Response:* A general adjudication of water rights in the Gila River system and its source is



underway, pursuant to Arizona Revised Statutes 45–251 to 45–260. This adjudication includes the San Pedro River watershed. Major water rights holders, particularly in the Sierra Vista subwatershed (in the river's watershed from Fairbank to the international border), are attempting to negotiate a settlement agreement. Listing of these three species would not directly affect water rights. Uses of water may be subject to section 7 consultation if such use involves a discretionary Federal action. Subsequent enforcement actions in regard to take of Sonora tiger salamanders could potentially also result in the modification or cessation of water use at specific sites, but the salamander occurs almost exclusively outside of the subwatershed. Although water rights are not directly affected by these listings, the Service agrees that listing could be a factor in the issues surrounding the settlement negotiations. The Service is involved in the negotiations and is likely to be a party to any settlement agreement. Compliance with the Act in regard to water use may be addressed in the agreement, and thus could provide a framework for addressing endangered species issues to which all parties to the agreement would have input. Of the three species listed, only *Lilaeopsis* is well-represented in the subwatershed.

*Comment:* One commenter stated that, as a result of this listing, the section 7 consultation process will add time and expense to any urbanization project.

*Service Response:* If a Federal agency is involved in urbanization, it would need to evaluate its actions and possible effects on listed species. The Service is required to deliver a biological opinion, which concludes consultation, to the action agency within 135 days of receipt of a request for consultation (50 CFR 402.14(e)). If the action agency incorporates consultation into their planning process and consultation is initiated early, project delays are unlikely. Some additional costs may accrue resulting from meetings with the Service, preparation of documents, and implementation of any reasonable and prudent alternatives or measures in the biological opinion. Private actions that do not require Federal funds, actions, or authorization, such as a private individual building a house with private funds, are not subject to section 7.

Issue 4: Information presented in the proposed rule was insufficient to support listing or was in error.

*Comment:* Several commenters stated that the status and population trends of *Spiranthes* cannot be determined because population size is unknown and cannot be accurately determined

because an unknown percentage of plants are dormant and nonflowering plants are difficult to find.

*Service Response:* While the Service believes that additional long-term studies are needed to more accurately determine the stability of *Spiranthes* populations, data as a result of monitoring suggest that the populations may be declining based on the tendency of plants to remain in a nonflowering state, the low numbers of new flowering plants, and the reduction to a single nonflowering individual at one site in 1991 (McClaren and Sundt 1992, Newman 1991). The definitive answers on population biology that the commenters believe necessary would involve destructive methodology in order to determine the exact number of plants and percentages of absent individuals. Such a destructive methodology would be devastating to an extremely rare species such as this one and could result in the extirpation of some populations. Mark Fishbein (University of Arizona, *in litt.* 1996), a researcher who has studied *Spiranthes* extensively, notes that the life history of this species provides difficulties in censusing; however, years of observation have enabled him to estimate the total number of individuals at somewhere below 5,000, and perhaps less than 2,000.

*Comment:* Several commenters stated that surveys for the Sonora tiger salamander have not been extensive enough to adequately determine its status. Many potential habitat sites on private lands have not been surveyed and the taxonomy of salamanders found in adjacent portions of Sonora needs to be clarified. The recent discovery of a population at Fort Huachuca suggests the range of the species may be greater than originally thought. The salamander is thriving in stock tanks.

*Service Response:* Additional survey work conducted since the proposed rule was published further clarifies the status of the Sonora tiger salamander (Collins 1996) and is summarized in "Background" and "Summary of Factors Affecting the Species." As of late 1995, Dr. James Collins (Arizona State University) and Tom Jones (Grand Canyon University) (pers. comm. 1995) estimated that roughly 75 percent of public lands within the range of the salamander had been surveyed. Additional extensive surveys occurred in 1996. Surveys of private lands, most of which are in the center of the San Rafael Valley on the historic San Rafael de la Zanja land grant and comprise about 31 percent of the range of the salamander, have been sporadic and incomplete. The Service estimates that

perhaps 60 percent of lands within the range of the salamander have been thoroughly surveyed. If we consider the 23 sites where salamanders have been found during one or more of the last three visits from 1993 through 1996 as extant populations, and if breeding populations occur on unsurveyed lands in a density similar to surveyed lands, then conceivably as many as 35 to 40 "extant" breeding populations could exist in Arizona. Regardless, a limited geographic range, very limited breeding habitat, and threats to the species described herein warrant protection as an endangered species.

The Service agrees that the taxonomy of the tiger salamander population at Los Fresnos in Sonora should be clarified; however, presence of Sonora tiger salamanders at this site is not unexpected (the salamander locality at Los Fresnos is within 1.3 mi (2.2 km) of the international boundary and 2.2 mi (3.6 km) of three extant localities in Arizona). The recently discovered population at Fort Huachuca also is not unexpected. It is approximately 1.4 mi (2.2 km) west of a salamander locality (presumed to be the Sonora tiger salamander) in Scotia Canyon. Neither of these new populations constitute significant range extensions, or lead the Service to believe that the range of the salamander is much greater than indicated in the proposed rule. Other potential habitats have been surveyed outside of the known range in Arizona and Sonora, but no Sonora tiger salamanders have been found (Collins and Jones 1987).

The Service disagrees with the general statement that the salamander is thriving in stock tanks. Many tanks within the range of the salamander are occupied by nonnative predatory fish that eliminate salamander populations and prevent colonization by salamanders. Bullfrogs, which also prey on salamanders, are well-established in the San Rafael Valley and have become more widely distributed since 1985 (Collins 1996). Virtually no recruitment of salamanders was noted by Collins (1996) during his surveys in 1993–1994. Furthermore, disease killed all aquatic salamanders at 3 tanks in the 1980's and recently killed salamanders at 7 tanks, and less than 10 salamanders were found during any 1 visit at 16 of 32 sites surveyed from 1993 through 1996 (James Collins, pers. comm. 1996).

*Comment:* Commenters stated that data are inadequate to determine the status of any of the three species. The information upon which the proposed listing is based is subjective and premised by qualifiers such as "might be," "may," etc. One commenter stated

that presumptions rather than science were the basis for listing. The same information could be interpreted that the species are not endangered.

*Service Response:* All three species are of very limited distribution and occupy very limited and sensitive aquatic habitats. The reasons for their limited distributions are not fully understood; however, the Service has attempted to describe all known and potential threats to the species in the proposed and final rules. Potential threats are described as possibly affecting the species and are treated as uncertainties, with qualifiers such as "may" and "might be." Despite these uncertainties, sufficient surveys have been conducted to adequately assess the current status of the species and whether they warrant listing. The Service makes listing determinations on the basis of the best scientific and commercial data available as required under section 4(b)(1)(A) of the Act.

*Comment:* One commenter stated that the status of the species cannot be determined without further study and survey in Mexico.

*Service Response:* Collins and Jones (1987) surveyed 30 sites in northeastern Sonora and 26 sites along the eastern slope of the Sierra Madre Occidental in northwestern Chihuahua without locating Sonora tiger salamanders. Other researchers have conducted casual surveys for salamanders in northern Sonora as well, without finding Sonora tiger salamanders, with the exception of the tiger salamander population of unknown subspecies at Los Fresnos. The Service believes that if the salamander occurs in Sonora, it probably has a limited distribution and occurs at very few sites. The species is most likely to occur in tanks or cienegas near the international boundary in the Sonoran portion of the San Rafael Valley.

Three populations of *Lilaeopsis* are known from Sonora (Warren, *et al.* 1991); however, recent efforts have failed to locate additional populations of this subspecies. Mark Fishbein (University of Arizona, *in litt.* 1995) has conducted extensive floristic surveys of the Sierra de los Ajos (site of one recently-discovered *Lilaeopsis* population reported herein) and believes the potential for additional new populations in that region to be low, although not all potential habitat for the species has been surveyed. Fishbein also notes that threats to wetland habitats in Mexico are similar to those in Arizona and, therefore, *Lilaeopsis* is probably as rare and threatened there as it is in Arizona.

Surveys for *Spiranthes* species in Mexico have not located populations of *Spiranthes delitescens*. While Sheviak (1990) noted that P.M. Catling had not found *Spiranthes delitescens* in his work in Mexico, Sheviak still believed that the species likely occurred in Mexico at that time. Recently, Charles Sheviak (University of New York at Albany, *in litt.* 1995) stated that the species appears " \* \* \* to be very restricted and critically rare." Jones, *et al.* (1995), in a discussion on the phylogenetic origins and taxonomy of the Sonora tiger salamander, also note the unique occurrences of *Spiranthes* and the Huachuca springsnail (*Pyrgulopsis thompsoni*) within the San Rafael Valley. Sheviak (*in litt.* 1995) noted in reference to this publication that it " \* \* \* suggests that this restricted distribution is real and the result of biogeographic processes that have produced a suite of similarly restricted organisms."

*Comment:* One commenter stated that *Lilaeopsis* populations are increasing, thus endangered status is not warranted.

*Service Response:* The size of *Lilaeopsis* populations fluctuate depending on flood cycles, refugia, habitat availability, and interspecific competition. Since publication of the proposed rule, some populations of *Lilaeopsis* have been found to be more extensive in their aquatic systems, i.e. scattered throughout a canyon system or in upstream tributaries; however, only one new population has been found. The other populations to which the commenter is referring are actually new areas of clumps of plants within a larger, connected system already known to contain *Lilaeopsis*. Probably the most extensive expansion of *Lilaeopsis* in a system has been within the upper San Pedro River. At the time of the proposed rule, the Service only knew of two springs along the San Pedro River containing *Lilaeopsis*. Mark Fredlake (BLM, pers. comm. 1996) documented 43 scattered patches of plants in the upper San Pedro River prior to the 1996 monsoon floods. Regardless of this information, the Service has not seen a reduction in threats to *Lilaeopsis*. Past and present habitat modification and destruction are significant issues in the Service decision to list *Lilaeopsis* as endangered.

*Comment:* *Spiranthes* is not endangered. It has existed for years on mostly Federal grazing lands that have been well-managed by permittees.

*Service Response:* With the exception of four individual plants recently found on public lands, all of the known sites for *Spiranthes* occur on private land.

*Comment:* AGFD herpetologist Jeff Howland is cited in the proposed rule as the source for the Sonora tiger salamander localities in Scotia and Copper canyons. Mr. Howland has not identified the salamanders at these locales to subspecies; thus, these localities are in question.

*Service Response:* The Copper Canyon locality is the same as "Game and Fish Tank," which Collins (1996) identifies as a Sonora tiger salamander locality. Salamanders from Scotia Canyon have not yet been identified to subspecies. This has been noted and corrected in this final rule.

*Comment:* One commenter noted that loss of *Lilaeopsis* habitat was the result of natural rather than human-caused processes. This commenter further stated that the San Pedro River and cienega habitats have been altered by natural climatic change, the 1887 earthquake, and cattle. The commenter stated that these changes were primarily the result of the geologic cycle and did not warrant listing *Lilaeopsis* as an endangered species. The commenter further stated that *Lilaeopsis* habitats were stable, but would now be subject to lawsuits by radical environmentalists and unknown decisions by judges.

*Service Response:* The Service is unaware of evidence supporting the comment that natural geologic cycles are the cause behind the modification and loss of cienega and riparian habitats containing *Lilaeopsis*. The 1887 earthquake affected the distribution of cienega habitats and spring flow along the upper San Pedro River (Hendrickson and Minckley 1984), but whether *Lilaeopsis* habitats increased or decreased as a result of the earthquake is unknown. Documented loss of *Lilaeopsis* habitat has resulted from habitat modification and destruction resulting from human-related activities; however, there has been a synergistic effect of overuse of habitats coupled with drought. The Service is unaware of long-term research indicating that *Lilaeopsis* habitats are stable. The Service is unable to predict the extent (if any) that *Lilaeopsis* habitats will now be subject to legal actions; however, we believe that cooperative partnerships to help conserve and restore riparian habitats will provide a positive basis for community interaction in the recovery of *Lilaeopsis*.

*Comment:* One commenter requested that the Service provide the mathematical equation used in determining whether or not a species is endangered.

*Service Response:* No equation, mathematical or otherwise, is used to determine a species' status. An

endangered species is one that is in danger of extinction throughout all or a significant portion of its range (50 CFR 424.02(e)). Determination of whether a taxon meets the definition of an endangered species is based on the best scientific and commercial data available after conducting a review of the species' status. Species are found to be threatened or endangered based on an analysis of the five listing factors evaluated in the section "Summary of Factors Affecting the Species," herein.

*Comment:* One commenter found that the Service failed to prove these species are declining and also failed to establish that they perform vital biological services for their ecosystem, are necessary to maintain a balance of nature, or that they contribute to biological diversity needed for legitimate scientific purposes.

*Service Response:* As described in the previous response, the Act and its implementing regulations require status review and analyses to determine if species meet the definition of a threatened or endangered species. Documented declines are one line of evidence that may contribute to a decision to list a species; other factors may be important. Documented declines are not a requirement for listing. Neither do endangered species need not perform vital biological functions for their ecosystems or contribute to biological diversity (section 4(a) and 4(b) of the Act).

*Comment:* One commenter questioned the historical reference to habitat qualities of the Santa Cruz River and stated that the river is still a "rapid brook, clear and crystal" now, following heavy rains.

*Service Response:* The Service searched historical references to provide answers to the specific questions and has fully incorporated that information into the rule; however, the Service is unaware of any instances where the reach of the Santa Cruz River near Tucson presently meets the historical habitat description.

*Comment:* One commenter stated that information provided in the notice was not the result of scientific research nor did any of the persons referenced in the notice have scientific training or expertise. Another commenter stated that the Service either misrepresented the best scientific and commercial data available or ignored these data altogether.

*Service Response:* The Service considered all known sources of information in its decisions to list these species. As required in 50 CFR 424.11(b), the best scientific and commercial data available formed the

basis for these decisions. These data included published and unpublished reports by qualified and reputable biologists, personal communications with researchers and biologists, and comments from the public. For instance, much of the status information on the Sonora tiger salamander is based on papers by, and communications with, Drs. James Collins and Thomas Jones. Dr. Collins is chair of the Zoology Department at Arizona State University. Dr. Jones is a professor at Grand Canyon University.

The published and unpublished data supporting listing of *Lilaeopsis* and *Spiranthes* were the result of the work of a number of experienced biologists recognized in their fields. Much of the literature cited in the proposed and final rule was published in peer reviewed scientific journals. Peer reviewed scientific journals provide a level of scrutiny that ensures publication of the best information available.

Issue 5: Threats to the three species were not adequately described or supported by the best available information. In some cases, the discussions of threats or other information presented in the proposed rule were confusing, unclear, and contradictory to available information.

*Comment:* One commenter questioned the reference to a loss of 90 percent of the riparian habitat in southern Arizona. This commenter stated that the loss figure was extrapolated from a study of cottonwood-willow habitat along the Colorado River in the Yuma area and does not represent an actual inventory of historical riparian areas in the Arizona. Another commenter also stated that this figure was inaccurate.

*Service Response:* The proposed rule stated "The State of Arizona (1990) estimates that up to 90 percent of the riparian habitat along Arizona's major desert watercourses has been lost, degraded, or altered in historic times." The Service believes this is an accurate statement. The exact percentage of riparian habitat lost, degraded, or altered cannot be determined, because knowledge of predevelopment conditions is often anecdotal or incomplete. However, numerous factors have cumulatively resulted in habitat loss and degradation throughout most of the major desert watercourses in Arizona, particularly the Colorado, Gila, Salt, Santa Cruz, and Verde rivers. These include—introduction of nonnative plants, such as salt cedar (*Tamarix* spp.); carrizo (*Phragmites australis*), and watercress (*Rorippa nasturtium-aquaticum*); construction and operation of dams, which have altered flow and flooding regimes,

sedimentation, water temperatures, and channel characteristics; water withdrawals; channelization; and construction of levees and other flood or bankline structures.

In contrast, the riparian habitats of the San Pedro River are surprisingly unaltered, and provide conditions that do not occur, or are very rare, on other desert watercourses. Thus there is great biodiversity on this river and many rare species, such as *Lilaeopsis*, occur there.

*Comment:* One commenter stated that there were no significant current threats to any of these species in the San Rafael Valley with the exception of potential unmonitored and increased recreation that could cause habitat degradation.

*Service Response:* As discussed in the "Summary of Factors Affecting the Species" section, threats to the species in the San Rafael Valley are many. The Service acknowledges that recreational activities, such as off-road vehicle use, fishing that would involve illegal use or transportation of bait fish or salamanders, fire caused by recreationists and subsequent watershed erosion and degradation, wood cutting, and other activities are threats to the Sonora tiger salamander, *Lilaeopsis*, and/or *Spiranthes*, in and near the San Rafael Valley. However, these species face many other threats in the San Rafael Valley, as well. As discussed herein, all three species are vulnerable to chance extinction owing to limited numbers of populations and individuals, and climatic and other environmental variability. The Sonora tiger salamander is threatened by introduction of nonnative predators, disease, habitat degradation due to heavy use by livestock at some tanks, and a variety of other factors, all of which operate in the San Rafael Valley. Subdivision of ranches into ranchettes or housing tracts is an additional threat to all three species within the San Rafael Valley. Subdivision could result in fragmentation of cienega habitats and increased groundwater pumping.

*Comment:* One commenter stated that discussions of threats to the Sonora tiger salamander described by the Service at the Patagonia public hearing and in the proposed rule differed. In particular, the proposed rule indicated the salamander faced many more serious threats than were indicated at the public hearing.

*Service Response:* The Service's presentation at Patagonia on the proposed listing was abbreviated to allot as much time as possible to hear public comment. Rather than discuss all known or potential threats in detail, the Service presented an overview of the status of the taxa based on information in the proposed rule.

*Comment:* One commenter stated that two of the three species are abundant and not in peril in Mexico, and therefore listing is not warranted.

*Service Response:* Neither *Spiranthes* nor the Sonora tiger salamander have been confirmed from Mexico, although a population of tiger salamanders suspected to be of the subspecies *stebbinsi* was observed at Los Fresnos, Sonora. *Lilaeopsis schaffneriana* ssp. *recurva* is known from three sites in Sonora; all of these sites face similar threats to those north of the international border, in the United States.

*Comment:* One commenter stated that *Lilaeopsis* occurs in some areas without perennial flows and with a regulated hydrograph, contrary to information presented in the proposed rule.

*Service Response:* The Service is unaware of any sites containing *Lilaeopsis* that do not have perennial flows.

*Comment:* One commenter believed statements in the proposed rule suggesting development in the upper San Pedro River Valley will result in increased erosion and other detrimental hydrologic effects are inaccurate and unsupported.

*Service Response:* Development can result in elevated runoff rates, such as from parking lots and roadways, and increased erodibility of soils due to soil disturbance, removal of vegetation, and disturbance of natural drainageways. Increased runoff rates and erosion in the Sierra Vista subwatershed can lead to more frequent "flash" floods and deposition and movement of sediment in the San Pedro River. This increased hydrologic instability would be detrimental to *Lilaeopsis*, which does not tolerate high levels of disturbance or channel instability. Additionally, flash floods could scour existing *Lilaeopsis* out of the system and could occur with frequency or intensity that would not allow for refugia sites for *Lilaeopsis* and subsequent recolonization.

The city of Sierra Vista has adopted a Surface Water Plan to address regional management of surface runoff. The plan includes construction of flood detention/retention basins at 30 locations (ASL Hydrologic & Engineering Services (ASL) 1995). New construction also includes provisions for stormwater retention and increased infiltration. Fort Huachuca also is investigating stormwater recharge as a part of their Mountain Front Recharge Project (Fort Huachuca 1995). However, development is occurring outside of the Sierra Vista/Fort Huachuca areas without these same controls, the city's plan has not been fully implemented,

and the Fort is in the planning stages. Thus, the Service still considers erosion caused by development in the watershed a threat to the habitat of *Lilaeopsis* in the San Pedro River.

*Comment:* One commenter stated that, contrary to statements in the proposed rule, stock tank maintenance is beneficial to the Sonora tiger salamander because it removes nonnative fish. Concern also was expressed that listing would result in removal of grazing and cessation of stock tank maintenance. Another commenter stated that habitat conditions for these species, especially the salamander, have improved in the past 30 years because landowners have directly benefitted and increased the extent of habitat through stock tank construction.

*Service Response:* Maintenance of the tanks is necessary not only to preserve their value for livestock but also to benefit salamander populations. Tanks would silt in and aquatic habitats would be lost without periodic maintenance. The Service acknowledges that maintenance also may help remove nonnative fish species that prey upon the Sonora tiger salamander. Silt is typically removed from tanks when they are dry or nearly dry. Remaining fish might be dredged out of the tanks or killed during silt removal. As described in the proposed rule, salamanders present in the tanks would probably also be killed. The Service believes that certain mitigating precautions are possible to reduce adverse effects to salamander populations resulting from removal of silt or other maintenance activities. These mitigation measures will be addressed through the section 7 consultation process and in recovery planning. As discussed elsewhere in this final rule, the Service believes well-managed livestock grazing is compatible with viable salamander populations. Thus, listing will not result in removal of grazing or the need for well-maintained water sources, such as stock tanks.

*Comment:* Several commenters stated that the analysis of threats in the proposed rule did not take into account efforts by the City of Sierra Vista and the town of Patagonia to maintain flows in the San Pedro River and Sonoita Creek, respectively. Groundwater pumping by Patagonia does not affect Sonoita Creek. One commenter stated that the Service had been contemptuous and arrogant by not documenting in the proposed rule the City of Sierra Vista's efforts to protect the riparian habitat of the San Pedro River.

*Service Response:* The "Summary of Factors Affecting the Species section"

has been revised to include efforts by the City of Sierra Vista and Fort Huachuca to maintain flows in the San Pedro River. The proposed rule did not specifically mention groundwater pumping by the Town of Patagonia as a threat to any of the three species. However, the Service acknowledges and appreciates efforts by the Town of Patagonia to avoid possible adverse effects to listed species and to maintain flows in Sonoita Creek.

*Comment:* One commenter stated that testimony by Dr. Thomas Maddox, Department of Hydrology and Water Resources, University of Arizona, refutes information presented in the proposed rule in regard to the effects of groundwater pumping on the San Pedro River. Another commenter noted that Maddox and Vionnet (1991) found that "the mean depletion rate of the regional aquifer in the Sierra Vista area from pumping is very small and that pumping from the regional aquifer is not the major factor imperilling stream flow." This commenter also stated that the conservation measures for recharge and reuse of sewage effluent recommended in this study will not be implemented if the listing process is finalized. One commenter stated that groundwater pumping does not pose an immediate threat to populations of *Lilaeopsis* at Lewis Spring and south of Boquillas Road.

*Service Response:* The point of the Service's discussion in the proposed and final rules in regard to groundwater pumping in the Sierra Vista subwatershed is that withdrawal of water from the aquifer in excess of recharge threatens the baseflow of the upper San Pedro River and, in turn, threatens *Lilaeopsis* habitat. Nothing in Dr. Maddox's testimony nor in Maddox and Vionnet (1991) refute this claim. On page 46 of Dr. Maddox's testimony he states that if pumping continues "the cone of depression continues to expand. It actually turns the stream (the San Pedro River), which is in some cases perennial in the reaches, to intermittent." On pages 65 and 66 of the testimony he states that if pumping continues the San Pedro River may become like reaches of the Santa Cruz River that are now dry and devoid of riparian vegetation due to groundwater pumping. He goes on to say on page 84 of the testimony that during the period of his study, groundwater pumping in the Palominas area had reversed the flow of groundwater so that the groundwater was flowing to the cone of depression there, rather than into the San Pedro River, which directly reduced river flows.

Much of the pumping in the Palominas area has been halted in recent years, and this condition may have changed. However, it illustrates the potential that groundwater pumping has to affect flows in the San Pedro River. The problem is not trivial. ASL (1995) calculated that the cone of depression in the Sierra Vista/Fort Huachuca area in 1995 was in excess of 36.6 m (120 ft) deep with drawdown levels of more than 6.1 m (20 ft) extending from north of Huachuca City and the Babacomari River to well south of Highway 90, a distance of approximately 18 km (11 mi). Water and Environmental Systems Technology, Inc. (1994) estimated that even if all pumping stopped in the Sierra Vista/Fort Huachuca area, the cone of depression would continue to spread toward the river as it flattened out and river flows would continue to decline through the year 2088.

Groundwater modeling indicates that effects to upper San Pedro River baseflows may not occur for 25 years or more (ASL 1995), thus the Service concurs that groundwater pumping in the Sierra Vista/Fort Huachuca area does not pose an immediate threat to *Lilaeopsis*. However, adverse effects are likely to occur in the foreseeable future unless mitigating actions are implemented very soon. These measures could include water conservation, effluent recharge, watershed improvements, stormwater recharge, and others, many of which are in the planning stages or are being implemented to some degree in the subwatershed. Modeling suggests that if effluent recharge and other measures are implemented, flows may actually increase in some reaches over the next 100 years (ASL 1995, Water and Environmental Systems Technology, Inc. 1994). However, in the long term, unless water withdrawals are brought into balance with recharge, growing cones of depression will eventually capture effluent recharge and river flows, and *Lilaeopsis* habitat in the San Pedro River will be lost.

Groundwater elevation has already declined under portions of the Babocomari River (ASL 1995), thus *Spiranthes* occurring on that river may also be threatened in the long-term. The Service is unaware of studies or modeling that specifically addresses areas where the species occurs. Loss of *Lilaeopsis* on the San Pedro River and *Spiranthes* on the Babocomari River would not, alone, likely result in the extinction of these species. However, loss of these populations and habitats would significantly increase the likelihood of extinction and

substantially reduce or preclude recovery options.

The Service does not believe that listing these three species will result in the City of Sierra Vista, Fort Huachuca or others in the Sierra Vista subwatershed abandoning efforts to reduce water use and increase recharge. These efforts are probably driven by projected increased pumping costs as groundwater elevations decline, the Gila River water rights adjudication, and other considerations. To the contrary, efforts by the City of Sierra Vista, Fort Huachuca, and other water users to conserve water, develop effluent recharge, enhance mountain front recharge, etc., complement actions to recover *Lilaeopsis* and *Spiranthes*.

*Comment:* Several commenters stated that, contrary to information presented in the proposed rule, livestock grazing is not detrimental to *Spiranthes*. Populations in grazed areas are larger and healthier than at a site where grazing has been excluded since 1969. Grazing may have replaced fire as a form of disturbance in cienegas. Removing or restricting grazing would be detrimental to *Spiranthes*.

*Service Response:* Discussions of well-managed livestock grazing and *Spiranthes* presented in the proposed rule did not indicate a detrimental effect. The Service stated that our preliminary conclusion is that well-managed livestock grazing does not harm *Spiranthes* populations. Additionally, the Service acknowledges that *Spiranthes* may favor some form of mild disturbance and would not recommend the removal of grazing as a component of responsible stewardship. However, negative effects of overgrazing remain a concern. The Service has tried to differentiate responsible, well-managed, livestock grazing from poor livestock management and overgrazing.

*Comment:* One commenter stated that the following statement in the proposed rule is incorrect: groundwater pumping in the Hereford-Palominas area has the largest impact on the aquifer of any groundwater pumping in the upper San Pedro River basin.

*Service Response:* Wells in the Hereford-Palominas area are or were located in the floodplain of the San Pedro River and draw water directly from the shallow aquifer and, in some cases, from deeper regional aquifers. Wells farther from the river, such as those at Fort Huachuca, draw water from deep aquifers, and not directly from the floodplain aquifer. Wells that draw water from the floodplain aquifer are more likely to directly affect river flow, but wells elsewhere in the watershed may intercept groundwater

flow that would otherwise be discharged to the floodplain aquifer (ASL 1994). As of 1990, pumping in the Palominas-Hereford area exceeded slightly that in the Sierra Vista-Fort Huachuca area (ASL 1994, Arizona Department of Water Resources 1991). Pumping at Palominas-Hereford has probably declined since then, while pumping at Sierra Vista-Fort Huachuca has likely increased, but the former would still be the major impact on the floodplain aquifer because it extracts water primarily from that aquifer, whereas water pumped in the Sierra Vista-Fort Huachuca area comes from deeper aquifers.

*Comment:* One commenter stated that the drying of stock tanks inhabited by Sonora tiger salamanders is not a serious threat because the larval salamanders metamorphose and return to breed when the tanks refill.

*Service Response:* If tanks dry out slowly, some salamanders will metamorphose into terrestrial adults and leave the tank. Young larval salamanders, perhaps less than 6 months of age, and some branchiate salamanders (mature aquatic forms), particularly older branchiates, are incapable of metamorphosing into a terrestrial form and would be lost. The percentage of aquatic salamanders lost when a tank dries out would depend on the age structure of the population and the dryness of the season. If a tank dried during May or June, which is the dry season in the San Rafael Valley, most or all salamanders hatched that spring would not be able to metamorphose. Survival of salamanders during metamorphosis or after they leave the tank is unknown, but predation of larvae may be high as water levels decline (Webb and Roueche 1971). If aquatic habitat in a tank is lost rapidly due to sedimentation after a storm or breaching of the impoundment, salamanders would not be capable of metamorphosing into terrestrial forms and all aquatic salamanders would be lost. Terrestrial adults in the area may return to the tank when it refills, breed, and repopulate the tank with larvae and branchiates. This has apparently occurred at several sites, including Campini Mesa North Tank, Huachuca Tank, Parker Canyon Tank #1, and Inez Tank; (Collins 1996, Collins *et al.* 1988). However, as noted in the "Summary of Factors Affecting the Species" section, if a tank were dry for several years and isolated from other salamander populations, insufficient terrestrial salamanders may remain and immigration from other populations may be inadequate to recolonize a tank. In any case, drying of a tank and loss of

any salamanders may reduce the number of breeding individuals and further reduce genetic heterogeneity, which is very low in this subspecies. Further reduction of genetic diversity increases the chance of local extirpations, as described in "Summary of Factors Affecting the Species" section. The Service acknowledges, and discussions herein have been modified, to recognize that drying of tanks can control some nonnative predators, particularly fish.

*Comment:* One commenter recommended not listing *Spiranthes* because endangered status will increase the demand for specimens and result in increased collecting pressure.

*Service Response:* The Service acknowledges that listing could potentially increase demand for specimens; however, the Service believes that the benefits of listing *Spiranthes* outweigh any additional potential collecting pressures that listing may create.

*Comment:* One commenter stated that the three species have coexisted with cattle grazing for over 300 years, and historical grazing intensity was much greater than it is today. As a result, cattle grazing cannot be a threat. Another commenter stated that studies have shown salamander populations decline when grazing is halted.

*Service Response:* The Service acknowledges that these species have coexisted with cattle grazing for up to 300 years. At times in the past and in certain areas, stocking levels were much greater than today (Hadley and Sheridan 1995). However, we disagree that this long coexistence is evidence that cattle grazing has no adverse effects and does not threaten these species. As discussed in the "Summary of Factors Affecting the Species," the effects of improper cattle grazing practices on these species are many, and depending on the species and the circumstances, may have varying impacts on the three species. The Service is unaware of any studies that found salamander populations declined when grazing was halted. With the exception of the population at Fort Huachuca, the entire range of the salamander has been grazed by cattle for many years.

*Comment:* One commenter suggested that declining salamander populations may be attributable to predation by various birds and mammals rather than factors indicated in the proposed rule.

*Service Response:* Predation by coyotes, bobcats (Webb and Roueche 1971), badgers (Long 1964), raccoons, gulls, and wading birds (Degenhardt *et al.* 1996) has been documented for other subspecies of tiger salamander, and

predation by a variety of birds and mammals likely contributes to mortality of Sonora tiger salamanders. However, population declines and extirpations of this subspecies have not been attributed to bird and mammal predation; the most apparent and direct causes are predation by nonnative fish and mortality due to disease (Collins and Jones 1987, Collins 1996).

*Comment:* The species are not adversely affected by threats because they are capable of moving to other locations.

*Service Response:* All three species have limited distributions and are found only in rare wetland habitats with very specific characteristics. For instance, aquatic populations of the Sonora tiger salamander only occur in stock tanks and impounded cienegas in the San Rafael Valley and adjacent areas where nonnative predators are rare or absent and other subspecies of salamander are absent. The salamander possesses limited mobility and may not be able to move outside of its current range due to competition and/or interbreeding with other subspecies or for other reasons.

*Spiranthes* has an extremely limited distribution that may be the result of a unique evolutionary history in the San Rafael Valley as discussed previously in this rule. There are few sites remaining that may be capable of supporting a population, were the species able to colonize them.

The ability of *Lilaeopsis* to colonize new areas within an aquatic system is dependent on the availability of habitat and the existence of refugia within that system. This has been discussed previously in this final rule. None of these three species are able to move to other locations when threats occur. The species cannot move elsewhere because there are few, if any, suitable habitats to which they can move with limited mobility.

*Comment:* One commenter stated that it made no sense to reestablish *Lilaeopsis* in the San Pedro River as that habitat is subject to scouring and flooding and would not be an appropriate habitat.

*Service Response:* Various microsites providing refugia for *Lilaeopsis* along the San Pedro River have enabled this plant to reestablish itself within the main channel in areas providing appropriate habitat.

The experts referenced in the proposed rule are reputable biologists with an extensive knowledge of *Spiranthes*. The extent of their qualifications as fire ecologists is unknown to the Service; however, as these experts (McClaren, Sundt, Gori, and Fishbein) are taxonomists and

ecologists with recognition in their fields, the Service sees no reason to question their expertise because data on the effects of fire is inconclusive at this time.

*Comment:* One commenter stated that consumptive water use by sand and gravel operations was inadequately evaluated. The commenter stated that the Service has no substantive evidence that sand and gravel mining and processing could cause *Spiranthes* or *Lilaeopsis* habitat or population losses either upstream or downstream of a mining operation. The commenter further added that the Service failed to provide information on how sand and gravel mining at the Babacomari Ranch could affect at least one *Spiranthes* population.

*Service Response:* Mining of sand and gravel within riparian systems can destabilize stream banks and channels, resulting in loss of riparian vegetation and increased stream sediment loads. The Service has described herein the pumping of groundwater to process mined materials near the Babacomari River as a potential threat to one *Spiranthes* site. This groundwater pumping, combined with an expanding cone of depression in the aquifer at Sierra Vista and Fort Huachuca, could dewater portions of the Babacomari River, and the *Spiranthes* population located near the river could be lost with the elimination of surface water.

*Comment:* One commenter stated that the San Pedro River would not be suitable habitat for the species because it is a dynamic system, and thus would not provide habitat for successful reestablishment.

*Service Response:* The San Pedro River is outside of the range of the Sonora tiger salamander and *Spiranthes*. The Service does not consider the San Pedro River as recovery habitat for either of these species. While the San Pedro River is a dynamic system, *Lilaeopsis* has been able to remain established within the system because of refugia sites that have not yet undergone massive scouring or loss of perennial waters. An opportunistic species *Lilaeopsis*, has been able to recolonize some of the disturbed habitats resulting from the dynamic nature of the system. The San Pedro River is an important recovery habitat for *Lilaeopsis*.

Issue 6: The three species should be listed as threatened rather than endangered.

*Comment:* One commenter stated that the three species should be listed as threatened rather than endangered because threats are localized and some populations are secure. Another

commenter stated that the proposed rule should be withdrawn because there is no biological evidence that the species meet the statutory definition of endangered species. The best available scientific information does not support the contention that they are endangered throughout a significant portion of their range.

*Service Response:* An endangered species is one that is in danger of extinction throughout all or a significant portion its range (50 CFR 424.02(e)). A threatened species is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (50 CFR 424.02(m)). The three species listed here are endangered because of widespread and serious threats that are thoroughly discussed in the "Summary of Factors Affecting the Species" section of this rule.

Issue 7: The Service failed to follow Federal or other regulations in regard to the listing of these species.

*Comment:* The proposed rule is void because this final rule was not published within 12 months of receipt of the listing petitions.

*Service Response:* The Service published a proposed rule to list these species on April 3, 1995. In accordance with 50 CFR 424.17, the Service is required to publish a final determination, withdrawal, or extension within 1 year of the date of the proposed rule. In this case, the final rule was published well over a year after the proposed rule; however, this was due in part to legislation preventing the Service from issuing final rules from April 10, 1995, to October 1, 1995; a near cessation of listing actions from October 1, 1995, to April 26, 1996, due to budget limitations. The Service disagrees that this invalidates this final rule.

*Comment:* One commenter stated that the Service did not provide adequate time for the public to comment on the proposed rule. The Service violated the Act and the Administrative Procedure Act (APA) by not providing the public with sufficient opportunity to comment. The Service also violated both Acts by denying public access to materials upon which the proposed rule was based. One commenter stated that the first public hearing was held in a small town located in a different county, and far away from the major population area impacted by the proposed listing—a transparent attempt to prevent public awareness in the City of Sierra Vista.

*Service Response:* The Service is required to allow 60 days for public comment on proposed rules (50 CFR 424.16(c)(2)). Three comment periods were provided on the proposed rule,

including a 60-day period from April 3 to June 2, 1995; 30 days from June 24 to July 24, 1995; and 45 days from September 11 to October 27, 1995; a total of 135 days.

The Service is required to hold at least one public hearing if any person so requests within 45 days of publication of a proposed rule (50 CFR 424.16(c)(3)). The Service received two requests for a public hearing within the 45 day request period. In response, a public hearing was held in Patagonia, the closest town with facilities for a hearing to the residents requesting the hearing and only 36 highway miles from Sierra Vista. Additional requests for a public hearing in Sierra Vista were received more than 45 days after publication of the proposed rule. The Service granted those requests and held a second public hearing in Sierra Vista.

In response to requests from the public, and in accordance with the Act and its implementing regulations, the Freedom of Information Act, and the APA, the Service provided copies of documents to several members of the public and loaned the administrative record to the City of Sierra Vista for copying. Some requests for information were not promptly addressed because they were contained within comment letters on the proposed rule. In accordance with Service guidance on implementation of Public Law 104-06 that halted work on final rules, comment letters were filed and not read; thus granting of some information requests were delayed. However, the Service did not deny any information requests, with the exception of information withheld in accordance with exemptions to disclosure under the Freedom of Information Act.

*Comment:* One commenter stated that people without proper biological training influenced the listing process, and thus the process is flawed.

*Service Response:* The Service is required to consider all comments and information received regardless of the extent of any biological training of the people submitting them. The Service recognizes that non-biologists may have valid comments or information that may contribute to a final determination. However, the Service's decision to list these species were based only on the best scientific and commercial information available, in accordance with 50 CFR 424.11(b).

*Comment:* Several commenters stated that the Service failed to comply with its own regulations governing public notification of hearings on the proposed rule. Other commenters believed more public hearings were necessary and that public meetings on the proposed rule

should be held in all areas potentially affected. Hearing times and locations were inconvenient and not conducive to public participation.

*Service Response:* In regard to public notification of public hearings, 50 CFR 424(c)(3) and provisions of the APA require the Service to publish a notice in the Federal Register not less than 15 days before the hearing is held. Notices announcing a public hearing were published in the Federal Register 21 days before the July 13, 1995, hearing in Patagonia (June 22, 1995) and 15 days before the September 27, 1995, public hearing in Sierra Vista (September 12, 1995). The Service's Listing Handbook, which is internal agency guidance, requires that notifications of public hearings be published in major and local newspapers within 20 days of the hearing. This requirement was met; publication dates and newspapers where notices were published are listed in "Summary of Comments and Recommendations" section. Hearings were held in the evenings during the week, when most people are not working and can attend. The hearing locations were in Patagonia and Sierra Vista, which are major population centers near the center of the distribution of these species, and near the homes of citizens requesting hearings.

*Comment:* Commenters stated that the Service, in violation of its own regulations, failed to give notice to and consult with local authorities in the Republic of Mexico, on development of the proposed rule and failed to notify Mexico of publication of the proposed rule.

*Service Response:* A letter notifying the Director General, Direccion General de Vida Silvestre, Mexico City, Mexico of this final determination, along with a copy of the proposed rule (60 FR 16836) was sent to for review and comment. As of December 9, 1996, no comments were received from the Mexican government.

*Comment:* Listing of the three species would constitute a violation of the National Environmental Policy Act of 1969 (NEPA), because the Service did not analyze the economic impacts of the action. Because the Service did not provide adequate notice and opportunity to the public to comment on the proposed rule, the Service must complete an NEPA analysis to guard against an arbitrary and capricious decision. An environmental assessment or impact statement should be completed prior to listing.

*Service Response:* As discussed in the "National Environmental Policy Act" section in this rule, the Service has determined that neither environmental



assessments nor environmental impact statements need to be prepared for proposed or final listing actions.

*Comment:* The Act is expired and thus these species should not be listed.

*Service Response:* No laws or regulations limit the duration of the Act's provisions. Section 15(a) of the Act authorizes appropriations for implementation only through fiscal year 1992, but Congress has appropriated funds in each fiscal year since 1992 to fund activities such as this final rule.

*Comment:* De facto division of species into separate populations at the international border is unsupported by either biology or the Act, and runs counter to the 1984 Agreement of Cooperation of Wildlife between Mexico and the Service.

*Service Response:* The Service has not attempted to split species into separate populations with the international boundary as a dividing line. Each species or subspecies is being listed throughout its range. The term "population" is used in this rule only as a term of convenience when referring to a particular part of a taxon's range.

*Comment:* One commenter stated that the notice was irretrievably flawed on a legal and technical basis by its use of an obsolete address to which comments and requests for public hearings on the proposed rule were to be sent. Additionally, this commenter stated that comments and materials received were not available for public inspection at the old address; therefore, the Service must, by law, withdraw the proposed rule.

*Service Response:* Between the time the proposed rule was prepared and its publication, the Service moved its office location within Phoenix, Arizona. The proposed rule listed the old address and facsimile number and the correct telephone number. The Service received some comment letters mailed to the old address, indicating that the Post Office was forwarding the mail. A recorded phone message at the old phone number also informed callers of the new number in the event the old office was contacted. The Service is unaware of any comment letters, requests for hearings, or requests to inspect records that were returned to the sender, or telephone callers that were not informed of our new number. In Federal Register notices announcing subsequent comment periods, from June 24 to July 25, 1995, and September 12 to October 27, 1995, the correct address and phone numbers were published. The Service thus believes the public was provided adequate opportunity to provide comment on the proposed rule and inspect supporting information.

*Comment:* One commenter believed the Service violated Section 4(b)(1)(A) of the Act. This commenter stated that we misrepresented the known requirements of the salamander, therefore, violating the Act. This commenter said our discussion of the threats of rural and urban development, road building, chaining, agriculture, mining, and other watershed degrading activities to *Lilaeopsis* was speculation and a violation of the Act.

*Service Response:* Habitat and other requirements of the Sonora tiger salamander presented here and in the proposed rule were based on the best scientific and commercial information available.

*Comment:* One commenter questioned whether persons conducting studies on these species had landowner permission to access sites. This commenter also questioned whether landowners had been given information on what work was being done and the reasons behind the research.

*Service Response:* Surveys and studies on these species were conducted by many individuals over many years. The Service used the results from those studies, but the Service has no control over the conduct of independent researchers, and thus we cannot answer this question definitively. Nearly all survey work for these species conducted by Service personnel has focused on Federal lands. The few surveys conducted by the Service on private lands were with the permission of the landowner.

*Comment:* One commenter stated that the listing of these three species would violate State water law.

*Service Response:* The listing of these species does not restrict groundwater pumping or water diversions, or usurp water rights, or violate State water law.

Issue 8: The Sonora tiger salamander is a hybrid organism and all three species are recent introductions to the San Rafael Valley, and as such should not be considered for listing.

*Comment:* The species are not native but were introduced within the last 300 years. One commenter stated the salamander was introduced into the San Rafael Valley earlier in this century and that there is no verifiable evidence that it ever occurred in any significance in cienegas. Stock tanks are the natural habitat of the salamander. One commenter stated that the Sonora tiger salamander was introduced for use as fish bait.

*Service Response:* All evidence suggests the species have occurred within their present ranges for much longer than 300 years. Fossil *Ambystoma* found in the Canelo Hills

date from at least 31,000 years ago (Jones *et al.* 1995). Additional *Ambystoma tigrinum* fossils dating from the late Pliocene, more than 2 million years ago, have been found in the San Pedro River Valley, east of the Huachuca Mountains (Brattstrom 1955). Hybridization is an important evolutionary process from which new taxa can arise (Harlan 1983, review in Jones *et al.* 1995). The Sonora tiger salamander likely resulted from a hybridization between the subspecies *navortium* and *nebulosum*. The latter no longer occurs in southeastern Arizona; its range has shifted to the north, an event that likely occurred during climatic and vegetational shifts during the Pleistocene (Jones *et al.* 1995). The absence of this ancestral subspecies in southeastern Arizona is further evidence that the Sonora tiger salamander originated long before historical times. Because stock tanks are a recent phenomenon, Sonora tiger salamanders must have occupied other habitats at one time. Throughout its range, *Ambystoma tigrinum* breeds in various types of wetlands, including ponds, lakes, slow streams, and backwaters (Bishop 1943). Habitats such as these were present in the San Rafael Valley during presettlement times in the form of cienegas and streams. Although no Sonora tiger salamanders have been collected from cienegas or streams (with the possible exception of the specimen from Los Fresnos, Sonora), these wetlands are the most likely presettlement breeding habitats of the salamander.

There is no evidence that supports the commenter's claim that *Lilaeopsis* and *Spiranthes* are recent introductions by humans into the San Rafael Valley. *Lilaeopsis* has been noted from sites within the Santa Cruz, San Pedro, Rio Yaqui, and Rio Sonora watersheds. *Lilaeopsis* was first described based on a specimen collected near Tucson in 1881 (Hill 1926). There is no indication that this inconspicuous plant was introduced by humans. *Spiranthes* was not discovered until 1968; however, evidence suggests this species has a unique evolutionary history associated with the San Rafael Valley and may have arose through hybridization between *Spiranthes vernalis* (a species of the southern Great Plains) and either *Spiranthes porrifolia* (a California-Northern Cordilleran species) or *Spiranthes romanzoffiana* (a species of high elevations in northern Arizona, the southern Rockies, and Pleistocene relict habitats in the Pinalenos (Sheviak 1990, Jones *et al.* 1995; Charles Sheviak, *in litt.* 1995)).

Issue 9: Experts on *Lilaeopsis* and the Sonora tiger salamander believe these species do not warrant listing.

*Comment:* Several commenters stated that experts on the Sonora tiger salamander (Dr. James Collins) and *Lilaeopsis* (Dr. Peter Warren) do not believe these species should be listed. Mexico also disagrees with the proposed endangered status. This expert testimony should convince the Service not to list these species, or the Service should publish a notice in the Federal Register extending the listing process to resolve differences among experts in regard to the status of these species.

*Service Response:* The Service discussed the listing of the salamander with Dr. Collins in October, 1996, and asked him to clarify his position. Dr. Collins has found that the status of the salamander has been stable from the mid 1980's to the present, based on numbers of occupied breeding sites. However, he believed that continued spread of nonnative predators, presence of a reoccurring, lethal disease, and other factors warrant concern and that some conservation measures are needed.

The Service has discussed the statements attributed to Dr. Warren with him. Dr. Warren has worked towards developing and implementing conservation measures in order to provide for the recovery of *Lilaeopsis* or possibly preclude its listing. As a staff member of The Nature Conservancy (TNC), neither Dr. Warren nor TNC has taken an official stand in support or opposition to the listing of *Lilaeopsis* (Peter Warren, Arizona Nature Conservancy, pers. comm. 1996).

The Mexican government has not taken or expressed an official position regarding listings of these three species. As stated previously, the Service has not received comments from Mexico. Mexico considers the tiger salamander, *Ambystoma tigrinum*, a species of special protection.

Issue 10: Current actions of the City of Sierra Vista and Fort Huachuca do not affect the species, and planned actions are not expected to affect the salamander or *Spiranthes*. Habitat of *Lilaeopsis* would not be affected for several decades.

*Comment:* The Director of Public Works for the City of Sierra Vista requested that the following information be included in the Federal Register to correct the proposed rule—“(1) Groundwater use by Sierra Vista and Fort Huachuca currently is not endangering any habitat critical to the survival of the umbel, lily, salamander, or any other listed or proposed species; is not expected to ever affect any habitat critical to the survival of the lily or the

salamander; and is not expected to affect any habitat critical to the survival of the umbel for several decades; (2) Sierra Vista has determined that recharging the City's sewage effluent can protect the San Pedro River from adverse effects caused by groundwater pumping to support expected growth of the City and Fort Huachuca for at least 100 years, and probably much longer; (3) Sierra Vista is actively pursuing projects to recharge its sewage effluent and increase floodwater recharge. Fort Huachuca also is actively working to recharge effluent and increase floodwater recharge. Both the City and Fort Huachuca are making real efforts to protect the San Pedro River riparian habitat and the species that live there; and (4) the growth and development of Sierra Vista, including Fort Huachuca, does not pose any immediate threat to any critical habitat or endangered species currently under consideration, and it is anticipated that action will be taken by both entities to eliminate any such threat before it occurs.”

*Service Response:* Information in the “Summary of Factors Affecting the Species Section” has been revised based on new information in regard to the effects of groundwater pumping in and near Sierra Vista, and efforts by Sierra Vista and Fort Huachuca to conserve water, recharge effluent, and implement other measures to reduce the potential effects of their activities on the San Pedro River and habitat of *Lilaeopsis*.

The Service has determined that designation of critical habitat for these three species is not prudent. For discussion relating to critical habitat (Item 1), see the “Critical Habitat” section of this rule. The Service concurs with item 3, but cannot concur with portions of items 2 and 4. In regard to item 2, ASL (1995) found that if effluent is recharged adjacent to the San Pedro River or at the Sierra Vista wastewater treatment plan, flows would be maintained or increased on the San Pedro River from Lewis Springs to Charleston Bridge (downslope and downstream of the recharge areas, respectively) for at least 100 years. However, in all scenarios modeled by ASL, river flow declined between Palominas and Lewis Spring. Furthermore, the model assumed that water demands outside of Sierra Vista are held at 1995 levels, which is highly unlikely. With increasing water demands throughout the subwatershed, river flows between Palominas and Lewis Spring will decline more than indicated by ASL's results, and flows between Lewis Spring and Charleston Bridge also may decline under any recharge scenario. Effective mitigation

of the effects of groundwater pumping on San Pedro River flows depends on development and implementation of the effluent recharge program as outlined in ASL (1995) for at least 100 years. ASL (1995) notes that questions remain before the feasibility of long-term recharge can be assessed. Also, we are unaware of any long-term funding commitments to operate such a program. Finally, the cone of depression under Sierra Vista/Fort Huachuca continues to grow in all scenarios. The Service is concerned that as it grows, the cone will in time (perhaps more than 100 years) capture the effluent recharge and then the river itself, unless water recharge is balanced with use. With regard to item 4, and as discussed in the “Summary of Factors Affecting the Species” section growth and development at Sierra Vista and Fort Huachuca, particularly groundwater pumping, but other activities as well, potentially threaten *Lilaeopsis*. In addition, activities at Fort Huachuca could potentially affect Sonora tiger salamander and *Lilaeopsis* populations on the Fort. As of this writing, the Service is in informal conferencing with Fort Huachuca with regard to implementation of their Master Plan and possible effects to *Lilaeopsis* and the salamander. The Service's opinion on the Master Plan will be based on the effects of current and planned activities at Fort Huachuca on *Lilaeopsis*, the salamander, and other listed species.

#### Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that *Spiranthes delitescens*, *Lilaeopsis schaffneriana* spp. *recurva*, and the Sonora tiger salamander should be classified as endangered species. Procedures found at section 4(a)(1) of the Act and regulations implementing the listing provisions of the Act (50 CFR Part 424) were followed. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to *Spiranthes delitescens* Sheviak (Canelo Hills ladies'-tresses), *Lilaeopsis schaffneriana* spp. *recurva* (A.W. Hill) Affolter (Huachuca water umbel), and the Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) are as follows:

#### A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Human activities have affected southwestern riparian systems over a

period of several thousand years. From prehistoric times, settlements in southern Arizona centered on oasis-like cienegas, streams, and rivers. Prior to the early 1800's, indigenous peoples and missionaries used southern Arizona cienegas and riparian areas mostly for subsistence purposes, including wood-cutting, agriculture (including livestock grazing), and food and fiber harvesting. In the early 1800's, fur trappers nearly eliminated beaver from southern Arizona streams and rivers (Davis 1986), significantly changing stream morphology. In addition, human-caused fire and trails may have significantly altered riparian systems (Bahre 1991, Dobyns 1981). Hadley and Sheridan (1995) suggest that use of fire by native Americans may have helped maintain grassland communities in the San Rafael Valley, a practice which undoubtedly affected riparian and cienega habitats, as well.

European settlement of southern Arizona and northern Sonora probably did not begin to significantly affect natural communities until the late 1600's or early 1700's when cattle were introduced (Hadley and Sheridan 1995). However, resistance by Apaches and other tribes discouraged settlement until the early to mid-1800's, after which human populations and associated livestock production and agriculture increased significantly. By the late 1800's, many southern Arizona watersheds were in poor condition due to uncontrolled livestock grazing, mining, hay harvesting, timber harvesting, and other management practices, such as fire suppression (Martin 1975, Bahre 1991, Humphrey 1958, Hadley and Sheridan 1995).

Watershed degradation caused by these management practices led to widespread erosion and channel entrenchment when above-average precipitation and flooding occurred in the late 1800's (Bahre 1991, Bryan 1925, Dobyns 1981, Hastings and Turner 1980, Hendrickson and Minckley 1984, Martin 1975, Sheridan 1986, Webb and Betancourt 1992). These events contributed to long-term or permanent degradation and loss of cienega and riparian habitat throughout southern Arizona and northern Mexico. Physical evidence of losses and changes in cienegas and other riparian areas can be found in the black organic soils of cut banks in the San Rafael Valley (Hendrickson and Minckley 1984), San Pedro River (Hereford 1992), Black Draw (Sue Rutman, Organ Pipe National Monument, pers. comm. 1992), and elsewhere. Between the 1860's and mid-1890's, the lush grasslands and cienegas of San Rafael Valley disappeared or

became highly localized (Hadley and Sheridan 1995). Although these events took place nearly a century ago, the ecosystem has not yet fully recovered and, in some areas, may never recover.

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

The largest area currently available for recovery of *Lilaeopsis* is the San Pedro River along the perennial reach from Hereford to about 4 miles north of Charleston. Whether or not the species can recover there depends largely on future perennial surface flows in the river and a natural, unregulated hydrograph. Perennial flow in the upper San Pedro River is derived from precipitation runoff and interflow through the unsaturated soil horizon, and baseflow in the form of groundwater flow from deep regional aquifers and a shallower floodplain aquifer (Arizona Department of Water Resources 1991, Arizona Department of Water Resources 1994, ASL 1994, Jackson *et al.* 1987, Vionnet and Maddock 1992).

Groundwater pumping has increased dramatically since the early 1960's (ASL 1994). Annual water use exceeds supplies by approximately 11,200 acre-feet and has resulted in cones of depression in the aquifer at areas with significant groundwater pumping. These areas include Sierra Vista and Fort Huachuca, Huachuca City, and the Hereford-Palominas areas (Water and Environmental Systems Technology, Inc. 1994). Although the relationships between groundwater pumping and river flow are complicated, continued unmitigated groundwater withdrawal threatens to reduce or eliminate baseflows in the San Pedro River (Arizona Department of Water Resources 1991, ASL 1995, Water and Environmental Systems Technology, Inc. 1994). A reduction in baseflow as a result of groundwater pumping in the Sierra Vista-Fort Huachuca area could occur within 25 years, but such effects could be reduced by water conservation, watershed management, effluent recharge or other measures to reduce water use or increase recharge (ASL

1995, Water and Environmental Systems Technology, Inc. 1994).

Such measures are being developed and implemented, including development of a Surface Water Plan and Effluent Recharge Plan, and adoption of water conservation measures by the City of Sierra Vista; and implementation of water conservation measures, enhancement of mountain front recharge, effluent recharge, and other actions by Fort Huachuca (ASL 1995, Fort Huachuca 1995). However, these measures may not be adequate to balance use with recharge, halt the eventual interception of the river by cones of depression, and ultimately, maintain baseflow throughout the upper San Pedro River (Water and Environmental Systems Technology, Inc. 1994, ASL 1995). If baseflow in the river decreases, a desertification of the riparian flora will occur (Stromberg *et al.* 1996). If the groundwater drops below the elevation of the channel bed, the wetland plant (herb) association where *Lilaeopsis* is found will be the first plant association to be lost (Arizona Department of Water Resources 1994, Stromberg *et al.* 1996).

Fort Huachuca also relies on a well and springs in Garden Canyon (Arizona Department of Water Resources 1991). These diversions and pumping could dewater the stream and damage or destroy the *Lilaeopsis* population in the canyon, particularly during below-average rainfall periods. The City of Sierra Vista is exploring means for implementing conservation and habitat restoration actions for *Lilaeopsis* and other rare plants.

Perennial flows in certain reaches of the Santa Cruz River remained perennial until groundwater pumping caused the water table to drop below the streambed. In 1908, the water table near Tucson was above the streambed, but from 1940-1969, the water table was 6.0-21.0 m (20-70 feet) below the streambed (De la Torre 1970). Recovery of perennial flow in the Santa Cruz River and of *Lilaeopsis* near Tucson is unlikely, given the importance of groundwater for the metropolitan area.

Groundwater pumping in Mexico threatens populations of *Lilaeopsis* on both sides of the border. South of the San Bernardino National Wildlife Refuge, groundwater is being pumped to irrigate farmlands in Mexico, and this pumping threatens to dry up the springs and streams that support several listed endangered fish and a population of *Lilaeopsis*. The large copper mine at Cananea, Sonora, pumps groundwater for processing and support services. Although little is known about how groundwater pumping near Cananea

may affect the spring at Ojo de Agua de Cananea, it is likely that overdrafts would decrease springflow or dewater the spring, extirpating the *Lilaeopsis* population. The spring at Ojo de Agua de Cananea is also the main source of municipal water for the town of Cananea. This water diversion, particularly if increased, may adversely affect *Lilaeopsis*. In the past, large contaminant spills from the mine have occurred, resulting in fish kills for many miles of the San Pedro River in Mexico and the United States. The effects of such spills on *Lilaeopsis* are unknown, but could be detrimental.

Reaches of many southern Arizona rivers and streams have been channelized for flood control purposes, which disrupts natural channel dynamics and promotes the loss of riparian plant communities. Channelization modifies the natural hydrograph above and below the channelized reach, which may adversely affect *Lilaeopsis* and *Spiranthes*. Channelization will continue to contribute to riparian habitat decline. Additional channelization will accelerate the loss and/or degradation of *Spiranthes* and *Lilaeopsis* habitat. Dredging extirpated *Lilaeopsis* at House Pond, near the extant population in Black Draw (Warren *et al.* 1991). The *Lilaeopsis* population at Zinn Pond in St. David near the San Pedro River was probably lost when the pond was dredged and deepened. This population was last documented in 1953 (Warren *et al.* 1991).

Livestock grazing potentially affects *Lilaeopsis* at the ecosystem, community, population, and individual levels. Cattle generally do not eat *Lilaeopsis* because the leaves are too close to the ground, but they can trample plants. *Lilaeopsis* is capable of rapidly expanding in disturbed sites and could recover quickly from light trampling by extending undisturbed rhizomes (Warren *et al.* 1991). Light trampling also may keep other plant density low, providing favorable *Lilaeopsis* microsites. Well-managed livestock grazing and *Lilaeopsis* are compatible. The fact that *Lilaeopsis* and its habitat occur in the upper Santa Cruz and San Pedro river systems in the San Rafael Valley attests to the good land stewardship of past and current landowners.

Poor livestock grazing management can destabilize stream channels and disturb cienega soils, creating conditions unfavorable to *Lilaeopsis*, which requires stable stream channels and cienegas. Such management can also change riparian structure and

diversity, causing a decline in watershed condition. Poor livestock grazing management is widely believed to be one of the most significant factors contributing to regional channel entrenchment in the late 1800's.

Livestock management in Mexico has severely degraded riparian areas along Black Draw and its watershed. The degraded habitat most likely contributed to the severity of a destructive scouring flood on San Bernardino Creek in 1988, which extirpated two patches of *Lilaeopsis*. Overgrazing is occurring immediately adjacent to the San Bernardino National Wildlife Refuge and has destabilized the channel of Black Draw. A headcut moving upstream threatens to undermine the riparian area recovery that has occurred since the refuge was acquired. The refuge is implementing management to avoid the destructive effects of downstream grazing.

Sand and gravel mining along the San Pedro, Babacomari, and Santa Cruz rivers in the United States has occurred and probably will continue, although no mining occurs within the San Pedro Riparian National Conservation Area. Sand and gravel operations remove riparian vegetation and destabilize the system, which could cause *Spiranthes* or *Lilaeopsis* population and habitat losses upstream or downstream from the mining. These mines also pump groundwater for processing purposes, and could locally affect groundwater reserves and perennial stream baseflow. Since 1983, groundwater has been used to wash sand and gravel mined near the Babacomari River, 0.8 km (0.5 mi) west of Highway 90 (Arizona Department of Water Resources 1991). This activity could affect at least one *Spiranthes* population.

Rural and urban development, road building and maintenance, agriculture, mining, and other land disturbances that degrade watersheds can adversely affect *Lilaeopsis*. These activities are common in the middle Santa Cruz basin but much less prevalent in the San Pedro basin. For these reasons, conservation and recovery of the middle Santa Cruz River is unlikely but still possible in the upper San Pedro watershed, given region-wide planning decisions favorable to good watershed management. Increased development in the upper San Pedro Valley, including the expansion of existing cities and increased rural building, will likely increase erosion and have other detrimental watershed effects.

Watershed-level disturbances are few in the upper Santa Cruz and Black Draw drainages. Irrigated farm fields were present in the Black Draw watershed,

but these were abandoned when the Service acquired the area as a refuge. The fields are returning to natural vegetation. The San Rafael Valley, which contains portions of the headwaters of the Santa Cruz and San Pedro rivers, is well-managed, and currently undeveloped, with few watershed-disturbing activities. However, there is potential for commercial development in the San Rafael Valley and resulting watershed effects.

Riparian areas and cienegas offer oasis-like living and recreational opportunities for residents of southern Arizona and northern Sonora. Riparian areas and cienegas such as Sonoita Creek, the San Pedro River, Canelo Hills cienega, and the perennial creeks of the Huachuca Mountains receive substantial recreational visitation, and this is expected to increase with an increasing southern Arizona population. While well-managed recreational activity is unlikely to extirpate *Spiranthes* or *Lilaeopsis* populations, severe impacts in unmanaged areas can compact soils, destabilize stream banks, and decrease riparian plant density, including densities of *Spiranthes* and *Lilaeopsis*.

Stream headcutting threatens the *Lilaeopsis* and presumed Sonora tiger salamander populations at Los Fresnos cienega in Sonora. Erosion is occurring in Arroyo Los Fresnos downstream from the cienega and the headcut is moving upstream. The causes of this erosion are uncertain, but are presumably livestock grazing and roads in this sparsely populated region. If the causes of this erosion are left unchecked and headcutting continues, it is likely that the cienega habitat will be lost within the foreseeable future. The loss of Los Fresnos cienega may extirpate the *Lilaeopsis* and tiger salamander populations. If the salamanders at the Los Fresnos cienega are Sonora tiger salamanders, this would represent the only known natural cienega habitat occupied by an aquatic population of this species.

All confirmed Sonora tiger salamander populations have been found in stock tanks or impounded cienegas constructed to collect runoff for livestock. Many tanks probably date from the 1920's and 1930's when government subsidies were available to offset construction costs (Brown 1985); however, some tanks were constructed as early as the 1820's and as late as the 1960's (Hadley and Sheridan 1995). These stock tanks, to some degree, have created and replaced permanent or semipermanent Sonora tiger salamander water sources.

Although the tanks provide suitable aquatic habitats, current management and the dynamic nature of these artificial impoundments compromise their ability to support salamander populations in the long term. The tanks collect silt from upstream drainages and must be cleaned out periodically, typically with heavy equipment. This maintenance is done when stock tanks are dry or nearly dry, at an average interval of about 15 years (Laura Dupee, Coronado National Forest, pers. comm. 1993). As the tanks dry out, a proportion of aquatic salamanders typically metamorphose and migrate from the pond. However, if water is present during maintenance, eggs, branchiate, and larval salamanders may be present and would be lost as a result of the excavation of remaining aquatic habitat. Aquatic salamanders also may occur in the mud of dry or nearly dry tanks and would be affected. Any terrestrial metamorphs at the tank or in areas disturbed would be lost during maintenance activities.

Flooding and drought pose additional threats to stock tank populations of Sonora tiger salamanders. The tanks are simple earthen impoundments without water control structures. Flooding could erode and breach downstream berms or deposit silt, resulting in a loss of aquatic habitat. Long-term drought could dry up stock tanks, as witnessed in 1994 and 1996. Fires in watersheds above the tanks may lead to increased erosion and sedimentation following storms and exacerbate the effects of flooding.

Sonora tiger salamanders have persisted in stock tanks despite periodic maintenance, flooding, and drought. If the tanks refill soon after drought or other events that result in loss of aquatic habitat, they could presumably be recolonized through terrestrial metamorph reproduction. However, if a tank was dry for several years and isolated from other salamander localities, insufficient terrestrial salamanders may remain and immigration from other populations may be inadequate to recolonize the stock tank. Potential grazing practice changes also threaten aquatic Sonora tiger salamander populations. Stock tanks could be abandoned or replaced by other watering facilities, such as troughs supplied by windmills or pipelines. Troughs do not provide habitat for Sonora tiger salamanders.

#### *B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

No commercial, recreational, or educational uses of *Lilaeopsis* are known. A limited amount of scientific

collecting is likely to occur but is expected to pose no threat to the species.

Although no specific cases of illegal commercial *Spiranthes delitescens* collecting have been documented, commercial dealers, hobbyists, and other collectors are widely known to significantly threaten natural orchid populations. The commercial value of an orchid already threatened by illegal commercial collection may increase after it is listed as threatened or endangered. To limit the possible adverse effects of illegal collecting, no specific *Spiranthes* population locations are discussed in this rule, nor will critical habitat be designated. No recreational or educational uses for *Spiranthes* currently are known. The small amount of legitimate scientific collecting that has occurred was regulated by the Arizona Native Plant Law (A.R.S. Chapter 7, Article 1).

Collecting of *Ambystoma* in the San Rafael Valley of Arizona is prohibited by Arizona Game and Fish Commission Order 41. Collins and Jones (1987) reported an illegal *Ambystoma* collection from the San Rafael Valley and suspected that bait collectors and anglers often move salamanders among stock tanks. The extent of this activity and its threat to populations is unknown. However, all Sonora tiger salamanders populations are relatively small (Collins and Jones 1987, Collins 1996). Collecting may significantly reduce recruitment, the size of branchiate or larval populations, and genetic diversity within a tank. This may increase the likelihood of extirpations.

#### *C. Disease or Predation*

Neither the *Lilaeopsis* nor *Spiranthes* are known to be threatened by disease or predation.

Sonora tiger salamanders populations are eliminated by nonnative fish predation, particularly sunfish and catfish (Collins and Jones 1987, Collins 1996). In laboratory studies, bullhead, mosquito fish, and sunfish ate Sonora tiger salamander eggs, hatchlings, and small larvae (Collins 1996). Introduced nonnative fish are well-established in the San Rafael Valley and have been implicated in apparent Sonora tiger salamander extirpations from five stock tanks, including the type locality (Collins *et al.* 1988, Collins 1996). Nonnative fish are known to occur at only one of 23 sites where salamanders have been found during one or more of the last three visits from 1993 through 1996. However, nonnative fish occur at 7 of 10 sites where the salamander is thought to be extirpated or where it has

not been found during the last three visits. The effect of native fishes on salamander populations is unknown (Collins *et al.* 1988), some native species have a potential to prey on Sonora tiger salamanders. No native fish are known to occur with aquatic populations of salamanders.

Bullfrogs occur with Sonora tiger salamanders at 16 of 23 sites at which salamanders have been found during one or more of the last three visits from 1993 through 1996. Adult bullfrogs are known to prey on salamanders; however, bullfrog tadpoles do not eat viable salamander eggs or hatchlings (Collins 1996; James Collins, pers. comm. 1996). Bullfrogs were found to be more widely distributed in the San Rafael Valley in the 1990's as compared to 1985 (Collins 1996). The effect of predation by bullfrogs on salamander populations is unknown; however, increased mortality attributable to bullfrog predation may reduce population viability.

Virtually no recruitment was noted in recent surveys, as evidenced by a lack of surviving larvae in tanks where eggs were known to have been deposited (Collins 1996). Lack of recruitment appeared to be a result of predation by overwintering branchiate and larval salamanders. This predation may occur due to a lack of structural complexity, such as emergent and shoreline vegetation, logs, and rocks, that would provide cover and protection from predation (Collins 1996). Lack of shoreline and emergent vegetation is at least partially due to trampling and foraging by cattle.

A disease characterized by sloughing of skin and hemorrhaging killed all branchiate salamanders at Huachuca Tank, Parker Canyon Tank #1, and Inez Tank in 1985 (Collins *et al.* 1988) and has been detected at seven tanks in 1995–1996 (James Collins, pers. comm. 1996). The disease may be caused by a combination of a virus and *Aeromonas* (a bacteria) infections (James Collins, pers. comm. 1996). Parker Canyon Tank #1 and Inez Tank were recolonized by 1987, and salamanders were found once again at Huachuca Tank in 1994. These tanks were presumably recolonized by reproducing terrestrial metamorphs that survived the disease or that moved to these tanks from adjacent populations. At the seven tanks where the disease was found in 1995–1996, the effects on the populations will not be known until the disease runs its course. If the disease recurs with enough frequency, populations could be lost due to lack of recruitment of juveniles into the adult cohort. The disease also has the potential to reduce genetic variability,

which is already very low in this taxon (Jones *et al.* 1995). Low genetic variability increases the chances of population extirpation (Shafer 1990). Bullfrogs, wading birds, waterfowl, and other animals that move among tanks may facilitate spread of the disease.

#### D. The Inadequacy of Existing Regulatory Mechanisms

Federal and state laws and regulations can protect these three species and their habitat to some extent. However, Federal and state agency discretion allowed under the authority of these laws still permits adverse effects to listed and rare species. Adding *Lilaeopsis*, *Spiranthes*, and the Sonora tiger salamander to the endangered species list will help to reduce adverse effects to these species.

*Lilaeopsis* and *Spiranthes* are not classified as rare, threatened, or endangered species by the Mexican government; nor do their habitats receive special protection in Mexico. However, *Ambystoma tigrinum*, including the Sonora tiger salamander, is a species of special protection. This designation affords certain protections to the species and its habitat (Secretario de Desarrollo Urbano y Ecología 1994).

On July 1, 1975, all species in the Orchid family (including *Spiranthes delitescens*) were included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international treaty established to prevent international trade that may be detrimental to the survival of plants and animals. A CITES export permit must be issued by the exporting country before an Appendix II species may be shipped. CITES permits may not be issued if the export will be detrimental to the survival of the species or if the specimens were not legally acquired. However, CITES does not regulate take or domestic trade. CITES provides no protection to *Lilaeopsis* or the Sonora tiger salamander.

The Lacey Act (16 U.S.C. 3371 *et seq.*), as amended in 1982, provides limited protection for these three species. Under the Lacey Act it is prohibited to import, export, sell, receive, acquire, purchase, or engage in the interstate or foreign commerce of any species taken, possessed, or sold in violation of any law, treaty, or regulation of the United States, any Tribal law, or any law or regulation of any state. Interstate transport of protected species occurs despite the Lacey Act because enforcement is difficult.

The Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 1701 *et seq.*) and National Forest

Management Act of 1976 (16 U.S.C. 1600 *et seq.*) direct the Bureau of Land Management and the U.S. Forest Service respectively, to prepare programmatic-level management plans that will guide long-term resource management decisions. The goals of the Coronado National Forest Plan (Plan) include a commitment to maintain viable populations of all native wildlife, fish, and plant species within the Forest's jurisdiction through improved habitat management (Coronado National Forest 1986a). The Plan provides a list of rare plants and animals found on the Forest, but gives only a very general description of programmatic-level management guidelines and expected effort (Coronado National Forest 1986a). The Coronado National Forest is committed to multiple use and, where the demands of various interest groups conflict, the Forest must make decisions that represent compromises among these interests (Coronado National Forest 1986b) which could result in adverse effects to listed species.

The Plan's endangered species program includes participation in reaching recovery plan objectives for listed species, habitat coordination and surveys for listed species, and habitat improvement (Coronado National Forest 1986b). After acknowledging budget constraints, the Plan states that studies of endangered plants will occur at approximately the 1980 funding level.

Three populations of *Lilaeopsis* and four individual *Spiranthes* are known to occur on the Coronado National Forest. The Forest also manages the habitat of 17 of the 23 aquatic sites at which Sonora tiger salamanders have been observed during one or more of the last three visits during 1993 through 1996. Twenty-six of the 36 aquatic sites at which salamanders have been found are on Coronado National Forest land, underscoring the importance of Forest Service management. However, these numbers are somewhat misleading in that salamander surveys have focused on National Forest lands. Other aquatic sites likely occur on private lands, which to date have not been intensively surveyed. Nevertheless, the Coronado National Forest is the most important land manager of aquatic sites known to be occupied by Sonora tiger salamanders. The Forest considers the salamander a sensitive species and a management indicator species, which receive special consideration in land management decisions (Coronado National Forest 1986a). The ability of the Forest Service to manage the three species addressed here is limited because many of the populations do not occur on Forest Service lands and/or

require ecosystem-level management that in some cases is beyond Forest Service control.

In accordance with Army Regulation 200-3, Fort Huachuca is preparing an Integrated Natural Resources Management Plan that will require preparation of Endangered Species Management Plans (ESMPs) for all listed and proposed species and critical habitat (Sheridan Stone, Fort Huachuca, pers. comm. 1996). The ESMPs are expected to provide management recommendations for conservation of Sonora tiger salamander and *Lilaeopsis* populations and habitat at Fort Huachuca. An ESMP is being prepared for the Fort Huachuca Sonora tiger salamander population. Although salamanders are known from only a single site at Fort Huachuca, the ESMP is expected to have recommendations that could be extended to other populations.

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4370a) requires Federal agencies to consider the environmental impacts of their actions. NEPA requires Federal agencies to describe a proposed action, consider alternatives, identify and disclose potential environmental impacts of each alternative, and involve the public in the decision-making process. It does not require Federal agencies to select the alternative having the least significant environmental impacts. A Federal action agency may decide to choose an action that will adversely affect listed or candidate species provided these effects were known and identified in a NEPA document.

All three species addressed in this rule inhabit wetlands that are afforded varying protection under section 404 of the Federal Water Pollution Control Act of 1948 (33 U.S.C. 1251-1376), as amended; and Federal Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Cumulatively, these Federal regulations are not sufficient to halt population extirpation and habitat losses for the three species addressed in this rule.

The Arizona Native Plant Law (A.R.S. Chapter 7, Article 1) protects *Spiranthes delitescens* and *Lilaeopsis schaffneriana* ssp. *recurva* as highly safeguarded species. A permit from the Arizona Department of Agriculture (ADA) must be obtained to legally collect these species on public or private lands in Arizona. Permits may be issued for scientific and educational purposes only. It is unlawful to destroy, dig up, mutilate, collect, cut, harvest, or take any living, "highly safeguarded," native plant from private, State, or Federal

land without a permit. However, private landowners and Federal and State agencies may clear land and destroy habitat after giving the ADA sufficient notice to allow plant salvage. Despite the protections of the Arizona Native Plant Law, legal and illegal damage and destruction of plants and habitat occur.

Collecting *Ambystoma* in the San Rafael Valley is prohibited under Arizona Game and Fish Commission Order 41, except under special permit. Nevertheless, some illegal collecting occurs (Collins and Jones 1987). The species is considered a species of special concern by the State of Arizona (Arizona Game and Fish Department 1996); however, this designation affords the species and its habitat no legal protection. Transport and stocking of live bullfrogs and fishing with live bait fish or *Ambystoma* within the range of this salamander in Arizona is prohibited by Arizona Game and Fish Commission Order 41 and R12-4-316, respectively. However, bullfrogs and nonnative fish are present at numerous extant and historical Sonora tiger salamander localities (Collins and Jones 1987, Collins 1996), suggesting continued illegal introductions. Furthermore, abandonment, modification, or breaching of stock tanks is allowed on private and public lands. Such actions could eliminate Sonora tiger salamander populations.

State of Arizona Executive Order Number 89-16 (Streams and Riparian Resources), signed on June 10, 1989, directs state agencies to evaluate their actions and implement changes, as appropriate, to allow for riparian resources restoration. Implementation of this regulation may ameliorate adverse effects of some state actions on the species addressed in this rule.

#### *E. Other Natural or Manmade Factors Affecting Its Continued Existence*

Arizona anglers and commercial bait dealers often introduce larval tiger salamanders into ponds and tanks for future bait collecting (Collins *et al.* 1988, Lowe 1954). Collins and Jones (1987) reported that tiger salamanders were illegally collected from the San Rafael Valley and transported to at least two tanks in the northern Patagonia Mountains. Bait dealers or others moving Sonora tiger salamanders to new localities could establish new populations. Collins and Jones (1987) suggest that transport and introduction of salamanders within the San Rafael Valley may have greatly influenced their present distribution. Moving could also transmit disease and cause unintentional introductions of fish or

bullfrogs, which might reduce or extirpate populations.

Transport and introduction of salamanders poses an additional threat. *Ambystoma tigrinum mavortium* is common in stock tanks and ponds to the east of the San Rafael Valley. Bait dealers and anglers probably introduced many of these populations (Collins 1981, Collins and Jones 1987). If *Ambystoma tigrinum mavortium* is introduced into Sonora tiger salamander localities, populations could be lost due to genetic swamping by interbreeding of the two subspecies.

Two populations of *Lilaeopsis* have been lost from unknown causes. Despite the presence of apparently suitable conditions, the species has not been observed at Monkey Spring near Sonoita Creek since 1965. *Lilaeopsis* was collected in 1958 in deep water along the San Pedro River by Highway 80 near St. David, but no longer exists there, nor is there now suitable habitat (Warren *et al.* 1990).

Aggressive nonnative plants disrupt native riparian plant communities. Nonnative Johnson grass (*Sorghum halepense*) is invading one *Spiranthes* site (Dave Gori, Arizona Nature Conservancy, *in litt.* 1993). This tall grass forms a dense monoculture, displacing less competitive native plants. If Johnson grass continues to spread, the *Spiranthes* population may be lost (Dave Gori, *in litt.* 1993). Bermuda grass (*Cynodon dactylon*) also displaces native riparian plants, including cottonwoods and willows that stabilize stream channels. Bermuda grass forms a thick sod in which many native plants are unable to establish. In certain microsites, Bermuda grass may directly compete with *Lilaeopsis* or *Spiranthes*. There are no known effective methods for eliminating Bermuda grass or Johnson grass from natural plant communities on a long term basis. Watercress (*Rorippa nasturtium-aquaticum*) is another nonnative plant now abundant along perennial streams in Arizona. It is successful in disturbed areas and can form dense monocultures that can out-compete *Lilaeopsis* populations.

Limited numbers of populations render each of the three taxa addressed in this rule vulnerable to extinction as a result of naturally occurring chance events that are often exacerbated by habitat disturbance. For instance, the restriction of these three species to a relatively small area in southeastern Arizona and adjacent Sonora increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought could eliminate populations or cause extinction. This is

of particular concern for Sonora tiger salamander populations inhabiting stock tanks that could wash out during a storm or dry out during drought. Furthermore, Sonora tiger salamander genetic heterozygosity is among the lowest reported for any salamander (Jones *et al.* 1988, Jones *et al.* 1995). Low heterozygosity indicates low genetic variation, which increases demographic variability and the chance of local extirpations (Shafer 1990).

The ability of Sonora tiger salamanders to move between populations is unknown, but arid grassland, savanna, or pine-oak woodland separate all populations and movement through these relatively dry landscapes is probably limited. Movement would be most likely during storms or where wet drainages are available as movement corridors. The distance between aquatic populations of Sonora tiger salamander is frequently more than 1.6 km (1.0 mi), and much greater distances separate several sites. For instance, Game and Fish Tank is 10.1 km (6.3 mi) from the nearest adjacent aquatic population. Thus, even if these salamanders are capable of moving relatively long distances, some populations may be effectively geographically isolated. Small, isolated populations have an increased probability of extirpation (Wilcox and Murphy 1985). Disease, predation by nonnative predators, and drying of tanks during drought further increase the chance of extirpation. Once populations are extirpated, natural recolonization of these isolated habitats may not occur (Frankel and Soule 1981).

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by these taxa in determining to make this rule final. Based on this evaluation, the preferred action is to list *Spiranthes delitescens*, *Lilaeopsis schaffneriana* spp. *recurva*, and the Sonora tiger salamander as endangered. These species are endangered because of widespread and serious threats that may lead to extinction in the foreseeable future. As a result, listing as threatened species would not fully address the extent and nature of threats to these species. The Service believes designation of critical habitat is not prudent for all three species. The rationale for these decisions are discussed in the following section.

#### Critical Habitat

Critical habitat is defined in section 3 of the Act as—(I) the specific areas within the geographic area occupied by a species, at the time it is listed in



accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection and; (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation," means the use of all methods and procedures needed to bring the species to the point at which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 242.12) require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time a species is determined to be endangered or threatened. The Service finds that designation of critical habitat is not prudent for *Lilaeopsis schaffneriana* ssp. *recurva*, *Spiranthes delitescens*, and *Ambystoma tigrinum stebbinsi*. Service regulations (50 CFR 424.12(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist—(1) the species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of such threat, or (2) such designation would not be beneficial to the species.

*Lilaeopsis schaffneriana* ssp. *recurva* and Sonora tiger salamander would not benefit from the designation of critical habitat. The Service determines that any potential benefits beyond those afforded by listing, when weighed against the negative impacts of disclosing their site-specific location, does not yield an overall benefit and is therefore not prudent. The overall habitat protection and conservation of these two species would be best implemented by the recovery process and section 7 provisions of the Act (see "Available Conservation Measures" section).

As discussed under Factor B in the "Summary of Factors Affecting the Species," *Spiranthes* is threatened by collecting. If it is listed, collecting of *Spiranthes* would be prohibited under the Act in cases of (1) removal and reduction to possession from lands under Federal jurisdiction, or malicious damage or destruction on such lands; and (2) removal, cutting, digging up, or damaging or destroying *Spiranthes* in knowing violation of any State law or regulation, including State criminal trespass law. Such provisions are difficult to enforce, and publication of critical habitat descriptions and maps would make *Spiranthes delitescens*

more vulnerable and increase enforcement problems. All involved parties and principal landowners are aware of the location and importance of protecting this species' habitat. Habitat protection will be addressed through the recovery process and through the section 7 provisions of the Act. Therefore, it is not prudent to designate critical habitat for *Spiranthes delitescens*.

Protection of the habitat of these species will be addressed through the recovery process and the section 7 consultation process. The Service believes that Federal involvement in the areas where these species occur can be identified without the designation of critical habitat. Therefore, the Service finds that designation of critical habitat for these three species is not prudent.

#### Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Act provides for possible land acquisition and cooperation with the states and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against certain activities involving listed species are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(4) requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service. All three taxa in this rule occur

on the Coronado National Forest. *Lilaeopsis* and the Sonora tiger salamander also occur on Fort Huachuca, managed by the Department of the Army. In addition, *Lilaeopsis* occurs on Service lands at San Bernardino National Wildlife Refuge and at the BLM's San Pedro Riparian National Conservation Area.

Examples of Federal actions that may affect the three species addressed in this rule include managing recreation, road construction, livestock grazing, granting rights-of-ways, stock tank development and maintenance, and military activities on Fort Huachuca. These and other Federal actions would require formal section 7 consultation if the action agency determines that the proposed action may affect listed species. Development on private or State lands requiring permits from Federal agencies, such as 404 permits from the U.S. Army Corps of Engineers, would also be subject to the section 7 consultation process. Federal actions not affecting the species, as well as Actions that are not federally funded or permitted, would not require section 7 consultation.

Pursuant to 50 CFR 402.10(a), the Coronado National Forest conferred with the Service on the effects of issuance of grazing permits in the Duquesne, Campini, and San Rafael allotments within the range of the Sonora tiger salamander. The Service determined that issuance of the permits would not likely jeopardize the continued existence of the salamander provided that stock tank maintenance and management plans were promptly developed and implemented for the allotments. These plans would ensure the maintenance of quality aquatic habitat for the Sonora tiger salamander.

The Act and its implementing regulations found at 50 CFR 17.61, 17.62, and 17.63 set forth a series of general trade prohibitions and exceptions that apply to all endangered plants. All trade prohibitions of section 9(a)(2) of the Act, implemented by 50 CFR 17.61, apply. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale listed species in interstate or foreign commerce, or to remove and reduce to possession listed species from areas under Federal jurisdiction. In addition, for plants listed as endangered, the Act prohibits the malicious damage or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, or damaging or destroying endangered

plants in knowing violation of any state law or regulation, including state criminal trespass law. Certain exceptions apply to agents of the Service and state conservation agencies.

The Act and 50 CFR 17.62 and 17.63 also provide for the issuance of permits to carry out otherwise prohibited activities involving endangered species under certain circumstances. Such permits are available for scientific purposes and to enhance the propagation or survival of the species. It is anticipated that few trade permits would ever be sought or issued for *Lilaeopsis* or *Spiranthes* because these species are not common in cultivation or in the wild.

The Act and implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. The prohibitions, codified at 50 CFR 17.21, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect; or to attempt any such conduct), import or export, ship in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and state conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities.

It is the policy of the Service (59 FR 34272) to identify to the maximum extent practicable at the time an animal species is listed those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a listing on proposed and ongoing activities with a species' range. The Service believes that, based on the best available information, the following are examples of actions that will not result in a violation of section 9.

Actions that would not result in a violation of section 9 for either *Lilaeopsis* or *Spiranthes* would include—

- (1) Otherwise lawful activities on private lands undertaken by the landowner since plants are not protected from taking by the private landowner of the habitat by the Act; or
- (2) Federally-approved projects, such as issuance of livestock grazing permits, road construction, and dredge and fill activities, when such activity is conducted in accordance with section 7 of the Act.

Actions that would not result in violation of section 9 for Sonora tiger salamander would include—

- (1) Recreational activities in the range of the Sonora tiger salamander that do not result in physical damage to stock tanks, vegetation at stock tanks, stock fences, and riparian habitats between occupied stock tanks; and that do not involve relocation of salamanders or nonnative aquatic vertebrates;
- (2) Well-managed livestock grazing of uplands, including running of cattle, and development, operation and maintenance of range improvements; or
- (3) Federally-approved projects, such as issuance of livestock grazing permits, road construction, and dredge and fill activities, when such activity is conducted in accordance with section 7 or section 10 of the Act.

The Service has determined that the following activities could potentially result in a section 9 violation. As section 9 is somewhat limited in the protection provided to plants, the possible actions that could result in a section 9 violation for *Lilaeopsis* or *Spiranthes* could include—

- (1) Malicious destruction or removal on lands under Federal jurisdiction;
- (2) Criminal trespass onto private lands and then removal of plants from those lands; or
- (3) Removal of plants without appropriate State permits.

Some of the possible actions that could result in a section 9 violation for Sonora tiger salamander include:

- (1) Unauthorized handling, collecting, or harming of Sonora tiger salamanders;
- (2) Destroying or altering berms or draining of aquatic sites occupied by the salamander and diverting flows upstream of breeding sites;
- (3) Livestock grazing or watering at sites occupied by the salamander when such activity results in trampling of salamanders;
- (4) Actions that result in the destruction or removal of aquatic or emergent vegetation, or shoreline vegetation at aquatic sites occupied by the species;
- (5) Stocking of fish, bullfrogs other subspecies of *Ambystoma tigrinum*, or other organisms within the range of the Sonora tiger salamander that prey on or

transmit diseases to Sonora tiger salamanders;

(6) Discharges or dumping of toxic chemicals, silt, or other pollutants into waters supporting the species; and

(7) Pesticide applications at or near occupied aquatic sites in violation of label restrictions.

Questions as to whether specific activities would constitute a violation of section 9 should be addressed to the Service's Arizona Ecological Services Field Office (see **ADDRESSES** section). Requests for copies of the regulations on listed plants and wildlife and inquiries about prohibitions and permits may be addressed to U.S. Fish and Wildlife Service, Branch of Endangered Species/Permits, P.O. Box 1306, Albuquerque, New Mexico 87103 (telephone 505/248-6920; facsimile 505/248-6922).

#### National Environmental Policy Act

The Fish and Wildlife Service has determined that Environmental Assessments and Environmental Impact Statements, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to Section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the Federal Register on October 25, 1983 (48 FR 49244).

#### Required Determinations

The Service has examined this regulation under the Paperwork Reduction Act of 1995 and found it to contain no information collection requirements. This rulemaking was not subject to review by the Office of Management and Budget under Executive Order 12866.

#### References Cited

A complete list of all references cited herein is available upon request from the Field Supervisor, Arizona Ecological Services Field Office (see **ADDRESSES** section).

#### Authors

The primary authors of this rule are Angie Brooks and Jim Rorabaugh, Arizona Ecological Services Field Office (see **ADDRESSES** section).

#### List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

#### Regulation Promulgation

Accordingly, part 17, subchapter B of chapter I, title 50 of the Code of Federal

Regulations, is amended as set forth below:

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500; unless otherwise noted.

of Endangered and Threatened Wildlife to read as follows:

**PART 17—[AMENDED]**

1. The authority citation for Part 17 continues to read as follows:

2. Section 17.11(h) is amended by adding the following in alphabetical order, under "Amphibians," to the List

**§ 17.11 Endangered and threatened wildlife.**  
\* \* \* \* \*  
(h) \* \* \*

SPECIES		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	*
Amphibians.							
*	*	*	*	*	*	*	*
Salamander, Sonora tiger.	<i>Ambystoma tigrinum stebbinsi</i>	U.S.A. (AZ), Mexico.	Entire	E	600	NA	NA
*	*	*	*	*	*	*	*

3. Section 17.12(h) is amended by adding the following two species, in alphabetical order under "Orchidaceae"

and "Umbelliferae" to the List of Endangered and Threatened Plants:

**§ 17.12 Endangered and threatened plants.**  
\* \* \* \* \*  
(h) \* \* \*

Species		Historic range	Status	When listed	Critical habitat	Special rules
Scientific name	Common name					
*	*	*	*	*	*	*
Orchidaceae—Orchid Family:						
*	*	*	*	*	*	*
<i>Spiranthes delitescens</i>	Canelo Hills ladies'-tresses.	U.S.A. (AZ), Mexico.	E	600	NA	NA
*	*	*	*	*	*	*
Umbelliferae—Parsley Family:						
*	*	*	*	*	*	*
<i>Lilaeopsis schaffneriana</i> spp. <i>recurva</i>	Huachuca water umbel.	U.S.A. (AZ), Mexico.	E	600	NA	NA
*	*	*	*	*	*	*

Dated: December 24, 1996.  
Jay L. Gerst,  
Acting Director, Fish and Wildlife Service.  
[FR Doc. 97-130 Filed 1-3-97; 8:45 am]  
BILLING CODE 4310-55-P

**DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
**50 CFR Part 622**  
**[Docket No. 950725189-6245-04; I.D. 123096B]**  
**Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic; Trip Limit Reduction.**  
**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.  
**ACTION:** Trip limit reduction.

**SUMMARY:** NMFS reduces the commercial trip limit in the hook-and-line fishery for king mackerel in the Florida west coast sub-zone to 50 king mackerel per day in or from the exclusive economic zone (EEZ). This trip limit reduction is necessary to protect the overfished Gulf king mackerel resource.  
**EFFECTIVE DATE:** The 50-fish commercial trip limit is effective 12:01 a.m., local time, January 1, 1997, and remains in effect through June 30, 1997.  
**FOR FURTHER INFORMATION CONTACT:** Mark F. Godcharles, 813-570-5305.  
**SUPPLEMENTARY INFORMATION:** The fishery for coastal migratory pelagic fish (king mackerel, Spanish mackerel, cero, cobia, little tunny, dolphin, and, in the Gulf of Mexico only, bluefish) is