SMEA, "Sensitive Aquatic Species Survey; Santa Clara River and San Francisquito Creek; Newhall Land and Farming Company Property; Los Angeles" (1995; 1995A)

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FINAL REPORT

Sensitive Aquatic Species Survey
Santa Clara River and San Francisquito Creek
Newhall Land and Farming Company Property
Los Angeles County, California

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Introduction

The following report presents the results of a series of surveys designed to document the presence/absence and distribution of sensitive aquatic species in the Santa Clara River between the Castaic Creek confluence and Bouquet Canyon Road bridge. Subsequently an additional survey was conducted for the sensitive fish species in San Francisquito Creek on the Newhall Land and Farming Company property and those results are incorporated herein. The following species were considered in the design of the surveys: unarmored threespine stickleback, *Gasterosteus aculeatus williamsoni*; arroyo chub, *Gila orcutti*; Santa Ana sucker, *Catostomus santaanae*; arroyo toad, *Bufo microscaphus californicus*; California red-legged frog, *Rana aurora draytonii*; western spadefoot, *Scaphiopus hammondii*; southwestern pond turtle, *Clemmys marmorata pallida*; and two-striped garter snake, *Thamnophis hammondii*. All the afore listed species have some special conservation status and two species, the unarmored threespine stickleback and the arroyo toad are listed as federally endangered.

The survey area defined by the Valencia Company and referred to as the study area in the body of the report lies within specially designated conservation zones. The San Francisquito Creek portion of the study lies almost entirely within Sensitive Ecological Area (SEA) 19 designated by Los Angeles County. The Santa Clara River portion of the study area lies entirely within SEA 23 as designated by Los Angeles County. In addition, the downstream reach of the Santa Clara River study area from the Castaic Creek confluence upstream to Interstate 5 lies within the Del Valle zone of the unarmored threespine stickleback essential habitat.

This report also includes information on the basic natural history of the aquatic organisms covered by these surveys.

Natural History Background of Sensitive Aquatic Resources

Fishes

Unarmored Threespine Stickleback
Gasterosteus aculeatus williamsoni Girard
Federally Endangered

Threespine sticklebacks are small, laterally compressed fish. They have three sharp spines on the back in front of the soft dorsal fin. The pelvic fin is reduced to a single stout spine and a small ray. Their eyes are large and the mouth terminal, but slanting slightly upward. The caudal peduncle is narrow. They lack spines but may possess a variable number of bony plates on their sides.

The holarctic threespine stickleback, *Gasterosteus aculeatus* Linnaeus, occurs along the western coast of North America from Alaska south to northern Baja California. G. aculeatus is best known for its morphologic and ecologic variation. This variation has been enhanced by the species' propensity to establish nonanadromous freshwater populations. As a consequence of this ability, *Gasterosteus aculeatus* occurs as remnant freshwater populations along the southern edge of its eastern Pacific distribution in areas where marine anadromous populations no longer exist. These southern freshwater populations were presumably founded during Quaternary glacial periods when cooler ocean temperatures would have allowed marine populations to penetrate more southerly waters (Bell 1976).

In California, the presence of *Gasterosteus aculeatus* in most coastal drainages has been well documented beginning in the mid-1800s (e.g., Girard 1854). Recent texts and field guides still list *Gasterosteus aculeatus* as present in virtually all coastal streams of California (e.g., Moyle 1976; McGinnis 1984). Miller and Hubbs (1969) recognized three subspecies in California: (1) *Gasterosteus aculeatus aculeatus*, a typically anadromous form with a complete row of lateral plates extending from the anterior portion of the body to the caudal peduncle; (2) *Gasterosteus aculeatus microcephalus*, a freshwater resident with the lateral plates restricted to the anterior portion of the body; and (3) *Gasterosteus aculeatus williamsoni*, a subspecies that lacks lateral plates and has a limited distribution within southern California.

Gasterosteus aculeatus williamsoni, the unarmored threespine stickleback, was described by Girard in 1854, however the type locality in the headwaters of the Santa Clara River near Acton was not unequivocally identified until 1960 (Miller 1960). At one time unplated sticklebacks were abundant throughout the Los Angeles basin (Culver and Hubbs 1917) but have been extirpated presumably as a result of increased urbanization in the region (e.g., Miller 1961; Irwin and Soltz 1982). *Gasterosteus aculeatus williamsoni* had been extirpated in the Los Angeles and Santa Ana Rivers by the early 1930s, whereas it survived in the San Gabriel River into the 1940s but was gone before the end of the decade (Miller 1961). Surveys conducted during the 1980s corroborate the absence of sticklebacks from these three drainages (Haglund, unpubl. data; Swift, pers. comm.).

Exploratory work by Baskin and Bell (1976) also led to the discovery of a population of sticklebacks in San Antonio Creek (Santa Barbara County) of questionable taxonomic status that had a mean lateral plate number intermediate between *Gasterosteus aculeatus microcephalus* and *Gasterosteus aculeatus williamsoni*. Most recently a population of unplated sticklebacks was discovered in Shay Creek, tributary to Baldwin Lake in San Bernardino County.

Initially all unplated populations were considered to be *Gasterosteus aculeatus williamsoni* (e.g., Miller and Hubbs 1969). *Gasterosteus aculeatus williamsoni* was listed by the U.S. Fish and Wildlife Service as an endangered species in 1970 (Federal Register 35: 16047). The Revised Recovery Plan for the Unarmored Threespine Stickleback (1985) recognized the upper Santa Clara River and San Antonio Creek populations as extant populations of the federally endangered *Gasterosteus aculeatus williamsoni* while postponing judgment on the Shay Creek population.

Critical habitat for the endangered unarmored threespine stickleback was proposed in 1980 (Federal Register 45:76012). A description of the essential habitat designated in the recovery plan (proposed critical habitat of the Federal Register) and a map showing its distribution have been included following this section on page 5

Sticklebacks occur throughout the stream but tend to gather in areas of slow flow or standing water. In fast flowing stream sections they are found in eddies behind obstructions or along the edge of the stream where vegetation slows the flow.

During breeding season male sticklebacks develop a distinctive nuptial coloration (red throat, blue sides and a blue eye). Males defend territories adjacent to vegetation where they construct a nest. The nest is constructed by excavating a depression in the substrate, placing a mound of algal strands and other plant material in the depression, and gluing the material together with a sticky kidney secretion. Once formed, the male creates a tunnel in the nest by wriggling his way through the mound. Once the nest has been completed the male performs an elaborate courtship which entices females to lay their eggs in the nest. Males attract several females to the nest, each of which will lay from 50-300 eggs. After the courtship phase has passed males defend the eggs and care for them while they develop. One activity during this period is "fanning". "Fanning" males use their pectoral fins to create water currents that flow over the eggs. This activity is apparently necessary for normal development of the eggs. The eggs take approximately 6-8 days to hatch at 18-20 °C. The fry remain in the nest for the first couple days during which time the male continues to guard them (Wootton 1976; Haglund 1981).

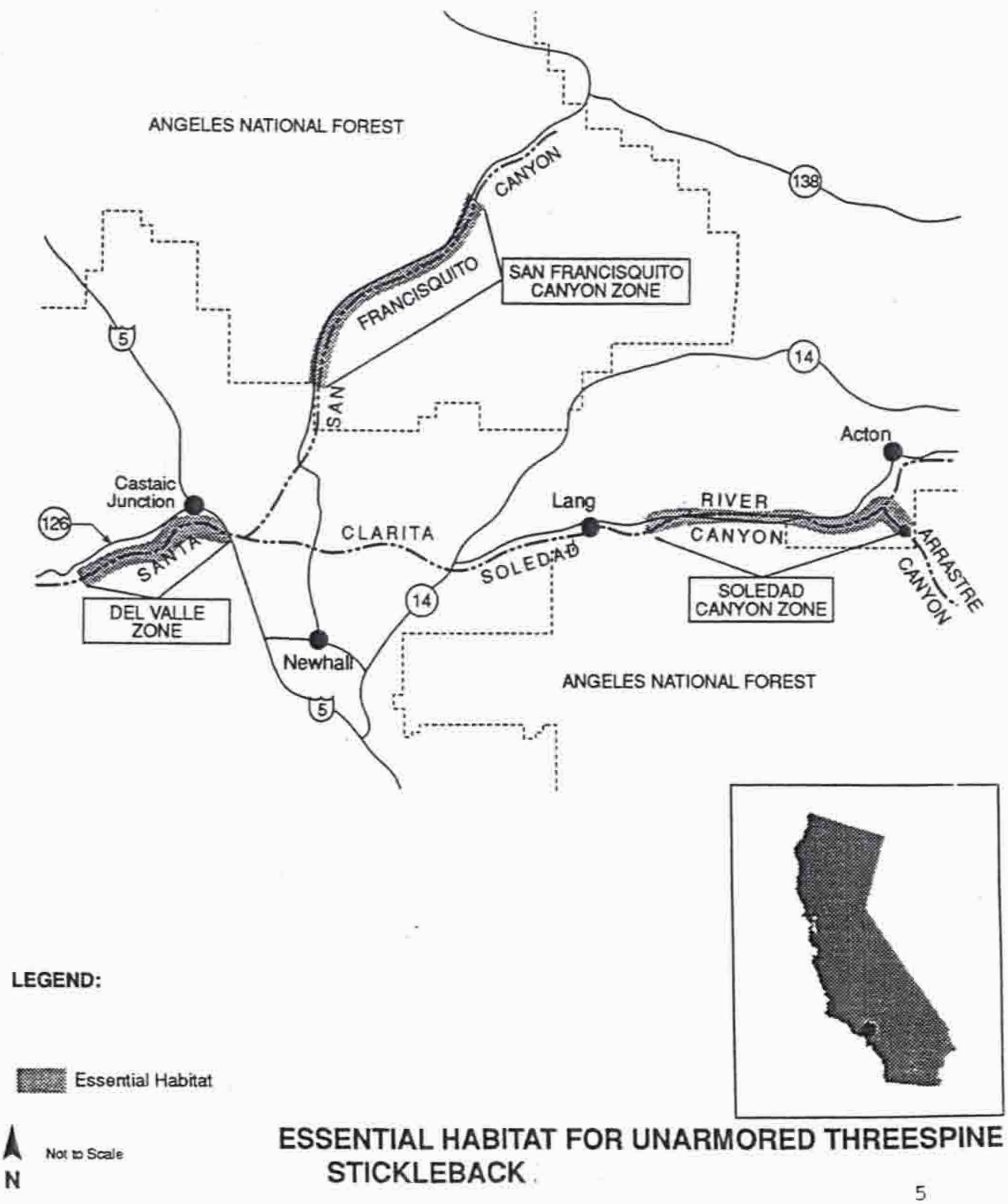
Two features of the sticklebacks habitat appear to be essential for the survival of the young. First a slow flow of clear water is necessary for the proper development of the eggs. Any form of pollution or even small amounts of turbidity may interfere with normal development. Second, once the fry emerge, aquatic vegetation must be present along the shoreline to supply cover and abundant microscopic food organisms (Ono *et al.* 1983).

Based on size-frequency curves, gonadal examination and field observations, there is some reproduction in most months if stream flows remain low. There is however, a peak reproductive time in the spring, beginning in about March. This reproductive peak continues into the early summer then attenuates through late summer and fall. Minimum reproduction occurs in the winter months.

The species apparently lives for only one year. Thus stickleback populations tend to decline in the winter due to natural mortality and low recruitment.

Sticklebacks are opportunistic feeders relying upon a wide variety of foods. They appear to prefer insects but at times snails may be important while flatworms and nematodes comprise only a small percentage of the diet.

Sticklebacks are preyed upon by a wide variety of organisms. Wading birds such as herons have been observed feeding on sticklebacks. Other native predators include the two-striped garter snake, *Thamnophis hammondii*, (Bell and Haglund 1981) and belostomatid water bugs, *Belostoma* sp., (pers obs). The southwestern pond turtle may occasionally feed on stickleback eggs. Introduced organisms also prey upon the stickleback. These include fishes, such as bullheads (*Ictalurus*) and sunfishes (*Lepomis*), and the African clawed frog (*Xenopus laevus*).



ESSENTIAL HABITAT FOR UNARMORED THREESPINE STICKLEBACK

Arroyo Chub
***Gila orcutti* (Eigenmann and Eigenmann)**
Species of Special Concern in California

The arroyo chub is a small fish that averages 120mm TL (total length) although occasionally large individuals may reach 300mm TL. They possess a "chubby" body, moderately large eyes and small mouths. The dorsal color is silvery or grayish to olive green, ventrally they are white and there is usually a dull gray lateral band (Moyle 1976). They have 7 anal fin rays, 8 dorsal rays, 5-9 gill rakers and 48-62 lateral line scales. The dorsal fin origin is placed behind the origin of the pelvic fins. The pharyngeal teeth (2,5-4,2; variable) are closely spaced and strongly hooked.

Miller (1945) placed both *Gila orcutti* and closely related *Gila purpurea* in the subgenus *temeculina*. The arroyo chub hybridizes with the Mohave tui chub (*Gila bicolor mohavensis*) and the California roach (*Lavinia symmetricus*) (Hubbs and Miller 1942; Greenfield and Greenfield 1970; Greenfield and Deckert 1973).

Arroyo chubs are native to the Los Angeles basin (Los Angeles, Santa Ana and San Gabriel Rivers), Malibu and San Juan Creeks and the Santa Margarita River drainage (Swift *et al.* 1990; 1993). Although once common and widespread, its distribution has been significantly reduced (Swift *et al.* 1990; 1993). Moyle and Williams (1990) considered the reduction severe enough to suggest that this species deserves close monitoring and that attempts should be made to improve the status of existing populations. The arroyo chub is presently listed by the state of California as a Species of Special Concern. Swift *et al.* (1990; 1993) suggested that the East, West and North Forks of the San Gabriel River be considered for status as a Native Fish Management Area for this species. Populations of arroyo chub presently exist to the north, outside the native range, in the Santa Clara, Santa Ynez, Santa Maria, Cuyama and Mojave river systems.

Arroyo chubs are adapted to survive in the warm fluctuating streams of the Los Angeles basin. These streams, prior to channelization, were often turbid torrents in the winter and clear intermittent creeks in the summer. The chub preferentially inhabits low gradient but flowing water, however, it is also found in slow water areas within high gradient streams. The association with low flow areas means that this species is usually found over sand or mud substrates (Swift *et al.* 1975). Laboratory studies demonstrate that the arroyo chub is physiologically adapted to survive hypoxic conditions and large temperature fluctuations (Castleberry and Cech 1986).

The only extensive studies on the biology of the arroyo chub were done on the introduced population inhabiting the Cuyama River in Santa Barbara County (Greenfield and Greenfield 1972; Greenfield and Deckert 1973) and more recently on the Santa Clara River population (Tres 1992). Arroyo chubs are known to breed primarily during March and April although some reproduction may occur into July (Tres 1992). Spawning typically occurs in pools in association with aquatic vegetation. The eggs are demersal and adhesive; hatching

Santa Ana Sucker
Catostomus santaanae (Snyder)
Category 2 Candidate Species for Federal Listing, listing petition submitted

Santa Ana suckers are small catostomids with adults commonly less than 175mm SL (standard length). Their gross morphology is generally similar to that of mountain suckers (*Catostomus platyrhynchus*) and they possess notches at the junctions of the lower and upper lips as do mountain suckers. Large papillae are found on the anterior of the lower lip but papillae are poorly developed on the upper lip. The jaws have cartilaginous scraping edges inside the lips. There are 21-28 gill rakers on the external row of the first arch and 27-36 on the internal row. This species has 67-86 lateral line scales; 9-11 dorsal fin rays, usually 10; and 8-10 pelvic fin rays. The axillary process at the base of the pelvic fins is represented only as a simple fold. They possess a short dorsal fin and a deep caudal peduncle. The fish are silver ventrally while the dorsal surface is darker with irregular blotching. The degree of dorsal darkening and blotching is variable. Breeding males develop breeding tubercles over most of the body, but the tubercles are most dense on the caudal and anal fins and the caudal peduncle. Reproductive females possess tubercles only on the caudal fin and peduncle (Moyle 1976).

Catostomus santaanae was originally described as *Pantosteus santa-anae* by Snyder in 1908 based on specimens collected from the Santa Ana River, Riverside, California. The hyphen was dropped from the specific name and the species was assigned to the genus *Catostomus* by Smith in 1966. Smith considers *Pantosteus* to be a subgenus of *Catostomus*. The older literature uses the name assigned by Snyder. A complete synonymy is provided in Smith (1966).

Santa Ana suckers are endemic to the Los Angeles basin. Their original range included only the Los Angeles, Santa Ana and San Gabriel river systems (Smith 1966). Today small populations are still found in the Santa Ana River; Tujunga Wash in the Los Angeles River system (possibly extirpated); and in the upper San Gabriel River system (Swift *et al.*, 1990; 1993). The Santa Ana sucker is presently listed as a Species of Special Concern in the state of California. Large populations are found only in the San Gabriel River. For this reason Swift *et al.* (1990; 1993) suggested that the East, West and North Forks of the San Gabriel River be considered for status as a Native Fish Management Area for this species. An introduced population exists in the Santa Clara River, however, this population is in decline and throughout the lower portion of the drainage has hybridized with another introduced sucker, the Owens River sucker, *Catostomus fumeiventris* (Haglund unpubl. data).

Santa Ana suckers are found in small to medium sized streams, usually less than 7 meters in width, with depths ranging from a few centimeters to over a meter (Smith 1966; Deinstadt *et al.* 1990). Flow must be present but it can range from slight to swift. The native streams were all subject to severe periodic flooding, thus suckers prefer clear water but can tolerate seasonal turbidity. The preferred substrates are gravel and cobble but may also include sand. Santa Ana suckers are associated with algae but not macrophytes.

Although the sucker seems to be quite generalized in its habitat requirements, they are intolerant of polluted or highly modified streams.

The only substantial life history study done on this species studied the introduced Santa Clara River population (Greenfield *et al.* 1970). Spawning in this species occurs from April until early July but peaks in late May/early June. The eggs are demersal and are spawned over gravel. Fecundity is high for such a small sucker species, ranging from 4,423 eggs in a 78mm SL (standard length) female to 16,151 in a 158mm SL female. The Santa Ana sucker is relatively short-lived, few individuals survive beyond their second year and none beyond the third year. They are reproductively mature in their first year and thus will typically spawn for two years. The species is more fecund than most other catostomids. Growth rates suggest first year individuals reach 61mm, second years 77-83mm and by the third year 141-153mm SL. Development of the eggs and larvae is described by Greenfield *et al.* (1970).

Greenfield *et al.* (1970) found that detritus, algae and diatoms comprised 97% of the stomach contents while aquatic insect larvae, fish scales and fish eggs accounted for the remaining 3%. Larger specimens usually had an increased amount of insect material in their stomachs. The herbivorous trophic status of the Santa Ana sucker is substantiated by it's long intestine with up to 8 coils.

Amphibians

Arroyo Toad
***Bufo microscaphus californicus* Camp**
Federally Endangered

The arroyo toad (*Bufo microscaphus californicus*) is a small toad in the family Bufonidae. This taxon was originally described as *Bufo cognatus californicus* from a specimen collected at Santa Paula, Ventura County (Camp 1915). Camp's specimen was later shown to differ in several respects from *Bufo cognatus* and was afforded specific status as *Bufo californicus* (Myers 1930). In the following two decades, this toad was considered a subspecies of *Bufo compactilis* (Linsdale 1940) and of *Bufo woodhousei* (Shannon 1949). The currently accepted taxonomy of the arroyo toad as a subspecies of *Bufo microscaphus*, the southwestern toad, is based on morphological similarities (Stebbins 1951; Price and Sullivan 1988; Frost and Hillis 1990). The arroyo toad (*Bufo microscaphus californicus*) is geographically isolated from the Arizona toad (*Bufo microscaphus microscaphus*) by the Mojave and Colorado Deserts. Work is now in progress to determine if the arroyo toad is genetically distinct at the species level (S. Sweet, Univ. of Calif., Santa Barbara, pers. comm.).

The arroyo toad is a small (5 - 8 centimeters / 2 - 3 inches), light greenish gray or tan toad with warty skin and dark spots. Its underside is buff colored and often without spots. A light colored stripe crosses the head and eyelids, and a light area usually occurs on each sacral hump and in the middle of the back. Its movement consists of hopping rather than walking. Its courtship vocalization is a high trill, usually lasting 8 to 10 seconds.

The arroyo toad is restricted to rivers that have shallow, gravelly pools adjacent to sandy terraces. Breeding occurs on large streams with persistent water from late March until mid-June (Sweet 1989; 1991a; 1993). Eggs are deposited and larvae develop in shallow pools with minimal current and little or no emergent vegetation and with sand or pea gravel substrate overlain with flocculent silt. After metamorphosis (June or July), the juvenile toads remain on the bordering gravel bars until the pool no longer persists (3 to 8 weeks, depending on site and year) (Sweet 1991c). Juveniles and adults forage for insects on sandy stream terraces that have nearly complete closure of cottonwoods (*Populus* spp.), oaks (*Quercus* spp.), or willows (*Salix* spp.), and almost no grass and herbaceous cover at ground level. Adult toads excavate shallow burrows on the terraces where they shelter during the day when the surface is damp or during longer intervals in the dry season (Sweet 1989).

Arroyo toads were historically found along the length of drainages in southern California from San Luis Obispo County to San Diego County, but now they survive primarily in the headwaters as small isolated populations (Sweet 1991c; J. Stephenson, Cleveland National Forest, in Federal Register 59: 64859). Urbanization and dam construction beginning in the early 1900's in southern California caused most of the extensive habitat degradation. The species was formerly distributed southward along the northwestern coastal region of Baja California, Mexico, to the vicinity of San Quintin (ca. 30.5° North Latitude).

Most remaining populations in the United States occur on privately owned lands, primarily within or adjacent to the Cleveland National Forest. Less than 50 percent of the known extant populations of arroyo toad occur in areas owned or managed by the Forest Service (Los Padres, San Bernardino, and Cleveland National Forests) (Sweet 1991c; J. Stephenson, in Federal Register 59: 64859). Due mostly to habitat destruction, only eight drainages remain where populations of this species may be viable (S. Sweet and J. Stephenson, in Federal Register 59: 64859). In 1990, only seven pairs of arroyo toads were known to have bred anywhere within the toad's range (Sweet 1991c). Due to the isolation and the small sizes, almost all populations are at great risk of extinction.

Habitat destruction and alteration constitutes the most severe threat facing the arroyo toad. This toad is now confined to the headwaters of streams it occupied historically along their entire lengths. The arroyo toad was formerly found on rivers with near-perennial flow throughout southern California from San Luis Obispo County to San Diego County. It is believed to be extirpated in San Luis Obispo County (S. Sweet in Federal Register 59: 64859). Populations persist in Santa Barbara, Ventura, Los Angeles, Riverside, and San Diego Counties. Recent sightings of scattered individuals have been reported from Orange, San Bernardino, and southwest Imperial Counties.

The majority of the remaining populations in Santa Barbara and Ventura Counties are located on the Los Padres National Forest. This National Forest supports the majority of southern California's remaining intact large river systems and maintains five viable populations of arroyo toads. Sespe Creek in Ventura County has the largest known population (Sweet 1991c). Other populations are found on the Sisquoc, Santa Ynez, and upper and lower Piru drainages (Sweet 1991c). Populations to the south are located primarily in San Diego and Riverside Counties and are predominantly found in the vicinity of the Cleveland National Forest and on private lands within or adjacent to national forest.

Although as mentioned above, arroyo toads are found within the Santa Clara River drainage; the populations in Sespe Creek and Piru Creek are downstream of the study area. The confluence of Piru Creek with the Santa Clara River is approximately 9.25 miles downstream of the confluence of Castaic Creek (the downstream boundary of the study area) and Sespe Creek is even further downstream.

Several factors presently threaten the remaining 25 percent of the habitat of the arroyo toad including: (1) Short- and long-term changes in river hydrology, including construction of dams and water diversions; (2) alteration of riparian wetland habitats by agriculture and urbanization; (3) construction of roads; (4) site-specific damage by off-highway vehicle use; (5) development of campgrounds and other recreational activities; (6) over-grazing; and (7) mining activities.

Dam construction was responsible for the loss of approximately 40 percent of the estimated original range of the arroyo toad. Twenty-six large impoundments are currently located within the range of this species, inundating over 190 km (120 miles) of suitable habitat. Additional areas have been identified as potential dam sites and, if constructed, would destroy 25 percent of the current range (6 to 7 percent of the original range) of the arroyo toad (Sweet 1991a).

In addition to habitat loss through direct inundation, dams can have significant effects on habitat quality downstream. Artificial flow regulation disrupts the natural processes that produce the terrace and pool habitats required by arroyo toads. Unseasonal water releases may prevent arroyo toads from breeding due to habitat changes (Sweet 1991c). Another consequence of sustained unnatural perennial flows associated with dams and other habitat modification is an adverse effect on the habitat of this species by encouraging vegetative growth in a riparian corridor, which increases ground stability and hence confines and deepens the creek channel. Under such conditions water temperatures may be reduced below the temperatures needed for larval development (Sweet 1991a).

The arroyo toad is also sensitive to stream diversions as they cause the riparian areas to dry. Water diversions that alter normal flows have degraded habitats and adversely affected arroyo toads by leading to: (1) The early drying of breeding pools, causing breeding failures or loss of the larval population (2) restriction of the period essential for rapid growth when newly metamorphosed toads can forage on damp gravel bars; and (3) loss of damp subsurface soil, which may result in high adult mortality during late summer and early fall (Sweet 1991c).

Development projects in riparian wetlands have caused permanent losses of riparian habitats and are the most conspicuous factor in the decline of the arroyo toad (S. Sweet in Federal Register 59: 64859). Agriculture and urbanization have already destroyed much of the suitable arroyo toad habitat south of the Santa Clara River in Ventura County (S. Sweet in Federal Register 59: 64859). Stream terraces have been converted to farming, road corridors, and residential and commercial uses, while the streams themselves have been channelized for flood control. Large stretches of riparian corridor habitat have also been degraded or destroyed by cattle and feral pigs (S. Sweet in Federal Register 59: 64859).

The vocalizations of male toads are crucial to the breeding success of this species, as their calls are the key factor to finding mates. Light and noise pollution from adjacent developments may also reduce arroyo toad reproductive success by disrupting the vocalization behavior of males during the breeding season (M. Jennings, National Biological Survey, pers comm). Generally, the local population of arroyo toads declines as human activity increases (Sweet 1991c).

Recreational activities in riparian wetlands have had substantial negative effects to arroyo toad habitat and individuals. Off-highway vehicles cause extensive damage to the shallow pools in which arroyo toads breed (Sweet 1991c).

The use of heavy equipment in yearly reconstruction of roads and stream crossings in the national forests has had significant and repeated impacts to arroyo toads and toad habitat. Regular maintenance of roads in the Los Padres National Forest negatively affects arroyo toad individuals and toad habitat on the Santa Ynez River, Piru and Sespe Creeks. Downstream sedimentation caused by any activity is detrimental to eggs and larvae.

Over the past 20 years, at least 60 species of fishes have been introduced to the western U.S. States, 59 percent of which are predatory (Hayes and Jennings 1986; Jennings 1988; Swift *et al.* 1993). The introduction of exotic predators to southern California waters has been facilitated, in part, by the interbasin transport of water (e.g., California Aqueduct). Introduced predators had substantial impacts on the sizes of extant populations of arroyo toads and may have contributed to regional extinctions (Hayes and Jennings 1986). Virtually all rivers that contain or once contained arroyo toads now support populations of introduced predatory fish, such as green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), mosquitofish (*Gambusia affinis*), black bullhead (*Ictalurus nebulosus*), arroyo chub (*Gila orcutti*), prickly sculpin (*Cottus asper*), rainbow trout (*Oncorhynchus mykiss*), oriental gobies (*Tridentiger* sp.), and red shiners (*Notropis lutrensis*) (Sweet 1991c). All of these introduced fish prey on tadpoles and have been observed inducing high arroyo toad larval mortality in breeding pools on the Piru, Sespe, and Santa Ynez drainages. It is probable that predation by introduced fish species occurs elsewhere (Sweet 1991c). In addition to predatory fishes most streams with populations of arroyo toads also have populations of introduced bullfrogs (*Rana catesbeiana*). Adult bullfrogs are highly predatory and have been observed to prey on adult arroyo toads (Sweet 1993). Habitat for bullfrogs has been enhanced within the existing range of the arroyo toad via diversions and artificially maintained perennial flows below dams. Increased bullfrog populations in these permanent water areas threaten the survival of arroyo toad populations.

California Red-legged Frog
***Rana aurora draytonii* Baird and Girard**
Category 1 Candidate for Federal Listing, listing petition submitted

The red-legged frog ranges from 4.4-13.1 cm. The frog has red on the lower abdomen and underside of the hind legs, often overlying a yellow ground color. The face has a dark mask bordered by a whitish jaw stripe. The back has many small black flecks and larger, irregular dark blotches with indistinct outlines on a brown, gray or olive ground color that may have a reddish tinge (Storer 1925). In some individuals the flecks join to form a more or less continuous network of black lines. Dark bands are present on the legs and there is usually a coarse black (gray), red and yellow mottling in the groin. Prominent dorsolateral folds are present. The young often have yellow instead of red on the underside of the legs and in the groin. *Rana aurora draytonii* has more numerous dark dorsal spots, usually with light centers than its northern counterpart whose spots frequently lack the light centers (Storer 1925). The California red-legged frog is also larger, growing to 13.1 cm (5.25 in.) while the northern red-legged frog reaches only 7.5 cm (3 in.) (Stebbins 1985).

Two species of red-legged frog were originally described by Baird and Girard; *Rana aurora* and *Rana draytonii*. Subsequently, *Rana draytonii* was synonymized with *Rana aurora*. The two forms are presently considered subspecies - *Rana aurora aurora* (northern red-legged frog) and *Rana aurora draytonii* (California red-legged frog). The California red-legged frog is morphologically, behaviorally, and probably a genetically distinct form (Hayes and Miyamoto 1984; Green 1985a).

The red-legged frog is found primarily west of the Cascade-Sierra Nevada crest from southwestern British Columbia to Arroyo Santo Domingo in Baja California del Norte, Mexico (Linsdale 1932). The California red-legged frog occurs from northern California in the vicinity of Redding (Jennings and Hayes 1994). Its range used to include parts of California's central valley but virtually all populations have been extirpated from that region. The species may also have been extirpated in the southern Sierra Nevada of California. It has been introduced into several locations in Nye County, Nevada (Linsdale 1940; Green 1985b). The species is found from sea level to approximately 1500 meters in altitude (Jennings and Hayes 1994). The California red-legged frog occurs from northern California southward.

The red-legged frog is primarily a pond frog that inhabits humid forests, woodlands, grasslands and streamsides, especially where cattails and other aquatic vegetation provide good cover. It is most common in the lowlands and foothills. Red-legged frogs inhabit areas of permanent water (Stebbins 1951) but following rains northern red-legged frogs may disperse to damp meadows or woodlands far from permanent water (Stebbins 1985). More recent data on adult California red-legged frogs suggests they do not move far from their aquatic habitat (Jennings and Hayes 1994) but limited data suggest they move into terrestrial riparian thickets in the fall (Rathbun *et al.* 1993).

Most life history data on the red-legged frog is based on the study of the northern red-legged frog. Much less information is available on the California red-legged frog. Recently populations of the California red-legged frog have declined precipitously and the subspecies is considered a California Species of Special Concern.

The California red-legged frog hibernates in the mud at the bottom of ponds and creeks in the winter. In central California, this frog comes out of hibernation in January or February. Based on northern red-legged frogs, the breeding period is short, often lasting only 1-2 weeks during February - April, depending on locality (Stebbins 1985). Data on southern frogs indicates a longer breeding season extending from late November to late April depending on locality (Storer 1925; Hayes and Jennings 1986; Jennings and Hayes 1994). Male northern red-legged frogs call from locations several feet apart with their bodies submerged, in water at least two feet deep and three or more feet from the water's edge. At the breeding site male California red-legged frogs typically call in small mobile groups of 3-7 individuals that attract females (Jennings and Hayes 1994). Females spawn only at night (Licht 1969). California red-legged frogs oviposit on emergent vegetation so that the surface of the egg mass is at the water surface (Hayes and Miyamoto 1984). Egg masses are compact, containing ca. 2,000-6,000 dark reddish brown eggs about 2.0-2.8mm in diameter (Jennings and Hayes 1994). Northern red-legged frog egg masses are compact and globular with individual ova averaging 3.03 mm (Licht 1971). The eggs hatch in about 6-14 days (Storer 1925; Dickerson 1969). Limits of temperature tolerance of young embryos are about 4-21 °C. Both the upper and lower lethals are the lowest for any North American ranid (Licht 1971). The tadpoles complete metamorphosis in about four or five months (Storer 1925; Dickerson 1969), typically between July and September (Storer 1925; Jennings and Hayes 1994). Studies of a population of northern red-legged frogs in Marion Lake, British Columbia suggest that males do not defend or remain in specific territories throughout the breeding season but there is a tendency for male frogs to return to a given area of the lake each year. Calling and egg laying took place in association with submerged weed beds in the lake (Calef 1973a).

The California red-legged frog feeds on a variety of foods. It feeds readily on fish but will also eat insects, tadpoles and small frogs. This species is one of the most cannibalistic of North American frogs (Dickerson 1969). Frogs and small mammal prey may contribute significantly to the diet of adults and subadults (Arnold and Halliday 1986; Hayes and Tennant 1986) Although not common, red-legged frogs have been observed feeding at night (Wright and Wright 1949). Licht's (1986) study of feeding in northern red-legged frogs in British Columbia suggested that the species fed predominantly on land, along a river bank or along margins of rainpools, moving within plant cover. The adults are quite wary and highly nocturnal (Storer 1925; Hayes and Tennant 1986), while juveniles are much less wary and frequently diurnally active (Hayes and Tennant 1986).

Studies on the northern red-legged frog in British Columbia suggest that predatory salamanders (*Taricha granulosa* and *Ambystoma gracile*) are important tadpole predators (Calef 1973b). Other tadpole predators include fish (Calef 1973b), garter snakes (San

Francisco garter snakes (Wharton 1989)/ two-striped garter snakes (Cunningham 1959)), birds (Jennings and Hayes 1994), and predatory insects (Calef, 1973b).

The habitat of the California red-legged frog is characterized by dense, shrubby riparian vegetation associated with deep ($\leq$0.7m), still or slow-moving water (Jennings 1988; Hayes and Jennings 1988). The shrubby riparian vegetation that structurally seems to be most suitable for California red-legged frogs is that provided by arroyo willow (*Salix lasiolepis*). Cattails (*Typhus* sp.) and bulrushes (*Scirpus* sp.) also provide suitable habitat (Jennings 1988). Although *Rana aurora draytonii* can occur in ephemeral or permanent streams or ponds, populations probably cannot be maintained in ephemeral streams in which all surface water disappears (Jennings and Hayes 1994). Juvenile frogs seem to favor open, shallow aquatic habitats with dense submergents (Jennings and Hayes 1994).

The establishment of a diverse exotic aquatic predator fauna that includes bullfrogs, crayfish, and a diverse array of fishes likely contributed to the decline of the California red-legged frog (Hayes and Jennings 1986), although it is not understood which exotic aquatic predator or predators may have been most significant (Hayes and Jennings 1988). Furthermore, habitat alterations that are unfavorable to California red-legged frogs and favorable to most of the exotic aquatic predators are confounded with potential direct effects of predation by such exotics (Hayes and Jennings 1986).

The few remaining populations of *Rana aurora draytonii* are threatened by proposed reservoir construction, off-road vehicle use, and continued habitat degradation due to the cumulative effects of abusive land use practices, especially with regard to livestock grazing (Kauffman *et al.* 1983; Kauffman and Krueger 1984; Bohn and Buckhouse 1986; Jennings and Hayes 1994) and development of groundwater resources (Groeneveld and Griepentrog 1985).

Between the Santa Clara River system and the Mexican border, extant populations of California red-legged frogs are known from only four relatively small areas (Jennings and Hayes 1994). These combined areas represent no more than 1% of the area historically occupied by California red-legged frogs within that region (Jennings and Hayes 1994).

Western Spadefoot
Scaphiopus hammondii Baird
Species of Special Concern in California

A moderate sized (37.0-62.0 mm) greenish, grayish or brownish toad irregularly marked with dark orange- or reddish-tipped tubercles. It has faint hour glass markings on the back consisting of four, light-colored stripes. The most distinctive feature is the distinctive , black, cornified, teardrop shaped spade on each hindfoot (Storer 1925; Stebbins 1985) as this in the only spadefoot in the study area. Hindlinbs are short and the under surfaces are cream to dirty white. Constricted pupils have a vertical, fusiform shape, and the iris is pale gold (Jennings and Hayes 1994).

Scaphiopus hammondii was originally considered to have a broad geographic range from California to western Texas and Oklahoma with a hiatus across the Colorado River (Storer 1925; Stebbins 1951; 1966). More recently Brown (1976) identified morphological, vocalization and reproductive differences between eastern and western (California) populations, thereby demonstrating species level differences between the two groups of populations. Therefore since the work of Brown (1976), the name *Scaphiopus hammondii* has been applied exclusively to California populations.

The western spadefoot is a near endemic to California ranges from Redding in Shasta County California southward into northwestern Baja California del Norte, Mexico (Stebbins 1985). Its elevational range extends from near sea level to 1363 meters (Zeiner *et al.* 1988). In California, the known range is entirely west of the Sierran-desert range axis (Myers 1944).

The western spadefoot is almost completely terrestrial, entering water only to breed (Dimmitt and Ruibal 1980a). Western spadefoots become surface active following relatively warm ($\geq$10.0-12.8°C) rains in the late winter-spring and fall, emerging from burrows in loose soil (Stebbins 1972). Burrow depth is at least 1 meter. Despite normal appearance time, surface activity may occur in any month between October and April if enough rain has fallen (Morey and Guinn 1992). Amount of rain may be a better predictor of surface activity than temperature, but the cue(s) to emergence remain poorly understood (Jennings and Hayes 1994). *Scaphiopus hammondii* can form large (> 1000 individuals) highly vocal breeding aggregations, although choruses are typically much smaller (Jennings and Hayes 1994). Females deposit eggs in irregular small cylindrical clusters of 10-42 eggs attached to plant stems or pieces of detritus in temporary rain pools, or pools in ephemeral streamcourses (Storer 1925; Stebbins 1985). The critical thermal minimum of early embryos is 9°C (Brown 1967), so oviposition does not occur until temperatures permit some warming of pools (Jennings and Hayes 1994). Depending on the temperature regime and annual rainfall, oviposition may occur between late February and late May (Storer 1925; Burgess 1950; Feaver 1971; Stebbins 1985).

Eggs hatch in 0.6-6 days, depending on temperature (Brown 1967), and larval development can be completed in 3-11 weeks (Burgess 1950; Feaver 1971). The variation is a function of temperature and food resources. Age of sexual maturity is unknown but Jennings and Hayes (1994) estimate that it may require 2 years based on long periods of subterranean dormancy.

Known food items include crickets (Gryllacrididae), butterflies, beetles, flies, ants, and earthworms (Dimmit and Ruibal 1980b; Morey and Gullin 1992). The most important predators of larval and post-metamorphic *Scaphiopus hammondii* are California tiger salamanders, garter snakes, great blue herons, and raccoons (Childs 1953; Feaver 1971).

Data is lacking on the movement ecology and colonization/recolonization abilities of the western spadefoot.

Western spadefoots require temporary rainpools or pools in ephemeral streams with water temperatures of $\geq 9°C$ and $<30°C$ (Brown 1966; 1967) in which to reproduce. These pools must last ≥ 3 weeks (Feaver 1971) in order for successful metamorphosis to occur. Successful reproduction requires pools that lack fishes, especially exotic fishes; bullfrogs (Hayes and Warner 1985); and crayfish. There are many indications that *Scaphiopus hammondii* cannot recruit in the presence of exotic predators (Jennings and Hayes 1994). The soil characteristics of burrow refuge sites of western spadefoots has not been studied but they may be similar to the requirements of *Scaphiopus multiplicatus* where the soil may become fairly hard and compact during summer aestivation (Ruibal *et al.* 1969).

Concern over the decline of *Scaphiopus hammondii* is not a recent phenomenon. Over 20 years ago Robert Livezey and Rudolfo Ruibal believed that this species had sustained drastic reductions in the last 15-20 years in the Central Valley and southern California (Jennings and Hayes 1994). Current data indicate that in southern California (from the Santa Clara River valley, Los Angeles and Ventura counties, southward), over 80% of the habitat once known to be occupied by *Scaphiopus hammondii* has been developed or converted to uses that are undoubtedly incompatible with its successful reproduction and recruitment (Jennings and Hayes 1994).

Reptiles

Southwestern Pond Turtle
Clemmys marmorata pallida Seeliger
Category 2 Candidate Species for Federal Listing

The southwestern pond turtle is a medium sized (120-210mm carapace length) turtle with a low carapace and a pattern of spots or lines that radiate from the centers of the scutes (Holland 1991a). The smooth, keelless carapace is short, broad and widest at the bridge. The carapace is olive, dark brown or black and the pattern is absent in some individuals. The head is moderate with a nonprojecting snout, the color is plain grey to olive but may occasionally have numerous black speckles or reticulations (Ernst and Barbour 1989).

Two subspecies of *Clemmys marmorata* are recognized. *Clemmys marmorata marmorata* (Baird and Girard 1852) in the northern portion of the species' range and *Clemmys marmorata pallida* Seeliger, 1945 in the south. The Baja California form presently recognized as the *pallida* subspecies may deserve independent taxonomic recognition.

The southwestern pond turtle (*Clemmys marmorata pallida*) occurs southward from San Francisco Bay to Arroyo Santo Domingo in Baja California del Norte and is the only freshwater turtle native to the area. Once common in southern California (Ventura County and south), populations of this turtle have declined dramaticly in recent years. In 1960 there were 87 known localities in southern California, by 1987 the number had dropped to 20 (Brattstrom and Messer 1988). Although the subspecies has declined precipitously in southern California, more northerly populations appear to be more stable.

This is the most aquatic member of the genus *Clemmys*. In southern California the southwestern pond turtle occupies three main habitat types: major rivers and streams, seasonal streams and ponds, and lakes and reservoirs (Brattstrom and Messer 1988). However, it is found in the swift mountain streams such as the East, West and North Forks of the San Gabriel River. Life history data definitely based on observations of *Clemmys marmorata pallida* are meager. Most studies have examined more northern populations and therefore have studied *Clemmys marmorata marmorata*. The known elevation range of the western pond turtle extends from sea level to ca. 1430 meters, records from higher elevation represent introductions (Jennings and Hayes 1994).

Habitat requirements generally consist of long deep pools with plenty of cover both above and below water (Storer 1930; Bury 1972). Western pond turtles are uncommon in high gradient streams probably because water temperatures, current velocity, food resources, or any combination thereof may limit their local distribution (Holland 1991a). Furthermore, basking sites exposed to the sun for several hours per day and a stable food supply are required (G. Stewart, pers. comm.). Preferred basking sites are near deep water for quick escape from terrestrial predators. The most prominent part of western pond turtle behavior is the activities they perform to thermoregulate, which vary with ambient temperature based

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In a pond situation, movement away from the water except to nest was rare (Rathbun *et al.* 1993). In a stream situation, turtles ere highly variable in their movements. Some individuals would nest, aestivate, or overwinter only a few meters away from the watercourse, whereas others move considerable distances (up to 350 meters) to overwinter (Rathbun *et al.* 1992; 1993). Turtles will move significant distances (at least 2 km) if the local habitat changes/disappears. Adult turtles can tolerate at least 7 days without water (Holland cited in Jennings and Hayes 1994), but the dispersal ability of juveniles and the recolonization potential of western pond turtles following extirpation of a local population are unknown.

Nesting occurs from late April through August with a peak period of oviposition in May - June (Storer 1930; Buskirk 1992; Rathbun *et al.* 1993). Most nests are dug in the morning and are located along the margins of a stream or pond, full sunlight seems to be a requirement of the nesting site (Ernst and Barbour 1989; Rathbun *et al.* 1993). Females emigrate from the aquatic site to an upland location that may be up to 400 meters or more from the aquatic site (Holland 1991a; Rathbun *et al.* 1992; 1993). Clutch size varies from 1 to 13 eggs. The hard white eggs are elliptical to oval, measuring 30.0-42.6mm in length and 18.5-22.6mm in width and are buried in a shallow nest 10-12 cm deep (Holland 1991a; Rathbun *et al.* 1993). Females may lay more than one clutch per year (Rathbun *et al.* 1993). The incubation period is probably about 70-80 days. Hatchlings have a carapace length of approximately 25mm. The young may hatch and overwinter in the nest because hatchling-sized turtles have almost never been observed in an aquatic site in the fall (Holland 1985). Most hatchling turtles are thought to emerge from the nest and move to an aquatic site in the spring (Buskirk 1992). Neonates spend much of their time feeding in shallow water that typically has relatively dense vegetation of submergents or short emergents.

The southwestern pond turtle is omnivorous and a dietary generalist but are highly opportunistic and will eat anything they can capture. Many individuals show a strong preference for animal foods. It will feed on a wide variety of material including insects, fish, worms, crustaceans and algae (Brattstrom and Messer 1988; Ernst and Barbour 1989). Nekton, the zooplankton fauna that can occur at high densities in the water column in standing water, are an important food of hatchlings and young juveniles (Holland 1991a), and these age groups may not grow as rapidly where this food source is lacking. Much variation exists in western pond turtle growth rates, however, in most areas hatchlings typically double their length in the first year and grow relatively rapidly over the next 4-5 years (Storer 1930; Holland 1985). There is some evidence that intraspecific competition is reduced by differences in food preference between males and females. Males eat a higher proportion of insects, while females were found to contain a higher proportion of algae in their stomachs (Bury 1986). Age and size at reproductive maturity varies with latitude. In California, reproductive maturity occurs at between 7 and 11 years of age, and approximately 110-120 mm carapace length.

The young are vulnerable to predation by large wading birds such as herons and introduced predatory fishes and the bullfrog. Bullfrogs in particular may be responsible for significant mortality of hatchling and juvenile turtles because they occupy the shallow water habitats favored by the youngest age classes of turtles (Moyle 1973; Holland 1991a; Jennings and Hayes 1994)The adults are occasionally taken by raccoons, coyotes and black bears, they may be particularly vulnerable to predation when aquatic habitats become constricted.

The 1988 report by Brattstrom and Messer indicated that few viable populations of *Clemmys marmorata pallida* remained in southern California. More recent fieldwork indicates that only 6-8 viable populations of the southwestern pond turtle exist south of the Santa Clara River system in California (Holland 1991a). Many localities that currently harbor turtle populations may be in trouble because the nesting habitat is being impacted or altered during the incubation interval on an annual basis by agriculture or livestock activity (Jennings and Hayes 1994). These impacts probably create annual nesting failures, leading to increasingly adult-based populations. These habitat modifications coupled with the impacts of introduced exotic aquatic predators and/or competitors are damaging the few extant turtle populations.

Two-striped Garter Snake
***Thamnophis hammondii* (Kennicott)**
Category 2 Candidate Species for Federal Listing

Two-striped garter snake adults reach 60-100 cm total length. A middorsal stripe is absent. Dorsal coloration is variable ranging from olive, brown, or brownish gray, typically with 4 lengthwise rows of small, well separated dark spots between the lateral stripes. The lateral stripes are yellow and not always distinct and melanistic forms lacking lateral stripes exist (Fitch 1940; Fox 1951; Bellemin and Stewart 1977; Larson 1984). The underside is dull yellowish to orange-red or salmon and the throat may be pale (pers observ).

Formerly considered a subspecies of the western aquatic garter snake, *Thamnophis couchii*, the two-striped garter snake was elevated to species rank as *Thamnophis hammondii* (Fox and Dessauer 1965; Rossman 1979; Lawson and Dessauer 1979; Fitch 1984; Rossman and Stewart 1987). Field observations indicate that *Thamnophis hammondii* is ecologically distinct from other sympatric *Thamnophis* species along the central California coast (Fox 1951; Bellemin and Stewart 1977; Rossman and Stewart 1987; Boundy 1990).

The known range of the two-striped garter snake extends through the South Coast and Peninsular ranges west of the San Joaquin Valley and deserts from the vicinity of Salinas and Cantua Creek, south to La Presa, Baja California, Mexico (McGuire and Grismer 1992). The known elevational range is from around sea level to about 2450 meters (Atsatt 1913).

Despite the familiarity of this snake to many people there is a dearth of information on the ecology of this species. The species is highly aquatic and is rarely found far from water, which it freely enters to forage and escape predators (Fitch 1940; 1941; Stebbins 1985). Juveniles emerge from hibernation in the spring although they may occasionally be observed foraging on warm winter days (Ruthling 1915; Rathbun *et al.* 1993). *Thamnophis hammondii* is often observed basking during the early morning and afternoon before foraging for prey. Two-striped garter snakes mate in the spring (March) and bear from 10-25 live young during the fall (Bogert 1930; Wright and Wright 1957; Cunningham 1959). Neonates have been observed from late August through November (Rathbun *et al.* 1993). The two-striped garter snake probably does not reach sexual maturity until 2-3 years of age (Jennings and Hayes 1994).

Juveniles and adults feed primarily on fish (*Cottus* sp. and *Eucyclogobius newberryi*: Rathbun *et al.* 1993; *Gasterosteus aculeatus*: Bell and Haglund 1978, Bell 1982, Rathbun *et al.* 1993; *Onchorhynchus mykiss*: Fitch 1941), fish eggs (Fitch 1940), and the tadpoles and metamorphs of anurans (Grinnell and Grinnell 1907; Klauber 1931; Fitch 1940; Cunningham 1959) have been recorded as prey. Potential predators include: hawks, shrikes, herons, raccoons, coyotes, and introduced exotic fishes and bullfrogs. Bullfrogs are known to eat all life stages of *Thamnophis hammondii* (S. Sweet cited in Jennings and Hayes 1994).

Adult snakes utilize different areas and habitats in summer and winter (Rathbun *et al.*

1993). During summer, snakes utilized streamside sites and had home ranges that varied from approximately $80m^2$ to over $5,000m^2$ (mean ca. $1500m^2$, n=7). During winter, they occupied coastal sage scrub and grassland locations in upland adjacent riparian areas, and had home ranges that varied from $80\text{-}9,000m^2$ (mean ca. $3400m^2$, n=3). Colonization abilities are poorly understood.

Two-striped garter snakes commonly inhabit perennial and intermittent streams having rocky beds bordered by willow thickets or other dense vegetation (Grinnell and Grinell 1907; Fitch 1940; Fitch 1941). They may also inhabit large sandy river beds such as the Santa Clara River, if a strip of riparian vegetation is present along the stream course (Jennings and Hayes 1994).

Thamnophis hammondii has disappeared from approximately 40% of its historic range, and most of the decline has occurred since 1945 (Jennings and Hayes 1994). Most of this decline is attributed to habitat destruction from urbanization, large reservoirs, destruction of riparian habitat, and the cement lining of stream channels in southern California for flood control. Other contributing factors include livestock grazing, predation by introduced fishes, bullfrogs, and loss of prey base.

Survey Techniques for the Sensitive Species in the Santa Clara River

Fishes

The fish surveys were accomplished by seining the Santa Clara River between the Castaic Creek confluence and Bouquet Canyon Road bridge at intervals of 100 paces. All seining used a 10 foot x 6 foot nylon minnow seine with 1/8 inch mesh. Length of individual seine hauls varied and was determined by shore configuration, bottom configuration, substrate, vegetation, debris and current. Surveys of the Santa Clara River were conducted on 11 June 1995. Subsequently a survey of San Francisquito Creek was conducted on the Newhall Land and Farming Company land on 7 July 1995. During this survey 45 seine hauls were made at various distances apart as determined by the habitat. Appendix B contains a table summarizing the results of these seines.

Amphibians

Nocturnal surveys were conducted to locate calling male anurans. These surveys were conducted on 17, 18, 24, and 25 May and 6 June 1995. U.S. Fish and Wildlife Service guidelines require a minimum of three surveys for arroyo toads to be completed by 31 May. These surveys were also conducted to determine if western spadefoots occurred in the study area. The local anuran species have distinctive calls that are readily recognized. The following call descriptions were taken from Davidson (1995)

> Arroyo toad - *Bufo microscaphus californicus*
>
> A long, musical trill, usually lasting 6 to 10 seconds. Calls usually rise in pitch and pulse rate right at the start and end abruptly.
>
> Western spadefoot - *Scaphiopus hammondii*
>
> A vibrating snore reminiscent of the purring of a cat, repeated over and over. Calls last 0.5-1.5 seconds and can be heard from a long distance.

The calls of the common anuran species of the Santa Clara River; western toad, *Bufo boreas* and Pacific treefrog, *Hyla regilla* cannot be confused with those of the sensitive species described above.

In addition, the fish surveys conducted on 11 June 1995 allowed the examination of tadpoles throughout the study area to determine if there were any specimens that could be assigned to one of the sensitive species (including the red-legged frog). The fish survey also allowed the study area to be examined for adults.

Reptiles

The presence of the two sensitive reptiles, southwestern pond turtle, *Clemmys marmorata pallida*, and the two-striped garter snake, *Thamnophis hammondii*, was best determined by trapping. Both of the species in question are wary and have crepuscular as well as diurnal activity patterns, they may even be nocturnally active. The traps were placed in habitats/microhabitats that were appropriate for the species being trapped.

San Marino Environmental Associates uses specially constructed turtle traps which it baits with canned sardines. The traps are placed in the water with the bait below the water surface and an air pocket in the trap that allows captured turtles to breathe.

To trap garter snakes, unbaited minnow traps were placed in or along marginal vegetation with the trap entrance submerged below the water surface. This technique has been successfully utilized previously and avoids the mortality often associated with fully submerging the trap.

Trapping was conducted between the Castaic Creek confluence and Old Road bridge from 15-19 May 1995 and the river reach from Old Road bridge to Bouquet Canyon Road bridge was trapped from 22-26 May 1995.

Distribution of the Sensitive Species in the Study Area

Fishes

Unarmored Threespine Stickleback
Gasterosteus aculeatus williamsoni

Santa Clara River

The stickleback has been recorded from the main channel of the Santa Clara River, wherever there is permanent water. Field records of Steven Ross from 1968; Jonathan Baskin, 1973 and Michael Bell, 1974; indicate that sticklebacks have been abundant in this stretch of river for at least the last 27 years. Bell (1976) surveyed the length of the river and records sticklebacks from the Interstate 5 overpass downstream to where the water goes underground. The designation of the Del Valle portion of the essential habitat for the unarmored threespine stickleback is largely based on Bell's 1970s surveys. Surveys (D. Soltz, pers. comm.) conducted during the summer of 1987 found the stickleback in a pool upstream of McBean Parkway, and wherever appropriate habitat existed, downstream to the Interstate 5 overpass. The stickleback became more abundant west of the interstate and was found downstream to the mouth of Castaic Creek where the survey ended. Haglund (unpubl. data) examined the area just upstream and downstream of McBean Parkway, between May and December of 1988. Sticklebacks were locally abundant in this area at the time of the survey. Haglund also confirmed that these fish were the endangered subspecies using horizontal starch gel electrophoresis.

Based on the results of the May 1995 survey, sticklebacks are continuously distributed from Bouquet Canyon road bridge downstream to the confluence of Castaic Creek. This portion of the study area is entirely within Los Angeles County's SEA 23. In addition much of this area falls within the Del Valle zone of the essential habitat for the unarmored threespine stickleback which begins at Interstate 5 and runs downstream to Del Valle (Del Valle is downstream of the confluence of Castaic Creek). Table 1 below summarizes the results of each seine haul in the survey. Although sticklebacks were not collected in many of the individual seine hauls, the seining sites were randomly selected because seining took place after 100 paces whether or not the habitat was optimal for sticklebacks.

San Francisquito Creek

During the summer of 1987, sticklebacks were abundant in the lower portion of San Francisquito Creek from Avenue Scott to the confluence with the Santa Clara River. This population was either destroyed or greatly reduced during construction in the area when the flow of water was blocked by construction of a temporary road for heavy equipment use (Soltz, pers. comm.). In 1988, Haglund found no fish in this portion of San Francisquito Creek. At that time flows in this portion of the creek appeared to be largely from wastewater from a produce processing plant on the west side of the creek and from occasional agricultural runoff, although subsurface flow emerged in the last 100 feet of the creek.

The survey conducted on 7 July 1995 began at the confluence of San Francisquito Creek with the Santa Clara River and continued upstream to the boundary of the Newhall Land and Farming Company property. Sticklebacks were found throughout the stream reach wherever there was appropriate habitat. The studied stream reach is downstream of the San Francisquito Creek portion of the essential habitat for the unarmored threespine stickleback and within SEA 19. Table 2 contains the results of the seining.

Arroyo Chub
Gila orcutti

The distribution of the arroyo chub parallels the distribution of the stickleback in the Santa Clara River and its tributaries and is continuously distributed throughout the study area. The chubs are the most abundant fish species in both portions of the study area: the Santa Clara River and San Francisquito Creek. There is no section of stream where chubs are not found and in many areas they are extremely abundant. Tables 1 and 2 contain the results of the surveys

Santa Ana Sucker
Catostomus santaanae

Of the three fish species, the Santa Ana sucker has the patchiest distribution. Bell (1976) records the occurrence of this species from Highway 5 downstream throughout the area of surface flow. However, unlike the two previously discussed species the sucker was apparently not distributed continuously throughout the stream. The adult sucker's preference for gravel and cobble substrate is the apparent limiting factor. The surveys by Soltz in 1987 and Haglund 1988 from McBean Parkway downstream to Interstate 5 failed to locate suckers from this stretch of stream. Neither Bell, Soltz nor Haglund records the sucker from San Francisquito Creek downstream of Scott Road. Bell (1976) found the sucker beginning at the Interstate 5 bridge, but Soltz (pers. comm.) did not locate any specimens between Interstate 5 and Castaic Creek in 1987. Habitat for the sucker exists in this section of the Santa Clara River but the fish may not be abundant and suckers are often difficult to locate.

During the May 1995 surveys, suckers were not found between Old Road bridge and the mouth of Castaic Creek but were located between Old Road bridge and Bouquet Canyon Road bridge and in San Francisquito Creek. The absence of suckers during the late 1980s from the McBean area of the Santa Clara River was probably due to the habitat modification caused by watercress farming. With the cessation of the stream alteration associated with watercress farming and the return of more natural flow conditions the suckers have colonized/recolonized this stream section. The results of the surveys are summarized in Tables 1 and 2.

Table 1. Seine 1 was at the mouth of Castaic Creek and each successive seine is sequentially numbered going upstream toward Bouquet Canyon Road bridge. The number of individual of each species captured in each seine haul is shown in the appropriate column.

Seine #	*Gasterosteus aculeatus williamsoni*	*Gila orcutti*	*Catostomus santaanae*
1		51	
2	1	1	
3			
4		3	
5		34	
6		1	
7	2	28	
8		2	
9		6	
10	2	2	
11			
12			
13	4	2	
14		38	
15	4	96	
16		29	
17	1	9	
18		1	
19		32	
20		3	
21	1	6	
22			
23	5		
24		56	

25	5		
26		32	
27	2	13	
28	2		
29	4	28	
30		21	
31	1	151	
32	14	211	
33			
34		5	
35			
36	4	3	
37	65	61	
38	1	4	
39			
40	2	7	
41	10	1	
42	30	5	
43	15	6	
44	1		
45	2	1	
46	18		
47	2		
48	11	12	
49	1	8	
50	1		
51		2	
52	1		

53	14	5	
54		1	
55		1	
56			
57	1	2	
58	4		
59	2	3	
60			
61		1	
62			
63		1	
64	1		
65	1	1	
66		2	
67	1	6	
68			
69		1	
70	1	5	
71			
72	3	7	
73		1	
74	8	23	23
75	2	1	
76		3	1
77		2	4
78		7	
79			
80	2	20	numerous fry

81		2	
82	1		
83		26	
84			
85	1	2	
86	2	10	
87	15	45	1
88	10	1	
89		5	
90	1		
91			
92			
93	2	6	
94			
95		5	
96		2	
97	2	1	
98			
99	9		
100	1		
101		3	
102	1		
103		1	
104			
105			
106			
107			
108			

109		1	
110			
111			
112		3	
113			
114	1	3	
115			
116			
117	2		
118		2	
119		1	
120	1		
121		9	
122			
123	1		
124	1		
125	2	1	
126	2		
127	1	2	
128	1	2	
129	1[1]	2	
130			
131			
132			
133			
134		3	
135			
136			

137			
138			
139			
140			
141			
142			
143		1	

[1] This seine haul represents the most upstream seine haul that contained unarmored threespine sticklebacks. Seine haul 129 was taken just upstream of the baseball diamond which is located on the south bank of the Santa Clara River downstream of Bouquet Canyon Road bridge.

Table 2. Seine 1 was immediately upstream of the confluence of the Santa Clara River and San Francisquito Creek and each successive seine is sequentially numbered going upstream toward the boundary of the Newhall Land and Farming Company's property. The number of individual of each species captured in each seine haul is shown in the appropriate column.

Seine #	*Gasterosteus aculeatus williamsoni*	*Gila orcutti*	*Catostomus santaanae*
1	3	17	
2	1	12	
3	1	22	
4		4	
5		17	
6		23	
7		4	
8	5	5	
9		1	
10		1	
11		1	
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			

24			
25			
26			
27			
28	1	1	1
29			1
30	1	6	17
31	1	numerous[1]	numerous[1]
32	7	numerous[1]	numerous[1]
33	numerous[1]	numerous[1]	numerous[1]
34	52		
35	1		1
36	12	4	
37	48	20	3
38	6	20	1
39	8	49	4
40	3		
41	3	2	
42	3	19	
43	1		
44	3		
45	31	118	

[1] Where the word "numerous" appears in the table it was because very large numbers of small individuals were captured and because of the heat the fish were returned to the water rapidly to avoid mortality. In each case the fish were examined sufficiently to ascertain the species composition of the seine haul.

Amphibians

Table 3. The following table summarizes the time and temperature conditions at the time of the nocturnal surveys.

Date	Time of Sunset	Time Survey Initiated	Temperature at Initiation	Time Survey Terminated	Temperature at Termination
17 May	1946 h.	2000 h.	20.6°C	0045 h.	18.9°C
18 May	1947 h.	2000 h.	20.2°C	0030 h.	19.1°C
24 May	1952 h.	2015 h.	19.7°C	0045 h.	17.4°C
25 May	1953 h.	2015 h.	21.0°C	0030 h.	18.1°C
6 June	2004 h.	2030 h.	18.9°C	0015 h.	17.3°C

As noted above all surveys were conducted between 17.3-21.0°C, which was essential since male arroyo toads stop calling when air temperatures fall below 13-14°C (Myers 1930; Jennings and Hayes 1994). During all survey both Pacific treefrogs (*Hyla regilla*) and western toads (*Bufo boreas)* were actively calling.

not good for NRan

Arroyo Toad
Bufo microscaphus californicus

The arroyo toad still occurs in the Santa Clara River drainage. The species still occurs in both the Piru Creek and Castaic Creek drainages (S. Ellis, S. Sweet, G. Stewart; pers comm). In addition, egg clusters attributed to the arroyo toad have been recorded in the Santa Clara River near the Los Angeles/Ventura County line and near Castaic Creek (S. Ellis, pers comm).

No males were heard calling during the 1995 surveys and no egg masses or tadpoles were subsequently found during the fish surveys. There is no evidence that arroyo toads occur in the study area.

California Red-legged Frog
Rana aurora draytonii

None of the surveys in this area record the red-legged frog, and there are no records of this species from the Santa Clara River for approximately 20 years (M. Jennings, pers comm). During the mid 1970s Haglund observed red-legged frogs in the Santa Clara River at Fillmore and this may represent the last sighting of this species in the Santa Clara River. Sweet (pers. comm.) has documented the presence of this species in the Piru Creek drainage.

During the 1995 surveys, no evidence of red-legged frogs was found, neither tadpoles nor adults were located. Despite the fact that good habitat is available the study area the presence of this species was not anticipated in the study area because the limited available data suggest this species is not a good recolonizer.

Western Spadefoot
Scaphiopus hammondii

No historical records of the occurrence of western spadefoots in the study area were located. However, they are known from other areas of the Santa Clara River drainage and suitable habitat does exist within the study area.

No western spadefoots were located during the nocturnal surveys and during the subsequent fish surveys neither egg masses nor tadpoles were located. Due to the lack of western spadefoot activity in the study area during the surveys; on 24 May the Lost Canyon area of the Santa Clara River was examined. This area, located approximately 6.25 miles upstream of Bouquet Canyon Road bridge, and is an area known to contain western spadefoots. The Lost Canyon area was surveyed in order to determine if western spadefoots were active during the time the surveys were being conducted. Two individuals were rapidly located at this alternative site, further substantiating that the absence of the western spadefoot during the surveys of the study area was due to their real absence rather than a lack of activity during the survey time.

Reptiles

Southwestern Pond Turtle
Clemmys marmorata pallida

Turtles are known from a variety of localities in the Santa Clara River drainage. There is a population in Piru Creek and there was a large population in Sespe Creek in the 1980s but the current status of that population is unknown to the authors. Turtles are also known to be present in the study area. Furthermore, the southwestern pond turtle is known to be capable of significant terrestrial movement allowing for the potential of colonization/recolonization.

During the 1995 trapping, 25 turtles were captured between the Castaic Creek confluence and the Old Road bridge indicating a good sized population in this area. Even on the last two trapping days 8 turtles were captured on each and there was only a 50% recapture rate. This stream section supports a population of turtles. A total of 60 trap days were used in this stream reach. The stream reach between Old Road bridge and Bouquet Canyon Road bridge had very little habitat even marginally suitable for turtles and 25 trap days failed to capture any turtles. Southwestern pond turtles appear to be absent from this stream reach.

Table 4. Numbers of turtles captured on trapping days.

Date	Number of Turtles New Captures	Number of Turtles Recaptured	Total Number of Turtles Captured
From the Castaic Creek Confluence to Old Road Bridge			
15 May	6	0	6
16 May	6	0	6
17 May	5	6	11
18 May	4	4	8
19 May	4	4	8
From Old Road Bridge to Bouquet Canyon Road Bridge			
22 May	0	0	0
23 May	0	0	0
24 May	0	0	0
25 May	0	0	0
26 May	0	0	0

Two-striped Garter Snake
Thamnophis hammondii

The status of the two-striped garter snake in the Santa Clara River is somewhat uncertain. Historical documentation of its presence and distribution is sparse. But the species has been observed in the Santa Clara River from Interstate 5 downstream to the end of surface flow, in Castaic and Piru Creeks, as well as further downstream in the Santa Clara River and Sespe Creek (pers observ).

The 1995 trapping failed to capture any snakes. Snakes certainly occur between the Castaic Creek confluence and Old Road bridge based on previous experience, however, the absence between Old Road bridge and Bouquet Canyon Road bridge is probably real. A total of 52 trap days were used in the downstream section and a total of 75 trap days were used in the upstream section. It is not understood why no snakes were captured in the downstream section of the study area.

Summary of Results

Table 5. This table summarizes the occurrence of the sensitive aquatic species in the study area. Shading indicates that no survey was conducted.

Species	Santa Clara River from the Castaic Creek confluence upstream to Old Road bridge	Santa Clara River from Old Road bridge upstream to Bouquet Canyon Road bridge	San Francisquito Creek from the confluence with the Santa Clara River upstream to the boundary of the Newhall Land and Farming Company property
Unarmored threespine stickleback	Present throughout	Present throughout	Present in appropriate habitat
Arroyo chub	Present throughout	Present throughout	Present in appropriate habitat
Santa Ana sucker	Absent	Present	Present in appropriate habitat
Arroyo toad	Absent	Absent	
Red-legged frog	Absent	Absent	
Western spadefoot	Absent	Absent	
Southwestern pond turtle	Population present	Absent	
Two-striped garter snake	Not located during survey but does occur, so the population is probably small	Absent	

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