SECTION FIVE: THREATENED OR ENDANGERED SPECIES

5.0 INTRODUCTION

Despite the moderate to high levels of development throughout the San Francisquito Creek watershed , the region still supports a substantial number of native animal species of conservation concern. The San Francisquito Creek Bank Stabilization and Revegetation project presents an opportunity to restore and expand the various natural habitats. However, as individual projects are developed, care will have to be taken to consider the existing conditions for fish and wildlife. There are numerous ways to improve the situation for species listed as threatened or endangered by State or federal agencies. Conversely, any action within the creek could lead to inadvertent impacts to biological resources.

This section summarizes some of the aquatic and semi-aquatic species known to occur within the watershed and discusses two listed species, the federally threatened steelhead (*Oncorhynchus mykiss*) and California red-legged frog (*Rana aurora daytonii*), in greater detail. Two other listed species have a low potential to occur in the project area, but no recent confirmed sighting have been reported. These are the federally threatened coho salmon (*O. kisutsch*) and the federally and State endangered winter-run chinook salmon (*O. tshawytscha*).

5.1 THE WATERSHED

The San Francisquito Creek watershed consists of four main components: Bear Creek, Los Trancos Creek, San Francisquito Creek proper, and streams that flow into Searsville Reservoir. San Francisquito Creek originates at the base of Searsville Reservoir Dam. As discussed in previous sections, the upper watershed between the reservoir and Junipero Serra Boulevard is characterized by moderate development, including low-density residential, commercial, recreational (golf courses, equestrian facilities), scientific (Stanford University's Linear Accelerator and Jasper Ridge Biological Preserve), and agricultural land uses (Launer and Spain, 1998). There are several water diversions in the upper watershed, most notably Searsville Dam and Reservoir and the Los Trancos Creek Diversion, both owned and operated by Stanford University. Other dams and diversions are located on the Bear Creek subdrainage. Most of the creeks in the upper watershed support a narrow band of riparian vegetation (willows, alders, cottonwoods, dogwoods, valley oaks, coast live oaks, and others) that appears to be limited by both development and local topography (Launer and Spain, 1998).

The lower portion of the San Francisquito Creek watershed between

Junipero Serra Boulevard and Bayshore Freeway (U.S. Highway 101) is highly urbanized. This portion of the Creek comprises the study area. Past development and associated flood control projects have encroached upon the creek channel and its floodplain, creating an incised, relatively deep and narrow channel supporting only a narrow band of riparian vegetation consisting primarily of Coast Live Oak Woodland and Valley Foothill Riparian habitats (see Section Four: Vegetation Conditions). Over 30% of the project area is dominated by non-native riparian species, including eucalyptus.

San Francisquito Creek downstream of Sand Hill Road is typically dry during the summer months. This condition does not appear to be a result of water diversions in the upper watershed, but rather represents the natural hydrology of the system (Johnson, pers. comm.; Coyote Creek Riparian Station (CCRS), 1998; U.S. Fish and Wildlife Service (USFWS), undated). The mouth of San Francisquito Creek, located between the U.S. Highway 101 and San Francisco Bay, is tidally influenced and thus contains Bay water even during the summer months.

5.2 AQUATIC RESOURCES

5.2.1 FISH

San Francisquito Creek and its tributaries support a number of native fish species such as steelhead, California roach (*Hesperoleucus symmetricus*), Sacramento sucker (*Catostomus occidentalis*), threespine stickleback (*Gasterosteus aculeatus*), and prickly sculpin (*Cottus asper*) (Anderson, 1995; Launer and Spain, 1998). Historic records indicate that riffle sculpins (*Cottus gulosus*) and Sacramento perch (*Archoplites interruptus*) have also been observed in the watershed in the past.

5.2.2 AMPHIBIANS

Of the native amphibians known to occur within the watershed, California red-legged frogs, rough-skinned newts (*Taricha granulosa*), and California newts (*Taricha tarosa*) are directly associated with the local creeks. Pacific tree frogs (*Pseudacris regilla*) and western toads (*Bufo boreas*) are occasionally found along the edges of the streams although most reproduction typically occurs in other areas. California tiger salamanders (*Ambystoma californiense*) are found in seasonal wetlands located within the overall watershed, but are not typically associated with its creeks.

5.2.3 REPTILES

Western pond turtles (*Clemmys marmorata*) are known to occupy the system, but have been rarely observed in the past few years. Garter snakes are found in the San Francisquito Creek watershed, which is generally considered to be an intergrade zone for the area's two subspecies of common garter snakes; the State and federally endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) and the California red-sided garter snake (*Thamnophis sirtalis infernalis*) (Launer and Spain, 1998). However, San Francisco garter snakes have not been observed within the project area and their presence is unknown but unlikely.

5.2.4 NON-NATIVE SPECIES

As with vegetation, the creek is home to several species that have been accidentally or deliberately introduced. The non-native bullfrog (*Rana catesbeiana*) has been found throughout most of the watershed (Launer and Spain, 1998). Non-native fish such as largemouth bass (*Micropterus salmoides*), sunfish (*Lepomis* species), mosquitofish (*Gambusia affinis*), and goldfish (*Carassius auratus*) have been observed in the system, but are presently not believed to significantly impact the native fish fauna (Launer and Spain, 1998). More recently, Chinese mitten crab (*Eriocheir sinensis*) arrived from the Bay sometime after 1993. Mitten crabs are native to mainland China and coastal areas along the Yellow Sea, and grow and develop in freshwater. They are well-distributed in the South Bay and may occur up to 10 miles inland.

5.3 STEELHEAD

San Francisquito Creek contains one of the few remaining steelhead runs in the San Francisco Bay drainage. Steelhead in this watershed belong to the federal threatened central California coast Evolutionarily Significant Unit (ESU). Critical habitat for the species was proposed by the National Marine Fisheries Service (NMFS) on February 5, 1999. Critical habitat would include all waterways and substrates below longstanding, naturally impassable barriers (i.e. natural waterfalls in existence for at least several hundred years) and dams that block access to former anadromous habitats (Fed. Reg., 1999). Thus, the San Francisquito Creek watershed may be designated as critical steelhead habitat in the near future.

5.3.1 ECOLOGY

Steelhead exhibit one of the most complex life histories of any salmonid species. The resident rainbow trout form spends its entire life in freshwater environments while the anadromous steelhead form migrates between their natal streams and the ocean. Steelhead migrate to marine waters after spending one or more years in freshwater. They typically reside in marine waters 2-3 years prior to returning to their natal stream to spawn as 4- or 5- year olds. Unlike salmon, steelhead are iteroparous, meaning they can spawn more than once before they die.

Steelhead incubate in gravel depressions termed "redds" made by the adult female. The egg incubation period varies based upon local conditions such as water temperature and oxygen availability. Juvenile "fry" emerge from the gravel and rear in the freshwater environment for 1-4 years, after which they migrate to the ocean as smolts. Two reproductive forms are recognized, the "stream maturing" and "ocean maturing" forms (also termed summer-run and winter-run, respectively), which describes the level of sexual development following return to the freshwater environment. The central California coast ESU consists entirely of winter-run steelhead.

5.3.2 LOCAL DISTRIBUTION

Fish surveys conducted during the 1990's have focused primarily on the upper San Francisquito watershed. Steelhead and/or the resident rainbow form were found to occur in Bear Creek, Los Trancos Creek, and San Francisquito Creek as far downstream as the Stanford University golf course (Anderson, 1995; Launer and Spain, 1998). Bear Creek and Los Trancos Creek contained the largest numbers of steelhead and seem to provide the most significant spawning grounds for the species. Due to the absence of permanent stream flows and significant spawning gravels in the lower portions of the creek, the primary value for steelhead of the project area appears to be that of a migratory corridor. Steelhead have been observed during both the winter/spring in-migration to spawning grounds in the upper watershed and the summer out-migration to San Francisco Bay (Johnson, pers. comm.).

5.3.3 EXISTING HABITAT CONDITIONS

The following discussion summarizes the existing steelhead habitat conditions of the lower portion of San Francisquito Creek based on data collected by CCRS (1998), Phillip Williams and Associates (PWA) (see *Section Three: Hydrology and Geomorphology*), and reconnaissance surveys conducted in 1998 and 1999. The primary focus of the discussion is on channel characteristics that are determining factors for steelhead habitat quality.

Stream substrates form one of the most important aspects of steelhead habitat quality. Steelhead construct redds in riffle areas where gravel and cobble are the primary substrate type. Smaller materials, collectively referred to as fines, generally clog redds and reduce water and oxygen permeability in the substrate while larger particles are typically too heavy to allow female steelhead to construct a depression in the stream bottom. The substrate composition in the majority of the project area is dominated by fine materials (sand, clay, etc.), which is a typical phenomenon in the low-gradient, downstream portions of creeks where reduced flow velocities allow fine materials transported in the water column to settle out. Gravel and cobble become dominant in the upstream portion of the project area near San Mateo Drive. (See Figure 3.12) Thus, San Francisquito Creek within the project area provides suboptimal spawning habitat for steelhead.

Steelhead and other fish species require a diverse array of instream and overhead shelter such as woody debris, root wads, aquatic vegetation, undercut banks and boulders, and overhanging riparian vegetation. Such features allow fish to escape predation, find protection from scouring winter stream flows, and also help to create thermal refugia by shading areas of the creek from the sun. Data collected by CCRS (1998) an H. T. Harvey & Associates (see *Section Four: Vegetation Conditions Survey*) indicate that the riparian vegetation along the portion of the creek located within the project area provides relatively extensive shading, aquatic vegetation, and woody debris. However, undercut banks and root wads are notably scarce in this area, which appears to be directly correlated to the past use of traditional flood control structures such as the placement of rip-rap, sacked concrete, and concrete retaining walls along stream banks. Thus, the riparian corridor within the project area appears to provide adequate protection from excessive water temperatures but does not contain significant amounts of instream rest and protection areas for migrating steelhead.

The geomorphology of a creek is another important aspect of steelhead habitat quality. A sinuous (meandering) channel with varying water depths and widths, as well as variety of habitat types such as pools, riffles, and runs, generally provides higher quality habitat than a straight channel with consistent depth and width and no variation in habitat types. Steelhead tend to be spatially distributed throughout the channel depending on their current activity. For example, individual steelhead may be found resting and feeding at the bottom of a large pool or preparing a redd in a swift riffle section. The CCRS (1998) data indicate that stream widths generally range between less than one meter to about eight meters, while depths rarely exceed one meter in late spring. Habitat types are highly variable, with roughly equal amounts of pools, riffles, and runs present in the project area. Thus, aquatic habitat variability in the project area is relatively high and appears to provide an adequate array of channel features favored by steelhead.

5.3.4 MIGRATION BARRIERS

While the lower portion of San Francisquito Creek as a whole appears to provide relatively high quality migratory habitat for steel-

head, there are several barriers located within the project area. Two sites in particular, the Palo Alto grade stabilization structure near El Camino Real and the rubble/concrete structure near 1849 Woodland Avenue, present migration barriers during low flow conditions in late spring and early summer that are difficult or impossible for steelhead to pass (Johnson, pers. comm.). The seasonality of these migration impediments coincides with the out-migration of smolts to the Bay. During that part of the year, steelhead have been observed to congregate and become trapped in pools immediately upstream of the structures where they fall victim to predation, increasing water temperatures, and the ever-decreasing water levels (Johnson, pers. comm.).
Of all the habitat conditions discussed above, the barriers are believed to present the most critical adverse impacts on the steelhead population of San Francisquito Creek.

5.3.5 OTHER SALMONIDS

There are no historic or current records of federally threatened coho salmon (*Oncorhynchus kisutsch*) from the San Francisquito watershed, suggesting that this species has never had a significant presence in the system. However, given the wide distribution of central California coho, it is possible that at some point in the past they reproduced in the watershed (Launer and Spain, 1998). Currently, coho salmon are believed to be absent from the entire San Francisco Bay drainage (Moyle et al. 1995; NMFS, 1995) and are highly unlike to occur in San Francisquito Creek in the near future.

San Francisquito Creek did, however, contain a historic run of the State and federally protected chinook salmon (*Oncorhynchus tshawytscha*) (SFEP, 1997). There are no recent records of this species occurring in the watershed, but an unidentified salmon was observed in the creek in 1998 (Johnson, per. comm.) and may have been a chinook. With near-by watersheds such as Coyote Creek and the Guadalupe River still or again supporting small populations of chinook (SFEP, 1997), the possibility of the species returning to San Francisquito Creek in the future exists.

Although the habitat requirements of coho and chinook salmon are not identical to steelhead, they are similar enough to assume that any existing or future habitat conditions in the San Francisquito Creek watershed favorable to steelhead would also benefit the other two salmonid species.

5.4 CALIFORNIA RED-LEGGED FROGS

The San Francisquito Creek watershed provides habitat for the California red-legged frog, a federal threatened species.

5.4.1 ECOLOGY

The red-legged frog is chiefly a pond frog that can be found in quiet permanent waters of ponds, pools, streams, springs, marshes, and lakes. Moist woodlands, forest clearings, and grasslands also provide suitable habitat for this species in the non-breeding season (Stebbins 1985). Adult frogs seek waters with dense vegetation, such as cattails, along the shore that provide good cover (Fed. Reg., 1996), but may be found in unvegetated waters as well.

Red-legged frogs breed from January to May. Eggs are attached to vegetation in shallow water and are deposited in irregular clusters (Fed. Reg., 1996). Tadpoles grow to three inches before metamorphosing. Red-legged frogs are active year-long along the coast but will aestivate inland from late summer to early winter. Adults consume insects such as beetles, caterpillars and isopods, while tadpoles forage on algae and detritus.

5.4.2 LOCAL DISTRIBUTION

Surveys conducted by Launer and Spain (1998), CCRS (1998), and Rich Seymore (Roper, 1996) indicate that California red-legged frogs occur in the upper watershed, namely San Francisquito Creek, Matadero Creek, and a quarry pool associated with Matadero Creek. The most recent of these surveys, conducted in 1997 by Launer and Spain (1998), suggest that red-legged frogs in the area are reproducing successfully and appear to be expanding their range. The observed range expansion, however, may be a result of the above-average precipitation experienced by the region over the past few years.

There are no current records of California red-legged frogs occurring within the project area and the species is believed to be extinct from the lower reaches of San Francisquito Creek east (downstream) of Stanford University.

5.4.3 EXISTING HABITAT CONDITIONS

Although San Francisquito Creek within the project area contains several calm pools and a limited amount of instream vegetation, the overall creek structure, flow patterns, and riparian zone are not conducive to egg deposition or summer upland aestivation. Male juvenile frogs could potentially disperse into the area from their upstream habitat during the end of the breeding season. However, it is unlikely that an individual would remain in the project area year-round.

5.5 CONCLUSIONS

In summary, the master planning process for San Francisquito Creek is constrained largely by a single species, the central California coast steelhead. While there is no significant spawning habitat for steelhead within the project area, the primary value of the lower reaches of the creek is that of a migration corridor. As such, this area provides relatively high quality habitat, with the notable exceptions of the migration barriers and the limited availability of instream cover features.

The migration barriers currently present the most significant adverse condition to the steelhead population of San Francisquito Creek. Although perhaps not directly related to the Bank Stabilization and Revegetation project, every attempt should be made to either remove these barriers or make them more easily passable to out-migrating smolts.

More instream cover features can be provided in two ways. The natural method is to allow fallen trees and other organic debris to remain in the channel, rather than removing them for flood control purposes. The other option would be to integrate the construction of artificial cover in association with specific bank stabilization projects. Bank revetments and log cribs can be installed to overhang the toe of the bank, thus providing valuable fish habitat in the water below. Furthermore, scour pools should be allowed to form wherever possible. Another option to aid steelhead smolts in their spring out-migration is to construct a low-flow channel or channel constrictors that increase the velocity and depth of otherwise spread-out and sluggish late-spring flows. Flosi et al. (1998) and Hunter (1991) provide detailed discussions of these and other stream restoration methods. However, artificial instream structures, if inadequately designed, may inadvertently result in inferior habitat conditions than the existing ones. Careful design and the involvement of an experienced stream restoration specialist are highly recommended for this type of project.

No bank stabilization projects should be allowed to result in a further decrease in aquatic habitat quality. Every attempt will need to be made to maintain the natural course of the channel and to avoid the filling of pools and undercut banks. Furthermore, all construction should be conducted during the dry season to avoid direct mortality of steelhead and other aquatic species. Individual revegetation projects will also need to avoid denuding the riparian corridor during the removal of non-native plant species, which may lead to an excessive increase in ambient water temperatures.

5.6 REFERENCES

Anderson, P. 1995. Biological assessment of San Francisquito Creek Watershed to document status of steelhead trout prior to removal of barriers to migration. California Department of Fish and Game, Memorandum.

Coyote Creek Riparian Station (CCRS). 1998. San Francisquito Creek Stream Inventory: Fisheries Habitat Data Base.

Federal Register (Fed. Reg.). 1999. Designated Critical Habitat: Proposed Critical Habitat for Nine Evolutionarily Significant Units of Steelhead in Washington, Oregon, Idaho, and California. Vol. 64, No. 24, February 5.

Federal Register (Fed. Reg.). 1996. Determination of Threatened Status for the California Red-legged Frog: Final Rule. Vol. 61, No. 101, May 23.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual. Third Edition. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.

Hunter, C. J. 1991. Better Trout Habitat: A Guide to Stream Restoration and Management. Montana Land Reliance. Island Press, Washington, D.C. 320 pp.

Johnson, Jim. Stream Keeper, Coordinated Resource Management and Planning (CRMP). Personal communication, October 16, 1998.

Launer, A. E. 1998. Biologist, Stanford University Center for Conservation Biology. Personal communication, September 30.

Launer, A. E. and D. Spain. 1998. Biotic Resources of the San Francisquito Creek Watershed: Report on 1997 Field Activities Associated with Streambed Alteration Agreement #934-96. Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, CA.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish Species of Special Concern in California. Second Edition. Prepared for the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.

National Marine Fisheries Service. 1995. Status Review of Coho Salmon from Washington, Oregon, and California. National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NMFS-NWFSC-24.

Platts, W.S., W.F. Meghan, and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. General Technical Report INT-138. U.S. Forest Service Intermountain Forest and Range Experiment Station, Ogden, UT.

Roper, M. 1996. California Department of Fish and Game Regional Fisheries Biologist, telephone note from conservation with Rich Seymore, October 16.

San Francisco Estuary Project (SFEP). 1997. State of the Estuary, 1992-1997.

Stebbins, R.C. 1985. Field Guide to Reptiles and Amphibians. Houghton Mifflin Company. Boston, MA.

United States Fish and Wildlife Service (USFWS). Undated. Draft National Wetland Inventory Map, Palo Alto, California.