SECTION TWO:

REGIONAL SETTING

2.1 GENERAL STATEMENT

This section describes the regional setting of the La Honda Creek area relevant to the condition of riparian habitat and to road maintenance. It is written to orient the reader and provide context to the detailed sections that follow.

The reach of La Honda Creek examined in this project extends northward approximately 5.0 km (3.1 mi) from the confluence with San Gregorio Creek upstream to the confluence of the Weeks Creek (Figure 1-3, Plates 1A-C). In this reach, Highway 84 closely parallels the creek and traverses it in three locations. The highway, rural suburban development, historic and current land uses, and natural geologic processes all affect the creek's form and character.

2.2 PHYSIOGRAPHY

La Honda Creek is located in the Santa Cruz Mountains of the Coast Ranges of central California. The Coast Ranges are tectonically active, can receive 600-2,000 mm (25-80 inches) of annual rainfall, and have areas of very erosive bedrock geology, making this mountain range one of the most highly dynamic landscapes in the United States. The Santa Cruz Mountains encompass rugged and mostly rural portions of San Mateo and Santa Cruz Counties. The San Gregorio watershed (the basin that encompasses La Honda Creek) drains a 158 km^2 (61 mi^2) portion of the coastal Santa Cruz Mountains, in southwestern San Mateo County. The north-south orientation of La Honda Creek is similar to that of neighboring tributaries to San Gregorio Creek (Harrington, Bogess, and El Corte De Madera Creeks), and appears to be controlled by active faulting.

La Honda Creek is a perennial third-order creek (Strahler, 1957) with an average channel gradient of 4.5% (ranging from approximately 9.7 to 1.2%) from the headwaters to the San Gregorio confluence. Relief in the La Honda watershed ranges from an elevation of 707 m (2,320 ft) to 110 m (360 ft) at the confluence with San Gregorio Creek [10 m Digital Elevation Models (DEM's) can be downloaded from the web (USGS, 2003)]. Four named tributaries, Woodhams, Langley, Woodruff and Weeks Creeks, flow into La Honda Creek.

2.3 CLIMATE

Overall, the Santa Cruz Mountains of the central Coast Ranges have a Mediterranean climate typical of the larger Bay Area, overprinted by a moister and cooler local microclimate due to a marine air layer emanating from the Pacific Ocean. Average annual air temperatures in the watershed range from 4.4° C (40° F) to 21.7° C (71° F) with the warmest temperatures occurring in September (often called an "Indian Summer").

Most of the rainfall comes from marine low-pressure systems moving onshore from the northern Pacific Ocean. Areas of lower relief or that face east generally have lower rainfall. The La Honda Creek watershed shares these same general traits; areas of higher elevation receive up to 864 mm (34 in) annually while lower areas receive 660 mm (26 in) (Rantz, 1971). Areas at a given elevation on the west side of the Santa Cruz Mountains have higher rainfall than areas on

the eastern side. Periodic, intense, winter rain storms cause local flooding, influxes of sediment, and landsliding as detailed in following sections.

2.4 VEGETATION

Aerial photographs taken in 1960 and 2000 were analyzed to identify major changes in land use, vegetation cover, and riparian corridor connectivity. The 2000 aerial photographs show that the La Honda Creek watershed is approximately 1% urban, 15% open grasslands, and 84% forest and chaparral. Although the 1960 photos are at a small scale (1:60,000), making subtle features difficult to discern, they do show that the percentage of vegetation cover, forest and chaparral versus grassland, has remained nearly constant for the past 40 years, with only a minor increase in the density of forest and chaparral, probably owing to fire suppression.

Vegetation type varies with elevation and aspect. Two vegetation types predominate: California coastal redwood forest with smaller numbers of other conifers and hardwoods, and grasslands with patches of chaparral-scrub shrubs. Particularly in the middle watershed, the ridge tops and some hill slopes have been converted from a chaparral-scrub ecosystem to open grasslands (Wieczorek et al., 1989).

The riparian corridor along La Honda Creek is similar in both photo sets, with nearly continuous riparian corridor along the entire study reach. With the exception of two, approximately 50-m (164 ft) reaches near the La Honda trailer park, current riparian canopy along the creek is nearly continuous. The overstory is mainly redwood with subordinate oak, maple, bay, alder, willow, ash and buckeye; while the understory consists of ferns, moss, sedge, blackberry, grasses, fleshy vines and woody shrubs. Invasive species include broom, German and English ivy, and periwinkle.

A history of forest fires in the watershed is not available, however burnt redwood logging stumps attest to recent fires. Although abundant fuel is available, the cool, moist climate reduces the likelihood of large fires except during drought years. A major forest fire that burns most of the vegetation could cause large volumes of sediment to wash into the channel by overland flow, rilling and gullying, or indirectly by landslides.

2.5 GEOLOGY AND SOILS

Bedrock underlying the La Honda watershed consists of three Mesozoic complexes: the Coast Range ophiolite and Great Valley sequence, the Franciscan complex, and the Salinian complex (See geologic time scale, Appendix W). These rocks are overlain by a thick section of Cenozoic marine strata and submarine basalt; units exposed in the La Honda watershed include the Tahana Member of the Purisima Formation, Monterey Formation, Lambert Shale and San Lorenzo Formation, Butano Sandstone, and Mindego Basalt (Brabb et al., 2000) (Figure 2-1).

The local structure includes the major, northwest-striking, active San Andreas, Pilarcitos and the San Gregorio fault zones (Brabb et al., 2000). These faults have numerous branches forming zones as much as 10 km (6.2 mi) wide. Historic earthquake shaking and seismically triggered landslides have caused considerable damage in the local area (Wieczorek and Keefer, 1984).

The area also contains many northwest-trending folds that formed mainly during Pliocene and Pleistocene time. Pleistocene marine terraces are tilted and uplifted, indicating that the La Honda watershed has been uplifted too, decreasing slope stability and increasing the rate of stream downcutting.

Soils are residual, upland loams that formed mainly on the underlying Tertiary sedimentary and volcanic rocks. Having high content of unstable clay, they are prone to landsliding (Wagner 1954; Wieczorek, 1982).

2.6 LAND USE

Features of the present local landscape and La Honda Creek's form and function reflect the cumulative effects of land use and land management mainly over the past 150 years and to a lesser extent over the period of Native American settlement (<10,000 years). Land in the watershed has undergone a series of different uses, including traditional Native American uses, logging, grazing, horticulture, viticulture, and rural residential (Table 2-1, Appendix A). At least eight water-powered saw mills operated in the La Honda watershed from 1855 to at least 1908 (Stanger, 1967)—a few structural remains and the effects of their water impounds can still be seen along the channel.

A 1943 U.S. Army Corps of Engineers 15-minute topographic map of the Half Moon Bay Quadrangle depicts La Honda Creek and town. The amount of green shading representing brush and forest is nearly the same as shown on 1955, 1961, and recent quadrangles (Figure 2-2). However, the 1943 map shows two separate locations in the study area where the road and stream are in opposite locations with respect to each other than they are now. Approximately half of the houses presently in the town of La Honda are shown on the 1943 map, but most of the houses now located along the creek and in Sky Londa at the top of the watershed are not, although most of the roads and houses do appear on aerial photographs taken in 1960.

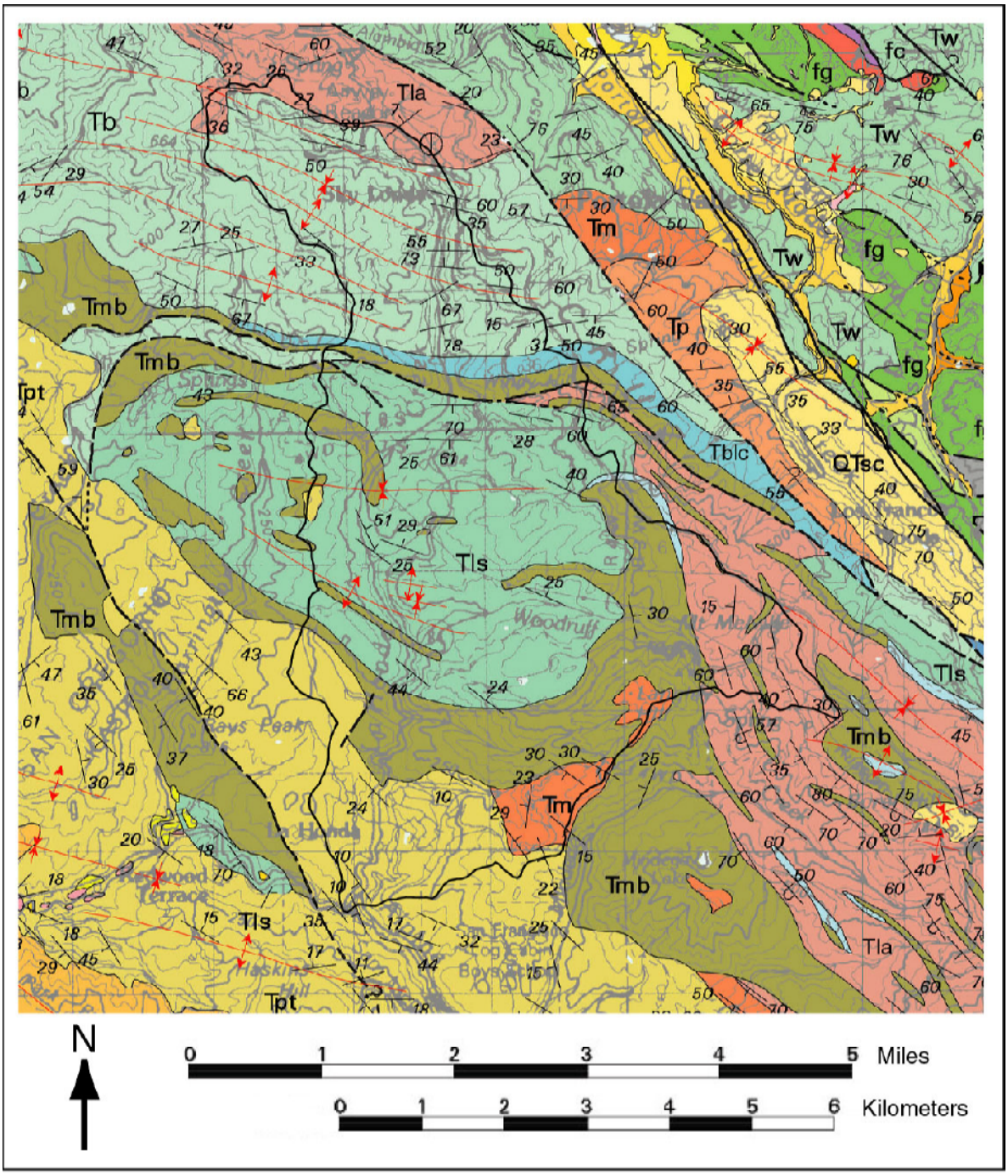

Figure 2-1. Geologic map of the La Honda Creek watershed; boundary shown by heavy black line. From a portion of the Palo Alto quadrangle (Brabb et al., 2000). Tmb=Mindego Basalt, Tls=Lambert Shale/San Lorenzo Fm., Tm=Monterey Fm., Tb=Butano Sandstone, Tpt=Purisma Fm. Tehana Mbr., Tla=Lambert Shale, QTsc=Santa Clara Fm., fg=greenstone.

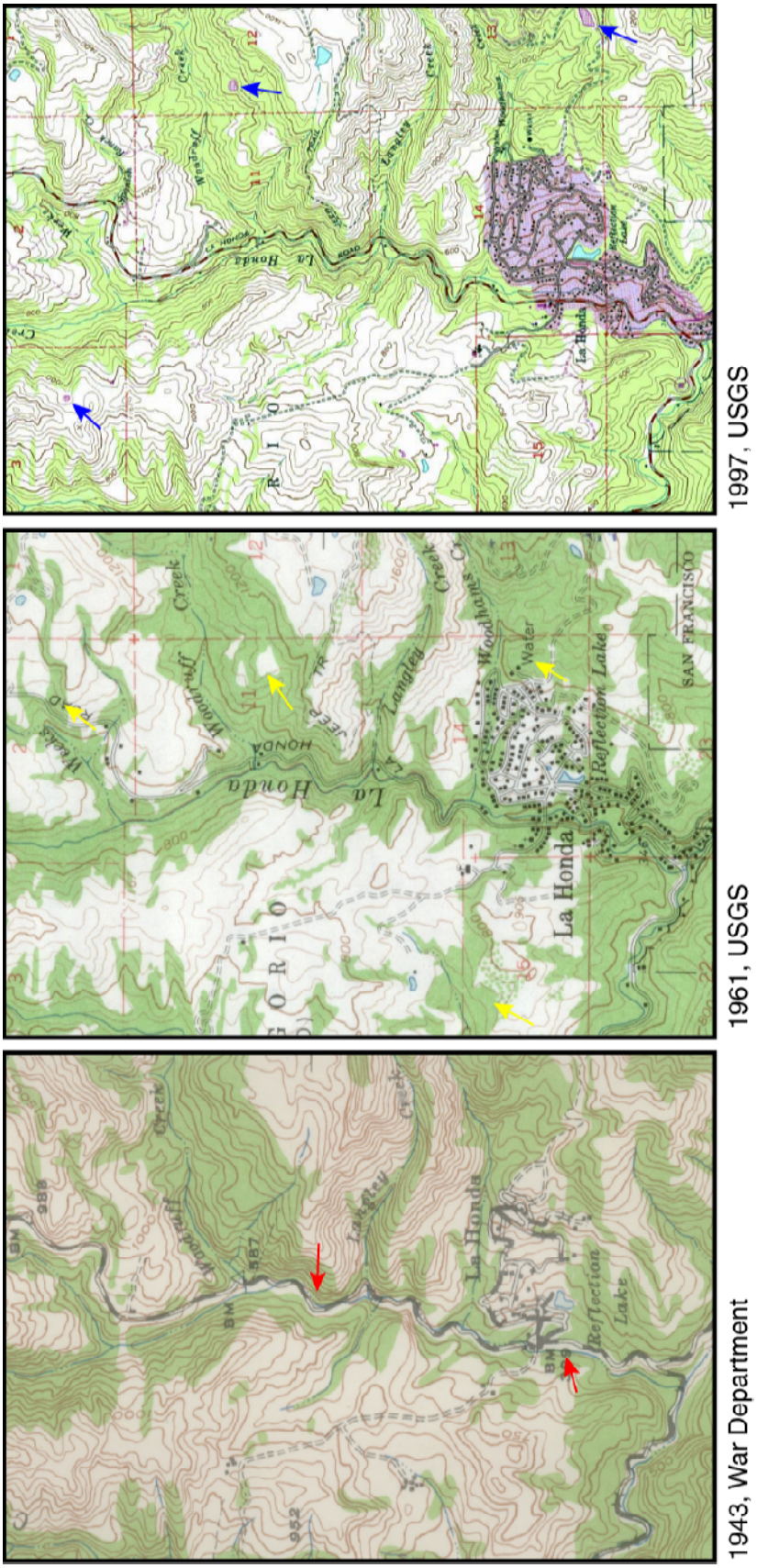

Figure 2-2. Topographic maps from 1943 (War Department), 1961 and 1997 (USGS) cropped to the study area. Red arrows show areas of differing road/stream alignment, yellow arrows show areas of altered vegetation density, and blue arrows show new reservoirs.

Road and Stream Corridor Interactions

As population increased within the watershed, so did the demand for improved transportation infrastructure, which significantly impacted La Honda Creek. Most of the original work was done in the early 1950's. To realign the roadway, the channel was straightened, and filled which reduced the cross-sectional area and/or increased the local gradient causing localized downcutting. The banks have been armored with riprap to reduce erosion, which was inadvertently exacerbated downstream. Water drained from the road surface to maintain safe driving conditions has been diverted through culverts that empty directly into the creek, sometimes concentrating fine sediment there or causing local scour (Figure 2-3). These modifications are further discussed in Section 7.

Eight bridges cross the La Honda Creek channel in the study area. Three are downstream of Highway 84, one downstream of Entrada Road (San Mateo County), and the others are private (Plates 1A-C). The public crossings are large, well constructed, and probably affect flows only during major discharges. At the confluence of Weeks Creek are the ruins of a railroad car bridge that fully spans the channel approximately 10 m (33ft) above the bottom (Plate 1A). Downstream near the Woodruff Creek confluence, are the ruins of a timber bridge that was used for logging and ranching. As indicated by upstream and downstream scour patterns, both of these bridges cause flow to backup during high discharges. A private, concrete-and-steel bridge, referred to herein as "Delay's bridge", was built at the site of an older concrete bridge that was undermined and completely destroyed by flooding (Plate 1B; Figures 4-11, 14, 7-6).

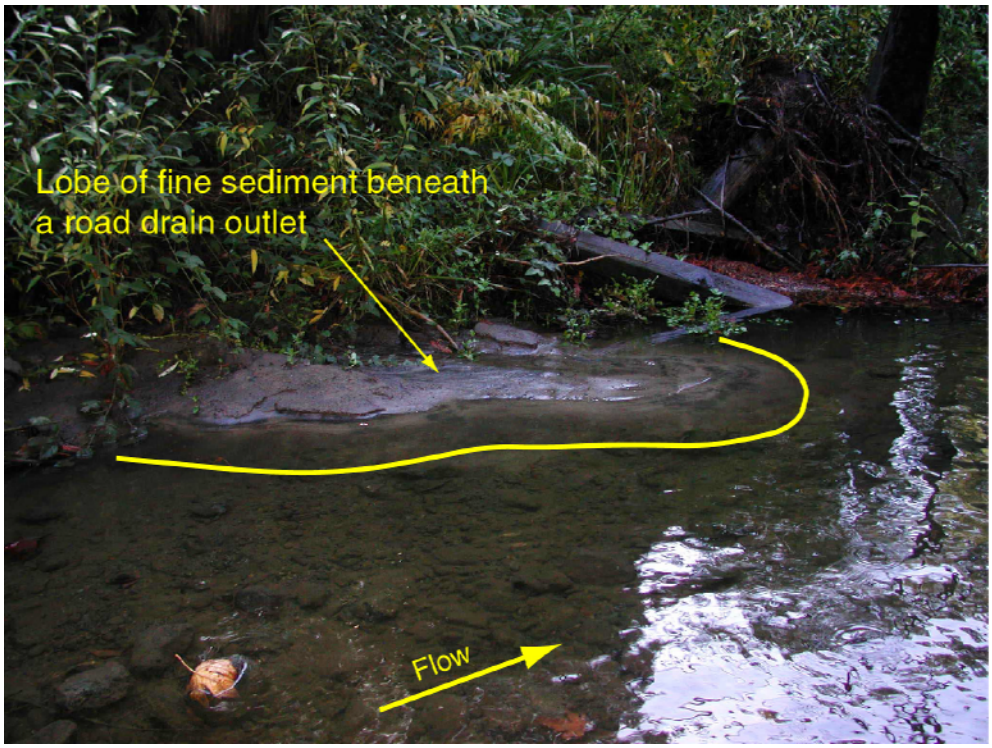

Figure 2-3. Delta of fine sediment beneath a culvert draining Highway 84, after the first storm in November 2002.

Table 2-1. Summary of land management changes in the La Honda Creek watershed and likely geomorphic processes influencing Highway 84 and physical habitat of La Honda Creek.

Date	Event	Potential Watershed Responses
<10,000 yrs BP - ~1800	Native American Land Management – burning and land clearing.	Moderate increases in sediment erosion and changes in seasonal hydrology.
1769	Captain Gaspar de Portola expedition.	-
1775	Juan Bautista de Anza expedition brought 34 families from "New Spain".	Moderate increases in sediment erosion and changes in seasonal hydrology.
1776	Mission San Francisco - timber harvesting, land clearing, Mexican land management, agriculture, and horticulture.	Changes in sediment and hydrology in areas of new management.
1777	Mission Santa Clara - timber harvesting, land clearing, Mexican land management, agriculture, and horticulture.	Changes in sediment and hydrology in areas of new management.
1797	Mission San Jose - timber harvesting, land clearing, Mexican land management, agriculture, and horticulture.	Changes in sediment and hydrology in areas of new management.
1830's	First American sawpit on the Peninsula - timber harvesting by hand.	Changes to sediment and hydrological process.
1841	Logging – "a big business".	Increased soil erosion impacts watershed hydrology.
1850 – at least 1906	25 separate mills in operation in the San Gregorio watershed.	Greatly increased soil erosion and supply of sediment to tributary creeks including La Honda. Increased runoff volume and peak storm flow. Dams and millponds.
1863	Redwood City and Pescadero Road built with parts following Woodruff and La Honda Creeks.	Changed hydrology, creek side geomorphology and sediment erosion. Removal of large woody debris from the creek to protect the road and road crossings.
1874-78	Searsville and La Honda Turnpike built.	Changed hydrology, creek side geomorphology and sediment erosion. Removal of large woody debris from the creek to protect the road and road crossings.
1874-76	Old La Honda road built between Sky Londa and La Honda.	Changed hydrology, creek side geomorphology and sediment erosion. Removal of large woody debris from the creek to protect the road and road crossings.
1877	La Honda to San Gregorio road completed.	Changed hydrology, creek side geomorphology and sediment erosion. Removal of large woody debris from the creek to protect the road and road crossings.
1876 - 1906	Stagecoach ran from Redwood city via San Gregorio to Pescadero via "the scenic route".	Sediment erosion, road compaction, changed hydrology. Removal of LWD from the creek to protect the road and road crossings.
Early 1900's	Camp ground in the vicinity of current location of the La Honda trailer park.	Revetments and changed creek geomorphology.
Early 1900's	La Honda Creek dammed in the lower reach.	Changed creek geomorphology and hydrology.
Early 1900's	Ranching became a dominant land use in the La Honda Creek watershed.	Changed creek and hillslope geomorphology and hydrology. Changing sediment supply to the creek.
1915	New La Honda Road running from Sky Londa to just south of the Woodhaven area along La Honda Creek was completed.	Changed hydrology, creek side geomorphology and sediment erosion. Removal of large woody debris from the creek to protect the road and road crossings.
1940's	Increasing number of family dwellings, many along creeks. Increased number of private roads.	Changed creek and hillslope geomorphology and hydrology. Changing sediment supply to the creek. Removal of large woody debris from the creek.
1940's	Suburban residential area of the La Honda Cuesta Guild is developing, just east of Highway 84 in the town of La Honda. Increased number of private roads.	Changed creek and hillslope geomorphology and hydrology. Changing sediment supply to the creek.
1940-present	Watershed has generally revegetated although not evenly and not at the same rate.	Decreasing sediment supply and changing hydrology.
Early 1970's	Hwy. 84 commissioned as a State Highway.	-
Recent	Vineyards planted most recently in Woodhams Creek basin.	Changed hydrology and hillslope sediment processes.

2.7 SALMONID HABITAT

Once highly productive, the salmonid habitat is recovering from the severe impacts during historic logging and poor stream management during most of the 1900's. Young steelhead were observed in La Honda Creek in all surveys except in 1978. Most steelhead were young-of-the-year, with lesser numbers of 1+ and 2+ year-aged steelhead observed. This information is discussed in more detail in Section 6 and Table 6-2.

As noted in The *Draft Strategic Plan for Restoration of Endangered Coho Salmon South of San Francisco Bay (1998)*, the primary threats to salmonid habitat in La Honda Creek during logging was excessive siltation and destruction of habitat. Other, more recent activities that may continue to degrade habitat quality include removal of LWD; water diversions; in-channel structures that act as migration barriers; bank revetments that decrease channel complexity; and fine sediment, garbage, and excess nutrients that decrease water quality.