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TO: Mr. Jim Steele
Environmental Services Division
Sacramento

February 6, 1996

FROM: Region 3, Monterey -Jennifer Nelson and Patricia Anderson

SUBJECT: Stream-Specific Coho Salmon Habitat Deficiencies and Limitations; Coastal Streams of San Mateo and Santa Cruz Counties Currently Supporting Coho Salmon or Under Consideration For Coho Salmon Recovery Efforts

I. Streams with remnant coho populations:

A. Scott Creek Watershed

1. Scott Creek Mainstem

a. The Highway 1 bridge, the re-alignment of Scott Creek to construct the bridge, and fill adversely influence timing and duration of the barrier sandbar prohibiting upstream and downstream migration.

b. Sedimentation of lagoon as a consequence of high sand bedload of the stream.

c. Several riparian and one instream water diversion used for agricultural purposes exist within the lower 0.5 mile. Cumulatively the diversions lower and on occasion dewater sections of the lower half mile. Riparian water diversions and seasonal instream diversions are also located at stream miles 2.3, 3.8 and there are several between stream miles 5.5 and 6.2.

d. Regulation/reduction of Mill Creek flow to lagoon as a consequence of water capture/use/regulation at Lockheed's Mill Creek reservoir.

e. Shallow lagoon causing water quality concerns of DO, temperature, and salinity.

f. Unauthorized breaching of lagoon adversely impacting lagoon populations.

g. Siltation and turbidity from pig activity, cattle grazing or trails (stream miles 2.3 through 3.8 and 4.7 through 5.3, however cattle have very limited access to creek), horse paddocks (stream mile 5.5), horse trails throughout the entire watershed, runoff from roads

and siltation from sidecast material during road maintenance activities on Swanton Road (intermittently from stream mile 2.3 through 3.8) and from a dirt road which parallels Scott Creek (stream mile 3.8 through 7.1).

h. Water diversion to headwater impoundments on Big Creek reduce stream flow from Big Creek.

2. Big Creek

a. Lack of pool habitat. Stream consists mostly of run habitat with few defined pools.

b. High sand bedload is filling in the few available pools. Sand appears to be coming from pig rooting activity and the dirt road which runs adjacent to the creek for 1.5 miles. For approximately 0.7 miles, this road is cut into a steep bank, 20 to 25 feet above the creek causing the stream bank and slope from the road to the creek to be unstable and subject to slides and slumps.

c. Substrate consists primarily of large cobble prohibiting spawning.

d. Water diversion to impoundments in the headwater tributaries reduce stream flow downstream.

e. Routine removal of woody debris which may undermine road system has decreased instream cover.

f. Introduction of exotic vegetation (German Ivy) has reduced functional quality of canopy and nutrient input.

g. Riparian and seasonal instream diversions occur throughout the lower 1.5 miles.

3. Mill Creek

a. Stream flow reduction due to diversion of water to Lockheed Reservoir located in the headwaters. Riparian and summer/fall instream diversions located from stream mile 1.2 through 1.3 also reduce stream flow.

b. A dirt road adjacent to the creek for 1.3 miles has caused moderate silt deposition. For approximately 0.3 mile, the road is cut on a

steep slope, 10 to 15 feet above the stream. Bank revetment (old car placement) has been attempted, but bank failure is spreading up- and downstream.

c. Introduction of exotic vegetation (periwinkle) has reduced functional value of leaf litter input and canopy.

d. In localized areas, the stream has been cleared of woody debris and other objects which may divert water into the bank and undermine the road. Lack of instream cover is confined to those areas of the stream where the road is close to the creek.

4. Little Creek - Part of Scott Creek Watershed but not a coho stream.

a. Moderate sediment (sand and silt) input from a dirt road which parallels Little Creek for 1.5 miles. The road is used for logging purposes but it is unknown what effect the logging activity itself is having on the stream.

b. Several riparian and instream water diversions located from stream mile 0 through 0.3 and at stream mile 1.3, which are reducing streamflow.

B. Waddell Creek Watershed

1. Waddell Creek Mainstem

a. From stream mile 1.0 through stream mile 3.7, a dirt road which is also a hiking and mountain bike trail, runs adjacent to Waddell Creek. Sidecast material from road maintenance activities, runoff from the road, erosion, bank failure (because of the roadcut into a steep slope) landslides and slumps are all sources of the sand and silt which is a major substrate component in Waddell Creek. Below stream mile 1.0, the road cut is away from the creek.

b. Lack of instream cover due to routine stream clearing activities.

c. Several riparian and instream water diversions located throughout the lower 1.5 miles reducing stream flow for that section and the lagoon.

d. Possible sedimentation from logging activities on east side of the creek between stream miles 2.0 and 3.5 (approximately).

2. West Fork Waddell

a. The dirt road/hiking-biking trail discussed under 1.a. continues up the West fork from stream mile 0 through stream mile 2.9. All problems associated with the road cut and maintenance activities that were listed under 1.a apply here as well.

b. Lack of instream cover due to routine stream clearing activities.

c. There are several small breaks in the riparian corridor on the east side of the stream because of the road. Unknown whether water temperature is affected, but bank integrity has been compromised and leaf litter input and woody debris recruitment have been reduced.

3. East Fork Waddell

a. Sewage treatment plant effluent may be contaminating water with chlorine which directly affects the fish survival and reduces/eliminates aquatic insect production.

b. Water diversion in Sempervirens Creek (tributary to East Fork Waddell Creek) is decreasing stream flow in the East Fork and in the mainstem from stream mile 3.7 downstream.

II. Streams with infrequent coho spawning

A. Pescadero Creek Watershed

1. Pescadero Creek Lagoon

a. High sediment bedload is reducing the quantity and quality of rearing space in the lagoon.

b. Lack of woody debris recruitment to the lagoon due to stream clearing activities. This has significantly reduced cover available for fish and increased predation potential. Stream clearing is done by many landowners from the lagoon to headwaters.

c. Highway 1 bridge alignment and fill adversely affect timing and duration of sandbar barrier which influences upstream and downstream migration.

d. Unauthorized breaching of lagoon adversely impacts lagoon populations by dewatering lagoon and sluicing juveniles out to sea. Adults may also attempt upstream migration when stream flows are insufficient to allow their passage upstream.

e. Agricultural operations are contributing to water quality degradation. Nutrient and toxic loading of lagoon from agricultural runoff (i.e. pesticides and herbicides).

f. Water diversion from wells and riparian pumps are reducing the amount of water reaching the lagoon, therefore affecting sandbar and lagoon formation. There are 14 water right applications pending due to the lack of instream flow data (IFIM or comparable) to set bypass terms on new water rights. The cumulative impact of water diversion by agriculture, individual landowners, water companies, state parks, and Pescadero Creek County Park, is substantial.

Data is available through the research of Dr. Jerry Smith which documents that the lagoon no longer converts to freshwater in the summer.

g. The shallow lagoon exacerbates water quality problems with DO, temperature, and salinity.

h. The structure of the lagoon levee system possibly confuses or captures outmigrating juveniles preventing their successful migration to the ocean.

i. Possibility of non-native species competing with juveniles rearing in the lagoon. Largemouth bass may have been introduced into the lagoon via an illegal stocking of an instream pond on Weeks Creek (7 miles upstream). Bullfrogs introduced from several instream impoundments in the tributaries may also be found in the lagoon.

2. Pescadero Creek Mainstem: Upper Boundary Pescadero Lagoon to USGS Stream Gage (length of this section is 4.6 miles).

a. Substrate predominately sand throughout this reach. Well-defined pool habitat is limited as is high quality spawning substrate, however that does not preclude fish from using this area of stream for rearing or spawning. Much of the creek in this section is a long continuous glide.

b. Lack of instream woody debris and other instream cover because 1) landowners within this reach remove any structure from the creek which may divert flow into the streambanks, 2) landowners remove any structure from the bank (trees, limbs, etc) which may eventually fall into the creek or impede flow and 3) there is a lack of recruitment from upstream sources.

c. Possible degradation of water quality from land use activities (i.e., agricultural activities, septic tanks within the town of Pescadero).

d. Breaks in the riparian corridor from agriculture encroachment which may cause temperature problems in the summer/fall.

e. Several riparian and instream water diversions throughout the town of Pescadero and adjacent to the agricultural fields, decrease the amount of water available for downstream uses (i.e. flushing agricultural runoff from the creek, maintaining a freshwater lagoon, rearing).

f. Aquatic insect production reduced/eliminated because the proper substrate (cobble) for production is not available. The lack of instream complexity and debris that catches leaf litter in streams also affects aquatic insect production.

3. Pescadero Creek Mainstem: USGS Gage to Wurr Road (Length of this section is 4.7 miles; section begins at stream mile 4.6 and extends to stream mile 9.3).

a. Lack of woody debris recruitment because of stream clearing. This occurs throughout the reach however it is most pronounced through the town of Loma Mar and Pescadero Creek County Park.

b. Runoff from a nursery (4,200 feet upstream from the USGS gage) may be adversely impacting water quality. This is suspect because of localized, prolific algae growth in the canopied areas of the stream as well as the open areas.

c. Approximately 2,275 feet upstream from the USGS gage, a small Eucalyptus grove is reducing the quality of nutrient input and increasing bank erosion because of the affects of allelopathy and the shallow root system.

d. Several riparian and instream diversions are decreasing the amount of water available especially during low flow conditions. Most of the water diversions are in Loma Mar and within one mile upstream of the USGS gage. However, there are approximately 10 private residences between the nursery area and Loma Mar which also have riparian diversions. Memorial County Park also places a flashboard dam in Pescadero Creek throughout the summer months for the duel purpose of recreation and water diversion (stream mile 9.2).

e. Large quantities of sand and silt are deposited in this reach. Possible sources include 1) natural erosion from steep banks and landslides, 2) numerous trail systems on steep banks from the homes within 1 mile of the USGS gage, Loma Mar, Memorial County Park and Pescadero Road, 3) Pescadero Road runoff and sidecast material from maintenance, 4) the cut of Pescadero Road into a steep slope which has undermined banks, 5) house construction on steep banks and 6) within Memorial Park, a concrete road crossing impedes stream flow, causing or accelerating sand and silt deposition.

f. A small tributary located 4,924 feet upstream from the USGS gage contributes naturally occurring toxic chemicals (i.e. strontium, sulphur, cyanide) during high flow conditions.

4. Pescadero Creek Mainstem: Wurr Road to Trestle Creek (9.2 miles in length; this section begins at stream mile 9.3 and extends to stream mile 18.5).

a. Moderate sediment load throughout this reach. Possible sources include 1) extensive foot trail system in Memorial County Park and Pescadero Creek Park (intermittently from stream mile 9.3 through 18.5), and Portola State Park (stream mile 16.2 through 18.5), 2) current logging (extraction of trees from bank, road construction, skid trails, landings) at Baptist Summer Camp (stream mile 9.9 through 10.3), 3) four dirt roads crossing through the creek at stream miles 11.1, 11.7, 12.9, 14.2), 4) bank erosion in conjunction with 2 logjams (stream mile 11.7 and 17.4), 5) natural bank erosion, landslides, and slumps and 6) bank erosion, runoff, and landslides associated with Portola State Park maintenance road (paved and runs directly along Pescadero Creek in areas) and Old Haul Road (dirt road which runs parallel to the creek but not adjacent to creek so deleterious impacts from this road would be

via the many intermittent tributaries which flow under Old Haul Road to Pescadero Creek).

b. Lack of woody debris recruitment due to stream clearing activities. Occurs throughout 9.2 mile reach.

c. Degradation of water quality from direct disposal of gray water into Parke Gulch Creek a tributary to Pescadero Creek (stream mile 11.6). Elevated phosphate levels have been recorded in Pescadero Creek at and below the confluence with Parke Gulch Creek. In addition, suds on the water surface and large quantities of filamentous green algae are found below the confluence with Parke Gulch Creek.

d. Water diversions located at stream mile 10.1 (instream diversion) and 14.0 (riparian diversion for County Jail) decrease stream flow thereby reducing rearing habitat, exacerbating poor water quality conditions, and allowing silt to settle.

e. Forage base reduced because of silty substrate and lack of instream complexity (i.e., boulders, woody debris) which serves to catch leaf litter. With decreasing flows throughout the summer months, the food base continues to decline.

f. A logjam located within Portola State Park at stream mile 17.4 may not be passable during all flows under which salmonids would be migrating.

5. Pescadero Creek Mainstem: Trestle Creek to Headwaters (length of this reach is 5.1 miles and extends from stream mile 18.5 through 23.6).

a. Moderate to high silt loads throughout this reach due to 1) direct disposal of sidecast material and runoff from road (road is either at the top of the left or right bank from stream mile 21 through 23) or indirectly from the many tributaries in this reach (especially Waterman Creek) which run adjacent to roads, 2) one road crossing through the creek at stream mile 19.6, 3) landslides, slumps, and bank erosion due to natural causes or because of road cuts which have undermined slope, 4) a horse trail to creek (stream mile 21.8), 5) eroding banks associated with log jams (stream miles 22.2, 22.9, 23, 23.2, 23.3, 23.31, 23.32, 23.35), 6) a culvert which empties directly onto the bank (stream mile 21.9), 7) pig rooting and 8) fallen trees located at stream mile 21.7 which have left gaping holes in the bank.

**The silt coming from Waterman Creek is substantial. A mountain which used to be located on the west side of Waterman Creek was excavated and pushed into Waterman Creek to either form a dam or dispose of the soil from the mountain. This was done early in the century, however Waterman Creek and downstream areas of Pescadero Creek will be suffering the effects for some time.

b. Severe lack of instream cover especially in pools.

c. Potential barriers: There are logjams located at stream miles 21.9, 22.3, 22.6, 22.8, 22.91, 22.93, 23, 23.2, 23.3 23.32, 23.35, and 23.4. The logjams located at 22.8 and 23.35 are barriers. All logjams have aggraded material behind ranging in height from 3 to 8 feet. In some cases water is subsurface above logjams. At stream mile 23.37, a thick willow patch is choking the stream channel, allowing debris and sediment to settle out in this area.

d. Substrate in this reach is compacted more than in other reaches probably because of the decreased streamflow in the headwater areas.

e. Amount of forage reduced due to silty substrate and the lack of instream complexity that serves to catch leaf litter in streams. With decreasing streamflow and increased silt deposition throughout the summer months, food base decreases.

6. Tributaries to Pescadero Creek:

a. Bradley Creek - Cattle grazing (within 5 mile reach upstream from the confluence with Pescadero Creek) has reduced riparian vegetation and caused erosion and increased sedimentation. Appropriative water rights are over allocated. Reservoir at Butler residence is a complete barrier.

b. Honsinger Creek - Large perched culvert is a complete barrier to migration.

c. Bloomquist Creek. Steep boulder fall at mouth of Bloomquist Creek.

d. Peterson Creek - Five foot high waterfall at confluence of Peterson and Pescadero Creeks is a partial, natural barrier to migration.

e. McCormick Creek - Twelve foot high bedrock sheet at mouth of McCormick Creek is a barrier to migration.

f. Schenly Creek - Steep gradient at mouth is a partial barrier to migration.

g. Rhododendron Creek - Fifteen foot high waterfall located 20 feet upstream from the confluence with Pescadero Creek is a barrier to migration. Humboldt crossing contributing sediment to system.

h. Iverson Creek - Steep, ephemeral stream. Humboldt crossing contributing sediment to system.

i. Fall Creek - Eight foot high bedrock barrier located approximately 900 feet upstream from confluence. Steep gradient below barrier. Humboldt crossing contributing sediment to system.

j. Keystone Creek - Steep, perennial stream. Humboldt crossing contributing sediment to system.

k. Trestle Creek - Steep, perennial stream.

l. Slate Creek - Within the 6,385 foot anadromous reach, the primary problems are:

    1. Moderate silt input from 3 landslides, extensive pig rooting, and bank scour associated with fifteen log jams within the reach.

    2. Streambed aggradation upstream from the logjams ranging in height from 3 to 7 feet.

    3. Logjams are located at stream miles 0.19, 0.31, 0.39, 0.45, 0.61, 0.76, 0.84, 0.97, 1.0, 1.15, 1.17, 1.18, 1.19 , 1.2, and 1.23.

m. Oil Creek - The most severe problem within Oil Creek are the 19 logjams ranging in height from 2 to 18 feet and 20 to 125 feet in length. The first logjam, located at the confluence of Oil and Pescadero Creeks, is 6.5 feet in height, precluding coho salmon from accessing this creek. All other logjams have aggraded substrate upstream and behind 12 of the logjams streamflow is subsurface for varying distances. Fourteen of the logjams appear to

be barriers, but under high flow conditions upmigrating adults may be able to go around the sides.

Siltation sources include 1) bank failure associated with the logjams, 2) runoff from defunct and currently used roads in the upper portion of the watershed, 3) undermined banks due to road cut in slope and 4) two landslides, but silt/sediment deposition is relatively minor. Localized compaction or armoring of the substrate occurs downstream from a tributary which has a high lime content.

n. Peters Creek - Five logjams, three of which appear to be barriers under certain flow conditions, are located within the lower 4 miles of Peters Creek. In addition to being barriers or potential barriers, there is substantial aggradation of material behind the logjams and streamflow is subsurface.

Hiking trails along portions of the slopes in the lower 3 miles of creek have led to unstable stream banks, erosion and bank failure. Siltation from banks and other watershed sources is minor, however.

o. Little Boulder Creek - Fairly steep gradient at the mouth of Little Boulder Creek.

p. Waterman Creek - In the past, a mountain which was located on the north side of Waterman Creek was removed or excavated to create a flat staging or working area. Waterman Creek was filled in with the spoils from this excavation either to create a dam in Waterman Creek or to have a road or access to the staging area. The dam or spoils from the excavation have been removed but the streambed consists primarily of silt/sand, the channel is choked with scotch broom and willows, and instream cover and canopy is minimal because of the steep banks which exist. Currently, sidecast from the several acre staging area appears to be pushed over the banks into Waterman Creek.

B. Gazos Creek Watershed

1. Gazos Creek Mainstem

a. High silt load inundating gravels and pools. Possible sources include 1) logging operations (roads, tree extraction, skid trails,

staging areas) within the watershed, 2) five logjams diverting flow into banks and causing erosion, 3) Gazos Creek Road (paved) runoff, 4) sidecast material from road maintenance activities (Gazos Creek Road), 5) bank destabilization because of the cut of Gazos Creek Road into a steep slope (stream mile 3.2 and above) and 6) poorly constructed and maintained dirt roads to private residences and within state park property (Old Woman's Creek Road).

b. Extensive water diversion in the lower quarter mile. Water diversions are both riparian and appropriative. Additional water diversions occur in the upper watershed (stream mile 5.4 and above).

c. At least 5 logjams may be forming barriers to upstream migration.

2. Old Womans Creek

a. A Culvert located at stream mile 1.4 is a barrier to migration.

b. Below the culvert, there are several logjams which are barriers to upstream migration. Log jams are also causing bank erosion, aggrading substrate upstream, and causing the dewatering of small reaches.

c. A dirt road adjacent to Old Woman's Creek is a major source of sediment. The road has been cut into a steep slope which has undermined the stability of the entire slope. Erosion, slumping, slides, side cast material from road maintenance and grading, poorly placed culverts, lack of armoring beneath culvert outlets, and the filling of at least 2 intermittent stream channels to construct the road have lead to the severe degradation of Old Womans Creek and have undoubtedly contributed to the bedload of Gazos Creek.

III. Historic coho salmon streams under consideration for recovery reintroduction efforts (Self-sustaining coho populations not currently present).

A. San Gregorio Creek Watershed

1. San Gregorio Creek Mainstem

a. Several water diversions occur throughout the watershed (now an adjudicated watershed, see Decree) decreasing the quality and quantity of rearing space.

2. Alpine Creek

a. Moderate to high silt loads within Alpine Creek are inundating pools and spawning gravels. Sources of sediment include 1) sidecast material from county road maintenance activities (stream mile 1.5 through 3.7), 2) natural landslides and slumps, 3) bank failure due to the cut of Alpine Road into a steep slope (stream mile 1.5 through 3.7), 4) bank failure due to the construction of homes adjacent to the creek and the concurrent removal of vegetation and grading of adjacent land (starting at the confluence of Alpine and La Honda Creeks and extending through stream mile 3.6), 5) substantial bank failure at stream mile 1.7 due to the construction of a private road on a steep slope and 6) contributions of sediment from Mindego Creek, Rodgers Gulch Creek and an unnamed intermittent tributary, all of which have roads adjacent to stream banks.

b. Change in channel morphology due to homes encroaching on the floodplain and streambank. A substantial portion of the stream banks in lower Alpine Creek (from the confluence of Alpine and La Honda Creeks through stream mile 3.65) are armored or riprapped and significant downcutting of the stream channel has occurred as a consequence of the armoring.

c. Degradation of water quality from 1) blocks of asphalt being deposited in the creek during road maintenance activities (stream mile 3), 2) runoff from Alpine Road, 3) trash from the residential section (from Alpine Creek and La Honda Creek confluence to stream mile 3.6) and 4) waste water or runoff from the many outlet and drainage pipes which run from private property to the creek.

d. The fish ladder located at stream mile 1.53 could be a barrier if not properly maintained and routinely cleared of debris and sediment. A log jam located at stream mile 0.5 is a low flow barrier. The log jam is 88 feet long, 7.5 feet high and 43 feet wide and although the streambanks around the logjam are stable, the stream channel behind the log jam has aggraded 7 feet.

e. From stream mile 4.4 to the headwater barrier located at stream mile 5.5, the substrate is severely armored with lime which emanates from several springs throughout this reach. The lime armoring appears to have affected aquatic insect production.

f. Decreased stream flow due to numerous riparian and appropriative water diversions and seasonal instream diversions. This is

especially critical during summer and fall months and during droughts.

3. La Honda Creek

a. Heavy silt load within La Honda Creek is inundating pools and spawning gravels. Sources of sediment include 1) sidecast material from road maintenance activities on La Honda Road, 2) extensive trail system from the homes to the creek, 3) bank failure due to a high density of homes in La Honda and the vegetation removal and grading of adjacent land to build the homes, 4) bank failure due to natural landslides and slumps, 5) bank failure due to La Honda Road cut and 6) sediment input via the many tributaries.

b. Change in channel morphology due to the construction of homes within the floodplain and on streambanks. Severe bank armoring and riprapping (from confluence of Alpine and La Honda Creeks to stream mile 3.7) have also led to changes in channel morphology.

c. A log jam located at stream mile 3.8 is a low flow barrier.

d. Decreased stream flow due to riparian and appropriative water diversion and seasonal instream diversions. The cumulative impact of these diversions is critical during the summer/fall months and during periods of drought.

e. Degradation of water quality from 1) gray water discharge from outlet or drainage pipes from the homes in La Honda (from Alpine and La Honda Creek confluence to stream mile 3.7), 2) runoff from La Honda Road and 3) trash from the residential section.

B. Butano Creek Watershed

1. Butano Creek Mainstem

a. Lack of channel integrity (from stream mile 0.4 through 0.8) due to high silt deposition within an overgrown willow patch. Pescadero Road bridge exacerbates the situation by decreasing the water velocity and increasing silt deposition.

b. High silt load in the creek from 1) numerous eroded banks throughout the lower 4 miles, 2) historic logging operations above

Butano Falls, 3) poorly constructed dirt road crossings through Little Butano Creek (tributary to Butano Creek) and 4) bank failure due to cattle grazing (Little Butano Creek).

c. Lack of riparian vegetation on the east side of the creek due to extensive agricultural operations. Exotic vegetation (mostly acacia, landscape plants, and vegetables) have replaced native vegetation in numerous areas.

d. Lack of instream flow caused by water diversions (riparian, appropriative and seasonal instream diversions).

e. A logjam located at approximately stream mile 6 is a barrier to fish migration and is increasing silt deposition.

f. Possible degradation of water quality from runoff generated on agricultural fields that have had pesticides, herbicides and fertilizers applied. Constant opaqueness in Creek from clay substrate. Cattle grazing contributing nutrients to creek (Little Butano Creek).

C. San Lorenzo River Watershed

1. San Lorenzo River Lagoon and Mainstem (See San Lorenzo River Management Plan)

a. High silt loading from bank erosion, logging in upper watershed, public works flood control project (from mouth to 4 miles upstream), development, (both adjacent landowners and upper watershed landowners) and road maintenance activities.

b. Water diversions from the City Water Department and riparian water users decrease streamflow especially during low summer flow. Dewatering has occurred. A substantial instream impoundment, Loch Lomond Reservoir, reduces the amount of water reaching the lagoon.

c. Degradation of water quality in the lagoon from silt loading which creates shallow depths, and problems with DO, temperature and salinity. Low water volume also concentrates toxics within runoff.

d. Barriers: Boulder barrier in State Park. Fish ladder at City's Felton

Diversion Dam (now modifying operations to improve fish passage).

e. Unauthorized breaching of lagoon causes saltwater intrusion. Adult fish may enter lagoon before sufficient stream flow exists to allow successful passage upstream. Also, juvenile fish may be flushed into ocean prematurely.

f. Predation by marine mammals (sea lions) if the sand bar is not breached when adults need to migrate upstream. Water diversions and lack of rainfall delay the natural breach of the sandbar.

g. The flood control project and private development in the riparian zone have significantly decreased riparian vegetation which has led to increased water temperatures and decreased drift insects and leaf litter input needed for aquatic insect production.

h. Channelization of the lower section for flood control has decreased habitat complexity (riffle-pool-run), making the area unsuitable for juvenile rearing and migration.

I. Lack of instream cover and complexity due to channelization and maintenance of flood control channel allowing very little vegetation or woody debris to accumulate in the river.

j. Natural disasters such as landslides, earthquakes, and floods, have rapidly modified and degraded fishery habitat by increasing the sediment load.

k. Lack of adequate control, maintenance and monitoring of invasive plants that reduce habitat value.

l. Loch Lomond Dam reduces gravel transport downstream.

m. Loss of natural channel complexity due to development in the floodplain.

2. Fall Creek

a. High silt inundation in pools and spawning areas. A significant source of silt emanates from the extensive trail system within Fall State Park (stream mile 1 and above). Silt is contributed directly in runoff or from the trail system which has undermined stream banks and made them susceptible to bank scour and slumps.

b. Riparian, appropriative, and instream diversions throughout stream mile 1 by private residences and a substantial water diversion at stream mile 1 from a local water company have decreased stream flows.

c. Degradation of water quality from septic tanks, direct discharge of gray water through outlet pipes, and trash disposal from the private residences occurs throughout stream mile one.

d. A log jam located at approximately stream mile 0.5 is a barrier to upstream migration under all but the highest flows. The logjam is 8 feet in height and has aggraded substrate behind.

3. Other Tributaries to San Lorenzo River

a. Upper Bear Creek, Shear Creek, and Connelly Gulch: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads and homesites, and lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow from water diversions, (riparian and appropriative) during critical summer flows, 4) hydrology of the streambed has been modified from the improper placement of culverts and bridges and 5) vineyards which have encroached upon the riparian zone have reduced riparian vegetation and degraded water quality with toxic runoff.

b. Hopkins Gulch, Harmon Creek, Whalebone Creek, Star Creek, Deer Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads and homesites, and lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) low stream flows due to water diversion (riparian and appropriative) during critical summer flows, 4) hydrology of the streambed has been modified from improper placement of culverts and bridges, and 5) Deer Creek has garbage dumps that are degrading water quality.

c. Upper Newell Creek, Upper Zayante: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites, and lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) reduced streamflow during the summer/fall months

because of riparian and appropriative water diversions and 4) hydrology of the streambed has been modified from improper placement of culverts and bridges.

d. Two Bar Creek, West Bear Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites, and the lack of vegetation around homesites, 2) degraded water quality from septic systems and storm runoff, 3) lack of streamflow from water diversions (riparian and appropriative) during critical summer flows, 4) Two Bar Creek has many old cars near or in the bank that could add petroleum products to the water and 5) West Bear Creek has a series of check dams to capture sediment from an illegally graded road.

e. Kings Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow due to water diversions (riparian and appropriative) during critical summer flows and 4) sedimentation from logging operations, Boy Scout activities, and firewood cutting which destroys the water bars left by the timber industry.

f. Logan Creek, Upper Kings Creek: Habitat degraded by sedimentation of the creek from improper (illegal) grading of private roads, homesites, and the lack of vegetation around homesites.

g. Clear Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) boulders removed from streambed for construction reducing diversity in creeks and changing the hydrology of the upper watershed, 3) degraded water quality from septic systems and stormwater runoff and 4) lack of streamflow due to water diversions (riparian and appropriative) during critical summer flows. There is currently no bypass requirements for the San Lorenzo Water District water diversions.

h. Lompico Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites,

2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow due to water diversions (riparian and appropriative) during critical summer flows and 4) timber harvest practices which add sediment to creek.

I. Zayante Creek, Lockhart Gulch: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites, and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow due to water diversions (riparian and appropriative) during critical summer flows and 4) hydrology of the streambed has been modified from improper placement of culverts and bridges.

j. Love Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow due to water diversions (riparian and appropriative) during critical summer flows, 4) hydrology of the stream has been modified from improper placement of culverts and bridges, 5) natural disasters such as landslides, earthquakes, and floods, have rapidly modified and degraded fish habitat and 6) illegal water diversions used to "irrigate" marijuana have dewatered the creek and added sediment to the system.

k. Bean Creek, Ruins Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow from water diversions (riparian and appropriative) during critical summer flows, 4) natural disasters such as landslides, earthquakes, and floods have rapidly modified and degraded fish habitat and 5) water diversion has modified and dewatered creeks during critical rearing periods for juvenile salmonids.

l. Gold Gulch Creek, Shingle Mill Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems, stormwater runoff, and from a rock quarry that is adding large amounts of magnesium to the water and 3) lack of streamflow

from water diversions (riparian and appropriative) during critical summer flows.

m. Marshall Creek, Hubbard Gulch Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow from water diversions (riparian and appropriative) during critical summer flows and 4) natural disasters such as landslides, earthquakes, and floods have rapidly modified and degraded fish habitat. A landslide on Hubbard Gulch Creek is adding a large amount of sediment to that system.

n. Molosky Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow from water diversions (riparian and appropriative) during critical summer flows and 4) natural disasters such as landslides, earthquakes, and floods have rapidly modified and degraded the fishery habitat. Landslides and the flood of 1982 have increased sedimentation within the creek.

o. Forman Creek, Bracken Brae Creek, Robinhood Creek, China Grade Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of streamflow from water diversions (riparian and appropriative) during critical summer flows, 4) hydrology of streambed modified from improper placement of culverts and bridges and 5) water quantity and quality degraded by; the golf course; large water diversions by the water district and subdivisions; off-road vehicles; and misuse of large earth moving equipment by operators.

p. Jamison Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of stream flow due to water diversions (riparian and appropriative) during critical summer flows and 4) water

company blasted for water sources and created large erosion areas.

q. Generally applicable to San Lorenzo River Tributaries:

1. High sediment loading from logging operations, unstable slopes, and development.

2. Decrease in stream flow during summer/fall months and dry years due to riparian water users.

3. Barriers to migration from improper timing of flashboard dam installation and removal.

D. Branciforte Creek Watershed

1. Branciforte Creek Mainstem

a. Lack of a defined channel in lower section due to the flood control project channelizing creek and a lack of proper maintenance within the channel. This is more a problem for outmigrants.

b. Heavy predation on outmigrants due to the lack of instream cover and channel integrity in flood control section.

c. Severe lack of riparian vegetation in flood control section contributing to increases in water temperature and decreases in forage.

d. Lack of pools and riffles in flood control section.

e. High silt loading from logging in upper watershed.

f. Barriers created by flood control channel and water diversion dam upstream of flood control section and flashboard dams if not removed at the proper time.

g. Sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites.

h. Degraded water quality from septic systems and stormwater runoff.

i. Lack of streamflow from water diversions (riparian and appropriative) during critical summer low flow periods.

2. Carbonera Creek

a. Degradation of water quality from 1) urban runoff in Scotts Valley, 2) septic systems and stormwater runoff and 3) sewage treatment plant has accidentally discharged chlorine and potassium permanganate into the creek and has the potential to discharge these chemicals in the future.

b. Breaks in riparian vegetation due to development have decreased instream cover and leaf litter input into the stream.

c. Lack of pools and instream habitat diversity and changes in channel morphology due to development within the floodplain which restricts lateral movement of the creek.

d. Degradation of substrate from silt loading from development.

e. Dramatic loss of groundwater due to groundwater used domestically and all sewage and gray water is pumped to Santa Cruz for treatment before entering the ocean. There is very little percolation in Scotts Valley.

f. Lack of instream flow during critical summer/fall low flow period due to water diversions (riparian and appropriative).

E. San Vicente Creek

1. San Vicente Creek Mainstem

a. Decreased streamflow from water diversions (City, agricultural, and riparian).

b. Large impassable barrier upstream from quarrying operations. Water goes underground through a pipe.

c. Sedimentation of the creek from improper grading and placement of private roads.

F. Soquel Creek Watershed

1. Soquel Creek Lagoon

a. Decreased stream flow to the lagoon especially in the summer because of upstream water diversions.

b. Degradation of water quality in lagoon from animal fecal coliform (mostly from gulls and ducks that people feed) and shallow depths contributing to low DO and high salinity and water temperatures.

c. Lack of complexity, diversity, and instream cover in lagoon due to development of bulkheads to protect property and the removal of woody debris upstream.

d. Lack of vegetation next to the lagoon has decreased canopy and increased water temperature.

e. High silt loading from upstream has decreased the capacity of the lagoon for summer rearing.

2. Soquel Creek Mainstem

a. Decreased stream flow during the summer/fall months and droughts, due to instream diversions, Soquel Creek Water Department and riparian water users.

b. Lack of riparian vegetation from development and roads encroaching upon the floodplain, which have reduced the amount of leaf litter input and cover available for juveniles.

c. Lack of instream shelter complexity due to routine maintenance by public works which removes woody debris because of its potential to contribute to flooding conditions.

d. High silt loading reducing pool habitat and inundating spawning gravels. Silt sources include questionable logging practices and the deposition of sediment into the creek during road maintenance activities.

e. Quarry operation accelerating sedimentation of the mainstem.

f. Degraded water quality from septic systems and stormwater runoff.

g. Natural disasters such as landslides, earthquakes, and floods have rapidly modified and degraded the fishery habitat. Sidecast material from road maintenance activities have also led to habitat degradation.

h. Lack of control or eradication of invasive plants that degrade habitat value, especially Scotch Broom.

3. West Fork Soquel Creek

a. Barrier created by an old water diversion dam that is still used occasionally.

b. High silt loading from unstable slopes, logging, and development which have reduced pool habitat and spawning areas.

c. Hydrology of the stream has been modified due to the improper placement of culverts and bridges. Undersized culverts also get plugged which then accelerates erosion.

d. Trash rack installed by Public Works creates a barrier to migration and blocks input of woody debris into the creek.

e. Degraded water quality from septic systems and stormwater runoff.

f. Lack of streamflow due to water diversion, (riparian and appropriative) during critical summer/fall low flow periods.

4. Soquel Creek Tributaries

a. Burns Creek, Laurel Creek, Hester Creek: Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems and stormwater runoff, 3) lack of water from water diversions (riparian and appropriative) during critical summer flows, 4) hydrology of the stream has been modified from improper placement of culverts and bridges, 5) natural disasters such as landslides, earthquakes, and floods have rapidly modified and degraded the fishery habitat and 6) Water company's water diversion structure creating a barrier to fish migration.

b. Miners Creek, Bates Creek, "Kennolyn Creek": Habitat deficiencies include 1) sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites, 2) degraded water quality from septic systems, stormwater runoff, and improperly placed equestrian facilities and orchards, 3) lack of stream flow from water diversions (riparian and appropriative) during critical summer flows and 4) a barrier to migration on Bates Creek known as "Little Hoover" prevents salmon and steelhead from accessing the headwaters.

G. Aptos Creek Watershed

1. Aptos Creek Lagoon

a. Fecal contamination of the water due to the large number of birds in the lagoon.

b. Decreased stream flow into the lagoon by upstream water diversions is causing increases in water temperatures and salinity and a decrease in dissolved oxygen.

c. High silt loads decreasing capacity and complexity of lagoon for juvenile rearing.

d. Lack of riparian vegetation resulting in very little canopy over the lagoon.

e. Confinement of the channel by development has affected the timing and duration of sandbar formation and has reduced complexity within the lagoon.

f. Artificial breaching and confinement of the lagoon by the Department of Parks and Recreation is reducing the quality and capacity of the lagoon.

2. Aptos Creek Mainstem

a. Breaks in the riparian vegetation from development have reduced canopy over the creek.

b. Decreased stream flows due to riparian and appropriative water diversions.

c. Erosion from development in floodplain. Erosion prevention techniques of development have also reduced complexity and diversity of streambed and bank.

3. Aptos Creek tributaries

a. A tributary located near the mill site in Nicene Marks State Park has a log jam barrier which prevents adult salmonids from accessing headwater areas.

H. Pajaro River Watershed

1. Pajaro River Lagoon (See Pajaro River Management Plan).

a. Very high silt loading from an unstable watershed (agriculture, gravel mining, channelization of river, runoff, unstable stream banks) has reduced the capacity of the lagoon.

b. Degradation of water quality from agricultural runoff (fertilizers, pesticides, and herbicides).

c. Shallow lagoon resulting in higher water temperatures and salinity and lower dissolved oxygen.

d. Lack of vegetation around the lagoon has resulted in no canopy or source of food for juveniles.

e. Lack of instream cover within lagoon.

f. Dams in the upper watershed capture the streamflow and delay the breaching of the sandbar and timing of attraction flows until after the coho migration.

2. Pajaro River Mainstem

a. Very high silt loading from an unstable watershed and severe erosion from removal of vegetation by public works resulting in no spawning gravel or substrate for invertebrates.

b. Lack of forage for fish due to silty substrate and large stretch of river without riparian vegetation.

c. Lack of channel complexity, diversity, and pools due to the

channelization of the river and routine maintenance activities involving the removal of vegetation.

d. Reduced stream flow from water diversions by wells resulting in higher water temperatures and little summer rearing habitat. Groundwater percolation and subsurface flow to Pajaro reduced by culverting and ditching the creeks which causes water to flow to ocean faster. Water diversion by the City of Watsonville has also dewatered creeks during critical times for juvenile salmonids.

e. Severe removal of riparian vegetation resulting in temperature increases, lack of canopy, lack of woody debris recruitment, and lack of leaf litter input.

f. Degraded water quality from septic systems and stormwater runoff. Agriculture contributing many sources of pollution to the creeks, especially sediment, herbicides, fertilizers, and pesticides.

g. Vehicle ford creating partial barrier to migration.

h. Sedimentation of the creek from improper (illegal) grading of private roads, homesites and the lack of vegetation around homesites.

i. Natural disasters such as landslides, earthquakes, and floods have rapidly modified and degraded the fishery habitat. Landslides have accelerated the rate of sedimentation into the creek and have caused barriers to fish migration.

3. Corralitos Creek

a. Moderate silt loading from logging operations and a road running adjacent to the creek have inundated spawning gravels, pool habitat, and substrate for insects.

b. Modified channel morphology has reduced pool habitat and habitat diversity.

c. Breaks in the riparian vegetation from road and housing development have resulted in less forage and canopy for fish.

d. Barriers from perched culverts at private residences.

e. Summer impoundment (College Lake) may affect migration of juveniles and increase water temperatures during juvenile rearing periods.

4. Pescadero Creek

a. Siltation of stream from logging operations especially in the upper watershed.

5. Other Tributaries:

Rattlesnake Creek, Grizzley Creek, Gamecock Creek

a. Sedimentation of the creek from improper (illegal) grading of private roads, homesites and lack of vegetation around homesites.