CITY OF
SANTA CRUZ

WATER DEPARTMENT

Watershed Protection Program – 715 Graham Hill Rd. Santa Cruz, CA 95060 – (831) 420-5483

Angela Carpenter
Regional Water Quality Control Board
81 Higuera St.
San Luis Obispo, CA 93401-5411

REGION 3
DATA
SUBMITTALS

August 28, 2001

Dear Angela,

Thank you for the opportunity to submit data for the potential 303(d) listing of Majors Creek. I appreciate that the Board felt a need to be especially critical in considering new waterways for listing in this round, and in so doing, determined not to list Majors Creek. However, as there are significant impacts to Majors Creek from sediment and the associated turbidity, I would like to bring up the following points for consideration by the Board:

- The Basin Plan objective for sediment states, "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." As the City's monitoring is focused on drinking water standards, we do not have sediment transport, embeddedness, percent fines or storm event related data that would demonstrate impairment by sediment or turbidity. However, maintenance of the diversion on Majors Creek has become increasingly problematic due to the sediment load in the creek. These maintenance problems, though described anecdotally, parallel the trend of 27 years of turbidity data which was submitted for the proposed listing in April 2001. In addition, salmonid habitat typing recently conducted on Majors Creek upstream of the drinking water diversion (Alley 1996) found that, in summary, the creek was severely impacted by sediment due to historic and potentially present land uses including timber harvest (attachment 1). I personally conducted reconnaissance surveys throughout the watershed during winter and spring of 2001 and identified a number of failed crossings, destabilized streambanks, and related sediment sources (attachment 2).

- The current objective for turbidity is written in Jackson Turbidity Units which are rarely used in industrial and scientific applications and furthermore have no accepted conversion to Nephalometric Turbidity Units. How is this issue addressed in the context of data submitted for potential 303 (d) listings?

- The City is amenable to investigating alternative methods of improving the Majors watershed without the 303 (d) listing if that is possible.

Finally, in the interest of consistency, it seems appropriate to list all the tributaries of the San Lorenzo River that are contributing to the impairment of beneficial uses in that watershed. Currently there are relatively few tributaries listed. These listed tributaries do not necessarily correspond to existing data regarding embeddedness and percent fines (Alley 2000, 1999, 1997, 1995, 1994, Andersen and Nelson 1997, Nelson 1996, etc.). While implementation of the current San Lorenzo Sediment TMDL has been reported by RWQCB staff to be applicable to the entire watershed, there is confusion amongst other stakeholders regarding the discrepancy between listed tributaries and tributaries included in the implementation of the TMDL. In the event that the current listing does not offer equal protection to tributaries such as Newell Creek, we would like to include the entire San Lorenzo watershed in the listing such that equitable protection is afforded to all tributaries in the watershed.

I appreciate your staff's willingness in working with us on these issues, and will be happy to assist them however I am able to. If you have any questions please feel free to call me at (831) 420-5483.

Sincerely,

Chris Berry

cc: Bill Kocher, Terry Tompkins, read file

Attachment 1

8 April 1996

Tom Osipowich
California Department of Forestry
P.O. Box 670
Santa Rosa, CA 95402

Re: THP No. 1-96-065 SCR, termed the "Gray Whale Ranch THP"

Enclosed are 15 pages of written comments, questions and recommendations regarding the Gray Whale Ranch Investors' THP in the Majors Creek watershed. I am a certified fisheries scientist with 14 years of experience in evaluating steelhead habitat within redwood forests along the central California Coast. I have personal experience and knowledge of the steelhead and resident trout populations inhabiting the Majors Creek watershed, having surveyed most of the mainstem stream course and its branches from Highway 1 to Smith Grade Road in 1992. As written, I believe the timber harvest plan neither adequately addresses nor mitigates the potential direct and cumulative adverse impacts to the timber harvest area, the watershed and the aquatic habitat within the watershed. I saw no mention of a monitoring program to verify the assertions in the THP.

I strongly request that my concerns and recommendations be considered and that you require independent, post-harvest monitoring to verify the claims made in the THP regarding reduced erosion and stream sedimentation after logging. If you should approve this THP, I would hope that your professional integrity would require that you make certain that mitigation measures to reduce stream sedimentation are effective and maintained until the next timber harvest. The intent of this timber harvest plan to mitigate damage from this proposed logging operation by repairing damage from past logging indicates a failure on the part of the regulatory agency and land owner to protect environmental resources in the past. I would hope that this destructive cycle may be broken so as to prevent a downward spiral in environmental quality in this small, sensitive Majors Creek watershed. Please require that logging roads either be maintained to prevent erosion until the next logging cycle or require that the roads be abandoned and returned to pre-road conditions.

I offer these comments as a concerned citizen without payment.

Sincerely,

Donald W. Alley, J.

Donald W. Alley
Certified Fisheries Scientist
P.O. Box 200
Brookdale, CA 95007

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Introduction

The proposed timber harvest area in the East Branch of Majors Creek is situated in a small coastal watershed (3500 acres according to the THP). A total of 19.8% of the watershed has been subjected to logging within the past 10 years, and 25% of the watershed will have been logged after this currently proposed timber harvest is concluded, based on calculations from acreages stated in the THP. According to the THP, the soils on the property to be logged consist of the Ben Lomond-Felton complex, having a moderate to high erosion hazard rating. The area proposed for logging is adjacent to the East Branch, a channel that is far from equilibrium in its sediment transport budget. Considerably more sediment is entering this channel than the stream has the ability to transport. The extreme sedimentation is accelerating streambank erosion and degrading the mainstem of Majors Creek to the ocean.

Need For More Complete Biological Assessment

Red-legged frog has been recommended for listing as an endangered species by the U.S. Fish and Wildlife Service (USFWS). Petitions have been submitted to the USFWS for listing of the pond turtle and steelhead. Any activities that may cause erosion and sedimentation where they are found will degrade habitat for these sensitive species. The assessment done for this THP did not determine the presence/absence of these species within the proposed timber harvest area or downstream in the watershed.

A formal biological assessment of aquatic resources is necessary to investigate the biota present in and downstream of the proposed timber harvest area on the East Branch of Majors Creek. The California Diversity Database maps and the Santa Cruz General Plan do not provide an adequate biological assessment of the Majors Creek watershed. The Diversity database maps are incomplete. I know of no herpetological experts who have surveyed Majors Creek downstream of the timber harvest area. The survey performed by David Suddjian was incomplete in that it stopped at the boundary of the timber harvest area, thus ignoring the downstream watershed. Furthermore, his survey was performed in January, which is an inappropriate time to detect the presence/absence of red-legged and yellow-legged frog or western pond turtles in the proposed timber harvest area. Mr. Suddjian described aquatic habitat conditions only within the proposed timber harvest area. No survey results for fish species or fish habitat were stated in the THP for the timber harvest area or the watershed as a whole. Therefore, the THP is incomplete regarding sensitive aquatic species.

Based on my observations in 1992, the deep pools and sunny low gradient riffles observed in the mainstem of Majors Creek below the confluence of the East Branch provided good habitat for red-legged and yellow-legged frogs (Alley 1993). High densities of resident trout were observed in the mainstem, though the

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substrate was degraded with sand from the East Branch compared to habitat above the East Branch confluence. Adult steelhead have been reported in the lower mainstem below a series of falls (D. Marsten, pers. comm. CDFG) and Jerry Smith captured juveniles in 1981. But steelhead habitat conditions were severely degraded in 1992 with pools filled with sand. The lagoon was not known to have tidewater gobies in 1992, but if sedimentation was reduced in the watershed, lagoon habitat may improve to allow their return. In the East Branch, resident trout were observed in 1992, though habitat conditions were severely degraded due to extreme sedimentation of the streambed.

Such species of special concern as red-legged frog, yellow-legged frog and western pond turtle may be present in the timber harvest area and are likely downstream in the mainstem. I captured red-legged frogs in nearby Baldwin and Yellow Bank creeks in spring of 1992, as reported to the City of Santa Cruz (Alley 1992) and the Department of Fish and Game in that year.

It should be noted that the portion of Reach 3 containing the City of Santa Cruz water diversion was not surveyed in 1992. At that time the location of the diversion was confused with memories of the diversion on Laguna Creek, which is upstream of Smith Grade Road.

Excerpts from Our 1992 Survey

Lower and middle Majors Creek were surveyed on 27 March 1992 with an estimated 2 cfs of flow. The upper creek was surveyed on 2 May 1992 with an estimated 1.5 cfs of flow. There have been reports of adult steelhead using the creek during spawning time (D. Marsten, CDFG, pers. comm.), despite the relatively short length of stream (3450 feet, 0.65 miles) available to them below the first steep section.

The stream was surveyed and divided into 4 reaches. Reach 1 (5280 feet, 1 mile) extended from the coast through the first steep section to an agricultural diversion. Reach 2 (8300 feet, 1.58 miles) went from the agricultural diversion to the second steep section where the streamchannel came from the east with higher gradient, looking upstream.

Reaches 3 (estimated flow of 1.5 cfs) and 4 (estimated flow of 1 cfs) as well as the east branch (estimated flow of 0.5 cfs) were surveyed on 2 May 1992. Reach 3 (4650 feet, 0.88 miles) included the second steep section and the channel up to the East Branch. Reach 4 (6700 feet, 1.27 miles) extended from the East Branch confluence to the steepening of the gradient above Smith Grade Road.

Due to its small size and evidence from recent sampling of Majors Creek Lagoon, tidewater goby apparently did not use the lagoon (J. Smith, pers. comm.).

Reach 1 consisted of mostly pools (80%) with short riffles between (20%). Pools were very shallow except at their heads where plunging water had scoured out small (2-3 feet diameter) cavities in otherwise sand-filled habitat. We sank 1-2 feet into loose sand when wading through pools. Any cobbles present in the pools had been buried in sand. Fish escape cover was poor and was primarily provided by undercut banks. Spawning glides were short and mostly sand except as they entered riffles. There, the substrate composition was good for spawning, but was very badly compacted. Sand deposition over redds was probably common.

The riparian corridor was well-developed, providing 85% shade with primarily alder and California bay. Big leaf maple were scarce. Redwoods were present up-slope. Channel width ranged from 7-14 feet, averaging 10 feet.

The steep section contained 7 major obstacles to steelhead spawning migration, 5 of which were within approximately 150 yards of channel length.

Habitat in Reach 2 was better than in Reach 1. In Reach 2 there was less silt and sand in pools (40-50% vs. 85-90%). Though larger cobbles and boulders were badly embedded (50%), more woody debris was present that provided more cover. The reach was dominated by riffles (45%) and runs (50%) with occasional pools (5%) that were not very deep (averaging 1.2 feet). Riffles and runs provided feeding habitat averaging 0.5 feet in depth even at the observed low flowrate (estimated 2 cfs). Cobbles were badly embedded (40%), with 45% of the bottom covered with granite cobbles and boulders. The primary source of fine sediment was the East Branch below Smith Grade Road. Shading was somewhat less than in Reach 1, it being 80% with alders, bays, redwood and more maples. Channel width ranged from 5-16 feet, averaging 10 feet. Flat runs 15 feet wide would require 15-20 cfs for adult steelhead passage.

Reach 3 was bedrock-controlled. The stream cut its way through bedrock outcrops where it passed narrowly between bedrock walls, plunging into deep pools. Pool habitat was abundant (30 % of the reach), with riffles (40%) and runs (30%) in similar proportions. Pool depth averaged 1.5 feet, with many pools 3-4 feet maximum depth. This is excellent and above average for a Santa Cruz County north coast stream. Each pool had an abundance of resident rainbow trout, with 5-15 fish visible in each one. Cover was excellent, it being provided by undercut bedrock, woody debris and large, unembedded boulders. Pool substrate was primarily silt and sand (70% of the bottom) deposited over bedrock that was exposed in places (25%).

Many riffles were of higher gradient than in Reach 2, with some swirling between bedrock outcrops before plunging into pools. Wide, higher gradient riffles were at bends with badly embedded (averaging 40%) granite cobbles, most of which were baseball to softball size. Spawning habitat was poor as was the case in Reach 2, due to the large sediment contribution from the East

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Branch. The stream was well shaded (85%) with occasional breaks in the riparian canopy.

Five spawning migration barriers were observed in Reach 3. More may exist because the lowermost portion (500 feet) was not surveyed due to time constraints.

Reach 4, extending upstream of the East Branch confluence, had the best substrate conditions. Pools were a small portion of the channel (5%), occurring mostly at bends. They were 30% covered with silt and sand, with good cover provided by undercut banks and woody debris. Pools were not well developed, averaging 0.9 feet in depth with most not more than 1.5 feet maximum depth. Riffles were dominant (70%) and still quite embedded (35%). Because of the scarcity of pools, spawning habitat was scarce, but of higher quality than downstream. Coarse sand made up 30% of the spawning material with small (<0.5 inches) uncompacted granite gravel dominating. It was fair quality for a coastal stream. The stream was heavily shaded (95%) by evergreens and had fair insect densities despite the low light penetration.

In the East Branch Majors Creek, the first 1/4 mile of the channel was surveyed (estimated 0.5 cfs streamflow). It had a low density of small trout present, but had badly degraded habitat. The first road crossing was badly eroded, causing a sediment delta at the tributary's mouth. Pools were rare (<1%), shallow (0.5 feet deep) and had only limited cover provided by woody debris. Banks were not undercut. They were dominated by silt and sand (70%) with small gravel less than 1 inch diameter (30%). The channel was primarily flat, shallow runs (80%) consisting of 80% sand and silt with 20% gravel less than 1 inch diameter. Short riffles were dominated by gravel less than 1 inch diameter. Gravel bars with larger gravel were present along the margins of the channel, but were not inundated. What one would call spawning gravel was absent. Fish were probably using sand as spawning material in the observed reach. Stream shading was good (90%).

Habitat in the East Branch above could be significantly enhanced by the creation of pools and the reduction of sediment erosion. Low-lying [vortex rock] weirs could be constructed to form plunge pools. Pool habitat and spawning gravel was nearly nonexistent in the reach surveyed. Substrate downstream of the East Branch confluence in the main branch was noticeably degraded by sediment originating in the East Branch. The habitat in Reach 3 could be improved by reduction in sediment. Insect production and pool depth would be improved.

Need for More Impact Assessment

The impact assessment is terribly incomplete. On what basis was it determined that there will be no significant direct or cumulative impacts to biological resources? There is

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insufficient information to support the findings of the RPF as is required by the Board of Forestry Technical Rule Addendum No. 2 - Cumulative Impacts Assessment. What will be the cumulative impact to the watershed of all the past timber harvests considered together? The assessment in the THP implies that no mitigation is necessary for the proposed timber harvest. The proposed mitigation is repairing damage from past logging and not the proposed logging. This implies that no additional erosion will occur or be encouraged in the future as a result of the logging activities. It implies that no sediment will reach the stream channels from the proposed logging.

The Direct Impacts Assessment is Incorrect

The proposed timber harvest will occur in the most erosive, sediment-contributing portion of the Majors Creek watershed, as evidenced by the extreme sedimentation and streambank erosion observed by myself in 1992 and by David Suddjian in 1996 in East Branch Majors Creek. In this very erosive timber harvest area, the California Forestry Practices Rules which allow logging within the WLPZ will not protect aquatic resources in the East Branch or downstream.

Steelhead and resident rainbow trout require cold water protected by stream shading. Stream sedimentation from erosion destroys spawning and rearing habitat. These salmonid fishes require spawning gravel with a low percentage of fine sands and silts and deep pools in which to find escape cover from predation in summer. Red-legged frogs and trout require deep pools with boulders and debris to hide under as cover. Sediment fills pools and buries objects of cover. Too much sunlight warms the water to add physiological stress and increased food requirements for trout/steelhead. Seldom is the tree canopy less than 75% in steelhead streams of Santa Cruz County. In the headwaters of most watersheds, shading is usually more than 90%, thus protecting steelhead and resident trout habitat by preventing water temperature from increasing where summertime streamflow is much reduced. The highest productivity and diversity of aquatic insects (fish and frog food) occurs in riffles with medium sized cobble and gravel substrate. The riffles of shifting sand common in the East Branch and sedimented riffles downstream of the East Branch in the mainstem may be expected to have reduced insect species abundance and richness.

In my opinion, the proposed cutting of trees and the dragging of them out of the WLPZ of Class I and Class II streams and the absence of a WLPZ to protect intermittent Class III and Class IV streams will significantly 1) increase water temperatures by reduction of shading, 2) initiate erosion and 3) reduce streambank protection from bank erosion. The THP admits that solar exposure to the stream will increase. It says this will be negligible and short term. Will water temperature be monitored before and after timber harvest? It should be. The claim that temperature effects will be short-term does not reduce the

negative impacts to survival of aquatic organisms in the short-term.

The Cumulative Impacts Assessment is Incorrect

How can a THP claim no significant cumulative impacts to animals and plants without determining the presence/absence and distribution of sensitive species in the watershed? It cannot.

How can the THP claim that logging operations in nearly 20% of the watershed in the last 10 years and 25% after this one will not have cumulative impacts? There has been no monitoring of sediment inputs to streams or streambank erosion to support this. Yet there is evidence contained in the mitigations section of the THP of erosion and sediment input to streams within the proposed timber harvest area. Has there been a survey of other past timber harvests to verify that they have not caused land-sliding and streambank erosion in the watershed?

The stream channel in the East Branch Majors Creek is a textbook example of the instability caused from massive, chronic sediment input, presumably from past logging. Poor watershed practices in the past have increased sediment input combined with increased surface runoff, leading to extreme channel instability and bank erosion. A stable channel may be defined as one that transports sediment adequately while maintaining an overall constant streambed elevation. The overall streambed elevation does not increase from widespread sediment deposition or decrease from widespread sediment scour. The channel's width/depth ratio remains stable. The East Branch channel, on the other hand, has become more entrinched, loosing its original floodplain that would dissipate energy while maintaining a thalweg (deepened, high velocity narrow channel within the overall channel) that would transport sediment. The stream gradient has probably decreased and the thalweg has been lost.

There has been the influx of masses of sediment to the East Branch presumably from past logging because that has been the most significant long-term, widespread activity in the upper watershed. Sediment input at a rate too great for the channel to transport downstream has caused the channel to erode laterally, undermining steep banks and riparian vegetation to exacerbate channel instability. Flattening of the channel increases sinuosity and meandering to cause lateral extension and increased streambank erosion. Mid-channel bars form in these sediment-laden streams to direct the streamflow toward streambanks to accelerate erosion. The East Branch Majors Creek's higher width/depth ratio has increased the channel instability.

The rate of sediment input must be reduced and sediment carrying capacity of the stream must be increased before channel stability and bank erosion will subside. A reduced width/depth ratio is needed to re-create a thalweg with sufficient water velocity to

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enhance sediment transport and prevent aggradation (deposition of sediment). A local resident of the Majors Creek watershed commented at the public hearing for the THP that the East Branch once had deep pools before recent logging operations (since the 1970's). Evidence of logging damage includes failed road culverts, erosion-causing channel crossings and even a change of stream course onto a road at a previously used landing, as identified in the THP.

Renewed high sediment supply and higher runoff from logging will only more energetically attack the streambanks, resulting in increased bank erosion, suspended sediment and turbidity. This must be prevented. Yet the THP states that equipment will be operated on unstable soils. No buffer zones are established between logging and Class III and IV channels. Will not this stimulate erosion if allowed to occur? On page 32 of the THP, it states that there is expected to be a "short term" increase in peak flow from timber harvest areas. It states that this, combined with similar logging activities on adjacent areas can be expected to have a cumulative effect of increasing peak flow for the "short term." Is "short term" meaning one storm event or one rainy season or several? The geomorphic conditions of streams in the Santa Cruz Mountains are sometimes a result of just one significantly large storm event from which the stream channel, streambank and the riparian vegetation may take decades to recover from. The claim that logging effects will be "short term" offers no protection or security from massive erosion events that may occur in a matter of hours.

The claim of no significant cumulative impacts apparently is based on the unsupported assertion that there will be less sediment entering the stream channels after this timber harvest than before. This is unbelievable because the entire road system will be opened up after presumably limited use in recent years. This will require grading of eroded soils off the existing roads, where gullies and slides probably exist, in order to smooth road surfaces. Brown (1991) stated that mass soil movement in forest watersheds is often triggered by road construction. One landslide or slump can place several times more sediment into a stream than is normally carried during a year. Fredriksen (1965, 1970) noted that landslides from mid-slope roads constructed across a patch-cut watershed produced sediment concentrations 34 times greater than expected from observations made during the pre-treatment period. Swanson et al. (1976) found that in a 15,860 acre watershed in the Oregon Cascades, roads triggered 41 times as many slides as occurred in forests. In another watershed, the rate from roads was 130 times the natural rate.

Newly used landing areas and skid trails will leave bare, unprotected, compacted soils. Erosive forces will be heightened from the clearing of vegetation during logging, re-construction of roads and skid trails, and even indentations in the soil left from heavy equipment and trees being dragged along skid trails in this very loosely consolidated soil type. These erosive forces include raindrop splash, the hydraulic action of overland flow,

rill and gully formation and landsliding on unstable slopes. The duff layer on the forest floor will be disturbed. Soil erosion will be increased where the duff is removed.

The THP states that at least 25% of the tree canopy will be retained outside the WLPZ. This means that up to 75% of the tree canopy will be cut and removed in places. This kind of disturbance must have an effect on erosion and sediment inputs to streams, particularly where activities occur near streamchannels.

Recommendations Regarding Protection of Riparian and Aquatic Habitat

Below are general recommendations to protect aquatic habitat by minimizing erosion and stream siltation from the timber harvest. In my judgment, unless these recommendations are followed, there will be very significant adverse impacts to biological resources from the proposed timber harvest. Close to 90% of the wildlife species in the forest use habitat in the riparian zone (Gregory and Ashkenas 1990).

As a point of reference, I will state the guidelines for riparian management zones according to the Riparian Management Guide developed for the Willamette National Forest in Oregon (Gregory and Ashkenas 1990). These guidelines will be implemented in several national forests in California. These federal guidelines recommend that there be No Cut/No Entry buffer zones along Class I, II and III streams, as well as around wetlands. According to these guidelines, Class I streams and wetlands should have such a buffer with a minimum horizontal width of 150 feet on either side of the active channel. Class II streams should have horizontal buffer widths of a minimum of 100 feet on either side of the active channel. Class III channels on moderate to unstable slopes should have minimum horizontal buffer widths of 75 feet on either side. Ephemeral Class IV streams should have minimum 25-foot buffers on either side of the active channel when slopes are unstable. These federal guidelines allow for stream crossings. The state forestry regulations are much less restrictive than these federal guidelines and do not adequately protect aquatic habitat, in my opinion. The state WLPZ's have heavy equipment exclusion, but allow timber harvest of up to 50% of the overstory and 50% of the understory. The WLPZ is also narrower than the federal buffer zones and is non-existent for Class III streams which may contribute significant sediment to Class I and Class II streams, if not protected from heavy equipment and logging.

Ideally, the federal guidelines should be followed in the Majors Creek Watershed. At the very least, I recommend a No Cut/No Entry buffer zone within the WLPZ or the width of the existing corridor of riparian tree species, whichever is wider, on either side of Class I and Class II streams. For Class III streams a No Cut/No Entry buffer zone of 50 horizontal feet on either side of the active channel should be established. This type of buffer should be established for 25 feet on either side of Class IV

channels on steep, unstable slopes, should they exist. Heavy equipment should be excluded within 150 feet, 100 feet, 75 feet and 25 feet of the active channels of Class I, II, III and IV stream channels, respectively. I recommend that equipment be excluded within a buffer of 150 feet around all marsh/wetland areas, should they exist. I recommend that the tree canopy closure should not be reduced below 75% for Class I and Class II streams as a result of logging outside the No Cut/No Entry buffer zones.

The importance of a No Cut/No Entry buffer zone had been reported for nearly 50 years, as evidenced by this excerpt from Cormack (1949);

"From evidence obtained in the present survey, one measure of stream protection that seems most desirable would be the prohibition of all cutting along wide strips on both sides of the stream. There is considerable precedent for advising a policy of this kind, as multiple use forestry admits non-cutting in certain areas, if it is genuinely needed. The width of the strips to be left uncut will undoubtedly vary with the individual stream and with the type of forest cover."

"Certainly the uncut areas should be wide enough to provide the maximum of shade and protection to both stream and streamside cover and to preserve the natural attractiveness of the stream. Also they should be extensive enough to include the stream's source, springs and small feeder tributaries."

Recommendations to Minimize Upland Erosion

To minimize erosion, I recommend that all unstable slide areas be designated as equipment exclusion zones. It is inappropriate to use or construct haul roads or skid trails across unstable slide areas. Roads constructed immediately above or below slide areas and cracks will accelerate sliding and erosion. Therefore, road construction and skid trails should be prohibited in these areas. I recommend that no hardwoods be intentionally harvested in the riparian buffer zones or equipment exclusion zones mentioned earlier, nor on slide areas or mud flows. The existing hardwoods in unstable sites protect the slopes from erosion. Disturbance in these areas should be kept to a minimum.

Recommendations Regarding Upland Wildlife Habitat

David Suddjian's general recommendations contained in the THP Addendum should be followed. He recommends to retain <u>all</u> acorn woodpecker granary trees and associated trees used for roosting and nesting. The THP does not follow this recommendation completely. The statement in the THP that the retention of every granary tree is not necessary or appropriate is not based on expert judgment and is contrary to the expert hired by the RPF. I recommend going further on some of his recommendations to prevent

negative impacts. All Douglas Fir trees exceeding four feet DBH should be retained and remain protected by existing surrounding trees rather than isolated in an area surrounded by cleared timber. All snags greater than 4 inches DBH should be retained.

Recommendations for Mandatory Monitoring of Project Success and Road Maintenance Until the Next Timber Harvest

What kind of monitoring will be done to verify the assertions contained in this THP regarding impacts? What kind of baseline stream channel data will be collected before the timber harvest begins? There should be baseline data to which post-harvest streambed conditions may be compared. Pool depths, escape cover and water temperature should be monitored in the East Branch and mainstem, within and downstream of the timber harvest area. Streambed profiles and pebble counts should be measured as a baseline at the mouths of Class II, III and IV channels just before they empty into larger channels. All monitoring sites should be photo-documented with dated photos providing visual evidence of field conditions. This should be done where the East Branch empties into the mainstem of Majors Creek. A site should be chosen upstream of the East Branch confluence on the mainstem as a control for sites downstream of the confluence. These baseline databases should be gathered and compared to post harvest databases at the established locations for a period of at least five years immediately following bankfull stormflows or other stormflows that produce sediment. If less sediment enters the stream after the timber harvest than before, one would expect a deepening of the East Branch streambed with deepening of pools and reduction of fines on the streambed in the East Branch and downstream in the mainstem.

Upland sites should be chosen for measuring soil movement after logging has been completed. Control sampling sites should be included. Upslope monitoring should include the use of sediment traps. Individual traps should be secured to the soil surface above the stream channel with the aperture facing directly way from the stream. These traps should be placed directly below logged areas to provide systematic sampling of the entire length of the potentially affected stream channel (Corner et al. 1996). Control traps should be placed along the streamchannel upstream of the logging area or elsewhere in the watershed with comparable geology and steepness of slopes. Traps should be removed after each rainy season with sediment volume and weight measured. An annual monitoring report should be prepared. If the assertions of the THP about reduced erosion and stream sedimentation prove incorrect, remedial actions should be taken.

The road system, skid trails and repaired sources of previous erosion should be monitored and maintained until the next timber harvest to prevent future erosion. If this maintenance is not carried out by the landowner, the same excessive erosion existing before this THP will be occurring soon afterwards. Water bars eventually fail if not maintained. Heavy stormflows can create

gullies out of skid trails without erosion control maintenance. If roads are not to be used in the future, abandon them and return them to pre-road conditions.

REFERENCES

Alley, D. 1993. North Coast Diversion and Storage Project - Reconnaissance Level Study of Fishery Resources. Prepared for CAMP DRESSER and McKEE, INC. by D.W. ALLEY and Associates.

Brown, G.W. 1991. Forestry and Water Quality. Published by O.S.U. Book Stores, Inc. Corvallis Oregon. Second Edition.

Cormack, R.G.H. 1949. A study of trout streamside cover in logged -over and undisturbed virgin spruce woods. Can. J. Res. 27(3); 78-95. [Taken from An Annotated Bibliography of the effects of Logging on Fish of the Western United States and Canada. By D.R. Gibbons and E.O. Salo, 1973. USDA Forest Serv. General Technical Report PNW-10.]

Corner, R.A., J.H. Bassman and B.C. Moore. 1996. Monitoring timber harvest impacts on stream sedimentation: Instream vs. upslope methods. W. Journal of Applied Forestry, Vol. 11, No. 1. pp. 25-45.

Fredriksen, R.L. 1965. Sedimentation after logging road construction in a small western Oregon watershed. In Proc. Fed. Interagency Sedimentation Conf. U.S. Dept. Agr., Misc. Pub. No. 970, pp. 56-59. [Taken from Brown 1991.]

Fredriksen, R.L. 1970. Erosion and sedimentation following road construction and timber harvest on unstable soils in three small western Oregon watersheds. U.S. Dept. Agr., Forest Serv., Pac. Northwest Forest and Range Exp. Sta., Res. Paper PNW-104, 15pp. [Taken from Brown 1991.]

Gregory, S. And L. Ashkenas. 1990. Riparian Management Guide for Willamette National Forest. Prepared for the Pacific Northwest Region of the U.S. Forest Service.

Swanson, F.J., G.W. Lienkaemper, and J.R. Sedell. 1976. History, physical effects and management implications of large organic debris in western Oregon streams. USDA Forest Serv. Pac. NW Forest and Range Exp. Sta. Gen. Tech. Report PNW-56. [Taken from Brown 1991.]

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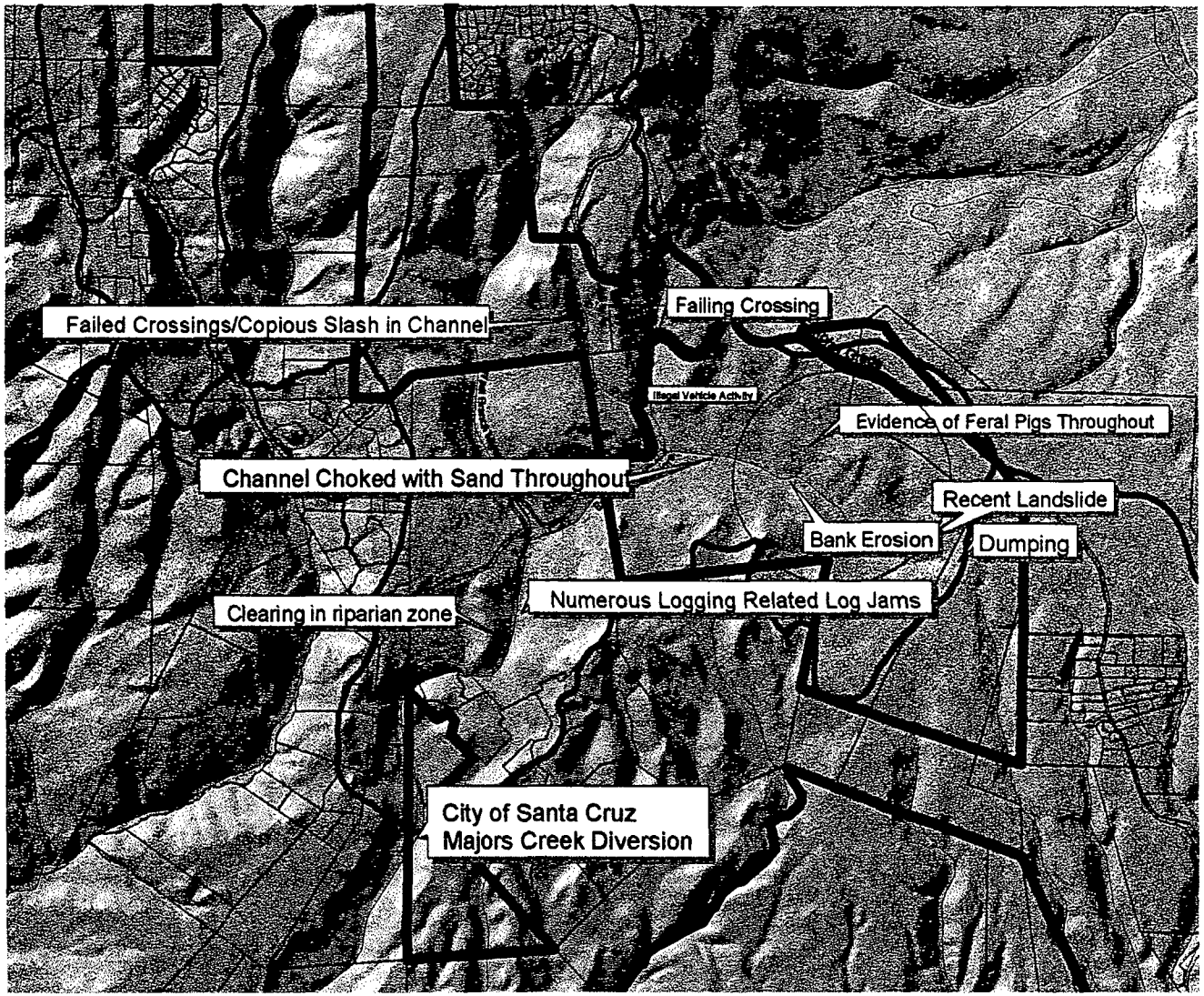
Attachment 2: Preliminary Majors Watershed Sediment Source Assesment



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Santa Cruz Water Supply Watersheds
State Parks Property
Creeks
Major Roads
North Coast Parcels
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Santa Barbara County
PUBLIC Health
DEPARTMENT

Environmental Health Services

225 Camino Del Remedio • Santa Barbara, CA 93110
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Roger Heroux, MPA *Director*
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Elliot Schulman, MD, MPH *Health Officer/Medical Director*

August 31, 2001

Ms. Angela Carpenter
Central Coast Regional Water Quality Control Board
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401

Subject: Comments regarding proposed modifications to the impaired water bodies listing under Section 303 (d) of the Federal Clean Water Act

Ms. Carpenter:

The Public Health Department wishes to provide the following comments to the Central Coast Regional Water Quality Control Board's proposed modifications to the 303 (d) listing of impaired water bodies as specified in Attachment II of your communication dated July 27, 2001.

General

1. Last year (the calendar year 2000), the State Water Resources Control Board publicly recognized that there were a number of inconsistencies between and within Regional Water Quality Control Board criteria and evaluation of data for the listing of impaired water bodies. The SWRCB recommended addressing this issue by proposing a comprehensive review of the listing process and inviting stakeholder participation to standardize the listing and delisting of impaired water bodies. Late last calendar year, that proposal was halted in favor of moving forward with the updating of the current 303 (d) listing which is over 2 years behind schedule. We were in support of the SWRCB proposal and were disappointed that it did not move forward. The process is not well defined within each individual regional board. We recommend that no new listings of impaired water bodies are included this year, but that these watersheds can be re-examined when the proposed state revised listing and delisting process has been defined.
2. Attachment 5 contains documentation of delisting and clarification rationale for 4 water bodies. These documents required a great deal of local resource allocation and RWQCB staff time. In some cases, the rationale for delisting is either faulty data or faulty data analysis. Given the potential for an elaborate and resource intensive delisting process, we recommend caution in moving forward with any additional water body listings in Santa Barbara County at this point in time.

There are two water bodies in the County unincorporated area- Arroyo Quemado Creek and Jalama Creek- for which we would like to submit the following comments:

Jalama Creek

1. The Ocean Plan Water-Contact Standards are applied for recreational water areas. There is an inconsistency between the Ocean Plan and AB 411 standards for fecal coliform. This issue was discussed at great length during the development of AB 411 and the subsequent implementation regulations as overseen by the Department of Health Services. Previously AB 411 contained secondary standards that used time weighted analysis (geomean) and trend analysis. However, these standards were removed from the mandated regulations, as the general consensus of public health officers, public health officials and regulatory officials was that these standards were not useful in preventing public health risk as part of an ongoing monitoring and notification program. We believe AB 411 standards are more protective of public health and that the Ocean Plan standards should not be applied in this instance. AB 411 exceedances for fecal coliform for Jalama Creek is on the order of 15% of the total access dates. Even the application of the Ocean Plan Water-Contact Standard using the geomean calculations shows only a 13% exceedance. It is the ultra-conservative 10% of the water samples over 400 per 100ml sample within a 60-day period of time that shows exceedances greater than 50% of the time. Because the Santa Barbara County Public Health Department performs weekly sampling at this location (and resample infrequently due to a low number of exceedances of AB 411 standards), 8 or 9 sample events are evaluated against the Ocean Plan Water-Contact Standard for the proposed listing. This equates to an average of 1 sample event exceeding the standard (1 sample event exceedance of 8 or 9 samples equates to an 11% or 14% exceedance respectively). The actual total number of samples that exceed 400 mpn/100ml is 35 of a total number of 221 samples. We therefore believe it is inappropriate to list Jalama Creek for fecal coliform impairment.
2. Total coliform sources can be traced to wastewater disposal, plant and animal origin as well as free-living organisms. The Ocean Plan standards for shellfish harvesting waters are very conservative. Reliance on total coliform alone, as an indicator of human health risk is very tenuous. The Department of Health Services, that provides monitoring and oversight of the National Shellfish Sanitation Program does not currently apply the total coliform standards for purposes of closing shellfish beds or restricting the installation of new shellfish growing areas. The EPA is recommending the use of Enterococcus as a better indicator organism for use in salt water environments (although the Ocean Plan Shellfish standards would need to be changed to consider a different indicator organism). Given that the fecal coliform levels are relatively low in relation to total coliform levels, this tends to indicate the majority of the total coliform present are not from animal sources and therefore have less association with human health risk. We recommended the removal of this listing for total coliform.

3. Currently there are a number of water quality improvement activities taking place within Santa Barbara County focused on beach posting issues. Project Clean Water, established in October 1998, has been investigating creek surface water problems in the local watersheds. Currently funding has been obtained through the Clean Beach Initiative to modify the existing county parks parking area and restroom septic system to reduce or eliminate any potential wastewater or polluted storm water runoff discharges from entering the ocean receiving waters. Based upon this level of activity, the potential for removal of the listing for fecal coliform (see #1 above) and/or total coliform (see # 2 above), we do not believe that the 303 (d) listing should be given a "high priority" listing for this water body. We believe, if the listing should go forward, that priority listing would be better categorized as a "low priority."

Arroyo Quemado

1. Currently a study has been undertaken by the County of Santa Barbara Public Works Department, Solid Waste Division to identify sources of fecal coliform in the watershed using genetic identification techniques in coordination with Dr. Mansour Samadpour with the University of Washington. The results of this study will be released in mid-September 2001. We would recommend the RWQCB staff evaluate this data before listing the water body as impaired.
2. Funding, through the Clean Beach Initiative, is designated for use for evaluating the onsite sewage disposal options for the community at Arroyo Quemado. The County, in coordination with the residents of the local area, will be exploring the possibility of upgrades to the existing septic systems. This beach is located in a private, gated community of 15 parcels. Access to the watershed and beach areas is restricted. The potential exposure of the residents or the local population from recreational water contact is much lower (due to lower numbers of residents/guests) than more frequently visited beach areas such as public beach areas that are routinely monitored under AB411 mandates. Considering the resources that are already being allocated to this beach area, and the relatively lower risk to the general population, we request that any listings be given a "low priority".

If you have any questions regarding these comments, please contact me at (805) 681-4927.

Respectfully

Daniel Reid

Daniel Reid, Project Manager
Environmental Health Services

Cc Dr. Elliot Schulman, Health Officer, Santa Barbara County Public Health Department
Roger Heroux, Director, Santa Barbara County Public Health Department
Peggy Langle, Director, Santa Barbara County Environmental Health Services Division
David Brummond, Supervisor, Santa Barbara County Environmental Health Services Division

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August 31, 2001

Angela G. Carpenter, Water Resources Control Engineer
Regional Water Quality Control Board
Central Coast Region
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5411

Re: Comments on Proposed Changes to 303(d) List of Impaired Water Bodies

Dear Ms. Carpenter:

Santa Barbara ChannelKeeper and its members are dedicated to the protection of water quality in the Channel and its watersheds. On May 15, we submitted comments to the Regional Board in response to the Board's March 7 "Public Solicitation of Water Quality Information." We submit the following comments in response to the Board's July 27 public information solicitation.

ChannelKeeper is very concerned about the deteriorating water quality in many of our local Santa Barbara water bodies. Seven of these water bodies have been placed on the State of California 303(d) list of impaired water bodies; six of these seven are designated as "High Priority." However, Regional Board staff's current work plan does not call for work to begin on any of these seven water bodies until 2004 (work on six of them will not begin until 2006).

As you know, Regional Board staff *has* begun work on the TMDL process for six water bodies, all located between San Luis Obispo and Santa Cruz Counties. We certainly do not question the importance of the water quality problems in these other areas. We are confident staff has made a reasonable determination that these water bodies merit an investment of staff resources. However, we strongly believe that the TMDL process should also begin in our area, even if only on one of our water bodies, as soon as possible.

We understand that Regional Board Staff will be submitting recommendations to the Board itself in the coming weeks. The Board will consider staff's recommendations at a hearing on October 26. We urge you to recommend to the Board that Region 3's schedule for developing TMDLs include as a top priority one or more of the seven impaired Santa Barbara South Coast water bodies.

Santa Barbara County is fortunate to have a large number of groups and individuals who are very concerned about water quality. Many of these groups have indicated to us that they agree that the Regional Water Quality Control Board should allocate sufficient resources such that work can begin immediately on one or more South Santa Barbara water bodies.

Impaired Water Bodies Along the South Santa Barbara Coast

The South Coast of Santa Barbara County has some of the finest beaches in the world. These beaches attract millions of residents and visitors every year. The beaches located on either side of

the mouths of Mission Creek and Arroyo Burro Creek are two of our most popular beaches. Unfortunately, they are also two of the most polluted, and for that reason have been placed on the 303(d) list. NRDC's *Testing the Waters 2000* report ranked Santa Barbara County *dead last* in terms of beach water quality, with 1,392 beach closures/advisories due to the presence of bacteria. Santa Barbara didn't do much better in 2001, ranking third (with 913 advisories/closures) behind only Los Angeles and San Diego, counties that each have over three times as many beaches and populations several orders of magnitude larger than Santa Barbara's.

In addition, Heal the Bay recently ranked Arroyo Quemado the Number 1 most polluted beach for bacteria in southern California.

Santa Barbara's coast is also home to some of California's most important remaining coastal wetlands. Over 90% of California's wetlands have been filled in. Two of those that remain, the Goleta Slough and the Carpinteria Salt Marsh, host well over 100 bird species and 200 plant species. Unfortunately, these two ecosystems are also impaired for multiple pollutants and have therefore been placed on the 303(d) list.

The following is a complete list of all of the water bodies on the Santa Barbara coast that have been placed on California's 303(d) list, and the types of impairments at each location:

Arroyo Burro Beach	(pathogens)
Arroyo Quemado Beach	(fecal coliform, total coliform)
Atascadero Creek	(dissolved oxygen)
Carpinteria Marsh	(priority organics, nutrients, sedimentation/siltation, organic enrichment, low dissolved oxygen)
Goleta Slough	(priority organics, metals, sedimentation/siltation, pathogens)
Mission Creek	(pathogens, unknown toxicity)
Point Rincon	(pathogens)

Rationale for Assigning Higher Priority to South Coast Water Bodies

Region 3 staff is currently performing work on 303(d) list impaired water bodies in six areas: Salinas, San Lorenzo, Pajaro, Morro Bay, San Luis Obispo Creek, and Valencia and Aptos Creek. The closest one of these water bodies to our area is San Luis Obispo Creek, which is approximately 100 miles north of here.

Purely as a matter of equity, it seems that if the majority of Region 3's current TMDL resources are being used on water bodies located in or north of San Luis Obispo County, *at least some of those resources* ought to be used to address the problems facing the South Coast watersheds. Nobody can predict with certainty to what extent funding will be available in the future to continue the decades-overdue TMDL process. Therefore, the limited funding that currently exists should be distributed throughout the region.

Moreover, even if future funding does become available, we believe it is inappropriate and imprudent to wait until 2006 (or 2004) to even begin the TMDL process on the South Coast. By beginning work immediately on at least one impaired South Coast water body, local Santa Barbara government officials and stakeholders will have the opportunity to participate in the TMDL process right away. By 2006, when work is set to begin on the majority of the other South Coast water bodies, enough local knowledge about the process will exist to facilitate work on those other projects.

As noted above, there are numerous individuals and groups working to improve water quality on the South Coast. If Regional Board staff begins the TMDL process in several different areas within Region 3, staff stands to learn more about the process than it would by focusing on only the northern parts of the Region. You can be sure that there will be robust debate about the TMDL process here on the South Coast, and this debate will likely lead to insights that will improve the overall process in the future.

Conclusion

For the foregoing reasons, Santa Barbara ChannelKeeper respectfully requests that staff recommend to the Regional Board that work begin immediately on one or more TMDLs in the South Coast Watershed of Region 3.

Cordially,

Drew Bohan
Executive Director

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September 4, 2001

Ms. Angela Carpenter
Central Coast Regional Water Quality Control Board
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401

SUBJECT: COMMENTS REGARDING PROPOSED MODIFICATIONS TO THE IMPAIRED WATER BODIES LISTING UNDER SECTION 303 (D) OF THE FEDERAL CLEAN WATER ACT

Dear Ms. Carpenter:

Thank you for the opportunity to comment on the proposed modifications to the impaired water bodies listing under Section 303 (d) of the Federal Clean Water Act. Our brief comments are below:

We wonder about the timing of this effort to modify the 303(d) list. Many communities in the Central Coast area, including the City of Santa Barbara, are embarking on increased efforts to improve stormwater runoff quality and to comply with Phase II requirements of the National Pollution Discharge Elimination System (NPDES). It seems premature to spend much time on modifications to the Total Maximum Daily Load (TMDL) program prior to seeing how these other efforts are working. How important and valuable is this current effort to rework the list when in a few years we are going to have much more information on where problems exist and how the current efforts to clean up problem areas are working?

If this effort to modify the 303(d) list is timely, then the entire list should be scrutinized for consistency within the list and with other California Regional Board 303(d) lists. Within this list, it appears that different approaches are being used on different streams. For example, Mission Creek, in Santa Barbara is listed for pathogens and unknown toxicity from a previous listing. It is not clear to us what "unknown toxicity" means and, regarding pathogens, in most other cases, the creeks are listed for a specific indicator organism, such as total coliform. We are not aware of a pathogen study being done on Mission Creek.

Regarding the proposal to add the Pacific Ocean at Mission Creek, we concur with the comments of Dan Reid, Project Manager, Santa Barbara County Environmental Health Services.

Again, thank you for the opportunity to comment.

Sincerely,

Stephen F. Mack
Water Supply Manager

SM/dm

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MEMO

TO: Angela Carpenter
Regional Water Quality Control Board
81 Higuera Street
San Luis Obispo CA 93401

FROM: Al Haynes
San Lorenzo Valley Water District

DATE: September 12, 2001

SUBJECT: HISTORICAL INFORMATION ON THE SAN LORENZO RIVER AND TRIBUTARY CONDITIONS RELATIVE TO EROSION AND SEDIMENTATION

In the course of our conversations concerning the contribution and impaired condition of tributaries to the San Lorenzo River, I went back and reviewed various reports concerning the sediment problem in the San Lorenzo River Watershed. It turned out to be quite a beneficial exercise for me as the time lapsed between my first involvement in researching water quality problems in the San Lorenzo River Watershed and today span over 30 years and one tends to forget many of the details without more recent review of some of these early reports. In 1972, Ronald Lang, a warden with the State Department of Fish and game, working with a biologist from Cabrillo College, completed a stream survey of the San Lorenzo River mainstem. He documented an increase in the percentage of fine sediment in the main river bottom from 8% in 1966 to 65% in 1972. Further, he showed the amount of gravel dropped from 20% to 2%. As noted in the Fishery Habitat and The Aquatic Ecosystem Technical Section of the 1979 San Lorenzo River Watershed Management Plan;

> "Conditions have not improved since then. Other surveys have pointed out the presence of excessive amounts of silt in all of the tributaries but the relatively undisturbed Fall Creek" (page 19).

An additional passage from the Fishery Habitat Technical Section of the Watershed Plan highlights the role of sediment in impairing aquatic beneficial uses:

> "Impacts of Sedimentation-Sedimentation is the major cause of the fishery decline in the San Lorenzo Watershed. It has clogged spawning gravels, reduced food production in the stream and reduced the amount of habitat available for fish.
>
> Excessive sediment in spawning areas has been found to reduce the number of fish emerging from the spawning gravels by up to 85%. (Shapovolav and Taft, 1954).

Observations of insect production on streams of the San Lorenzo Watershed show biomass to be 75-90% lower on silted reaches of Bean, Zayante, and Carbonera Creeks as compared to the upper San Lorenzo (B) (see table 3). Where the rocks became completely surrounded by sand, researchers in Idaho found that the number of young fish that could be supported was reduced by 90% (Bjornn, 1977)."

The main San Lorenzo River Watershed Management Plan in Chapter IV Erosion and Sediment sums up the importance of excessive sediment in the entire watershed;

"Excessive erosion leading to sedimentation is the biggest problem in the San Lorenzo Watershed."

The next paragraph speaks to the condition of the tributaries as well as the mainstem;

"The San Lorenzo River and its tributaries show an alarming accumulation of sediment throughout much of their length. While there is a high natural susceptibility to erosion in the watershed due to steep slopes and unstable soils, human activities have greatly accelerated this natural tendency. This has caused onsite land and property damage, water supply problems, increased flood hazards, greatly impaired fishery habitat, degraded water quality, reduced aesthetic value and impaired recreation opportunity" (page 67).

Another important and relevant technical study from the Watershed Management Plan supporting chapter IV is the Physiography-Geology and Erosion and Sediment Transport Technical Sections prepared by John Ricker and Jeffery Mount. Mount, at the time, was a graduate student at UCSC. Mount now is a professor at U C Davis teaching geomorphology. His observations are relevant:

"The road network of the upper reaches of Zayante Creek and Mountain Charlie Gulch consists of dirt roads and paved roads. The dirt roads in this area contribute sediment directly to local drainages. Field observations showed extensive gullying and rilling of these roads. The higher runoff velocities produced by the impermeable surfaces of the secondary improved roads have caused channel scour of the local drainages. The combined effect of both types of roadways has produced significant sediment contributions in this area.

Numerous other areas throughout the watershed have poorly graded dirt roads that show extensive gullying. If uncontrolled, the gullying proceeds until the road is rendered useless. However, temporary efforts to improve the road may be done often causing new disturbance and in the worst case, sidecast of material into adjacent drainageways. During the course of this study Jeff Mount noted hundreds of abandoned or soon to be abandoned dirt roads. The majority of these

were located in stream valleys or on very steep slopes and usually were associated with past logging operations. It was his opinion that abandoned and poorly graded dirt roads contribute more sediment to the river system than all other land uses combined. Additional areas containing significant dirt road densities are: Scotts Valley, upper Bean Creek, Lockhart Gulch, Lompico Creek, lower Newell Creek, Quail Hollow Road area, Love Creek, Deer Creek, upper and lower Bear Creek, Kings Creek, Empire Grade area, and along the entire length of the San Lorenzo River" (page 34).

This technical section contains numerous references to the impaired condition of the San Lorenzo River's tributaries. Too numerous to extract and quote in this memo; therefore, I have appended page 40 to the conclusion of this technical section to this memo and highlighted relevant passages for your review and information. The San Lorenzo River Watershed Management Plan was the first Watershed Management Plan prepared in California. The State Department of Fish and Game paid approximately half the cost to underwrite preparation and research for this plan because in 1976 a bill passed by the State legislature and signed by the Governor added the San Lorenzo River to the States Protected Waterways Act. I lobbied our local Assemblyman, Frank Murphy (R) to carry the bill in 1975.

The State Protected Waterways Act (Public Resources Code) states:

> "The Resources Agency and affected local agencies shall prepare detailed waterway management plans which shall include provisions for necessary and desirable flood control, water conservation, recreation, fish and wildlife preservation and enhancement, water quality protection and enhancement, streamflow augmentation and free flowing rivers, segments or tributaries for.....the San Lorenzo River and its tributaries."

The protected Waterways Act was originally passed in 1971 before the Wild and Scenic Rivers Act. I point this out because the Resource Agency Secretary (Huey Johnson) wrote a letter to the County in March 1980 in which he requested Resource Agency Boards and Commissioners to work closely with Santa Cruz County in the implementation of the plan. I have appended a copy of this letter to this memo for your information. You should note that the Central Coast Regional Water Quality Control Board is copied at the end of the letter as one of the Resources Agency Boards and Commissions. I believe the letter has never been amended or revoked by subsequent Resources Agency Secretaries; therefore, it should stand as a directive to the RWQCB.

In 1981 the SWRCB initiated an Instream Beneficial Use Program by adopting regulations and selecting 2 water bodies in California as pilot projects to test the feasibility of the program. After extensive lobbying by local agencies and citizens the SWRCB selected Zayante Creek/lower San Lorenzo River as one of the two (2) pilot

TABLE 4 - FISHERY PRODUCTIVITY OF THE SAN LORENZO WATERSHED

Stream	Overall[1] Length	Length for[1] Spawning	Spawning[2] Condition	Nursery[2] Suitability	Contribution[3] in 1974	Limiting[2] Conditions
San Lorenzo River	26	22	Poor	-	-	Siltation (1972)
Upper portion	-	-	Good	-	23%	Siltation
Bear Creek	8	7	Poor (Potentially good)	Good	7%	Siltation
Deer Creek	4	3	Poor (Potentially good)	Good	-	Siltation
Fall Creek	5	3.5	Good	Moderate	-	Log jams Food
Boulder Creek	7	3	Poor	Moderate	8%	Siltation Large boulders
Love Creek			Poor	Moderate	2.7%	Low flow
Newell Creek	7	3	Poor	Poor	2.2%	Siltation
Zayante Creek	10	7.5	Moderate	Good	18%	Siltation
Bean Creek	6	3.75	Good	Good	20%	Siltation
Kings Creek	6	4	Good	Moderate	13%	Low flows
Two Bar Creek	3	2	Moderate	Poor	.4%	Low flows
Carbonera Creek	7	5	Poor	Poor	.2%	Siltation Pollution Food
Branciforte Creek	8	7.5	Poor	Poor	2%	Siltation

[1]Murphy, 1948

[2]Information taken from 1974 surveys by Dennis Johnson and John Yoakley, supplemented by more recent surveys by the Office of Watershed Management. (1976) (Johnson and Yoakley, Department of Fish and Game)

[3]Estimated by Benkman (1976) from stream survey information by Dennis Johnson and John Yoakley in the fall of 1974.

TABLE 4 FROM THE FISHERY HABITAT AND THE AQUATIC ECOSYSTEM
TECHNICAL SECTION
SAN LORENZO RIVER WATERSHED MANAGEMENT PLAN

projects. The City of Santa Cruz at this time was involved in studying Zayante Creek as a possible site for a water supply project involving a dam larger than Loch Lomond on Newell Creek. Several studies had recently been completed concerning fish habitat and sediment. At the same time the various water agencies in the Northern half of the County were considering an MOU to begin a jointly funded study of water supply and land use demand. The North Santa Cruz County Water Master Plan was formally initiated in December 1982. The final report was completed in June 1985. 1982 was also a wet year in which precipitation was two (2) times average at Boulder Creek (120") and storm damage from one event, January 3-5, 1982, (19" of rainfall over a 24 hour period) caused some of the most extensive damage to existing infrastructure and improvements noted in the historical record (1930s - present). Induced landslides and debris flows damaged hundreds of County roads and estimated damage exceeded $110 million dollars. The SWRCB contracted with the Center for Natural Resource Studies (Coats, et.al.) to prepare a report for the Instream Beneficial Use Program on Zayante Creek and the lower San Lorenzo River, Landsliding, Channel Change, and Sediment Transport in Zayante Creek and the Lower San Lorenzo River, 1982 Water Year, and Implications for Management of the Stream Resource.

This report was used as a primary source of information in the staff report prepared by Ray Dunham of the SWRCB staff for the SWRCB's "fact-finding" public hearing held in October 1982. The public was allowed to comment until November 1982. The entire Instream Beneficial Use Program came under widespread criticism by powerful elements of the State's water industry who feared the implications of a statewide program reserving instream water flows on rivers and streams where the desire for additional water diversions and storage might be affected. In January 1983 Carla Baird, then chair of the SWRCB, left office and the SWRCB abandoned the entire program. However, the 1982 report prepared for the SWRCB contains more supporting information concerning the role of San Lorenzo River tributaries in supplying excessive sediment and the impairment of these tributaries.

> "Although the lower and upper portions of the San Lorenzo River were initially proposed as two independent stream investigations, it has become apparent that the problems encountered in each of these streams are problems involving the whole watershed. Any proposed program to address these problems would be largely ineffective if it were not also applied to the entire watershed" (page 3).

RWQCB staff should carefully review additional excerpts (see attachment 3) for relevance and proposed standards regarding the San Lorenzo River Sediment TMDL (see page 6C Water Quality Objectives for the San Lorenzo River and page 8 IV Implementation Plan).

Please note that in 1982 timber harvest activity in the watershed had not yet accelerated to the levels of the late 1980's early 1990's. Therefore, the 1982 estimate of timber

harvests constituting 10% of erosion is likely not accurate now. Santa Cruz County staff indicates that 120 miles of new THP roads were constructed between 1987 and 1997 (Matt Baldikowski-personal communication). In fact, total miles of THP roads may equal the 600 miles of County maintained roads.

The National Marine Fishery Service developed a standard in their recent report Essential Fish Habitat that road density above three (3) miles per square mile is a good indication of road induced sediment problems in watersheds. Most of the San Lorenzo watershed exceeds that standard. The following table D3 is excerpted from the SWRCB 1982 report and lists by tributary the basin sediment yield and the source of the sediment problem in 1982.

The North County Water Master Plan was completed in 1985. Over 30 technical reports were prepared under individual tasks called out in the scope of work. Task Report C. Analysis of Resource Problems prepared by Barry Hecht in 1984 contains a summary of sediment problems in the San Lorenzo River and tributaries in 1984. I have attached table 10 from that report for your information (see attachment 4).

This memo should be considered an attempt to highlight the most pertinent sources of information. It is not an exhaustive analysis of all the relevant reports and studies. For example, reports following the January 3-5, 1982 storm by USGS, Corps of Engineers contracted studies of the lower San Lorenzo River flood control channel, and D.W. Alleys 1982 Fishery and Habitat Study have not been included in my review and analysis. A comprehensive list of reference is contained in Balance Hydrologics 1998 report An Assessment of Streambed Conditions and Erosion Control Efforts in the San Lorenzo River Watersheds, Santa Cruz County, California or Swanson Hydrology and Geomorphology's 2001 Zayante Area Sediment Source Study which, as you know, provides the technical foundation for the RWQCB's draft San Lorenzo River Sediment TMDL.

In 1994 the San Lorenzo Valley Water District and the City of Santa Cruz Water Department began collaboratively in assessing the condition of the San Lorenzo River Coho Salmon and Steelhead population. Santa Cruz County had petitioned the State to list Coho Salmon throughout the County under the States Endangered Species Act. We contracted with D.W. Alley and Associates to prepare an assessment of the population, as there was no comprehensive reliable scientific data of these critical species population status in the watershed. In 1995 the first report was completed. As part of the assessment at each sampling station, sedimentation was evaluated by assessing the embeddedness for riffle and flat water reaches, streambed sediment in riffle/run, and glide reaches, and embeddedness of pool habitat. In 1998 the study scope was expanded to include population-sampling stations on all the major tributaries and to incorporate habitat typing into the study. As you know, I have already transmitted a copy of the latest Alley report for 2000 to you. Figures 30a through 33b provide tables summarizing

TABLE D-3

ESTIMATED ANNUAL SEDIMENT RATES AND PROBLEM TYPE BREAKDOWN IN SAN LORENZO BASINS

BASINS	ESTIMATED TOTAL BASIN SEDIMENT YIELD (Cu. Yd./ Year)	TOTAL BASIN AREA (Acres)	ESTIMATED AVERAGE BASIN YIELD: Cu. Yd./Acre/ Year	PROBLEM TYPES ESTIMATED RANKING
Boulder Creek	13,300	6,530	2.0	Unimproved Roads Recent & New Construction Major Problems Other
Zayante/ Lompico	24,000	10,620	2.3	Existing Paved Roads Recent & New Construction Unimproved Roads Major Problems
Bear Creek	26,800	10,340	2.7	Unimproved Roads New Construction Other
Upper San Lorenzo River	9,700	8,470	1.2	Unimproved Roads New Construction Recent Construction Other
Lower Newell Creek	4,000	1,170	3.4	Recent & New Construction Existing Paved Roads Other Disturbance
Kings Creek	11,200	4,940	2.3	Unimproved Roads New Construction Other
Bean Creek	13,100	6,250	2.1	Recent, New Construction Existing Paved Roads Major Problems Unimproved Roads Other
Two Bar Creek	2,700	1,650	1.6	Unimproved Roads Other Existing Pave Roads New Construction

Source (4)

TABLE D-3 continued

BASINS	ESTIMATED TOTAL BASIN SEDIMENT YIELD (Cu. Yd./ Year)	TOTAL BASIN AREA (Acres)	ESTIMATED AVERAGE BASIN YIELD: Cu. Yd./Acre/ Year	PROBLEM TYPES ESTIMATED RANKING
Love Creek	3,200	1,480	2.2	Unimproved Roads Recent Construction Other
Felton/ Highway 9	3,000	6,000	0.5	Streambank New Construction Unimproved Roads Other
Carbonera Creek	3,000	4,710	0.6	Recent Construction Existing Paved Roads Major Problem Other
Branciforte Creek	7,600	6,220	1.2	New Construction Existing Paved Roads Streambank Recent Development
SAN LORENZO WATERSHED TOTAL	121,600	89,000	1.4	

Source (4)

sediment data for the past seven (7) years the study has been conducted. There are also numerous sections of the text that discuss the effects of sediment on aquatic habitat for the 1999/2000 rainfall season, for the mainstem and tributaries. A thorough review of this sediment and the previous six (6) Alley reports provides the most substantial recent evidence of tributary and mainstem impairment by sediment over an extended period. It also provides a more comprehensive and dynamic context as reviewers can get a sense of the watershed response to periods of intense winter rainfall events such as the 1998 El Niño storms and the subsequent movement of sediment pulses caused by land sliding and road related failures from their origin in the tributary watersheds through the tributary channels to the mainstem over several years of subsequent winter seasons. As Hecht and other geomorphologists have pointed out, a great deal of the bedload which generally provides the habitat impairing sand sized particles move in the peak hydrologic runoff events i.e.

> "On Zayante Creek 41% of the 1973 sediment discharge occurred on one day. During the 4620 cfs storm peak on January 14, 1978, the instantaneous rate of sediment transport on Zayante Creek exceeded 1,188,000 tons/day" (page 41 Mount et.al. Physiography-Geology and Erosion and Sediment Transport Technical Sections San Lorenzo River Watershed Management Plan 1979-see attachment 1 to this memo).

Alley's reports following the 1998 winter show sediment moving downstream on Kings, Branciforte, Carbonera, Zayante, Bean, Boulder and Bear Creeks, while conditions in the middle and lower mainstem of the San Lorenzo declined due to increased levels of sediment. 1998-1999 and 1999-2000 were about average rainfall years and may help explain why bedload sediment didn't flush out of the watershed. Also sources of sediment in the tributaries while washed into the channel in large volumes in the 1998 El Niño winter continue to provide chronic sources of additional sediment above the capacity of the tributary channel to convey downstream (if they weren't assessed and repaired). For example, San Lorenzo River Water District in the upper Kings Creek watershed had about 1/2 mile of severely damaged dirt road on its then Waterman Gap property. We successfully applied for FEMA funding and working with CDF with a plan prepared by a consultant repaired the road and generally improved the design and stability by incorporating rolling dips abandoning culverts and outsloping the road where feasible (CDF was technically responsible for the road since they constructed it in 1954 and by written agreement were responsible for maintenance. In 1954 wildlands fire fighting technology involved access to remote watershed locations for fire equipment and hand crews via road networks). By comparison, many landslides and several debris flow failures from logging roads have not been addressed. Santa Cruz County Public Works, overwhelmed by extensive damage are still in the process of addressing some culvert and road failures in the watershed. Private road owners generally don't have sufficient capitol to adequately address runoff and erosion damage. The County Planning Department secured a grant from the State Department of Fish and Game to surface the unpaved

miles of upper Kings Creek Road with gravel two (2) years age. Two (2) roads in the Kings Creek watershed Logan Creek and Araki Road are privately maintained. Many of the structures/houses off Araki Road are bootlegged i.e. built without County permits with no electricity or in some cases a water source. Sections of the roads cross instabilities such as landslides, fill failures, etc. and are subject to annual road grading with side casting to maintain a usable running surface. Repairs are ad hoc and not designed to address the underlying causes of instability (see pages 26-30 of D.W. Alley's 2000 report for discussions of mainstem and tributary habitat conditions generally associated with impairment by sediment).

Two reports prepared by the State Department of Fish and Game in 1995 and 1996 in conjunction with the so called 2090 agreement for THP's to address the impacts of proposed timber harvests on listed Coho contain evaluations of impairment by sediment based on an extensive survey of streams by DFG Fishery Biologists. Stream Specific Coho 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: California Department of Fish and Game, Region 3 Report to J. Steele 1996 Plus Updates and San Lorenzo River Watershed Lagoon and Mainstem, Fall Creek Carbonera and Other Tributaries 1995 should be reviewed for information.

Perhaps the most relevant report was completed by Hecht and Kittleson for the County 1m 1998 The Assessment of Streambed Conditions and Erosion Control Efforts in The San Lorenzo River Watershed, Santa Cruz County, California completes the circle by assessing the condition of both tributaries and the mainstem after 20 years of County implementation of the 1979 Watershed Management Plan.

Sediment is clearly recognized as the primary water quality impairment of beneficial uses of the San Lorenzo River and tributaries from 1972 to the present. A fundamental question to be answered in the 1998 Balance report,

> "Have instream habitat conditions and related beneficial uses improved, worsened, or remained the same since the development of the 1979 plan?"
>
> "Stream conditions have not substantial improved since the 1979 Watershed Plan, despite the original plan's general well-founded recommendations." (page 2).
>
> "What is the status of implementation of 1979 plan recommendations and other County sponsored erosion control efforts?"
>
> "Residential land clearing, grading without effective erosion control and ad hoc drainage management, active timber harvests and disruption of riparian zones continue to contribute sediment, mostly noticeable from newer or recurring area of disturbance" (page 3).

In regard to pool depths Balance talked to a number of local fishery Biologists,

> "All fisheries scientists consulted in the course of this investigation agreed that pool habitat improvements in specific reaches can quickly be offset by road failures, landslides, and other common occurrences in the Santa Cruz Mountains.
>
> None of the biologists noted overall habitat improvements since the 1979 Watershed Plan. Instead they noted that bed condition continue to fluctuate generally between moderate to poor" (page 28).

Balance's study utilized several methods to assess sedimentation in the watershed. One involved finding and revisiting sites that were previously subject to rigorous investigation by Hecht in 1978-1981, and re sampling 1n 1996. Some of the sites involved extensive bed census by pebble counts which measures relative proportions of particle sizes and by accepted scientific method determines the level of impairment.

"The direct measurement of sedimentation at bed census sites during summer flows has proven to be the most robust and convincing of the data sets, and one which can be repeated in the future. Based on detailed bed census analysis at selected geomorphic study sites, we have made the following observations and interpretations:

- There appears to be a general fining of bed materials at all sites except the San Lorenzo River at the Felton Diversion. While the limited number of samples at each study site may preclude a definitive trend analysis, contemporary conditions do not show improvement in reduction of sediment supply or improvements in gravel availability and/or embeddedness of gravel size material.
- Proportionately less bed material in Zayante and Bean Creeks appears to be generated now north of the Zayante fault. Quartzites and volcanics, which originate almost exclusively north of the fault, are only about half as abundant as in 1978-81. These two rock types are both very durable and are also easily identified, so we believe this finding to be especially informative. Proportionately more sediment is originating from areas downstream of the Zayante fault, most of which are sandy.
- Proportionally, more sediment is generated in middle and lower Bean Creek subwatershed than in earlier evaluations, based on gravel lithologies.
- There is a sharp decrease in relative bed material sizes at the station on Bean Creek below Lockhart Gulch. It appears that Lockhart Gulch is overwhelming the monitoring site with sand. Development-related disturbance and road slipouts in Lockhart Gulch are likely sources. Slides and associated gullies on Bean Creek Road, particularly a set of slides 0.5 miles north of Camp Evers, also are significant sources of fines to this reach.
- There is a marked increase in introduced rock types (roadbed, asphalt, and concrete) in Zayante Creek at Graham Hill Road. This was particularly notable in the gravel size classes. About 11 percent of the bed surface is composed of materials entering the stream from the road surface. Nearly all of these materials are associated with roads and point to the importance of roads as sediment sources."

The second approach involved a sediment source survey which was more detailed and rigorous than the method used for the 2001 Zayante Area Sediment Source Study by Swanson Hydrology and Geomorphology. The Swanson report as you know is the basis for the RWQCB's draft sediment TMDL for the San Lorenzo River.

5.3 Streams Visited in the Sediment Source Survey

Variations in the main sediment-source locations and types are discussed in this section, based on our canvass of major streams in the watershed (Table 7). Due to time and budget constraints, we were unable to visit a number of remote, difficult-to-access tributaries. To optimize limited field time, we chose not to devote significant time to protected water supply watersheds. These include portions of San Lorenzo Valley Water District, private water company and State Park lands on Ben Lomond Mountain, tributaries to Loch Lomond on Santa Cruz Water Department lands, and the upper San Lorenzo above Waterman Gap managed by SLVWD and California Department of Parks and Recreation.

Our observations may be summarized as follows:

- Overall, the most persistent, chronic source of sediment to area streams appears to be year round use of roads, and especially unpaved roads and drives primarily for residential access. Periodic grading and leveling of these road surfaces continuously exposes erodible material both on the road surface and along the road shoulder. This loose, unconsolidated material may be extremely mobile during typical winter storms.

- Culvert blow-outs, failures of at-grade crossings, and slipouts of fill slopes affect all roads, but tend to be more prevalent on unpaved roads. There is also a tendency to spread failed cutslope debris on unpaved beds to 'level' the road; this loose material, readily available for transport, usually is quickly removed from paved roads where it presents a hazard.

- Background geologic instabilities, landslides, mudflows, and debris slides often affect the severity of human-induced erosion and sedimentation problems and greatly increase costs of stabilization efforts at some sites throughout the watershed, roads fail recurrently at the same unstable locations. They are then replaced, often using similar construction, since --in the interest of erosion control -- it would be too disruptive to build a new road. This cycle appears more prevalent on timber parcels than on those used for homes, but occurs in both settings, as well as in public road and highway maintenance. Means of encouraging routing all new roads and drives around these instabilities (or, as is sometimes done, to span them) should be found at an early stage of design or grading review.

Table 7
Str. .ns Visited in the Sediment Source S ey

During our field survey, Balance did reconnaisance - level assessments of the following streams and their associated road networks.

STREAM	SEDIMENT SOURCES AND TYPE OF DISTURBANCE
San Lorenzo River	Residential use, roads, trails, timber, commercial
Carbonera Creek	Residential use, roads, commercial
Branciforte Creek	Residential use, roads, commercial
Granite Creek	Residential use, roads, horses
Redwood Creek	Residential use, roads
Jamison Creek	Residential use, roads, timber
Boulder Creek	Residential use, roads, timber, recreation
Robinhood Creek	Residential use, roads, timber
Bracken Brae Creek	Residential use, roads
Foreman Creek	Residential use, roads
Malosky Creek	Residential use, roads
Hubbard Gulch	Residential use, roads, vineyard
Marshall Creek	Residential use, roads
Fall Creek	Residential use, roads, trails
Shingle Mill Creek	Residential use, roads
Gold Gulch	Residential use, roads, quarry
Ruins Creek	Residential use, roads
Bean Creek	Residential use, roads, horses, quarry
Upper Newell Creek	Residential use, roads, timber
Lockhart Gulch	Residential use, roads
Zayante Creek	Residential use, roads, timber
Lompico Creek	Residential use, roads, timber
Love Creek	Residential use, roads, timber
Clear Creek	Residential use, boulder mining
Logan Creek	Residential use, roads, timber
Upper Kings Creek	Residential use, roads, timber
Kings Creek	Residential use, roads, timber
West Bear Creek	Residential use, roads, timber
Two Bar Creek	Residential use, roads
Upper Zayante Creek	Residential use, roads, timber
Bear Creek	Residential use, roads, vineyards, timber
Deer Creek	Residential use, roads, timber
Lompico Creek	Residential use, roads, timber
Connelly Gulch	Residential use, roads
Hopkins Gulch	Residential use, roads, commercial use
Harmon Creek	Residential use, roads
Whalebone Creek	Residential use, roads
Lower Newell Creek	Residential use, roads
Mountain Charlie Gulch	Residential use, timber, roads

- Several geologic formations are consistent contributors of sediment loads to local streams, despite stabilization efforts. Several of these units are sandstones, which contribute disproportionately to the sandy, habitat-impairing bed sedimentation of particular concern in this watershed:

    1. Santa Margarita Sandstone along Bean Creek and neighboring drainages. Disturbance of the Zayante soils and weathered mantle results in severe gulleying and long term instability. The high permeability and low available water capacity and fertility in exposed Santa Margarita sandstone severely limits revegetation efforts, particularly on south-facing slopes.

    2. Vaqueros Sandstone where disturbed by road development in upper Bear Creek and Deer Creek, and in the upper Boulder Creek, Zayante Creek, and Kings Creek drainages.

    3. Sandier members of the Purisima and Lompico formations in Branciforte and Carbonera Creeks, particularly where residential development, roads, agricultural practices and livestock (primarily horses) concentrate flows or reduce capacity of the soils to hold moisture and attenuate runoff are also sources of landslides and winter debris.

    4. Mudstones in Kings Creek, Logan Creek, and the upper San Lorenzo River. Where exposed, vegetation is often naturally sparse, soils are thin or non-existent, and weathering continuously exposes erosive surfaces. Steep slopes, unsurfaced roads, and roadcuts in these areas are notable sources of persistent turbidity, particularly where year-round road use is necessary for residential access.

- Where exposed to weathering or erosive forces, the contacts between geologic formations may be significant chronic sources of sediment. Steeply bedded contacts between mudstones, shales, and less coherent sandstone units in the upper watershed are often points of continuous sediment supply. The small incising tributary next to Araki Road in the Kings Creek drainage is one clear example of accelerated erosion along a geologic 'strike' into less-resistant units.

- Roadcuts along most steep roads are notable chronic sediment sources. Selected examples include Jamison Road, China Grade, Kings Creek Road, Araki Road, Logan Creek Road, Deer Creek Road, Two Bar Road, and Bean Creek Road. Smaller cut/fills for residential driveways exacerbate sedimentation problems.

- Many erosion sites, mudslides, and landslides result from ad hoc and uncoordinated control for drainage onto, across, and off of private lands and public rights of way. Landowner responsibilities and obligations for management of storm runoff are not well understood and chosen strategies are often emergency "fixes" that neglect to consider downslope conditions. Runoff from roofs, impervious driveways and private roads can greatly increase the volume, velocity and erosive force of offsite runoff. In addition, undersized, plugged, poorly installed, or inadequately maintained culverts and drainage structures can lead to changes in drainage patterns that exacerbate gulleying, sheet erosion, or sliding of saturated slopes.

- The stockpiling of winter landslide debris contributes sediment to streams on roads that are subject to slides. Sidecasting of material appears to be less common than stockpiling. Where stockpiles are left through subsequent winters, erosion of piles can be a major source of sediment. Where stabilization or removal of stockpiles occurs, streambank vegetation and downstream bed conditions show less disturbance. Stockpiles and side-casting of debris on non-County maintained roads appear to

contribute sediment in proportions that appear greater than contributions fr roads. Larger stockpile areas would clearly be a useful step, and was sugge many knowledgeable individuals with whom we spoke.

- Where public and private roads are located in or right next to the riparian zc frequently subject to failure by slippage and/or undercutting as streams mig fill prism below the roadbed. Kings Creek Road, Logan Creek Road, Deer Creek Road, Bean Creek Road and Jarvis Road have visible examples of this condition.

- Numerous County maintained and private roads cross old landslides and debris flows or cones. Love Creek Road, Kings Creek Road, and Deer Creek Road are notable examples. These are particularly unstable where steep bedding in the geologic formations facilitates rockslides.

- Roads in steep side drainages, particularly long access roads to homes, retreats, and camps appear to contribute significant sediment to larger tributaries just downstream, particularly when sediment yield is viewed on a road mileage per capita perspective. This is due to the persistent use of unpaved roads in all seasons. Use of baserock on the road surface or paving the roads reduces rutting, and may decrease fine sediment loads.

- Ditch clearing and vegetation removal in roadside swales also contribute sediment by exposing soils to rainfall and road runoff. The level of impact resulting from these day-to-day activities on County roads and private lands appears to be less significant than unsurfaced roads, failed roadcuts, and landslides.

- Repeated riparian disturbance is self perpetuating. Walking Bean Creek and driving the associated roads, for example, clearly illustrated to the investigators the role of a healthy riparian zone, in promoting streambank stability. Where there is a discontinuous riparian canopy, there is bank instability. Where bank stabilization has been attempted without re-establishing riparian vegetation, we observed few stable streambanks (see also Singer and Swanson, 1983).

- Restored riparian zones result in improved bank stability whether actively planted or simply left to naturally regenerate. A reach of upper Carbonera Creek in Scotts Valley that was kept clear until the late 1970s for a lumber yard has developed a healthy alder/willow riparian zone, and now provides habitat for resident rainbow trout.

- Within areas subject to timber harvests, actively used haul roads and skids usually contribute the majority of the site's sediment yield, particularly when compared to actual harvest areas. This disparity is due to the regeneration of redwoods and herbaceous understory plants that serve to stabilize slopes when minimally disturbed. Failing, poorly installed or inadequately maintained erosion control and drainage structures, may, however cause locally high erosion rates.

- Even well-managed timber harvests and grading projects contribute sediment, particularly in the first winter season following harvest activities or construction. Additional points observed in the field and discussed with County staff, San Lorenzo Valley Watershed Plan Technical Advisory Committee members, and landowners are listed below:

    ◊ At-grade crossings in residential, open-space or timber harvest areas are chronic sediment sources.

without measures which will anticipate and reduce erosion both at the hor[illegible]site and along the access roads.

- ◊ Timber harvests can result in road networks which may result in ongoing erosion as neighboring or subsequent homeowners modify the road net to provide privacy and as they perform ad hoc repairs of post-logging instabilities.[17]

- ◊ Timber harvest roads are not necessarily constructed to standards required for residential access roads. In particular they may cross steeper or less-stable slopes than allowed in the County grading standards. This may be offset in part by these roads often being narrower.

- Horse and livestock facilities on slopes and encroaching into the riparian zones may locally be notable contributors of sediment. Where riparian vegetation has been lost and use is constant, livestock facilities and stream crossing trails are chronic sources of fine sediment.

- Quarry operations in the Bean Creek and Zayante Creek subwatershed and in Gold Gulch have substantially improved sediment management since the first watershed plan.

- In streams where residents have undertaken individual streambank stabilization efforts, concrete rubble, cinder blocks, asphalt, baserock and other road-related materials may make up 15 percent or more of the streambed surface. It appears that the presence of these types of materials originated from previous uncoordinated streambank protection projects. In sections of lower Branciforte, Carbonera, and Bean Creeks, these introduced materials and sand make up the majority of the bed surface. The addition of these materials may have de-stabilizing geomorphic consequences by forming bars and braids in sandy reaches with less-coherent sandy banks and a disturbed riparian buffer zone.//

(pages 37-40)

Balance then posed the question whether bed conditions had improved or deteriorated since the watershed plan was adopted in 1979.

> "Data for the Zayante and Bean Creek subwatersheds suggest several answers which may in some cases also pertain to other portions of the San Lorenzo Basin. First, bed condition clearly have not improved in the lower portions of these streams, and may well have become more sedimented with sands and fine gravels. These streams, in turn, deliver the habitat impairing sediment to the lower San Lorenzo River" (page 41).

I am not attempting to summarize the 2001 Zayante Area Sediment Source Study or the RWQCB's draft Sediment TMDL for the San Lorenzo River. RWQCB staff is obviously aware of the references and text dedicated to characterizing the San Lorenzo River tributaries contribution to excessive sediment levels and the impaired condition of those tributaries from sediment.

From my own personal observations both during winter storm periods and directly viewing sources of erosion during the dry time of year, I can attest that even watersheds

considered to be in protected status by researchers are a source of accelerated erosion and excessive sediment. Old THP roads on portions of Castle Rock State Park are not actively maintained or decommissioned, frequently don't have even rolling dips or water bars to control runoff. Dirt roads on the backside of Big Basin State Park were observed during winters of 1998 and 1999 to be delivering excessive sediment in runoff either to the roadside of China Grade Road or directly into upper Boulder Creek. Private lands and inholdings in the upper watersheds of both the City of Santa Cruz's Loch Lomond and San Lorenzo valley Water District's surface water supply sources on Ben Lomond Mountain have been observed to be contributing excessive and chronic sediment from poorly or unmaintained dirt roads. I believe the evidence to be overwhelming and conclusive that most tributaries in the San Lorenzo River watershed are impaired by sediment within the definition and meaning of the Clean Water Act.

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Watershed and Planning Analyst

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SAN LORENZO RIVER WATERSHED MANAGEMENT PLAN

PHYSIOGRAPHY-GEOLOGY

AND

EROSION AND SEDIMENT TRANSPORT

TECHNICAL SECTIONS

Prepared by:

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Community Resources Agency
Watershed Management Section

State of California
Resources Agency
Department of Fish and Game
Protected Waterways Program

November, 1979

During higher flows, much of the loose bottom material is set into motion, exposing the underlying bedrock to erosion. Erosion of the bedrock occurs through the process of corrosion, the bouncing and rolling of loose rock material across the bedrock surface.

The many collisions that occur during transport of the larger sediment sizes in high flows leads to a breakdown of material to smaller particle sizes. This breakdown during transport continues until diameters of 1mm or less are reached. A significant amount of breakdown may also occur as the material weathers in place during the interlude between high flows.

At any time or place where the flow decreases or the transporting forces diminish, material falls from suspension, with the larger particle sizes falling out first. Deposition may occur as the discharge decreases after a storm, where the stream gradient lessens, or where velocity lessens behind debris piles or impoundments. Often a section will experience a scouring out of bottom material during high flows, only to be refilled as the flow lessens. Periodic scour of bottom material is important for removing finer particles and making the bottom more suitable for aquatic biota. Deposition of sediment may also occur when there is an influx of sediment in excess of the stream capaicty. Smaller tributaries may often have a very high capacity for sediment transport due to their steepness and roughness. The sediment discharged to the main River may settle out and form a bar at the mouth of the tributary.

The characteristics of sediment transport, bottom material, discharge, flow velocity, channel geometry, and stream gradient, are all interrelated, and tend towards a dynamic equilibrium. In the upstream areas, transport rates are often high, bottom material is coarse, the channel is deep and narrow and the gradient is steep. Downstream the gradient lessens, deposition may occur, the bottom material is finer, and the stream has more tendency to cut laterally. An alteration in any one of the above factors will lead to changes in the other factors to adjust for the initial change. A landslide into the stream will locally alter the gradient, induce deposition upstream, and provide more sediment available for transport downstream. The increased steepness immediately below the slide will induce greater rates of transport.

Sediment Transport In The San Lorenzo Watershed

There have been several efforts in recent years to measure sediment transport in the San Lorenzo Watershed. The US Geological Survey has provided a daily monitoring of sediment loads on Zayante Creek (1970-73), and on the San Lorenzo River at Big Trees (1972 - present). In addition, they conducted a reservoir sedimentation survey of Loch Lomond to determine the extent of sediment production from upper Newell Creek. (Brown, 1973.) The County Office of Watershed Management monitored sediment transport throughout the Watershed during the winter of 1977-78. Additional efforts have been carried out by Macy (1976) in the upper San Lorenzo Watershed; by Griggs (unpublished) on suspended and bedload sediment on Zayante Creek and the San Lorenzo River; and by Hecht on sources of sand in the Zayante Drainage (Kelley, 1979).

The information derived to date is not adequate to fully describe sediment transport characteristics in the Watershed. Sediment production is highly variable, depending on rainfall, watershed disturbance, availability of sediment for transport, and a number of other factors. It generally takes several years of good data to reliably define sediment transport relationships. The existing data is quite useful to at least begin to define those relationships, and to draw some conclusions regarding the high levels of transport and deposition that are occurring.

Overall Transport Rates

The amount of sediment carried in Watershed streams is directly related to the amount of stream flow. Sediment transport is dependent on the supply of eroded material brought to the stream by surface runoff, and on the amount of flow present to carry the available load.

Sediment transport rates can be plotted against stream flows on logarithmic paper to determine a sediment transport rating curve for the stream under prevalent conditions. This has been done for the San Lorenzo River at Big Trees in 1973 (Figure 5). Figures are shown for transport of suspended sediment only as this accounts for more than 90% of the total sediment produced. There is quite a bit of scatter about the central tendency. This can be caused by changes in sediment availavility. Transport rates may be relatively lower if most of the transportable sediment has already been removed. Conversely, if the winter has brought a sudden influx of sediment from the tributaries, resultant transport rates will be higher. Sediment rating curves may shift from one year to the next if erosion rates in the Watershed change.

A set of sediment transport curves have been plotted in Figure 6. It can be seen that Zayante Cteek has a much higher transport rate than Big Trees for a given discharge. In 1973, upper Zayante Creek produced 20% of the total suspended sediment discharge through the Big Trees gage. It can also be seen that the transport curves from both stations have shifted down in 1978, indicating that there may be less sediment available for transport, at least during lower flows.

As indicated by the sediment transport curves, sediment load increases dramatically with discharge. One large storm may transport most of the annual sediment discharge. On Zayante Creek 41% of the 1973 sediment discharge occurred on one day. During the 4620 cfs storm peak on January 14, 1978, the instantaneous rate of sediment transport on Zayante Creek exceeded 1,188,000 tons/day. The importance of these extreme events makes it somewhat difficult to determine long term rates of sediment production. A set of measured transport rates are shown in Table 5. This table includes values of Kn to compare the differences in annual sediment transport potential. This value takes into account both the extremes of streamflow and the overall wetness of the year.

The transport rates shown in the table may be compared with the rates found in other similar areas in the State. Sediment transport for rural basins in Santa Clara County ranged from 400 to 1030 tons per square mile per year (Brown, 1973). (It should be noted that relatively lower rainfall prevails there.) Sediment production from small undisturbed areas in the redwood-Douglas fir forests of northern California and

FIGURE 5
SUSPENDED SEDIMENT DISHCARGE
SAN LORENZO RIVER AT BIG TREES GAGE - 1973 WATER YEAR

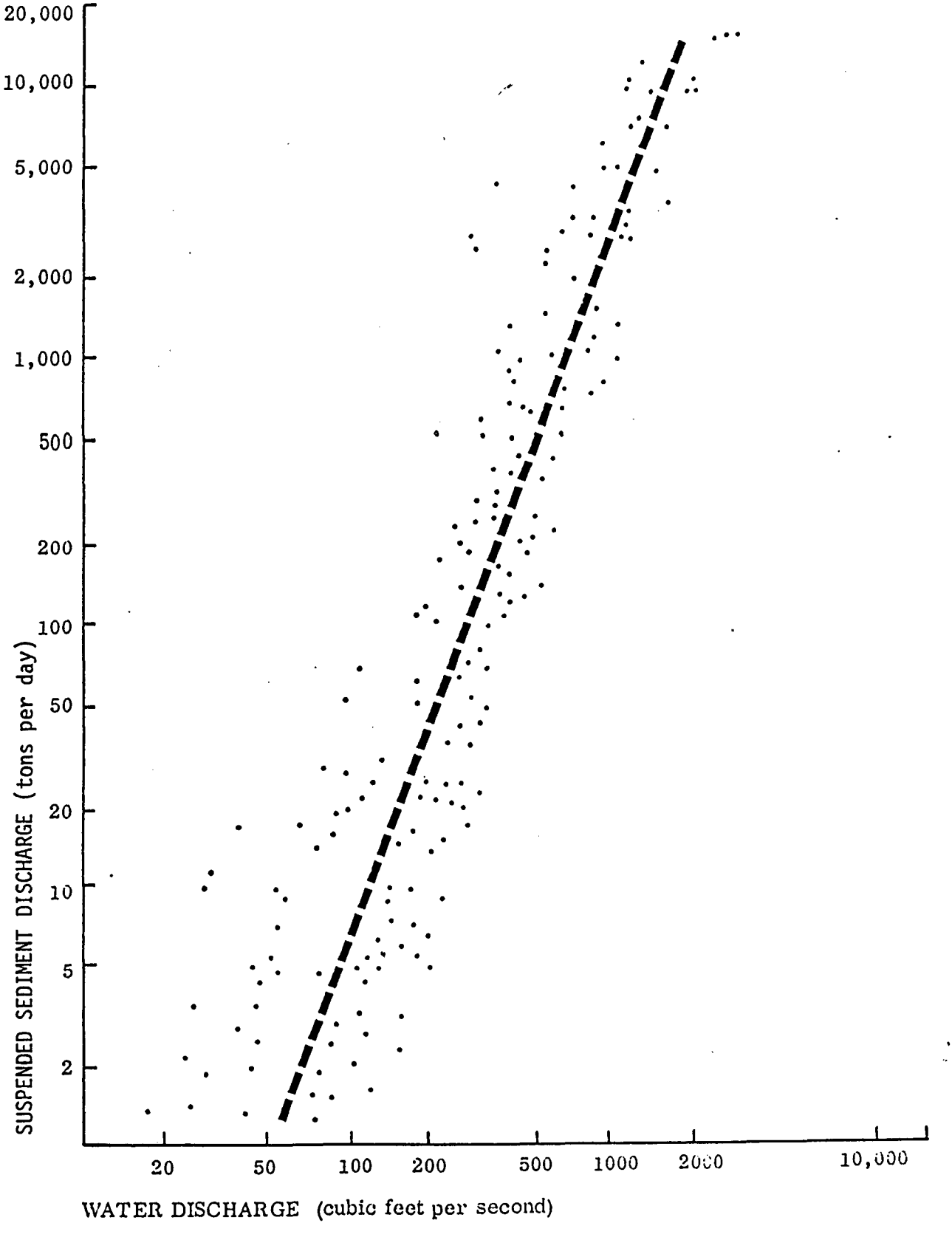

FIGURE 6: SEDIMENT TRANSPORT CURVES FOR ZAYANTE CREEK ABOVE ZAYANTE AND SAN LORENZO RIVER AT BIG TREES

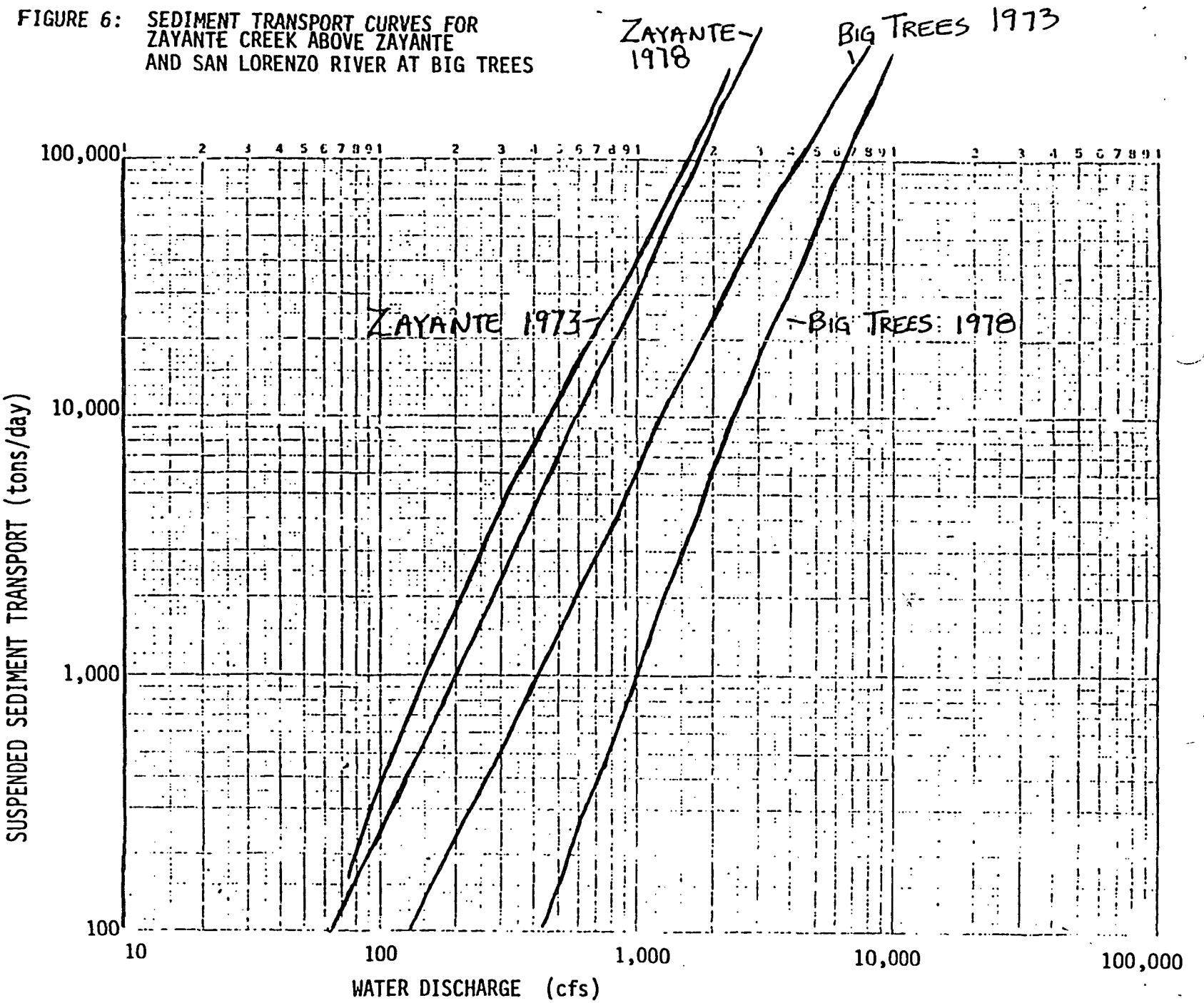

TABLE 5: SUSPENDED SEDIMENT LOAD

Stream	Water Year	Annual Runoff Acrefeet	Kn[d]	Annual Suspended Sediment Production Tons/Square Mile/Year
Newell Creek[a]	1960-1975	-	-	1,000
Zayante Creek[b]	1971	4,480	2.91	567
above Zayante	1972	1,030	.09	58
(Average Kn 1958-1974: 24.51 Median Kn 10.2)	1973	14,380	47.76	7,884
San Lorenzo River[b]	1973	163,600	2,667	4,134
at Big Trees	1974	138,200	806	880
(Average Kn 1937-1974: 1613 Median Kn 628)	1975	77,700	529	605
	1976	14,010	9	5
	1977	9,570	3	5
	1978	147,100	2,293	3,166
San Lorenzo River[c]	1971	2,890	.73	149
above Boulder Creek	1975	4,060	1.49	1,184
(Waterman Switch)				

(a) Brown, 1973

(b) USGS, Water Supply Papers

(c) Macy, 1976

(d) $Kn = \frac{\text{Mean Flow} \times \text{Instantaneous Peak Flow}}{1,000}$

Oregon ranged from 125-250 tons/square mile/year. (Janda, 1972.) These were areas of low natural sediment production. Average annual sediment production in large, disturbed basins in that same area are generally in excess of 2000 tons per square mile. The Eel River averaged 10,080 tons per square mile per year from 1958-1967. This is one of the highest measured rates of sediment production in the world. However, in the 1973 water year, the sediment transport rates for the San Lorenzo River and Zayante Creek both exceeded the transport rate for the Eel River. (The Eel did not experience as wet a winter as the San Lorenzo River.)

It appears that the sediment transport from the Upper San Lorenzo and Newell Creek are not significantly higher than expected rates of natural sediment production. The Watershed would be expected to have a fairly high rate of sediment production due to the steep topography, high rainfall and fairly erodible rock types.

Sediment transport on Zayante Creek seems to greatly exceed the expected rate of natural sediment production. (Brown, 1973.) It appears to have a much higher rate than the adjacent Newell Creek basin which has a very similar geology. This increase in sediment transport has been attributed primarily to road-building and development which has exposed many slopes to the forces of erosion and landsliding. (Brown, 1973).

Overall sediment transport rates on the River at Big Trees also seem to be in excess of natural rates. The figures indicate that prevalent transport rates on the River are now averaging about 2500 tons/square mile/year (Jones-Tillson and Associates, 1979). If the natural transport rate is taken to be about 1000 tons/square mile/year (as indicated by Newell Creek and the Upper Watershed), then existing transport rates on the River are more than double the expected natural rate. Similarly, transport rates on Zayante Creek are probably four times the natural rate.

The discussion up to this point has focused on suspended sediment transport. Measurements taken by the USGS at the Big Trees gage has shown that bedload only contributes a small amount to total load, particularly in the wet years. The proportion of total load transported as bedload amounted to 3.3%, 11% and 3.9% in 1973, 1974, and 1978, respectively. Bedload transport is important in the spring for removal of sediment from the River bottom that has been carried in by the tributaries during the winter months. In 1978, bedload transport at Big Trees in April and May amounted to 2392 tons, 47% of the total load.

The data for suspended load and bedload during the 1972-73 water year may be used to estimate the contribution of sand by the San Lorenzo River above Big Trees. Thirty-six percent of the suspended load was composed of sandsized particles (0.062-2.0mm) while 81% of the bedload was composed of sandsized particles. This led to a total contribution for the 1972-73 water year of 169,765 tons of sand through Big Trees. This sand transport is important for replenishing the beaches. Griggs and Johnson (1976), estimated that the average annual contribution of sand by the whole Watershed was 50,000-70,000 cubic meters. Based on an average density of

TABLE 6

MEASUREMENTS OF SEDIMENT TRANSPORT FROM INDIVIDUAL TRIBUTARIES

STREAMS	Suspended Sediment Concentration (mg/l)* and Percentage of Sand (> .62 mm) Content							
STORM DATE	1/9/78		1/16/78		2/12/78		4/15/78	
	mg/l	%	mg/l	%	mg/l	%	mg/l	%
Peak Flow at Big Trees (cfs)	4060		10,300		2840		889	
San Lorenzo River - Waterman	205	21					510	6
Kings Creek	479	5	4336	34			1968	9
Two Bar Creek	877	24	6793	21				
San Lorenzo River above Boulder Creek	1260	26						
Bear above Deer	3058	40						
Deer Creek	932	30						
Bear Creek at Boulder Creek	3316	25	15300	45	1473	52	1268	26
Boulder above Jamison Creek	194	12						
Boulder at Boulder Creek	310	55	1556	38			281	24
Love Creek	500	52						
Newell Creek	751	87	812	98	799	98		
Fall Creek	377	57						
Zayante above Mountain Charlie	3311	47			3985	39		
Mountain Charlie Creek	1794	31			2678	47		
Zayante Creek at Zayante	4697	27	19378	44	3435	35	479	20
Lompico Creek	964	61	941	24			1464	9
Zayante at Felton	3926	40						
Bean Creek	4355	48			1867	54	455	39
San Lorenzo River at Big Trees	2696	45	7301	28	2561	68	1048	46
Branciforte	3811	54			1905	63	1650	12
Carbonera	3895	48			3871	80	956	50
Boulder Creek above Hare Crk	194	12						
Hare Creek	454	69						
Jamison Creek	43	56						
Peavine Creek	765	95						
Bracken Brae Creek	231	87						
Foreman Creek	43	0						
Boulder Creek at Foreman Crk	310	55						
Clear Creek	82	52						
Alba Creek	510	74						
Marshall Creek	268	62						
Manson Creek	529	49						
Gold Gulch Creek	5017	75						
Shingle Mill Creek	2074	53						

*Measurements were taken at various times during passage of the storm peak, and thus are only useful for general comparison.

1.32 tons/cubic yard (1 cubic meter = 1.308 cubic yards), this would amount to an average of 112,000-120,000 tons per year of sand contributed to the beach. Griggs and Johnson felt that this would amount to 22-30% of the sand contributed to the beaches from all sources, including down-coast drift.

Sand transport is also important as it affects fishey habitat and flooding. Excessive sand transport will lead to deposition and degradation of habitat. Sand is also the main contributor to the infilling of the flood control channel in Santa Cruz. A study of sediment transport and deposition in that area is currently being carried out by Jones-Tillson and Associates. Reference to their reports should be made for a good discussion of the problem.

Sources of Sediment in the Watershed

An attempt has been made to sample the individual tributaries to determine their contribution to overall sediment transport in the Watershed. Findings from these measurements are presented in Table 6.

These measurements identify those tributaries that have the most significant levels of sediment production. The Bear Creek and Kings Creek sub-basins have very high sediment production rates, similar to upper Zayante Creek. These sub-basins are very erodible, and each has a relatively heavy rate of development. Two Bar and Lompico Creeks have moderately high rates of sediment yield. Bean, Carbonera, Branciforte, Gold Gulch, and Shingle Mill Creeks yield moderate contributions of sediment, especially sand. All the other streams (except Fall Creek and others on the west side) show relatively lower rates of sediment production, yet they are still unnaturally high. Fall Creek and other west side tributaries, whose watersheds are fairly undeveloped and which drain areas of low erodibility, have low rates of sediment production.

One year of data has not been enough to pin down long-term sediment contributions from individual streams. However, some rough sediment rating curves have been derived to allow an approximate determination of contribution for some of the major creeks. Peak flows and estimated sediment transport rates are shown for a moderate storm on January 5, 1978.

Table 7

Estimated Sediment Production from Major Streams

Stream	Peak Flow cfs	Sediment Concentration (mg/l)	Discharge tons/day
Bear Creek	580	4470	7,000
Boulder Creek	580	350	550
Upper Zayante	580	7025	11,000
San Lorenzo River at Big Trees	2810	2370	18,000

The measurements of sediment transport have pointed out that transport rates can be quite variable depending on land disturbance in the Watershed. In the past, Upper Zayante Creek has been a major source of sediment. In 1978 Bear Creek also became a major source as indicated by Table 6. In the early part of the year, Kings Creek was relatively low compared with Bear Creek (1/9, 1/16). However, late in the year fresh disturbance from road construction resulted in a major increase in sediment load on King Creek (4/15). The increase relative to Bear Creek represents about a seven-fold increase in sediment production. A similar increase in sediment production was seen on Lompico Creek where extensive construction for placement of water mains caused a five-fold increase in sediment production (4/15).

Work is currently being done by Barry Hecht of H. Esmaili and Associates to define sources of sediment in the Zayante Creek basin. He has been using heavy mineral analyses to identify the sources of sands. Based on this he feels that 70% of the sediment load in Zayante Creek above Bean Creek is derived from the above the site of the Zayante dam (above the USGS gage). About half of this amount is contributed by Bean Creek. These findings and their relationship to sediment scour is discussed further in the report assessing the impacts of the proposed Zayante dam (Kelley, 1979).

Sediment Deposition

The presence of sediment accumulations in the stream bottom throughout the Watershed is further testimony to excessive amounts of sediment produced by Watershed erosion. Stream surveys by the Department of Fish and Game and the Office of Watershed Management indicate that all major streams except for Fall Creek and the San Lorenzo River above Waterman Switch experience excessive sedimentation (see Fishery Habitat Technical Section). Fish and Game documented an increase in the percentage of fine sediment in the main River bottom from 8% in 1966 to 65% in 1972 (Lang, 1972). It is felt that these conditions are indicative of a general overloading of the sediment transport capabilities by excessive erosion in the Watershed.

Need for Additional Studies

Additional work is needed to better define sediment transport rates and particular sources of sediment throughout the Watershed. Overall monitoring of transport is also needed to determine the effects of erosion control strategies to be applied in the future.

County staff will be carrying out detailed field investigations to identify specific erosion problems and to secure control of those problems. More intensive monitoring of sediment transport and stream discharge is planned for the main River and streams which are significant sediment sources such as Zayante Creek, Bear Creek, Kings Creek and Bean Creek. Ongoing periodic monitoring of other streams will also be done. More detailed monitoring of flow and sediment movement is also needed in the flood control channel in Santa Cruz. An attempt will be made to integrate all of these efforts into the ongoing management program for the Watershed.

REFERENCES FOR PHYSIOGRAPHY-GEOLOGY SECTION

Akers, J.P., 1969, Groundwater in the Scotts Valley Area, Santa Cruz County, California, U.S. Geological Survey, Open-file Department, Menlo Park.

Akers, J.P. and Hickey, J.J., March, 1967, Geohydrologic Reconnaissance of the Soquel-Aptos Area, Santa Cruz County, California, U.S. Geological Survey, Open-file Report.

Akers, J.P. and Jackson, Lionel E., Jr., 1976 (Advance Copy) Potential for Developing Groundwater in Western Santa Cruz County, California; with Particular Emphasis on the Santa Margarita Sandstone, U.S. Geological Survey, Menlo Park.

Bailey, Edgar H., ed., 1966, Geology of Northern California, California Division of Mines and Geology, Bulletin 190.

Brabb, E.E., 1961, "Geology of the Santa Cruz Mountains", in John H. Thomas, Flora of the Santa Cruz Mountains, Stanford University Press, 1961.

Brabb, E.E., 1970, Preliminary Geologic Map of the Central Santa Cruz Mountains, California, U.S. Geological Survey, U.S. Department of Housing and Urban Development, San Francisco Bay Region Environment and Resources Planning Study, Basic Data Contribution.

Brabb, Earl B., Pamplyan, Earl H., and Bouillo, Manual G., 1972, Landslide Susceptibility in Van Mateo County, U.S. Geological Survey, HUD Basic Data Contribution 43.

Brown, William M. III, 1973, Erosion Processes, Fluvial Sediment Transport and Reservoir Sedimentation in a Part of the Newell and Zayante Creek Basins, Santa Cruz County, California, U.S. Geological Survey, Open-file Report.

Clark, J.C., 1966, Tertiary Stratigraphy of the Felton-Santa Cruz Area, Santa Cruz County, California: PhD Thesis, Stanford University.

Cooper, Clark and Associates, 1974, Preliminary Map of Landslide Deposits in the Santa Cruz County, California.

Hecht, Barry, et. al., 1973, Waddell Creek, the Environment Around Big Basin Santa Cruz Mountains, California, The Sempervirens Fund and the Environmental Studies Office, University of California at Santa Cruz.

Hecht, Barry, Salination of Shallow Groundwater - Central Bear Creek Drainage, Unpublished Report.

Rogers, Thomas H., February 1974, Environmental Geologic Analysis, Santa Cruz Mountains Study Area, County of Santa Clara, California, California Division of Mines and Geology, Santa Clara Planning Department.

Santa Cruz County Planning Department, 1975, Seismic Safety Element.

Spencer, Steve, 1973, The Ben Lomond Fault, Geology and Potential Impact on Development, University of California at Santa Cruz, unpublished thesis.

ADDITIONAL REFERENCES FOR

EROSION AND SEDIMENT TRANSPORT SECTION

Anderson, H. W., 1975, Relation of Reservoir Sedimentation to Catchment Attributes, Landslide Potential, Geologic Faults and Predicted Density, in: Report of the Committee on Quantification of Erosion and Sedimentation, Watershed Management Workshop for Earth Science Specialists, Region V, U.S. Forest Service, Fresno, California.

Brabb, E.E., compiler, 1970, Preliminary Geologic Map of the Central Santa Cruz Mountains, California, U.S. Geological Survey, Basic Data Contribution, No. 6.

Brown, William M. III, and Lionel E. Jackson Jr., 1973, Erosional and Depositional Provinces and Sediment Transport in the South and Central Part of the San Francisco Bay Region, California, U.S. Geological Survey, Menlo Park, California.

Brown, G.W. and Krygier, J.T., 1971, Clear-cut Logging and Sediment Production in the Oregon Coast Range, Water Resource Research 7(5): 1189-1198.

Cherkauer, D.S., 1976, The Impact of Suburban Development on the Hydrology of Small Watersheds, submitted to Annual Meeting of the American Water Resources Association.

Douglas, I., 1967, Man, Vegetation and the Sediment Yields of Rivers, Nature 215 (2):925-928.

Fredricksen, R.L., 1970, Erosion and Sedimentation Following Road Construction and Timber Harvest on Unstable Soils in Three Small Western Oregon Watersheds, Pacific Northwest Forest Range Exp. Sta. Res. Pap. PNW-104, 15pp, U.S. Department of Agriculture Forestry Service, Portland Oregon.

Griggs, G.B. and Johnson R.E., 1976, Effects of the Santa Cruz Harbor on Coastal Processes on Northern Monterey Bay: Environmental Geology, p299-312

Janda, Richard, 1972, Testimony Conerning Stream Sediment Loads in Northern California and Southern Oregon Presented in Public Hearings Before the California Regional Water Quality Control Board, North Coast Region in Eureka, California, on July 19, 1972.

Jones-Tillson and Associates, Water Resources Engineers, 1979, "San Lorenzo River Reconnaisance Study, checkpoint and Submittal - Preliminary." Prepared for the Army Corps of Engineers

Kelley, D.W. 1979, Zayante Dam Project Fish and Wildlife Investigation Phase 1 Report. Prepared for the City of Santa Cruz.

Lang, Ronald, 1972, Stream Survey of the San Lorenzo River, California Department of Fish and Game.

Macy, Jonathan S., 1976, Sediment Yield of the Upper San Lorenzo Watershed Using Quantative Geomorphic and Sediment Sampling Approaches, Master Thesis, Geology Department, San Jose State University.

Mount, Jeffrey F., 1977, The Erosion Hazard Potential of the San Lorenzo River Watershed, prepared for the Santa Cruz County Office of Watershed Management.

Rantz, S.E. 1971. Rainfall Depth - Duration Frequencies in the San Francisco Bay Region, U.S. Geological Survey.

Santa Cruz County Office of Watershed Management, 1976, Land Use Vegetation Maps of Santa Cruz County.

U.S. Department of Agriculture, Soil Conservation Service, 1977. Soil Survey, Santa Cruz County, Interium Report.

Wolman, M.G., 1967, A Cycle of Sedimentation and Erosion in Urban River Channels, Geografiska Annaler, 49-A, p. 385-395.

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Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

MAR 6 1 · 53 '80

ATTACHMENT 2

Air Resources Board
California Coastal Commission
California Conservation Corps
Colorado River Board
Energy Resources Conservation and Development Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Coastal Conservancy
State Lands Commission
State Reclamation Board
State Water Resources Control Board

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

MAR 0 4 1980

Mr. Kris Schenk, Director
Planning Department
County of Santa Cruz
701 Ocean Street
Santa Cruz, CA 95060

Dear Mr. Schenk:

Thank you for your recent letter indicating that your Board of Supervisors had adopted the San Lorenzo River Watershed Management Plan. Also, I appreciate your comments commending the Department of Fish and Game's Planning Branch. They indicate it has been a pleasure working with your staff in the preparation of this plan.

On behalf of the State, I would like to commend Santa Cruz County for showing great leadership in supporting an entire watershed management program for the protection of the San Lorenzo River's resources. Your County's Watershed Manager's Office was responsible for conducting most of the work involved in this program, and should also be commended for a job well done.

As you know, the Protected Waterways Act doesn't provide specific direction as to how the management plans will be implemented. We believe that most of the actions necessary to accomplish the objectives of the San Lorenzo River Plan must come from local governmental agencies. By way of this letter, I am requesting that the various departments, boards, and commissions within the Resources Agency cooperate and work closely with Santa Cruz County in the implementation of the San Lorenzo River Plan.

MAR 0 4 1980

We also look forward to continued cooperative efforts in protecting the San Lorenzo River's resources, and in implementing the San Lorenzo Plan. We feel this whole program has been a model of cooperative effort between local and State governments in developing a meaningful watershed management plan and earnestly desire full implementation.

Sincerely,

Huey D. Johnson
Secretary for Resources

cc: Department of Fish and Game
California Division of Forestry
Department of Water Resources
State Water Resources Control Board
Central Coast Regional Water Quality Control Board
Department of Parks and Recreation
Cal Boating
Department of Conservation
California Coastal Commission
California Conservation Corps

Excerpts from SWRCB Draft Instream Beneficial Use Protection Program Zayante Creek/lower San Lorenzo River and the upper San Lorenzo River 1982

II. POLICY FOR WATER QUALITY CONTROL

A. Instream Beneficial Uses to be Maintained or Achieved.

The following levels of key instream uses[1/] are goals to be attained and maintained by this action in Zayante Creek and the Lower San Lorenzo River:

Instream Use	Level
Steelhead	7500 returning to spawn
Silver salmon	1375 returning to spawn
Water contact use	Undetermined level. The goal will be to reduce the health risk during May through September by achieving water quality objectives in the Basin Plan.
Recreation and esthetic use	Undetermined level. The goal will be to maintain water quality standards for aesthetic qualities.

B. Water Quality Principles and Guidelines for the Protection of the Instream Uses in A Above

1. Instream beneficial uses are to be maintained or restored to levels which provide maximum environmental and socio-economic benefits to the people of the State, considering present and future needs for the well-being of human society.

2. Actions for managing water resources are to be consistent with the State Water Resources Control Board's Policy with Respect to Maintaining High Quality of Water in California."

3. Instream beneficial use levels should be maintained or achieved in place by water and other resource management practices. Proposals for compensation or enhancement of instream uses other than in place will be considered by the State Water Resources Control Board when acting upon water rights applications and petitions and requests for grants for construction of wastewater treatment plants. Such proposals will be considered by the Central Coast Regional Water Quality Control Board when acting upon waste discharge requirements or NPDES permits.

1/ "Beneficial instream use" includes those uses described in Water Code Sections 13050(f), 1243.5, and 1257 which are achieved by allowing water to remain in a stream system and for which a diversion or some other form of controls is not necessarily required. Beneficial uses may be described in terms of levels (quantities) of a particular resource to be preserved or achieved.

C. Water Quality Objectives for the San Lorenzo River

1. The flow or man-caused sediment loading of the San Lorenzo River and its tributaries shall not be altered in such a manner as to

a) increase the deposition or

b) reduce the discharge of sediment and settleable solids to cause:

1) the percent fines in spawning gravels less than or equal to 6 mm in diameter to exceed 20% by volume.

2) a reduction in the permeability of spawning gravels which results in reduction of the dissolved oxygen concentration below 7.0 ppm at a point 30 cm. below the gravel surface.

3) any increase in the percent fine material less than or equal to 6 mm in diameter in the bedload.

4) a reduction in aquatic insect production or a reduction in the species diversity of aquatic insect populations

5) a reduction in the ability of the river to support the average annual production of approximately 10,000 spawning salmonids

2. PROHIBITION:

The discharge or threatened discharge, attributable to new development of solid or liquid waste, including soil, silt, sand, clay, rock, metal, plastic, or other organic, mineral or earthen materials, to stream environment zones in the San Lorenzo River and its tributaries is prohibited.

PROVIDED: The above prohibition shall not apply to any structure or activity the Regional Board, or a management agency designated by the State Board to implement the Central Coast Basin Water Quality Control Plan, approves as reasonably necessary:

. to control existing sources of erosion or water pollution
. for health, safety, or public participation

As Used in this Prohibition:
"New Development" means the construction of any structure, including any commercial or residential building, road, driveway, or other impervious surface, or any other construction activity resulting in significant soil disturbance, which had not received

IV IMPLEMENTATION PLAN

The Central Coast Regional Water Quality Control Board shall:

1. Amend the Water Quality Control Plan for the Central Coast Basin (Basin Plan) to:
   a) include the objections in section II of this document.

   b) require that the following plans be formulated and submitted to the Regional Board by May 30, 1983.

      (i) an erosion control plan[1/] by the California Department of Transportation (CalTrans) for correction and maintenance of erosion problems on State Highway 9.

      (ii) an erosion control plan[1/] by the County of Santa Cruz for correction and maintenance of erosion problems on all roads maintained by the County in the San Lorenzo River watershed.

      (iii) an erosion control plan by the County of Santa Cruz for correction and and maintenance of erosion problems on all private roads exceeding 100 feet in length.

      (iv) a plan by the County of Santa Cruz for controlling erosion and monitoring reductions in erosion products on all major construction projects completed within the past three years.

      (v) a plan developed by the County of Santa Cruz for pre-sale inspection of all existing septic tanks in the San Lorenzo Valley Inspection District.

      (vi) a plan developed by the County of Santa Cruz for amending the ordinances establishing the San Lorenzo Valley Inspection District to include as a minimum all individual disposal systems within the zone of prohibition defined by the Regional Board.

      (vii) a plan developed by the County of Santa Cruz for enforcement of county ordinances relating to the permitting of new septic tanks and the maintenance of existing septic tanks.

   c) adopt an action plan[2/] for waiving or requiring waste discharge requirements, and other orders to control erosion from sources described in paragraphs b.(i) through (vii) above by June 30, 1983.

---

[1]An erosion control plan would include but not be limited to:

- a statement of objectives
- a plan to inventory erosion problems; categorize them according to volume of soil lost per year, distance to a streambed, and priority of action.
- a schedule for all activities and an estimate of sediment reduction by year.
- a monitoring program to support the estimates of sediment reduction.
- engineering plans for any new construction or replacement of existing structures.

d) require the County of Santa Cruz to prepare a plan for improving the control of erosion from all newly permitted grading and construction projects in the San Lorenzo Basin by June 30, 1983.

This plan shall distinguish the controls required in Stream Environment Zones from those required in other areas.

2. Submit a Water Quality Control Action Plan for the San Lorenzo River Basin to the State Board by June 30, 1983, which includes:

(a) a listing of existing erosion problems within the primary responsibility of Caltrans, County of Santa Cruz or other jurisdictions.

(b) an explanation of the method for determining priority in the above list. High priority would be given to recent major construction projects, i.e., soil disturbance within the past two years, and to projects on highly erodible soils within a stream disturbance zone.

(c) an agreement with each of the agencies listed in (a) above for correction of the highest priority problems by a specific date. The agreement should provide for assistance by the Regional Board in seeking funding, and recognition of the actions available to the Regional Board if the agency does not correct the erosion problems by the agreed upon date, or in a satisfactory manner.

(d) staging of a program for correcting the lower priority programs.

(e) a program for monitoring the performance and achievements of the agencies responsible for erosion control, improving the measurements and estimates of erosion products from problem areas, improving the measurements and estimates of sediment load in various streams or stream sections as a means of evaluating erosion control achievements.

(f) a program of monitoring the performance and achievement of the agencies responsible for controlling pollution from individual and community sewage disposal systems in that portion of the County of Santa Cruz within the San Lorenzo River Basin.

2/ An action plan would include but not be limited to:

- a statement of objectives
- identification of specific activities to be undertaken
- specific responsibilities of each participating agency, including resources or other forms of commitment.
- schedule for all important stages of each major activity or project
- procedure for monitoring results and modifying plan if found necessary.

TABLE D-2

Anticipated Long-term Sediment Yields From the Zayante Creek Watershed by Sub-Basin

Sub-Basin	Drainage Area (mi^2)	Sediment Yields Unit (tons/mi^2)	Sediment Yields Total (tons)	Estimated Percent Bedload	Bedload Sediment Yields Unit (tons/mi^2)	Bedload Sediment Yields Total (tons)
Zayante Cr. above Mt. Charlie Gulch	6.38	3000	19100	4	120	765
Mt. Charlie Gulch	2.80	3000	8380	4	120	335
Other above damsite	0.28	2250	630	4	90	25
"Cobble Creek"	0.36	2100	760	4.5	95	35
Other Mid-Zayante	1.26	1600	2020	5	80	100
Lompico above Mill Cr.	1.27	2800	3550	4	112	140
Mill Cr.	0.21	2250	470	5	112	25
Lower Lompico	1.26	1600	2020	5	80	100
Quail Hollow & Zayante School	0.84	1100	920	12	130	110
Other Zayante above Bean	1.87	1200	2240	8	96	180[b]
Upper Bean Creek	2.58	3000	7740	4	120	310
Lockhart & Ruins	2.60	1100	2850	12	130	340
Other Bean Creek	4.51	1200	5410	10	120	540
Zayante Cr. below Bean Cr.	0.08	800	60	7.5	60	5
Total			56650			2965[b]

[a] sediment yields are expressed on an average annual basis
[b] several hundred acres within existing quarries are non-contributing; yields should be reduced by about 40 tons per year

Source (12)

TABLE D-4

PROPOSED REDUCTIONS IN

WATERSHED EROSION

	Percent of Disturbance Erosion	Percent Contributed to Total Sediment in Stream	Percent Reduction in Sediment of Erosion Reduced by One-Half
Unimproved Roads	35%	17.5%	8.75%
Paved Roads	15%	7.5%	3.75%
New, and Recent Construction	25%	12.5%	6.25%
Logging	10%	5%	not included
Major Problems	10%	5%	not included
Other	5%	2.5%	not included
		Total	18.75%

Based on Butler (4)

TABLE D-7

INDUCED EROSION IN PRINCIPAL AREAS
OF STEELHEAD SPAWNING HABITAT

Stream	Induced Erosion Tons/Acre/Yr.[1]	Total Sediment Yield From Induced Erosion (Tons/Yr.[1]	Spawning Habitat Contribution[2]	Increase in Housing Units 1970-1976[3]
Lower Newell	3.4	5,300	2.2%	90%
Bear Cr.	2.7	35,400	7.	33.5%
Zayante Cr.	2.3	31,700	18.	34.7%
Kings Cr.	2.3	14,800	13.	12.9%
Love Cr.	2.2	4,200	2.7	Not Available
Bean Cr.	2.1	17,300	20.	10%
Boulder Cr.	2.0	17,600	8.	32.6%
Total		126,300 Tons (78.6% of the total estimated induced erosion)	70.9%	19.0%[4]

1/ From (4) using 1 cubic yard = 1.32 tons (4)

2/ From (18)

3/ From (2)

4/ Average for watershed excluding Branciforte and Carbonera Creeks and the City of Santa Cruz (2).

Table 10. Principal Resource Problems Affecting Potential Water Sources
San Lorenzo Valley, Santa Cruz County

Stream	Estimated Housing Units		Main Existing Resource Problems	Main Resource Uncertainties
	Existing[a]	Projected[b]		
Upper San Lorenzo River at Waterman Switch	50(E)	60(E)	Minor, other than heavy bed sedimentation downstream to Boulder Creek.	Sandy soils and steep slopes could lead to severe sedimentation with expanded hillside agriculture or timber harvests (Brown, 1973; Macy, 1975).
Kings Creek below Logan Creek	80(E)	60(E)	Chronically one of the most severely sedimented beds in county, attributed usually to land development and road construction both above and below Logan Creek.	Most of the watershed is in Castle Rock State Park and other public holdings, generally an advantage for water development. Remaining areas in private ownership are in mainly steep sandy soils, with high potential for erosion if cultivated or timbered.
Bear Creek at mouth	750	500	See above for Kings Creek; both basins have among the most severe erosion problems in area (San Lorenzo Watershed Plan). Among highest ultimate residential densities in region (about 100 per square mile).	See above for upper San Lorenzo River. About 5 percent of basin underlain by very sandy soil.
Boulder Creek at mouth	975	225	Approximately two-thirds of existing units are clustered on minimally-erodible alluvial soils adjacent to major streams. Ongoing sediment delivery from very sandy soils in Bracken Brae area.	About 10 percent of basin underlain by very sandy soil, including Gallery Heights. Significant areas of forested areas with severe to extreme erosion hazard (e.g., HEA, 1978) High susceptibility to post-fire sedimentation.
Fall Creek above mouth	125(E)	50(E)	Nearly entire basin is in Fall Creek State Park, a designated wilderness area; no storage facilities will be feasible or allowed.	Very few existing or potential resource problems and uncertainties.
Zayante Creek[c]				
above dam site	200	200	High erosion rates and chronic bed sedimentation. Large number of present and potentially-buildable sites on steep slopes. Road construction, land development, and timber harvests (see San Lorenzo Watershed Plan, Hecht and Erkeboll, 1981; and State Water Resources Control Board staff, 1982)	Most forested areas have severe to extreme erosion hazard if heavily harvested. About 5 percent of upper and middle basins and 35 percent of lower basin underlain by very sandy soils.
above Lompico Creek	500	475		
above Bean Creek	1400	1150		
Bean Creek above mouth[c]	1050	600	Erosion and sedimentation from roads, land development, bank erosion, Mt. Hermon Slide, quarries and agriculture. Diminished baseflow from recharge loss and future groundwater pumping and changes in wastewater disposal. See Soil Conservation Service (1980).	Potential for toxic substances inflow from highways and industrial areas. Approximately 20 percent of basin underlain by very sandy soils, intolerant of cultivation and certain other uses.
San Lorenzo River at Big Trees	10,700	2900	All of the above.	All of the above.

[a] Developed from traffic zone projections compiled by County staff for 1983 based on census-tract data. Correspondence between traffic zones and watersheds estimated to the nearest 20% of traffic zone population.

[b] Projections for traffic zones by County Planning Department staff, distributed by HEA per current population pattern within each zone.

[c] Populations estimated from unpublished analyses by County staff (see Hecht and Erkeboll, 1981), Task E3 update of July 25, 1984, plus per footnotes a, b.

SAN LORENZO VALLEY WATER DISTRICT
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September 10, 2001

Angela G. Carpenter
Central Coast Regional Water Quality Control Board
81 Higuera Street, Suite 200
San Luis Obispo CA 93401

Subject: RWQCB Letter - July 27, 2001 Concerning Proposed Changes to 303 (d) Listed Water Bodies

Dear Ms. Carpenter:

The San Lorenzo Valley Water District Board of Directors reviewed your letter of July 27, 2001 at our regular Board meeting of August 16, 2001. The Board of Directors voted unanimously to direct a letter be sent to the RWQCB expressing our concern about two (2) issues involving the proposed 303 (d) List of Impaired Water Bodies. The current listing for the San Lorenzo River for sediment/siltation listed only the mainstem i.e. 25 miles. While our staff noted that your letter states that water quality based controls called TMDLs "will evaluate controls for waters upstream of the 303 (d) listed water as well as the 303 (d) listed waters." We are concerned that tributaries of the mainstream San Lorenzo River historically have been impaired and continue to contribute to the overall loss of beneficial uses throughout the watershed by excessive levels of human induced erosion and sedimentation. Our staff informs us that the current in house draft TMDL for sediment being prepared by the RWQCB staff addresses the entire watershed in the sections dealing with estimates of sediment production by subwatersheds; however, implementation involves monitoring impairment only on the mainstem. The ambiguity in the current 303 (d) listing has already caused RPFs preparing several proposed timber harvest plans on tributaries to express doubt about the necessity to follow the Forest Practice Regulations for impaired water bodies. Our Board recommends the RWQCB and staff consider clarifying language or standards in the current 303 (d) listing of the San Lorenzo River for sediment. Our preference would be to include the wording San Lorenzo River and Tributaries in the listing for sediment. Alternatively, the miles of listed water bodies could be amended to include the approximate miles of major tributaries impaired by

sediment such as the associated 303 (d) listing of pathogens for the San Lorenzo states 60 miles impaired.

Our staff indicated RWQCB staff believes the authority already exists to enforce any provision of the TMDL once adopted and approved, upstream of the mainstem on tributaries for listed water bodies. It would be helpful for either RWQCB staff or legal counsel to provide a section in the staff report or a separate memo that lays out in some detail the specific language in the Clean Water Act, federal regulations or in state law or regulations the authority and ability of the RWQCB to enforce TMDLs upstream of listed water bodies. By providing a specific and detailed discussion this could help alleviate any ambiguity and uncertainty concerning enforcement and regulation.

It has been 22 years since the County adopted the Watershed Management Plan for the San Lorenzo River and associated County Ordinances concerning erosion and sedimentation. Balance Hydrology's Seminal 1998 Report, An Assessment of Streambed Conditions and Erosion Control Efforts in the San Lorenzo River Watershed, Santa Cruz County, California noted sadly in response to the question, "Have instream habitat conditions and related beneficial uses improved, worsened or remained the same since the development of the 1979 plan?" "Stream conditions have not substantially improved since the 1979 Water Plan despite the original plan's generally well founded recommendation." (page 2)

We find ourselves in 2001 with both major anadramous species utilizing the San Lorenzo River for reproduction and rearing now listed as threatened species under the Federal Endangered Species Act and Coho Salmon state listed as endangered. Coho likely are extirpated from the San Lorenzo Watershed. Fishery Biologist D.W. Alley and Associates have not found one Coho at 33 sampling locations on the mainstream and major tributaries in seven (7) years of research.

Excessive levels of sediment are clearly and unequivocally the reason for this decline in the San Lorenzo River Watershed. D.W. Alley's annual reports for the past seven (7) years have documented the continuing severe impact of excessive sediment in causing loss of habitat in both the mainstem and major tributaries. Both early research in the 70's as well as more recent work in the 90's estimate sediment loads 2 to 4 times natural background rates. Every report or study concerning the sediment problem in the watershed discusses the major role of the tributaries in generating the levels of sediment choking the mainstem and the impairment of the tributaries from these excessive levels of sediment throughout the watershed. While it maybe impractical and costly to investigate each tributary in the TMDL, clearly D.W. Alley's research shows that each year some tributaries

become major sources of impairing sediment. This occurs in the tributaries and downstream due to a combination of upland disturbance, fluctuating patterns of winter storm intensities and stream geomorphology. Some tributaries continue to generate unnatural levels of sediment year after year due to chronic sources that have never been successfully addressed. Bean Creek is a prime example where County Public Works spent substantial capital restoring Bean Creek Road following the 1989 earthquake but never addressed comprehensively slope stability problems between the Road and Bean Creek. Exposed slope failures in the Santa Margarita Sandstone on vertical faces below the road continue to generate chronic excessive levels of eroded sand directly into Bean Creek. Just downstream an extensive landslide below the Hanson Quarry continues to creep toward the Creek where the toe forms the streambank. Wash water stored at the Quarry likely contributes subsurface flow that accelerates slope movement. D.W. Alley evaluated the entire length of Bean Creek in 1999 for this agency mapping streambank failures as a collaborative effort for inclusion in the County's Zayante Area Source Study by Swanson Hydrology and Geomorphology, 2001. As you know this County report is the main source of the RWQCB's draft sediment TMDL for the San Lorenzo River.

The second issue of concern to our Board in the draft RWQCB 303 (d) staff report concerns the proposed delisting of the San Lorenzo River estuary at the mouth of the river for sediment. Just as the RWQCB staff is now requiring substantial documentation to list water bodies as impaired, we feel the same standard should apply to delisting. While RWQCB staff cite a 1989 report (Phillip Williams and Associates, et. al 1989) RWQCB staff conclude "problems with the lagoon are associated with the breaching of the sand bar that becomes established between the lagoon and Monterey Bay, and are not due to the delivery of sediment from upstream sources".

While our staff agreed that most of the impairment of water quality in the estuary related to breaching the sand bar allowing salt water to enter an create stratified conditions resulting in excessive temperature and diminished DO at depths as well as poor water quality from storm drains and untreated sewage, a brief exploration with several experts found support for continued listing for sediment. (Mitchell Swanson, Swanson Hydrology and Geomorphology, Gary Kittleson formerly with Swanson and Balance Hydrologics, Don Alley, D.W. Alley and Associates Fishery Biologist, personal communication).

The predominate opinion is that although the City of Santa Cruz no longer disturbes the channel upstream with heavy equipment, which was a major source of bedload moving downstream, periodic storm events still deposit sediment in the

estuary causing impairment of all the beneficial uses associated with aquatic habitat. Rather than delist, at this time it is this Board's opinion supported by our staff that monitoring is needed to determine whether sediment is indeed creating impaired condition. Since both the City of Santa Cruz and this agency support the preparation of the San Lorenzo River annual population survey for Coho and Steelhead; with the City's concurrence the consultant could add a station at the lagoon and evaluate the condition of the habitat and impairment by sediment as part of our annual report. This would provide some documentation to either delist the estuary or continue to list it as impaired by sediment. This would also provide information which could help the City as it moves forward with the adoption and implementation of the lower San Lorenzo and Lagoon Management Plan. Therefore, we request RWQCB staff consider changing your recommendation in the 303 (d) list report retaining the San Lorenzo River estuary as impaired by sediment at this time and allow the observation, monitoring and evaluation to occur over the next few years as implementation of the City's Management Plan moves forward.

In summary, our Board believes it is necessary to provide sufficient written documentation by RWQCB staff to clearly demonstrate legal authority of the state to regulate upstream activities on tributaries in the San Lorenzo River Watershed under the sediment TMDL. Preferably, clarification could be provided by simply amending the San Lorenzo River designation on the 303 (d) list by adding "and tributaries" and/or expanding the miles of water body defined as impaired to include the added miles of major tributaries in the watershed. Secondly, we believe there is currently insufficient documentation or monitoring to support delisting the San Lorenzo River Estuary for sediment. We thank the RWQCB staff for your extending us the courtesy of allowing our comments beyond the August 31, 2001 deadline and the numerous conversations concerning these issues with our staff over the past few weeks.

Sincerely,

James Nelson
President Board of Directors

JAM/AH:kas

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DEPARTMENT OF FISH AND GAME
MARINE REGION
20 LOWER RAGSDALE DRIVE, SUITE 100
MONTEREY, CA 93940
(831) 649-2870

Memorandum

LISA/Angela

Date: September 11, 2001

To: Mr. Roger Briggs, Executive Officer
California Regional Water Quality Control Board
Central Coast Region
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5411

From: **California Department of Fish and Game**

Subject: Changes to 303(d) List of Impaired Water Bodies

The Department of Fish and Game has reviewed the staff report regarding proposed changes to the 303(d) list of impaired water bodies for the Central Coast Regional Water Quality Control Board (RWQCB). The State is mandated to identify a list of impaired water bodies requiring water quality based controls, or Total Maximum Daily Loads (TMDLs), under Section 303(d) of the federal Clean Water Act (CWA). The TMDL will address waters upstream of the listed water body as well as the listed water body itself. After receiving public input, the RWQCB will provide recommended changes to the State Water Resources Control Board (SWRCB) for their review. Once the SWRCB review process is completed, they will finalize the 303(d) list and transmit the list to the Environmental Protection Agency (EPA) for their approval.

Under the authority of Section 303(d) of the CWA, EPA expects states to develop a TMDL for waters on the 303(d) list where technology based effluent limits or other legally required pollution control mechanisms are not sufficient or stringent enough to implement the water quality standards applicable to such waters. Updates to the list must be performed according to Section 303(d) of the CWA. The proposed changes include additions to water bodies and pollutants; removal of water bodies and pollutants (if standards are attained); and changes to the description of water bodies currently listed. The staff report indicated that no specific minimum data requirements or a specific frequency of exceedances are required for making a finding that water quality objectives are not attained. It further states that the rigor of evidence used to recommend that a water body be listed is a judgment decision of the RWQCB and the staff and, therefore, the judgment of staff is a sufficient basis for listing.

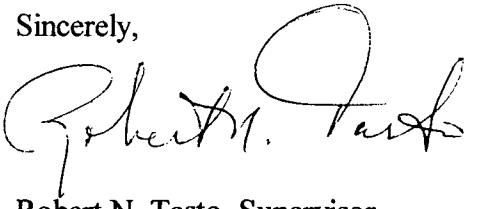
RWQCB staff recommend that Los Osos Creek be delisted for priority organics based on analysis of two sampling efforts. Fish tissue samples from Los Osos Creek, analyzed in 1992, found DDE and DDD at levels exceeding the standard in the California Ocean Plan. Since no criteria for tissue is available for freshwater, staff used the Ocean Plan criteria as a default level.

The staff report supporting the delisting indicates that DDT, DDE, and DDD are still present in the sediments of Los Osos Creek. EPA studies show that exposure pathways of aquatic organisms include ingestion of soil/sediment, ingestion of prey, and dermal contact from soil/sediment (EPA 1993)[1]. Studies further indicate that humans absorb DDT directly from the soil via diffusion (EPA 1992)[2] and indicate that animal skin is thinner than human skin. It is apparent that aquatic organisms have the potential to absorb DDT from dermal contact at higher rates than humans. Sandpipers have soil/sediment ingestion rates of up to 30 percent, raccoons up to approximately 10 percent, and box turtles up to approximately 5 percent (EPA 1993)[1]. Therefore, the Department recommends that Los Osos Creek be retained on the 303(d) list for priority organics (specifically DDT and its breakdown components) since sampling documents that DDT is being transferred from the sediments into aquatic organisms.

National Oceanic Atmospheric Administration (NOAA) sediment guidelines indicate that a Threshold Effects Level (TEL) of 6.98 parts per billion (ppb) shows documented toxic effects to freshwater aquatic organisms (3.98 ppb for marine sediments). The total DDT_{Total} levels recorded in the sampling effort was 8.6 ppb wet weight (RWQCB staff report). The staff report assumed a moisture content of either 8.0 or 20.0 percent. Sediments can have a moisture content up to 60.0 percent (Stephenson pers. comm) and some freshwater sediments have been reported to have up to 22.0 percent moisture. Correction to dry weight, for comparison to the NOAA guidelines, yield a dry weight of 9.3 ppb (assuming 8% moisture) or 10.75 ppb (assuming 20% moisture). Both of these levels exceed the criteria where toxic effects have been documented. The TEL is calculated as the geometric mean of the 15th percentile concentration of the toxic effects data set and the median of the no-effect data set; and, as such, represent the concentrations below which adverse effects are expected to occur only rarely. Since recent data show that DDT concentration exceeds levels where toxic effects are demonstrated, the Department recommends that Los Osos Creek be retained on the 303(d) list. In addition, the Ocean Plan does not have a tissue criteria so that statement should be deleted from the staff report.

As always, Department personnel are available to discuss our concerns, comments, and recommendations in greater detail. To arrange for discussion, please contact Ms. Deborah Johnston, Environmental Specialist, California Department of Fish and Game, 20 Lower Ragsdale Drive, Suite 100, Monterey, CA 93940, telephone (831) 649-7141.

Sincerely,



Robert N. Tasto, Supervisor
Project Review and Water Quality Program
Marine Region

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[1]Wildlife Exposure Factors Handbook. 1993. EPA/600/R-93/187

[2]Dermal Exposure Assessments. 1992. EPA/600/8-91/011B

cc: Ms. Deborah Johnston
Department of Fish and Game
Monterey, California

Mr. William Paznokas
Department of Fish and Game
San Diego, California

Mr. Mike Rugg
Department of Fish and Game
Yountville, California

HEAL THE OCEAN

In association with Ocean Futures

September 13, 2001

Angela G. Carpenter, Water Resources Control Engineer
Regional Water Quality Control Board
Central Coast Region
81 Higuera Street, Suite 200
San Luis Obispo, CA. 93401-5411

Re: Immediate Action on 303(d) List of Impaired Water Bodies; South Coast Region

Dear Ms. Carpenter:

Heal the Ocean is a 2,000-member citizens action group in Santa Barbara whose focus is the bacterial pollution along the Santa Barbara County coastline. We have spearheaded the use of DNA testing, as well as virus testing, along beaches, in creeks and lagoons, as well as in the final settling ponds of sewage treatment plants discharging into the ocean.

The results of our tests are alarming. They reveal the presence of human bacteria and viruses – including Hepatitis A and enteric (polio-type) viruses in ocean swimming water AND in creeks running from the mountains to the sea – in both populated and less-populated areas of Santa Barbara.County. Many of these creeks and beach areas have been included on the 303(d) list. These include:Arroyo Burro Beach, Goleta Slough, Mission Creek and Point Rincon.

Heal the Ocean has also picked up human viruses in the ocean off of Carpinteria Marsh, and we have conducted tests in the Arroyo Quemada Beach area that show enormous fecal bacteria counts.

This letter is an urgent request from Heal the Ocean that your staff recommend to the Regional Board during its October 26 hearing that the Regional Board NOT delay work on TMDLs in the South Coast Watershed/Region 3. We ask that work begin immediately on as many of the above-named water bodies as possible.

I am enclosing the results of our most recent virus testing (August 4, 2001), as well as previous test results that corroborate the statements in this letter. All of the tests were conducted in a USC laboratory, except for Arroyo Quemada, which was done by an independent laboratory.

Thank you for giving me this opportunity to comment.

Sincerely,

Hillary Hauser, Executive Director
HEAL THE OCEAN

CC: Ken Greenberg, EPA

POST OFFICE BOX 90106, SANTA BARBARA, CA. 93190. PHONE (805) 965-7570; FAX (805)962-0651
E-MAIL: info@healtheocean.org • WWW.HEALTHEOCEAN.ORG

USC
UNIVERSITY
OF SOUTHERN
CALIFORNIA

Heal the Ocean: Detection of Human Enteric Viruses and/or Hepatitis A Viruses in Beach Water Samples.

Summer 2001

Alison A. Davis, University of Southern California

College of Letters, Arts and Sciences

Biological Sciences

Reverse transcriptase polymerase chain reaction (RT-PCR) was used for the detection of Hepatitis A viruses and enteroviruses in 20L samples of water collected around the Santa Barbara area. This method is much faster than traditional cell culture methods, which are not sensitive enough to be used for the detection of many types of viruses. This method can be used to detect members of the human enteric virus family, enteroviruses, which includes Coxsackievirus, Echovirus and Poliovirus. A total of 66 serotypes belong to the enterovirus family, the primers used in this study are capable of detecting 25 of those. For detection of enteroviruses by RT-PCR, large volumes of seawater (20L) were retrieved from the sampling sites using carboys. The samples were transported immediately to the laboratory at the University of Southern California. Filtration of the samples was started as soon as they arrived. Samples were dispensed into a 40-liter stainless steel pressure vessel and pressure filtered through a stainless steel filtration unit. The unit housed a glass fiber filter (Whatman, nominal pore size 1.2 μm). After filtration, the filters were stored at –80 C waiting further processing.

Reverse Transcriptase Polymerase Chain Reaction (RT-PCR)

Enteroviruses are members of the picornaviridae, a family of single stranded RNA viruses. Detection of human enteroviruses by RT-PCR was performed using modified pan-enterovirus "universal" primers. This primer set can amplify at least 25 enteroviral types, and the relatively short length of the PCR amplicon ensures efficient amplification. Perkin-Elmer's RNA PCR Core kits were used for both sets of RT-PCR. (Enterovirus and Hepatitis A virus.) Visualization of amplified DNA was by staining a 2% agarose gel with ethidium bromide and illumination with UV light.

Negative and positive controls were performed for each RT-PCR run. For the negative controls, 2 μl of sterile water was added to the PCR reactions rather than viral RNA. The positive controls were samples spiked with 1 μl of Hepatitis A virus (obtained from Green Monkey cells in culture) or 1 μl of poliovirus type LsC at 10^5 PFU/100 μl.

Hepatitis A and poliovirus were serially diluted down to 10^1 PFU/microliter to test the sensitivity of the RT-PCR assay. The dilution series was run concurrently with the other samples

All positive and negative test results were reconfirmed by repeating the RT-PCRs.

University of
Southern California
Allan Hancock
Foundation Building 107
Los Angeles,
California 90089-0371
Tel: 213 740 2777
Fax: 213 740 8123

RNA Extractions From A/E Glass Fiber Filters

A portion of the frozen glass fiber filter was extracted using a Qiagen RNeasy Midi Kit. The total RNA collected was tested for the presence of viral RNA using the Perkin-Elmer RNA PCR Core kit.

Results :

A total of 11 environmental samples were analyzed for the presence of enterovirus and Hepatitis A virus genomes by RT-PCR.

Arroyo Burro Beach

The sample collected at Arroyo Burro on 8-4-01 was positive for Hepatitis A virus but negative for enterovirus.

Arroyo Burro Creek

The sample collected on 8-4-01 tested negative for both enterovirus and Hepatitis A virus.

Butterfly Beach

The sample collected at Butterfly Beach on 8-4-01 tested positive for the presence of Hepatitis A virus. The sample tested negative for enterovirus .

Carpinteria Beach

The sample collected on 8-4-01 was negative for both Hepatitis A virus and enterovirus.

El Estero

The sample collected on 8-4-01 from the El Estero site tested positive for enteric viruses but negative for Hepatitis A virus.

Goleta Beach

The sample collected at Goleta Beach on 8-4-01 was positive for the presence of enterovirus and negative for Hepatitis A virus.

Goleta Sanitary

The sample collected on 8-4-01 tested positive for the presence of enteroviruses.The sample tested negative for the presence of Hep. A virus.

Goleta Slough

The sample collected on 8-4-01 tested negative for both enterovirus and Hepatitis A virus.

Hope Ranch Beach

The sample collected at Hope Ranch Beach on 8-4-01 was negative for both enterovirus and Hepatitis A virus.

Leadbetter Beach (City College)

The sample collected at Leadbetter Beach on 8-4-01 was positive for both Hepatitis A and enterovirus.

Summerland Beach

The sample collected on 8-4-01 was positive for Hepatitis A virus. There was a moderately strong band on the gel from the RT-PCR. The sample tested negative for the presence of enterovirus.

Summary

Arroyo Burro Beach	Enterovirus (-)	Hepatitis A virus (+)
Arroyo Burro Creek	Enterovirus (-)	Hepatitis A virus (-)
Butterfly Beach	Enterovirus (-)	Hepatitis A virus (+)
Carpinteria Beach	Enterovirus (-)	Hepatitis A virus (-)
El Estero Plant	Enterovirus (+)	Hepatitis A virus (-)
Goleta Beach	Enterovirus (+)	Hepatitis A virus (-)
Goleta Sanitary	Enterovirus (+)	Hepatitis A virus (-)
Goleta Slough	Enterovirus (-)	Hepatitis A virus (-)
Hope Ranch Beach	Enterovirus (-)	Hepatitis A virus (-)
Leadbetter Beach	Enterovirus (+)	Hepatitis A virus (+)
Summerland Beach	Enterovirus (-)	Hepatitis A virus (+)

Of the 4 samples that tested positive for Hepatitis A virus, Butterfly Beach and Summerland Beach had the strongest bands on the agarose gel. This would indicate slightly higher levels of Hepatitis A virus in those samples.

...Viruses, continued from page 1

Goleta Beach, Leadbetter Beach and Summerland Beach. Except for El Estero, all sites were negative for both enteric and Hepatitis A viruses. There had been a strong rain two weeks before test day, and Heal the Ocean had hoped to test before the rains came. We have been working with USC researchers on their theory that there is a "Hepatitis A season" during the spring and summer months – when the creeks are NOT running.

In a way, our November results support the USC theory, because the creeks were running and the beach water we collected contained no viruses.

The fact that the Hepatitis A and enteric *viruses are showing up in the ocean when the creeks are not running* may mean that human waste is getting into the ocean from a source or sources no one has yet investigated – which includes groundwater, as well as sewage outfalls.

Heal the Ocean has therefore initiated an "Environmental Quality Assessment of Shallow Groundwater/Ocean Interface" – a four-part study now underway that will take a close look at the possibility of leaking sewer pipes getting into the flow of groundwater to the sea. We have contracted with D.M. Bernal Geologic Consulting, which is already at work on Phase I information-gathering from public records, with the other three phases to follow afterward – including sampling from wells, seepage, beneath creeks and by drilling new wells.

Heal the Ocean advisory board member Patricia Duffy, who worked on this issue during her tenure as chair of Project Clean Water's sewer systems committee, is bringing to this project the results of her years of information gathering. Although the majority of her committee voted on a professional hydrogeological study and possibly drilling of wells to investigate the problem, Project Clean Water deemed such a study "inappropriate" to PCW goals. Patricia has therefore brought her work to us.

We are also pleased to have additional input on this project from Drew Bohan, director of Santa Barbara ChannelKeeper. Drew contributes a research expertise that the Keeper program is noted for nationwide. Our aim is to collaborate and work on this investigation, and whatever problems emerge, together with our city officials.

Heal the Ocean Quarterly Virus Testing

Conducted in the laboratory of Dr. Jed Fuhrman, USC

√Fall (Nov. 11) 2000	Hepatitis A	Enteric viruses
Arroyo Burro	No	No
Butterfly Beach	No	No
Carpinteria State	No	No
El Estero sewage treatment plant	Yes	Yes
Goleta Beach	No	No
Leadbetter Beach	No	No
Summerland Beach	No	No

√Summer 2000	Hepatitis A	Enteric viruses
Arroyo Burro	No	No
Butterfly Beach	Yes	No
Carpinteria State	Yes	No
East Beach @ Mission Creek	Yes	No
Goleta Beach	No	No
Hope Ranch Beach	No	No
Leadbetter Beach	No	No
Summerland Beach	Yes	No

√Winter 1999	Hepatitis A	Enteric viruses
Arroyo Burro	No	Yes
Butterfly Beach	No	Yes
Carpinteria State	No	Yes
East Beach @ Mission Creek	No	Yes
Goleta Beach	No	No
Hope Ranch Beach	No	No
Las Palmas Creek (Hope Ranch)	No	No
Leadbetter Beach	No	No
Summerland Beach	No	Yes

√Fall 1999	Hepatitis A	Enteric viruses
Arroyo Burro	No	No
El Estero sewage treatment plant	Yes	Yes
Goleta Sanitary District	No	Yes
Goleta Beach East	Yes	No
Goleta Beach West	No	Yes
Hope Ranch Beach	No	No
Las Palmas Creek (Hope Ranch)	Yes	No
Leadbetter Beach	Yes	Yes
East Beach @ Mission Creek	No	Yes

September 17, 2001

Angela G. Carpenter,
Water Resources Control Engineer
Regional Water Quality Control Board
Central Coast Region
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5411

Re: Proposed Changes to 303(d) List of Impaired Water Bodies

Dear Ms. Carpenter:

The Environmental Defense Center ("EDC") is a non-profit environmental law firm working to protect and enhance natural resources in Santa Barbara, Ventura and San Luis Obispo Counties. EDC has been instrumental in numerous water quality issues in the tri-Counties area, working to both enforce existing water quality laws and to cooperate with local municipalities in developing plans to minimize urban runoff and non-point source pollutants. We write in support of the August 31 letter sent by Santa Barbara ChannelKeeper concerning the 303(d) list of impaired water bodies.

We have commented on this process in the past, and we reiterate our request that priority attention be paid to impaired water bodies along the South Coast of Santa Barbara County. Due to the urgency of surface water pollution problems in the County, we strongly believe that the TMDL process should begin on at least one of the impaired water bodies along the South Coast as soon as possible. We urge staff to make this recommendation to the Board on October 26.

Thank you very much.

Sincerely,

Brian Trautwein
Environmental Analyst

cc: Santa Barbara ChannelKeeper

906 Garden Street
Santa Barbara, CA 93101
Phone (805) 963-1622
FAX (805) 962-3152

31 N. Oak Street
Ventura, CA 93001
Phone (805) 643-6147
FAX (805) 643-6148

864 Osos Street, Suite A
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FAX (805) 781-9384

South Coast Watershed Alliance
c/o: 930 Miramonte Dr., Santa Barbara, CA 93109

California Trout, Inc.
Carpinteria Creek Committee
Citizens Planning Foundation
Community Environmental Council
Conception Coast Project
CURE - Clean Up Rincon Effluent
Environmental Defense Center
Gaviota Coast Conservancy
Growing Solutions
Heal the Ocean
Santa Barbara Audubon Society
Santa Barbara ChannelKeeper
Santa Barbara Sea
Santa Barbara Surfrider Foundation
Santa Barbara Trappers
Urban Creeks Council
Individual Community Members

September 20, 2001

Ms. Angela Carpenter
Water Resources Control Engineer
Regional Water Quality Control Board
Central Coast Region
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5411

RE: TMDL Development for 303(d) List of Impaired Water Bodies in Southern Santa Barbara County

Dear Ms. Carpenter,

The South Coast Watershed Alliance (SCWA) is a coalition of community planning, environmental, educational and scientific organizations and individuals working to promote sound watershed planning, riparian enhancement and water quality improvements throughout southern Santa Barbara County. SCWA formed in July 1998 in response to increasing degradation of water quality in area creeks and beaches. Since our inception, SCWA and our member organizations have been very active in the establishment of and participation in local water quality and restoration programs, including the County of Santa Barbara's Project Clean Water, the City of Santa Barbara's Creeks Restoration and Water Quality Improvement Program, and the Santa Barbara County Task Force of the Southern California Wetlands Recovery Project. In addition to our involvement in these community-wide efforts, many of our SCWA member organizations have taken leading roles in creek and wetland restoration projects, research and habitat analysis, water quality testing, and regional watershed planning and coordination.

Our community is deeply committed to improving the water quality in this region and we have formed strong alliances between local government agencies, non-government organizations and individuals in order to take a pro-active role in implementing projects to restore, enhance and improve our degraded waterways. While the city and county agencies in Santa Barbara County are not required to apply for Phase II NPDES Storm Water Permits until 2003, our community has made the commitment to begin working on these important issues now. That is why we are deeply concerned that the southern Santa Barbara County coastal region, with seven California 303(d) listed impaired water bodies, is not scheduled in the Regional Water Quality Control Board's work plan to begin development of TMDLs for these impaired waterways until 2006.

We understand that the Regional Water Quality Control Board staff will be submitting recommendations to the Board in the coming weeks in preparation for a hearing on October 26. We request that RWQCB consider a more equitable distribution of resources throughout Region III so that work on the listed Santa Barbara County water bodies may begin immediately. While we understand that the RWQCB has limited resources and may not be able to address all seven listed water bodies in this county simultaneously, we do believe there is a strong case for beginning work on at least some of our impaired water bodies now.

In addition to the equity issue for the allocation of TMDL resources throughout Region III, there are several other important factors that make Santa Barbara County worthy of immediate attention. These factors include the presence of federally listed endangered species in several of the listed impaired waterways and increased human health risks due to the proximity of a dense urban population to the impaired water bodies with high recreational usage in the near shore ocean environment. In addition, this community has secured local funding sources and outside grants to begin implementing a variety of water quality improvement and habitat restoration projects in many of the listed water bodies. Without the benefit of the simultaneous development of TMDLs, we may find that our projects don't meet the TMDL standards long after significant investments have been made in those waterways. In essence, we are moving forward on projects in hopes that they will meet future TMDL standards without the benefit of knowing what those standards are.

The South Coast Watershed Alliance respectfully requests that staff recommend to the Regional Water Quality Control Board that work on TMDLs in southern Santa Barbara County begin immediately. Thank you for your consideration.

Sincerely,

Sharyn Main

Sharyn Main
South Coast Watershed Alliance

TEL 805.965.8080 FAX 805.965.6050

WENDY P. McCAW FOUNDATION

SHARYN MAIN

POST OFFICE BOX 22458 SANTA BARBARA, CA 93121
EMAIL: SMAIN@WPMFOUNDATION.ORG

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

October 22, 2001

Ms. Lisa McCann
Central Coast Regional Water Quality Control Board
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5411

Dear ~~Ms. McCann~~ Lisa:

The U.S. Environmental Protection Agency (EPA) has reviewed the proposed 303(d) list recommendations for the Central Coast Region dated July 26, 2001. We provided initial comments on the proposed Region 3 listing methodology in an email message to the State Water Resources Control Board dated September 2, 2001, a copy of which was sent to you. We also provided suggestions concerning data and information sources that should be considered in a letter to the State Board dated May 15, 2001, a copy of which was sent to you. We have completed a more thorough review of the proposed list recommendations and would like to provide further comments for your consideration.

The RWQCB has clearly devoted substantial effort in crafting its proposed listing revisions, and we appreciate your efforts to seek out and consider existing and readily available information. We understand that you are providing an update to your Board concerning your listing recommendations next week. We agree that it is wise to apprise the Board of the status of your efforts and to provide the public with the opportunity to review your assessment recommendations.

As we discussed yesterday, we believe there are several remaining issues that need to be addressed in order to ensure that the listing decisions will be fully consistent with the requirements of the Clean Water Act and associated federal regulations. Rather than describe these issues in detail at this point, we would suggest that we work with your staff and staff at the State Board in the next few months to better understand your approach and resolve any remaining issues. Here is a quick summary of the issues with which we are concerned:

1. **Listing Decision Thresholds** We understand that you are recommending listing of waters only in cases where more than 50% of samples exceed the applicable water quality objective. This proposed decision threshold is excessively stringent and apparently inconsistent with applicable water quality standards and federal listing requirements.

2. **Assessment of Toxic Pollutants** The listing report does not indicate that potential exceedences of standards for toxic pollutants (e.g., pollutants addressed by the California Toxics Rule) were evaluated. Based on our conversation, we understand that you did consider potential exceedences of toxics standards, but found insufficient evidence to list waters for these pollutants. It may be that the listing approach simply needs to be described more clearly.

3. **Assessment of Narrative Objectives** The listing report does not clearly explain how narrative standards exceedences were assessed. Federal regulations require assessment of potential violations of narrative objectives. If the Regional Board did consider these objectives, it may be sufficient to clarify the description of your assessment efforts. If not,

additional analytical work may be needed to consider potential listings based on exceedences of narrative objectives.

4. **Assessment of Unconventional Data and Information** The listing report does not clearly explain how unconventional data and information sources (e.g. fish tissue data, sediment data, biological data, information on beach closures and fish advisories, qualitative information, and other sources listed in our letter of May 15, 2001) were assembled and considered in the assessment process. If the Regional Board did consider these data and information sources, it may be sufficient to clarify the description of your assessment efforts. If not, additional analytical work may be needed to consider unconventional data and information sources.

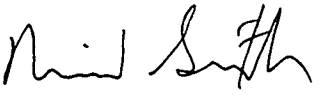
5. **Exclusion of Data From Consideration** We understand that some data and information were excluded from consideration due to quality assurance concerns. In order to meet federal regulatory requirements, it may be necessary to provide a more detailed rationale for the decision to exclude this data and information from consideration.

6. **Consideration of Threatened Waters** Federal regulations require listing of waters which are not expected to attain applicable water quality standards. It was not clear in the listing report that the Regional Board made efforts to identify threatened waters and, if so, the results of that analysis.

7. **Caveats in TMDL Development Schedule** The listing report indicates that the proposed schedules for TMDL development are tentative. As we have discussed in the past, we believe it is important for the State to make firm commitments to complete TMDLs within reasonable time periods, and then ensure that those TMDLs are completed on schedule.

In closing, I want to emphasize our main impression that the Regional Board has conducted a reasonably diligent assessment of its waters which provides the basis for sound 303(d) listing decisions. Although there are significant issues which require further discussion and resolution, we believe there is ample time to work out remaining these issues with your staff and the State Board in the coming months. Thank you for the opportunity to share our review of the listing recommendations. If you have questions, please call me at 415-744-2012.

Yours,



David Smith
TMDL Team Leader

Cc: Valerie Connor
Tom Mumley

PO Box 167, Boulder Creek, CA 95006 Ph/Fax(831)426-1697 JodiFredi@aol.com

August 31, 2001

Angela G. Carpenter
Central Coast Regional
Water Quality Control Board
81 Higuera St., Ste. 200
San Luis Obispo, CA 93401

Revised Version

Dear Angela,

I am writing in regards to the request of the City of Santa Cruz Water Department to list Majors Creek in Santa Cruz County as impaired for sediment. As a 30 year resident of the watershed, I completely concur that the creek is degraded and urge you to list it as impaired for sediment.

Twenty years ago, my then seven year old son used to catch trout in the clear pools of Majors Creek south of Smith Grade. On hot summer afternoons, my friends and family would head for the creek where we cooled off in swimming holes so deep the water covered our heads while standing. Since then those pools have filled with sediment and have never scoured clean. Today, with a few exceptions, one can walk the same stretch of creek without getting ones knees wet.

In addition to the resident trout which inhabit the creek, the watershed supports California red-legged frogs and Western Pond Turtles. I have spotted red-legged frogs on my property and a neighbor, who's property fronts directly on the creek, has also observed red-legged frogs on her land. In addition, I have observed Western Pond Turtles on two separate occasions in two locations at least 1/2 mile apart, close to the banks of the creek.

Over the past twenty years I have observed numerous sources of sediment dump into Majors Creek, the majority a result of human activity. I have spent many hours on foot and on horseback traversing the watershed in and adjacent to the various branches and tributaries of Majors during that time. As Chair of the Sierra Club Forestry Task Force for more than 15 years and as Executive Director of Citizens for Responsible Forest Management, I feel that my observations have been informed and accurate.

Following is a list of various sources that have delivered sediment into the creek in the past (not necessarily in chronological order), including some which continue to be problems.

CULVERT FAILURES

Public Roads:

In 1982 a substantial slide occurred at the Empire Grade end of Smith Grade delivering an unknown quantity of earth and asphalt into the creek system. While the slide was a direct result of the excessive rains that season, neighbors who were present in the early 1950's, when the County re-routed that segment of Smith Grade, chided the engineers because, they said, there was a spring at that exact location. After the road failed in '82, water was observed running at the base of the slide directly under the location of the failed road bed.

In 1998 a major segment of Smith Grade failed at a culvert crossing where a section of the East Branch of the creek crosses the road. This culvert clogged as a result of woody debris most likely deposited as a result of upstream logging. Logging operations in that reach of the creek had been allowed to take place in the "alluvial plane", or the channel of the creek bed itself. This failure also deposited substantial amounts of earth and asphalt into the creek. The culvert has been replaced with another culvert built with a cement headwall.

At the same time, further upstream a second culvert failure (#1) occurred where the creek crosses under Smith Grade. This failure was caused by logging road failure just upslope at a culvert crossing (#2a & 2b) on what is currently State Park lands. Much of that logging road slipped, overwhelming the Smith Grade crossing and forcing the creek to bypass the culvert and undermine the road. The upslope culvert is still in place waiting to fail further.

Private Access Roads:

Two culvert crossings that serve residents south of the East Branch of the creek have failed completely delivering large volumes of earth into the watercourse. One of those failed on three separate occasions, beginning in the early 1980's, and was finally replaced by a bridge, and the other was rebuilt and is currently in place in the creek. A third culvert on private property south of Smith Grade also failed approximately 20 years ago delivering a large quantity of soils directly into the main stem at that time.

Logging Roads:

In addition to the culvert crossing on Grey Whale mentioned above, numerous logging roads criss-cross the State Park lands of Grey Whale Ranch in the watershed of the East Branch of Majors. Several of these culverts plus other segments of road failure along what is know as the Woodcutters Trail (#3a & 3b) are on-going with sediment delivery. In addition, a branch trail off the Woodcutters has several culvert failures (#4), including a culvert delivering water into the opposite bank currently undermining a clump of redwoods and surface erosion which enters the creek. Some of these culverts were installed under CDF approved Timber Harvest Plans and others were illegally installed under CDF approved Firewood Exemptions.

More logging roads exist on the north side of Smith Grade on State Parks land, are not currently being maintained by State Parks, and may also be contributing sediment.

The bridge approach on Grey Whale Ranch which serves the Don Campbell property was put in under a Timber Harvest Plan and is currently used as a residential access road as well as a log haul road. While the Campbells do maintain that road, the crossing approach was cut through a 15' +/- bank of sand just upslope of the creek channel. While currently shored up it has the capacity to deliver sediment into the creek.

OTHER HUMAN ACTIVITIES:

Bank Clearing:

Ongoing clearing of under-story has occurred along a 1/2 mile stretch of creek bank along the west side of the Paisley property (#5). Many of the woody stems up to 5" in diameter have entered the creek contributing to downstream log jams. One such logjam is of such a magnitude as to be a contributing factor in re-routing the stream flow and undercutting the steep creek bank. This section of bank became unstable after the property owner re-opened an old logging road directly above the slide area and the creek below. Large chunks of earth fell into the creek bed as well as trees which uprooted after the road was reopened.

Illegal Logging and other activities:

In the 1980's, 40 acres of the watershed on the Meyer's property along the West Branch of the creek were clearcut with slash deposited directly into Class III drainages (#6), then covered over with soil. Following rains, the soil was washed into the creek and more soil was graded over the uncovered slash. This again washed into the creek. The County required erosion control measures and replanting of the site, but it is unknown how that area has recovered. The slash was not required to be removed from the Class III.

Also, in the 1980's, Paisley placed a pump in the creek and took a bulldozer to the creek bed creating a dam (which failed) from slash in the creek and bulldozed soil from the creek bed. CDFG was informed and stopped any further activity at that location. The pump was abandoned.

A road illegally put in probably as early as the late 1970's, on what is now the Brown's property, failed directly into the mainstem of Majors Creek most likely in the 1980's.

Other roads leading directly to the creek exist on several private properties in the watershed. Many of these are unmaintained and may continue to bleed into the creek.

NATURAL SOURCES

Landslides:

Certainly land-sliding can be considered a natural part of sediment delivery into the creeks of the Santa Cruz Mountains. Two particularly significant slides exist that I am aware of along Majors Creek. The first is on Gray Whale Ranch along a tributary to the East Branch. Contributing factors may include an adjacent trail (previously an old log road) or increased sediment in the creek bed, leading to high flows reaching above bedrock and undercutting the higher sandy soils. The elevated level of the creek bed may be a result of upstream logging activities.

A second area of land-sliding exists in the gorge area further downstream. While it is not clear whether there have been contributing factors to this slide, there is evidence of human activity in that area of the creek including old water lines running along the bank.

Feral Pigs:

Feral pigs are found in large numbers (some groups with as many as 20 pigs) on State Parks lands as well as the private lands of Don Campbell. While feral pigs can be considered 'natural' sources of sediment delivery, they are not a native species and, in fact, were introduced in the past to provide sport for hunters.

The above list is most likely incomplete, but does give a picture of the types of activities which have impacted the creek over the past 20+ years. While the bulk of the watershed is in State Parks hands, there are several residential properties in the watershed. These range in size from 3-365 acres in size. The State owns lands both above and below the privately owned section. Logging activities, access roads, culvert failure and bank clearing are the main impacts from those private parcels.

The main activities on State owned lands which are negatively impacting the creek are the same as those from privately owned lands, minus bank clearing.

I understand that enforcement actions and/or working with property owners to get voluntary compliance may be the quickest way to correct the current problems. However, I do not believe that those measures should replace efforts to list Majors Creek as impaired for sediment. At least 600 acres of private forest land are found within the Majors Creek watershed. A 303d listing of the watershed would require any future timber harvest activities to comply with more stringent Forest Practice Rules. For this reason alone, I believe this creek should be listed. In addition, I would expect that an impaired listing would be useful in accessing funds for restoration efforts.

Enclosed are photos of a number of the hotspots, past and present. I also have a parcel map showing the location of some of the problems areas which I can make available. I would also be happy to take any members of the RWQCB on a tour of these sediment sources.

Thank you for your time and attention to this matter.

Sincerely,

Jodi Frediani

Jodi Frediani
Executive Director

P.S. I have included page 7# to show the importance of listing all tributaries of the San Lorenzo River system as impaired for sediment. While this is a particularly egregious harvest, other poor practices have occured & continue to occur in local logging operations.

Majors Creek
East Branch

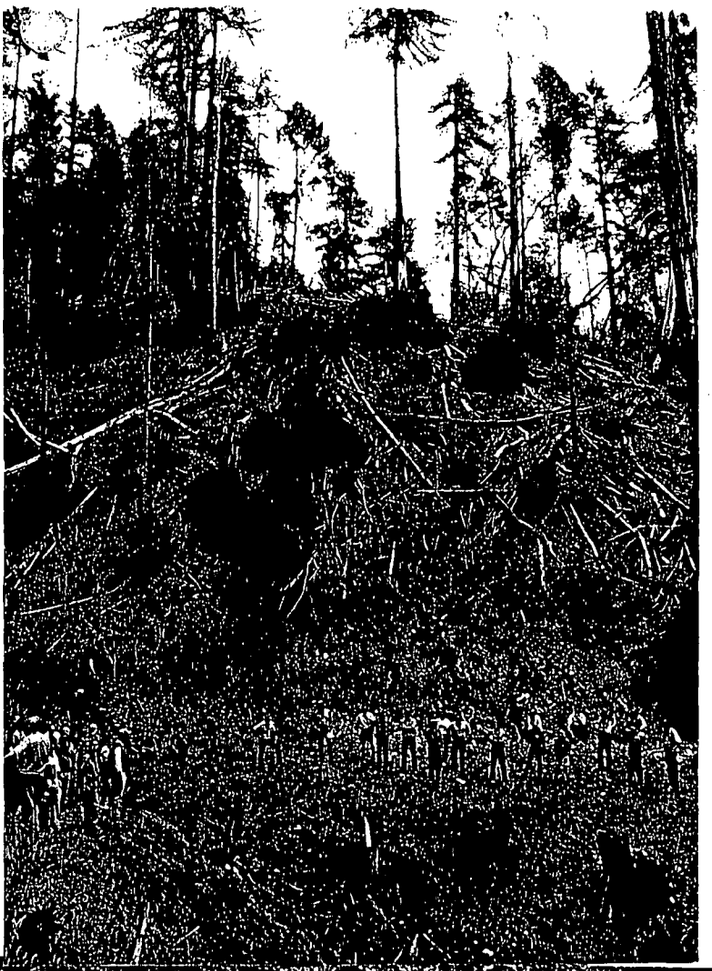
Smith Grade
culvert
failure -
blocked by
log road failure

#1

Majors Creek, East Branch, Grey Whale
Log road failure; culvert crossing
2a

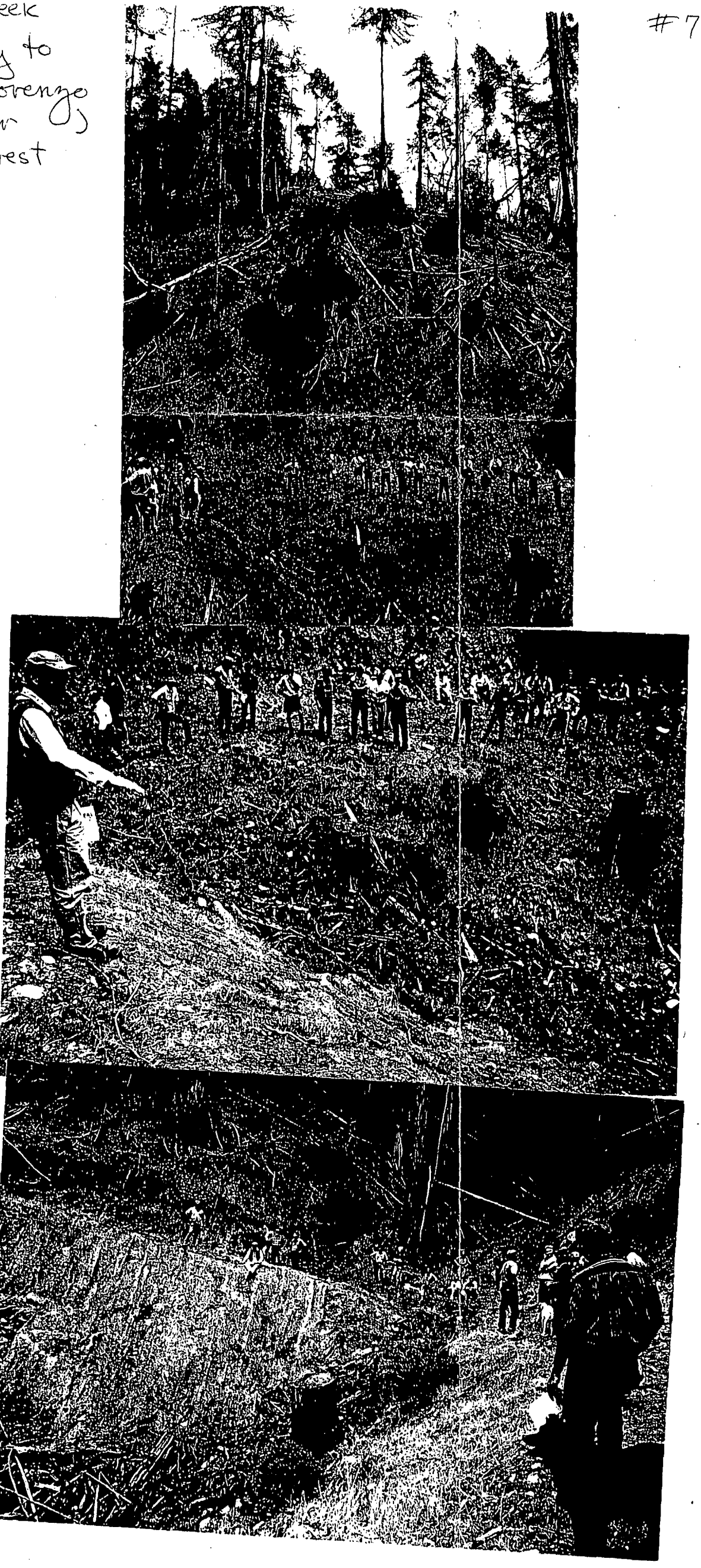
Fritch Creek
(Tributary to
the San Lorenzo
River)
Timber Harvest

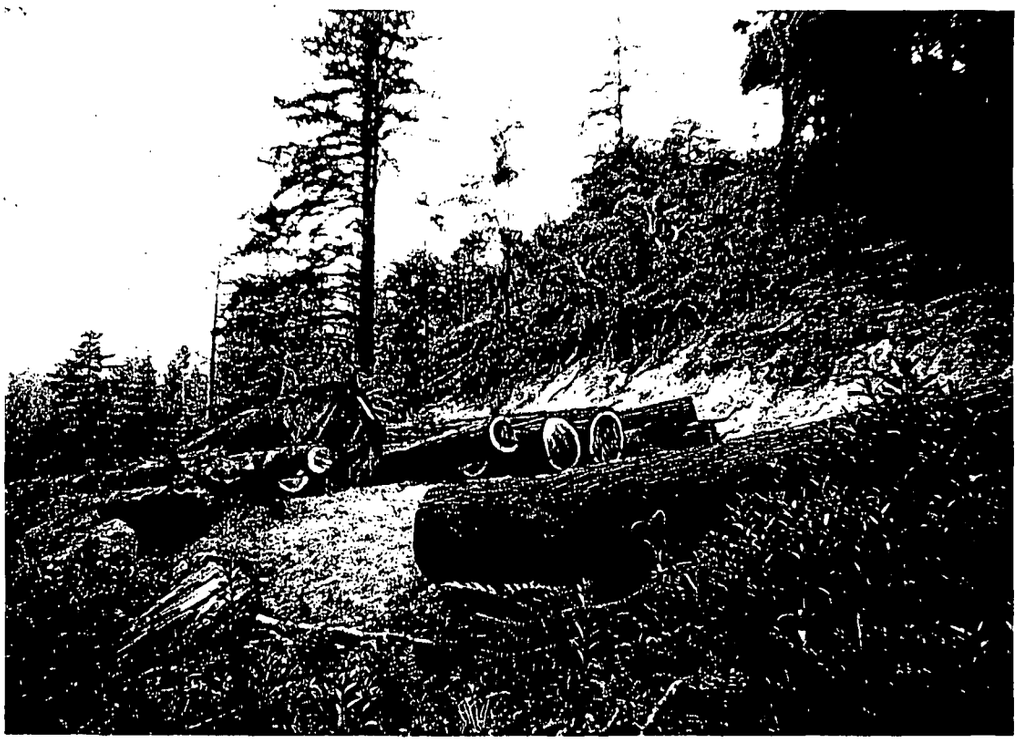
#7



Tritch Creek
(Tributary to
the San Lorenzo
River)
Timber Harvest

#7

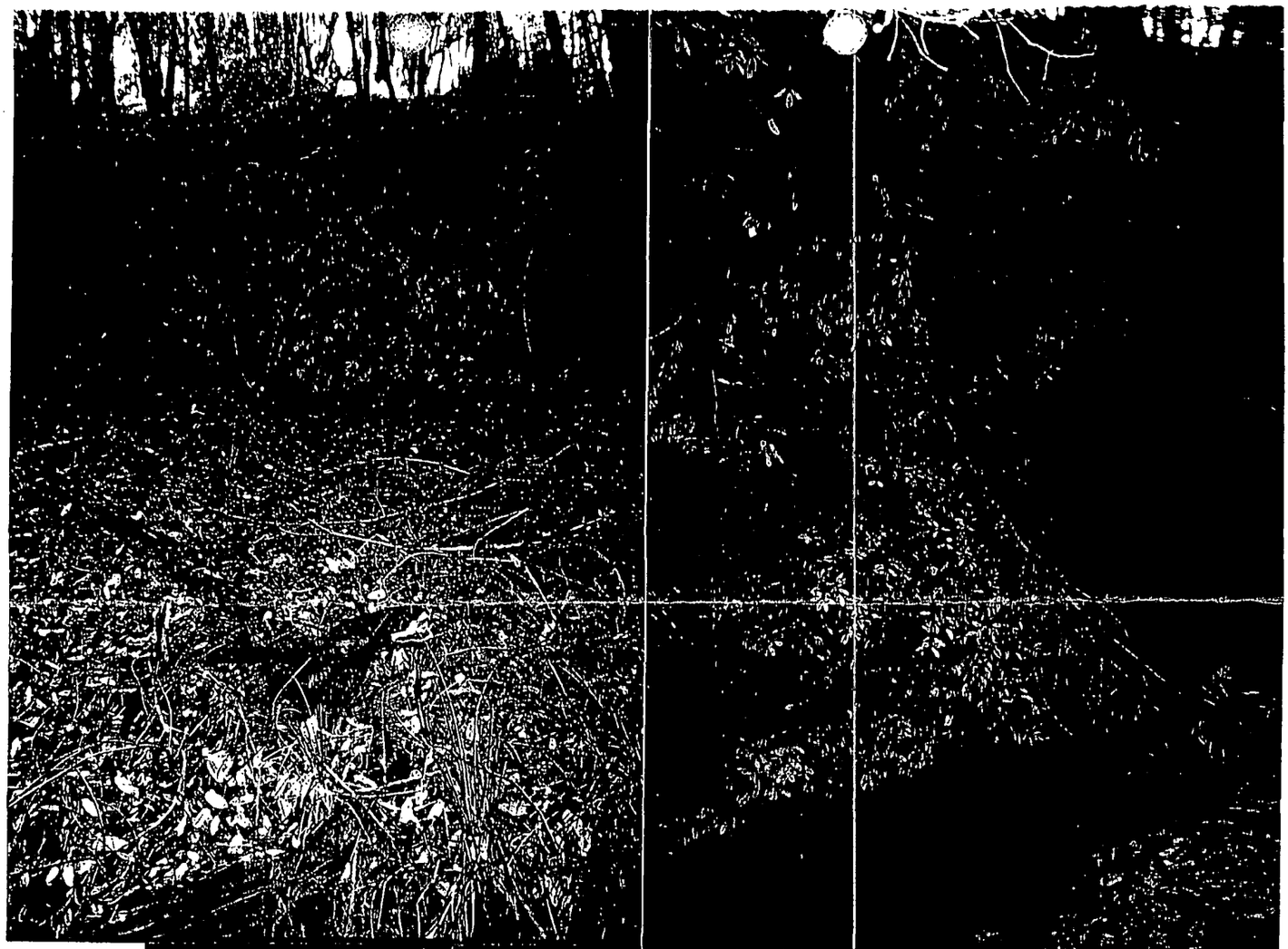




Majors Creek.
Illegal
Clearcut &
grading
(main stem)

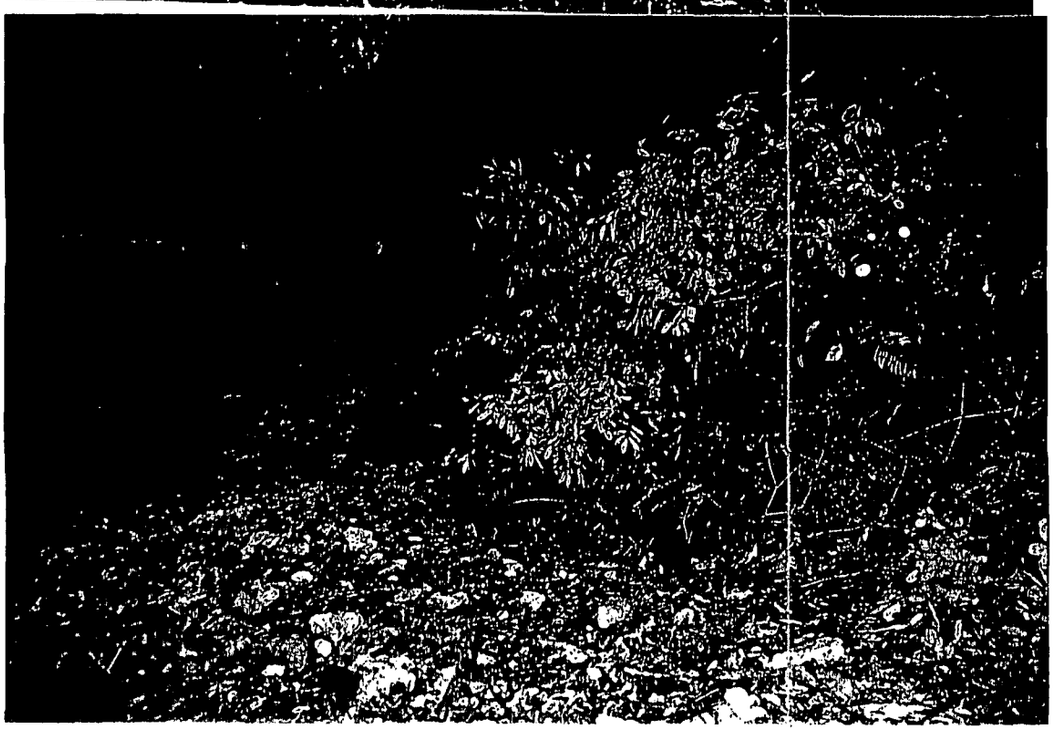
Mengers illegal 40 acre clear cut.
Slash deposited into Class III of
West branch Majors Creek

#6



Majors Creek, Main stem

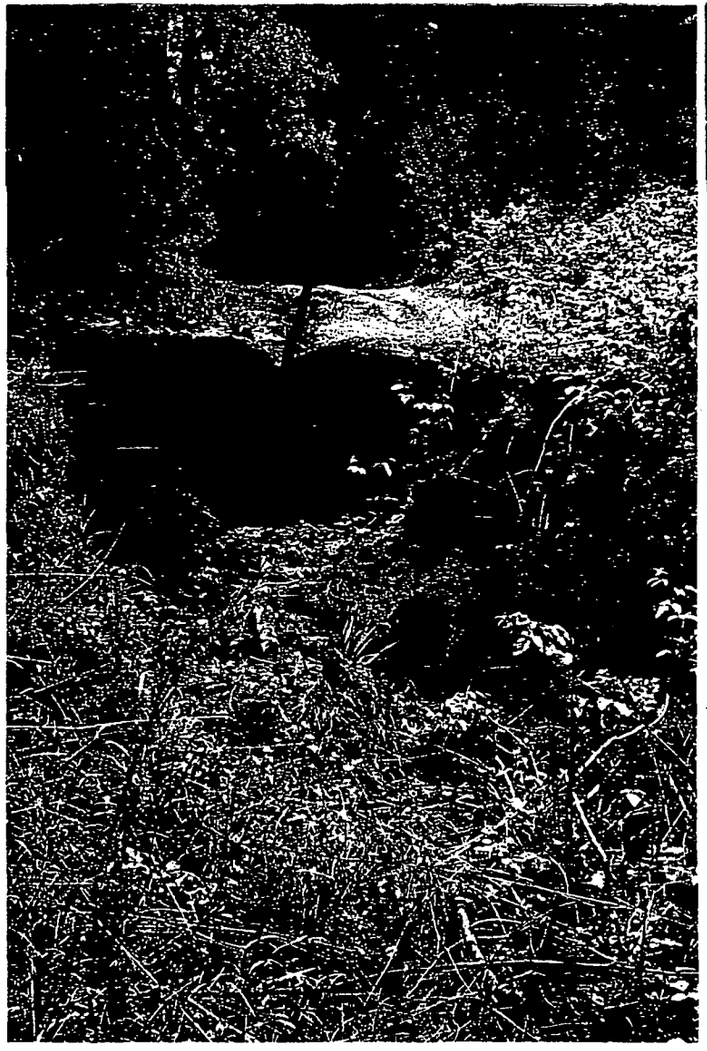
½ mile understory clearing, Paisley (current)



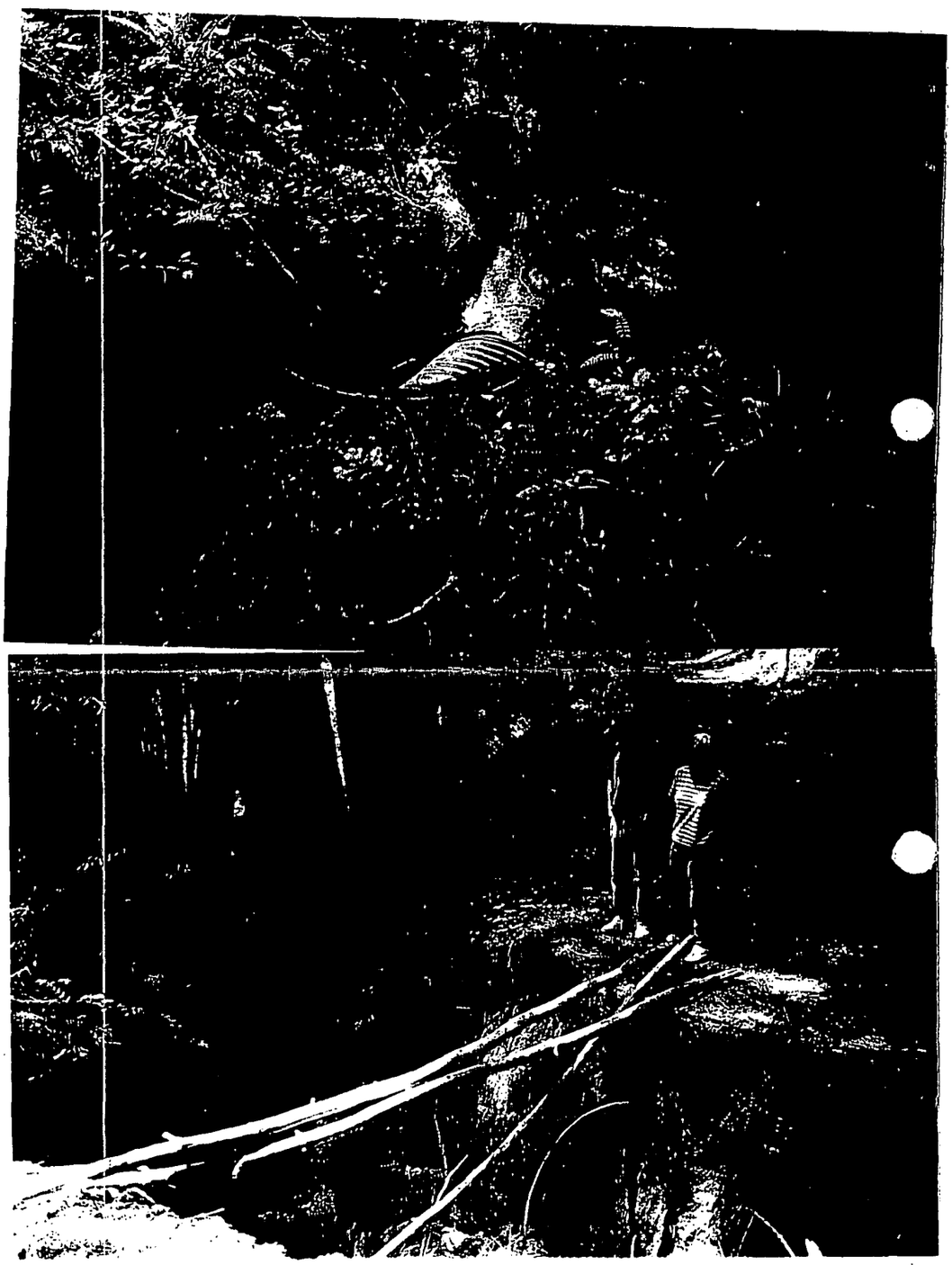
#5

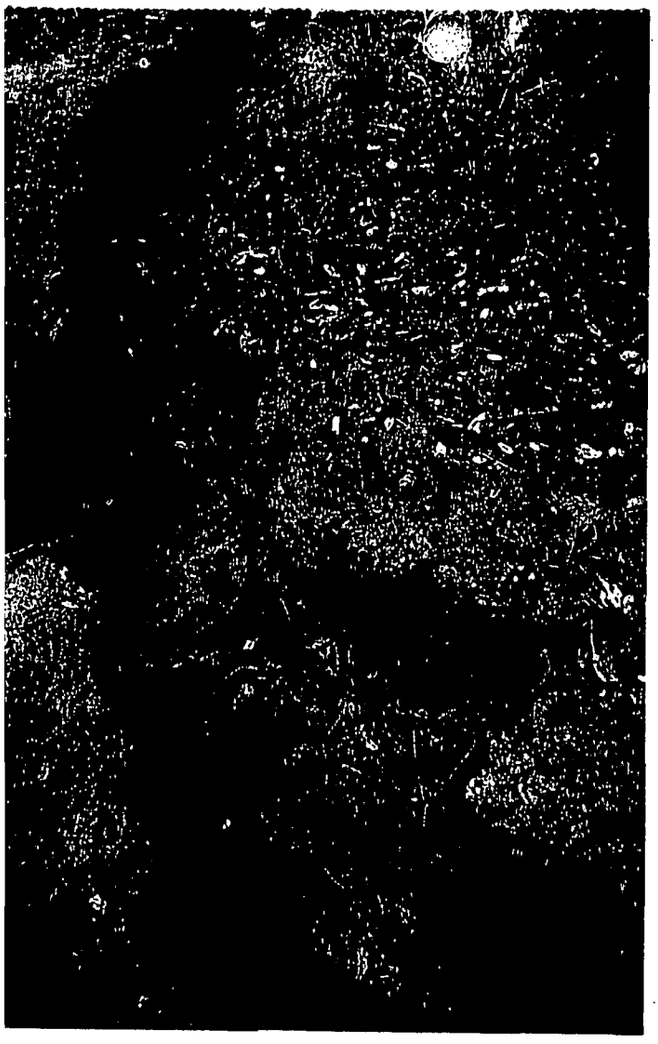
Mayors Creek East Branch
Grey Whale Ranch - 1 sodcutters Road
Logroad failure, continued erosion

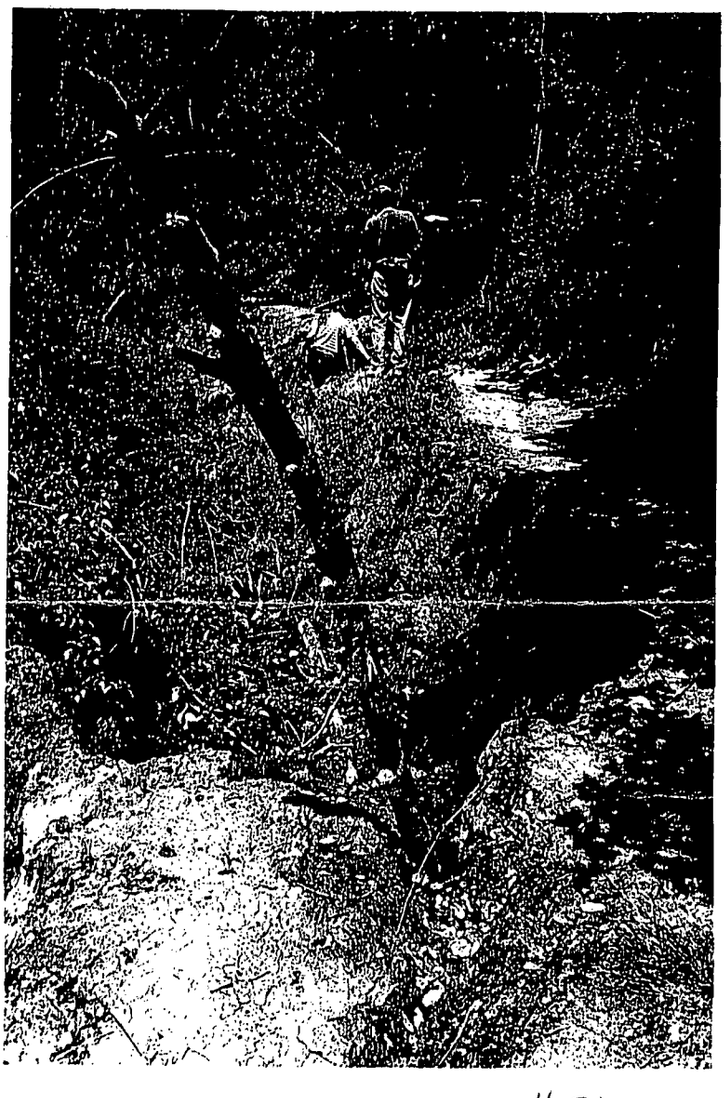
#3a



anch
- fork off
Woodcutters





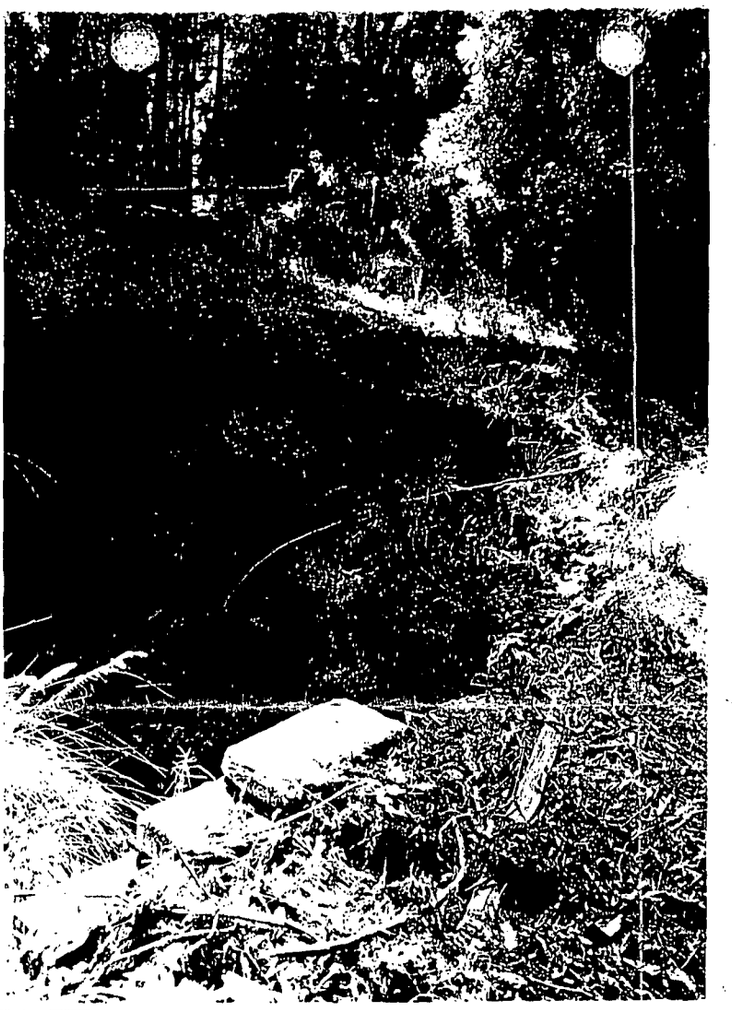


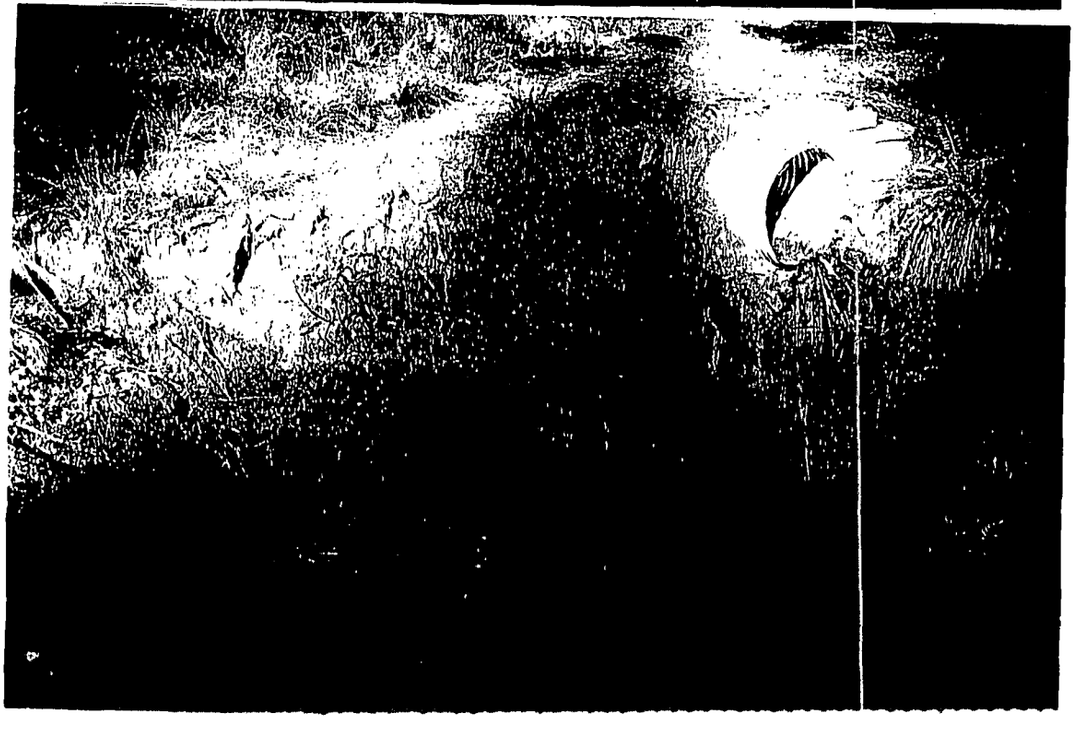
ajors Creek - East Branch
Greywhale Ranch - Woodcutters road
Log road failure, continued erosion

#3b

Mayors Creek
East Branch
Grey Whale

Log road failure;
Culvert crossing
#2b





October 25, 2001
California Region 3 Water Quality Control Board
81 Higuera St.
San Luis Obispo CA 93401

Subject: Agenda item 16, Clean Water Act Section 303(d) list update as pertaining to the San Lorenzo River Basin

Chairman and Members of the Board:

I hope that my comments can be taken into account when your board decides on the above listed agenda item. I had expected to be able to attend the Public Meeting but will have to rely on this letter to express my thoughts and provide useful information pertinent to this matter.

I believe that the staff recommendations for the 303(d) list update will result in confusion as to the meaning of the law and the monitoring and enforcement responsibilities of Water Quality staff.

It is illogical to list the mainstream of the San Lorenzo as impaired under the 303(d) list without directly specifying that the tributaries are also listed. Sediment impairing the main stem of the drainage obviously originates to an overwhelming degree from its tributaries and documenting evidence for this is available. For instance, Zayante Creek is a principle tributary which is obviously impaired by sediment. This sub-drainage has been described in two recent reports, the Balance Hydrologics "An Assessment of Streambed Conditions and Erosion Control Efforts in the San Lorenzo River Watershed, Santa Cruz County, CA", July 1998 and the subsequent "Zayante Area Sediment Source Study" by Swanson Hydrology & Geomorphology. Both of these reports, the Balance Hydrologics being the more informative of the two, describe Zayante Creek as impaired by sediment. If 303(d) listing is not directly afforded to Zayante Creek and other tributaries to the San Lorenzo then the intent of the Clean Water Act will not be properly carried out.

A tributary of Zayante Creek, Lompico Creek, is one of the three San Lorenzo tributaries which are currently specifically listed as impaired. The respected hydrologist Dr. Robert Coates recently wrote a letter at the request of the residents on upper Lompico Rd. which is very relevant to the issue that I am addressing in this letter. Dr Coates did research in the

Zayante drainage after the 1982-83 winter storms. This letter, written in response to the filing of a Timber Harvest Permit for the headwaters of Lompico Creek includes this paragraph.

> "Lompico Creek differs from streams of the north coast in terms of it interaction with hillslopes, but the watershed is nonetheless a very actively eroding terrain. Much of the mature timber grows on over-steepened inner gorge slopes that are prone to shallow-seated debris slides. In addition, there are numerous large deep-seated complex slides. The long term average sediment yield in the upper Zayante Creek Basin has been estimated to be about 3,000 tons/mi(squared)/year, about 75 percent of the pre-1964 sediment yeald rate of the Eel River at Scotia. In 1982, inner gorge debris slides in the Lompico Creek watershed contributed sediment to the creek at a rate of about 11,000 tons/mi(squared)."

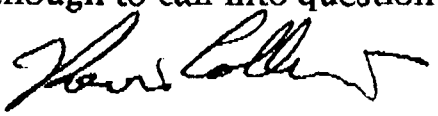
As stated in a subsequent report by engineering geologist Dr. Eugene Kojan who has studied and instrumented landslides on several continents, the Eel River is widely considered to be one of the most erosive watersheds in the entire world. I have included this information to demonstrate the importance of the need for clarity in the 303(d) listing for the San Lorenzo Basin.

Coho salmon have been extirpated from the San Lorenzo and steelhead rainbow trout have been rapidly declining. The ruin of spawning and rearing areas by excessive sedimentation is the most important cause. The Water Quality Control Board is a very important agency for the rational management of California's resources. Please make it clear that the entire San Lorenzo and tributaries are listed as impaired for sediment.

I would like to ask the Board to re-consider de-listing the San Lorenzo "Lagoon" for sediment. The importance of the lagoon for the survival of anadromous fish is considerable. It is very unlikely that the depth and overall condition of the lagoon is not adversely affected by the sediment load transported by the San Lorenzo. An important question to ask when considering de-listing is what documentation are you relying on?

As a final comment on a related item, I am aware that only 5 monitoring stations are planned for the TMDL studies of the San Lorenzo and that only gravel imbeddedness will be the defining measurement. From years of watching the response of this drainage to weather, I know that the vast majority of sediment moves during intense rainfall/high water events. I recommend that water sampling during high water storm conditions be

incorporated into the TMDL studies so that a more complete picture of sediment transport can be completed. The potential for error in measurement that is likely if only imbeddedness is measured could be enough to call into question the meaningful accuracy of the TMDL process.



Regards, Kevin Collins
Board President, Lompico Watershed Conservancy

STATE OF CALIFORNIA-THE RESOURCES AGENCY GRAY DAVIS, *Governor*
DEPARTMENT OF FISH AND GAME
Mailing Address:
P.O. BOX 47
YOUNTVILLE, CA 94599

October 24, 2001

Angela G. Carpenter
Central Coast Regional Water Quality Control Board
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401

Dear Angela,

This letter provides preliminary comments to Regional Water Quality Control Board's Proposal to Delist San Lorenzo River Lagoon for Siltation (dated July 25, 2001), and requests additional time to provide more detailed comments. There was an unfortunate oversight in providing detailed comments on this proposal in a more timely manner.

Please reconsider this proposed decision to delist San Lorenzo River lagoon, located in the transition zone between saltwater and freshwater habitats. The degraded condition of San Lorenzo Lagoon is a result of cumulative impacts, some dating back to major sediment impacts that occurred prior to conditions recorded by Phil Williams and Associates, et. al. 1989.

Department of Fish and Game personnel look forward to working with you to determine whether delisting protects Public Trust Resources and beneficial uses of this watershed. Lagoons deserve more focused attention in terms of assessment, monitoring, and management to restore essential salmonid rearing habitat (i.e. capacity) and water quality.

If you have any questions, or require additional clarification, please call me at my office (831) 724-7130, or through my cellular phone (831) 917-4014.

Sincerely,

Patricia Anderson

Patricia Anderson
Associate Fishery Biologist
Central Coast Region

USC
UNIVERSITY
OF SOUTHERN
CALIFORNIA

Heal the Ocean: Detection of Human Enteric Viruses and/or Hepatitis A Viruses in Beach Water Samples.

October 1999

Alison A. Davis, University of Southern California

College of Letters, Arts and Sciences

Biological Sciences

Polioviruses, coxsackieviruses and echoviruses are similar in epidemiologic pattern, in physical, chemical, and biologic characteristics; and in infecting the human gastrointestinal tract. They were originally given the name Enteroviruses, but the inadequacy of this term became apparent when some coxsackieviruses and echoviruses were also found to produce acute respiratory infections. The new term Picornaviruses was coined as the family designation. Human picornaviruses are classified into two genera: Enteroviruses (which occasionally cause respiratory rather than intestinal or neurologic disease) and Rhinoviruses who produce primarily acute respiratory infections.

Poliovirus enters the host by the oral route. It may be found in contaminated food or water or in oral secretions. The virus passes into the small intestine and associated lymph nodes. These nodes are the principal place of residence for B and T cells, so if the host has been previously immunized, a vigorous immune response at this stage limits the infection (the strategy employed by the Sabin vaccine).

The attenuated poliovirus used in the Sabin vaccine has a reduced neurovirulence. It replicates poorly in neuronal cells of the human spinal cord. The vaccine strain is administered to humans by placing the virus on a sugar cube. The virus replicates well in the human intestinal cells. The Sabin virus remains in the intestine for a long period of time and is excreted in the feces, so that the attenuated virus can be spread to household members of a newly immunized person. Because this polio vaccine is given to infants, adults are commonly exposed to the virus as they change diapers.

There have been rare reversions in the attenuated poliovirus, producing a more virulent form. This has resulted in cases of paralytic poliomyelitis in either the infant or the family member.

Hepatitis A virus, a picornavirus with a structure and pattern of replication similar to those of poliovirus, is most commonly acquired from contaminated food and water. After exposure, there is a variable incubation period (15 to 40 days). During this time virus can be detected in the feces, stomach, and also in the blood and urine. The virus attains it's highest concentration in the feces prior to the appearance of jaundice. The onset of jaundice usually signals the approaching termination of viral shedding. Therefore the danger of Hepatitis A virus dissemination from an infected person is greatest during the latter part of the incubation period, when viral shedding in the feces is greatest but is unrecognized because jaundice is not yet present.

The incidence of hepatitis A in the U.S. population is about ten cases per hundred thousand, and the geographical distribution reflects the fact that poor sanitation favors disease. Many hepatitis A infections occur with no symptoms, and a large percentage of individuals have antibodies against this virus.

Humans are the only species that are infected by Hepatitis A virus. Some primates can be infected with the virus in a laboratory setting but in nature humans are it's only host. The same is true for the coxsackieviruses and the echoviruses.

While some animals can harbor Enteroviruses (cows, pigs, ducks, monkeys and birds). It is most likely that this problem is human in origin. The one exception would be areas with very large bird populations. Occasionally Avian encephalomyelitis virus, an enterovirus, can be found in the water near the birds.

University of
Southern California
Allan Hancock
Foundation Building 107
Los Angeles,
California 90089-0371
Tel: 213 740 2777
Fax: 213 740 8123

Reverse transcriptase polymerase chain reaction (RT-PCR) was used for the detection of Hepatitis A viruses or enteroviruses in 20L samples of water collected around the Santa Barbara area. This method is much faster than traditional cell culture methods, which are not sensitive enough to be used for the detection of many types of viruses. This method can be used to detect members of the human enteric virus family, which includes Coxsackievirus, Echovirus and Poliovirus. (A total of 66 serotypes belong to the enterovirus family, the primers used in this study are capable of detecting 25 of those.) For detection of human viruses by RT-PCR, large volumes of seawater (20L) were retrieved from the sampling site using acid-rinsed carboys. The samples were put on ice and transported immediately to the laboratory at the University of Southern California. Concentration of the samples was started as soon as they were delivered. Samples were dispensed into a 40-liter stainless steel pressure vessel and serially pressure filtered through 2 stainless steel filtration units. The first unit housed a glass fiber filter (Whatman, nominal pore size 1.2 μm), and the second unit housed a 0.22 μm Durapore filter. The filtrate was then concentrated to a final volume of 100 ml with the use of a spiral cartridge system (Amicon, Inc., 30kDa molecular weight cutoff, SY130). Centricon-30 centrifugation concentration units were used to bring the sample volume down to a final volume of approximately 1 ml. Previous use of the spiral cartridge concentration method for viruses has demonstrated a recovery of 80%, determined on the basis of the concentration of countable virus particles in the sample.

Reverse Transcriptase Polymerase Chain Reaction (RT-PCR)

Enteroviruses are members of the picornaviridae, a family of single stranded RNA viruses. Detection of human enteric viruses by RT-PCR was performed using modified pan-enterovirus "universal" primers. This primer set can amplify at least 25 enteroviral types, and the relatively short length of the PCR amplicon ensures efficient amplification. Perkin-Elmer's RNA PCR Core kits were used for both sets of RT-PCR. (Enteric virus and Hepatitis A virus.) The target templates produced amplified DNA fragments of 196 bp for the enteric viruses, and 125 bp for the Hepatitis A viruses after 35 cycles. Visualization of amplified DNA was by staining a 1.8% agarose gel with ethidium bromide and illumination with UV light.

Negative and positive controls were performed for each RT-PCR run. For the negative controls, 2 μl of sterile water was added to the PCR reactions rather than concentrated seawater. The positive controls were samples spiked with 1 μl of Hepatitis A virus (obtained from Green Monkey cells in culture) or 1 μl of poliovirus type LsC at 10^5 PFU/100 μl.

Hepatitis A or polio virus were serially diluted down to 10^1 PFU/microliter to test the sensitivity of the RT-PCR assay. The dilution series was run concurrently with the other samples

Results and Discussion:

A total of 7 environmental and 2 effluent samples were analyzed for the presence of human enteric virus or Hepatitis A virus genomes by RT-PCR.

Arroyo Burro Beach

The sample collected at Arroyo Burro on 10-10-99 was negative for both enteric viruses and Hepatitis A viruses. The positive controls had bands of the expected sizes indicating the lack of any inhibitory substances in the sample.

City College Beach

The sample collected at City College Beach on 10-10-99 was positive for enteric viruses. The agarose gel showed two bands. One faint band of 180 bp and a stronger band at about 100 bp. Since the enteric primers are capable of detecting up to 25 different enteroviral types, multiple banding patterns are not uncommon.

The sample was also positive for Hepatitis A virus. A band of the expected size (125 bp) was visible on the agarose gel.

Mission Creek Beach

The sample collected at Mission Creek on 10-10-99 was positive for enteric viruses. A single band of about 100 bp was visible on the agarose gel.

A negative result was obtained with the hepatitis A primers. The positive control showed a strong band at 125 bp indicating there were no inhibitory substances present that might interfere with the RT-PCR reaction.

Goleta Beach East

The sample collected at Goleta Beach East on 10-16-99 was negative for the presence of enteric viruses. The positive control had a strong band at 196 bp.

The sample was positive for the presence of Hepatitis A virus. There was a faint band of 125 bp present on the gel. The positive control showed a strong band of 125 bp as well.

Goleta Beach West

The sample collected at Goleta Beach West on 10-16-99 was positive for enteric viruses. The agarose gel showed a faint band of about 100 bp. The positive control showed a band of moderate intensity. This would indicate that some inhibition occured but not enough to totally prevent the RT-PCR reaction from occuring.

The sample was negative for the presence of Hepatitis A virus. The positive control showed a band of the expected size.

Hope Ranch Beach

The sample collected at Hope Ranch Beach on 10-16-99 was negative for both enteric virus and Hepatitis A virus. Both positive controls showed strong signals of the expected size.

Hope Ranch Creek

The sample collected on 10-16-99 was negative for enteric viruses. The positive control showed a strong signal of the expected size.

The sample was positive for Hepatitis A virus. There was a strong band on the gel fairly close in intensity to the positive control.

This sample had the clearest positive result out of all the samples tested. It isn't possible to quantify the amount of virus that may be present in a sample by this type of assay but it would be safe to say that there appears to be a fair amount of virus present in this sample.

El Estero Treatment Plant

Previous testing of this sample in June 1999 showed the presence of enteric viruses but the results were somewhat inconclusive due to the presence of inhibitory substances in the sample. The positive controls and the samples both showed weak signals on the agarose gel.

The same sample was tested on 10-20-99 for the presence of Hepatitis A virus. There was a moderate band of the expected size visible on the agarose gel. The positive control showed a band of the correct size.

Whatever was inhibiting the RT-PCR reactions with the enteric virus primers did not seem to have the same effect with the HAV primers. The bands were clearly visible on the gel.

Goleta Sanitary District

Previous testing of this sample in June 1999 showed the presence of enteric viruses. The sample collected at 6 a.m. showed 3 distinct bands. The sample collected at 11:20 a.m. showed one faint band and the 3 p.m. sample was negative.

The 6 a.m. sample was tested for the presence of Hepatitis A virus on 10-20-99. There were no bands visible on the agarose gel although the positive control had a band of the expected size.

Based on the negative result of the 6 a.m. sample, all 3 time points were retested on 10-27-99 for the possible presence of Hepatitis A virus. All 3 samples were negative. The positive controls for the 6 a.m. and 3 p.m. samples were faint but visible. It is possible that there is something in the samples inhibiting the RT-PCR reactions.

Summary

Arroyo Burro Beach:	Enteric viruses (-)	Hepatitis A virus (-)
City College Beach:	Enteric viruses (+)	Hepatitis A virus (+)
Mission Creek Beach:	Enteric viruses (+)	Hepatitis A virus (-)
Goleta Beach East:	Enteric viruses (-)	Hepatitis A virus (+)
Goleta Beach West:	Enteric viruses (+)	Hepatitis A virus (-)
Hope Ranch Beach:	Enteric viruses (-)	Hepatitis A virus (-)
Hope Ranch Creek:	Enteric viruses (-)	Hepatitis A virus (+)
El Estero Treatment Plant	Enteric viruses (+)	Hepatitis A virus (+)
Goleta Sanitary District	Enteric viruses (+)	Hepatitis A virus (-)

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Heal the Ocean: Detection of Human Enteric Viruses and/or Hepatitis A Viruses in Beach Water Samples.

Winter 2000

Alison A. Davis, University of Southern California

College of Letters, Arts and Sciences

Biological Sciences

Reverse transcriptase polymerase chain reaction (RT-PCR) was used for the detection of Hepatitis A viruses or enteroviruses in 20L samples of water collected around the Santa Barbara area. This method is much faster than traditional cell culture methods, which are not sensitive enough to be used for the detection of many types of viruses. This method can be used to detect members of the human enteric virus family, which includes Coxsackievirus, Echovirus and Poliovirus. (A total of 66 serotypes belong to the enterovirus family, the primers used in this study are capable of detecting 25 of those.) For detection of human viruses by RT-PCR, large volumes of seawater (20L) were retrieved from the sampling site using acid-rinsed carboys. The samples were put on ice and transported immediately to the laboratory at the University of Southern California. Concentration of the samples was started as soon as they were delivered. Samples were dispensed into a 40-liter stainless steel pressure vessel and serially pressure filtered through 2 stainless steel filtration units. The first unit housed a glass fiber filter (Whatman, nominal pore size 1.2 μm), and the second unit housed a 0.22 μm Durapore filter. The filtrate was then concentrated to a final volume of 100 ml with the use of a spiral cartridge system (Amicon, Inc., 30kDa molecular weight cutoff, SY130). Centricon-30 centrifugation concentration units were used to bring the sample volume down to a final volume of approximately 1 ml. Previous use of the spiral cartridge concentration method for viruses has demonstrated a recovery of 80%, determined on the basis of the concentration of countable virus particles in the sample.

Reverse Transcriptase Polymerase Chain Reaction (RT-PCR)

Enteroviruses are members of the picornaviridae, a family of single stranded RNA viruses. Detection of human enteric viruses by RT-PCR was performed using modified pan-enterovirus "universal" primers. This primer set can amplify at least 25 enteroviral types, and the relatively short length of the PCR amplicon ensures efficient amplification. Perkin-Elmer's RNA PCR Core kits were used for both sets of RT-PCR. (Enteric virus and Hepatitis A virus.) The target templates produced amplified DNA fragments of 196 bp for the enteric viruses, and 192 bp for the Hepatitis A viruses after 35 cycles. Visualization of amplified DNA was by staining a 1.5 % agarose gel with ethidium bromide and illumination with UV light.

Negative and positive controls were performed for each RT-PCR run. For the negative controls, 2 μl of sterile water was added to the PCR reactions rather than concentrated seawater. The positive controls were samples spiked

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with 1 μl of Hepatitis A virus (obtained from Green Monkey cells in culture) or 1 μl of poliovirus type LsC at 10^5 PFU/100 μl.

Hepatitis A or polio virus were serially diluted down to 10^1 PFU/microliter to test the sensitivity of the RT-PCR assay. The dilution series was run concurrently with the other samples

RNA Extractions From A/E Glass Fiber Filters

A portion of the frozen glass fiber filter was extracted using a Qiagen Rneasy Midi Kit. The total RNA collected was tested for the presence of viral RNA using a Qiagen One Step RT-PCR kit. The same primers were used to test the RNA extracts as were used to test the sea water concentrates.

Results :

A total of 9 environmental samples were analyzed for the presence of human enteric virus or Hepatitis A virus genomes by RT-PCR.

Arroyo Burro Beach

The sample collected at Arroyo Burro on 1-22-00 was positive for enteric viruses but negative for Hepatitis A viruses. The glass fiber filter extracted for this sample gave similar results.

Butterfly Beach

The sample collected at Butterfly Beach on 1-22-00 showed a very light band of the correct size with the enteric primers. The concentrate was diluted 1:10 in an effort to reduce background interference and increase the signal on the gel. Dilution of the concentrate increased the intensity of the band. The positive result was confirmed by RNA extraction of a portion of the frozen glass fiber filter and re-testing with the enteric primers.

The sample was negative for the presence of Hepatitis A virus.

Leadbetter Beach (City College)

The sample collected at Leadbetter Beach on 1-22-00 was negative for both Hepatitis A and enteric viruses. The positive control showed a band of the correct size indicating there were no inhibitory substances present in the concentrate.

Mission Creek Beach

The sample collected at Mission Creek on 1-22-00 was positive for enteric viruses. A single band of about 196 bp was visible on the agarose gel. This positive result was confirmed with the RT-PCR performed on the RNA extracted from this sample.

A negative result was obtained with the hepatitis A primers. The positive control showed a strong band at 192 bp indicating there were no inhibitory substances present that might interfere with the RT-PCR reaction.

Goleta Beach

The sample collected at Goleta Beach on 1-30-00 was negative for the presence of enteric and Hepatitis A viruses. The positive control had a strong band at 196 bp when the sample was diluted 1:10.

Hope Ranch Beach

The sample collected at Hope Ranch Beach on 1-30-00 was negative for both enteric viruses and Hepatitis A virus. The positive control showed a weak and fuzzy band on the gel. The sample was diluted 1:10 and 1:100 in case there were substances inhibiting the PCR reaction. The positive control signal increased in intensity but the sample remained negative.

Hope Ranch Creek

The sample collected on 1-30-00 was negative for enteric and Hepatitis A viruses. The positive control showed a weak signal of the expected size. Dilution of the sample did not improve the result.

Previous testing of water collected at this site indicated a relatively high level of Hepatitis A virus. To confirm that the negative result was not due to contaminants in the sample, the glass filter for this sample was extracted and the RNA was tested for the presence of enteric and hepatitis viral RNA. The sample was negative for the presence of either type of virus.

Carpinteria Beach

The sample collected on 2-11-00 was positive for enteric viruses. There was a light band on the gel of the expected size. The sample tested negative for Hepatitis A virus.

The frozen glass fiber filter from this sample was extracted for RNA. The RT-PCR was positive for the presence of enteric viral RNA confirming the result obtained with the sea water concentrate.

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Heal the Ocean: Detection of Human Enteric Viruses and/or Hepatitis A Viruses in Beach Water Samples.

Summer 2000

Alison A. Davis, University of Southern California

College of Letters, Arts and Sciences

Biological Sciences

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Enteroviruses are members of the picornaviridae, a family of single stranded RNA viruses. Detection of human enteroviruses by RT-PCR was performed using modified pan-enterovirus "universal" primers. This primer set can amplify at least 25 enteroviral types, and the relatively short length of the PCR amplicon ensures efficient amplification. Perkin-Elmer's RNA PCR Core kits were used for both sets of RT-PCR. (Enterovirus and Hepatitis A virus.) Visualization of amplified DNA was by staining a 1.5 % agarose gel with ethidium bromide and illumination with UV light.

Negative and positive controls were performed for each RT-PCR run. For the negative controls, 2 μl of sterile water was added to the PCR reactions rather than concentrated seawater or viral RNA. The positive controls were

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samples spiked with 1 µl of Hepatitis A virus (obtained from Green Monkey cells in culture) or 1 µl of poliovirus type LsC at 10^5 PFU/100 µl.

Hepatitis A and poliovirus were serially diluted down to 10^1 PFU/microliter to test the sensitivity of the RT-PCR assay. The dilution series was run concurrently with the other samples

RNA Extractions From A/E Glass Fiber Filters

A portion of the frozen glass fiber filter was extracted using a Qiagen Rneasy Midi Kit. The total RNA collected was tested for the presence of viral RNA using the Perkin-Elmer RNA PCR Core kit. The same primers were used to test the RNA extracts as were used to test the seawater concentrates.

Results :

A total of 8 environmental samples were analyzed for the presence of enterovirus and Hepatitis A virus genomes by RT-PCR.

Arroyo Burro Beach

The sample collected at Arroyo Burro on 7-2-00 was negative for both Hepatitis A virus and enterovirus. The glass fiber filter and the seawater concentrate gave similar results.

Goleta Beach

The sample collected at Goleta Beach on 7-2-00 was negative for the presence of enterovirus and Hepatitis A virus. The seawater concentrate and the RNA extracted from the glass fiber filter showed the same negative result.

Hope Ranch Beach

The sample collected at Hope Ranch Beach on 7-2-00 was negative for both enterovirus and Hepatitis A virus.

Butterfly Beach

The sample collected at Butterfly Beach on 7-8-00 showed a light band of the correct size with the Hepatitis A primers. The sample tested negative for enterovirus when either RNA or seawater was used for testing.

When the seawater concentrate was tested for the presence of enterovirus, the spiked control showed a strong band at 192 bp indicating the lack of inhibitory substances in the sample.

Leadbetter Beach (City College)

The sample collected at Leadbetter Beach on 7-8-00 was negative for both Hepatitis A and enterovirus. The positive control showed a band of the correct size indicating there were no inhibitory substances present in the concentrate.

Mission Creek Beach

The sample collected at Mission Creek on 7-8-00 was negative for enterovirus. A positive result was obtained with the Hepatitis A primers. The gel showed a light band of the expected size.

Carpinteria Beach

The sample collected on 7-8-00 was positive for Hepatitis A virus. There was a light band on the gel of the expected size. The sample tested negative for enterovirus.

The glass fiber filter from this sample was extracted for RNA. The RT-PCR was negative for the presence of enteric viral RNA confirming the result obtained with the seawater concentrate.

Summerland Beach

The sample collected on 7-8-00 was positive for Hepatitis A virus. There was a moderately strong band on the gel from the RT-PCR. The sample tested negative for the presence of enterovirus.

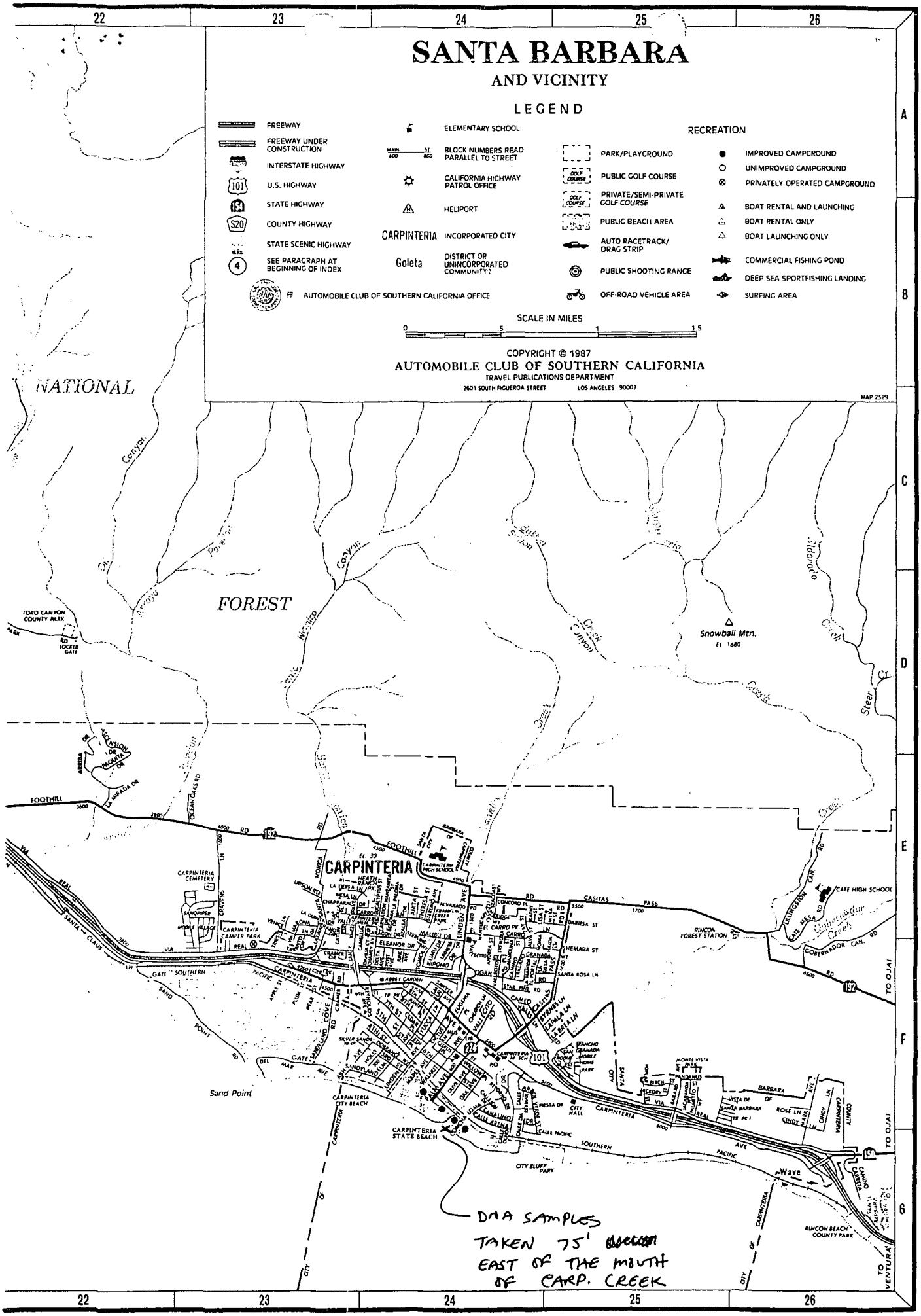
It is not known whether enterovirus have a seasonal pattern but there is definitely a Hepatitis A season. There are high incidences of Hepatitis A outbreaks during the Spring and Summer months.

The many samples tested in this lab seem to agree with this observation. Hepatitis A positive samples were not found during the Winter months, while half of the samples tested this Summer were positive for Hepatitis A viruses.

It will be interesting to see if the warm climate of California extends the Hepatitis A season in to the Fall.

Summary

Arroyo Burro Beach	Enterovirus (-)	Hepatitis A virus (-)
Butterfly Beach	Enterovirus (-)	Hepatitis A virus (+)
Leadbetter Beach	Enterovirus (-)	Hepatitis A virus (-)
Mission Creek Beach	Enterovirus (-)	Hepatitis A virus (+)
Goleta Beach	Enterovirus (-)	Hepatitis A virus (-)
Hope Ranch Beach	Enterovirus (-)	Hepatitis A virus (-)
Carpinteria Beach	Enterovirus (-)	Hepatitis A virus (+)
Summerland Beach	Enterovirus (-)	Hepatitis A virus (+)


SANTA BARBARA
AND VICINITY
LEGEND
FREEWAY
FREEWAY UNDER CONSTRUCTION
INTERSTATE HIGHWAY
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
STATE SCENIC HIGHWAY
SEE PARAGRAPH AT BEGINNING OF INDEX
AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA OFFICE
ELEMENTARY SCHOOL
BLOCK NUMBERS READ PARALLEL TO STREET
CALIFORNIA HIGHWAY PATROL OFFICE
HELIPORT
CARPINTERIA INCORPORATED CITY
Goleta DISTRICT OR UNINCORPORATED COMMUNITY
RECREATION
PARK/PLAYGROUND
PUBLIC GOLF COURSE
PRIVATE/SEMI-PRIVATE GOLF COURSE
PUBLIC BEACH AREA
AUTO RACETRACK/ DRAG STRIP
PUBLIC SHOOTING RANGE
OFF-ROAD VEHICLE AREA
IMPROVED CAMPGROUND
UNIMPROVED CAMPGROUND
PRIVATELY OPERATED CAMPGROUND
BOAT RENTAL AND LAUNCHING
BOAT RENTAL ONLY
BOAT LAUNCHING ONLY
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SCALE IN MILES
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CARPINTERIA CITY BEACH
CARPINTERIA STATE BEACH
CITY BLUFF PARK
Sand Point
RINCON FOREST STATION
CATE HIGH SCHOOL
RINCON BEACH COUNTY PARK
FOOTHILL
CASITAS PASS
SOUTHERN PACIFIC
CARPINTERIA AVE
TO OJAI
TO VENTURA
DNA SAMPLES TAKEN 75' EAST OF THE MOUTH OF CARP. CREEK

file: TMDLs 303(d) List & Impaired Waters Update for 2001

SCAP
SOUTHERN CALIFORNIA ALLIANCE OF PUBLICLY OWNED TREATMENT WORKS

November 1, 2001

Roger Briggs
Central Coast Regional Board
81 Higuera Street, Ste 200
San Luis Obispo, CA 93401 5427

Re: SCAP's List of Principals for the 303(d) Listing Process for 2002

Dear Mr. Briggs:

Attached please find SCAP's final list of Principals for the 303(d) Listing Process for 2002.

We would appreciate a response to our comments on principals for listing criteria.

Sincerely,

Raymond C. Miller
Executive Director

Enclosure

Cc: Angela Carpenter

30200 Rancho Viejo Road, Suite B
San Juan Capistrano, CA 92675
Fax: 949/489-0150 Tel: 949/489-7676

SCAP

949.489.7676 E-mail address: kris@scap.occoxmail.com 949.489.0150 (FAX)

Principals for 303(d) Listing Process

1. Divide 303(d) list into a preliminary (watch) list and an action list. Watch list would be used for further data gathering and assessment.
2. A "transparent" process for listing and de-listing process.
3. A State listing process that includes:
   - A publicly reviewable document
   - A description of how different types of data will be evaluated
   - Explanation of how the following factors will be considered:
     a. data quality, age, degree of confidence, degree of exceedances
   - description of procedures for collecting and using ambient water quality data
   - description of methods and factors to develop a prioritized schedule
   - requirements to develop listing methodology which includes descriptions of factors used to "de-list" water bodies.
4. A weight of evidence approach
   - Consideration of spatial, temporal (at several scales), and hydrologic variations and their effects on water quality
5. For uses related to aquatic life, consider biological indicators as having a greater weight than pollutant concentration levels, to the extent that some waters may have unimpaired beneficial uses even though some chemical criteria have been exceeded. Water quality objectives or criteria that are based on national guidance may not be reflective of local on-site specific conditions.
6. Consider on a case-by-case basis whether or not a water body is oligotrophic, mesotrophic or eutrophic and provide criteria for each type.
7. Eliminate subjective criteria such as "significant amount observed."

8. Control Measures – Recognition of control measures already in place – or expected to be installed within the next listing cycle – that will result in protection of beneficial uses. Control measures that should be considered an adequate basis for de-listing include permits, clean up and abatement, cease and desist, or time schedule orders, and watershed management plans that are enforceable and include a time schedule for compliance with objectives.
9. Analytical and Public Review Process should contain:
   - A thorough explanation of the thinking process that went into each decision should be made available in writing
   - The Regional Board should document each of the types of data that support water quality decision-making and explain how they are used in the context of applicable water quality standards to support different water quality determinations
   - A description of and reference for the quality assurance procedures should be included in water quality assessment and listing documentation. The Regional Board should define data quality requirements and how they utilize and interpret data to make decisions about whether the water body is impaired or attaining water quality standards.
10. Sample Size -- In the CALM draft, EPA is recommending that in order to have a high level of confidence in the results, a sample size of at least 30 samples is necessary. Recognizing that sample size is a big debate, we believe that a statistically-based approach should be used in the listing process, with an adequate sample size. The tremendous implications or attainment/impairment decisions argue for the use of rigorous and statistically-valid data sets.
11. Fact Sheets -- Explain the proposed listings and de-listings, including constituents of concern, the data used, and the water quality standard and the basis for the decision to list or de-list must be provided to the public when the list is made available for public review. This is absolutely essential to enable informed public review, and will go a long way towards instilling confidence in the process and analysis prepared by the Regional Board.

Santa Barbara County
PUBLIC Health
DEPARTMENT

Environmental Health Services

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805/681-4900 • FAX 805/681-4901

Roger Heroux, MPA *Director*
Tara Brown, MBA *Assistant Director*
Elliot Schulman, MD, MPH *Health Officer/Medical Director*

December 6, 2001

Ms. Lisa McCann
Central Coast Regional Water Quality Control Board
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5411

Subject: Total Maximum Daily Loads (TMDLs) scheduling for the Central Coast Regional Water Quality Control Board (RWQCB)

Dear Ms. McCann:
It is the understanding of Santa Barbara County staff that the Regional Board will be considering the scheduling of TMDL development for Region 3. County staff are in support of the RWQCB staff recommendation for TMDL prioritization and scheduling.

Santa Barbara County's local water quality improvement project, Project Clean Water, is focused on program development to reduce pollution to surface and ground water. Program components include:

- Source control Best Management Practices (BMPs)
- Treatment control BMPs
- Creek restoration
- Low flow and wet weather water quality monitoring of creeks
- Nonpoint source pollution reduction through the conversion of onsite sewage disposal systems to sanitary sewer where appropriate

As indicated in the RWQCB staff report for Total Maximum Daily Loads, Consideration of Schedule dated November 16, 2001, the TMDL process encompasses many of the above components. In essence, the overall objective of the TMDL process should be to remove the impacts to beneficial uses. In Santa Barbara County, we are fortunate to already be in a pro-active position of aggressively implementing numerous aspects of water quality improvement projects.

We respectfully request consideration and recognition of the accomplishments that Santa Barbara County is undertaking by the Regional Water Quality Control Board to allow for continuation of these programs which meet the intent and outcomes of the TMDL process. To avoid redundancy of local programs currently in place, it is Santa Barbara County staff's belief that the acceleration of TMDL scheduling on the south coast of Santa Barbara County is not warranted.

If you have any questions regarding this correspondence, please contact me at (805) 681-4927.

Respectfully

Daniel Reid, Project Manager
Project Clean Water/Environmental Health Services

Cc Roger Briggs, Executive Director, CCRWQCB
Jeff Young, Board Member, CCRWQCB
Roger Heroux, Director, Public Health Department, Santa Barbara County
Peggy Langle, Director, Environmental Health Services, Santa Barbara County
Phil Demery, Director, Public Works Department, Santa Barbara County
Tom Fayram, Manager, Flood Control Division, Santa Barbara County
Rob Almy, Manager, Project Clean Water, Santa Barbara County

Swanson Hydrology & Geomorphology

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FINAL

Watershed Resources Management Plan
~ *EXISTING CONDITIONS REPORT* ~

Prepared for

City of Santa Cruz Water Department
and
The Watershed Resources Technical Advisory Task Force

Prepared by

Swanson Hydrology & Geomorphology
Nolan Associates
Steve Singer Environmental and Ecological Services
Pacific Meridian Resources
Dana Bland and Associates
Biotic Resources Group
Pacific Legacy
Max Moritz, PhD.

November 2001

downstream water body (in this case Loch Lomond Reservoir) as a proxy for the ocean. This behavior mimics anadromy and allows the fish to live in the reservoir and grow larger by feeding off other fish but return to their natal stream to spawn. This situation is found in other coastal streams in Central California that have been impacted by reservoirs such as the Santa Ynez River in Santa Barbara County and the Ventura River in Ventura County. Though it is not clear whether this behavior still occurs in Newell Creek, a large individual (>12 inches) observed during a survey in April of 2001 appeared to exhibit this trait. Individuals that do not exhibit this trait would most likely be smaller due to the lack of available food sources. In order for a rainbow trout to grow to a large size (>12 inches) it must become piscivorous, supplementing its diet with small cyprinids ("bait" fish) that would be plentiful in a reservoir. To reproduce, a rainbow trout living in a reservoir would be required to swim into an adjacent stream to spawn.

Results from habitat condition surveys conducted on two reaches of Newell Creek suggest that conditions are similar to other tributaries draining the eastern side of the San Lorenzo Valley with underlying bedrock consisting mostly of highly erodible sandstone (Table 7.2 and Figures 7.4 – 7.7). High fine sediment loads from natural and human-induced sources result in pool filling, loss of escape cover and a general decline in overall aquatic habitat health.

Of particular concern in Newell Creek is the lack of riffle habitat that was 5 and 17 percent of the habitat types surveyed in reaches 16b and 16c, respectively (Table 7.2). The lack of riffle habitat, combined with high embeddedness (Figure 7.4) and percent fines (Figure 7.5) suggests that the lack of aquatic invertebrate production may be limiting overall food production for resident rainbow trout.

Table 7.2: Surveyed Habitat Parameters for fish bearing streams in the City's Watershed Lands

	Proposed Target *from Zayante Sediment Study*	Zayante Tract		Newell Tract		Laguna Tract	
		13e	13g	16b	16c	1	2
Pool Embeddedness (percent)	≤ 25	55	60	50	45	60	55
Riffle/Run Embeddedness	NA	40	45	40	35	45	45
Fines in Pools (percent)	≤ 30	55	60	45	50	60	65
Mean Pool Depth (ft)	NA	1.4	1	1.2	1.3	1.1	1.1
Average Maximum Pool Depth (ft)	NA	2.1	1.6	1.8	1.9	1.6	1.6
Percent Run	NA	13	22	37	39	11	66
Percent Riffle	NA	13	19	5	17	51	7
Percent Pool	NA	74	59	57	43	38	27
Escape Cover Ratio (for Pools)	NA	0.09	0.12	0.10	0.14	0.15	0.10
Rearing Index (percent good to very good)	NA	57	43	64	56	42	18

Swanson Hydrology & Geomorphology

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Watershed Resources Management Plan

Existing Conditions Report

Prepared for

City of Santa Cruz Water Department
and
The Watershed Resources Technical Advisory Task Force

Prepared by

Swanson Hydrology & Geomorphology
Nolan and Associates
Steve Singer Environmental and Ecological Services
Pacific Meridian
Don Alley and Associates
Dana Bland and Associates
Biotic Resources Group
Pacific Legacy
Max Moritz, PhD.

April 10, 2001

Table 2.7.2 Surveyed Habitat Parameters for fish bearing streams in the City's Watershed Lands

	Zayante Tract		Newell Tract		Laguna Tract	
	13e	13g	16b	16c	1	2
Pool Embeddedness (percent)	55	60	50	45	60	55
Riffle/Run Embeddedness	40	45	40	35	45	45
Fines in Pools (percent)	55	60	45	50	60	65
Mean Pool Depth (ft)	1.4	1	1.2	1.3	1.1	1.1
Average Maximum Pool Depth (ft)	2.1	1.6	1.8	1.9	1.6	1.6
Percent Run	13	22	37	39	11	66
Percent Riffle	13	19	5	17	51	7
Percent Pool	74	59	57	43	38	27
Escape Cover Ratio (for Pools)	0.09	0.12	0.10	0.14	0.15	0.10
Rearing Index (percent good to very good)	57	43	64	56	42	18

One of the factors contributing to the introduction of fine sediment to Newell Creek is bank erosion and the contribution of fine sediment to the creek channel (Figure 2.7.1). Bank erosion was most prevalent on the West Fork of Newell Creek just upstream of the confluence with the mainstem. A large landslide on the right bank (looking downstream) has been exacerbated by road development across the landslide resulting in increased erosion. Stabilization of the bank and improved management practices that would reduce erosion of fine-grained sediment into the creek channel would improve aquatic habitat conditions for a considerable distance downstream.

Zayante Tract

Fisheries resources in streams of the Zayante Tract are dominated by steelhead rainbow trout. Anadromous fish streams function as spawning habitat for adult individuals and rearing habitat for juveniles which spend 1 to 2 years to grow to an adequate size to survive in the ocean. Coho salmon historically occurred in Zayante Tract streams up until at least 1981 (Smith, 1982). Their decline is often attributed to degradation of habitat quality due to their requirement for deep pool habitat and adequate escape cover. Impacts to coho salmon include loss of deep pools from fine sediment deposition and a reduction in escape cover from increased embeddedness and policies that encourage the removal of large woody debris from stream channels.

Other native fish found in the Zayante Tract include California roach, Pacific lamprey, Speckled dace, Prickly sculpin, Threespine stickleback and Sacramento sucker (Table 2.7.1). No non-native fish are known to occur within the Zayante Tract though crayfish were identified during habitat surveys.

Steelhead populations occur in both the mainstem of Zayante Creek and Mountain Charlie Gulch. According to studies conducted over the past four years, Zayante Creek constitutes the largest percentage of spawning and rearing habitat for steelhead of all San Lorenzo River tributaries (Alley, 2000). Due to their anadromous behavior, populations of steelhead occurring in these two tributaries to the San Lorenzo River are dependent upon conditions present in the rest of the watershed and ultimately the ocean. Of particular concern is adult steelhead access to streams within the Zayante Tract, especially in drought years. The City of Santa Cruz currently operates two diversion structures downstream of the Zayante Creek

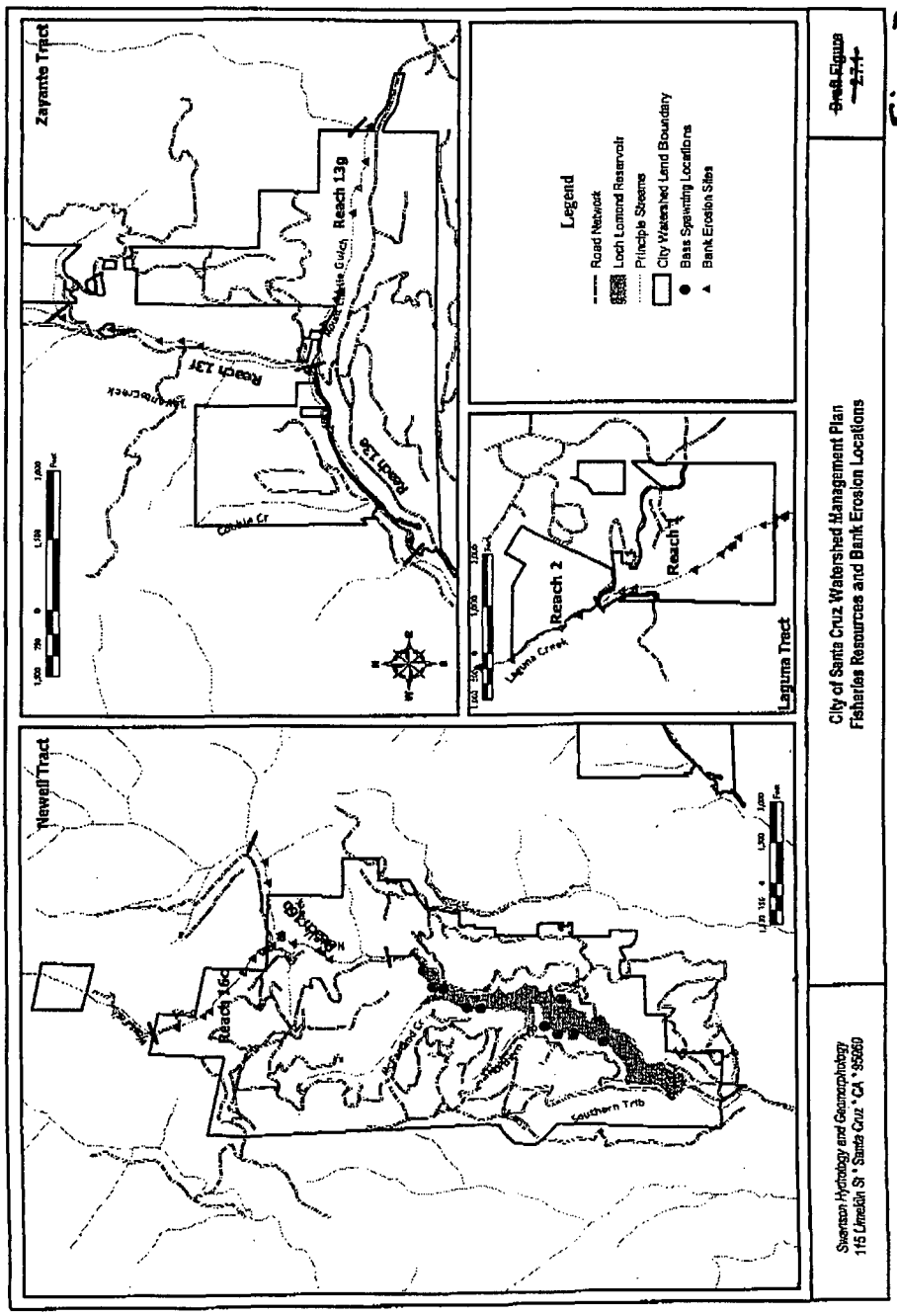
Zayante Tract
Reach 13g
Reach 13f
Reach 13e
Legend
Road Network
Loch Lomond Reservoir
Principle Streams
City Watershed Land Boundary
Base Spawning Locations
Bank Erosion Sites
Reach 2
Reach 1
Laguna Tract
Newell Tract
Reach 16d
Southern Trib
City of Santa Cruz Watershed Management Plan
Fisheries Resources and Bank Erosion Locations
Shannon Hydrology and Geomorphology
115 Limeklin St * Santa Cruz * CA * 95060

Figure 7.3

An Assessment of Streambed Conditions and Erosion Control Efforts in the San Lorenzo River Watershed, Santa Cruz County, California

Prepared for:
Santa Cruz County,
Environmental Health Department

Prepared by:
Barry Hecht
Gary Kittleson

Balance Hydrologics, Inc.

July 1998

Table 4. Sizes and Rock Types of Gravels in the San Lorenzo River, Zayante Creek and Bean Creek, 1979/80 and 1996

				Size Descriptors (in mm)				Overall Lithology (%)			Gravel Lithology (%) 4-64 mm			Cobble & Boulder Lithology (%) > 64 mm		
Stream	Station	Date[a]	N[b]	D50[c]	D16[c]	D84[c]	% < 4	S[d]	X[e]	I[f]	S[d]	X[e]	I[f]	S[d]	X[e]	I[f]
San Lorenzo River	Bar below Felton Diversion	800208	130 + 8	37	17	63	6	51	48	1	45	54	1	50	50	0
		961114	85 + 3	60	31	95	4	50	49	1	60	37	2	45	52	3[g]
Zayante Creek	Riffle above Graham Hill Rd.	790405	88 + 8	69	23	180	8	58	35	7	55	38	7	61	33	7
		800321	240 + 107	111	37	200	31	54	41	5	45	43	5	61	39	0
		961024	162 + 13	40	12	128	7	59	30	11	47	37	15	73	21	5
Zayante Creek	Riffle above Woodwardia Weir	790209	89 + 6	78	27	220	6	49	48	3	46	51	3	52	46	2
		790405	46 + 1	86	38	304	2	43	50	7				53	46	0
		800322	249 + 4	86	31	227	2	54	39	6	43	46	11	65	33	2
		961024	150 + 6	66	26	125	4	50	42	7	52	38	10	50	45	5
Bean Creek	Riffle at 1958 DWR Site	960808	67 + 3	40	19	81	4	33	60	7	24	68	9	42	52	6
Bean Creek	First riffle below Lockhart Gl.	790209	70 + 0	44	27	72	0	48	48	3	44	54	2	63	31	6
		960808	54 + 0	29	12	50	0	50	44	2	49	51	0	64	27	9

Notes:

a. Date of sampling: 790405 is equivalent to April 5, 1979

b. Sample size expressed as number of rocks counted plus number of sampling points with material finer than 4 mm

c. 50th, 16th, and 84th percentile finer than. (D-size represents equivalent diameter of particle size in mm)

d. Sedimentary rocks as percent of total (shales, sandstone, chert, conglomerate)

e. Crystalline rock types as percent of total. Lithology calls by B. Hecht 1979/80 and 1996

f. Introduced rock types as percent of total. Lithology calls by B. Hecht 1979/80 and 1996.

g. Introduced materials noted at this site are cobble-sized material which appears directly related to reconstruction and maintenance of the Felton Diversion, and differ from the nonpoint-source introduced materials found elsewhere.

Table 7
Streams Visited in the Sediment Source Survey

During our field survey, Balance did reconnaisance - level assessments of the following streams and their associated road networks.

STREAM	SEDIMENT SOURCES AND TYPE OF DISTURBANCE
San Lorenzo River	Residential use, roads, trails, timber, commercial
Carbonera Creek	Residential use, roads, commercial
Branciforte Creek	Residential use, roads, commercial
Granite Creek	Residential use, roads, horses
Redwood Creek	Residential use, roads
Jamison Creek	Residential use, roads, timber
Boulder Creek	Residential use, roads, timber, recreation
Robinhood Creek	Residential use, roads, timber
Bracken Brae Creek	Residential use, roads
Foreman Creek	Residential use, roads
Malosky Creek	Residential use, roads
Hubbard Gulch	Residential use, roads, vineyard
Marshall Creek	Residential use, roads
Fall Creek	Residential use, roads, trails
Shingle Mill Creek	Residential use, roads
Gold Gulch	Residential use, roads, quarry
Ruins Creek	Residential use, roads
Bean Creek	Residential use, roads, horses, quarry
Upper Newell Creek	Residential use, roads, timber
Lockhart Gulch	Residential use, roads
Zayante Creek	Residential use, roads, timber
Lompico Creek	Residential use, roads, timber
Love Creek	Residential use, roads, timber
Clear Creek	Residential use, boulder mining
Logan Creek	Residential use, roads, timber
Upper Kings Creek	Residential use, roads, timber
Kings Creek	Residential use, roads, timber
West Bear Creek	Residential use, roads, timber
Two Bar Creek	Residential use, roads
Upper Zayante Creek	Residential use, roads, timber
Bear Creek	Residential use, roads, vineyards, timber
Deer Creek	Residential use, roads, timber
Lompico Creek	Residential use, roads, timber
Connelly Gulch	Residential use, roads
Hopkins Gulch	Residential use, roads, commercial use
Harmon Creek	Residential use, roads
Whalebone Creek	Residential use, roads
Lower Newell Creek	Residential use, roads
Mountain Charlie Gulch	Residential use, timber, roads

Zayante Area Sediment Source Study

Presented to

John Ricker, Water Quality Program Manager
County of Santa Cruz Department of Environmental Health

by

Swanson Hydrology & Geomorphology
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Submitted on

January 31, 2001

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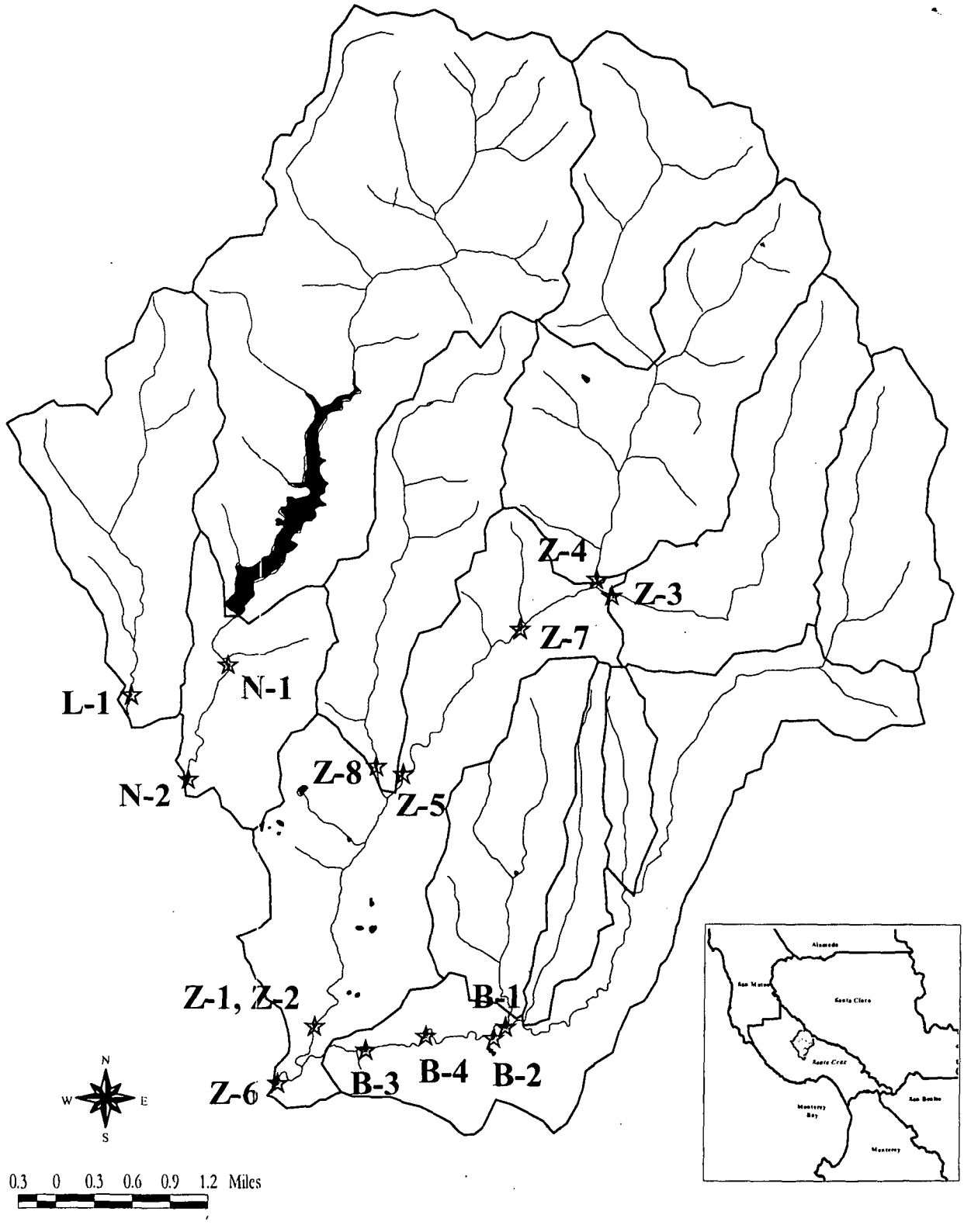

Figure 5.1: Surface pebble count monitoring locations from 1999 surveys

Swanson Hydrology & Geomorphology
*115 Limekiln St * Santa Cruz * CA * 95060*
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that is larger than 50 percent of the total sample), and the end points of the sample standard deviation (D_{16} is the lower end of the sample sediment size being larger than 16 percent of the total sample while D_{84} represents the sample size that is 84 percent larger than the entire sample). This statistical data describes the mean size and the range of sizes within the sample, as well as the percent of fine sediments. The results of pebble counts are shown in **Figure 5.2**.

Particle embeddedness was measured in the pebble counts for grain sizes over 16mm, which was the minimum grain size measured in earlier studies (HEA, 1980). Visually, the embedded portion of a particle appears cleaner than the algae stained unembedded portion, particularly in summer low flow conditions. **Table 5.2** summarizes the measured bed conditions at each monitoring site along with recommended numeric targets. The target reduction in embeddedness is consistent with samples of good quality substrate escape cover measured by Alley (1998), although particles Alley measured were greater than 64 mm.

Table 5.3 summarizes the results from 1978 to 1999 for the repeated sampling locations. In general, there appears to be an increase in sand from 1996 to 1999 at monitoring sites on Zayante and Bean Creeks. The increase in sand in Lower Zayante and Bean Creeks is consistent with an increase in erosion documented in 1998 and 1999 stream surveys (Alley 1998; Don Alley - Personal Communication, 1999). The heavy rains of February 1998 triggered landslides and bank erosion within the riparian corridors of Bean Creek, Lockhart Gulch, and lowermost Zayante Creek.

Table 5.3: Comparison of pebble count sediment size distributions for repeated monitoring sites

Stream	Station	Date	Grain Size Distribution (in mm)			
			D_{50}	D_{16}	D_{84}	% < 4 mm
Zayante	Riffle above Graham Hill Road	4/5/79	69	23	180	8
		3/21/80	111	37	200	31
		10/24/96	40	12	128	7
		6/26/99	53	16	120	16
Zayante	Riffle above Woodwardia Weir	2/9/79	78	27	220	6
		4/5/79	86	38	304	2
		3/22/80	86	31	227	2
		10/24/96	66	26	125	4
		5/22/99	21	8	71	36
		5/22/99	46	8	148	41
Zayante	Above Mountain Charlie Gulch	12/12/78	87	20	236	4
		6/22/99	38	11	222	11
M.C. Gulch	At Confluence w/ Zayante Creek	12/12/78	100	27	228	12
		6/22/78	12	4	182	38
Bean	Riffle at 1958 DWR Site	8/8/96	40	19	81	4
		7/30/99	25	10	57	23
Bean	First Riffle below Lockhart Gulch	2/9/79	44	27	72	0
		8/8/96	29	12	50	0
		6/5/99	24	7	55	42

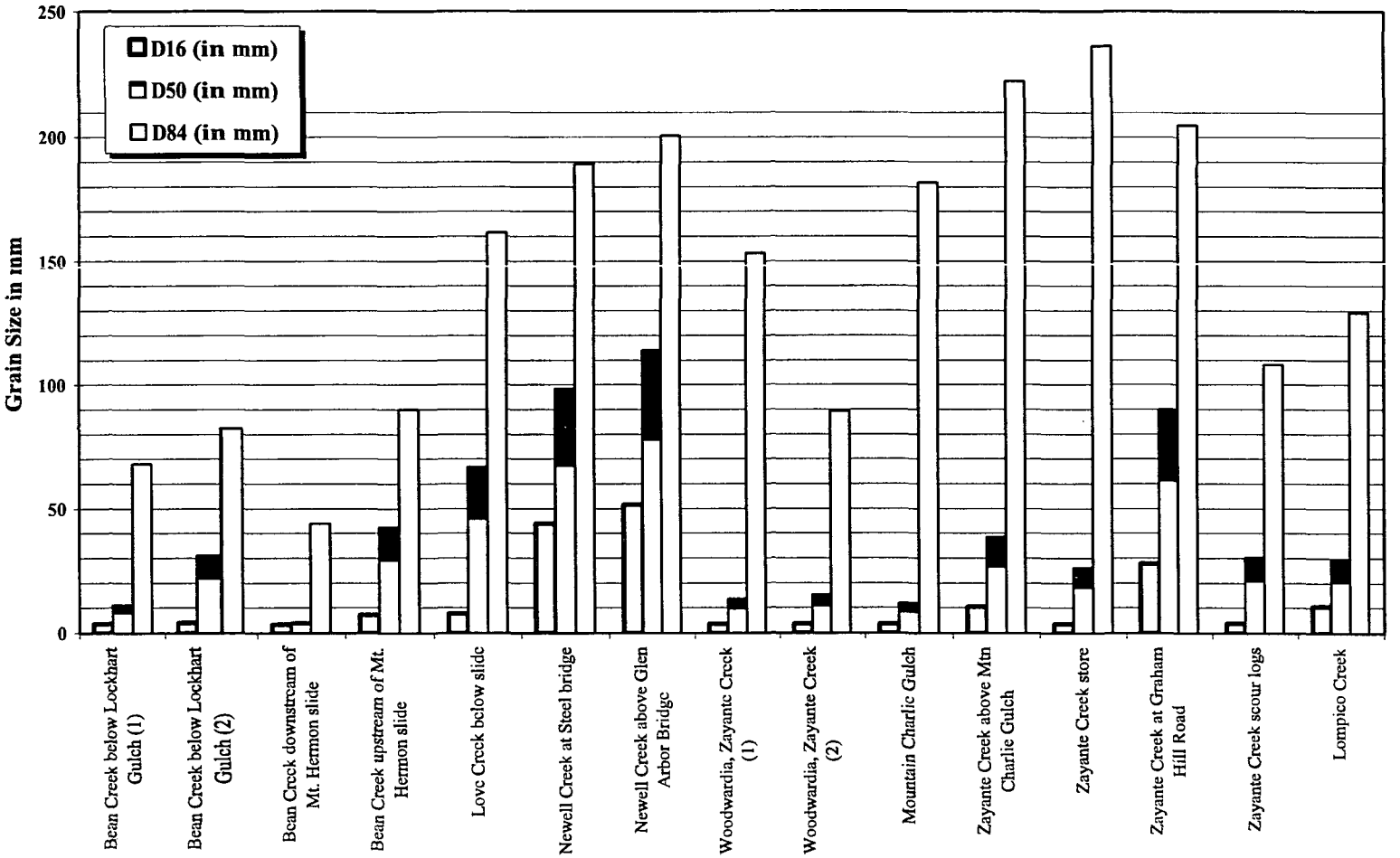

Figure 5.2: Particle size distribution for pebble count sample locations from 1999 by Swanson Hydrology & Geomorphology and Coastal Watershed Council.

Swanson Hydrology and Geomorphology
115 Limekiln Street * Santa Cruz * CA * 95060
tel: 831.427.0288 http://www.swansonh2o.com

Sample ID		Date	Location Description	< 4mm	Pebble Count Embeddedness (particles > 16 mm)
Current Condition	B-1	6/5/99	Bean Creek below Lockhart Gulch	42%	52%
			Proposed Target	**30%**	**25%**
Current Condition	B-2	7/30/99	Bean Creek at 1958 DWR site	23%	50%
			Proposed Target	**30%**	**25%**
Current Condition	B-3	7/10/99	Bean Creek downstream of Mt. Hermon slide	55%	60%
			Proposed Target	**30%**	**25%**
Current Condition	B-4	7/24/99	Bean Creek upstream of Mt. Hermon slide	15%	49%
			Proposed Target	**30%**	**25%**
Current Condition	L-1	9/18/99	Love Creek below slide	12%	44%
			Proposed Target	**30%**	**25%**
Current Condition	N-1	6/19/99	Newell Creek at Steel bridge	1%	23%
			Proposed Target	**30%**	**25%**
Current Condition	N-2	6/19/99	Newell Creek above Glen Arbor Bridge	4%	22%
			Proposed Target	**30%**	**25%**
Current Condition	Z-1	10/21/99	Woodwardia, Zayante Creek	38%	54%
			Proposed Target	**30%**	**25%**
Current Condition	Z-2	5/22/99	Woodwardia, Zayante Creek	34%	47%
			Proposed Target	**30%**	**25%**
Current Condition	Z-3	6/12/99	Mountain Charlie Gulch	38%	24%
			Proposed Target	**30%**	**25%**
Current Condition	Z-4	6/22/99	Zayante Creek above Mtn Charlie Gulch	11%	39%
			Proposed Target	**30%**	**25%**
Current Condition	Z-5	6/19/99	Zayante Creek store	27%	42%
			Proposed Target	**30%**	**25%**
Current Condition	Z-6	6/26/99	Zayante Creek at Graham Hill Road	16%	46%
			Proposed Target	**30%**	**25%**
Current Condition	Z-7	6/12/99	Zayante Creek scour logs	28%	25%
			Proposed Target	**30%**	**25%**
Current Condition	Z-8	11/14/99	Lompico Creek	6%	48%
			Proposed Target	**30%**	**25%**

Table 5.2: Surface pebble count and embeddedness results from the 1999 surveys and proposed targets for each bed census monitoring site.

Swanson Hydrology and Geomorphology
115 Limekiln Street * Santa Cruz * CA * 95060
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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

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.

From: Lisa McCann
To: Wilson, Craig J.
Date: 2/12/02 1:24PM
Subject: 303d List Recommendations Final Tweaks for Reg 3

On Feb. 1 our Board concurred with final recommendations to State Board on our 2002 303d List. Here's what you need to know:
-- On Feb. 1 we proposed adding ten waterbodies for sediment and revised almost ALL priorities and schedules. The attached staff report and attachments reflects the details and supporting documentation for these changes.
- This is follow on to our October recommendations. At that time, we sent you our proposed recommendations with rationale, explanation, data, etc. as requested by Val. After the Board meeting in October, we informed you of a couple of additional changes (see email/transmittal from Angela Carpenter regarding leave San Lorenzo River Estuary listed for Sediment and add Santa Maria River for organochlorine pesticides).

The attached Attachment Two should embody all of the additions, delists, priorities and schedules per our staff's analysis and our Board's additional direction and approvals. Rest assured we won't be tweaking with this anymore and will leave the rest of the work to you guys. Let us know if you have questions about this information.

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CC: Carpenter, Angela; Harris, Ken

Recommendations for Listing Tributaries to the San Lorenzo River for Impairment due to Sedimentation

In response to a request by the Central Coast Regional Board, information on various tributaries to the San Lorenzo River (SLR) were evaluated to determine if the River is impaired due to sedimentation. Five sources of information were reviewed in evaluating the SLR tributaries. Each reference was reviewed and the results of that review were compiled in a database (see Table 1). Table 1 includes columns for the waterbody name, length of named waterbody in miles, whether the waterbody is currently listed for impairment due to sedimentation, and a column for each of the references listed below indicating whether a potential impairment due to sedimentation exists (noted by a check if there is potential impairment).

The references were:

1. A Department of Fish and Game internal memo (DFG, 1996) by Patricia Anderson and Jennifer Nelson that contains qualitative assessments of many of the SLR tributaries for impacts due to sedimentation and potential sediment sources.
2. A study (Hecht, 1998) by Barry Hecht and Gary Kittleson that assessed streambed conditions quantitatively for a small number of SLR tributaries and included a qualitative survey of many of the SLR tributaries.
3. A study by Don Alley (Alley, 2000) that focuses on deriving fish population estimates using a quantitative habitat assessment method along with fish counts in selected reaches. This study provided the bulk of the quantitative data used for evaluating the SLR tributaries for impairment due to sedimentation.
4. A study by Swanson Hydrology & Geomorphology (SH&Ga, 2001) that included a quantitative assessment of the bed conditions of selected tributaries within the Zayante, Bean, Newell and Love Creeks watersheds. This study incorporated the quantitative work (pebble count data) of the Hecht, 1998, work.
5. A study by Swanson Hydrology & Geomorpholgy, et.al (SH&Gb, 2001), for the City of Santa Cruz that included a quantitative habitat assessment for tributaries within the Zayante and Newell Creeks watersheds located on City-owned properties. These assessments were performed by Don Alley using the same methods as in 3, above.

The instream assessment data (Alley, 2000, SH&Ga and b) was weighted the heaviest due to its quantitative nature. The DFG stream assessments and the Hecht source assessments were used as supporting information in determining impairment due to sedimentation. Waterbodies that had quantitative data that indicated potential impairment and also had a qualitative instream assessment and/or a qualitative sediment source assessment were recommended for listing as waterbodies impaired by sediment. This list is shown graphically in Figure 1 and in Table 2.

Three parameters were used when reviewing the quantitative data. These were embeddedness of particles, percent fines in riffle habitat and D_{50} - median particle size. Data that exceed a predetermined value for any of these three parameters are shown in Table 3. The approximate locations of the sites referenced in Table 3 are shown in Figure 2.

Embeddeness was used despite some reservations about its validity as a reproducible method and as a good measure of sediment impacts. Since it is the most extensively gathered parameter within the SLR Watershed it was decided to incorporate it as part of the evaluation process. Sites where embeddedness was greater than 25% were considered to be potentially impaired by sediment. The value of 25% was chosen based on the discussion in Alley (pg. 47).

The methods used for evaluating embeddedness differed between the SH&Ga study and the work performed by Alley. The SH&Ga study measured embeddedness of particles down to 16 mm (5/8 inch) in diameter. Alley measured embeddedness of cobbles and boulders greater than 150 mm (6 inches) in diameter. Also, the SH&Ga study measured embeddedness as part of a pebble count. The pebble count was performed between bankfull limits on either side of the stream. This is cause for concern as Kondolf (2000) has pointed out, since deposition rates are different for different geomorphic features. The fact that different geomorphic features provide different habitats within the stream is also a concern. Riffles, for example, are critical areas for food production and also provide spawning habitat for salmonids. Therefore, pebble counts should be performed within a single geomorphic feature and should not cross feature boundaries in order to quantify impacts to specific habitat. Riffles and point bars are examples of geomorphic features that would be appropriate to use when performing pebble counts. Alley measured embeddedness in specific geomorphic features.

The type of substrate that the particle of interest is embedded in is also critical. Gravels and cobbles embedded in fines (< 4mm) may not provide, or may provide a less than optimum, habitat for benthic macro-invertebrates (BMI) and may not be suitable for spawning. However, cobbles that are embedded in gravels, not fines, provide excellent habitat for BMI within the interstitial spaces created by the gravel around the base of the cobble. Embeddedness within gravels is not a good measure of impact to the habitat for food production.

In Alley (2000, pg.47), embeddedness was estimated as the percent that cobbles and boulders were buried in finer substrate. Embeddedness of cobbles and boulders (d >= 6 inches) greater than 25% can negatively affect habitat for benthic invertebrates. The negative affects of embeddedness on BMI habitat are not independent of substrate type; the embeddedness that impacts BMI production occurs when the substrate consists of fines. Alley states that embeddedness of cobbles and boulders (d >= 9 inches) greater than 25% can impact their usefulness as fish cover. Impacts to fish cover due to embeddedness are independent of the type of substrate in which the boulders are embedded. The impacts due to embeddedness are subtler for fish cover versus BMI habitat. For example, if a boulder 12-inches in diameter or greater were embedded 25%

in a fine substrate, it would still appear to have some value for fish cover (assuming that it provides at least the same cover that would be provided by a 9-inch diameter boulder).

In contrast, a cobble or boulder of any size that is embedded 25% in a fine substrate has lost a substantial part of its ability to provide BMI habitat.

It appears from the results of the measurements on the lower Newell Creek that "finer substrate" includes gravels in this case. It is also unclear what criteria was used in the SH&Ga study, although their results on the lower Newell Creek indicate that embeddedness in gravels may also have been used as a measure of embeddedness. The lower Newell Creek is of particular interest because it is downstream of Loch Lomond Reservoir and is considered to be a sediment-starved reach due to the filtering capacity of the reservoir. The SH&Ga study measured the percent fines < 4mm as 1 % (Site N-1) and 4% (Site N-2) at the two monitoring points downstream of the reservoir but measured embeddedness as 23% (Site N-1) and 22% (Site N-2) at the same sites. The D_{50} was measured as 99 mm (Site N-1) and 124 mm (Site N2), which compared to a recommended minimum of 37 mm, indicates that this is not a stream that is impaired by sediment. Alley estimated the percent fine sediment in riffle habitat at a point downstream of the reservoir (Reach 16) as 10% in 1999, with a corresponding 37.5% embeddedness measurement. The percent fines percentages are in line with what would be expected downstream of a reservoir. The embeddedness values, especially the Alley value, appear to be inconsistent with the fines and D_{50} values and indicate that embeddedness was measured within a gravel substrate and not a substrate composed of fines. Therefore, staff recommends that the lower Newell Creek not be added to the list of impaired waterbodies.

The value of percent fines greater than 30% in riffles was used as another measure of impairment. "Generally, fine sediment content in excess of 30 percent has been found detrimental to spawning success and primary benthic invertebrate productivity" (SH&Ga, pg. 44). Alley visually estimated percent fines in riffles to the nearest 5%. The percent fines data in SH&Ga were measured using pebble counts where fines were defined as particles <4 mm in diameter. Pebble counts are typically performed by randomly selecting a number of points (preferably at least 100 points) in a riffle and recording the size of the substrate at each point. The percentage of points within a site that have a substrate size <4 mm is the "percent fines" for that site.

D_{50} was also used as another measure of potential impairment. The D_{50} for a site is derived from the pebble count data and is the median particle size for a given site. The D_{50} is that particle size that is greater than 50% of the total sample. A value of 37 mm was chosen as the minimum D_{50}, which is consistent with the numeric targets contained in the current draft of the San Lorenzo River Sediment TMDL. An average for a reach was not used, as recommended in the draft TMDL because the available data was not collected on a reach basis and therefore does not allow for an average to be calculated.

As pointed out above in the embeddedness discussion, the pebble count performed as part of the SH&Ga study did not use an optimum technique, but it is felt that the results of the

pebble count for percent fines and D_{50} do provide an indication of impairment due to sediment.

Variability of the data between years was not addressed in the criteria, since much of the monitoring has not been performed over a long enough period of time to derive a

measure of variability. Therefore, the latest available data were used to evaluate impairment of the tributaries.

Conclusions

Staff recommends that the tributaries to the San Lorenzo River listed in Table 2 be added to the list of impaired waterbodies (303d list) due to impairment caused by sedimentation.

It should be noted that the field methods used to determine impairment due to sedimentation will need to be modified in order to use them for ongoing monitoring to support the TMDL.

Table 1
2002 303(d) List
San Lorenzo River Watershed - Potentially Sediment Impaired Waterbodies

Waterbody	*Miles*	*Currently Listed*	*DFG (1996)*	*Hecht (1998)*	*Hecht Source*	*Alley (2000)*	*S&Ga (2001)*	*SH&Gb (2001)*
Bean Creek	6.2			X		X	X	X
Bear Creek	8.6			X		X	X	
Boulder Creek	7.8		X		X	X		
Bracken Brae Creek	0.8		X		X			
Branciforte Creek	7.3		X			X		
Carbonera Creek	5.0	X	X		X	X		
Clear Creek	2.2		X		X			
Connely Gulch	2.0		X		X			
Deer Creek	3.9		X		X			
Fall Creek	6.1		X		X	X		
Foreman Creek	1.3		X		X			
Harmon Gulch (Creek)	0.9		X		X			
Hopkins Gulch	1.0		X		X			
Hubbard Gulch (Marshall Creek)	1.5		X		X			
Jamison Creek	2.2		X		X			
Kings Creek	4.5		X		X	X		
Lockhart Gulch	2.8		X		X			
Logan Creek	1.6		X		X			
Lompico Creek	4.6	X	X		X		X	
Love Creek	3.9		X		X		X	
Malosky Creek	0.9		X		X			
Mountain Charlie Gulch	1.4				X			X
Newell Creek (Lower)	1.8				X	X		
Newell Creek (Upper)	3.6		X		X			X
Ruins Creek	2.7		X		X			
San Lorenzo River	25.0	X	X		X	X		
Shear Creek	1.5		X					
Shingle Mill Creek	1.6	X	X		X			
Two Bar Creek	4.0		X		X			
Whalebone Gulch	1.7		X		X			
Zayante Creek	7.1		X		X	X	X	

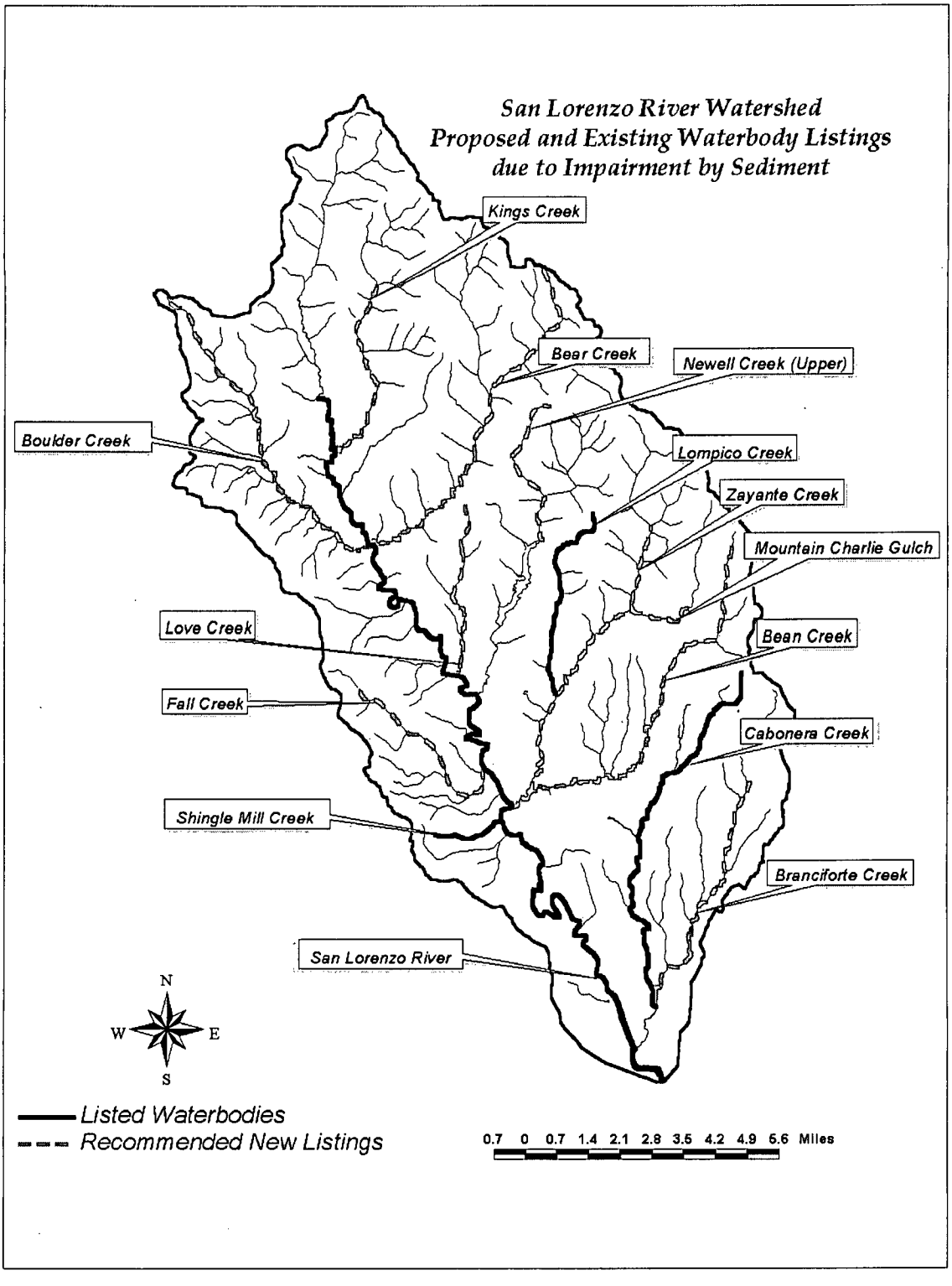

Figure 1 Current and Proposed Listed Waterbodies

Table 2
2002 303(d) List
San Lorenzo River Watershed
Recommended Listings for Waterbodies Impaired by Sediment

Waterbody	*Miles*	*Cause*
Bean Creek	6.2	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, Residential use, roads, horses, quarry
Bear Creek	8.6	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, Residential use, roads, vineyards, timber
Boulder Creek	7.8	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, Residential use, roads, timber, recreation
Branciforte Creek	7.3	Logging in upper watershed, Improper/Illegal
Fall Creek	6.1	Trail system in Fall State Park (stream mile 1 and above), bank erosion/slumping, Residential use, roads, trails
Kings Creek	4.5	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, Residential use, roads, timber
Love Creek	3.9	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, agriculture (marijuana), Residential use, roads, timber
Mountain Charlie Gulch	1.4	Residential use, timber, roads
Newell Creek (Upper)	3.6	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, landslides and flood of 1982 have increased sedimentation in creek, Residential use, roads, timber
Zayante Creek	7.1	Improper/Illegal grading of private roads and homesites, lack of vegetation around homesites, Residential use, roads, timber

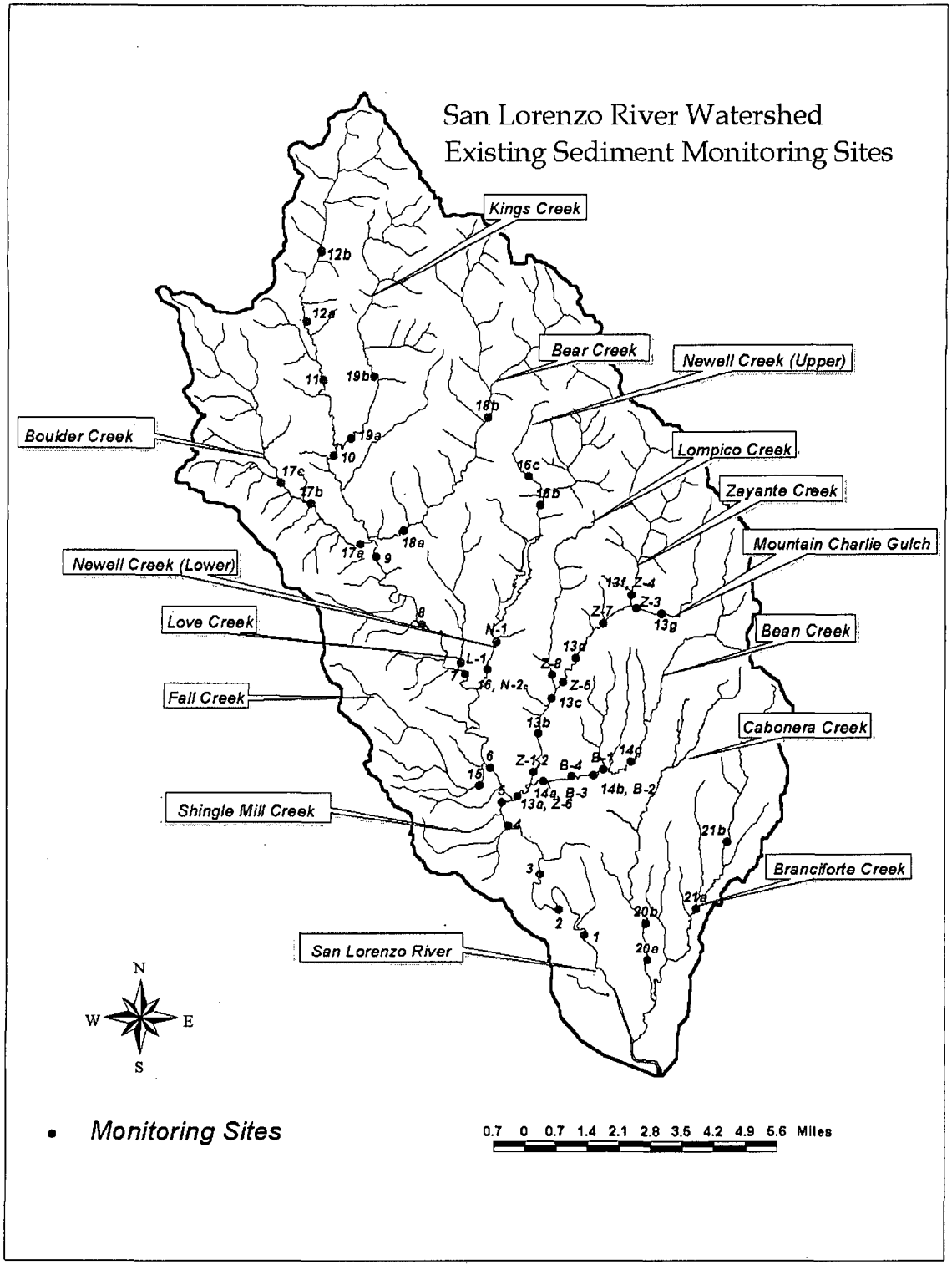

Figure 2 Sediment Monitoring Sites

Table 3 Quantitative Criteria and Measured Values that Exceed Criteria

Waterbody	*Criteria*	*Measured Value*	*Source*
Branciforte Creek	Riffle/Run Embeddedness >25%	Site 21a – 60% Site 21b – 37.5%	Alley, 2000
	Fine Sediment in Riffles > 30%	Site 21a – 40%	Alley, 2000
Zayante Creek	Riffle/Run Embeddedness >25%	Site 13a – 45% Site 13b – 45%	Alley, 2000
		Site 13e – 40%	SH&Gb, 2001
		Site Z-1 – 54% Site Z-2 – 47% Site Z-4 – 39% Site Z-5 – 42% Site Z-6 – 46%	SH&Ga, 2001
	Fine Sediment in Riffles > 30%	Site 13b – 40% Site 13c – 50% Site 13d – 45%	Alley, 2000
		Site Z-1 – 38% Site Z-2 – 34%	SH&Ga, 2001
	D50: 37 mm (minimum for a reach)	Site Z-1 – 12 mm Site Z-2 – 14 mm Site Z-5 – 24 mm Site Z-7 – 30 mm	SH&Ga, 2001
Mt. Charlie Gulch	Riffle/Run Embeddedness >25%	Site 13g – 45%	SH&Gb, 2001
	Fine Sediment in Riffles > 30%	Site Z-3 – 38%	SH&Ga, 2001
	D50: 37 mm (minimum for a reach)	Site Z-3 – 11 mm	SH&Ga, 2001
Bean Creek	Riffle/Run Embeddedness >25%	Site 14a – 50% Site 14b – 60%	Alley, 2000
		Site B-1 – 52% Site B-2 – 50% Site B-3 – 60% Site B-4 – 49%	SH&Ga, 2001
	Fine Sediment in Riffles > 30%	Site 14a – 45%	Alley, 2000
		Site B-1 – 42% Site B-3 – 55%	SH&Ga, 2001
	D50: 37 mm (minimum for a reach)	Site B-1 – 24 mm Site B-2 – 25 mm Site B-3 – 6 mm	SH&Ga, 2001
Fall Creek	Riffle/Run Embeddedness >25%	Site 15 – 47.5%	Alley, 2000
	Fine Sediment in Riffles > 30%	Site 15 – 40%	Alley, 2000
Newell Creek (Lower)	Riffle/Run Embeddedness >25%	Site 16 – 37.5%	Alley, 2000
Newell Creek (Upper)	Riffle/Run Embeddedness >25%	Site 16b – 40% Site 16c – 35%	SH&Gb, 2001
Love Creek	Riffle/Run Embeddedness >25%	Site L-1 – 44%	SH&Ga, 2001
	D50: 37 mm (minimum for a reach)	Site Z-8 – 30 mm	SH&Ga, 2001
Boulder Creek	Riffle/Run Embeddedness >25%	Site 17a – 40% Site 17b – 37.5% Site 17c – 45%	Alley, 2000
Bear Creek	Riffle/Run Embeddedness >25%	Site 18a – 37.5% Site 18b – 40%	Alley, 2000
Kings Creek	Riffle/Run Embeddedness >25%	Site 19b – 52.5%	Alley, 2000

References

Alley, D.W & Associates (2000), Comparison of Juvenile Steelhead Densities, Population Estimates and Habitat Conditions for the San Lorenzo River, Santa Cruz County, California, 1995-99; with an Index of Adult Returns, for the City of Santa Cruz Water Department and San Lorenzo Valley Water District, June, 2000.

DFG (1996), Department of Fish and Game, Anderson, Patricia and Jennifer Nelson, contained in Streams south of San Francisco Bay Coho Salmon Reference Materials for Registered Foresters, Volume 1

Hecht, Barry, Kittleson, Gary (1998), An Assessment of Streambed Conditions and Erosion Control Efforts in the San Lorenzo River Watershed, Santa Cruz County, California, Balance Hydraulics: July 1998.

Kondolf, G. Mathias, 2000, "Assessing Salmonid Spawning Gravel Quality", Transactions of the American Fisheries Society, 129:pgs. 262-281, 2000.

SH&Ga (Swanson Hydrology & Geomorphology) (2001), Zayante Area Sediment Source Study, Swanson Hydrology and Geomorphology, January, 2001.

SH&Gb (Swanson Hydrology & Geomorphology), Nolan and Associates, Steve Singer Environmental and Ecological Services, Pacific Meridian, Don Alley and Associates, Dana Bland and Associates, Biotic Resources Group, Pacific Legacy, Max Moritz, PhD. (2001), Watershed Management Plan, Existing Conditions Report, Swanson Hydrology and Geomorphology, April, 2001.

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

STAFF REPORT FOR REGULAR MEETING OF FEBRUARY 1, 2002

Prepared on December 26, 2001

ITEM: 7

SUBJECT: Changes to the 2002 303(d) List of Impaired Water Bodies

SUMMARY:

The State is required to identify a list of impaired water bodies requiring water quality-based controls, or Total Maximum Daily Loads (TMDLS), under Section 303(d) of the Federal Clean Water Act (CWA). The last list was prepared in 1998. The Regional Water Quality Control Board, Central Coast Region (Regional Board) considered public comments and provided recommended changes to the 1998 303(d) List to the State Water Resources Control Board (State Board) at a regular Board Meeting on October 26, 2001. At that meeting the Board agreed with the staff recommendations to reevaluate some additional data and information and reconsider priorities and schedules for a few waterbodies.

Staff reevaluated the data and information, and reconsidered the priorities and schedules. The results are presented in this staff report and the attachments to this staff report. The Board will determine if these revisions to the 303(d) List should be recommended to the State Board.

The State Board will review the recommendations from all the Regional Boards. The State Board will hold a public hearing and consider public comments; finalize the 303(d) List for the whole state; and transmit the 303(d) List to the US Environmental Protection Agency.

DISCUSSION:

Background

At the meeting on October 26, 2001, the Board concurred with most of the proposed changes to the 303(d) List and directed staff to reconsider 1) adding Carpinteria Beach for pathogens, 2) adding several tributaries to the San Lorenzo River for siltation, and 3) changing the start date for Total Maximum Daily Loads for Arroyo Burro and Mission Creeks for pathogens to earlier dates.

As of the meeting on December 7, 2001, staff recommended maintaining the start dates for the Total Maximum Daily Loads for Arroyo Burro and Mission Creeks for pathogens. The Board concurred with this recommendation. Staff indicated that changes to priorities and schedules for many of the existing and proposed listings would be presented for reconsideration at this meeting on February 1, 2002. Additionally, staff had initiated, but not yet completed, reevaluation of the additional data to determine whether to add the new listings for Carpinteria Beach and the tributaries to the San Lorenzo River.

Staff has completed reevaluation of the data and information and reconsidered the priorities and schedules. The results are presented in this staff report and the attachments to this staff report. The Board will determine if these revisions to the 303(d) List should be recommended to the State Board.

Consideration of Data and Information for Listing Tributaries to the San Lorenzo River for Impairment due to Sediment

Information on various tributaries to the San Lorenzo River (SLR) was evaluated to determine if the river is impaired due to sedimentation. Five sources of information were reviewed in evaluating the SLR tributaries. Each reference was reviewed and the results of that review were compiled in a database. Waterbodies that had quantitative data that indicated potential impairment and also had a qualitative instream assessment and/or a qualitative sediment source assessment were recommended for listing as waterbodies impaired by sediment. Three numeric parameters were used when reviewing the quantitative data. These were 1) embeddedness of particles, 2) percent fines in riffle habitat and, 3) D_{50} (median particle size).

The tributaries with data that exceed the appropriate values for any of these three parameters are considered to be impaired for sediment (with the exception of Lower Newell Creek). The tributaries determined to be impaired for sediment include:
Bean Creek, Bear Creek, Boulder Creek, Branciforte Creek, Fall Creek, Kings Creek, Love Creek, Mountain Charlie Gulch, Newell Creek (Upper) and Zayante Creek. Lower Newell Creek is located below Loch Lomond Reservoir. The reservoir traps most of the fines that enter it, thereby "starving" lower Newell Creek of sediment. Careful analysis of the available monitoring data indicates that this section of creek is not impacted by excess sedimentation, therefore it is recommended that lower Newell Creek not be included on the proposed 303(d) list.

These tributaries are shown graphically in Figure 1, Attachment One. These tributaries have also been added to the proposed 2002 303(d) List as shown in Attachment Two. Additions are shown in a highlighted format.

A more detailed discussion of the sources of information, numeric values for the parameters, and data evaluation is contained in Attachment One.

Consideration of Virus Data for Listing Carpinteria Beach (or other Santa Barbara South Coast Waterbodies) for Impairment

At the October 26, 2001 Regional Board meeting, the Regional Board asked staff to review Heal the Ocean virus data for Carpinteria Beach. Heal the Ocean also has virus data for other water bodies and staff reviewed this information as well. The waters with virus data include Arroyo Burro Beach, Arroyo Burro Creek, City College Beach (Leadbetter Beach), Mission Creek Beach, Goleta Beach East, Goleta Slough, Goleta Beach West, Hope Ranch Beach, Butterfly Beach, Hope Ranch Creek, and Summerland Beach.

Staff is recommending the Regional Board not list Carpinteria Beach (nor the other waters) for the following reasons: 1) virus detection methodology is not conclusive enough to indicate a virus problem, 2) the virus data do not represent the weight of evidence for listing, and/or the waterbody is already listed for bacteria or pathogens which will result in TMDL development and implementation actions that will address viruses simultaneously.

The virus detection method used, the Reversetranscriptase-polymerase chain reaction (RT-PCR) method, provides a preliminary indication that virus is present. It detects the presence of viral genetic material. However, this method does not determine the potential infectivity of the virus particle(s), hence the method may be detecting "dead" virus. This information is based on a report by Noble (Noble, R.T. Enterovirus detection in storm drain-impacted waters along the shoreline of the Southern California Bight. Southern California Coastal Water Research Project Annual Report 1999-2000, Southern California Coastal Water Research Project Authority, March 2001). Additionally, *Standard Methods for the Examination of Water and Wastewater*, 1995, states, "current methods for concentrating virus from water are still being researched and continue to be improved." According to Linda O'Connell of

the State Board Ocean Standards Unit, the Ocean Plan does not have virus objectives because there is no sound virus detection method available yet. These waterbodies continue to be monitored for bacteria as pathogen indicators because standards and methods of detection are already established for bacteria.

With the exception of Arroyo Burro Beach, City College Beach (Leadbetter Beach), and Mission Creek Beach, neither Carpinteria Beach data, nor data for the other waters, represents a weight of evidence to support listing. There were fewer positive results (that is, virus "hits" or detections) than negative results (Staff generally listed waters with 50% violation of water quality standards). Specifically, Carpinteria Beach data shows 30% of the samples had positive results for presence of a virus. Furthermore, there are too few data points during the most sensitive period (typically winter for pathogens) to represent a problem worthy of listing based on this virus data.

These data do indicate possible problems at Arroyo Burro Beach, City College Beach (Leadbetter Beach), and Mission Creek Beach if one considers only the weight of evidence approach. However, these water bodies are already covered by the existing 303(d) list. Bacteria and pathogen improvements recommended through TMDLs for these waters will also result in virus improvements.

Proposed Changes to TMDL Priorities and Schedules

A priority ranking is required for listed waters to guide TMDL planning pursuant to 40 CFR 130.7. TMDLs for each listed waterbody and constituent are ranked into high, medium, and low priority categories based on the following considerations:

- water body significance (such as importance and extent of beneficial uses, threatened and endangered species concerns and size of water body);
- degree of impairment or threat (such as number of pollutants/stressors of concern, and number of beneficial uses impaired or threatened);
- conformity with related activities in the watershed (such as existence of watershed assessment, planning, pollution control and remediation, or restoration efforts in the area);
- potential for beneficial use protection or recovery;
- degree of public concern and
- available information.

It should be noted that these considerations can be applied in different ways to different water bodies and pollutants. For example, a water body may be severely impaired, but if there is little likelihood of beneficial use recovery, than a lower priority might be given. Staff also considered the overall need for an adequate pace of TMDL development for all listed waters, and the need to create a flexible schedule that responds to annual revisions to resource allocations, changes in local watershed coordination (e.g., local agency funding, stakeholder involvement, monitoring efforts), and internal changes as staff develops new expertise and gains access to new water quality analysis methods and tools.

TMDL schedules are developed related to the priority assigned. Generally, the highest priority TMDLs will be developed first. Occasionally, a lower priority TMDL will be initiated ahead of a higher priority TMDL for the following types of reasons: 1) in order to leverage funds that are available for a specific purpose or location in a limited window of time; 2) to leverage staff or stakeholder involvement by coordinating an effort on a waterbody ranked as low priority with an existing effort on a waterbody ranked as high priority; and 3) to show program success by completing a TMDL even if it is not one of the highest ranked waterbodies.

In addition to updating the 303(d) List every two years, TMDLs can be rescheduled administratively during the annual update of the Watershed Management Initiative Chapter, which considers a five-year planning horizon. They can also be rescheduled during the annual development of the State's TMDL Program Workplan. TMDL priorities, however, can only be revised during the publicly-reviewed updates to the 303(d) List.

Originally, the priorities and schedules proposed for the 303(d) List Update, as presented at the October 26, 2001 Board meeting, only addressed the newly listed waterbody/pollutant combinations. This was because USEPA, Region IX and State Board staff advised Regional Board staff not to change proposed schedules for previously listed waters (listed prior to and in 1998) as the State's progress on completing TMDLs per the existing schedule continues to be scrutinized and has not yet been well-tested. However, this resulted in inconsistencies and confusion regarding the priorities and schedules for the existing and newly proposed listings on Region 3's 303(d) List. Consequently, staff reevaluated priorities and schedules for all of the waters proposed to remain on or be added to the 2002 303(d) List.

As a result, each listing has been identified as either high[1], high[2], high[3], medium[4], medium[5], low[6] or low[7] priority and shown by footnotes on the 2002 303(d) List in Attachment Two.

The explanation for each numeric superscript is as follows:

High Priority

1) Those waterbodies previously listed as high priority on the 1998 303(d) List AND with TMDL development in progress. (Except San Lorenzo River Estuary which is revised to low priority to coordinate with new studies which have just been initiated.)
2) Those waterbodies previously assigned medium or low prioirity, but have been revised to high due to: new information such as data or public concern, initiation of related watershed activities by others that will aid in TMDL development, increased efficiency by merging TMDL development efforts of separately listed waterbodies.
3) Those waterbodies newly listed on the proposed 2002 303(d) List, scheduled to commence in 2006 when resources become available.

Medium Priority

4) Those waterbodies previously listed as medium priority on the 1998 303(d) List, scheduled to commence in 2006 when resources become available. (Except Aptos and Valencia Creeks for sedimentation because these TMDLs have already been initiated.)
5) Those waterbodies newly listed on the proposed 2002 303(d) List, scheduled to commence in 2006 when resources become available.

Low Priority

6) Those waterbodies previously listed as low priority on the 1998 303(d) List, scheduled to commence in 2011 when resources become available.
7) Those waterbodies newly listed on the proposed 2002 303(d) List, scheduled to commence in 2011 when resources become available.

ATTACHMENTS:

1. Data and Information for Listing Tributaries to San Lorenzo River for Impairment due to Sediment
2. Revisions to Proposed 2002 Central Coast Regional Board 303(d) and TMDL Priority List

RECOMMENDATION:

Approve staff recommendation for additional changes to the 1998 303(d) List as a recommendation to the State Water Resources Control Board for the 2002 303(d) list.

S:\Shared\WB\Watershed Assessment Unit\2001 303(d) List\Follow-Up 303d Info and Hearing\Feb 1 303d Staff Report and Attachments\Staff Report- Changes to 2002 303D List - 12-26-01 .doc

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
B	Monterey Bay South	309.50	Pesticides	Agriculture	Low[6]	10	Miles	2011	2015
			Metals	Surface Mining	Low[6]	10	Miles	2011	2015
B	Monterey Harbor	309.50	Unknown Toxicity	Source Unknown	Low[6]	74	Acres	2011	2015
			Metals	Railroad Slag Pile	High[2]	74	Acres	2001	2007
B	Morro Bay	310.22	Metals	Surface Mining Nonpoint Source Boat Discharges/Vessel Wastes	High[1]	100	Acres	1996	2005
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Construction/Land Development Resource Extraction Channelization Channel Erosion	High[1]	100	Acres	1996	2003
			Pathogens	Upland Grazing Urban Runoff/Storm Sewers Septage Disposal Natural Sources Nonpoint Source	High[1]	50	Acres	1996	2004
B	Moss Landing Harbor	306.00	Pesticides	Agriculture Irrigated Crop Production Specialty Crop Production	Low[6]	160	Acres	2011	2015
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Agriculture-storm runoff Hydromodification Dredging (Hydromod.) Channel Erosion Erosion/Siltation Nonpoint Source	Low[6]	160	Acres	2011	2015
			Pathogens	Agriculture Nonpoint Source Boat Discharges/Vessel Wastes	Low[6]	40	Acres	2011	2015
E	Carpinteria Marsh (El Estero Marsh)	315.34	Priority Organics	Urban Runoff/Storm Sewers	Low[6]	80	Acres	2011	2015
			Nutrients	Agriculture	Low[6]	80	Acres	2011	2015
			Sedimentation/Siltation	Agriculture Construction/Land Development Storm sewers	Low[6]	80	Acres	2011	2015
			Org. enrichment/Low D.O.	Agriculture	Low[6]	80	Acres	2011	2015

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
E	Elkhorn Slough	306.00	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows Contaminated Sediments Erosion/Siltation Nonpoint Source	Low[6]	500	Acres	2011	2015
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Agriculture-storm runoff Channel Erosion Nonpoint Source	Low[6]	50	Acres	2011	2015
			Pathogens	Natural Sources Nonpoint Source	Low[6]	500	Acres	2011	2015
E	Goleta Slough	315.31	Priority Organics	Nonpoint Source	Low[6]	200	Acres	2011	2015
			Metals	Industrial Point Sources	Low[6]	200	Acres	2011	2015
			Sedimentation/Siltation	Construction/Land Development	Low[6]	200	Acres	2011	2015
			Pathogens	Urban Runoff/Storm Sewers	High[2]	200	Acres	2006	2008
E	Moro Cojo Slough	309.10	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows Nonpoint Source	High[2]	345	Acres	2001	2007
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Agriculture-storm runoff Construction/Land Development	Low[6]	345	Acres	2011	2015
E	Old Salinas River Estuary	309.11	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agriculture-irrigation tailwater Agricultural Return Flows Nonpoint Source	High[2]	50	Acres	2001	2007
			Nutrients	Agriculture Irrigated Crop Production Agriculture-irrigation tailwater Nonpoint Source	High[2]	50	Acres	2001	2007
E	Salinas River Lagoon (North)	309.10	Pesticides	Agriculture	High[2]	75	Acres	2001	2007
			Nutrients	Nonpoint Source	High[2]	75	Acres	2001	2007
			Sedimentation/Siltation	Nonpoint Source	High[2]	75	Acres	2000	2005
E	Salinas River Refuge Lagoon (South)	309.10	Pesticides	Agriculture	High[2]	163	Acres	2001	2007
			Nutrients	Agriculture	High[2]	163	Acres	2001	2007
			Salinity/TDS/Chlorides	Agriculture	Medium[4]	163	Acres	2006	2011

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
E	San Lorenzo River Estuary	304.12	Sedimentation/Siltation	Hydromodification	Low[6]	20	Acres	2011	2015
			Pathogens	Urban Runoff/Storm Sewers Natural Sources	High[2]	20	Acres	1999	2005
E	Soquel Lagoon	304.13	Nutrients	Septage Disposal Nonpoint Source	Low[6]	2	Acres	2011	2015
			Sedimentation/Siltation	Construction/Land Development	Medium[4]	2	Acres	2006	2011
			Pathogens	Urban Runoff/Storm Sewers Natural Sources Nonpoint Source	High[2]	2	Acres	2001	2005
E	Tequisquita Slough	305.30	Fecal Coliform	Agriculture Nonpoint Source Natural Sources	Medium[5]	5	Miles	2006	2011
L	Hernandez Reservoir	305.50	Mercury	Subsurface Mining	High[2]	619	Acres	2001	2005
L	Nacimiento Reservoir	309.82	Metals	Subsurface Mining Natural Sources	High[1]	5370	Acres	1997	2003
L	Oso Flaco Lake	312.10	Nitrate	Agriculture Nonpoint Source	Medium[5]	8	Acres	2006	2011
L	Schwan Lake	304.12	Nutrients	Nonpoint Source	Low[6]	32	Acres	2011	2015
			Pathogens	Urban Runoff/Storm Sewers Natural Sources	High[2]	32	Acres	2001	2005
R	Alamo Creek	312.30	Fecal Coliform	Natural Sources Agriculture Range Land	Low[7]	5	Miles	2011	2015
R	Alisal Creek	309.20	Fecal Coliform	Urban Runoff Natural Sources Nonpoint Source Agriculture	Medium[5]	15	Miles	2006	2011
R	Aptos Creek	304.13	Sedimentation/Siltation	Disturbed Sites (Land Develop.) Channel Erosion	Medium[4]	4	Miles	2006	2011
			Pathogens	Urban Runoff/Storm Sewers	High[2]	4	Miles	2001	2005
~~R~~	~~Arroyo Burro Creek~~ (Moved to coastal water section)	~~315.32~~	~~Pathogens~~	~~Urban Runoff/Storm Sewers~~ ~~Nonpoint Source~~	~~Medium~~	~~6~~	~~Miles~~	~~2006~~	~~2011~~
R	Atascadero Creek	309.81	Dissolved Oxygen	Agriculture Urban Runoff Unknown Source	Medium[5]	5	Miles	2006	2011
R	Bean Creek	304.12	Sedimentation/Siltation	Animal Operations Disturbed Sites(Land Development) Erosion/Siltation Nonpoint Source Resource Extraction Road Construction	Low[7]	6.2	Miles	2011	2015

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
R	Bear Creek	304.12	Sedimentation/Siltation	Disturbed Sites(Land Development) Erosion/Siltation Nonpoint Source Road Construction Silviculture Specialty Crop Production	Low[7]	8.6	Miles	2011	2015
R	Blanco Drain	309.10	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agriculture-irrigation tailwater Agricultural Return Flows Nonpoint Source	High[2]	8	Miles	2001	2007
R	Blosser Creek	312.10	Fecal Coliform	Agriculture Pasture Lands Urban Runoff Storm water Natural Sources	Low[7]	5	Miles	2011	2015
R	Boulder Creek	304.12	Sedimentation/Siltation	Disturbed Sites/Land Development Erosion/Siltation Nonpoint Source Road Construction Silviculture	Low[7]	7.8	Miles	2011	2015
R	Bradley Canyon Creek	312.10	Fecal Coliform	Agriculture Urban Runoff Pasture Lands Natural Sources	Low[7]	5	Miles	2011	2015
R	Branciforte Creek	304.12	Sedimentation/Siltation	Erosion/Siltation Nonpoint Source Road Construction Silviculture	Low[7]	7.3	Miles	2011	2015
R	Carbonera Creek	304.12	Nutrients	Nonpoint Source	High[1]	10	Miles	1993	2000
			Sedimentation/Siltation	Construction/Land Development Nonpoint Source	High[1]	10	Miles	1998	2003
			Pathogens	Urban Runoff/Storm Sewers Nonpoint Source	High[2]	10	Miles	2001	2005
R	Carpinteria Creek	315.34	Pathogens	Agriculture Land Disposal Septage Disposal	High[2]	6	Miles	2006	2011
R	Cholame Creek	317.00	Fecal Coliform	Pasture Lands Nonpoint Source Natural Sources	Medium[5]	8	Miles	2006	2011

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Agriculture					
R	Chorro Creek	310.22	~~Metals~~ (proposed for delisting)	~~Resource Extraction~~ ~~Mine Tailings~~	~~High~~	~~11~~	~~Miles~~	~~1996~~	~~2000~~
			Nutrients	Municipal Point Sources Agriculture Irrigated Crop Production Agriculture-storm runoff	High[1]	11	Miles	1996	2003
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Range Land Upland Grazing Agriculture-storm runoff Construction/Land Development Road Construction Resource Extraction Hydromodification Channelization Streambank Modification/Destabilization Channel Erosion Erosion/Siltation Natural Sources Golf course activities Nonpoint Source	High[1]	11	Miles	1996	2003
R	Clear Creek	304.12	Mercury	Resource Extraction	High[2]	2	Miles	2001	2005
R	Espinosa Slough	309.10	Pesticides	Agriculture Urban Runoff/Storm Sewers	High[2]	320	Acres	2001	2007
			Priority Organics	Nonpoint Source	High[2]	320	Acres	2001	2007
			Nutrients	Agriculture Storm sewers	High[2]	320	Acres	2001	2007
R	Fall Creek	304.12	Sedimentation/Siltation	Erosion/Siltation Habitat Modification Nonpoint Source	Low[7]	6.1	Miles	2011	2015
R	Gabilan Creek	309.70	Fecal Coliform	Urban Runoff Nonpoint Source Natural Sources	Medium[5]	4	Miles	2006	2011
R	Kings Creek	304.12	Sedimentation/Siltation	Disturbed Sites/Land Developmen Erosion/Siltation Nonpoint Source Road Construction Silviculture	Low[7]	4.5	Miles	2011	2015
R	Las Tablas Creek	309.81	Metals	Surface Mining	High[1]	13	Miles	1997	2003
R	Las Tablas Creek, North Fork	309.81	Metals	Surface Mining	High[1]	5	Miles	1997	2003
R	Las Tablas Creek, South Fork	309.81	Metals	Surface Mining	High[1]	4	Miles	1997	2003
R	Llagas Creek	305.30	Nutrients	Municipal Point Sources Agriculture Irrigated Crop Production Pasture Land	High[1]	22	Miles	2000	2005

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Agriculture-storm runoff Agriculture-irrigation tailwater Agricultural Return Flows Urban Runoff/Storm Sewers Habitat Modification Nonpoint Source Point Source					
			Sedimentation/Siltation	Agriculture Hydromodification Habitat Modification	High[2]	22	Miles	2000	2005
			Fecal Coliform	Pasture Land Nonpoint Source Natural Sources	Medium[5]	4	Miles	2006	2011
			Chloride	Nonpoint Source Unknown Source	Low[7]	1	Miles	2011	2015
			Dissolved Oxygen	Nonpoint Source Unknown Source Point Source	High[2]	1	Miles	2001	2005
			Sodium	Nonpoint Source Unknown Source	Low[7]	1	Miles	2011	2015
			Total Dissolved Solids	Nonpoint Source Unknown Source	Low[7]	1	Miles	2011	2015
R	Lompico Creek	304.12	Nutrients	Septage Disposal	High[1]	5	Miles	1993	2000
			Sedimentation/Siltation	Construction/Land Development Natural Sources	High[1]	5	Miles	1998	2003
			Pathogens	Septage Disposal Natural Sources Nonpoint Source	High[2]	5	Miles	1999	2005
R	Los Osos Creek	310.22	~~Priority Organics~~ (proposed for delisting)	~~Urban Runoff/Storm Sewers~~	~~High~~	~~10~~	~~Miles~~	~~2001~~	~~2003~~
			Nutrients	Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows	High[1]	10	Miles	1996	2003
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Range Land Upland Grazing Agriculture-storm runoff Hydromodification Channelization Dredging (Hydromod.)	High[1]	10	Miles	1996	2003

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Habitat Modification Removal of Riparian Vegetation Streambank Modification/Destabilization Channel Erosion Erosion/Siltation Natural Sources Nonpoint Source					
			Dissolved Oxygen	Agriculture Urban Runoff Pasture Lands Unknown Sources	High[2]	1	Miles	2000	2003
R	Love Creek	304.12	Sedimentation/Siltation	Disturbed Sites/Land Developmen Erosion/Siltation Nonpoint Source Road Construction Silviculture	Low[7]	3.9	Miles	2011	2015
R	Main Street Canal	312.10	Nitrate	Agriculture Nonpoint Source Urban Runoff	Low[7]	6	Miles	2011	2015
R	Majors Creek	304.11	Sediment/Siltation	Nonpoint Source Silviculture Unknown Sources	Low[7]	4	Miles	2011	2015
R	Mission Creek	315.32	Unknown Toxicity	Urban Runoff/Storm Sewers	Low[6]	9	Miles	2011	2015
			Pathogens	Urban Runoff/Storm Sewers Septage Disposal	High[2]	9	Miles	2006	2011
R	Mountain Charlie Gulch	304.12	Sedimentation/Siltation	Erosion/Siltation Nonpoint Source Road Construction Silviculture	Low[7]	1.4	Miles	2011	2015
R	Newell Creek (Upper)	304.12	Sedimentation/Siltation	Channel Erosion Disturbed Sites/Land Development Erosion/Siltation Nonpoint Source Road Construction Silviculture	Low[7]	3.6	Miles	2011	2015
R	Nipomo Creek	312.10	Fecal Coliform	Urban Runoff Agriculture Natural Sources	Low[7]	5	Miles	2011	2015
R	Orcutt Solomon Creek	312.10	Fecal Coliform	Pasture Lands Nonpoint Source Agriculture Natual Sources	Low[7]	5	Miles	2011	2015
R	Pajaro River	305.10	Nutrients	Agriculture Irrigated Crop Production	High[1]	49	Miles	2000	2005

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Agriculture-storm runoff Agriculture-subsurface drainage Agriculture-irrigation tailwater Agricultural Return Flows Urban Runoff/Storm Sewers Wastewater - land disposal Channelization Removal of Riparian Vegetation Nonpoint Source					
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Range Land Agriculture-storm runoff Resource Extraction Surface Mining Hydromodification Channelization Habitat Modification Removal of Riparian Vegetation Streambank Modification/Destabilization Channel Erosion Natural Sources	High[2]	49	Miles	2000	2005
			Fecal Coliform	Pasture Lands Nonpoint Source Natural Sources	Medium[5]	5	Miles	2006	2011
R	Quail Creek	309.20	Fecal Coliform	Pasture Lands Natural Sources Agriculture	Medium[5]	4	Miles	2006	2011
R	Rider Gulch Creek	305.10	Sedimentation/Siltation	Agriculture Silviculture Construction/Land Development	High[2]	2	Miles	2000	2005
R	Salinas Reclamation Canal	309.20	Pesticides	Minor Industrial Point Source Agriculture Irrigated Crop Production Agriculture-storm runoff Agriculture-irrigation tailwater Agricultural Return Flows Nonpoint Source	High[2]	20	Miles	2001	2007
			Priority Organics	Minor Industrial Point Source Agriculture Irrigated Crop Production Agriculture-storm runoff Agriculture-irrigation tailwater Agricultural Return Flows Urban Runoff/Storm Sewers Source Unknown	High[2]	20	Miles	2001	2007

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
				Nonpoint Source					
			Fecal Coliform	Urban Runoff Pasture Lands Natural Sources Agriculture	Medium[5]	5	Miles	2006	2011
R	Salinas River	309.10	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agriculture-irrigation tailwater Agricultural Return Flows Nonpoint Source	High[2]	50	Miles	2001	2007
			Nutrients	Agriculture	High[2]	50	Miles	2001	2007
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Range Land Agriculture-storm runoff Road Construction Land Development Channel Erosion Nonpoint Source	High[2]	90	Miles	2000	2005
			Salinity/TDS/Chlorides	Agriculture	Medium[4]	50	Miles	2006	2011
R	Salinas River (Upper)	309.81	Chloride	Agriculture Urban Runoff Pasture Lands	Low[7]	25	Miles	2011	2015
			Sodium	Agriculture Urban Runoff Pasture Lands	Low[7]	15	Miles	2011	2015
R	San Antonio Creek (Santa Barbara Co)	315.31	Sedimentation/Siltation	Agriculture Nonpoint Source	Low[6]	6	Miles	2011	2015
R	San Benito River	305.50	Sedimentation/Siltation	Agriculture Resource Extraction Nonpoint Source	High[2]	86	Miles	2000	2005
R	San Lorenzo Creek	309.70	Fecal Coliform	Agriculture Urban Runoff Pasture Lands Natural Sources	Medium[5]	3	Miles	2006	2011

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
R	San Lorenzo River	304.12	Nutrients	Septage Disposal Nonpoint Source	High[1]	25	Miles	1993	2000
			Sedimentation/Siltation	Silviculture Construction/Land Development Land Development Urban Runoff/Storm Sewers	High[1]	25	Miles	1998	2003
			Pathogens	Urban Runoff/Storm Sewers Septage Disposal	High[1]	60	Miles	1999	2005
R	San Luis Obispo Creek (Below W. Marsh Street)	310.24	~~Priority Organics~~, clarified as PCB	~~Industrial Point Sources~~	~~Medium~~	~~9~~	~~Miles~~	~~2001[d]~~	~~2003~~
			PCB	Unknown Sources	Low[7]	9	Miles	2011	2015
			Nutrients	Municipal Point Sources Agriculture Irrigated Crop Production Agriculture-storm runoff	High[1]	9	Miles	1999	2004
			Pathogens	Urban Runoff/Storm Sewers	High[1]	9	Miles	1999	2004
R	Santa Maria River	312.10	Fecal Coliform	Pasture Lands Urban Runoff Agriculture Natural Sources	Low[7]	5	Miles	2011	2015
			Nitrate	Urban Runoff Agriculture Pasture Lands	Low[7]	3	Miles	2011	2015
R	Santa Ynez River	314.00	Nutrients	Nonpoint Source	Low[6]	70	Miles	2011	2015
			Sedimentation/Siltation	Agriculture Urban Runoff/Storm Sewers Resource Extraction	Low[6]	70	Miles	2011	2015
			Salinity/TDS/Chlorides	Agriculture	Low[6]	70	Miles	2011	2015
R	Shingle Mill Creek	304.12	Nutrients	Septage Disposal	High[1]	2	Miles	1998	2001
			Sedimentation/Siltation	Construction/Land Development Nonpoint Source	High[1]	2	Miles	1998	2003
R	Tembladero Slough	309.10	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows Nonpoint Source	High[2]	150	Acres	2001	2007
			Nutrients	Agriculture Irrigated Crop Production Agriculture-storm runoff Agricultural Return Flows Nonpoint Source	High[2]	150	Acres	2001	2007
			Fecal Coliform	Pasture Lands Urban Runoff Natural Sources Agriculture	Medium[5]	10	Miles	2006	2011

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
R	Valencia Creek	304.13	Sedimentation/Siltation	Agriculture Construction/Land Development	Medium[4]	7	Miles	2006	2011
			Pathogens	Agriculture Septage Disposal	High[2]	7	Miles	2001	2005
R	Waddell Creek, East Branch	304.11	Nutrients	Municipal Point Sources	Medium[4]	3	Miles	2006	2011
R	Watsonville Slough	305.10	Pesticides	Agriculture Irrigated Crop Production Agriculture-storm runoff Agriculture-irrigation tailwater Nonpoint Source	Medium[4]	300	Acres	2006	2011
			Metals	Agriculture Urban Runoff/Storm Sewers	High[2]	300	Acres	2001	2005

2002 CENTRAL COAST REGIONAL BOARD 303 (D) AND TMDL PRIORITY LIST

TYPE	WATER BODY NAME	HYDRO UNIT	CAUSES	SOURCE	PRIORITY	SIZE AFFECTED	UNIT	START DATE	END DATE
			Sedimentation/Siltation	Agriculture Irrigated Crop Production Agriculture-storm runoff Nonpoint Source	High[2]	300	Acres	2000	2005
			Pathogens	Urban Runoff/Storm Sewers Source Unknown Nonpoint Source	High[2]	300	Acres	2001	2005
			Oil and grease	Urban Runoff/Storm Sewers Nonpoint Source	High[2]	300	Acres	2001	2005
R	Zayante Creek	304.12	Sedimentation/Siltation	Disturbed Sites/Land Developmen Erosion/Siltation Nonpoint Source Road Construction Siviculture	Low[7]	7.1	Miles	2011	2015
C	Pacific Ocean at Arroyo Burro Beach	315.32	Pathogens	Urban Runoff/Storm Sewers Nonpoint Source	High[2]	6	Miles	2006	2011
C	Pacific Ocean at Arroyo Quemado Beach	315.10	Fecal Coliform	Pasture Lands Nonpoint Source Agriculture Natural Sources	High[3]	2	Miles	2006	2011
			Total Coliform	Pature Lands Nonpoint Source Natural Sources Agriculture	High[3]	2	Miles	2006	2011
C	Pacific Ocean at Jalama Beach	315.10	Fecal Coliform	Pasture Lands Nonpoint Source Natural Sources Agriculture	High[3]	1	Miles	2006	2011
			Total Coliform	Pasture Lands Agriculture Nonpoint Source Natural Sources	High[3]	1	Miles	2006	2011
C	Pacific Ocean at Mission Creek	315.31	Fecal Coliform	Urban Runoff Agriculture Nonpoint Source Natural Sources Unknown Sources	High[3]	5	Miles	2006	2011
			Total Coliform	Urban Runoff Nonpoint Source Sources Unknown Agriculture	High[3]	5	Miles	2006	2011
C	Pacific Ocean at Point Rincon	315.34	Pathogens	Urban Runoff/Storm Sewers Nonpoint Source	High[2]	3	Miles	2006	2011

Footnotes for Attachment Two

The explanation for each numeric superscript is as follows:

High Priority

1) Those waterbodies previously listed as high priority on the 1998 303(d) List AND with TMDL development in progress. (Except San Lorenzo River Estuary which is revised to low priority to coordinate with new studies which have just been initiated.)
2) Those waterbodies previously assigned medium or low prioirity, but have been revised to high due to: new information such as data or public concern, initiation of related watershed activities by others that will aid in TMDL development, increased efficiency by merging TMDL development efforts of separately listed waterbodies.
3) Those waterbodies newly listed on the proposed 2002 303(d) List, scheduled to commence in 2006 when resources become available.

Medium Priority

4) Those waterbodies previously listed as medium priority on the 1998 303(d) List, scheduled to commence in 2006 when resources become available. (Except Aptos and Valencia Creeks for sedimentation because these TMDLs have already been initiated.)
5) Those waterbodies newly listed on the proposed 2002 303(d) List, scheduled to commence in 2006 when resources become available.

Low Priority

6) Those waterbodies previously listed as low priority on the 1998 303(d) List, scheduled to commence in 2011 when resources become available.
7) Those waterbodies newly listed on the proposed 2002 303(d) List, scheduled to commence in 2011 when resources become available.