



SOQUEL CREEK LAGOON MONITORING REPORT, 1992



Prepared for

**CITY OF CAPITOLA
420 Capitola Avenue
Capitola, California 95010**

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Project # 106-02

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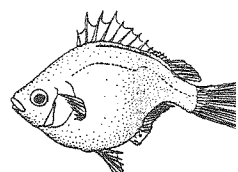


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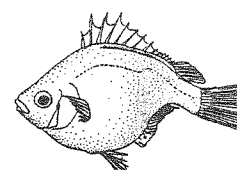


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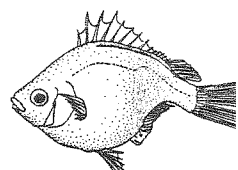
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SOQUEL CREEK LAGOON MONITORING REPORT, 1992

ACKNOWLEDGMENTS

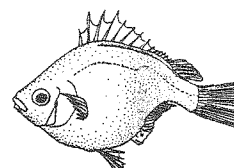
We wish to acknowledge the funding entities for this monitoring work. They were the Coastal Conservancy, with Jim King being the project analyst who obtained state funds, and the City of Capitola with its enlightened City Council which adopted the Soquel Creek Lagoon Management and Enhancement Plan which called for lagoon monitoring. The monitoring was greatly facilitated by the cooperation of City personnel. The experience and skill of Bill Casalegno in constructing the sandbar will be sorely missed when he retires. We have developed an appreciation for his abilities to protect the flume while working quickly and precisely around it.

We wish to thank Nels Westman, and all of the Begonia Festival organizers, for doing another effective job of cleaning up the flowers after the festival in September, 1992.

We are indebted to the volunteer efforts of Dr. Jerry Smith, several of his San Jose State students and friends, the Friends of Soquel Creek and lagoon visitors during the fish sampling in October, 1992. A little girl, about 8 years old, spotted the first of only 2 tidewater gobies collected in the seine that day. She had never seen one before, but knew that it was different from anything else she had seen! Many other children helped that day. Hopefully, we may obtain more volunteer help in 1993.

We wish to thank the Friends of Soquel Creek for their continued interest in the wildlife that live in and around the lagoon and estuary. The long-term health and welfare of this special ecosystem, Soquel Creek Lagoon, will depend on Capitola's citizens.

The cover photograph of Tim Calahan at Capitola Beach was shown on the front page of the May 20, 1992 issue of the San Jose Mercury News. The photographer was Len Lahman. Tim was taking a break from raking the lagoon. We wondered where he went. The caption said that he had "FLIPPED OUT!"



EXECUTIVE SUMMARY

In May, 1992, Soquel Creek meandered east across the beach to the rock jetty before emptying into the Monterey Bay. Fish that may have been in this eastward channel were herded back into the main estuary at the advisement of the Department of Fish and Game. Then the channel was closed off for sandbar construction. After sufficient sand was stockpiled by Mr. Casalegno, clean up of the lagoon was begun. The process of final sandbar closure involved a 3-day process in which the lagoon was opened each morning at low tide. City personnel and Don Alley hand-raked decomposing kelp, sea grass and decomposed ooze out of the lagoon through the opening each day. Each day the sandbar was closed just before high tide in order to prevent salt water incursion. A bull-dozer was used to scrape ooze above the water line down to the lagoon opening for removal. Large conglomerates of plant material above the water line was raked by tractor and spread out in the surf.

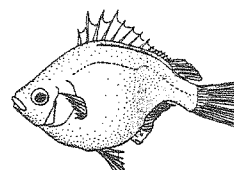
Ninety percent of the decomposing plant material and ooze was removed before sandbar closure. The flume was prepared for fish passage, and the shroud was installed to pull salt water off the lagoon bottom. The lagoon converted to freshwater within a few days, except in deep pockets near the bridge piers. This salt water was flushed out by the summer stormflow on 29-30 June.

Water quality for aquatic life was good with regard to oxygen, salinity, conductivity and cover. However, water temperatures were elevated to near critical levels in July due to clear, fog-less mornings and lower lagoon levels. However, steelhead were able to survive. Fish passage through the flume was excellent. However, the sandbar breached prematurely with an early storm on 29 October. The flume entrance became plugged with aquatic vegetation.

Fish sampling in October indicated that steelhead densities in the lower lagoon were probably lower than the lagoon could support. Sacramento suckers had dramatically entered the lagoon in high numbers and helped to control algal densities. Tidewater gobies were nearly absent downstream of the bridge, unlike in 1988 when densities were high. Staghorn sculpins were abundant upstream of the railroad trestle. Threespine sticklebacks were abundant throughout the lagoon.

Regarding waterfowl, there appeared to be fewer geese, ducks and pigeons using the lagoon in summer. Domestic birds concentrated in the lower lagoon below the bridge, primarily. Bird-feeding by humans appeared to be reduced except for one resident. The 3 remaining geese were commonly seen feeding on aquatic vegetation, indicating fewer handouts.

Pondweed and algae production was delayed in early summer. Aquatic plant production greatly increased during the warm July days. However, floating algae was only a very minor occurrence throughout the summer and fall. The ducks and geese were good

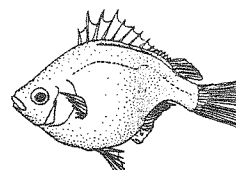


required for algae control in 1992.

Fecal bacterial levels in the lagoon were similar to those in 1991. Fecal coliform counts were above the safety standard for 94% of the weekly monitorings at the flume. However, at the railroad trestle coliform levels met the safety standards for swimming on 61% of the monitorings. At the mouth of Noble Gulch the safety standards were met 66% of the time, despite high coliform levels in Noble Gulch at Bay Street. For the third year, fecal coliform levels increased dramatically during Week 14, 10 days into August. Coliform/streptococcus ratios indicated a human source. Spring testing of restaurant plumbing detected disconnected sewage drains and a broken grease trap pipe. They were repaired before lagoon formation.

Soquel Creek went dry in Soquel Village, downstream of Soquel Avenue, on 12 August 1992. It remained dry until late October when rainfall occurred. Fortunately, streamflow surfaced before reaching the lagoon throughout the summer. Streamflow into the lagoon dwindled to less than 0.1 cfs by 9 October 1992.

Notable new recommendations include the maximizing of lagoon height after July 1. Exclude the walking of dogs on the lagoon path. Move the tidewater goby's interpretive sign. Install of a perimeter fence around the flume by October 1. This will prevent plugging of the flume opening with aquatic plants and premature sandbar breaching.



LAGOON AND ESTUARY FORMATION

Sandbar Construction, 1992. Appendix A provides pictures of the various activities associated with sandbar closure.

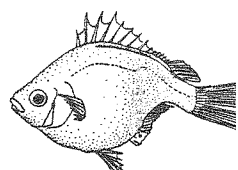
11 May 1992. The City obtained a Fish and Game Permit (Appendix B) to close the sandbar. It stated that no vehicles were to enter the wetted creekbed except within 25 feet of the flume. The Creek was flowing east of the flume across the beach to the rock jetty. The stream went laterally east from the flume and parallel to the coastline for approximately 150 meters and bent abruptly south at the jetty to empty into the surf. It was decided that fish in the east-coursing channel across the beach would be herded back into the lagoon before the sandbar was constructed around the lagoon. A beach seine that extended the full width of the channel was used to herd fish back upstream into the lagoon from this eastward stream section. Then sand was quickly pushed across the channel by Mr. Casalegno to cut it off from the lagoon so that the sandbar could be constructed. Three or four staghorn sculpins were seen in the isolated eastern channel next to the jetty, where cover prevented their capture with the seine. A sizable amount of sea grass had accumulated in the lower lagoon downstream of the Stockton Avenue bridge prior to sandbar closure. It had been decomposing for some time.

The flume was plugged with sand. The boards were removed from the west side of the flume entrance. Water began to trickle out the west exit, which had been opened. Six-inch mesh screen was installed over the flume entrance. Bill Casalegno continued to stockpile sand from the beach throughout the day.

12 May 1992. At 0630hr, the sandbar was closed with the flume flushing at full capacity from a full lagoon. Juvenile steelhead were observed feeding in the lower lagoon. Mr. Casalegno had opened the outlet of the isolated eastern arm at 0600hr to allow any stranded staghorn sculpins to enter the surf. The high tide was at 0756hr and 2015hr. Ed Morrison of the City made sure the exit to the flume was open after the evening high tide so that juveniles could out-migrate as needed.

13-17 May 1992. The sandbar remained closed with Mr. Casalegno stock-piling material for the sandbar each day. The flume exit was unplugged each morning, first thing, if necessary. Ed Morrison made sure that the flume was open each evening after the high tide.

18 May 1992. At 0715hr, Mr. Casalegno opened the sandbar on the east side of the flume in order to flush plant material out of the lagoon. Water was flowing out the flume beforehand. The lagoon was filled mostly with sea grass with little kelp. It had been decomposing for weeks. The entire lagoon bottom, downstream of the bridge had a thick layer of black ooze covered with a thin layer of sand. There was considerably more ooze on the bottom than in 1991. Five City personnel and Don Alley raked the bottom



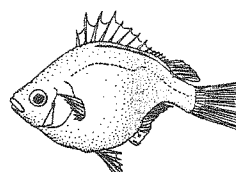
by hand while the lagoon was draining. Mr. Casalegno closed the sandbar at 1015hr before the high tide could bring salt water into the lagoon. The flume was open with the entrance screened.

19 May 1992. At 0730hr, the lagoon was full with water flowing through the flume. Juvenile steelhead were seen feeding near the bridge earlier in the morning. A young sea lion pup was in the lagoon, apparently feeding. Mr. Casalegno opened the sandbar at 0800hr. Hand-raking of the plant material and ooze out of the lagoon was resumed. The sea lion was coaxed out of the lagoon to the beach, and the animal rescue facility was notified. Tim Calahan received a moment of glory when a San Jose Mercury-News photographed him and the sea lion for the newspaper.

There was a layer of ooze and buried plant material, up to 0.3 meters thick adjacent the restaurants, which was difficult to rake out by hand. This area could not be reached with the bulldozer. However, on the west side of the stream channel after the lagoon had mostly drained, we had Mr. Casalegno scrape the ooze down to the edge of the stream channel near the flume so that it could be raked out of the lagoon. The bulldozer did not enter the water. The sandbar was closed at 1030hr before the high tide could bring salt water into the lagoon.

20 May 1992. At 0630hr, Mr. Casalegno opened the sandbar a final time for the final effort to remove plant material from the lagoon. Water was draining freely out the flume beforehand. Hand-raking focused on the lagoon downstream of the bridge and under the bridge. Plastic sheeting was placed around the flume entrance and buried under a thin layer of sand. This would prevent undermining of the flume. A deep spot was contoured on the east side near the flume. The west side of the lagoon was contoured with the bulldozer while it was above the water line. On the west side of the flume entrance, a submerged hole was cut in the planks for adult steelhead out-migrants. Its dimensions were 8 inches wide and 12 inches deep. On the east side of the flume entrance, a V-notch was cut in the upper plank to aide juvenile out-migrants entering the flume. The 12-inch plank placed in the flume the previous spring to create a plunge pool was still in place. The flume's shroud was installed to pull heavier salt water off the lagoon's bottom to be flushed out. Mr. Casalegno closed the sandbar a final time for 1992 at 1100hr, just before the high tide could enter the lagoon. He accomplished this very rapidly with considerable precision and skill.

After three mornings of effort with 3-6 men raking by hand, approximately 90% of the plant material and ooze had been raked out of the lower lagoon, downstream of the Stockton Avenue Bridge. There was insufficient time to rake upstream of the bridge, and ooze still remained by the restaurants where so much plant material had been buried by tidal action. Contrary to 1991, no plant material was buried in the sandbar. All of it was either hand-raked or scraped with the bulldozer or tractor and raked into the bay. This was acceptable to the County

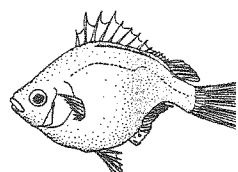


Environmental Health Department. Plant material that was raked across the beach by the tractor was spread out along the beach. No heavy equipment was used on the east side of the lagoon near the restaurants. No contouring was done on the east side of the lagoon while it was drained because it could not be reached without disturbing the stream channel.

Four feral geese fed on plant material after lagoon closure. During the three mornings of raking, 1 dead staghorn sculpin and one dead threespine stickleback were observed. No fish were seen to travel out the channel through the beach after the sandbar was opened each of the three days. The flume had remained open at night for steelhead out-migrants.

Recommendations Regarding Sandbar Construction

1. Evaluate the structural integrity of the flume and its supports. Repair cracks and supports as necessary.
2. During the 2-3 days of construction, continue to close the lagoon each day before the incoming tide can wash salt water and kelp into the lagoon. Continue to re-open the sandbar and unplug the flume each day at low tide to drain out more kelp.
3. Continue to rake as much kelp out of the lagoon as possible before final closure, including kelp trapped under the restaurants.
4. Dispose of kelp from the lagoon during sandbar closure in the bay rather than bury it in the sandbar. Disperse it up and down the beach so as to spread it out. Continue to include this in the Fish and Game permit for sandbar construction. County environmental health has no problem with this so long as kelp is spread out over a wide area (J. Ricker, pers. comm.)
5. Seal off storm drains on the west side of the street in front of the Esplanade, as well as the portals in the walkway to the beach between the Beach House and Zelda's. This should be the case from May 15 to after the clean-up from the Wine Festival in mid-September. Seal off any storm drain pipes leading from the street to the lagoon in front of the restaurants. This will reduce pollution from restaurant clean-up.
6. Attempt to make the area around the flume the deepest part of the lagoon so that heavy salt water will collect there and be pulled out easily by the shroud.
7. Examine the feasibility of filling the area under the restaurants with sand to make it dry underneath.
8. Continue to maintain the portal in the flume entrance for adult steelhead out-migration until June 1, while maintaining a notched top plank for steelhead smolt out-migration until July 1.



9. Continue to maintain the 1-foot high plank inside the flume until July 1 for smolt fish passage.

11. Continue to maintain an 8-inch depth at the outlet of the flume until July 1. Install two 4"x 4" planks in the outlet if necessary as per Fish and Game's suggestion.

12. Develop a system to move the lagoon out from under the restaurants during the summer months in order to reduce accidental pollution and pollution caused by daily cleaning of restaurant dining areas and sidewalks. This may be done by 1) attempting to add a layer of sand under restaurants adjacent to the lagoon sufficient to prevent standing water under the buildings, 2) contouring the lagoon during sandbar construction so that a sand berm is created between the restaurants and the lagoon, with expansion of the lagoon on the west side to make up for loss in volume on the east side, or 3) placement of an inflatable coffer dam alongside the restaurant pilings and back-filling the area under the adjacent to the restaurants with sand. The inflatable dam would be removed at the time of sandbar breaching in the fall/winter.

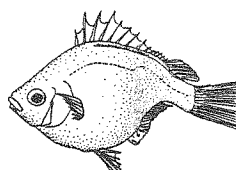
The bolt that was screwed into the piling for sandbar breaching is 1.77 feet above the top of the flume and could be used as an elevational reference point (Appendix A-3). If standing water occurs under the restaurants after one of these options is pursued, stagnation will probably lead to foul odors.

Permission from Fish and Game will be required to contour the lagoon so that the area adjacent to the restaurants is above the level of the water, while increasing the lagoon area on the Venetian Court side. Make sure that an equal area of equal depth is created on the Venetian Court side to make up for losses next to the restaurants. This contouring on the west side should be completed before the contouring on the east side. When working on the west side, it would be easier to avoid the wetted channel if the sandbar was open on the east side of the flume. When working on the east side of the lagoon, it would be easier to avoid the wetted channel if the sandbar was open on the west side. It is crucial to leave the wetted channel undisturbed while moving sand.

Sandbar Breaching During the 1992-93 Rainy Season.

21 October 1992. At 0450hr the sandbar was intact with all boards in place at the flume entrance. The flume was open to the bay with a streamflow of approximately 0.8 cfs. The lagoon gage height was 2.14.

29 October 1992. The City had notched the sandbar at the elevation of the piling bolt (1.77 feet above the elevation of the top of the sandbar and 1.32 feet above top of berm at 443 Riverview Avenue), in anticipation of sandbar breaching from predicted stormflow.



30 October 1992. The first significant storm of the season occurred early in the morning hours, and the sandbar breached before dawn. The sandbar breached despite there being 2-3 feet openings on both sides of the flume entrance. Screens were in place, and algae had plugged the holes in the screening. Streamflow had then gone through the notch in the sandbar instead of through the flume. Jim Turcotte estimated that the lagoon level had reached about 1 foot above the piling bolt before going out the notched sandbar. No complaint of flooding was reported. Our observations of the stream channel at behind Nob Hill Shopping Center indicated that 20-25 cfs was the peak flow the previous night. At 1630hr on 30 October, the streamflow was an estimated 8 cfs as it flowed across the beach to the bay. Photos are in Appendix A.

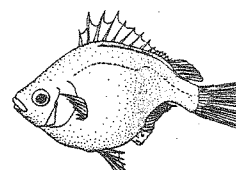
13 November 1992. At 1520hr, the tide was out with a slight berm across the channel to the bay, Thus, the estuary was temporarily separated from the bay at low tide. The estuary was very full with water backed up to behind Nob Hill Shopping Center and a gage height of 2.82. A dead cormorant floated near the flume.

Recommendations Regarding Sandbar Breaching

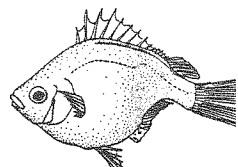
- 1) Recommend to the owners of 443 Riverview that they build a better bulk head to replace the old sandbag wall.
- 2) The notch in the sandbar should be cut slightly lower than the piling bolt.
- 3) Just before the first storm of the fall season, remove 2 boards from each side of the flume. Clear the exit to the flume by removing the plate from one side of the exit. Clear the sand away from the top of the flume back to the first hole cover. Remove the cover and remove the 1-foot plank inside the flume. Replace the hole cover. By October 1, install a temporary perimeter fence in the lagoon around the flume entrance to prevent clogging of the flume with plant material. The fence should be 15 feet from the entrance and extend at least a foot higher than the top of the flume. Clean the pondweed and algae off the fence after each minor stormflow.

Replace the boards after each small storm and remove them before each storm until the sandbar is eventually breached during later, larger storms after approximately Thanksgiving. Remove the hole cover if the entrance of the flume cannot handle the volume of the stormflow in October and early November. After the stormflow subsides, replace the hole cover until the next minor storm.

- 4) If the sandbar breaches early in the rainy season, followed by a period of 2-4 weeks of a reformed sandbar that prevents water exchange with the ocean, attempt to pull the decomposing kelp out of the stagnating lagoon. Open the flume and encourage streamflow out with the shroud installed.



5) If a stagnant, kelp-filled lagoon forms in fall after an early breach and a dry period, do not empty the lagoon by breaching the sandbar. Instead, use the flume to pull salt water out. Breaching of the lagoon will increase the opportunity for more kelp to enter the lagoon and probably will not empty the entire lagoon at any rate. Fish passage need not be maintained through the flume. In fact, passage from the ocean into the lagoon should be discouraged until sufficient stormflows develop to allow good spawning passage up the Creek. If adult salmon or steelhead come in too early, they will become stranded in the lagoon. Artificial breaching without stormflow may strand adult fish.



MONITORING OF PONDWEED AND ALGAL DENSITIES

The lagoon was divided into 3 reaches. Reach 1 extended upstream from the flume to Stockton Avenue Bridge (Figure 10). Reach 2 extended upstream from Stockton Avenue Bridge to the railroad trestle. Reach 3 extended upstream to a point just past the Shadowbrook Restaurant. Appendix A provides photos of pondweed and algae through the summer and fall months.

Table 1 provides a summary of pondweed and algae densities for 1992. Pictures of the lagoon during monitoring times are included in Appendix A. In 1992, pondweed and associated algae did not begin to grow until July. However, a phytoplankton bloom began the first week after lagoon formation and continued through the summer and fall. By 4 August, the entire lagoon bottom was covered with pondweed and associated algae as well as filamentous algae alone. Floating algae was not detected until 17 August. It covered less than 1% of the lagoon's surface. By 10 September, shortly before the Begonia Festival, surface algae covered 1-5% of the lagoon from Reach 1 to 3. By 9 October, floating algae and dead pondweed covered 5-10% of the lagoon's surface. It remained at about this level until the sandbar breached on 29 October. A chronic filamentous algal bloom was present most of the summer at the mouth of Noble Gulch. Its highest level was reached by 9 October, when 80% of the surface was covered with algae within a 15-foot radius of the Gulch.

Residents at 519 and 533 Riverview Drive noted considerable algae in the upper lagoon. On Tuesday, 21 July, behind 519 Riverview Drive the lagoon bottom was 90% covered with algae, and 40% of the surface was covered with algae. Just upstream, algae covered 60% of the surface. Behind 533 Riverview Drive, algae covered 80% of the surface. In this area, the lagoon bends and narrows, thus tending to accumulate algae blown upstream from onshore breezes.

The following Saturday, 25 July, the surface algae had dissipated at 519, but was still thick at 533 Riverview Drive. A beach seine was used by myself and one volunteer to collect the floating algae at that location. In 1-2 hours this was accomplished. The removal provided clear conditions for a time afterwards. On 4 August both areas were still clear of surface algae. By 1 September, at 519 the bottom was 70% covered while the surface was 10% covered with algae. The resident estimated that the algae build up began 5 days previous. At 533, algae covered 40% of the bottom and 20% of the surface.

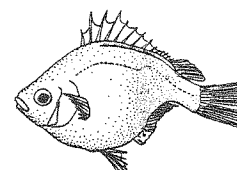
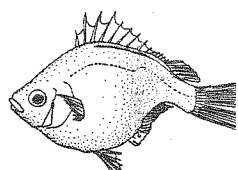


Table 1. Changes in Pondweed and Algae Densities, 1992.

Date	Reach #	Pondweed & assoc. Algae % covering bottom	Algae % bottom	Algae % surface
17-20May92		Sandbar Constructed.		
27May92	1,2,3	No aquatic vegetation present.		
7Jun92	1	0	<1(at bridge pier)	0
"	2	0	0	0
"	3	0	0	0
14Jun92	1	0	1(at bridge pier)	0
"	2	0	1(at trestle base)	0
"	3	0	0	0
30Jun92	Rain			
1July92	1,2,3	Bottom invisible		
21July92	1	35	0	0
"	2	35 (1-2' high)	0	0
"	3	20	0	0
"	Planktonic algal bloom present.			
4Aug92	1	40 (2-3' high)	60 (0.5' high)	0
"	2	35 (2-3' high)	65 (0.5' high)	0
"	3	70 (1-2' high)	30 (0.5' high)	0
"	Noble G.	60 (1-2' high)	40 (1-2' high)	0
"	Planktonic algal bloom continued and dense.			
17Aug92	1	65 (2-3' high)	35 (0.5-1' high)	0
"	2	50 (2-3' high)	50 (0.5' high)	0
"	3	60 (2' high)	40	1
"	Noble G.	40 (2-2.5' high)	60 (0.5' high)	2
1Sep92	1	65	35	<1
"	2	70	30 (0.5-1.5'high)	<0
"	3	50	50 (0.5-1.0'high)	1
"	Noble G.	45	55 (0.5' high)	1
10Sep92	1	90 (3-4' high)	10	1
"	2	80 (3-4' high)	20	2
"	3	60 (3-4' high)	40	5
13Sep92	Begonia Festival			
14Sep92	Begonia Festival clean-up.			
				Algae & Dead pondweed % Floating
9Oct92	1	70 (3-4' high)	28 (.3-.6' high)	10
"	2	80 (3-4' high)	18 (.2-.7' high)	5
"	3	88 (3-4' high)	10 (.5'high)	10
"	Noble G.			80
21Oct92	Rain			
23Oct92	1	90 (4-5' high)	none seen	5
"	2	85 (4.5-5.5' high)	5	7
"	3	70 (4.5-5.5' high)	10	5
"	Noble G.			none
29Oct92	Rain caused a sandbar breach.			



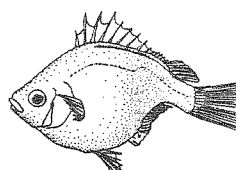
Recommendations for Control of Algae

1. Establish criteria which may be used to decide when algae is excessive, keeping in mind that pondweed and algae provide necessary cover for fish from bird predators. If aquazine is used in mid-summer, apply a low dose to the lower lagoon that will clear out the algae, making it easier for fish to move around and feed on invertebrates, as well as give pondweed a competitive advantage over the algae.

2. Choose to skim off floating algae until just before the Begonia Festival, at which time aquazine may be used to reduce algae before people walk around in the lagoon. The skimming off of algae removes the nutrients stored in the algae and may slow future algal growth. Use of aquazine returns the nutrients to the lagoon during bacterial decomposition. This nutrient release stimulates faster algal growth afterwards.

Offer to donate funds to a volunteer group to skim algae off the lagoon instead of paying to have the lagoon treated with aquazine.

3. If a mid-summer treatment of aquazine is deemed necessary, apply it in a low dose (5 pounds or less) well below the Stockton Avenue Bridge so that no pondweed is killed and only Reaches 1 and 2 will be affected. If pondweed is not present in Reaches 2 and 3 at the time of aquazine treatment, algae control will leave little or no cover for fish, requiring special concern about aquazine spreading upstream of Reach 1 after treatment. In such cases, we recommend that just 2-3 pounds of aquazine be applied near the flume only and in early morning before the onshore breeze develops.



ANALYSIS OF FECAL BACTERIA MONITORING

Fecal Coliform/Streptococcus Counts from Santa Cruz County Monitoring

The summer months were focused on, from the time of sandbar closure (usually mid-May before Memorial Day weekend) to the Begonia Festival (first weekend in September). These are the months in which recreational use of the lagoon would potentially be highest. These are the months in which reductions in fecal bacterial counts would allow swimming in the lagoon. A management goal is to reduce fecal coliform counts below the 200/100 ml level, which is deemed a hazard to health by the Environmental Protection Agency. If this can be done, the lagoon may once again be used for swimming.

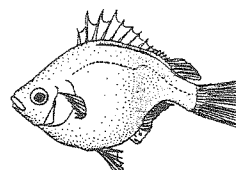
Summer months of 1990, 1991 and 1992 were compared in order to detect any trends or improvements that may be related to initiation of the Lagoon Management and Enhancement Plan.

The Department of Environmental Health in Santa Cruz County collected weekly samples at various stations in the Soquel Creek Creek/Lagoon. Their data were analyzed to evaluate bacterial levels. The discussion will focus on the 3 reaches of the lagoon. Reach 1 (lower lagoon) spanned from the flume to the Stockton Avenue Bridge. Reach 2 (middle lagoon) included the area from the Stockton Avenue Bridge to the railroad trestle. Reach 3 (upper lagoon) went from the trestle upstream to just beyond the Shadowbrook Restaurant. The bacterial sampling station at the flume was used to represent counts in Reach 1. The station at the trestle was used to represent counts in upper Reach 2 and lower Reach 3. No station was present in 1990 or 1991 near the mouth of Noble Gulch until mid-September, 1991. The station at the mouth of Noble Gulch continued through 1992. Therefore, data were only compared between 1991 and 1992 after mid September in upper Reach 3. It must be understood that concentrations of bacteria may vary considerably from one place to another. Therefore, the data only indicated bacterial levels in a general way.

Computer print-outs of actual bacterial counts are in **Appendix C**. Any counts above 4000 that end in 2, such as 4002 or 5002, had too many bacteria to count. In addition, streptococcus counts of less than 100 may be suspect (J. Ricker, S.C. County Envir. Health, pers. comm.).

Fecal Bacterial Counts in Reach 1

Week 3 was the week in which the sandbar was closed. Week 20 was the first week after the Begonia Festival. Counts in 1992 were lower than 1991 at the time of sandbar closure, but somewhat higher or similar to counts in 1991 for the next 8 weeks to Week 10 (Figure 1). The storm runoff on 30 June, just before the



monitoring for Week 8 in 1992, greatly elevated fecal coliform. From Week 11 to Week 20, coliform counts were similar in 1991 and 1992. In the lower lagoon, fecal coliform counts were consistently lower in 1991 compared to 1990. In 1992, 18 weekly samples were taken, and 17 counts were greater than 200/ 100 ml. One of the 3 low counts was right at 200. Therefore, though fecal coliform counts in 1992 were higher than the allowable level for swimming in 94% of the weekly samples at the flume. In 1991, 17 weekly samples were taken, and 14 counts (82%) were greater than 200/ 100 ml at the flume.

Interestingly, in all 3 years of monitoring, coliform levels were dramatically elevated at Week 14, which spanned August 6-10 in the various years. However, after the Begonia Festival in Week 20, fecal coliform bacterial levels dropped below 200/ 100 ml in 1992, while they shot up to above 1500 in the two previous years.

In 1992, fecal streptococcus counts were lower than previous years from mid-July to mid August (Weeks 9-14), though they were sporadically higher earlier and later than this period in 1992 compared to 1991 (Figure 2). As with fecal coliform counts after the Begonia Festival, fecal streptococcus levels were significantly less in 1992 compared to earlier years. Streptococcus was elevated after the rain on 30 June 1992, as was the case for fecal coliform.

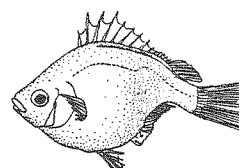
Fecal Bacterial Counts in Upper Reach 2 and Lower Reach 3

Fecal coliform counts in 1992 were generally similar to those in 1991 (Figure 3). Counts were consistently lower in 1991 than 1990 at the railroad trestle, except for mid-July (week 11). In 1990, coliform counts were above the 200/ 100 ml cutoff for environmental safety in 9 of 11 (82%) weekly samples. In 1991, coliform counts were above the cutoff in only 6 of 17 (35%) of the weekly samples. In 1992, counts were above the cutoff in 7 of 18 (39%) of the weekly samples. In 1992, there was no great increase of fecal coliform in mid-July or after the Begonia Festival, as was the case in 1991.

Fecal streptococcus counts in 1992 were generally less than those in 1991, except after the late June rain (Figure 4). Fecal streptococcus counts were generally lower at the trestle in 1991 compared to 1990 except in early July (Week 10).

Fecal Bacterial Counts in Noble Gulch

Fecal coliform and streptococcus counts in 1990, 1991 and 1992 in Noble Gulch were generally much higher than in Soquel Creek Lagoon. The monitoring station was located at the entrance of the tunnel at Bay Avenue. Fecal coliform counts fluctuated wildly in 1992, sometimes higher and sometimes lower than in 1991 (Figure 5). Fecal streptococcus counts in 1992 were usually



lower than in 1991 (Figure 6). Fecal coliform and streptococcus counts fluctuated widely in 1991 at this station and were consistently higher than in 1990. In most cases, counts were at least twice, and many times more than 3 times as high in 1991 compared to 1990. Algal blooms were common at the mouth of Noble Gulch in all three years, indicating a nutrient input from Noble Gulch to the lagoon.

Fecal Bacterial Counts in Reach 3 at the Mouth of Noble Gulch

In 1992, it appeared that despite the high bacterial levels in Noble Gulch adjacent to the Bay Street Park, levels at the mouth in the lagoon were not elevated. This was the case even though ducks commonly roosted on a partially submerged tree stump at the mouth of Noble Gulch.

Fecal coliform bacterial counts were generally low in 1992 except after the late June storm runoff (Figure 7). Counts were above the safety level of 200/ 100 ml for only 6 of 18 (33%) weekly samples from mid-June to late October before sandbar breaching. Only one sampling was above 300/ 100 ml, and that was after the 30 June storm runoff. Three of the four samplings in September, 1991, were higher than during the same period in 1992.

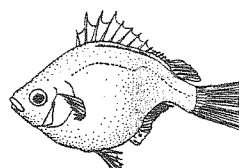
Fecal streptococcus bacterial counts in 1992 were also generally low at the mouth of Noble Gulch except immediately after the 30 June storm runoff and from the Begonia Festival on into October (Figure 8). The counts in September, 1991 were similar to those during the same period in 1992.

Comparison of Fecal Coliform Counts at the Flume, Railroad Trestle and the Mouth of Noble Gulch, 1992.

Fecal coliform bacterial counts generally decreased from Reach 1 near the flume to Reach 3 near the mouth of Noble Gulch (Figure 9). However, counts at the railroad trestle were similarly low compared to those at the mouth of Noble Gulch.

Observations of Dogs and Their Owners Along the Lagoon Path

No fewer than 25 piles of dog excrement were present at the small park just downstream of the trestle on 27May92. They were not counted after that. It was common to see people walk their dogs to the open lot next to the railroad trestle where they relieved themselves. Refer to Appendix A for photos of these areas. On one morning when the opening to the lot was obstructed with trash cans, there were more piles of dog feces than usual on the path parallel to the lagoon. At no time did we observe a dog owner pick up after their dogs. On 1Sep92, the little park at the trestle had been cleared of grass and dog excrement. We do not know where the excrement was disposed of. We do not know where residents dispose of excrement along the path. It is easier and



"cleaner" from the terrestrial point of view to throw it into the lagoon than put in trash cans where it will smell and collect flies. Pet excrement can be a significant source of nutrients and bacteria to the lagoon.

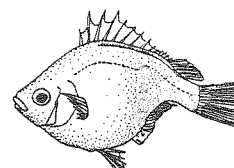
Conclusions from Fecal Bacterial Monitoring

We had concluded that fecal bacterial counts were reduced in 1991 compared to 1990 in reaches 1 and 2 (Alley 1992). Counts in 1992 were similar to those in 1991. In Reach 1 the counts were at unsafe levels for swimming during 82% of the weeks in 1991 and 94% of the weeks in 1992 from the time of sandbar closure to the weekend of the Begonia Festival. On the other hand, in Reach 2 at the trestle, counts were at safe levels of coliform bacteria 65 % in 1991 and 61% in 1992 during the same time period.

Compared to 1990 conditions, reductions in fecal bacteria in Reach 1 continued to be detected in 1992 as occurred in 1991, though they were not low enough to allow swimming. Some reasons for lower counts in 1991 and 1992 may be that there were fewer domestic ducks and geese in the lower lagoon than previously. There may have been less human handouts than before. The water may have been cooler than in 1990, thus, slowing bacterial decomposition. Additional reasons may be that kelp was not buried under the lagoon in 1991 as was the case in 1990. Kelp was largely removed from the lagoon before sandbar closure in 1991 and 1992. An additional improvement in 1992 was that no plant material was buried in the sandbar. Therefore, decomposition was reduced in the sand with less bacteria leaching into the lagoon. There may have been fewer gulls using the lower lagoon for bathing in 1991 and 1992 than 1990. There were no data available from 1990 for comparison, however. Censusing data indicated that the number of gulls in the lagoon was similar in 1991 and 1992. We began to census gulls on the beach in 1992 for future comparisons. Refer to the bird-censusing section of the report for more details.

Reasons for the dramatic increase in fecal bacteria counts during Week 14 in all three years, 1990-92. are unknown. The ratios of fecal coliform/streptococcus in 1990 would not indicate any human sewage contamination. The ratios in 1991 were high (177 at the trestle in mid-July and 10.4 and 12.7 in Weeks 14 and 15 at the flume). The ratio in 1992 was also high in Week 14 (17.3). Consistently high ratios would indicate chronic sewage contamination. These incidents may indicate contamination from the Esplanade restaurants or storm drain runoff or even dog feces near the trestle. However, no sewage spills were reported. The fact that fecal bacteria counts and ratios increased in Week 14 in all 3 years may indicate a human source.

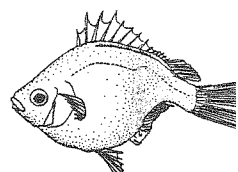
A likely cause for the increased levels of bacteria in Week 20 of 1991 and not in 1992 could be that they came about 10 days after the two aquazine applications in 1991, and no aquazine was used in 1992. The algae and pondweed had died in the lower lagoon by



Week 20 of 1991, and bacterial decomposition may have been high. There may be a connection between aquazine application and subsequent high bacterial counts. However, more monitoring is needed to rule out coincidence.

Recommendations Regarding the Monitoring and Reduction of Fecal Bacteria

1. Pass an ordinance that prohibits walking of dogs along the path adjacent to the lagoon. This seems consistent with the dog ordinance for the beach area.
2. Encourage the mobile home park to allow the removal of domestic ducks that use Noble Gulch.
3. Remove the domestic ducks at the mobile home park on Noble Gulch with the cooperation of the residents.
4. Continue to enforce the no bird-feeding ordinance at the lagoon. Discourage feeding of fish at the lagoon, as well.
4. Set up a volunteer program to remove the kelp from Reaches 1 and 2 on a weekly basis from April 1 to lagoon closure as stated in the management and enhancement plan. Decomposing kelp adds nutrients and bacteria to the lagoon and is nearly impossible to remove when it becomes mushy.
5. Dispose of kelp from the lagoon during sandbar closure along the beach as in 1992 rather than bury it in the sandbar as in 1991. Disperse it up and down the beach so as to spread it out.
6. Continue to open and close the lagoon during outgoing tides and before incoming tides, respectively, during the 2-3 days that are required for sandbar closure.
7. Spend the necessary time to remove as much kelp as possible from the lagoon with hand tools during the 3 or more days that are required for sandbar closure.
8. Remove the remaining domestic geese and ducks from the lagoon and transplant them to an acceptable private pond.
9. Maintain weekly fecal bacteria sampling stations at the flume, the park at Stockton Avenue Bridge (in front of Mrs. Hubback's house, and near the railroad trestle for the period, May 15 to September 15.
10. Discuss the feasibility of opening Reaches 2 and 3 to swimming if fecal coliform counts are consistently less than 200/100 ml in the samples.
11. Maintain a log of complaints/reports of pollution entering the lagoon as well as excessive algae. Record the date, time and names of the concerned parties.



12. Choose to manually skim off floating algae from the lagoon instead using aquazine, except possibly before the Begonia Festival in 1993.

13. Continue to seal off storm drains on the west side of the street in front of the Esplanade, as well as the portals in the walkway to the beach between the Beach House and Zelda's. This should be the case from May 15 to after the clean-up from the Wine Festival in mid-September.

14. Examine the feasibility of sealing the storm drains at the Railroad trestle and continue to seal the drain under the restaurants during the period of sandbar closure.

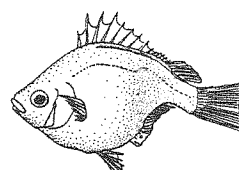
15. Request that bypass tubes be connected to the drain pipes from the roof of Larry's Surf and Turf Restaurant such that they drain way from the lagoon for the period, May 15 until the sandbar is breached in the fall/winter. Request that they construct a gutter system under their windows which will prevent window-washing water from entering the lagoon.

16. Request that Sea Bonne and Margaritaville Restaurants attach gutter systems to the concrete wall that will prevent wash-water and food particles from entering the lagoon when they hose off their decks.

17. Develop a system to move the lagoon out from under the restaurants during the summer months in order to reduce accidental pollution and pollution caused by daily cleaning of restaurant dining areas and sidewalks. This may be done by 1) attempting to add a layer of sand under restaurants adjacent to the lagoon sufficient to prevent standing water under the buildings, 2) contouring the lagoon during sandbar construction so that a 5-10 foot wide sand berm is created between the restaurants and the lagoon and under the restaurants, with expansion of the lagoon on the west side to make up for loss in lagoon volume on the east side, or 3) placement of an inflatable coffer dam alongside the restaurant pilings and back-filling the area under the adjacent to the restaurants with sand. The inflatable dam would be removed after the sandbar has breached in the fall/winter. The bolt that was screwed into the piling for sandbar breaching is 1.77 feet above the top of the flume and could be used as an elevational reference point. If standing water occurs under the restaurants after one of these options is pursued, stagnation will probably lead to foul odors.

18. Request that repairs of plumbing under the Esplanade restaurants be done with double pipes to prevent sewage leaks.

19. Continue the annual inspection program for evaluating the plumbing under Esplanade restaurants. Continue to have a City building official. Please keep a record of the inspections for the consultant's reference.



WATER QUALITY MONITORING, 1992

Rating Criteria

Water quality parameters were rated according to the tolerances of steelhead. This was because other fishes were more tolerant to low oxygen, higher salinity and higher temperatures than steelhead. Stress to freshwater acclimatized steelhead would probably not occur until conductivity levels reach 12,000 to 15,000 umhos with sudden increases in salinity to 10-12 parts per thousand. Water temperatures above 22 C (72 F) and oxygen levels below 5 parts per million (mg/l) are thought to stress steelhead. However, steelhead have been found surviving in pools in the Carmel River at 1-2 ppm for 1-2 hours at dawn. Based on 1988 monitoring, steelhead appear to survive in Soquel Lagoon at water temperatures of 23-25 C for 1-2 hours toward the end of the day (Habitat Restoration Group 1990). Morning oxygen levels below 5 would be rated poor. Morning oxygen levels of 5 to 7 ppm were rated fair with above 7 ppm rated as good. Morning water temperatures in the lower 0.25 meters of the water column of less than 20 C were rated good while those 20-21.5 C were rated fair. Temperatures above 21.5 C would be rated poor. Water temperature may rise 3-4 degrees C by the end of a sunny day.

High levels of dissolved carbon dioxide in water will inhibit absorption of oxygen by fish. However, in alkaline conditions that exist in Soquel Creek Lagoon, carbon dioxide is poorly dissolved and believed not to be a problem (Jerry Smith, pers. comm.). Therefore, monitoring of carbon dioxide was unnecessary.

Lagoon depth was monitored with the staff gage on the eastern bulkhead, upstream of the Stockton Avenue Bridge. Readings less than 1.85 were rated poor. Readings between 1.85 and 2.2 were rated fair. Readings above 2.2 were rated good. These criteria were somewhat arbitrary, being based on an as yet poorly defined relationship between lagoon depth and associated fish cover, water temperature and algae growth. If the upper lagoon becomes too shallow, steelhead habitat is eliminated and algae growth may be stimulated.

Results of Water Quality Monitoring After Sandbar Closure

Appendix D provides detailed data on water quality. Table 2 summarizes conditions at each monitoring time, based on the rating criteria.

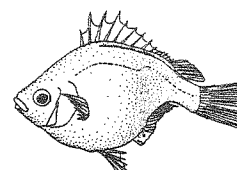
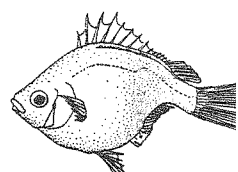


Table 2. Water Quality Ratings for Key Parameters in Soquel Creek Lagoon, 1992.

Date	Flume Passage	Gage Height	Water Temperature	Oxygen	Salinity
27May92	open	poor 1.76	good	fair (Rch 1) fair (Rch 2) fair (Rch 3)	good
7Jun92	open	poor 1.76	good	good good* fair*	good
14Jun92	open	poor 1.56	good	good good poor	good
29-30Jun92	Rain overnight, both days.				
1Jul92	manually opened	fair 2.14	fair fair good	malfunction	good
27Jul92	open	poor 1.63	poor	good good fair	good
4Aug92	open	fair 1.81	fair poor fair	good	good
13Aug92	Plastic sheeting placed over flume boards.				
17Aug92	closed	fair 1.87	poor	good	good
1Sep92	closed	fair 1.94	fair	good good fair	good
10Sep92	manually opened	fair 1.93	fair fair good	good	good
10Sep92	One flume board removed for the Begonia Festival.				
12Sep92	-	poor 1.59	fair fair good	good	good
13Sep92	-	poor 1.55	fair	-	-
Begonia Festival					
14Sep92	-	poor 1.55	fair	good	good
19Sep92	-	poor 1.60	good	good	good
8Oct92	Replaced board that was removed before Begonia Festival				
9Oct92	closed	poor 1.55	good	good	good
15Oct92		poor 1.71			
20Oct92	Light rain.				
21Oct92	open	fair 2.14			
23Oct92	trickling out	fair 2.06	good	good fair fair	good
29Oct92	Sandbar breached prematurely.				

* If 3 ratings are listed, they refer to Reaches 1, 2 and 3.



Lagoon Level. As of the first monitoring, 7 days after sandbar construction on 20 May, until sandbar breaching on 29 October, 9 monitoring periods were performed at approximately 2-week intervals before the Begonia Festival, with 4 additional episodes before and after the Begonia Festival and 4 additional readings after the flume board was replaced on 8 October. Of the 17 monitorings, fair lagoon depth occurred on 6 occasions. Placement of plastic sheeting over the flume boards and having all of the flume boards in place improved lagoon depth. Poor lagoon depth occurred on 11 occasions. The lagoon was generally more shallow and warmer in 1992 than in 1991.

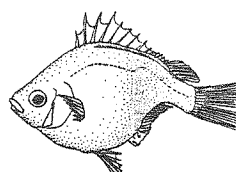
Flume Passability. According to the Management Plan, fish passage was to be maintained until July 1. Passage for steelhead smolts was in fact good until August 4. Then the flume remained closed until it was manually opened 3 days before the Begonia Festival. Then it closed again until boards were removed just before the sandbar breached on 29 October.

Water Temperature. Lagoon water temperature was good until July 1, when it had warmed up into the fair category. In July and August, the lagoon was warmer and entered the poor category much of the time. Pondweed and algae grew rapidly during this period. By September 1, the lagoon began to cool and was rated mostly fair until September 19, when water temperature was rated good until sandbar breaching.

Dissolved Oxygen. Critical oxygen levels are lowest in the early morning before plant photosynthesis may occur to produce oxygen. This was the time that levels were measured and rated. Oxygen levels were rated "fair" 7 days after sandbar closure. After that, in Reaches 1 and 2 the oxygen levels remained "good" until a week before sandbar breaching, at which time oxygen levels dropped into the "fair" category in Reach 2. At the mouth of Noble Gulch, oxygen levels were commonly in the poor range on the bottom and usually "fair" to "good" at 0.25 meters above the bottom. The depletion of oxygen on the bottom was caused by respiration from the algal bloom that existed there most of the summer. One dead juvenile steelhead was seen at the mouth of Noble Gulch on 21 July. Cause of death was unknown. The reduction in oxygen towards the end of October, lagoon-wide, was probably caused by the beginnings of a die-off of pondweed occurring in the fall. Reduced photosynthesis and increased bacterial decomposition would accompany this seasonal change.

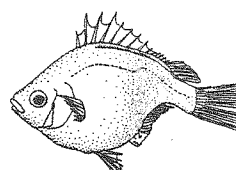
Salinity. On 27May92, within 7 days of sandbar closure that occurred at low tide, all but a small amount of salt water near the bridge piers was flushed from the lagoon with the aid of the shroud. The pocket of salt water at the west pier was flushed out during the stormflow on 29-30 June. The lagoon remained freshwater until sandbar breaching on October 29. After that, salinity fluctuated.

Conductivity. It was not a problem during the monitoring period.



Recommendations to Improve Water Quality and Fish Habitat in the Lagoon

1. Do not allow the pedal boat operator to dictate the lagoon level.
2. Maximize lagoon depth while maintaining passage through the flume for adult steelhead until June 1 and steelhead smolts until July 1. If the lagoon level begins to drop below the notch for steelhead smolts on one side of the flume because of the hole for adult steelhead on the other side after June 1, close up the hole for adults. Close up the adult hole by July 1 in any event. If adult steelhead are seen in the lagoon after June 1 when the hole has been closed up, open the hole until the adults out-migrate.
3. After July 1, do not open the flume exit if it closes unless flooding is eminent. Install plastic sheeting on the outside of the flume boards to prevent leakage into the flume. Put as many boards as possible into the flume entrance to raise the lagoon level as much as possible.
4. When the lagoon level is reduced for the Begonia Festival, remove the board on the flume on the Friday before the festival and re-install it immediately after the festival clean-up.



BIRD CENSUSING

Comparisons were made regarding bird distribution between the results obtained in 1988 (Habitat Restoration Group 1990), 1991 (Alley 1992) and 1992. In all three years, the highest bird use of the lagoon was in Reach 1, it being dominated by gulls, domestic geese and feral ducks. Wild mallards fed primarily in Reach 3, though they were often seen in Reaches 1 and 2. They roosted most visibly along primarily the margins of Reach 2. The primary roosting locations for rock doves (pigeons) were at the east and west parks (just upstream of the Stockton Avenue Bridge) and on the railroad trestle. Gulls roosted on building roof tops along the Esplanade. Larry's Surf and Turf positioned 3 stationary plastic owls on their roof to discourage gulls from roosting there. The owls worked very effectively for the first couple of weeks. After that they had more limited effect. If the owls were made to rotate, they may be more effective. Also, they could be taken down periodically and re-installed after a few days to possibly improve their effectiveness.

In 1992, birds were censused during each water quality monitoring visit to the lagoon, as well as intensively during the period 23-27 October. Unfortunately, the sandbar breached during the first fall storm, making data collected after that incomparable to past lagoon censusing. There were 11 censusing from 27 May to 23 October on mornings of water quality monitoring. Then there were 5 censusing 23-27 October and 6 more 5-12 November throughout the day. As in 1991, birds were concentrated in Reach 1, with 67% occurring there. Reach 2 had 19%, and in Reach 3 had 14%. All of the censused gulls were in Reach 1, with them totaling 80% of the birds counted there. 96% of the pigeons were observed in Reach 2, making up 30% of the birds censused in Reach 2. Most of the pigeons roosted on the railroad trestle.

In 1991, birds were concentrated in Reach 1 of the lagoon. 58% occurred there. In Reach 2, 19% occurred, while 23 % were in Reach 3. Refer to Table 3 for comparisons of bird densities between 1991 and 1992.

Results of bird censusing in 1992 were not directly comparable to those in 1991 because in 1991, censusing was carried out throughout the day. In 1992, most censusing occurred early in the morning. Our intention was to have more censusing later in the day in 1992. However, the sandbar breached after the first stormflow in October, before more censusing could be done. In early morning, some ducks were probably roosting and not in the water. At times, a large group of ducks and the 3 geese were roosting on the beach near Venetian Court in the morning and were not counted. Also, in 1991 the pigeons were not counted on the trestle. But they were counted in 1992. Even so, there appeared to be fewer pigeons in 1992 than 1991.

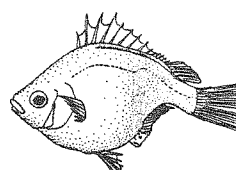


Table 3. Comparison of Bird Densities in Soquel Creek Lagoon for 1991 and 1992.

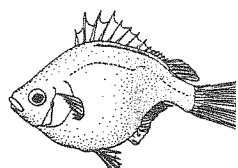
Group	Reach 1 Density		Reach 2 Density		Reach 3 Density	
	1991	1992	1991	1992	1991	1992
Gulls*	30.4	31.6	3.2	0	1.1	0
Mallards (some domestic)	8.1	2.5	1.0	4.1	14.0	3.3
Domestic Ducks	0.4	2.0	1.0	0.1	0.6	0.4
Geese	2.3	0.3	0.2	0.6	0.9	0
Pigeons	0.8	0.1	7.8	3.5	0	0
Coots	1.6	6.6	0.8	5.1	3.3	9.0
Pied-billed Grebes		0.2		0.3		0.1
Cormorants		0.06		0.25		0.1

*Gulls present on the beach in early morning were counted 8 times during the period of lagoon conditions in 1992. The average number censused was 183 gulls, with a range of 61 (9Oct92) to 367 (1Sep92).

There were 5 geese in 1991 and 3 left in 1992. There were more domestic ducks (non-mallard) censused in 1992 than 1991, indicating an increase.

Fish-eating Birds Observed at the Lagoon

Regarding fish-eating birds, they were more species seen and with greater frequency in 1992 than in 1991. One merganser was observed by Tom Mader during June, 1992, before the rain on 29-30 June. The lagoon turned murky, and it left after that. However, mergansers were more prevalent in 1991. Little pied-billed grebes were observed in 1992 and not in 1991. These grebes were observed on 5 of 13 days of water quality monitorings. During more intensive censusing, the grebes were observed on every occasion of observation for 23-27 October and 5-12 November (after sandbar opening). They presumably fed on threespine sticklebacks, primarily. In 1992, juvenile cormorants were seen on 2 of the 13 days of water quality monitoring, this being in October. Then one was seen in November after sandbar breaching. In 1991, one cormorant was seen in the lagoon in October. One morning in 1992, a great blue heron was observed wading in Reach 1 for the first time. Kingfishers were seen for the first time in 1992 on 5 of 13 water quality monitoring. They were not seen in previous years.



Bird-feeding by Humans

Bird-feeding by humans was not observed during water quality monitoring episodes in the early morning in 1992. There were too few observations later in the day to compare the level of human handouts in 1991 and 1992. During more intensive censusing throughout the day in 1992, one case of bird feeding by humans was observed at Venetian Court in November after 11 censusing, 23-27 October and 5-12 November.

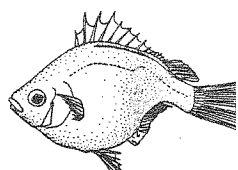
A resident regularly fed the steelhead in Reach 2. This attracted ducks into Reach 2 to take advantage of handouts. In addition, steelhead may become dependent on this artificial source of food. Their natural feeding behavior and distribution may be disturbed. Smolts may elect to stay in the lagoon and receive a free lunch instead of out-migrating as they should. This may be especially true for hatchery-reared fish that were raised on artificial feeding. This activity should be discontinued.

Waterfowl as Biological Control of Aquatic Plants

The effectiveness of ducks grazing on pondweed and algae was evident in 1992 because very little algae reached the surface. Sacramento suckers also grazed on algae along the lagoon bottom. Geese were commonly seen feeding on natural vegetation. The lower density of pigeons may have been a result of fewer human handouts. However, bird seed was seen several times on the path in front of one house.

Recommendations Regarding Management of Bird-Feeding and Domestic, Non-native Waterfowl

1. Maintain enforcement of the no bird-feeding ordinance. Discourage fish-feeding, as well.
2. Request that Restaurant owners allow positioning of devices to the roof tops adjacent to the lagoon to discourage roosting of gulls. Artificial owls that rotate on poles may be more effective than stationary ones.
3. Maintain the appearance and presence of no bird-feeding signs around the lagoon.



FISH CENSUSING

Steelhead Plantings in Soquel Creek

According to the records kept by Dave Strieg, hatchery manager at the Big Creek Hatchery (Monterey Bay Salmon and Trout Project), 11,648 steelhead smolts were planted in Soquel Creek in 1992. On 9Apr92 approximately 3500 smolts were released near the Casalegno Store, above the high school. On 10Apr92 approximately 4000 smolts were introduced behind the Grange Hall in Soquel Village. On 13Apr92, the remainder were released behind Nob Hill.

In 1993, 12,224 steelhead smolts were planted in Soquel Creek. On 10Mar93 approximately 4000 smolts were released near the Casalegno Store. On 13Mar93 the remainder were released at the end of Cherryvale Lane near a nursery.

Fish Sampling in Soquel Creek Lagoon

Tables 4 and 5 indicate the sampling results from 1988 and 1992, respectively. The sampling effort downstream of the Stockton Avenue Bridge on 24Oct92 included 3 seine hauls with a 106-foot long bag seine that was identical to the one used in 1988 and 2 seine hauls with the 30-foot seine used on 17Nov88. However, unlike 1988, in 1992 the captured steelhead were marked with a partial left pectoral fin clip. The intent was to return the following week to sample again and estimate the population size from the percentage of recaptured marked steelhead. Unfortunately, the sandbar breached before it could be done. In 1988, steelhead collected in earlier seine hauls were not marked and could have been recaptured and counted multiple times. In addition, 2000 young-of-the-year hatchery steelhead had been planted in the lagoon on 25Aug88, less than 2 months before sampling that year. For these reasons, density comparisons of stream-produced steelhead were impossible between the two years.

Regarding steelhead numbers, there appeared to be fewer steelhead juveniles using the lower lagoon in 1992, compared to 1988. In 1992, 42 juvenile steelhead were captured in 3 large seine hauls below the bridge. 22 of those were recaptured a second or third time. In 1988, 146 juvenile steelhead were captured in 5 seine hauls below the bridge. An unknown number of those had been captured more than once and counted more than once. Interestingly, several hatchery smolts remained in the lagoon over the summer in 1992 rather than going out to sea. They were considerably larger than the wild, stream-produced steelhead.

Seine hauls upstream of the Stockton Avenue Bridge were inefficient in 1988 and 1992, and could not be used to compare relative densities of steelhead in the different reaches. We would suspect that steelhead densities were similar in all 3 reaches, at least as far upstream as the Shadowbrook Restaurant. In 1992, the fourth large seine haul was downstream of Noble Gulch near the small dock area. It yielded 4 juvenile steelhead

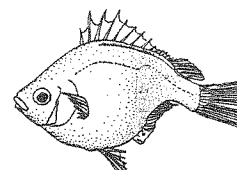


Table 4. Fish Sampling Results, 17 November 1988.
 SOQUEL CREEK LAGOON FISH SAMPLING
 17 November 1988

Sampling Summary

Species	Site		
	Below Bridge	Trestle	Noble Gulch
Steelhead			
Adults	1		
Juveniles	147	3	6
Starry Flounder	19		1
Staghorn Sculpin	59	2	8
Prickly Sculpin	1		
Threespine Stickleback	242+	3+	7+
Tidewater Goby	102+	+	+
Effort			
Large Seine Hauls (106' x 6' x 3/8")	5	1	3
Small Seine Hauls (30' x 4' x 3/16")	2		

Standard Lengths
 Tidewater Goby
 (n = 107)

25 - 29 mm *****40
 30 - 34 *****38
 35 - 39 *****26
 40 - 44 3

Threespine Stickleback
 Plate Morphs
 (n = 102)

High Plate *****61
 Partial *****29
 Low **12

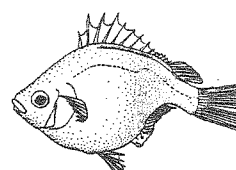


Table 4 (continued). Fish Sampling Results, 17 November 1988.
 SOQUEL CREEK LAGOON FISH SAMPLING
 17 November 1988

Standard Lengths	Steelhead (n = 157)	Staghorn Sculpin (n = 69)	Starry Flounder (n = 20)
75 - 79 mm	1		
80 - 84			
85 - 89	1	XX3	
90 - 94	1	X2	
95 - 99	1	XXXXXXXX8	
100-104	XX3	XXXXXXXXXXXXX14	X2
105-109	XXXXXXXX8	XXXXXX7	
110-114	XXXXXXXXXX12	XXXXXXXXXXXXXX16	XX3
115-119	XXXXXXXX8	XXXXXXXXXX11	XX3
120-124	XXXXXXXXXX11	XX3	XXX4
125-129	XXXXXXXXXX11	XXX4	1
130-134	XXXXXXXXXXXXXXXXX17	1	X2
135-139	XXXXXXXXXXXXXXXXXXXXX20		X2
140-144	XXXXXXXXXXXXXXXXXX17		1
145-149	XXXXXXXX8		X2
150-154	XXXX5		
155-159	XXXXXXXX9		
160-164	XXXX6		
165-169	XX3		
170-174	XX3		
175-179	X2		
180-184	X2		
185-189	X2		
190-194			
195-199	1		
200-204			
205-209	X2		
220-224	1		
225-229	1		
510-514	1		

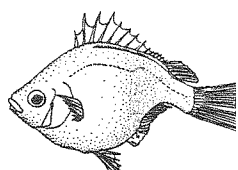


Table 5. Fish Sampling Results, 24 October 1992

SOQUEL CREEK LAGOON FISH SAMPLING
24 October 1992

CAPTURE SUMMARY

Seine	-----Steelhead-----			Sac. Sucker	Staghorn Sculpin	Calif. Roach	Stickle- back
	Wild	Hatch.	Recap.				
1	43	7		32	1	2	1000+
2	7	2	18	40	2		1000+
3	6	3	4	40	1	2	1000+
4	4			21	26		1000+

Standard Lengths

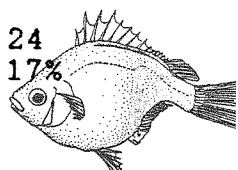
	Steelhead (n=60 wild; 12 hatchery) (Marked: partial L pect. clip)	Sacramento Sucker (n=112) (21 not measured)	Staghorn Sculpin (n=30)
90 - 94 mm			*
95 - 99	**	**	***
100-104	***		****
105-109	***	****	*****
110-114	****	**	*****
115-119	*****	****	*****
120-124	*****	*****	***
125-129	****	*****	*
130-134	****	*****	
135-139	*****	*****	
140-144	****	*****	
145-149	*****	*****	
150-154	*****	*****	
155-159	****	*****	
160-164	*	****	
165-169	*	****	
170-174	* H	***	
175-179	H	*	
180-184	HHH		
185-189			
190-194			
195-199			
200-204	HH		
205-209	H		
210-214	H		
215-219			
220-224	H		
225-229		*	
230-234	H		
255-259	H		

California Roach SL: 70, 90, 140, 155

Tidewater Goby SL: 33, 37

Threespine Stickleback: HighPlate: 77 55% Partial: 39 28% Low Plate: 24 17%

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and 26 staghorn sculpins. In 1988, one seine haul under the railroad trestle and 3 hauls near Noble Gulch yielded only 9 juvenile steelhead and 10 staghorn sculpins.

A very rough estimate of juvenile steelhead density in the lagoon in 1992 was probably a few hundred. This would be a significant number, though presumably less than the lagoon could support in other years. If the lagoon becomes too shallow, the upper lagoon becomes too shallow for steelhead to use.

Some striking differences between sampling results between the two years occurred with 1) the distribution of staghorn sculpins, 2) the much lower density of tidewater gobies in the lower lagoon in 1992, and 3) the appearance of Sacramento suckers and California roach in the lagoon in 1992. In 1992, no staghorn sculpins were collected below the Stockton Avenue Bridge, while a large number were collected in one seine haul (#4) between the railroad trestle and Noble Gulch. In 1988, most of the staghorn sculpins were collected below the bridge.

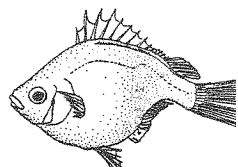
Only two tidewater gobies were collected and released in 1992 below the bridge. In 1988, 102 individuals were collected. Perhaps the most abundant fish other than threespine stickleback in the 1992 lagoon was the Sacramento sucker. Suckers were not tagged to prevent repeated counting of the same fish in later seine hauls. Therefore, an unknown percentage of 112 Sacramento suckers were counted more than once. However, none were collected in 1988. Four California roach were collected in the lagoon for the first time in 1992. They were common in Soquel Creek, upstream of the lagoon. No starry flounders were captured in 1992, indicating that fewer, if any, were trapped in the summer lagoon as occurred in 1988. Threespine stickleback were abundant in both years.

Discussion of Results of Fish Sampling

The dramatic appearance of Sacramento suckers may have resulted from a population increase in lower Soquel Creek, with individuals expanding into the lagoon. Several years of drought may have enhanced slow, warm water habitat for Sacramento suckers and California roach. Sacramento suckers consume algae and may have helped to biologically control filamentous algae biomass in the lagoon.

It appeared that tidewater gobies were severely reduced in number from 1988 to 1992. However, the only heavily sampled area was downstream of the Stockton Avenue Bridge. A sizable number of gobies still could have been distributed upstream.

The absence of staghorn sculpin and near absence of tidewater goby in 1992 seine hauls in Reach 1 were puzzling. No definitive explanation is forthcoming. Staghorn sculpins may have preferred habitat upstream of the trestle where there was greater lagoon depth and more associated cover. Downstream of the bridge,



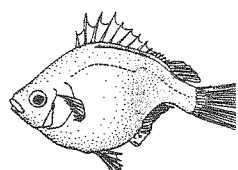
little pondweed and algae grew near the shallow lagoon margin in October, offering little cover. Fish-eating birds were usually observed upstream of the bridge, perhaps indicating higher densities of fish or possibly less human interference in Reaches 2 and 3. Threespine stickleback were abundant everywhere.

Recommendations Regarding Fish Management

1. Maximize lagoon depth after July 1 by adding boards to the flume and sealing them with plastic.
2. Do not unplug the flume exit after July 1 until the Begonia Festival.
3. Replace the flume board immediately after the Begonia Festival.
4. Maintain the lagoon in fall until streamflow has increased enough to prevent stranding of adult steelhead and osmotic stress in lagoon-inhabiting steelhead. Install a perimeter fence with 2"x4" mesh with 6-foot panels around the flume entrance by October 1. This will prevent plugging of the flume's screen with aquatic vegetation during the first minor storms of fall.
5. Move the interpretive sign for tidewater goby from beneath the railroad trestle to a safer location. It is commonly vandalized.

LITERATURE CITED

- Alley, D.W. 1992. Soquel Creek Lagoon Monitoring Report, 1990-91. Prepared by D.W. ALLEY & Associates for the City of Capitola and Coastal Conservancy.
- Soquel Creek Lagoon Management and Enhancement Plan. 1990. Prepared by Habitat Restoration Group for the City of Capitola and Coastal Conservancy.



**Fecal Coliform Bacterial Counts
Soquel Creek Lagoon Weekly Samples
At the Flume**

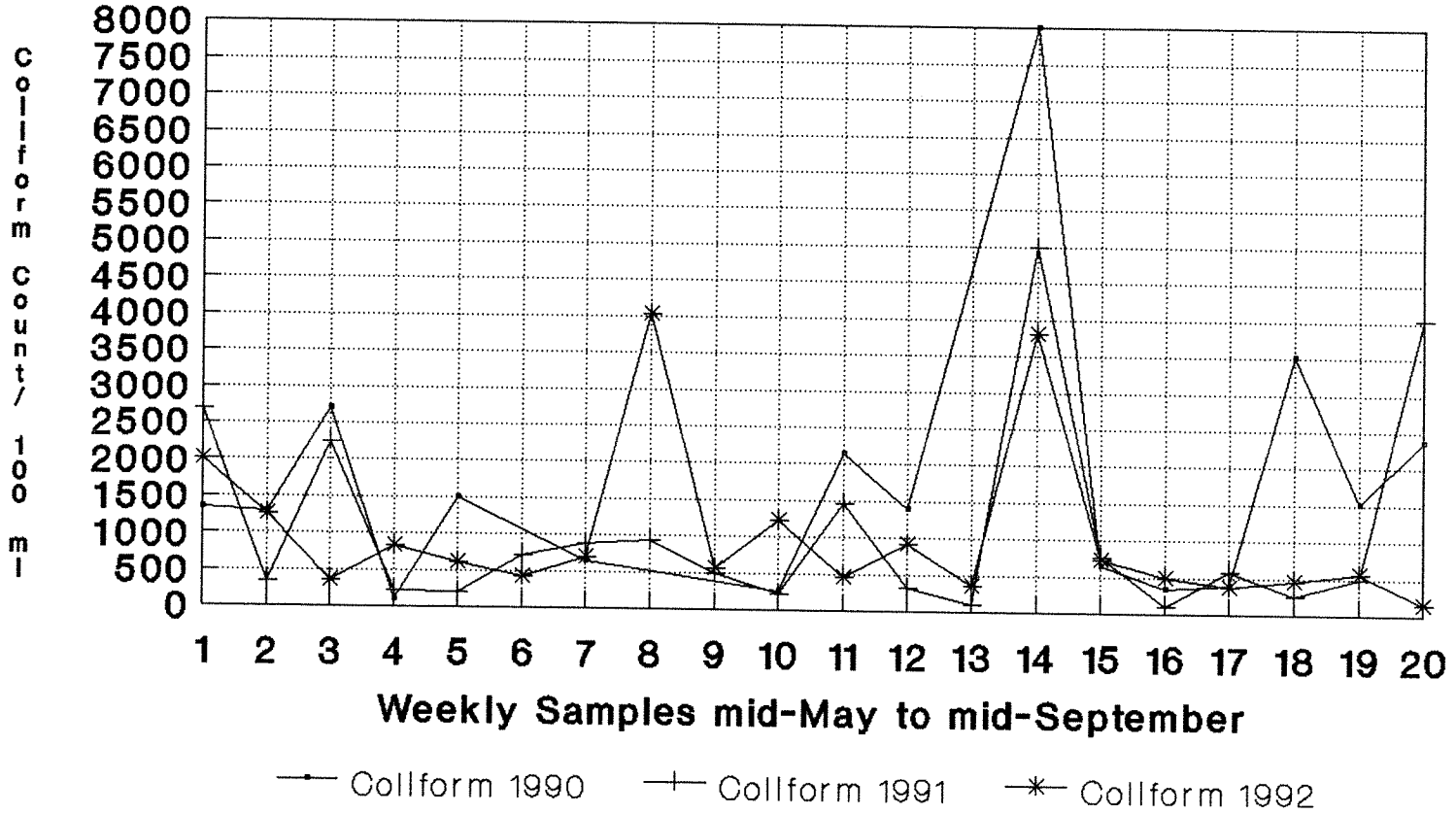
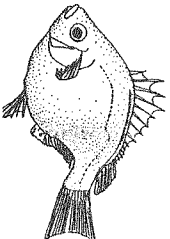


Figure 1. Fecal coliform counts at the Flume, comparing 1990, 1991, and 1992. (Santa Cruz County Data)



**Fecal Streptococcus Counts
Soquel Creek Lagoon Weekly Samples
At the Flume**

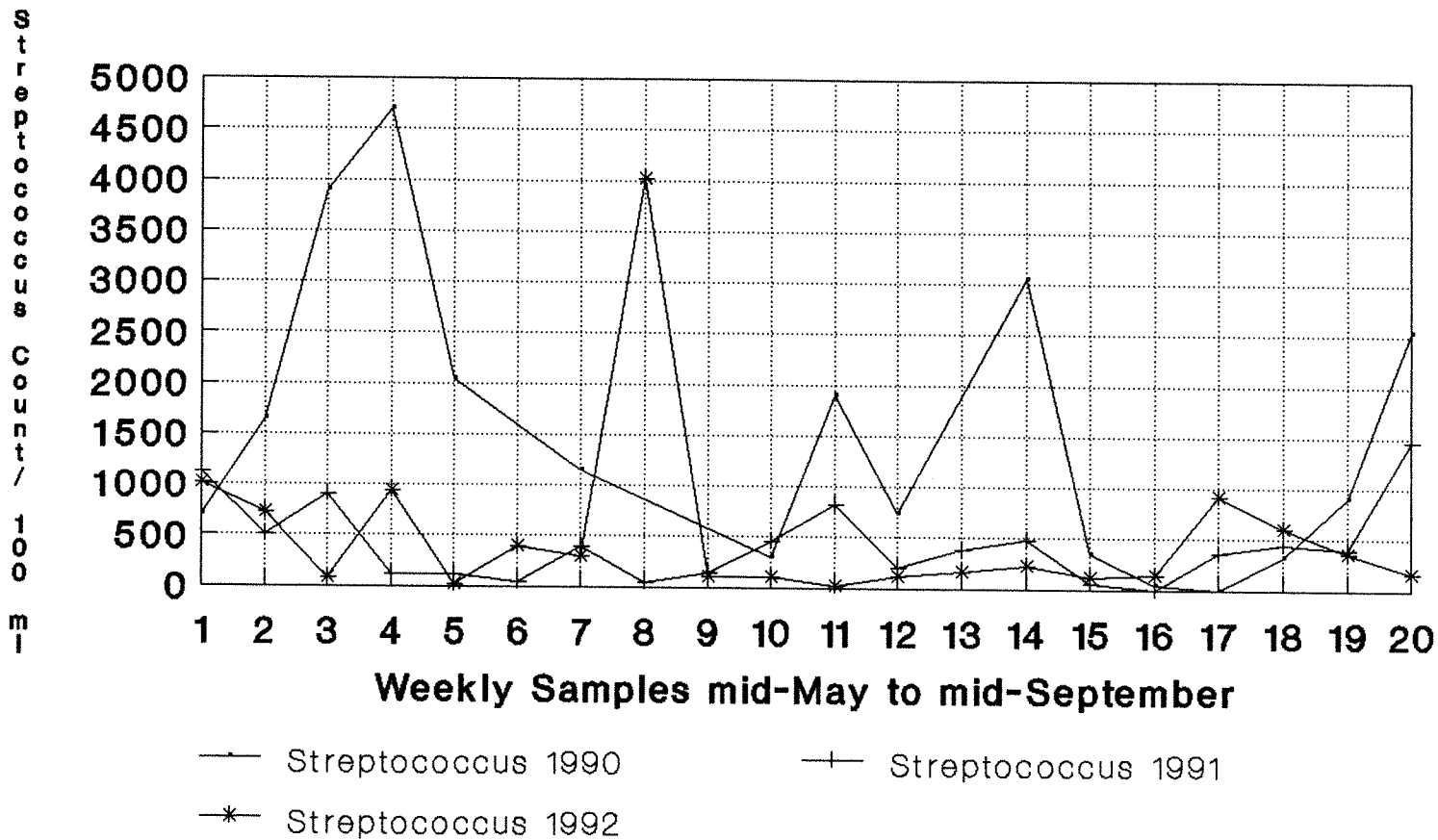
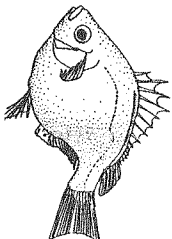


Figure 2. Fecal streptococcus counts at the flume, comparing 1990, 1991 and 1992. (Santa Cruz County Data)



**Fecal Coliform Bacterial Counts
Soquel Creek Lagoon Weekly Samples
At the Railroad Trestle**

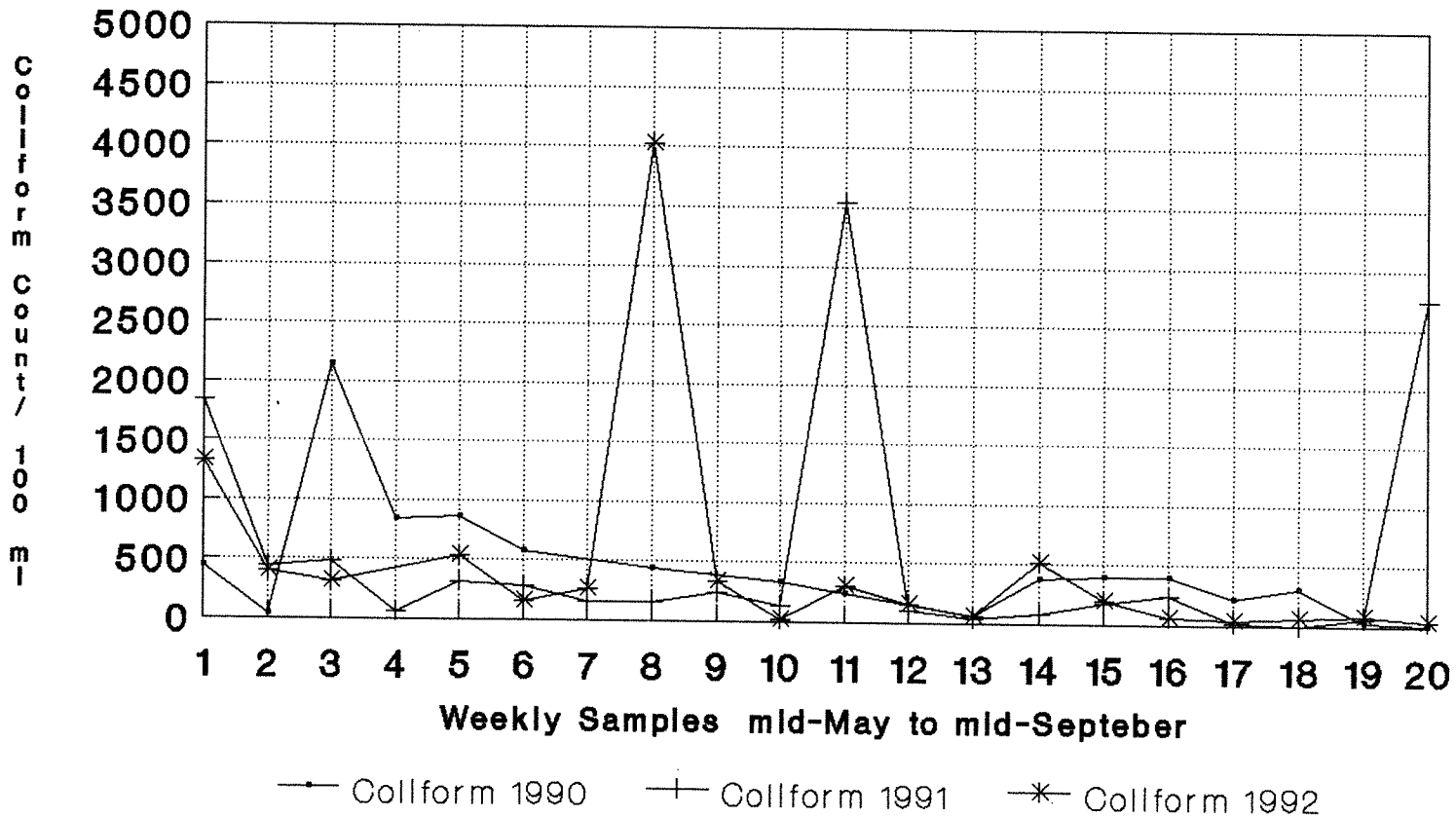
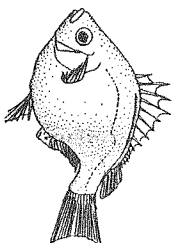


Figure 3. Fecal collform counts at the Railroad Trestle, comparing 1990, 1991, 1992. (S.C. County Data)



**Fecal Streptococcus Counts
Soquel Creek Lagoon Weekly Samples
At the Railroad Trestle**

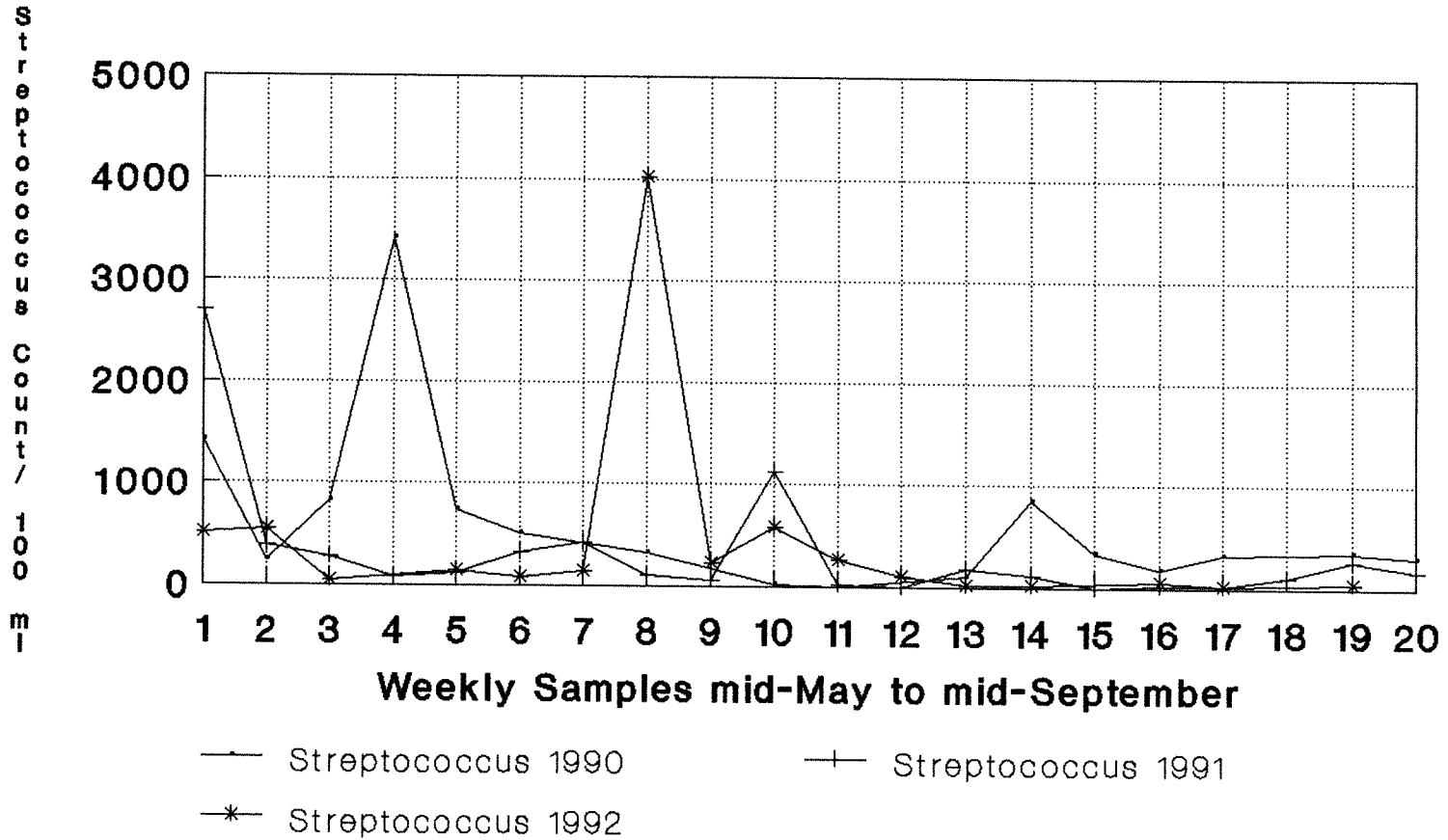
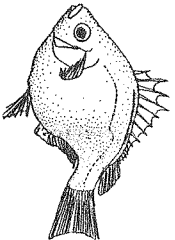


Figure 4. Fecal streptococcus counts at the Railroad Trestle, comparing 1990, 1991, 1992. (S.C. County Data)



**Fecal Coliform Bacterial Counts
Noble Gulch Weekly Samples
At Tunnel and Bay Street**

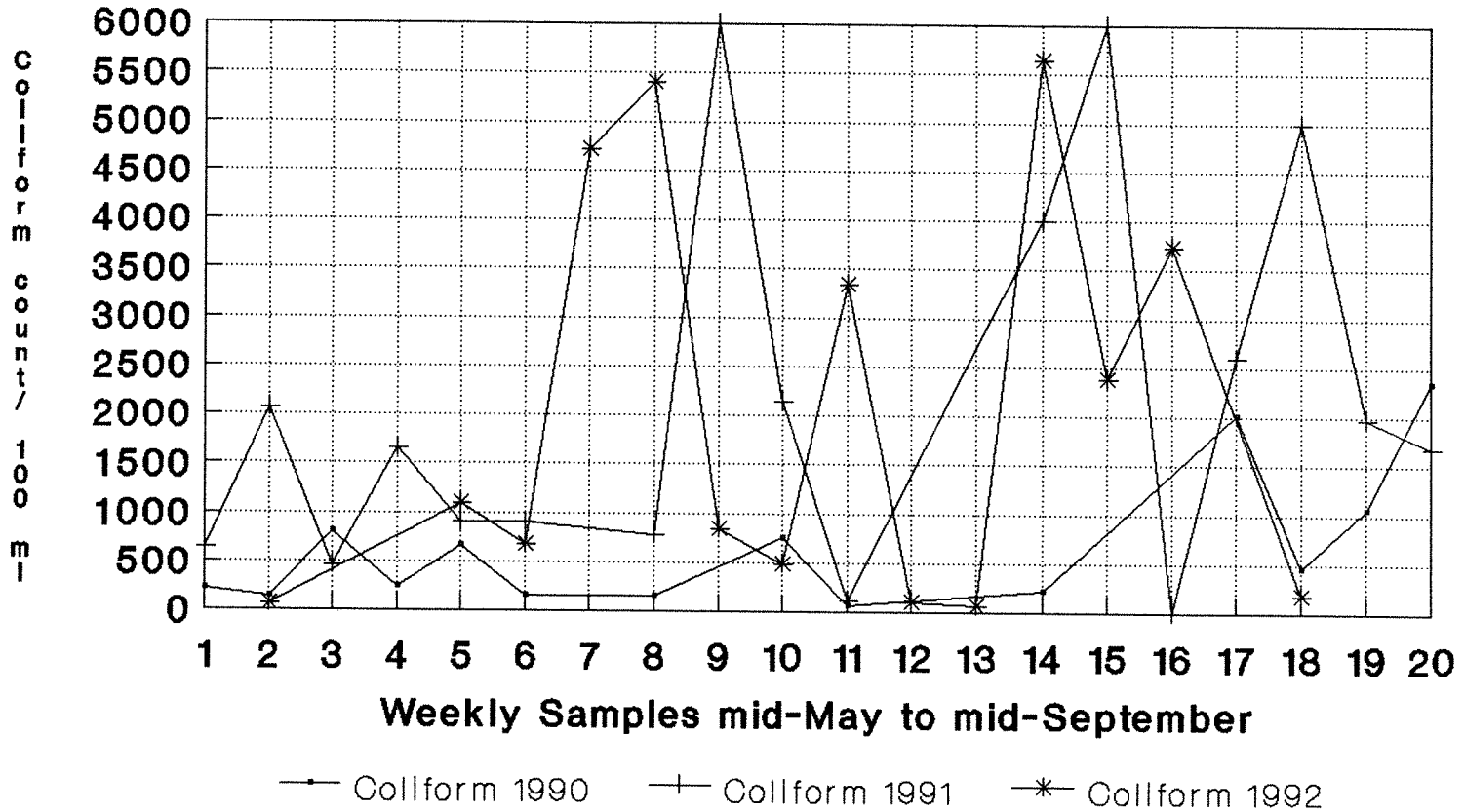
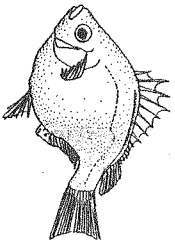


Figure 5. Fecal collform counts at Bay St. tunnel on Noble Gulch, comparing 1990, 1991, and 1992. (S.C.County Data)



Fecal Streptococcus Counts Noble Gulch Weekly Samples at Tunnel and Bay Street

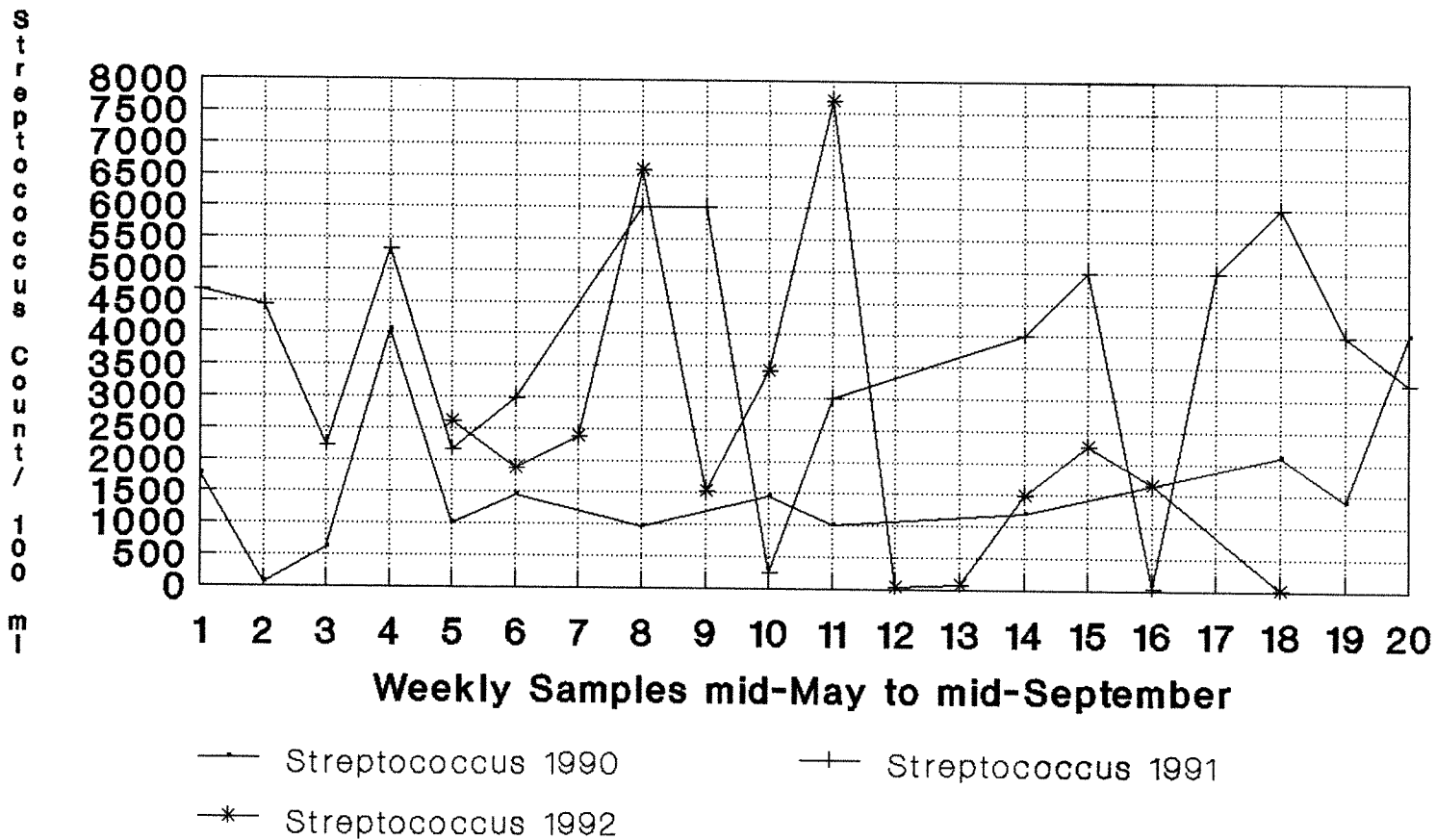
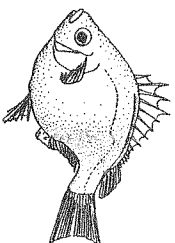
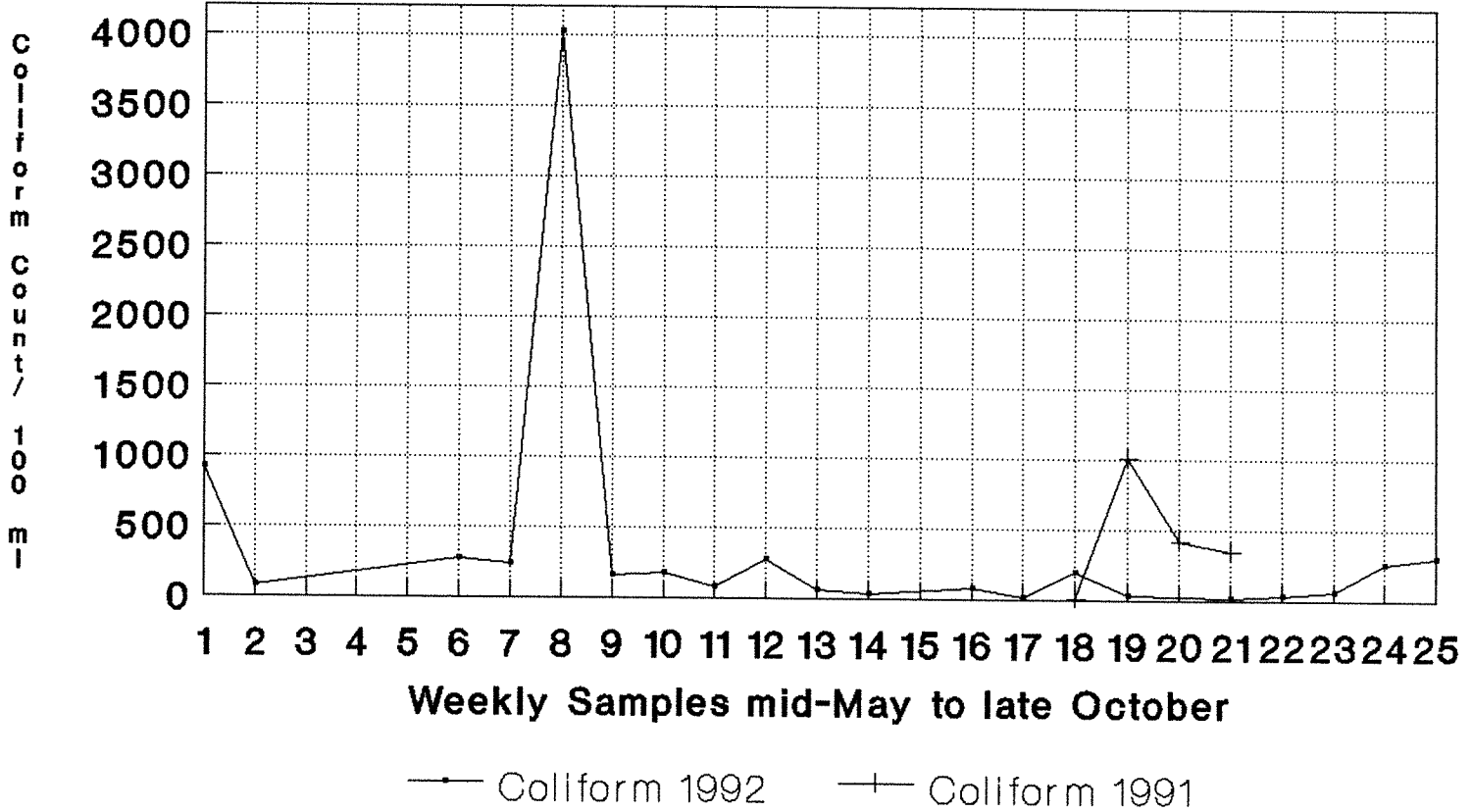


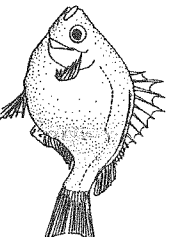
Figure 6. Fecal streptococcus count at Noble Gulch tunnel and Bay Street, comparing 1990, 1991, 1992.(County Data)



**Fecal Coliform Bacterial Counts
Soquel Creek Lagoon Weekly Samples
Mouth of Noble Gulch**



**Figure 7. Fecal Colliform count
at the Mouth of Noble Gulch, comparing
1992 to 1991. (S.C. County Data)**



**Fecal Streptococcus Counts
Soquel Creek Lagoon Weekly Samples
at the Mouth of Noble Gulch**

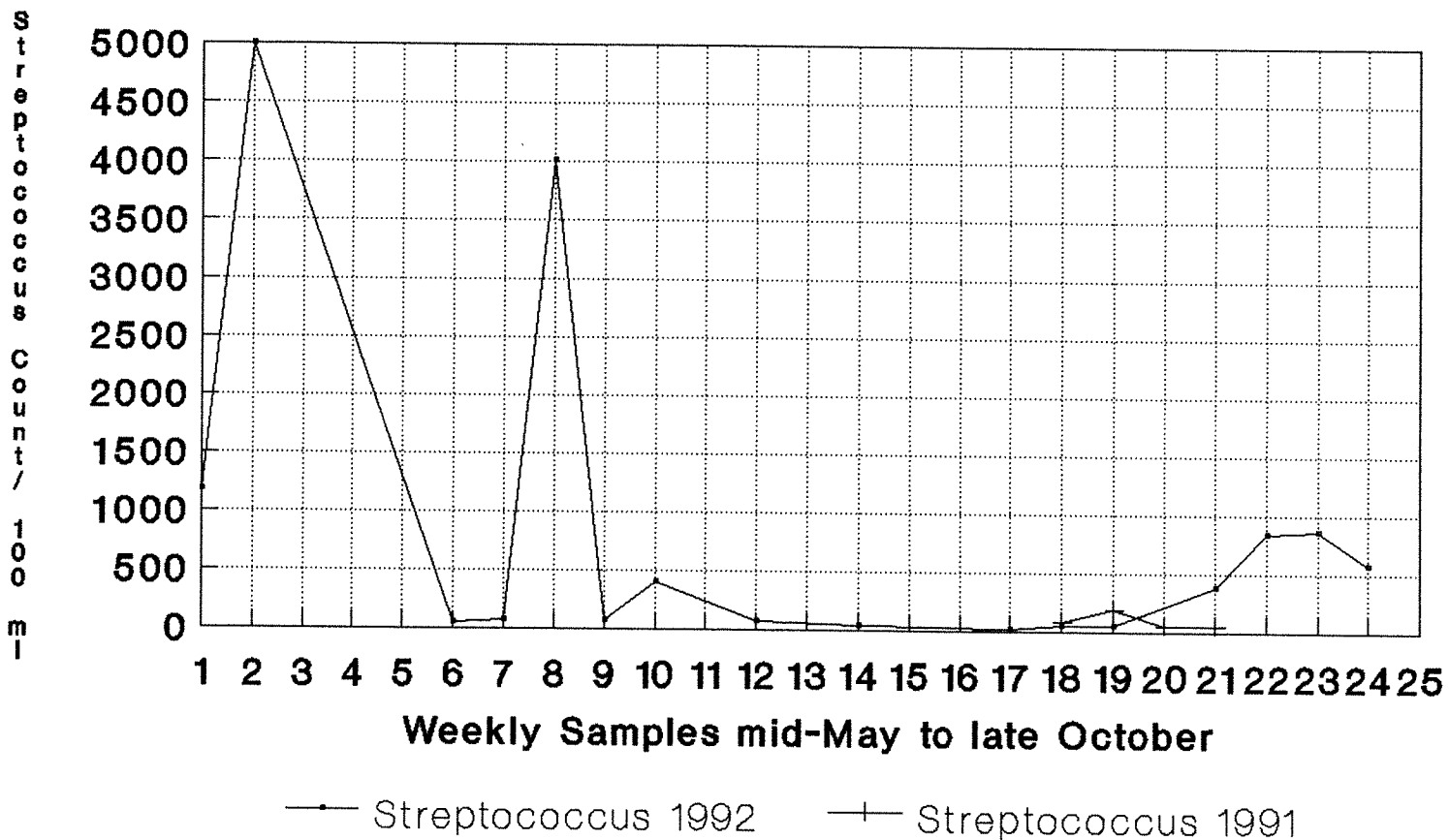
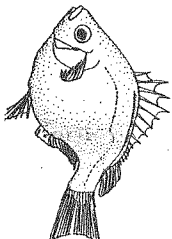


Figure 8. Fecal Streptococcus counts at the Mouth of Noble Gulch, comparing 1992 to 1991. (S.C. County Data)



**Fecal Coliform Bacterial Counts
Soquel Creek Lagoon Weekly Samples, 1992
Comparison of Stations**

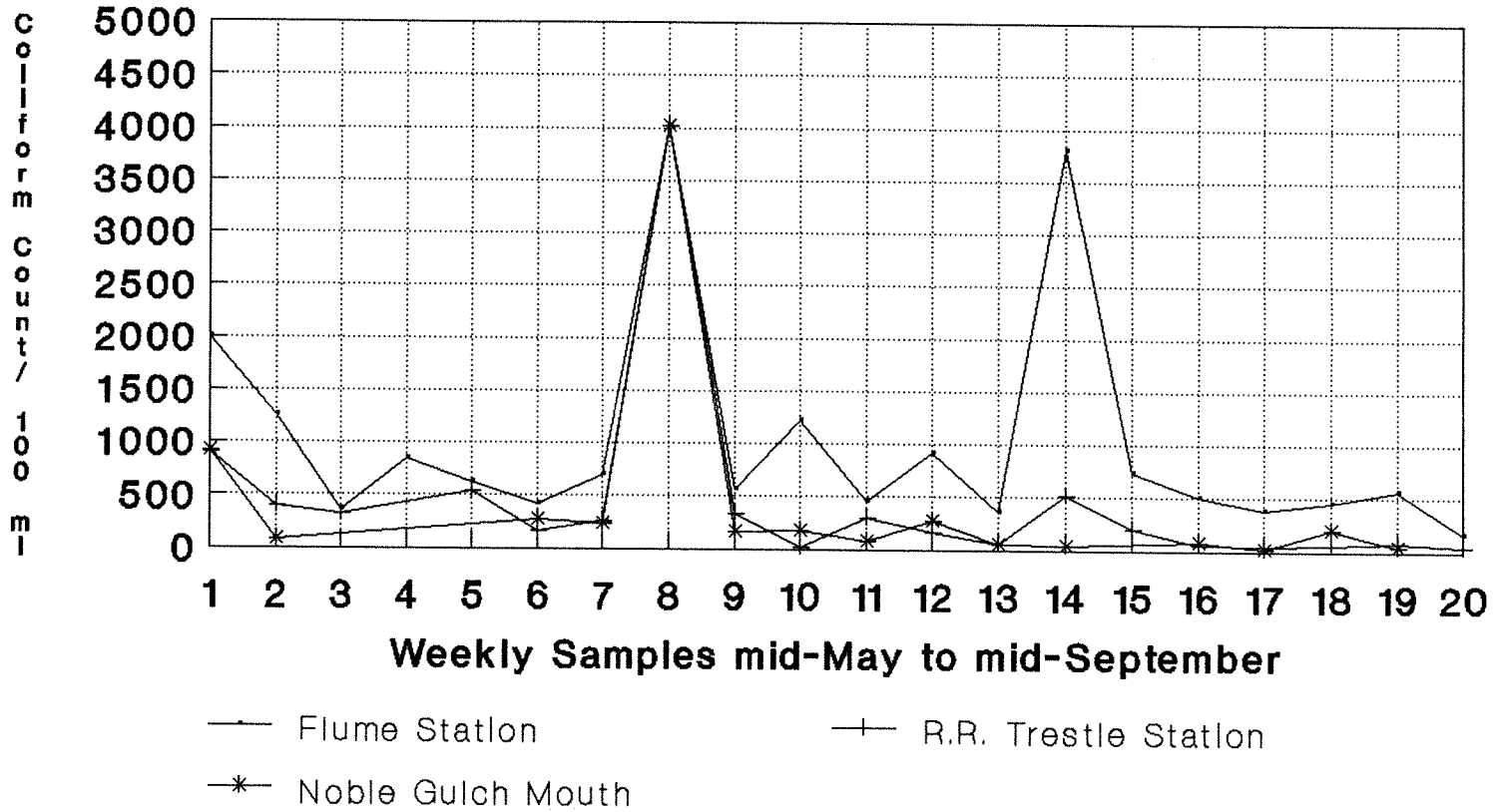
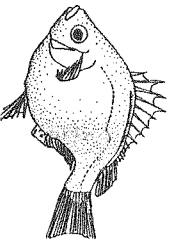


Figure 9. Comparison of Fecal Coliform Counts for the Flume, Trestle, and Noble Gulch Mouth, 1992. (S.C. County Data)



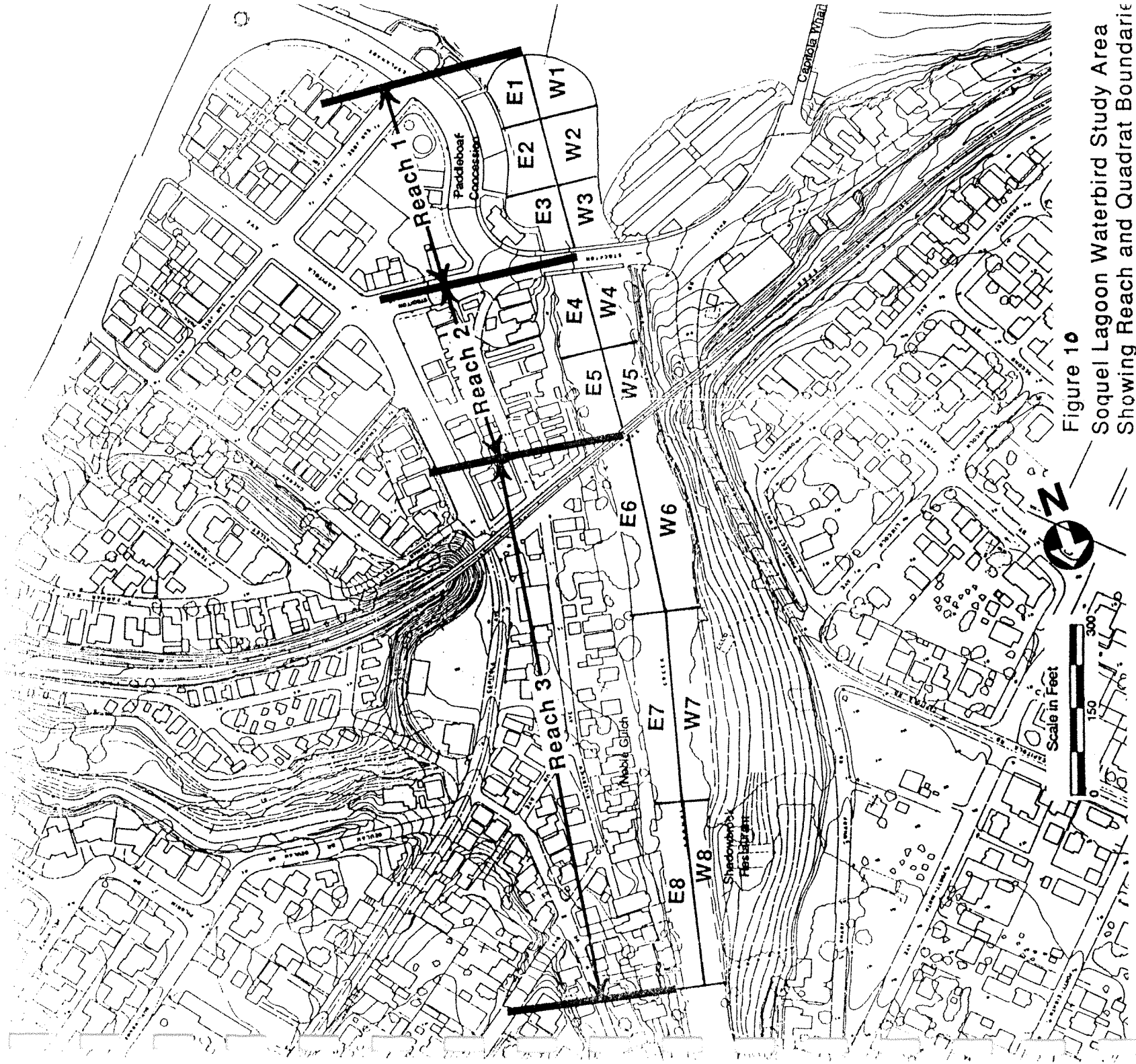
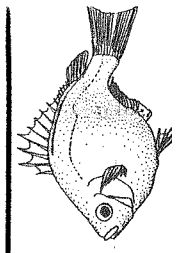


Figure 10
 Soquel Lagoon Waterbird Study Area
 Showing Reach and Quadrat Boundaries

May 1990
 424-01

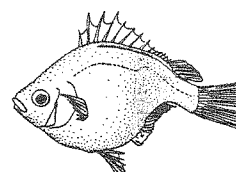
SOQUEL LAGOON
 Management & Enhancement Plan

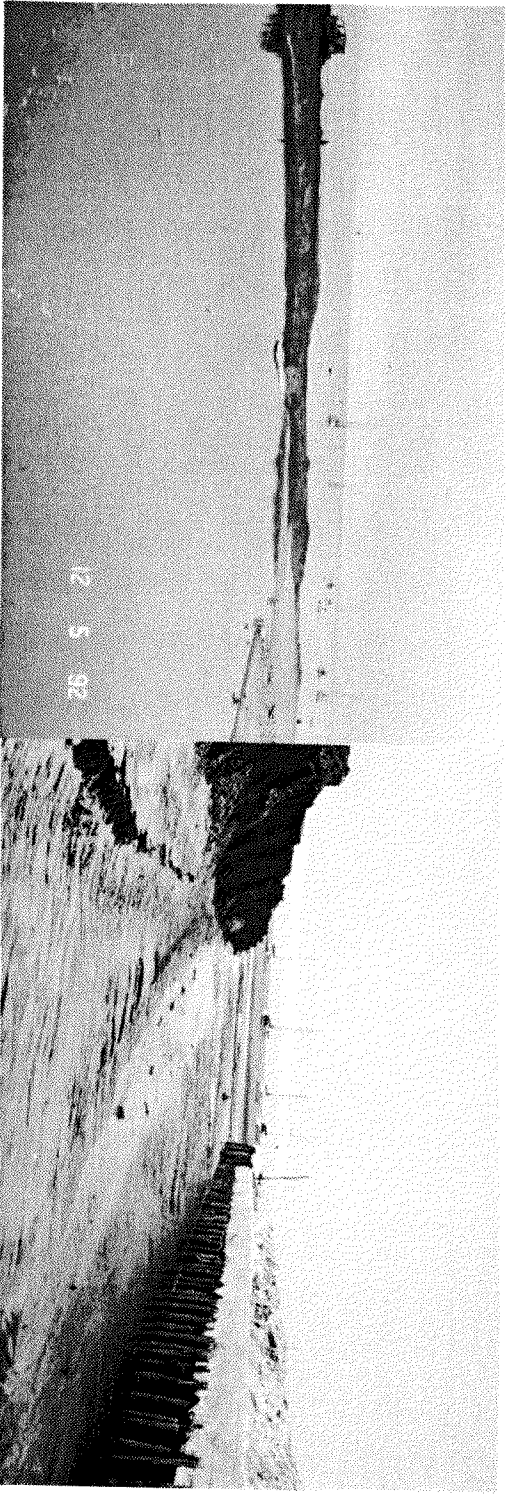
Habitat Restoration Group



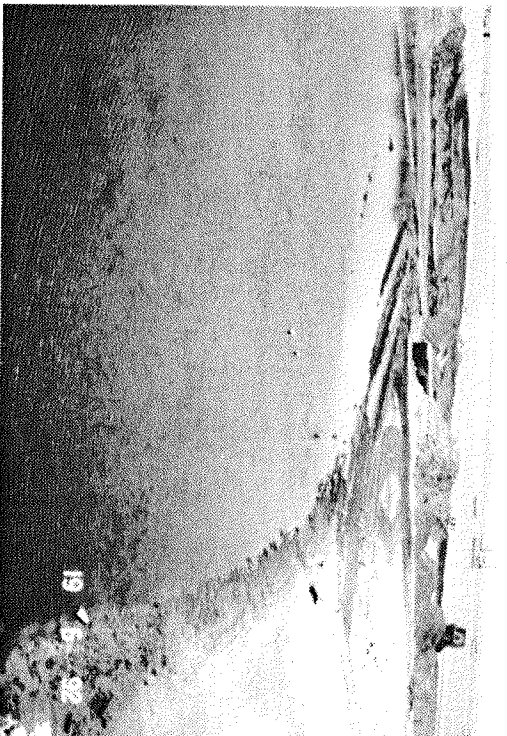
D.W. ALLEY & Associates

APPENDIX A.
PHOTOGRAPHS, 1992

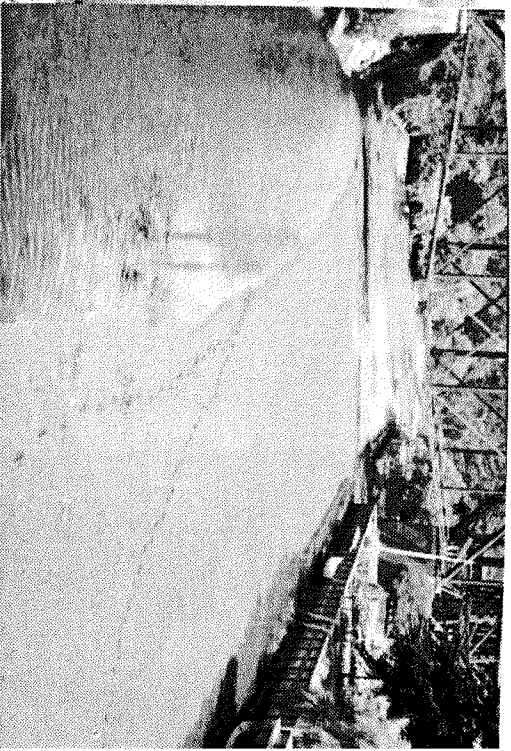




After Sealing East Channel 12May92 After Sandbar Opening 19May92



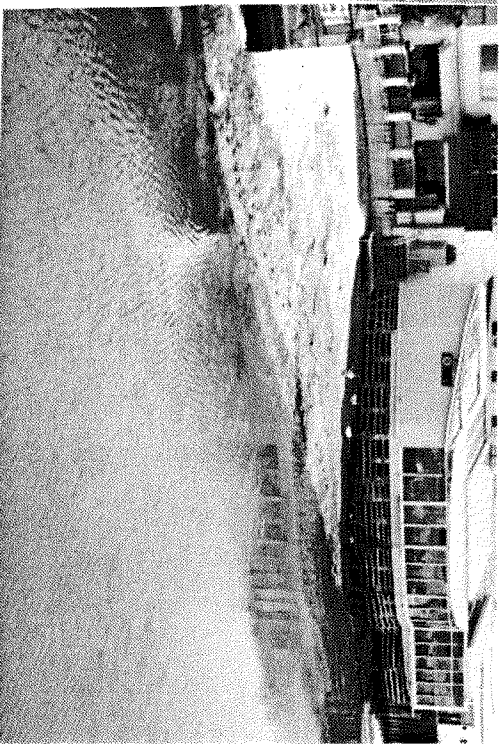
Sandbar Construction 19May92



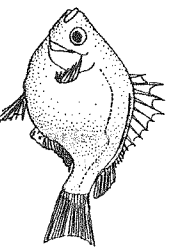
Reach 2 at Low Tide 19May92



Bottom Ooze, Reach 2 19May92



Buried Plant Material 19May92





Preparing the Flume 20May92



Covering the Plastic 20May92



Flushing of Suspended Ooze 20May92



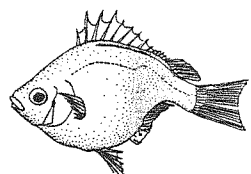
Covering the Flume 20May92

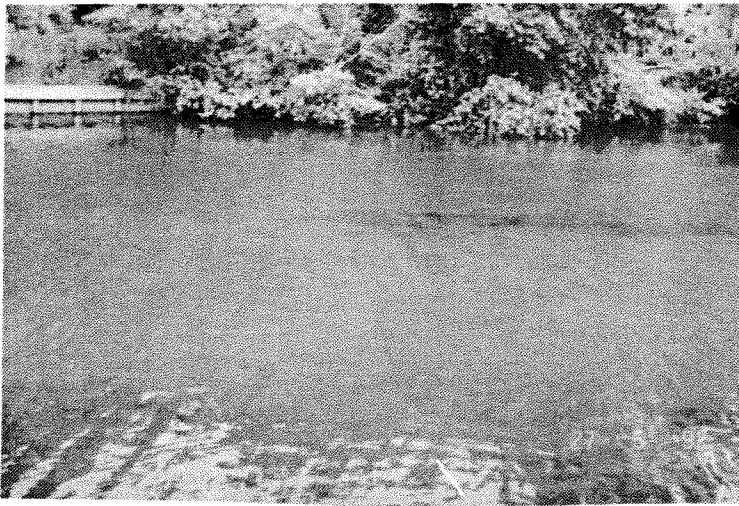


Covering the Flume 20May92

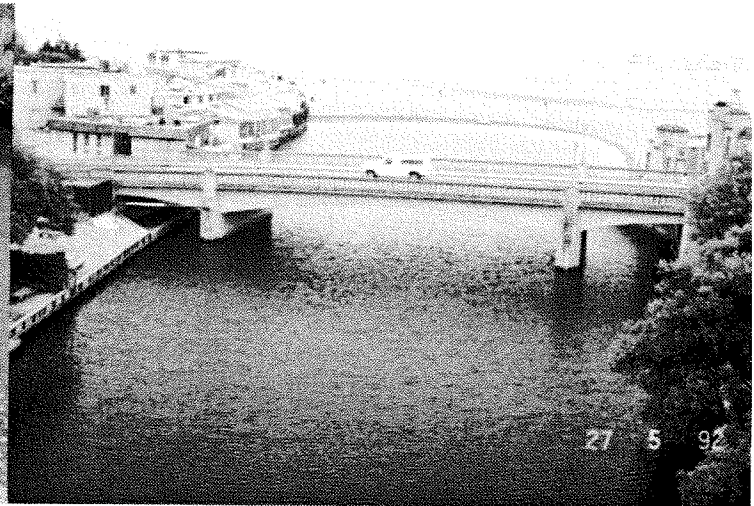


Final Sandbar Closure 20May92





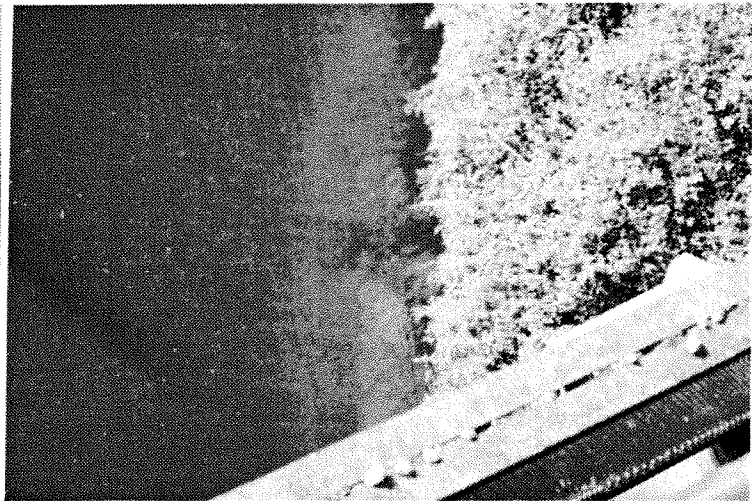
Planktonic Algal Bloom 27May92



Full Lagoon 27May92



Mallard Mother and Chicks 6June92



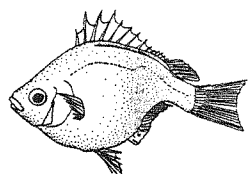
Filamentous Algae 6June92



Aquatic Vegetation, Reach 3 21Jul92



Log at Noble Gulch 21Jul92

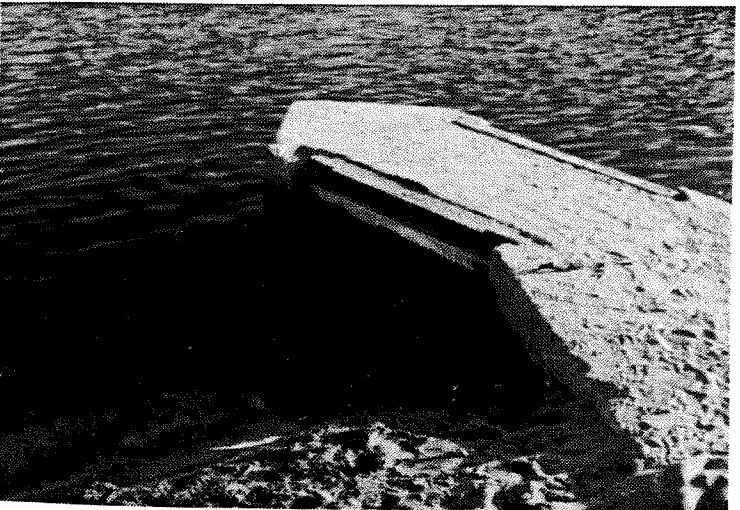




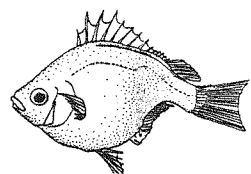
Phytoplankton Bloom 21Jul92 Floating Algae,519 Riverview21Jul92

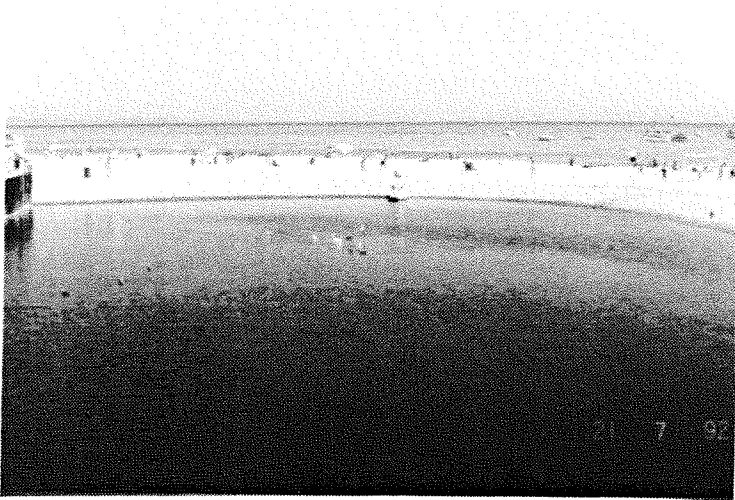


Floating Algae,533 Riverview 21Jul92 Vacant Lot & Dog 21Jul92



Vacant Lot & Trestle Park 21Jul92 Lagoon Level at Flume 21Jul92

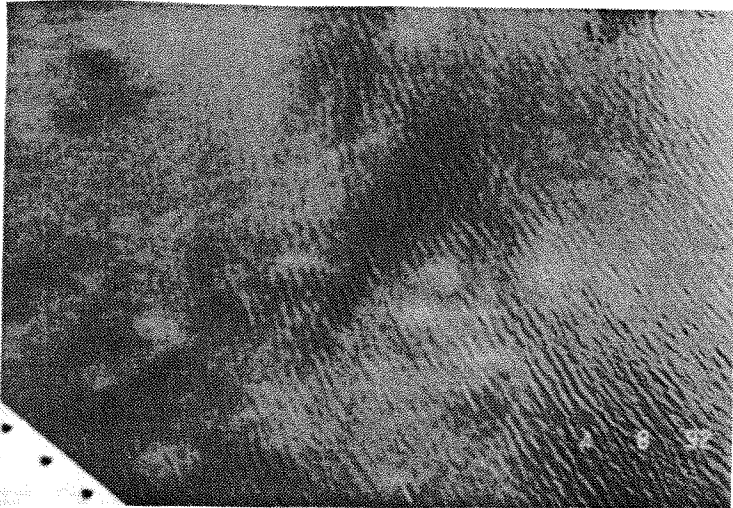




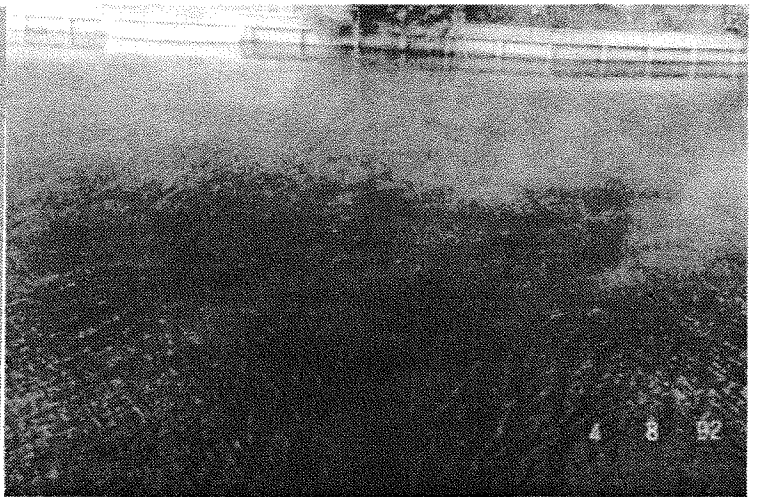
Reach 1 21July92



Lagoon Level at Flume 4Aug92



Aquatic Veg., Reach 2 4Aug92



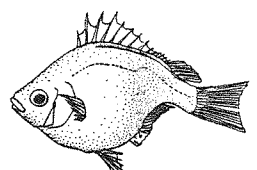
Aquatic Veg., Reach 3 4Aug92



Roosting Mallards, Noble G. 4Aug92

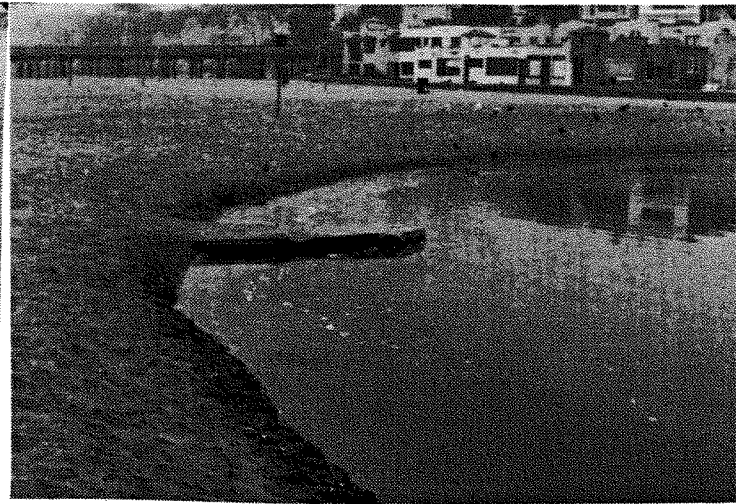


Dry Soquel Creekbed 12Aug92





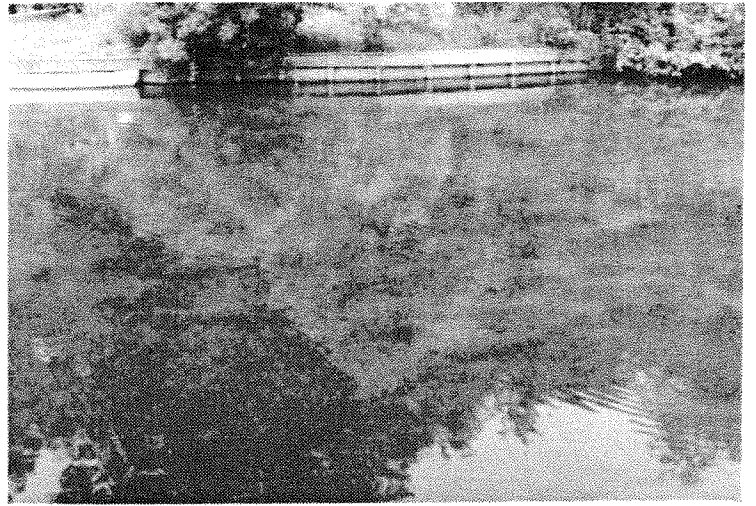
Lagoon Level at the Flume 12Aug92



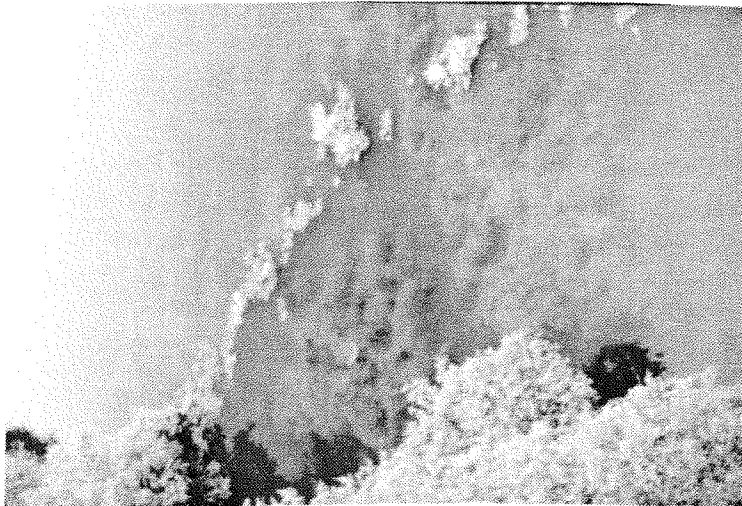
Surface Film at Flume 1Sep92



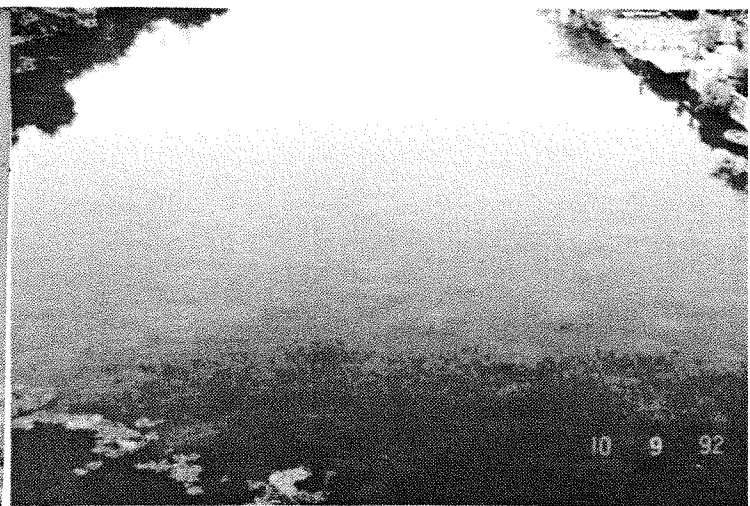
Skylight Washing, Reach 1 1Sep92



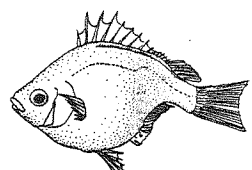
Aquatic Veg., Reach3 1Sep92



Pondweed Forest, Algae Floats 10Sep92

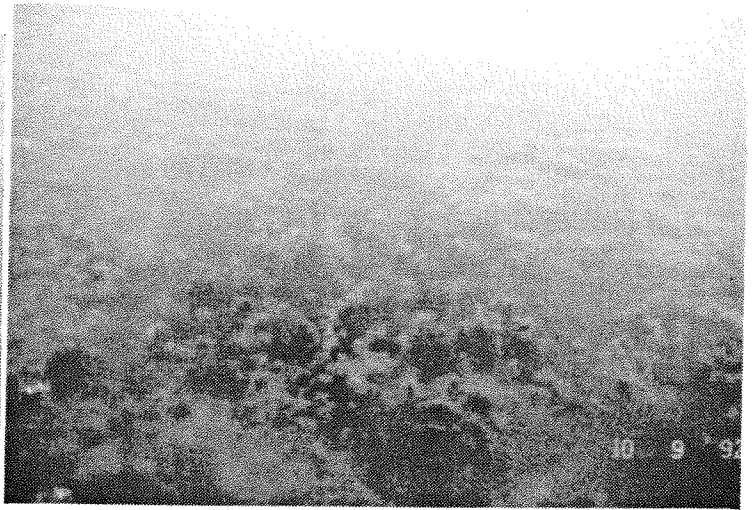


Aquatic Veg., Rch 2 10Sep92

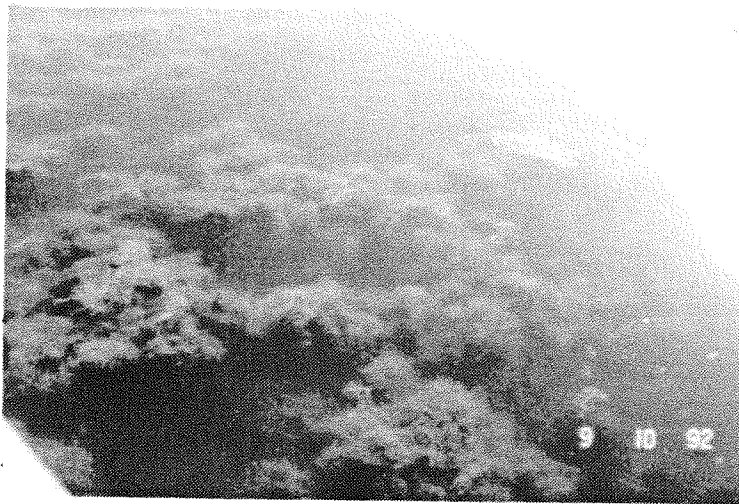




Pondweed Forest, Reach 1 10Sep92



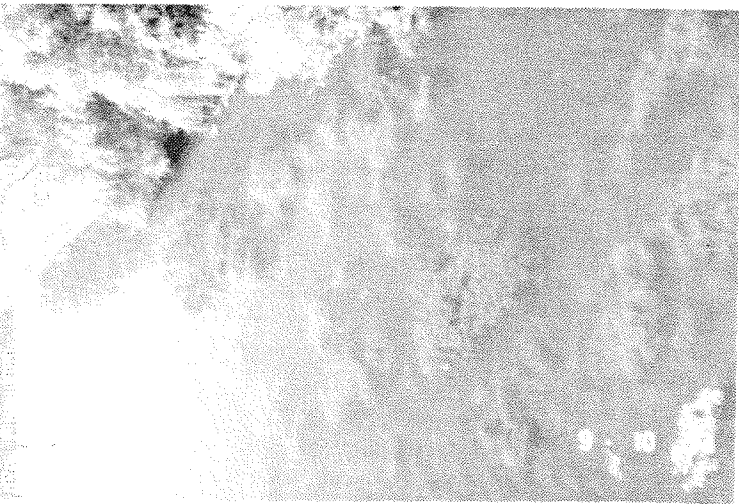
Pondweed Forest, Rch 2 10Sep92



Pondweed Forest, Rch 3 10Sep92



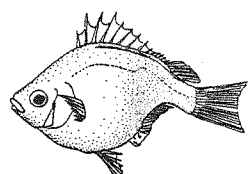
Floating Algae 90Oct92

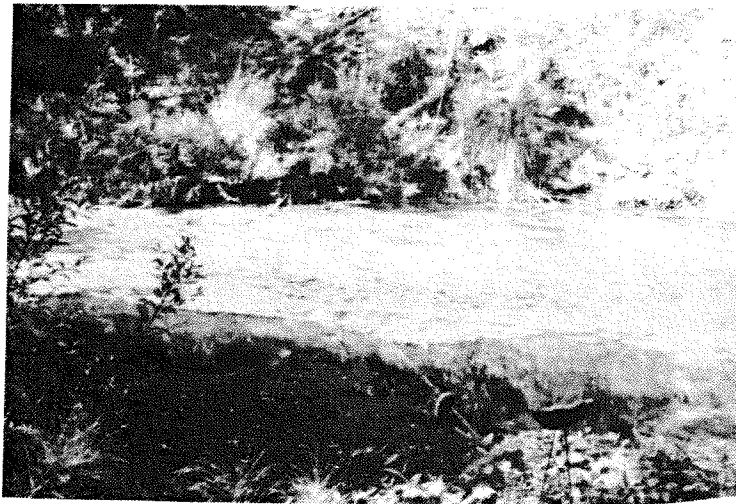


Pondweed Forest Rch 2 90Oct92



Surface Film at Flume 90Oct92





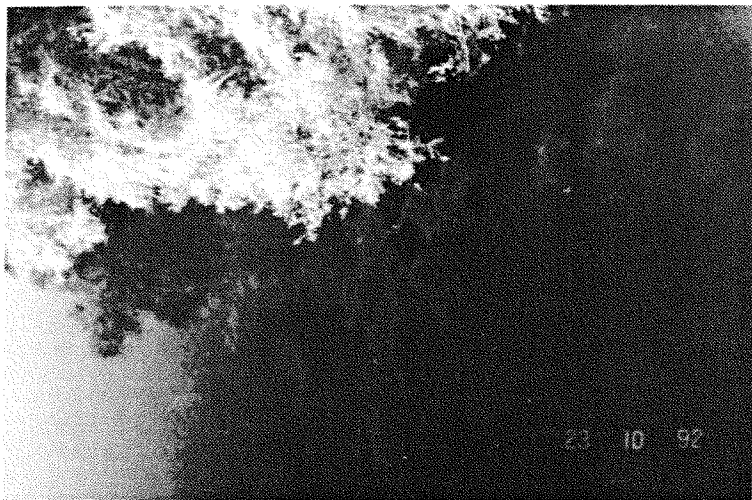
Surface Algae, 533 Riverview 90Oct92



Soquel Creek Behind Nob Hill 90Oct92



Lagoon Level After Rain 23Oct92



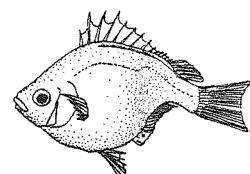
Senescent Willows, Rch 2 23Oct92



Soquel Creek Behind Nob Hill 23Oct92

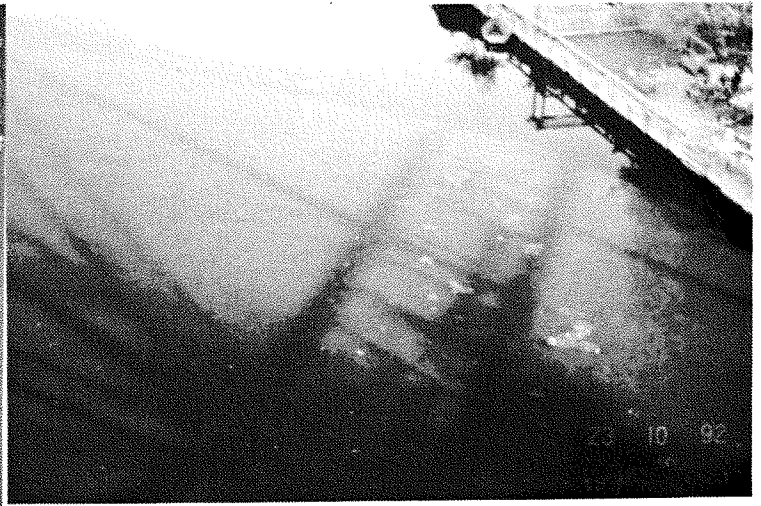


Senescent Willows Rch 3





Floating Algae, Rch 2 23Oct92



Floating Algae, Rch 3 23Oct92



Beach Seining Rch 1 24Oct92



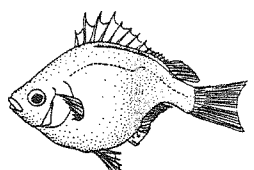
Beach Seining Rch 1 24Oct92



Beaching the Seine 24Oct92

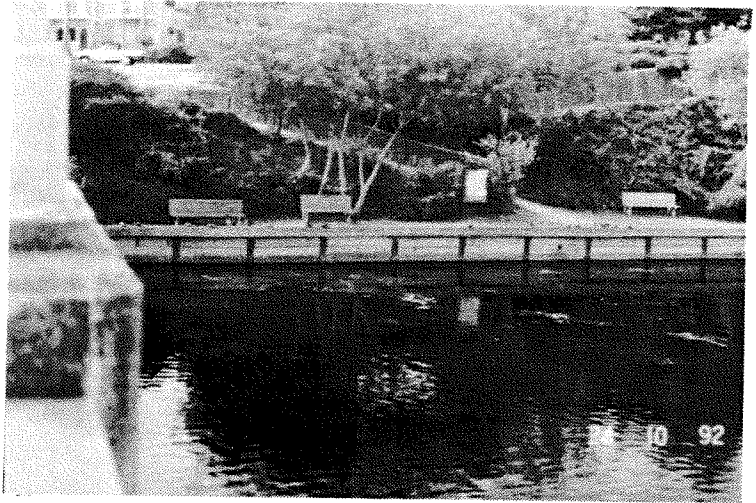


"Keep Your Lead Line Down" 24Oct92





Bathing Gulls, Reach 1 24Oct92



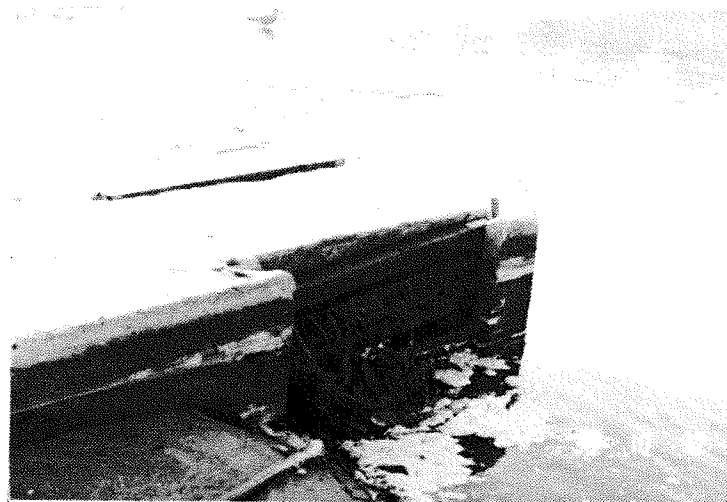
Roosting Ducks & Pigeons 24Oct92



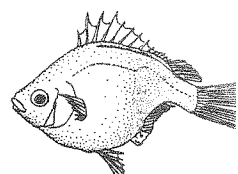
After Sandbar Breaching 30Oct92

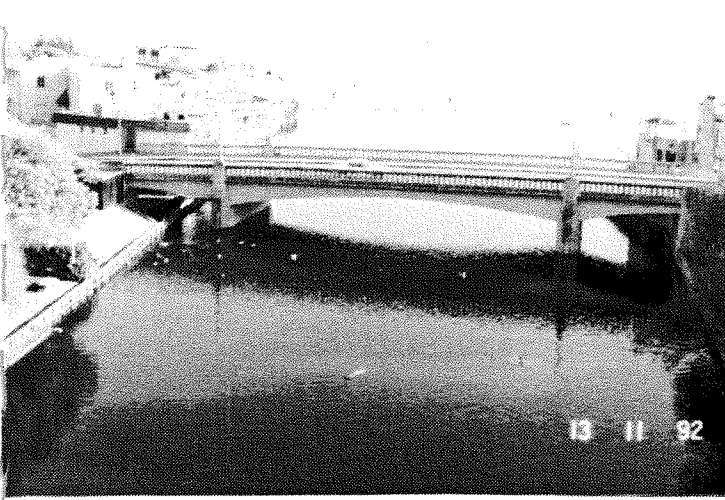


Channel Through Sandbar 30Oct92



Pondweed-choked Screening on Flume Entrance 30Oct92

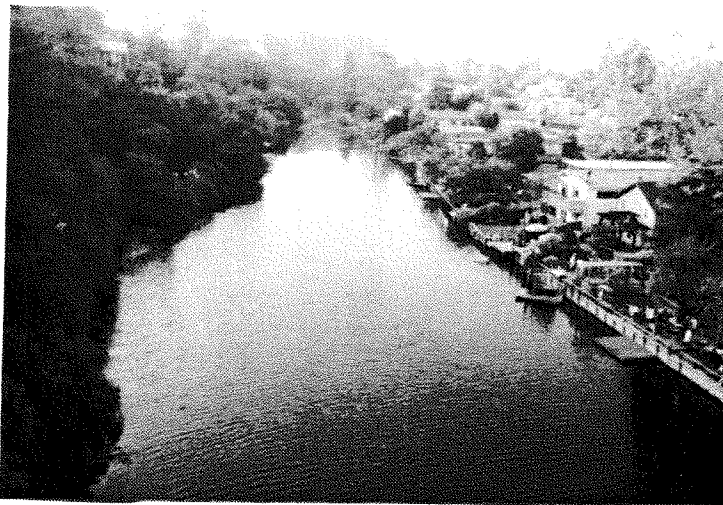




Estuary @ High Tide 13Nov92



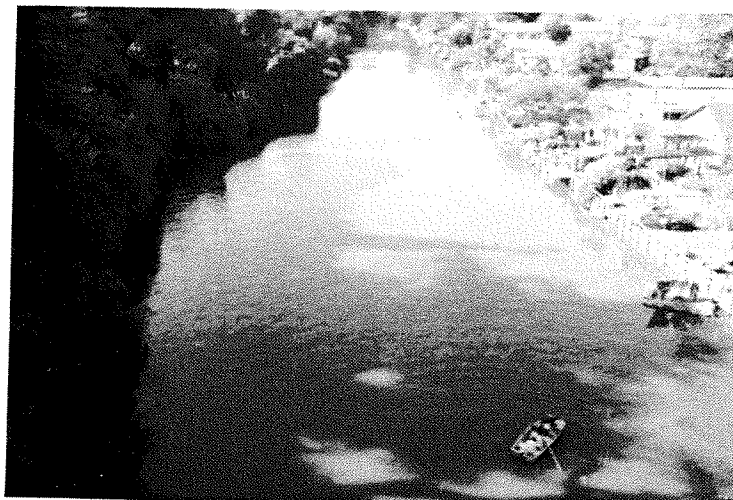
Submerged Flume @ High Tide 13Nov92



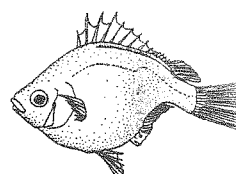
Pre-Begonia Festival 12Sep92

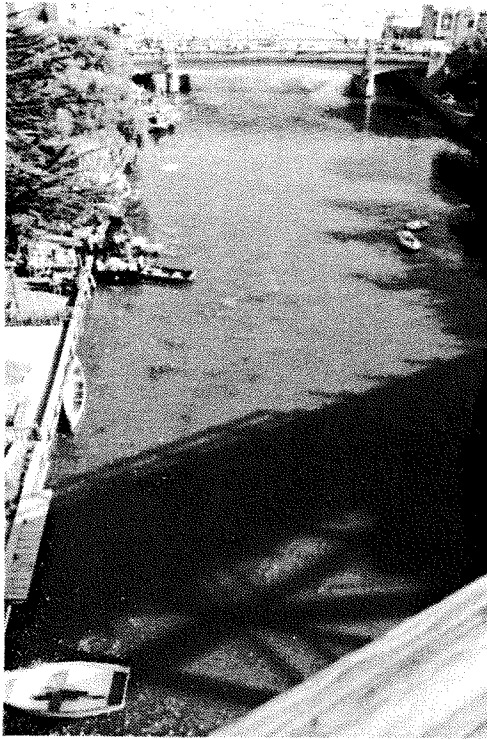


Post-Begonia Festival 13Sep92

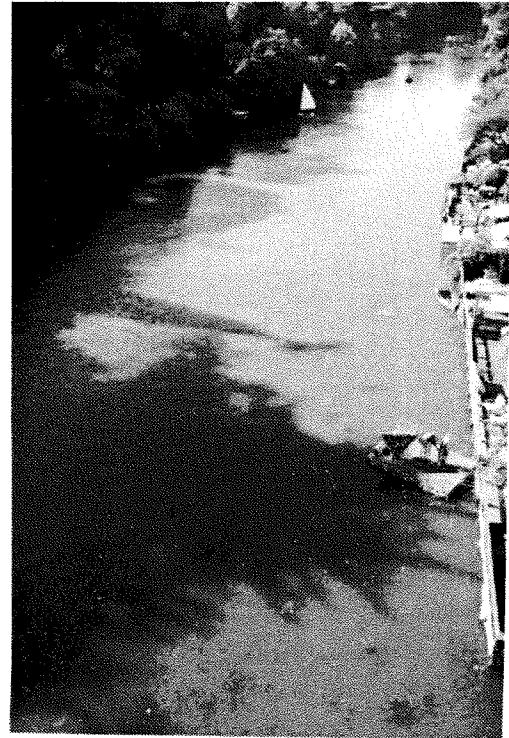


Post-Begonia Festival 13Sep92





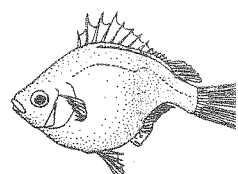
Post-Begonia Festival 13Sep92



Post-Begonia Festival 13Sep92

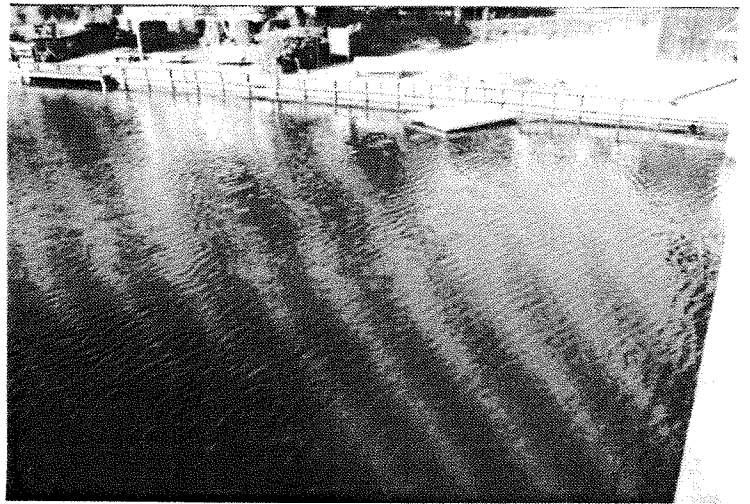


Post-Begonia Festival During Clean-up 14Sep92





After Clean-up, Reach 1 14Sep92



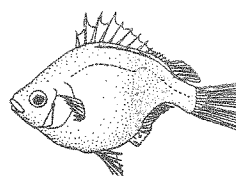
After Clean-up @ Bridge 14Sep92



After Begonia Festival Clean-up 14Sep92

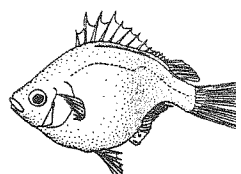


Lagoon Resident



APPENDIX B.

**FISH AND GAME AGREEMENT REGARDING PROPOSED STREAM OR
LAKE ALTERATION**



AGREEMENT REGARDING PROPOSED STREAM OR LAKE ALTERATION

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Department and CITY OF CAPITOLA of CAPITOLA, State of CALIFORNIA, hereinafter called the operator, is as follows:

WHEREAS, pursuant to Division 2, Chapter 6 of California Fish and Game Code, the operator, on the 13 day of APRIL 1992, notified the Department that he intends to substantially divert or obstruct the natural flow of, or substantially change the bank of, or use material from the streambed of, the following water: SOQUEL CREEK, in the County SANTACRUZ, State of California, S. - T. - R. - .

WHEREAS, the Department (represented by DENNIS BALDWIN has made an inspection of subject area on 29 day of APRIL, 1992, and) has determined that such operations may substantially adversely affect existing fish and wildlife resources including: SALMON, STEELHEAD, TIDEWATER GOBIES, NON-GAME FISH, RIPARIAN STRIP BIRDLIFE AND ANIMAL LIFE.

THEREFORE, the Department hereby proposes measures to protect fish and wildlife during the operator's work. The operator here agrees to accept the following recommendations as part of his work: Numbers 7, 10, 20, 21, 22 (649-2870) from the list of recommendations on the back of this page and the following special recommendations:

1. All work in or near the stream or lake shall be confined to the period MAY 11, 1992 TO OCT. 15, 1992
2. THIS PROJECT SHALL BE LIMITED TO DAMMING OF SOQUEL CREEK AT THE MOUTH, SUBJECT TO THE BELOW CONDITIONS.
3. A NEW STRAIGHT LINE BREECH MAY BE MADE. THE EXISTING CHANNEL PARALLEL ACROSS T BEACH SHALL BE SEINED WITH FISH BEING PLACED IN THE LAGOON, PRIOR TO A PLUG OF SAND BEING PLACED AT THE HEAD OF THE OUTFLOW CHANNEL. PRIOR TO STARTING THE FILLING OF THE DEEP HOLE ALONG THE FLUME TO THE CAPITOLA BUSINESSES, THE DEEP HOLE SHALL BE SEINED AND NETTED OFF TO PREVENT FISH FROM RE-ENTERING THE AREA.
4. OPERATOR SHALL PUT THE FLUME IN OPERATION DURING ALL CONSTRUCTION AND DURING ALL DAILY CLOSURES DURING CONSTRUCTION.
5. ALL SEINED SHALL BE REMOVED FROM THE CHANNEL BOTTOM BEFORE DAMMING OCCURS.
6. THE STEEL SHROUD PUT IN PLACE IN 1991 SHALL BE PLACED ON THE FLUME. A MINIMUM OF 8-12" OF WATER SHALL BE MAINTAINED THROUGH THE FLUME. THE FLUME SHALL BE KEPT OFF TO THE OCEAN UNTIL AT LEAST JULY 1, 1992. AFTER FINAL DAMMING, NO DRAW DOWN WILL BE ALLOWED WITHOUT PRIOR DFG APPROVAL. OPERATOR SHALL CONTACT DFG PRIOR TO BREECH UNLESS FLOODING IS IMMINENT.

The operator, as designated by the signature on this agreement, shall be responsible for the execution of all elements of this agreement. A copy of this agreement must be provided to contractors and subcontractors and must be in their possession at the work site.

If the operator's work changes from that stated in the notification specified above, this agreement is no longer valid and a new notification shall be submitted to the Department of Fish and Game. Failure to comply with the provisions of this agreement and with other pertinent Code Sections, including but not limited to Fish and Game Code Sections 5650, 5652 and 5948, may result in prosecution.

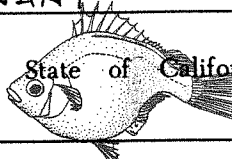
Nothing in this agreement authorizes the operator to trespass on any land or property, nor does it relieve the operator of responsibility for compliance with applicable federal, state, or local laws or ordinances.

THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

This agreement becomes effective on WHEN SIGNED BY BOTH PARTIES.

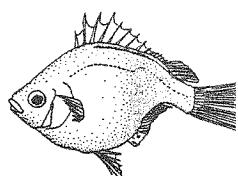
Operator [Signature]
 Title Mayor
 Organization City of Capitola
 Date 4/29/92

[Signature]
 Department Representative
 Title PATROL LIEUTENANT
 Department of Fish and Game, State of California
D.W. ALLEY & Associates
 Date 4/29/92



APPENDIX C.

Santa Cruz County Water Monitoring Data, 1992.



5/5/92

LABORATORY SERVICES
HEALTH SERVICES AGENCY
WATER SAMPLE REPORT
(MEMBRANE FILTER)

PURPOSE OF SAMPLE: Fresh Coastal Creeks & Lagoons

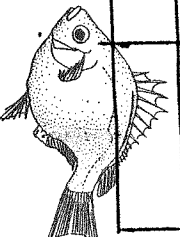
DATE SAMPLED: 5/5/92 DATE REPORTED: _____ BY: DBA

TIME AT INCUBATION: _____ TIME AT COUNTING: _____ FC _____ FS _____

Sample No. / Time/Type	Source/Conductivity T °C	MLS. FILTERED	NO. COLONIES	FECAL COLI/100ml	STREP COLI/100ml	FC/FS
① SØ 12:40 W	Soguel c. at Filene	5	31	620	460	1.3
170, 750	Clear water / 3 yeast	5	23			
② SØ 6 12:30 W	Soguel c. at TRESTLE	5	39	780	460	1.6
170, 880	Clear water	5	23			
③ S12 12:20 W	Nobel G. at Tunnel at Bay	5	21	420	800	0.5
170	Clear water	5	40			
④ S1 12:10 I	Nobel G. at Soguel c.	5	83	1660	760	2.1
160	Clear water	5	38			
⑤ S23 11:58 W	Soguel c. at Nob Hill	5	33	660		2.0
160	Clear water / 2 ducks	5	16		320	
⑥ S254 11:43 I	Soguel c. Below Soguel dr.	5	11	220	240	0.9
160	Clear water, some algal growth	5	82			
⑦ S26 11:40 M	Soguel c. Above Soguel dr.	5	0	0		0
160	Clear water / 5 ducks	5	17		340	
⑧ 10:35 I	Pond at R. Above Dalphin Dr. B-swish water / decaying organic matk.	5	0	0	40	0
180	E. Phillips Ditch	5	2			
⑨ AM 112 11:10	Very slow moving water / little flow	5	TNTC	-	-	-
			TNTC	-	-	-

Conductivity at Lagoons only

D.W. ALLEY & Associates



5/11/92

LABORATORY SERVICES
HEALTH SERVICES AGENCY

WATER SAMPLE REPORT
(MEMBRANE FILTER)

Fresh

PURPOSE OF SAMPLE: Coastal Creeks & Lagoons

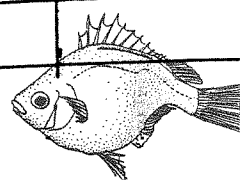
DATE SAMPLED: 5/11/92 DATE REPORTED: _____ BY: CPBA

TIME AT INCUBATION: _____ TIME AT COUNTING: _____ FC _____ FS

Sample No./ Time/Type	Source/Conductivity T °C	MLS. FILTERED	NO. COLONIES	FECAL COLI/100ml	STREP COLI/100ml	FC/FS
✓ (A) Aφ 10:45 W	⊕ Aptos C. at Mouth	5	286	5720		2.4
19°, 780	clear water/6 seagulls in H ₂ O	5	118		2360	
✓ (B) Sφ 11:50 I	⊕ Soguel C. at ocean confluence	5	64	1280		1.2
21°, 10	13 seagulls, clear water - mouth is being closed.	5	51		1020	
✓ (C) Sφ 12:00 W	⊕ Soguel C. at flume	5	TNTC	-		-
19°, 600	clear water/mouth closed/some foam	5	102		2040	
✓ (D) Sφ4 12:00 I	⊕ Soguel C. at Zelda's	5	143	2860		-
20°, 10	clear water/mouth closed/some foam	5	TNTC		-	
✓ (E) Sφ3 13:50 I	⊕ Soguel C. Above Stockton Bridge	5	50	1000		1.3
18°	clear water/ some foam	5	36		720	
✓ (F) Sφ6 1:00 W	⊕ Soguel C. at Trestle	5	64	1320		1.4
18°, 450	clear water/ some foam	5	46		920	
✓ (G) SWφ 1:20 M	⊕ Swan L. at Mouth	5	11	220		0.5
23°, 10	clear water/40 birds in H ₂ O	5	21		420	
✓ (H) Nφ 1:35 W	⊕ Near L. at Mouth	5	5	100		1.6
21°, 940	clear water	5	3		60	
✓ (I) MRφ 1:50 W	⊕ Moore C. at Mouth at Nat. B.	5	26	520		1.6
24°, 10	standing clear water/5 seagulls	5	16		320	

⊕ Conductivity at Lagoons only

D.W. ALLEY & Associates
All Permutat Signs posted



5-12-92

LABORATORY SERVICES
HEALTH SERVICES AGENCY

WATER SAMPLE REPORT
(MEMBRANE FILTER)

Fresh

PURPOSE OF SAMPLE: Coastal creeks & Lagoons

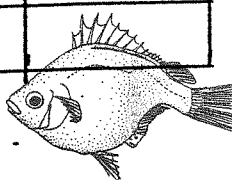
DATE SAMPLED: 5/12/92 DATE REPORTED: _____ BY: COBA

TIME AT INCUBATION: _____ TIME AT COUNTING: FC FS

Sample No./ Time/Type	Source/Conductivity T. °C	MLS. FILTERED	NO. COLONIES	FECAL COLI/100ml	STREP COLI/100ml	FC/FS
① 5φ 12:55 W	Soquel C. at Flume	5	100	2000		4.3
20°, 340	clear water/many Seagulls	5	23		460	
② 5φ6 12:45 W	Soquel C. at Trestle	5	45	900		1.8
18°, 550	clear water	5	25		500	
③ 51 12:35 I	Nobel C. at Soquel C.	5	46	920		0.7
18°	clear water	5	59		1180	
④ 523 12:25 W	Soquel C. at Nob Hill	5	40	800		40
170	clear water	5	1		20	
⑤ AM112 11:35 I	E. Phillips Ditch	5	TNTC	-		-
190	greyish water	5	45		900	
⑥ 5254 12:15 I	Soquel C. Below Soquel cr.	5	33	660		1.2
170	clear water/algal growth	5	26		520	
⑦ 5Vφ 10:40 M	San Vicente C. at Mouth	5	3	60		0.2
140	clear water	5	11		220	
⑧ N2φ 11:00 M	Westlake P. at Westside	5	5	100		0.02
220	10 birds in water	5	211		4220	
⑨ AM113 11:45 I	Amesti Ditch at Block Hole	5	0	0		0
	clear water	5	8		160	

⊖ Conductivity at Lagoons only

D.W. ALLEY & Associates



LABORATORY SERVICES
HEALTH SERVICES AGENCY

WATER SAMPLE REPORT
(MEMBRANE FILTER)

Fresh

PURPOSE OF SAMPLE: Coastal creeks & Lagoons

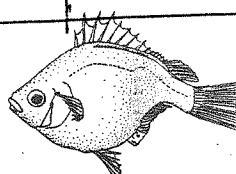
DATE SAMPLED: 5/19/92 DATE REPORTED: _____ BY: DBB

TIME AT INCUBATION: _____ TIME AT COUNTING: _____ FC _____ FS

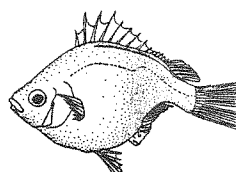
Sample No./ Time/Type	Source/Conductivity T °C	MLS. FILTERED	NO. COLONIES	FECAL COLI/100ml	STREP COLI/100ml	FC/FS
✓ ① S02 12:25 W	Sequel C. at Flume greyish water, Seagulls	5	63	1260		1.7
24°, 980		5	36		720	
✓ ② S03 12:15 I	Sequel C. Above Stockton Bridge Low flow, greyish water, sulfur smell	5	10	200		0.5
23°		5	19		380	
✓ ③ S06 2:05 W	Sequel C. at Trestle greyish water, low flow	5	20	400		0.7
22°, 930		5	27		540	
✓ ④ S1 11:55 I	Nobel C. at Sequel C. clear water	5	4	80		0.01
17°		5	250 ⁺		5000	
✓ ⑤ S12 11:45 W	Nobel C. at Tunnel at Bay clear water	5	3	60		-
17°		5	TNTC		-	
✓ ⑥ S23 11:35 W	Sequel C. at Nob Hill clear water/algal growth	5	35	700		0.7
18°		5	44		880	
✓ ⑦ S26 11:25 M	Sequel C. Above Sequel C. clear water/algal growth	5	29	580		0.4
17°		5	63		1260	
✓ ⑧ S254 11:20 I	Sequel C. Below Sequel C. clear water/pigeons, algal growth 3 ducks	5	52	1040		1.3
17°		5	39		780	
✓ ⑨ AM112 10:40 I	E. Phillips Ditch oily film on slow moving water	5	TNTC	-		-
19°		5	159		3180	

⊖ Conductivity at Lagoons only

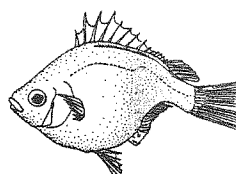
D.W. ALLEY & Associates



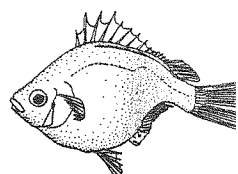
STANUM	LOCATION	DATE	TIME	TEMP-C	ELCOND	FECOLI	FECSTR	FCFSRA	NOTES
3	SOQUEL C @ NOB HILL	26-May-92	11:05 AM	18		300	760	0.4	CLEAR WATER, ALGAL GROWTH
S23	SOQUEL C @ NOB HILL	03-Jun-92	11:10 AM	17		1460	920	1.6	CLEAR WATER, ALGAL GROWTH
S23	SOQUEL C @ NOB HILL	10-Jun-92	11:10 AM	18		720	380	1.9	CLEAR WATER, ALGAL GROWTH
3	SOQUEL C @ NOB HILL	16-Jun-92	09:55 AM	16		440	440	1.0	CLEAR WATER, ALGAL GROWTH
3	SOQUEL C @ NOB HILL	24-Jun-92	12:00 PM	18		1040	740	1.4	CLEAR WATER, 3 DUCKS
S23	SOQUEL C @ NOB HILL	30-Jun-92	10:15 AM	18		5340	5460	1.0	CLEAR WATER, RAIN 6/29
3	SOQUEL C @ NOB HILL	07-Jul-92	12:20 PM	19		640	800	0.8	CLEAR WATER
3	SOQUEL C @ NOB HILL	08-Jul-92	10:40 AM	18		540	880	0.6	CLEAR WATER
S23	SOQUEL C @ NOB HILL	14-Jul-92	10:55 AM	20		640	1680	0.4	CLEAR WATER
S23	SOQUEL C @ NOB HILL	22-Jul-92	11:00 AM	19		480	400	1.2	CLEAR WATER
3	SOQUEL C @ NOB HILL	28-Jul-92	11:35 AM	18		140	700	0.2	CLEAR WATER
S23	SOQUEL C @ NOB HILL	04-Aug-92	01:20 PM	21		40	200	0.2	CLEAR WATER
S23	SOQUEL C @ NOB HILL	10-Aug-92	12:15 PM			80	2740	0.0	SLIGHTLY YELLOWISH, LOTS OF ALGAE
3	SOQUEL C @ NOB HILL	17-Aug-92	11:15 AM			400	560	0.7	
3	SOQUEL C @ NOB HILL	25-Aug-92	12:15 PM	18		120	160	0.8	GREYISH WATER, LOW H2O FLOW
S23	SOQUEL C @ NOB HILL	01-Sep-92	12:00 PM	20		160	440	0.4	ALGAL GROWTH
S23	SOQUEL C @ NOB HILL	08-Sep-92	11:20 AM	17		480	1040	0.5	GREYISH WATER, ALGAL GROWTH
3	SOQUEL C @ NOB HILL	22-Sep-92	12:10 PM	19		260	260	1.0	GREYISH WATER
S23	SOQUEL C @ NOB HILL	30-Sep-92		18		240	280	0.9	GREYISH WATER, LITTLE FLOW
S23	SOQUEL C @ NOB HILL	06-Oct-92	12:45 PM	19		20	280	0.1	GREYISH WATER
3	SOQUEL C @ NOB HILL	13-Oct-92	11:20 AM	15		580	280	2.1	GREYISH WATER
S23	SOQUEL C @ NOB HILL	20-Oct-92	10:45 AM	16		200	340	0.6	GREYISH, SLOW MOVING WATER
S23	SOQUEL C @ NOB HILL	27-Oct-92	11:20 AM	18		440	180	2.4	GREYISH WATER
3	SOQUEL C @ NOB HILL	03-Nov-92	11:55 AM	17		780	1180	0.7	CLEAR WATER
3	SOQUEL C @ NOB HILL	17-Nov-92	10:42 AM	15		340	820	0.4	CLEAR WATER
S23	SOQUEL C @ NOB HILL	01-Dec-92	10:45 AM	12		150	660	0.2	CLEAR WATER
S23	SOQUEL C @ NOB HILL	15-Dec-92	10:10 AM	8		60	140	0.4	CLEAR WATER
3	SOQUEL C @ NOB HILL	22-Dec-92		8		560	340	1.6	CLEAR WATER
S23	SOQUEL C @ NOB HILL	29-Dec-92	11:20 AM	10		600	4300	0.1	RAIN 12/28 & 12/29
S23	SOQUEL C @ NOB HILL	05-Jan-93	11:25 AM	6		40	300	0.1	CLEAR WATER
3	SOQUEL C @ NOB HILL	19-Jan-93	01:10 PM	11		ERR	ERR		ERR RESULTS NOT VALID.
S23	SOQUEL C @ NOB HILL	02-Feb-93	11:30 AM	10		20	20	1.0	CLEAR WATER
S23	SOQUEL C @ NOB HILL	16-Feb-93	12:30 PM	11		60	60	1.0	CLEAR WATER
3	SOQUEL C @ NOB HILL	23-Feb-93	11:35 AM			1040	ERR		ERR BROWNISH WATER, RAIN 2/23, STREP P CONTA
3	SOQUEL C @ NOB HILL	02-Mar-93	10:40 AM	11		40	120	0.3	CLEAR WATER
S23	SOQUEL C @ NOB HILL	10-Mar-93	10:43 AM	13		60	340	0.2	CLEAR WATER.
S12	NOBEL G @ TUNNEL @ BAY	10-Jun-92	11:25 AM	17		1100	2620	0.4	CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	16-Jun-92	10:45 AM	16		680	1880	0.4	CLEAR, SHALLOW WATER
S12	NOBEL G @ TUNNEL @ BAY	24-Jun-92	12:10 PM	17		4720	2380	2.0	CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	30-Jun-92	10:25 AM	18		5400	6580	0.8	CLEAR WATER, RAIN 6/29
2	NOBEL G @ TUNNEL @ BAY	08-Jul-92	11:15 AM	17		840	1520	0.6	CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	14-Jul-92	11:10 AM	19		480	3420	0.1	CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	22-Jul-92	11:15 AM	17		3340	7700	0.4	CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	28-Jul-92	11:25 AM			100	40	2.5	CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	04-Aug-92	01:15 PM	21		60	80	0.8	CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	10-Aug-92	12:05 PM			5640	1480	3.8	
S12	NOBEL G @ TUNNEL @ BAY	17-Aug-92	10:40 AM			2380	2260	1.1	
2	NOBEL G @ TUNNEL @ BAY	24-Aug-92	11:03 AM			3740	1660	2.3	
S12	NOBEL G @ TUNNEL @ BAY	25-Aug-92	12:00 PM	20		40	20	2.0	CLEAR WATER



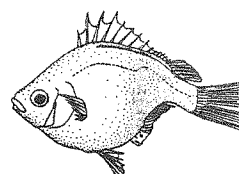
STANUM	LOCATION	DATE	TIME	TEMP-C	ELCOND	FECOLI	FECSTR	FCFSRA	NOTES
2	NOBEL G @ TUNNEL @ BAY	01-Sep-92	12:25 PM	20		0	0		ERR
S12	NOBEL G @ TUNNEL @ BAY	08-Sep-92	11:10 AM	19		180	20		9.0 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	22-Sep-92	11:55 AM	19		0	0		ERR CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	30-Sep-92		19		40	360		0.1 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	13-Oct-92	10:35 AM	15		60	2320		0.0 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	20-Oct-92	10:35 AM	15		4380	4300		1.0 CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	27-Oct-92	11:30 AM	17		3460	40		86.5 CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	03-Nov-92	11:45 AM	17		4020	6020		0.7 CLEAR WATER, LOW FLOW.
S12	NOBEL G @ TUNNEL @ BAY	17-Nov-92	11:25 AM	14		200	600		0.3 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	01-Dec-92	10:55 AM	9		110	1090		0.1 CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	15-Dec-92	10:20 AM	8		400	140		2.9 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	22-Dec-92		8		140	100		1.4 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	29-Dec-92	11:10 AM	10		1200	19500		0.1 RAIN 12/28 & 12/29
2	NOBEL G @ TUNNEL @ BAY	05-Jan-93	11:15 AM	6		60	280		0.2 CLEAR WATER
2	NOBEL G @ TUNNEL @ BAY	02-Feb-93	12:25 PM	10		100	0		ERR CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	16-Feb-93	11:45 AM	12		220	264		0.8 GREYISH WATER.
2	NOBEL G @ TUNNEL @ BAY	16-Feb-93	11:45 AM	12		220	264		0.8 GREYISH WATER
2	NOBEL G @ TUNNEL @ BAY	23-Feb-93	12:00 PM			800	ERR		ERR BROWNISH WATER, RAIN 2/23, STREP P CONTA
S12	NOBEL G @ TUNNEL @ BAY	02-Mar-93	10:50 AM	10		0	140		0.0 CLEAR WATER
S12	NOBEL G @ TUNNEL @ BAY	10-Mar-93	11:14 AM	15		160	540		0.3 CLEAR WATER.
1	NOBEL G @ SOQUEL C	02-Feb-93	11:43 AM	10		2240	20		112.0 CLEAR WATER
S11	NOBEL G @ SOQUEL C	16-Feb-93	12:17 PM	11		0	50		0.0 BROWNISH WATER
S11	NOBEL G @ SOQUEL C	23-Feb-93	11:47 AM			840	ERR		ERR BROWNISH WATER, RAIN 2/23, STREP P CONTA
1	NOBEL G @ SOQUEL C	02-Mar-93	11:02 AM	11		80	120		0.7 CLEAR WATER
7	SOQUEL C @ NOBEL G	16-Jun-92	11:00 AM	18		280	60		4.7 CLEAR WATER
S07	SOQUEL C @ NOBEL G	24-Jun-92	12:40 PM	21		240	80		3.0 CLEAR WATER
7	SOQUEL C @ NOBEL G	30-Jun-92	10:35 AM	20		4020	4020		1.0 BROWNISH WATER, RAIN 6/29
7	SOQUEL C @ NOBEL G	08-Jul-92	11:25 AM	22		160	80		2.0 CLEAR WATER, 6 DUCKS
S07	SOQUEL C @ NOBEL G	14-Jul-92	11:20 AM	23	500	180	400		0.5 25 DUCKS, CLEAR WATER
S07	SOQUEL C @ NOBEL G	22-Jul-92	11:30 AM	23		80	0		ERR CLEAR WATER
7	SOQUEL C @ NOBEL G	28-Jul-92	11:15 AM	22		280	80		3.5 9 DUCKS, CLEAR WATER
S07	SOQUEL C @ NOBEL G	04-Aug-92	01:00 PM	23		60	0		ERR CLEAR WATER, 2 BOATS
S07	SOQUEL C @ NOBEL G	10-Aug-92	11:55 AM			40	40		1.0
7	SOQUEL C @ NOBEL G	17-Aug-92	11:05 AM			0	0		ERR
7	SOQUEL C @ NOBEL G	24-Aug-92	11:14 AM			80	0		ERR
S07	SOQUEL C @ NOBEL G	25-Aug-92	11:45 AM	22		160	20		8.0 CLEAR WATER, SOME ALGAL GROWTH.
7	SOQUEL C @ NOBEL G	01-Sep-92	12:10 PM	22		20	20		1.0
7	SOQUEL C @ NOBEL G	08-Sep-92	11:00 AM	20		200	60		3.3 CLEAR WATER, ALGAL GROWTH
S07	SOQUEL C @ NOBEL G	14-Sep-92				40	60		0.7
S07	SOQUEL C @ NOBEL G	14-Sep-92				100	80		1.3
7	SOQUEL C @ NOBEL G	22-Sep-92	11:40 AM	20		0	0		ERR CLEAR WATER, SOME ALGAL GROWTH
S07	SOQUEL C @ NOBEL G	30-Sep-92		20		20	380		0.1 CLEAR WATER, SOME ALGAL GROWTH
S07	SOQUEL C @ NOBEL G	06-Oct-92	12:35 PM	21		40	840		0.0 CLEAR WATER, ALGAL GROWTH
7	SOQUEL C @ NOBEL G	13-Oct-92	11:05 AM	18		60	860		0.1 ALGAL GROWTH
7	SOQUEL C @ NOBEL G	20-Oct-92	10:55 AM	18	350	260	580		0.4 ALGAL GROWTH
S07	SOQUEL C @ NOBEL G	27-Oct-92	12:00 PM	19		300	0		ERR CLEAR WATER
S07	SOQUEL C @ NOBEL G	03-Nov-92	12:10 PM	19	280	220	120		1.8 CLEAR WATER, 6 DUCKS.
7	SOQUEL C @ NOBEL G	17-Nov-92	11:00 AM	15		140	120		1.2 CLEAR WATER
S07	SOQUEL C @ NOBEL G	01-Dec-92	10:35 AM	10		115	2060		0.1 CLEAR WATER



STANUM	LOCATION	DATE	TIME	TEMP-C	ELCOND	FECOLI	FECSTR	FCFSRA	NOTES
7	SOQUEL C @ NOBEL G	15-Dec-92	10:30 AM	8		20	480	0.0	CLEAR WATER
S07	SOQUEL C @ NOBEL G	22-Dec-92		10		180	60	3.0	CLEAR WATER
S07	SOQUEL C @ NOBEL G	29-Dec-92				0	7300	0.0	RAIN 12/28 & 12/29
7	SOQUEL C @ NOBEL G	05-Jan-93	11:00 AM	6		40	240	0.2	CLEAR WATER
7	SOQUEL C @ NOBEL G	19-Jan-93	01:20 PM	11		ERR	ERR	ERR	RESULTS NOT VALID
S07	SOQUEL C @ NOBEL G	02-Feb-93	11:40 AM	10		0	40	0.0	CLEAR WATER
7	SOQUEL C @ NOBEL G	16-Feb-93	12:15 PM	11		76	36	2.1	CLEAR WATER.
7	SOQUEL C @ NOBEL G	16-Feb-93	12:15 PM	11		76	36	2.1	CLEAR WATER
S07	SOQUEL C @ NOBEL G	23-Feb-93	11:45 AM			840	ERR	ERR	BROWNISH WATER,RAIN 2/23,STREP P CONTA
S07	SOQUEL C @ NOBEL G	02-Mar-93	11:00 AM	11		100	140	0.7	CLEAR WATER
7	SOQUEL C @ NOBEL G	10-Mar-93	10:53 AM	13		80	460	0.2	CLEAR WATER, 2 DUCKS.
S06	SOQUEL C @ TRESTLE	26-May-92	11:25 AM	21	380	320	40	8.0	CLEAR WATER
S06	SOQUEL C @ TRESTLE	10-Jun-92	11:40 AM	20	220	540	140	3.9	CLEAR WATER, NO BIRDS
5	SOQUEL C @ TRESTLE	16-Jun-92	11:10 AM	18	270	160	80	2.0	CLEAR WATER, PIGEONS ON TRESTLE
5	SOQUEL C @ TRESTLE	24-Jun-92	12:30 PM	20	450	260	140	1.9	CLEAR WATER
S06	SOQUEL C @ TRESTLE	30-Jun-92	10:45 AM	20	220	4020	4020	1.0	BROWNISH WATER, RAIN 6/29
5	SOQUEL C @ TRESTLE	07-Jul-92	12:30 PM	21	160	340	220	1.5	CLEAR WATER
5	SOQUEL C @ TRESTLE	14-Jul-92	11:30 AM	23	250	20	580	0.0	CLEAR WATER
S06	SOQUEL C @ TRESTLE	22-Jul-92	11:40 AM	23	320	300	260	1.2	CLEAR WATER
S06	SOQUEL C @ TRESTLE	28-Jul-92		22	160	160	100	1.6	20 DUCKS, CLEAR WATER
5	SOQUEL C @ TRESTLE	04-Aug-92	12:50 PM	23	150	60	20	3.0	CLEAR WATER, PEOPLE FEEDING 17 BIRDS
S06	SOQUEL C @ TRESTLE	10-Aug-92	11:20 AM			520	20	26.0	
S06	SOQUEL C @ TRESTLE	17-Aug-92	11:00 AM			200	0	ERR	
5	SOQUEL C @ TRESTLE	25-Aug-92	11:35 AM	21	260	60	60	1.0	6 DUCKS, CLEAR WATER
5	SOQUEL C @ TRESTLE	01-Sep-92	12:40 PM	22	160	40	20	2.0	CLEAR WATER
S06	SOQUEL C @ TRESTLE	08-Sep-92	10:50 AM	20	160	60	0	ERR	CLEAR WATER, ALGAL GROWTH
5	SOQUEL C @ TRESTLE	14-Sep-92				80	40	2.0	
5	SOQUEL C @ TRESTLE	22-Sep-92	11:30 AM	20	230	40	0	ERR	CLEAR WATER
S06	SOQUEL C @ TRESTLE	30-Sep-92		20	220	40	60	0.7	CLEAR WATER, 4 DUCKS
S06	SOQUEL C @ TRESTLE	06-Oct-92	12:25 PM	21	250	20	40	0.5	CLEAR WATER
5	SOQUEL C @ TRESTLE	13-Oct-92	10:55 AM	18	260	0	60	0.0	CLEAR WATER
S06	SOQUEL C @ TRESTLE	20-Oct-92	11:05 AM	18	280	40	20	2.0	ALGAL GROWTH
S06	SOQUEL C @ TRESTLE	27-Oct-92	11:50 AM	19		20	0	ERR	CLEAR WATER
5	SOQUEL C @ TRESTLE	03-Nov-92	12:30 PM	19	450	320	180	1.8	CLEAR WATER
5	SOQUEL C @ TRESTLE	17-Nov-92	11:05 AM	15	550	160	200	0.8	CLEAR WATER
S06	SOQUEL C @ TRESTLE	01-Dec-92	10:30 AM	9	570	145	390	0.4	CLEAR WATER, DUCKS
5	SOQUEL C @ TRESTLE	15-Dec-92	10:50 AM	9	270	40	220	0.2	CLEAR WATER
5	SOQUEL C @ TRESTLE	22-Dec-92		10		1000	1560	0.6	CLEAR WATER
S06	SOQUEL C @ TRESTLE	29-Dec-92	11:50 AM			200	6800	0.0	RAIN 12/28 & 12/29
S06	SOQUEL C @ TRESTLE	05-Jan-93	10:50 AM	6		80	360	0.2	CLEAR WATER
5	SOQUEL C @ TRESTLE	19-Jan-93	01:25 PM	11		ERR	ERR	ERR	RESULTS NOT VALID
S06	SOQUEL C @ TRESTLE	02-Feb-93	11:55 AM	10		80	60	1.3	CLEAR WATER
S06	SOQUEL C @ TRESTLE	16-Feb-93	12:05 PM	11		100	328	0.3	CLEAR WATER
5	SOQUEL C @ TRESTLE	23-Feb-93	12:20 PM			1200	ERR	ERR	BRONWISH WATER,RAIN 2/23,STREP P CONTA
5	SOQUEL C @ TRESTLE	02-Mar-93	11:15 AM	11		0	200	0.0	CLEAR WATER
S06	SOQUEL C @ TRESTLE	10-Mar-93	11:03 AM	14		180	540	0.3	CLEAR WATER.
5	SOQUEL C @ FLUME	26-May-92	11:15 AM	21	330	360	80	4.5	CLEAR WATER, 5 PIGEONS
5	SOQUEL C @ FLUME	03-Jun-92	11:00 AM	19	320	840	940	0.9	PIGEONS,DUCKS,12 SEAGULLS,CLEAR WATER
S0	SOQUEL C @ FLUME	10-Jun-92	11:50 AM	21	220	620	20	31.0	CLEAR WATER, MANY SEAGULLS

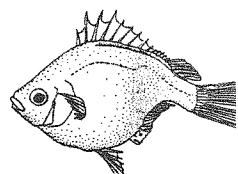


STANUM	LOCATION	DATE	TIME	TEMP-C	ELCOND	FECOLI	FECSTR	FCFSRA	NOTES
S	SOQUEL C @ FLUME	16-Jun-92	11:20 AM	19	260	420	400	1.1	CLEAR WATER, 7 SEAGULLS UPSTREAM
SO	SOQUEL C @ FLUME	24-Jun-92	12:20 PM	22	670	700	300	2.3	CLEAR WATER, 7 SEAGULLS
SO	SOQUEL C @ FLUME	30-Jun-92	10:55 AM	21	150	4020	4020	1.0	BROWNISH WATER, RAIN 6/29
S	SOQUEL C @ FLUME	07-Jul-92	12:40 PM	23	160	560	100	5.6	13 SEAGULLS UPSTREAM, CLEAR WATER
S	SOQUEL C @ FLUME	08-Jul-92	11:35 AM	23	160	580	80	7.3	CLEAR WATER
SO	SOQUEL C @ FLUME	14-Jul-92	11:40 AM	24	260	1220	100	12.2	CLEAR WATER, 20 BIRDS UPSTREAM
S	SOQUEL C @ FLUME	22-Jul-92	11:50 AM	24	270	460	20	23.0	CLEAR WATER.
S	SOQUEL C @ FLUME	28-Jul-92	11:05 AM	22	260	920	120	7.7	18 BIRDS, CLEAR WATER
SO	SOQUEL C @ FLUME	04-Aug-92	12:40 PM	23	260	360	160	2.3	CLEAR WATER, 40 SEAGULLS
SO	SOQUEL C @ FLUME	10-Aug-92	11:10 AM			3800	220	17.3	
S	SOQUEL C @ FLUME	17-Aug-92	10:50 AM			740	120	6.2	
SU	SOQUEL C @ FLUME	24-Aug-92	11:14 AM			500	140	3.6	
SO	SOQUEL C @ FLUME	25-Aug-92	11:25 AM	22	220	560	40	14.0	25 BIRDS, CLEAR WATER
S	SOQUEL C @ FLUME	01-Sep-92	12:35 PM	23	180	380	920	0.4	MANY SEAGULLS, CLEAR WATER
S	SOQUEL C @ FLUME	08-Sep-92	10:40 AM	20	170	460	60	7.7	25 BIRDS, CLEAR WATER
SO	SOQUEL C @ FLUME	14-Sep-92				560	360	1.6	
S	SOQUEL C @ FLUME	22-Sep-92	11:20 AM	20	290	160	160	1.0	CLEAR WATER, SEAGULLS
S	SOQUEL C @ FLUME	30-Sep-92		20	280	140	0	ERR	CLEAR WATER, 6 BIRDS UPSTREAM
SO	SOQUEL C @ FLUME	06-Oct-92	12:15 PM	20	370	300	60	5.0	CLEAR WATER, ALGAL GROWTH; SEAGULLS
SO	SOQUEL C @ FLUME	13-Oct-92	10:45 AM	19	360	360	140	2.6	CLEAR WATER, MANY SEAGULLS
S	SOQUEL C @ FLUME	20-Oct-92	11:15 AM	18	240	800	240	3.3	CLEAR WATER, SEAGULLS
SU	SOQUEL C @ FLUME	27-Oct-92	11:40 AM	19		3080	20	154.0	CLEAR WATER, SEAGULLS
SO	SOQUEL C @ FLUME	03-Nov-92	12:20 PM	20	450	980	80	12.3	CLEAR WATER; SEAGULLS; OPENED
S	SOQUEL C @ FLUME	17-Nov-92	11:15 AM	15	460	1040	2120	0.5	CLEAR WATER; SEAGULLS
S	SOQUEL C @ FLUME	01-Dec-92	10:20 AM	9	710	200	620	0.3	CLEAR WATER, ORGANIC MATTER; SEAGULLS
SO	SOQUEL C @ MOUTH	07-Dec-92		12		1080	4020	0.3	RAIN 12/6
S	SOQUEL C @ FLUME	15-Dec-92	10:40 AM	9	370	380	880	0.4	CLEAR WATER, MANY SEAGULLS
S	SOQUEL C @ FLUME	22-Dec-92	10:30 AM	10		920	1860	0.5	CLEAR WATER
SO	SOQUEL C @ FLUME	29-Dec-92	11:40 AM	10		900	9900	0.1	RAIN 12/28 & 12/29
SO	SOQUEL C @ FLUME	05-Jan-93	10:40 AM	6		600	4020	0.1	GREYISH WATER, SEAGULLS
S	SOQUEL C @ FLUME	19-Jan-93	01:33 PM	12		ERR	ERR	ERR	RESULTS NOT VALID.
SU	SOQUEL C @ FLUME	02-Feb-93	12:05 PM	10		160	60	2.7	CLEAR WATER
SO	SOQUEL C @ FLUME	16-Feb-93	11:55 AM	11		88	104	0.8	CLEAR WATER
S	SOQUEL C @ FLUME	02-Mar-93	11:25 AM	11		340	180	1.9	CLEAR WATER, SEAGULLS UPSTREAM
S	SOQUEL C @ FLUME	10-Mar-93	11:25 AM	15		80	0	ERR	CLEAR WATER, HIGH TIDE.
SO	SOQUEL C @ FLUME	31-Mar-93	01:20 PM	15		885	105	8.4	CLEAR WATER, SEAGULLS UPSTREAM



APPENDIX D.

**Water Quality Data and General Observations of Aquatic Vegetation
27 May - 23 October, 1992**



**Water Quality Data and General Observations of Aquatic Vegetation
Density, 27 May - 23 October, 1992**

27 May 1992. The shroud was in place and functioning. The flume was open with the tide outgoing by 0945hr. The depth inside the entrance to the flume was 2.3 feet while the depth at the exit was 1.8 feet. The weather was foggy and misty. The gage height = 1.76. The no-bird-feeding signs were present on the beach near Venetian Courts and the Beach House. Interpretive signs were in place near the park benches on either side of the Stockton Avenue bridge, as well as near the shower rooms at the kiosk and under the railroad trestle. Washing of sidewalks and mats into the streets of the Esplanade had been prohibited since 15 May. Drains leading to the lagoon on the lagoon side of the Esplanade had been closed off. 25 piles of dog excrement were present at the small park near the railroad trestle, adjacent the empty lot.

Station: Flume at 0650 hr, foggy with mist. Gage Height= 1.76

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.5	0.00	8.8	800
0.25	21.0	0.00	8.5	800
0.50	21.0	0.00	8.75	800
0.75(bot)	21.0	0.00	8.85	800

Station: Stockton Avenue Bridge, NW pier, 0740 hr. Secchi depth to bottom.

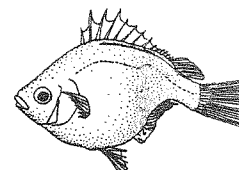
surf	20.0	0.0	8.10	780
0.25	20.0	0.0	8.15	780
0.50	20.0	0.0	8.0	780
0.75	20.0	0.0	8.1	780
1.00	20.0	0.0	7.95	780
1.25	20.5	0.0	7.7	780
1.50	20.5	0.0	7.15	780
1.75	20.5	0.0	6.95	780
1.85(bot)	21.0	16.0	0.7	24,000

Station: Railroad trestle, 0800 hr

surf.	20.2	0.0	8.55	780
0.25	20.2	0.0	8.65	780
0.50	20.2	0.0	8.65	780
0.75	19.8	0.0	7.2	780
1.00(bot)	19.3	0.0	6.1	750

Station: Noble Gulch, 0825 hr

surf.	19.0	0.0	8.78	750
0.25	19.0	0.0	8.60	750
0.50	18.8	0.0	8.21	750
0.75	18.5	0.0	6.8	780
1.00(bot)	18.0	1.5	1.0	3000



Birds on the Beach: 120-150 gulls, many of which were immature. 11 pelicans in breeding plumage.

Birds in Reach 1: 3 domestic ducks. 22 gulls bathing.

Birds in Reach 2: none.

Birds in Reach 3: 3 domestic mallards, 3 wild mallards with 2 ducklings.

Conclusion: Seven days after sandbar construction and installation of the shroud, the lagoon had nearly been flushed of salt water except at the deeper holes such as around the piers of the Stockton Avenue Bridge. Conductivity was typical of a freshwater lagoon. Water quality was good with cool enough water temperature (< 21 C) and oxygen levels near full saturation except in the hole at the Stockton Avenue pier and near the bottom at Noble Gulch. Full saturation would be 9.09 ppm at 20 C. The water column was clear to the bottom at all stations. The low oxygen level at the mouth of Noble Gulch corresponded to decomposing sea grass and kelp there. A 10-inch steelhead and 3, 4-inch steelhead were seen feeding on the surface in the vicinity, despite the lower dissolved oxygen.

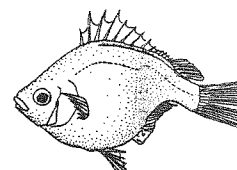
7 June 1992. Contaminated water signs up on beach. Flume shrouds were in place. The flume had been open to the bay since the last monitoring. The storm drain to the lagoon from the Esplanade was capped. Metal sheeting was in place to seal sidewalk drains. A man was washing roof windows on Larry's Surf and Turf with hot water. Tom Mader, a creekside resident, observed a merganser present on the lagoon for the first week of June and on 24 June.

Station: Flume, 0530 hr. The flume had been open continuously since last monitoring. Estimated outflow was 2.5 cfs. Flume depth at entrance = 2.0 feet. Exit = 1.2 feet. Weather was overcast. Gage height = 1.74.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	18.0	0.00	8.9	780
0.25	18.2	0.00	9.0	750
0.50	18.2	0.00	9.0	750
0.75(bot)	18.2	0.00	9.05	750

Station: Stockton Avenue Bridge. NW pier, 0550 hr. Planktonic algal bloom visible. Secchi depth to bottom.

surf.	18.2	0.0	8.45	760
0.25	18.2	0.0	8.25	760
0.50	18.2	0.0	8.15	760
0.75	18.2	0.0	8.15	760
1.00	18.2	0.0	7.95	760
1.25	18.5	0.0	7.55	760



1.50(bot)18.9 14.5 0.5 19500

Station: Railroad trestle, 0615 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	17.8	0.0	7.45	750
0.25	17.8	0.0	7.40	750
0.50	17.8	0.0	7.36	750
0.75	17.8	0.0	7.16	750
0.95(bot)	17.6	0.0	7.15	750

Station: Mouth of Noble Gulch, 0635 hr.

surf.	17.0	0.0	8.35	
0.25	17.0	0.0	8.50	
0.50	17.0	0.0	8.50	
0.75	17.0	0.0	6.8	
1.00(bot)	17.0	0.0	0.65	4050

Birds on the Beach: Approximately 200 gulls. 18 pelicans. 30 terns.

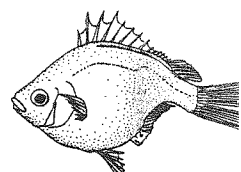
Birds in Reach 1: 3 domestic ducks. 2 domestic geese. One wild mallard female and 4 ducklings. 8 gulls bathing.

Birds and fish in Reach 2: 6 wild mallards. 3 domestic mallard males. Pigeons on the trestle. 4 swallows feeding on insect emergence. 15 steelhead hits on surface per minute. Tom Mader reported a merganser was present the first week in June.

Birds in Reach 3: 3 domestic mallard males. One mallard female. 3 swallows.

Conclusion: Water quality conditions were excellent for aquatic organisms. Water temperature was cool enough and oxygen levels were near full saturation, which would be 9.67 ppm at 17 C. The water column was clear to the bottom. The only salt water still present was at the bridge piers. This indicates that in years when scour around the piers is extensive, saltwater may remain in the depressions for awhile. Note that algae began to grow first in the depression at the pier, water temperature was highest. Sand bags could be placed in these depressions a week after sandbar closure and opened to fill the holes. We would not recommend grading into the holes during sandbar closure because fish tend to collect there at sandbar closure time. The flume was working well for fish passage.

14 June 1992. A planktonic algae bloom was well developed with tufts of filamentous algae beginning to form under the trestle on the west side near where the ducks commonly roost. Other algae tufts were forming under the trestle, below where the pigeons roost. Two geese were seen coming out into the lagoon from under the restaurants. Two dogs were allowed to run on the beach



with their owners present. Gage height was 1.56. Secchi depth = 1.3 meters at 0800hr at the bridge. Friends of Soquel Creek had put up no fishing signs at the trestle and Noble Gulch. The one at Noble Gulch had been torn down. Graffiti had been sprayed on the no bird feeding sign, and the plexi-glass cover of the tidewater goby sign next to it at the trestle was scratched. The bulkhead had partially come apart during the winter, and the soil behind it at the trestle park had eroded. The bulkhead on the west side of the Stockton Avenue bridge was also damaged.

Station: Flume, 0615hr. Weather clear. Flume entrance = 1.6 feet. Flume exit = 0.8 feet.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	18.6	0.00	8.35	800
0.25	18.8	0.00	8.40	780
0.50	18.8	0.00	8.30	780
0.75(bot)	18.8	0.00	8.20	780

Station: Stockton Avenue Bridge, west pier, 0645 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	18.0	0.00	8.40	780
0.25	18.2	0.00	8.35	780
0.50	18.2	0.00	8.35	780
0.75	18.2	0.00	8.30	780
1.00	18.2	0.00	8.23	780
1.25	18.2	0.00	8.20	780
1.50	18.5	2.2	7.70	3650
1.75(bot)	18.5	14.0	0.50	20300

Station: Railroad trestle, 0720 hr.

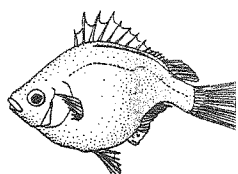
Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	18.0	0.00	8.05	780
0.25	18.2	0.00	8.03	780
0.50	18.2	0.00	8.0	780
0.75	18.2	0.00	8.02	780
0.95(bot)	18.0	0.00	7.95	800

Station: Mouth of Noble Gulch, 0735 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	16.5	0.00	8.45	750
0.25	16.7	0.00	8.41	750
0.50	16.6	0.00	8.25	750
0.75	16.8	0.05	4.70	1850
1.00(bot)	17.3	1.80	0.45	3400

Birds on the Beach: Approximately 75 gulls. The dogs had scared many birds away.

Birds in Reach 1: 4 domestic ducks. 2 domestic geese. One wild mallard female and 5 ducklings. One wild mallard female with 1 duckling. 21 gulls bathing.



Birds and turtle in Reach 2: 10 domestic mallard males (4 of which roosting at west bridge park). 4 pigeons on the trestle. Biting knats emerging. Turtle on west concrete footing of trestle. No fishing sign in place at trestle with Tom Mader's effort. No fish seen feeding on surface.

Birds in Reach 3: 9 swallows feeding on insect emergence. No ducks observed. No fishing sign had been torn off piling at Noble Gulch. No fish were seen.

Conclusion: More than 3 weeks after sandbar construction, a pocket of salt water still existed in the hole adjacent to the west pier of the bridge. Oxygen was low at the bottom there. The conductivity at Noble Gulch was slightly elevated while the oxygen concentration was low in the lower 0.25 meters. This may indicate a source of organic pollution up the Noble Gulch drainage. The remainder of the lagoon had excellent water quality for steelhead, although oxygen levels were about 1 mg/l lower than the same time the previous summer. This was probably due to the elevated respiration of planktonic algae.

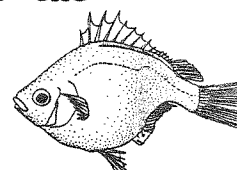
28-30 June 1992. It rained two nights in a row, 28-29 June and 29-30 June. Jim Turcotte had removed the shroud on the east side, removed 2 boards and installed screening. The flume received the stormflow without danger of sandbar breaching.

1 July 1992. The oxygen meter malfunctioned and no oxygen data could be collected. The water was tea-colored after runoff from the late -June storm. The screen was still in place on the east side with the shroud on the west side. The high tide during the night had risen and moved inland 1/2 the thickness of the sandbar. Hundreds of dead smelt were on the beach and along the margin of the lagoon. The bulkhead along the west side of the lagoon upstream of the Stockton Avenue Bridge had been repaired. The storm drains at the Stockton Avenue bridge had been labeled by Matt McCaslin of the Monterey Bay Salmon and Trout Project and students. Lagoon gage height = 2.23 @ 0530hr. Gage height at 0800hr = 2.14. Secchi depth = 1 meter.

Station: Flume, 0530 hr. Weather clear. Flume exit closed at 0530hr. By 0730hr, exit had been opened by City personnel.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.6	0.00	-	610
0.25	20.6	0.00	-	600
0.50	20.5	0.00	-	600
0.75	20.5	0.00	-	600
1.00(bot)	20.5	0.00	-	630

Threespine stickleback larvae abundant at the lagoon margins. Dead smelt were present in the lower lagoon as well as on the



surrounding beach. They may have swam through the flume while it was open or been left by gulls. No surface algae was present, and the bottom was not visible.

Station: Stockton Avenue Bridge, west pier, 0630 hr.

surf.	20.2	0.00	-	600
0.25	20.3	0.00	-	600
0.50	20.5	0.00	-	610
0.75	20.5	0.00	-	620
1.00	20.2	0.00	-	650
1.25	20.2	0.00	-	650
1.50	20.0	0.00	-	650
1.75	20.0	0.00	-	750
2.00(bot)	19.8	0.00	-	780

Station: Railroad trestle, 0650 hr.

surf.	20.0	0.00	-	610
0.25	20.2	0.00	-	610
0.50	20.2	0.00	-	610
0.75	20.2	0.00	-	620
1.00	20.2	0.00	-	670
1.25	19.8	0.00	-	700

No algae on surface.

Station: Mouth of Noble Gulch, 0710 hr.

surf.	18.8	0.00	-	700
0.25	18.9	0.00	-	700
0.50	19.0	0.00	-	700
0.75	18.6	0.00	-	710
1.00	18.5	0.00	-	720
1.25	18.7	0.02	-	890
1.35(bot)	18.7	1.5	-	2950

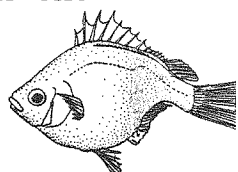
Birds on the Beach: Approximately 45 gulls on beach near Venetian Courts. The remainder of the beach was not censused.

Birds in Reach 1: 3 large domestic ducks, including a new gray and white one with clipped wings. 1 female mallard and 1 duckling. 4 gulls bathing.

Birds in Reach 2: 2 domestic male mallards. 1 wild female mallard. 4 pigeons roosting on the trestle. No steelhead seen. No fishing sign still present at the trestle.

Birds in Reach 3: 1 domestic male mallard. 1 pied-billed grebe. 7 steelhead surface strikes/minute. No fishing sign completely gone at Noble Gulch.

Conclusion: The late June storm had flushed the remaining salt water out of the hole at the bridge. Despite the surface run-off from streets, etc., the conductivity was not elevated, though the



water clarity was reduced. The June rain undoubtedly brought considerable nutrients into the closed lagoon. Unfortunately, we were unable to measure oxygen. The occurrence of smelt on the beach and dead in the lagoon was an unusual site. Despite the high tide, there was no evidence of salt water migration into the lagoon. This was the first observation of a grebe in the lagoon this summer period. We may assume that oxygen levels were sufficiently high for steelhead as evidenced by their feeding on the surface in Reach 3. Unlike the previous summer, algae has not yet accumulated on the surface. Water temperatures have been somewhat cooler this summer compared to the previous summer until this monitoring period.

21 July 1992. Water depth at flume inlet was 1.5 feet. Exit was 0.5 feet with the tide out. The streamflow was an estimated 1 cfs. Sunrise to a clear day came at approximately 0630hr. Lagoon gage height = 1.63 at 0640hr. Lagoon gage height = 1.65 at 1715 hr. The shroud had been removed from the flume. All the boards were in place on the west side of the flume. The east side had one board slotted at the bottom. They had been in place since 9 July. Secchi depth to bottom = 1.7 meters.

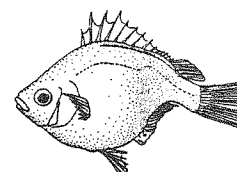
Residents at 519 and 533 Riverview Drive noted considerable algae in the upper lagoon. On Tuesday, 21 July, behind 519 Riverview Drive the lagoon bottom was 90% covered with algae, and 40% of the surface was covered with algae. Just upstream, algae covered 60% of the surface. Behind 533 Riverview Drive, algae covered 80% of the surface. In this area, the lagoon bends and narrows, thus tending to accumulate algae blown upstream from onshore breezes.

The following Saturday, 25 July, the surface algae had dissipated at 519, but was still thick at 533 Riverview Drive. A beach seine was used by myself and one volunteer to collect the floating algae at that location. In 1-2 hours this was accomplished. The action provided clear conditions for a time afterwards. On 4 August both areas were still clear of surface algae. By 1 September, at 519 the bottom was 70% covered while the surface was 10% covered with algae. The resident estimated that the algae build up began 5 days previous. At 533, algae covered 40% of the bottom and 20% of the surface.

Station: Flume, 0600 hr, clear.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	23.0	0.00	8.65	900
0.25	23.0	0.00	8.60	900
0.50	23.0	0.00	8.60	900
0.75(bot)	23.0	0.00	8.55	900

No algae on surface. Small clumps of algae, 3 inches thick, covering 5% of the bottom near the flume.



Station: Stockton Avenue Bridge, west pier, 0620 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	23.5	0.00	8.25	920
0.25	24.0	0.00	8.25	920
0.50	24.0	0.00	8.14	920
0.75	24.0	0.00	8.10	920
1.00	24.0	0.00	8.08	920
1.25	24.0	0.00	8.05	920
1.50	24.0	0.00	7.95	920
1.75(bot)	24.0	0.00	7.65	930

In Reach 1, pondweed and associated algae covered 35 % of bottom in lower lagoon. None on surface.

Station: Railroad trestle, 0640 hr.

surf.	23.0	0.00	8.40	930
0.25	23.0	0.00	8.25	930
0.50	23.0	0.00	8.18	930
0.75	23.0	0.00	8.10	930
0.85(bot)	23.0	0.00	8.15	930

Pondweed and associated algae covered 35 % of bottom in Reach 2. 1-2 feet tall plants. Thick planktonic algal bloom. None on surface.

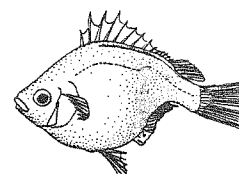
Station: Mouth of Noble Gulch, 0655 hr.

surf.	22.2	0.00	7.80	900
0.25	22.2	0.00	7.88	900
0.50	22.2	0.00	7.90	900
0.75	21.5	0.00	7.20	950
1.00	21.2	0.05	5.55	1800
1.10(bot)	21.2	0.09	-	1950

Thick algal mat 0.5-1 foot high and covering 35% of bottom near the Noble Gulch mouth. Pondweed and associated algae cover 20% of lagoon bottom in Reach 3 as a whole. No algae on the surface.

Station: Flume, 1715 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	26.0	-	-	-
0.25	26.0	-	-	-
0.50	26.0	-	-	-
0.75(bot)	26.0	-	-	-



Station: Stockton Avenue Bridge, west pier, 1700 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	26.0	-	-	-
0.25	26.0	-	-	-
0.50	26.0	-	-	-
0.75	26.0	-	-	-
1.00	26.0	-	-	-
1.25	25.0	-	-	-
1.50	25.0	-	-	-
1.75(bot)	25.2	-	-	-

Birds on the Beach: Birds not censused on the beach.

Birds in Reach 1: 6 domestic mallards and 3 wild females. 3 gulls bathing.

Birds in Reach 2: 3 domestic geese. Pigeons not counted on trestle.

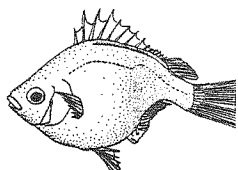
Birds and fish in Reach 3: 11 wild mallards. 8 juvenile steelhead in a school near Noble Gulch. 1 dead steelhead at mouth of Noble Gulch. 3 steelhead surface strikes per minute.

Conclusions: It was evident that at the existing lagoon volume and degree of solar radiation that was experienced, the lagoon heated to dangerously high water temperatures for steelhead. Fortunately, early morning oxygen levels remained high. 26 degrees C, which was experienced in late afternoon, is near the lethal limit for steelhead. Their metabolic rates are very high at that temperature, requiring high food uptake at a time when activity may cause anaerobic respiration and lactic acid build up in fish tissue.

These high water temperatures appeared to stimulate algae production, as well. A chronic nutrient pollution source appeared to be present in Noble Gulch. Oxygen levels approached lethally low levels near the lagoon bottom at the Noble Gulch mouth with dawn temperatures at 21 C. The cause of death of the one steelhead was not determined. Live steelhead were seen in the vicinity, and some were feeding.

The high lagoon temperatures combined with shallowness at the upper end of the lagoon apparently stimulated algae production.

4 August 1992. Depth at flume entrance = 1.6 feet. Depth at flume exit = 0.5 feet. Lagoon gage height = 1.81. Weather was foggy, cool and breezy. Air temperature was 56 F. It was still foggy at 0900hr. Considerable water was leaking between the boards at the flume entrance. The no bird-feeding sign and tidewater goby sign under the trestle had been vandalized with orange paint. Kelp was heavily deposited on the beach, and City personnel were pushing it back into the surf. City personnel



stated that the lagoon height had been higher, but that the paddleboat operator had complained. So, the lagoon level was lowered. Friends of Soquel Creek put up a new no fishing sign at Noble Gulch and protected it with hardware cloth. Sunrise was at about 0645hr. Secchi depth to the bottom @ 1.6 meters.

Station: Flume, 0620hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.8	0.00	9.8	960
0.25	21.1	0.00	9.75	960
0.50	21.2	0.00	9.75	950
0.75	21.3	0.00	9.73	960
0.80	21.5	0.00	9.75	960

Planktonic algae formed a thick, green soup. Algae covered only 5% of the bottom and none of the surface near the flume.

Station: Stockton Avenue Bridge, 0635 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	21.3	0.00	9.2	980
0.25	22.0	0.00	8.9	980
0.50	21.8	0.00	9.0	980
0.75	22.0	0.00	8.95	980
1.00	22.0	0.00	8.95	980
1.25	22.0	0.00	9.0	980
1.50	21.9	0.00	9.05	980
1.75	21.9	0.00	8.8	980
1.95(bot)	22.0	0.02	6.1	990

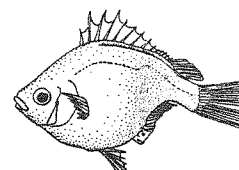
For Reach 1 as a whole, pondweed and associated algae covered 40% of the bottom to a height of 2-3 feet. The remaining 60% of the bottom was covered with algae approximately 0.5 feet thick. No algae or pondweed reached the surface.

Station: Railroad trestle, 0700 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	21.2	0.00	8.0	1000
0.25	21.5	0.00	7.75	1000
0.50	21.5	0.00	7.60	1000
0.75	21.6	0.00	7.78	1000
1.00(bot)	21.7	0.00	7.75	1000

In Reach 2, algae and pondweed covered 35% of the bottom and was 2-3 feet high. The remaining 65% of the bottom was covered with algae, alone, approximately 0.5 feet thick. No algae on surface.

Station: Mouth of Noble Gulch, 0735 hr.



Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.3	0.00	7.6	980
0.25	20.5	0.00	7.8	980
0.50	20.6	0.00	7.65	980
0.75	20.2	0.00	7.8	940
1.00(bot)	19.8	0.05	3.05	1620

Bubble production from the bottom at the mouth of Noble Gulch. Bubbling came from 4 locations. In Reach 3, algae and pondweed covered 30% of the bottom up to 2 feet high. Algae alone covered the remaining 70% of the bottom and was 0.5 feet thick. At the mouth of Noble Gulch, 60% of the bottom was covered with algae and pondweed, 1-2 feet thick. Algae covered the remaining 40% of the bottom to 0.5 feet thick except near the submerged tree stump. There, the algae was 1-2 feet thick. None reached the surface.

Birds on the Beach: 111 gulls.

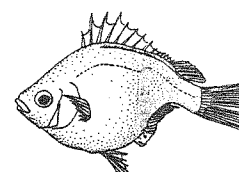
Birds and fish in Reach 1: A school of 100-200 stickleback near the flume. 7 ducks feeding, 3 of which were domestic. 40 bathing gulls. Later there were 20 ducks and the 3 geese roosting on the beach near Venetian Court with 2 black domestic ducks dabbling for pondweed.

Birds in Reach 2: 3 domestic geese swimming toward Reach 1. 5 wild mallards feeding on pondweed. 3 kingfishers flying upstream. 8 pigeons on the trestle.

Birds in Reach 3: 4 domestic mallards, 3 of which roosting on stump at Noble Gulch and one in the water.

Conclusion: Algae and pondweed had grown dramatically since 21 July to the point that they covered most of the lagoon bottom. Still, none reached the surface, indicating that the waterfowl were effective biological control. High production of planktonic algae was still occurring. Domestic waterfowl were observed feeding on natural plant material, indicating that handouts were insufficient. Water temperatures were significantly cooler than 21 July with the lagoon elevation nearly 0.2 feet above that in July and the days shortening. The lagoon elevation may have been higher at some time during the interim period between the last 2 monitorings.

12 August 1992. At 1130hr Soquel Creek was dry at E. Walnut and Main Street. It was flowing at 0.3 cfs into the lagoon. All the boards were in the flume and the flume exit was closed. The lagoon gage height = 1.82. We recommended to Susan Westman that plastic be put over the flume boards to help prevent leakage. The Creek remained dry in Soquel Village until 30Oct92 when it rained.



17 August 1992. The flume exit was closed, and plastic was in place at the flume entrance to reduce leakage between the boards. Lagoon gage height was 1.87. The willows along the west lagoon margin between the bridge and trestle appeared to be senescing early with yellowing of leaves. The no fishing sign was gone from the trestle bulkhead. The no fishing sign under hardware cloth was still intact at Noble Gulch. Secchi depth to the bottom at 1.5 meters.

Station: Flume, 0610 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	22.0	0.00	10.05	1080
0.25	22.1	0.00	9.9	1080
0.50	22.2	0.00	9.9	1080
0.75	22.2	0.00	9.9	1080
0.90(bot)	22.2	0.00	9.95	1080

Algae covering 5% of the bottom around the flume.

Station: Stockton Avenue Bridge, 0630 hr.

surf.	22.3	0.01	9.7	1120
0.25	22.5	0.01	9.6	1120
0.50	22.5	0.01	9.45	1120
0.75	22.6	0.01	9.45	1120
1.00	22.6	0.01	9.35	1120
1.25	22.7	0.01	9.35	1120
1.50	22.7	0.01	9.35	1120
1.75	22.6	0.01	9.30	1130
2.00(bot)	22.8	0.01	9.15	1130

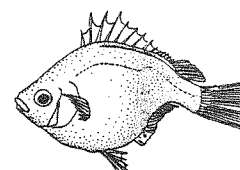
In Reach 1, 65% of bottom covered with algae and pondweed to 2.5 feet high, but about 1 foot below surface. Remaining 35% of bottom covered with algae 0.5-1 foot high. No surface algae.

Station: Railroad Trestle, 0655 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf	21.9	0.02	7.6	1150
0.25	22.1	0.02	7.6	1150
0.50	22.2	0.02	7.6	1150
0.75	22.2	0.02	7.55	1150
1.00	22.2	0.02	7.50	1150

Pondweed and associated algae covered 50% of the bottom in Reach 2 and was 3 feet high in the deeper areas. The remaining 50% of the bottom was algae to about 0.5 feet thick. Only 1% of the surface was covered with algae.

Station: Mouth of Noble Gulch, 0715 hr.



Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	21.8	0.02	8.15	1220
0.25	22.1	0.02	8.05	1220
0.50	22.2	0.02	8.15	1220
0.75	21.6	0.02	8.30	1210
1.00(bot)	20.7	0.01	4.95	1150

In Reach 3, algae and pondweed covering 40% of the bottom, it being 2-2.5 feet high. Algae alone covered the remaining 60% to a thickness of 0.5 feet. 2% of the surface with floating algae, mostly near the Noble Gulch mouth.

Birds on the Beach: 79 gulls.

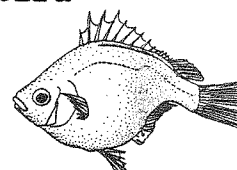
Birds in Reach 1: 55 bathing gulls. 6 domestic ducks. 3 geese roosting near Venetian Court by 0755hr. The geese appear to spend the night upstream and then swim down to the beach in the morning.

Birds in Reach 2: 4 pigeons roosting at Stockton Avenue park. 8 roosting pigeons on the trestle. 1 pied-billed grebe. 1 kingfisher.

Birds in Reach 3: 8 mallards, 3 of which were domestic males.

Conclusion: Water temperatures continued to be warm, despite the increase in lagoon elevation by 0.06 feet. The flume was finally closed presumably by reduced streamflow. It was unclear whether the plastic over the flume boards helped to elevate lagoon levels. There continued to be nearly no surface algae, indicating the effectiveness of ducks in cropping off the pondweed that the algae attaches to. No good explanation can be made for the relatively depressed oxygen levels under the railroad trestle. Decomposing bird droppings from birds roosting on the trestle may cause some oxygen depletion. Higher aquatic vegetation densities may have caused greater respiration to reduce oxygen. Pondweed did appear to be taller there because the lagoon appeared to be deeper in Reach 2. But densities did not appear greater. Even with slightly lower oxygen concentrations in Reach 2, oxygen levels were very adequate for fish. There was evidence of oxygen depletion during the night, presumably due to decomposition of dead algae and pondweed at some stations. However, oxygen levels were still high and offered no problems for aquatic organisms. The mouth of Noble Gulch continued to have high algae production from possibly organic pollution that provided nutrients. The lagoon bottom there had the greatest oxygen depletion measured during this period. It probably did not cause stress to fish.

1 September 1992. The flume continued to be closed. The bulkhead at the railroad trestle park had been repaired. All grass and dog feces had been cleared from the park near the railroad trestle, adjacent to the vacant lot. The no bird-



feeding sign and tidewater goby sign continued to be vandalized. This time they wrote on them with permanent ink. Willows along the west lagoon margin along Reach 2 and part of reach 3 near the trestle continued to senesce early with leaves yellow-green for entire trees. Streamflow of Soquel Creek beneath Highway 1 was an estimated 0.05 cfs with no sewage smell. A sewage spill into the Creek occurred approximately 200 meters upstream the previous morning, it being reported at 0600 hr. Streamflow behind Nob Hill shopping center was an estimated 0.15-0.2 cfs and clear. A great blue heron was present at a pool there. The gage height was 1.94. Air temperature was 62 F. Secchi depth = 1.5 meters and not to bottom. An artificial owl was erected on the roof of Larry's Surf and Turf. No gulls were on the roof. The no fishing sign was still intact at Noble Gulch.

Station: Flume, 0700 hr. Overcast and misty.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.7	0.02	11.2	1130
0.25	21.0	0.02	11.1	1130
0.50	21.0	0.02	11.1	1130
0.75(bot)	21.0	0.02	11.0	1120

In Reach 1 there was 65% pondweed and associated algae and 35% algae alone. Less than 1% of the surface covered with algae.

Station: Stockton Avenue Bridge, 0730 hr.

surf.	20.8	0.02	10.6	1160
0.25	21.2	0.02	10.8	1160
0.50	21.2	0.02	10.7	1160
0.75	21.2	0.02	10.7	1160
1.00	21.2	0.02	10.7	1160
1.25	21.2	0.02	10.6	1160
1.50	21.2	0.02	10.6	1160
1.75(bot)	21.2	0.02	10.5	1150

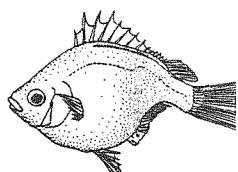
Station: Railroad trestle, 0750 hr.

surf.	21.0	0.03	10.1	1210
0.25	21.0	0.03	10.05	1210
0.50	21.0	0.03	9.95	1210
0.75	21.0	0.03	9.85	1220
1.00(bot)	21.0	0.03	8.65	1220

In Reach 2, 70% of the bottom was pondweed with algae growing on it and the remaining 30% was algae alone. The algae mats were 0.5 to 1.5 feet thick. Floating algae covered less than 1% of the surface.

Station: Mouth of Noble Gulch, 0810 hr.

surf.	20.5	0.01	8.75	1220
0.25	20.8	0.01	8.7	1220



0.50	20.7	0.00	8.7	1200
0.75	20.7	0.00	8.64	1050
1.00	19.5	0.05	6.65	1450
1.15(bot)	19.5	0.07	0.06	1980

In Reach 3, 45% of the bottom was pondweed with associated algae on it. 55% was algae alone and 0.5 feet thick. Floating algae covered 1% of the surface. Bubbles were common at the mouth of Noble Gulch where 45% of the bottom was pondweed and associated algae with 55% of the bottom as algae alone and 0.5 feet thick. 1% of the surface had floating algae there.

Birds on the Beach: 367 gulls. 9 pelicans flying by.

Birds in Reach 1: 57 bathing gulls. 2 domestic ducks and 3 wild mallards in water, feeding. Onshore near Venetian Court were 10 domestic ducks, 3 domestic geese, 4 pigeons. One pied-billed grebe in water. First American coot of the season feeding along the margin.

Birds in Reach 2: 1 pigeon roosting at Stockton Avenue park. 3 roosting pigeons on the trestle. 3 geese moved here to feed.

Birds in Reach 3: 2 domestic mallards on tree stump at Noble Gulch. 6 ducks fly by.

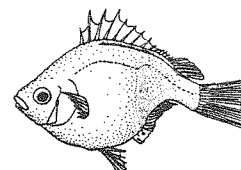
Conclusions: Water temperature was somewhat cooler than 2 weeks previously. Days were shorter, and the lagoon was 0.05 feet deeper with the flume closed. Conductivity and salinity were slightly higher, but very low and not a problem to fish. Oxygen levels were higher than on 17 August, particularly at the trestle. Oxygen was ample. Significantly more gulls were on the beach and bathing in the lagoon than earlier in the summer.

10 September 1992. The flume was initially closed, and then Capitola personnel opened it. Lagoon gage height went down from 1.935 to 1.93 from 0730hr to 0915hr. Jim Turcotte planned to remove one board from the flume entrance in preparation for the Begonia Festival. Workmen were steam-cleaning the Esplanade sidewalk. Three artificial owls were now on the roof of Larry's Surf and Turf. Behind 519 Riverside Avenue there was 70% of the bottom covered with algae and 10% of the surface. At 533 Riverside Avenue, 40% of the bottom and 20% of the top were covered with algae. Air temperature was 61.3 F.

Station: Flume, 0645 hr. Overcast and misty.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.2	0.01	13.1	1130
0.25	20.3	0.01	12.9	1130
0.50	20.3	0.01	13.1	1140
0.75(bot)	20.3	0.01	12.7	1130

In Reach 1, the bottom was covered with 90% pondweed and



associated algae (to near the surface) and 10% algae alone. 1% of the surface covered with algae.

Station: Stockton Avenue Bridge, 0705 hr.

surf.	20.4	0.01	12.3	1150
0.25	20.5	0.01	12.4	1140
0.50	20.5	0.01	12.5	1150
0.75	20.6	0.01	12.5	1140
1.00	20.5	0.01	12.4	1150
1.25	20.6	0.01	12.5	1150
1.50	20.7	0.01	12.5	1160
1.75(bot)	20.8	0.02	12.0	1160

Station: Railroad trestle, 0740 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.5	0.02	11.1	1200
0.25	20.5	0.02	10.95	1200
0.50	20.5	0.02	11.0	1200
0.75	20.5	0.02	10.95	1200
1.00(bot)	20.5	0.03	7.0	1210

In Reach 2, 80% of the bottom was pondweed with algae growing on it (to near the surface) and the remaining 20% was algae alone. The algae mats were near the surface. Floating algae only covered 2% of the surface.

Station: Mouth of Noble Gulch, 0800 hr.

surf.	19.8	0.02	9.0	1220
0.25	20.0	0.02	9.3	1220
0.50	19.8	0.02	9.25	1200
0.75	19.8	0.01	8.8	1120
1.00(bot)	18.8	0.02	6.7	1220

In Reach 3, pondweed and associated algae covered 60% of the bottom (to near the surface) while algae alone covered 40% of the bottom. 5% of the surface had floating algae.

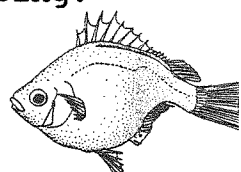
Birds on the Beach: 280 gulls.

Birds and fish in Reach 1: 25 bathing gulls. 2 mallards in the water with 2 pied-billed grebes feeding constantly. Threespine sticklebacks abundant. Onshore near Venetian Court were 11 domestic ducks, 3 domestic geese, 1 coot.

Birds and fish in Reach 2: 1 pigeon roosting at Stockton Avenue park. 3 roosting pigeons on the trestle. 1 pied-billed grebe feeding. Sticklebacks abundant.

Birds in Reach 3: 1 coot. One steelhead strike seen.

Conclusions: Water temperature continued to decline while oxygen was even higher than 10 days previously. Coots were increasing.



The abundance of sticklebacks was accompanied with more pied-billed grebes. Aquatic vegetation was at its highest level, but little reached the surface.

12 September 1992. More intensive monitoring was performed immediately before and after the Begonia Festival (13 September) to detect any impacts to water quality from activities in the lagoon and the lowering of the lagoon level. Water conductivity, water temperature and oxygen concentrations were focused on. A photo log was made of the cleanup process after the Festival. Lagoon gage height = 1.59.

Station: Flume, 1830 hr. Fog moving in quickly.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	23.0	-	-	1200
0.25	23.0	-	-	1200
0.50(bot)	23.2	-	-	1100

Station: Stockton Avenue Bridge, 1842 hr.

surf.	23.0	-	-	1220
0.25	23.0	-	-	1220
0.50	23.0	-	-	1220
0.75	22.8	-	-	1220
1.00	22.2	-	-	1220
1.25(bot)	21.1	-	-	1220

Station: Railroad trestle, 1900 hr.

surf.	23.0	-	-	1290
0.25	23.0	-	-	1290
0.50	23.0	-	-	1290
0.75	23.0	-	-	1290

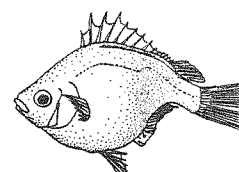
Station: Mouth of Noble Gulch, 1912 hr.

surf.	22.5	-	-	1280
0.25	23.0	-	-	1300
0.50	23.0	-	-	1300
0.75	22.0	-	-	1180
1.00(bot)	20.5	-	-	1400

13 September 1992 Weather clear. After the Begonia Festival.

Station: Stockton Avenue Bridge, 1635 hr. Gage ht. = 1.55

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	22.0	-	17.0	-
0.25	22.0	-	17.0	-
0.50	22.0	-	17.0	-
0.75	22.0	-	16.5	-
1.00(bot)	22.0	-	16.6	-



14 September 1992 Weather foggy.

Station: Stockton Avenue Bridge, 0410 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	21.0	-	13.5	-
0.25	20.0	-	13.2	-
0.50	20.8	-	13.2	-
0.75	20.8	-	13.3	-
1.00(bot)	20.8	-	13.1	-

Station: Railroad trestle, 0435 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	20.5	-	10.0	-
0.25	20.6	-	9.8	-
0.50	20.5	-	9.8	-
0.75(bot)	20.5	-	9.8	-

Station: Stockton Avenue Bridge, 1750 hr. Gage ht. = 1.55.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	22.5	-	-	1220
0.25	22.5	-	-	1220
0.50	22.2	-	-	1220
0.75	22.1	-	-	1220
1.00(bot)	22.1	-	-	1220

19 September 1992 Weather foggy. Gage height = 1.60.

Station: Flume, 0655 hr.

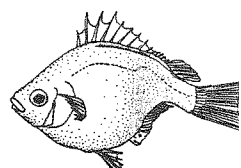
Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	19.0	-	11.8	1200
0.25	19.0	-	11.8	1200
0.50(bot)	19.0	-	11.8	1100

Station: Stockton Avenue Bridge, 0717 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	19.0	-	10.6	1220
0.25	19.3	-	10.6	1210
0.50	19.5	-	10.6	1210
0.75	19.5	-	10.5	1210
1.00	19.5	-	10.5	1210
1.25(bot)	19.5	-	10.4	1200

Station: Railroad trestle, 0735 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	19.8	-	8.8	1270
0.25	19.8	-	8.6	1270
0.50	19.8	-	8.5	1280
0.75	19.8	-	8.5	1280
1.00(bot)	19.8	-	8.2	1250



Station: Mouth of Noble Gulch, 0753 hr.

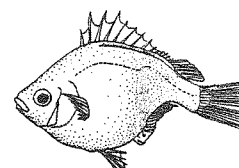
Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	18.5	-	8.0	1200
0.25	18.6	-	8.0	1200
0.50	18.8	-	8.0	1170
0.75	18.0	-	7.8	1020
1.00(bot)	17.9	-	7.4	1000

Conclusions: No negative impacts to water quality were detected from the Begonia Festival. The lagoon did not become too warm with the reduction in lagoon level. Oxygen levels became somewhat less from levels measured on 10 September and 19 September, indicating more nighttime respiration. This would occur from decomposition of any flower petals remaining in the lagoon or plant material killed during festival wading. However, oxygen levels remained more than adequate for steelhead despite the reductions. Water conductivity did not increase from the wading activity during the festival. The most significant impact was the reduced fish cover that resulted from postponement of re-installing the flume boards that would increase lagoon height. Our intention was for the City to replace the boards on Monday, 14 September, after the festival. The boards were replaced on 8 October. Tom Mader noted a change in steelhead behavior for a few days after the Begonia Festival in that they did not respond to handouts of trout chow. This indicated a temporary change in distribution of steelhead. The fish may have temporarily moved to the upper lagoon to avoid human activity during the festival.

9 October 1992 Weather clear. Boards had been re-installed in the flume entrance on 8 October. However, the lagoon level was still low at a gage height = 1.55 with a closed flume exit. Streamflow into the lagoon was very small. It was estimated to be 0.05-0.1 cfs behind Nob Hill shopping center and 0.5 cfs in Noble Gulch. California coots had migrated to the lagoon in higher numbers and were feeding heavily on algae on and below the surface. Wild mallards were not seen during monitoring.

There seemed to be more pet excrement along the path than usual. The access to the open lot near the trestle was closed off near the path by refuse cans. This was where many dogs were taken in the past to relieve themselves, along with the small trestle park area next to the lagoon. Three dog owners were seen without pooper-scoopers during monitoring. The dogs relieved themselves on the path. Bank erosion was evident at Noble Gulch. The railroad trestle's wall had become a target for graffiti. The tidewater goby sign had been scratched further. Dead pondweed fragments were common near the flume.

At 519 Riverside Avenue, pondweed with algae covered 60% of the bottom with height of 1-2 feet, and algae covered 25% of the



surface. At 533 Riverside Avenue, only 10% of the bottom was covered with pondweed and algae. But 90% of the surface was covered with algae. Water depth was very shallow, varying between 0.5 and one foot. The onshore breeze along with the bend in the lagoon and narrowing at this point cause algae to accumulate at this location. Soquel Creek flow into the lagoon was between 0.05 and 0.1 cfs. A photo is provided in **Appendix A**.

Station: Flume, 0630 hr.

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	17.5	-	12.7	1220
0.25	18.0	-	12.8	1220
0.50	18.0	-	12.8	1220
0.65(bot)	18.0	-	12.7	1170

In Reach 1, 70% of the bottom was covered by pondweed and algae clinging to it and within 0.5 feet of the surface. 28% of the bottom was algae alone, 4-8 inches thick. Algae and pondweed fragments covered 10% of the surface. 2% of the bottom was bare. Secchi depth was to the bottom = 1.4 meters.

Station: Stockton Avenue Bridge, 0650 hr.

surf.	18.5	0.02	12.1	1240
0.25	19.0	0.02	12.1	1250
0.50	19.0	0.02	12.1	1250
0.75	19.0	0.02	12.1	1250
1.00	19.0	0.02	12.1	1250
1.25	19.0	0.02	12.05	1250
1.50	19.0	0.02	11.95	1250
1.60(bot)	19.0	0.02	11.95	1250

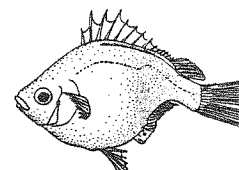
Station: Railroad trestle, 0715 hr.

surf.	18.3	0.02	9.6	1150
0.25	18.5	0.02	9.9	1180
0.50	18.6	0.02	9.98	1210
0.75	18.8	0.02	9.88	1210
0.88(bot)	18.8	0.03	9.85	1210

In Reach 2, 80% of the bottom was pondweed with associated algae to very near the surface. 18% was algae alone, 0.2-0.7 feet thick. 2% of the bottom was bare. 5% of the surface had algae and pondweed fragments.

Station: Mouth of Noble Gulch, 0735 hr.

surf.	17.6	0.01	8.65	1150
0.25	18.0	0.01	9.20	1160
0.50	18.0	0.01	9.21	1150
0.75	17.7	0.01	7.7	1100
0.95(bot)	17.6	0.01	5.8	1050



In Reach 3, 88% of the bottom was covered with pondweed and associated algae to within 0.5 feet of the surface. 10% of the bottom was algae alone, 0.5 feet thick. 10% of the surface was floating algae and pondweed fragments. A 15-foot diameter surface area at the mouth of Noble Gulch was covered with surface algae, indicating a pollution source.

Birds on the Beach: 61 gulls.

Birds and fish in Reach 1: 26 bathing gulls. 4 domestic ducks and 11 coots in the water. Onshore near Venetian Court were 3 domestic geese. Interestingly, a cormorant was fishing. Sticklebacks were abundant.

Birds in Reach 2: 17 coots feeding. The cormorant was also fishing in Reach 2. 7 roosting pigeons on the trestle.

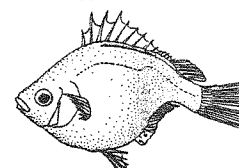
Birds in Reach 3: 17 more coots. 1 kingfisher in the riparian trees.

Conclusions: The lagoon was cooling down with the shortening of the days and cooler air temperatures, despite the shallow conditions. Oxygen levels were very high and optimal for steelhead and other fishes. A small percentage of the bottom was becoming bare of aquatic vegetation. Pondweed appeared to be dying back with fragments on the surface. Algae was increased on the surface, presumably due to the shallow conditions. The algae production was particularly noticeable at the mouth of Noble Gulch.

15 October 1992. The lagoon gage height was now 1.71 with a lagoon inflow of about 0.08 cfs behind Nob Hill shopping center. Riparian tree's leaves were dropping, thus reducing transpiration rates.

21 October 1992. The lagoon gage height was up to 2.14 after rain the night before. Streamflow was approximately 0.8 cfs at 0450hr. All the flume's boards were in place, and the flume exit was open to the bay.

23 October 1992. Weather clear. There had been report of a sewage spill along the beach in the middle of October. Air temperature = 17 C (62.6 F). Lagoon gage height was 2.06. Soquel Creek streamflow was at an estimated 0.2 cfs. Depth at the lagoon entrance was 3.3 feet while water was flowing out the exit at a trickle. It had rained 2 nights before, and the lagoon was lightly tea-colored. However, secchi depth was to the bottom at 1.8 meters, indicating good clarity. However, it was difficult to distinguish aquatic plant distribution. There was a



green film on the surface near the flume. There were 2 immature cormorants (brownish-gray color) fishing in Reaches 2 and 3. Also, a pied-billed grebe was fishing. There was even a great blue heron hunting for fish in Reach 1! The tidewater goby sign had been cleaned off.

Station: Flume, 0655 hr. (Before sunrise.)

Depth(m)	Temp.(C)	Salin.(ppt)	Oxygen(ppm)	Cond. (umhos)
surf.	17.5	0.01	8.1	1140
0.25	17.7	0.01	7.95	1150
0.50	17.8	0.01	7.8	1150
0.75	17.8	0.01	7.8	1150
1.00(bot)	17.8	0.02	7.8	1150

In Reach 1, 90% of the bottom was covered by pondweed and algae clinging to it and within 0.5 to 1.0 feet of the surface. About 10% was bare. Algae and pondweed fragments covered 5% of the surface.

Station: Stockton Avenue Bridge, 0715 hr.

surf.	18.0	0.02	8.05	1160
0.25	18.2	0.02	7.95	1160
0.50	18.2	0.02	7.95	1160
0.75	18.2	0.02	7.89	1160
1.00	18.2	0.02	7.84	1160
1.25	18.2	0.02	7.70	1160
1.50	18.2	0.02	7.55	1160
1.75	18.2	0.02	7.40	1160
2.00(bot)	18.3	0.02	1.45	1160

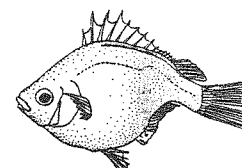
Station: Railroad trestle, 0740 hr.

surf.	17.8	0.02	6.95	1100
0.25	17.9	0.02	6.80	1100
0.50	18.0	0.02	6.80	1100
0.75	18.0	0.02	6.80	1100
1.00(bot)	18.1	0.02	6.52	1100

In Reach 2, 85% of the bottom was pondweed with associated algae more than 0.5 feet from the surface. 5% was algae alone. 10% of the bottom was bare. 7% of the surface had algae and pondweed fragments.

Station: Mouth of Noble Gulch, 0755 hr.

surf.	17.2	0.0	6.65	840
0.25	17.2	0.0	6.85	840
0.50	17.3	0.0	6.90	840
0.75	17.3	0.0	6.90	850
1.00(bot)	17.5	0.01	5.90	930



In Reach 3, it was very murky, making estimates of aquatic vegetation difficult. An estimated 70% of the bottom was covered with pondweed and associated algae to within 0.5 feet of the surface. 10% of the bottom was algae alone. 10% of the bottom was bare. 5% of the surface was covered with algae. No surface algae was observed at the mouth of Noble Gulch, despite its accumulation on 9 October. The increased streamflow may have washed it downstream.

Birds on the Beach: 143 gulls. 10 terns.

Birds in Reach 1: 7 bathing gulls. 2 mallards. 1 pied-billed grebe. 2 coots. 1 great blue heron wading at the margin. All in the water. One kingfisher flying overhead.

Birds in Reach 2: 7 coots feeding. 3 geese swimming toward Reach 1. One juvenile cormorant.

Birds in Reach 3: 5 more coots. 2 juvenile cormorants just upstream of the trestle (one had been seen in Reach 2), diving frequently. The great blue heron was seen flying upstream.

Conclusions: There was a dramatic reduction in oxygen concentrations compared to the 9 October levels. There were reductions of 2-4 mg/l at various stations, with the largest drops in Reach 1. However, oxygen levels still remained good for steelhead. The sewage spill and early fall rains may have been responsible for increase in bacterial and plant respiration. The County monitoring of bacteria on 27 October indicated high fecal coliform counts of 3080/100ml at the flume. Unfortunately, samples at the other stations were not successfully analyzed.

Duck densities appeared low at this time of year.

30 October 1992. The sandbar had breached the previous night. At the flume entrance there were 2-3 feet screened openings on both sides. The holes in the screens were plugged with pondweed and algae. The estuary was emptying via a channel through the beach at 1630hr at an estimated flow volume of 8 cfs.

