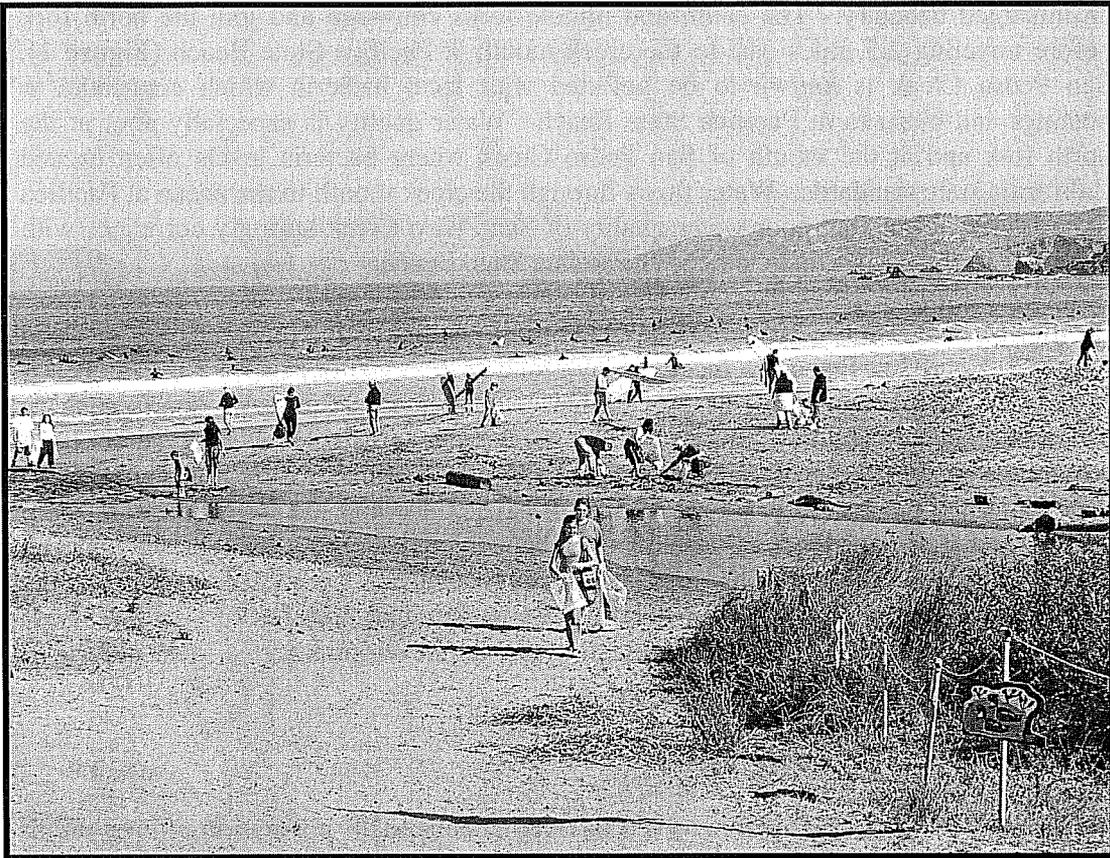


***Clean Beaches Initiative NO. 02-236-550-0
Proposition 40 Final Project Report***



Pacifica State Beach ~ Coastal Cleanup Day 2006

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Project Goals and Objectives

Located within the City of Pacifica (Pacifica), San Pedro Creek is an important coastal stream that drains a partially urbanized watershed of approximately 8 square miles. The creek has five major tributaries, including Sanchez Creek, North Fork, South Fork, and an unnamed tributary. The south and middle forks converge and join the north fork before traveling 2.5 miles east to the creek mouth at Pacifica State Beach (**Figure 1**). San Pedro Creek is known to be polluted with fecal bacteria which contribute to postings and closures at Pacifica State Beach. Water quality is especially poor at the north fork and at the mouth of San Pedro Creek where bacteria levels often exceed California state standards. Water flows through the creek mouth to the ocean at Pacifica State Beach. Thus, the poor water quality of San Pedro Creek strongly correlates with the number of postings and closings at Pacifica State Beach.

Pacifica State Beach is considered one of the most popular recreational beaches between Santa Cruz and San Francisco receiving over one million visitors each year. The beach is also the first beach south of San Francisco that is safe for water sports such as swimming, surfing and kayaking and offers spectacular surf for locals and visitors from around the State. However, numerous “Beach Contamination/Closure Signs” placed by the San Mateo County Department of Health have concerned local citizens, surf camp parents and staff, and local environmental organizations. Surfers, bathers and children playing at the mouth of the creek have complained of body rashes and flu-like symptoms after contact with water potentially contaminated with fecal pollution. These reports encouraged independent water testing and the development of a local watershed coalition.

Project Scope and Background

Since 1989, Pacifica has been involved in riverine ecosystem restoration efforts within the San Pedro Creek watershed. The approach utilized by Pacifica has been to deal with water quality issues and habitat degradation on a watershed level. Due to concerns over elevated bacteria levels at Pacifica State Beach, Pacifica began working towards improving the water quality in the creek and at the beach with a goal of reducing beach postings and closures, thereby ensuring a safe environment for recreational use.

In April 2004, Pacifica was awarded \$1,100,000.00 in State Water Resources Control Board Clean Beaches Initiative funding to assist with design, permitting and construction of six water quality improvement projects meant to reduce postings and closures in San Pedro Creek and at Pacifica State Beach. Using historical records from the turn of the century as the basis for the design, the total project costs for design and construction was approximately \$10,000,000.00 including land acquisition. As part of the Pacifica State Beach Clean Beaches Initiative Project, Pacifica successfully constructed a series of water quality improvement projects to divert urban runoff away from the creek and provided treatment for those waters entering the ocean at Pacifica State Beach. The projects included: construction of a four-acre wetland at the mouth of the San Pedro Creek to provide biological diversity and storm water treatment;

construction of a storm drain diversion along Montezuma Dr., to divert urban runoff away from San Pedro Creek; improvements at the Linda Mar Pump Station associated with the diversion; placement of a new sewer line at the Linda Mar Convalescent Hospital to eliminate potential illicit discharge; construction of two new wetlands behind Pedro Point Shopping Center to treat storm water runoff from the San Pedro Headlands; and restoration of two acres of wetlands west of Capistrano along San Pedro Creek's main-stem to treat storm water runoff from the surrounding urban areas.

Project 1. Wetlands at San Pedro Creek Mouth (Figure 2-3)

The southern portion of the Pacifica Sate Beach Project site lies over the old Lake Mathilde, a fresh to brackish water tidal lagoon formerly at the mouth (and north of) San Pedro Creek. Between the mid 1900's and 1950's Lake Mathilde was completely filled as the San Pedro Creek valley was developed first for agriculture and second for housing. In 1950, the City built the Linda Mar Sanitary Sewer plant at the current creek mouth location. In 1973, the Linda Mar Treatment Plant was condemned. During the spring of 2000, the City negotiated the purchase of several lots at the mouth of San Pedro Creek, and immediately north along the beach. The acquisition and demolition of these homes was critical to the restoration of the creek mouth; adding over 2 acres of beach and wetland habitat. Approximately 4 acres of wetland were excavated and planted using SWRCB Proposition 40, CA Coastal Conservancy, and Army Corps of Engineers grants funds. During construction, the City removed 10,000 yards of soil and the northern berm allowing expansion of the wetland system. Utilities were relocated and the abandoned treatment plant foundation was removed. The City also located and re-routed 4 breaks in existing sewer lines running through the project site. The major hydrologic feature of the wetland, in addition to opening the channel to a more northerly entrance into the Pacific Ocean, is the inclusion of a small embayment to the north of the channel. Plant community types installed include three communities that are common to the reference domain. Surrounding the embayment to the north is a small palustrine emergent coastal meadow community, dominated by native graminoids, including slough sedge and Pacific reed grass. On the slopes surrounding the creek and embayment is a palustrine scrub-shrub community dominated by arroyo willow, as well as the common shrubs thimbleberry, elderberry, and red-stemmed dogwood.

Benefits of the project include a newly restored tidally influenced freshwater riverine wetland, some of the rarest wetlands along the Pacific coast of North America. The addition of a varying fresh to brackish water lagoon also serves to restore a portion of the former embayment. This is important because the embayment allows for immigrating steelhead (*Oncorhynchus mykiss*) to adjust osmotically to the freshwater environment and to serve as a nursery area for juvenile and young-of-the year fish. The City has successfully obtained the project goals through the reduction of both biological and chemical pollutants discharging into the Pacifica Ocean.

Project 2. Linda Mar Pump Station Improvements for Wetlands Treatment (Figure 4-5)

The Linda Mar Pump Station was modified to collect storm water from the adjacent parking lot and Hwy 1 runoff by providing a sump pump in the storm drain. The pump and associated piping circulates storm drain water through constructed treatment

wetlands. The wetlands provide a level of treatment and groundwater recharge that has a measurable improvement to beach water quality. During dry weather months, the water leaves the area primarily through evaporation, evapotranspiration, and subsurface drainage. During wet weather months, overflow is discharged on to Pacifica State Beach. Construction of the treatment wetlands was paid for through a State Water Resources Control Board Proposition 13 Clean Beaches Initiative Grant and has successfully achieved its project goal: diversion of non-point source pollution through diversion of storm runoff from first flush release into the ocean.

Project 3. Relocation of Drainage Pipes at Montezuma Dr. (Figure 6-7)

As part of the Montezuma Storm Water Diversion Project, the City installed a new 42" storm drain system approximately 600 feet along the length of Montezuma Dr. between the intersections of Flores Dr. and De Solo Dr.. This project diverts approximately 75 acres of lower Linda Mar neighborhood storm water runoff from entering San Pedro Creek and instead discharges to a new treatment wetland on the west side of Highway 1 extending from Crespi Drive to Linda Mar Blvd. The treatment wetland was designed for storm water treatment and assists in capturing and diverting storm water and groundwater contaminated by non-point source pollution in the San Pedro Valley Watershed during the dry periods and partially diverting contaminated storm water in the wet months. The water quality in the project area was impacted through surface water contaminated through street runoff, non-point source pollution, and wet weather overflows of wastewater. All of this water, without some sort of treatment, flowed directly San Pedro Creek, which discharges to the ocean. The City has successfully obtained the project goals through the reduction of approximately 75 acres storm water flow containing both biological and chemical pollutants otherwise discharging into San Pedro Creek.

Project 4. Sewer Line Improvements (Figure 8-11)

As part of the Sewer Line Improvements Project, the City excavated 600 feet (approximately 1,000 cubic yards of soil) of existing degraded habitat along San Pedro Creek to connect to the existing stream terrace elevation of the wetland/flood control channel. Prior to construction, the riparian habitat consisted primarily of non-native invasive plant species with some native willow and alder trees. The project included removing the pump station along the creek, and bank lay back to a minimum 2:1 grade to stabilize the creek bank after the pump station was removed. In addition to removal of the pump station, the project included new terrace construction; installation of rock and woody debris structures; connection of the private sewer line at the Linda Mar Convalescent Hospital to City sewer system at the Linda Mar Pump Station; and replanting of appropriate plant species native to the creek. From the existing cleanout located adjacent to the Linda Mar Convalescent Hospital, a new sewer line was placed due north 142 feet to a new Manhole No. 1. At Manhole No. 1, the new sewer line extends west 240 linear feet along the new top of bank to Manhole No. 2. The new sewer line gravity flows 100 feet across the creek, continues another 110 feet to Flores Drive and heads west 350 feet before connecting to the existing sewer main tie-in. Removal of the Linda Mar Convalescent Hospital Sewage lift station and placement of

the new sewer gravity line eliminated a water quality hazard consisting of storm water outfalls and illicit discharge from the substandard sewage pump station.

Project 5. Wetlands behind Pedro Point Shopping Center (Figure 12-15)

The San Pedro Headlands Watershed drained through the Pedro Point development into a drainage ditch and culvert that discharged on the south bank near the mouth of San Pedro Creek. The wetlands restoration behind Pedro Point Shopping Center Project involved weed removal and native planting in the open channel to the south of the newly constructed wetland. The new treatment wetland was excavated and 3,000 yards of fill was removed. The existing storm drain pipe was removed and the new wetland was planted. The wetland runs northwest to the southeast, and is approximately fifteen feet in depth. The bottom of the depression is flat to gently sloping (0-1% slopes). The wetland receives water through precipitation and storm water runoff from the Pedro Point Shopping Center and/or Pedro Point neighborhood. Water enters the area through surface flow, subsurface flow, and through a 24-inch storm water drain/flap gate. Water leaves the area primarily through a 55-inch corrugated metal pipe culvert that directs flow into San Pedro Creek

Project 6. Wetlands West of the Capistrano Bridge (Figure 16-17)

As part of the Wetlands west of the Capistrano Bridge, the City of Pacifica restored approximately 1,300 linear feet of San Pedro Creek downstream of the Capistrano Bridge. The project reach was impaired due to severe down cutting of the channel and degraded riparian corridor with vertical raw eroding banks. Some banks were covered with plastic where backyards were slumping into the channel. A dysfunctional fish ladder and 12 foot drop from the culvert outfall acted as a migration barrier to wildlife migration. The project reach supported disturbed riparian plant communities dominated largely by non-native and ornamental species. The City removed the failing fish ladder from beneath the bridge and brought in 12,000 cubic yards of fill to raise the streambed. A series of rock/log weirs were placed creating a riffle/pool and step-pool complex that gradually rises in elevation from the downstream gradient to the Capistrano Bridge. Non-native escaped ornamentals were removed and creek banks were re-graded, covered with erosion control materials, and replanted with native riparian vegetation. The Wetlands West of Capistrano Project improved hydrologic function and habitat/faunal support function to a 1300 foot reach of San Pedro Creek transforming this degraded riverine system to a more natural and healthy state. The project provides a significant water quality improvement as storm drain runoff is channeled through a riparian wetland buffer prior to discharge to the ocean, thereby improving water quality over pre-project conditions.

Conclusion

The projects described above exemplify a new vision in coastal management that integrates multiple objectives while emphasizing sustainability. They are not only an example of successful wetland restoration and storm water diversion projects, but an example of an approach potentially appropriate for many California beaches and streams. The primary goal of these projects was to reduce periodic postings at Pacifica

State Beach, thereby reducing health risks to bathers and surfers. This was accomplished through complete diversion of Montezuma Dr. storm drain discharge in the dry season, partial diversion in the wet season, elimination of illicit discharge at the Linda Mar Convalescent Hospital, and utilization of wetlands restoration to reduce both biological and chemical pollutants.

As required by Assembly Bill 411, the County Health Department tests waters adjacent to Pacifica State Beach and will close the beach when sewage spill/overflows are reported. Advisory warnings are posted when Single Sample Density tests for *E. coli* exceed 400 colonies per 100/ml, the 5 Week Geometric Mean is greater than 200 colonies per 100/ml and Total Coliform exceeds 10,000/ml. **Table 1** details the 2000 - 2005 history of postings and closures at Pacifica State Beach. Improvements to creek and ocean water quality have occurred since the year 2000 when the number of days posted and closed reached almost 60.

Bacteriological monitoring for the project was performed by the San Mateo County Health Department's on-going water testing program as described in the *Dune Swale Waters/Wetlands Maintenance and Monitoring Guide for the Pacifica State Beach Master Plan for Public Improvements*. Monitoring goals included (1) complete diversion in the dry periods and partial diversion in the wet months and (2) improvement of water quality at Pacifica State Beach and in San Pedro Creek to ensure that these waters meet bacteriological standards set forth by the State of California. Bacteria samples were taken every Monday by the County Department of Health at the mouth of San Pedro Creek and at Pacifica State (**Appendix A**). For the purpose of this project, county monitoring provided information about the concentrations of total coliform, and *E. coli* in San Pedro Creek and at Pacifica State Beach. The creek mouth and beach were preferred sampling locations to evaluate project effectiveness because they provide a means of comparing post-construction creek mouth and ocean sampling data to historical, pre-diversion and pre-wetland construction sampling data for use in trend analysis (**Exhibit B-F**).

Although the RWQCB Basin Plan identifies the creek as non-contact water recreation, all sampling data was analyzed according to water contact recreation use because the creek mouth is often used for recreational purposes. Weekly water samples collected between 2002 and 2004 at the mouth of creek and at the beach closest to the creek mouth show us that the water quality often exceeded EPA standards for *E.coli* and SWRCB standards Total Coliform. In late 2003 throughout 2004 construction began on a series of treatment wetland projects including the wetlands at the creek mouth. However, it would be premature to expect improvements to water quality at the creek mouth through early 2005 as the projects were still incomplete, or the native wetland vegetation was not fully established. Conversely, improvements in Total Coliform levels at the beach during the dry season in 2005 and 2006 could be the result of the improvements to the Linda Mar Pump Station associated with the storm water treatment system. In late 2005, construction began on the wetlands west of the Capistrano Bridge. During this time, both *E.coli* and Total Coliform levels remained relatively low at the beach in comparison to the previous years but still exceeded State standards at the

mouth of the creek. Late 2006 proved to be the busiest construction season as a number of projects were implemented and completed. Lowered *E.coli* counts in summer 2006 could be the result of the sewer line improvements at the convalescent home. However, construction on a number of projects ended in late summer and the majority of wetland plants were not installed until the fall. These things in combination make it difficult to identify whether the projects will effectively reduce winter 2006/2007 beach postings. It is expected that continued sampling over the next three to five years will identify the impacts of the treatment wetlands and diversions project on water quality at Pacifica State Beach. Reductions in bacterial concentrations will be an indicator of the projects success.

In addition to creek and ocean sampling, water samples were collected at the Anza Pump Station wet well diversion structure by city staff to identify impacts the Montezuma Drainage Pipe Diversion Project has on creek and ocean water quality. (**Appendix B**). The total quarterly diversion pump hours of operation were recorded and multiplied by the flow per hour. Bacterial levels were then multiplied by the total amount of flow and the mass of bacteria diverted was calculated. The Montezuma Dr. Drainage Pipe Diversion Project was constructed in August 2006 during which time *E.coli* levels at the creek mouth and at Pacifica State Beach remained relatively low. Increases in Total and Fecal Coliform treated at the Anza pump station can be seen in the months following the project, however; additional sampling is needed to identify the long-term impacts of the diversions project on water quality at Pacifica State Beach.

The treatment wetland restoration projects in San Pedro Creek were constructed with an understanding that the competitive nature of biodiversity would assist with improved water quality over time. The water pollutants that are removed through biodiversity include harmful bacteria, biological and organic pollutants, inorganic sediments, oil and grease, etc. Unhealthy bacterial pollutants are removed through the food chain through competition with native soil and water bacteria forming food for larger organisms. Native plant wetlands provide a complete and healthy food chain for biomass conversion from unhealthy bacteria to other functional beneficial species. The larger and more diverse the habitat is, the greater its treatment capacity.

Threatened species within the system have positively responded to the restored habitat and the increased channel section and channel roughness through the restored riparian corridor has assisted in balancing excessive sediment transport and reducing both biological and chemical pollutants. The City has successfully obtained the project goals through the reduction of both biological and chemical pollutants discharging into the Pacifica Ocean and has completed the required deliverables set forth by the SWRCB Clean Beaches Initiative grant (Exhibit I).

Figure 1 Map of the San Pedro Creek Watershed and Sub-watersheds, Pacifica, California.

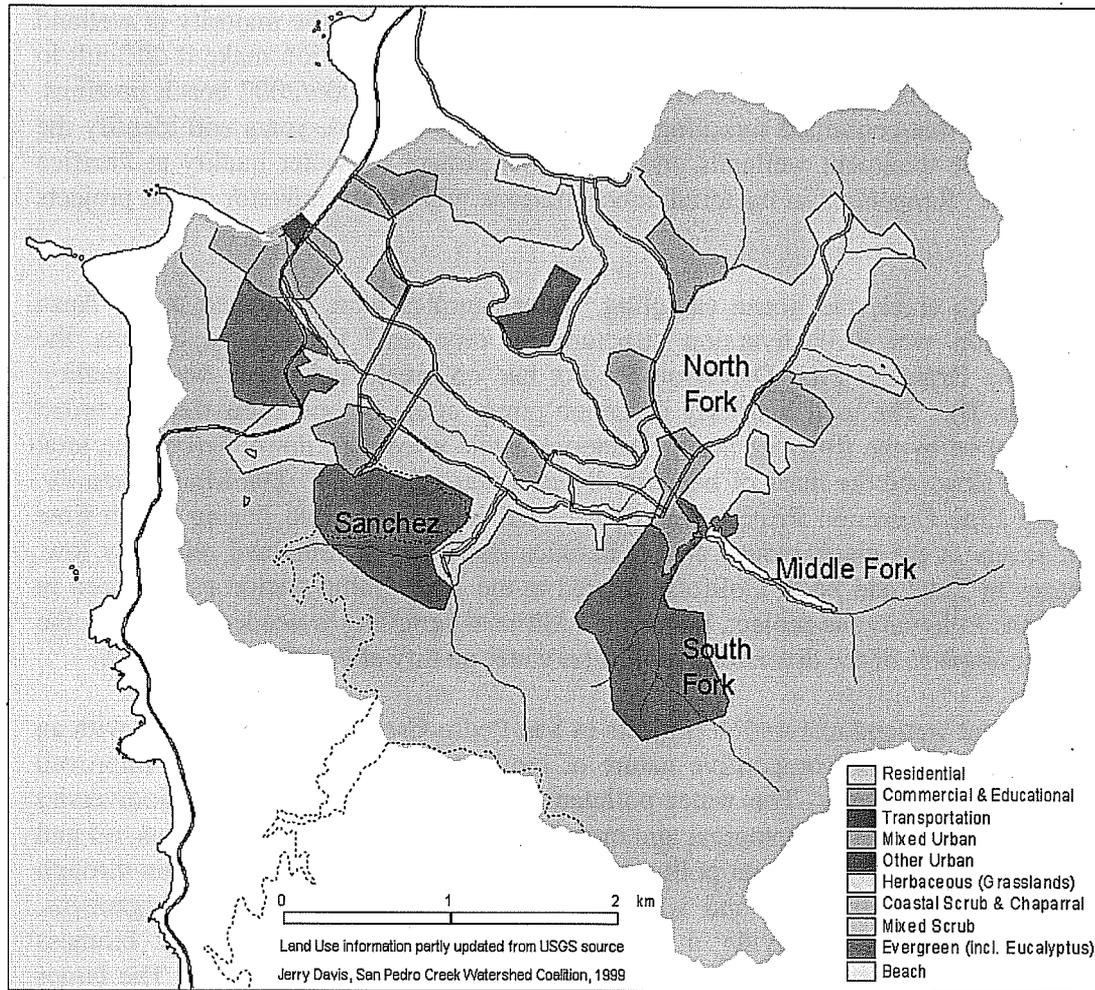


Exhibit A Map of Sampling Sites

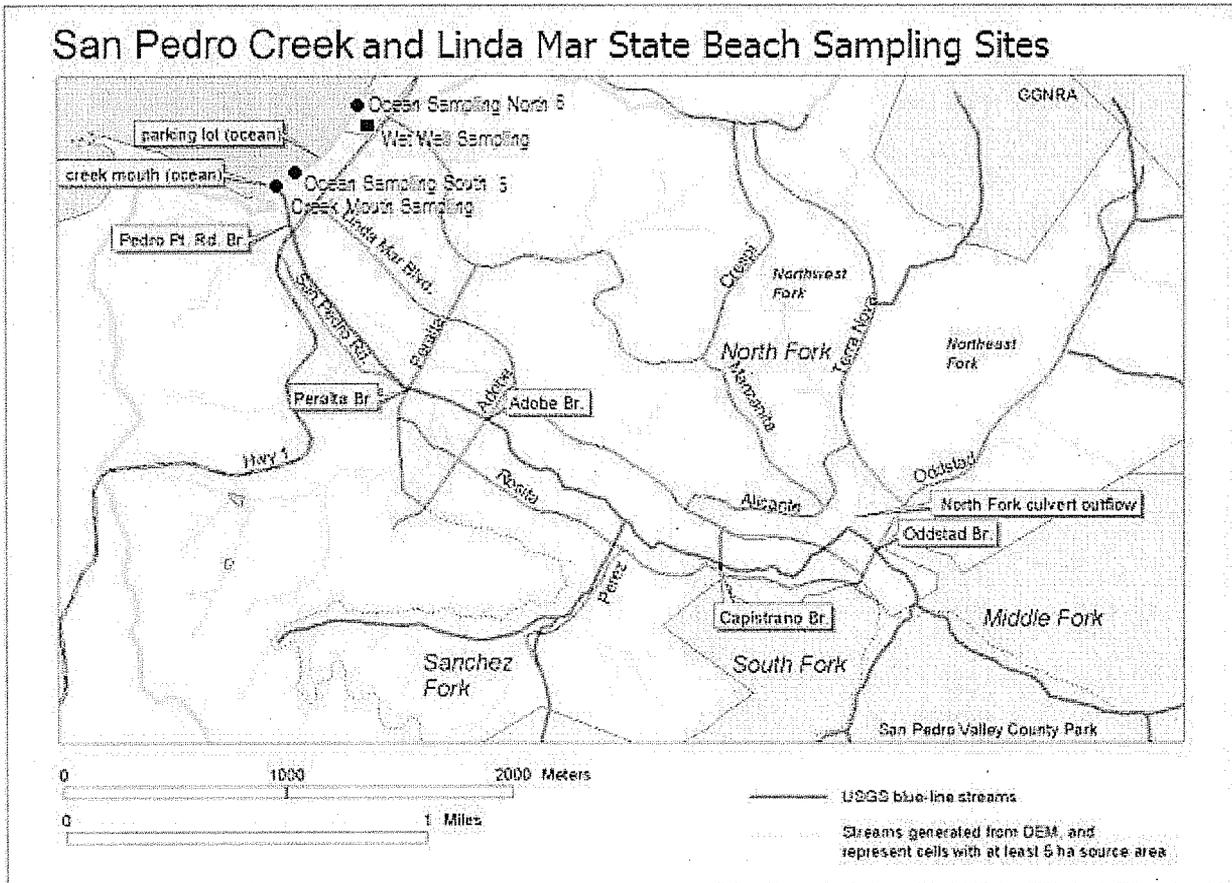


Table 1 Pacifica State Beach History of Postings and Closures: 2000 - 2005

<i>Year</i>	<i>Number of Days Posted and Closed</i>	<i>Beach Mile Days</i>
2000	59	59 Days x 0.5 miles = 29.5
2001	28	28 Days x 0.5 miles = 14
2002	18	18 Days x 0.5 miles = 9
2003	<i>Data not available</i>	<i>Data not available</i>
2004	42	42 Days x 0.5 miles = 21
2005	35	35 Days x 0.5 miles = 17.5

