7. Chorro Flats

7.1 Introduction

Chorro Flats, located near the mouth of Chorro Creek, is the site of a floodplain restoration and sediment retention project and was acquired by the Coastal San Luis Resources Conservation District. This $1.2 million, 120-acre parcel was purchased by a grant from the California Department of Transportation through the California Coastal Conservancy. In the 1989 "Erosion and Sediment Study" conducted by the SCS, it was estimated that construction of this project would result in a 33.8% reduction in sediment reaching the bay.

The Coastal San Luis Resource Conservation District (CSLRCD) presently manages the land. The engineering design was completed and project construction was finalized during the summer of 1997. Where the creek was channeled and levied, the project reestablished an active floodplain, riparian corridor, and overflow channels. The majority of the creek flow is now using the newly created main channel.

High flows during the 97-98 rain season and sediment deposition at the confluence with the overflow channel led to channel avulsion to the designed floodplain channel. The ability of the overflow channel to withstand concentrated flow and avoid downcutting was not fully understood. In retrospect, some believe the original design would have performed better without the overflow channel and possibly including a rock cross vane in Chorro Creek at the confluence with the overflow channel. Since the occupation of the new channel many instream and bank restoration efforts have been pursued. The current condition is an increasingly stable channel with a gradual progression towards a mature and functioning riparian corridor.

The NMP component of the project was to evaluate pre- versus post-project suspended sediment delivery by collecting event-based stream water samples above and below the project site.

7.2 Methods

7.2.2 Even-Interval and Event-Based Water Quality Sampling

Monitoring of the Chorro Flats project included an upstream-downstream evaluation of water quality (suspended sediment and turbidity) including an even-interval and storm-event sampling regime, stream profiling, benthic macro invertebrate analysis, and a qualitative evaluation of riparian and wetland re-establishment. Event-based samples were collected with automated samplers of same design to those in the paired watersheds (Chapter 3).

The initial years of sediment and flow data were collected to develop the relationship between stream flow and sediment concentration. Unfortunately, the stream gage used to monitor flow on San Bernardo Creek was lost during one of the high flow events during

the winter of 1995-96. This flow data was needed to supplement the Canet Road flow data to approximate flow for Chorro Creek at the upstream portion of Chorro Flats. Additionally, the automated water quality samplers were damaged during high stream flows. Furthermore, lack of a consistent relationship in turbidity and TSS between the upstream and downstream stations reduced the confidence in the monitoring design. The lack of upstream and downstream flow data necessary to compute loads, along with inconsistent relationships in turbidity or TSS, combined with difficulty in collecting event-based data, led to the decision to discontinue event-based sampling for the Chorro Flats project. As an alternative, various survey methods have been used to monitor sediment deposition and evaluate effectiveness of restoring the floodplain. These are discussed below.

Two regularly sampled NMP monitoring sites were established above and below the Chorro Flats Floodplain Restoration Project; Chorro Creek Road (CCR) is at the location of the previous upstream automated sampling device and Twin Bridges (TWB) is at the bridge downstream of the project. In 1997-98, five cross-sectional profiles were established across the main channel to document stream channel morphology, vegetative cover, and substrate size. Rapid Bioassessment reaches were established at Chorro Flats to provide an indicator of water quality upstream and downstream of the floodplain restoration site. Habitat Assessments were also conducted along with macro invertebrate collection to better characterize fish habitat, erosion potential and vegetative cover. Rapid Bioassessment and Stream Profile methods are described in Chapter 4.

In 1998-99, a topographic evaluation of sediment deposition on the floodplain, cross-sectional profiles, and photographic documentation was conducted by the Coastal San Luis Resource Conservation District.

7.3 Results and Discussion

7.3.1 Event-Based Water Quality Sampling

Event-based sampling was discontinued after two years, in favor of comparisons of detailed topographic surveys. Comparisons made between upstream and downstream stations require reasonably accurate flow data at each site to calculate sediment loads for each runoff event. The lack of upstream and downstream flow data precluded an evaluation of differences in sediment load between stations. An attempt was made to consider comparisons of turbidity or sediment concentrations (without flow), however, inconsistent relationships in turbidity or suspended sediment concentrations between the upstream and downstream stations were evident before the Chorro Flats project even began. This, along with difficulties encountered in collecting event-based samples, led to the decision to discontinue event-based sampling for the Chorro Flats project. It should be noted that the topographic surveys are considered to be a more cost-effective and reliable evaluation to document the effectiveness of the Chorro Flats project.

7.3.2 Even-Interval Water Quality Sampling

NMP Project Staff evaluated turbidity concentrations collected upstream and downstream of Chorro Flats. Using even-interval data collected between 1996 and 2000, no trends

were observed.. Even-interval sampling does not appear to be an effective method of detecting turbidity reductions, as sediment is transported primarily during storm events.

7.3.3 San Luis Coastal Resource Conservation District monitoring

The San Luis Coastal Resource Conservation District (RCD) efforts to monitor the effectiveness of the sediment floodplain funded through other sources have proven more successful. Results from the Chorro Flats Enhancement Project Final Report prepared by the RCD (2000) states that approximately 23% of the total load, and 85% of the bed-load, from Chorro Creek between 1992 and 1998 was captured on Chorro Flats. The current estimate for sediment load from the watershed is more than twice the estimate used in 1993. Based on the revised annual sediment load, and the 23% trapping efficiency, it is expected that the Chorro Flats site will fill in 26 years.

Also noted in the report is the stream is developing a dynamically stable configuration. First-winter changes were significant. Second winter changes were much smaller. Future annual changes are expected to be small because the banks are more thickly vegetated and therefore more stable, and because the first-winter changes significantly increased the flow capacity of the channel.

In July and August, of 1998 and 1999, a survey of the planted areas was conducted. The riparian plant community is developing. Willow growth exceeds expectations. Other riparian plant species are growing and will soon be large enough to persist without additional maintenance.

Lastly, habitat suitable for endangered species is being created. Pools and riffles are developing Steelhead and red-legged frogs have been found on the site. Water temperature in Chorro Creek at the upstream and downstream ends of the projects were measured in 1998 and 1999. In both years, downstream temperatures are generally higher than upstream temperatures. These increases are generally between 3°F and 5°F, with a maximum increase of almost 8°F. These temperatures would expect to decrease as riparian vegetation develops. A Monitoring Avian Productivity and Survivorship (MAPS) monitoring station was set up on the Chorro Flats site in 1999. Initial results indicate that the site provides habitat for a wide variety of birds.

7.4 Rapid Bioassessment

Feeding strategies percentages employed by groups of benthic macro-invertebrates at Chorro Creek Road (CCR) and Twin Bridges (TWB) were mixed and without obvious trends through the years sampled.

As shown in Figure 7.1, the effects of the floodplain restoration project at CCR were not detected (the floodplain restoration project is refereed to in this chapter as a BMP).

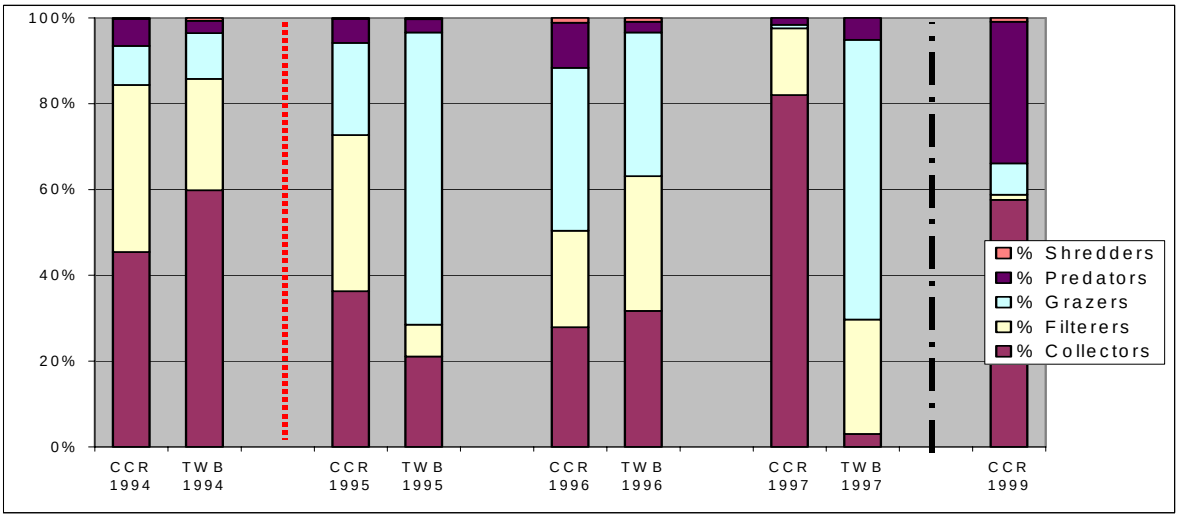

Figure 7.1. Percentages of macro invertebrate feeding strategies at Upper Chorro Creek sites CCR and TWB from 1994 through 1999 (minus 1998 and 1999 for TWB) are displayed.
For each year, the feeding percentages are stacked (all feeding strategies are represented in each column) equaling 100%. BMPs implementation occurred in 1996-1997; the years 1994, 1995, 1996, and 1997 are considered pre-BMPs and 1999 is post-BMPs. The dotted line marked the event of the Highway 41 fire. The dash dot line marks the end of BMP implementation.

Taxonomic richness and EPT Taxa were examined upstream of the floodplain at Lower Chorro Creek at CCR and downstream at TWB. Taxonomic richness is the number of taxa (species is commonly used) present in a sample. EPT Taxa is the number of taxa representing mayflies (*Ephemeroptera spp*), stoneflies (*Plecoptera spp*), and caddisflies (*Trichoptera spp*). These taxa are expected to decrease in number with disturbance to habitat.

Taxonomic richness is very similar between Chorro Creek sampling sites (Figure 7.2). Taxonomic richness and EPT taxa did not show change due to BMP implementation. The Highway 41 fire also effected taxonomic richness and number of EPT taxa. Both matrices declined at both sites during 1995.

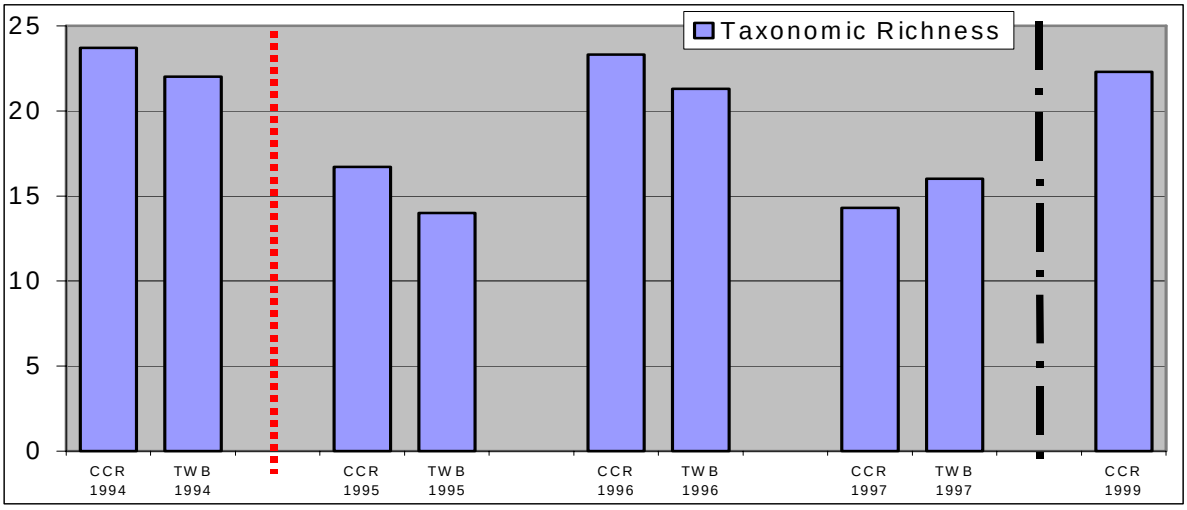

Figure 7.2. Taxonomic Richness at Lower Chorro Creek sampling sites CCR and TWB from 1994 to 1999 (minus 1998 and 1999 TWB).
Pre-BMP time period is 1994 through 1997 and post-BMP time period is 1999. The dotted line marked the event of the Highway 41 fire. The dash dot line marks the end of BMP implementation.

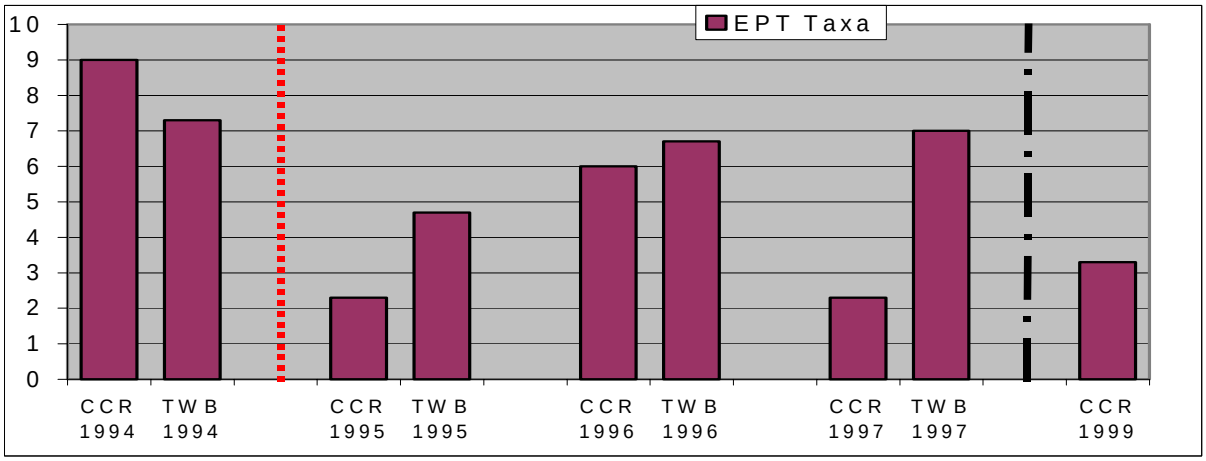

Figure 7.3. Abundance of EPT taxa at Lower Chorro Creek sampling sites CCR and TWB from 1994 to 1999 (minus 1998 and 1999 TWB).
Pre-BMP time period is 1994 through 1997 and post-BMP time period is 1999. The dotted line marks the event of the Highway 41 fire. The dash dot line marks the end of BMP implementation.

Although richness provides us with a measure of the number of species present, it does not provide us with insight into taxa abundance and evenness. The percent dominant taxon is the percent of the sample dominated by the most abundant taxon. It provides information into how much of the dominant taxon is represented in a sample. The greater the percentage one taxon in the sample, typically the less diverse and less healthy the stream is. Figure 7.4 shows the percentage of the dominant taxon

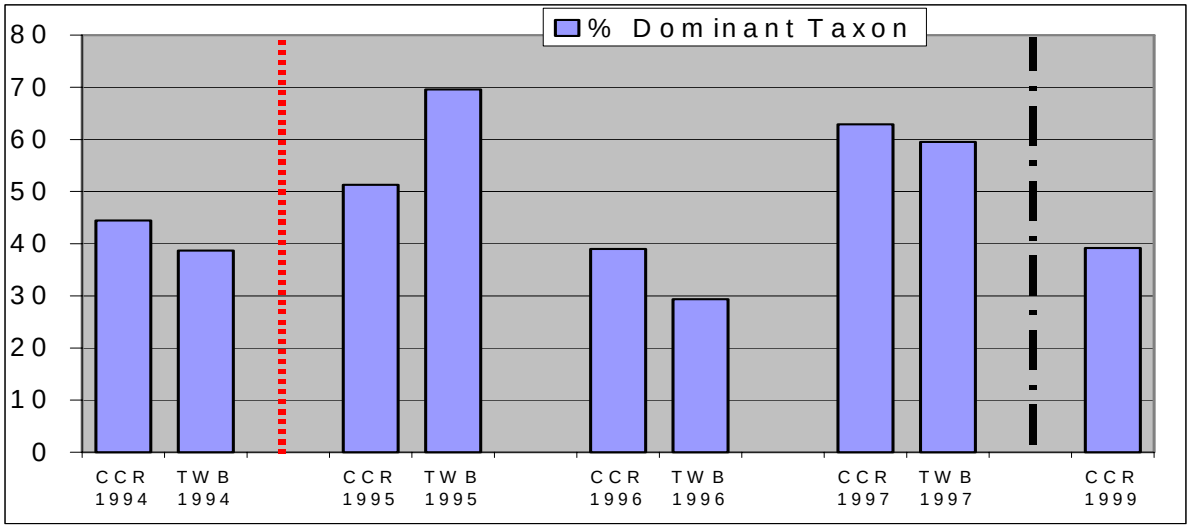

Figure 7.4. Percentage of the dominant macro-invertebrate taxon at CCR and TWB from 1994 to 1999 (with the exception of 1998 and 1999 TWB).
A percent dominant taxon is defined as the percent of the sample dominated by the most abundant macro-invertebrate taxon (species). Pre-BMP time period is the 1994, 1995, 1996, and 1997 and post-BMP time period is 1999. The dotted line marks the event of the Highway 41 fire. The dash dot line marks the end of BMP implementation.

Habitat assessment scores varied between years at CCR and TWB (Figure 7.5).

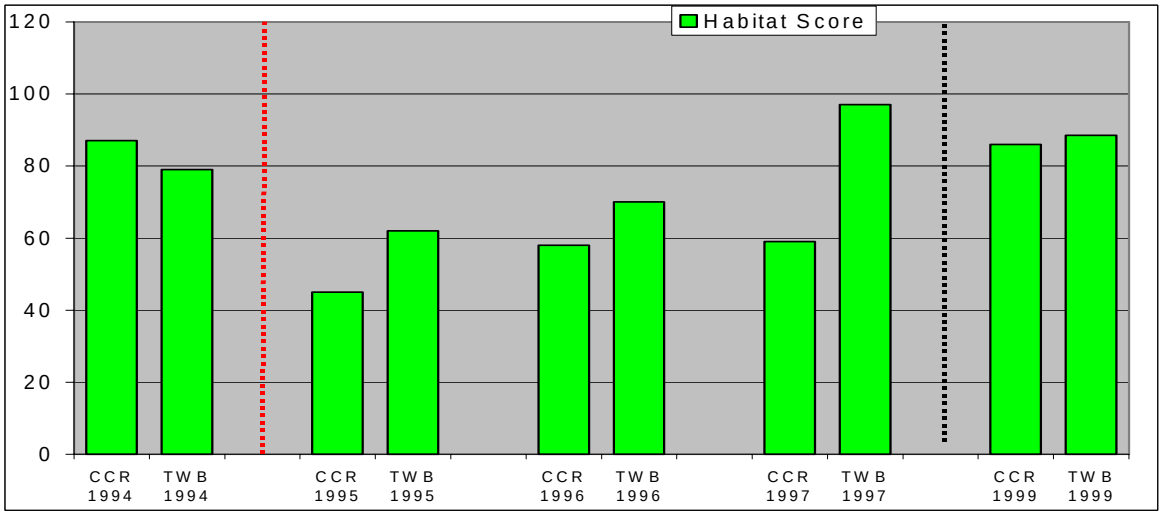

Figure 7.5. Habitat scores for Lower Chorro Creek sites CCR and TWB between 1994 and 1999. Highest possible score is 145.
Pre-BMP time period is the 1994, 1995, 1996, and 1997 and post-BMP time period is 1999. The dotted line marks the event of the Highway 41 fire. The dash dot line marks the end of BMP implementation.

7.5 Stream Profiles

Changes in stream morphology have occurred in the lowered reaches of Chorro Creek, and changes have been influenced by the Chorro Flats project. Additional profiles have been monitored that span the distance between the water quality sampling sites CCR and TWB (). Figure 6 and Figure 7 show stream profiles taken in the lower reaches of Chorro Creek downstream of TWB. Steam profile 1 and 2 are located below TWB at the beginning of the estuary.

Stream profile #1 has changed drastically in the three years sampled (Figure 7.6).

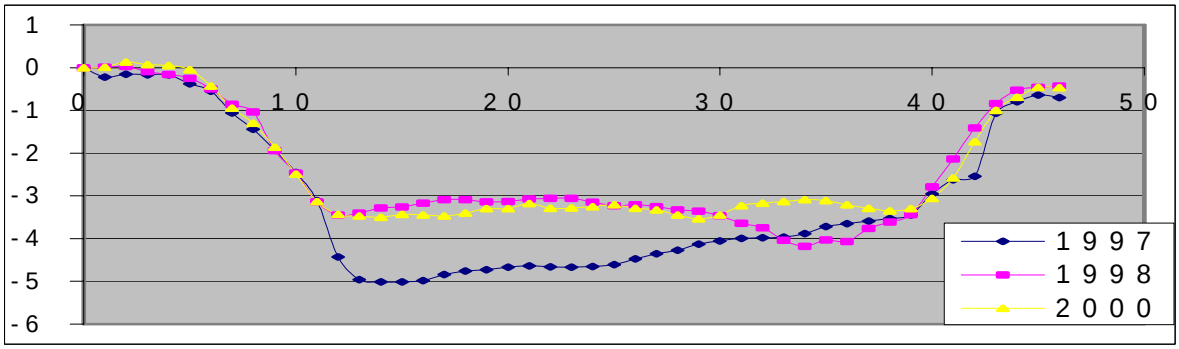

Figure 7.6. Cross sectional profile #1 of Chorro Creek. The X and Y axis are in feet units. The X axis is the height of the permanent reference point. The profile extends from left bank of creek (0 ft) to the right bank of the creek and was sampled in 1 foot increments.

Steam profile #2 at Lower Chorro Creek shows sediment aggradation (Figure 7.7).

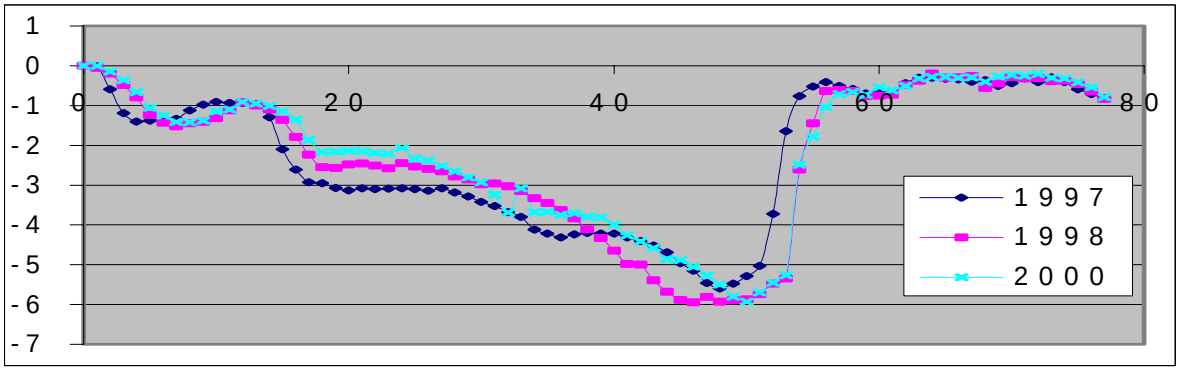

Figure 7.7. Cross sectional stream profile #2 of Lower Chorro Creek. The X and Y axis are in feet units. The X axis is the height of the permanent reference point. The profile extends from the left bank (0 ft) to the right bank of the creek and was sampled in 1 foot increments

7.6 Conclusions

Event-based samples were collected with automated samplers of same design to those in the paired watersheds, but were discontinued after two years, in favor of comparisons of detailed topographic surveys. No trends were observed in even-interval data collected between 1996 and 2000. Even-interval sampling does not appear to be an effective method of detecting turbidity reductions, as sediment is transported primarily during storm events.

RBA assessment appears to be effective at detecting changes following the Highway 41 Fire, but additional data is needed to detect changes due to BMP implementation. The stream profiles do not appear to be affected by implementation, but rather provide data for long-term stream morphology. Rapid Bioassessment monitoring will be continued by the Morro Bay Volunteer Monitoring Program in future years and may aid in this effort.

The San Luis Coastal Resource Conservation District (RCD) efforts to monitor the effectiveness of the sediment floodplain funded through other sources have proven more successful that those carried out as part of this project.