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Title

Continued monitoring of the Tassajara Creek restoration project 2004

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Abstract- Monitoring the ensuing morphological and vegetative change of river restoration projects has become evermore important as an increasing number of communities embrace such efforts. Numerous projects have succeeded in the short run and failed in the long run, but the success of a project can only be assessed through post-project monitoring efforts. A section of Tassajara Creek in Dublin California stretching roughly one mile was restored in 1999. The generalized goals of the project were to reconstruct the highly incised channel to accommodate for the 100 year discharge and to restore riparian habitat. A monitoring plan to document the effects of the implemented project was developed in 2001 accompanied by a series of eight cross-sections, a longitudinal profile, and photographs to begin the post-project evaluation. Between 2002 and 2003 four additional studies were conducted to continue the monitoring effort. All of these projects found some localized incision and aggradation. We took photographs of the riparian zone and resurveyed four of the cross-sections in the southern part of the restoration area and found evidence of aggradation of the thalwegs ranging from 0.25ft and 3.07ft at all sites following the first year of substantial flows. We also found evidence that suggests erosion and deposition along the floodplain terraces, but our results are inconclusive due to disparities in methodologies between our study and past studies. Regardless, our findings allow us to conclude that channel morphology may have been altered by the high flow events in 2004 and that restoration goals of improving riparian habitat are being met.

Introduction

The Tassajara Creek drains 23.2 mi² within Alameda and Contra Costa counties, CA, and is a tributary to Alameda Creek (Figure 1). As with many streams in the San Francisco Bay Area, land use changes have changed Tassajara Creek. Cattle grazing in the catchment since the 19th century caused increased storm runoff and incision (Hudzik and Truitt, 2001) undermining highly valued oaks. The study site was formerly occupied by a Naval Hospital. The navy attempted to stabilize the channel with a lining of concrete sometime prior to the mid 1960's, but the concrete was undercut (Lave 2003). Alameda County received the property for development, and completed a restoration project on a one-mile section of Tassajara Creek immediately north of the I-580 freeway in Dublin (Figure 2). As seen in the following guiding documents, the project attempted to achieve flood control and enhance ecological and recreational features. The East Dublin Comprehensive Stream Restoration Program published by Sycamore Associates lists “storm conveyance and sediment loads, channel crossing, maintenance access, and natural scouring and meandering” as primary concerns. The Santa Rita Drainage Master Plan published by Brain Kangas Foulk Engineers (BKF), emphasizes the aesthetic components of the restoration through proposals of hiking trails and riparian habitat areas.

The project was split into two phases, where two sections of the creek were restored in different styles. For Reach 1, located between the I-580 and Dublin Blvd. Bridges, the design focused on a low flow channel set within a larger trapezoidal channel capable of

handling the 100-year discharge. In Reach 2, extending north from Dublin Blvd. to Gleason Rd., the design reduced the degree of channelization by leaving the original creek bed intact up to the height of the fifteen year flood. At this height, the floodplain terrace was widened to accommodate the 100-year discharge, thus creating a larger area for riparian habitat and recreation (Sycamore Associates *et al.* 1996).

To evaluate the progress of the restoration, students from UC Berkeley have conducted four surveys of the site to document morphological change. The first of the post-restoration studies, completed by Hudzik and Truitt in 2001, proposed a monitoring plan for which they established guidelines and baseline data for eight cross-sections within the restored reach (Figure 3). They compared their thalweg elevation data for cross-sections DD' through HH' to a survey conducted by BKF in 2000 and found incision in the upstream portion. In 2002 Lave conducted a longitudinal profile of reach 2 and found some evidence of minor localized incision, but mostly found evidence of aggradation. In the fall of 2003 Krofta and Novotney conducted surveys of cross-sections AA'-DD' as well as a longitudinal profile of the entire restoration area. They found localized incision in the downstream portion. Later in 2003, Lave returned to the site and conducted surveys of cross-sections EE'-HH' and found localized incision as well as some aggradation, but notes that the lack of a high discharge during the survey years has presented an obstacle to a more comprehensive evaluation of the creeks morphological change.

We re-surveyed cross-sections EE'-HH' to document any changes to Tassajara Creek in 2004. We compared our morphological data with previous studies; we also make general

observations about the creek environment, supplemented by photo documentation, in order to assess the ecological dimension to the restoration. Our experiences with the guidelines of Hudzik and Truitt (2001) allow us to make suggestions for revision and improvement based on various changes that have occurred since the creation of the plan.

Methods

On April 17th, 2004 we re-surveyed four of eight cross-sections (EE', FF', GG', and HH') established by Hudzik and Truitt (2001) using an automatic level and 25-foot survey rod. We located the benchmarks for the cross-sections using written descriptions and photographs from their report. We established our mean sea level elevations using a benchmark (356.46 ft.) established by the United States Geological Survey (USGS) located in the middle of the southern sidewalk of Dublin Blvd. on the bridge spanning Tassajara Creek. When turning points were used, we closed our surveys at the same benchmark.

We measured elevations at seventeen different points where there were slope breaks or significant changes in channel topography for cross-sections EE', FF', and GG'. For cross-section HH', we measured thirteen points because the channel form exhibited less topographical complexity. We measured distances to each elevation measurement using the stadia intercept method. Previous studies laid tape on the ground to measure distances between survey stations. Due to our use of the stadia intercept method to measure

distances; our data is not directly comparable lengthwise to the previous survey data. Neither methodology is desirable. The amount of error increases as you move away from the level when using the stadia intercept method, and the actual distances are distorted by laying tape over terrain features. Ideally one would want to stretch the tape across the channel in order to measure station distances most accurately.

Using Microsoft Excel, we plotted our cross-section data against the previous survey data conducted by Lave (2003), Hudzik and Truitt (2001), and BFK engineering (2000) (Figures 4-7). Since our Data is not comparable lengthwise, we analyzed changes in geomorphology by aligning recognizable features in the cross-sections such as thalwegs and banks of our survey with the previous survey data.

We took digital photographs to record surveying locations, to monitor vegetative state in the restoration area, and to document overall channel conditions. We took photographs across each cross-section to note benchmark locations established by Hudzik and Truitt (2001) (Figures EE1, FF1, GG1, and HH1). We photographed behind survey locations, so benchmarks could be readily located (Figures EE2, FF2, GG2, and HH2). We photographed upstream and downstream shots from the creek level at each cross-section so future studies could monitor vegetation change (Figures EE3,4, FF3,4, GG3,4, and HH3,4). Photos were taken from a similar vantage point for comparison with photos contained in Hudzik and Truitt's (2001) study that show pre-project and November 2001 conditions (Photo series 1 & 2). Although not taken in previous studies, we took a

photograph from the aforementioned benchmark location in the downstream direction to be compared to in future projects (Figure BM).

Results and Discussion

Thalweg Elevation

A compilation of thalweg elevations from different studies as shown in Table 1 summarizes the history of one aspect of the creek's morphological evolution. For Reach 1, based on cross sections GG' and HH', our data show aggradation in comparison to all previous surveys. The overall trend observed for GG' is that thalweg elevation has had net increase in the previous years. At HH', the incision found by Lave in 2003 has stopped and subsequent aggradation has brought the thalweg elevation higher than the even the design specifications. For Reach 2, our results indicate aggradation since Lave's 2003 survey, however the numbers suggest net incision since the completion of the restoration. Dr. Matthias Kondolf commented in the 2004 water symposium held at the University of California Berkeley in April that the design specifications cannot be completely trusted and compared to. Although they were designed to meet the noted elevations, it may not have happened in practice.

Table 1.

Comparison of Thalweg Elevations (Ft above mean sea level)					
Cross Section	Design	2000	Hudzick & Truitt, 2001	Lave, 2003	DeHollan & Oden 2004
South of Central Pkway (EE')	345.6	345.4	343.51	343.78	344.03
North of Dublin Blvd. (FF')	344.5	344.7	343.59	343.43	344.32
South of Dublin Blvd. (GG')	341.4	341.6	341.33	341.68	342.6
North of I-580 (HH')	339.8	339.4	339.55	338.19	341.26

Cross-section morphology

Cross-section EE' suggests signs of aggradation, erosion, and deposition. Figure 4 shows the channel morphology and the aforementioned aggradation of the creek bed. The overlay suggests that the banks on both sides of the channel eroded considerably during the wet season widening the channel, and that the right side of the floodplain terrace experienced deposition ranging from one to three feet. We cannot confirm the erosion because of the incomparable distances between survey, nor the deposition because our field work took place months after the high flow events and grasses were growing on the floodplain terrace. This limited us from noting how fresh the deposition was. The overlay suggests that the left bank eroded significantly, but we did not take note of this in the field. However, we did note high water marks to be 7.1 feet above the thalweg for this cross-section, thus placing the flows of this year as high as the channels bank full discharge, which is not high enough to directly erode the left bank.

Cross-section FF' also suggests aggradation, erosion, and deposition, though not as noticeably as EE'. Figure 5 reveals that the channel may have widened mostly due to erosion on the left side, but the right side appears to have also eroded slightly.

Unfortunately, we cannot confirm these findings because of the incomparable distances. The right floodplain terrace looks similar to previous studies, but the left seems to have received some minor deposition since the last survey.

Cross section GG' shows that Tassajara creek responded to the high flows of the 2004 water year through aggradation of the creek bed and deposition on the floodplain terraces in this part of the lower reach (Figure 6). The overlay suggests that the floodplain terrace rose between zero and three feet following the high flow events, with the left side showing considerably more deposition. Unfortunately, our field observations cannot confirm this notion. The channel structure appears to be comparable to the previous surveys.

Cross section HH' shows signs of channel widening and aggradation since Lave's 2003 survey, as well as significant erosion of the river's left bank (Figure 7). In our survey we noted two small channels flowing through an area where reeds had colonized the creek bed, but more water was flowing through the small channel furthest east. The right floodplain terrace is almost non-existent, as it has assimilated with the bank to form one continuous slope leading to the channel. Therefore, what appears to be deposition may actually be erosion from the bank resituating the left floodplain terrace at a higher elevation. We also noted high water marks at five feet above the thalweg for this location,

thus placing the high flow of 2004 along the left bank and flowing out onto the right floodplain terrace.

Qualitative Analysis

Photographs of the restoration area show maturation of riparian vegetation. In 1999 Restoration Resources contracted with Summerhill Homes to restore wildlife habitat and create recreational area creek side. They planted over 5000 trees and created an irrigation system to be used for three years. A close look at photo series 1 & 2 shows that the original project goals of restoring riparian habitat and creating vegetative trails along the restoration reach have been successful since the irrigation system was discontinued in 2002 (Restoration Resources, 2004). The upstream and downstream photos taken from each cross section (Figures EE.3, 4, FF.3, 4, GG.3, 4, HH.3, 4) give further proof to the success of the project, as riparian vegetation appears to be fully established and growing vigorously to the point that the density of growth is making surveying increasingly difficult. The increase in vegetation increases the roughness of the channel, which in turn will lower the velocity of the water during storm events (Chow 1959). This will help to protect the channel from being drastically altered in high flow events, so that the riparian habitat, recreational area, and highly valued oaks can be preserved.

Conclusions and Recommendations

Aggradation has occurred at cross sections EE', FF', GG', and HH'. The channel morphology may have been modified due to erosion of banks and deposition along the floodplain terraces, but it is difficult to conclude because cross-section distances can't be directly compared to past studies and deposition was not fresh when we made field observations. Riparian vegetation has flourished since the start of the restoration project providing ample habitat for wildlife and a nice recreational area for people. Because of the increase in vegetation, we recommend people bring garden shears to the field and avoid laying a measuring tape and the stadia intercept method, but rather clear a path and stretch tape across the cross-sections. We also recommend that photographs be taken from similar vantage points as ours, so that further comparisons can be made in the future. Monitoring should be continued to assess further change.

References

Brian Kangas Foulk Engineers. *Santa Rita Drainage Master Plan*. 1995.

Chow, V. T. *et al.* 1964. *Handbook of Applied Hydrology*. McGraw-Hill Inc.

Hudzik, C. and J. Truitt. *Characterization of Channel Morphology in the Tassajara Creek Restoration Project Area: Documentation of Post-Project Change and Recommendations for a Monitoring Plan*. UC Berkeley Water Resources Archive. 2001.

Krofta, C., Novotney, M. *Looking Forward, Look Back: Monitoring the Tassajara Creek Restoration Project*. UC Berkeley Water Resources Archive. 2003.

Lave, Rebecca. *Monitoring Changes in Bed Elevation Tassajara Creek*. UC Berkeley Water Resources Archive. 2002

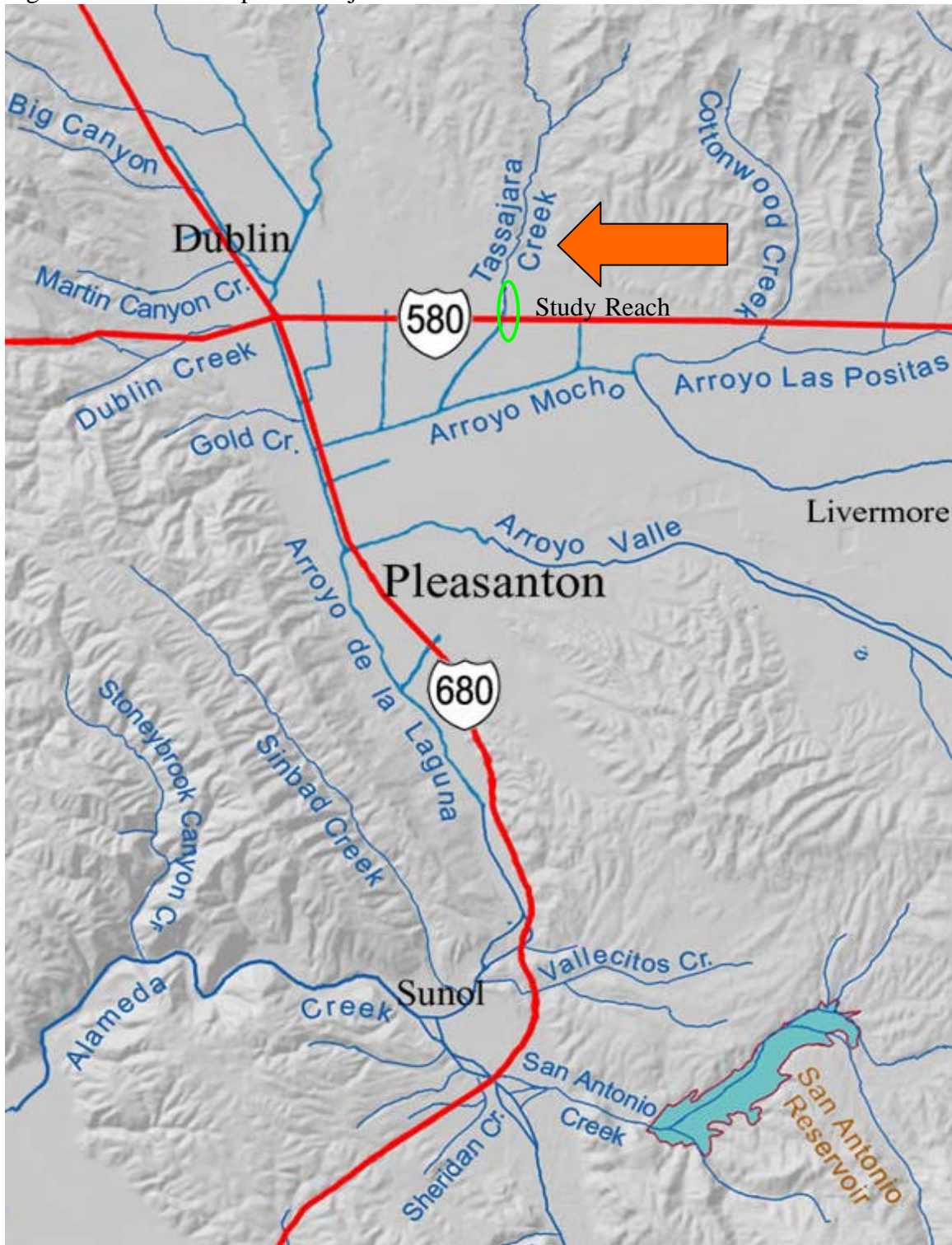
Lave, Rebecca. *Evaluating Success of Incision Control Measure on Tassajara Creek, Dublin, CA*. Received from Author. 2003

Restoration Resources *Riparian Restoration*. <http://www.restoration-resources.net/riparian.html>). Accessed 04/27/04.

Sycamore Associates, Balance Hydrologics, and dk Associates. *Eastern Dublin Comprehensive Stream Restoration Program*. June 1996.

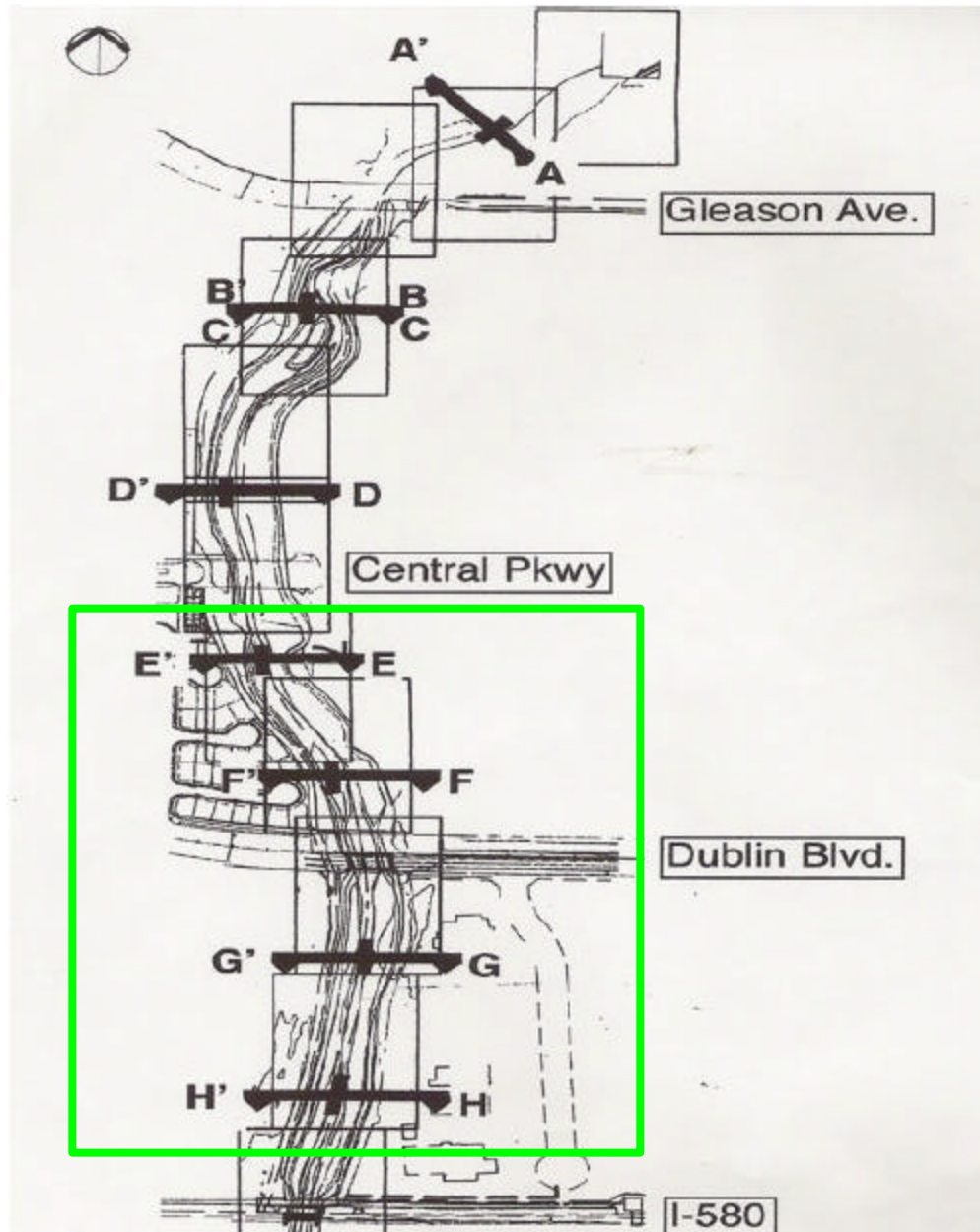
Figures

Figure 1- Location map of Tassajara Creek



(The location of Tassajara Creek. Courtesy of the Oakland Museum of California @ <http://www.museumca.org/creeks/33B-RescALaguna.html>. Accessed 04-26-04)

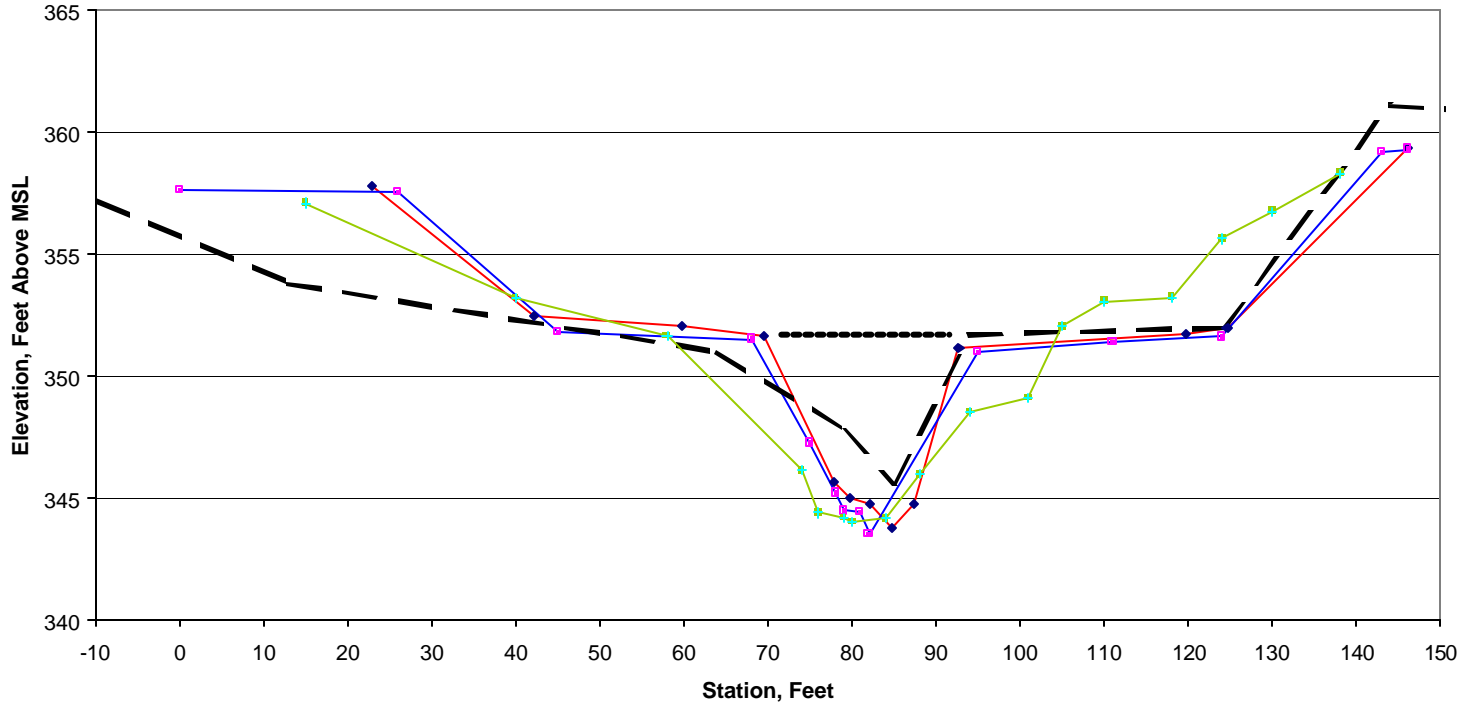
Figure 3- Cross-section locations



(Cross-section locations from Hudzik and Truitt 2001. Large Box shows the cross-sections we re-surveyed)

Figure 4.

Tassajara Creek, Cross-Section EE'
Looking Downstream



—◆— Lave, 2003 —■— Hudzik/Truitt, 2001 - - - Design —■— Dehollan/Oden 2004

- - - - - Approximate height of high water marks for 2004

Figure 5.

**Tassajara Creek, Cross-Section FF'
Looking Downstream**

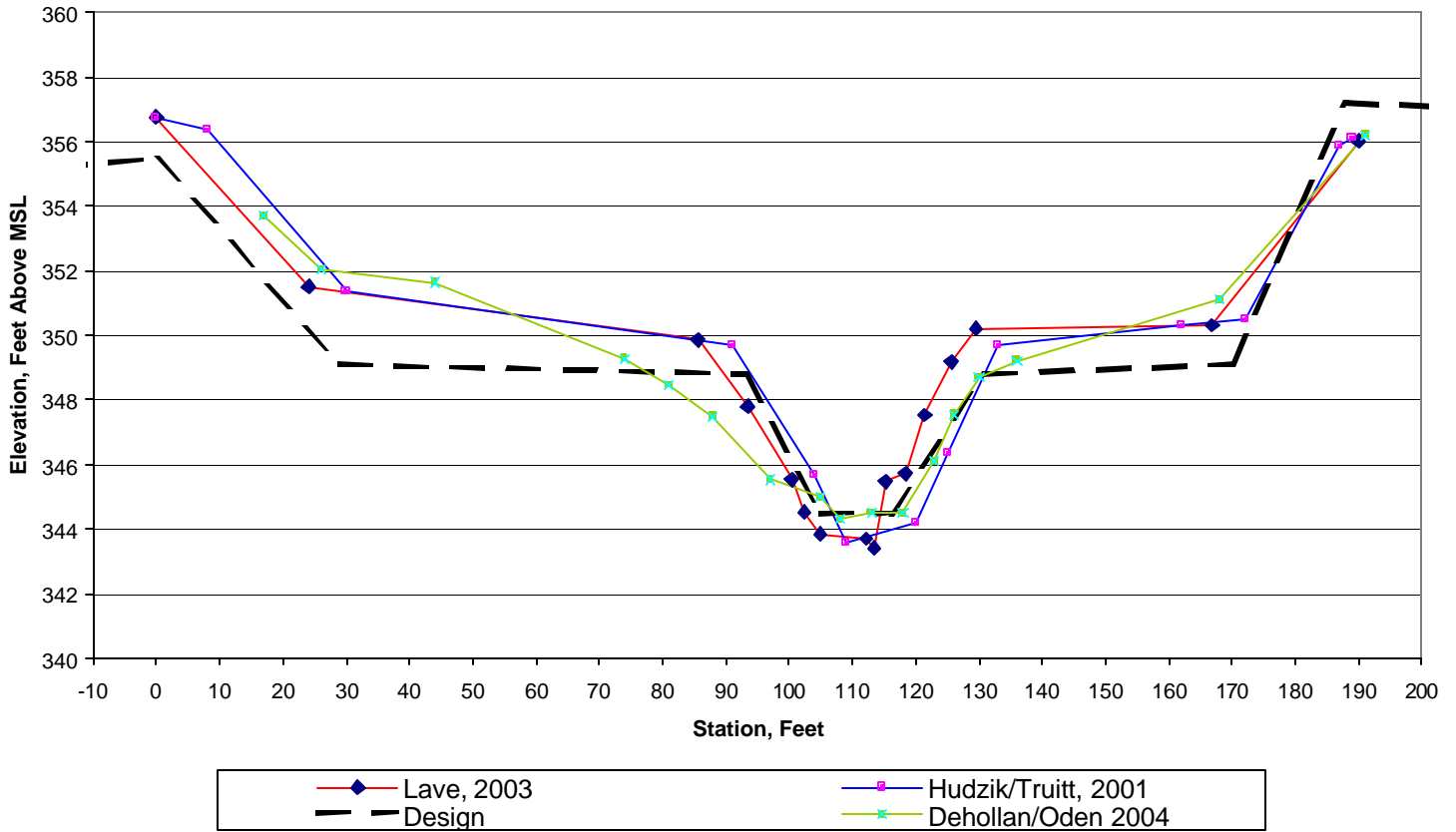


Figure 6.

Fig. 15: Tassajara Creek, Cross-Section GG'
Looking Downstream

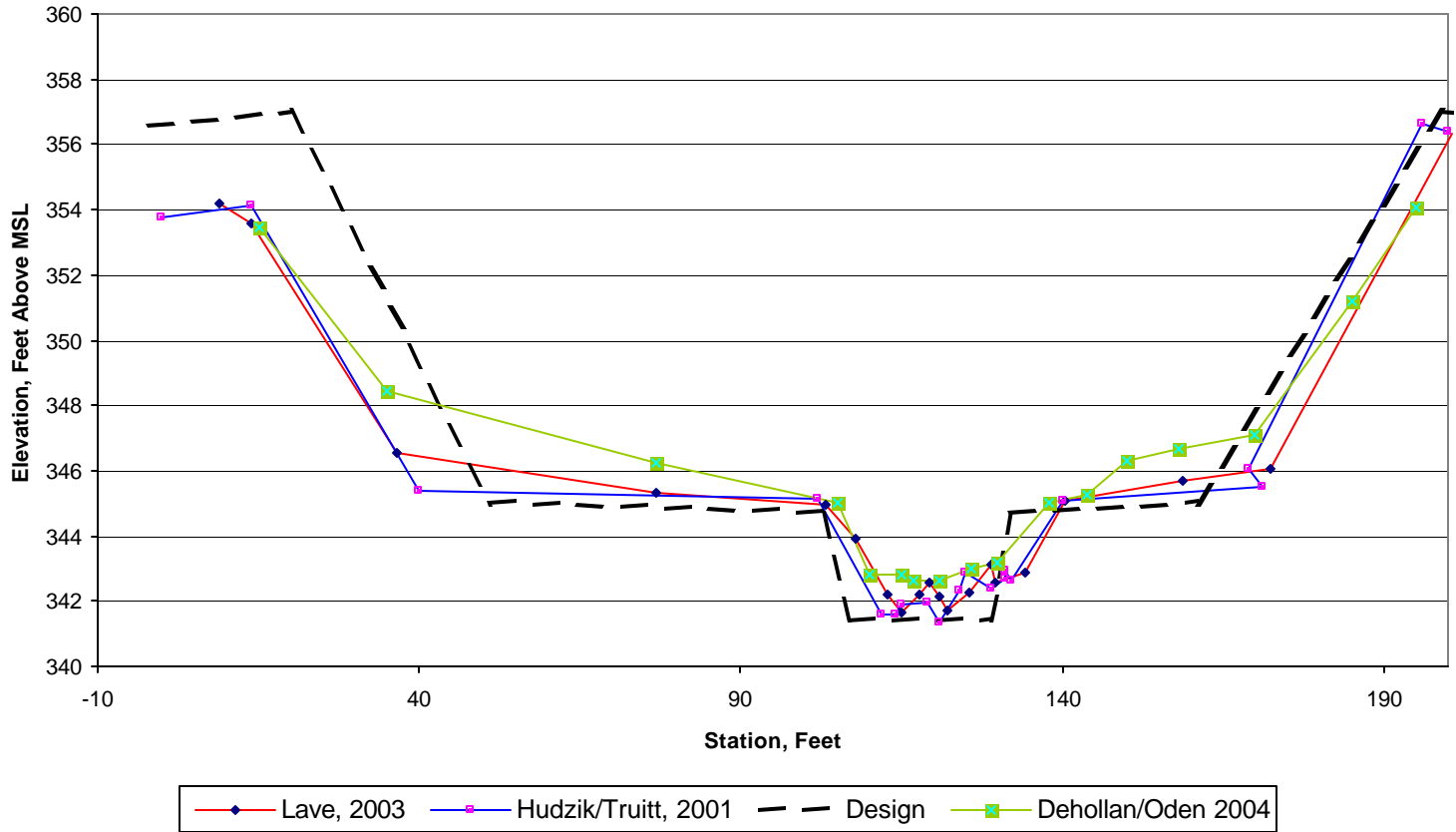
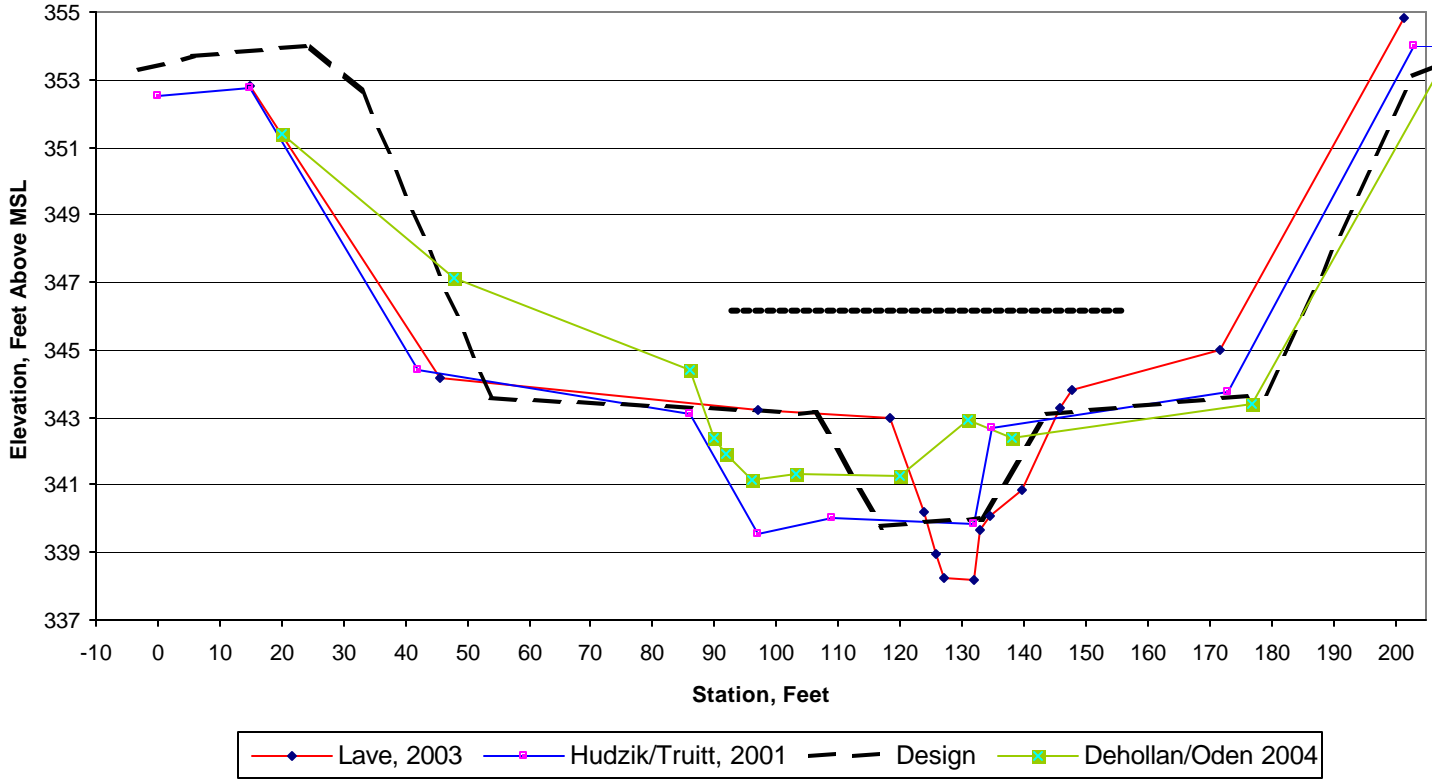


Figure 7.

Tassajara Creek, Cross-Section HH'
Looking Downstream



----- Approximate height of high water marks for 2004

Figure EE.1



(View of cross-section EE from “Owl Court”. The Oak tree on right side was used as a benchmark.)

Figure EE.2



(View of “Owl Court” pathway, which was used as a benchmark for cross-section EE.)

Figure EE.3



(Upstream view of cross-section EE from creek level.)

Figure EE.4



(Downstream view of cross-section EE from creek level.)

Figure FF.1



(View across cross-section FF from “Peacock Court”. The wooden post where the wooden and metal fences meet near the southern edge of the house second from left was used as a benchmark.)

Figure FF.2



(View of “Peacock Court” pathway, which was used as a benchmark for cross-section EE.)

Figure FF.3



(Upstream view of cross-section FF from creek level.)

Figure FF.4



(Downstream view of cross-section FF from creek level.)

Figure GG.1



(View of cross-section GG from pathway to the Econolodge. The southern edge of a storage shed in the hotels parking lot across creek (not visible) was used as a benchmark.)

Figure GG.2



(View of garages at Buik Pontiac GMC dealership. The wall between the two garages on right was used as a benchmark for cross-section GG.)

Figure GG.3



(Upstream view of cross-section GG from creek level.)

Figure GG.4



(Downstream view of cross-section GG from creek level.)

Figure FF.1



(View across cross-section HH from pathway to light post used as benchmark. The light post was the second one from the north end of the Ford dealership nearest the fence bordering the restoration area.)

Figure GG.2



(View of fence at cross-section HH. The post on the right was used as a benchmark.)

Figure GG.3



(Upstream view of cross-section FF from creek level.)

Figure GG.4



(Downstream view of cross-section FF from creek level.)

Photo Series 1

Pre-Restoration



(Kondolf)

2001



(Hudzik and Truitt 2001)

2004



(Photo taken from footpath along the west side of creek looking northwards towards Gleason Rd..)

Photo Series 2

Pre-Restoration



(Kondolf)

2001



(Hudzik and Truitt 2001)

2004



(Photo taken from footpath on west side of creek looking south towards the Central Parkway Bridge.)

Figure BM



(Photo taken from benchmark on Dublin Blvd. looking Downstream. To be used for future monitoring)