The Tale of Two Creeks: The Effects of Restoration on Water Quality in Oakland, California

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Introduction

Urbanization has resulted in habitat loss in California; native diversity has been replaced, in many areas, by exotic species. Terrestrial and aquatic ecosystems that were once integrated are now dissociated and fragmented by human activities. Diamond and Peralta creek in Oakland, CA. are examples of the impact of urbanization as culverts have replaced these two creeks (Figure 5).

Our study employed a Rapid Bioassessment Protocol to compare the water quality of two creeks in Oakland California. Peralta Creek has recently undergone small changes to restore it to its historical ecological community, while Diamond Creek has been undergoing restoration since 1996. We determined the overall water quality by using a biotic index extrapolated by four functional pollution sensitivity groups.

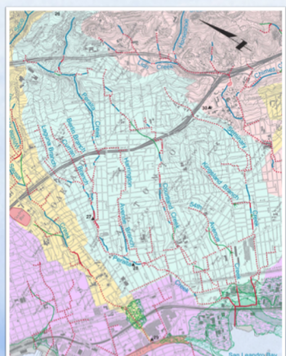
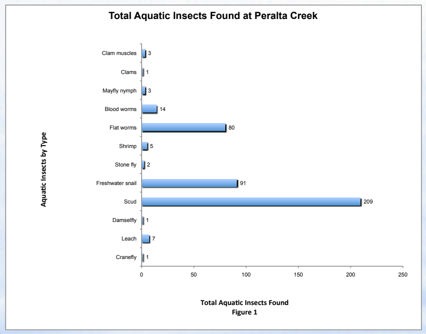


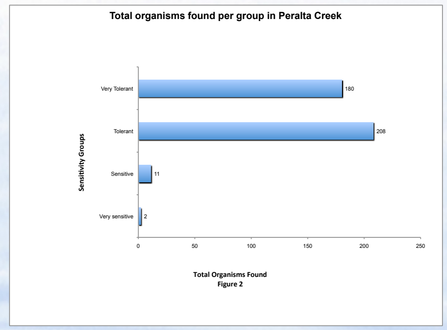
Figure 5: Map of Peralta and Diamond (Sausal) creek watersheds, Oakland, CA. Dotted lines are underground culverts, blue lines are day-lighted and non-culverted creek areas.

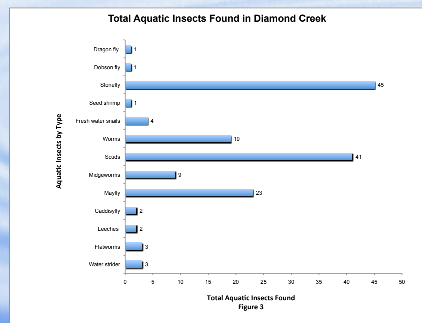
Methods and Materials

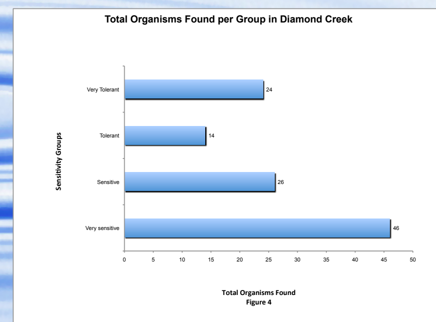
The research team was comprised of four positions. Each member of the team had a specific job. The Data Collector collected the insects inside the creek for samples, the Data Logger wrote all the information and analyzed the environment where we worked, the Timer timed the Data collector while they retrieved the insects, the Equipment handler held all the equipment during the sampling process. Our collection method was to have the Data collector scoop from the bottom of the creek and insert the benthos into the net. While the time keeper counted 20 seconds for the data collector to stop. Once the invertebrates were caught we separated them into different species and used a biotic index and split the species into four tolerance groups.

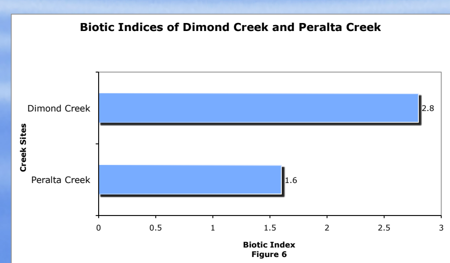
The four groups represent levels of tolerance and each level has a biotic index associated with it, which are groups 1 highly sensitive, 2 sensitive, 3 tolerant, and 4 highly tolerant. The places we sampled were Diamond creek and Peralta creek, in Oakland, California. Each site was sampled once. Peralta Creek was sampled on Aug 1, 2011 and Diamond creek on Oct 8, 2011 The biotic index will be used to infer the health of the creeks.











Results

The graphs present the total number of individual organisms found in both Diamond and Peralta creek. We organized these organisms into groups associated with their sensitivity to pollutants, which gives us the biotic index score for each creek. The biotic index score is a quantitative method used to determine water quality.

- In **Figure 1** of the Peralta Creek graph, we list all of the Aquatic Macroinvertebrates found in Peralta Creek, which range from crane flies to leeches. The most organisms found were 209 scuds and the fewest were clams, damselfly, and crane fly.

- **Figure 2** represents the sensitivity groups from Peralta Creek; we organized the organisms into four groups according to their sensitivity to pollutants. The *tolerant* group was the largest group found with 208 macroinvertebrates. These organisms were a mix of amphipod, and/or snails. The second largest sensitivity group was *very tolerant* at 180 organisms. These organisms were a mix of freshwater snail, leeches, and bloodworms. The *sensitive* group came in third with 11 organisms, comprised of of crane fly larva, damselfly larva, and water pennies. The lowest group found were *very sensitive* with 2 invertebrates. In **Figure 3**, like figure 1, we listed all the aquatic organisms found at Diamond creek. Out of a scale of 50, the most macroinvertebrates found were stoneflies with 45 individuals. The lowest count being 1 dragonfly, 1 Dobson fly, and 1 seed shrimp.

- **Figure 4** shows the total number of Aquatic Macroinvertebrates grouped by their ability to tolerate pollution. *Very sensitive* being the highest count at 46, followed by *sensitive* 26, *very tolerant* at 24, and ending with *tolerant* 14.

- Figure 6 shows the Biotic Index. The method we used to determine the health of each creek was biotic index. The scale for determine a creek's health is as follows: 3.6+= Excellent, 2.6-3.5= Good, 2.1-2.5= Fair, and 1.0-2.0= Poor. Diamond Creek rated 2.8, concluding that it is in a Good, or at a healthy state. Peralta Creek rated 1.6, concluding that it is in a poor state. This means that Peralta Creek needs much improvement

Conclusion

The results of our investigation on Diamond Creek and Peralta Creek demonstrate that Diamond Creek was significantly healthier than Peralta Creek. We surmise that our data reflects the different types of riparian management being used at the two different creek sites. Diamond Creek has been restored since 1996 and Peralta creek has recently started to be restored. Our recommendation is to keep using the Rapid Bioassessment Protocol to continue to monitor the creeks health. We recommend collecting more samples that are representative of the whole watershed, sampling different parts of the creek, and during different times of the year

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