Aquatic Invertebrates: Indicators of Water Quality in Watsonville Sloughs

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Introduction

At Pajaro Valley High School, we receive the important message that it is essential we conserve and protect the environment. Aquatic invertebrates are often overlooked and ignored by the general public as well as some scientists. Invertebrates are the focus of our project because they are important indicators of healthy water conditions in aquatic ecosystems (1). Some are pollution tolerant and can live in both polluted and healthy water, while pollution intolerant invertebrates only live in healthy water.

Aquatic invertebrates are responsible for a large part of secondary production that takes place in the wetlands and they are part of the detrital and grazing food chains (1). The detrital invertebrates, called detrivores, feed on dead and decaying plant and animal matter, while those in the grazing food chain consume living aquatic vegetation and algae. Their absence would negatively affect the food web, because they are a food source for other organisms. They also consume algae which reduces the risk of algal blooms and helps to maintain water quality (1).

Our research focused on three wetlands in the Pajaro Watershed: Upper West Struve, Hanson, and Watsonville Sloughs. West Struve Slough is a relatively pristine location, meaning that it has been less impacted by human activity compared to the other sites. The reason we consider this a relatively pristine location in comparison with the other sites is because that site is directly fed by a spring and has no direct pollution inputs that we are aware of. Organic farming methods are practiced in the fields surrounding Hanson Slough. Watsonville Slough is an urban/suburban site that is visited by humans frequently.

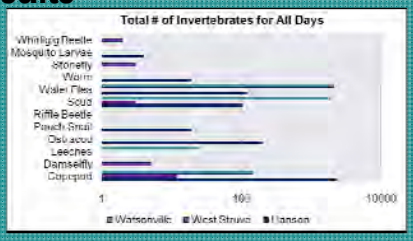
We decided to test one final question: is water quality affecting aquatic invertebrate biodiversity in West Struve Slough, Hanson Slough, and Watsonville Slough?

Map of site locations

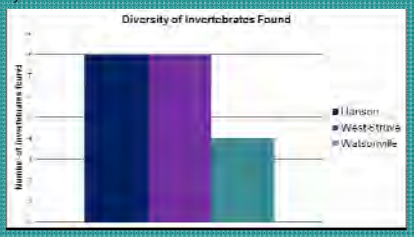
Materials and Methods

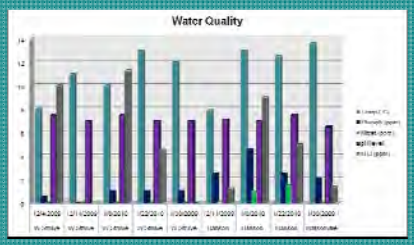
We began by gathering background information to help us amplify our knowledge on aquatic invertebrates. Our locations for collecting data are: Watsonville Slough, Hanson Slough, and Upper West Struve Slough. We collected four scoops of water with a dipper of five hundred milliliters using protocols from the Watsonville Wetlands Watch. We collaborated with another WATCH group, Run Off With Us, whom shared their water quality data with us. We conducted different water quality tests including nitrates, phosphates, dissolved oxygen, turbidity, and temperature. We identified invertebrates and calculated their abundance in each location. We collected data on December 6 and 12, January 8, 23 and 30. Our materials were the following: water quality testing kits, Nokia phones, journals, dipper, gloves, meter stick, plastic bags, thermometer, plastic containers, basin, and a sieve.

Results



Note: The graph above does not show that West Struve Slough had a riffle beetle, ostracod and water flea, and that Hanson Slough had a stone fly.





In Hanson and Upper West Struve Slough we found more diversity in aquatic invertebrates and less in Watsonville Slough. Both Watsonville and Hanson Slough contained smaller invertebrates usually being somewhat pollution sensitive and pollution tolerant. In Upper West Struve Slough we discovered pollution sensitive invertebrates. We found a greater amount of the microscopic invertebrates and a smaller amount of the larger invertebrates.

Water Flea

Scud

Discussion

A high level of species diversity keeps an ecosystem stable. In our three sites, we found that Hanson and Upper West Struve Slough have the most diversity, while Watsonville Slough has the least. However, Watsonville Slough has more abundance in aquatic invertebrates than Upper West Struve Slough. Hanson had a moderate diversity and abundance. Upper West Struve is smaller in size compared to the other two sites, therefore due to the concept of island biogeography, it cannot support a great abundance of invertebrates. A factor of why Watsonville Slough has a low diversity but great abundance is because water quality levels might be affecting the different types of invertebrates that are capable of living there.

We found that when the water temperature was 14 degrees, there were more scuds than any other species. This is because scuds thrive in warmer water temperatures. During the same time, daphnia were present but when water temperature got colder, they became the dominant species. This can be contributed to the fact that they reproduce in cold temperatures. The species that were present were able to reproduce because of the water quality. Hanson Slough had a good abundance and diversity because the water quality was just the right level for them to multiply, but not high enough to affect the diversity of aquatic invertebrates.

The nutrients are one factor that contribute to the abundance of the aquatic invertebrates found in the sloughs. When the rainy season started, the runoff from the fields flowed into Hanson Slough, increasing the level of phosphates. Our data supports that there were high levels of algae and turbidity. Watsonville Slough had more water fleas than Hanson which we can deduct from the fact that there was a lower amount of algae. In West Struve Slough we found Riffle Beetles, Stoneflies, Damselflies, and Whirligig Beetles which are either pollution sensitive or somewhat pollution tolerant. West Struve is fed by a spring which might be a reason of why it is less polluted than the other two sloughs. We can also prove this by the type of invertebrates that we found and by the water quality collected on the testing days.

Conclusion

We believe that water quality is indeed affecting the biodiversity of aquatic invertebrates in Hanson Watsonville and West Struve Sloughs. There are pollution sensitive invertebrates who cannot survive in a body of water that has a great abundance of nitrates and phosphates. There are certain chemicals in the water that do not allow invertebrates to live. The pollution tolerant invertebrates can live in conditions where some nitrates and phosphates are found, but these amounts are not extremely high. The last group is pollution tolerant invertebrates that can handle high pollution levels throughout their life cycles. The water fleas are affected by the high temperatures found in the sloughs which show that not only pollution is affecting the invertebrates. Upper West Struve slough is fed by a spring and is mostly surrounded by plants and it receives very small amounts of pollution. Watsonville Slough receives pollution from the city and storm runoff. Hanson Slough gets polluted by the agricultural fields it is surrounded by and the soil erosion they produce. These factors also affect the levels of pollution the sloughs have.

Works Cited

(1)NSW Department of Environment, Climate Change, and Water Website. 2009. NSW Government. Web. 19 Mar 2010.

(2)Pennak, Robert W. *Freshwater Invertebrates of the United States Second Edition*. New York: Wiley, 1978. Print.

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