Characterization of Urban Runoff Water Treatment Ponds in San Dieguito River Park

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Introduction

• Natural lagoon and wetland area east of Del Mar Racetrack has been restored under the San Dieguito River Park
• Urban runoff threatens to damage lagoon with flood of pollutants
• Four sequential treatment ponds were installed to trap and filter this runoff before it enters the lagoon
• This study aims to quantify the effectiveness of these treatment ponds based on water quality and soil pollutants

Hypothesis

Treatment pond four will have lower water and soil pollution levels than treatment pond one. Figure one represents a diagram of the four treatment ponds located at SDRP.

Methods

Sample Collection
At each pond one 100m Transect line is set up following the gradient flow of water. A total of 24 (six samples collected per pond in both summer and winter), 10 cm soil samples were collected every 20meters along each transect. These samples were analyzed for nitrogen and carbon content.

Water quality samples were taken using the SD Coast Keeper procedures on a monthly basis between May 2012 to May 2013 to characterize the water quality during both summer and winter. Water samples are analyzed for nitrogen and carbon levels, conductivity, temperature, pH, and dissolved oxygen.

Processing Samples
Soil samples were dried for one week at 70°C. Samples were ground into a fine powder and 5-10mg were weighed and placed into small aluminum tins. The soil samples were run in an auto analyzer and recorded for carbon and nitrogen content. Water quality samples were processed by the San Diego Coast Keeper and forwarded to us for further statistical analysis.

Statistical Analysis
A series of indicators such as carbon, nitrogen, dissolved oxygen, conductivity, and pH were compared to determine if these levels declined from treatment pond one to treatment pond four. Results were compared between both ponds in winter and summer months. Results were also compared to Environmental Protection Agency (EPA) environmental standards. Statistical t-tests determined if there was a significant difference in pollutant levels between ponds.

Soil
• Significantly higher carbon levels (p=0.0389) found in treatment pond one during dry summer months (figure 3).
• Pond one has a significantly higher nitrogen level (p=0.029) during summer months (figure 4).

Water
• Conductivity did not show a significant change from treatment pond one to four in both summer and winter months (figure 6).
• Dissolved oxygen levels were significantly different between ponds one and four in both winter and summer months (p=0.05, figure 7). Treatment pond four expressed an acceptable dissolved oxygen range according to EPA.
• Significant difference from treatment pond one to four in pH (p=0.002) and ammonia (p=0.019, figure 8) during winter months.
• Significant difference from treatment pond one to four in pH (p=0.005), ammonia (p=0.036), and nitrate (p=0.009, figure 9).

Results

Results indicate that the treatment ponds effectively filter pollutants before water and sediment are released into the salt water marsh.

Water Quality
• EPA has set standards on water quality and all of this data was compared to these standards and ranges (http://water.epa.gov/type/isd/monitoring/).
• Optimal pH for brackish water ranges from 7.5-8.5 and although the runoff is not considered brackish water, it will eventually empty into a brackish lagoon water column. Without maintaining a pH within this range, pollutants can become more readily absorbed by my marine organisms and can cause stress to plant life as well.
• Safe nitrate, ammonia and phosphorus levels were found in both ponds
• Dissolved oxygen is dependent on several factors such as phosphorus, nitrogen and temperature. It was found there was a significant improvement in dissolved oxygen levels from pond one to four; pond four fell within a safe range and pond one did not.
• Although there was no significant difference in conductivity levels between pond one to four both ponds fail to fall within the safe range of 150-500µhos/cm.

Conclusion

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