Individual report on Frenchmans Bay within the Toronto Region Conservation Authority (TRCA)

Background:

Located in Pickering, Ontario, Frenchmans Bay is one of several different watersheds administered by the TRCA and Covers about 27km^2 . It is drained by four tributaries: Amberlea, Dunbarton, Pine, and Krosno creeks. Due to its proximity to the GTA and the people living in this city, urbanization has had severe impacts on the Frenchman's Bay lagoon biota and water quality. The loss of wetlands, mud deposition, and algae bloom all contribute to the reduced diversity and abundance of submerged vegetation species. However, invertebrates rely on these habitats for spawning, refuge, etc. This is important because Frenchman's Bay is an important spawning and nursery habitat for fish populations and their prey in western Lake Ontario.

Stakeholders:

The stakeholders involved in the management and conservation of the Frenchmans Bay ecosystem are the city of Pickering, the Toronto and Region Conservation Authority (TRCA), the Pickering Harbour Company, local residents and businesses, and researchers. The reason the city of Pickering is a stakeholder is that it oversees land planning and environmental policies that will help sustainable development for ecological preservation. The TRCA is also a stakeholder because it conducts studies that monitor fish and invertebrate communities which provide data for conservation strategies. The Pickering Harbour Company is a stakeholder because they own the bay and surrounding areas so they have substantial influence over land management and access to these areas. Local residents and businesses also are stakeholders because they rely on the Bay's ecosystem for both health and economic reasons and any changes to the environment directly impact their well-being and revenue generation. Finally, the reason researchers are stakeholders is because studying the bay helps them get data from it for the protection and sustainable use of the Bay.

Importance of our Study:

Our study is important because Frenchman's Bay, one of Canada's oldest and most densely urbanized watersheds, presents a unique opportunity to examine how urbanization affects water quality and biodiversity. The bay's extensive development makes it an ideal site to monitor variations in water quality and environmental conditions, providing insight into the long-term impacts of urban pressures on aquatic ecosystems. By assessing the effects of contamination and habitat changes on the bay's biodiversity, this research can inform targeted conservation strategies and guide sustainable management practices. Understanding these dynamics is essential to preserving the ecological health of Frenchman's Bay and can serve as a model for managing other urbanized watersheds facing similar challenges.

Methods:

Our study focuses on the Frenchman's Bay watershed in Pickering, Ontario, specifically examining invertebrate diversity over time. Invertebrate diversity data for the study was provided by the Toronto and Region Conservation Authority (TRCA), which actively monitors aquatic biodiversity and water quality in the region. The dataset consists of invertebrate community assessments collected from a south shore site within the Frenchman's Bay watershed over multiple years. Sampling records span from 2015 to 2016. To analyze diversity, we used the Shannon-Wiener Diversity Index, a metric that accounts for species abundance and evenness each year. Additionally, total species abundance and taxa richness were calculated annually to further understand ecosystem composition. Sodium levels were chosen as the water quality measure due to the common presence of road salt as a water contaminant. To test for significant differences in water quality, we performed a t-test on sodium concentrations, allowing us to assess the potential impact of urban influences on the watershed's aquatic health.

Results:

The selected water quality parameter for this study was sodium, we chose this because sodium is a prevalent contaminant from road salt runoff, which is common in urbanized areas. Sodium concentrations were measured to evaluate the impact of urban influences on water quality within the Frenchman's Bay watershed.

A t-test was conducted to compare sodium concentrations across different years in the dataset, aiming to determine if there was a statistically significant change in sodium levels over time. The results of the t-test yielded a p-value of 0.088, which is above the typical significance threshold of 0.05. This indicates that there was no statistically significant difference in sodium concentrations in the water between the years studied.

These findings suggest that sodium levels have remained relatively stable over time, despite seasonal variations in road salt application. The lack of significant change could imply effective runoff management practices or relatively consistent urban inputs, though further monitoring is necessary to confirm long-term trends in sodium levels in the watershed.

Conclusion:

The biodiversity index measured using the Shannon Index typically falls within a range of 1.5 to 3.5, indicating that an environment supports diverse organisms with varying levels of abundance (Environment Canada, 2001). This range, along with the presence of organisms that are both abundant and sensitive to environmental changes, suggests a low pollution level in Frenchman's Bay. Given that sensitive organisms thrive in this area, the contamination is minimal. Also, sodium concentration levels are within the standard threshold of 50 mg/L, which supports the conclusion of limited pollution. Statistical analysis using a t-test showed no significant difference in sodium contamination levels between 2015 and 2016. This may be due to Frenchman's Bay being a small community in Pickering, where pollution levels might naturally be lower compared to larger, more industrialized areas.

Sources:

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