



Examining Macroinvertebrates in NYC Wetlands



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Abstract:

Wetlands provide many ecological services such as filtering pollutants and providing habitats for a variety of organisms. Organisms such as macroinvertebrates indicate changes of water quality in wetlands over time. The purpose of this study was to observe the effects of wetland age on macroinvertebrate community composition. The Ramble, Flushing Meadows, and Inwood Hill were constructed in 1857, 1939, and 2014, respectively. Macroinvertebrates were collected from these wetlands using one millimeter dip nets and were sorted based on their traits. There was a positive trend between wetland age and biodiversity, and a negative trend between wetland age and percentage of pollution tolerant macroinvertebrates. This study should continue in the future to see if these trends are still observed.

Introduction:

Purpose: To evaluate the effects of time on macroinvertebrate community composition.

- Wetlands:
 - Many are natural; few are constructed (Sharpe and Baldwin, 2009).
 - Provide ecological services such as filtering pollutants, contaminants, and nutrients from water (Mackintosh *et al.*, 2015).
 - Provide habitats for aquatic invertebrates (Mackintosh *et al.*, 2015).
- Macroinvertebrates:
 - Possess no backbone and can easily be seen by the naked eye.
 - Include insects, annelids, molluscs, crustaceans, and arachnids.
 - Some have gills to collect oxygen from wetlands (Silver *et al.*, 2012).
 - Are indicators of water quality.
- Established Wetlands:
 - Macroinvertebrates have a longer time to migrate and reproduce, which results in increased abundance, taxon richness, and biodiversity.
 - A longer interaction between macroinvertebrates and the urban environment will result in a higher pollution tolerance.

Hypothesis: As the age of the wetland increases, the abundance, taxon richness, biodiversity, and number of pollution tolerant macroinvertebrates will also increase.

NYC Wetlands	Year Constructed
The Ramble (Central Park Conservancy)	1857-58
Flushing Meadows (NYC Parks)	1939-40
Inwood Hill (NYC Parks)	2014

Methods:

- Sites were selected and the surroundings in each site were observed.
- Six random plots were selected from each site.
- A dip net with a mesh size of one millimeter was used to perform a triplicate sweep.
- The sediment collected from the dip net was emptied onto a container covered with a one millimeter mesh netting.
- 250mL of water were poured onto the sediment.
- For 15 minutes, the pelagic and upper benthic macroinvertebrates were collected, identified, and sorted (IOWATER, 2010).
- Steps 3-10 were repeated for the remaining five plots.
- Data was analyzed using R and Excel.

Results:

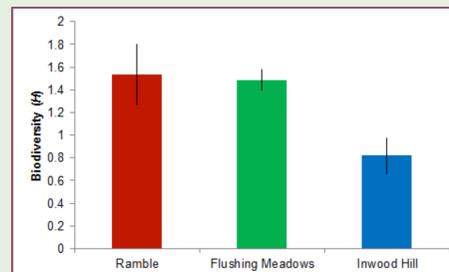


Figure 1: Biodiversity (Shannon-Wiener Index) of macroinvertebrates at the Ramble, Flushing Meadows, and Inwood Hill. The Ramble had the highest biodiversity ($H=1.53$) while Inwood Hill had the lowest ($H=0.82$).

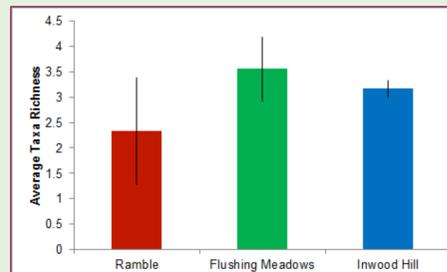


Figure 2: Average taxa richness of macroinvertebrates at the Ramble, Flushing Meadows, and Inwood Hill. Flushing Meadows had the highest average taxa richness (3.56) while the Ramble had the lowest (2.33).

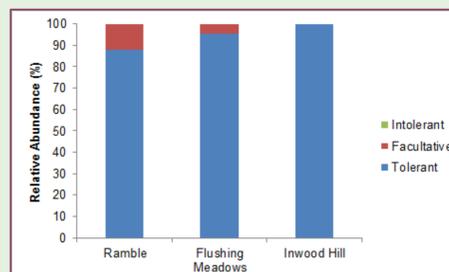


Figure 3: Relative abundance (%) of macroinvertebrates at the Ramble, Flushing Meadows, and Inwood Hill. Inwood Hill had the highest relative abundance of pollution tolerant macroinvertebrates (100%) while the Ramble had the lowest (88.14%).

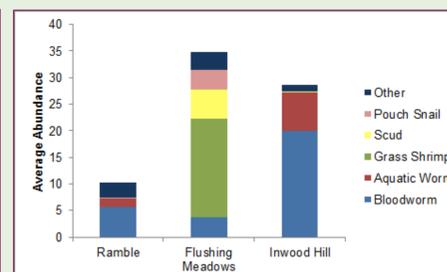


Figure 4: Average abundance of macroinvertebrates at the Ramble, Flushing Meadows, and Inwood Hill. The Ramble and Inwood Hill had the greatest average abundance of bloodworms (5.67 and 20, respectively) and Flushing Meadows had the greatest average abundance of grass shrimp (18.44).



Discussion:

- The hypothesis appears to be supported for Figure 1.
- Figure 1 suggests that biodiversity decreases as age of the wetlands decreases. This may be a result of macroinvertebrates slowly migrating and settling in their habitat.
- Figure 2 shows that there is no trend between the age of the site and average taxa richness.
- Figure 3 shows a positive trend between age of the wetlands and percentage of pollution tolerant organisms.
 - This trend countered the hypothesis in this study.
 - The percentages of pollution tolerant organisms may have been affected by other factors within the sites, such as location.
- Figure 4 shows that there is no trend between age of the wetlands and abundance of macroinvertebrates.
- This study could be improved by using different mesh sizes for the collection of microinvertebrates and macroinvertebrates.

Future Work:

- Increase the duration of time spent collecting data and sorting macroinvertebrate.
- Increase the number of sites and plots sampled.
- Analyze water quality and relate it to macroinvertebrate biodiversity and abundance.

Works Cited:

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Acknowledgements:

A special thank you to Michael Sekor, Acer VanWallendael and Jennifer Cele for their guidance and support in this research- from fieldwork to data analysis. We also thank the National Science Foundation for the Project TRUE grant.