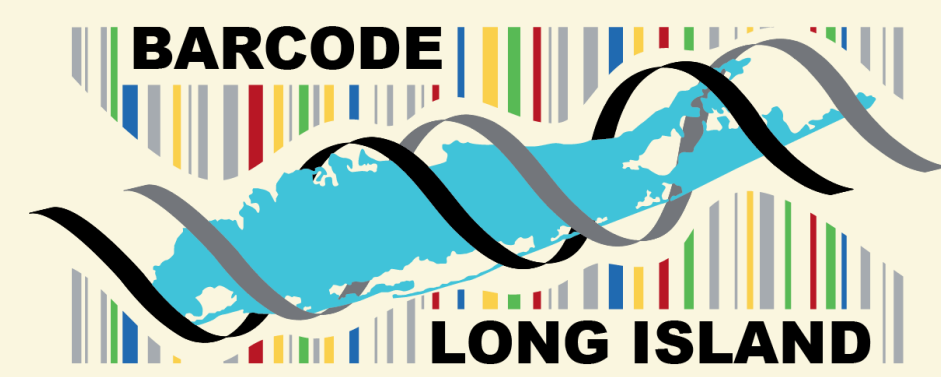


# A look into the Invertebrate Diversity Between Twin Lakes Preserve and a Suburban Creek in Wantagh Using DNA Barcoding

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## Abstract

Foot traffic, animals, and human behavior can impact biodiversity. We studied how biodiversity has been affected by people and animals by comparing an area with more interaction (the creek parallel to Wantagh Avenue by Wantagh High school in Wantagh, New York), and an area with less interaction (the Twin Lakes in Wantagh, New York). DNA barcoding was used to help identify species found in these areas. In the end we found there was a larger amount of biodiversity in the twin lake area. We found that there was a higher biodiversity in the Twin Lakes area. This is most likely due to foliage and moisture content in that area. The suburban creek area is very dry and we found less invertebrates in that area as well. We also found that many of the invertebrates found were the same.

## Introduction

When looking for habitats with differing biodiversity we decided to collect data on invertebrate populations by the Twin Lakes in Wantagh, New York and the creek parallel to Wantagh Avenue by Wantagh High school in Wantagh, New York. These habitats both have water and vegetation to different extents. The creek is located in a suburban area under a road, and the Twin lakes is a nature preserve that is protected (Twin Lakes Preserve, n.d.). The creek area tends to be drier, which makes it difficult to sustain as many creatures as the Twin Lakes (Cornwallis et al). On the other hand, the Twin Lakes are large lakes that provide moisture which may provide sufficient food and shelter for invertebrates such as millipedes and centipedes (Kober et al., 2024).

Another important point that makes these environments different is not only location, but factors such as human and animal behavior (Cepic et al). The creek is closer to Wantagh High School and a pet shelter, which makes it a popular place for walking. This is very common throughout the day compared to the Twin Lakes, which, despite being larger in area, is less often used as a walking path. Pets have also been found to negatively impact the environment, contributing to significant amounts of waste each and every year (The Truth about Cats' and Dogs' Environmental Impact, n.d). However, pets may increase biodiversity near the creek since they may transport non-native species to an area when they are brought there for walks. In addition, the creek is often littered with plastic waste, which has most likely impacted the diversity of insects that live there. Invertebrates that prefer dry areas would most likely be near the creek and invertebrates that are specific to wet environments would live in the Twin Lakes. The *COI* gene is the most common to be used for barcoding because the rate of gene sequence changes is slow, making it identical within the species. It is also fast enough to be different from other species (Science Learning Hub, 2009). Our objective is to see how biodiversity differs between these two places.

## Materials & Methods

To catch the invertebrates, we used methods that would minimize destruction in both environments. This included luring insects using dry food and placing empty water bottles with holes outside to lure flying invertebrates. We also used pitfall traps in the ground to catch invertebrates, as well as a mini shovel for efficiency. We left the pitfall and flying insect trap, and cookie crumbs in the area to attract invertebrates. At the Twin Lakes, we gathered near saturated areas of soil lining the lakes, allowing us to find more invertebrates than in the creek. Taxonomic keys and iNaturalist were used to identify the invertebrates. We followed the chelex protocol to extract DNA which was then amplified for the *COI* gene through PCR. The results were verified through gel electrophoresis. We were able to sequence, trim, and compare the DNA we collected by using DNA Subway.

## Results

We found 20 invertebrates between the creek area and the Twin Lakes. The species we identified them as matched up with what the barcoded as. We were only able to sequence 9 of the 20. DJX-019 didn't have enough DNA so it didn't give us much reliable information. The species we found had similarities in DNA. The lines in the muscle matched up The bugs from the Twin Lakes were more similar to each other than to the suburban creek. At the suburban creek, we found that there were multiple *Philoscia muscorum* (Common Striped Woodlouse). At the Twin Lakes, we found bugs such as the *Order julida* (Snake Millipedes). *Family formicidae* (Ants) were found in both areas. We found a higher biodiversity in the Twin Lakes area. We think that is because we found more invertebrates, it is a bigger area, and more different species can be supported because there is a higher variety of environmental charactersitics and more mositure in the soil to support life.

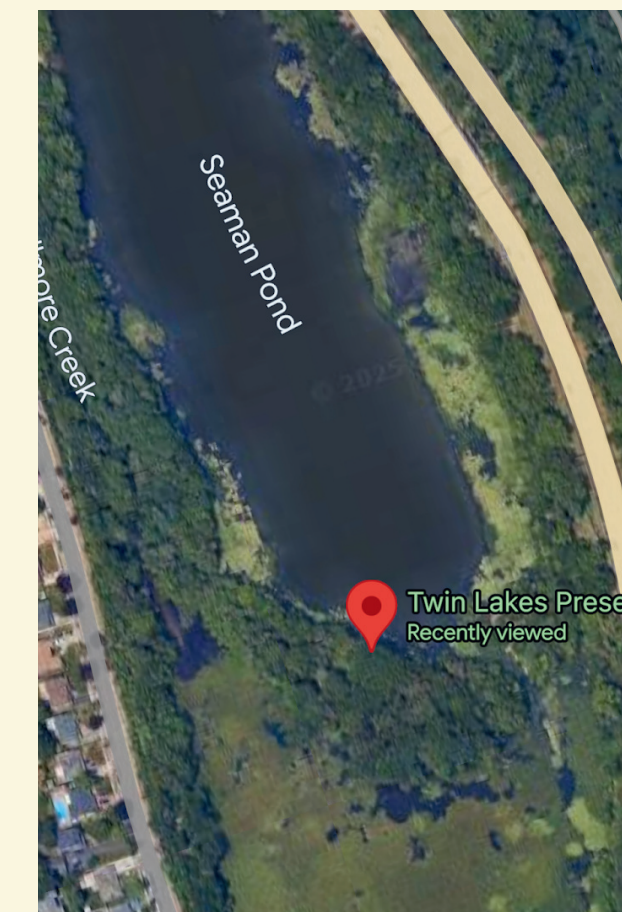


Figure 1: Twin Lakes Location

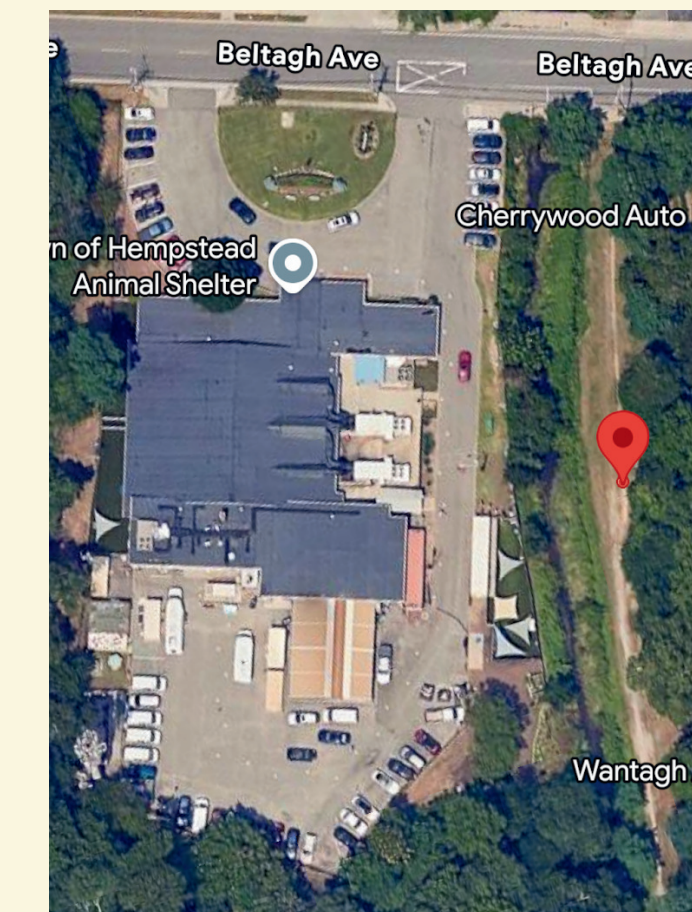


Figure 2: Suburban Creek Location

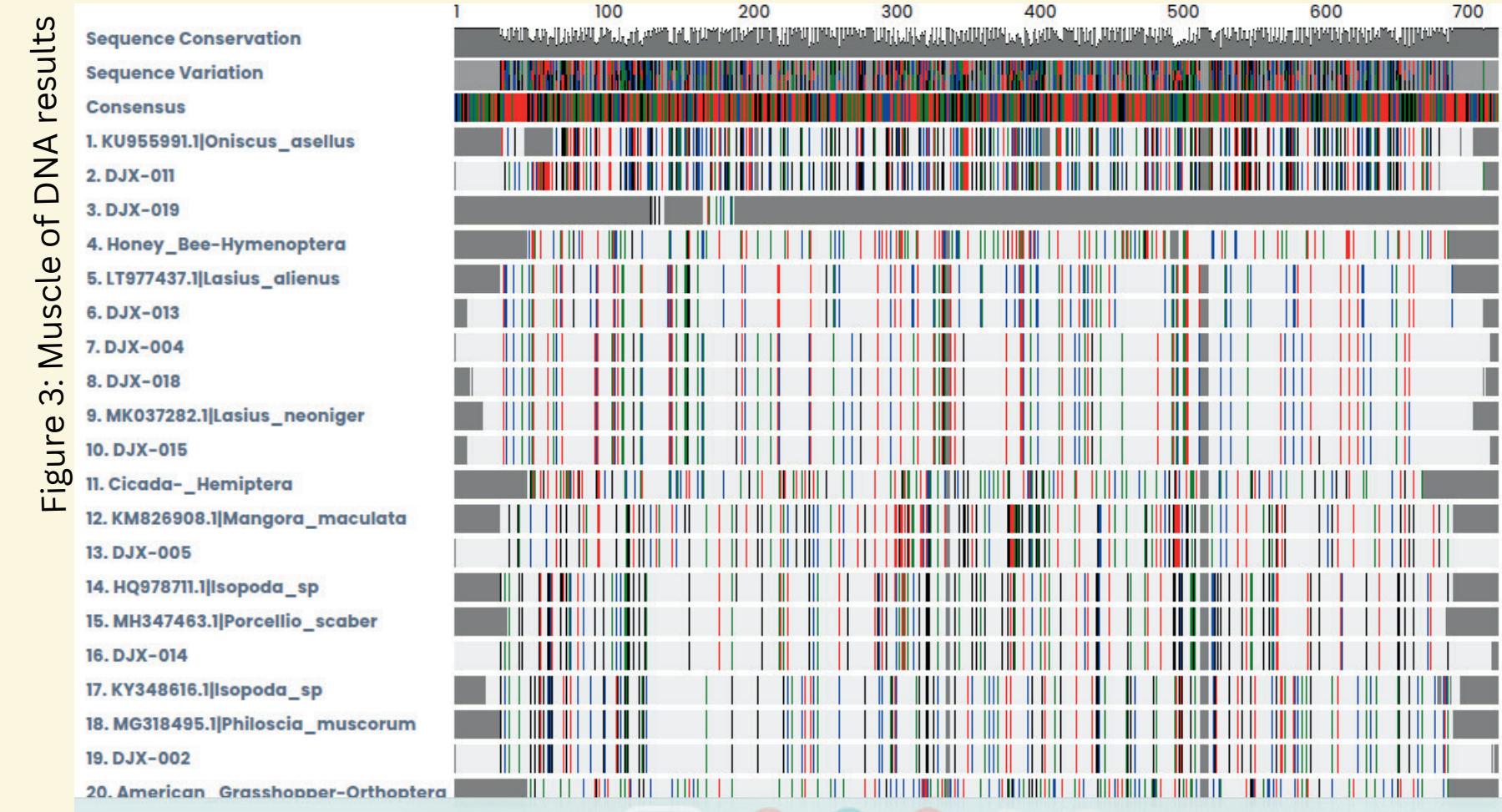


Figure 3: Muscle of DNA results

Figure 4: Phylogenetic Tree



## Discussion

We found that there was greater amount of biodiversity at the Twin Lakes than the Suburban Creek in Wantagh. Given these findings, we believe the differing biodiversity between these areas because of the differing vegetation and moisture levels. Near the Twin lakes, a lot of the invertebrates we found preferred wetter environments and were different from the dry environment invertebrates near the creek. Depending if the invertebrates were niche generalists or specialists they were able to live in certain areas. Additionally, other species in the area and symbiosis can have an affect on where insects live (Cornwallis et al, 2023). This means that our hypothesis was correct. Our muscles shows similarity between our results. Many of the invertebrates had very similar DNA sequences. They also matched to other known invertebrates. DJX-019 didn't match very well because there wasn't enough DNA. Our phylogenetic tree shows that the invertebrates are closely related and connected. Although we had findings of more biodiversity in the Twin Lakes area these results may be skewed due to limitations such as time, materials, and failed collection of some DNA. We spent more time at the Twin Lakes and we had trouble lining up our schedules for invertebrate collection. Lastly, some of our invertebrates couldn't be sequenced. In the future we should collect more bugs to try to prevent such issues. We could also go further into these two areas to see how species can differ in those deeper areas. We could also regulate how much time we spend at each area to ensure that no results are skewed.

## References

Anthony, M. A., Bender, S. F., & van der Heijden, M. G. (n.d.). Enumerating SoilBiodiversity. PNAS. <https://www.pnas.org/doi/10.1073/pnas.2304663120>  
Cornwallis, C. K., van 't Padje, A., Ellers, J., Klein, M., Jackson, R., Kiers, E. T., West, S. A., & Henry, L. M. (2023, May 18). Symbioses shape feeding niches and diversification across insects. Nature News. <https://www.nature.com/articles/s41559-023-02058-0>  
Science Learning Hub. (2009, June 24). The ideal barcoding gene — Science Learning Hub. Science Learning Hub. Retrieved September 22, 2025, from <https://www.sciencelearn.org.nz/resources/1937-the-ideal-barcoding-gene>  
Twin lakes preserve. (n.d.). Hempstead Town, NY. Retrieved October 21, 2025, from <https://hemsteadny.gov/facilities/facility/details/Twin-Lakes-Preserve-113>  
US EPA, O. (2022, October 18). Climate change impacts on freshwater resources [Overviews and Factsheets]. <https://www.epa.gov/climateimpacts/climate-change-impacts-freshwater-resources>  
Cepic, M., Bechtold, U., & Wilfing, H. (2022). Modelling human influences on biodiversity at a global scale—A human ecology perspective. Ecological Modelling, 465, 109854. <https://doi.org/10.1016/j.ecolmodel.2021.109854>

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