What kind of biodiversity swims at Great Hollow?

NRCA Student: Lucie Tuthill[1]
Community Partners: Megan Upp[2] & Dr. Jason Vokoun[2]
[1]New Fairfield High School; [2]University of Connecticut

Introduction

Great Hollow is located on the New York State border in southwestern Connecticut. The 825-acre preserve was officially established in 2016, but served as a YMCA campsite for many years prior. To date, there has not been a study of stream quality or fish biodiversity at Great Hollow. Biodiversity is crucial to study because it gives insight into the productivity of an ecosystem. Studying fish populations can help us determine stream health and species richness, which can be compared to other waterways.

In this project, we sought to gain an understanding of fish species occurrence, and how they compare to overall fish populations in Connecticut.

Objectives

In order to inventory the species of fish inhabiting the brooks of Great Hollow, this project investigated:

1. What do certain biometrics indicate about overall stream quality?
2. How does fish diversity correspond with stream quality?

Table 1. Fish species identified at Great Hollow

Scientific Name	Common Name
Rhinichthys atratulus	Blacknose dace
Rhinichthys cataractae	Longnose dace
Luxilus cornutus	Common shiner
Etheostoma olmstedi	Tessellated darter
Semotilus atromaculatus	Creek chub
Catostomus commersonii	White sucker
Salvelinus fontinalis	Brook trout
Lepomis gibbosus	Pumpkinseed
Micropterus salmoides	Largemouth bass
Esox americanus	Redfin pickerel
Ameiurus melas	Black bullhead

Figure 1: A. Lucie wading in stream; B. The electrofishing backpack in action; C. Brook trout stunned in Quaker Brook.

Method and Materials

Sampling Protocol

➢ On October 28 and November 11, 2018, an electrofishing backpack was used to sample fish species at Great Hollow Nature Preserve and Ecological Research Center in New Fairfield, CT.
➢ Two streams were sampled: Headwater Stream and Quaker Brook
   ❖ One replicate of 41 meters for Headwater Stream
   ❖ Three replicates of 50 meters were assessed in Quaker Brook and designated 'Upper, Middle, or Lower' with respect to stream location.
➢ Identification and abundance of all sampled fish species were recorded at each replicate.
➢ Walking against the current with the backpack, areas with high likeliness of fish, such as banks and fallen logs, were scanned.
➢ After stunning and collecting the fish in a bucket, species and length measurements were recorded.

Data Analysis

➢ Biodiversity data from both streams were used to compare stream quality at Great Hollow to other Connecticut streams using established Multi-Metric Indices (MMIs), as outlined in Kannoe et al. (2010) (1).
➢ Headwater stream was analyzed as a cold-water stream, and Quaker Brook was a mixed water stream.
➢ The indices used in analysis are outlined in Tables 2 and 3.
➢ The total MMI score for both streams were calculated by averaging the individual metric scores.

MMI Results

Table 2. Quaker Brook individual metric scores.

Metric	Upper	Middle	Lower
% White Sucker	91.865	80.475	93.097
% Cyprinidae	95.279	82.292	90.533
% Fluvial-specialist individuals	33.120	4.416	28.101
% Non-tolerant general feeder individuals	41.529	83.057	23.491
%Native warm water individuals	100	100	100
% Intolerant Individuals	18.748	7.499	15.907
# Fluvial specialists	50	25	75

Table 3. Headwater Stream individual metric scores.

Metric	Values
# BKT per 100 m^2	29.515
% Fluvial dependent	0
# Warm water spp.	100
% warm water individuals	100
% BKT individuals	43.953

Other Results

➢ 11 species of fish were identified at Great Hollow (Table 1)
➢ Quaker Brook MMI: 59.0194 (Table 2, Fig 2)
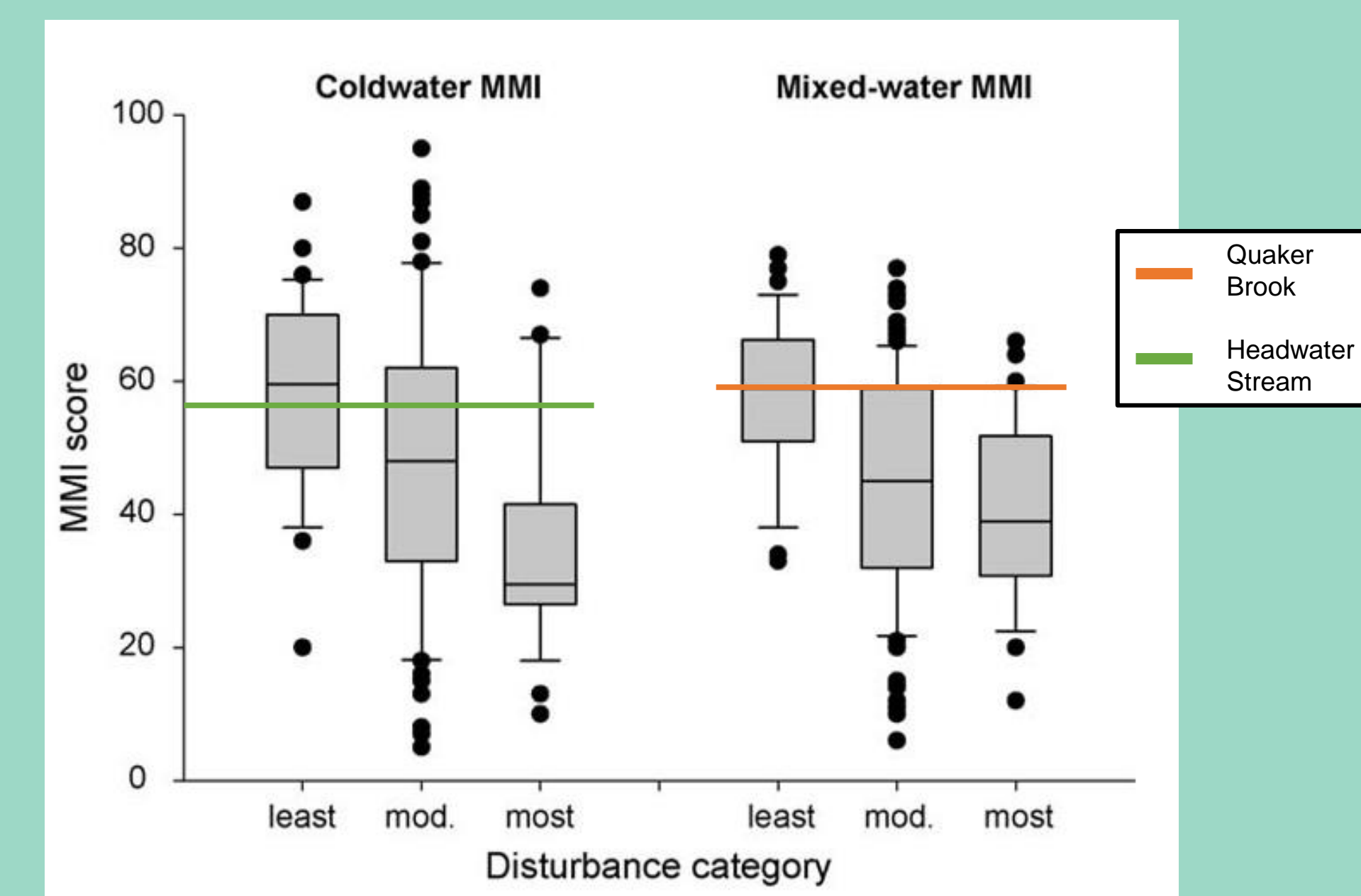➢ Headwater Stream MMI: 54.6935 (Table 3, Fig 2)

Figure 2. Adapted from Kannoe et al. 2010, the MMI scores of Quaker Brook and Headwater Stream are compared to other coldwater and mixed-water streams in Connecticut

Figure 3. Field photos from sampling at Great Hollow.

Interpretation & Conclusions

➢ The MMI scores of the tested streams were slightly above average, in comparison to other MMI scores of CT streams with the same classifications (1).
➢ In addition to biodiversity, other multi-metric indicies such as tolerance, stream flow preference, and abundance play major roles in determining overall stream quality.
➢ This study offers a baseline of quality for Great Hollow streams.
➢ Repeated studies could be conducted in the future to assess fish assemblage changes, and ultimately monitor any stream quality changes.

References

1. Kanno, Y., Vokoun, J.C., Beauchene, M., 2010. Development of dual fish multi-metric indices of biological condition for streams with characteristic thermal gradients and low species richness. Ecol. Ind. 10 (3), 565–571.

Acknowledgements

Check out this news article written about the project!
https://goo.gl/3KexhS