The Nature of Our Lake

What did we learn from research projects in 2014?





Welcome to the Muller Field Station



Bruce Gilman, Director



Muller Mission: Foster education and research that promotes understanding and appreciation of environmental issues and the unique natural resources of the Finger Lakes region.

Priority Audiences:

FLCC college students K-12 students Neighboring college and universities students The general public through events and lectures: "Speaking of Nature" series

Visit our webpage (<u>www.flcc.edu/muller</u>) for more information!

THE NATURE OF SOUND SCIENCE

(a disciplined approach to understanding how the natural world works)

- We make observations
- We develop an hypothesis
- We design experiments
- We collect data
- We formulate explanations consistent with the data
- We strengthen our understanding of natural concepts

Our work informs and assists lake and watershed natural resource managers and regulatory agencies.

2014 RESEARCH PROJECTS

- Zebra mussel population studies
- Tributary stream sampling
- Long-term monitoring of submerged vegetation
 - Shifts in composition
 - Changes in biomass
 - Detection of any new invasive species

Acknowledgements: FLCC faculty and students, Ontario County aquatic vegetation management personnel, Nature Conservancy LEAF interns







WHAT'S HAPPENING TO ZEBRA MUSSELS (Dreissena polymorpha) IN HONEOYE LAKE?

In summer 2014, the zebra mussel population in Honeoye Lake was sampled at the previous twelve locations. Samples were processed by tallying and weighing the mussels. Despite the variability created by the clumped benthic distribution patterns exhibited by their colonies (TABLE 1), mean mussel density declined by about 27% $(\text{from } 1647/\text{m}^2 \text{ in } 2002 \text{ to } 1199/\text{m}^2 \text{ in } 2014) \text{ and mean}$ total mussel biomass declined by about 35% (from 292 g/m^2 in 2002 to 188 g/m^2 in 2014). Indeed the perception of the public was correct. And about the other benthic invasive species, both good news and bad news – no quagga mussels or Asian clams were found in the dredge samples but four European fingernail clams (Sphaerium *corneum*) were collected on gravelly substrates along the eastern shore of Honeoye Lake.



Sandy Bottom	<u>density</u>	<u>biomass (g)</u>
nearshore	-323	-205
midshore	+4651	+217
offshore	-357	-52
Trident Marine		
nearshore	-1459	-323
midshore	+467	+155
offshore	+175	+116
California Point		
nearshore	+68	-50
midshore	-1392	-360
offshore	-1742	-86
Forest View		
nearshore	-710	-309
midshore	-158	+97
offshore	-4592	-444

TABLE 1 – Net change in zebra mussel population parameters (per m²) from 2002 to 2014.



TRIBUTARY STREAM SAMPLING IN THE WATERSHED

Monitoring for temperature, dissolved oxygen, conductivity, and pH Sample collecting for suspended solids, total phosphorus and nitrate/nitrate

Bray Gully Briggs Gully Honeoye Inlet Cratsley Hill Stream Affolter Gully

Funded by Ontario County Water Resources Council

LONG-TERM MONITORING OF SUBMERGED VEGETATION

Replicating studies completed in 1984, 1994 and 2004 by Finger Lakes Community College under the direction of Dr. Bruce Gilman







Depth zone where macrophyte harvesting has occurred in 1994, 2004 and 2014

ADDITIONAL 2014 SUBMERGED VEGETATION RESULTS

- Maximum depth of vegetation = 372 cm (12.2 ft)
 - 1984 = 14.1 ft, 1994 = 18.7 ft, 2004 = 17.6 ft
- Mean vegetation density = 137 g/m²
 - 1984 = 167 g/m², 1994 = 109 g/m², 2004 = 163 g/m²
- Estimate of total fall standing crop biomass in the lake = 412067 kg (908443 lbs or 454 tons)
 - 1984 = 527359 kg, 1994 = 333443 kg, 2004 = 463720 kg

CHANGES IN THE SUBMERGED VEGETATION COMMUNITY

- Shifts in plant frequency of occurrence
- Shifts in fall standing crop biomass
- Shifts in importance value, calculated as the mean of relative frequency (occurrence) and relative dominance (fall standing crop biomass)

Most common members of the submerged vegetation

Eelgrass (native plant)



Coontail (native plant)



Water stargrass (native plant)



Large-leaf pondweed (native plant)



Elodea (native plant)



Eurasian water milfoil (introduced plant)









- Number of plant species (community richness) is remarkably stable
- Variable plant composition from year to year
- Declining importance value for invasive aquatic plant species

Future Research Projects

- Tributary stream monitoring (continued)
- Hemlock woolly adelgid
- Emerald ash borer
- Mercury levels in fish
- Collaboration with Cornell University
 - "Effect of climate change on thermal stratification, and its relationship to nutrient dynamics and cyanobacteria"



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Terry Gronwall, Chairman Honeoye Lake Watershed Task Force

State of the Art Lake Mapping

- Contour Innovations internet lake mapping service
 - Aquatic vegetation, bottom hardness, bathymetric maps
 - Requires a Lowrance HDS GPS/Depth Finder
- Received 2014 Ontario County WRC Grant for \$1,525
- ~60 hours of data collection and processing time
- Primary objective was to provide our mechanical harvesting crew with information on aquatic vegetation growth patterns to increase their efficiency

Aquatic Vegetation Map



- Color code
 - Red near water surface
 - Yellow 50% water column
 - Blue o% water column
- Produced three maps
 - June, July, & August
- Effort
 - ~30 hours
- Weed line
 - Discovered weed line had moved from ~16' to ~12'
- Electronic mapping results were verified by Bruce Gilman as part of his 10 year macrophyte survey

2015 Aquatic Vegetation Map July 2, 2015 July 1, 2015





Whole Lake Mapping



- Collected data along East/West transects
- 200' between transects
- ~30 hours of effort

Honeoye Lake Bathymetric Maps





Honeoye Lake Bottom Hardness



- Color code
 - Dark Brown Hard
 - Light Brown Medium
 - Grey Soft

Water Quality Data CollectionSecchi DiskSecchi Disk under Water



Water Quality Data Collection

YSI DO/Temperature Meter

Van Dorn Bottle



Water Quality Data Collection

Water Sample Collection

Temperature & D.O. Profiles



2014 Water Quality Data







Historic Water Quality Data Trends (mid-lake at site D)







Surface Water Temperature Trends

Surface Water Temperature Average June-Aug (°C)



Tot Precipitation (inches) June-August



Chlorophyll-*a* (µg/L) Algae Average June-Aug



Secchi Disk (m) Water Clarity Average June-Aug



Honeoye Lake Blue-Green Algae Monitoring



- Started July 2013 at the request of NYSDEC
- 2014 Weekly June through mid October
- BGA observations and test results posted on NYSDEC BGA web site every Friday
- Very positive feedback from recreational lake users
- BGA = Blue-Green Algae



Rapidly Changing BGA Conditions







Our Southwest Shores sampling location

What a Difference a Year Makes!June 27th, 2014June 25th, 2015



Our BGA Monitoring Process

- Weekly Monday Morning BGA Monitoring
 - June through mid October
 - Have 10 regular sites that we monitor
 - Take pictures at each of these sites weekly
 - Take open water blue-green algae sample weekly
 - Take two near shore blue-green algae samples weekly
 - Send blue-green algae samples to SUNY ESF for testing
 - Send DEC two e-mail reports with pictures weekly

• Weekly Friday visual only blue-green algae monitoring

BGA Monitoring Effort

- Honeoye Lake has ~10 miles of shoreline
- One hour to make a complete surveillance run and collect 3 blue-green algae samples (2 volunteer hours)
- Write our weekly e-mail with pictures (0.5 volunteer hours)
- Soil & Water staff person time to collect samples, prepare forms, and ship samples (2-3 Soil & Water staff hours)

BGA Testing Results

6/2-7/6 2015

- 58 samples were collected and tested in 2014
 - 18 open water
 - 14 NE near shore
 - 15 SW near shore
 - 11 other locations
- Testing Results

•	# of Wks	BGA Bloom	High Toxin
2013	10	9	6
2014	18	4	0
2015	6	Ο	0

2015 Plans

- Lake Mapping
 - Received a 2015 Ontario County WRC Grant
 - Provide three Aquatic Vegetation Maps for our Mechanical Harvesting Program
 - Collect additional Bathymetric map data
- Continue to collect water quality data
 - To further our knowledge about the nature of our lake
 - To support future water quality grant proposals
- Continue our BGA monitoring program
 - Weekly monitoring and test results
 - Perform scientific BGA experiments as requested by NYSDEC and SUNY ESF

Honeoye Watershed Task Force Project Update

Yard Waste proper disposal initiative Spring and Fall

- Low participation rate last Spring
- Fall dates: September 6th and November 7th & 14th
- Richmond and Canadice Brush Pits

• WQIP Grant Project Awarded & NYS Contract Issued for \$ 135,000

- Project work will start later this summer
- Stream bank stabilization in road right a ways, 3 sediment basis with debris guards, 1 one acre storm water detention pond, and several vernal pools

• DEC Honeoye Lake Total Maximum Daily Load (TMDL) analysis project

• TMDL process will model the various external and internal nutrient sources that contribute to our lake's water quality issues, set target nutrient levels for each controllable nutrient source, and our future grant proposals to address the actions recommended in the DEC TMDL Final Report will receive a higher priority for funding

Honeoye Watershed Task Force Project Update



Honeoye Lake Inlet Restoration Project, southern Honeoye Valley

- Worked with The Nature Conservancy, US Fish and Wildlife, and Ontario County Soil and Water Conservation District to develop detailed design
- Met with DEC Region 8 management in late June to get their feedback on the design and permitting requirements
- Currently preparing a WQIP Grant proposal for ~\$300,000 to fund the implementation project
- WQIP Grant will require ~\$50,000 of local in-kind and cash match
- Plan to identify additional grant opportunities later this year

Thanks!

Questions?







