# Effects of Grass Carp: 25 Years of Lake Mahopac Data

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# Lake Mahopac: An Overview

Location: Mahopac NY (Putnam County)

Size: 586 acres; shoreline circumference: 3.8 miles

Max Depth: 20 meters; Average Depth: 8.5 meters

Trophic Status: mesotrophic (moderate productivity)

Land use: residential and commercial (septic and sewer systems)

Recreation: boating, swimming, fishing

Lake Management Issue: Eurasian milfoil

Plant Management: Triploid Grass Carp

# Why Triploid Grass Carp?

Prior to the stocking of grass carp, the Town of Carmel used a weed harvester to remove plants from the lake. There were 3 drawbacks:

- ► It was expensive
- It was labor intensive
- It was effective in the short-term, but not in the long-term

Triploid Grass Carp was viewed as a management strategy that would address all 3 of these issues.



# How Many Grass Carp?

# of Grass Carp
2564
200
1500
700
200

### Monitoring Lake Mahopac for 25+ Years

#### ► Who?

- Northeast Biologists (John Grimm); 1993 1997
- Aquatic Ecosystems Consulting (Alissa Perrone); 1998
  present
- What?
  - Vegetation Surveys
    - Plant Identification and Biomass (1995 to present)
    - Percent coverage (2017 to present)
  - Water Quality
    - Temperature and Oxygen Profile
    - Water Clarity (Secchi Disk)
    - Conductivity, pH
    - Chl a (measure of algal biomass)
    - Nutrients (N & P)

## Sampling Protocol - Vegetation Surveys

### **Biomass Study**

- Annually (August)
- ► 5 Sites
- ► 3 depths
  - ► Shallow (≈2 ft)
  - ► Mid (≈7.5 ft)
  - ► Deep (≈15 ft)
- ► m<sup>2</sup> quadrats
- Wet weight (g) by species



# Biomass Study -Sampling Sites



Southern Cove

Sou

#### Southeastern Cove

# Biomass Study -Sampling Sites





### Aquatic Plant Community

#### Dominant plant species:

- *Myriophyllum spicatum* (Eurasian Milfoil)
- *Najas flexilis (*water nymph*)*
- Lyngbya sp. (blue-green filamentous alga)



#### Other plant species:

- Vallisneria americana (water celery)
- Elodea canadensis
- Potomogeton perfoliatus (clasping-leaf pondweed)
- Ceratophyllum demersum (coontail)



### Effect of Carp on Aquatic Plant Biomass



### Effect of Carp on Plant Community: Submerged Plants vs Benthic Filamentous Algae



### Effect of Carp on Submerged Aquatic Plant Community



# Sampling Protocol - Vegetation Surveys

### **Visual Inspection**

- Annually (August)
- Target species = Eurasian milfoil
- 16 sites visually inspected
- Assigned a percent coverage/area/site
- Total vegetated acreage was calculated relative to the area of all the sites combined.



Change in Eurasian Milfoil Coverage Post restocking of Triploid Grass Carp

Approx. 55% less area covered by Eurasian milfoil across our survey sites

2017	2021
<ul><li>77%</li><li>203 acres</li></ul>	• 35% • 90 acres

Total Inspected Area = 262 acres

## Effect of Carp on Water Clarity



1986-1993			
Average	Min	Max	
3.1	1.63	4.6	
	1994-2014		
Average	Min	Max	
3.1	1.75	4.8	
*2015-2021			
Average	Min	Max	
4.2	3.25	5.75	
* Zebra Mussels first observed in 2015			

# Effect of Carp on Oxygen Levels



### What we have learned?

- Triploid Grass Carp (TGC) are effective at controlling *Eurasian milfoil* in Lake Mahopac.
  - From 1997 through 2012, submerged aquatic plants were absent from all sampling sites.
- TGC consumed all submerged aquatic plants after initial stocking in 1994.
  - Possible evidence of TGC preference for Najas flexilis (phased restocking after 2015)
- In the absence of submerged aquatic plants, benthic filamentous algae became dominant.
  - Lyngbya sp. (blue-green filametnous alga) was measured at all 5 sites; abundance greatest at the southern sites.
- TGC did not have an effect on water clarity and oxygen levels (deep water site).
  - Although not mentioned in this presentation, the abundance (Chl a) and species composition of algae was similar through the years.

# Questions?