An Overview of Herbivory to Limit the Growth of *Myriophyllum spicatum* (Eurasian watermilfoil) in Three NYS Lakes

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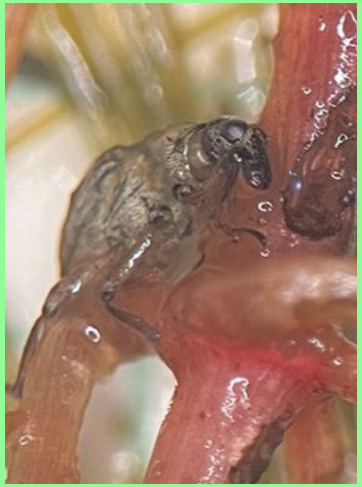
NYS Lakes Herbivore Surveys

- Bear Lake 2010 - 2024
- Lake Bonaparte 2009 - 2024
- Chautauqua Lake 2002 - 2024

Five biological control agents for Eurasian watermilfoil (EWM)

- *Euhrychiopsis lecontei* (weevil)
- *Acentria ephemerella* (moth)
- *Cricotopus myriophylli* (midge)
- *Nectopsyche albida* (Walker or Ghost caddis)
- *Setodes grandis*, *Leptocerus americanus*, or *Setodes americana* (small caddis)



Herbivore Survey Methods

- Collect 25 Eurasian watermilfoil (EWM) apical stems at each location using a double-headed rake
- Each stem is examined using a dissecting microscope
- Examiner records all insect activity found
- Analyze data using Excel

Bear Lake 2024

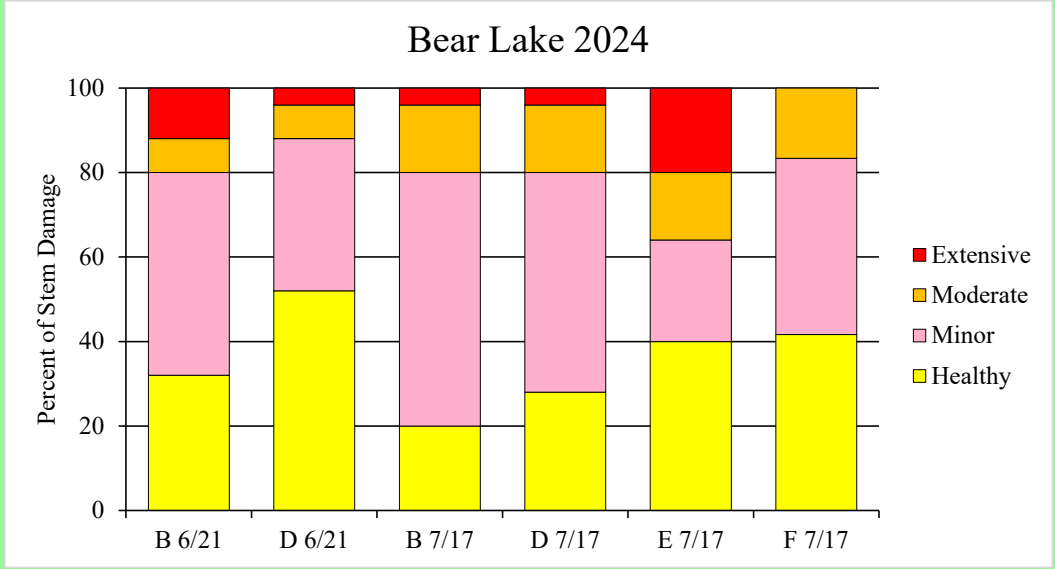
- Two sampling events on June 21 and July 17, 2024
- No EWM found at Locations A or C
  - *Potamogeton robbinsii* (Robin's pondweed) has taken its place
- Added Locations E and F on July 17
- 42 weevils found lake-wide
- Location E had the highest number of 0.72 weevils per apical stem
- Overall lower weevil density compared to earlier values
  - Lack of healthy EWM

Bear Lake Herbivores

- *Acentria ephemerella* (moth)
  - Two found lake-wide
- No *Nectopsyche albida* (Walker or Ghost caddis)
- *Setodes grandis* (small caddisfly)
  - Six found lake-wide
- Nineteen damaging midges
  - None were the *Cricotopus myriophylli*
  - Possibly two new species
  - Need more research to determine each species

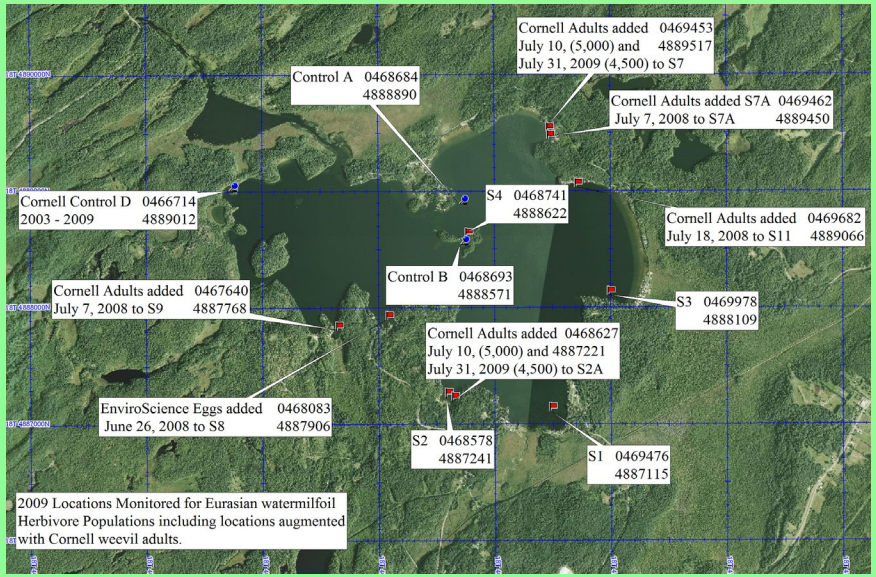
Stem Damage

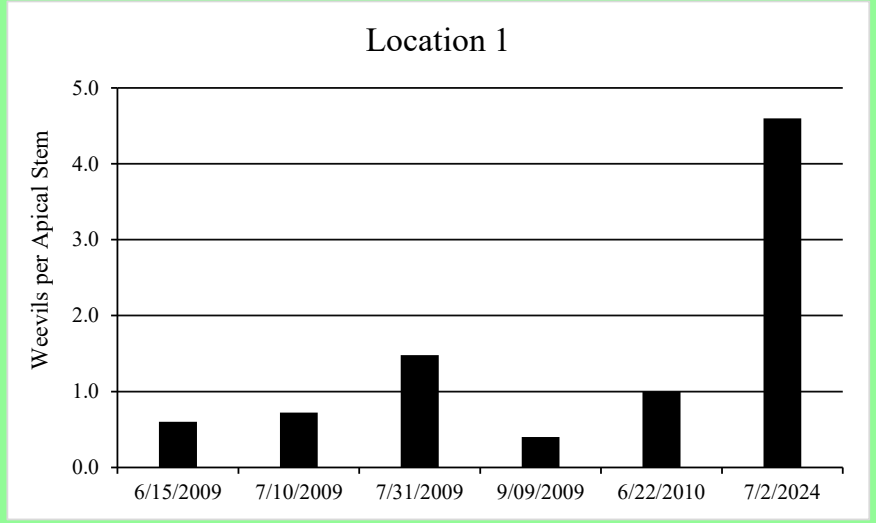
- Count all scars, pupal chambers, and weevil mining on the stem
- Classify stem into healthy, minor, moderate, or extensive damage
- 64.39% damaged stems
- 20.78% of all samples had moderate or extensive ratings
- Location E had the most extensive percentage of stems at 20%
- Helps predict year-to-year changes



Lake Bonaparte 2024

- Sampled on July 2, 2024
- 103 weevils found lake-wide
- Highest numbers at location 1 with 4.60 weevils per apical stem
- Generally seeing a decrease in weevils compared to earlier years
- Less Eurasian watermilfoil lake-wide
  - No samples at location 2
  - Trace amount at locations 1, 3, 4, 7, 11, and B



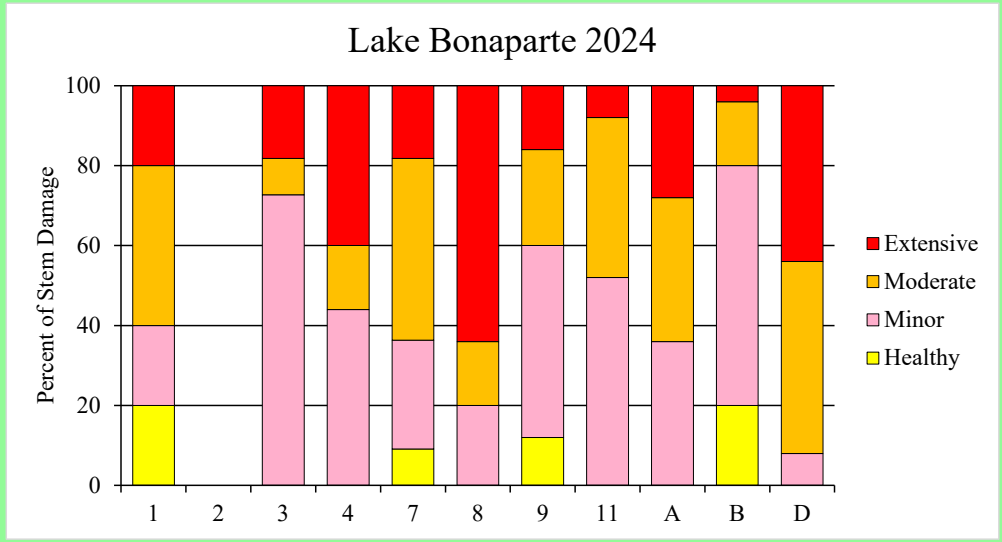


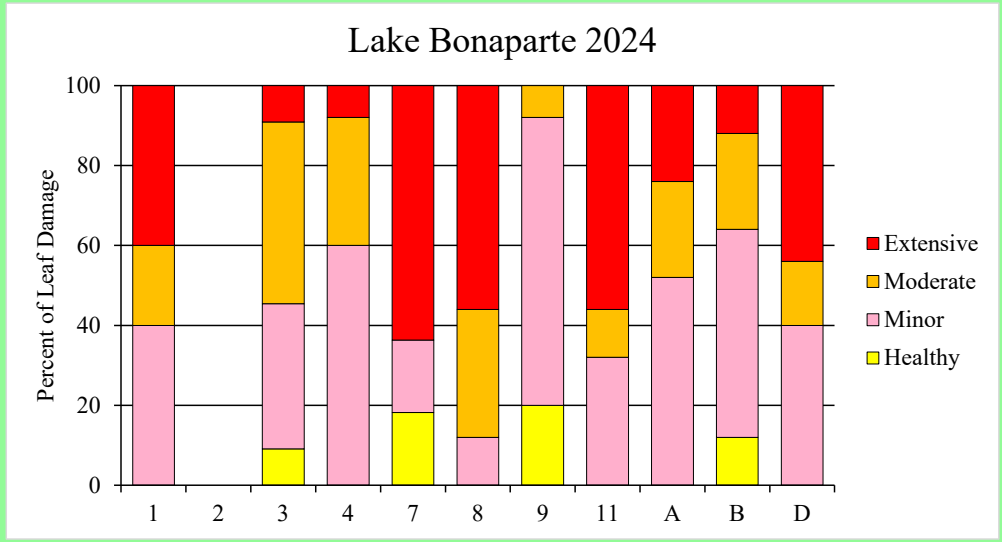
Lake Bonaparte Herbivores

- *Acentria ephemerella* (moth)
  - Six found lake-wide
- 104 damaging midges
  - *Cricotopus myriophylli* and possibly two new species
  - Location 7 had the highest numbers at 2.64 midges per apical stem
- *Nectopsyche albida* (Walker or Ghost caddis)
  - Six found lake-wide
- *Setodes grandis* (small caddisfly)
  - One found lake-wide

Stem and Leaf Damage

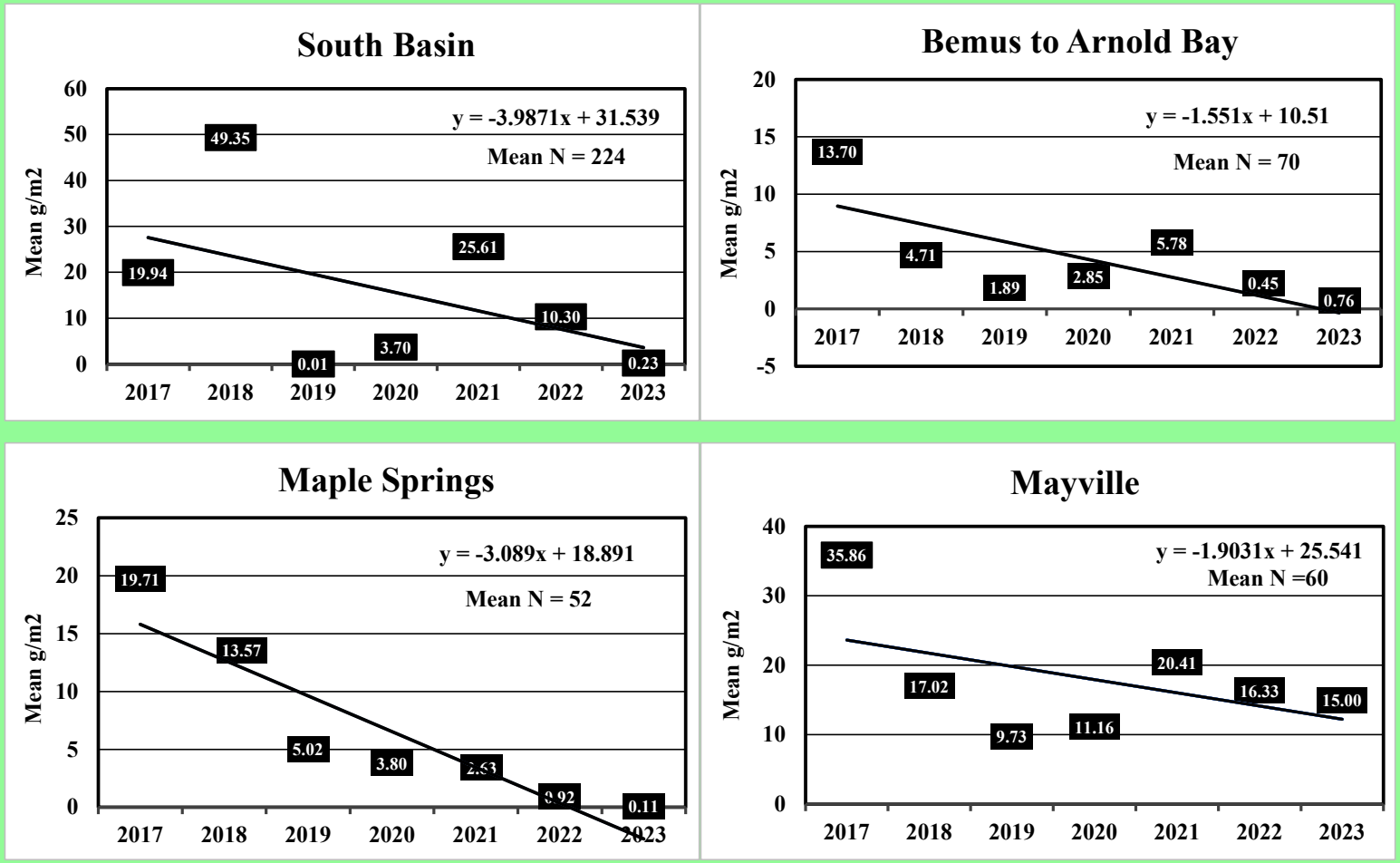
- Stem damage
  - 93.89% damaged stems
  - 55.09% of all samples had moderate or extensive ratings
  - Location 8 had the highest extensive stem damage at 64.00%
- Leaf damage
  - Count all retreats, cocoons, and leaf mining
  - 94.07% damaged leaflets
  - 52.62% of all samples had moderate or extensive ratings
  - Location 7 had the highest extensive leaf damage at 63.64%





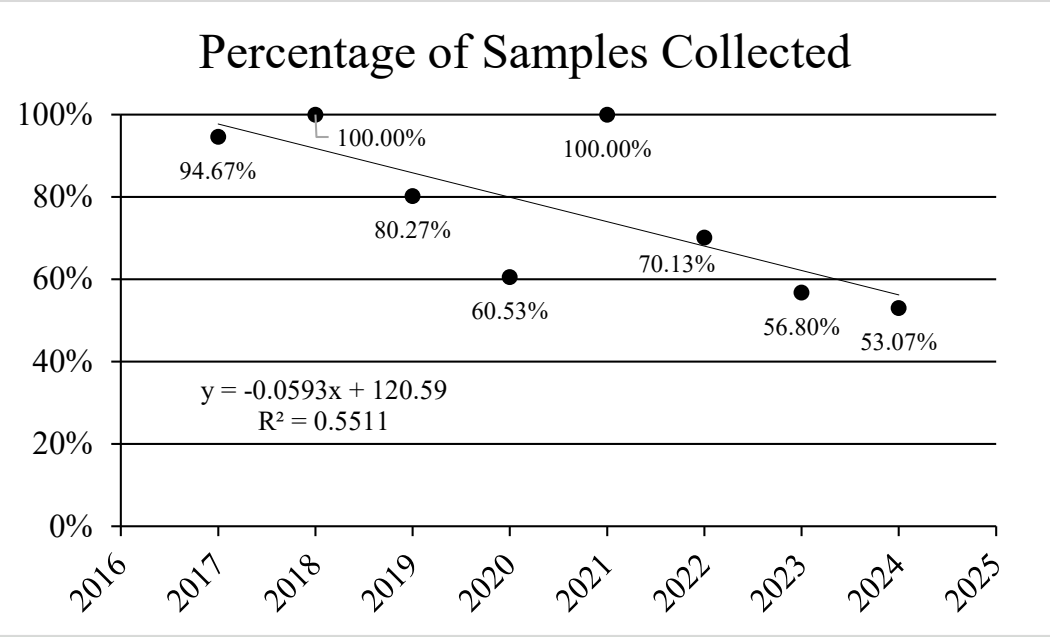
Chautauqua Lake

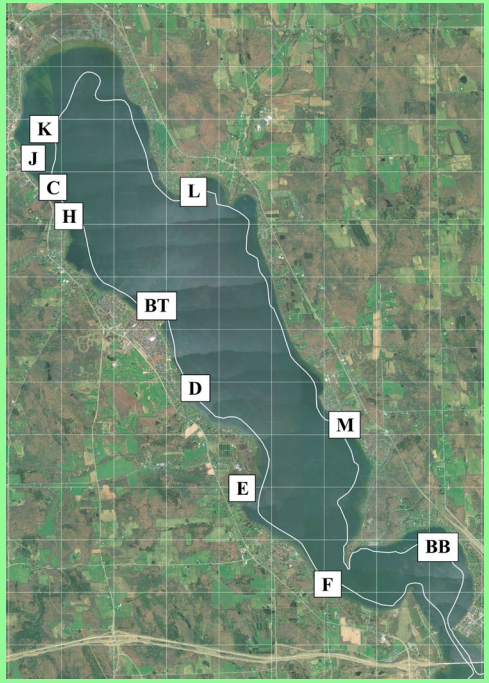
- Macrophyte (plant) and herbivore surveys yearly since 2002
- From 2017 – 2023, the plant surveys show that there has been a decrease in biomass (g/m^2) for EWM lake-wide
- Due to recent herbicide use and ongoing herbivore activity

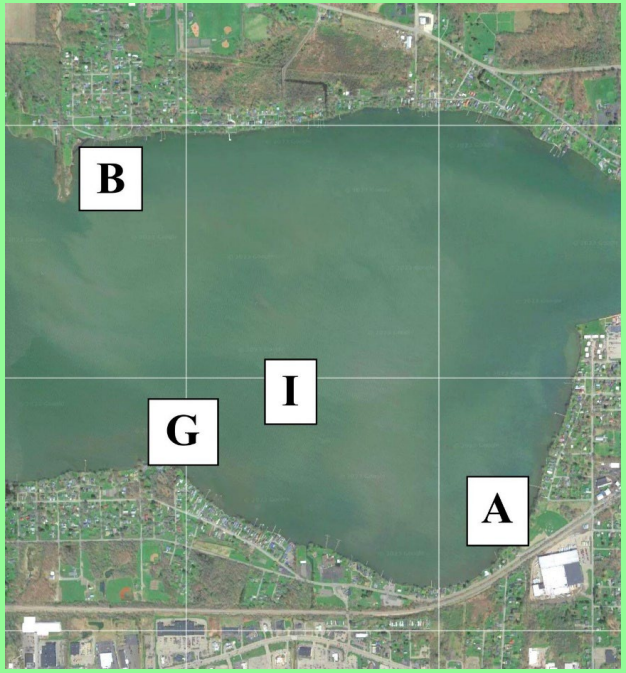


Chautauqua Lake 2024 Results

- Since 2017, there has been a decrease in the percentage of EWM samples collected
- On July 16, 2024, collected only 199 out of a possible 375 EWM tips – 53.07%
- No samples were collected at D (Chautauqua) and G (Lakewood)
- Collected all 25 samples at only five locations: F (Woodlawn), I (Burtis Bay), K (Mayville), BT (Bell Tower), and BB (Bemus Bay)

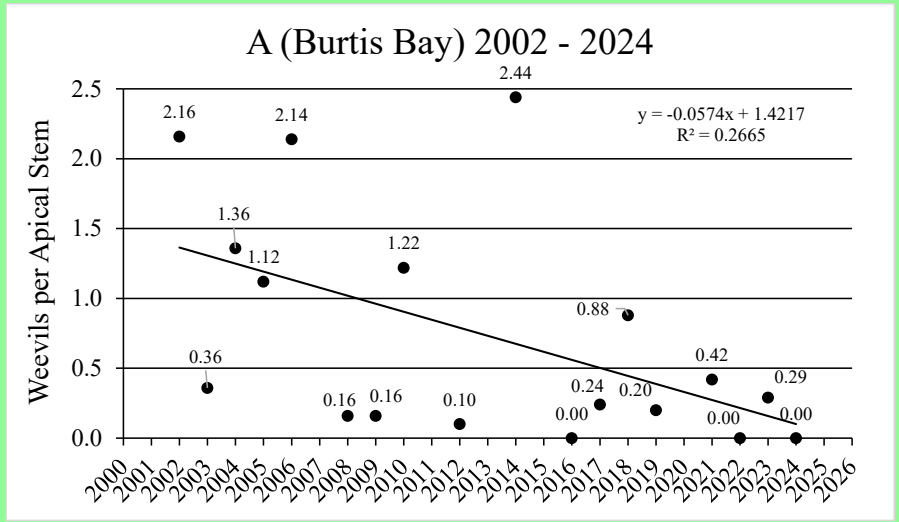


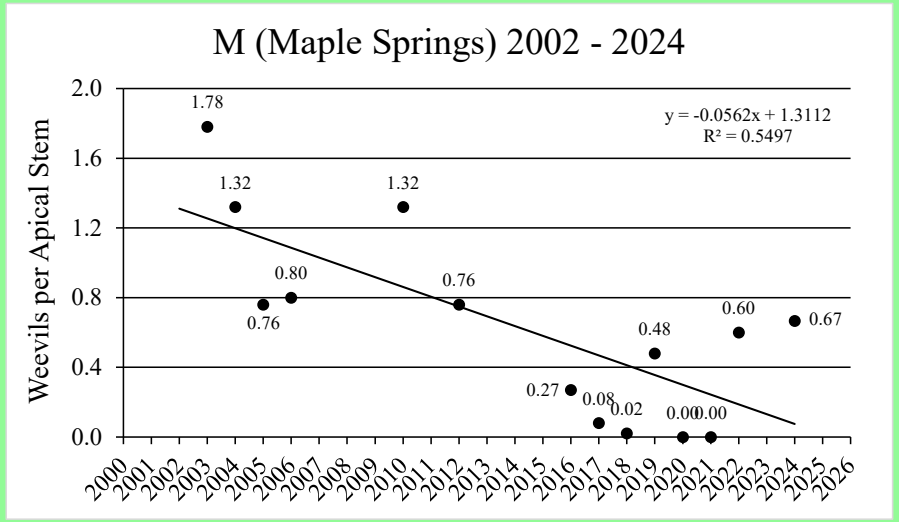




Chautauqua Lake 2024 Results

- Overall, there is a decrease in the number of weevils and both caddisflies lake-wide
- 49 weevils found lake-wide
  - Location E (Whitney Bay) had the highest numbers at 1.09 weevils per apical stem
- No *Nectopsyche albida* (Walker or Ghost caddis) since 2022
- *Setodes grandis* (small caddisfly)
  - 51 compared to 2,983 in 2021





Contributing Factors

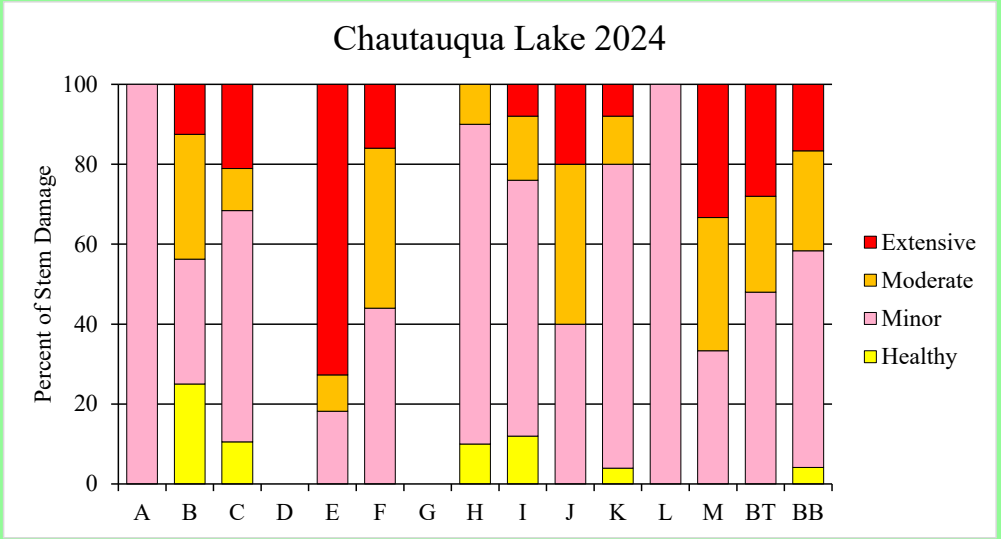
- Fewer EWM stems per location
- Increase herbivore competition and lower food quality
- Mechanical harvesting
- Herbicide use since 2017
  - Locations A, B, G, I, and BB
- Dense algal blooms, mainly south of Long Point

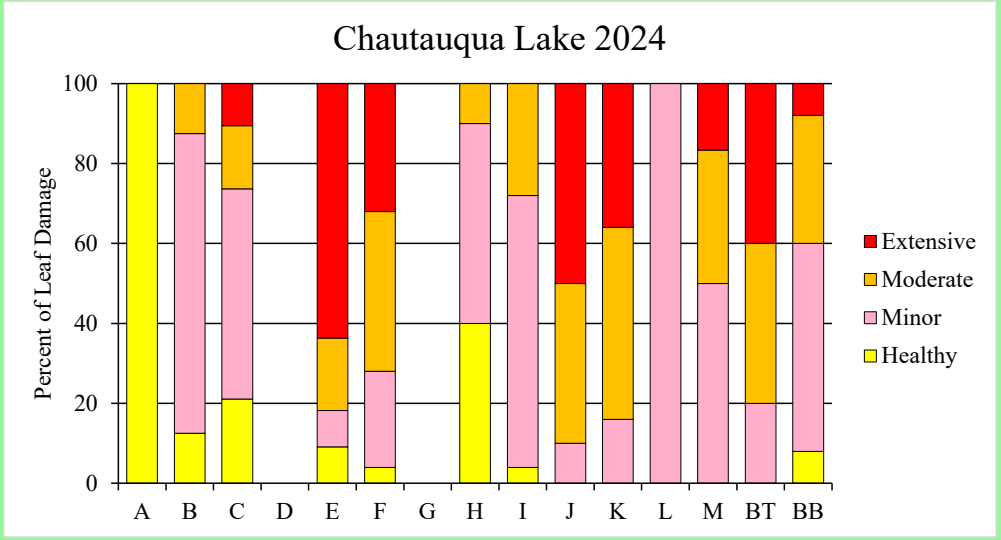
Chautauqua Lake Herbivores

- *Acentria ephemerella* (moth)
  - 51 found lake-wide
  - Location E (Whitney Bay) had the highest numbers at 1.64 moths per apical stem
- 44 damaging midges
  - *Cricotopus myriophylli* and possibly two new species
  - Location BT (Bell Tower) had the highest numbers at 1.32 midges per apical stem

Stem and Leaf Damage

- Stem damage
  - 94.95% damaged stems
  - 37.50% of all samples had moderate or extensive ratings
  - Location E had the highest extensive stem damage at 72.73%
- Leaf damage
  - 84.72% damaged leaflets
  - 44.21% of all samples had moderate or extensive ratings
  - Location E had the highest extensive leaf damage at 63.64%





Correlation Between Herbivores and Damage

- As the number of herbivores increases, the percentage of stem and leaflet damage also increases
- Bear Lake
  - New Location E had the highest number of weevils, and the percentage of stem damage
- Lake Bonaparte
  - Location 7 had the highest number of damaging midges, and the percentage of leaflet damage
- Chautauqua Lake
  - Location E (Whitney Bay) had the highest number of weevils and moths, and the percentage of stem and leaflet damage

In conclusion

- These herbivores are the best biological control agents with a history of managing Eurasian watermilfoil long-term
  - All three lakes have areas where EWM is either gone or in Trace quantities
- Alternative to using harmful materials
- Promotes the growth of Native species, especially the weevil that is host-specific to milfoils
- Unfortunately, herbivores are not available to the public for introduction to lakes or ponds with EWM

Thank you!

- Chautauqua Lake Association, Inc.
- Lake Bonaparte Conservation Club
- Bear Lake Association, Inc.
- Robert Johnson
- SUNY Oneonta
- All volunteers
- NYSFOLA

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