

Starry Stonewort (*Nitellopsis obtusa*): Research Efforts Towards an Integrated Management Plan



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MISGP 2014 Integrated Invasive Aquatic Plant Management: Evaluating, Refining and Expanding the Management Toolbox



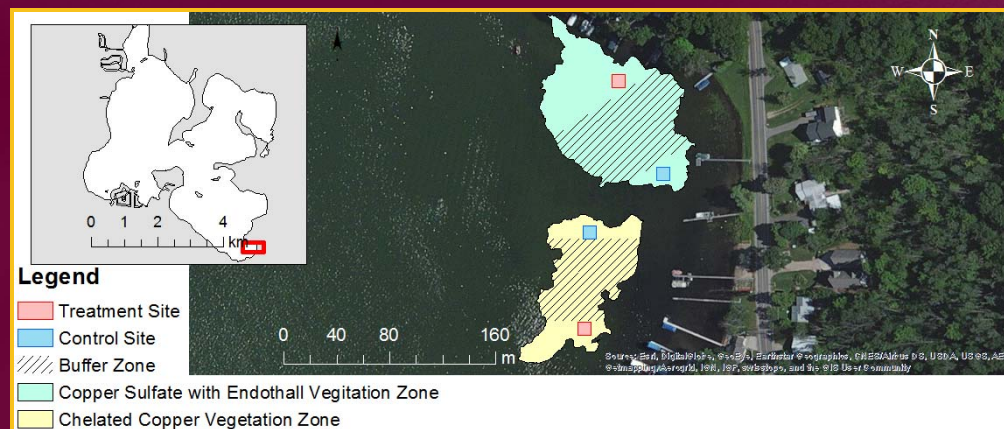
MISGP Project Objectives

- Employ experimental field trials to:
 - Optimize herbicide control
 - Test the efficacy of biodegradable benthic barriers
- Three species:
 - Eurasian watermilfoil
 - Carolina fanwort
 - Starry stonewort (SSW)



2015 SSW Pilot Herbicide Study: Site Selection and Treatment

- Gun Lake, Barry Co., MI
 - 2 treatments areas; defined SSW perimeter
 - Control and treatment (10m x 10m); 200' buffer
 - Aug. 12 treatment of 1 acre with copper sulfate (4.4 lb/acre-ft) and endothall (0.75 gal/acre)
 - Aug. 12 treatment of 2 acres with Komeen crystals/chelated copper (30 lb/acre)



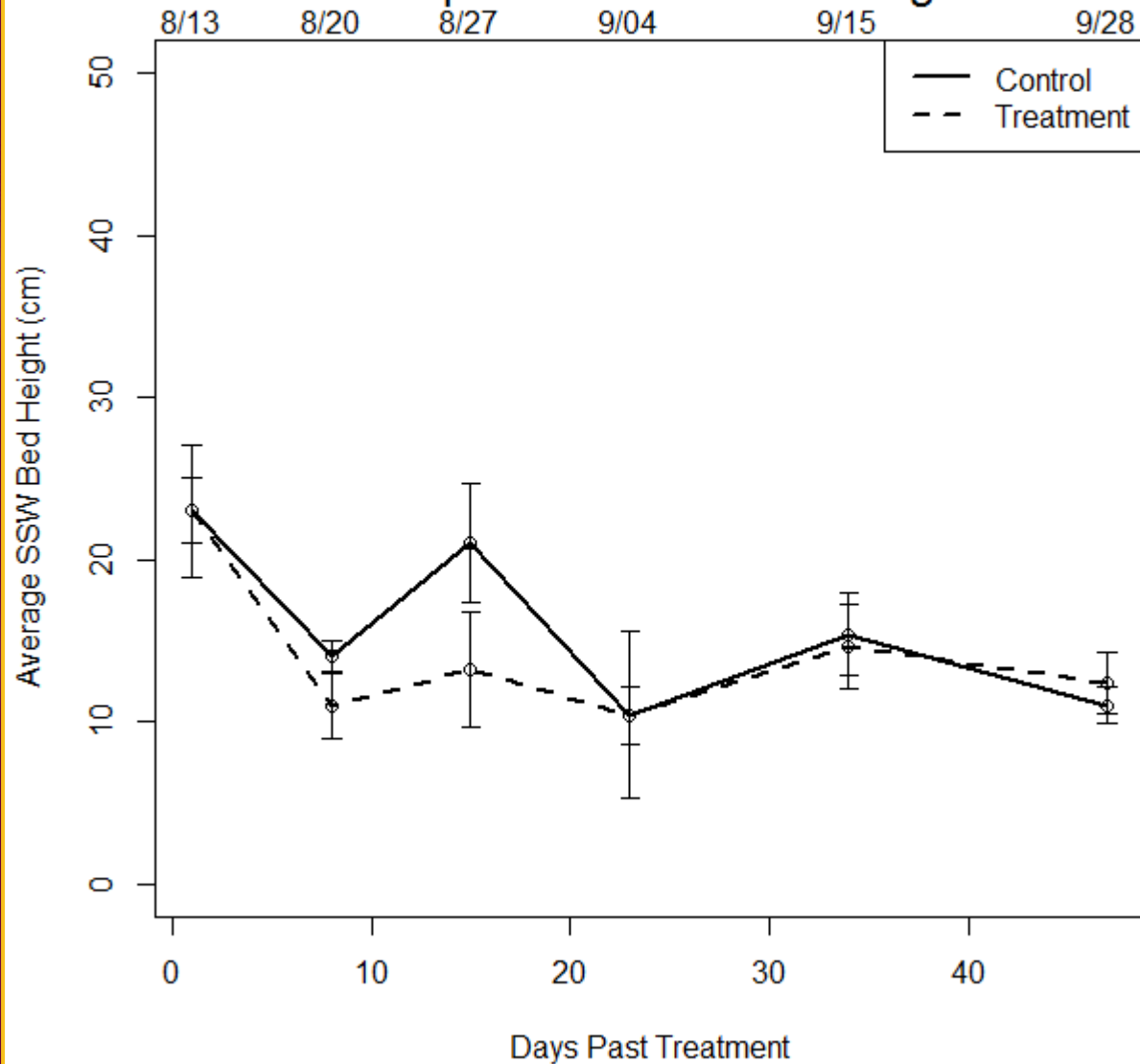
2015 SSW Pilot Herbicide Study: Monitoring

- Biomass sampling
 - Pre- and 2 weeks post-treatment
 - Systematic random design
 - 25 sample points per treatment and control (0.04 m² quadrat)
 - Dry weight biomass by species
- Height of SSW
 - 1 day post treatment; weekly for 6 weeks
 - Systematic design
 - 5 points per treatment and control
 - Substrate to canopy

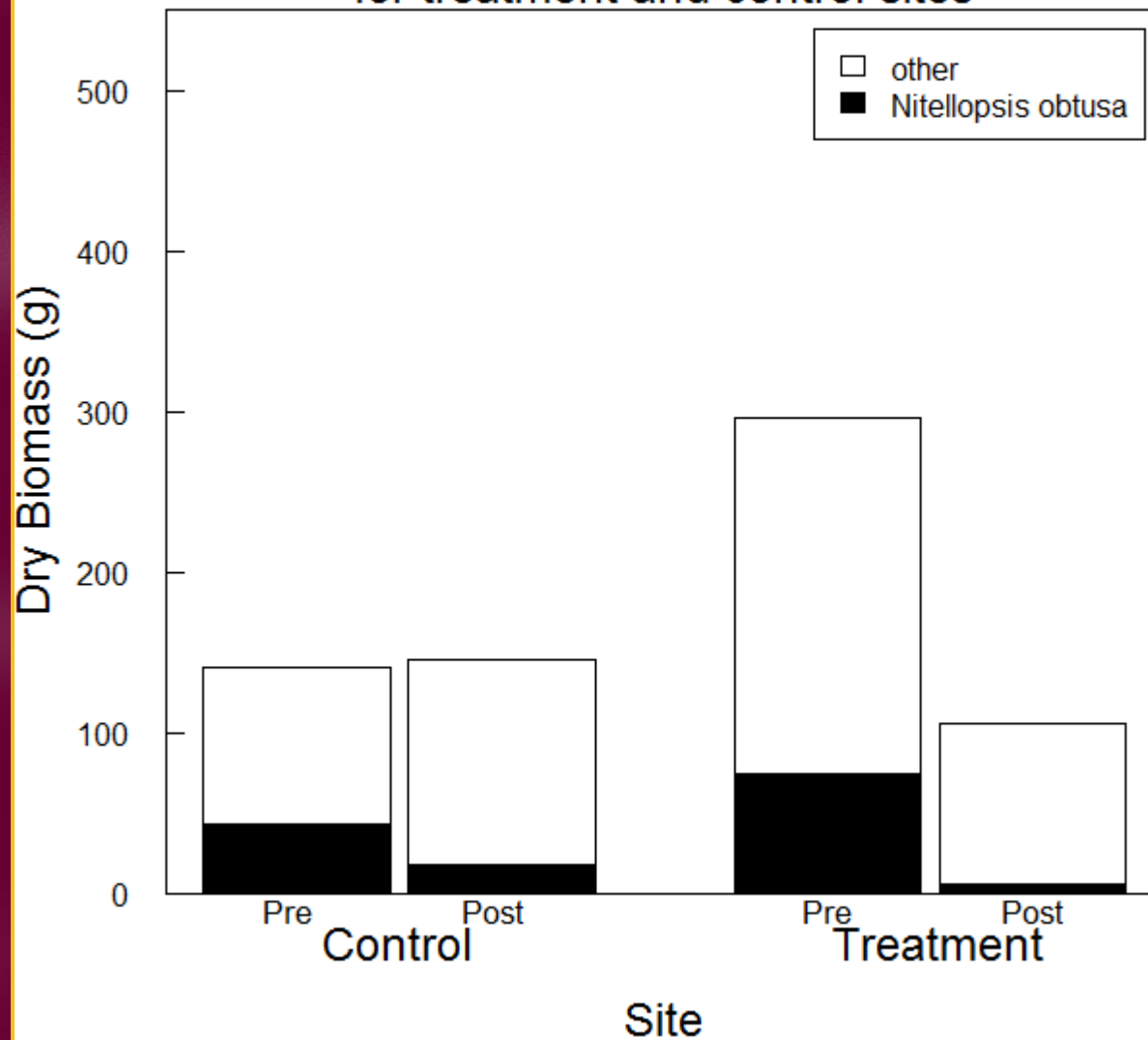


Copper Sulfate with Endothall Sites

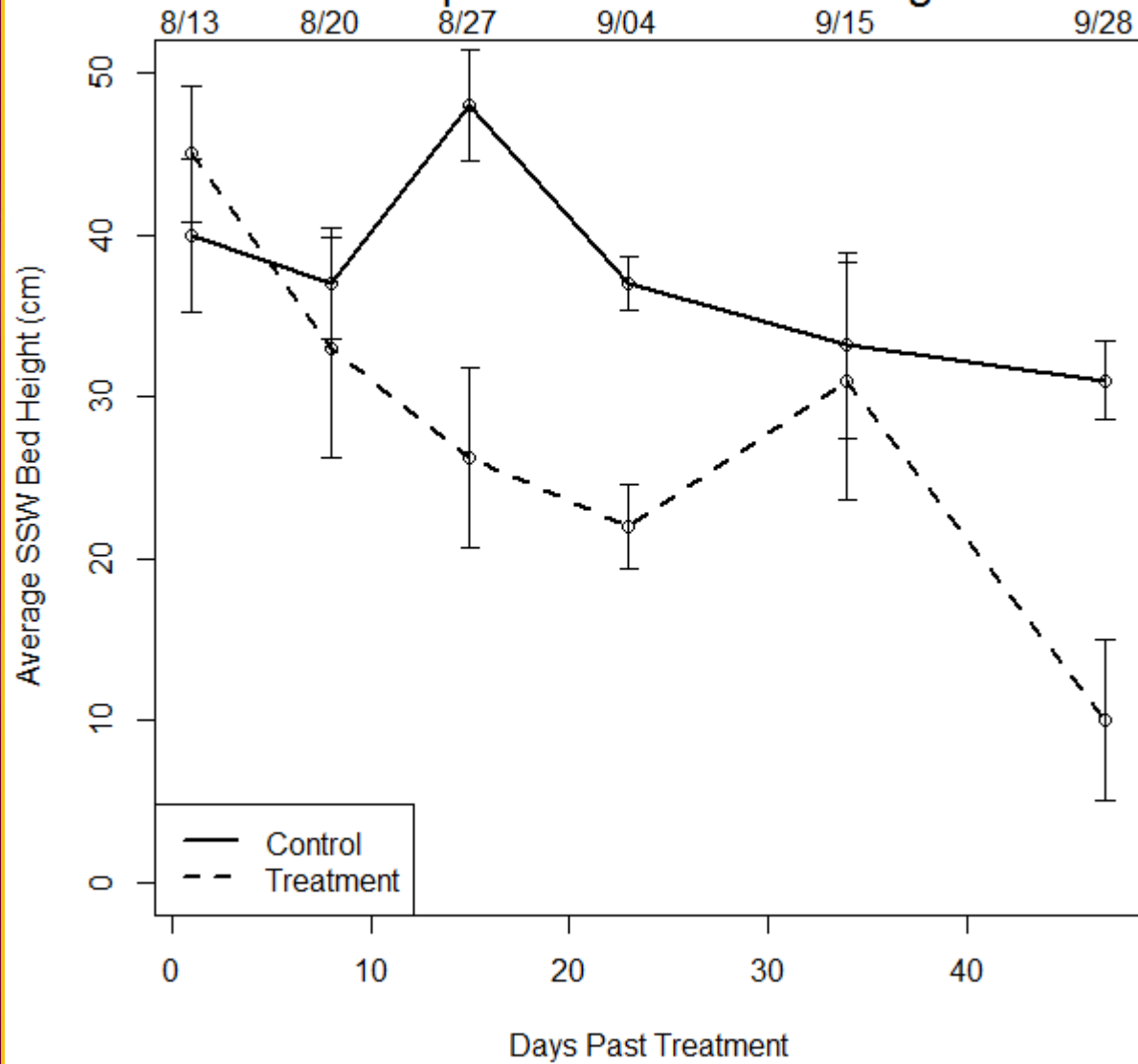
SSW post-treatment bed height



Copper Sulfate with Endothall Sites change in SSW and total biomass after treatment for treatment and control sites

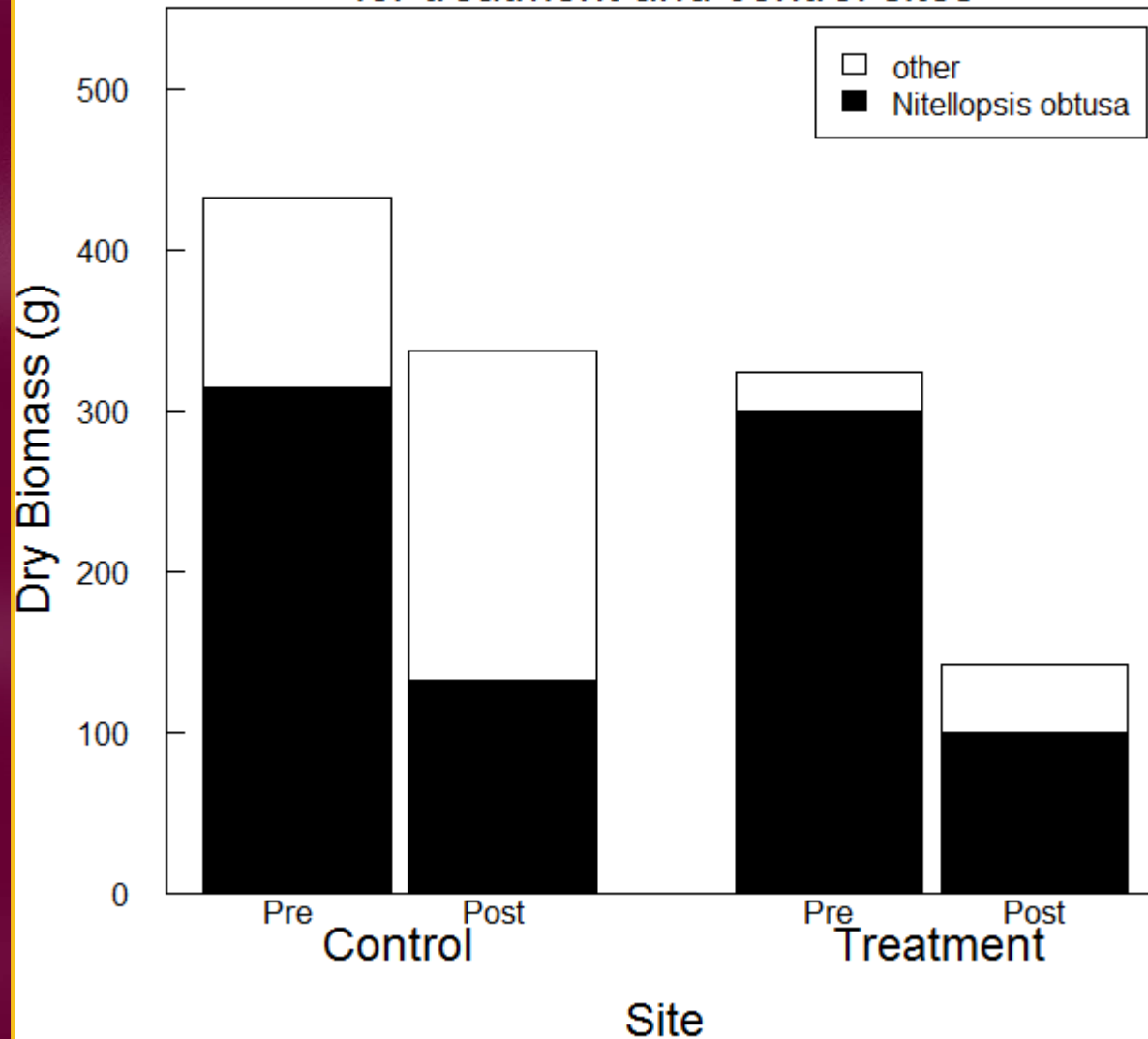


Chelated Copper Sites SSW post-treatment bed height



Chelated Copper Sites

change in SSW and total biomass after treatment
for treatment and control sites



2016 SSW Herbicide Study: Site Selection and Treatment

- Gun Lake, Barry Co., MI
 - 3 replicates; 3 controls (15m x 5m)
 - 2 paired sites in highly impacted canals
 - 1 paired site in mixed community
 - June 23rd and July 25th treatments of Komeen Krystal (1 ppm)
 - Aug. 29th – Sept. 9 mechanical harvesting



2016 SSW Herbicide Study: Monitoring

- Biotic Monitoring
 - 1 week pre-treatment; 2 weeks post-treatment (6 visits)
 - Systematic random design
 - 5 sample points per treatment and control
 - Biomass: Dry weight biomass by species (vertical rake)
 - Height of SSW: Surface to canopy
 - water depth

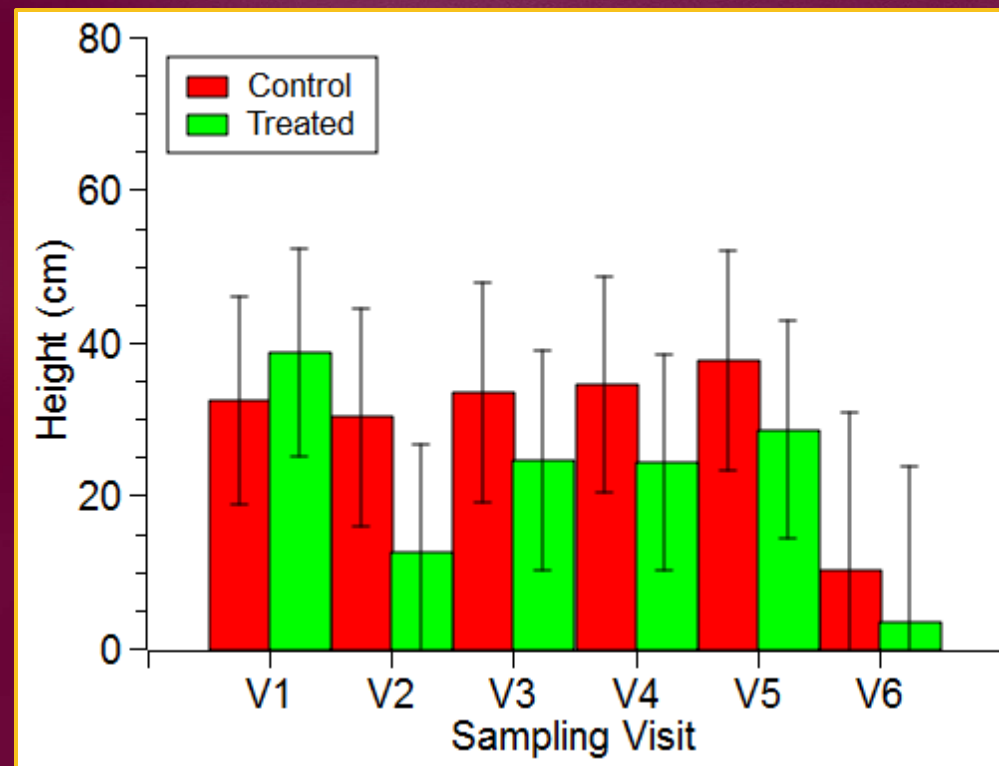


2016 SSW Herbicide Study: Data Analysis

- Compared mat height and biomass using Mixed Model analysis (SAS PROC MIXED).
 - Log transformed data prior to analysis
 - Fixed effects: stratum (i.e., treated or control), sampling visit (i.e., time), and stratum*visit interaction.
 - Random effects: plot and quadrat (nested within plot).
 - We accounted for correlations among multiple measures taken at the same quadrats over time (repeated measures).
 - Multiple comparison test to evaluate difference between treatment and control plots within each sampling visit

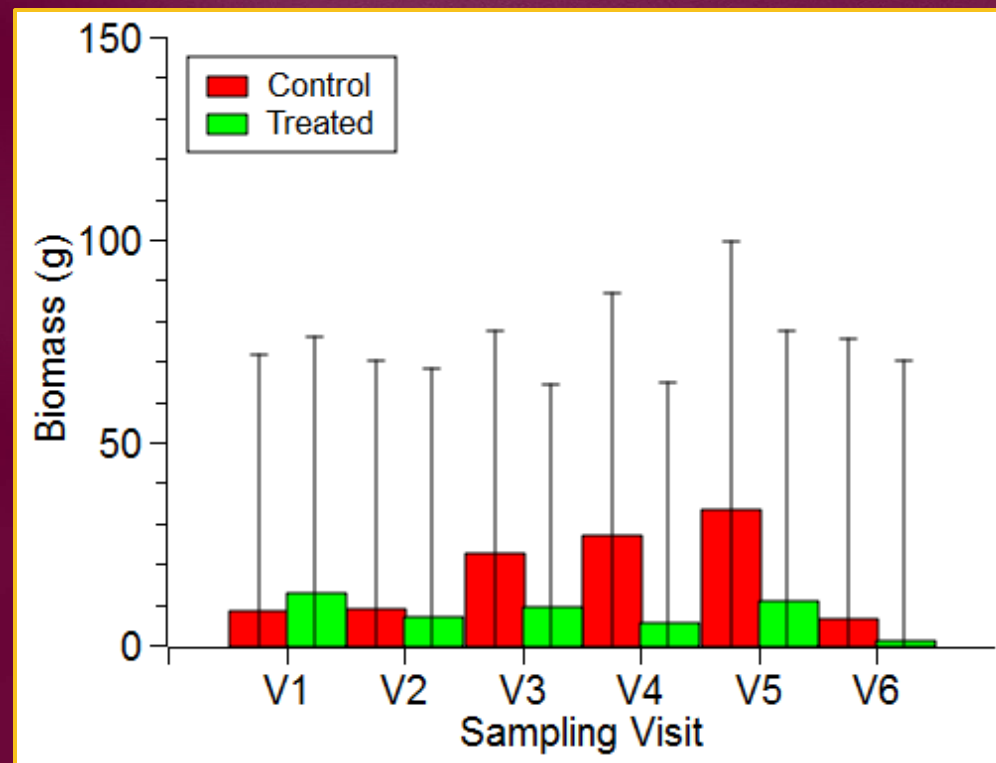
2016 SSW Herbicide Study: Height of SSW Results

- No significant difference in mat height between treatment and control at V1-6



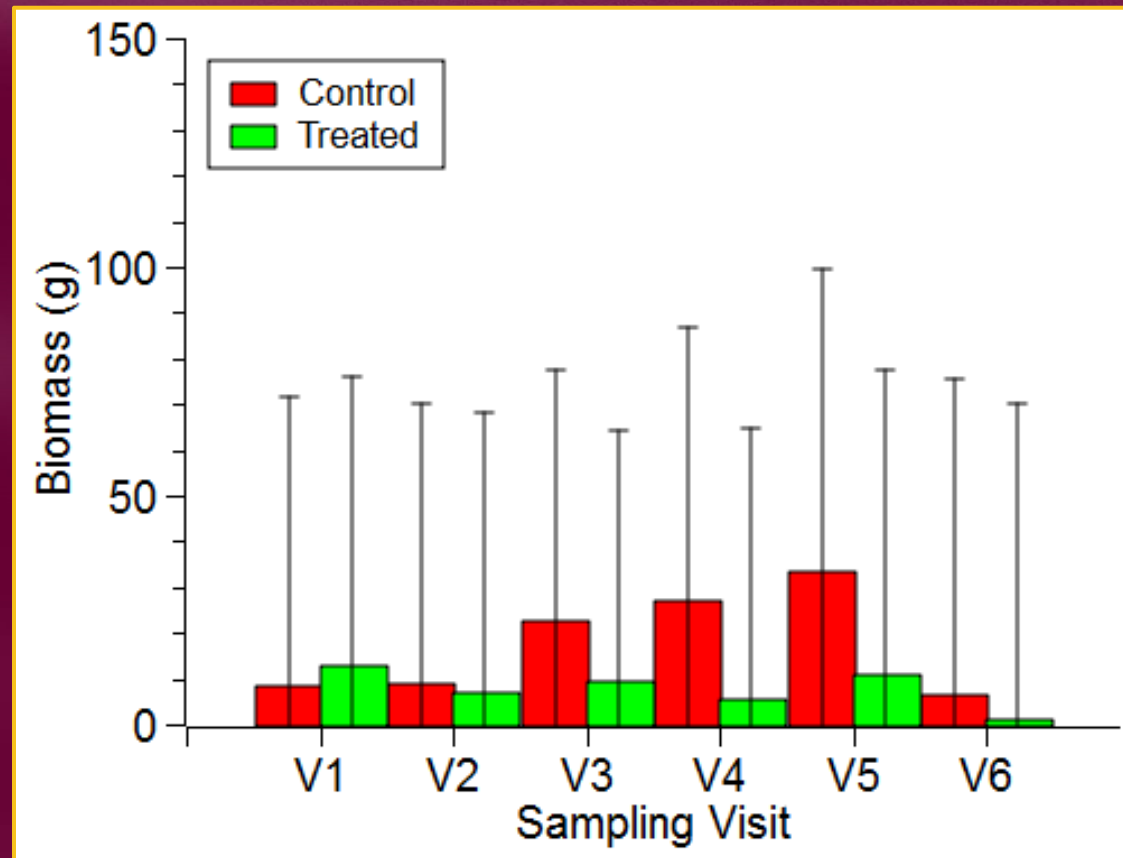
2016 SSW Herbicide Study: Total Biomass Results

- No significant difference in biomass between treatment and control at V1-6



2016 SSW Herbicide Study: Discussion of SSW

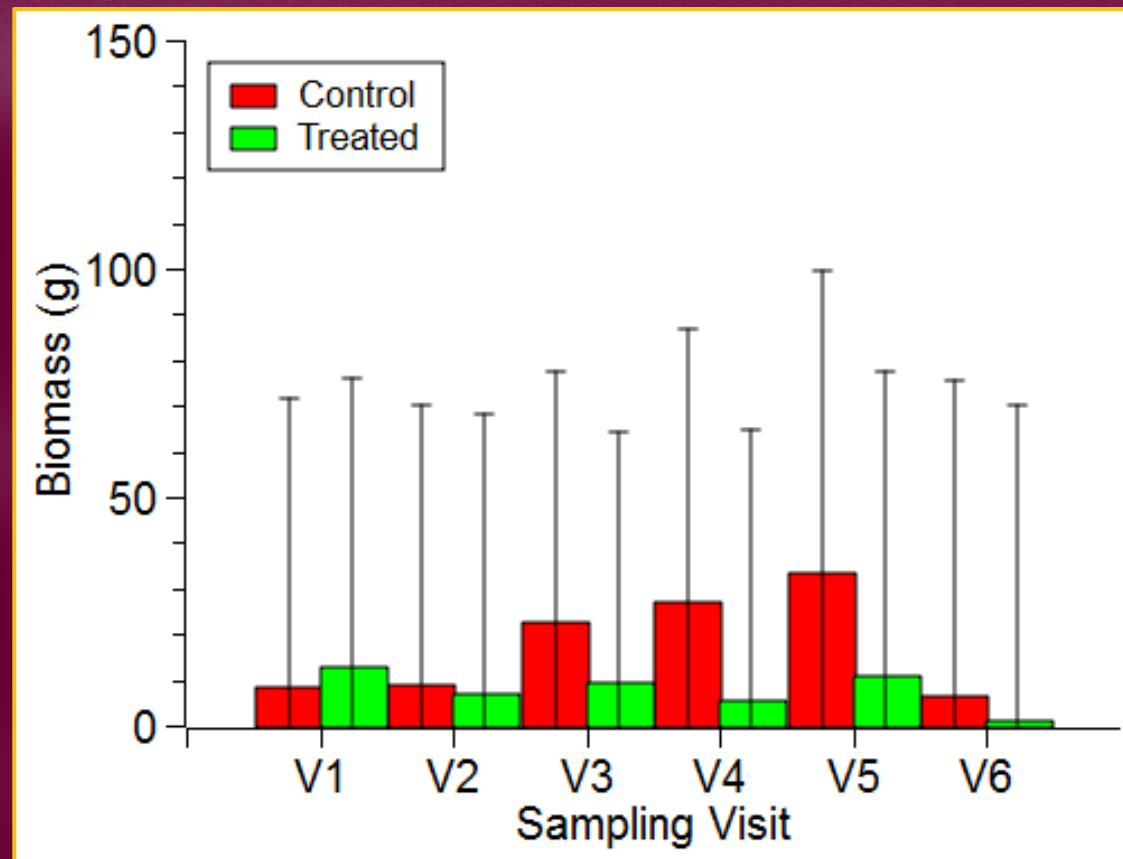
- There appear to be some short lived treatment effects; they are not significant in this study



2016 SSW Herbicide Study: Discussion of SSW

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- In natural systems, SSW biomass and mat height are highly variable across treatments and controls

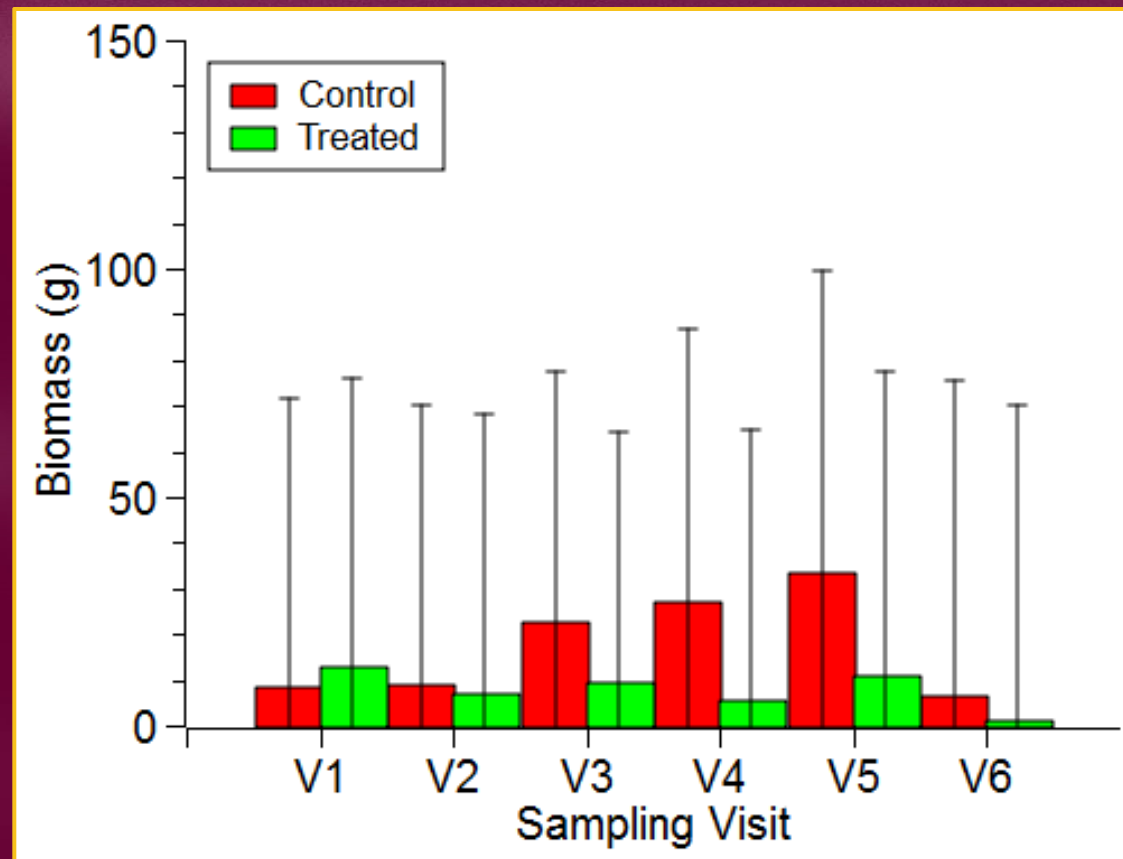
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2016 SSW Herbicide Study: Discussion of SSW



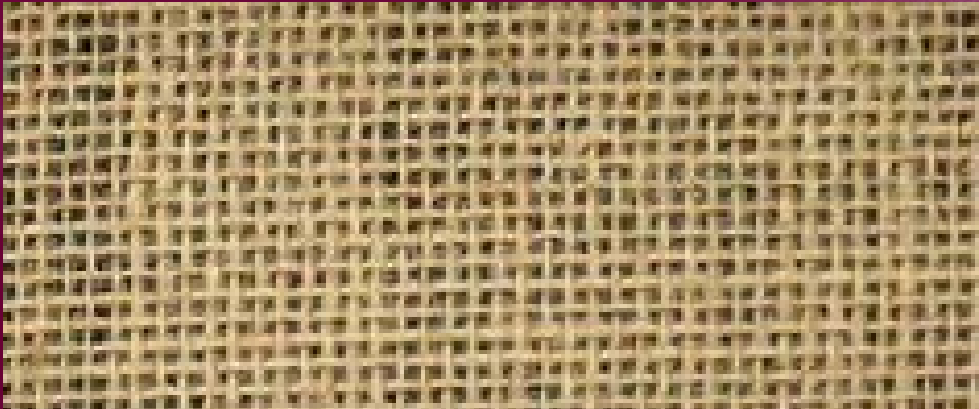
2016 SSW Herbicide Study: Discussion of SSW

- There appears to be some short lived treatment effects; they are not significant in this study
- In natural systems, SSW biomass and mat height are highly variable across treatments and controls
- We need controlled and replicated *in situ* studies (short and long term) to assess impact of control
- We need novel management strategies (i.e. benthic mats, lake drawdown, bio-controls)



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CMU
CENTRAL MICHIGAN
UNIVERSITY



14 oz



17 oz

Last updated 2017

State of Michigan's

Status and Strategy for Starry Stonewort (*Nitellopsis obtusa* (Desv. in Loisel.) J. Groves) Management

Scope

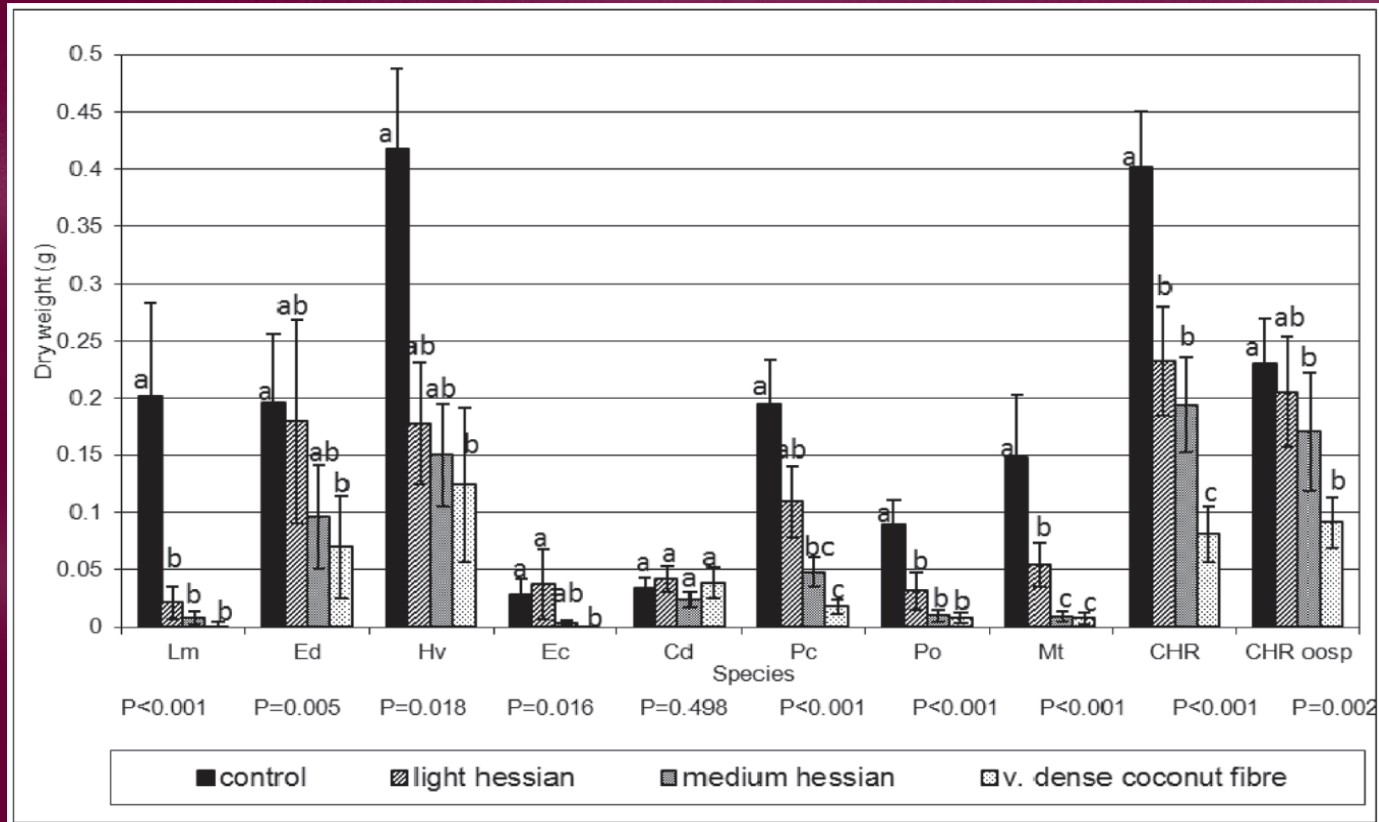
The first written documentation of Starry stonewort (*Nitellopsis obtusa* (Desv. in Loisel.) J. Groves, hereafter SSW) in North America was in 1978 in the St. Lawrence Seaway (Geis 1981); however, a vial containing SSW collected in 1974 in the St. Lawrence Seaway has been confirmed in the New York Botanical Garden's Characeae collection (Larkin et al. *in review*). Starry stonewort was first reported in Michigan in 1983 in the St. Clair-Detroit River System (Schloesser et al. 1986). Only recently has SSW been considered an aggressive nuisance in inland lakes (Eichler 2010). An earlier version of this document was a product of Environmental Protection Agency - Great Lakes Research Initiative 205(j) grant between the Michigan Department of Environmental Quality and Central Michigan University (CMU) in 2014 (Hackett et al. 2014); It was significantly revised by CMU and partners on the Michigan Invasive Species Grant Program and reviewed by Michigan Departments of Environmental Quality and Natural Resources for the purposes of:

- Consolidating current science-based knowledge relative to the biology and ecology of SSW.
- Summarizing scientific literature and research efforts that inform management options for SSW in Michigan.
- Identifying future directions for research relative to successful SSW management in Michigan.

Acknowledgements

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- Kyle Kucher (MDNR)
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Biodegradable benthic mats



Species abbreviations are as follows; Lm is *L. major*, Ed is *E. densa*, Hv is *H. verticillata*, Ec is *E. canadensis*, Cd is *C. demersum*, Pc is *P. crispus*, Po is *P. ochreatus*, Mt is *M. triphyllum*, CHR is charophyte and CHR oosp is oospore rich lake sediment.

Hofstra & Clayton 2012 J Aquat. Plant Manage. 50: