

How Genetic Methods Can Influence the Way We Assess Watermilfoil

Syndell Parks, Ryan Thum

Robert B. Annis Water Resources Institute

Project AquaGen

Montana State University

Invasive Watermilfoil Management

- Eurasian watermilfoil
- Variation in response in the field
 - Faster regrowth
 - Less control
 - Hardier plants



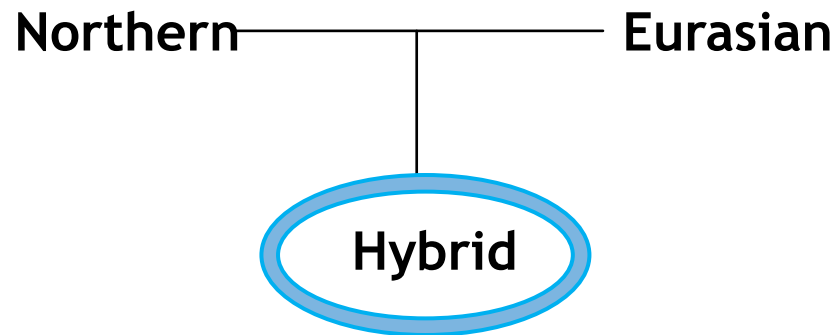
Invasive Watermilfoil Management

- Something else was occurring
- Hybridization?
- Genetically confirmed



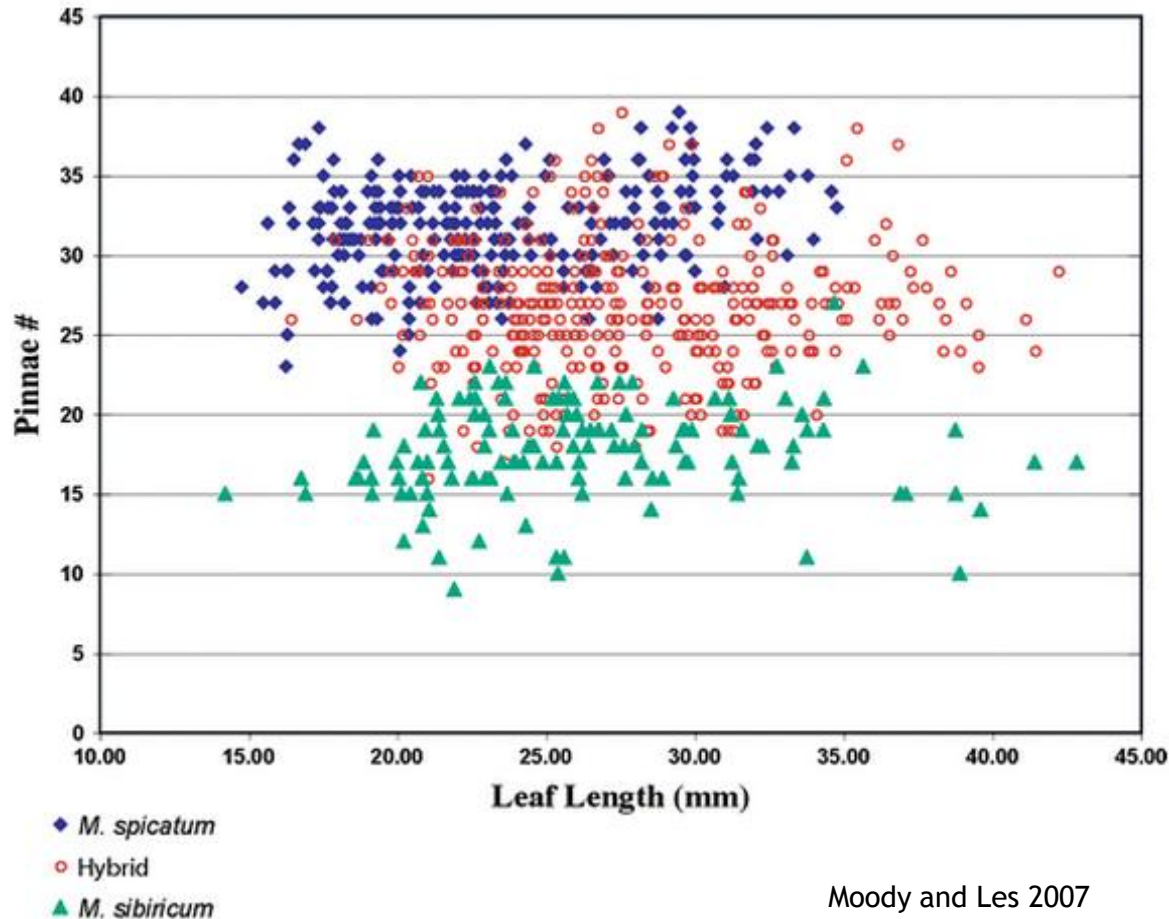
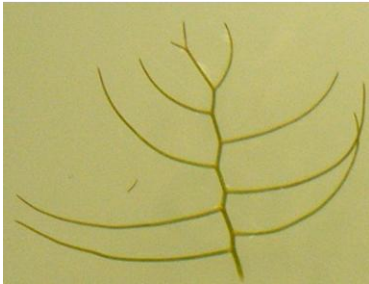
Hybrid Watermilfoil

- Are hybrids a problem?
 - Ecology
 - Genetics
- Eurasian vs. hybrids



Previous findings

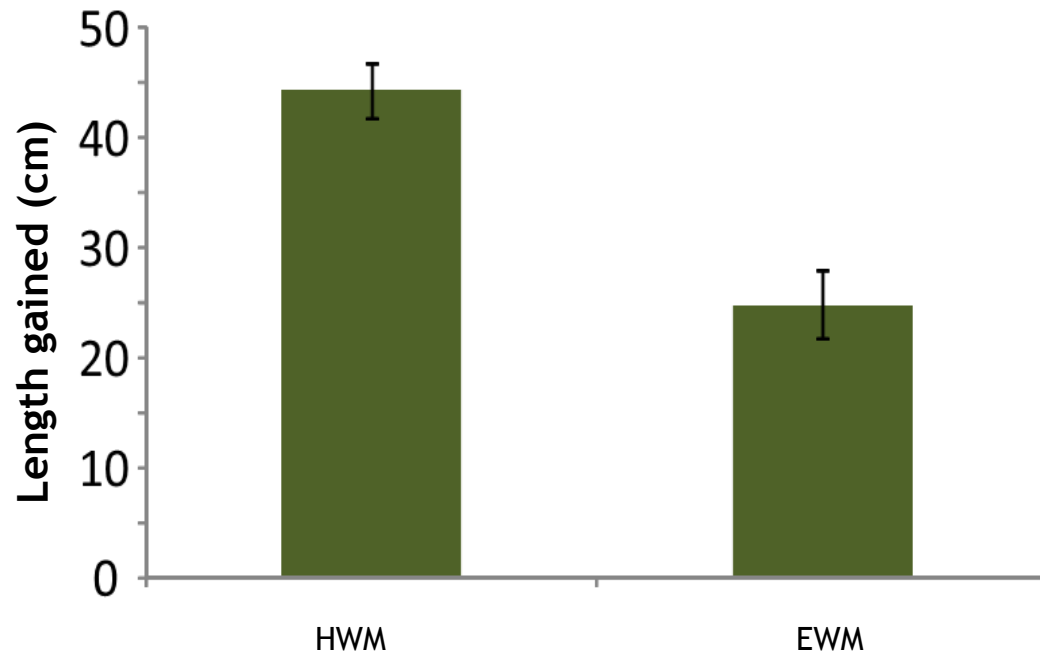
- Hybrid watermilfoil is physically indistinguishable



Moody and Les 2007

Previous findings

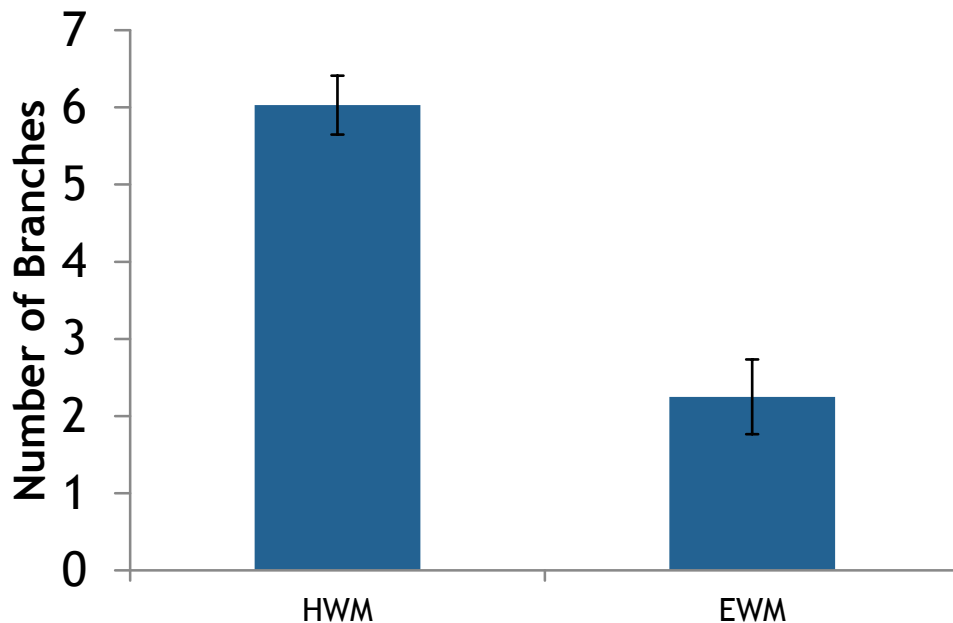
- Hybrid watermilfoil is physically indistinguishable
- Eurasian/hybrid comparisons
 - Consistent differences in growth



Grimm et al. In Prep

Previous findings

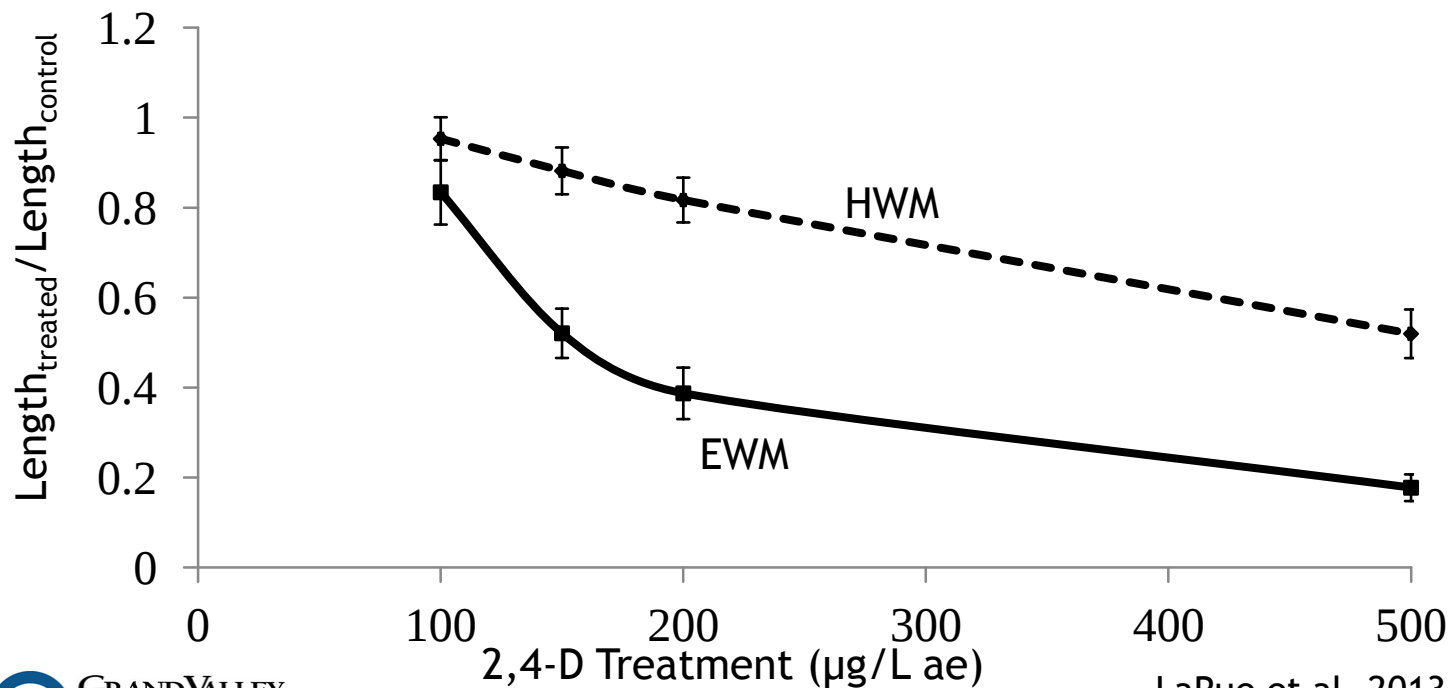
- Hybrid watermilfoil is physically indistinguishable
- Eurasian/hybrid comparisons
 - Consistent differences in growth



Grimm et al. In Prep

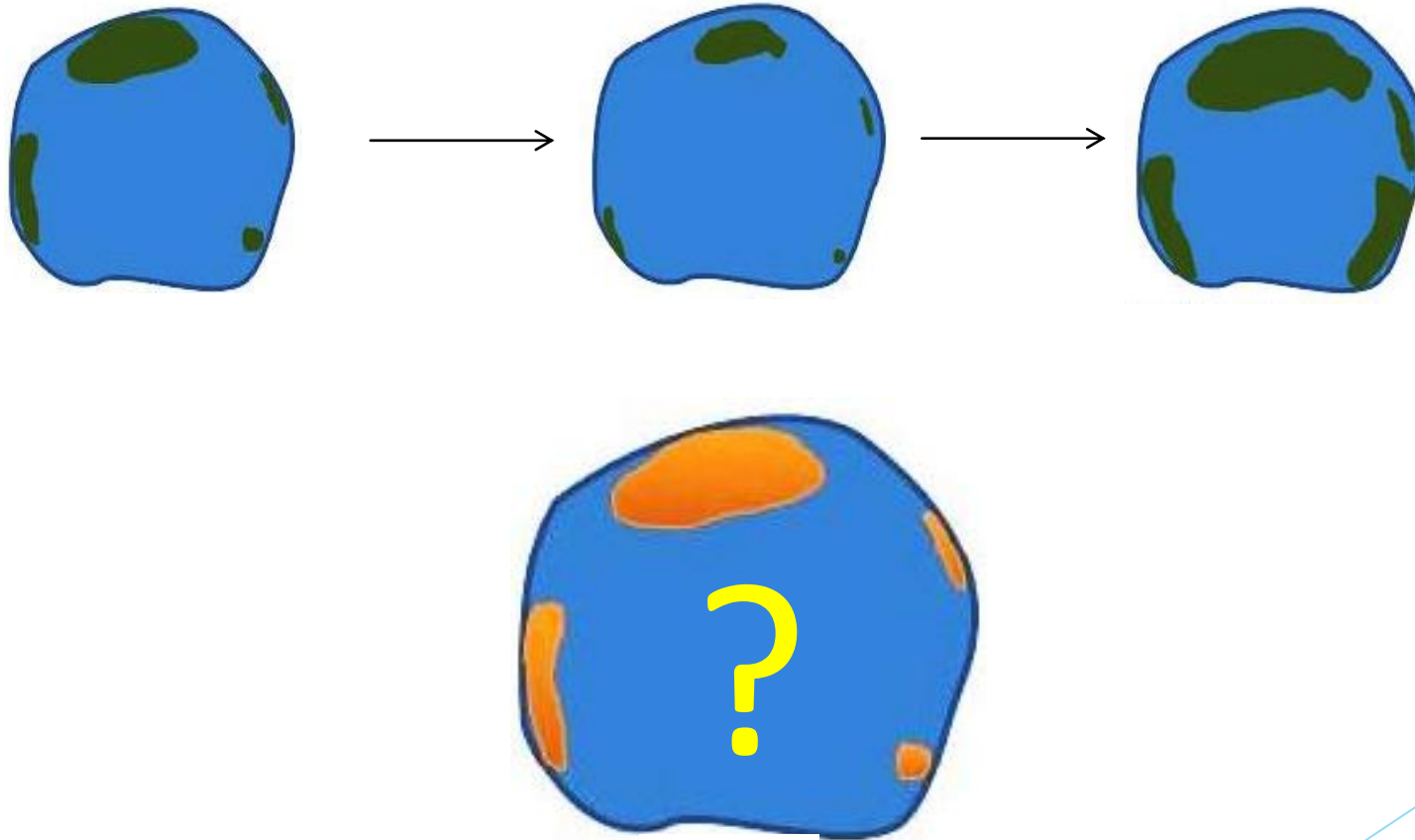
Previous findings

- Hybrid watermilfoil is physically indistinguishable
- Eurasian/hybrid comparisons
 - Consistent differences in growth
 - Consistent differences in herbicide effects

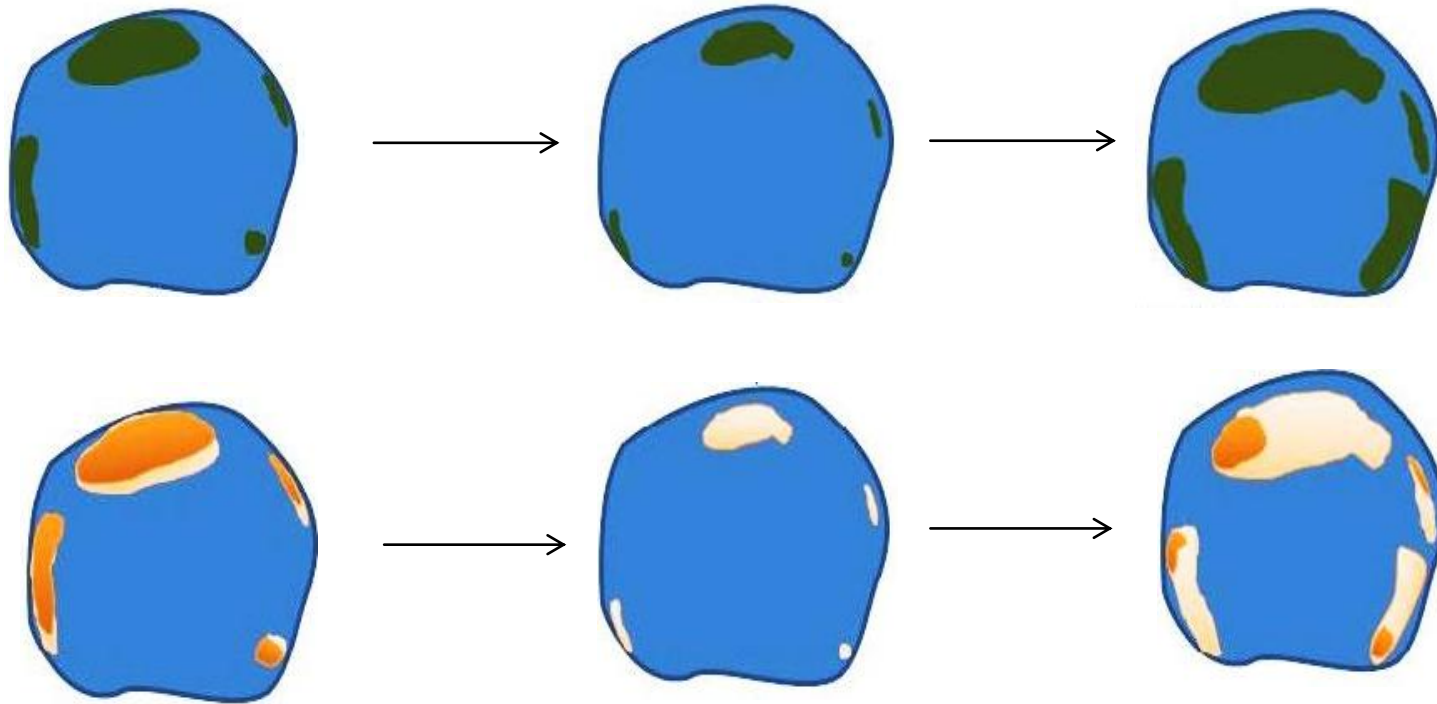


LaRue et al. 2013

All One Population



Co-occurring Populations



Previous findings

- Hybrid watermilfoil in the lab
 - Lower sensitivity
 - Exaggerated growth
 - Cryptic morphology

Previous findings

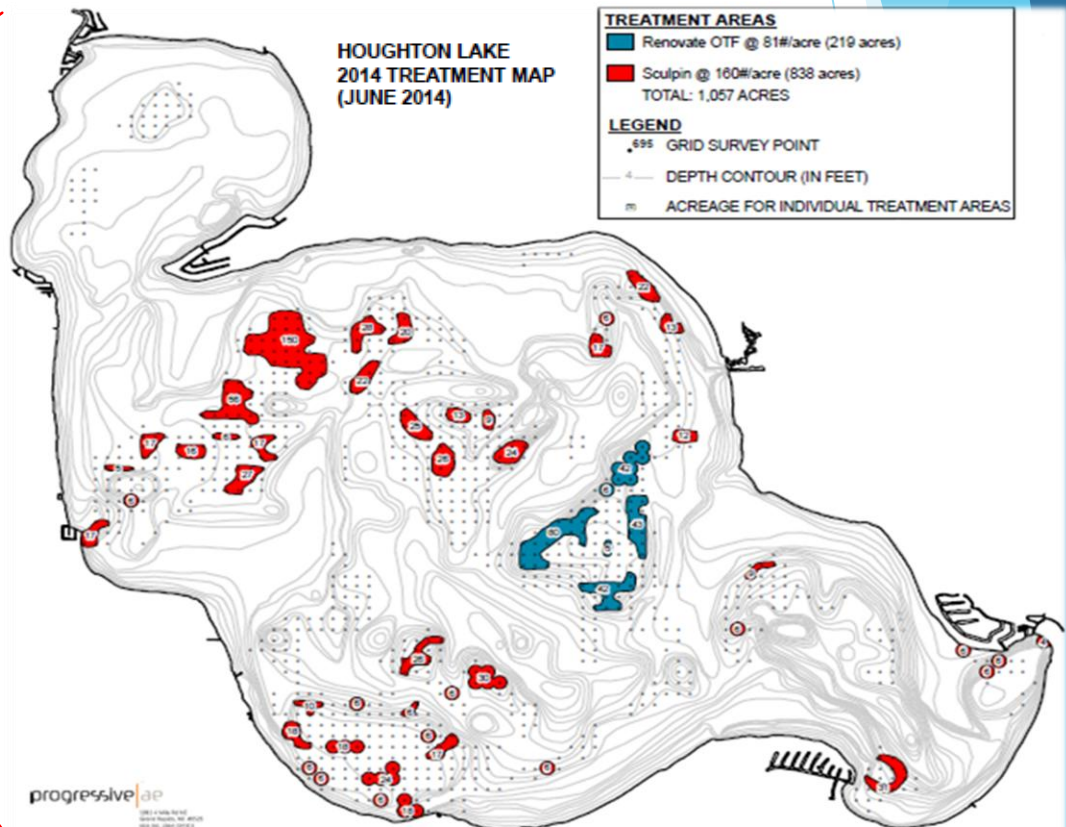
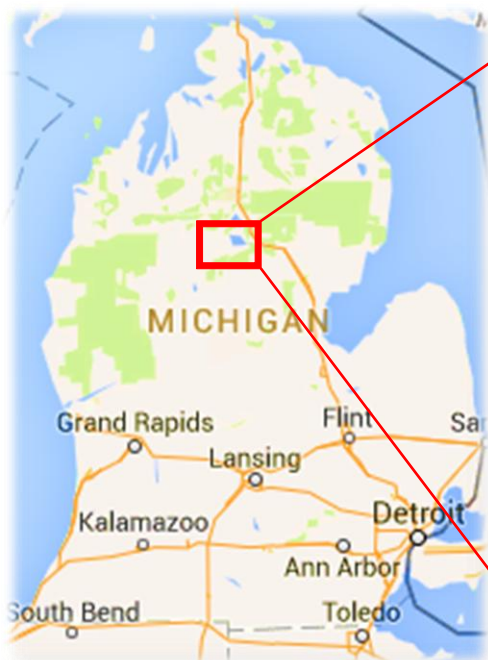
- Hybrid watermilfoil in the lab
 - Lower sensitivity
 - Exaggerated growth
 - Cryptic morphology
- Suggests:
 - Hybrids could be a major contributing factor for variation in control in the field
 - Hybrid presence and change must be known to assess management results
 - Genetic identifications are a necessary piece of vegetation mapping

Field Study

- ✓ Test for a differential change in hybrid versus parental watermilfoil following treatment in the field.
- ✓ Hypothesized that hybrids would be less impacted by treatment resulting in lower overall control.

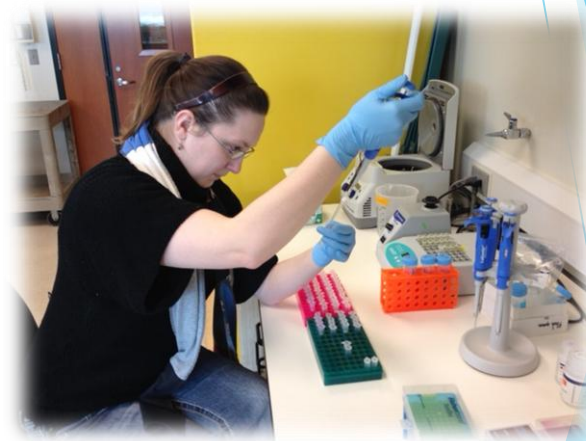
Houghton Lake, Michigan

- ~20,000 acre lake in central Michigan
- Treated with 2,4-D-amine and triclopyr in 2014
- Sampled 996 points before and after treatment

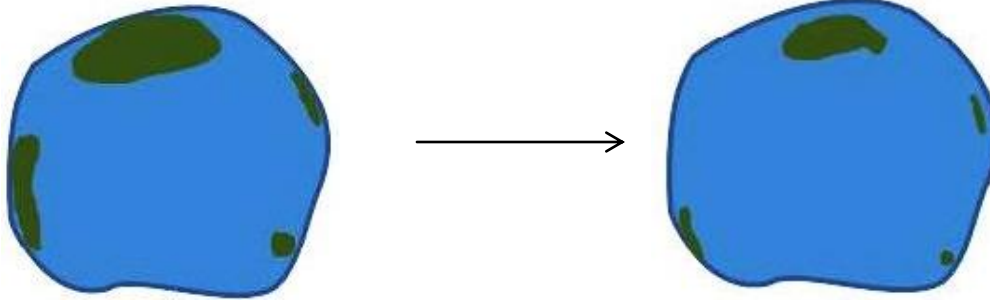


Analysis

- Plants identified using GVSU genetic identification assay
- Assessed reduction of plants following treatment
 - Differential change in EWM vs. HWM
 - EWM+HWM vs. EWM and HWM

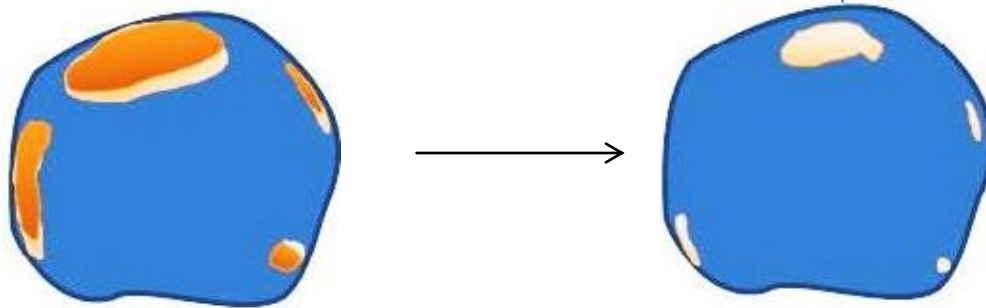


Results:



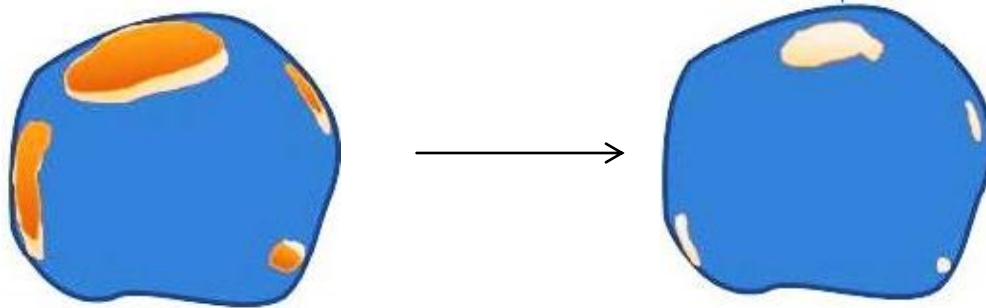
Population	Reduction
EWM+HWM	27%

Results:



Population	Reduction
EWM+HWM	27%
EWM	93%

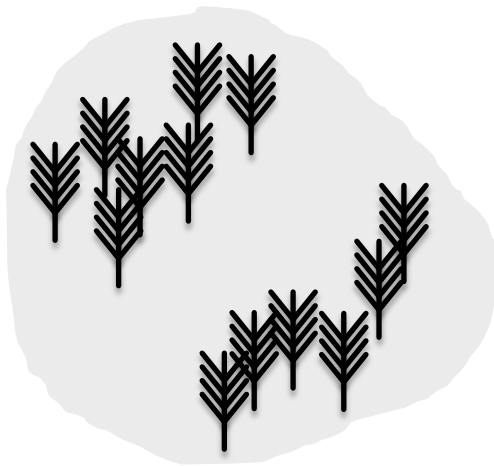
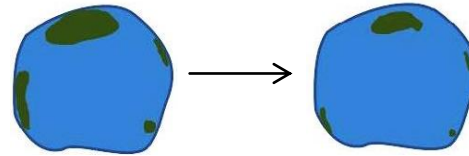
Results:



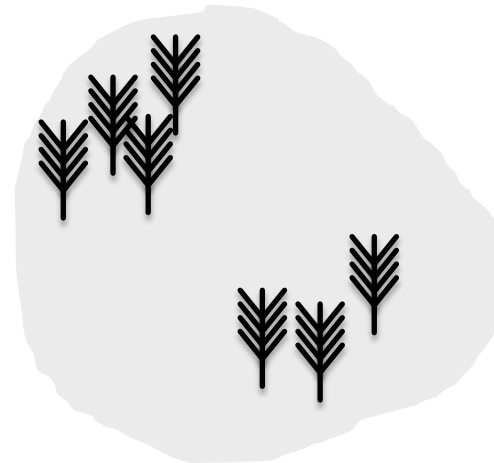
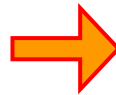
Population	Reduction
EWM+HWM	27%
EWM	93%
HWM	24%

What does it mean?

- Assessment for EWM+HWM

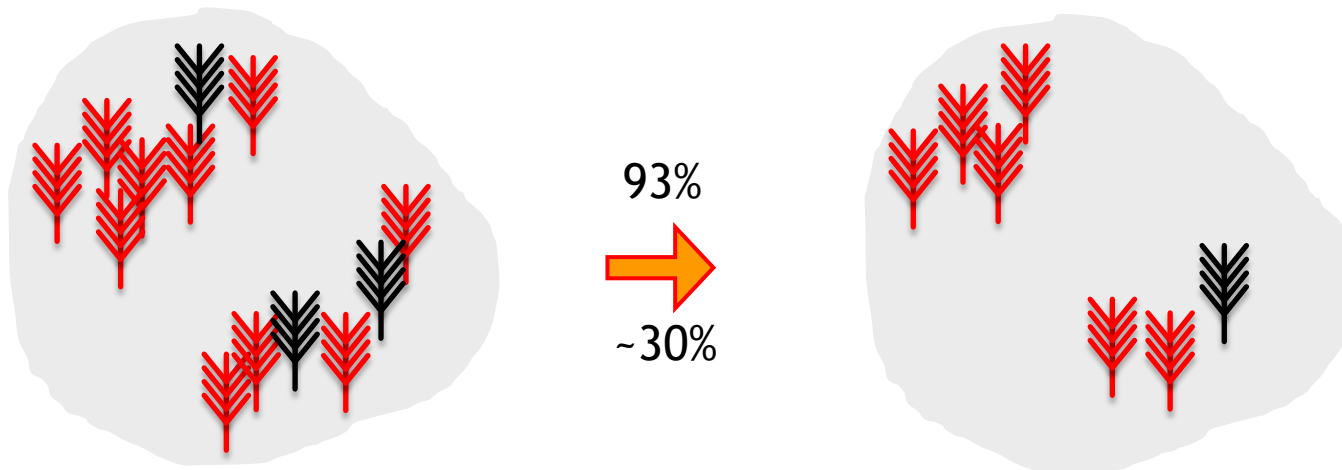
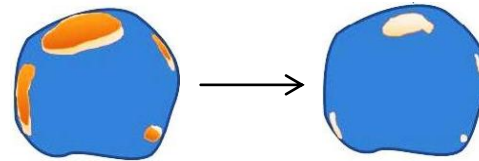


~30%



What does it mean?

- Assessment for EWM and HWM separately

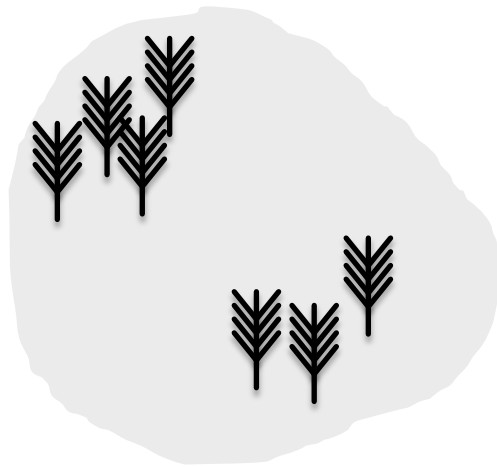


Much greater control of EWM

What does it mean?



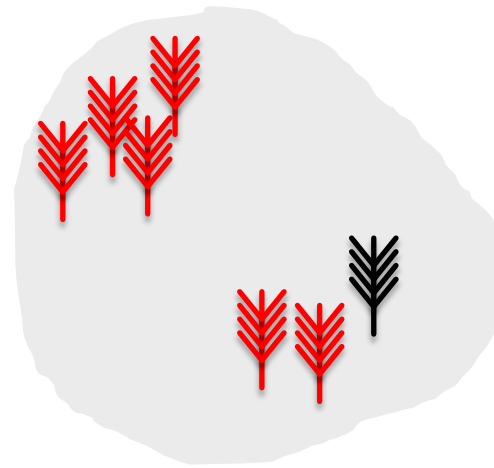
EWM+HWM



Implies less total control with no way to determine if future treatments work better.



EWM and HWM



Shows less control for HWM but not for EWM and provide a means to compare HWM response to treatment changes.

Genetics in Houghton Lake

- Different treatment results
 - Low overall watermilfoil control
 - Management worked for EWM but not HWM
- Both suggest a different strategy may be necessary for HWM control
 - EWM vs. HWM provide a means of assessment
- Long-term genetic mapping would have been beneficial
 - Already dominated by hybrids
 - May have changed management sooner

More to be done

- How do we improve control and predictability?
 - Development of adaptive strategies
 - Within lakes
 - Within treatment
 - Between treatment
 - Use of available tools and information



Coming down the pipeline

- Additional field studies
 - What contributes to limited die back?
- Continuation of Houghton Lake analysis
 - Is there evidence of selection for hybrids?
- Watermilfoil Population modeling
 - Can resistance modeling provide insight for effective and affordable management strategies?

Acknowledgements



Paul Hausler
Pam Tying
Tony Groves



Also:
Rick
Ryan
Evan



GVSU folks

Ryan Thum
Lindsey Schulte
Jeff Pashnick
Andrew Pyman
Danielle Grimm
Ryan Scheik
Greg Chorak
Jeremy Newton
Fatouma Abdoulaye
Kurt Thompson
Jim McNair
Sheila Blackman
Tim Evans



Questions??

