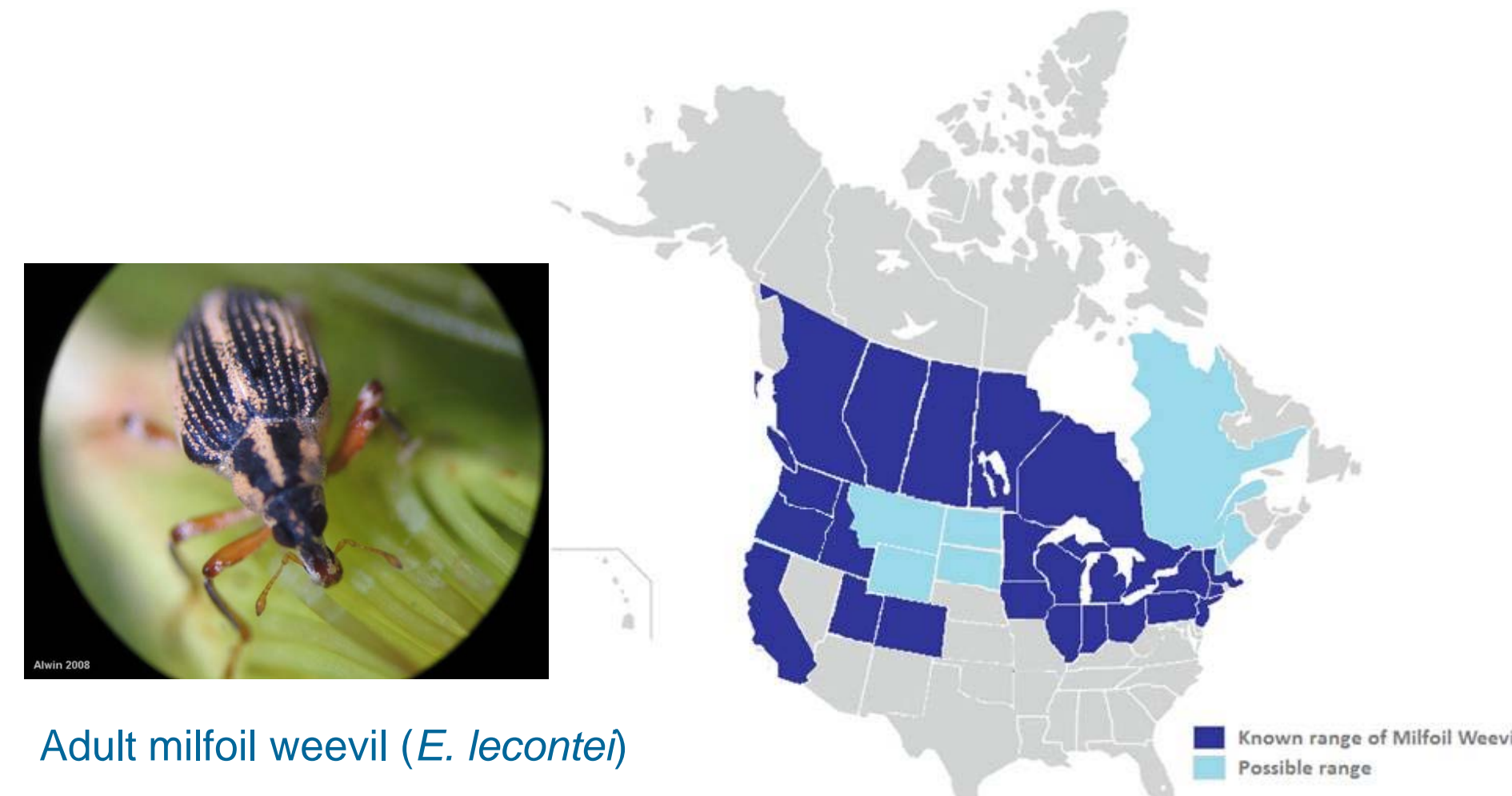


Milfoil Weevils Challenge Big Lake Troubles: Case Studies in Biological Control

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Introduction

Eurasian watermilfoil, *Myriophyllum spicatum*, is an exotic aquatic plant affecting freshwater bodies across North America. Milfoil Solution®, offered exclusively by EnviroScience Inc. since 1998, is one of several management options¹. It utilizes the North American native milfoil weevil, *Euhrychiopsis lecontei*, in an augmentative biocontrol program. The milfoil weevil naturally occurs across the continent.



Although Northern watermilfoil, *M. sibiricum*, (NWM) is considered its native host, the weevil prefers EWM and the hybrid EWM X NWM to the NWM².

Milfoil Solution® programs have been implemented in over 150 water bodies across 14 states and 2 provinces. Weevils are introduced over multiple years, with ongoing quantitative and qualitative monitoring. The results are gradual and native macrophytes are restored and play a major role in halting the resurgence of EWM.

Program Strategy:

1. Initial Survey – Qualitative & Quantitative
2. Weevil stocking – dense EWM beds
3. Follow-up Survey – same as Initial
4. Full Report with map

Surveys:

Quantitative – weevil & EWM density, % damage, depth
Qualitative – # weevils observed, EWM condition, sediment type, native plant id

Expected EWM Control with Milfoil Weevils

- Reduction in density of the EWM (stems/m²)³
- Maintenance of EWM at non-nuisance levels
- Increase in native plant species and density
- Elimination of EWM beds

South Spectacle Pond, CT

Two-Year Program

100 ac, Litchfield County, South Kent, CT, residential, private. EWM found in 2008.

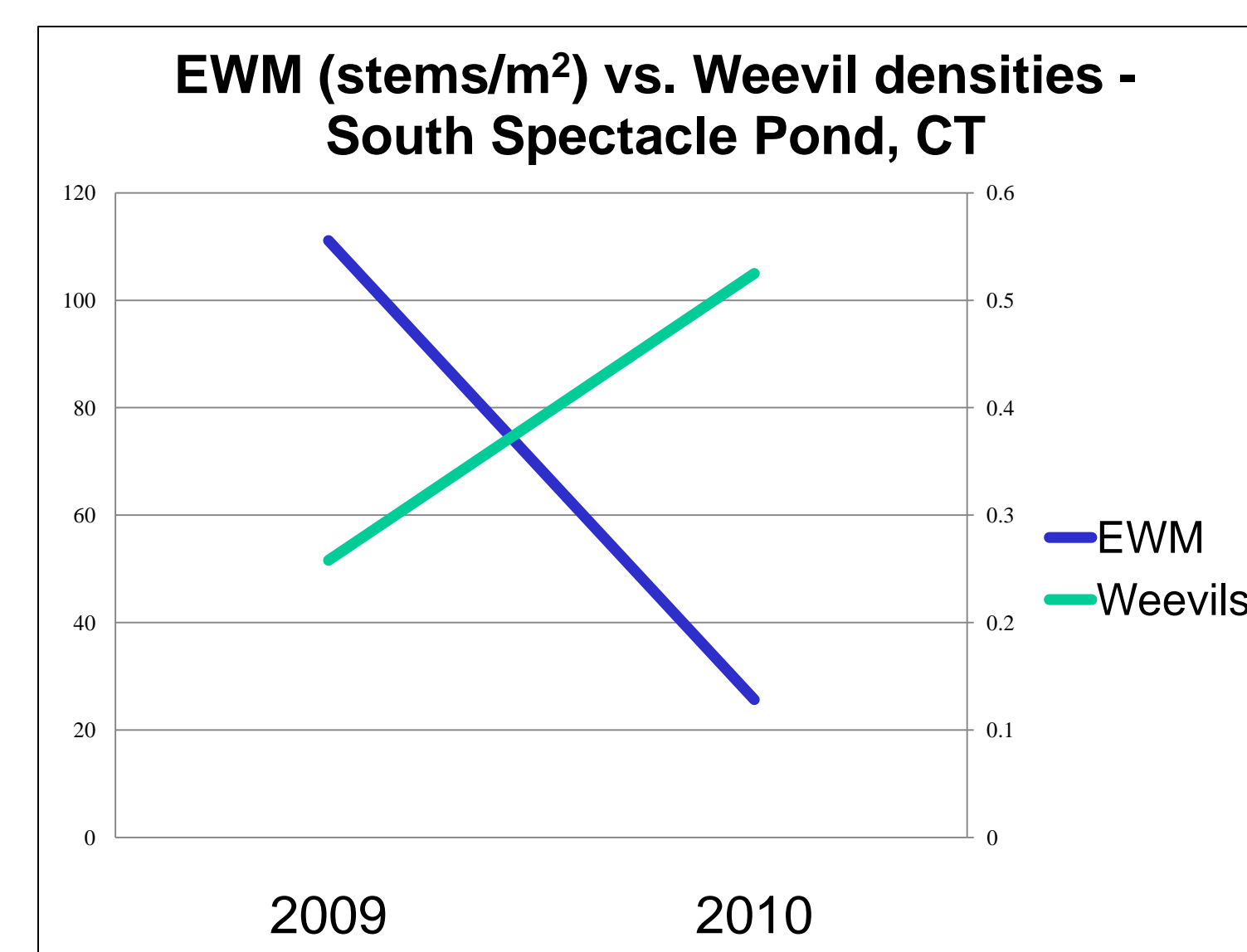
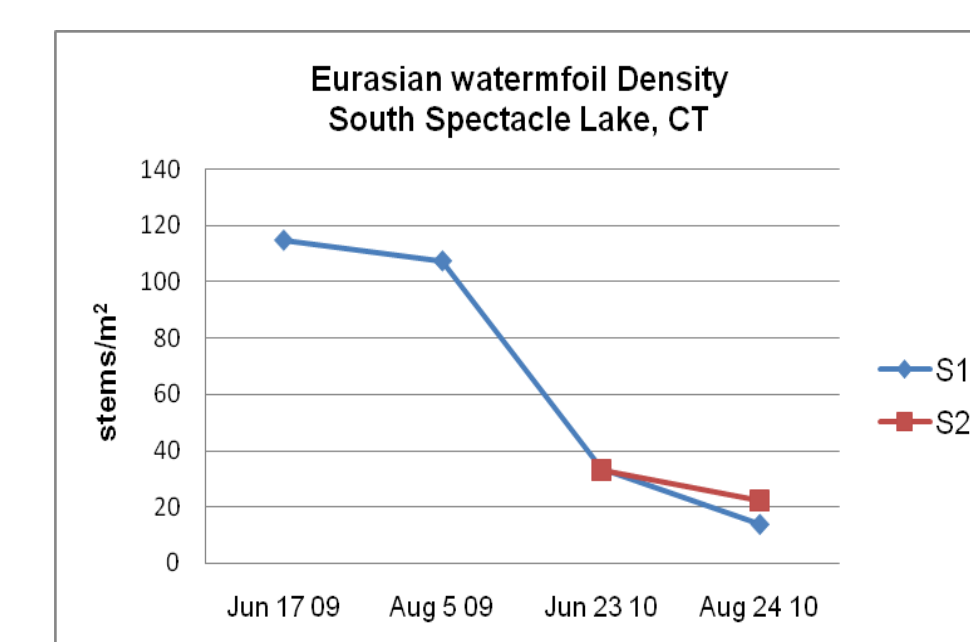
| Year | Survey Dates | Sites Est. | No. of weevils |
|------|-------------------------------------|------------|----------------|
| 2009 | Initial: 6/17 Follow-up: 8/5 | S1 | 5,000 |
| 2010 | Initial: 6/23/10 Follow-up: 8/24 | S2 | 6,000 |
| 2011 | Follow-up: to be determined | --- | 0 |



S1 and S2 - 5 x 30 m.
S1 - 1.5-3.5 m deep; rocky substrate, forested shoreline.
S2 - 1.5-2m deep; mucky wetland.

2009-2010 Results

- Rapid decrease in EWM density to isolated short, weak stems
- Weevil densities increased to critical range necessary to cause EWM decline.¹
- High initial weevil density and weevil damage at S2 in 2011 may have resulted from the 2009 stocking at S1.

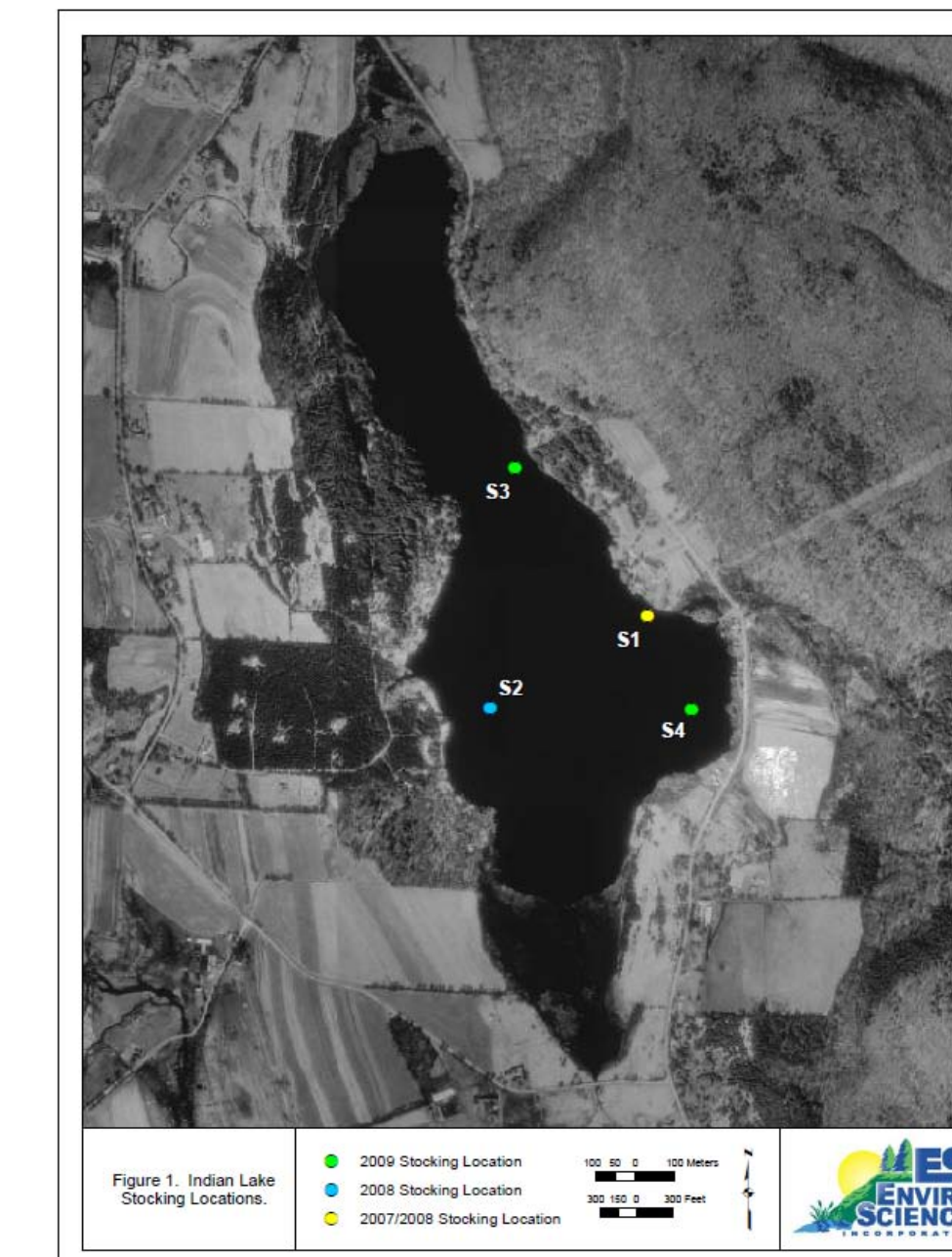


Indian Lake, CT

Three-Year Program

196 acres, Litchfield County, Sharon, CT, residential, Indian Lake Association.

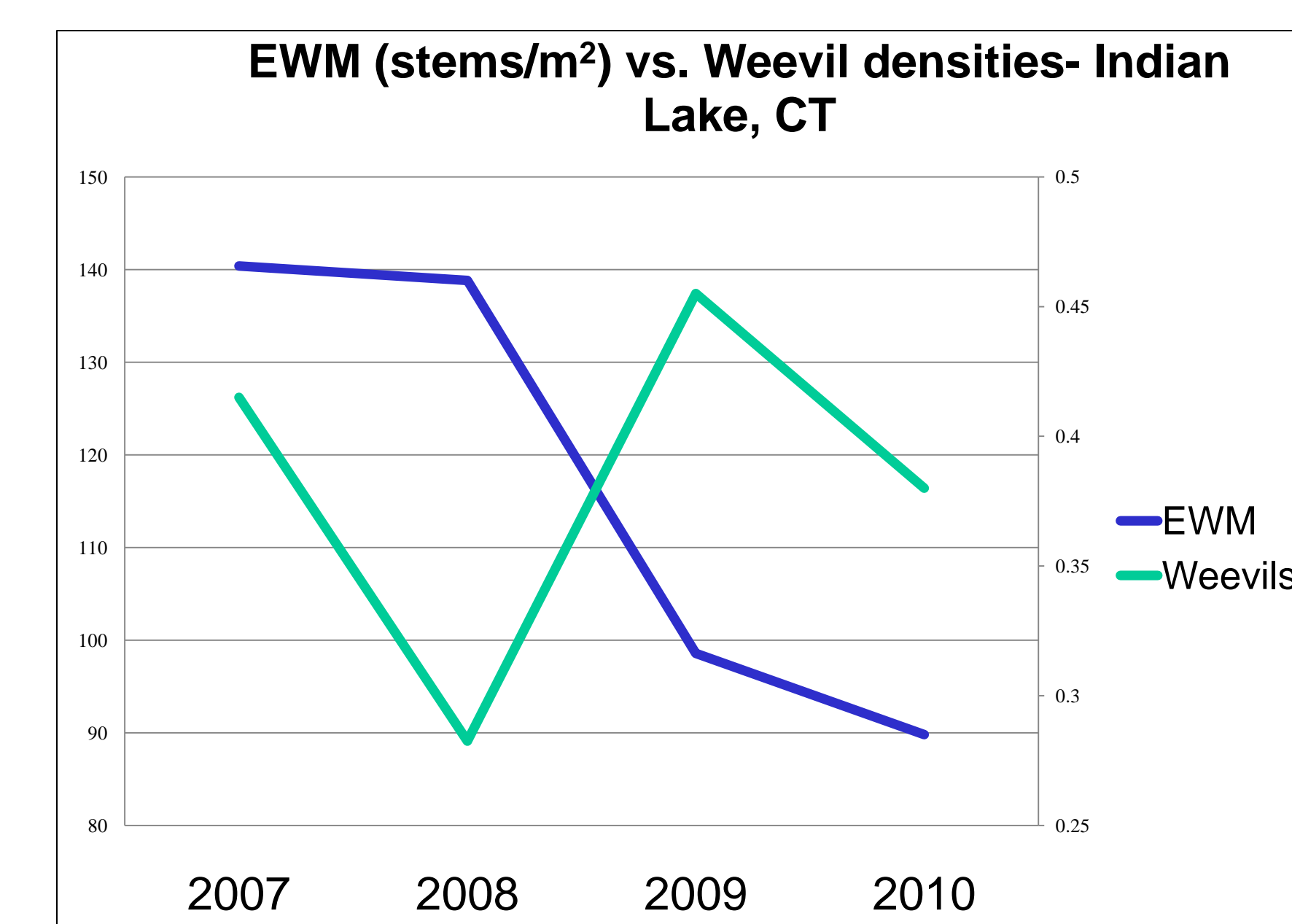
| Year | Survey Dates | Sites Est. | No. of weevils |
|------|----------------------------------|------------|-------------------------------|
| 2007 | Initial: 6/15 Follow-up: 8/22 | S1 | 8,000 |
| 2008 | Initial: 7/2 Follow-up: 8/28 | S1, S2 | 8,500 (4.5K in S1 & 4K in S2) |
| 2009 | Initial: 6/17 Follow-up: 8/6 | S3, S4 | 15,000 (5K ea S2, S3, & S4) |
| 2010 | Final Follow-up: 8/25 | ---- | ---- |



2007 - extensive EWM infestation across most of southern end. Few native plants noted.

2008 – 2010 Results

- Steady decline in EWM density;
- Increase in native plants;
- Weevil densities maintained and reached critical range³ in some sites;
- EWM well below surface
- Large bare patches of sediment in sites

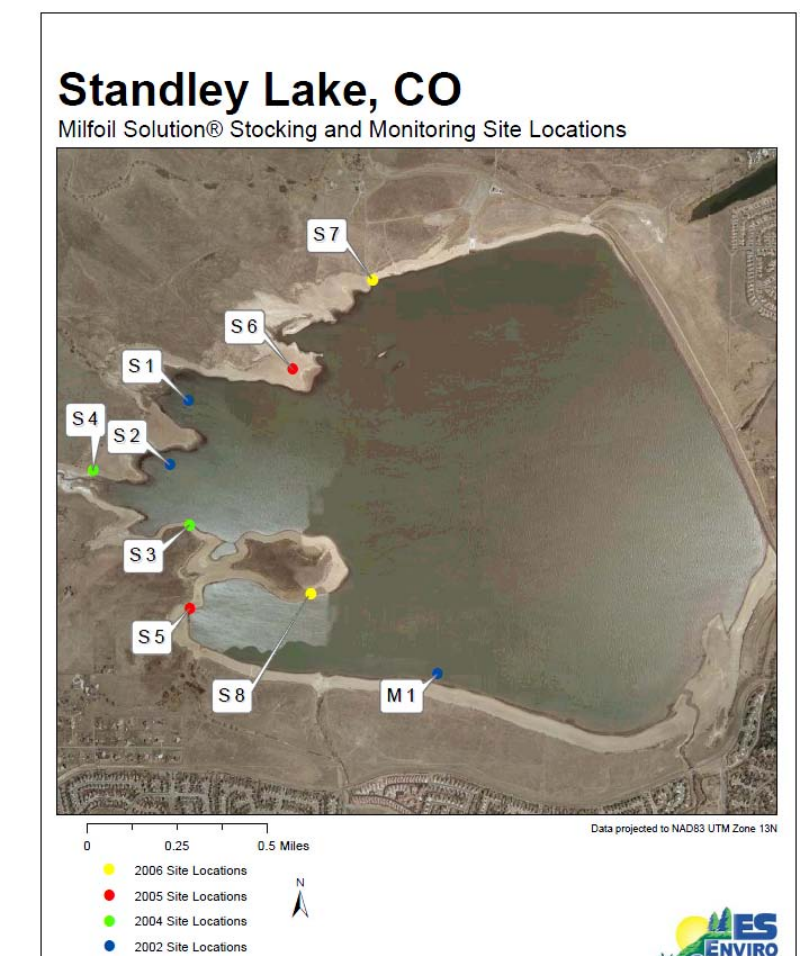


Standley Lake, CO

Four-Year Program

1,200 ac, Jefferson County, City of Westminster Works and Utilities, Serves over 250,000 people in three cities.

| Year | Survey Dates | Sites Est. | No. of Weevils |
|-----------|-------------------------------------|------------|----------------|
| 2002 | Initial: 7/18 Follow-up: 9/9 | S1, S2, M1 | 16,000 |
| 2004 | Initial: 6/20-21 Follow-up: 9/16 | S3, S4 | 46,000 |
| 2005 | Initial: 6/6 Follow-up: 8/16 | S5, S6 | 46,000 |
| 2006 | Initial: 8/10 Follow-up: 9/20 | S7, S8 | 47,000 |
| 2007 | Follow-up: 7/16 | - | - |
| 2008 | Follow-up: 8/20 | - | - |
| 2009 | Follow-up: 8/7 | - | - |
| 2010 | Follow-up: 8/19 | - | - |
| 2002-2006 | | Total | 155,000 |



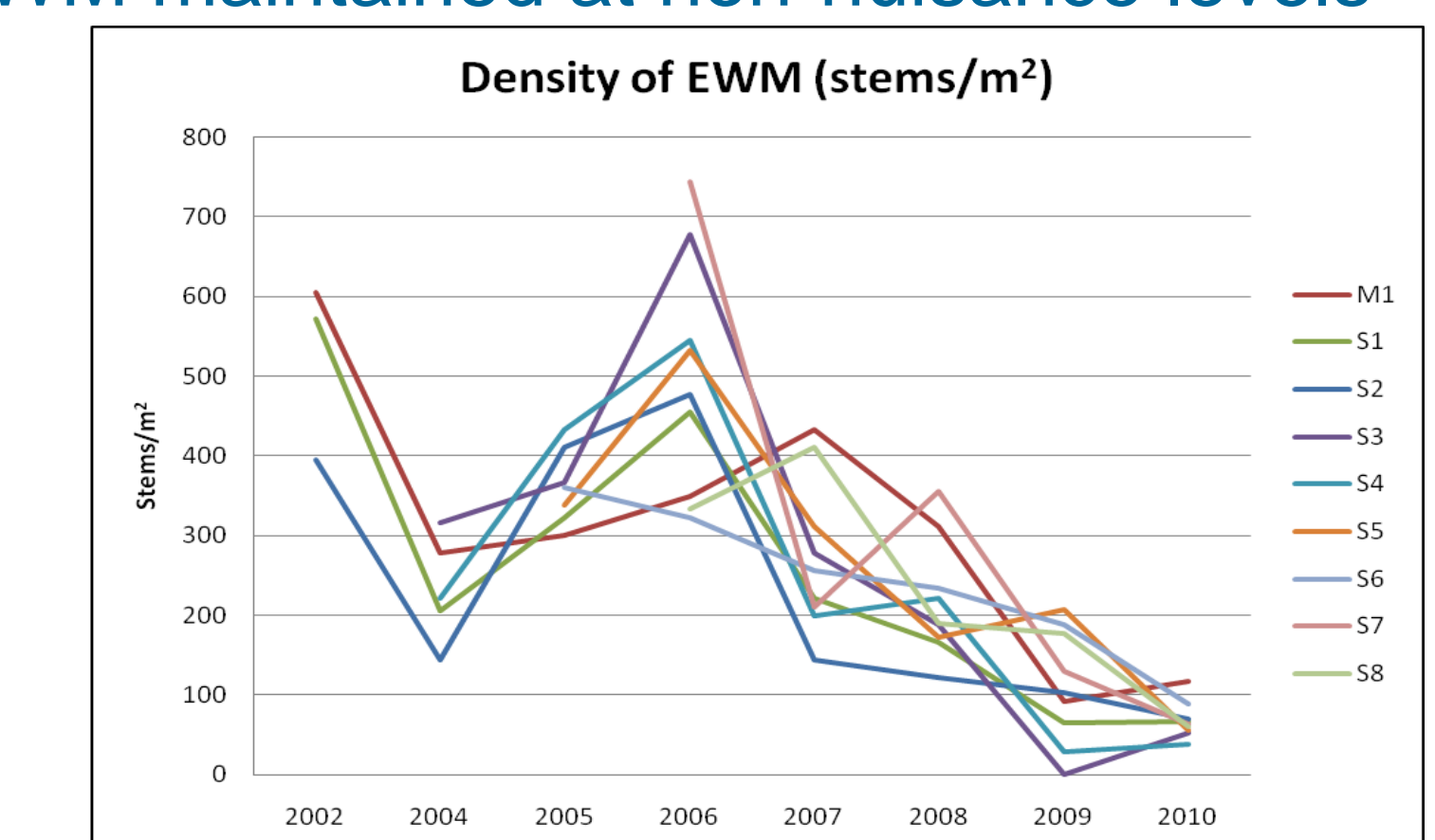
2002 - Dense EWM found lake wide

2004 – 2007 Results

- 8 sites total, all stocked only once
- EWM density fluctuated but decreased steadily
- First native macrophyte found in lake 2006; 5 new natives by 2007

2008 – 2010 Results

- Weevil damage in all sites
- Weevils present in all sites 4-8 years post stocking, but at low levels
- EWM density down to .08-.25 of original amounts
- EWM maintained at non-nuisance levels



Literature Cited

- 1 Cofrancesco, A.F. and H. Crosson. 1999. *Euhrychiopsis lecontei* (Dietz) as a potential biological control agent of Eurasian watermilfoil (*Myriophyllum spicatum* L.). U.S. Army Corp of Engineers Aquatic Plant Control Research Program. A-99-3.
- 2 Solarz, S.L. and R.M. Newman. 2001. Variation in hostplant preference and performance by the milfoil weevil *Euhrychiopsis lecontei* Dietz exposed to native and exotic watermilfoils. *Oecologia* 126: 66-75. *Oecologia*: online August 2000.
- 3 Newman, R.M. and Biesboer, D.D. 2000. A Decline of Eurasian Watermilfoil in Minnesota Associated with the Milfoil Weevil *Euhrychiopsis lecontei* J Aquat. Plant Manage. 38: 105-111.