

Renovate[®], Sculpin[®], and Sonar[®] PlanTEST Susceptibility Assay

Study Site: Sand Lake
(Lenawee Co., MI)

Target Species: Suspected *Eurasian X Northern milfoil hybrid*

Sampling Date: July 6, 2016
Laboratory Receipt Date: July 7, 2016
Number of Sites Assayed (Received): 5 (5)
Assayed Site Identification: Site 1, Site 2, Site 3, Site 4, Site 5
Sculpin Rates Assayed (parts per million 2, 4-D): 0, 1.5
Renovate Rates Assayed (parts per million Triclopyr): 0, 1
Sonar Rates Assayed (parts per billion Fluridone); 0, 6

Quality Control:

Untreated Rate Confirmation (FasTEST™ Measurements versus Theoretical):
Number of Replicates Tested: 1 % Target: 100
2, 4-D Rate Confirmation (FasTEST™ Measurements versus Theoretical):
Number of Replicates Tested: 1 % Target: 108
Triclopyr Rate Confirmation (FasTEST™ Measurements versus Theoretical):
Number of Replicates Tested: 1 % Target: 87
Fluridone Rate Confirmation (FasTEST™ Measurements versus Theoretical):
Number of Replicates Tested: 1 % Target: 87

Methods Summary

Invasive milfoil samples were collected from Sand Lake in Lenawee Co., MI and shipped overnight to the SePRO Research & Technology Campus (SRTC) for baseline screening of responses to multiple common aquatic herbicides for milfoil control. On the day of receipt, milfoil samples were planted in aquaria alongside reference classically 2, 4-D, triclopyr, and Sonar susceptible Eurasian watermilfoil (EWM) and a hybrid watermilfoil (HWM) populations cultured at the SRTC. The reference HWM has been measured as less susceptible to Sculpin and Sonar, but is sensitive to Renovate. It is important to note the hybrid was successfully controlled in the lake it was discovered with Renovate. After a brief transitional growth period, sets of Sand Lake and reference EWM and HWM were exposed to single short exposure of either Sculpin (a.i. 2,4-D amine) at 1.5 ppm as acid or Renovate (a.i. triclopyr) at 1 ppm as acid. Simultaneously, another set of Sand Lake milfoil and reference EWM was statically exposed to a 6 ppb Sonar (a.i. fluridone) treatment.

Along with visual observations of plant herbicide injury, a common biochemical response of plant health was measured a couple weeks post treatment to complete the assay. The herbicide exposure period for the test along with the biochemical indicator in this assay is currently proprietary. However, the auxin screening procedure has been repeatedly tested under specific laboratory conditions and confirmed to be predictive of general field response of tested milfoil to auxin-mimic herbicides and Sonar.



Results and Discussion:

Sculpin

Biochemical injury and visual observations indicated sites 1, 2, and 4 had a sensitivity to Sculpin similar to that of the less susceptible HWM population. Invasive milfoil collected from site 5 had a response similar to the Sculpin-susceptible EWM population. Biochemical response of the site 3 milfoil was not different from the EWM or HWM population to discern susceptibility. However, visual observations indicate a mixed population of milfoil with some susceptible, necrotic and dead, while others were less susceptible to Sculpin, recovered with non-epinastic tissue.

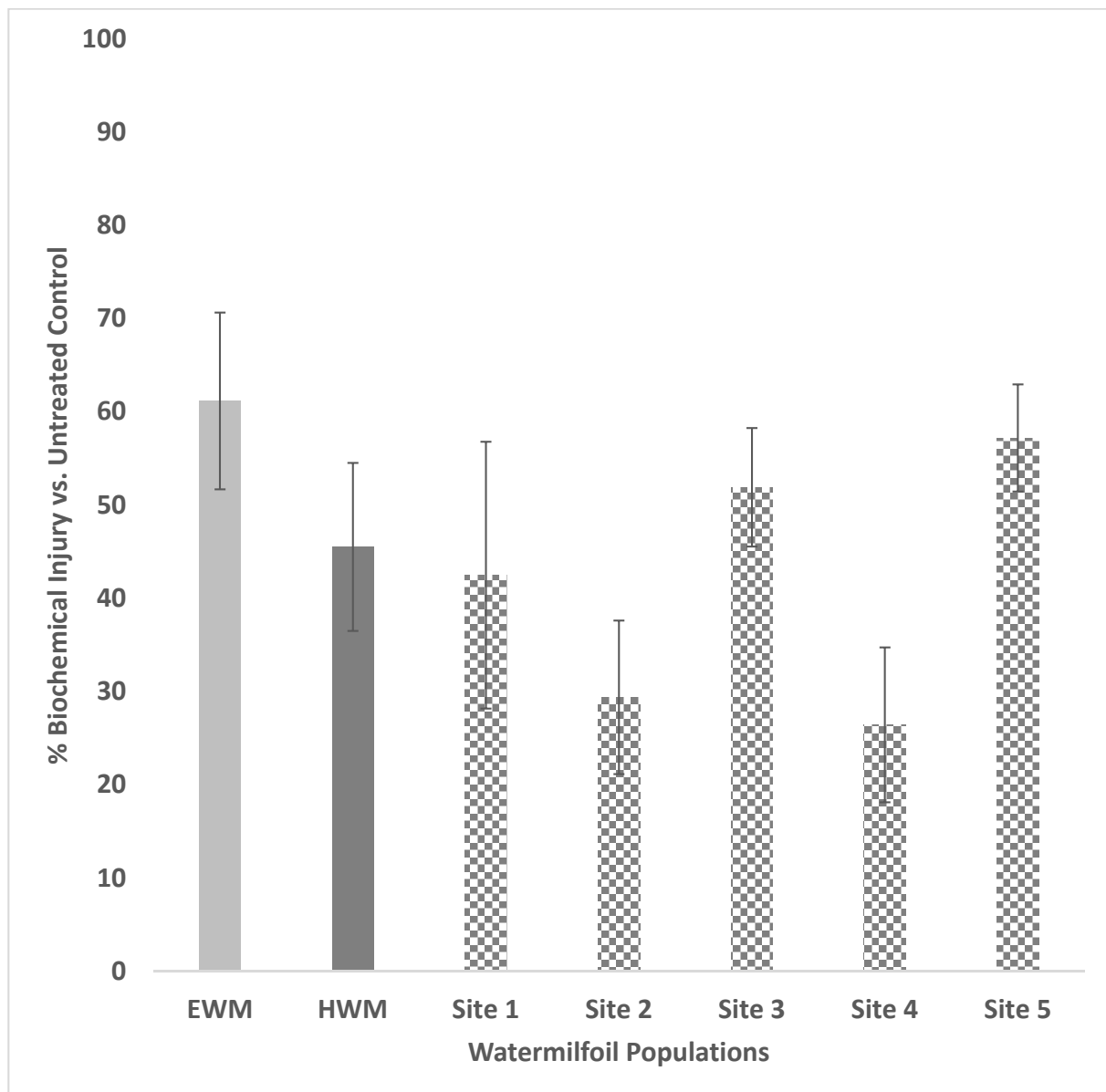


Figure 1. Biochemical injury of the Sand Lake samples and a classically susceptible Eurasian watermilfoil population (EWM) and less susceptible HWM population to a Sculpin treatment. Error bars are ± 1 standard error of the mean (n=4).



Renovate

Biochemically, all but site 4 milfoil were sensitive to Renovate similar to that measured with the EWM, and the Renovate-susceptible HWM population. Visually milfoil from sites 1, 2, 3, and 5 were necrotic and dead, while milfoil from site 4 was recovering from treatment and had produced non-epinastic tissue.

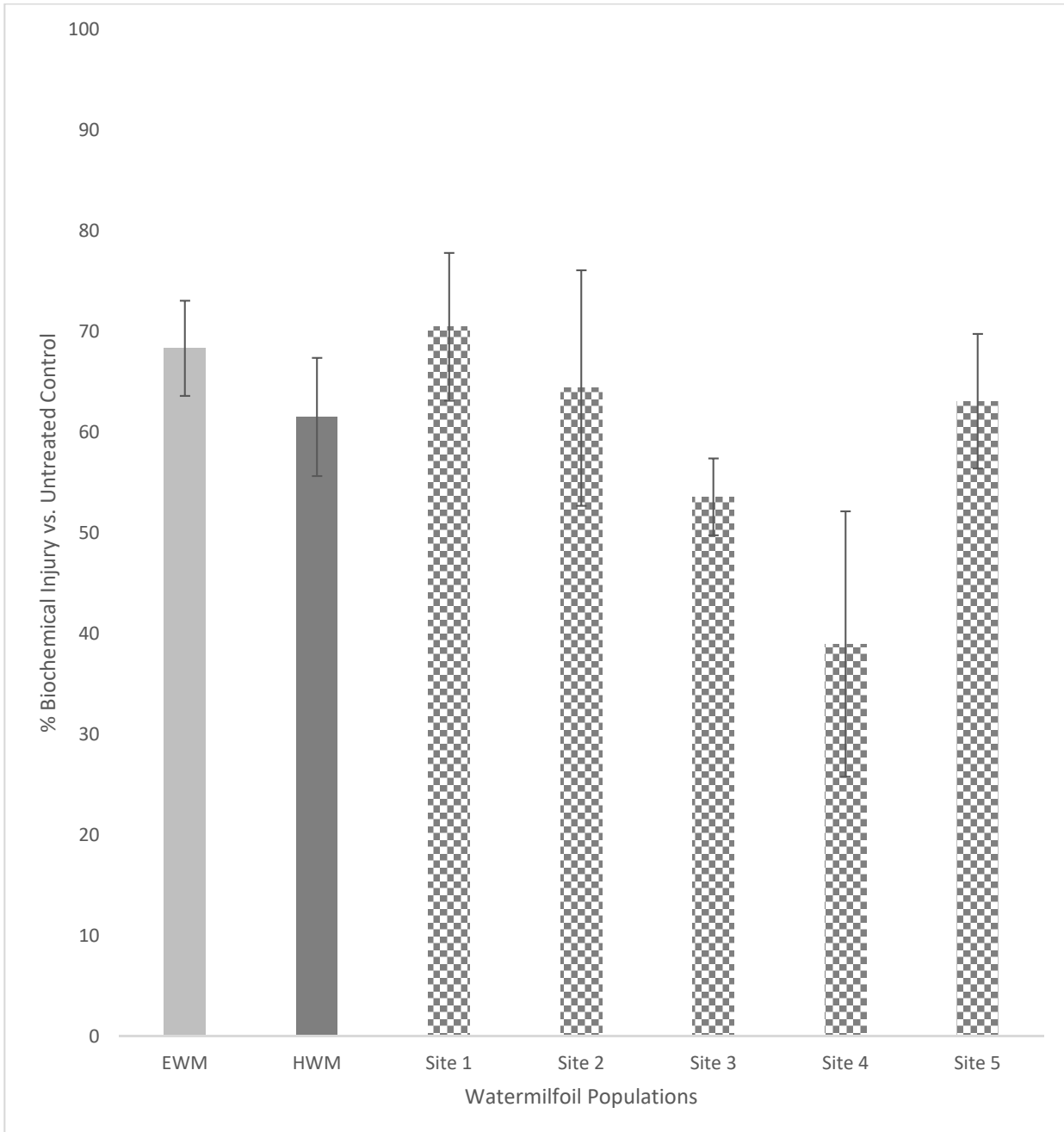


Figure 2. Biochemical injury of the Sand Lake samples, a classically susceptible Eurasian watermilfoil population (EWM), and a susceptible hybrid watermilfoil population (HWM) to a Renovate treatment. Error bars are ± 1 standard error of the mean ($n=4$).



Sonar

All the milfoil sampled from sites 1, 2, 3, 4, and 5 had a biochemical injury and visual response similar to that measured and observed with the Sonar-susceptible EWM population.

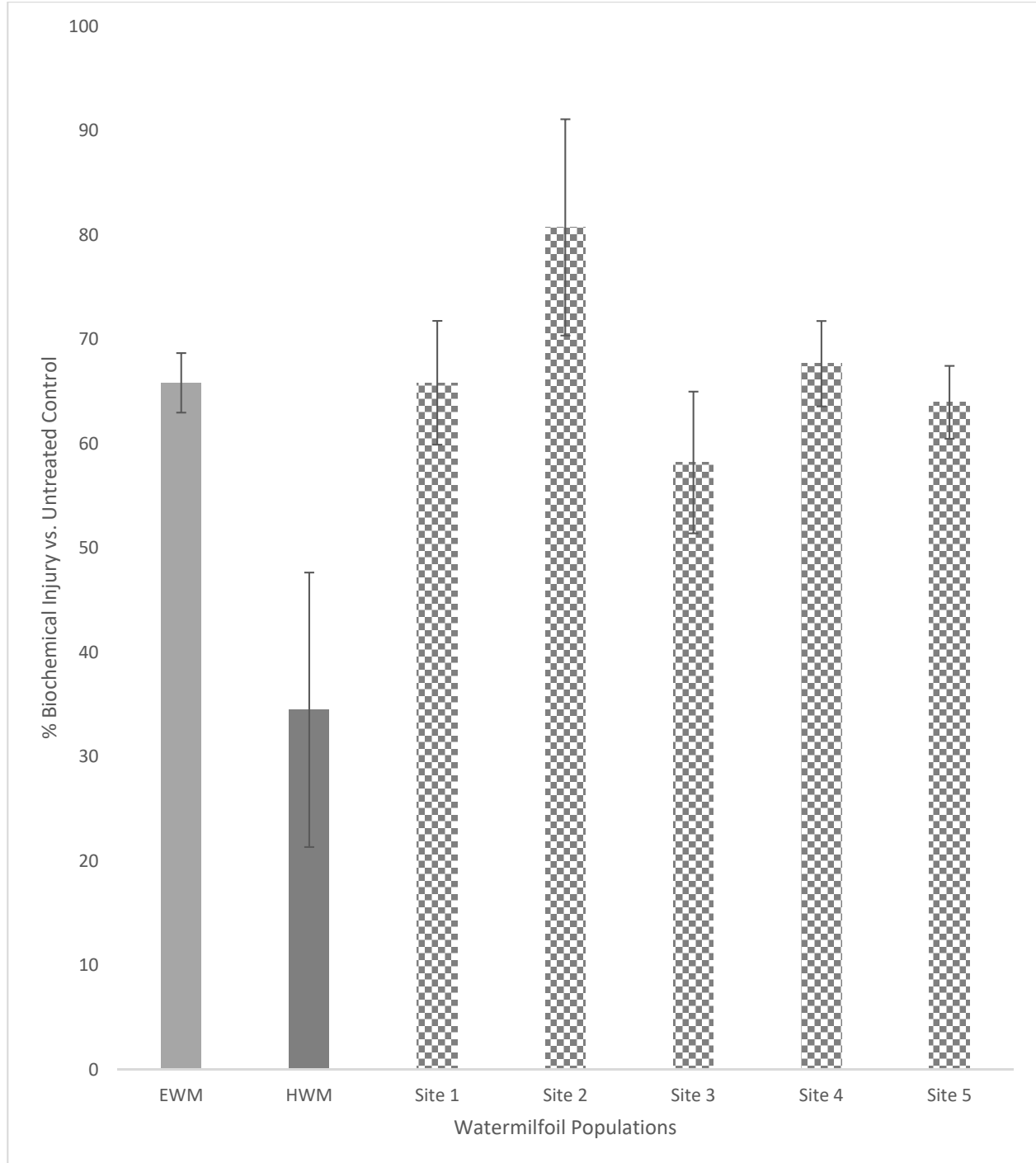


Figure 2. Biochemical injury of the Sand Lake samples and a classically susceptible Eurasian watermilfoil population (EWM) to a Sonar treatment. Error bars are ± 1 standard error of the mean (n=4).



Aquatics Research



Based on these results, typical use patterns of Sculpin (2,4-D) and Renovate (triclopyr) may not fully control milfoil in Sand Lake. Quantitatively, more sites had invasive milfoil that was susceptible to typical Renovate treatment than Sculpin. Modified treatment designs with Sculpin or Renovate implemented to enhance rate and exposure may be successful, and consult with SePRO for plan development. The milfoil collected from Sand Lake had a typical Sonar susceptibility expected with EWM, and standard protocols for Sonar use should provide excellent control.

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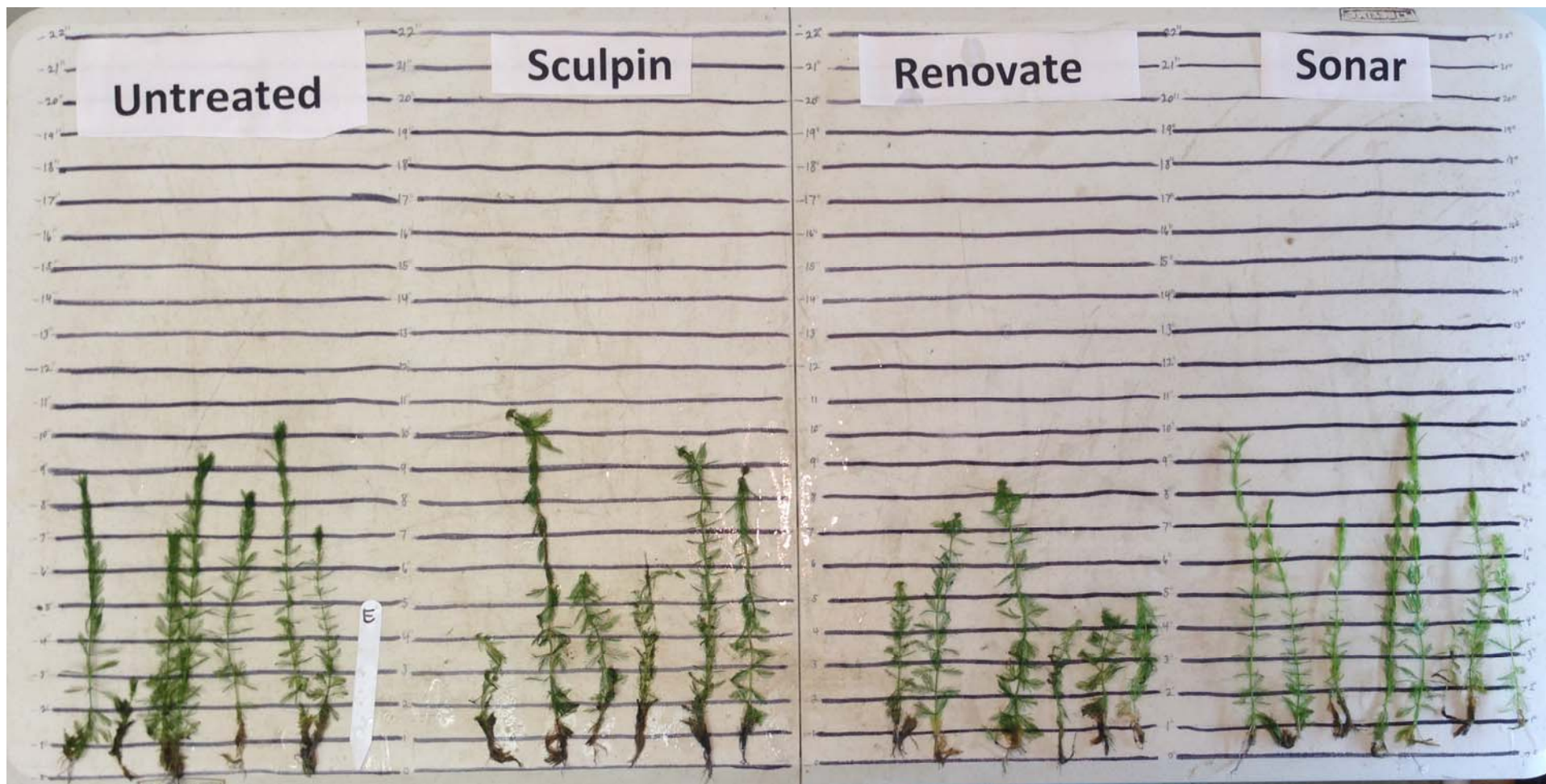


Image 1. Photomicrograph of a Sculpin, Renovate, and Sonar susceptible EWM population at termination of PlanTEST bioassays. Note untreated controls appear healthy, while Renovate and Sculpin treated plants have chlorotic and necrotic apical tissue, and Sonar treated plants have chlorotic apical tissue.

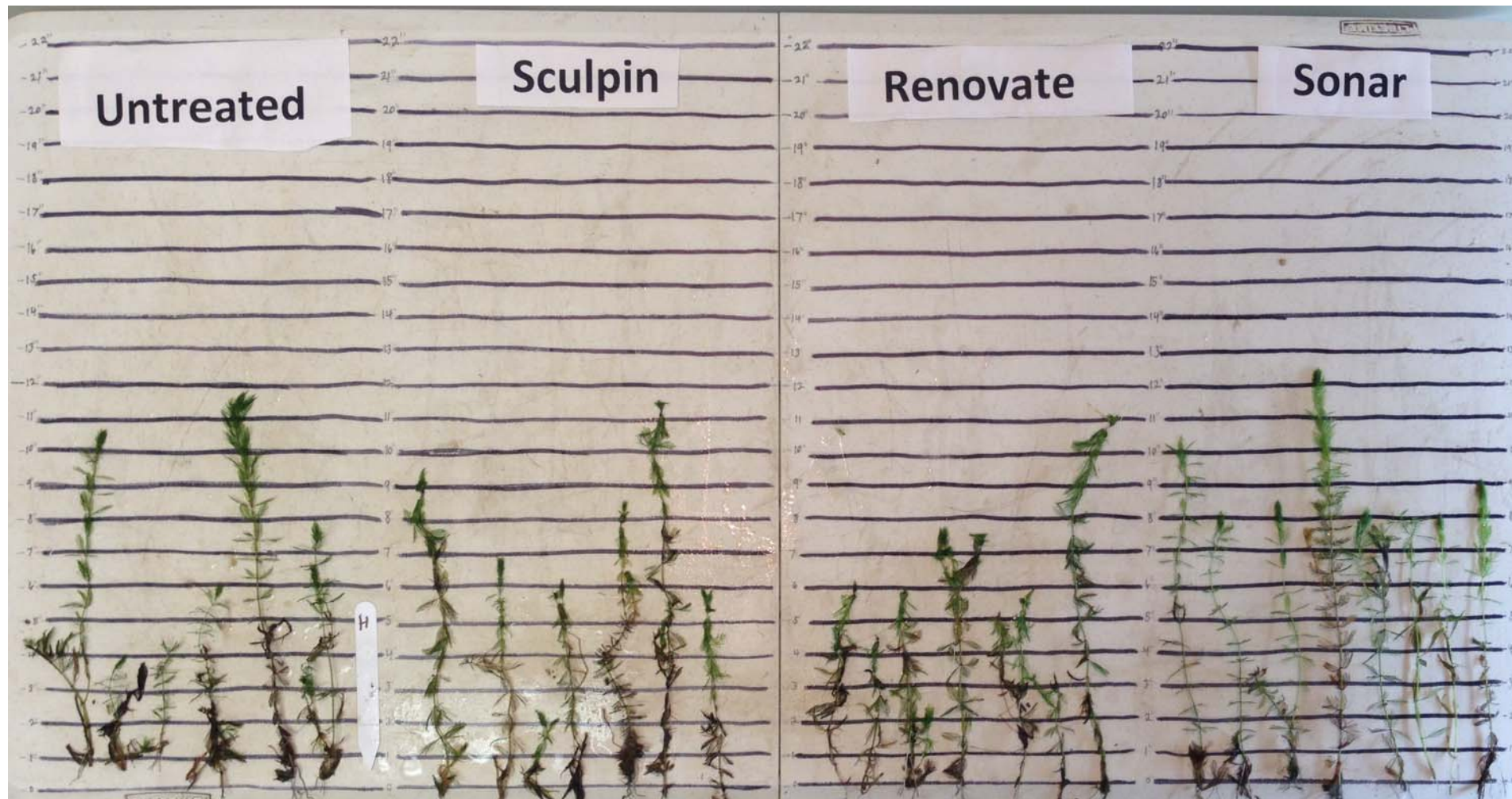


Image 2. Photomicrograph of a Sculpin and Sonar less susceptible HWM population at termination of PlanTEST bioassays. Note untreated controls appear healthy, the Sculpin and Sonar treated plants appear uninjured, while Renovate treated plants have epinastic and necrotic apical tissue.

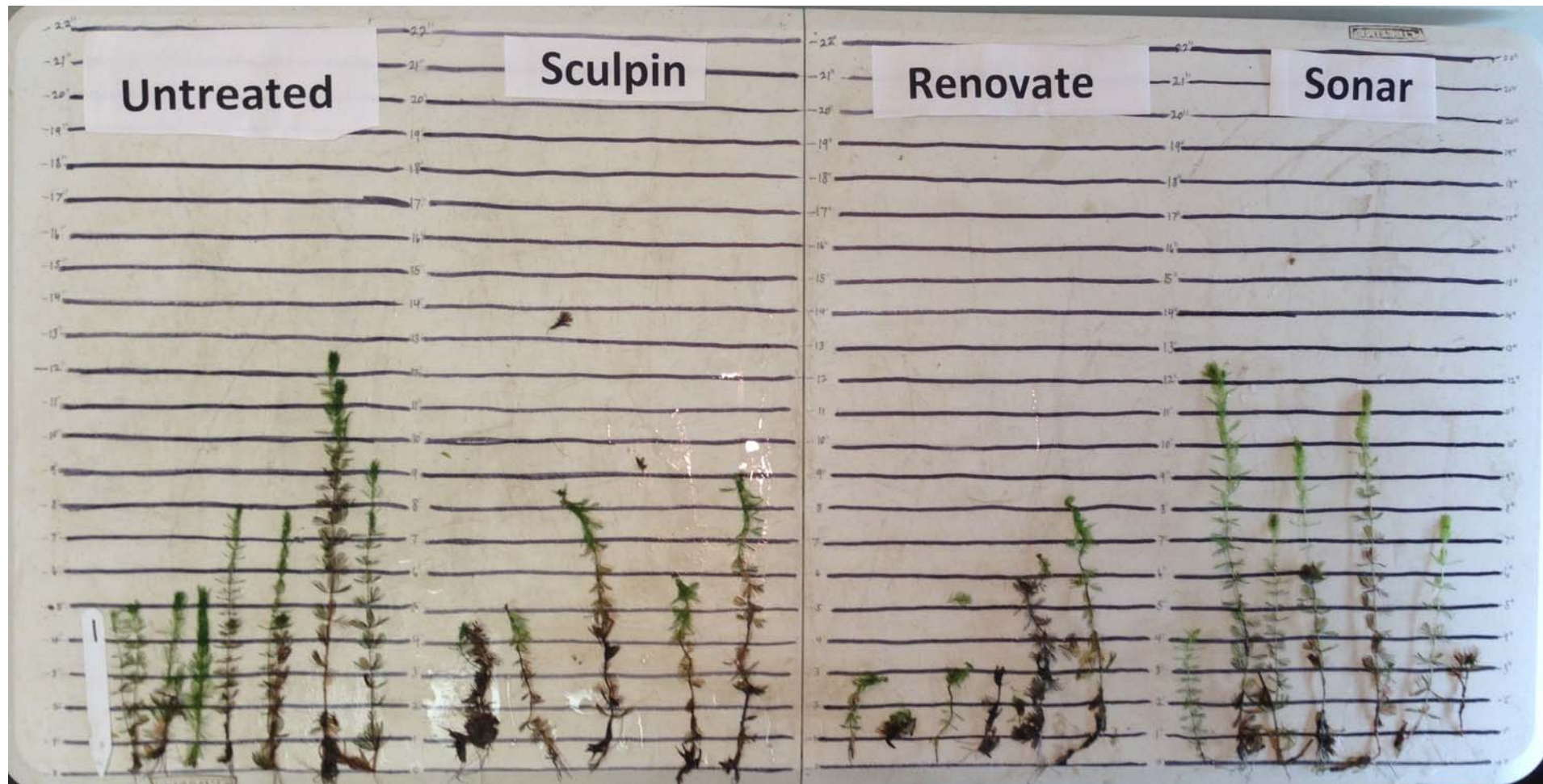


Image 3. Photomicrograph of Sand Lake milfoil collected from site 1 at termination of PlanTEST bioassays. Note untreated controls appear healthy, Sculpin treated plants are a mixture of susceptible chlorotic and less susceptible recovering milfoil, Renovate treated plants have a mixture of chlorotic and necrotic apical tissue, and Sonar treated plants have chlorotic apical tissue.

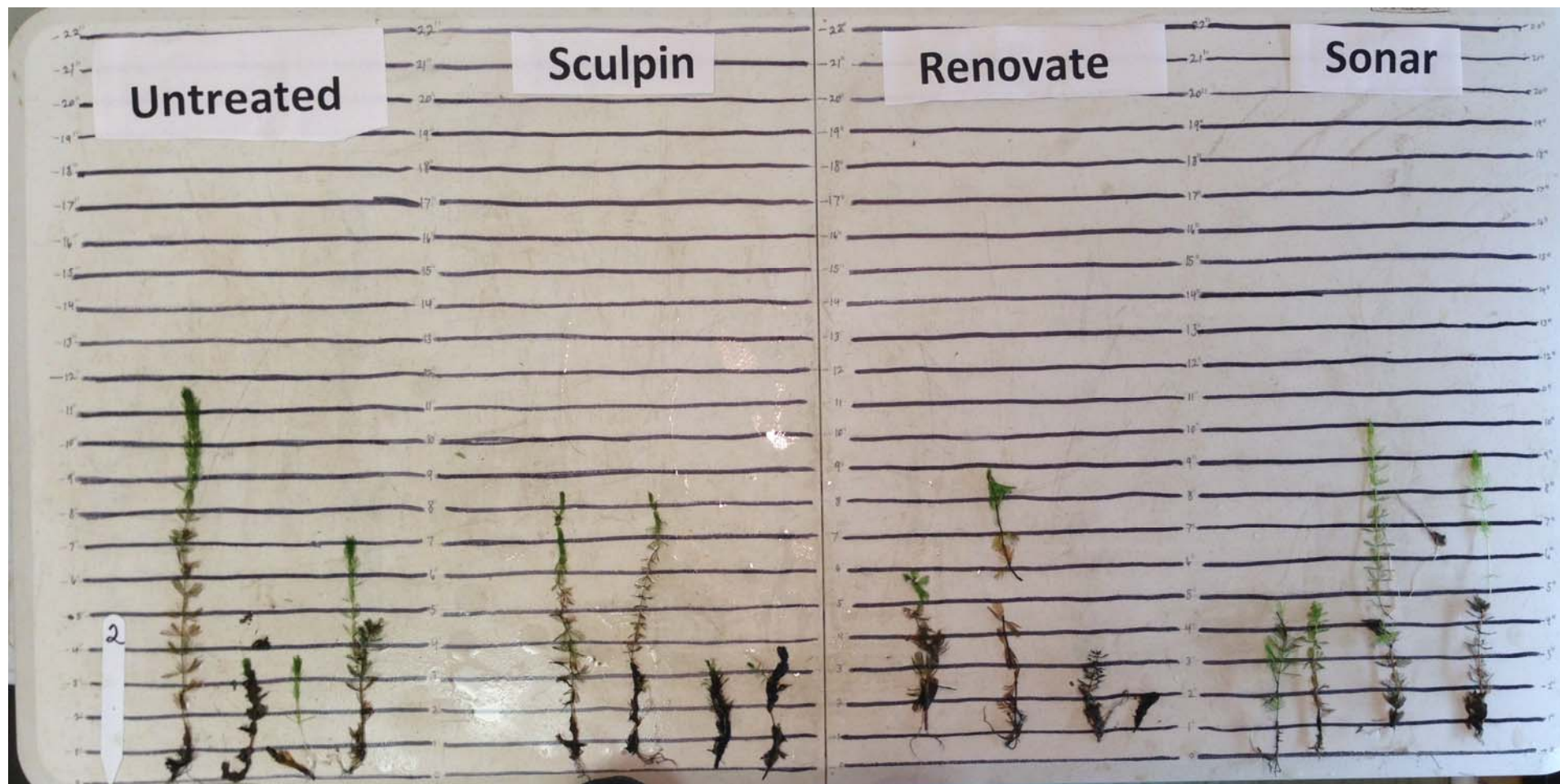


Image 4. Photomicrograph of Sand Lake milfoil collected from site 2 at termination of PlanTEST bioassays. Note untreated controls appear healthy (although few in number), Sculpin treated plants are recovering, Renovate treated plants have necrotic apical tissue, and Sonar treated plants have chlorotic apical tissue.

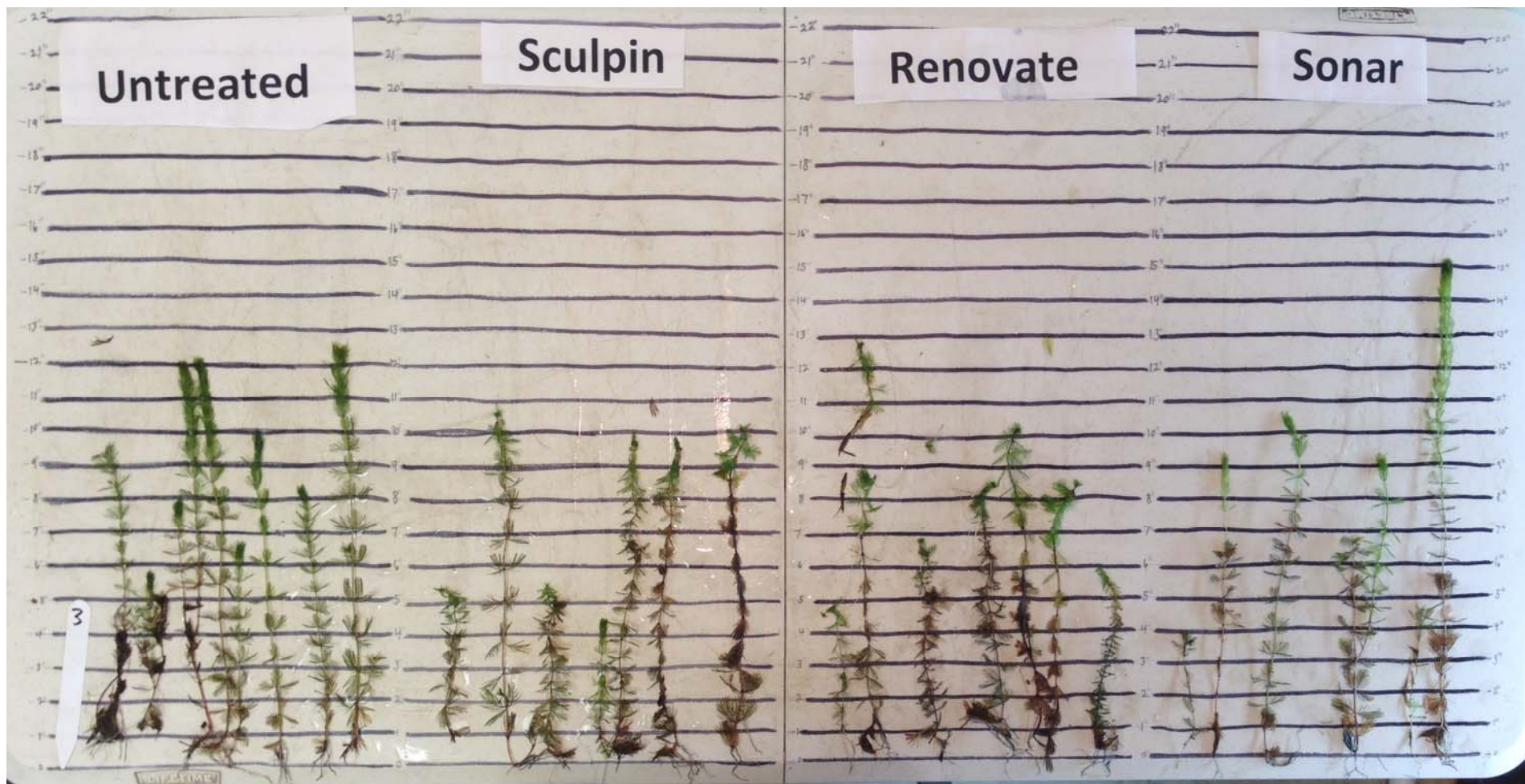


Image 5. Photomicrograph of Sand Lake milfoil collected from site 3 at termination of PlanTEST bioassays. Note untreated controls appear healthy, Sculpin treated plants are recovering, Renovate treated plants are a mix of necrotic apical tissue and recovering plants with more necrotic than surviving, and Sonar treated plants have chlorotic apical tissue.

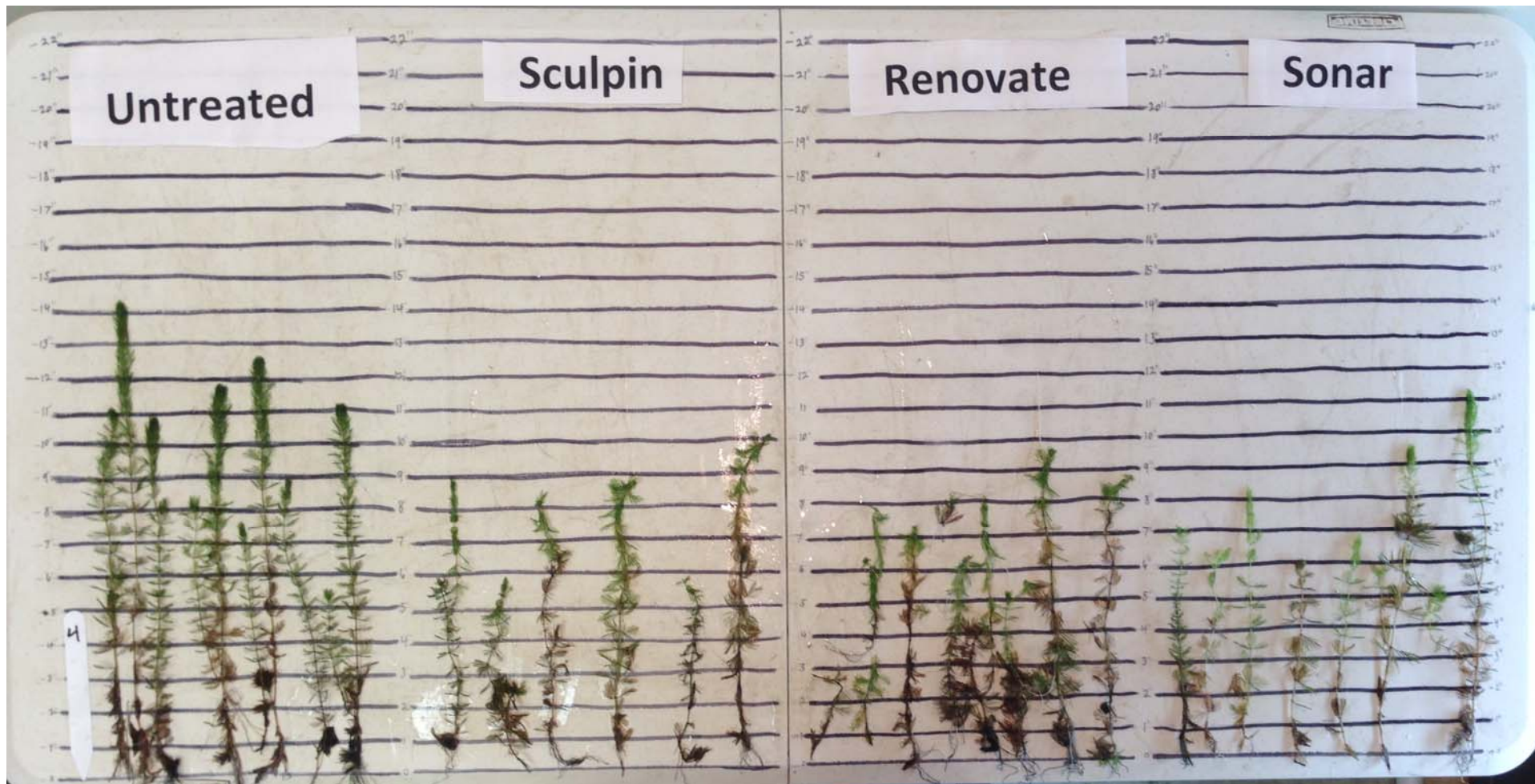


Image 6. Photomicrograph of Sand Lake milfoil collected from site 4 at termination of PlanTEST bioassays. Note untreated controls appear healthy, Sculpin treated plants are recovering, Renovate treated plants are recovering, and Sonar treated plants have chlorotic apical tissue.

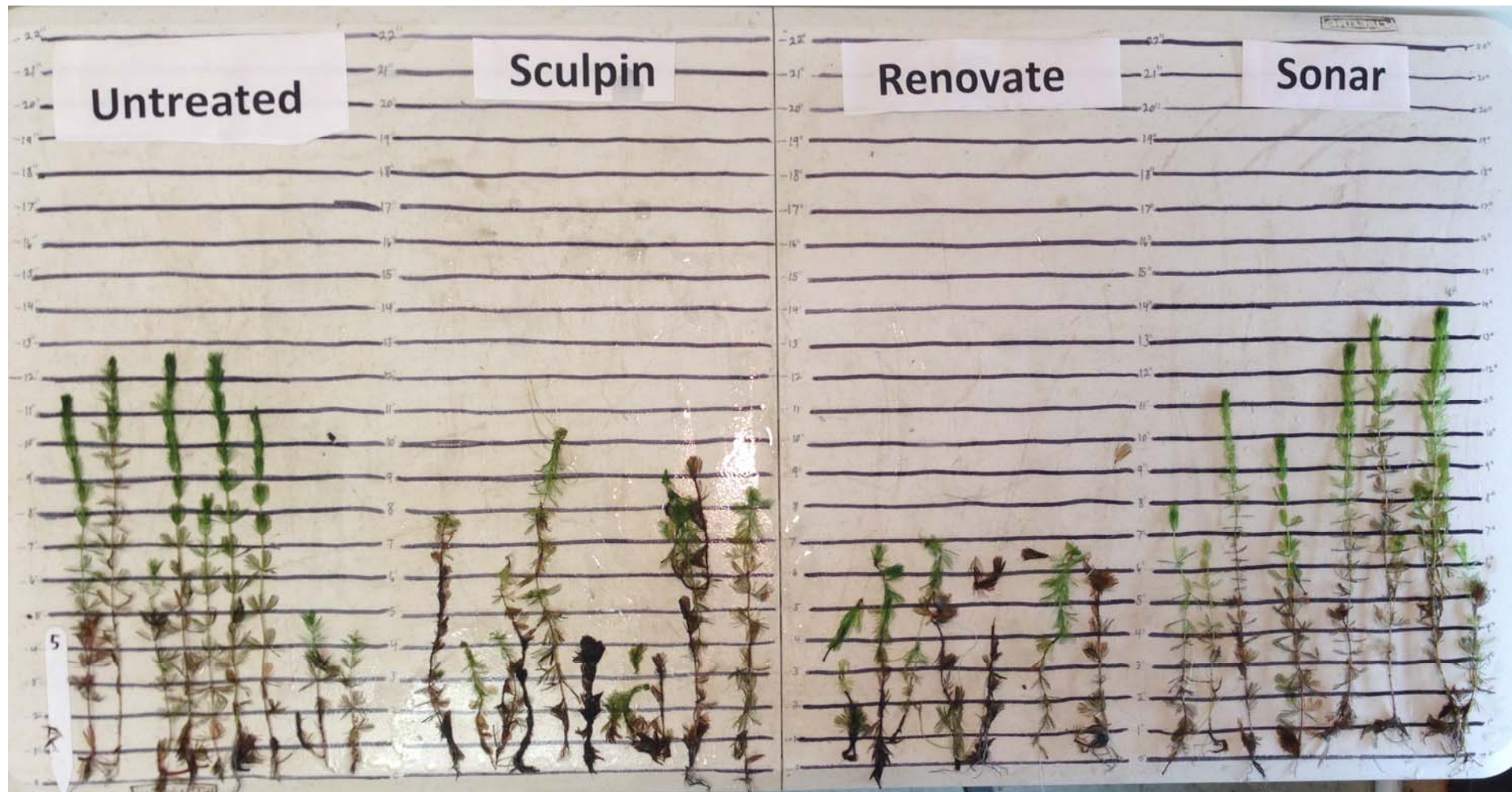


Image 7. Photomicrograph of Sand Lake milfoil collected from site 5 at termination of PlanTEST bioassays. Note untreated controls appear healthy, a majority of the Sculpin treated plants appear necrotic with a few showing signs of recovery, Renovate treated plants are necrotic and fragmenting, and Sonar treated plants have chlorotic apical tissue.