

2016 Year End Report to the Initiative Foundation
Koronis Lake Association
Starry Stonewort Pilot and Management for MN Lakes

Summary:

Pilot project work, verification, and results were completed in fall of 2016 as planned. Initial start of project was not as planned due to growth characteristics of Starry Stonewort. We needed to delay the start of the pilot until the algae was high enough off the bottom to mechanically remove. Initial results were promising with over 250,000 lbs. of Starry Stonewort biomass being removed by mechanical and hand removal. Chemical treatments were very effective in continuing to reduce the biomass of the Starry Stonewort with the most dramatic results in the area both pulled and chemically treated. Only one chemical treatment was written into the pilot, with the consultant's recommendation, the pilot was modified to utilize two different forms of the chemical, liquid and granular, to achieve better results. Following each chemical treatment we observed increased production of the bulbils (stars) in those areas chemically treated. This was a new observed phenomenon according to the consultant.

The third party evaluation and testing data is included. The protocol submitted and approved by DNR was used for the evaluation.

The University of Minnesota sampled bulbils following all of the pilot activities that were completed. Initial laboratory testing demonstrated that bulbils remained viable even after two chemical treatments. Next year's verification surveys will be critical to determining what happens in actual lake situations.

The mechanical puller equipment was also evaluated as part of the pilot. It was found to be very effective in shallow areas, but not as effective in deeper areas as claimed by the manufacturer. It also may have limitations due to its width to effectively manage large areas.

It was determined that either mechanical pulling, or mechanically pulling with chemical treatment, or just chemical treatment can effectively manage for short terms (until more information is known next year) small areas of Starry Stonewort infestation below a nuisance level.

Project Work:

Pilot Set-up and Planning – The project plan was to perform the pilot in one of several pre-determined areas, but on review with Third Party Auditor and DNR it was decided that these areas were not ideal and another area was delineated for the pilot that met the key criteria. Prior to the start of the pilot project these areas were monitored on a weekly basis with a double headed sampling rake to check growth and height of Starry Stonewort off of the bottom. Once it was determined that the conditions were right a final delineation verification of conditions was performed. The results are in the attached report and discussed below.

Mechanical Pulling with gleaning - In mid-July it was determined that we were ready to begin the pilot project. The mechanical puller came into the area around August 8th and underwent a complete cleaning with added chemical cleaning protection prior to being allowed entry into Lake Koronis. Prior to any pulling activities 900 feet of seine net was placed in the shape of a large "U" with the open end facing the shore line. With the shore line being used as one side of the "U" approximately 3.8 acres was contained. On August 11th it started working in the pilot area. The mechanical puller worked in this area until September 9th. Adjacent to this area was an additional 2.8 acres that was under permit for pulling and chemical treatment also. This area was used as a comparison pilot and was only treated with chemicals and not pulled which allowed for greater evaluation of the pilot plan. With mechanical pulling and diver gleaning it was estimated that 250,000 lbs. of biomass were removed from the 3.8 acre

portion and taken to a location where the waste could deteriorate and not be available for further dispersion.

Chemical Treatment - Two chemical algaecide treatments were applied to the entire 6.6 acre area. The first treatment was on September 21, 2016 and used Cutrine Plus liquid. The second application was on October 11, 2016 and Cutrine Plus Granular was used. Application sheets from applicator are attached.

Verification by Third Party Auditor – Prior to gaining the DNR permit the project was required to submit a sampling protocol to DNR and to be reviewed by the University of Minnesota. This approved protocol was used for the sampling. Blue Water Science, the third party auditor, completed the initial area reviews prior to the start of the pilot project. Following each step of the pilot the third party auditor verified the work performed per the DNR approved protocol submitted to DNR as part of the permitting requirements. As part of the verifications they evaluated density and height of mass off bottom of Starry Stonewort. Samples were taken to do dry mass evaluation. Data along with observations are in the attached report. This report will be important as the success or failure of the pilot is considered in future years. Observations listed in this report are as follows:

SSW Observations in Lake Koronis in 2016

Several SSW observations were noted over the project period of July through October:

- All 3 approaches (mechanical harvesting, algaecides, and harvesting plus algaecides) were able to control nuisance SSW growth.*
- The 3 measurement methods using the density scale 1-4, biomass as dry weight, and the SSW bed depth were consistent in measuring the abundance of starry stonewort. For example in Figure 6 in report, the relative abundance ranking for harvesting with algaecides, the algaecide only, and the reference area had the same trends for all 3 methods.*
- After mechanical harvesting, the survey on September 13 showed SSW biomass was less in the harvested area (red bar) compared to pre-harvesting conditions (Figure 6 in report). In contrast the biomass, measured as dry weight on September 13, in the area where algaecides was not yet been applied and in the reference area increased compared to pre-treatment biomass.*
- A single Cutrine Plus (liquid) treatment applied on September 21, 2016 and sampled on October 7 found SSW biomass (measured as dry weight) was significantly reduced. In both treatment areas, harvesting with algaecide, and just the single algaecide application biomass (as dry weight) reductions were 99% or better. Using the MnDNR density scale of 1-4, the mechanical harvesting plus algaecide area had a lower density than just the algaecide treatments but the rake density results indicated there was light SSW growth in both treatment areas (Table 1 in report).*
- The second Cutrine Plus (granular) showed SSW biomass (as dry weight) reductions were still greater than 99%, but biomass was already diminished after the first algaecide application.*
- Variability within SSW beds was great as shown with the high standard deviations associated with the dry weight results in Table 1 in report.*
- High variability was also found over distances just feet apart. Sampling for SSW density using one rake and sampling for biomass using another rake on the other side of the boat, 6 feet apart sometimes found major differences in SSW abundance.*
- Sampling for SSW biomass using the rotating rakehead technique was appropriate for Lake Koronis because the same technique was used for all sites in all surveys. However, as the rake sample was taken, surrounding SSW was likely entangled. The SSW biomass samples at sites of heavy growth probably overestimated the actual dry weight biomass within a 0.018 m² area that was theoretically sampled with the rake. Biomass as dry weight determined in the Koronis study may not be comparable to SSW biomass determined in other studies where different collection methods were used.*
- On the October 28 sample date, bulbil densities were higher in the area that was treated twice with a copper-based algaecide compared to the area that was harvested first and then treated twice with copper. Bulbil densities were also higher in the twice treated area compared to the untreated reference area (Table 3 in report).*

• *It is unclear why bulbil densities were found in higher densities in the area treated twice with Cutrine. It could be an artifact of sampling or maybe it is related to the greater initial SSW biomass that was treated. It is also possible that the Cutrine Plus treatment enhanced bulbil production. There is some speculation that reduced SSW biomass after a treatment receives more light and light induces bulbil formation. However, after the second Cutrine Plus application the samples collected on October 28 had higher densities in the area treated twice compared to the area that was harvested and then treated twice (Table 3 in report). Sunlight exposure to the reduced SSW biomass was the same in both treatment areas, but there were more bulbils in the area treated twice. The untreated reference area had low bulbil densities.*

Equipment Evaluation:

The mechanical puller was also evaluated as part of the pilot. It operated very well with no breakdowns that inhibited its operation. It had been used very successfully with pulling other species, but this was the first time it had been used for Starry Stonewort. According to the equipment owner, in the cases of other species that were longer plants that were up, off the bottom substrate, the equipment could “grab” the plant and effectively pull those plants out of deeper water. With Starry Stonewort which grows with large pillow like structures the equipment could reach down only about 4 feet and then pull out whatever was “massed” together. If it went lower in the water than the main roller the Starry Stonewort would be pulled up but would not adhere to the incline belt for removal, it would just circle around the roller. It was not as effective in deeper areas as claimed by the manufacturer. It was however, found to be very effective in shallow areas. The operators did experiment with using the rollers as a plow to push the Starry Stonewort into a position that would allow it to be more easily removed. All of this work was performed inside a containment net that was installed and maintained throughout all pilot work.

The mechanical puller was found to also have limitations due to its width to effectively manage large areas. Managing any large area would be possible, but take some time to clear the area. However, in areas close to and around docks and boats, this width was found to be an advantage because it could enter into tight areas and effectively remove Starry Stonewort. When workers were in the water they could hand remove the Starry Stonewort directly under the docks and boats and feed it into the mechanical puller. This procedure was very effective.

Comments regarding project goals 1 & 3 as listed in the contract:

Goal 1

Pilot the "best-to-date" Starry Stonewort management practices in the control of a defined area on Lake Koronis. *This is to be determined with further evaluation.*

Expected Outcome of Goal 1

Expected outcome defined by key success factors:

1. Area Chosen meets the criteria for the pilot, manageable. *Area selected with Third Party Auditor and DNR approval.*
2. Successful extraction. *Starry Stonewort was successfully extracted from approximately 3.8 acres which allowed about 2.8 acres to be only chemically treated as comparison to provide a more thorough way to evaluate the success or failure of the pilot management plan.*
3. Seining operation works well and screen size appropriate. *900 feet of seining net was installed in the lake surrounding the work area. With using the shoreline as one of the edges of the polygon created, the net surrounded the entire work area and was maintained in place throughout all activities including the chemical treatments. Observational evidence showed that it worked very well*

to contain small pieces/fragments of Starry Stonewort. Maintaining the net in place may have helped to improve the effectiveness of the chemical treatments.

4. Effective chemical treatment. *Verification data from Third Party Auditor demonstrated effectiveness of chemical treatments on “vegetative” portions of the plants which were visibly damaged by the chemicals.*

5. Time component - Area is maintained for 5 years without significant SS growth. *In place.*

6. The pilot allows us to learn reasonable management/control measures. *In process.*

7. Pilot widely adoptable. *Pilot process shared with DNR and with several of the other lakes that have had Starry Stonewort infestation identified.*

Other factors that relate to any project such as this:

- No injuries – *One injury of a sprained ankle.*

- No legal complications – *Unaware of any.*

- No breakdowns in equipment – *The mechanical puller did not have any breakdowns that impacted work schedule. Other accessory equipment had some breakdowns that did impact schedule, trucks, etc.*

- Project completed on time, on schedule, and under budget. *Project did not start on anticipated schedule and was completed this year slightly later than hoped, however all work was still completed including the verifications. The budget was slightly exceeded due to the second chemical treatment which included an additional verification step, but the In-Kind match dollars were well above what was anticipated. The In-Kind match was high because much of the work completed will also apply to the next phase of the pilot. Over-all, this phase was completely paid for without the use of any of the Imitative Foundation funding.*

Goal 3

With pilot success, this management plan becomes recognized and acceptable for broader usage across the state. *We are not yet ready to declare the pilot a success, although the pilot process has been shared with other associations working on Starry Stonewort issues.*

Expected Outcome of Goal 3

Expected outcome defined by key success factors:

1. Dissemination to other lakes – *We are not yet ready to declare the pilot a success, although the pilot process has been shared with other associations working on Starry Stonewort issues.*

Additional Discussion Regarding Project Work:

The pilot plan allowed for two types of management plans to be used in a delineated area on Lake Koronis.

One of the plans was an area that had been mechanically pulled followed by two algaecide treatments, one was a liquid and the other was granular. The granular application was used to allow chemical application and dispersion to be on the bottom sediment. Treatments occurred within the same month following label.

The second plan was in the adjacent area where no mechanical pulling was performed and the same two algaecide treatments were applied. These areas were compared to another area about ½ mile away, on the same side of the lake, where no treatment was performed, pulling or chemical treatments.

Results summary from the Third Party Auditor report:

Mechanical harvesting/pulling of SSW resulted in a reduction in biomass of 69%, whereas the biomass in an adjacent unharvested area increased 75% and the biomass in a reference area increased 25%.

After the first algaecide treatment in an area that was previously harvested, SSW biomass was reduced by 99% compared to the pre-chemical treatment biomass. In the adjacent area, which was not previously harvested, the algaecide treatment also resulted in a 99% decrease in biomass as well. In the untreated reference area, SSW biomass decreased naturally by only 45%.

After the second algaecide treatment using Cutrine Plus (granular), the SSW biomass in the treatment areas remained at 99% decrease compared to the pre-chemical treatment biomass. The biomass in the untreated reference area declined naturally by 78%. The SSW density and bed depth followed the same patterns.

Attachments:



Koronis R16 - SSW
12-28-16.pdf



PLM Treatment 1.pdf



PesticideApplicationR
ecordseptem.pdf