



MEMORANDUM

Comfort Lake-Forest Lake Watershed District

Date: April 13, 2026
To: CLFLWD Board of Managers
From: Mike Kinney, District Administrator
Subject: Starry Stonewort Rapid Response Plan



District Wide

Background/Discussion:

Staff have reviewed the District's Starry Stonewort Rapid Response Plan with the purpose of ensuring that all guidance documents are updated with the most current management procedures. Additionally, staff performed a tabletop preparedness exercise where all steps were simulated, available resources were visually inspected, and District staff reached out to contacts that are not communicated with them on a regular basis.

An effective rapid response plan for Starry stonewort infestation depends on early detection. Current control methods suggest a combination of liquid chelated copper algaecide and mechanical harvesting with diver-assisted suction harvesting (DASH). If possible, floating barriers around the perimeter of the treatment area can be used to prevent spread and maintain algaecide concentrations. However, final treatment approach should be discussed with the MN DNR, Blue Water Science, and algaecide applicator.

Currently the most effective management activities that the District can perform are all prevention and early detection focused. Watercraft inspectors provide a valuable opportunity to engage and educate the public regarding the risks of spreading AIS. Additionally, once they have been trained WCI can perform regular early detection inspections at public boat launches with the purpose of detecting a potential AIS infestation and performing rapid management activities.

Attached:

Starry Stonewort Rapid Response Plan

Comfort Lake – Forest Lake Watershed District (CLFLWD) Species Profile and
Rapid Response Plan
Starry Stonewort (*Nitellopsis obtusa*)



Photo of starry stonewort thallus and bulbils (Minnesota DNR 2020c.)



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Introduction

Starry stonewort (*Nitellopsis obtusa*) is a non-native freshwater invasive macroalga that is native to Europe and Asia (Glisson et al. 2020). While it is considered a species of conservation concern within its native range, in North America it is an aggressive invader (Glisson et al. 2018). Starry stonewort was first introduced into the United States through the ballast water of ships navigating the Great Lakes (Larkin et al. 2018). The oldest account of starry stonewort in North America was found in the St. Lawrence River in New York in 1974 (Glisson et al. 2020). According to D.J. Larkin et al. (2018), by 2012 reports of starry stonewort expanded to Pennsylvania, Indiana, and interior Michigan, to Wisconsin in 2014, and Minnesota and Vermont in 2015. To the researcher's knowledge, the current known distribution of starry stonewort in North America spans two Canadian provinces and seven U.S. states. Currently, there is ongoing research that will look to quantify the potential negative ecological effects of starry stonewort, but there is concern due to its pattern of growing in large, dense, monotypic stands that cover lake-bottoms and could outcompete native aquatic vegetation.

Reproductive Biology

Characeae, the family to which starry stonewort belongs, are capable of reproducing both sexually and vegetatively (Larkin et al. 2018). In starry stonewort's native range, reproduction is primarily achieved through fragmentation and bulbil production. Bubbles are star-shaped, starch-containing organs for hibernation and clonal multiplication (Larkin et al. 2018; Wersak 2020). These structures are routinely produced but are most abundant in late summer (Minnesota DNR 2020c.). Under certain conditions, bubbles may be a less effective reproductive strategy compared to sexual reproduction as they are short lived, can only be transported short distances out of water, and are less viable in shallow habitats that experience winter freezing and summer drying. Comparatively, sexual reproduced structures can persist dormant in sediments for long periods of time and can be transported by waterfowl (Larkin et al. 2018). Fortunately, to date, only sterile or male plants have been observed in North America and bulbil production is likely the main reproductive mechanism of starry stonewort (Glisson et al. 2018).

According to Larkin et al. (2018), a potential reason for why only males are present in North America may have to do with the fact that in its native range, where males and females are present, starry stonewort exhibits protandry: male organs develop and mature throughout growing season and female organs develop late in the growing season. The researchers suggested North America's environmental conditions such as high latitudes and cold climates may shorten the growing season and inhibit development of female organs. Their alternative hypothesis is only males survived introduction into N.A. and spread clonally. Regardless, it is fortunate to only have clonal multiplication rather than sexual reproductive starry stonewort as managing the latter could be more difficult.

Native and Introduced Habitats

As in its native ranges, introduced populations of starry stonewort in North America preferentially seem to colonize calcareous, neutral to alkaline, mesotrophic to eutrophic waters on a variety of substrates (Larkin et al. 2019). While native populations have been observed growing 7m deeper (Larkin et al. 2019), introduced populations are typically observed growing at depths between 0.5-7m in waters with slow moving currents (Skawinski, P. M. 2018)

Parameter	Native range			Introduced range		
	Min.	Max.	Mean	Min.	Max.	Mean
Depth (m)	0.4	31	3.9	—	—	—
Summer temperature (C)	14.0	28	16.1	18.2	25.4	23.0
Dissolved O ₂ (mg/L)	—	—	—	3.4	13.5	9.3
Oxidation reduction potential (mV)	—	—	—	46.3	277.1	98.4
pH	3.8	9.8	8.0	7.3	9.2	8.5
Conductivity (µS/cm)	32	2,880	228.3	160.7	499.2	301.3
N-NH ₄ (µg/L)	0	494	218.0	9.7	171.6	56.0
N-NO ₃ (µg/L)	0	660	177.7	2.4	1,732	230.9
Total N (µg/L)	0	7,800	873.9	—	—	—
Soluble reactive PO ₄ (µg/L)	0	1,015	12.0	0.6	110.7	11.9
Total dissolved P (µg/L)	2	430	50.2	6.6	172.2	24.6
Dissolved organic C (mg/L)	—	—	—	3.6	50.2	10.3
Ca (mg/L)	5.2	172	92.5	28.8	107.1	50.8
Mg (mg/L)	3.4	17.5	10.7	1.2	20	9

Figure 1: Environmental conditions of lakes with starry stonewort in both native and introduced ranges (Larkin et al. 2019).

Ecological Effects in Invaded Ranges

Starry stonewort's effects on invaded ecosystems is actively being researched though initial findings indicate similarities with other aquatic invasive species (AIS) and anecdotal evidence of impacts in introduced ranges give reason for concern. According to Larkin et al. (2019), starry stonewort has the ability to form dense mats on lake bottoms that could displace and shade native species, especially in shallower waterbodies where it can fill the entire water column. Other Characeae species can alter water chemistry and nutrient cycling through high production, nutrient uptake, and low rates of decomposition (Larkin et al. 2019). Again, more research is needed to scientifically verify these effects, however, there is at least some early evidence to support these negative impacts as one study found increasing abundance of starry stonewort was associated with decreased native plant species richness and biomass in four New York lakes (Brainard and Schulz 2017).

Risk of Starry Stonewort introduction into District Lakes

Viability of Starry Stonewort out of Water

It has been well documented that AIS spread from one waterbody to another primarily through anthropological means. The ability for AIS to survive out of water and resist desiccation (drying out) is an important factor in its ability to be viable after transport. Like many other AIS, starry stonewort occurrences have been linked to boat launches and proximity to other infested lakes which suggests

transport is primarily via overland travel of boats and trailers. To assess the risk of overland transport of starry stonewort, Glisson et al. (2020) investigated the species desiccation tolerance and viability out of water. The following were the main findings of their research:

In their research, Glisson et al. (2020) performed tests in both a lab and outdoor setting. This plan will focus on results from outdoor experiments, as they are most applicable to real life conditions. Desiccation rates were tested on 4 sample types: single fragment (an apical node and two nodes along the [thallus](#), 10-20cm long), small clumps (egg-shaped clump 6 x 3cm), large clumps (egg-shaped clump 9 x 6cm), and bulbils. Results showed that single fragments were no longer viable at 1 hour out of water, 6 hours for small clumps, 6 hours for large clumps, and 1 hour for bulbils. Mean outdoor conditions during this experiment were the following: temperature = 25.2 C, relative humidity = 47%, and wind speed = 6.5 mph. As mentioned in the study, it is likely that desiccation rates of bulbils and thallus would be accelerated under increased temperatures (depending on season) and wind speeds associated with overland travel. It was also noted that bulbils could survive longer than one hour out of water if they are imbedded in mud or sediment as they would be better shielded from temperature and wind speeds. Further research is needed to simulate real-world over-land transport conditions; however, this study provides some desiccation rate estimates to aid in infestation risk assessment for local waterbodies.

District Lake Infestation Risk based off Travel Time

As of December 16th, 2025, there are 38 lakes in Minnesota that are listed as infested with starry stonewort on the [Minnesota DNR Infested Waters List](#) (Minnesota DNR, 2020b.) and the [EDDMapS](#) web

mapping application (EDDMapS, 2026). All 38 lakes are within six hours of the Comfort Lake – Forest Lake Watershed District, located Northeast of the Twin Cities in Minnesota (

Figure 2: List of all starry stonewort infested lakes in Minnesota. Current as of 9/4/2020. and

Figure 3: Map of all starry stonewort infested lakes in Minnesota). Six hours is the max time out of water starry stonewort was found to be viable (Glisson et al. 2020). However, starry stonewort clumps that can survive this long have a higher likelihood of being detected and removed due to their high visibility; this is especially true during watercraft inspections performed by a trained inspector. Conversely, bulbils are much smaller and can be obscured in undrained water, carpeted pads of trailers, engine parts, sediment, and many other discrete locations. Fortunately, according to the study by Glisson et al. (2020), bulbils were no longer viable after one hour out of water, but aforementioned scenarios can lengthen this time. Despite this low

desiccation tolerance, there is still one infested lake that is under an hour away from the District and several that are just over an hour that pose the greatest risk to District lakes (

Figure 2: List of all starry stonewort infested lakes in Minnesota. Current as of 9/4/2020.and

Figure 3: Map of all starry stonewort infested lakes in Minnesota).

In 2025, a total of 94 watercrafts entering District Lakes told watercraft inspectors starry stonewort infested lakes were the last waterbody they were in. Of this total, 10 boats were last in Medicine lake which is only 40 – 50 minutes away from the District and poses the greatest risk of starry stonewort transmission due to its proximity. To quantify this risk, less than 0.6% of boats entering a District lake in

2019 came from a starry stonewort infested waterbody that was less than an hour away. While the risk is relatively low, it is important to remember that it takes only one boat to infest a waterbody.

Minnesota Department of Natural Resources (DNR) List of Infested Waters - December 16, 2025

Water body name	County or counties	Listed for aquatic invasive species	Year listed as infested	DOW number	Distance from CLFLWD (rough estimate)
Anna	Otter Tail	starry stonewort	2025	56-0448-00	3 hr
Beltrami	Beltrami	starry stonewort	2019	04-0135-00	4 hr
Bemidji (includes Stump)	Beltrami	starry stonewort	2022	04-0130-00	4 hr
Benedict	Hubbard	starry stonewort	2025	29-0048-00	3 hr 20 min
Blackduck	Beltrami	starry stonewort	2023	04-0069-00	3 hr 50 min
Bowen	Cass	starry stonewort	2022	11-0350-00	2 hr 50 min
Carnelian	Stearns	starry stonewort	2020	73-0038-00	1 hr 20 min
Cass	Beltrami	starry stonewort	2016	04-0030-00	3 hr 40 min
Clearwater	Wright	starry stonewort	2023	86-0252-00	1 hr 20 min
Dora	Itasca	starry stonewort	2023	31-0882-00	3 hr 40 min
Garfield	Hubbard	starry stonewort	2025	29-0061-00	3 hr 30 min
Grand	Stearns	starry stonewort	2017	73-0055-00	1 hr 30 min
Gull	Beltrami	starry stonewort	2025	04-0120-00	4 hr
Koronis (includes Mud)	Stearns	starry stonewort	2015	73-0200-00	1 hr 50 min
Leech	Cass	starry stonewort	2021	11-0203-00	3 hr 10 min
Long	Hubbard	starry stonewort	2023	29-0161-00	3 hr 10 min
Long	Kandiyohi	starry stonewort	2023	34-0066-00	1 hr 50 min
Medicine	Hennepin	starry stonewort	2018	27-0104-00	50 min
Middle Cullen	Crow Wing	starry stonewort	2024	18-0377-00	2 hr 30 min
Minnewaska	Pope	starry stonewort	2017	61-0130-00	2 hr 20 min
Mississippi River between Wolf Lake (04-0079-00) and Andrusia Lake (04-0038-00)	Beltrami	starry stonewort	2021	NA	3 hr 50 min
Moose	Beltrami	starry stonewort	2016	04-0011-00	3 hr 50 min
North Twin	Beltrami	starry stonewort	2023	04-0063-00	4 hr
Pimushe	Beltrami	starry stonewort	2021	04-0032-00	3 hr 50 min
Pleasant	Wright	starry stonewort	2018	86-0251-00	1hr 20 min
Pokegama	Itasca	starry stonewort	2024	31-0532-00	2 hr 40 min
Rice	Stearns	starry stonewort	2016	73-0196-00	1 hr 50 min
Rush	Crow Wing	starry stonewort	2024	18-0311-00	2 hr 40 min
Three Island	Beltrami	starry stonewort	2025	04-0134-00	4 hr
Thunder	Cass	starry stonewort	2022	11-0062-00	2 hr 50 min
Turtle (Big Turtle)	Beltrami	starry stonewort	2016	04-0159-00	4 hr
Turtle River Lake	Beltrami	starry stonewort	2022	04-0111-00	4 hr
Two Rivers	Stearns	starry stonewort	2025	73-0138-00	1 hr 50 min
Upper Red	Beltrami	starry stonewort	2016	04-0035-01	4 hr 20 min
West Sylvia	Wright	starry stonewort	2016	86-0279-00	1 hr 30 min
Winnibigoshish	Multiple (Cass and Itasca)	starry stonewort	2016	11-0147-00	3 hr 20 min
Wolf (Big Wolf)	Beltrami	starry stonewort	2018	04-0079-00	3 hr 50 min

Figure 2: List of all starry stonewort infested lakes in Minnesota. Current as of 9/4/2020. (Minnesota DNR 2020b.)

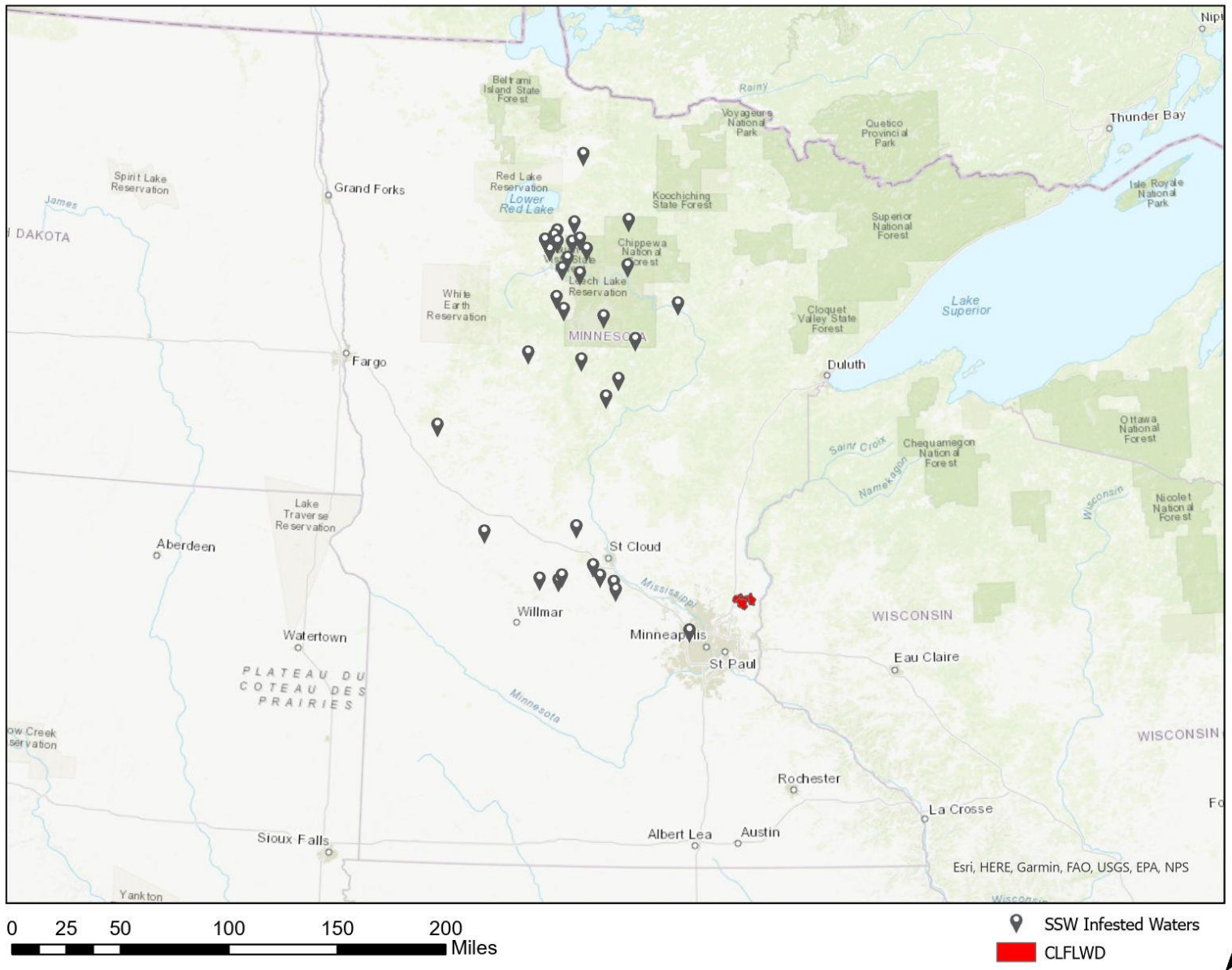


Figure 3: Map of all starry stonewort infested lakes in Minnesota (as of December 16th, 2025); data obtained from MN DNR List of Infested Waters (January 14th, 2026)

Management

This section should be prefaced with the understanding that starry stonewort management in North America is still in the early stages. In fact, to the knowledge of Glisson et al. (2018), their research is the first to study the outcomes of algaecide and mechanical treatments aimed at controlling starry stonewort. While this study looked at treatments conducted on only one lake, Lake Koronis MN, in one growing season, it still provides useful insights into management strategies.

The research objectives of Glisson et al. (2018) were to evaluate the effects of mechanical, algaecide, and mechanical + algaecide treatments on (1) starry stonewort biomass, (2) bulbil density, and (3) bulbil viability. For mechanical removal, a single-manned harvester vessel with rotating drum, called an Eco Harvester, was used. For algaecide treatments, both liquid and granular formulations of chelated copper were used. An untreated invaded area of the lake was used as a control to which the treated locations were compared. All treatments and effect sampling were conducted between July 19, 2016, and October 28, 2016. The results from Glisson et al. (2018) are summarized below:

1. Starry Stonewort Biomass

- Change in biomass from before to after all treatments- Mechanical removal alone did not significantly reduce biomass compared to the untreated reference area, whereas both algaecide alone and mechanical + algaecide treated area resulted in significantly greater biomass reductions compared to the untreated area.
- Effects of individual management actions (1. Mechanical, 2. First (liquid) algaecide treatment, and (3) second (granular) algaecide treatment – Mechanical removal did not significantly reduce biomass compared to the untreated area but did show an overall reduction in biomass. For the liquid formulation of chelated copper, reduction in biomass was significantly greater in both the algaecide-only and mechanical + algaecide areas compared to the untreated reference area. Lastly, the granular formulation of the algaecide showed no significant difference compared to the untreated reference area. However, following the granular algaecide application an increase in biomass was observed when compared to untreated area (caution should be taken with this finding as remaining biomass was low in treated area prior to granular application and detecting changes could be difficult).

2. Bulbil Density

- Algaecide alone showed a significantly greater increase in bulbil density than the untreated reference area and mechanical + algaecide areas. No significant difference was found between mechanical + algaecide and the untreated reference area.

3. Bulbil Viability

- Lab Viability Results- Bubbles were collected from all sampling locations and cultivated in the lab for 12 weeks. Within 7 days, bubbles from all sampling locations began to sprout. By counting the number of sprouted to unsprouted bubbles they discovered the following: 85.7% sprouted from algaecide treated area, 84.0% from untreated reference area, and 70.4% from mechanical + algaecide treated area. Bulbil sprouting was significantly lower in the mechanical + algaecide treated area compared to both the algaecide and untreated areas.

- Recovery Potential – Viable bulbils/m²
 - Algaecide treated area was 24x greater than untreated reference area (Rapid biomass reductions associated with algaecide treatments could stimulate bulbil production – by chemical signaling, translocating resources, and/or increasing resource availability.)
 - Algaecide treated area was 13.4x greater than mechanical + algaecide treated area
 - Mechanical + algaecide was 1.8x greater than untreated reference area

To summarize Glisson et al. (2018), it was found that mechanical + chelated copper algaecide treatments on Lake Koronis were the most effective at both reducing starry stonewort biomass and bulbil viability. While it was the most effective of treatments tested in their study, there are still downsides such as ≥70% of bulbils were still viable following the mechanical + algaecide treatment. Furthermore, as observed with other aquatic invasive species, mechanical harvesters can facilitate their spread within a waterbody. To reduce this risk, manual hand-removal of starry stonewort should be employed over the use of mechanical harvesters when possible. Another consideration is forgoing the second granular algaecide treatment for possibly another liquid algaecide treatment (or other method) as the former was not shown to significantly reduce biomass. Lastly, eradicating starry stonewort's branchlets is not the main issue, reaching the bulbils below the sediment with algaecide is the real challenge and is often why the species persists after treatment. Experimental bulbil treatment methods may be necessary to significantly reduce bulbil viability and obtain a reasonable level of control. Final note, realistic management expectations are crucial; starry stonewort is likely to persist in invaded waterbodies for the foreseeable future, however it is possible to reduce populations through repeated treatments and removals.

Identification

(Direct quotes from "Aquatic Plants of the Upper Midwest -Third Edition" by Paul M. Skawinski)

According to Paul M. Skawinski's identification guide," Aquatic Plants of the Upper Midwest – Third Edition" the following are the identifying characteristics of starry stonewort: "Up to 2m tall, robust, **dioecious**. Main axis ("stem") not *corticating*. *Stipulodes* are absent. **Branchlets 5-8 whorls, each with 1-2 long bract cells giving the appearance of the branchlet being forked**. Often lime-encrusted **White, 2-8mm, star-shaped bulbils are abundantly produced on colorless, underground filaments (rhizoids)**. Each of these bulbils can be easily transported and can produce many new individuals."

**words highlighted in bold text are key identifying characteristics*

Branchlets – a small branch or a subdivision of a branch

Dioecious – having only male or female parts on one individual. Two separate plants (one male, one female) are necessary for sexual reproduction

Stipulode – cells originating from the base of a whorl of branchlets on some species of Characeae. These cells are variable in size and shape.

Corticating cells – long, vertical cells which span between two nodes. Common on the main axis and branchlets of many species in the Characeae family

Thallus- a plant body that is not differentiated into stem and leaves and lacks true roots and a vascular system

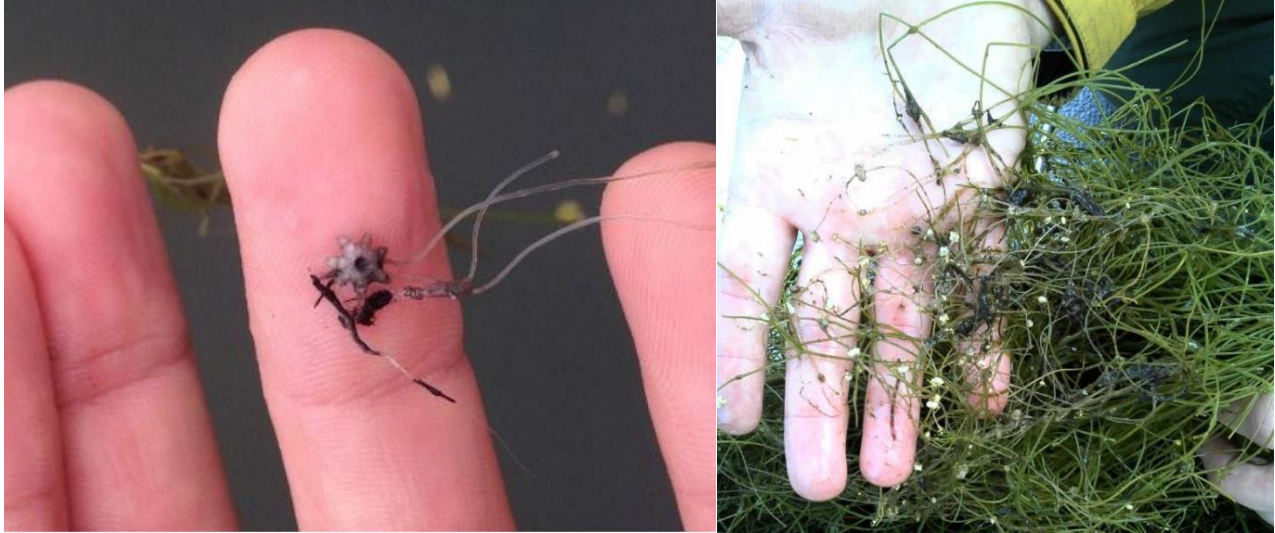


Figure 4: Photo on left: single bulbil attached to colorless rhizome. Photo on right: starry stonewort thallus and attached bulbils. (Minnesota DNR 2020c.)

Prevention and Early Detection Strategy

(Based off Pelican River Watershed District's "Readiness Response Plan for Aquatic Invasive Plants – Eurasian and Hybrid Watermilfoil, Starry Stonewort and Hydrilla" and was adapted for use by the CLFLWD)

1. Create and use educational signage, pamphlets, or web materials on how to identify starry stonewort in comparison to native macro-algae such as *Chara* spp. Or *Nitella* spp.
2. Provide boaters with information relating to locations of operating decontamination units using the DNR's "Courtesy Decontamination Sites in Minnesota" map. Encourage boaters to perform a courtesy decontamination.
3. Employ watercraft inspectors at District boat launches to look for branchlets and bulbils on boats, trailers, fishing gear, and other water related equipment
4. Train watercraft inspectors to perform early detection surveys around the boat launch during each shift using provided throw-rakes. Any suspected AIS will be appropriately documented following guidelines established by MAISRC's AIS Detectors program, and watercraft inspectors will immediately notify supervisors.
 - a. It is recommended that early detection surveys performed by watercraft inspectors be conducted on Friday as this will typically have less watercraft traffic when compared to weekends. Additionally, during weekly check-ins any potential AIS can be confirmed, and supervisors can work with staff on further development of aquatic plant identification skills.
5. Have Blue Water Science or District staff conduct meandering boat searches of littoral areas in each waterbody at least once per year to look for starry stonewort. This will be conducted late August or early September during the peak of Starry stonewort's growing season.
6. Partner with the University of Minnesota Extension Aquatic Invasive Species Detectors Program to train volunteers who live on the lake to perform AIS early detection surveys.
7. Provide permanent boat cleaning tools and equipment at each District boat access that can be used to assist with the removal of potential physical contamination. Tools should be

secured to an accessible fixed location with appropriate signage that provides guidance related to general usage.

Rapid Response Plan of Action

(Based off Pelican River Watershed District's "Readiness Response Plan for Aquatic Invasive Plants – Eurasian and Hybrid Watermilfoil, Starry Stonewort and Hydrilla" and adapted for use by the CLFLWD)

1. If starry stonewort is identified in a District waterbody, CLFLWD staff will be notified, who in turn will notify the Minnesota Department of Natural Resources (MN DNR) to facilitate identification, verification, and public notification. If the specimen is confirmed to be starry stonewort by the MN DNR, the CLFLWD will contact stake holders and provide them known infestation details.
2. Following ID confirmation, the CLFLWD will contract Blue Water Science to perform a point intercept survey in the areas of suspected infestation. This survey will determine the extent of the infestation and serve as a pre-treatment baseline for assessment of management strategies. In addition to a point intercept survey, sediment core samples will be taken from infested areas to estimate bulbil densities. Bulbil data may be able to determine how long the infestation has been present and quantify the recruitment potential after management.
3. If starry stonewort acreage is small enough and cost for control methods is low enough, the CLFLWD can consider treating the infestation. Based off the work by Glisson et al. (2018 & 2025), a combination of liquid chelated copper algaecide and mechanical harvesting with diver-assisted suction harvesting (DASH) should be employed. If possible, floating barriers around the perimeter of the treatment area can be used to prevent spread and maintain algaecide concentrations. However, final treatment approach should be discussed with the MN DNR, Blue Water Science, and algaecide applicator as new approaches may be available.
4. Following treatment, surveys will be conducted using the same points as the initial point intercept survey. This survey will assess the effectiveness of the treatment and determine if a second treatment will be necessary. If a second treatment is deemed necessary, repeat step three and perform another assessment survey afterwards.
5. Given Minnesota's history with starry stonewort, any management strategies employed in this rapid response plan are unlikely to eradicate the infestation. With this in-mind, CLFLWD should hold meetings at the end of the management season with local stakeholders to discuss results and the following year's management strategy.

Spread Mitigation and Public Education after Infestation

Education is a crucial component of the management plan to prevent further spread and transmission to other water bodies. The following are suggested approaches:

1. Create educational signage to display at lake accesses that are infested with starry stonewort. Content of signs can include impacts associated with species, identification characteristics, and boat inspection tips.
2. Create or purchase pre-made educational handouts such as ID cards and stickers to give to lake visitors. These materials can serve as in-boat reminders to be vigilant for AIS hitchhikers when leaving the waterbody.

3. Increase watercraft inspector presence at lake accesses infested with starry stonewort. Additionally, provide inspectors with training on how to identify and properly inspect a watercraft for starry stonewort.
4. Partner with lake associations to annually forward educational materials to lake residents.
5. Depending on location of infestation, work with Chisago County and the MN DNR to station their decontamination units on lake accesses most likely to have starry stonewort on exiting watercrafts. In addition to this, having watercraft inspectors encourage exiting watercrafts to undergo courtesy decontaminations.
6. Have watercraft inspectors encourage exiting boats to dry their equipment for five days or more before entering another waterbody (Minnesota Department of Natural Resources [DNR] 2020a.).
7. Depending on budget, staff capacity, perceived value, and storage, the District can consider purchasing a decontamination unit. While initial purchase cost, maintenance, and operation can be expensive, it is likely the most effective decontamination strategy watercraft inspectors have at their disposal beyond physically locating and removing all vegetation. According to Gottschalk and Karol (2020), researchers found steam (140 F) significantly reduced bulbil viability within 10 seconds of treatment and virtually eliminated all viability between 10 – 30 seconds. While 140 F is the maximum water temperature the MN DNR (2020d.) recommends (temperatures ranged from 100-140 F depending on decontamination scenario), the New York State Department of Environmental Conservation still recommends the following “ (1) clean the outside of the watercraft and trailer with high pressure (2500 psi) hot water (140 degrees F) for 10 seconds. (2) Flush the inside of the motor and all compartments (bilge, live well, bait buckets, ballast, etc.) with hot water (140 degrees F) for two minutes. (3) Soak fishing gear and equipment in hot water (140 degrees F) for two minutes.”

References

- Brainard, A. S. and K. L. Schulz. 2017. Impacts of the cryptic macroalgal invader, *Nitellopsis obtusa*, on macrophyte communities. *Freshwater Science*. **36**:55-62.
- EDDMapS. 2026. Early Detection & Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. Available online at <http://www.eddmaps.org/>; last accessed February 19, 2026.
- Glisson, W. J., C. K. Wagner, M. R. Verhoeven, R. Muthukrishnan, R. Contreras-Rangel, and D. J. Larkin. 2020. Desiccation tolerance of the invasive alga starry stonewort (*Nitellopsis obtusa*) as an indicator of overland spread risk. *Aquatic Plant Management*. **58**:7-18.
- Glisson, W. J., C. K. Wagner, S. R. McComas, K. Farnum, M. R. Verhoeven, R. Muthukrishnan, and D. J. Larkin. 2018. Response of the invasive alga starry stonewort (*Nitellopsis obtusa*) to control efforts in a Minnesota lake. *Lake and Reservoir Management*. **34**:3: 283-295.
- Glisson, W. J., Nault, M., Jurek, C., Fischer, E., Lund, K., Bloodsworth Cattoor, K., ... & Larkin, D. J. (2025). Evaluation of a decade of management of a North American aquatic invasive species (*Nitellopsis obtusa*) highlights scale-dependent effectiveness and monitoring gaps. *Facets*, 10, 1-14.
- Gottschalk, S. D., and K. G. Karol. 2020. Survivability of starry stonewort bulbils using commonly available decontamination strategies. *Aquatic Plant Management*. **58**:19-25.
- Larkin, D. J., A. K. Monfils, A. Boissezon, R. S. Sleith, P. M. Skawinski, C. H. Welling, B. C. Cahill, and K. G. Karol. 2018. Biology, ecology, and management of starry stonewort (*Nitellopsis obtusa*; Characeae): A Red-listed Eurasian green alga invasive in North America. *Aquatic Botany* **148**:15-24.
- Minnesota Department of Natural Resources [DNR]. 2020a. Clean in clean out: When boating or fishing in Minnesota, protect your waters by following state aquatic invasive species laws. https://www.dnr.state.mn.us/invasives/preventspread_watercraft.html. Accessed on October 7, 2020.
- Minnesota DNR 2020b. Minnesota Department of Natural Resources infested waters list. <https://www.eddmaps.org/midwest/tools/infestedwaters/>. Accessed on October 8, 2020.
- Minnesota DNR 2020c. Minnesota Department of Natural Resources. Starry Stonewort (*Nitellopsis obtusa*). <https://www.dnr.state.mn.us/invasives/aquaticplants/starrystonewort/index.html> . Accessed on October 8, 2020.
- Minnesota DNR 2020d. Minnesota Department of Natural Resources. Watercraft inspection manual. https://files.dnr.state.mn.us/natural_resources/invasives/mndnr_ais_watercraft_inspection_handbook.pdf . Accessed on October 6, 2020.
- New York State Department of Environmental Conservation. Starry Stonewort. <https://www.dec.ny.gov/animals/109530.html>. Accessed on October 13, 2020.
- Skawinski, P. M. 2018. *Aquatic Plants of the Upper Midwest*. Third Edition. Pages 186-187.

Wersak, R. M. 2020. Readiness Response Plan for Aquatic Invasive Plants – Eurasian and Hybrid Watermilfoil, Starry Stonewort and Hydrilla. Pelican River Watershed District.