
Carnelian Lake, Stearns County Point-intercept Survey and Monitoring Report for Starry Stonewort Management (2020)

Report by the Invasive Species Program - Division of Ecological and Water Resources
Minnesota Department of Natural Resources



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Lake Summary

Lake: Carnelian Lake

County: Stearns

DOW Number: 73003800

Lake Area: 180 acres

Littoral Area: 63 acres

Project Details

Project Year: 1

Primary Contact: Christine Jurek, Invasive species specialist, Minnesota Department of Natural Resources, Christine.jurek@state.mn.us, 320-223-7847.

Surveyors: Chris Jurek, Emelia Hauck Jacobs (MN DNR)

Date(s) of Management: 2020 (see Table 1)

Date(s) of Survey(s): 2020

Date of Report: February 24, 2021

Survey Methods: Point-intercept survey; snorkel surveys

Report Details

Jurek C. and E. Hauck Jacobs. 2021. Point-intercept Survey and Monitoring Report for Starry Stonewort in Carnelian Lake, Stearns County (2020). Minnesota Department of Natural Resources, Division of Ecological and Water Resources, Invasive Species Program, 1035 South Benton Drive, Sauk Rapids, MN 56379. 12 pp.

Summary

The purpose of this report is to provide an overview of aquatic plant distribution and the management of invasive aquatic plants in Carnelian Lake, Stearns County, including the starry stonewort infestation, monitoring and management efforts that occurred in 2020. This document summarizes the surveys and management efforts that were coordinated by the MN DNR, Steve McComas with Blue Water Science and from members of the Carnelian Lake Association.

Lake Description

Carnelian Lake is a 180 acre lake located three miles north of the town of Kimball in Stearns County, MN. The maximum depth of water in Lake Carnelian is 36 feet, and 35% of the lake is classified as littoral (areas of water depth between 0 to 15 feet, where aquatic plants are most likely to grow). Carnelian Lake has a mean water clarity of 10 feet. Carnelian Lake has a small watershed (2,950 acres) in which land use consists primarily of agriculture (56%), open water (14%), hay/pasture (11%), residential (9%), forest (6%) and grassland (4%). A public access is located on the south side of the lake. A MN DNR aquatic plant survey conducted in 2004, indicated the lake had up to 37 species of aquatic plants and approximately 40% of the shoreline contained at least one type of native vegetation with bulrush and yellow waterlily being the most common.

Invasive aquatic plants

Starry stonewort (*Nitellopsis obtusa*) was found in Carnelian Lake during the Minnesota Aquatic Invasive Species Research Center (MAISRC) Starry Trek event on 15 August 2020 (Figure 1). In 2020, as part of the rapid response plan, the population of starry stonewort was delineated and mapped (Figure 2). On the 18 of August 2020, DNR staff conducted an initial field inspection by snorkeling and rake sampling to determine the extent of the infestation. The snorkel area was about 9,000 square feet in front of the public access (Figure 2). During the snorkel search, observers found one large patch of starry stonewort growth (approximately 690.1 sq. ft.) within 60 feet from shore and one smaller patch (approximately 2.4 sq. ft.) within the area

surveyed. Starry stonewort growth extended from shore to 115 feet offshore. Prior to management, we conducted a pre-treatment survey (21 sampling points within the management area) to determine the frequency of occurrence of starry stonewort and native aquatic plants. At this time, 90% of the sampling points had submersed native taxa, totaling 13 species. The most common aquatic plants observed during the initial survey include coontail (*Ceratophyllum demersum*), water star-grass (*Heteranthera dubia*), native stonewort (*Nitella* sp.), bladderwort (*Utricularia* sp.), and Canada waterweed (*Elodea canadensis*). Overall, the mean native taxa per a point was 3.1. Of the 21 points, 5% of the points had starry stonewort which was mostly found at the bottom of the public access ramp. Furthermore, a lake-wide point-intercept survey conducted on 27 August 2020 further determined its spread was limited to the access. Observations from both the lake-wide survey and snorkel search indicated that Carnelian Lake had extensive beds of muskgrass (*Chara* sp.), which is a starry stonewort look-alike.



Figure 1 – Starry stonewort (*Nitellopsis obtusa*) sample collected from Carnelian Lake, Stearns County (DOW# 73003800) by volunteers during the MAISRC Starry Trek event held on 15 August 2020.

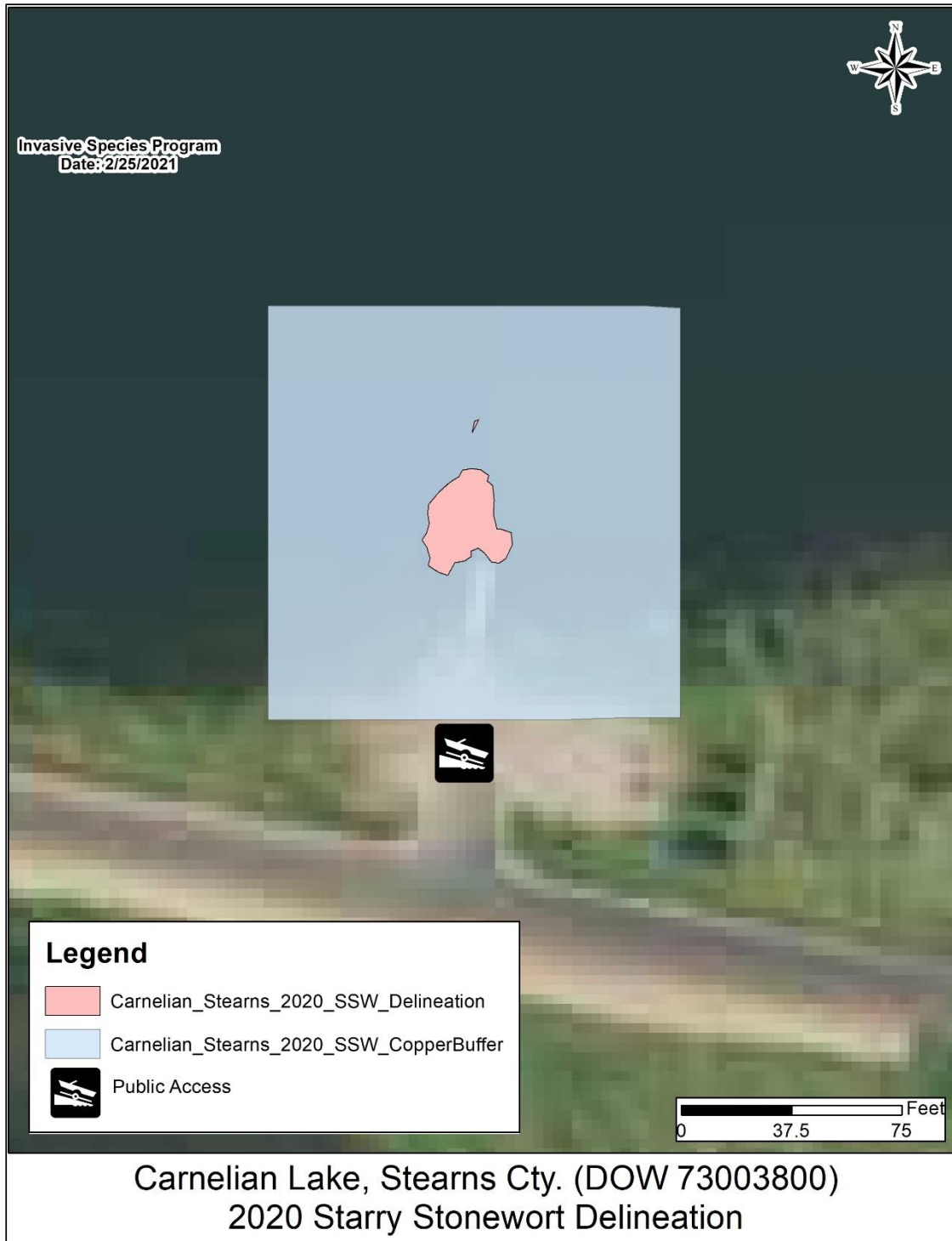


Figure 2 - Initial starry stonewort search summary; approximate perimeter of copper treatment, starry stonewort location, and the location of the farther known point of starry stonewort growth as of 18 August 2020 in Carnelian Lake, Stearns County (DOW #73003800).

Management

Management using both physical removal via scuba divers and a copper treatment of starry stonewort was conducted in 2020 (Table 1). On 18 September 2020, Bluewater Science scuba divers physically removed approximately 1,188 pounds of starry stonewort at the public access (Table 1, Figure 3). Biomass removal estimates were based on wet weight measurements (Bickel and Perrett 2015) using a digital scale. Once the biomass was weighed, the MNDNR then bagged the starry stonewort into 40 gallon bags for disposal. The first hand-pulling event removed the majority of the biomass, although a follow-up copper treatment was used to destroy the remaining biomass (Table 1). Lake Restoration applied copper to the management area on 7 October 2020 at a rate of 1.0 PPM. Due to the timing of the treatment, a post-treatment survey will be conducted in 2021.

Table 1 - Starry Stonewort Management Summary. History of management activities (physical removal via snorkel and scuba diving) for Carnelian Lake, Stearns County (DOW# 73003800, Total acres: 180, Littoral acres: 63). Weight rounded to the nearest whole number (pounds).

Date	Control Method	Approximate amount (lbs.)/acres treated	Pesticide	Dose Rate	Licensed Commercial Applicator
18 Sept 2020	Manual	1,188 lbs.			Steve McComas, Blue Water Science
7 Oct 2020	Pesticide	0.5 acres	Citrine Plus (liquid)	1.0 PPM	Lake Restoration






Figure 3 – Starry stonewort (*Nitellopsis obtusa*) hand pulled from Carnelian Lake, Stearns County (DOW# 73003800) by Bluewater Science on 18 September 2020.

Aquatic Plant Surveys

Methods

A point-intercept survey was conducted on 27 August 2020 using the method developed by John Madsen in “Aquatic Plant Control Technical Note MI-02, 1999”. A total of 208 sampling points were placed 60 meters (197 feet) apart using a Geographic Information System (GIS). The purpose of this survey was to determine the lake wide distribution of starry stonewort and native aquatic plants (Figure 4). Sampling points were based on depth to rooted vegetation because of this method, we only surveyed 123 points in depths up to 20 feet (Figure 4). At each sample point, a double-sided garden rake was thrown and dragged along the lake bottom of the lake. All plant taxa (submerged, floating-leaf, emergent and free floating) were recorded during the survey following Crow and Hellquist (2000). Plant samples were assessed on the boat to determine species and abundance (1: sparse, 2: common/frequent/occasional, 3: abundant/matted; Table 2) and data was recorded using an electronic device. Frequencies of occurrence (how often a plant species appeared on a rake) were calculated in depths up to 15 feet.

Table 2- Quantitative rake abundance ranking (0-3) used to estimate plant abundance for each species based on rake coverage and/or visual observation (MN DNR). A zero (0) ranking indicates no target plants were retrieved or observed in a sample.

Abundance Ranking	Rake Coverage	Description
1		Sparse; plants covering <25% of the rake head
2		Common; plants covering 25%-75% of the rake head
3		Abundant; plants covering >75% of the rake head

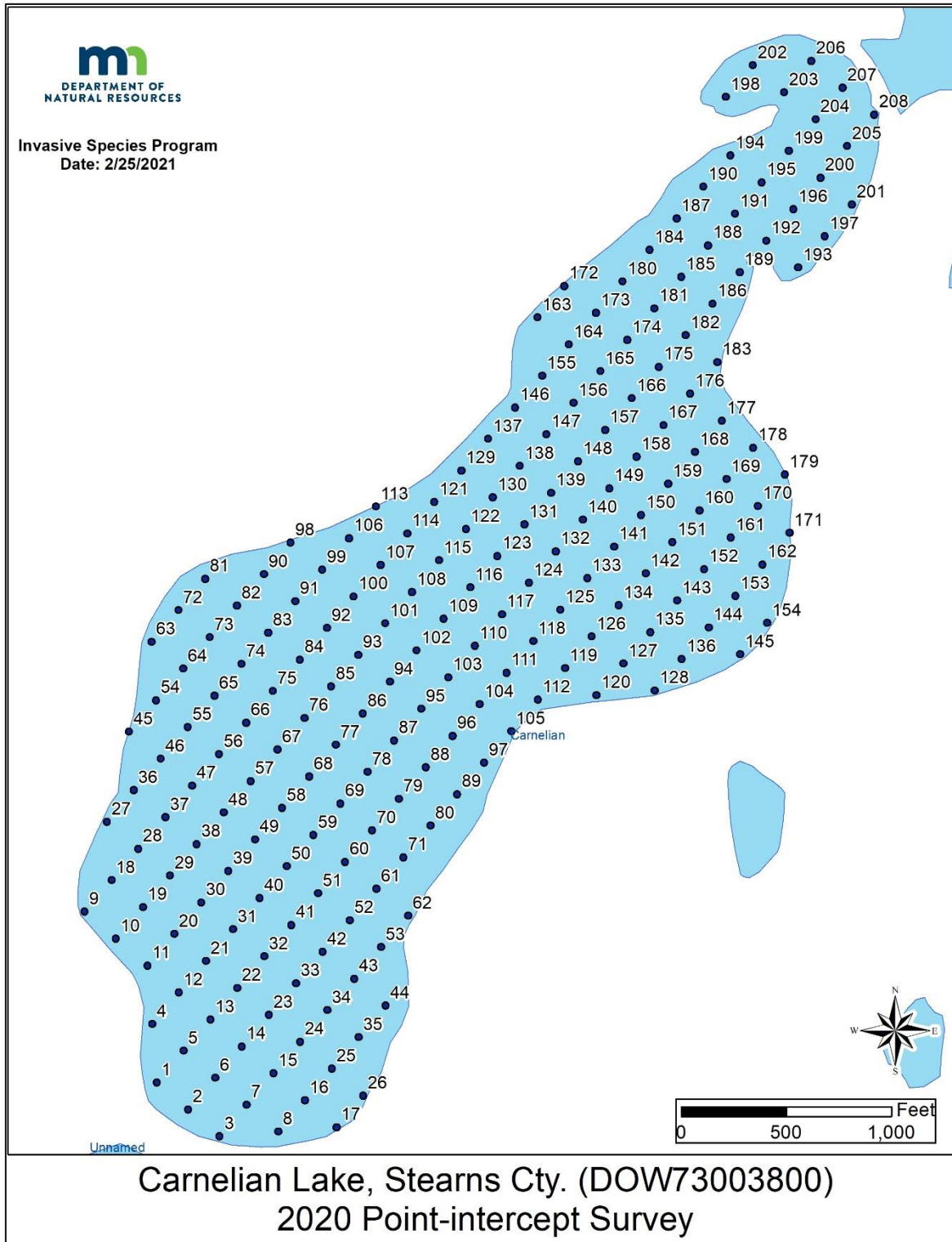


Figure 4 - Lake-wide point-intercept survey illustrating locations of the rake toss waypoints within Carnelian Lake, Stearns County (DOW#73003800). Approximately 123 survey points were sampled during the point-intercept survey on 27 August 2020.

Survey Observations

The most recent aquatic vegetation point-intercept survey of Carnelian Lake (DOW #73003800) occurred on 27 August 2020. Plants were rooted to a maximum depth (95%) of 15 feet. In the littoral zone, 96% of the points had submersed native vegetation (Table 3) with a mean submersed native taxa per point of 2.99. Lake has up to 19 submersed native taxa (Table 3, Table 4) and one non-native submerged taxa (starry stonewort).

Table 3 - Plant Survey Metrics. Summary of metrics for Carnelian Lake, Stearns County (DOW# 73003800). Shaded values were calculated from littoral depth range.

Survey Metrics	8/27/20
Surveyor	MN DNR
Total # Points Sampled	123
Max Depth of Growth (95%) in feet	15
# of Vegetated Points in Max Depth Range	112
Max Depth of Starry Stonewort (feet)	5
# Points in Littoral (0-15 feet)	112
% Points w/ Submersed Native Taxa	96
Mean Submersed Native Taxa/ Point	2.99
# Submersed Native Taxa	19
% Points with Starry Stonewort	0

*95th percentile calculated based on all vegetated sampling points

Taxa refers to groups of submersed aquatic plant species or genera

The native plant community in Carnelian Lake Lake was primarily dominated by northern watermilfoil at 54%, followed by coontail (42%), Richardson's pondweed (36%) and muskgrass (35%). These aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife. In addition to submersed taxa, the survey also indicated one floating-leaf taxa (yellow waterlilies), three emergent taxa (bulrush, smartweed and arrowhead) and one free- floating taxa (star duckweed). Both floating-leaf and emergent plants are especially good at preventing shoreline erosion, habitat and providing food sources for waterfowl. Plants also absorb nutrients and reduce algae, thereby improving water quality.

Table 4 – Lakewide Plant Frequency Occurrence. Percent frequency of occurrence for submersed taxa (most identified to species) up to 15 feet in Carnelian Lake, Stearns County (DOW# 73003800). *denotes invasive aquatic plant/algae

Taxonomic Name	Common Name	27 Aug 2020
<i>Ceratophyllum demersum</i>	Coontail	42
<i>Bidens beckii</i>	Water marigold	4
<i>Chara</i> sp.	Muskgrass	35
<i>Elodea canadensis</i>	Canada waterweed	4
<i>Heteranthera dubia</i>	Water stargrass	1
<i>Lemna triscula</i>	Star duckweed	3
<i>Myriophyllum sibiricum</i>	Northern milfoil	54
<i>Najas</i> sp.	Naiad species	4
<i>Nitella</i> sp.	Nitella species	9
<i>Persicaria</i>	Water smartweed	1
<i>Potamogeton freisii</i>	Fries' pondweed	5
<i>Potamogeton gramineus</i>	Variable pondweed	2
<i>Potamogeton illinoensis</i>	Illinois pondweed	4
<i>Potamogeton praelongus</i>	White-stem pondweed	12
<i>Potamogeton richardsonii</i>	Clasping-leaved pondweed	36
<i>Potamogeton</i> spp.	Narrow-leaf pondweed group	7
<i>Potamogeton</i> spp.	Broadleaf pondweed group	1
<i>Potamogeton zosteriformis</i>	Flat-stemmed pondweed	47
<i>Stuckenia pectinata</i>	Sago pondweed	25
<i>Utricularia</i> sp.	Bladderwort species	6
<i>Nuphar variegata</i>	Yellow waterlily	4
<i>Potamogeton natans</i>	Floating-leaf pondweed	3
<i>Sagittaria species</i>	Arrowhead species	1
<i>Schoenoplectus</i> spp.	Bulrush species	13

Discussion

Carnelian Lake was the third lake in Minnesota to hand remove starry stonewort via scuba diving. These recent management efforts have shown to be effective at decreasing the frequency of occurrence and abundance, in addition, to limiting the spread within the lake. Because the extent of the infestation, it was practical to physically remove the starry stonewort. Hand removal via scuba diving is a good option since it has minimal, non-target effects to native macroalgae and native aquatic plants. This method removes the macroalgae as well as the attached bulbils. Removing all bulbils during hand-removal, especially in the sediment, is challenging. Because of the remaining bulbils in sediment, re-growth is likely to occur. Overall, physical removal has shown to be an effective option for small, isolated infestations. It is recommended to continue monitoring and managing the infestation to limited spread and abundance.

Literature Cited

- Bickel, T.O and C. Perrett. (2015). *Precise determination of aquatic plant wet mass using a salad spinner*. Can. J. Fish. Aquat. Sci., 73 (2015), 1-4pp.
- Crow, G.E. and C.B. Hellquist. (2000). *Aquatic and wetland plants of Northeastern North America*. (Vols. 1 & 2). Madison, WI: The University of Wisconsin Press.
- Madsen, J. (1999). *Point-intercept and line intercept methods for aquatic macrophytes management*. APCRP Technical Notes Collection (TN APCRP-M1-02). Vicksburg, MS: U.S. Army Engineer Research and Development Center.