

2026 Lake Vegetation Management Plan

Section I: Lake Information

Name: Lake Shaokotan DOW **Lake ID:** 41008900 **County:** Lincoln

Fisheries Area: Windom Surface **Acres:** 996 **Littoral Acres:** 996 **Watershed size Acres:** 8,920, 9:1 ratio

Classification: ☐ Natural Environment ☒ Recreational Development ☐ General Development

Cooperator(s): Lake Shaokotan Lake Improvement District (LID), Lake Shaokotan Lake Association, Lake Shaokotan Sportsmen's Club, Lincoln County Environmental Services, Minnesota Department of Natural Resources

Section II: Water Quality and Plant Community

A. Water Quality

- | | |
|--|----------------------------------|
| ☒ Total Phosphorus: MNDNR, MPCA, CWP | Date: various 1980-2018, ongoing |
| ☒ Secchi Disc: same as above | Date: collaborative and various |
| ☒ Chlorophyll 'a': same as above | Date: collaborative and various |

Narrative (describe water quality concerns, quantify TSI):

Shaokotan Lake is a public waterbody located in western Lincoln county. Through the combined efforts of local citizens, farmers and ranchers, Lincoln County Environmental Services, Yellow Medicine Watershed District, Shaokotan Lake Clean Water Partnership, and Minnesota Department of Natural Resources (MN DNR) and Minnesota Pollution Control Agency (MPCA), incoming phosphorus from the watershed has been reduced. Through a Clean Water Partnership, feedlot cutoffs, wetland restoration, septic tank compliance, and higher rates of pasture land and CRP than ecoregion averages have worked collectively to reduce incoming phosphorus to manageable levels. Shallow groundwater monitoring has shown lower phosphorus which may increase flushing of lake (dilution). As a result of these changes, the lake has flipped alternative stable states from a turbid, phytoplankton dominated system with nuisance blue-green algae to a clear water, macrophyte dominated system with recent (2019 and 2023 nuisance levels of native submergent plants. Water quality measures and monitoring data are primarily housed with MPCA. Carlson's TSI values have shifted greatly with changing chlorophyll a, total phosphorus, and water transparency values. Uncertainty exists about what natural perturbation or manmade manipulations could flip the lake back to the turbid state and undo the work of the past decades to improve water quality. Phosphorus levels are still high enough to initiate a flip, despite the reduction of phosphorus from the watershed.

B. Plant Community:

Narrative (describe plant community, list common, rare, or other important aquatic plant species, list plant surveys):

The types of aquatic plants found in Shaokotan Lake has not changed dramatically since 2000, or even since 1949. However, the aquatic plant community abundance has varied in densities during this time.

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For instance, a 1983 MN DNR Fisheries lake survey documented about 50% of the lake surface was covered in July by submersed aquatic plants. Currently, the lake contains aquatic plants we would expect to find in a southern Minnesota shallow lake including sago pondweed, coontail, and clasping-leaf pondweed. Several species were recorded for the first time in 2015: grass-leaved water plantain (*Alisma graminea*), horned pondweed (*Zannichellia palustris*) – these species may have been present in previous survey years but either mis-identified and/or undetected if they occurred at lower frequency. Other species found in yearly point intercept survey include: northern watermilfoil, clasping-leaf pondweed, sago pondweed, narrow-leaf pondweed, coontail, and chara. The presence of certain species in 2025 such as northern watermilfoil and clasping-leaf pondweed, indicate that the water clarity of the lake is sufficiently high to allow these taxa which are moderately intolerant of turbidity.

Lakewide abundance of aquatic plants, as estimated by frequency of occurrence, using the point intercept survey methodology, increased from near zero in 2002, to about 30-40% between 2008 and 2011, to near 100% in 2015. Abundance decreased approximately to 75% coverage to the surface in 2016. In 2017 vegetation abundance decreased slightly to approximately 60-70% of surface coverage. During the summer of 2018 vegetation and water clarity both decreased. Coontail also became the abundant species while narrow-leaf pondweed and northern watermilfoil decreased. Water clarity is high enough to allow aquatic plant growth at the maximum lake depth (10') and nearly all sites surveyed were vegetated. In 2019, the vegetation growth was extensive with a lot of surface matting on a majority of the lake. The LID was allowed to conduct treatment. After the treatment, the clarity of the water decreased and algae blooms were present the rest of the summer. The decreased water clarity was expected due to the large phosphorus release of the dying vegetation. In 2020, the year following treatment, the lake seemed to be more turbid and the vegetation not as abundant early in the season. The increased turbidity couldn't be directly related to the previous year's treatment. As the summer progressed, more vegetation was present on the surface in the later part of July and water clarity increased. No treatment was permitted in 2020. The point intercept survey was changed from mid-June to early July in 2021. Changing the dates allowed us to see two to three weeks of additional growth on the vegetation. During the survey, surface matting was minimal. By the end of July surface abundance increased dramatically. During a site visit in September, the lake virtually could not be navigated for recreational use. For 2022 summer the lake was approximately 78% vegetated with just a few pockets of surface matting. Recreation was able to occur throughout the summer freely. The LID was able to treat the lake in 2023. During the point intercept survey, it showed vegetation occurrence was at 90%. After the July 4th holiday, the vegetation really took off and covered the entire lake. In 2024 during the point intercept survey vegetation was detected as common on 78% of the lake. The LID decided to treat the common channels. In 2025, 76% of the lake had vegetation. Again, the LID treated the common channels. The LID has treated the common channels since 2024 and has seemed to indicate that treatment option has been helpful and that large offshore treatment has not been warranted.

The increase in aquatic plants from 2015 to 2025 is not attributed to a single species; it is associated with an expected growth response that is a natural condition of a shallow clear-lake when water quality improves. The four most frequent taxa (*Chara* spp., coontail, northern watermilfoil and narrow-leaf pondweed group) all showed significant increases in occurrence.

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To date, all the aquatic plants observed in Shaokotan Lake are native plants. Therefore, the limitations of treating native aquatic plants in open common areas of the lake per Minnesota Rule (M.R.) 6280 apply and Shaokotan Lake is not eligible for an Aquatic Plant Management (APM) permit. However, a variance (M.R. 6280.1000) to control invasive aquatic plants may be considered if the commissioner decides that there are exceptional circumstances or special or unique conditions on a particular year based on the request, criteria, and field findings that support the Actions in this Lake Vegetation Management Planning (LVMP).

Section III: Public Input Process (narrative)

The first meeting of any sort was a general question and answer session with Minnesota DNR Fisheries Representatives during a Lincoln County Commissioner's Meeting in July 2015. Some lakeshore owners attended and expressed frustration with the current state of aquatic vegetation inhibiting recreation in the lake. One recommendation coming out of the meeting, besides individual properties seeking Aquatic Plant Management permits, was to work together to come up with a plan through the LVMP process. Representation was independently organized within the Lake Shaokotan Lake Association, with some members also representing the Lake Shaokotan Sportsmen's Club. A committee of representatives convened (Nov 2015-Feb 2016) to participate in creating this LVMP on behalf of the larger group. Also participating was staff from Lincoln County Environmental Services, Minnesota.

Department of Natural Resources (MN DNR), and Minnesota Pollution Control Agency (MPCA). Meeting discussions formulated the first LVMP issued in 2016 with the goals, objectives, strategies, and actions that required data collection and monitoring, along with triggers that would approve a permit for control.

Section IV: Problems to be addressed in this Plan (narrative)

- 1) Because of major increases in aquatic plant density, particularly in mid-depth areas (6-10 feet), recreational traffic was greatly diminished during the open water season of 2015 and some reported during 2016 and 2017. This LVMP will serve to find a balance between providing areas for and access to boating and aquatic recreation as well as maintaining native aquatic plant communities for their role in preserving water quality by stabilizing sediments, arresting wind and wave erosion, and uptake of nutrients.
- 2) Developing collaborative goals and objectives with specific actions that are permissive, specific, measurable, attainable, repeatable, time-sensitive, and monitored regularly.
- 3) Defining what constitutes reasonable thresholds or metrics for triggering aquatic plant control on this lake. For instance, visual estimations of native aquatic plant densities are highly subjective, are not repeatable, and highly variable among observers, making them not amendable to statistical treatment. Also, it is very difficult to estimate abundance of submerged aquatic plants, and as such species are missing or underestimated.

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4) Chemical treatment control, if selected, needs an application strategy designed to prevent a rapid reduction in dissolved oxygen caused by large scale aquatic plant die-off; subsequently causing a fish kill and a greater nuisance situation.

Section V: Goals for Management of Aquatic Plants

During the first meeting of the Shaokotan Lake LVMP planning group, a goal sharing exercise yielded several shared goals. Those stated goals were:

- * Maintain water quality and water clarity (9)
- * Importance of Water Recreation (Fishing, Water sports, boating) (6)
- * Develop a plan ready for the spring with trigger points (6)
- * Find a balanced approach (5)
- * Find funding for treatment/project (2)
- * Control vegetation (2)
- * Economics – value versus costs (2)
- * Unique nature of the lake (2)
- * Create a working relationship with everyone's input sought (1)

Primary Goal: Develop an increased understanding of aquatic plant diversity, fish habitat, and water recreation needs while managing and improving water quality in Shaokotan Lake. Water transparency is a quick and easy measurement that tells scientists a lot about a lake's water quality. First it indicates the amount of light penetration into a lake. Second, Secchi transparency provides an indirect measure of the amount of suspended material in the water, which in many cases is an indication of the amount and type of algae in the water.

The Actions in following objectives and strategies must be implemented and collected by the LID or County in order to determine if an herbicidal or mechanical control permit can be issued and executed.

Objective 1: Gather baseline and annual long-term water clarity data through the MPCA Citizen Lake-Monitoring Program (CLMP) and other sources.

Strategy 1: Increase citizen involvement for efforts to collect water transparency information.

Action 1.1: Establish committed member(s) to collect weekly secchi disks readings. [LID]or County

Action 1.2: Boat to designated spots on the lake to take weekly readings from June 1 to August 1. [LID] or County

Action 1.3: Record and report readings on weekly basis to MN DNR and LID representatives. [LID] or County

Aquatic plant density in Shaokotan Lake varies each year and predicting the amount of rooted submerged aquatic plants that might reach the surface is rather unobtainable during May and early June. As summer and the growing season progresses, visual observations are subjective estimates in determining percent of plant coverage, while quantitative methods are labor intensive and may not

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produce the desired results. A compromise between subjective estimates and quantitative methods would be a semi-quantitative survey in which preselected areas are surveyed using a presence/absence approach to establish the frequency of occurrence for species (Madsen and Bloomfield 1993). These areas in the lake can be established and delineated for monitoring purposes based on local knowledge and the propensity of where aquatic plants have grown or not in Shaokotan Lake.

Objective 2: Utilize quantitative methods to rapidly collect information regarding aquatic plant occurrence, species richness, and distribution.

Strategy 2: Continue monitoring and evaluating lake conditions and aquatic plant density through collaborating agencies, organizations, and partners.

Action 2.1: Maintain long-term monitoring survey frequency of aquatic plant densities by point intercept or line transect methods in early July. [DNR]

Action 2.2: Conduct, record, and report weekly visual observations committed by committed members between June 1 and August 1. Visual observations to take place in each of the six quadrants (A-F) as set up in 2015. [LID]

Action 2.3: Coordinate and develop plans for possible drone or plane flights to obtain aerial photography as needed. [DNR & LID]

Action 2.4: Communicate with LID to share and inform results of aquatic plant evaluations with stakeholders and refine conditions in the APM permit application request. [DNR]

Action 2.5: Delineated areas will also be verified pre-treatment as part of a standard APM permit inspection for this LVMP. Those treatment areas will remain in the same location for subsequent year's treatments and data points provided to all parties involved. [DNR & LID]

Action 2.6: Submit an annual report by December 31st, 2026, summarizing the data and results collected during the monitoring season. [LID]

The purpose of the Aquatic Plant Management Program is to protect native vegetation and the aquatic environment from unnecessary harm while allowing lakeshore homeowners to control some aquatic vegetation for reasonable water access. The use of pesticides in lakes to control submerged vegetation or aquatic nuisances, the use of automated plant control devices, or the destruction of emergent vegetation by any means, require DNR permits.

Objective 3: Enhance and improve the efficiency of the APM program requests for this lake.

Strategy 3: Maintain the capacity to work together with the LID to monitor aquatic vegetation

Action 3.1: Establish contact information and frequent communication between the Windom Area Fisheries Office, APM Specialist, and the Lake Shaokotan Lake Improvement District for APM planning. [LID]

Action 3.2: Keep accurate and up-to-date records on permitting and results. [DNR]

Action 3.3: Inspect new permit requests and track past treatment results. [DNR]

Action 3.4: Ensure and agree to habitat protection when permit requests are not warranted. [DNR]

Minnesota has 5,400 fishing lakes and 15,000 miles of fishable rivers and streams. Maintaining and enhancing high quality aquatic habitat and healthy ecosystems are essential for sustaining the populations of fish that are safe to eat, support a multi-billion dollar angling economy, and contribute to

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the quality of life we enjoy. Each waterbody is an asset to the local wildlife and human communities. Each waterbody is also a reflection of the land use within its watershed and on its shoreline. Changing land use and population growth threaten aquatic habitats in Minnesota. In the face of these and other pressures, sustaining Minnesota's excellent fishing is not guaranteed and cannot be taken for granted.

Objective 4: Sustain knowledge and long-term data collection of MN DNR fish lake survey program, Sentinel Lakes program, LGU programs, and efforts driven by One Watershed One Plan.

Strategy 4: Maintain efforts to monitor fish communities and evaluate management criteria.

Action 4.1: Maintain lake survey frequency for test netting and electrofishing by the Fisheries Lake Management Plan. [DNR]

Action 4.2: Evaluate response of fish communities, forage, and targeted game fish. [DNR]

Action 4.3: Conduct near-shore larval fish survey by long term monitoring schedule. [DNR]

Action 4.4: Conduct water quality assessments per MPCA schedule. [DNR]

Action 4.5: Evaluate multi-agency lake and watershed data to make ongoing decisions. [DNR]

SUMMARY: This LVMP was created as a result of some lakeshore owners on Shaokotan Lake expressing frustration with the current state of native aquatic vegetation inhibiting their recreation on the lake. Boaters would like to boat the length of the lake, but it is not possible due to matting vegetation. This LVMP seeks to accommodate herbicidal control of native aquatic vegetation for up to 14% of Shaokotan Lake specifically to an agreed upon "commons area" for: a) a mid-lake treatment zone, and b) pre-determined access routes (>150' from shore) that will be delineated and established on maps. Before a MN DNR APM permit can be issued in this commons area, vegetation growth must be at nuisance levels as determined by the Aquatic Habitat Specialist and current information as provided in the above action items. This treatment zone is to provide for that desired boating in the deepest portion of the lake.

During the point intercept survey, the vegetation will be categorized into rare, sparse, common, and abundant/surface matting. If 85% of the surveys points greater than 150' from shore are considered to be common or abundant, a permit may be granted for chemical treatment of vegetation in the "common area". If one of the delineated "common area" shows abundant vegetation but not the other, a permit will be considered for that polygon. An optional control plan in this LVMP to that of using herbicides would be for permitting up to 50% of the lake's littoral area if done by mechanical methods. However, no more than 36% of the lake's littoral area may be mechanically harvested if the maximum allowed 14% of herbicidal control is applied (MR 6280/0350, Subp 3.B). All plant biomass mechanically harvested has to be removed from the lake and composted at acceptable locations.

FINDINGS OF FACT AND THRESHOLDS: Key components and thresholds that may trigger herbicidal control between mid-June and early August resides within the Strategies and Actions of this proposed LVMP. A permit may be issued if all components and thresholds are met, but lake monitoring and observations must continue after treatment. If an MN DNR APM permit is issued for up to 14% "commons area" herbicidal control, conditional approval will be granted for a licensed commercial applicator to commence chemical application after all the following criteria are met:

- 1) Secchi disk reading is greater than 6.0 feet between June 1 - August 1.

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- 2) Semi-quantitative surveys and visual observations are recorded weekly by the LID in quadrants A-F, between June 1 – August 1 and communicated weekly with data sheets sent to the MN DNR.
- 3) Access routes and mid-lake areas marked and delineated to verify pre-treatment zones.
- 4) Open water in the “commons area” is less than 14% of the total littoral area.
- 5) A standard APM permit inspection is completed by the APM Specialist to affirm if conditions may warrant treatment and delineated mapping locations are provided to the licensed commercial applicator and permittee.

Section VI: Operational Treatment Plan (map marked with areas where control of plants is anticipated):

A. Commons Area (>150' from shore)

☒ Mechanical Control: 497 acres to be treated, 50% of littoral area

Narrative: Optional mechanical control for up to 50% of Shaokotan's 996 acres; those areas must be approved by an APM Specialist.

☒ Herbicide Control: up to 139.4 acres to be treated, 14% of littoral area

Product(s): Product Recommendation will come from a licensed, commercial applicator.

Rate of Application: Product application recommendation will come from a licensed, commercial applicator

Timing of Application: Application will not occur until the point intercept survey has been completed in late June to early July, and is in agreement with the Regional MNDNR office. No permit will be issued after August 1.

Narrative: Herbicidal control for up to 14% of Shaokotan Lake. Treatment areas will be delineated on an attached map that includes acreage of the "commons area" and access routes. Delineated areas will be verified pre-treatment as part of a standard APM permit inspection and commercial applicator shall follow that course.

☒ Other: 9.9 acres to be treated, 1% of littoral area

Narrative: 1% will be earmarked for Riparian Aquatic Plant Management (APM) Permits.

B. Individual Permit Standards (new permits)

Chemical Treatment of Submerged Vegetation:

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Narrative: Riparian Landowners can apply for APM permits to treat aquatic plants along their shoreline frontage as approved by the APM Specialist. Treatments will extend up to 150 feet lakeward. Requests for treatment of channels to open water will be granted as necessary and within the 1% limit. Therefore, all channels will not exceed 15 feet in width and their length will be recorded on the permit.

VII. Funding [check all that apply]

- ☒ Lake Association
- ☒ Lake Improvement District (LID)
- ☐ DNR Grant
- ☐ Conservation District

Section VIII: The commissioner may issue APM permits with a variance from one of more of the provisions of parts 6280.0250, subpart 4, and 6280.0350, except that no variance may be issued for part 6280.0250, subpart 4, items B and C. Variances may be issued to control invasive aquatic plants, protect or improve aquatic resources, provide riparian access, or enhance recreational use on public waters (6280.1000, subpart 1). Variance(s) and Justifications(s) [check all that apply]

- ☐ **Application of pesticides to control submerged vegetation in more than 15 percent of the littoral area (M.R. 6280.0350, Subp 4, A). (list justification below)**
- ☐ **Application of pesticides to control aquatic macrophytes in natural environment lakes established pursuant to part 6120.3000 (M.R. 6280.0250, Subp. 4, E). (list justification below)**
- ☐ **Mechanical control of aquatic macrophytes in more than 50 percent of the littoral area (M.R. 6280.0350, subp. 3, B). (list justification below)**
- ☐ **Other (please explain)**

Justifications (identify which variance and provide the rational for all items checked above):

This plan operates within current Minnesota Rules (MR 6280; 15% littoral acreage for herbicidal control and up to 50% littoral acreage for mechanical treatment; the sum of both not to exceed 50%) to document 2016 conditions and observe outcomes from treatment per Minnesota Rule limits.

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Section IX: Signatures

This Lake Vegetation Management Plan is in effect for 5 years from date of Regional Fisheries approval.

DNR Approval

Submitted By: Durel Carstensen

Title: Aquatic Plant Management Specialist

Date: 07/17/2026

Area Fisheries Supervisor

Date

Regional Fisheries Approval

Date

Regional Ecological Resources Approval

Date

I affirm that I am an authorized representative of and acknowledge participation in the development and implementation of this lake vegetation management plan.

Lake Improvement District Signature and Title

Date

Either party may terminate participation in this plan at any time, with or without cause, upon 30 days' written notice to the other party.

Appendix 1

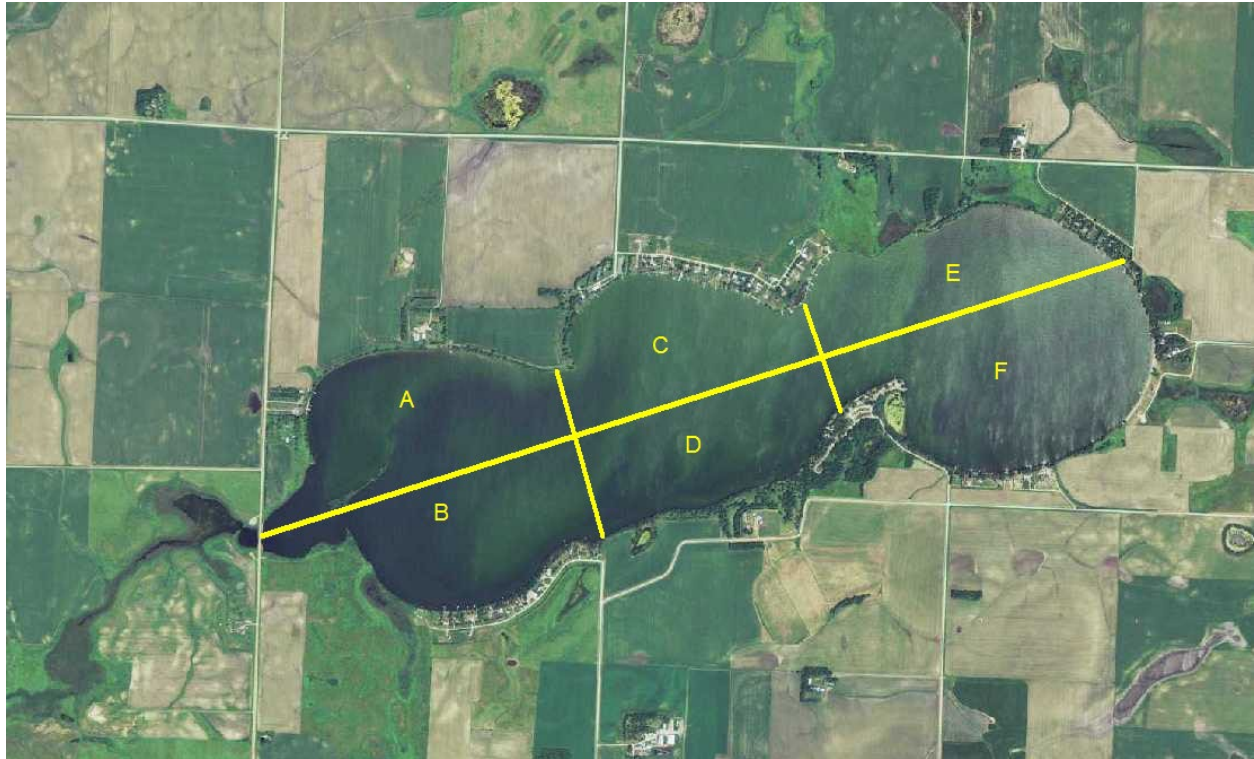
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[Appendix 1]

Observer: _____

Date: _____

Time: _____



Quadrant A:

Categories of coverage on surface: _____ Categories: **R**-Rare (1-25%), **S**-Scattered (25-50%), **C**-Common (50-75%) or **A**-Abundant (75-100%)

Percent coverage under water _____%

Dominant types (top 2) of aquatic vegetation (if known) _____

How many times stopped to clean off propeller? _____

General Comments on water clarity?

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General comments on recreational use for the week if observed?

Quadrant B:

Categories of coverage on surface: _____ Categories: R-Rare (1-25%), S-Scattered (25-50%), C-Common (50-75%) or A-Abundant (75-100%)

Percent coverage under water _____%

Dominant types (top 2) of aquatic vegetation (if known) _____

How many times stopped to clean off propeller? _____

General Comments on water clarity?

General comments on recreational use for the week if observed?

Quadrant C:

Categories of coverage on surface: _____ Categories: R-Rare (1-25%), S-Scattered (25-50%), C-Common (50-75%) or A-Abundant (75-100%)

Percent coverage under water _____%

Dominant types (top 2) of aquatic vegetation (if known) _____

How many times stopped to clean off propeller? _____

General Comments on water clarity?

General comments on recreational use for the week if observed?

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Quadrant D:

Categories of coverage on surface: _____ Categories: R-Rare (1-25%), **S**-Scattered (25-50%), **C**-Common (50-75%) or **A**-Abundant (75-100%)

Percent coverage under water _____%

Dominant types (top 2) of aquatic vegetation (if known) _____

How many times stopped to clean off propeller? _____

General Comments on water clarity?

General comments on recreational use for the week if observed?

Quadrant E:

Categories of coverage on surface: _____ Categories: R-Rare (1-25%), **S**-Scattered (25-50%), **C**-Common (50-75%) or **A**-Abundant (75-100%)

Percent coverage under water _____%

Dominant types (top 2) of aquatic vegetation (if known) _____

How many times stopped to clean off propeller? _____

General Comments on water clarity?

General comments on recreational use for the week if observed?

Quadrant F:

Categories of coverage on surface: _____ Categories: R-Rare (1-25%), **S**-Scattered (25-50%), **C**-Common (50-75%) or **A**-Abundant (75-100%)

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Percent coverage under water _____%

Dominant types (top 2) of aquatic vegetation (if known) _____

How many times stopped to clean off propeller? _____

General Comments on water clarity?

General comments on recreational use for the week if observed?
