

Lake Shoreland & Shallows Habitat Survey

Grindstone Lake WBIC: 2391200

Sawyer County, Wisconsin

July 2021

Sponsored by the Grindstone Lake Association and the Wisconsin Dept. of Natural Resources

Field data collected by Bay Area Environmental Consulting, Washburn, WI and analyzed/mapped by Ecological Integrity Service, Amery, WI

Table of Contents

Introduction	3
Methods	3
Riparian zone	3
Bank zone.....	6
Littoral zone	8
Coarse woody habitat inventory.....	10
Results	11
Riparian zone data	11
Bank zone data.....	12
Littoral zone data	12
Survey data comparison (2006 to 2021).....	13
Coarse woody habitat.....	13
Maps for management	15
Tree canopy	15
Ground cover-shrub/herbaceous	16
Ground cover-impervious surfaces.....	17
Ground cover-manicured lawn	18
Ground cover-agriculture	19
Ground cover-other (duff, mulch, etc.)	20
Riparian structures-buildings	21
Runoff potential-lawn/soil slopes to lake	22
Runoff potential-bare soil.....	23
Bank modification-rip rap	24
Bank erosion < 1 foot face	25
Bank erosion > 1foot face	26
Aquatic plants-floating plants present	27
Aquatic plants-emergent plants present	28
Invasive plants species present	29
Other maps	30
Coarse woody habitat inventory maps (coming in spring 2022)	43
Branches	44
In water.....	45
Touches shore.....	46
Segment number/parcel reference maps	47
Data	50

Introduction

In July 2021, a lake shoreland and shallows habitat survey was conducted on Grindstone Lake, Sawyer County, Wisconsin. This survey followed the Wisconsin Dept of Natural Resources field protocol for a shoreline and shallows survey. The methodology involved surveying, assessing, and mapping habitat in lakeshore areas, including the riparian zone, bank, and littoral zone. The data collected include the following: percent tree cover, percent ground cover by type (impervious surfaces, manicured lawns, and natural), erosion concerns, length of modified banks, the density of human structures, presence of floating/emergent plants, and coarse woody habitat. This data will provide information to help manage Grindstone Lake. The data is presented as an overview of each lake, followed by maps showing the presence and magnitude of various categories.

Methods¹

The assessment boundary included the riparian zone (from the ordinary high-water level inland 35 feet), the bank, and the littoral zone (area with plants). Each site was evaluated for specific data, separated by zone or category. One massive parcel on the south shore in the riparian zone is listed as Bass Lake Township. This parcel was divided into smaller segments to better reflect the human activity in this area.

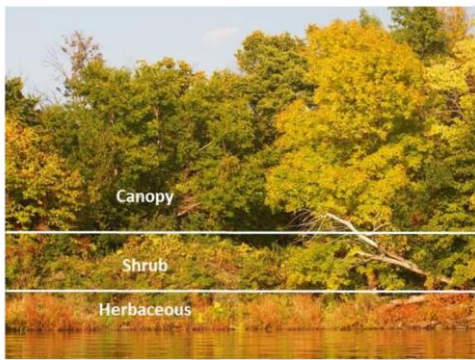
Riparian zone:

The riparian zone was estimated at 35 feet from the ordinary high-water mark and was evaluated horizontally along the shore for the entire parcel. GPS coordinates marked the parcel's corners, and the boat's position was used as a position reference.



1. The canopy (large trees at least 16 feet tall) cover was estimated by percent cover (0-100%).

¹ The methods used and all pictures in methods were obtained from the *Lake Shorelands and Shallow Habitat Monitoring Field Protocol*. Wisconsin Department of Natural Resources. May 2016.



2. Ground layer coverage (by %, which adds to 100%). The different types include:
 - a. Shrubs and herbaceous plants (shrubs are woody plants with multiple stems or tree saplings < 16 feet tall, and herbaceous plants are grasses and forbs).
 - b. Impervious surfaces (water won't infiltrate into the soil), including concrete, decking, boulders, stone, rip rap, rooftops, compacted gravel/soil, and flipped over boats near shore.



- c. Manicured lawn.
 - d. Agriculture such as row crops, pasture, range, and hayfields.



- e. Other, including duff, bedrock, gravel, bare soil, sand, mulch, etc.

Plants were only quantified in their growth form and not their taxonomy. This includes invasive species included in the native plants for percent cover.

3. Human structures in the riparian zone.
 - a. The number of structures present within the riparian zone was counted. These include buildings, boats, fire pits, and other objects that are not easily moved.

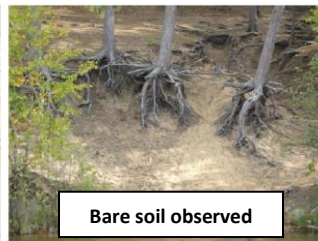


4. Runoff concerns

- a. Changes that could increase runoff were evaluated. The runoff concerns were identified as within the riparian zone or the parcel but outside the riparian zone. These changes may have included culverts, drain pipes, rain gutters, sump pumps, gray water outflow, channelized flow gullies, stairways, trails, sloped lawn, bare soil, sand/silt deposits, or any other observed concerns.



Point source runoff source



Bare soil observed



Stairs, trail, road walks present



Lawn/bare soil sloped into lake (directly)

Bank zone:

The bank zone (space between ordinary high-water mark and present water level (at time of the survey) was evaluated for bank modification and erosion. The length of any modifications and erosion was estimated to the nearest 10 feet. These modifications could include:

1. Vertical sea wall



2. Rip rap



3. Other erosion control features



4. Artificial beach



5. Slumping banks/erosion of banks > one-foot bank face



6. Slumping banks/erosion of banks < one-foot bank face



Littoral zone

The littoral zone was surveyed for human structures and aquatic plants. The aquatic plant evaluation was limited to recording if floating and emergent plants were present within the littoral zone and evidence of aquatic plant removal within this zone.

The human structures could include:

1. Piers



2. Boatlifts



3. Swim rafts/water trampolines



4. Boathouses (only over water)/Marinas



Aquatic vegetation:

1. Presence of emergent plants-plants that stick up beyond the water surface.
2. Presence of floating plant leaves lay on the water's surface.



3. Evidence of aquatic plant removal.



Exposed Lake Bed Zone

These areas were evaluated when lake levels were low and exposed at least three horizontal feet of the lake bed. The lake level appeared below the ordinary high watermark.

Coarse Woody Habitat Inventory

In this portion of the survey, any “large wood” (defined as greater than 4 inches in diameter and at least 5 feet long). GPS coordinates were recorded for any piece of large wood between the ordinary high-water level and 2 feet in water depth. Only dead or alive natural wood (trees) was counted. (Note: Secchi depth needs to be greater than 2ft to record coarse woody habitat. This threshold was met in each lake.)



Each coarse woody habitat recorded was evaluated with a ranking as follows:

“0” = no branched on the wood

“1” = a few branches

“2” = tree trunk was a full crown.

Each coarse woody habitat wood was also evaluated to touch the shore. A “0” was recorded if the log did not cross the high-water level and thus did not come out of the water to the shore. A “1” was recorded if the wood did cross the high-water level and went out of the water and touched the shore. The coarse woody habitat was also evaluated in terms of in the water. It was given a “1” if at least 5 feet of the log is under the water and a “0” if less than 5 feet of the log is under the water.



Results²

The shoreland survey data set is extensive. To summarize, the mean values for all parcels on the lake are listed. It is essential to keep in mind that these data do not account for the size of the parcels but are simply means for all parcels. For this reason, some values could be somewhat misleading. For example, a small parcel may have a large lawn, leading to a large % ground cover by manicured lawn. While another parcel may have the same size lawn, the % ground cover by manicured lawn will be smaller because the parcel is large. However, to summarize the parcels in each lake, it should reflect a reasonably accurate representation for management purposes by scrutinizing parcel size.

Maps of each data set are also presented. This will allow for identifying parcels of concern to help mitigate nutrient loading.

Riparian zone data

Tree cover/ground cover:

Cover	Mean % of all parcels	Area weighted % ³
Canopy/tree	77%	78%
Shrub/herbaceous (natural)	61.4%	67.3%
Manicured Lawn	19.2%	15.1%
Impervious surface	5.4%	5.0%
Agriculture	0.17%	0.1%
Other (duff/mulch)	13.9%	12.5%

Human structures in the riparian zone:

Category	Mean per parcel
Buildings	0.21
Boats onshore	0.65
Fire pits	0.23

Runoff concerns:

Category	All Grindstone Lake Parcels
% of parcels with point source runoff observed	0%
% of parcels with channelized flow	0%
% of parcels with stair/trail/road to the lake	51.6%
% of parcels with lawn/soil sloping directly to the lake	21.6%
% of parcels with bare soil observed	16.9%
% of parcels with sand/silt deposited	0.3%
% of parcels with bank erosion face <1 ft	5.9%
% of parcels with bank erosion > 1ft	6.9%

² Some parcels are quite large therefore maps may be misleading as it may appear the entire segment has structures or other human activity when in reality it is only a small segment of the entire parcel segment.

³ This considers the size of the parcel. The area of the parcel is multiplied by the percent fraction to calculate the area of the cover. This total was then divided by total area of all parcels in riparian zone.

Bank Data

Modified banks:

	% of entire shore with vertical sea wall	% of the whole shore with rip rap	% of the whole shore with other erosion control structures	% of the whole shore with artificial beach
Total length of installation (ft)	60	3670	60	150
% of Grindstone Lake Entire shore length	0.1%	6.5%	0.1%	0.3%

Littoral zone data

Structures:

	Mean number of Piers/parcels	Mean number of Boat Lifts/parcel	Mean number of Swim rafts/water trampolines/parcel	Mean number of Boathouses/parcels	Mean number of Marinas/parcel
Grindstone Lake per parcel	0.87	1.26	0.025	0.0	0.0

Aquatic plants in the littoral zone:

	% of parcels with emergent plants observed	% of parcels with floating plants observed	% of parcels with evidence of Plant Removal	% of parcels with AIS observed
Grindstone Lake all parcels	6.25%	3.75%	0%	6.25%

Comparison to a previous survey (2006)

In 2006 a shoreline survey was completed. The protocol for that survey differs from the Wisconsin DNR Shoreland and Shallows Survey protocol. However, there are a few parameters that can be extracted from the 2021 survey to compare to the 2006 survey.

Survey Year	Rip Rap as % of total shoreline length	Structures as % of total shoreline length	Lawn as % of total riparian area*	Impervious surface as % of total riparian area	% of total shoreline length that is <i>natural</i>	% of total riparian area <i>natural</i>
2006	2.3%	0.2%	9.4%	2.2%	95%	73%
2021	6.5%	0.2%	15.5%	5.0%	93%	67.4%
Change from 2006 to 2021	+4.2%	0.0%	+6.1%	+2.8%	-2%	-5.6%

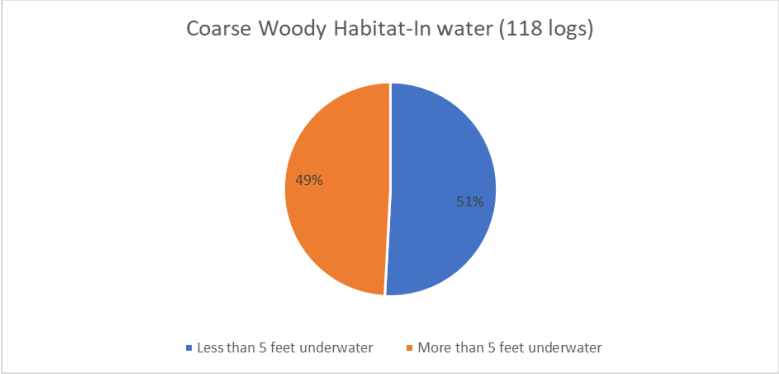
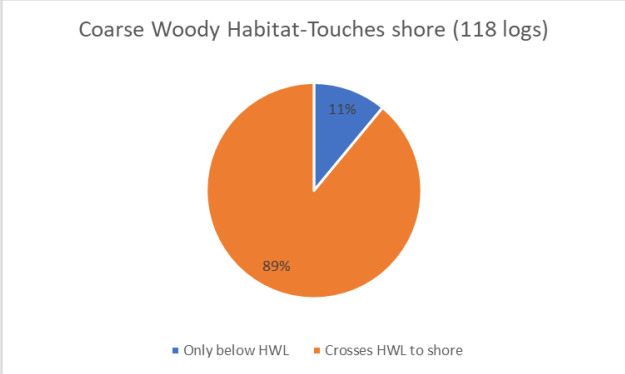
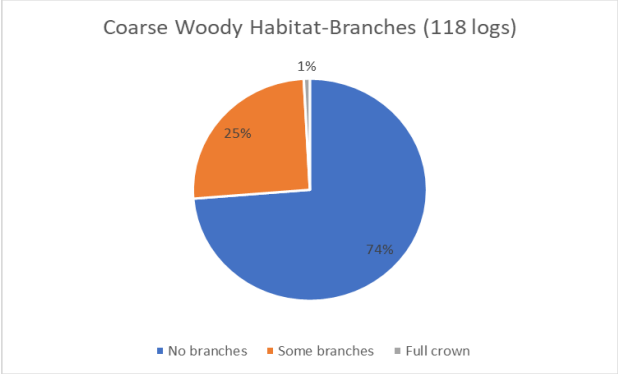
*The area of the riparian area calculation in 2006 is not known but is assumed to be based on 35 ft buffer depth to determine.

Coarse woody habitat

The coarse woody habitat resulted in 118 logs identified that qualify as coarse woody habitat. Grindstone Lake, including the two islands, has 11.17 miles of shoreline. This calculates to **10.56 logs/mile of shoreline**. This is somewhat limited for a lake with a large amount of forested cover around the lake. Residents should be encouraged to leave trees that fall into the water as they provide important habitat for many organisms.

The survey included identifying the amount of branching on the logs if the logs touch the shore above the high-water mark, and how much is under the surface of the water. The table below shows the summary of the various categories.

<i>Each is out of 118 logs recorded</i>	Branches	% of all logs
No branches	87	73.73%
Some branches	30	25.42%
Full crown	1	0.85%
	Touches shore	% of all logs
Only below HWL	13	11.02%
Crosses HWL to shore	105	88.98%
	In water	% of all logs
Less than 5 feet underwater	60	50.85%
More than 5 feet underwater	58	49.15%

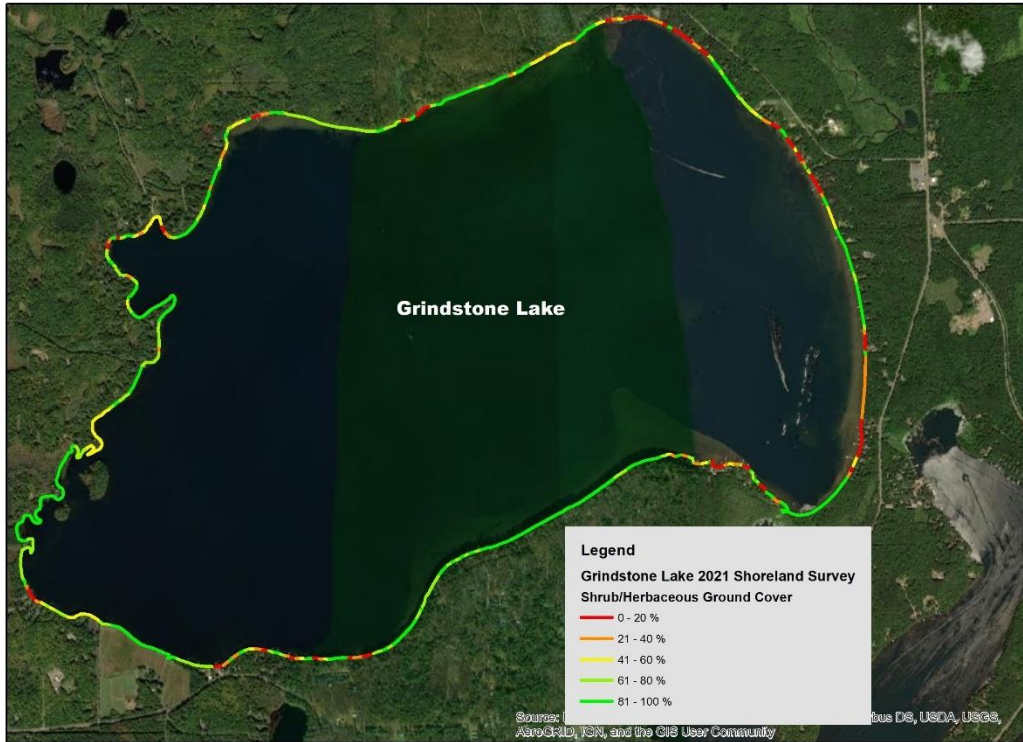


Maps that may aid in management:

Canopy cover: Less canopy cover can increase runoff and increase erosion.



Herbaceous/Shrub Cover: This indicates natural ground cover. The less natural ground cover means more, less desirable cover, increasing runoff and nutrients in that runoff.



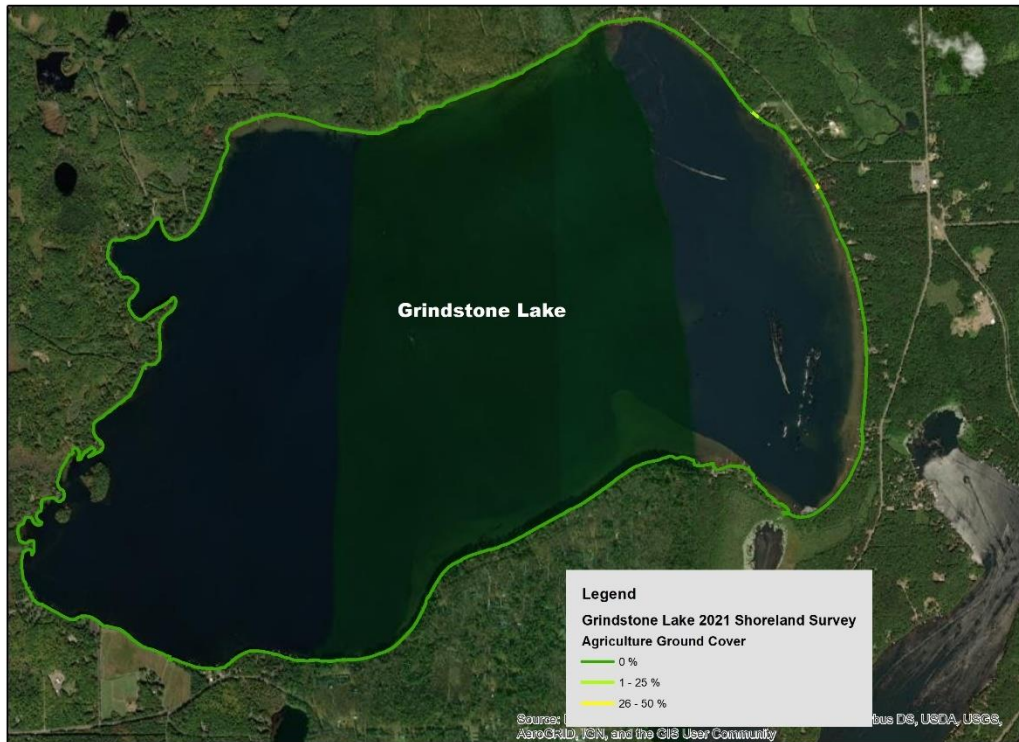
Impervious surface cover: Impervious surfaces do not allow for the infiltration of precipitation. This increases runoff immensely.



Manicured lawn ground cover: Manicured lawns are less effective in reducing runoff due to limited root structure, shorter height, and fertilization. This can increase runoff and nutrient loading.



Agriculture ground cover: Agriculture practices can lead to more exposed soil and may include fertilizer use. This can lead to increased runoff and nutrient loading. If the cover is a garden and functioning as a rain garden, its impact is positive.



Other ground cover (duff/mulch/soil): This cover indicates little to no plant cover. If the other is bare soil, it can increase erosion and nutrient loading. Duff may be due to extensive tree cover, and mulch is associated with landscape. This may be beneficial depending on the practice for which the cover is being utilized.



Buildings in the riparian zone: Buildings increase impervious surfaces with the roof. These structures can increase runoff.



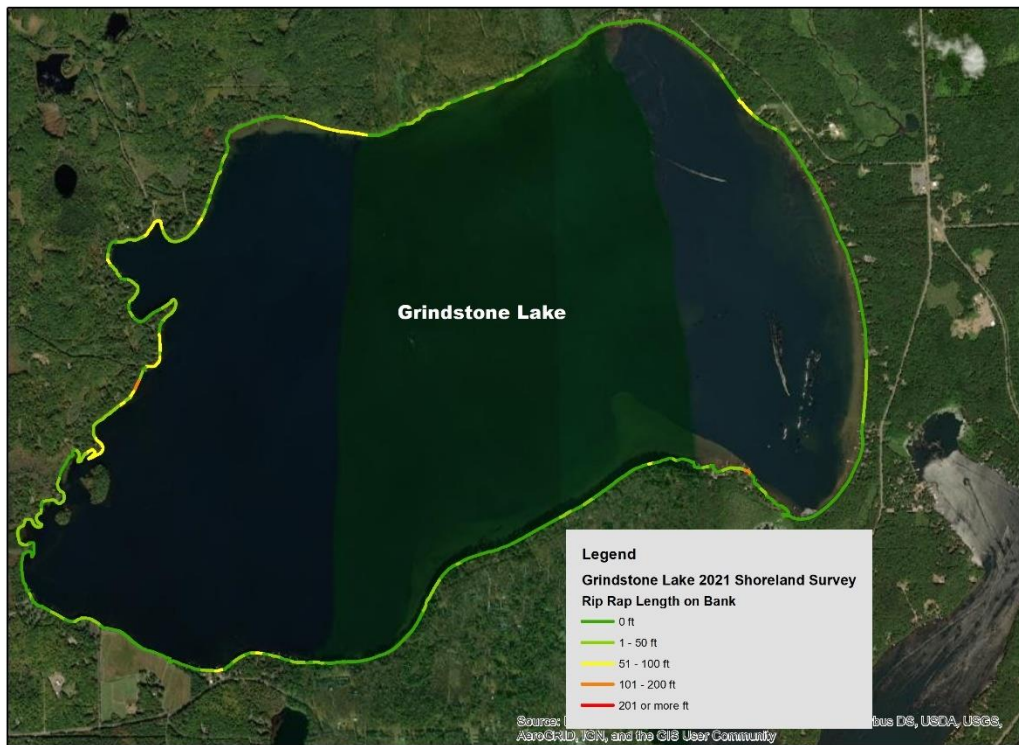
Lawn/soil sloping directly to the lake: If the land cover includes lawn sloping or exposed soil on a slope that runs now to the lake can increase runoff and nutrient loading compared to natural ground cover.



Bare soil: Bare soil implies that there is no ground cover. Bare soil is prone to erosion which can increase runoff and nutrient loading.



Riprap: Riprap on a bank can be positive by reducing bank erosion. However, rip rap can also reduce shoreline habitat for various organisms.



Bank erosion with < 1ft face: Bank erosion can lead to sedimentation. Phosphorus is typically associated with sediment, therefore increasing nutrient loading and water runoff potentially increasing.



Bank erosion with > 1ft face: Bank erosion can lead to sedimentation. Phosphorus is typically associated with sediment, therefore increasing nutrient loading and water runoff potentially increasing. The larger face indicates more intense erosion.



Floating plants present: It is desirable to have floating plants in the littoral zone. They provide cover and habitat for a myriad of lake organisms. These plants can also reduce wave energy and stabilize lake sediments.



Emergent plants present: Emergent plants stick out beyond the lake surface. They provide cover for many organisms including larger species such as waterfowl, birds, and aquatic mammals. Emergent plants can also reduce wave energy bank erosion and stabilize lake sediment.

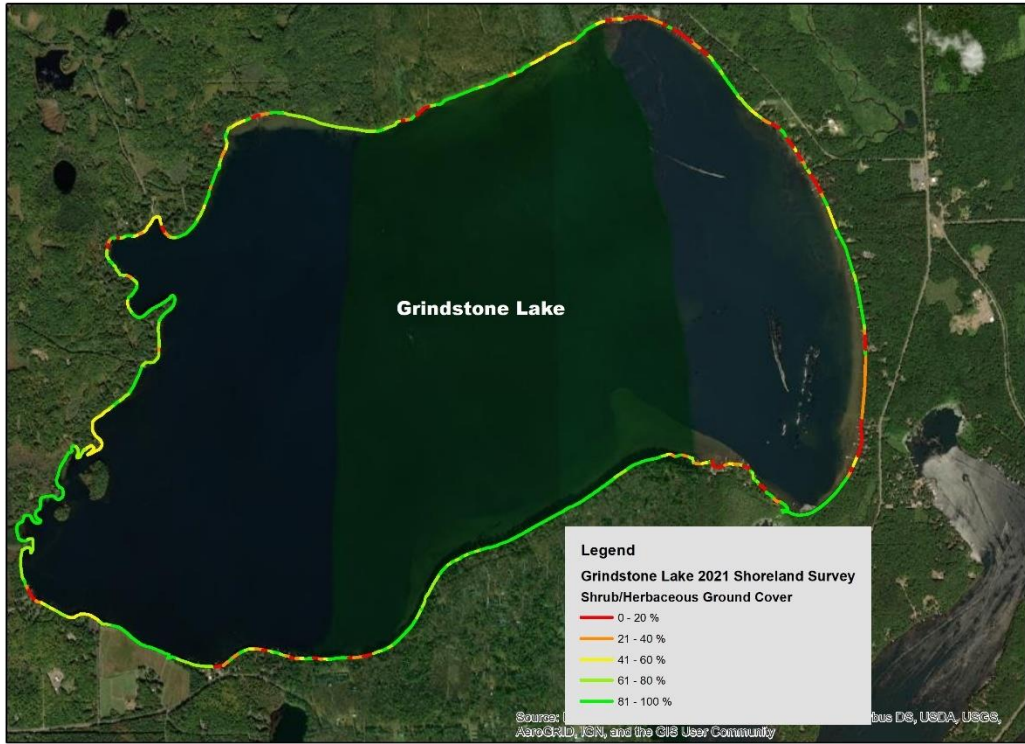


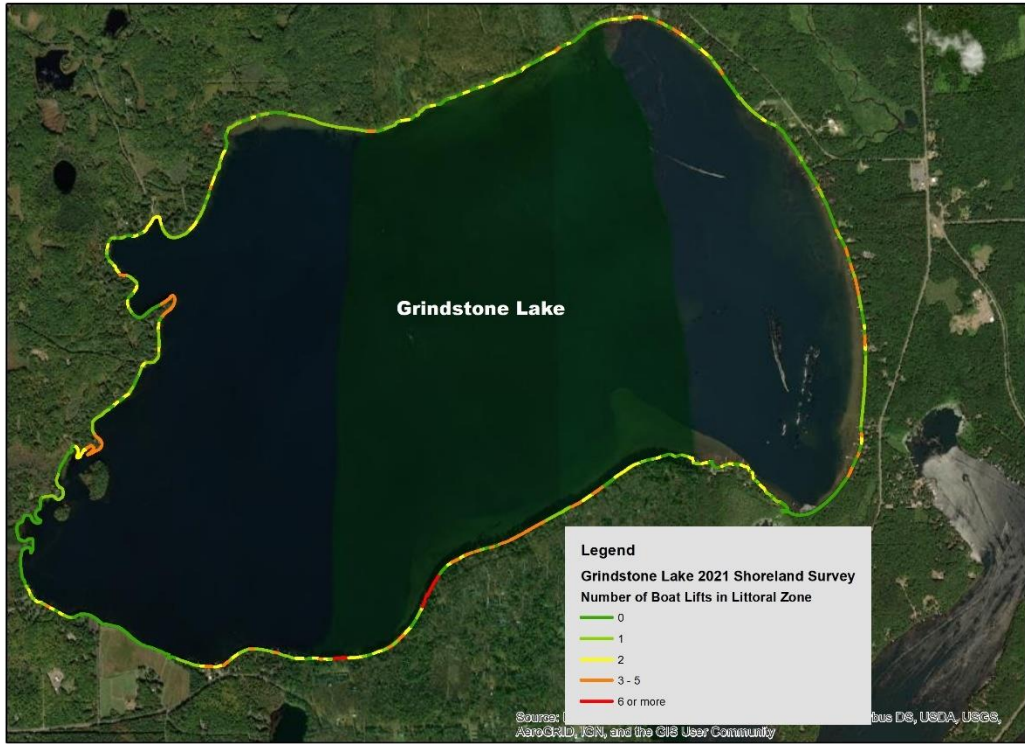
Aquatic invasive species (AIS): Aquatic invasive species (and terrestrial species) can out-compete native plants and reduce diversity in ecosystems. The plants are observed in the riparian zone, which an aquatic plant survey may miss.

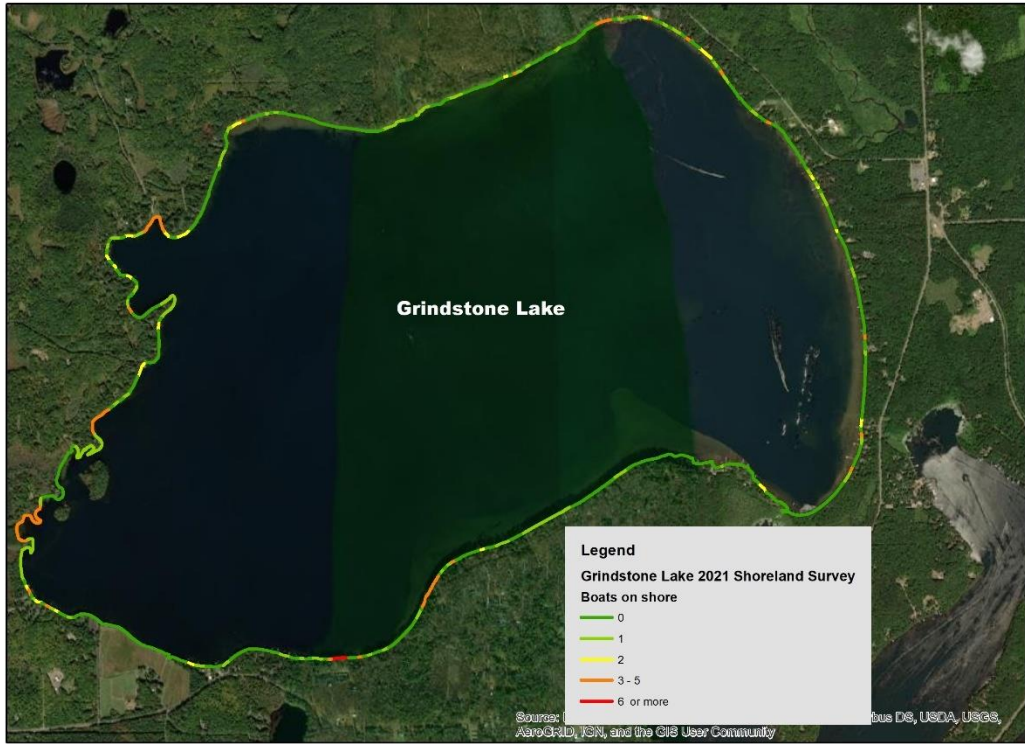


Other maps

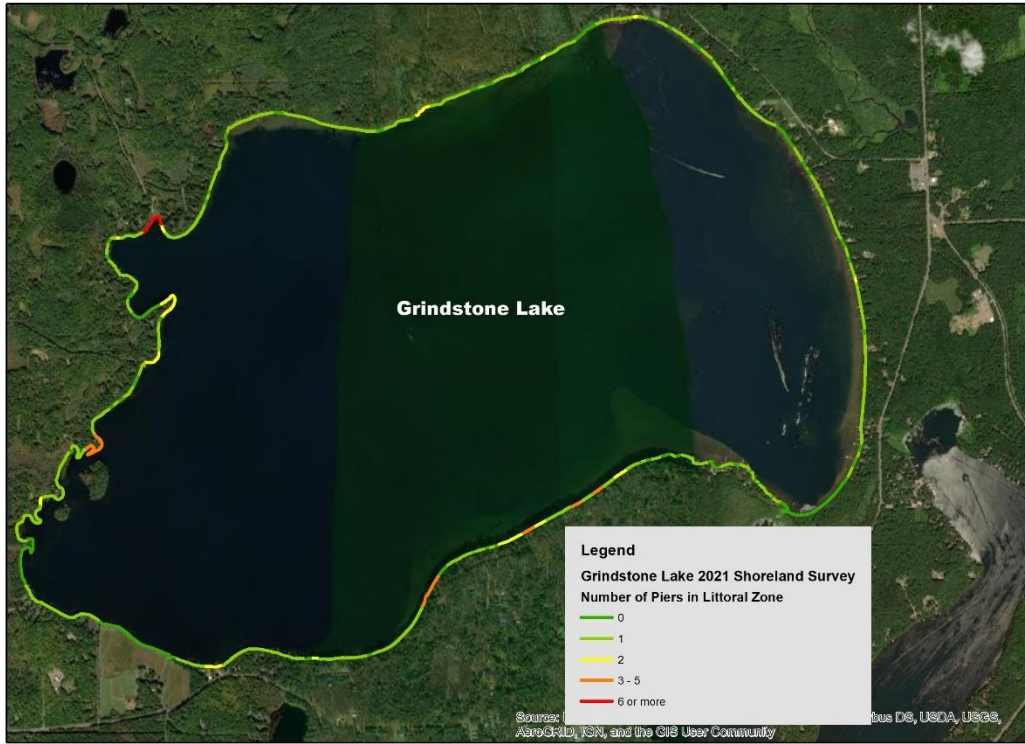
















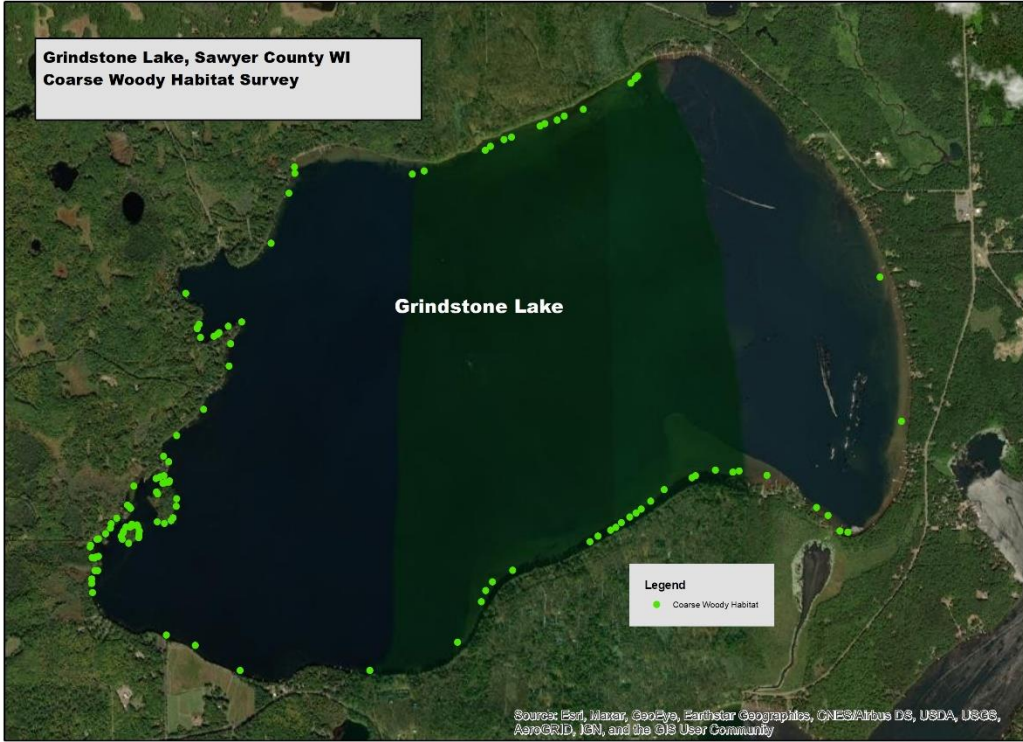


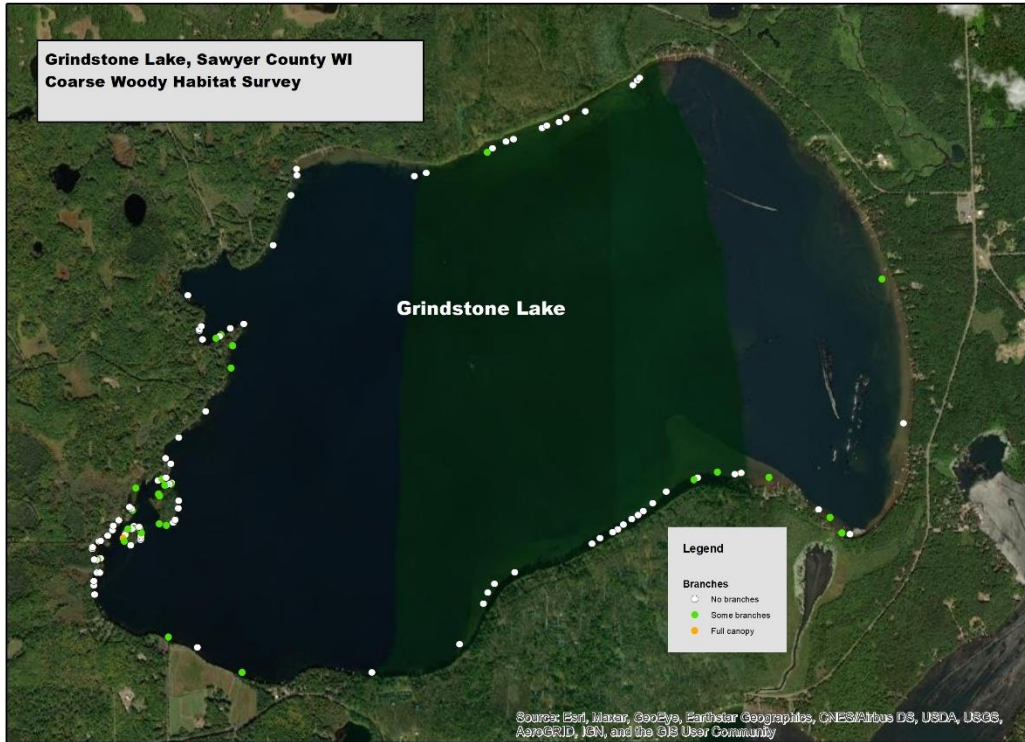


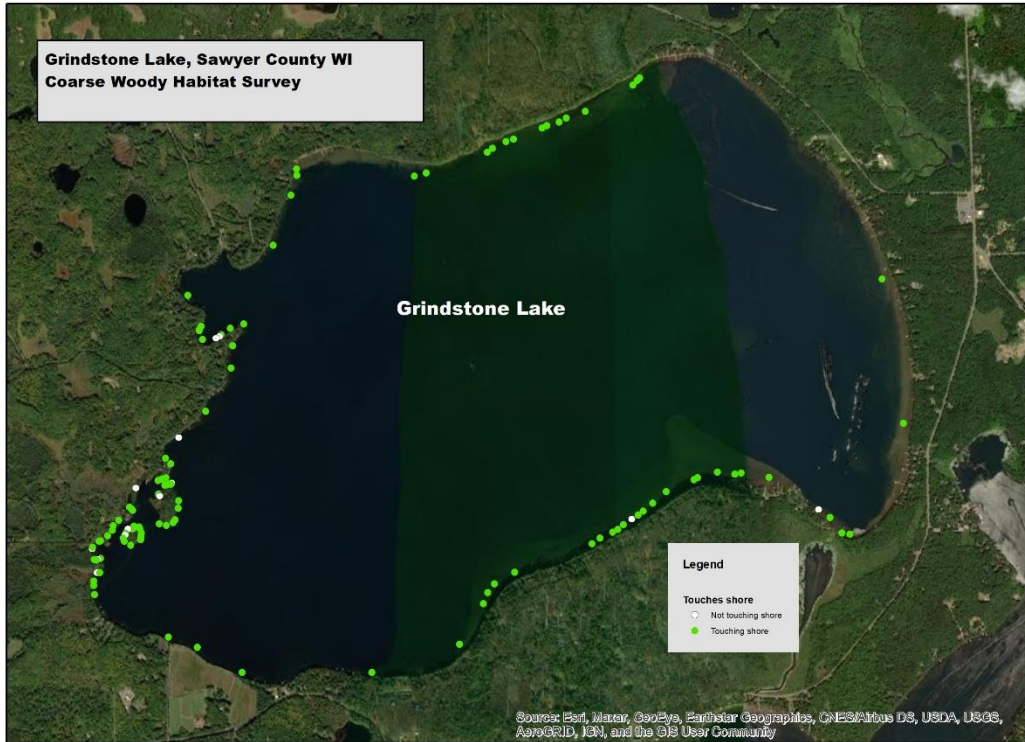


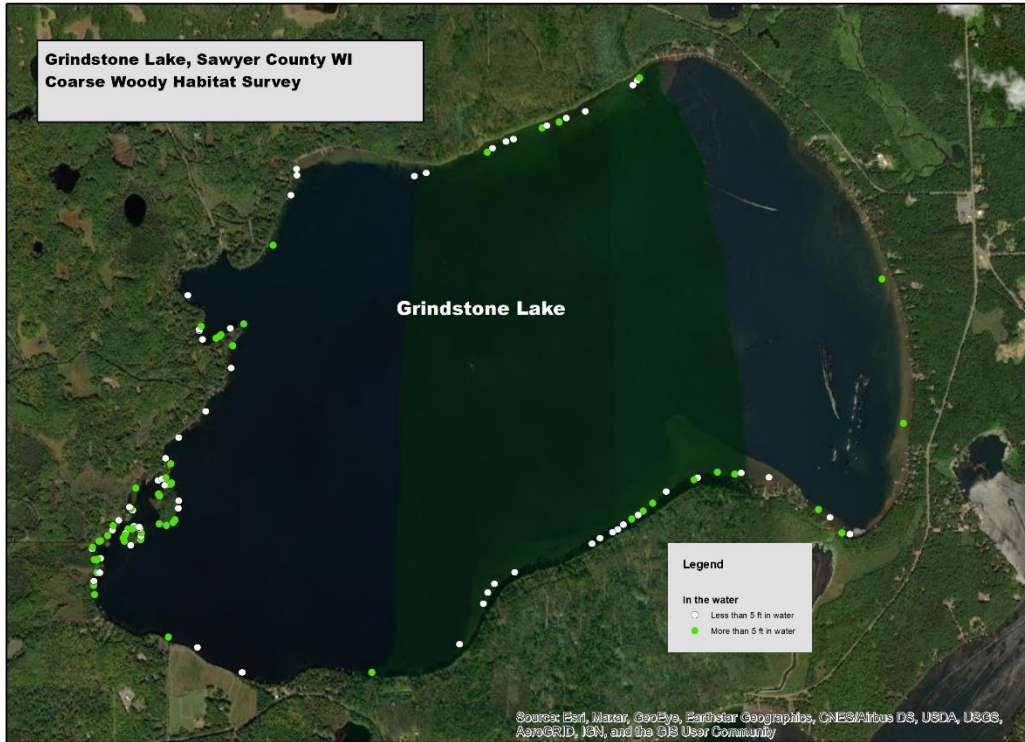








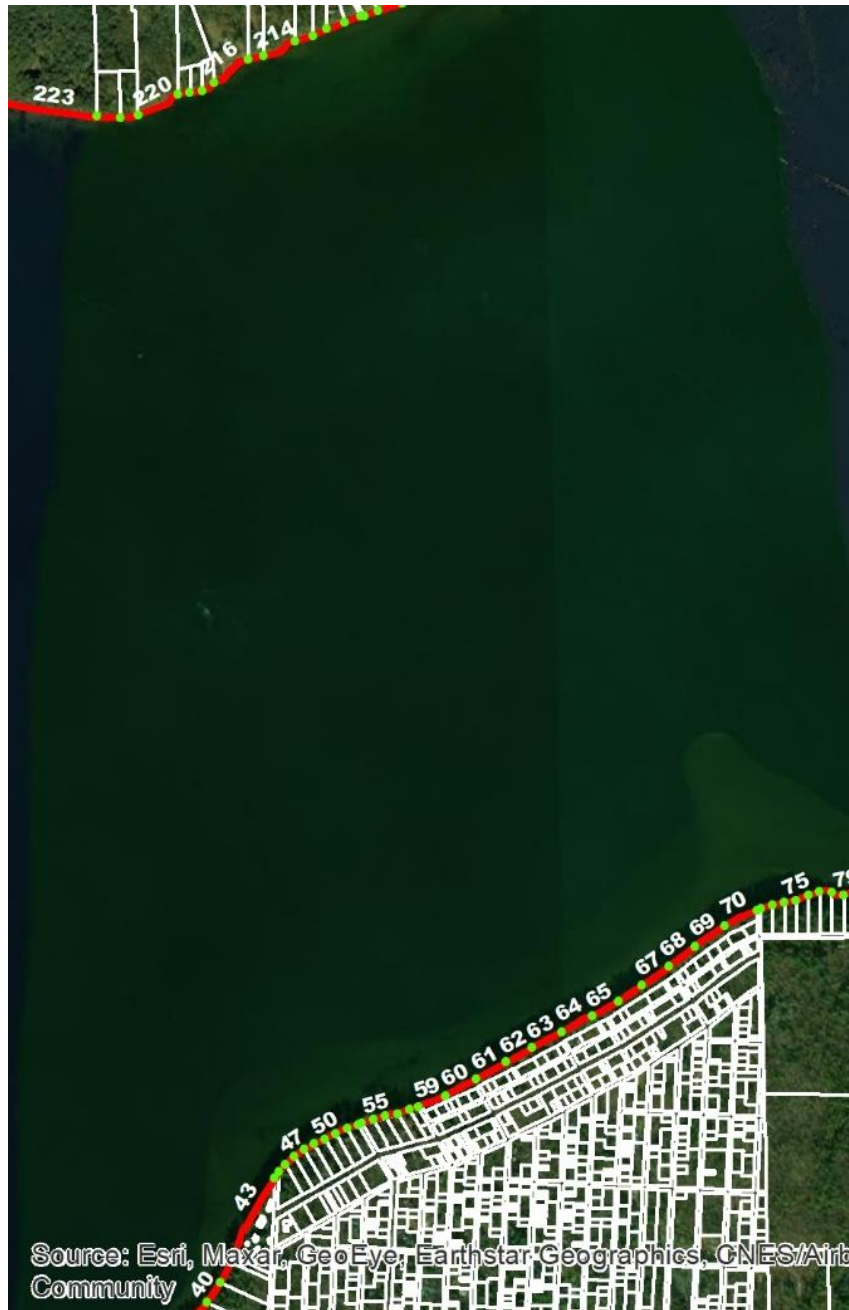




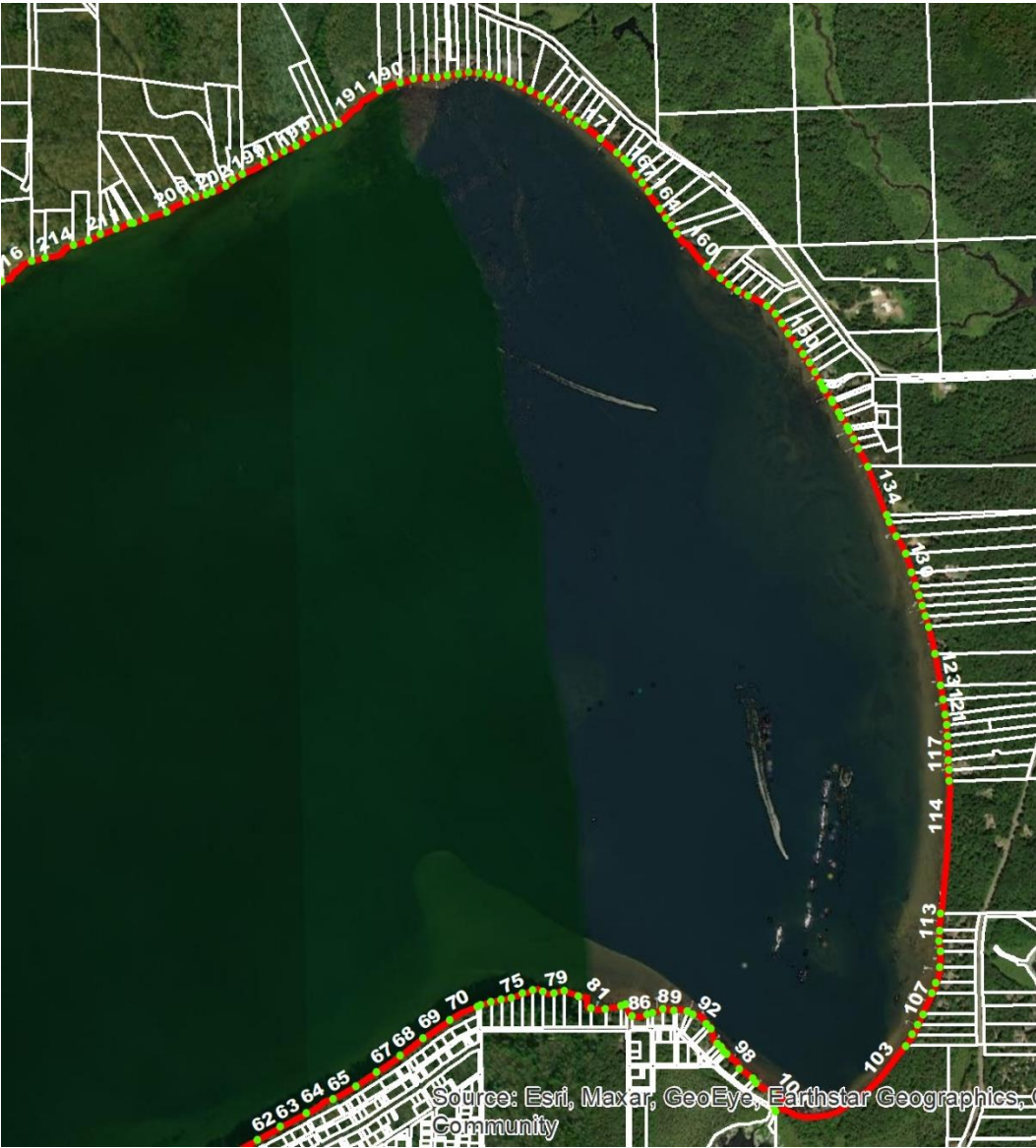
The western portion of Grindstone Lake Parcels/Shore Segments



The Central portion of Grindstone Lake Parcels/Shore Segments



The Eastern portion of Grindstone Lake Parcels/Shore Segments



Data (zoom in with digital copy)

Coarse woody habitat data

ident	Latitude	Longitude_y_proj	x_proj	branches	shore	in water
WP001	45.92342	-91.4498	5086707	620199.8	0	1
WP002	45.92394	-91.4499	5086765	620193.8	0	1
WP003	45.92421	-91.4499	5086795	620193.9	0	1
WP004	45.92468	-91.4496	5086847	620214.5	0	1
WP005	45.92466	-91.4494	5086846	620231.9	0	1
WP006	45.92548	-91.4493	5086937	620235	0	1
WP007	45.92543	-91.4495	5086931	620218.4	1	0
WP008	45.92539	-91.4496	5086925	620210.2	0	1
WP009	45.92542	-91.4498	5086929	620196.2	0	1
WP010	45.92602	-91.45	5086996	620183	0	0
WP011	45.92611	-91.4499	5087006	620184.9	0	1
WP012	45.92644	-91.4494	5087044	620225.3	0	1
WP013	45.92646	-91.4493	5087046	620235.7	0	1
WP014	45.92675	-91.4487	5087079	620281	0	1
WP015	45.92706	-91.4483	5087114	620311.7	0	1
WP016	45.92712	-91.4482	5087143	620316.7	0	1
WP017	45.92762	-91.4477	5087177	620330.9	0	1
WP018	45.92736	-91.4465	5087139	620446.4	0	1
WP019	45.92715	-91.4466	5087127	620443.8	1	1
WP020	45.92711	-91.4466	5087122	620437	1	1
WP021	45.9271	-91.4467	5087121	620433.5	0	1
WP022	45.92712	-91.447	5087123	620409.1	1	0
WP023	45.92686	-91.4472	5087094	620394.3	1	1
WP024	45.92677	-91.4472	5087083	620391.7	0	1
WP025	45.92659	-91.4474	5087063	620380.3	2	1
WP026	45.92643	-91.4473	5087045	620386.2	1	1
WP027	45.92619	-91.4468	5087019	620425.7	0	1
WP028	45.92648	-91.446	5087053	620489.2	0	1
WP029	45.92656	-91.446	5087062	620491.1	0	1
WP030	45.92669	-91.4459	5087096	620492.2	1	1
WP031	45.92686	-91.4459	5087096	620494.6	1	1
WP032	45.92712	-91.446	5087124	620485.7	1	1
WP033	45.9272	-91.4461	5087133	620479.9	0	1
WP034	45.92818	-91.4466	5087240	620439.5	1	1
WP035	45.92825	-91.4467	5087249	620431.7	0	1
WP036	45.92836	-91.4468	5087260	620420.3	0	1
WP037	45.92944	-91.4463	5087381	620459.1	1	0
WP038	45.92982	-91.4445	5087427	620600.3	0	1
WP039	45.92992	-91.4441	5087428	620625.9	0	1
WP040	45.92999	-91.4438	5087447	620650.8	0	1
WP041	45.92969	-91.4434	5087413	620684.9	0	0
WP042	45.92962	-91.4434	5087405	620683.3	1	1
WP043	45.92962	-91.4436	5087405	620669	0	1
WP044	45.92959	-91.4438	5087401	620651.7	0	1
WP045	45.92955	-91.4439	5087398	620642.7	0	1
WP046	45.92906	-91.4445	5087342	620602	1	1
WP047	45.92895	-91.4444	5087330	620610.6	1	0
WP048	45.92738	-91.4444	5087155	620608.4	1	1
WP049	45.92727	-91.4439	5087144	620603.2	1	1
WP050	45.92744	-91.4433	5087163	620695.3	0	1
WP051	45.92757	-91.4431	5087179	620707.6	0	1
WP052	45.92844	-91.4429	5087253	620727.7	0	1
WP053	45.92866	-91.4428	5087300	620729.6	0	1
WP054	45.93077	-91.4434	5087354	620799	0	1
WP055	45.93108	-91.4438	5087367	620848.4	0	1
WP056	45.93226	-91.4427	5087700	620730.8	0	0
WP057	45.9327	-91.4405	5087984	620901.1	0	1
WP058	45.93615	-91.4383	5088139	621000.8	1	1
WP059	45.93739	-91.4382	5088277	621072	1	1
WP060	45.93864	-91.4372	5088417	621141.7	0	1
WP061	45.93839	-91.4383	5088388	621066.6	0	1
WP062	45.93805	-91.4391	5088349	620998.9	1	1
WP063	45.93795	-91.4392	5088338	620988.6	0	0
WP064	45.93785	-91.4395	5088326	620987.3	1	1
WP065	45.9378	-91.4406	5088319	620979.7	0	1
WP066	45.93829	-91.4409	5088372	620981.2	0	1
WP067	45.93836	-91.4409	5088381	620980.3	0	1
WP068	45.93854	-91.4407	5088401	620873.2	0	1
WP069	45.94011	-91.4418	5088996	620787.9	0	1
WP070	45.94207	-91.4447	5089119	621221.7	0	1
WP071	45.94588	-91.4332	5089228	621440.7	0	1
WP072	45.94702	-91.4327	5089355	621472.2	0	1
WP073	45.94788	-91.4327	5089395	621475.7	0	1
WP074	45.94683	-91.4231	5089349	622220.4	0	1
WP075	45.947	-91.4221	5089369	622295.3	0	1
WP076	45.94811	-91.4211	5089500	622480.6	1	1
WP077	45.94831	-91.4217	5089523	622713.6	0	1
WP078	45.9487	-91.4216	5089568	622799.7	0	1
WP079	45.94881	-91.4249	5089582	622846.8	0	1
WP080	45.94941	-91.4236	5089652	623027.9	0	1
WP081	45.94954	-91.4222	5089667	623058.3	0	1
WP082	45.94974	-91.4212	5089691	623135.1	0	1
WP083	45.94995	-91.4206	5089715	623179.9	0	1
WP084	45.95032	-91.4209	5089758	623300.9	0	1
WP085	45.95176	-91.4201	5089924	623602.6	0	1
WP086	45.95201	-91.4208	5089953	623629.2	0	1
WP087	45.95215	-91.4205	5089969	623645.6	0	1
WP088	45.94945	-91.3851	5089899	625177.7	1	1
WP089	45.92225	-91.3836	5087900	625314.2	0	1
WP090	45.92601	-91.3882	5087089	624974.1	0	1
WP091	45.92629	-91.3888	5087097	624924.5	1	1
WP092	45.92688	-91.3898	5087195	624947.3	1	1
WP093	45.92744	-91.3907	5087245	624774.5	0	0
WP094	45.92932	-91.3947	5087448	624461	1	1
WP095	45.9296	-91.3969	5087475	624287	0	1
WP096	45.92955	-91.3974	5087469	624247.4	0	1
WP097	45.92967	-91.3989	5087480	624135	1	1
WP098	45.92938	-91.4005	5087446	624010.3	0	1
WP099	45.92928	-91.4008	5087433	623988.3	1	1
WP100	45.92863	-91.4031	5087358	623812.1	0	1
WP101	45.92788	-91.4042	5087284	623719.9	0	1
WP102	45.92755	-91.405	5087235	623666.9	0	1
WP103	45.92734	-91.4054	5087210	623635.3	0	1
WP104	45.9271	-91.4059	5087184	623595.4	0	1
WP105	45.9268	-91.4066	5087148	623541.8	0	1
WP106	45.92655	-91.4071	5087123	623506.1	0	1
WP107	45.92639	-91.4075	5087102	623475.1	0	1
WP108	45.92608	-91.4085	5087065	623393.6	0	1
WP109	45.92577	-91.4092	5087030	623343.5	0	1
WP110	45.9242	-91.4155	5086848	622855.4	0	1
WP111	45.92309	-91.4172	5086775	622726.6	0	1
WP112	45.92309	-91.4178	5086720	622684.2	0	1
WP113	45.92248	-91.4182	5086661	622605.7	0	1
WP114	45.92021	-91.4201	5086395	622506.7	0	1
WP115	45.9187	-91.4274	5086217	621951.4	0	1
WP116	45.91884	-91.4379	5086216	621305	1	1
WP117	45.92022	-91.4415	5086375	620848	0	1
WP118	45.92092	-91.4439	5086439	620665.6	1	1

