

# Shoreland and Shallows Survey

## Deer Lake, Polk County Wisconsin

WBIC: 2619400

July 2021



Photo from Bay Area Environmental Consulting as part of georeferenced shoreline photos from the survey.

Sponsored by: Deer Lake Conservancy and the Wisconsin Dept. of Natural Resources

Data collected by: Bay Area Environmental Consulting, Ashland WI

Data summary and mapping by: Ecological Integrity Service, Amery WI

## Table of Contents

<b>Introduction.....</b>	<b>3</b>
<b>Methods.....</b>	<b>3</b>
Riparian zone .....	3
Bank zone.....	6
Littoral zone .....	8
Coarse woody habitat inventory.....	10
<b>Results.....</b>	<b>11</b>
Comparison of 2003 and 2021 surveys.....	11
Riparian zone data .....	12
Bank zone data.....	12
Littoral zone data .....	13
<b>Maps for management.....</b>	<b>13</b>
Tree canopy .....	13
Ground cover-shrub/herbaceous .....	14
Ground cover-impervious surfaces.....	14
Ground cover-manicured lawn .....	15
Runoff potential-lawn/soil slopes to lake.....	15
Bank modification-rip rap .....	16
Riparian structures-buildings .....	16
Runoff concern-channelized flow .....	17
Bank erosion < 1foot face .....	17
<b>Coarse woody habitat inventory maps .....</b>	<b>18</b>
Branches .....	18
In water.....	19
Touches shore.....	19

## Introduction

In July 2021, a lake shoreland and shallows habitat survey was conducted on Deer Lake, Polk 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 Deer Lake. The data is presented as an overview, followed by maps showing the presence and magnitude of various categories.

## Methods<sup>1</sup>

The assessment boundary included the riparian zone (from the ordinary high-water level inland 35 feet), the bank, and the littoral zone (in-lake area with plants). Each site was evaluated for specific data, separated by zone or category. The shoreline segments did not follow the shoreline exactly west of landing due to the very irregular shoreline in the wetland area.

A previous survey that was more limited than this was conducted in 2003. This last survey was only performed using parcels in the Town of St. Croix as the Town of Balsam Lake parcels were not mapped at that time. The 2021 Town of St. Croix parcels were separated to compare the two surveys. In addition, there was a category of the length of lawn bank was added to the 2021 survey protocol. This summary will compare the data collected in the previous survey only.

### Riparian zone:

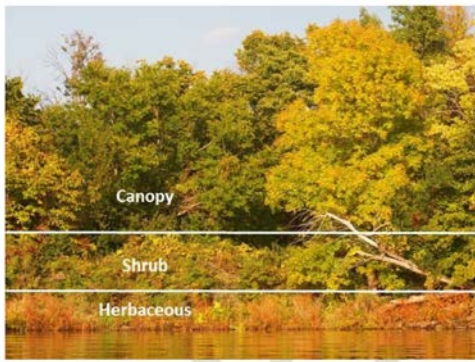
The riparian zone was estimated at 35 feet from the ordinary high-water mark and was evaluated horizontally along the shore for the entire parcel. GPS coordinates marked the parcel's corners, and the boat's position was used as a position reference.



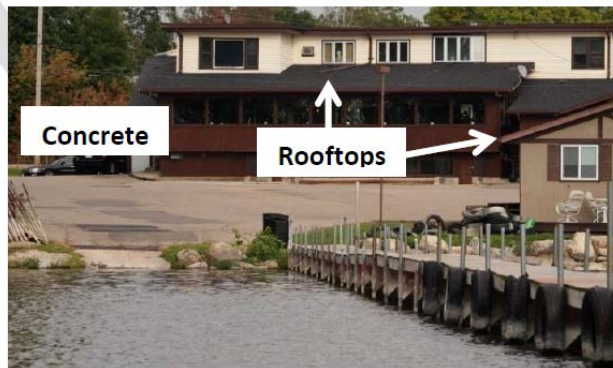
1. The canopy (large trees at least 16 feet tall) cover was estimated by percent cover (0-100%).

---

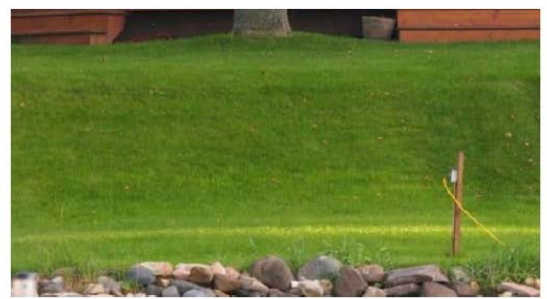
<sup>1</sup> The methods used and all pictures in methods were obtained from the *Lake Shorelands and Shallow Habitat Monitoring Field Protocol*. Wisconsin Department of Natural Resources. May 2016.



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.

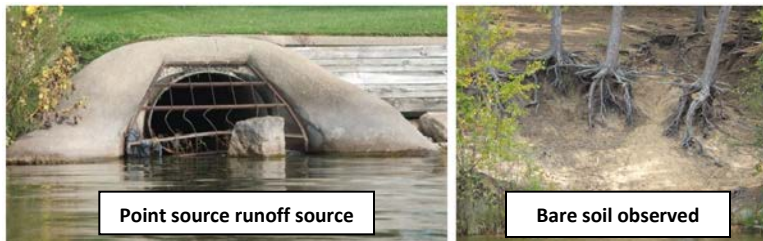
Plants were only quantified in their growth form and not their taxonomy. This includes invasive species in the shrubs and herbaceous plants percent cover.

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 within 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.



**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 if there was 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**

If lake levels are low, exposed lake bed is recorded if there is at least three horizontal feet of the lake bed exposed. The surveyors estimated that the lake level was somewhat below the ordinary high water mark at the time of the survey, but none of the exposed areas met the recording threshold.

## 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 large wood piece 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 Deer 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.



## Results

### 2003-2021 survey comparison

The 2003 shoreline survey focused on less data collection than the 2021 survey. The 2003 data focused on the length of bank characteristics related to natural, lawn, rip rap, and other structures. The area of the riparian zone (length of parcel shore X 35 feet inland) was evaluated for the amount of manicured lawn, impervious surfaces, landscaped, and natural. Since only the Town of St Croix parcels were available in 2003, these parcels were extracted out of the 2021 survey and used to calculate data comparable to the 2003 survey. Tables 1-2 show the values compared.

There were some discrepancies between the two surveys. The total length of parcels and total riparian zone areas were different. This may be due to the different sources of these measurements (length was listed on the parcel map in 2003, while in 2021, they were obtained from GIS parcel maps and measured digitally) and possible changes in parcel boundaries since 2003.

<b>% of total bank length</b>	<b>2003</b>	<b>2021</b>	<b>Change in %</b>
Manicured lawn bank	6%	6.9%	+0.9
Rip Rap bank	41%	41.8%	+0.8
Vertical sea wall (listed as "structure" in 2003)	1%	0.2%	-0.8
Natural bank	52%	51.1%	-0.9

**Table 1: Bank lengths from 2003 and 2021 surveys.**

<b>% of total sq. ft riparian</b>	<b>2003</b>	<b>2021</b>	<b>Change in %</b>
Manicured lawn cover	48.2%	30%	-18.2
Impervious surfaces cover	8.1%	10.6%	+2.5
Other (duff, soil, mulch)(listed as "landscaped" in 2003) cover	1.4%	1.8%	+0.4
Natural (2003)/Herbaceous/Shrub(2021) cover	42.3%	57.6%	+15.3

**Table 2: Ground cover area from 2003 and 2021 surveys.**

Table 1, showing the bank lengths by percent, indicates little to no change from 2003 to 2021. The riparian zone coverage of different land covers differs between the two surveys (Table 2). The lawn change is good for Deer Lake as less lawn and more natural land cover will reduce runoff and nutrient loading. This change may be due to installing a buffer zone within the lawn cover.

2021 survey data summary (all parcels around Deer Lake)

**Riparian zone data**

Canopy cover/Ground cover:

Cover	Mean % of all parcels <sup>2</sup>	Area weighted mean % <sup>3</sup>
Canopy/tree	78.4	80.0
Shrub/herbaceous (natural)	48.3	53.4
Manicured Lawn	38.6	33.8
Impervious surface	11.6	11.3
Agriculture	0.1	0.1
Other (duff/mulch)	1.4	1.4

Human structures/items in the riparian zone:

Category	Mean per parcel
Buildings	0.4
Boats onshore	0.6
Fire pits	0.3

Runoff concerns:

Category	All Lake Parcels
% of parcels with point source runoff observed	0.56 (2 parcels)
% of parcels with channelized flow	1.1 (4 parcels)
% of parcels with stair/trail/road to the lake	61.0
% of parcels with lawn/soil sloping directly to the lake	72.4
% of parcels with bare soil observed	2.5
% of parcels with sand/silt deposited	0
% of parcels with bank erosion face <1 ft	0.28 (1 parcel)
% of parcels with bank erosion > 1ft	0

**Bank Data**

Modified banks:

	% of entire shore with vertical sea wall	% of the whole shore with rip rap	% of the entire shore with artificial beach
Deer Lake Entire shore	0.98%	57.0%	0.4%

<sup>2</sup> These values do not take into account the size of the parcel. It is an estimate of coverage regardless of parcel area.

<sup>3</sup> Area weighted mean takes into consideration the parcel size. Therefore the larger parcel cover has more impact on the overall average for the entire lake.

**Littoral zone data**

Structures:

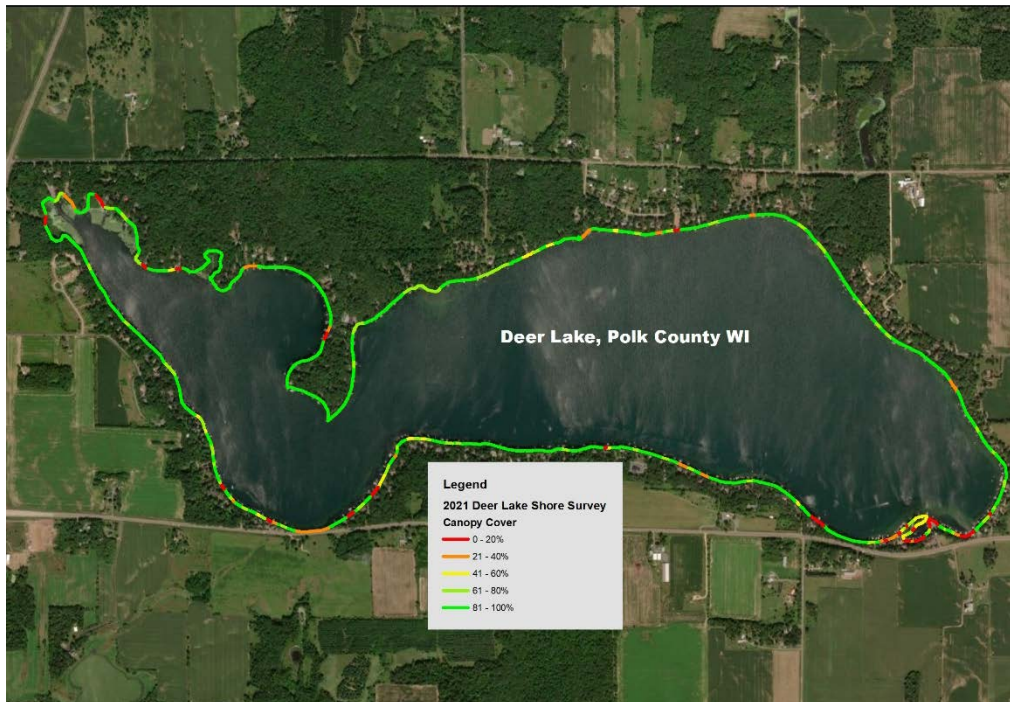
	Mean number of Piers	Mean number of Boat Lifts	Mean number of Swim rafts/water trampolines	Mean number of Boathouses (over water)
Deer Lake per parcel	1.05	1.29	0.12	0.0

Aquatic plants in the littoral zone:

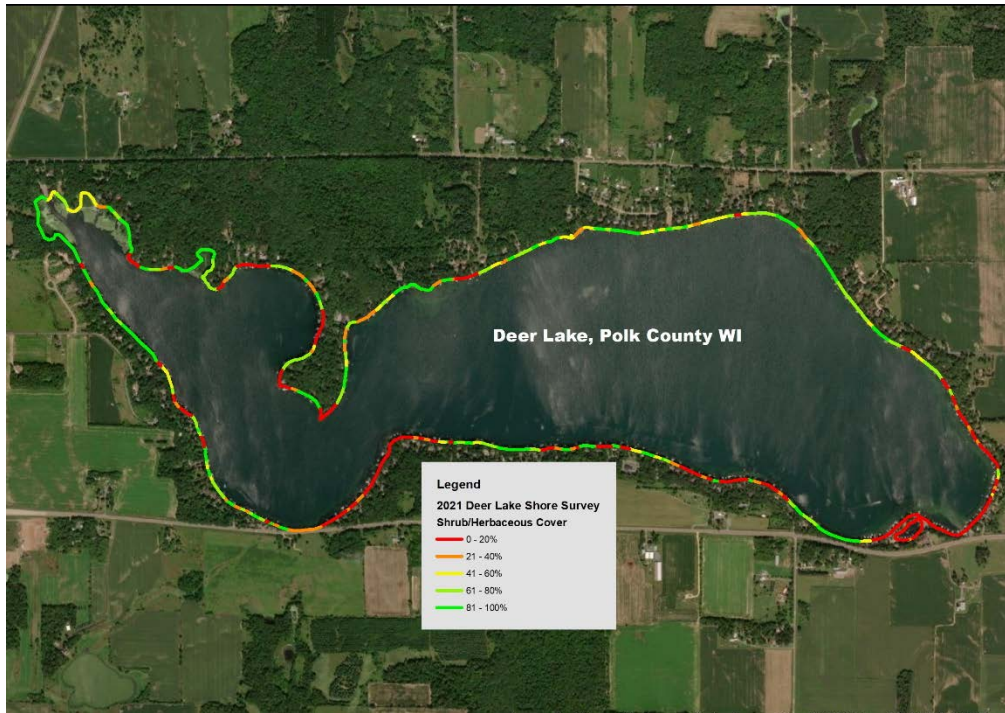
	% of parcels with emergent plants observed	% of parcels with floating plants observed	% of parcels with evidence of Plant Removal
Deer Lake all parcels	5.8	4.7	0.0

**Maps for management reference:**

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



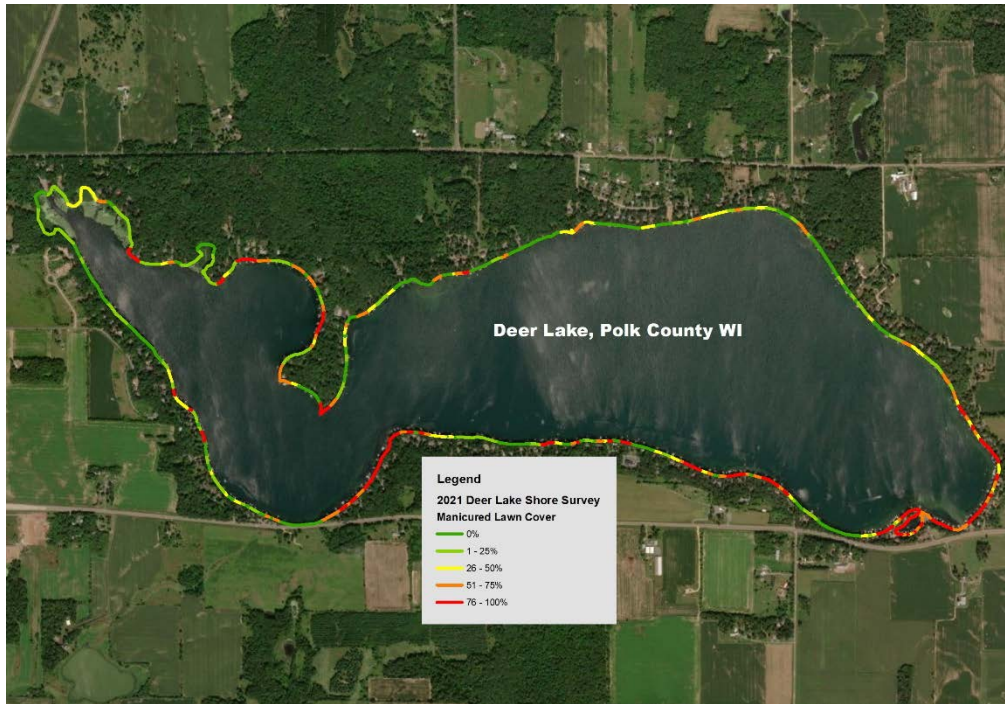
Herbaceous/Shrub Cover: This indicates natural ground cover. The less natural ground cover means more, less desirable cover, increasing runoff and nutrients in that runoff.



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.



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.



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

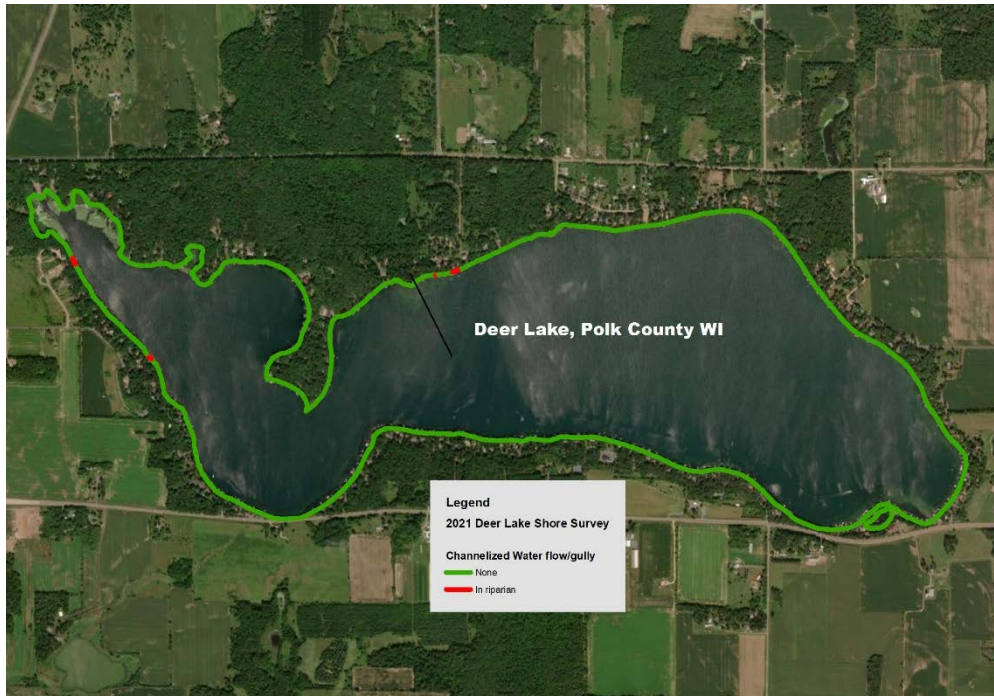


Buildings in the riparian zone: Buildings increase impervious surfaces with the roof. These structures can increase runoff.





Channelized flow: Gullies or channels can form if the runoff is intense and the substrate is not stable. This indicates increased runoff and potential nutrient loading.



Bank erosion with < 1 ft face: Erosion of the lake bank can increase sedimentation and nutrient loading since sediment often has phosphorus bound. If the face is less than 1ft indicates less erosion (likely) than if the face is greater than 1 ft. There was NO parcel with bank face erosion > 1 ft face.



## Coarse Woody Habitat (CWH) Survey Summary

Coarse woody habitat is essential to a lake ecosystem in that it provides critical habitat for aquatic organisms. Periphyton will grow extensively on the submerged logs/branches, attracting many invertebrates. Fish utilize coarse woody habitats for cover and feeding areas. Therefore, if a tree falls in the water, it is good to leave it.

CWH Category	% with "0."	% with "1."	% with "2."	Numbers represent
Branches	70.4	15.1	14.5	"0" = no branches on the wood "1" = a few branches "2" = tree trunk was a full crown
Touching Shore	17.1	82.9	n/a	"0"=log doesn't cross highwater mark. "1"=log crosses highwater mark and touches shore.
In Water	57.2	42.8	n/a	"0" = < 5ft of the log is underwater. "1" = at least 5 ft of the log is underwater.

## CWH Maps

### Branches:



Touching shore:



In water:

