

Cloverleaf Lakes, Shawano County
Shoreline Assessment 2020

Introduction

The Fox-Wolf Watershed Alliance and Waterways Association of Menominee and Shawano Counties regional watershed coordinator for Shawano and Menominee Counties was tasked with the shoreline survey on the Cloverleaf Lakes Lake as part of Wisconsin Department of Natural Resources Grant LPE-570-18.

On June 22nd through June 24th, the shoreline survey was conducted on the Cloverleaf Lakes. Connecting Our Waters, a program of the Fox-Wolf Watershed Alliance and the Waterways Association of Menominee and Shawano Counties (WAMSCO), completed the survey with help from volunteers around the Cloverleaf Lakes.

The Wisconsin Department of Natural Resource Lake Shoreland & Shallows Habitat Monitoring Field Protocol was used to completed the Cloverleaf Lakes survey in 2020. This protocol has been used on other lakes within Shawano and Menominee Counties and more detail can be found under the survey methodology section.

Cloverleaf Lakes Shoreline Historically

The Cloverleaf Lakes Protective Association have a long history with the Wisconsin DNR Lake grant program. While a lake management plan completed in 1992 does not include a shoreline survey, it does discuss that the creation of 20-foot wide buffer strips can control wave erosion and trap soil eroded from the land above (IPS Environmental and Analytical Services 1992).

In 2008, the Cloverleaf Lakes Protective Association worked with NES Ecological Services to plan for and plant 11 native plant projects around the Cloverleaf Lakes. A thorough inventory was taken of the soil, sun exposure and moisture regime of the sites around the lake. The report created with this project has been included as Appendix D. It includes plant names and site designs for the projects installed in 2010.

2020 Cloverleaf Lakes Survey

From June 22 through June 24, 2020, Connecting Our Waters with help from a volunteer from Pine Lake, completed the Cloverleaf Lakes Shoreline survey. Emily Henrigillis completed the Round Lake shoreline survey and coarse woody debris survey on June 22nd. With help from Kristy Krueger, Pine Lake, Grass Lake was surveyed on June 23rd, and Pine Lake was surveyed on June 24th. The coarse woody debris survey was completed on Grass and Pine Lakes on July 30th.

The general observations from the survey were there was a large variety in shoreline practices around the Cloverleaf Lakes. The sandy soils around the lake also lead to a lack of floating-leaf and emergent plants around Pine Lake.

Survey Methodology

The Wisconsin Department of Natural Resource Lake Shoreland & Shallows Habitat Monitoring Field Protocol was used to complete the Cloverleaf Lakes shoreline survey in 2020. The methodology is described below but the full protocol can be found in Appendix A. Definitions can also be found in the full protocol.



Before heading out to the field, a map was created of the lakes and associated tax parcels that touch the lake. These type of maps can be loaded on to a GPS or smart phone. Maps were created in ArcGIS then exported as a georeferenced PDF to be loaded into Avenza maps. During the Cloverleaf Lakes survey Avenza maps was used to track our location on the lake, as well as the tax parcel number we were working on

The riparian zone, the area of interest, starts at the high water level and extends 35 feet inland. The high water mark is defined as the point on the bank or shore up to which the water, by its presence, wave action, or flow, leaves a distinct mark on the shore or bank¹. Water levels were slightly lower than average during the survey but did not change the methods used during the Cloverleaf Lakes survey.

While completing the survey, multiple variables are assessed. The canopy cover is assessed on trees greater than 16 feet tall and in 5% increments. The trees that are providing the canopy cover may or may not fall within the riparian zone.

Next the ground layer of the riparian buffer zone is analyzed. There are five options for the ground layer cover and their percent cover needs to equal 100%. Similar to canopy cover, this is broken down in 5% increments:

1. Shrubs and herbaceous plants: Shrubs refer to woody plants that are less than 16 feet tall. Herbaceous plants are generally grasses, forbs, and sedges
2. Impervious surfaces: Examples include decks, stone/concrete paths or stairs, over turned boats, rip-rap, etc.
3. Manicured lawn
4. Agriculture
5. Other: duff, bare soil, gravel, mulch, etc.

If a ground layer cover was not present in the riparian zone, it was written as a zero on the data sheet.

Human structures present within the riparian zone were then counted. Buildings, boats on shore, and fire pits are the most common. Small, easily moveable objects do not get counted, for example, lawn chairs near the water's edge.

The next step is to record the presence of run-off concerns within and outside of the riparian zone. A run-off concern being present within the riparian zone is a more critical problem to fix than one being present outside the riparian zone. A run-off concern outside the riparian zone can still be a problem but may not affect the lake as quickly as a concern within the riparian zone. The run-off concerns assessed during a shoreline survey are listed below:

1. Point source: Examples could be a culvert, rain gutter, drain pipe or sump pump
2. Channelized flow or gullies
3. Stair, trail, or road leading to the lake
4. Lawn or soil sloping to the lake

¹ Wisconsin Department of Natural Resources Lake Shoreland & Shallows Habitat Monitoring Field Protocol 2016



5. Bare soil
6. Sand/silt deposits
7. Other run-off concerns

The bank zone is then looked at to determine the length, in feet, of bank modifications and/or erosion. Erosion of shoreline can cause problems for the lake as well as the landowner. Seawalls and rip-rap are the most common types of erosion control structures. Artificial beaches and bank erosion are also factors to be considered during the bank zone analysis. The bank erosion is broken up into greater than one foot and less than one-foot face erosion.

Finally, the littoral zone of each parcel is described. The human structures present within the littoral zone are counted. The common structures present are piers, boat lifts, swim rafts or water trampolines, boathouses over the water, and marinas. Swim rafts may not always be counted during the survey due to their proximity to shore, the rafts need to be within 50 feet of the shore. During this portion of the survey presence of emergent and/or floating-leaf vegetation are documented. If there is obvious removal of such plants, it is also documented.

During the coarse woody habitat assessment, the wood is categorized by:

1. Branches: no branches, a few branches, tree trunk with full crown
2. If it touches shore
3. If it is in the water

Only coarse woody habitat greater than 4 inches in diameter are considered.

These attributes help determine the quality of the coarse woody habitat presence within the lake. GPS points are taken on each piece of coarse woody habitat to showcase their presence around the lake.

Cloverleaf Lakes Survey Results

There were a total 264 spaces surveyed during the Cloverleaf Lakes survey. Two hundred and sixty of those spaces contained a tax parcel ID while four spaces were added by the watershed coordinator to connect those previously identified parcels. The added spaces were things like boat launches or areas where roads led to the lake with no home

Before diving into the results, Adams Beach needs to be described and discussed. Adams Beach is an area located on both Pine and Grass Lakes where multiple properties own a portion of a single tax parcel. Due to the methodology of the survey, the Adams Beach parcels in Pine Lake were surveyed individually due to the width of Adams Beach in that lake. The portion of Adams Beach in Grass Lake were surveyed as one long parcel, again due to the width of the tax parcel. The results will show all of Adams Beach in Grass Lake containing beach or seawall where in reality only portions of the shoreline contain those items. If property owners within Adams Beach are interested in improving their shoreline, a shoreline visit will need to occur to ensure proper restoration occurs.

The area surveyed totaled approximately 5.2 miles. Of the 5.2 miles of shoreline surveyed, 35% of the shoreline contained a shrub/herbaceous layer, 11% of the shoreline had some type of impervious



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surface, 41% contained manicured lawn, and 13% contain some other type of ground layer cover. Many of the parcels contain multiple types of ground cover, so each ground type will be discussed separately. Table 1 and Figure 1 show the breakdown of all parcels by 25% increments.

Table 1. Percent breakdown of parcel canopy cover and ground cover. Each row will equal 264 for the 264 parcels surveyed.

	0-25%	25-50%	50-75%	75-100%
Canopy Cover	59	60	50	95
Shrub/Herbaceous	187	40	17	20
Impervious Surface	226	30	4	4
Manicured Lawn	74	35	59	96
Agriculture	0	0	0	0
Other	220	26	14	4

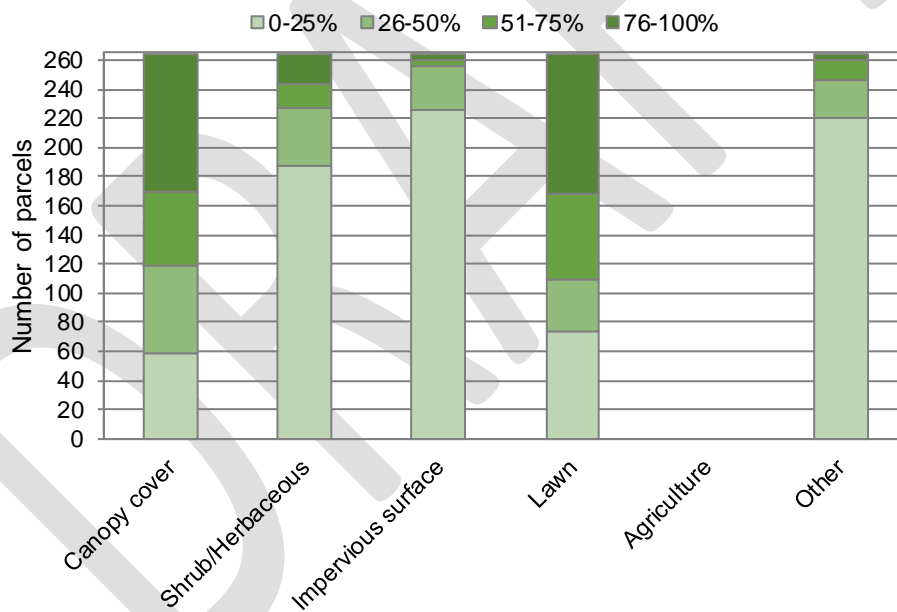


Figure 1. Percent breakdown of parcel canopy cover and ground cover. Each column will equal 264 for the 264 parcels surveyed.

Percentage increments do not do a great job of explaining what is good or bad about a property, so more descriptive terms will be used for this report: ideal, acceptable, minor improvements, and major improvements. For canopy cover and shrub/herbaceous layer, 75-100% is considered ideal, 50-75% is considered acceptable, 25-50% could benefit from suggested minor improvements, and 0-25% is in



major improvements. For impervious surfaces, manicured lawns, and other ground cover, 0-25% is considered ideal, 25-50% is considered acceptable, 50-75% could benefit from suggested minor improvements, and 75-100% could benefit from suggested major improvements.

Canopy cover

The Cloverleaf Lakes contained properties that ranged from 0% canopy cover to 100% cover with the average parcel around the Cloverleaf Lakes having 58% canopy cover. Figure 2 displays the Cloverleaf Lakes and each parcel's respective canopy cover within the riparian zone. Of the 264 parcels, 22% (59 parcels) have a canopy cover which needs suggested major improvements, 23% (60 parcels) have a canopy cover needing suggested minor improvements, 19% (50 parcels) have acceptable canopy coverage, and 36% (95 parcels) have ideal canopy cover. The greater the canopy cover, the more habitat it provides, and the more time it takes for precipitation to hit the ground. This slowdown of precipitation can aid in that precipitation infiltrating into the ground rather than running off into the lake.



As discussed above, canopy cover is assessed only on trees above 16 feet in height. A concern for many property owners is that the presence of many trees on their property. Large trees can lead to safety concerns during extreme weather events as well as potentially blocking their view of the lake. The number of trees present on a property does not always correlate to a high percentage of canopy cover. A few larger, mature trees may create as much canopy cover as many smaller trees.



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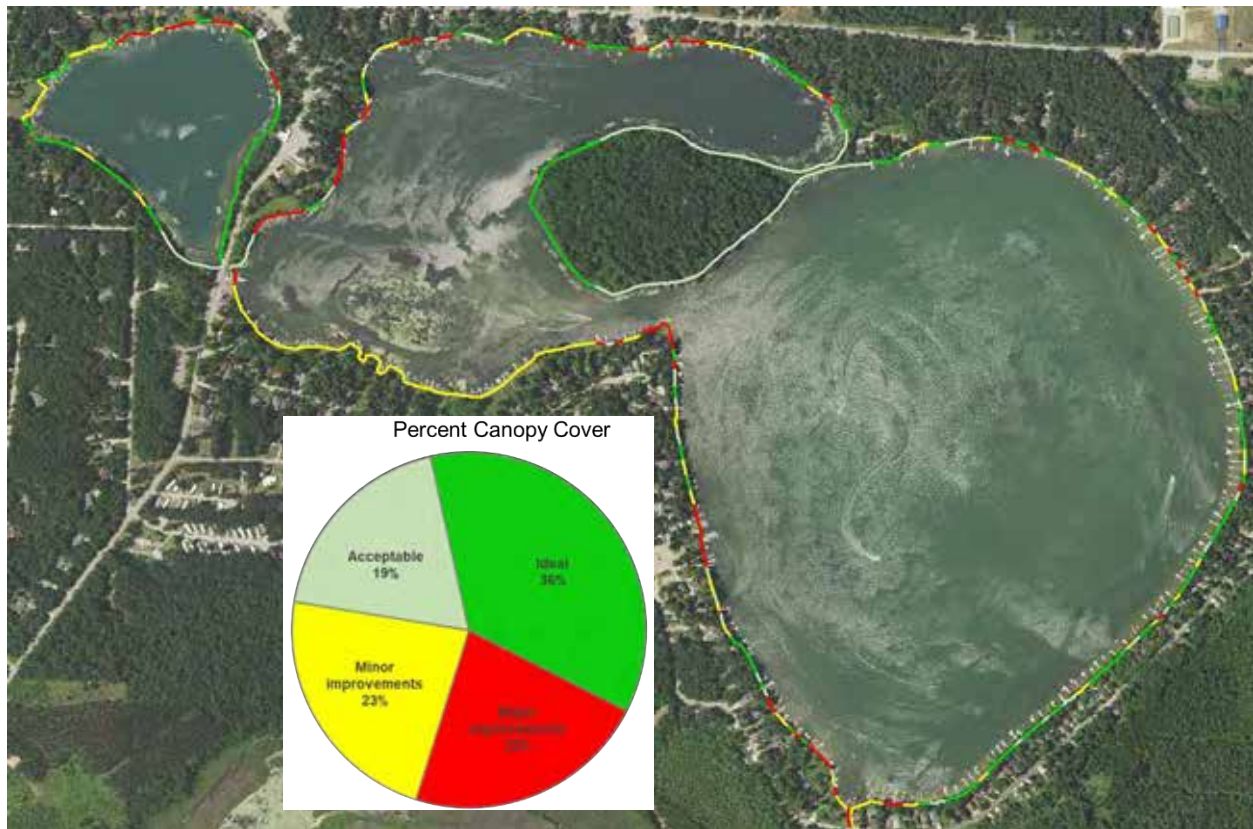


Figure 2. Canopy cover of the Cloverleaf Lakes. The ideal shoreline contains 75-100% canopy cover within the riparian zone, an acceptable shoreline contains 50-75% canopy cover, a shoreline with 25-50% canopy cover is in need of minor improvements, and a shoreline with 0-25% canopy cover is in need of major improvements.

Shrub/Herbaceous Layer

Similar to canopy cover, a strong shrub and/or herbaceous layer can aid in slower run-off on a property. Of the 264 parcels, 203 contain either a shrub or herbaceous layer within the riparian zone, with 122 containing a shrub layer and 192 containing an herbaceous layer. Figure 3 displays the Cloverleaf Lakes and each parcel's respective shrub/herbaceous layer. Of the parcels with a shrub and herbaceous layer, 71% (187 parcels) had no shrub and/or herbaceous layer or a shrub and/or herbaceous layer that would benefit from suggested major improvements, 15% (40 parcels) had a shrub and/or herbaceous layer that



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would benefit from suggested minor improvements, 6% (17 parcels) have an acceptable shrub and/or herbaceous layer present, and 8% (20 parcels) have an ideal shrub and/or herbaceous layer present.

The Cloverleaf Lakes Protective Association and its members have made efforts to get shoreline property owners to add native plants in shoreline buffers and rain gardens to their properties. A number of these projects were seen but only a few areas had these types of projects present throughout the entire

35-foot riparian zone. As a reminder, the easiest way to improve the shrub and herbaceous layer is by adding more plants within the riparian zone. Rain gardens and shoreline restoration projects can be completed to have that same manicured garden look with a nice border. Native plants have the tendency to spread but by adding that border it may help maintain a level of order to the project. An increase in percentage of shrub and/or herbaceous present would be very beneficial to the lake.



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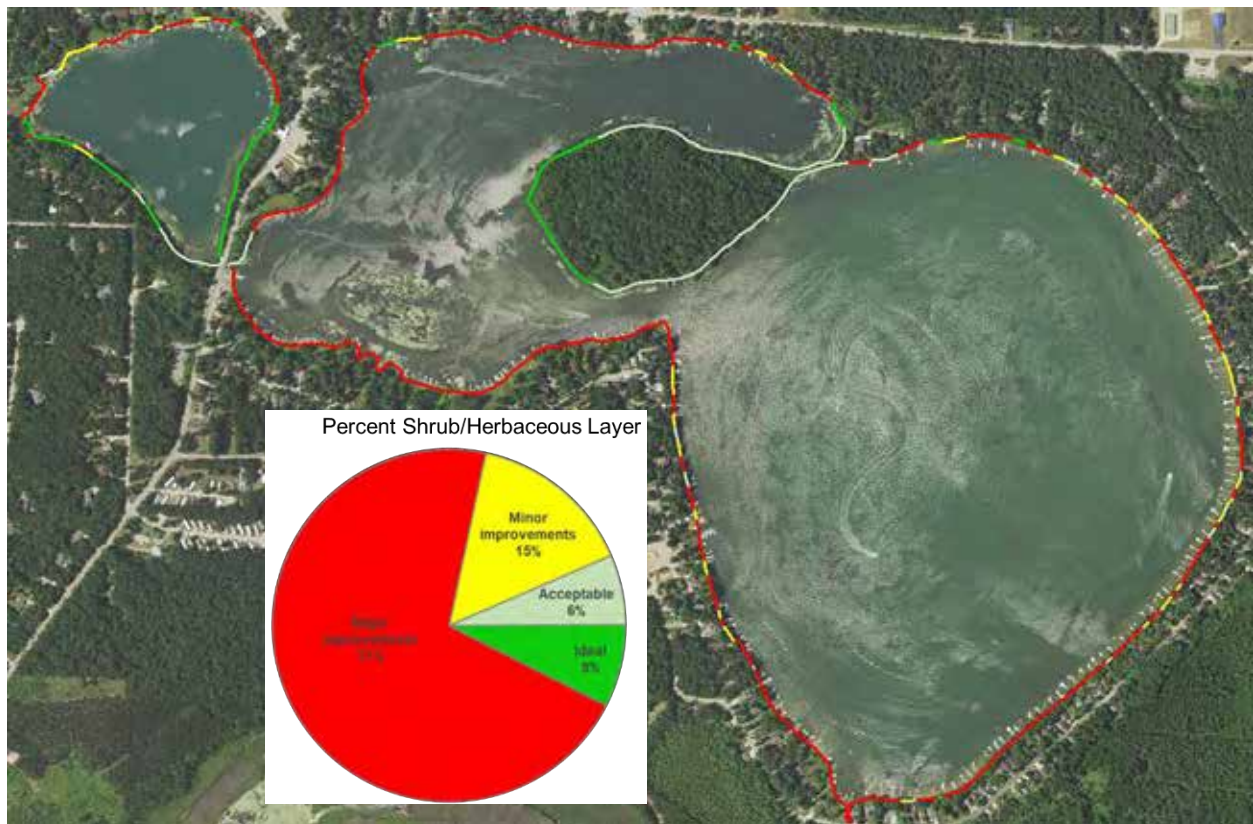


Figure 3. Shrub and herbaceous layer of the Cloverleaf Lakes. The ideal shoreline contains 75-100% shrub and/or herbaceous cover within the riparian zone, an acceptable shoreline contains 50-75% shrub and/or herbaceous cover, a shoreline with 25-50% canopy cover needs minor improvements to the shrub and/or herbaceous layer within the riparian zone, and a shoreline with 0-25% shrub and/or herbaceous cover needs major improvements.

Impervious surface

Impervious surfaces are one of the greatest causes of run-off. Unlike the shrub/herbaceous layer or manicured lawn, precipitation has no way of being slowed down, cooled down, or infiltrating when it hits an impervious surface.

Of the 264 parcels, 209 contained some type of impervious surface within the riparian zone. Figure 4 displays the breakdown of impervious surface around the Cloverleaf Lakes. Of parcels surveyed, 86% (226 parcels) contained 0-25% impervious surface, 11% (30 parcels) contained 26-50% impervious surface, 1% (4



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parcels) contained 51-75%, and 2% (4 parcels) contained 75-100% impervious surface. The impervious surface categories do not follow the scale used throughout the rest of this report because no level of impervious surface is desirable. All areas of impervious surface need major improvements.

The parcels that contained 75-100% impervious surface were generally boat launches or parts of business that had roads or parking lots near the water.

A decrease in impervious surface would be very beneficial for the Cloverleaf Lakes. Even very small amounts of impervious surface can affect fish habitat. Shore spawning and nursery habitat, for many of our fish, are very close to the shoreline. Run-off, impervious surface, and scour causes a decrease in habitat availability for these young fish. Efforts towards removing all impervious surfaces should be made to further protect the shoreline, aquatic habitat, and the water quality.

If the removal of all impervious surface is not possible or undesired, changes to how the run-off leaves the property need to be explored and executed. By pointing down spouts or grading impervious areas toward rain gardens or native plant buffers, improvements can be made to the water running off the impervious surfaces present, while providing habitat.

The Wisconsin DNR does offer funding for the removal of impervious surface from the riparian zone under their surface water management grants in the surface water restoration category. Reach out to your lake biologist to learn more.



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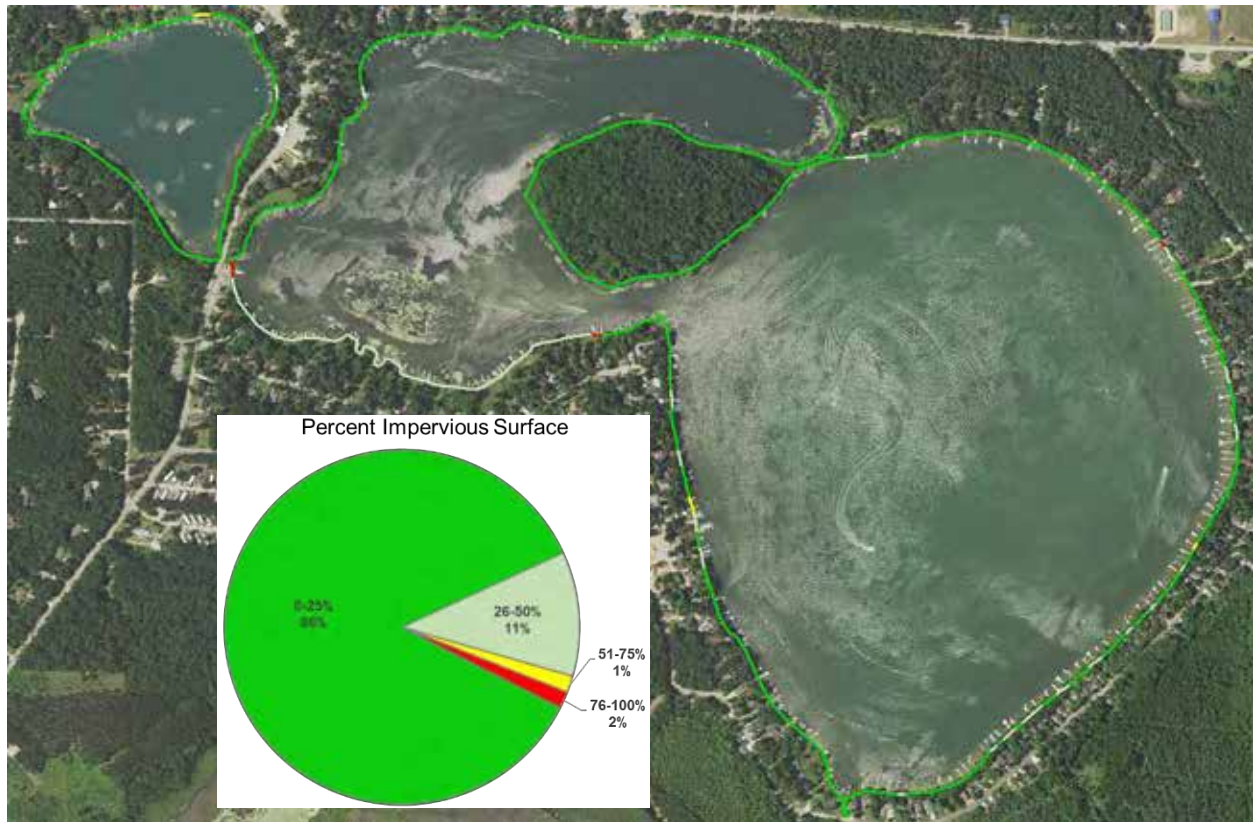


Figure 4. Impervious surface around the Cloverleaf Lakes. There is no level of impervious surface that is acceptable within the shoreline. The shoreline is broken down into 25% increments to showcase what is present around the Cloverleaf Lakes.

Manicured Lawn

As mentioned above, manicured lawns were one of the more commonly seen things within the riparian zone around the Cloverleaf Lakes. Of the 264 parcels around the Cloverleaf Lakes, 220 contained manicured lawn at varying levels. Of the parcels surveyed, 28% (74 parcels) contained an ideal amount of manicured lawn, 13% (35 parcels) contained an acceptable amount of manicured lawn, 22% (59 parcels) that would benefit from suggested minor improvements, and 37% (96 parcels) contained manicured lawn that would benefit from suggested major improvements.



A properly fertilized and maintained lawn can aid to slowing down run-off and allowing for proper infiltration of that run-off. The problems that can occur are over fertilization and improper handling of



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grass clippings. A soil test can be helpful in establishing the proper fertilizer for your lawn. Collecting grass clippings during mowing can also aid in stopping a phosphorus source from entering the lake.

Geese are also attracted to manicured lawns because of the visibility. Geese get wary of areas where they cannot fully see their surroundings. The addition of taller native plantings in the riparian zone can deter geese from coming onto a lawn. They cannot see their surroundings in the taller plant and avoid them in an effort to not be attacked by predators.

The thing to remember is property owners can have a manicured lawn and native plants to protect the shoreline and add habitat. As discussed in the shrub and herbaceous layer section, more traditional looking gardens can be created with the native plants to give you that balance of lawn and buffer.

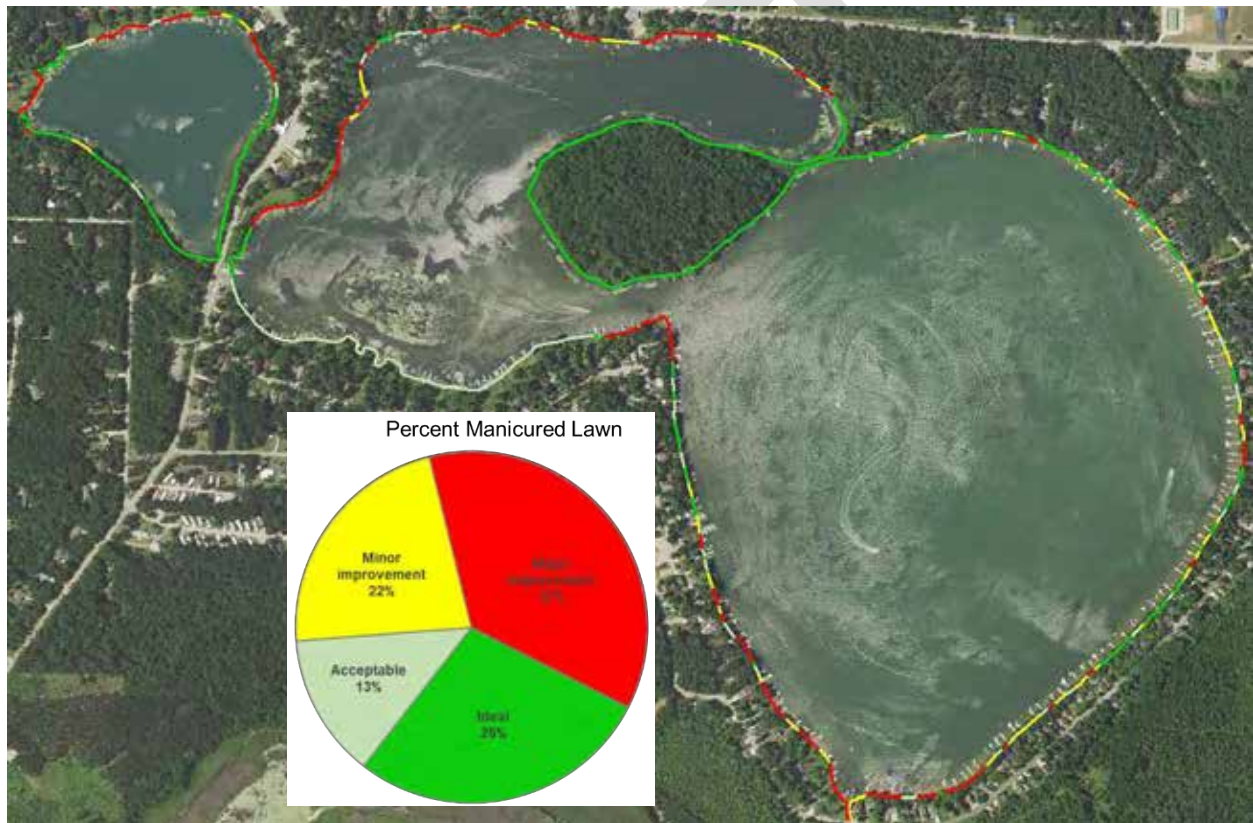


Figure 5. Manicured lawns around the Cloverleaf Lakes. The ideal shoreline contains 0-25% manicured lawn within the riparian zone, an acceptable shoreline contains 25-50% manicured lawn, a shoreline with 50-75% manicured lawn needs minor improvements, and a shoreline with 75-100% manicured lawn needs major improvements.

Agriculture

No parcels on the Cloverleaf Lakes contained agriculture within the riparian zone.



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Other

As discussed above, the other category includes any other ground layer cover that does not fit in the previously mentioned categories. Properties around the Cloverleaf Lakes contained duff, mulch, bare soil, sand, and/or gravel. Of the 264 parcels around the lake, 114 parcels contained some other type of ground layer cover. Figure 6 displays the breakdown of other ground layer types around the Cloverleaf Lakes. Of the surveyed parcels, 83% (220 parcels) contained the ideal amount of other types of ground layer cover, 10% (26 parcels) contained an acceptable amount of other types of ground layer cover, 5% (14 parcels) contained an amount of other types of ground layer cover that would benefit from suggested minor improvements, and 2% (4 parcels) contained an amount of other types of ground layer cover that would benefit from suggested major improvements.

Most of the other ground layer cover that was found around the Cloverleaf Lakes was in the form of duff or sandy beaches. One way to decrease the amount of other ground cover types around the Cloverleaf Lakes would be to transform the beaches into native plantings or even maintained lawns. The most important thing to do is to keep the soil and sand on the landscape. This can be accomplished by more and better root structures. While the ideal situation would be to completely remove beaches and other ground cover types and replace them with native plants, we understand that is unrealistic. Even changing a small portion of beach, or other area, to native plantings can have great benefits.



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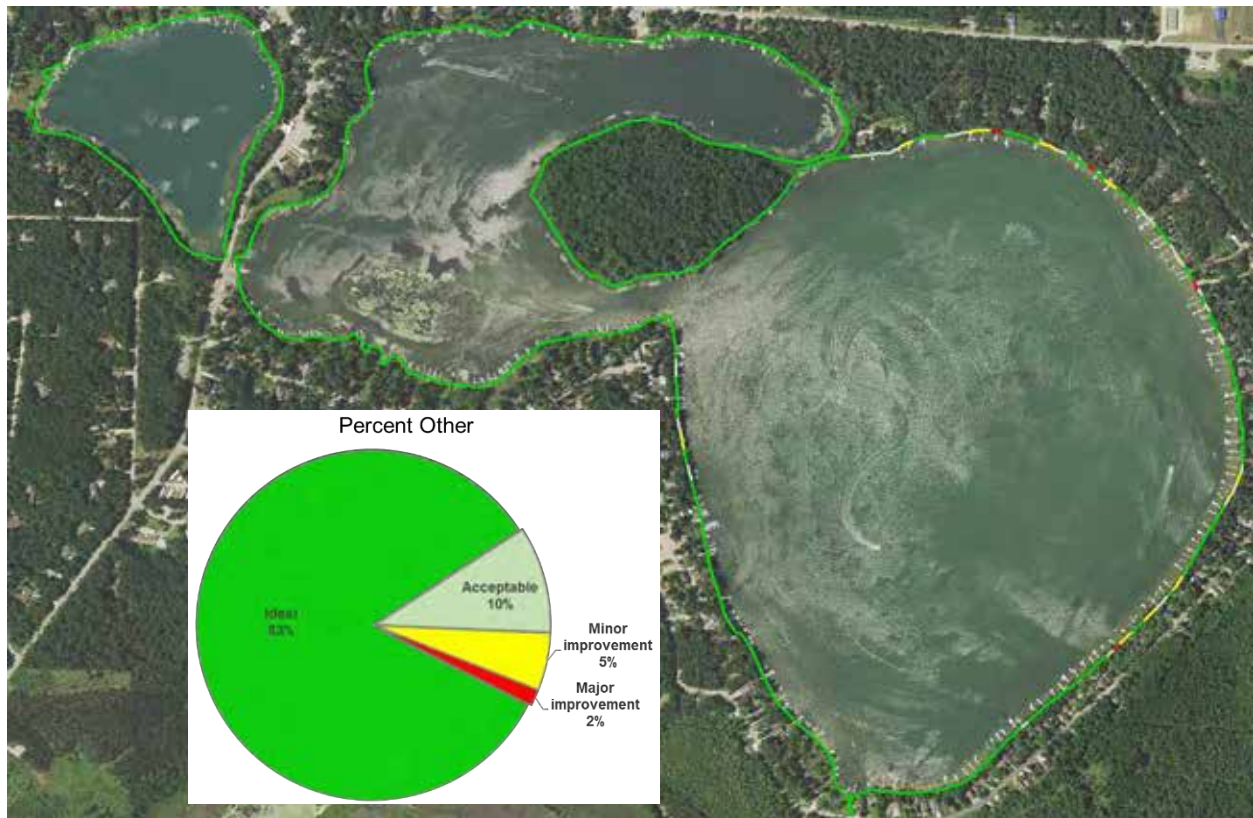


Figure 6. Other types of ground layer cover around the Cloverleaf Lakes. The ideal shoreline contains 0-25% other types of ground layer within the riparian zone, an acceptable shoreline contains 25-50% other types of ground layer, a shoreline with 50-75% other types of ground layer needs minor improvements, and a shoreline with 75-100% other types of ground layer needs major improvements.

Human structures

Human structures within the riparian and the littoral zone were counted during the survey (Figure 7 and Figure 8). Buildings counted included sheds, garages, and similar structures. Boats that were left on shore were counted. This ranged from kayaks to pontoons on shore. Fire pits were also counted around the lake, this included in ground and non-permanent fire pits. If the fire pit was outside the riparian zone, it was not counted. Finally, a number of other human structures were counted around the Cloverleaf Lakes. The majority of the other human structures found were large wooden swings or benches and boatlifts or piers that were left on land.

Human structures within the littoral zone that were counted during this survey were piers, boat lifts, swim rafts, boat houses, marinas, and any other structure that may be present. Boats in the water were not counted as part of this survey. The most common other human structures within the littoral zone were basketball hoops, volleyball nets, slides, and floating lifts for jet-skis or boats.



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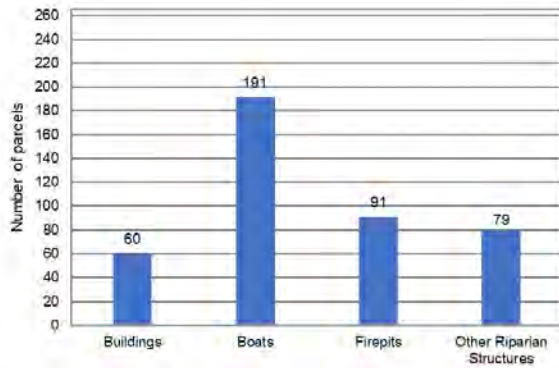


Figure 7. Human structures within the riparian zone.

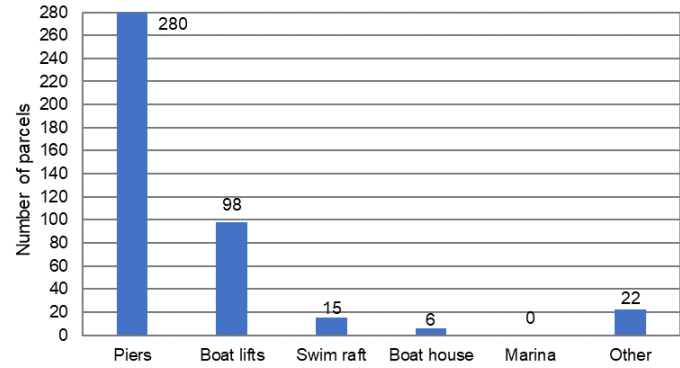


Figure 8. Human structures within the littoral zone.

Run-off concerns

The Cloverleaf Lakes contain a number of run-off concerns around the shoreline. Most of these concerns can be easily mitigated with some small changes on the land. The largest concerns around the Cloverleaf Lakes are stairs, trails, or roads leading to the lake and lawn or soil sloping towards the lake. Also, as mentioned above, a number of properties contain sand or silt deposits within the riparian zone.

Table 2 lists the run-off concerns and their presence within or outside the riparian zone. As mentioned above, while a run-off concern outside the riparian zone may not immediately affect the lake, it may eventually cause the same issues as if it were present within the riparian zone.

The steeper shorelines around the Cloverleaf lakes causes run-off to enter the lake at an accelerated rate. The survey protocol does not currently take into account the degree of slope but any degree of slope causes run-off to gain speed as it moves towards the lake.

Table 2. Run-off concerns around the Cloverleaf Lakes within and outside the riparian zone.

	Point Source	Channelized flow/gully	Stair/trail/road leading to lake	Lawn/soil sloping to lake	Bare soil	Sand/silt deposits	Other run-off concern
Present in riparian zone	10	2	158	142	13	22	12
Present outside riparian zone	4	0	44	52	0	0	6
Absent	251	263	63	71	252	243	247

The easiest ways to improve the run-off concerns around the Cloverleaf Lakes is by adding native plantings or rain gardens to the landscaping. Stairs, trails, roads, and manicured lawns need some sort of buffer zone to slow down run-off and help it infiltrate and add habitat. This buffer does not need to be large but it is crucial to help keep warm, dirty water out of the lake.



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Bank Zone

During the Cloverleaf Lakes shoreline survey, it was found that approximately 65% of the shoreline (3.4 miles) were unaltered or lacked erosion, 27% of the shoreline (1.4 miles) contained rip-rap, 4% (994 feet) contained seawall, 1.5% (421 feet) contained less than one-foot erosion, 1.4% (381 feet) contained beach, less than 1% (135 feet) contained other erosion control structures, and less than 1% (79 feet) contained greater than 1-foot erosion. Figure 9 displays the breakdown of the bank zone around the Cloverleaf Lake.

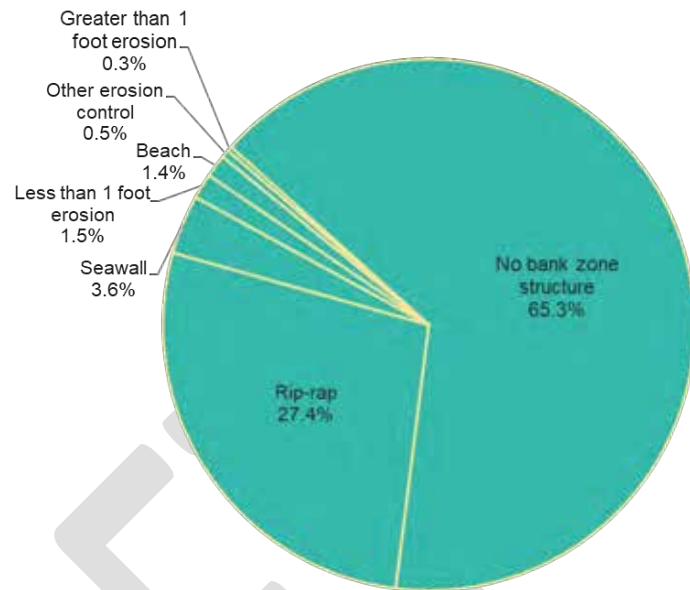


Figure 9. Bank zone structures and concerns around the Cloverleaf Lakes.

Rip-Rap

Rip-rap has become a recommended method of stabilizing the shoreline, rather than a seawall. Natural plantings with coir biologs is still the best option for the environment, but some shorelines need more protection from erosion than a natural shoreline can provide. Rip-rap needs to be made of clean field stone or quarry stone. It allows ice shoves to climb up the shoreline rather than push the shoreline out of place. Scouring, as discussed in seawalls, is also less likely to happen with rip-rap. The removal of a seawall and replacing it with rip-rap and native plantings could be very beneficial to the shoreline and lake health of the Cloverleaf Lakes. Mixing in native plants throughout the rip-rap can also give extra support to the shoreline.

Seawalls

Seawalls can be a controversial subject when it comes to the shoreline of lake. Ice shoves and high wind wave action can cause the desire to armor the shoreline with seawalls. However, adding, fixing, or replacing seawalls can be expensive for the landowner where native plantings or rip-rap may be a more affordable option. Permits can also be hard to get for adding a seawall due to the environmental implications they can have on the lake.



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Figure 10. Illustration of wave action against a seawall.

Courtesy of Michigan Natural Shoreline Partnership

versus a vertical seawall. According to the Army Corps of Engineers, scour still occurs with sloping structures but is less significant than against a vertical seawall². The more energy a wave has as it crashes against a seawall the greater the scour whether the seawall is sloped or vertical.

In a perfect world, seawalls would be pulled out and replaced with practices like coir biologs and native plants but this is not always realistic for property owners. Adding native plants near the border of seawalls can help alleviate the run-off concerns that occur with the presence of seawalls.

Figure 11 displays the presence of seawall and rip-rap around the Cloverleaf Lakes.

Research has found that wind and wave action against seawalls can cause a lack of submergent and emergent plants to be present in front of seawalls. This scouring of the lake bottom can have negative effects for lake-life (Figure 10). Other concerns with seawalls are: loss of fish spawning and nursery habitat, preventing amphibians and reptiles from getting into and out of the lake, prevention of future recruitment of fisheries habitat.

There can be a difference in how water moves against a sloped seawall

² Design of Maritime Structures: Scour and Scour Protection. Steven A. Hughes



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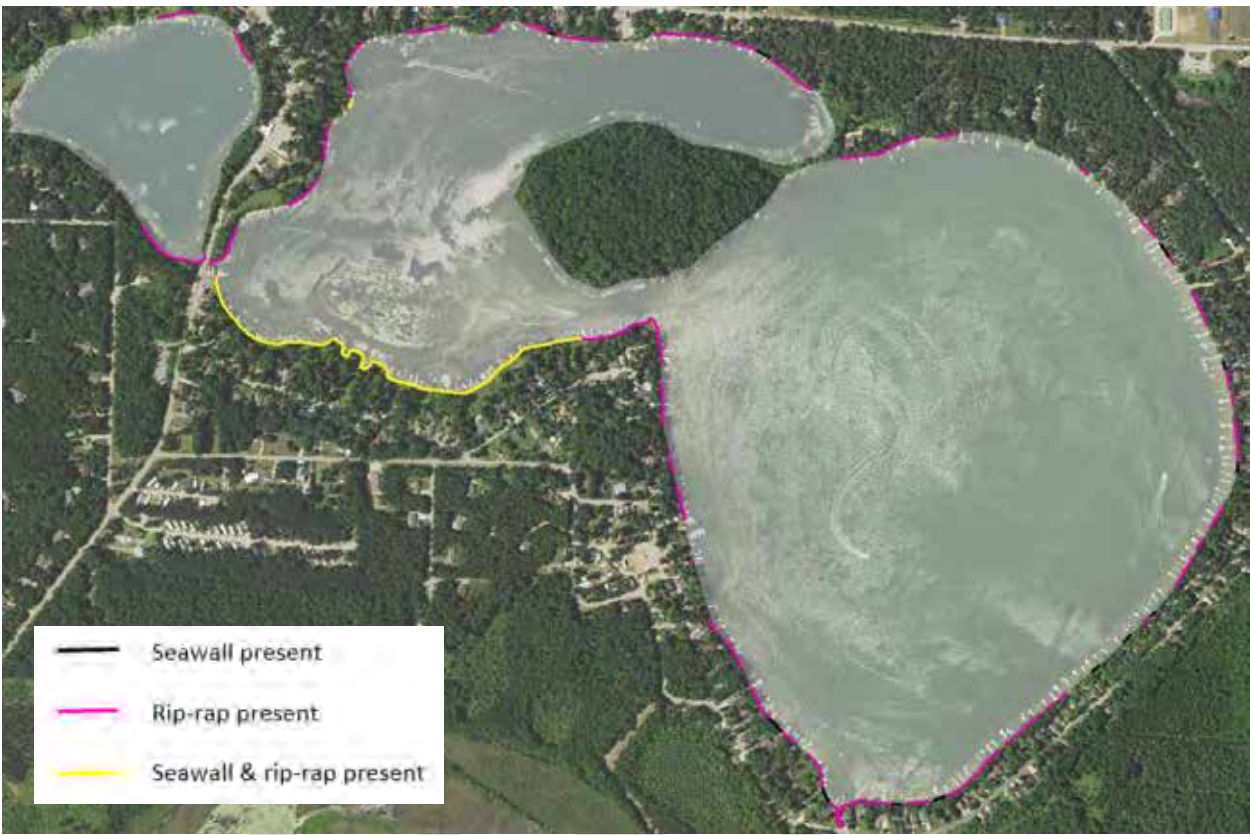


Figure 11. Seawalls and rip-rap present within the bank zone of the Cloverleaf Lakes.

Erosion

Eroding and slumping shorelines around the Cloverleaf Lakes are directly adding nutrients to the lake and action needs to take place to improve these areas. Not only is the property losing land but they are directly contributing to the water quality issues on the lake by adding phosphorus and total suspended solids to the lake. Aquatic animals, like fish, struggle with these extra pollutants and nutrients. These excess sources of nutrients can add to the nuisance level of native plants found near shore.

There are different options to help with soil and shoreline stabilization. Geoweb cellular confinement structures have been used to help keep the soil from moving (Photo 1). These Geoweb structures would be used on majorly eroding shorelines. Around the Cloverleaf Lakes, properties that contained channelized gullies or eroding shoreline greater than 1 foot may consider this an option to help contain the erosion.

The use of Curlex blocs (similar make up to biologs) have also been used to help stabilize eroding shorelines. These blocks can be stacked to help hold back slightly eroding shorelines (Photo 2). These blocks can be planted into with native plants, also. Properties around the Cloverleaf Lakes containing less than 1-foot erosion and greater than 1-foot erosion may consider this an alternative to stabilizing their shoreline.



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Photo 1. Geoweb cellular confinement structure. Photo courtesy of Menominee County.



Photo 2. Curlex blocs. Photo courtesy of Menominee County.

Other erosion control structures

This category is more of a catchall for things found around the bank zone that do not readily fall into the prescribed categories. Other erosion control structures examples are biologs, fine pea gravel or erosion control structures during active construction. It was also hard to tell, at times, if the material present in the bank zone was an eroding seawall or rip-rap, or something else. The presence of biologs was also hard to note since they become overgrown. As mentioned above, it can be expensive to add rip-rap or a seawall but making sure your shoreline structure is not failing is also very important. Failing seawalls or broken down seawalls or rip-rap can have negative impacts on your shoreline as well as the health of the lake.

Beaches

The presence of beaches around the Cloverleaf Lakes was a concern brought to Connecting Our Waters as we were preparing for the presentation given at the Cloverleaf Lakes Protective Association's annual meeting.

The DNR states that sand blankets that are placed below the OHWM and in the lake are very bad for water quality and for shoreline erosion. The physical placement of sand within the riparian zone is a permitted activity, needing approval from both the DNR and the county. Sand can smother benthic organisms and aquatic plants which are both crucial to the health of the lake. Figure 12 shows where there are beaches are present around the Cloverleaf Lakes



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Figure 12. Beaches present around the Cloverleaf Lakes.

Emergent and Floating-leaf presence

Of the 264 parcels around the Cloverleaf Lakes, 133 parcels included emergent and/or floating-leaf plant communities. Of those parcels, 56 of them contained emergent plants and 77 parcels contained floating-leaf plants.

The presence of floating-leaf and/or emergent plants is very important for young fish as well as helping slow down wind/wave action headed toward the shoreline. Generally, a lake is calmer behind a large stand of emergent or floating-leaf plants. As discussed in the seawall section, emergent and floating-leaf plants are not generally found in front of seawalls due to the scouring that can occur.

Seiche (sāsh)

Lake water can resonate in its basin under certain conditions of sustained unidirectional winds followed by calm. The seiche may be externally visible or unseen, only in hypolimnion (internal seiche). Seiche cause entrainment (mixing) of layers.

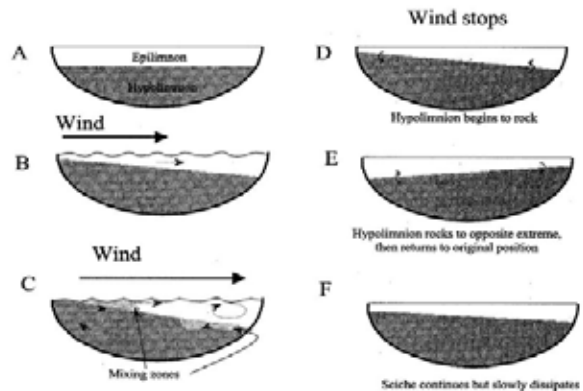


Photo courtesy of <https://slideplayer.com/slide/6667616/>



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It was also found that 2 parcels around the Cloverleaf Lakes had removed plants from the lake. As a reminder, both native and invasive plants can naturally dislodge themselves from the lake sediment. Property owners can remove any and all floating plants, not to be confused with floating-leaf plants, from their waterfront. Floating-leaf and emergent plants should be kept in place to protect the shoreline.

Coarse woody habitat

The coarse woody habitat survey was completed on July 30th. One hundred and sixty-five pieces of coarse woody habitat were found around the lake. The majority of the habitat found were of higher quality, meaning they had some branching, crossed the high water mark, and were in the water.

Coarse woody habitat provides great fish habitat. Addition of tree drops, anywhere on the lake, will be beneficial for the lake. The Healthy Lakes grant program offers cost sharing for adding fish sticks (tree drops) to the lake. The Healthy Lakes grant Action Plan can be found in Appendix B.



Figure 13. Coarse woody habitat around the Cloverleaf Lakes.



Conclusions

In conclusion, the Cloverleaf Lakes' shoreline, like a lot of lakes, is in need of restoration efforts. Most of the concerns can be addressed with small, management projects or changes completed by the property owner.

Simple restoration suggestions are to increase native plantings within the riparian buffer zone, installation of rain gardens, and changes to or removal of large human structures with riparian zones. All three of these can help increase infiltration as well as decrease in run-off. Adding diversion practices to the uplands is another way to stop run-off from reaching the lake.

Changes to lawn maintenance can also aid in improving water quality around the Cloverleaf Lakes. By increasing the height of cut when mowing, a greater root mass can remain to help water infiltrate before reaching the lake. As mentioned, the removal of impervious surface would be beneficial to the lake and funding should be pursued in accomplishing that goal.

Shawano County offers 50% cost-share funding up until \$2500 for shoreline restoration projects and rain gardens. The Healthy Lakes grant program offers up to \$1000 per qualified practice and up to \$25,000 can be applied for. These two funding sources can be used in combination to keep costs low for the participants. More information on the Shawano County program can be found in Appendix C.

Recommendations

On September 9th, 2020 Connecting Our Waters presented the results of the survey to the members of the Cloverleaf Lakes Protective Association. Prior to this meeting, the CLPA submitted a pre-proposal for a Healthy Lakes Grant with the plan to submit a full Healthy Lakes grant application on November 1st. In addition to the individuals participating in the Healthy Lakes grant, it is suggested that individuals interested in shoreline buffers and rain gardens apply for Shawano County funds as they are available year round and do not need an association to apply on their behalf. The addition of rain barrels is also highly suggested in an effort to remove point sources pointed at the lake.

It should be noted that the Shawano County LCD funding will be expiring in 2021. If there is interest in utilizing those funds, applications need to be sent in before the end of the summer of 2021.

Shoreline Restoration Project Resources

Shawano and Menominee Counties are very fortunate to have many partners willing to assist with shoreline restoration on waterfront properties. Connecting Our Waters, a partnership of the Fox-Wolf Watershed Alliance and the Waterways Association of Menominee and Shawano Counties, is a newer program that aims to improve water quality through shoreline restoration projects. Both Shawano County Land Conservation Department and Menominee County Land Conservation Department offer cost sharing programs for applicable shoreline restoration projects. The Wisconsin Department of Natural Resources has funds available through the Wisconsin Healthy Lakes Program. There are also landscapers throughout the counties, as well as the state, familiar with completing shoreline restoration projects.



Menominee County



Table 3. Contact information for the different resources in Shawano and Menominee Counties.

Resource Program	Contact	Contact information
Connecting Our Waters http://fwwa.org/connecting-our-waters	Emily Henrigillis	emily@fwwa.org ; 920.851.6472
Healthy Lakes Grant Program https://healthylakeswi.com/	Pamela Toshner	Pamela.toshner@wisconsin.gov ; 715.635.4073
Menominee County Land Conservation Department	Jeremy Johnson	jeremyj@co.menominee.wi.us ; 715.799.5710
Shawano County Land Conservation Department	Scott Frank	Scott.frank@co.shawano.wi.us ; 715.526.4632
Waterways Association of Menominee and Shawano Counties https://wamsco.org/	Shanda Hubertus	wamsco@gmail.com
Wild Ones – Wolf River Chapter	Gail Sarnwick	gailwildones@gmail.com
Wisconsin Department of Natural Resources	Brenda Nordin	Brenda.nordin@wisconsin.gov

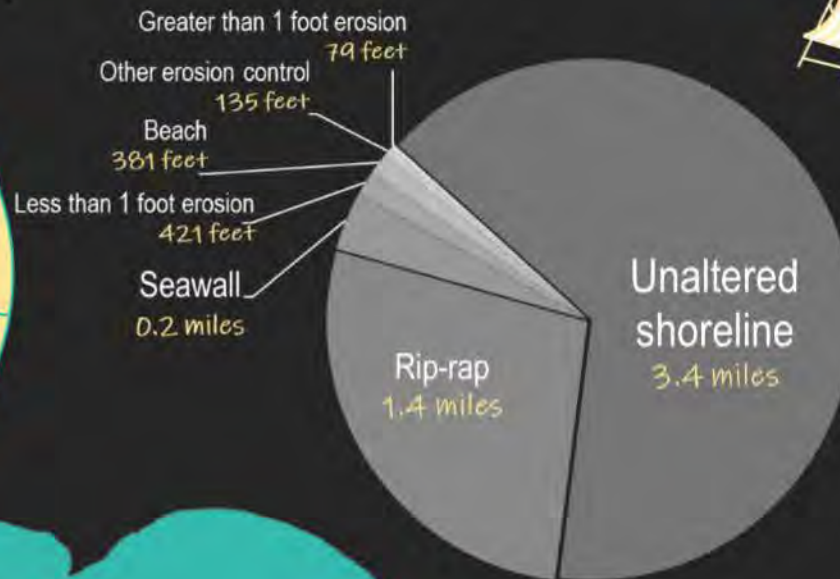
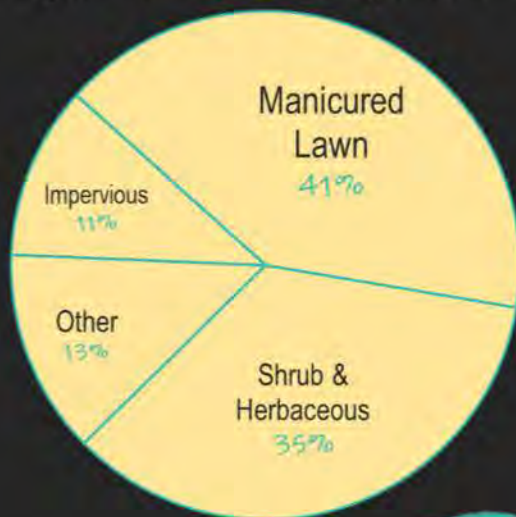


Menominee County



Cloverleaf Lakes Shoreline Survey 2020 RESULTS

Riparian Zone Composition



264 tax parcels surveyed
5.2 miles of shoreline

Present around



280 Piers



98 Boat Lifts



15 Swim Rafts



10 Beaches



6 Boat Houses



Emergent plants found at **56** parcels



Floating-leaf plants found at **76** parcels



167 pieces of coarse woody habitat found

Suggestions:

Add rain gardens

Decrease impervious surface

Decrease manicured lawn by planting native plants

Add more coarse woody habitat to the lakes to improve fish habitat

Restore areas with erosion concerns by stabilizing then planting with native plants

