TOMAHAWK LAKE ASSOCIATION'S STORMWATER AND SHORELAND GIS PROJECT – AN OVERVIEW

Mike Meyer and Jim Kreitlow

Nova Ecological Services

Manitowish Waters, WI

August 1, 2020

Introduction

The goal of the Tomahawk Lake Association (TLA) Shoreland GIS project is to encourage private and public landowners to implement shoreland best management practices in ecologically sensitive shoreland regions of Tomahawk Lake where needed. It is our working assumption that by increasing knowledge of Tomahawk Lake's valuable ecological features, we will motivate lake property owners to initiate and continue practices that conserve or restore native shoreland vegetation and minimize erosion and surface water run-off into Tomahawk Lake – thus protecting critical fish and wildlife habitat and maintaining high water quality.

Lakeshore property development and recreational use often leads to degraded fish and wildlife habitat quality as well as increased sediment and nutrient run-off which can increase weed growth and reduce water clarity. Best management practices which reduce run-off and improve habitat quality are available and can repair the impacts of development. As there are over 350 individual property owners on Tomahawk Lake, we will use the results of this project to prioritize education and outreach efforts to target landowners and shoreland areas that will benefit most from shoreland best management practices.

Under contract with TLA, Nova Ecological Services (NES) undertook 3 surveys and GIS mapping projects to accomplish this goal. GIS (Geographical Information Systems) is a computerized mapping program that permits the overlay of many sources of data on one map. First, NES conducted boat surveys along the entire Tomahawk and Mud Lake shorelines and mapped Critical Habitat - sites with high quality fish and wildlife habitat, diverse aquatic plant communities, shorelands with natural scenic beauty that are protective of water quality, and important wetland areas. Results of this work are contained in the companion report "Getting to Know Tomahawk Lake's Special Places". Second, NES conducted a boat survey on July 4th weekend to identify shoreland areas (commercial, public, and private properties) receiving concentrated human use (boating and recreation) in the shoreland areas. Ten high use areas were identified. Third, NES assessed the shoreland condition at 414 tax parcels adjacent to Tomahawk Lake during July 2019, using the draft WDNR Lake Shoreland & Shallows Habitat Monitoring Field Protocol (Hein et al. 2016). See companion report titled "Assessing the State of Tomahawk Lake's Shoreland – 2020" for results.

Results from these efforts are used in a GIS project to identify individual Tomahawk Lake properties for shoreland management education and outreach efforts including site assessments and recommendations for best management practices. We will focus our outreach and education programs on properties that have buffer conditions in need of improvement, have potential erosion and run-off issues, and are near shoreland areas of high ecological value (e.g. Critical Habitat). The project implements several mapping action steps identified in the TLA CLMP Work Plan (2016-2020) with shoreland implications and updates the Tomahawk Lake shoreland inventory.

Project Outcomes

Products from this project are being posted on the Tomahawk Lake Association web page. Information may also be posted on Facebook, YouTube, and contained in printed brochures. The purpose will be to;

- Inform the Tomahawk Lake community of the existing critical habitat features and shoreland conditions on Tomahawk Lake.
- Discuss ways to maintain or improve the lake's water quality, fisheries, wildlife, wetlands, and natural scenic beauty.
- c. Identify projects to enhance or improve shoreland and aquatic habitat through best management practices.
- d. Identify shoreland areas which would lend themselves to neighbor to neighbor shoreland restoration discussion meetings.

Why this project?

Tomahawk Lake is designated by the Wisconsin DNR as an Outstanding Resource Water (ORW) with excellent water quality, natural scenic beauty, diverse aquatic plant communities, and healthy fisheries and wildlife populations. It is a headwaters drainage lake with a very small watershed – little water enters Tomahawk Lake other from rainfall, snowmelt, groundwater,

and run-off from the shoreland surrounding it. Properly managing these shoreland areas is critical to safeguarding the high standards of Tomahawk Lake into the future.

Development on northern Wisconsin lakes can result in increased erosion and surface water run-off from the uplands along with reductions in natural vegetation in the shoreland buffer zone – these changes can allow excess nutrients and sediment to reach the lakes. Research in Wisconsin and the Upper Midwest has linked these changes to negative effects on water quality and fish, wildlife, aquatic plants and aquatic insect populations. These changes can also reduce water clarity and promote excessive weed and algae growth thus impacting property values over time. While efforts have been made to encourage lakeshore property owners to conserve and restore natural shoreland habitat and control run-off in other lakes in northern Wisconsin, successes have been spotty.

The goal of this project is to encourage private and public landowners to implement shoreland best management practices in ecologically sensitive regions of Tomahawk Lake when needed. Our assumption is that by increasing general knowledge of the ecologically important features of the lake, landowners near these sites will be encouraged to adopt Shoreland Best Management practices.

Identifying Critical Habitat on Tomahawk Lake

Nova Ecological Services (NES) mapped 39 critical habitat areas on Tomahawk Lake in 2019. These sites provide important habitat for fisheries and wildlife, others protect wetlands and water quality, and all add to the natural scenic beauty on Tomahawk Lake. NES also identified rock and rubble along shorelines and location of coarse woody habitat as these are critical habitat for a healthy fishery. The results of these surveys, along with maps and descriptions of each of the critical habitat sites can be found in the companion report "Getting to Know Tomahawk Lake's Special Places".

Assessing the Condition of Tomahawk Lake's Shoreland

Nova Ecological Services used the WDNR Lake Shoreland and Shallows Habitat Survey protocol to assess the condition of 414 Tomahawk lakeshore properties in 2019. During these

preliminary surveys, 38 properties were identified with potential upland and buffer gullying and channeling due to surface water run-off, 83 properties were identified with potential bank erosion, and 144 properties had apparent high levels (>40%) of manicured lawn and impervious (hard artificial) surfaces in the shoreland buffer. This project brings together this information to identify properties with apparent erosion, run-off, and/or degraded buffers that are near critical habitat sites. It is recommended that property owners request TLA sponsored on-site visits to verify the survey findings and receive information on improving their shorelines when needed. See companion report titled "Assessing the State of Tomahawk Lake's Shoreland – 2020" for results.

Recommendations for Tomahawk Lake Property Owners

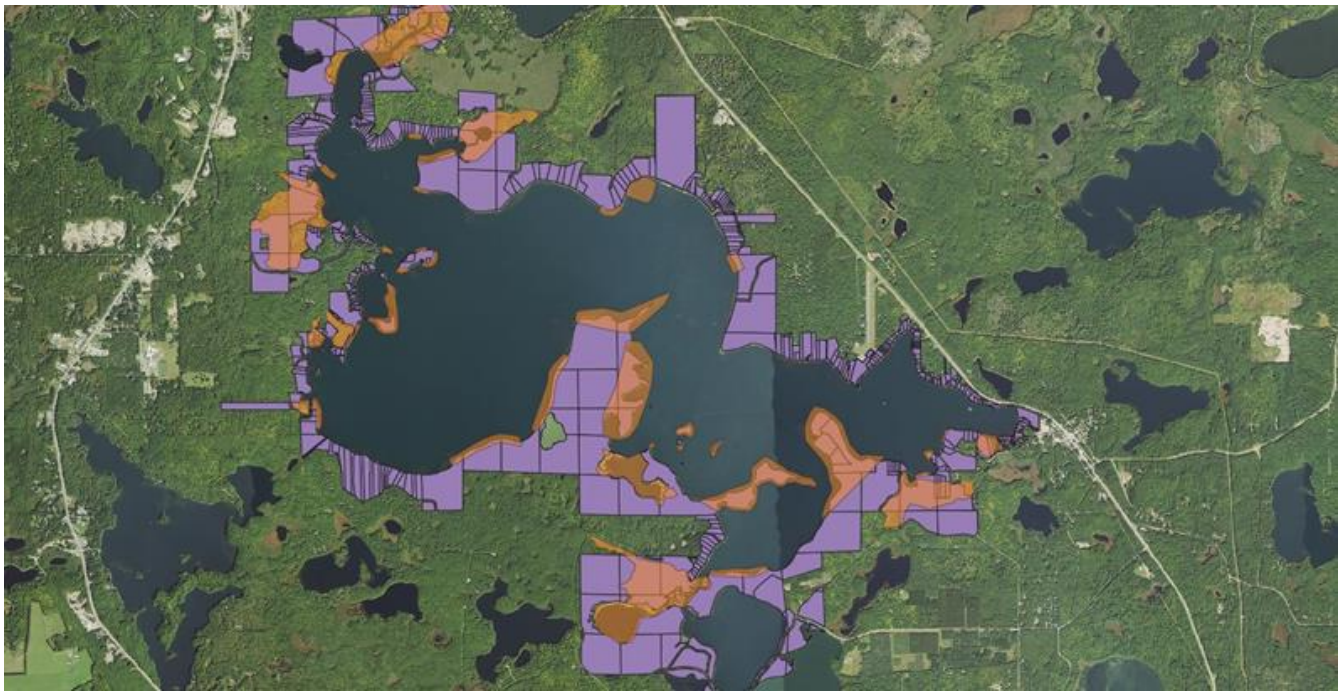
- Get to know the important fish and wildlife habitat areas on Tomahawk Lake by reading the report "Getting to Know Tomahawk Lake's Special Places". Familiarize yourself with areas that are in close proximity to your property. Spend some time in these areas to learn more about the natural communities on Tomahawk Lake.

- Take the Tomahawk Lake Association Rate Your Shoreland Self-Assessment Survey to evaluate how your property is doing as related to Shoreland Best Management Practices https://www.tomahawklake.org/rate-your-shoreline).

- Contact the Tomahawk Lake Association for a free on-site visit to further evaluate your property's condition and receive an individual property report and recommendations for shoreland best management improvements.

- Become familiar with the Tomahawk Lake Association's Shoreland Best Management Practices to best manage your property to safeguard fish and wildlife habitat, water quality, and natural scenic beauty of the lake we all love (https://www.tomahawklake.org/more-shore).

ASSESSING THE STATE OF TOMAHAWK LAKE'S SHORELANDS - 2020



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Identifying High Concentration Human Use Locations and Relationship to 39 Critical Habitat Sites on Tomahawk Lake

A survey was conducted on Friday July 5 to identify properties on Tomahawk Lake with high concentrations of human activity including beach use, boating, commercial operations, recreation, and presence of 15+ people at properties during the surveys. The locations of these public and private properties are shown in comparison to Critical Habitat sites in the maps below. Operators of these properties should be made aware of important natural features in proximity to their operations and the shoreland best management practices that could be undertaken to minimize sediment and nutrient run-off and maximize the protection and restoration of natural habitat on their properties.

Figure 1. Concentrated Use Sites on Tomahawk Lake - North

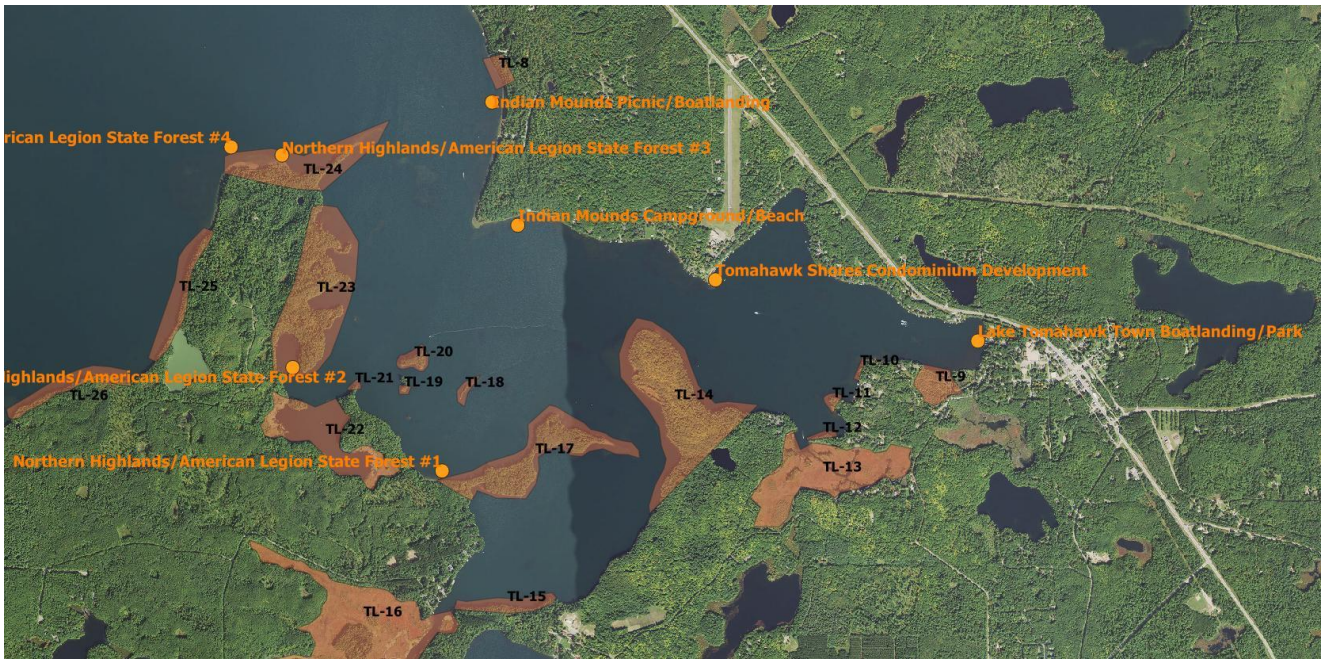


Figure 2. Concentrated Use Sites on Tomahawk Lake - South

Lakeside Grill and Condominium *https://www.facebook.com/lakesidegrillminocqua/*

This popular shoreline restaurant and bar serves customers that arrive by boat and auto. The outside deck is a big draw during warm summer afternoons and evenings. Several condominium units are also on the property. At the time of our survey on July 5th there were 7 boats moored and 65 people at the tables and along the shoreline. Much of the property is covered with pavement and roof tops (impervious surfaces) so practices that minimize run-off to the lake should be employed. Over 50% of the shoreland buffer is impervious surface or manicured lawn but some natural shoreland vegetation remains on the north end of the property and should be maintained. There is little natural habitat on the property shoreline near the restaurant– given its concentrated use it may be difficult to restore or conserve, but an attempt should be encouraged. There were 17 piers and 13 boat lifts present.

Figure 3. Lakeside Grill Photos and Aerial Map

Indian Shores Campground and Cottage Resort

This commercial operation on the north shore of Tomahawk Lake is near critical habitat site TL-7 and our shoreline survey indicated there was evidence of erosion and surface water run-off. Shoreland best management practices should be employed to address these concerns. We also found much of the buffer to be in natural vegetation so a key objective would be to maximize conservation and restoration of natural habitat adjacent to the lake. There are over 30 boat lifts and 5 piers in the Marina so the concentrated boating near the high quality aquatic macrophyte bed (TL-7) is a concern – it would be useful to make boaters aware of this critical habitat which is in close proximity to the marina and boat traffic. See companion Critical Habitat report for more information.

Indian Shores - A Northwoods Campground and Cottage Resort *http://www.indian-shores.com/*

Figure 4. Indian Shores Photos

Tomahawk Shores Condominium Development

There is no publicly available information on the *Tomahawk Shores* Owners *Association* LTD or other information related to the condominium development via the internet. During our shoreline inventory survey of the property on July 19 the buffer was estimated at 35% lawn and impervious surface and there was about 40' of artificial beach. Thirteen piers were counted along with 15 boat lifts. Approximately 25 people were present at the beach and along the shoreline during our July 5 Concentrated Use survey. There was no evident erosion, channeling or gullying from run-off, or bare soil but because of the concentrated use of the site and steep slopes on the north end of the property, care should be taken to divert any potential run-off from reaching the lake or creating erosion.

Figure 5. Tomahawk Shores Photos

Lake Tomahawk Town Boat Landing Park

The Lake Tomahawk Boat Landing Park is a primary access point for boaters (ice-free seasons) and ice fisherman and snowmobiles (winter). The shoreland buffer adjacent to the park is in natural vegetation while that near the boat landing is primarily impervious surface and lawn. Despite the large amount of impervious surface present there was little sign of channeling or gullies and little bare soil. The potential for run-off does exist so an effort to divert run-off from the access road which has a steep grade would be beneficial.

*"**Boat Landing Park** is in town on the eastern shore of Tomahawk Lake. The boat landing features three concrete launch ramps, floating docks and tie up piers and new in 2016, a handicapped accessible fishing pier. There is parking for dozens of boat trailers as well as autos. Outhouse style toilets, a wheelchair accessible porta-potty, picnic tables, a volleyball pit and grills make this a fun area to take a swim, have a cookout, or do a little fishing. In the winter months this is an access area for ice fishermen and snowmobiles. The hill is used for sledding and snowboarding as well."*

http://www.laketomahawkwi.org/government/commissions-and-committees/parks-commission

Figure 6. Lake Tomahawk Town Boat Landing Park Photos

Concentrated Use Areas on Northern Highland/American Legion State Forest Land

We mapped 6 locations of concentrated use at shoreland properties managed by the State of Wisconsin on the 4th of July weekend – and this pattern of use was evident throughout the summer. The Wisconsin DNR operates the Indian Mounds Campground and Picnic Area on the northcentral portion of the lake shoreline. The state also owns several parcels on the southern shore of the lake – concentrated use by boaters and recreationists was observed at 4 locations throughout the summer (see Northern Highlands/American Legion #1 - #4 below). Significant shoreland run-off and erosion problems were noted at these sites.

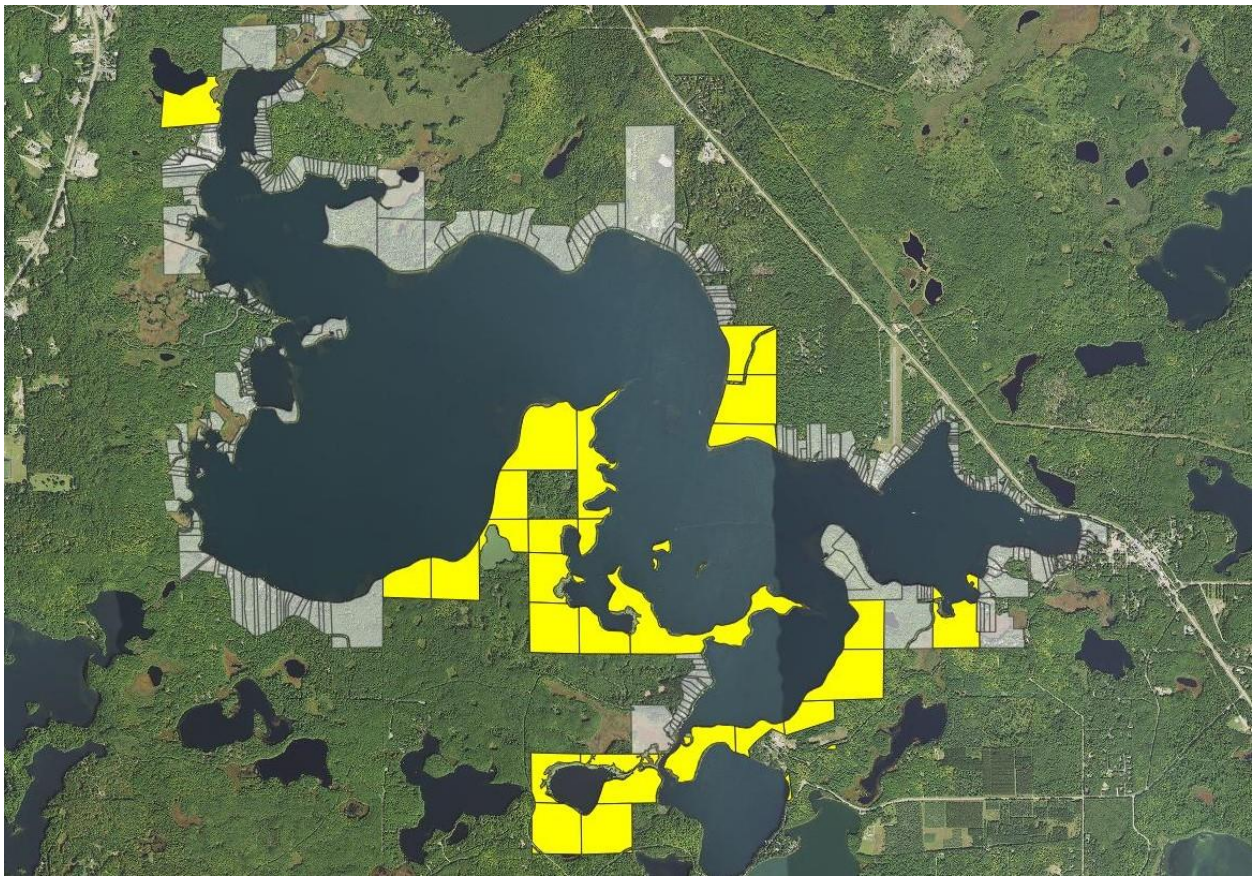


Figure 7. State-owned shoreland parcels on Tomahawk Lake

Indian Mounds Campground

Indian Mounds Campground is in the southern portion of the forest on the northeast corner of the Lake Tomahawk. The campground has three vault toilet buildings, three hand pumps for drinking water, separate trash and recycling dumpsters and access to the water. There is also an adjacent picnic area with tables, grills, a marked swimming area, vault toilet building, changing stalls, ADA accessible picnic area and boat launch. Three of the four vault toilet buildings are designated ADA accessible.

There are 2 concentrations of use on the property – 1) the picnic area and boat landing in the northwest part of the property and 2) the 39 campsites and beach on the south end of the property.

https://dnr.wi.gov/topic/StateForests/nhal/documents/indianmounds.pdf

CAMPGROUNDS

Northern Highland American Legion State Forest

Camping Fees

Resident..... $20/night
Non-resident $25/night

State Parks and Forest Admission Sticker

A State Parks and Forest Admission sticker is **REQUIRED** year-round on vehicles in the campgrounds.

Resident.....$28/annual
Resident Senior Citizen (+65) $13/annual
Non-resident $38/annual

Campground Address

7490 Tomahawk Road, Woodruff

Amenities

- **Campsites Available:** 39
- **Reservable Sites:** 7-39
- **Non-reservable Sites:** 1-5
- **Walk-to/tent-only Sites:** 20, 24-27, 29-31
- **Double Sites:** 9-10, 17-18
- On-site campground host (Memorial Day thru Labor Day)
- Beach access
- Nearby access to Clear Lake/Indian Mounds Paved Bike Trail
- Boat landing and parking
- Trash and recycling stations
- Three pit toilet buildings
- Three hand pumps for drinking water
- Paved campground roads
- **State Parks and Forest Admission Sticker required for camping**

Reservations

To make online camping reservations, visit CAMIS at: ***wisconsin.goingtocamp.com*** or call **1-888-947-2757**.

Welcome!

Indian Mounds Campground, sites 1-39, are located in the southern portion of the forest on the northeast corner of Lake Tomahawk. Lake Tomahawk is part of the Minocqua Chain of Lakes and offers excellent fishing and boating. There is a boat landing and parking area near the entrance of the campground. Within the campground, the translucent waters at the sandy, updated beach attracts persons of all ages to enjoy the cool waters. Indian Mounds Campground derives its name from the four historic conical burial mounds built by the Woodland people many years ago. **Please register for camping at the Clear Lake Visitor Station prior to setting up camp.**

Entrance to Indian Mounds Campground.

Additional Information

For questions about this property, contact:

- **Clear Lake Visitor Station** 715-356-3668
- **Crystal Lake Visitor Station** 715-542-3923

Local Emergency Contact Information

Oneida County Sheriff's Department: 715-361-5100

Vilas County Sheriff's Department: 715-479-4441

Iron County Sheriff's Department: 715-561-3800

Campground Rules

- Upon availability, all campers must register at a: 1) campground kiosk, 2) visitor station, or 3) with a campground manager.
- **Checkout Time:** Must vacate site by 3 p.m. on the last day of the permit.
- **Campground/Day-use Areas and Closing Time:** Campground closed to nonregistered campers 11 p.m. to 6 a.m.
- **Pets** must be on a leash at all times and not left unattended.
- **Noise** may not interfere with the enjoyment of the forest by others.
- **Generators** may be used from 10 a.m. to 5 p.m.
- **Camping Party:** A "non-family group" may not exceed six persons. A "family" is limited to parents with their dependent children and not more than two guests.
- A **State Parks and Forest Admission Sticker** is required for camping.
- For complete rules and regulations, see Chapter NR 45, Wis. Admin. Code, or contact DNR Law Enforcement.

dnr.wi.gov (search keywords "Northern Highland")

Indian Mounds Picnic Area and Boat Landing

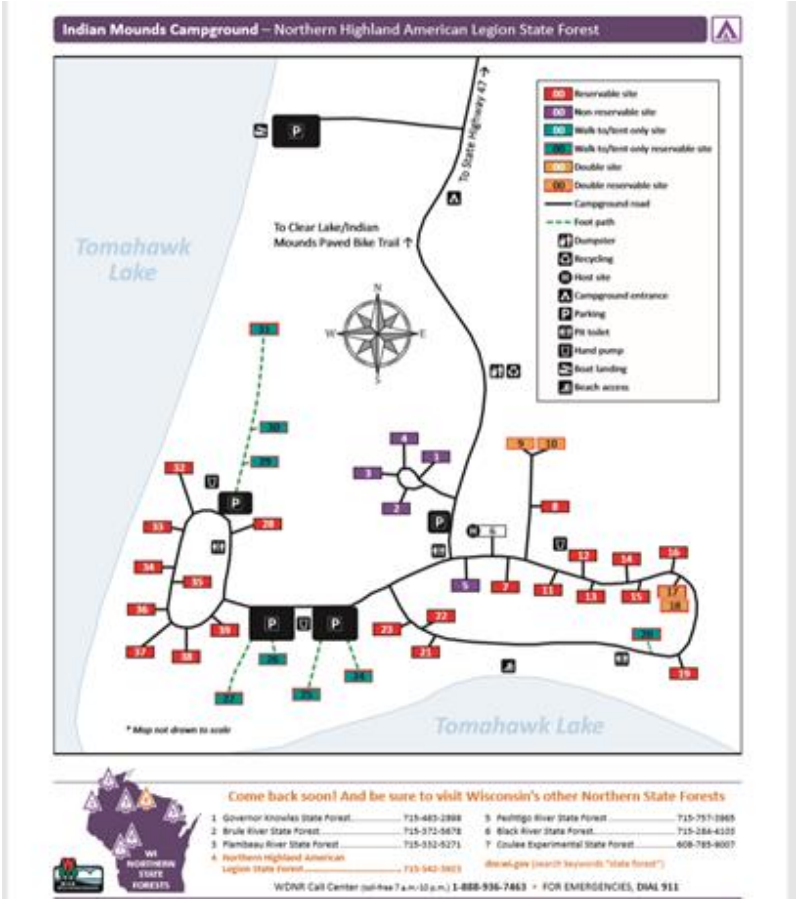
The Wisconsin DNR operates the Indian Mounds Campground and Picnic Area on the northcentral portion of the lake shoreline. Boats anchor and people picnic and swim at the picnic area north of the boat landing which until recently was also managed as a swimming beach. At the time of the July 5th survey there were 5 boats anchored and 15-20 people using the shore area. At times over the summer there were over 20 boats anchored at this location with 60+ people using the site. The shoreland buffer is primarily in natural vegetation and there was no obvious run-off or erosion concerns (as there is little slope in the beach/boat landing area) though the site should be monitored as concentrated use of the areas will continue and there is a walleye spawning area (TL-8) just to the north of the picnic area where the shoreline slope is steep. The boat landing is a popular boat launching area when lake levels are normal to high but launching is difficult for larger boats during low water periods. There is much prop scouring of the bottom in this area. Several dozen vehicles and trailers were observed during busy summer days in the boat landing parking lot. See companion Critical Habitat report for more information.

Figure 8. Indian Mounds Picnic Area and Boat Landing Photos

Indian Mounds Campground/Beach

There are 39 campsites at this WDNR property and a beach area. The campground is open for camping when snow-free and generally at capacity during July and August. There are steep slopes along a portion of the northern shore with extensive erosion, gullying/channeling, and surface water run-off due to foot traffic associated with the campsites. Boats are moored along the shoreline as well, without improved docking sites.

Figure 9. Indian Mounds Campground/Beach Photos



Northern Highland/American Legion State Forest #1

There are 4 locations on State of Wisconsin shoreland parcels where we noted large numbers of boats and jet skis anchored or pulled ashore along long stretches of shoreline. These areas are relatively shallow and sandy, offering ideal swimming and water sport (water skiing, waterboarding, jet skiing) staging areas. When we conducted the survey between 1PM and 2PM on July 5 there were 15 boats moored and 62 people enjoying site #1. Despite this high level of use, only 40' of bank erosion was noted – the upland area is level. This area is adjacent to and within Critical Habitat site TL-17 (See companion report on Critical Habitat).

Figure 10. Northern Highland/American Legion State Forest #1 Photos

Northern Highland/American Legion State Forest #2

This peninsula is used by boaters for swimming and picnicking. At the time of the survey there were 5 boats and 20 people present at this site. Approximately 40' of bank erosion was noted. This area is within critical habitat site TL-23. See companion report on Critical Habitat for more information.

Figure 11. Northern Highland/American Legion State Forest #2 Photos

Northern Highlands/American Legion State Forest #3

Two concentrated use areas were located on the north shoreline of Windy Point. At the time of the July 5th survey there were 25 boats and 3 jet skis at anchor and between 80-100 people present on the shoreline, in anchored boats, or in the water. Several ski boats and jet skis were actively using the area. Extensive gullying and channeling of the adjacent uplands and buffer was associated with the activity as well as bank erosion. These sites have the most severe erosion problems on Tomahawk Lake and are within Critical Habitat site TL-24 (See companion report on Critical Habitat for more information).

Figure 12. Northern Highlands/American Legion State Forest #3 Photos

Northern Highlands/American Legion State Forest #4

This location, often referred to the “otter slide”, had the most severe erosion and run-off problems observed on Tomahawk Lake. Human use of the adjacent steep sandy upland has resulted in over 200’ of gullying and channeling of run-off with >250’ of bank erosion present. Because of the high concentration of use and steep slopes, management of the site could include fencing and signage and perhaps seasonal porta-potty facilities to keep people off the steep upland sites. Again, this location is within Critical Habitat site TL-24 – see Critical Habitat Report for more information.

Figure 13. Northern Highlands/American Legion State Forest #4 Photos

3. Tomahawk Lake Shoreland and Shallows Habitat Monitoring Surveys

We conducted boat surveys July – August 2019 of the Tomahawk Lake shoreline and assessed the upland and shoreland buffer condition and identified erosion and run-off issues on 414 tax parcels adjacent to Tomahawk Lake, Oneida County in 2019, using the draft WDNR Lake Shoreland & Shallows Habitat Monitoring Field Protocol (Hein et al. 2016). We identified 38 properties with potential upland and/or buffer gullying and channeling due to surface water run-off, 83 parcels with potential bank erosion, and 144 with buffers that were greater than 40% in manicured lawn and/or impervious (hard, non-porous) surfaces. **As this was a one-time shoreland evaluation done offshore by boat, an actual onsite visit is needed to confirm the survey results (see Recommendations to Property Owners in Section 4).**

Figure 14. Tomahawk Lake Shoreland Parcels - North

Figure 15. Tomahawk Lake Shoreland Parcels - South

Shoreland Parcels with Erosion Potential (Lawn/Soil Sloping to Lake)

We identified several developed parcels with steep topography in the upland which have lawns, stairways, and soil sloping to the shoreline. These properties should be monitored by owners for erosion or run-off problems. Many of these sites do not have existing run-off or erosion issues but landowners should be made aware of this risk (due to the topography and development) along with preventative steps that can be taken to ensure erosion and run-off does not occur. Property owners should also be made aware of critical habitat sites that are near their development.

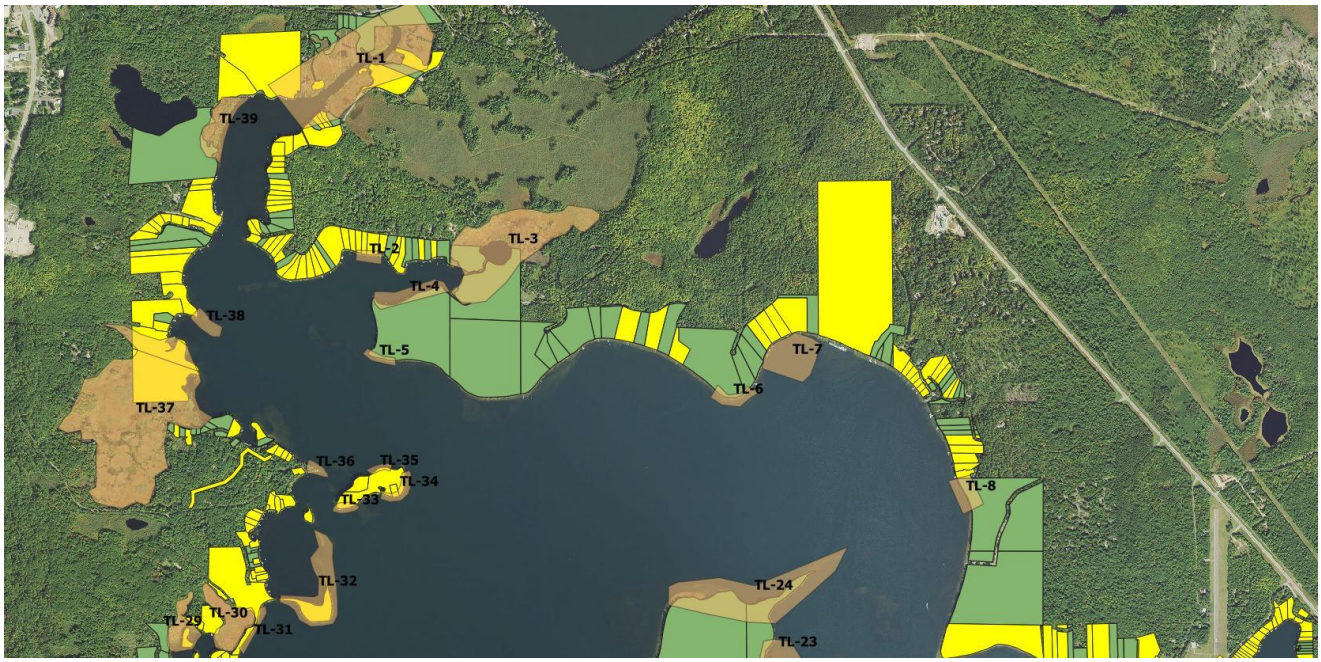


Figure 16. Shoreland Parcels with Erosion Potential (yellow) – North. Critical Habitat sites are in orange.

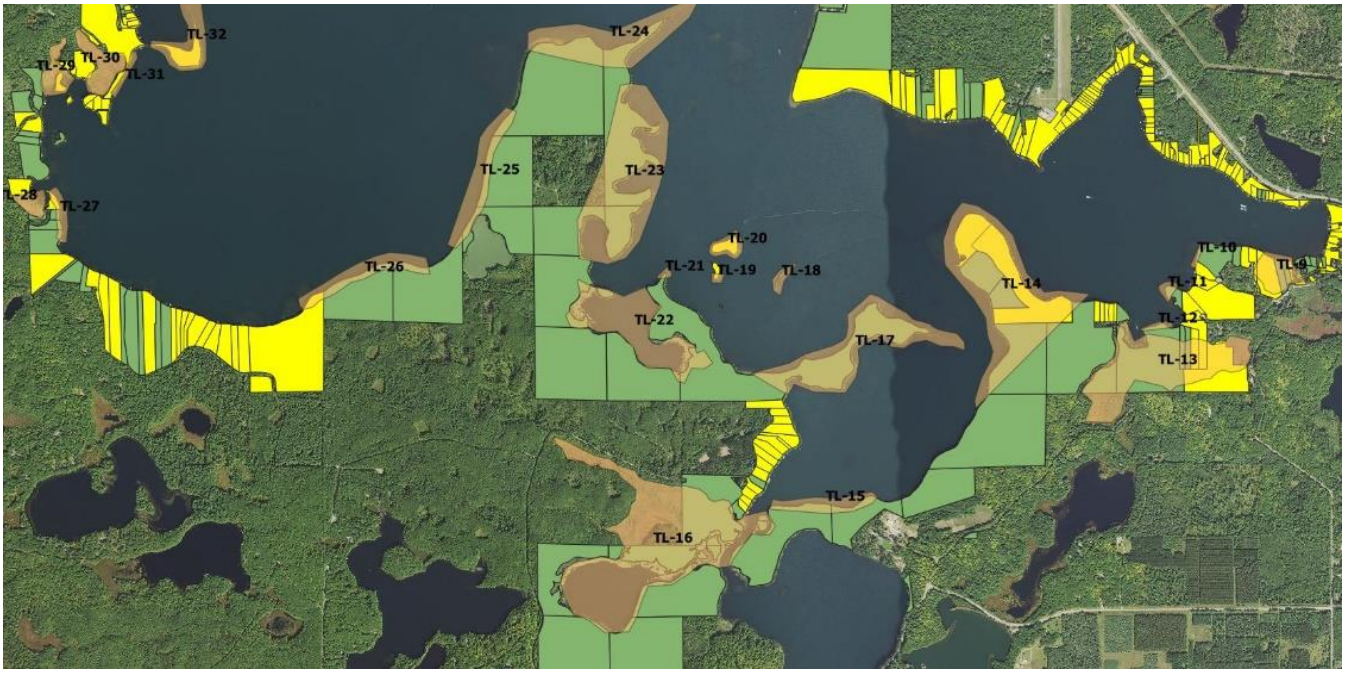


Figure 17. Shoreland Parcels with Erosion Potential (yellow) – South. Critical Habitat sites are in orange

Shoreland Parcels with Potential Gullying and Channeled Run-off

We identified several shoreline parcels which appeared to have active erosion and run-off conditions leading to gullying and channeling in the upland and buffer. Corrective actions should be taken to address this as run-off increases nutrient and sediment run-off into Tomahawk Lake. These property owners should be made aware of critical habitat sites near their development.

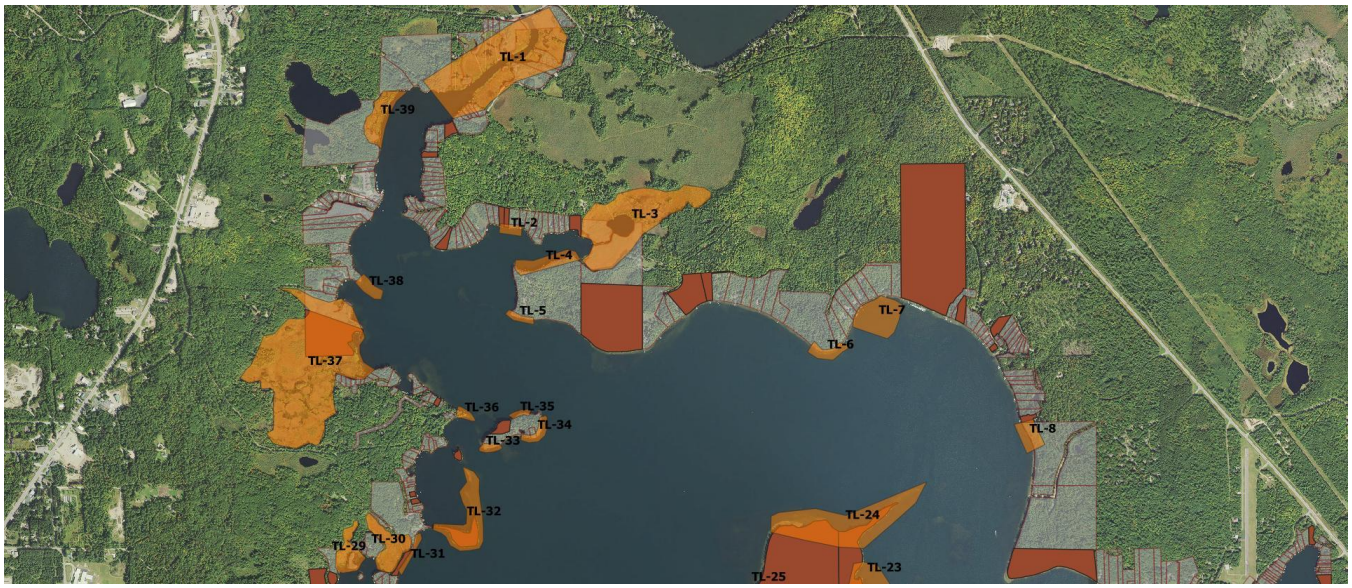


Figure 18. Shoreland Parcels with Gullying/Channeled Run-off – North (brown)

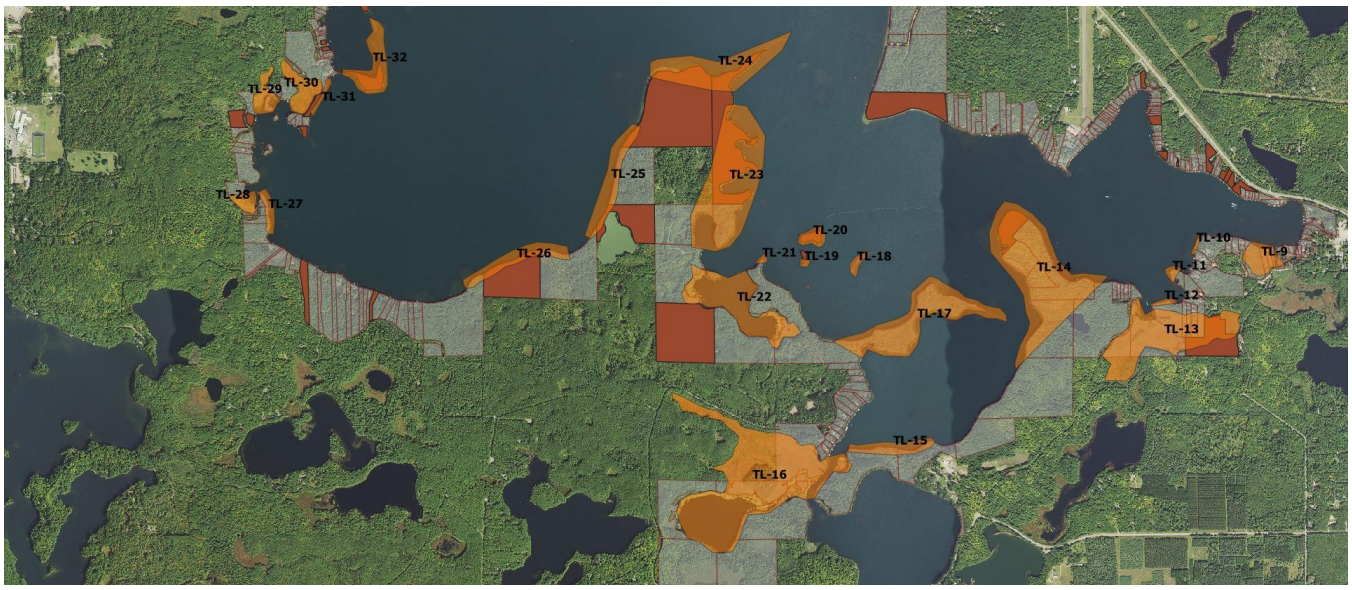


Figure 19. Shoreland Parcels with Gullying/Channeled Run-off – South (brown)

Shoreland Parcels with Potential Bank Erosion

We identified several shoreline parcels with active bank erosion immediately adjacent to the shoreline. Corrective actions should be taken to address this erosion as it increases nutrient and sediment run-off into Tomahawk Lake. These property owners should also be made aware of critical habitat sites near their development.

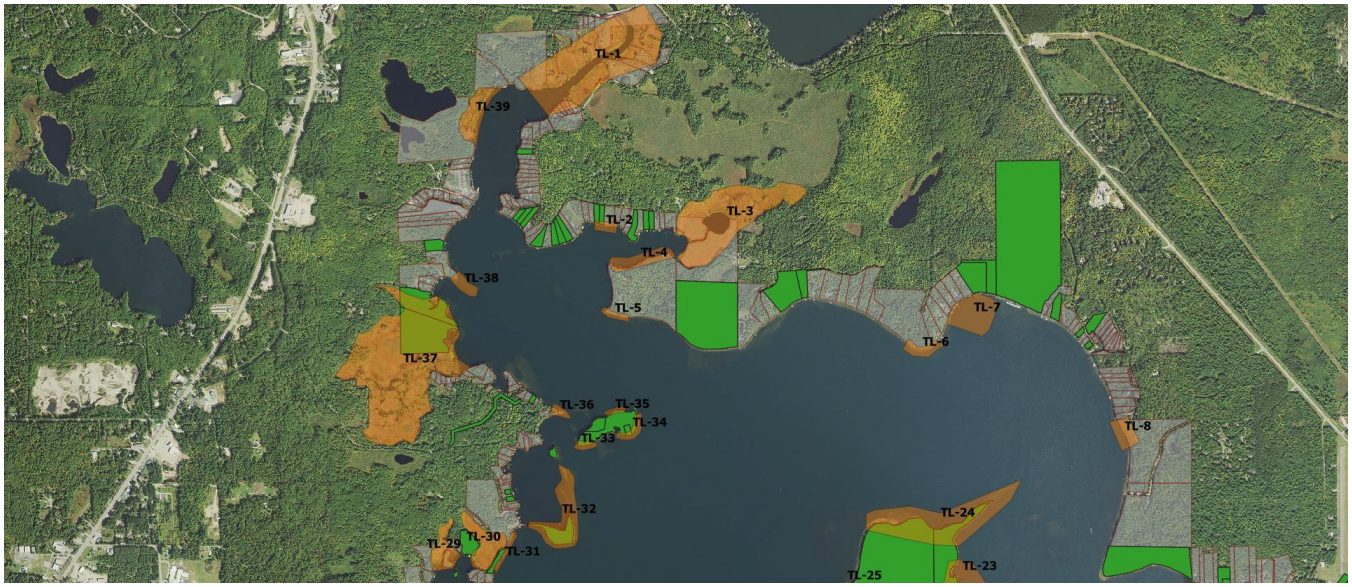


Figure 20. Shoreland Parcels with Observed Bank Erosion – North (dark green)

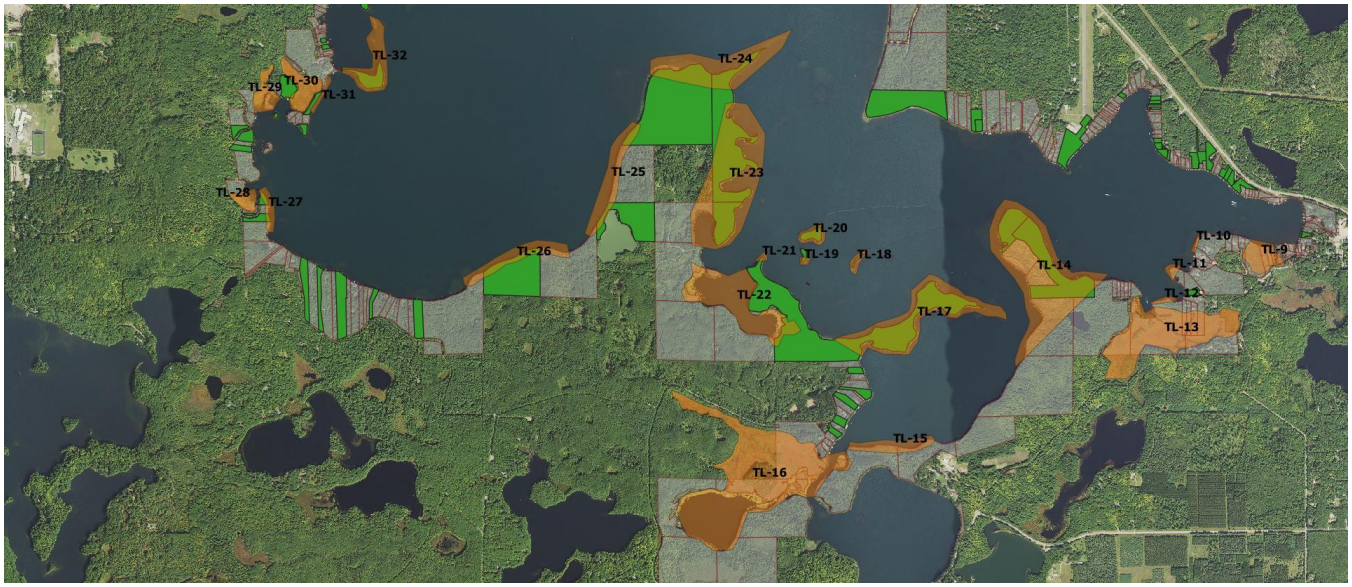


Figure 21. Shoreland Parcels with Observed Bank Erosion – South (dark green)

Shoreland Parcels Needing Buffer Habitat Improvement

Shoreland development often degrades the habitat quality of buffer zones. Manicured lawns reduce wildlife habitat, and impervious surfaces (rooftops, driveways, etc.) increase nutrient and sediment run-off. We identified properties where the buffer zone is greater than 40% manicured lawn and impervious surface and are near critical habitat sites. These landowners should be encouraged via education and outreach to increase native plantings along their lakeshores. Lake managers recommend leaving at least 70% of the buffer in native vegetation.

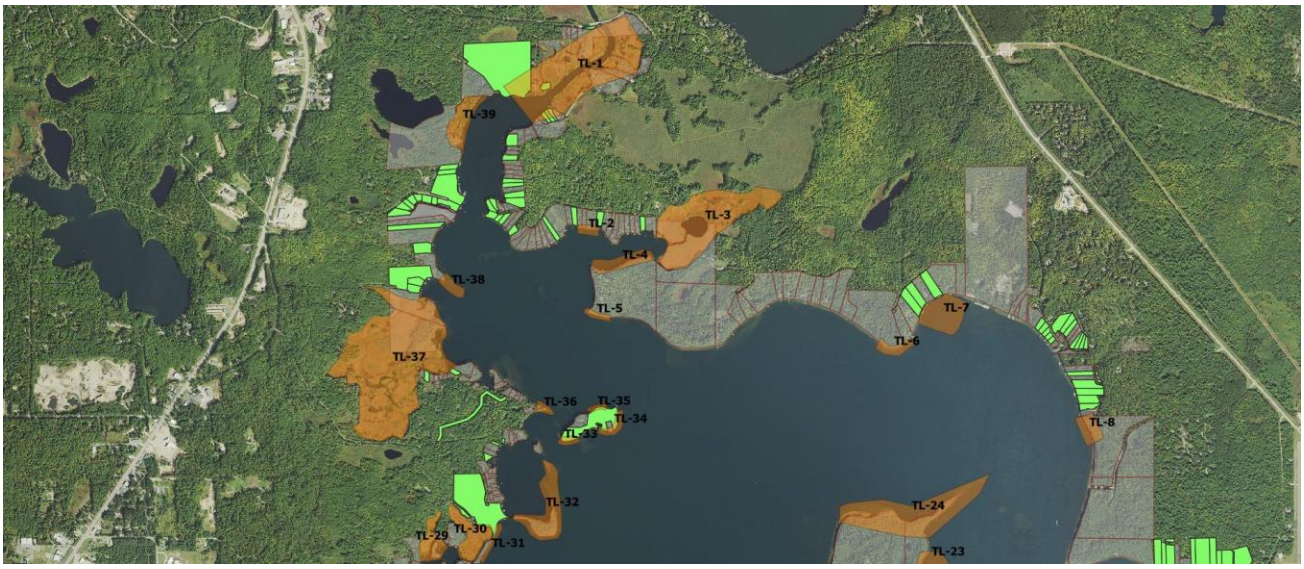


Figure 22. Shoreland Parcels with Degraded Buffer Habitat – North (light green)

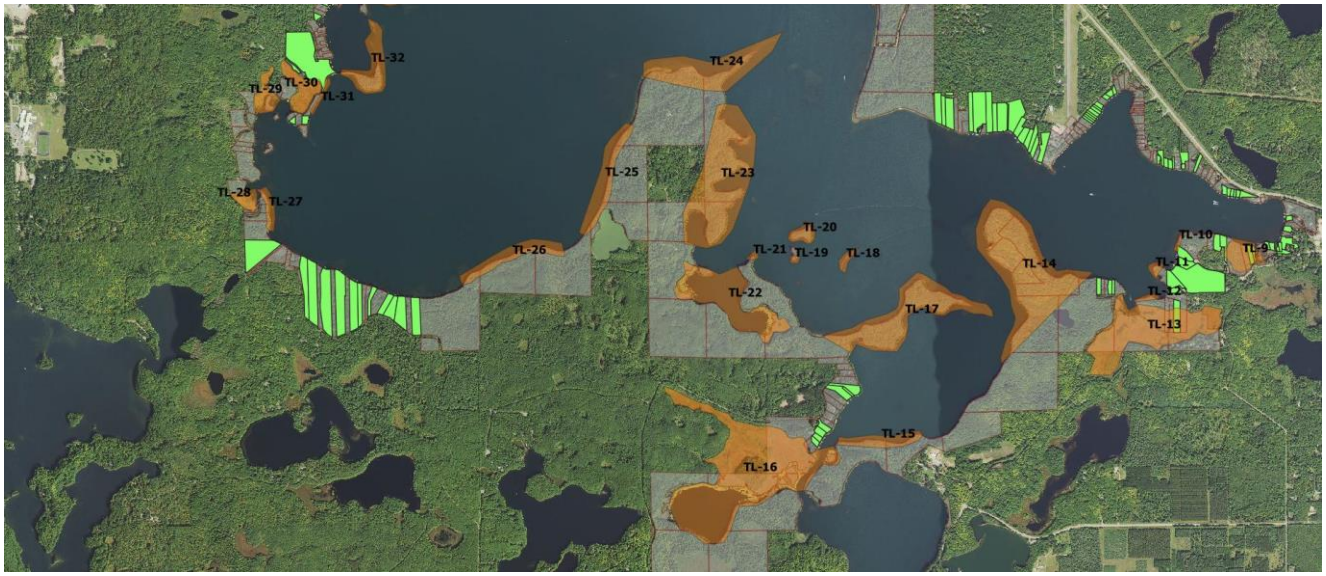


Figure 23. Shoreland Parcels with Degraded Buffer Habitat – South (light green)

4. Recommendations for Tomahawk Lake Property Owners

- Get to know the important fish and wildlife habitat areas on Tomahawk Lake by reading the report "Getting to Know Tomahawk Lake's Special Places" Familiarize yourself with areas that are in close proximity to your property. Spend some time in these areas to learn more about the natural communities on Tomahawk Lake.

- Take the Tomahawk Lake Association Rate Your Shoreland Self-Assessment Survey to evaluate how your property is doing as related to Shoreland Best Management Practices (https://www.tomahawklake.org/rate-your-shoreline).

- Contact the Tomahawk Lake Association for a free on-site visit to further evaluate your property's condition and receive an individual property report and recommendations for shoreland best management improvements.

- Become familiar with the Tomahawk Lake Association's Shoreland Best Management Practices to best manage your property to safeguard fish and wildlife habitat, water quality, and natural scenic beauty of the lake we all love (https://www.tomahawklake.org/more-shore).

Getting to Know Tomahawk Lake's Special Places

Mike Meyer and Jim Kreitlow
Nova Ecological Services
August 1, 2020

Introduction

The goal of the Tomahawk Lake Association (TLA) Shoreland GIS project is to encourage private and public landowners to implement shoreland best management practices in ecologically sensitive shoreland regions of Tomahawk Lake where needed. It is our working assumption that by increasing knowledge of Tomahawk Lake's valuable ecological features, we will motivate lake property owners to initiate and continue practices that conserve or restore native shoreland vegetation and minimize erosion and surface water run-off into Tomahawk Lake – thus protecting critical fish and wildlife habitat and maintaining high water quality.

Lakeshore property development and recreational use often leads to degraded fish and wildlife habitat quality as well as increased sediment and nutrient run-off which can increase weed growth and reduce water clarity. Best management practices which reduce run-off and improve habitat quality are available and can repair the impacts of development. As there are over 350 individual property owners on Tomahawk Lake, we will use the results of this project to prioritize education and outreach efforts to target landowners and shoreland areas that will benefit most from shoreland best management practices.

Under contract with TLA, Nova Ecological Services (NES) undertook 3 surveys and GIS mapping projects to accomplish this goal. GIS (Geographical Information Systems) is a computerized mapping program that permits the overlay of many sources of data on one map. First, NES conducted boat surveys along the entire Tomahawk and Mud Lake shorelines and mapped Critical Habitat - sites with high quality fish and wildlife habitat, diverse aquatic plant communities, shorelands with natural scenic beauty that are protective of water quality, and important wetland areas. Results of this work are contained in this report. Second, NES conducted a boat survey on July 4th weekend to identify shoreland areas (commercial, public, and private properties) receiving concentrated human use (boating and recreation) in the shoreland areas. Ten high use areas were identified. Third, NES assessed the shoreland condition at 414 tax parcels adjacent to Tomahawk Lake during July 2019, using the draft WDNR Lake Shoreland & Shallows Habitat Monitoring Field Protocol (Hein et al. 2016). See companion report titled "Assessing the State of Tomahawk Lake's Shoreland – 2020" *(link)* for results.

Results from these efforts are used in a GIS project to identify individual Tomahawk Lake properties for shoreland management education and outreach efforts including site assessments and recommendations for best management practices. We will focus our outreach and education programs on properties that have buffer conditions in need of improvement, have potential erosion and run-off issues, and are near shoreland areas of high ecological value (e.g. Critical Habitat). The project implements several mapping action steps identified in the TLA CLMP Work Plan (2016-2020) with shoreland implications and updates the Tomahawk Lake shoreland inventory.

Project Outcomes

Products from this project are being posted on the Tomahawk Lake Association web page. Information may also be posted on Facebook, YouTube, and contained in printed brochures. The purpose will be to;

- Inform the Tomahawk Lake community of the existing critical habitat features and shoreland conditions on Tomahawk Lake.
- Discuss ways to maintain or improve the lake's water quality, fisheries, wildlife, wetlands, and natural scenic beauty.
- c. Identify projects to enhance or improve shoreland and aquatic habitat through best management practices.
- d. Identify shoreland areas which would lend themselves to neighbor to neighbor shoreland restoration discussion meetings.

TOMAHAWK LAKE CRITICAL HABITAT SHORELAND AREAS - 2019

Critical Habitat Surveys and Mapping

A primary objective of the Tomahawk Lake Association (TLA) Shoreland GIS project is to educate property owners of the location and value of important natural ecological features in the shorelands of Tomahawk Lake. With this knowledge, it is our hope that property owners will better understand the importance of implementing and maintaining shoreland stewardship projects on private and public lands. The Wisconsin DNR Critical Habitat Program Protocol (Cunningham 2008 Draft Wisconsin DNR Critical Habitat Designation Manual) was followed to designate these Critical Habitat sites on Tomahawk Lake.

2019 Field Work - Under contract with TLA, Nova Ecological Services (NES) identified 39 critical habitat sites on Tomahawk Lake in 2019 (Figures 1 & 2). This work was sponsored by the Tomahawk Lake Association and supported with WDNR Lake Planning Grant LP168819.

Prior to field work an extensive data review was conducted to gather preliminary data about critical habitat on Tomahawk Lake. Data sources reviewed include:1) Fish survey data and reports, 2) Natural Heritage Inventory data, 3) Lake Management Plans, 4) Wisconsin Wetland Inventory, 5) Waterbody Designations, 6) Riparian Areas under Public Ownership, 7) Aquatic Plant Survey Data, 8) DNR Surface Water Data Viewer database and 9) Watershed Delineation Maps. Critical habitat sites selected contained 2 or more of the following characteristics - high quality 1) fish habitat, 2) wildlife habitat, 3) water quality protection, 4) wetlands, 5) aquatic plant communities, and 6) natural scenic beauty.

An initial lake-wide boat survey was conducted by NES in May/June 2019 to identify important fish habitat (presence of littoral zone rock/rubble and/or coarse woody habitat). A GPS waypoint was generated for the location of all coarse wood following the draft WDNR Lake Shoreland & Shallows Habitat Monitoring Field Protocol (Hein et al. 2016, Figures 5 & 6). Waypoints were also generated for locations of shoreland areas containing rock and rubble suitable for walleye and white sucker spawning (Figures 7 & 8). Diverse aquatic plant communities were located using the 2014 Point-Intercept aquatic plant survey data collected by Harmony Environmental for the TLA Comprehensive Management Report (Figures 9 & 10). We also consulted with the WDNR Fish Biologist to identify known walleye spawning areas on Tomahawk Lake. All this information was transferred to a lake map and areas that were designated as potential critical habitat sites were evaluated in the field. Also, Wisconsin DNR conducted

preliminary critical habitat surveys on Tomahawk Lake in 2006 (Cunningham, pers. comm.) and we used results and maps from this survey in the 2019 assessment.

A second lake-wide shoreland survey was conducted by boat in September 2019 where the potential critical habitat identified by WDNR in 2006 (n=21 sites) were assessed. 19 of 21 sites were accepted as critical habitat sites in 2019. An additional 20 sites were also identified based on the 6 criteria described above. Narratives were developed for each Critical Habitat site, numbered TL-1 through TL-39 (see Figures 1 & 2 for locations and Table 1 for habitat attributes) which includes a description of the public rights habitat characteristics, a map of the site, and photographs of the important features. We ranked (1-6) the Critical Habitat sites based on the presence of the following attributes – quality fish habitat, quality wildlife habitat, quality wetlands, diverse aquatic plant communities, water quality protection, natural scenic beauty. Each attribute provided a value of 1 with a maximum of 6 attributes per site.

At the present time **the 39 Critical Habitat designations made by NES are *advisory***, and TLA would have to request the DNR initiate the procedure described in section **Formally Designating the Critical Habitat Features on Tomahawk Lake (below)** if there is a desire to make the designations legally binding.

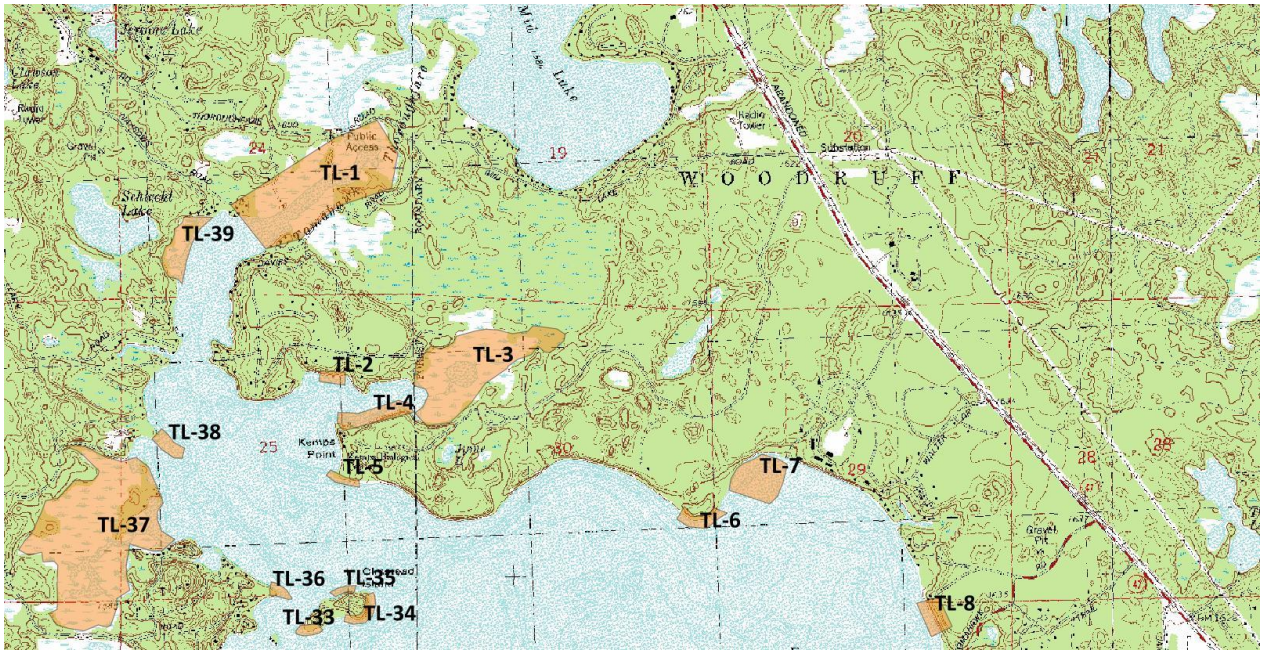


Figure 1. Tomahawk Lake Critical Habitat Locations - North

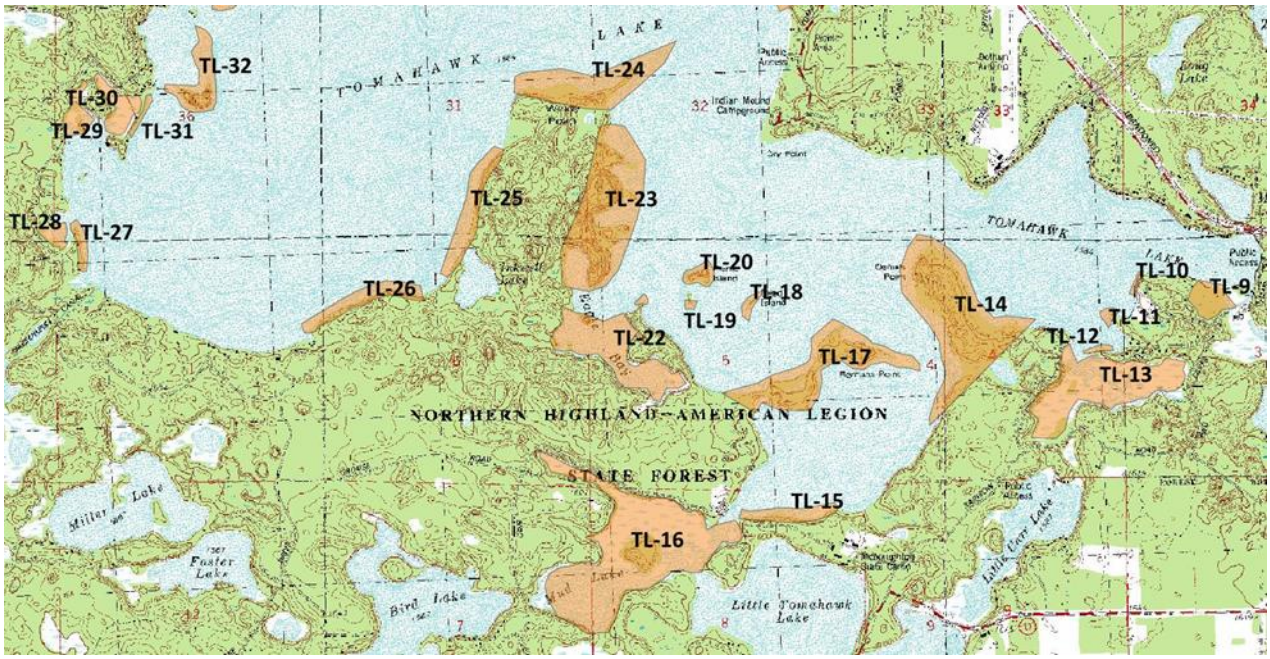


Figure 2. Tomahawk Lake Critical Habitat Locations - South

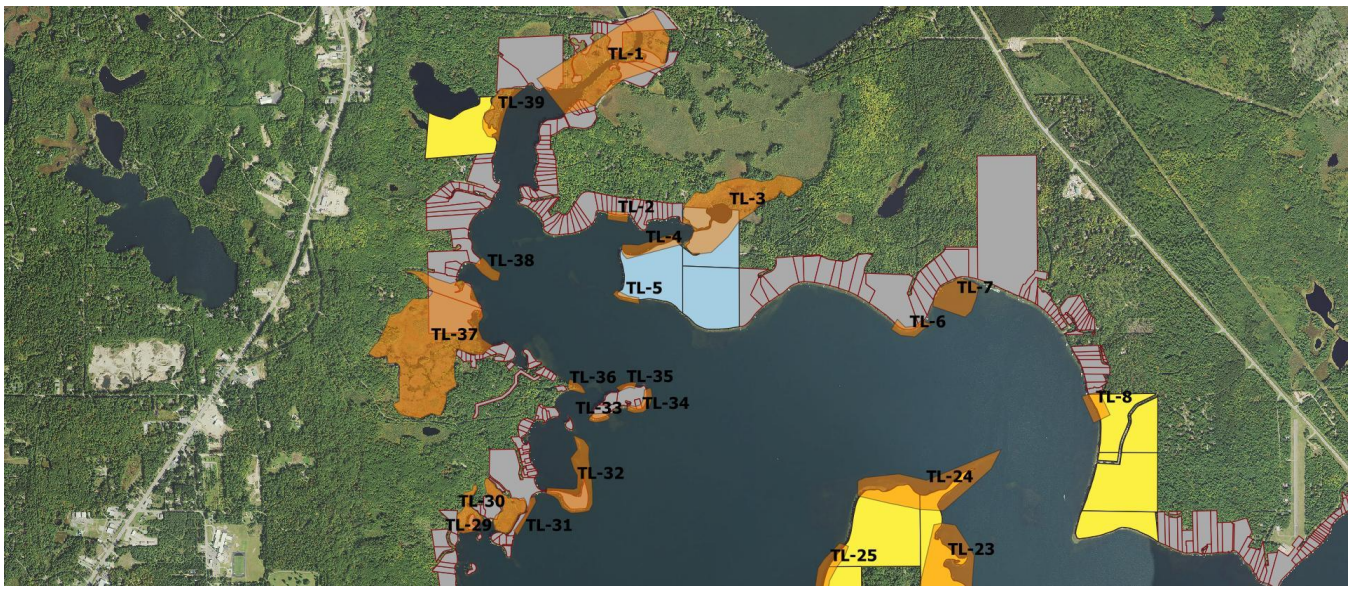


Figure 3. Critical Habitat (Orange) and Shoreland Property Ownership (Gray=Private, Yellow=State, Blue=UW) in Tomahawk Lake – North

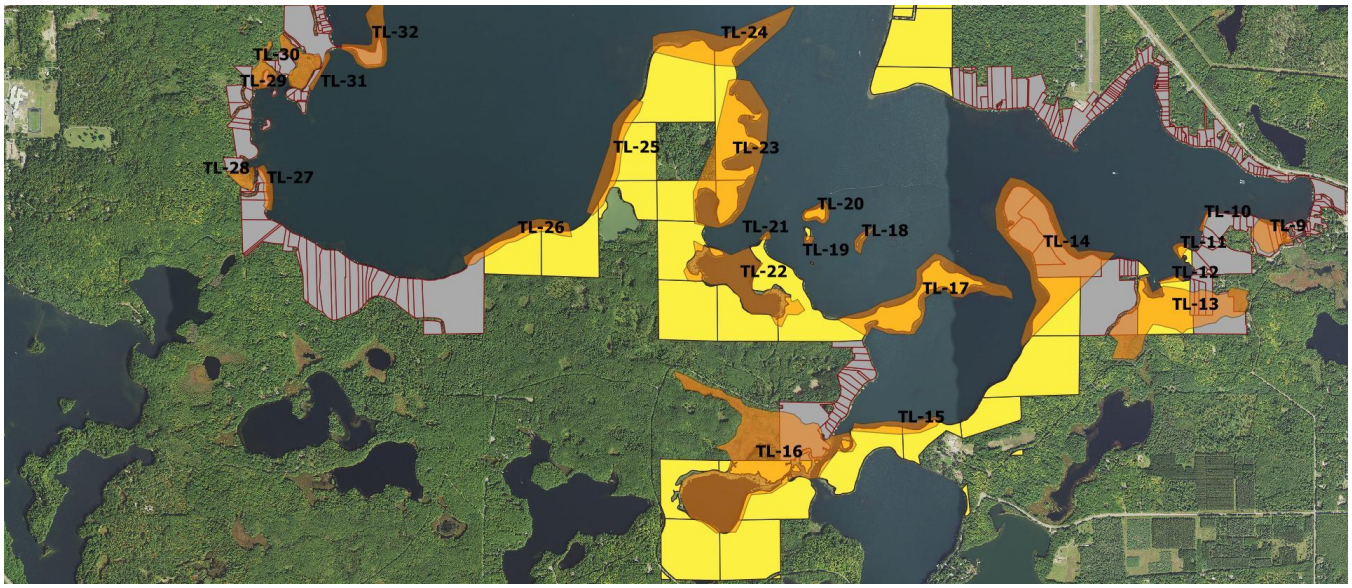


Figure 4. Critical Habitat (Orange) and Shoreland Property Ownership (Gray=Private, Yellow=State, Blue=UW) in Tomahawk Lake – South

Table 1. Attributes of the 39 Critical Habitat Sites on Tomahawk Lake. Fish Habitat (FishHab), Wildlife Habitat (WildHab), Important Wetlands (Wetlands), Diverse Aquatic Plant Communities (AquaPl), Natural Scenic Beauty (NatScenic)

LakeID	FishHab	WildHab	Wetland	AquaPL	WaterQual	NatScenic	Total
TL-1	Y	Y	Y	Y	Y	Y	6
TL-2	Y				Y		2
TL-3	Y	Y	Y	Y	Y	Y	6
TL-4	Y	Y			Y	Y	4
TL-5	Y	Y			Y	Y	4
TL-6	Y	Y			Y	Y	4
TL-7	Y	Y		Y	Y		4
TL-8	Y	Y			Y	Y	4
TL-9	Y	Y	Y	Y	Y	Y	6
TL-10	Y	Y			Y	Y	4
TL-11	Y	Y			Y	Y	4
TL-12	Y	Y			Y	Y	4
TL-13	Y	Y	Y	Y	Y	Y	6
TL-14	Y	Y			Y	Y	4
TL-15	Y	Y			Y	Y	4
TL-16	Y	Y	Y	Y	Y	Y	6
TL-17	Y	Y		Y	Y	Y	5
TL-18	Y	Y				Y	3
TL-19	Y	Y				Y	3
TL-20	Y	Y			Y	Y	4
TL-21	Y	Y			Y	Y	4
TL-22	Y	Y	Y	Y	Y	Y	6
TL-23	Y	Y		Y	Y	Y	5
TL-24	Y	Y			Y	Y	4
TL-25	Y	Y			Y	Y	4
TL-26	Y	Y			Y	Y	4
TL-27	Y	Y	Y		Y	Y	5
TL-28	Y	Y	Y	Y	Y	Y	6
TL-29	Y	Y	Y	Y	Y	Y	6
TL-30	Y	Y	Y	Y	Y	Y	6
TL-31	Y				Y		2
TL-32	Y	Y		Y	Y		4
TL-33	Y	Y			Y		3
TL-34	Y	Y			Y		3
TL-35	Y	Y			Y		3
TL-36	Y				Y		2
TL-37	Y	Y	Y	Y	Y	Y	6
TL-38	Y				Y		2
TL-39	Y	Y	Y	Y	Y	Y	6

Coarse Wood Waypoints, Fish Habitat, and Relationship to 39 Critical Habitat Sites

Waypoints using a Garmin GPSMAP 64s were collected of all coarse wood (pieces >4" diameter, >5' length) along the shoreline of Tomahawk Lake. Over 3000 pieces were identified and further delineated as submerged logs, shore logs, full tree crowns, logs with branching, and submerged stumps. Coarse wood was most concentrated in protected bays along the southern shores of Tomahawk Lake**.** Concentrations of coarse wood correspond with several critical habitat sites and are important fisheries and amphibian habitat components.

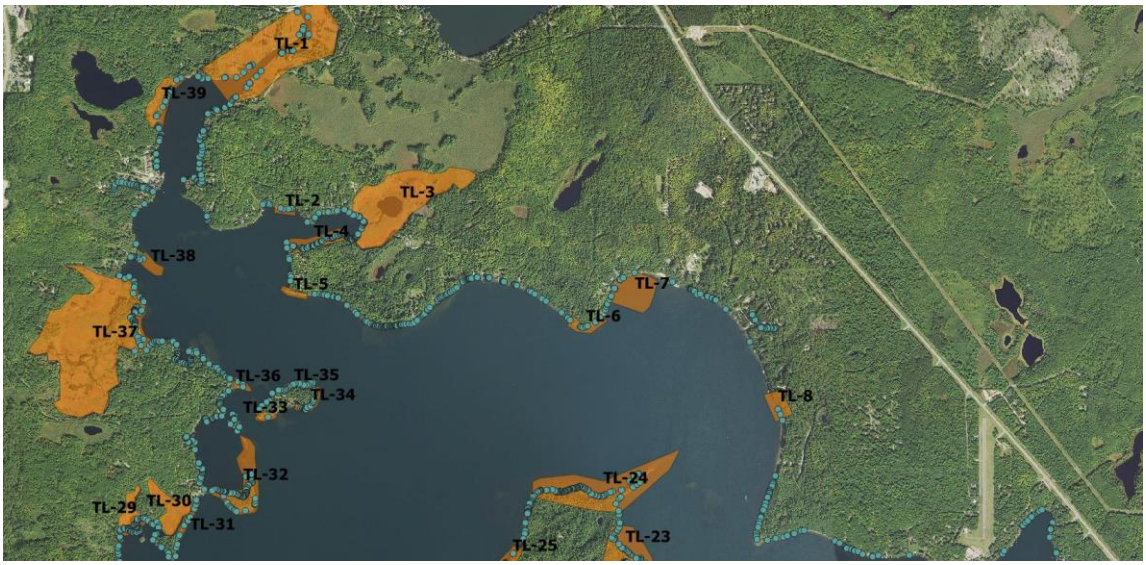


Figure 5. Coarse Woody Habitat (blue points) Tomahawk Lake - North

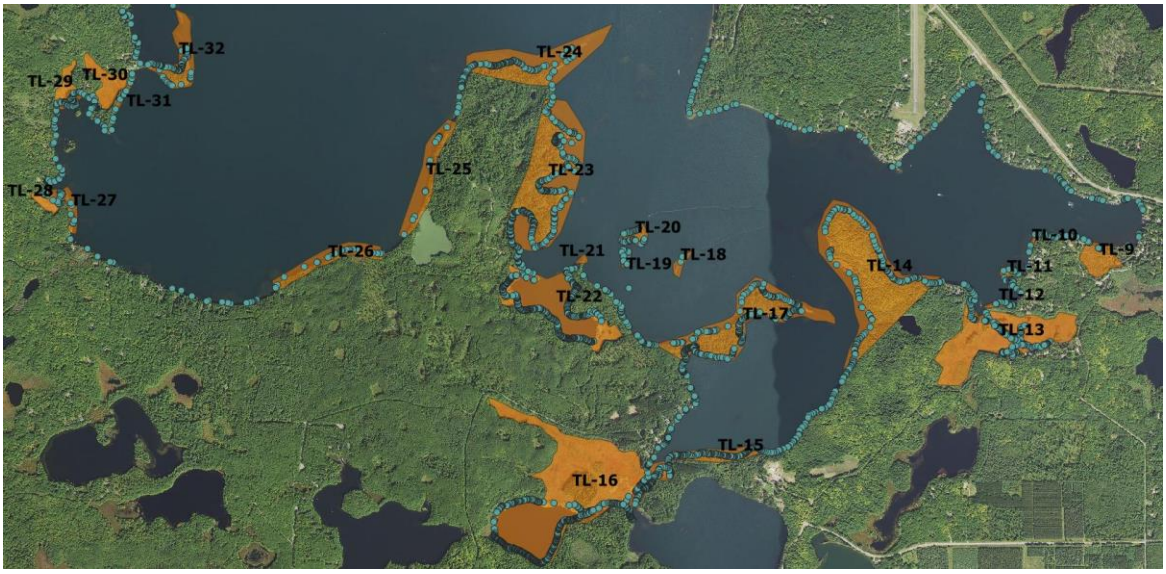


Figure 6. Coarse Woody Habitat (blue points) Tomahawk Lake - South

Rock and Rubble Waypoints/Walleye and White Sucker Spawning Areas, and Relationship to 39 Critical Habitat Sites

Waypoints were collected at shorelines and lake zones dominated by rock and rubble during the fish habitat surveys in May/June 2019. These waypoints are shown as red points below (Figures 5 & 6). The rock and rubble waypoints often correspond with critical habitat sites and are important spawning areas for walleye, white suckers, and small mouth bass.

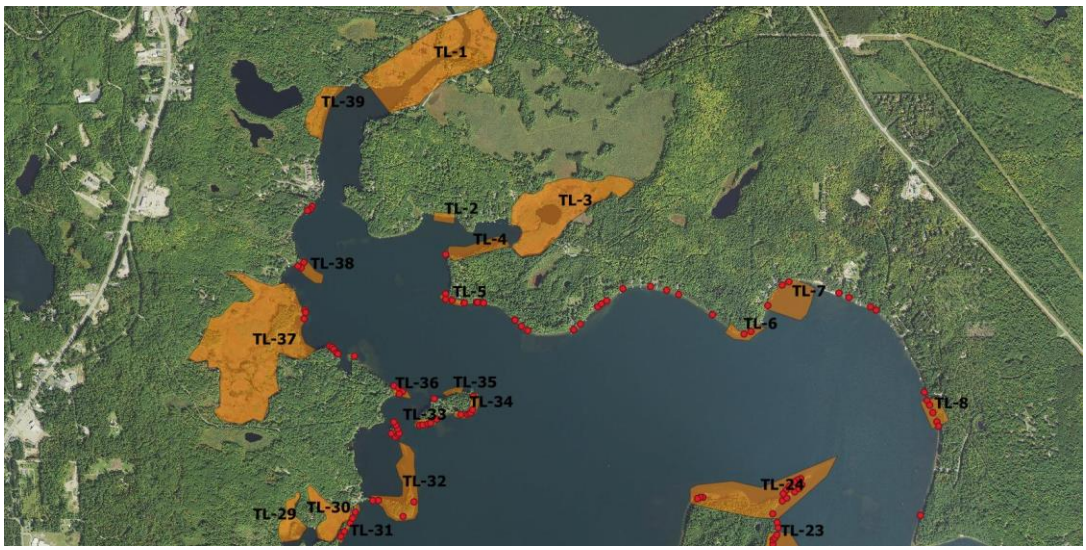


Figure 7. Rock and Rubble waypoints on Tomahawk Lake (red points) in relation to 39 critical habitat sites on Tomahawk Lake - North

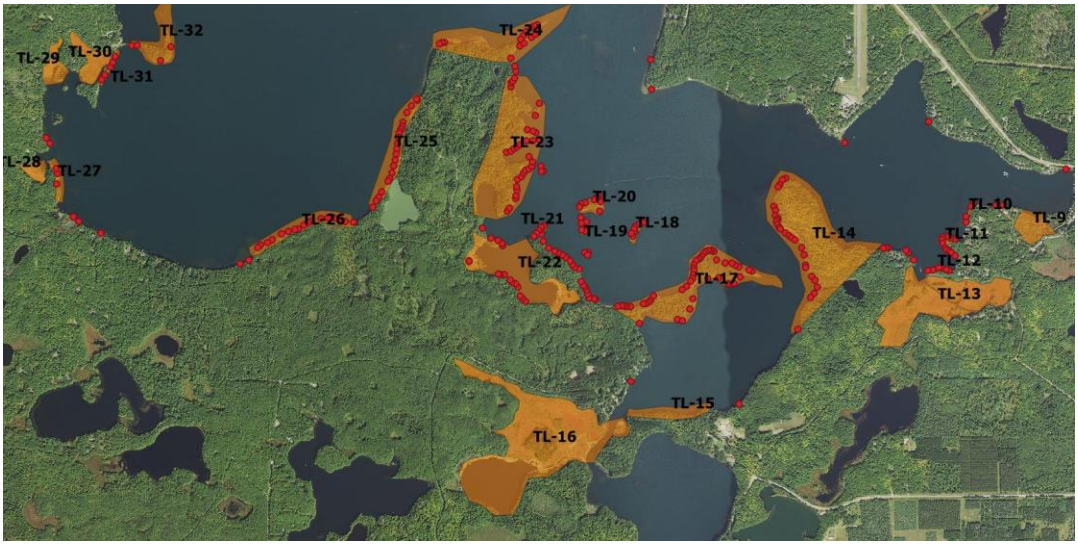


Figure 8. Rock and Rubble waypoints on Tomahawk Lake (red points) in relation to 39 critical habitat sites on Tomahawk Lake South and Mud Lake

Diverse Aquatic Plant Communities and Relationship to 39 Critical Habitat Sites

Several of the Critical Habitat sites correspond with areas of the lake identified by Harmony Environmental as having diverse aquatic plant communities as measured in the 2014 aquatic macrophyte point intercept surveys. Yellow points represent point-intercept locations where 2+ native species occurred per sampling site.

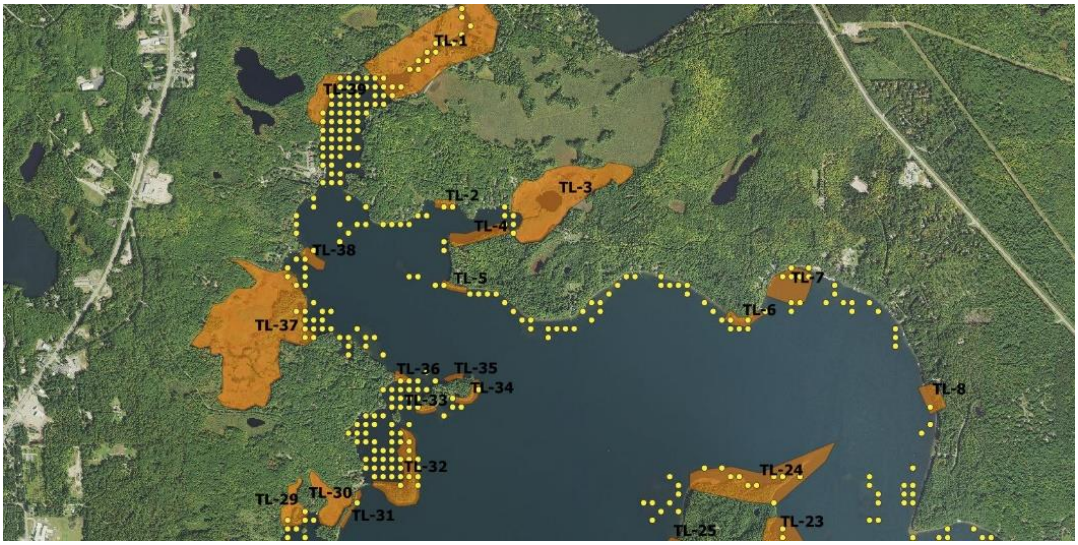


Figure 9. Aquatic macrophyte sample points on Tomahawk Lake (yellow points) where 2+ native species were found in relation to 39 critical habitat sites on Tomahawk Lake - North

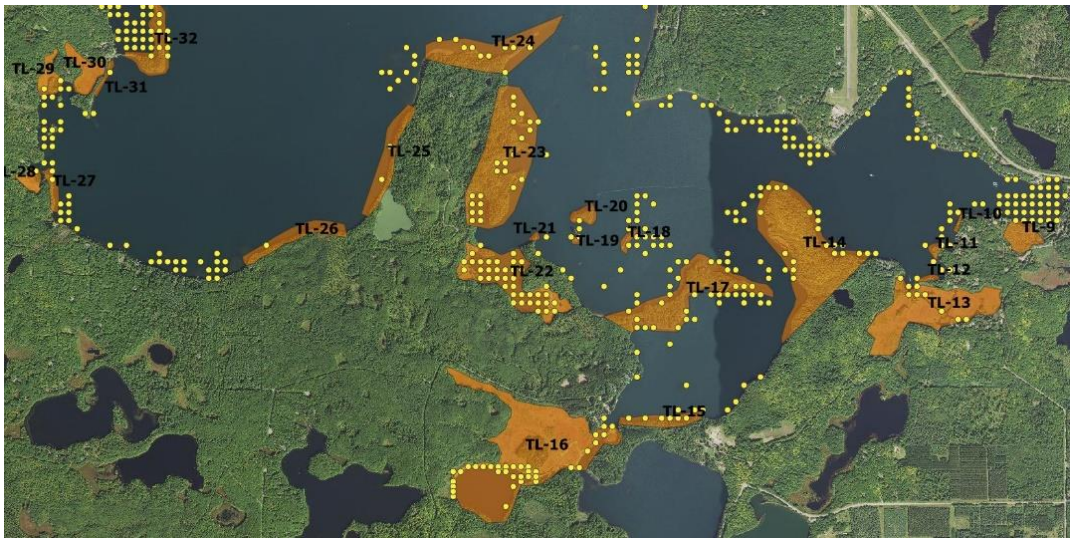


Figure 10. Aquatic macrophyte sample points on Tomahawk Lake (yellow points) where 2+ native species were present in relation to 39 critical habitat sites on Tomahawk Lake South and Mud Lake.

Tomahawk Lake

Critical Habitat Maps and Descriptions

TL-1 Thoroughfare Wetland Complex (north end to boat landing)

This is a large diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation, water quality protection, and natural scenic beauty. It is used extensively by the public as a thoroughfare between the Minocqua and Tomahawk Lakes. There is minimal human disturbance. (photos)

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 70% wetland, 20% wooded and 10% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs with trees present and a small amount of lawn.

Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Diverse emergent, submergent, free floating and overhanging shoreland vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish. Fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Diverse Aquatic Plant Community - The 2014 Aquatic Plant Point Intercept survey shows this area to have a diverse aquatic plant community. Diverse emergent, submergent, and free-floating aquatic vegetation is abundant.

Wetland Features - Wetland types found include Deep Marsh (cattails, pickerel weed), Shrub Carr (shrubs, woody plants, alders) and Conifer Swamp (tamarack and spruce).

Natural Scenic Beauty – The shoreland area is primarily undeveloped and natural except for a boat landing near the Mid Lake Road bridge and piers built over the wetlands on the north shore.

Management Recommendations

1. Maintain current protection (slow no wake).
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.

TL-2 Kemp Bay Gravel Bar (northwest of Kemp Station boathouse)

This is a rock/gravel bar. It was selected for its fishery value (photos).

Physical Description of the Site

The site includes shoreline and littoral zone habitats. The riparian type (%) is 50% wooded and 50% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with herbaceous/scrubs common and lawn present.

Critical Habitat Values (2)

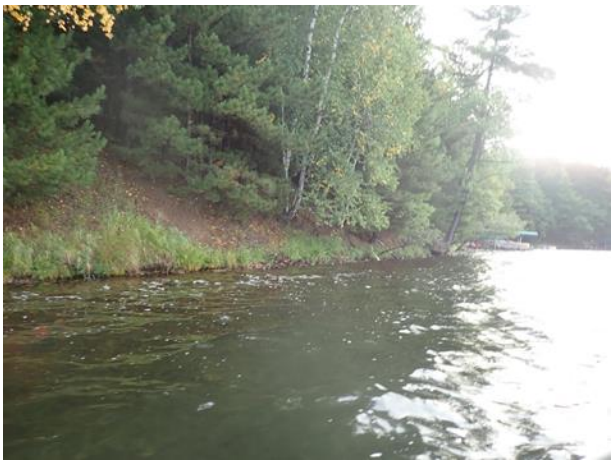
Attributes of Water Quality - This site serves as:

> Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).

Fish Habitat - Rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.
4. Restore or increase shrub/herbaceous plant cover.

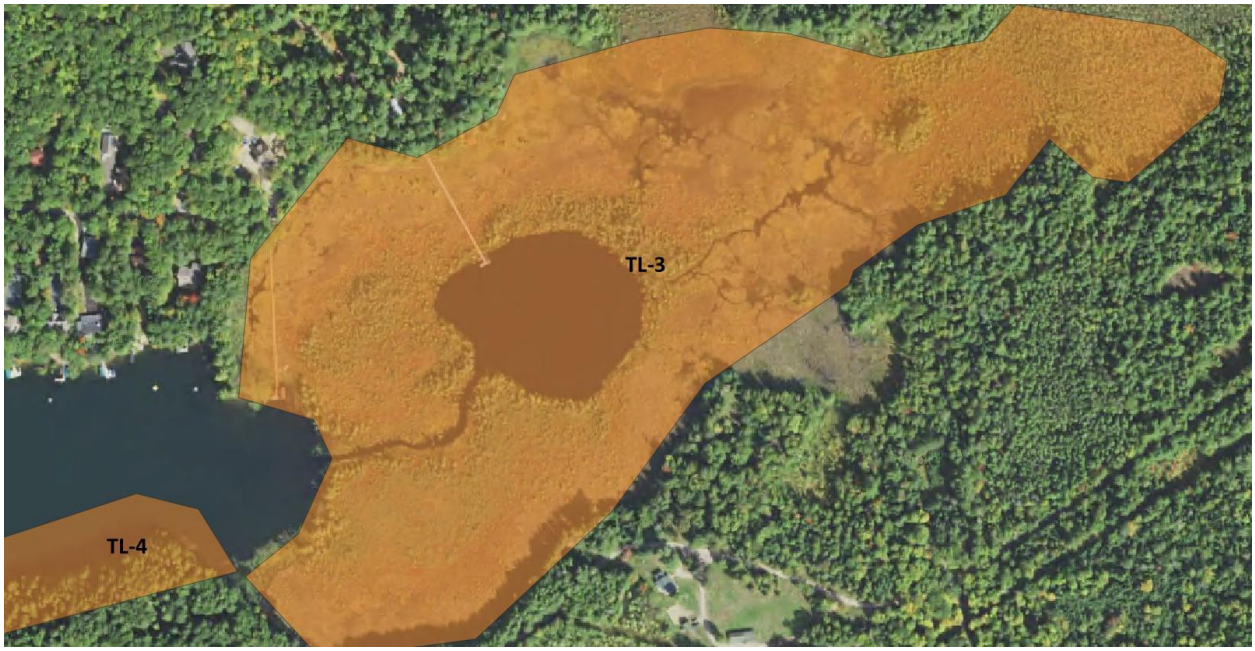


TL-3 Kemp Bay Wetland Complex (east end of bay)

This is a large diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and natural scenic beauty. There is minimal human disturbance (photos). An open water area (e.g. the Paddle Pond) is found in the center of the wetland.

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 80% wetland and 20% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs with trees present.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover is common and diverse emergent, submergent, free floating and overhanging aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site. Merlin's and loons' nest in this bay.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow pond lily) and Bog (sphagnum moss, tamarack, leatherleaf).

Diverse Aquatic Plant Community - Diverse emergent, submergent, free floating and overhanging aquatic vegetation is abundant. Coarse woody cover is common.

Natural Scenic Beauty – There is no human alteration of this habitat community, it is in nearly pristine condition.

Management Recommendations

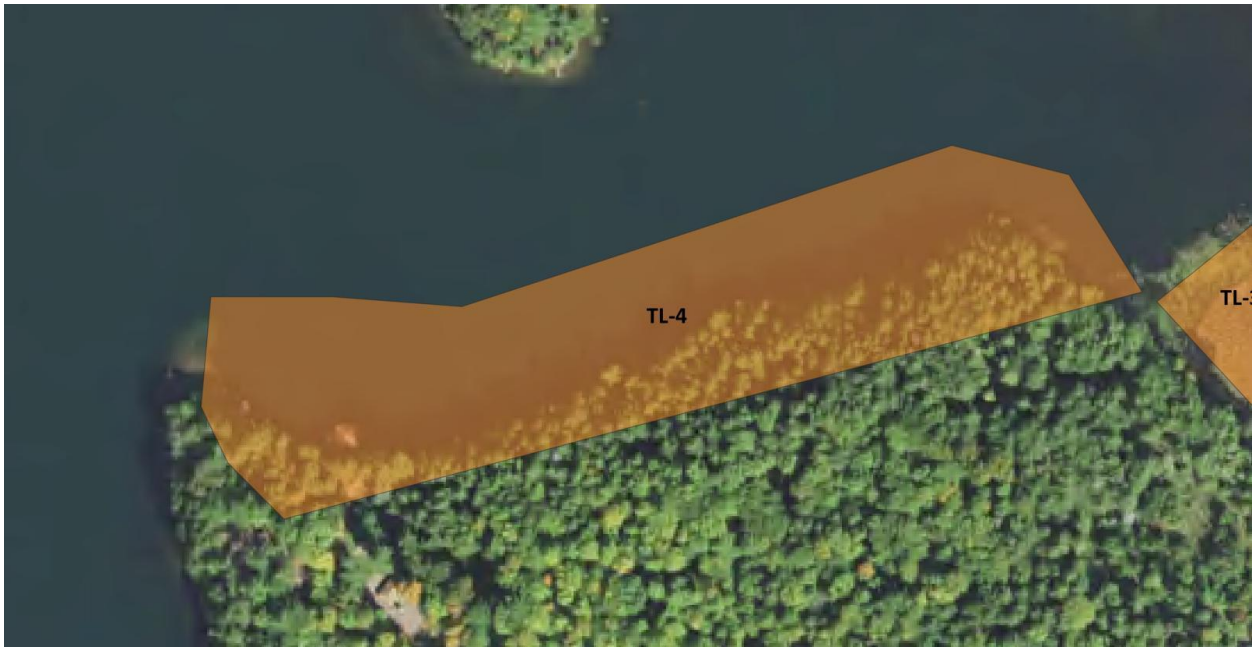
1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.

TL-4 Kemp Bay Coarse Wood (south shoreline)

This site contains abundant coarse woody cover. It was selected for its fish and wildlife values, diverse submerged aquatic vegetation and natural scenic beauty. There is minimal human disturbance. (photos)

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees and abundant herbaceous/scrub cover. Diverse submergent vegetation and overhanging shoreland vegetation is present. Coarse wood is abundant.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Abundant woody cover, diverse submergent and overhanging vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish. Fish species utilizing the site include largemouth bass, black crappie, bluegill and pumpkinseed.

Wildlife Habitat - This site has an undeveloped hemlock shore and upland. Diverse shrubs/brush in riparian zone, fallen logs and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – Though UW Kemp Biological Station is inland from about half this site, it is screened by a thick canopy of mature white pine and hemlock. The only structure present within the shoreland zone is the Kemp Boathouse of historic significance.

Management Recommendations

1. Maintain current protection (slow no wake).
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.
5. Do not remove woody cover.

TL-5 Kemp Point Rock/Gravel Bar (southern point)

This is a rock/gravel bar. It was selected for its fishery value (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Coarse woody cover is present.

Critical Habitat Values (3)

Attributes of Water Quality - This site serves as

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. Diverse shrubs/brush in riparian zone, snag/perch trees and boulders/rocks provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.

TL-6 Rock/Gravel Bar (south of South Cross Cut Trail Road)

This is a rock/gravel bar. It was selected for its fishery value (photos)

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 90% wooded and 10% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer.

Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder, rock and gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has is mostly an undeveloped shoreline and upland. Boulder/rock, diverse shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Management Recommendations

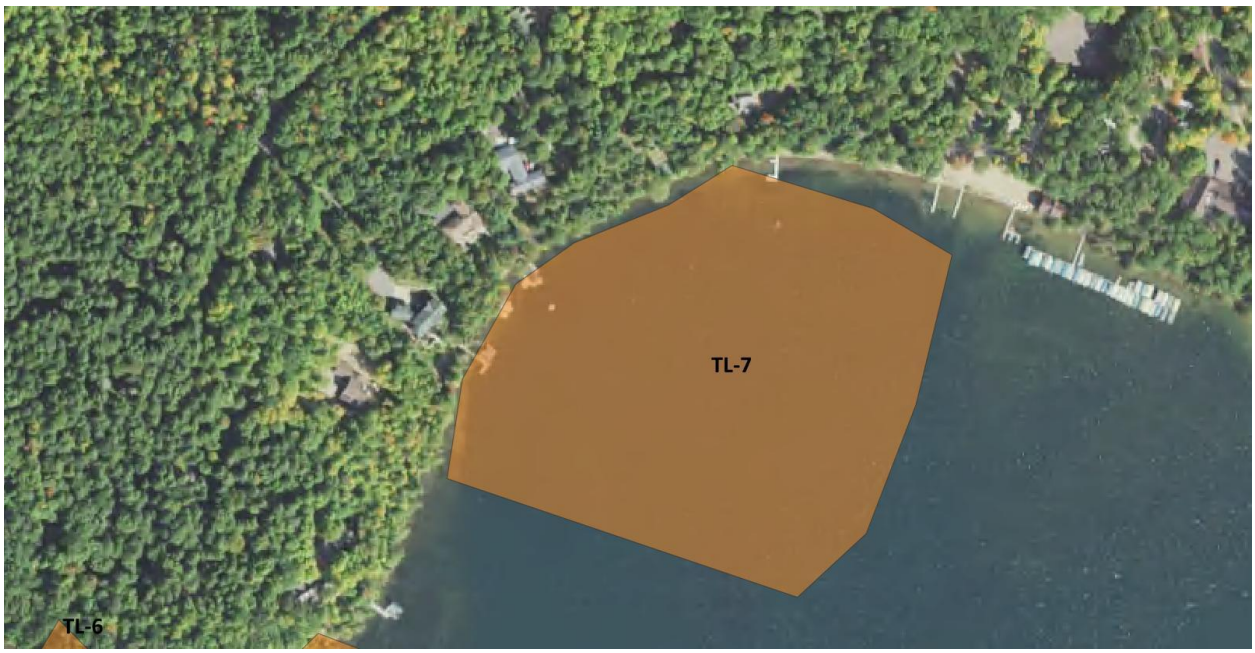
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.

TL-7 Diverse Plant Bed (off Camp Strongheart Road)

This is a diverse aquatic plant bed, rare on this side of the lake. It was selected primarily for its fishery value (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 60% wooded and 40% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs with lawn present. Diverse submergent aquatic vegetation is abundant.



Critical Habitat Values (3)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Diverse submergent aquatic vegetation provides the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Shrubs/brush in riparian zone provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds and amphibians utilize this site.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.

TL-8 Rock/Gravel Bar (off Pine Aire Lane)

This is a rock/gravel bar along an undeveloped shoreline. It was selected for its fish and wildlife value (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer.

Critical Habitat Values (4)

Attributes of Water Quality - This site serves as

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder, rock and gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. Boulder/rock, diverse shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – The shoreland area is undeveloped.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.

TL-9 Owl Road Wetland Complex (far eastern end of lake)

This is a diverse wetland. It was selected for its fish and wildlife values and diverse aquatic vegetation (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 50% wetland, 40% wooded and 10% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs with trees common and a small amount of lawn present. Coarse woody cover is abundant.

Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Diverse emergent, submergent, free floating and overhanging aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish. Fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and fallen logs provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Wetland - Wetland types found include Deep Marsh (cattails, pickerel weed) and Shrub Carr (shrubs, woody plants, alders).

Diverse Aquatic Plant Community - Diverse emergent, submergent, free floating aquatic plants and overhanging shoreland vegetation is abundant.

Natural Scenic Beauty – The mix of wetland/upland/and backwaters gives this area of the lake a unique wilderness appearance despite some development.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.

TL-10 Rock/Gravel Bar (north of Blue Jay Road)

This is a rock/gravel bar along an undeveloped shoreline. It was selected for its fish, wildlife value and scenic beauty (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Coarse wood is present.

Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing shoreline vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock and gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. Diverse shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland mammals, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty - The shoreland area is undeveloped.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.

TL-11 Rock/Gravel Point (west of Blue Jay Road)

This is a rock/gravel bar along an undeveloped point. It was selected for its fish, wildlife value and natural scenic beauty (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Floating, emergent aquatic plants and coarse woody habitat is present.

Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder, rock, gravel and coarse wood provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat -This site has an undeveloped shoreline and upland. Boulder/rock, diverse shrubs/brush in riparian zone, snag/perch trees and fallen logs provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – The shoreland area is undeveloped.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Maintain fallen trees or coarse wood along the shoreline.
4. Maintain snag/perch trees.

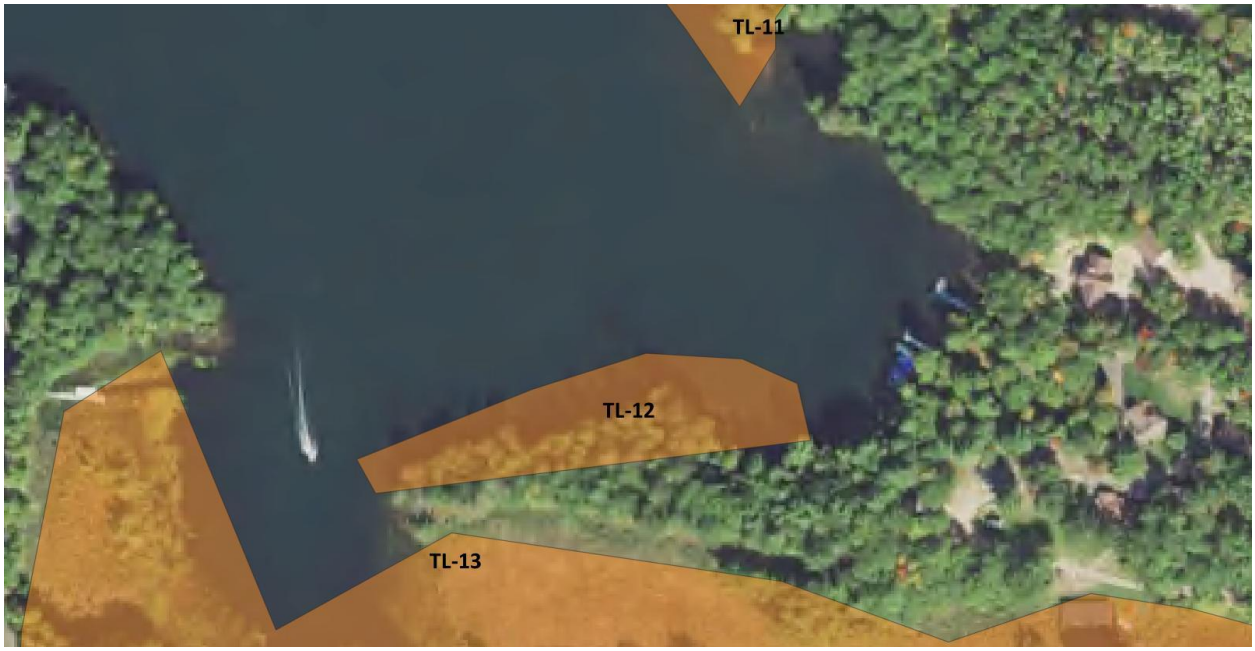



TL-12 Rock/Gravel Bar (west of Lark Road)

This is a rock/gravel bar with abundant coarse wood along an undeveloped shoreline. It was selected for its fish, wildlife value and natural scenic beauty (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Floating and emergent aquatic plants are present. Coarse woody habitat is common.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder, rock, gravel and coarse wood provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. Boulder/rock, diverse shrubs/brush in riparian zone, snag/perch trees and fallen logs provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers and birds utilize this site.

Natural Scenic Beauty – The shoreland area is undeveloped.

Management Recommendations

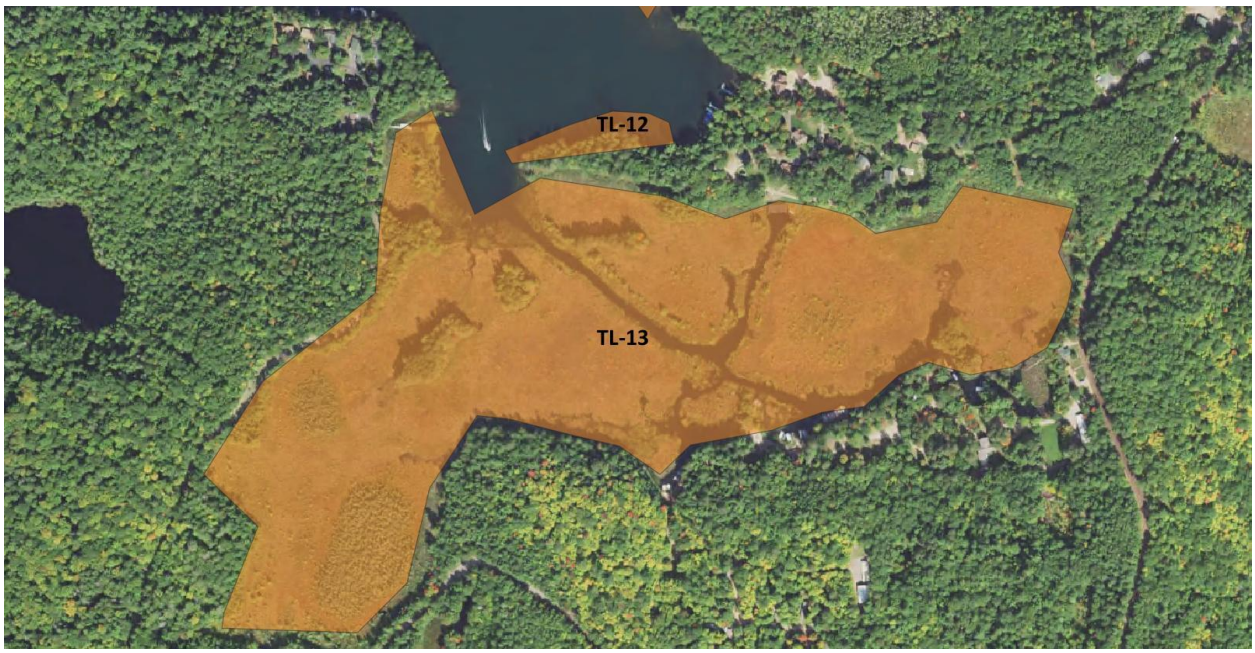
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Maintain fallen trees or coarse wood along the shoreline.
4. Maintain snag/perch trees.

TL-13 Wetland Complex (north of Robin/Rainbow Road)

This is a large diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 90% wetland and 10% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs with trees present. Coarse woody cover is common.



Critical Habitat Values (6)

Attributes of Water Quality

This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent and free-floating aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation and shrubs/brush in riparian zone provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site. Common loons nest here.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily) and Sedge Meadow.

Diverse Aquatic Plant Community - Diverse emergent, submergent and, free floating aquatic vegetation is abundant.

Natural Scenic Beauty – This backwater/wetland area is lightly developed and has a true Northwoods character.

Management Recommendations

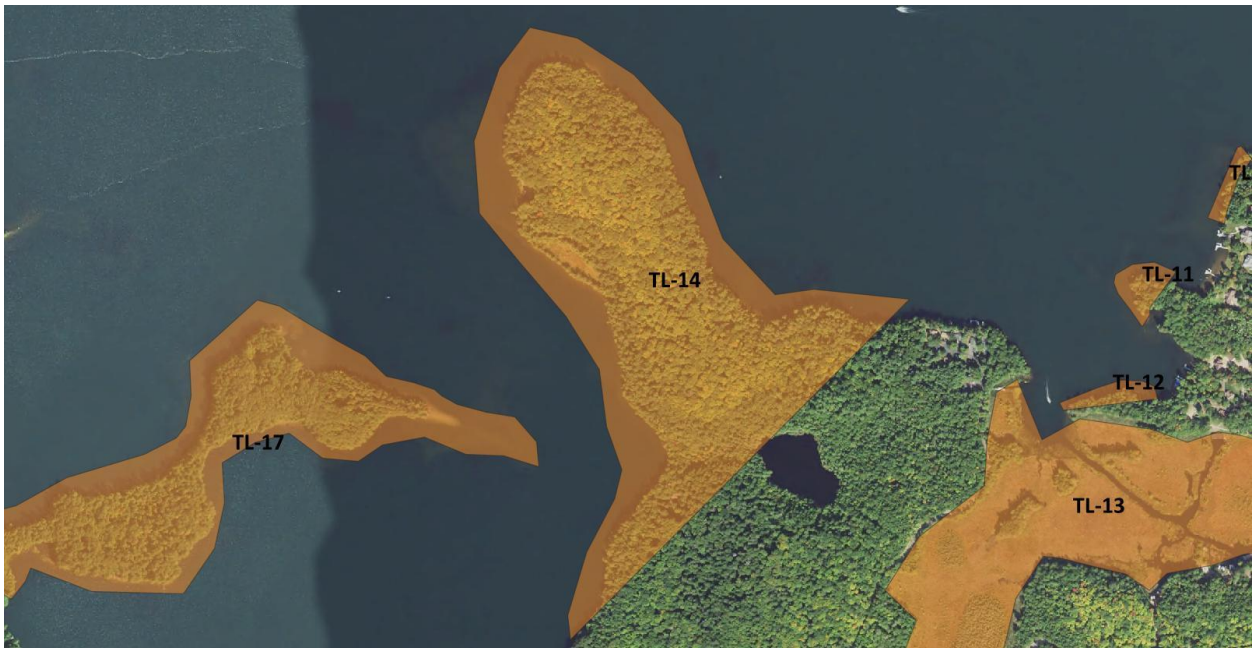
1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain fallen trees along the shoreline.

TL-14 Daniels Point

This is an extensive (> 2 miles) undeveloped shoreline in private ownership. It was selected for its fish and wildlife values, diverse aquatic vegetation, coarse wood, rock rubble substrate and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 95% wooded and 5% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with herbaceous/scrubs abundant. Coarse woody cover is common. There is also extensive rock rubble fish habitat.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Rock/Rubble substrate, coarse woody cover, diverse submergent and overhanging vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, smallmouth bass, northern pike, largemouth bass, and panfish.

Wildlife Habitat - Fallen logs, shrubs/brush in riparian zone, snag/perch trees and boulders/rocks provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Wetlands – Wetland types found include a Sedge Meadow.

Diverse Aquatic Plant Community - Diverse submergent aquatic vegetation is abundant in a few locations.

Natural Scenic Beauty – Despite private ownership, Daniel's Point remains minimally developed and the 2+ miles of shoreline retain a natural wild character of mature northern forest species.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain fallen trees along the shoreline.
4. Maintain snag/perch trees.
5. **At the present time large portions of land on Daniels Point are for sale. If it is developed it should be done in a way to protect the natural features present.**



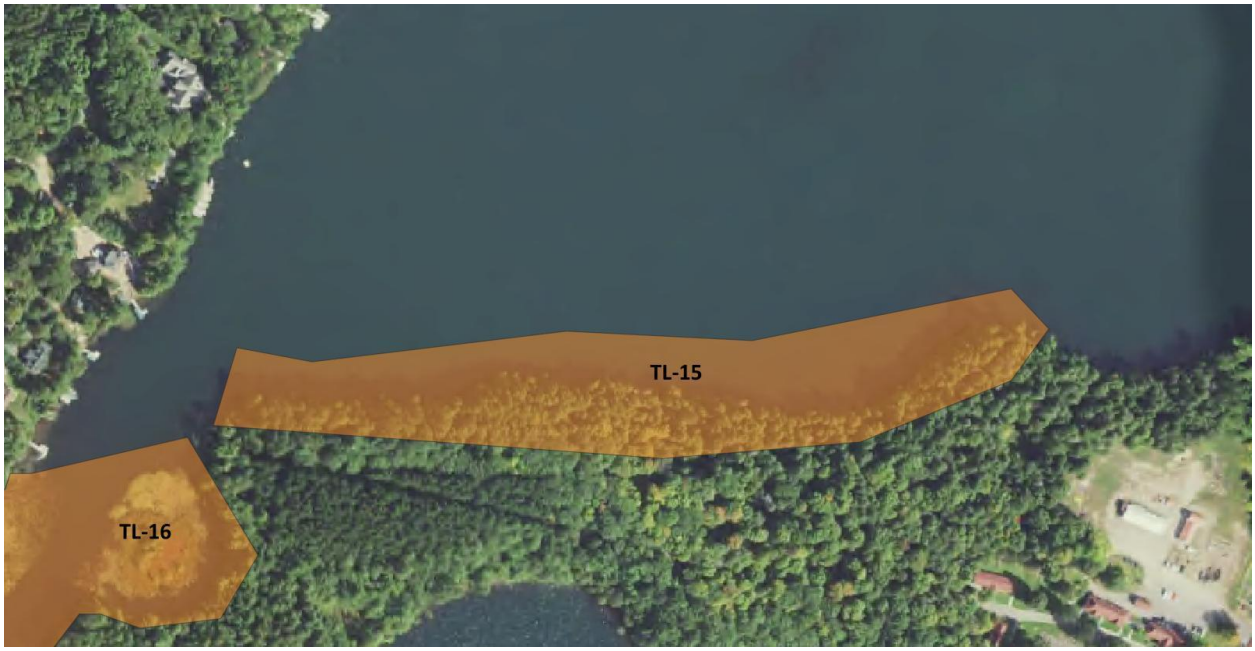



TL-15 Coarse Wood Shoreline (north of Rainbow Road)

This site contains abundant coarse woody cover. It was selected for its fish and wildlife values and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees and abundant herbaceous/scrub cover. Diverse submergent and overhanging aquatic vegetation is present. Coarse wood is abundant.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat

Abundant woody cover, diverse submergent and overhanging vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for all species of game fish. Fish species utilizing the site include northern pike, musky largemouth bass, black crappie, bluegill and pumpkinseed.

Wildlife Habitat

This site has an undeveloped pine hemlock shore and upland. Diverse shrubs/brush in riparian zone, fallen logs and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – The shoreland area is undeveloped and heavily forested with mature conifers.

Management Recommendations

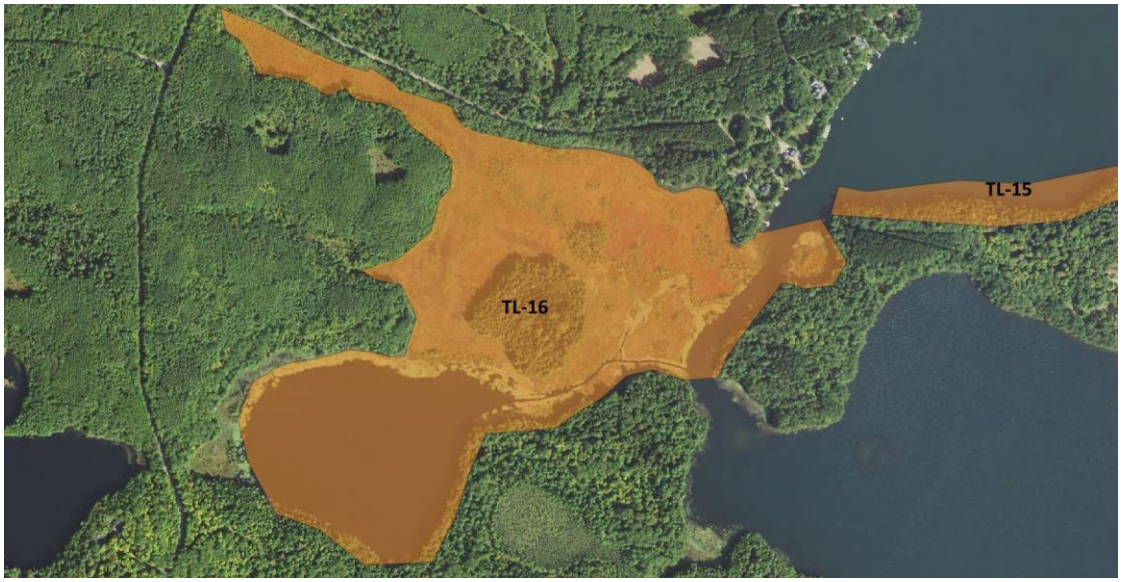
1. Maintain current protection (slow no wake).
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.
5. Do not remove woody cover.

TL-16 Mud Lake Wetland Complex

This is a large diverse wetland which includes Mud Lake. It was selected for its fish and wildlife values, coarse wood, diverse aquatic vegetation and natural scenic beauty. There is no human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 40% wetland and 60% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs and trees. Coarse woody cover is abundant.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent, free floating and overhanging aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety

of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site. Loons nest in this bay. Eagles and Osprey also utilize this site.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily) and Bog (sphagnum moss, tamarack, leatherleaf).

Diverse Aquatic Plant Community - Diverse emergent, submergent, free floating and overhanging aquatic vegetation is abundant.

Natural Scenic Beauty – Nowhere else on the Tomahawk Lake system can you find yourself in a more remote, wild, and quiet place. The natural beauty here is extraordinary.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.

TL-17 Romans Point

This is an extensive (2 miles) undeveloped shoreline which provides a variety of habitat types. It was selected for its fish and wildlife values, diverse aquatic vegetation, coarse wood, rock& rubble substrate and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with herbaceous/scrubs abundant. Coarse woody cover is common. There is also extensive rock rubble fish habitat.

Critical Habitat Values (5)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Rock/Rubble/Gravel substrate, coarse woody cover and diverse emergent, free floating, submergent and overhanging vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, smallmouth bass, northern pike, largemouth bass, and panfish.

Wildlife Habitat - Fallen logs, shrubs/brush in riparian zone, snag/perch trees and boulders/rocks provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Diverse Aquatic Plant Community - Diverse emergent, free floating, submergent and overhanging vegetation is abundant in a few locations.

Natural Scenic Beauty – This site has >2 miles of forested, undeveloped shoreland.

Management Recommendations

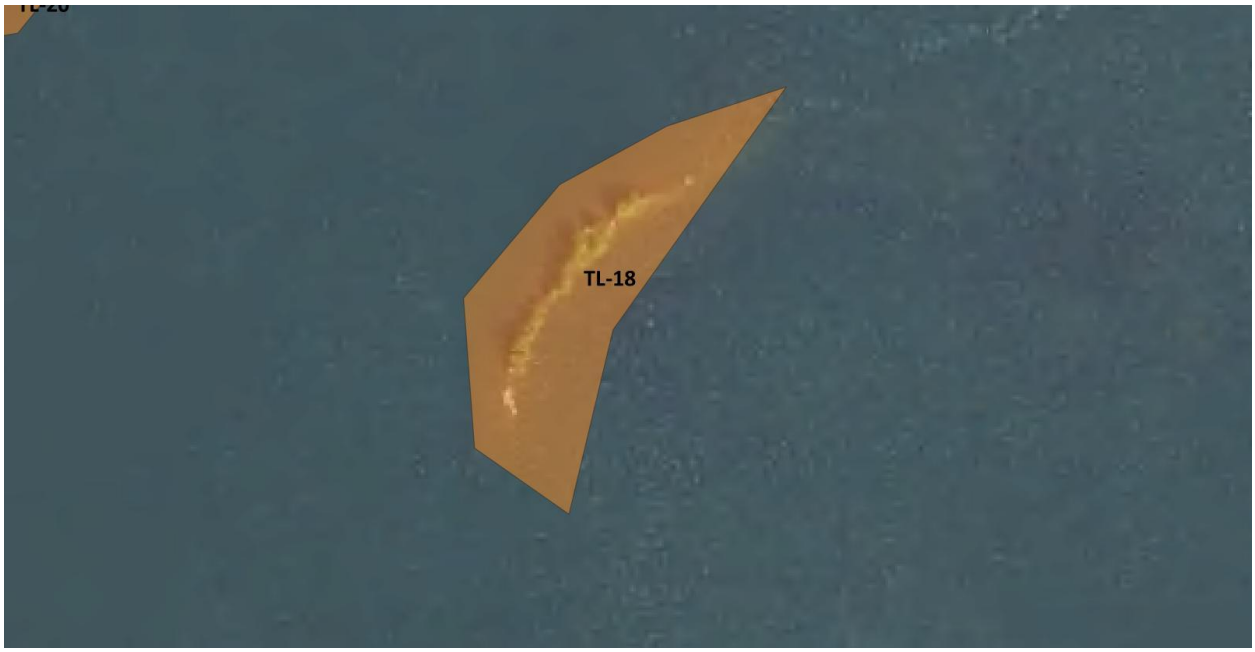
1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain fallen trees along the shoreline.
4. Maintain snag/perch trees.

TL-18 Rock/Gravel Bar Seagull/Dead Island

This is a rock/gravel bar that surrounds the small islands. It was selected primarily for its fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The littoral zone is the sensitive habitat. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with some herbaceous/shrub layer present.



Critical Habitat Values (3)

Fish Habitat - Rock/gravel and diverse submergent vegetation provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - The shoreline habitat is white cedar. The island provides habitat for upland wildlife birds (songbirds, loons have nested on these islands). Common loons have nested on the island in recent years.

Natural Scenic Beauty – Rocky and undeveloped, these islands are "Northwoods Picturesque"

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.

TL-19 Rock/Gravel Bar Pine Island

This is a rock/gravel bar that surrounds most of the Island. It was selected primarily for its fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is mostly trees with a common herbaceous/shrub layer.

Critical Habitat Values (3)

Fish Habitat - Rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - Shrub/Brush in riparian zone and snag/perch trees on the island provides habitat for upland wildlife and songbirds.

Natural Scenic Beauty – The island is a popular boating and picnicking destination, it is undeveloped.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Do not remove fallen trees from shoreline.

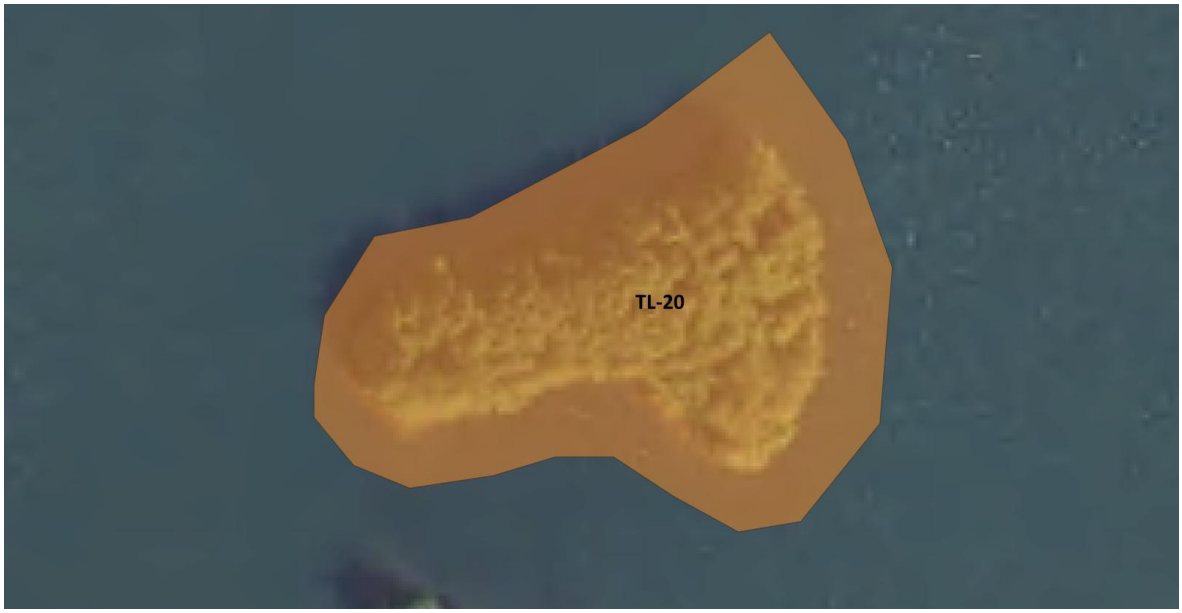
4. Maintain snag/cavity trees.
5. Lots of human use of island. One third of island is de-vegetated. These areas use should be replanted and recreational use of the site better managed – perhaps through fencing.

TL-20 Picnic Island

A rock/gravel bar surrounds two thirds of the island. It was selected primarily for its fishery and wildlife value.

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Coarse woody cover is present around half of the island.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock/gravel/boulders and coarse wood provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - Shrub/brush on shoreline, snag/perch trees, fallen logs and boulders and rocks provide wildlife habitat. Upland wildlife, furbearers and birds utilize this island for their functional needs (shelter, cover nesting feeding).

Natural Scenic Beauty – The island is undeveloped and has minimal impact from boaters/picnickers

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Do not remove fallen trees from shoreline.
4. Maintain snag/cavity trees.
5. Some de-vegetated areas on the north and south tip of island from human use should be replanted and recreational use of the site better managed.

TL-21 Eagle Bay Rock Bar (west of Picnic Island)

This is a rock/gravel bar. It was selected primarily for its fishery value (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer.

Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. Diverse shrubs/brush in riparian zone, snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – The shoreland is forested and undeveloped.

Management Recommendations

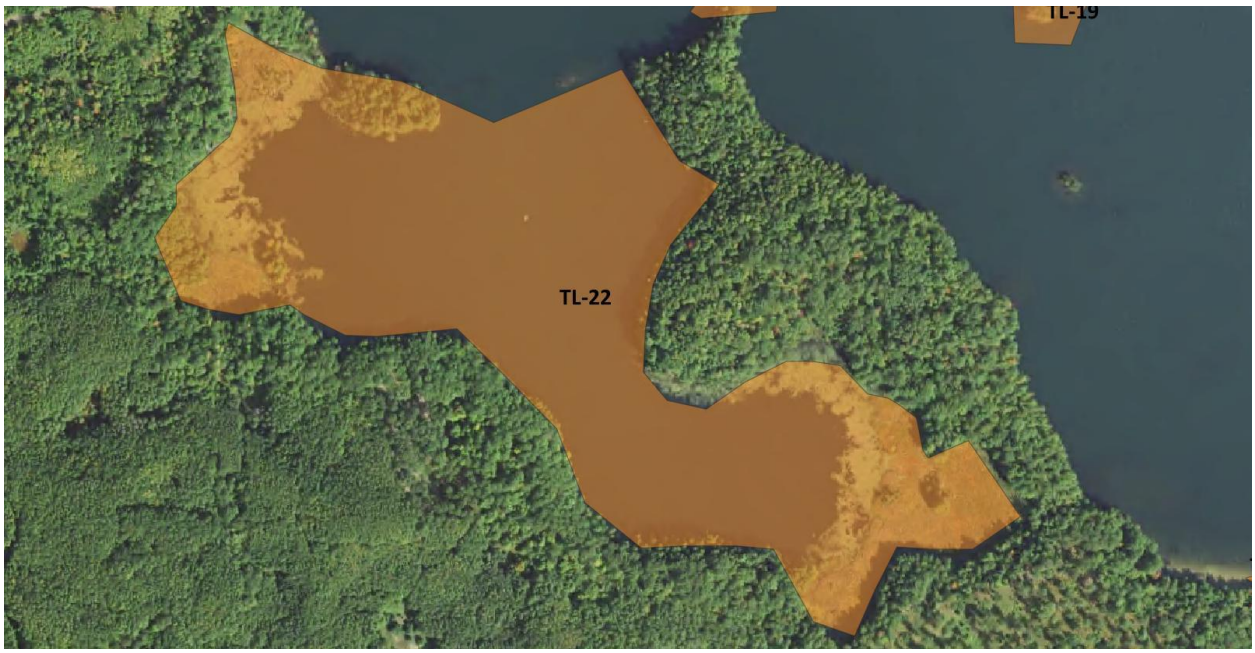
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.

TL-22 Eagle Bay

This is a large undeveloped bay. It was selected for its fish and wildlife values, diverse aquatic vegetation, large wetlands and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 20% wetland, 80% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees and abundant herbaceous/scrubs. Coarse woody cover is abundant.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent and free-floating aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety

of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site. Eagles and common loons nest in this bay.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily) and Shrub Carr (willow, shrubs and woody plants).

Diverse Aquatic Plant Community - Diverse emergent, submergent and free-floating aquatic vegetation is abundant.

Natural Scenic Beauty – Eagle Bay has all the natural characteristics of a Northwoods wild lake.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.

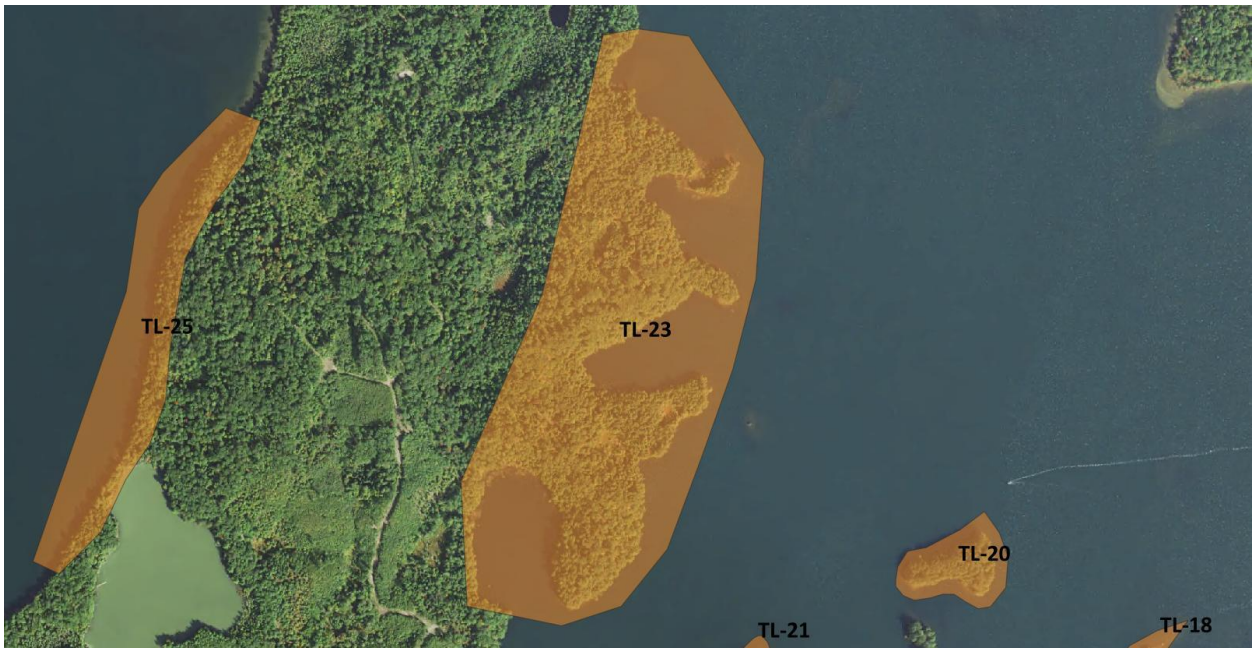



TL-23 Shoreline from Eagle Bay north to Windy Point

This is an extensive (> 2 miles) undeveloped shoreline in public ownership. It was selected for its fish and wildlife values, diverse aquatic vegetation, coarse wood, rock rubble substrate and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with herbaceous/scrubs abundant. Overhanging vegetation is common. Coarse woody cover is abundant. There is also extensive rock rubble fish habitat.



Critical Habitat Values (5)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Rock/Rubble substrate, coarse woody cover, diverse emergent, submergent, free-floating, overhanging vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, smallmouth bass, northern pike, largemouth bass, and panfish.

Wildlife Habitat - Emergent and floating leaf vegetation, fallen logs, shrubs/brush in riparian zone, snag/perch trees and boulders/rocks provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Diverse Aquatic Plant Community - Diverse emergent, submergent and free-floating aquatic vegetation is abundant.

Natural Scenic Beauty – Tomahawk Lake is blessed by miles of undeveloped shoreland in public ownership. This >2 mile stretch of shoreland is naturally diverse and important fish and wildlife habitat.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain fallen trees along the shoreline.
4. Maintain snag/perch trees.

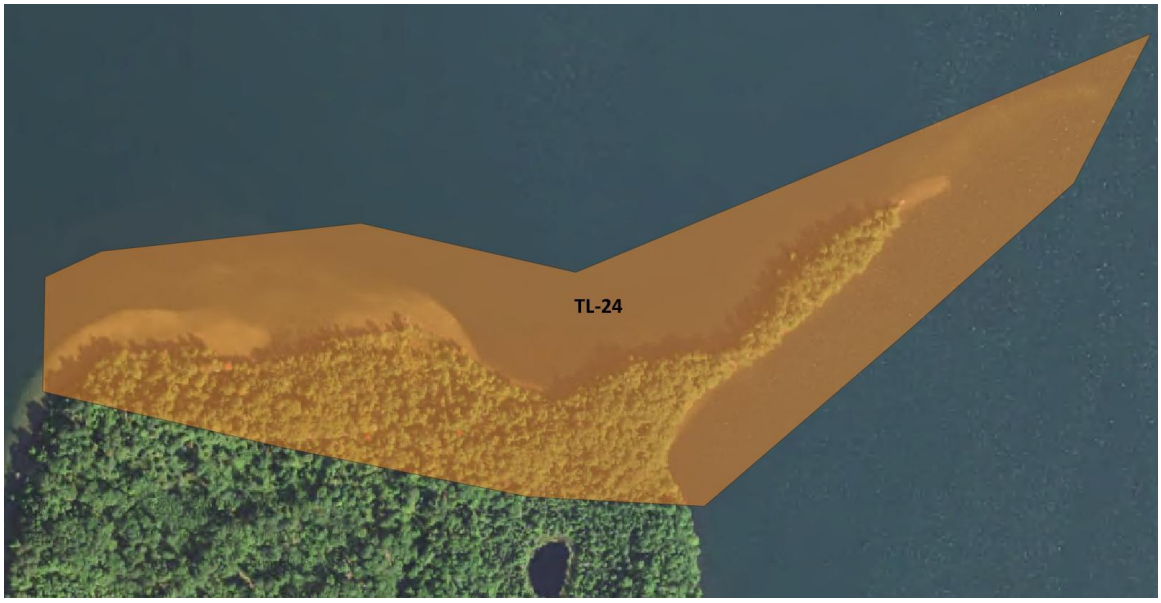



TL-24 Windy Point

This point has an extensive offshore rock bar. It was selected primarily for its scenic beauty, fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Coarse woody cover is present.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder/rock/gravel and coarse wood provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker. The adjacent deep water provides year-round cover for walleye and smallmouth bass.

Wildlife Habitat - The shoreline habitat is pine and oak forest. Snag /perch trees are common. The island provides habitat for upland wildlife and birds (songbirds, eagle, osprey and loons.)

Natural Scenic Beauty – The shoreland is undeveloped and a dramatic interface between the shorelands and the lake habitat.

Management Recommendations

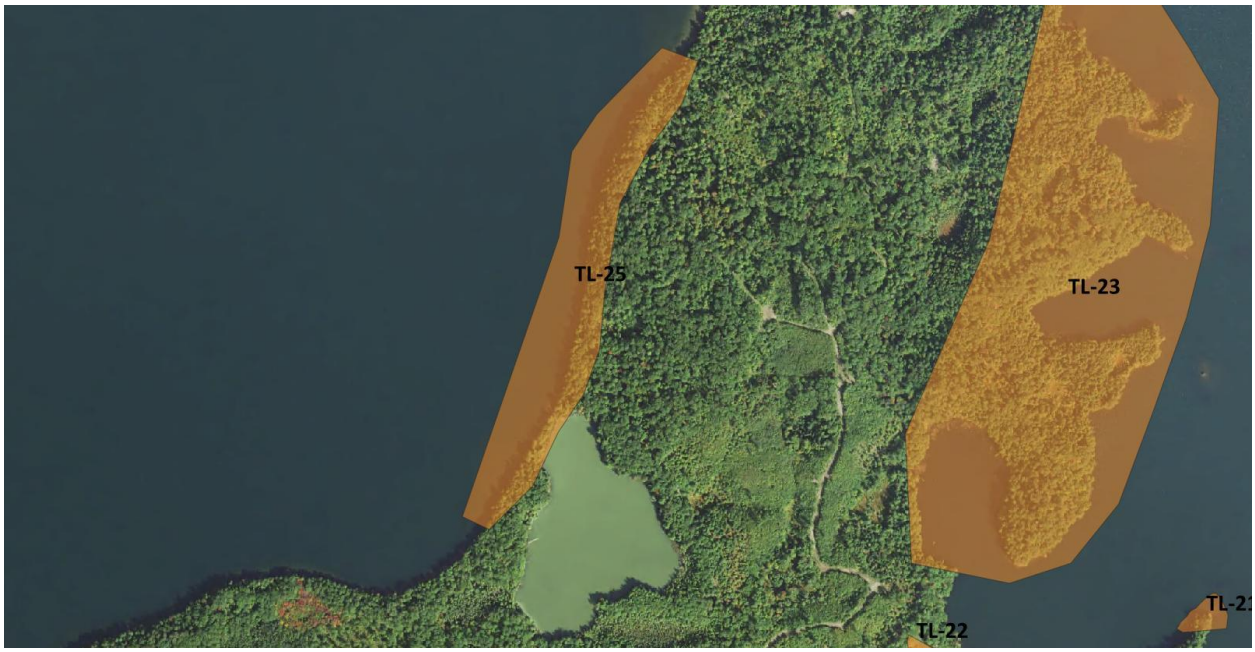
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Maintain snag/cavity trees.
4. Do not remove coarse woody cover along shoreline.

TL-25 Rock/Gravel Bar (near Inkwell Lake)

This is an extensive rock/gravel bar. It was selected for its fishery value and natural scenic beauty (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer.



Critical Habitat Values (4)

Attributes of Water Quality -This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder, rock and gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. The upland is a pine, oak, aspen forest. Boulder/rock, diverse shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – This is another extensive stretch of wild, undeveloped shoreland. Inkwell Lake is a hidden wilderness lake a short hike inland.

Management Recommendations

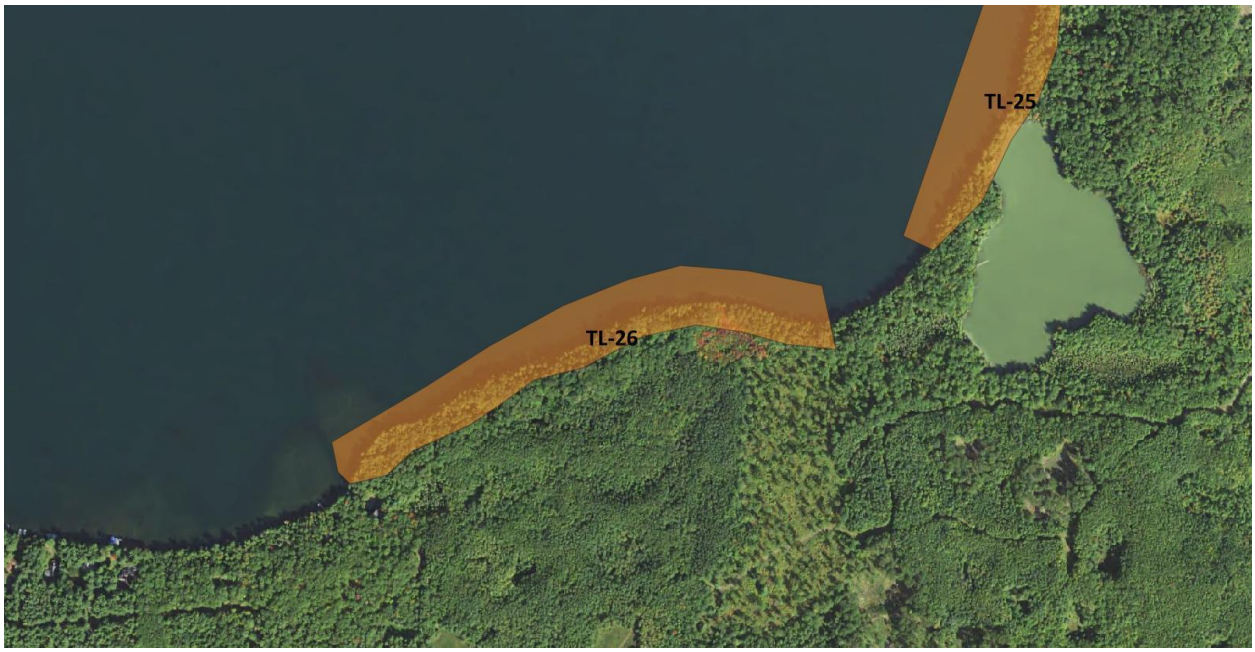
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Maintain snag/cavity trees.
4. Maintain fallen trees on shoreline.

TL-26 Rock/Gravel Bar (west of Inkwell Lake)

This is an extensive rock/gravel bar. It was selected for its fishery value and natural scenic beauty (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder, rock and gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - This site has an undeveloped shoreline and upland. The upland is a pine, oak, aspen forest. Boulder/rock, diverse shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, birds, amphibians and reptiles utilize this site.

Natural Scenic Beauty – This undeveloped shoreland is part of an extensive stretch of undeveloped state-owned shoreland dominated by mature hardwood and conifer forests.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Maintain snag/cavity trees.
4. Maintain fallen trees on shoreline.

TL-27 Wetland and Gravel Bar (north of Katherine Lake Canal)

This is a small shrub swamp wetland and a rock/gravel bar. It was selected primarily for its fishery value, but the small wetland also provides wildlife habitat (photos).

Physical Description of the Site

The site includes shoreline and littoral zone habitats. The riparian type (%) is 50% wooded, 30% developed and 20% wetland. The buffer zone (from water's edge to 35 feet back) is dominated by trees with herbaceous/shrubs abundant. Coarse woody cover is present.

Critical Habitat Values (5)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation at or within the lake provides a sink for nutrients).

Fish Habitat - Rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - Fallen logs, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Wetlands - Wetland types include Shrub Carr (willow, shrubs and woody plants) and Hardwood Swamp (silver maple).

Natural Scenic Beauty – This is an undeveloped extent of forested shoreland.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain fallen trees or coarse wood along the shoreline.
4. Maintain snag/cavity trees.

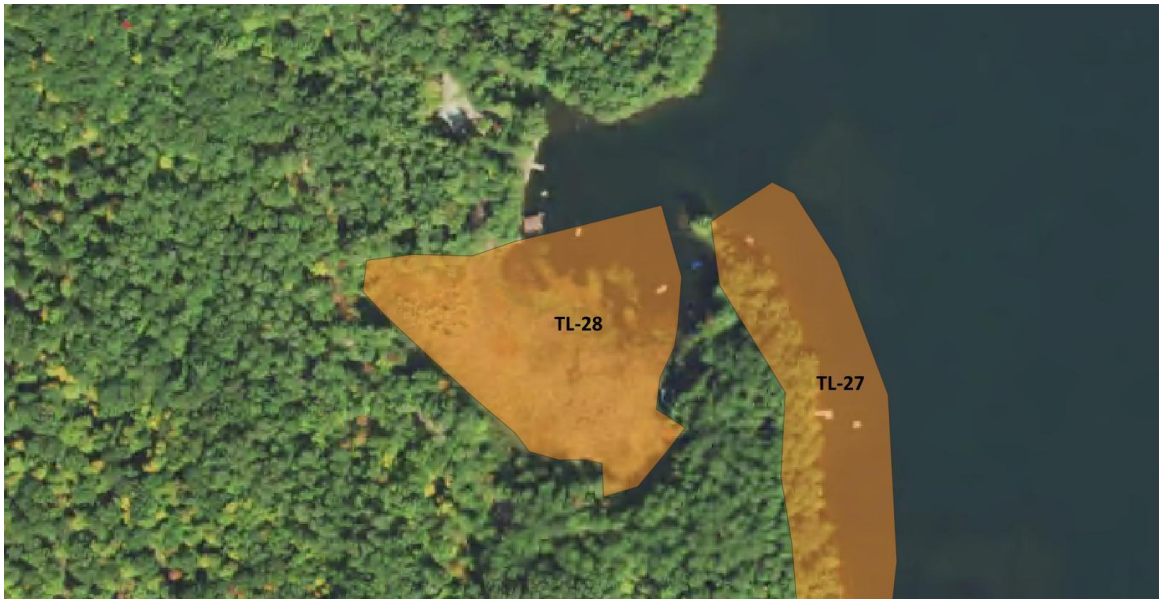



TL-28 Echo Bay Wetland Complex (near McCoy Road)

This is a small diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and coarse woody habitat. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 80% wetland, 15% wooded and 5% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/shrubs with trees abundant. Coarse woody cover is common.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent and free-floating aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety

of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site. Common loons nest on the wetland fringe in Echo Bay and use the bay as a nursery after chicks hatch.

Wetlands – Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily), Shrub Carr (willow, shrubs and woody plants) and Alder Thicket (tag alder).

Diverse Aquatic Plant Community – Diverse emergent, submergent and free-floating aquatic vegetation is abundant.

Natural Scenic Beauty – Though a small wetland with some shoreland development, the site has a remarkable diversity of wild lake habitat.

Management Recommendations

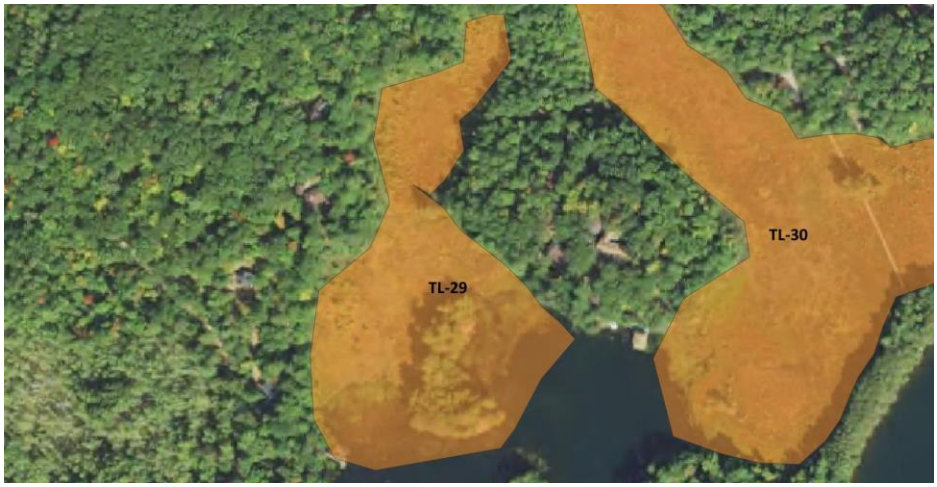
1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.

TL-29 Echo Bay Wetland Complex

This is a small diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and coarse woody habitat. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type is 50% wetland, 40% wooded and 10% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/shrubs with trees abundant. Coarse woody cover is abundant.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent and free-floating aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily), Shrub Carr (willow, shrubs and woody plants), Hardwood Swamp (black ash, silver maple, yellow birch) and Conifer Swamp (black spruce/tamarack).

Diverse Aquatic Plant Community – Diverse emergent, submergent and free-floating aquatic vegetation is abundant.

Natural Scenic Beauty – Despite a small area of shoreland development, this wetland area remains in a natural state.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain and do not remove fallen trees along the shoreline.

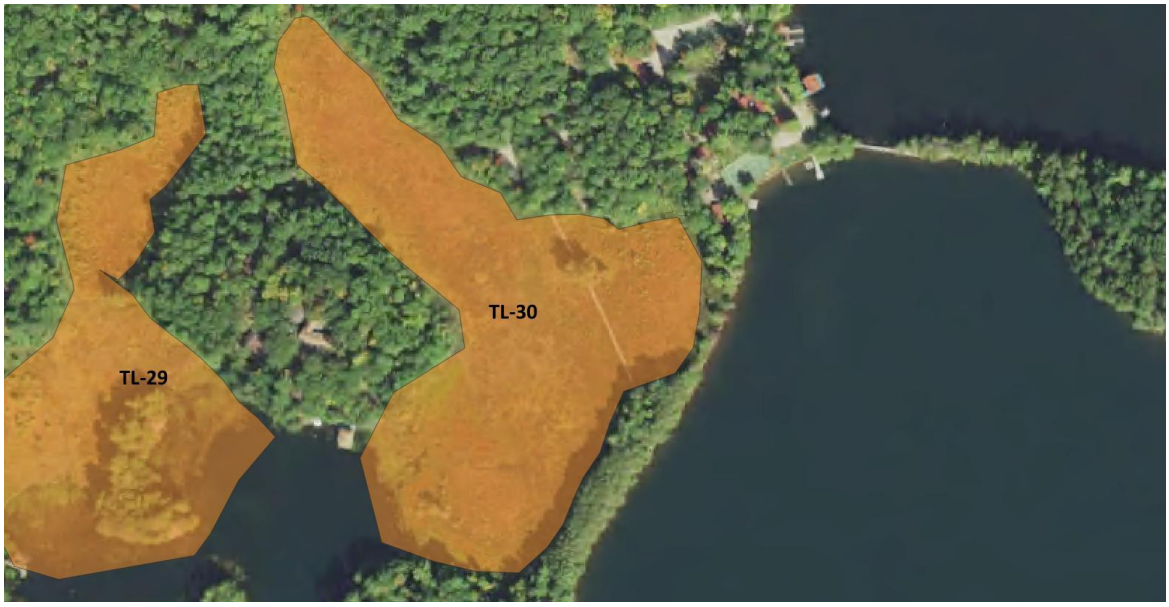



TL-30 Ross Bay Wetland Complex

This is a small diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and coarse woody habitat. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type is 50% wetland, 40% wooded and 10% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/shrubs with trees abundant. Coarse woody cover is abundant.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent and free-floating aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Wetlands – Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily), Shrub Carr (willow, shrubs and woody plants), Hardwood Swamp (black ash, silver maple, yellow birch) and Conifer Swamp (black spruce/tamarack).

Diverse Aquatic Plant Community – Diverse emergent, submergent and free-floating aquatic vegetation is abundant.

Natural Scenic Beauty – The site is primarily undeveloped mature forest and wetlands with very minimal human development.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain and do not remove fallen trees along the shoreline.

TL-31 Rock/Gravel Bar (southwest of Clearwater Camp)

This is a rock/gravel bar. It was selected for its fishery value (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. Coarse woody cover is present.

Critical Habitat Values (2)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder/rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Management Recommendations

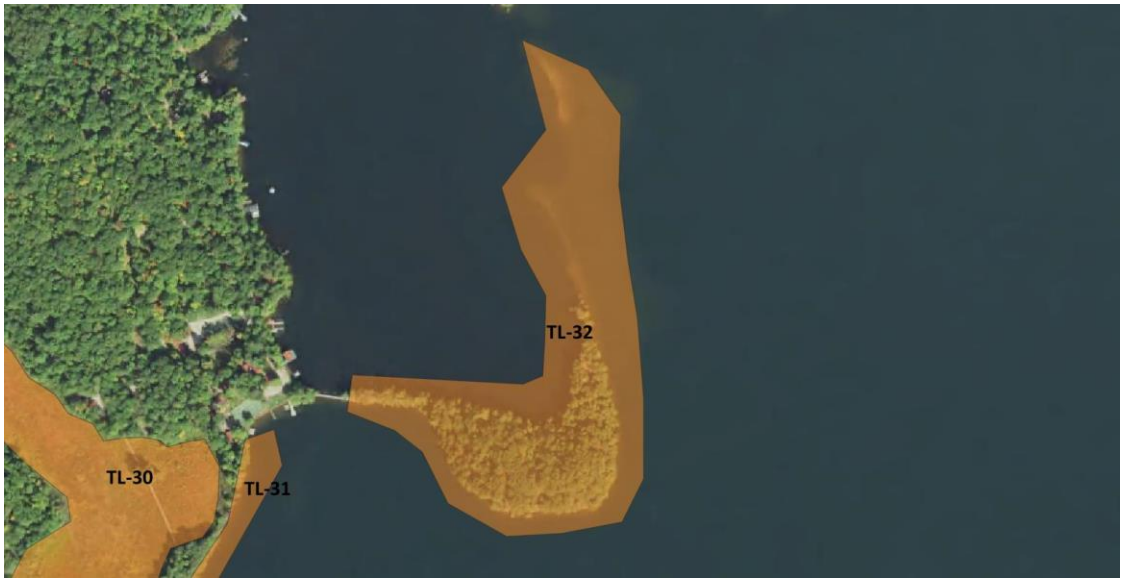
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.

TL-32 Island off Clearwater Camp (southwest of Olmsteads Island)

This island has an extensive offshore rock bar, diverse submergent plant community and abundant coarse woody cover. It was selected primarily for its fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type is 70% wooded and 30% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous and common shrub layers. Coarse woody cover is common.



Critical Habitat Values (4)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Boulder/rock/gravel and coarse wood provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker. The adjacent deep water provides year-round cover for walleye and smallmouth bass.

Wildlife Habitat - The shoreline habitat is oak forest and pine and oak forest. Fallen logs are common. The island provides habitat for upland wildlife.

Diverse Aquatic Plant Community - The north side of the island has a diverse submergent plant community.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Maintain snag/cavity trees.
4. Do not remove coarse woody cover along shoreline.






TL-33 Rock/Gravel Bar Olmsteads Island (southwest side of island)

This is a rock/gravel bar. It was selected primarily for its fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 70% wooded and 30% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer.

Critical Habitat Values (3)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock/gravel provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - The shoreline habitat is pine and oak forest with some white cedar and hemlock. Fallen logs are common. The shoreland provides habitat for upland wildlife.

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Do not remove fallen trees from shoreline.
4. Maintain snag/cavity trees.

TL-34 Rock/Gravel Bar Olmsteads Island (east side of island)

This is a rock/gravel bar with abundant coarse woody cover. It was selected primarily for its fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 70% wooded and 30% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. There is abundant coarse wood and overhanging vegetation.

Critical Habitat Values (3)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock/gravel, coarse wood and overhanging vegetation provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - The shoreline habitat is pine and oak forest with some white cedar and hemlock. Fallen logs are common. The island provides habitat for upland wildlife birds (songbirds, eagle, osprey and loons.)

Management Recommendations

1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Do not remove fallen trees from shoreline.
4. Maintain snag/cavity trees.

TL-35 Rock/Gravel Bar Olmsteads Island (north side of island)

This is a rock/gravel bar with abundant coarse woody cover. It was selected primarily for its fishery value but there are some wildlife benefits as well (photos).

Physical Description of the Site

The site includes near-shore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 70% wooded and 30% developed. The buffer zone (from water's edge to 35 feet back) is dominated by trees with an abundant herbaceous/shrub layer. There is abundant coarse wood and overhanging vegetation.

Critical Habitat Values (3)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).
2. Nutrient buffer zone (existing vegetation on the shoreline provides a sink for nutrients).

Fish Habitat - Rock/gravel, coarse wood and overhanging vegetation provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Wildlife Habitat - The shoreline habitat is pine and oak forest with some white cedar and hemlock. Fallen logs are common. The island provides habitat for upland wildlife birds (songbirds, eagle, osprey and loons.)

Management Recommendations

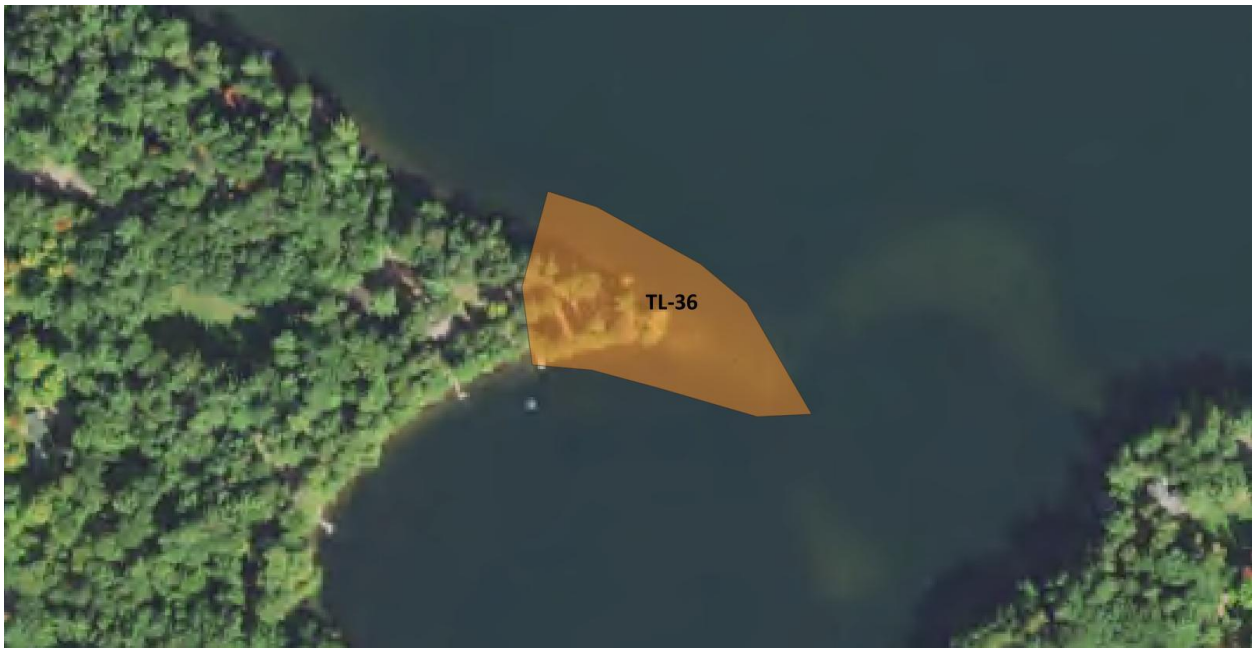
1. Maintain current protection of riparian zone.
2. No alteration of littoral zone.
3. Do not remove fallen trees from shoreline.
4. Maintain snag/cavity trees.

TL-36 Rock Bar west of Ohmsteads Island (tip of Camp Minocqua Road)

This is a rock/gravel bar. It was selected for its fishery value (photos).

Physical Description of the Site

The site includes shoreline and littoral zone habitats. The riparian type (%) is 60% wooded and 40% developed. The buffer zone (from water's edge to 35 feet back) has abundant trees and herbaceous/scrubs. Coarse woody cover is present.



Critical Habitat Values (2)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).

Fish Habitat - Rock/gravel and overhanging vegetation provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Management Recommendations

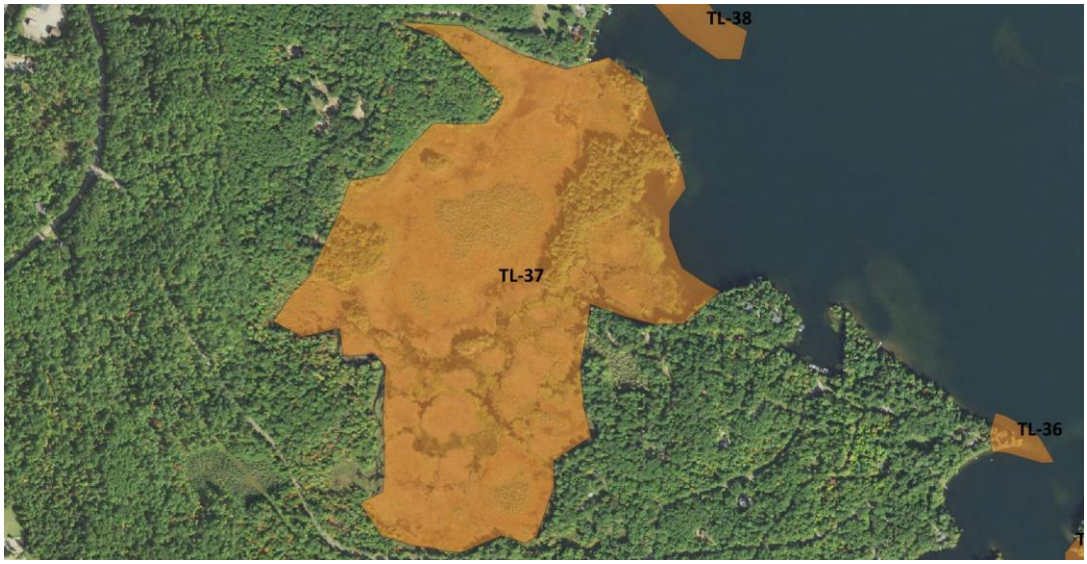
2. Maintain current protection.
3. No alteration of littoral zone.
4. Add fallen trees or coarse wood along the shoreline.

TL-37 Musky Bay Wetland Complex (west end of bay)

This is a large diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 90% wetland, 5% wooded and 5% developed. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs with trees present. Coarse woody cover is common.



Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent, free floating and overhanging aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site. Eagle's nest in this bay.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily), Shrub Carr (willow, shrubs and woody plants), Hardwood Swamp (black ash, silver maple and yellow birch) and Conifer Swamp (black spruce/tamarack).

Diverse Aquatic Plant Community - Diverse emergent, submergent, free floating and overhanging aquatic vegetation is abundant.

Natural Scenic Beauty – This wetland complex is largely undeveloped and provides an extensive natural area within the primarily developed west shoreline of Tomahawk Lake.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.




TL-38 Rock Bar Point north of Musky Bay

This is a rock/gravel bar. It was selected for its fishery value (photos).

Physical Description of the Site

The site includes shoreline and littoral zone habitats. The riparian type (%) is 100% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by trees and abundant herbaceous/shrubs.

Critical Habitat Values (2)

Attributes of Water Quality - This site serves as:

1. Physical buffer zone (existing vegetation provides protection against shoreline erosion and plant fragmentation).

Fish Habitat - Rock/gravel and overhanging vegetation provide the functional needs (spawning, nursery area, feeding) for walleye, smallmouth bass and white sucker.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Add fallen trees or coarse wood along the shoreline.

TL-39 Thoroughfare Wetland Complex (east of Schlecht Lake)

This is a large diverse wetland. It was selected for its fish and wildlife values, diverse aquatic vegetation and natural scenic beauty. There is minimal human disturbance (photos).

Physical Description of the Site

The site includes nearshore terrestrial, shoreline and littoral zone habitats. The riparian type (%) is 70% wetland and 30% wooded. The buffer zone (from water's edge to 35 feet back) is dominated by herbaceous/scrubs and trees. Coarse woody cover is present.

Critical Habitat Values (6)

Attributes of Water Quality - This site serves as a:

1. Nutrient buffer zone (provides a sink for nutrients).
2. Physical buffer zone (provides protection against shoreline erosion and plant fragmentation).
3. Sediment stabilization zone.

Fish Habitat - Coarse woody cover, diverse emergent, submergent, free floating and overhanging aquatic vegetation provide the functional needs (spawning, nursery area, feeding and protective cover) for a variety of game fish and forage fish. Game fish species utilizing the site include walleye, northern pike, musky, largemouth bass, bullhead and panfish.

Wildlife Habitat - Fallen logs, diverse emergent, free floating aquatic vegetation, shrubs/brush in riparian zone and snag/perch trees provide the functional needs (shelter/cover, nesting area, feeding) for a variety of wildlife. Upland wildlife, furbearers, birds, amphibians and reptiles utilize this site.

Wetlands - Wetland types found include Deep Marsh (cattails, pickerel weed, yellow water lily), Shrub Carr (willow, shrubs and woody plants) and Bog (sphagnum moss, black spruce/tamarack, leatherleaf).

Diverse Aquatic Plant Community – Diverse emergent, submergent, free floating and overhanging aquatic vegetation is abundant.

Natural Scenic Beauty – The undeveloped shoreland is contiguous with the state-owned land surrounding nearby Schlect Lake providing a unique wild lake parcel.

Management Recommendations

1. Maintain current protection.
2. No alteration of littoral zone.
3. Maintain snag and cavity trees for cavity nesting species.
4. Maintain fallen trees along the shoreline.




. Recommendations for Tomahawk Lake Property Owners

- Get to know the important fish and wildlife habitat areas on Tomahawk Lake by reading the report "Getting to Know Tomahawk Lake's Special Places". Familiarize yourself with areas that are in close proximity to your property. Spend some time in these areas to learn more about the natural communities on Tomahawk Lake.

- Take the Tomahawk Lake Association Rate Your Shoreland Self-Assessment Survey to evaluate how your property is doing as related to Shoreland Best Management Practices (https://www.tomahawklake.org/rate-your-shoreline).

- Contact the Tomahawk Lake Association for a free on-site visit to further evaluate your property's condition and receive an individual property report and recommendations for shoreland best management improvements.

- Become familiar with the Tomahawk Lake Association's Shoreland Best Management Practices to best manage your property to safeguard fish and wildlife habitat, water quality, and natural scenic beauty of the lake we all love (https://www.tomahawklake.org/more-shore).