SCORE YOUR SHORE

CITIZEN SHORELINE DESCRIPTION SURVEY

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State of Minnesota
Department of Natural Resources
Division of Ecological and Water Resources

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A note to readers:

Text that appears in blue underlined font indicates a word or phrase that is defined in the glossary on page 30. Double-click on the phrase to move to the glossary.

CONTENTS

OVERVIEW

MANUAL

This Manual is divided into the following Chapters.

Ch. 1: Introduction - provides background information about the functions and values of natural shorelines. This section explains why it can be useful to identify natural shoreline habitat and provides some common language for describing these sites. The reader is introduced to the concept of lakeshore zones (upland, shoreline and aquatic) and is provided with examples of undisturbed habitat in each zone.

Ch. 2: Survey Overview - prepares the reader to conduct an actual survey. It describes how to prepare for and to conduct an on-the-water assessment of developed lots.

Ch. 3: How to Survey - outlines the stepwise process used during each lot assessment. Scorecards are provided for each lakeshore zone.

The last two chapters are specifically for groups interested in assessing multiple lots.

Ch. 4: Reference Sites and Quality Control – provides some ideas for how groups can customize the scoring system for their particular lake by viewing undeveloped reference sites. Ideas are also provided to help ensure that different surveyors assess sites in a similar manner.

Ch. 5: Data Management – discusses the importance of organizing and summarizing the information collected.

QUICK GUIDE

A quick 4 page reference guide is provided for field use and is available on the MnDNR website. Figures from this Quick Guide are provided in Chapter 3 of this Manual.

SLIDE PRESENTATION

An 18 slide presentation is available for groups interested in training volunteers to assess shorelines. A downloadable version is available on the MnDNR website.

CHAPTER 1. INTRODUCTION

This manual outlines a standardized protocol to assess habitat conditions of developed lake lots. The protocol is designed for use by lakeshore property owners to self-assess habitat and stewardship on their land and adjacent aquatic areas. This tool may also be used by organizations, such as lake associations, to assess multiple sites on a particular lake or river stretch. This protocol provides an objective and systematic method to assess the type, quantity and quality of the existing shoreland habitat within the shore impact zone.

Objectives of this protocol include: assessment of remaining habitat at developed sites, generation of awareness of what makes a high quality functioning shoreline buffer, and to provide a system to recognize landowners with functioning shoreline buffers.

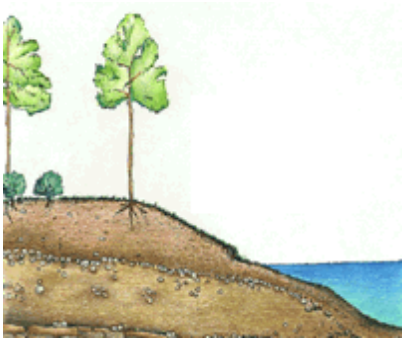
THE IMPORTANCE OF A HEALTHY LAKESHORE

A healthy lakeshore consists of many natural elements (plants, soils, rocks, decaying trees and logs) that function together to form a unique ecosystem (Figure 1). Shoreline alterations that damage or remove some of these components sever essential biological and physical connections between the upland and the water (Figure 2).

Protecting natural vegetation, or re-establishing it either directly or through natural succession, is critical for a functioning shoreline buffer. The vegetative goal for the shoreline buffer is mature native forest or other natural vegetation. A natural vegetated shoreline buffer generates important ecological and aesthetic functions. A vegetated buffer can: provide vegetative screening for structures; maintain physical conditions such as bank or shore stabilization; shade streams and lakes; minimize disturbances to the littoral zones of lakes; retain and transform sediments, nutrients, and toxicants; improve stream and lake habitat structure by allowing for contribution of woody habitat and organic matter to lakes and streams; provide habitat for some shoreline-dependent wildlife such as amphibians that utilize narrow corridors; and provide perching spots for fish-eating birds and ambush sites for other shoreline predators.

Figure 1. Vegetated Shoreline

Figure 2. Altered Shoreline



LAKESHORE PLANTS AS NATURAL FILTERS AND STABILIZERS

Shoreline buffers are corridors of natural vegetation along rivers, streams, and lakes which help to protect water quality by providing a transition between upland development and adjoining public water. A shoreline buffer of natural vegetation traps, filters and reduces runoff. Buffers stabilize lake and river banks, offer scenic screening of shoreland development, reduce erosion, control sedimentation, and provide habitat for shoreline species.

Buffers with natural ground cover, understory plants, and a forest floor layer are most effective in removing phosphorus from runoff. Native vegetation, with its deep root systems and natural duff layer, acts like a sponge to hold runoff and associated pollutants. If runoff is allowed to "short circuit" a buffer by concentrating and forming channels or rivulets, the chance for filtration of runoff is greatly reduced. The denser the vegetation is in a buffer and the higher the integrity of the understory, the better it will filter runoff.

Vegetation plays a major role in filtering runoff of such things as organic and inorganic solids and the pollutants that travel with them. Filtration through ground cover, accumulated detritus, mulch, and various exposed parts of the plant or tree occurs as these obstacles get in the way of moving particles. Vegetation also reduces the energy of flow, thus slowing water down, spreading flow out and allowing gravity to settle particles too heavy to move at a reduced energy level. This energy reduction also cuts the erosive potential of runoff.

The 'lawn to lake' shoreline allows 7 to 9 times more phosphorus to enter the lake than a more natural native vegetated shoreline. While absolute values of phosphorus entering the lake from a developed shoreline lot vary due to soil, slope, and other site specific conditions, a lot with a lawn extending to the lake has been estimated to average 0.2 pounds per summer compared to 0.03 pounds per summer for a lot with a native vegetated shoreline buffer. For many lots, the phosphorus yield to the lake due to the alteration of the shoreline buffer may exceed the phosphorus yield from all other sources. Phosphorus is a plant nutrient, and more of it entering the lake means more aquatic plants or algae resulting in lower water clarity (0.2 pounds of phosphorus can produce 100 pounds of algae). Soils around many lakes are usually naturally phosphorus rich. Excess nitrogen will also be transported to lakes from these land uses. Nitrogen will enter attached to soil particles, as organic matter, or dissolved in the form of nitrite, nitrate, or ammonia – forms that are readily useable by algae and rooted plants.

Ground water under lawn areas can also have high concentrations of nutrients. Hydrologists have found nitrate and total phosphorus concentrations 3 to 4 times higher in ground water under lawn areas than wooded areas. Infiltration from lawns results in higher rates of nutrients leaching to the ground-water system, and subsequently to the lake, even if the runoff itself does not reach the lake. Researchers studied the interaction of runoff and shoreline buffers

and found that the use of native vegetation buffers would increase the likelihood that high-intensity rainfalls would be filtered before entering the lake. Shoreline buffers are important because they enhance a site's ability to absorb water before it is conveyed to public waters.

Restoration or maintenance of the quality of structural diversity of natural shoreline vegetation is as important as buffer depth. Natural vegetation is a critical component in buffer effectiveness, so it is important to protect existing native vegetation and reasonable to consider restoration of native vegetation.

LAKESHORE PLANTS AS HOMES FOR NATIVE FISH AND WILDLIFE

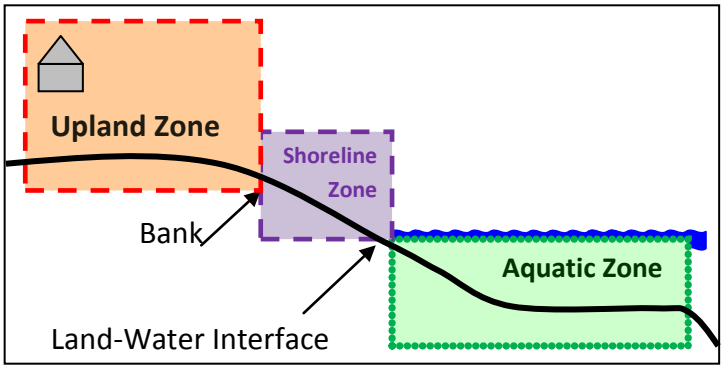
The near-shore areas adjacent to lakes and rivers are considered one of the richest zones for aquatic organisms, mammals, and birds. In Minnesota, large numbers of birds, amphibians, reptiles, and mammals use near-shore areas or those buffer transition areas. This area has an overlap of ecological zones between upland and aquatic habitats where species from both zones live. The tree canopy provides foraging and nest sites for many species of neotropical migratory birds. The understory is used by nesting birds and also provides cover, foraging sites, and travel corridors for mammals. Birds, such as thrushes and ovenbirds, nest among the ground cover on the forest floor, while shoreline grasses provide forage and shelter for small mammals.

Even when vegetation dies, it continues to be a critical component of the shore habitat. Trees that grow alongside the lake or river often fall into the water due to factors such as natural mortality, beaver activity, and wind throw. Leaves from shoreline trees and shrubs also accumulate along the lake bottom. These materials provide fish habitat, natural platforms for resting wildlife, and food for algae, aquatic insects and invertebrates.

LAKESHORE ZONES

Lakeshores are transitional zones between dry land and water and they include terrestrial and aquatic ecosystems. The Score Your Shore Assessment focuses on lakes and includes three lakeshore zones: upland, shoreline and aquatic (Figure 3). Surveyors need to use their best judgment to estimate the boundaries of each zone.

Figure 3. Three lakeshore habitat zones.



UPLAND ZONE

The Upland Zone includes most of the landowner's lot, beginning at the top of the lake bank and extending landward to the primary structure (house or cabin) on the lot (Figure 3).

Figure 4. Ecological Provinces of Minnesota.

In the forested region of Minnesota (Figure 4), undeveloped uplands adjacent to lakes are primarily forested or wetlands. Because wetlands are not suitable development sites they are not covered in this manual. Lakeshore forests vary in the tree types and ages (Figures 5-7) but often include multiple canopy layers of mature trees, saplings, shrubs and a ground layer of grasses and wildflowers. In the prairie region of Minnesota, much of the upland lakeshore has been converted to agricultural land but some upland lakeshores may still contain tall grass prairies or savannas with scattered trees (Figure 8). This terrestrial zone has been described as "core habitat" for many terrestrial and semi-aquatic species and is essential for their survival. Although the lake may be critical breeding ground for many semi-aquatic species, the surrounding terrestrial habitat is critical for feeding and growth. These semi-aquatic animals may rarely be seen because they make only brief visits to terrestrial habitat or may spend most of their lives underground.

When upland zones around lakes and rivers are developed for residential homes or recreational cabins, trees and other vegetation layers are removed to open a site for buildings. Additionally, land adjacent to the building may also be cleared and converted to manicured lawn, similar to developed lots within cities. Some property owners may retain the tree canopy on their property but remove the understory layers for a "park-like" appearance.

Examples of undeveloped Upland Zones on Minnesota lakes.

Figure 5. Laurentian Mixed Forest Province: coniferous forest shoreland.

Figure 6. Eastern Broadleaf Forest Province: deciduous forest shoreland.

Figure 7. Eastern Broadleaf Forest Province: mixed conifer-deciduous forest shoreland.

Figure 8. Prairie Parkland Province: tall native grasses surround lake (Glacial Lakes State Park).

SHORELINE ZONE

The Shoreline Zone is the portion of the lakeshore zone between the upland and the water (Figure 3). This zone begins at the bank top and extends to the land-water interface and may be only a few yards wide on some lots. The shoreline has been described as the "glue" for the waterfront because it provides a natural barricade against erosion. This is not a demarcation between terrestrial and aquatic ecosystems but a connecting zone for the transfer of water, nutrients and other substances from land to water.

A natural Minnesota shoreline may include a mix of live and dead trees, shrubs (Figure 9), wildflowers, grasses (Figure 10) and rocks (Figure 11). Some shorelines have natural sand covering most or a portion of the site, with only scattered vegetation (Figure 12). This shoreline transition zone attracts a wide variety of birds and animals that move back and forth between the upland and water. Upland trees hang over the water's edge and create shade and cooler water for fish and animals in the lake or river. But as people remove vegetation, this shoreline zone becomes "unglued" and resulting erosion allows silt and sediment into the lake. In

response to this, landowners may opt to install rip-rap or retaining wall to prevent further erosion. As Minnesota shoreline zones are changed from "wild" naturally vegetated areas to "domesticated" sites of turf grass and hard surfaces, critical areas for wildlife are lost.

Examples of undeveloped, terrestrial Shoreline Zones on Minnesota lakes.

Figure 9. Shoreline shrubs.

Figure 10. Shoreline wildflowers and grasses.

Figure 11. Natural rocky shoreline.

Figure 12. Shoreline with natural sand.

AQUATIC ZONE

The Aquatic Zone begins at the land-water edge and includes the lake or river area immediately adjacent to the lakeshore lot (Figure 3). It begins at the land-water interface and includes the shallow water where rooted aquatic plants grow (Figure 13). A wide variety of aquatic plants may grow at the water's edge and gradually change as the water gets deeper. Emergent plants, like bulrush (Figure 14), cattails, wild rice, and reeds can be found at the shore-water interface and may extend lakeward to depths of about six feet. Floating-leaf plants, such as water lilies (Figure 15), may begin in knee-deep water and may be interspersed with emergent and underwater plants (Figure 16). Beyond the zones of emergents and water lilies are underwater beds of submerged plants (Figures 17 and 18). In shallow, protected sites, these submerged plants may also form floating-leaves but in more open water they occur entirely beneath the water surface. On many Minnesota lakes, submerged plants are commonly found to depths of about 15 feet and in very clear lakes, they may occur as deep as 25 feet.

Examples of undisturbed Aquatic Zones in Minnesota lakes.

Figure 13. Emergent plants (bulrush).

Figure 14. Emergent plants (cattails)

Figure 15. Mixed beds of emergent (wild rice) and floating-leaf (water lily) plants.

Figure 16. Floating-leaf plants (water lilies)

Figure 17. Submerged plants

Figure 18. Submerged plants

Another important component of the aquatic zone ecosystem is woody habitat that is created when whole trees, tree limbs, branches, twigs and leaves fall into the lake from the adjacent upland (Figures 19). Fish and other aquatic life use this woody habitat in a variety of ways: as shade from sunlight, refuge from predators, spawning and nesting sites, and for foraging. When shoreline trees are cut for development, they are often removed from the site, reducing the potential for woody habitat to be added to the aquatic zone. Homeowners often remove existing woody habitat and may not realize that these material provide critical habitat.

Figure 19. Woody habitat on shore.

This shallow, vegetated area of the Aquatic Zone is known as the littoral zone and is the most productive area in the lake. As much as 90% of the lake's plants, fish and wildlife either live in this zone or pass through it. However, the aquatic zone is also a busy area for human activity with docks, boats, swimmers all competing with aquatic life for space. To minimize negative impacts to the lake or river ecology, the DNR regulates development and alteration activities below the ordinary high water level in public waters. For more information about permit requirements in lakes and rivers see www.dnr.state.mn.us/permits/water/needpermit. If you are interested in planting vegetation in the aquatic zone adjacent to your lot, see www.dnr.state.mn.us/shorelandmgmt or please contact the DNR for more information.

CHAPTER 2. SURVEY OVERVIEW

With Score Your Shore, the three lakeshore zones (Upland, Shoreline, and Aquatic) are assessed independently at each developed lot. Within each zone, surveyors score specific features related to habitat. These feature scores are summed for an overall Zone Habitat Score. Higher scores indicate a greater amount of habitat. This scoring process provides a simple method of ranking sites based on the percent of site that is in natural condition versus the percent of the site that has been altered.

UPLAND AND SHORELINE ZONE SCORES

The Upland Zone score (Figure 20) may range from 0 to 65 and the Shoreline Zone Score (Figure 20) may range from 0 to 35. These two zone scores are combined for an overall Land Score that may range from 0 (no vegetation) to 100 (high habitat value). Features scored in the Upland Zone are trees, shrubs and ground cover (Table 1). Similar features are scored in the Shoreline Zone (Table 2).

Figure 20. Scoreable habitat features in each lakeshore zones.

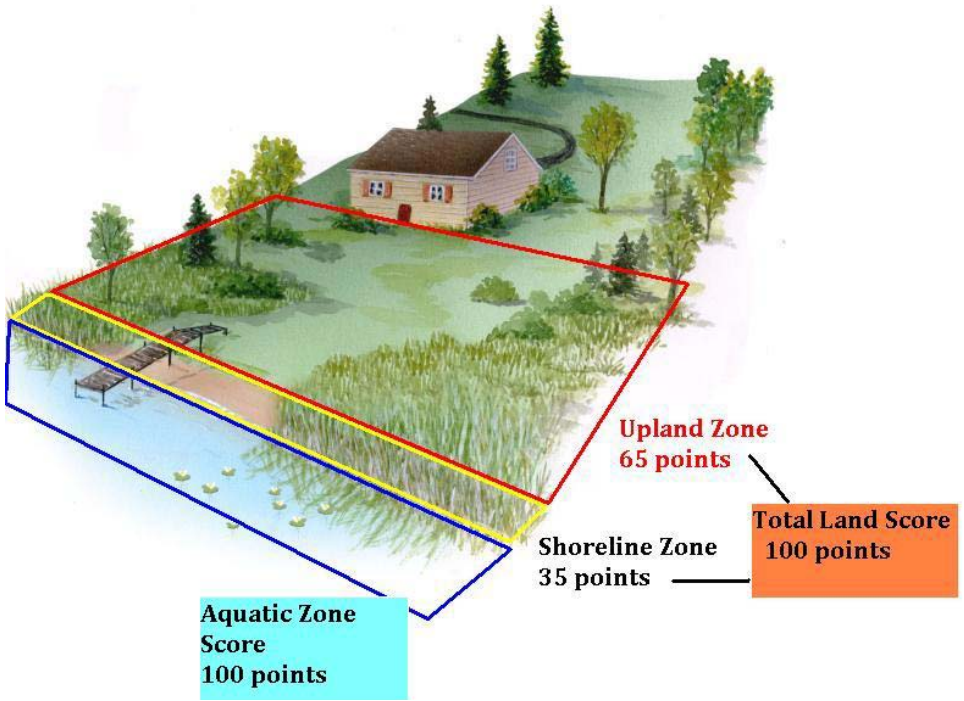


Table 1. Scoreable habitat features in Upland and Shoreline Zones.			Maximum Score	
Land Zones	**FEATURE**	**Potential Points**	**Zone Score**	**Total Land Score**
Upland	1. Percent of lot frontage with Trees	0-25	65	**100**
	2. Percent of lot frontage with Shrubs	0-20		
	3. Percent of lot frontage with Natural Ground Cover	0-20		
Shoreline	4. Percent of lot frontage with Trees/Shrubs	0-20	35	
	5. Percent of lot frontage with Natural Ground Cover	0-15		

AQUATIC ZONE SCORE

The Aquatic Zone Score (Figure 20) may range from 0 (no vegetation or woody habitat) to 100 (high habitat value) and it is not combined with other scores. Features scored in the Aquatic Zone are emergent, floating-leaved and submerged plant abundance as well as the presence of woody habitat. Submerged plant abundance may be difficult to assess in low clarity water and/or if there is wave action at a site. If surveyors elect not to assess submerged vegetation, the maximum possible score for the Aquatic Zone will be 65.

Table 2. Scoreable habitat features in Aquatic Zone.				Maximum	
Zone	**FEATURE**		**Potential Points**	**Sub Score**	**Total Aquatic Score**
Aquatic	Emergent and Floating-leaf	1. Percent of lot frontage with Emergent and/or Floating-leaf plants	0-40	45	**100**
		2. Continuity of Emergent and/or Floating-leaf plants (amount of fragmentation)	0-5		
	Submerged	3. Abundance of Submerged growth	0-35	35	
	Woody Habitat	4. Presence of Overhanging vegetation	0-10	20	
		5. Presence of Woody Habitat	0-10		

WHO CAN CONDUCT THE SURVEY?

This assessment is designed for non-scientists and can be conducted by anyone who has an interest in shoreland habitat. Similar to a personal health assessment, the Score Your Shore Assessment may be most effective when it is conducted by the actual landowner. This "self-assessment" allows the individual landowner an opportunity to objectively view their property management. If they have owned the site for several years, they may have an historical knowledge of what the site looked like prior to development. Once on the water, an individual can survey a single lot in 5 to 10 minutes. If multiple sites are to be assessed, it is recommended that a survey team be formed.

SURVEY TEAMS

If multiple teams are available to conduct the survey, a survey coordinator should be selected. This person will help organize the surveyors and collect data sheets at the end of the survey. The lake is divided into sections and each team is assigned a shoreline section. It is recommended that volunteers be assigned to the lake or river area where they live. Developed areas of islands should be included in the survey. Volunteers are divided into survey teams with two to four people per boat. Responsibilities of team members are:

Boat operator – navigates to each developed lake lot along assigned shoreline; should be comfortable operating boat in shallow water and near docks. The boat operator should not attempt to take photographs or record data but should focus on maintaining the position of the boat.

Recorder – records description of each developed shoreline on field data sheets

GPS operator (optional) - records the Global Positioning System (GPS) location of each developed lot; should be familiar with basic GPS operation including creation and naming of waypoints.

Photographer (*optional*) - photographs each developed lot and accurately records the location of each photograph.

WHEN SHOULD WE SURVEY?

Surveys should be conducted between June and mid-October when upland vegetation is present. Depending on specific objectives, surveys may be targeted for specific dates. Because these surveys are conducted by boat, surveyors should select times when weather permits safe boating. Periods of higher winds and potential storms should be avoided. If feasible, surveyors should also avoid surveying on weekends and holidays when recreational boat activity is high.

HOW SHOULD WE SURVEY?

Individual property owners can conduct a single self-assessment of their own lot by traversing the lot and making observations from their dock. The Score Your Shore assessment is also designed to be conducted from the water, using a boat, canoe or other watercraft. This "on-site" evaluation allows surveyors to view each lake lot in person and provides a first-hand look at the site conditions. This method also allows for a relatively rapid assessment without trespassing onto private property. Site conditions are also documented by photograph which, if needed, allows for follow-up review and discussion about each site.

An alternative way to conduct this survey is by reviewing photographs of each developed lake lot. This option still requires a survey team to tour the lake or river stretch by boat and take a photograph of each developed lot. The photograph team must carefully record the location of each photograph which is later used to assess the lot.

A photograph survey may be an option if most volunteers are unable to physically visit each site by boat. It does provide a method for a larger group of volunteers to interact and discuss lot assessments without the logistical issues associated with boat surveys. A main disadvantage of a photograph survey is that it is one-dimensional and certain aspects of the lot may not be viewable from a photograph. The Aquatic Zone, in particular, may be difficult to assess from photographs alone.

WHAT EQUIPMENT IS NEEDED?

An equipment checklist is provided in Appendix 1. For survey teams that will assess multiple sites, general equipment includes:

1. *Printable Field Data Collection Forms* are provided in Appendix 2 and example completed forms are shown in Appendix 3. For individuals interested in assessing their own lake lot, the score cards (Forms 2 and 3) are the main item needed.
   Form 1: Site Details Form where surveyors keep track of the individual lots surveyed and may collect information such as a GPS location, photograph records, etc.
   Form 2: Upland Scorecard, Shoreline Scorecard and Aquatic Scorecard

2. *Boat and associated safety equipment* – the type of boat will be determined by the number of surveyors on each team and the depth and accessibility of the survey area (ex. A pontoon boat may work well for a larger survey team; a canoe may be most appropriate in backwater bays).

3. *Base Maps* – A map of the lake is used to navigate along the shoreline and identify locations of each survey site. Several types of maps may be available for a particular lake.

Depth contour map. These maps include the lake outline and depth contours. Islands and hazard areas are often included. Depth contour maps for most Minnesota lakes are available from the Minnesota DNR website: LakeFinder

Tax parcel map. These maps show the individual lots around lakes. Some Minnesota counties now provide a web-based interactive map service where parcel maps may be viewed and printed. Most of these websites also include aerial photograph and wetland coverage.

Finally, various digital maps are available for use with GPS units.

4. *Camera* – Surveyors photograph each developed lot and these images can be used for follow-up discussions about sites.

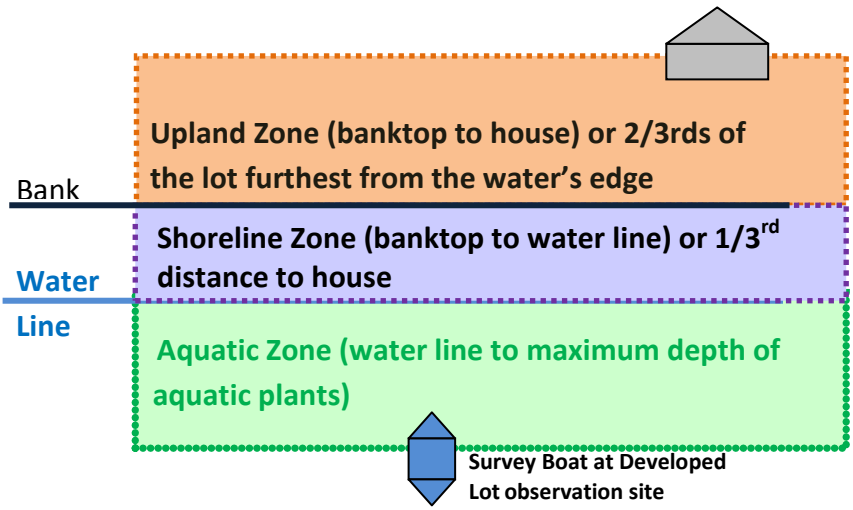
5. *GPS (optional*) – a global positioning system (GPS) receiver may be used to record the waypoint location of each developed lot. Hand-held GPS units or boat-mounted GPS units may be used. This option is recommended if the lake group intends to repeat the survey in future years because the GPS location can be used to permanently mark each lot location.

CHAPTER 3. HOW TO SCORE

STEP 1. NAVIGATE BOAT TO DEVELOPED LOT AND IDENTIFY THREE HABITAT ZONES

A. Surveyors navigate by boat to each developed lake lot and stop the boat about the midpoint of the lot (Figure 21). Where feasible, surveyors boat to within 50 feet (15 meters) of shore to view the site. Each site extends the entire length (frontage) of the developed lot. On many lakeshores, developed lot boundaries are defined by mowing patterns, fences, tree rows, pathways, etc. At other sites, it may be difficult to determine lot boundaries, particularly if a building is not visible from the lake and/or if the shoreline is relatively undisturbed. At sites where it is difficult to clearly identify lot boundaries, surveyors should use their best judgment and estimate the boundaries. Survey groups may opt to use plat maps and/or global positioning systems (GPS) to help delineate lots. In either case, the main objective is to assess the condition and character of the shoreline.

Figure 21. Locating each lakeshore zone from



B. Photographs may be taken of each developed lot. Surveyors should be sure to record the photograph number(s) associated with each lot.

C. GPS location of each site may also be recorded (optional).

HOW TO ESTIMATE LOT FRONTAGE PERCENTAGES

In Steps 2 through 4, surveyors will need to estimate the percent of the lot, or lake area adjacent to the lot, that is occupied by the given feature. To maintain consistency in scoring, surveyors are asked to select a percentage range, rather than estimate a specific percentage.

STEP 2. SCORE THE UPLAND ZONE

The upland zone begins at the bank top and extends landward to the house. If the home is setback much greater than the required setback, then score only that area that approximates the required minimum setback distance.

The extent of the upland that can be viewed from a boat will vary with slope. Vegetation and structures may also limit the surveyors view onto the land. In general, include the land from the top of the bank to the house. If there is no slope or a very gradual slope, begin the Upland Zone at the house and extend it towards the water's edge to include about 2/3rds of the lot (the 1/3 of the lot closest to the water's edge will be considered the Shoreline Zone) (Figure 22).

<u>Surveyors score three features in the Upland Zone:</u>
Use the Upland Scorecard (Figure 22) or the Quick Guide (Figures 23-25) to assign points to each of the following features:

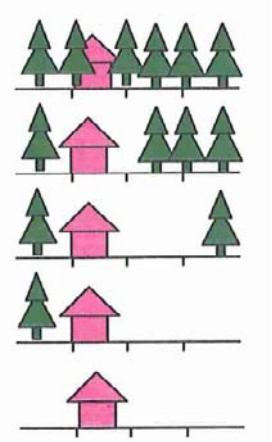
Figure 22. Upland Scorecard.

1. Upland Zone (65 pts max)			% of lot	points
A.	Upland trees		75-100	25
			50-74	18
			25-49	13
			1-24	9
			0	0
B.	Upland shrubs		75-100	20
			50-74	15
			25-49	10
			1-24	5
			0	0
C.	Upland ground cover	Naturally Vegetated Ground	75-100	20
			50-74	15
			25-49	10
			1-24	5
			0	0
		Mowed, Bare or Impervious Surface	75-100	0
			50-74	0
			25-49	0
			1-24	0
			0	0

A. Percent of Upland lot frontage with Trees

Estimate the percentage of the lake lot, within the Upland Zone, that contains trees (Figure 23). Note this estimate does not include trees found in the Shoreline Zone.

Figure 23 Upland Tree Cover

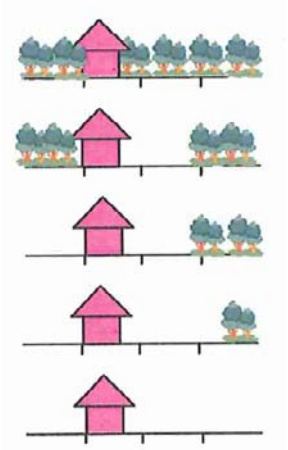


Percent of Lot	Description within the Upland Zone.	Points
75-100%	Trees present along at least ¾'s of lot front, hiding at least part of house from view.	25
50-74%	Trees cover at least ½ of lot; at least ¼ of lot has no trees; house may be fully visible	18
25-49%	Trees cover at least ¼ but less than ½ of lot' lot is mostly open.	13
1-24%	Trees cover less than ¼ of lot' only scattered yard trees present.	9
0%	No trees present.	0

B. Percent of Upland lot frontage with Shrubs

Estimate the portion of the lot length (frontage), within the Upland Zone, which contains a mid-canopy layer of shrubs and/or tree saplings (Figure 24). Note, this estimate is independent of the tree cover. There may be no trees present on the lot but a shrub layer may be present.

Figure 24. Upland Shrub Cover



Percent of Lot	Description within the Upland Zone.	Points
75-100%	Shrubs present along at least ¾'s of lot front, hiding at least part of house from view.	20
50-74%	Shrubs cover at least ½ of lot; at least ¼ of lot has no shrub layer.	15
25-49%	Shrubs cover at least ¼ but less than ½ of lot; middle canopy layer is mostly open.	10
1-24%	Shrubs cover less than ¼ of lot; only a few scattered shrubs present.	5
0%	No shrubs present.	0

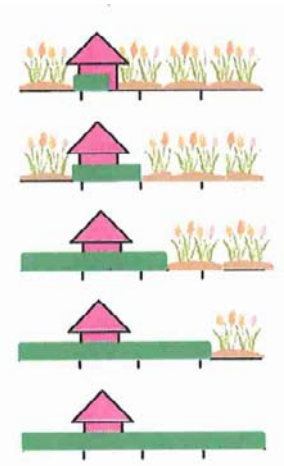
C. Percent of lot frontage with Natural Ground Cover.

Use Figure 25 to estimate the proportion of the ground covered by natural ground cover.

1. Within the Upland Zone, estimate the portion of the lot length (frontage), with natural ground cover. Natural ground cover that may be found in the Upland Zone includes unmowed vegetation, like grasses and wildflowers that grow beneath the tree and shrub layers of forests or plants that grow in open sites like prairies and fields. It may also include rocks, tree leaves and needles, and mosses that naturally cover the ground and have not been planted or placed by humans.

2. The next step is designed to help the surveyor better estimate the relative proportion of vegetated to un-vegetated ground cover. Within the Upland Zone, estimate the portion of the lot length (frontage), with un-natural ground cover. Unnatural ground cover that may be found in the Upland Zone includes cultivated gardens, fire pits, mowed vegetation, bare ground, artificial beaches and impervious surfaces such as decorative rocks, cement driveways and paths, sheds, and retaining walls.

Figure 25. Upland Ground Cover



Percent of Lot	Description within the Upland Zone.	Points
75-100%	Unmowed plants cover at least ¾ of lot; minimal lawn &/or impervious surface.	20
50-74%	Unmowed plants cover at least ½ of lot; lawn &/or impervious surface covers up to ¼ of lot.	15
25-49%	Unmowed plants cover at least ¼ but less than ½ of lot; lawn &/or impervious surface cover at least ¾ of lot.	10
1-24%	Shrubs cover less than ¼ of lot; only a few scattered shrubs present.	5
0%	Entire lot is mowed, bare and/or impervious surface.	0

STEP 3: SCORE THE SHORELINE ZONE

The Shoreline Zone is between the Upland Zone and the Aquatic Zone. This zone may be narrow or broad, depending on the slope. In general, this area extends from the top of the bank to the water's edge. If no bank is evident, begin the Shoreline Zone at the water's edge and continue one-third the way to the house (Figure 21). Scoring the Shoreline Zone is similar to the Upland Zone assessment but the tree layer and the shrub/sapling layer are combined.

Surveyors score two features in the Shoreline Zone:

Use the Shoreline Scorecard (Figure 26) or the Quick Guide (Figures 27-28) to assign points to each of the following features:

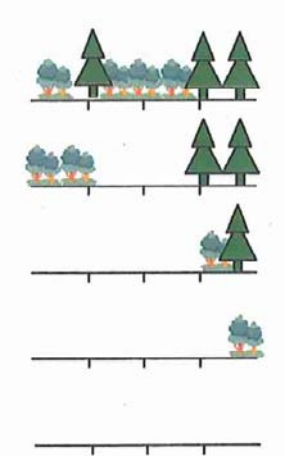
Figure 26. Shoreline Scorecard.

2. Shoreline Zone (35 pts max)			% of lot	points
A.	Shoreline Trees/Shrubs		75-100	20
			50-74	15
			25-49	10
			1-24	5
			0	0
B.	Shoreline Ground Cover	Naturally Vegetated Ground	75-100	15
			50-74	12
			25-49	7
			1-24	4
			0	0
		Mowed, Bare or Impervious Surface	75-100	0
			50-74	0
			25-49	0
			1-24	0
			0	0

A. Percent of lot frontage with Trees and/or Shrubs

Within the Shoreline Zone, estimate the portion of the lot length (frontage), with trees and/or shrubs (Figure 27).

Figure 27. Shoreline Tree and Shrub Cover



Percent of Lot	Description within the Shoreline Zone.	Points
75-100%	Trees &/or shrubs present along at least ¾'s of shoreline.	20
50-74%	Trees &/or shrubs cover at least ½ but less than ¾'s of shoreline.	15
25-49%	Trees &/or shrubs cover at least ¼ but less than ½ of shoreline.	10
1-24%	Trees &/or shrubs cover less than ¼ of shoreline.	5
0%	No trees or shrubs present along shoreline	0

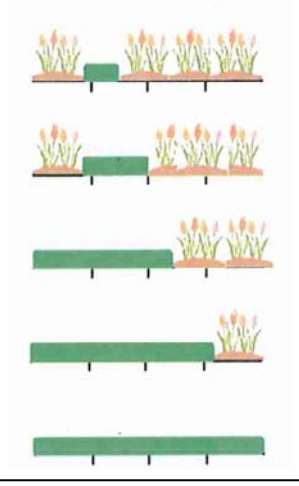
B. Percent of lot frontage with Natural Ground Cover.

1. Within the Shoreline Zone, estimate the portion of the lot length (frontage), with natural ground cover. Natural ground cover that may be found in the Shoreline Zone

includes unmowed vegetation, tree leaves and needles, and mosses. It may also include dead trees, rocks, and/or sand that naturally cover the ground and have not been planted or placed by humans.

2. Within the Shoreline Zone, estimate the portion of the lot length (frontage), with un-natural ground cover. Unnatural ground cover that may be found in the Shoreline Zone includes riprap, retaining walls, mowed vegetation, bare ground, artificial beaches and impervious surfaces such as described in the Upland Zone section.

Figure 28. Shoreline Ground Cover



Percent of Lot	Description within the Shoreline Zone.	**Points**
75-100%	Unmowed plants cover at least 3/4 of shoreline; minimal lawn &/or impervious surface.	15
50-74%	Unmowed plants cover at least ½ of shoreline; lawn &/or impervious surface cover up to ¼.	12
25-49%	Unmowed plants cover at least ¼ but less than ½ of shoreline; lawn &/or impervious surface cover at least ½.	7
1-24%	Unmowed plants cover less than ¼ of shoreline; lawn &/or impervious surface covers at least ¾.	4
0%	Entire shoreline is mowed, bare and/or impervious surface.	0

STEP 4: SCORE THE AQUATIC ZONE

The Aquatic Zone extends from the water/shoreline edge to deep water, where the submerged plant bed ends. The near-shore will vary among lakes and between sites. Along shorelines with steep depth contours, the shallow zone may be only a few feet in width. At other sites, the shallow zone may extend 100's of feet into the lake or the entire bay or lake may be shallow.

In-lake assessment of habitat conditions can be difficult because water clarity and wave action can limit visibility. Further, the presence or absence of aquatic vegetation at a particular lake site can be influenced by a variety of natural and human factors and determining the relationship between development and current in-lake conditions can be challenging. Six features of in-lake habitat area assessed.

Use the Aquatic Scorecard (Figure 29) or the Quick Guide (Figures 30-39) to assign points to each of the following five features:

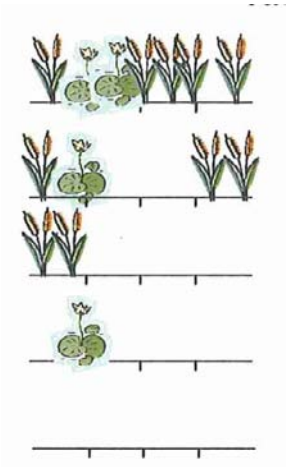
Figure 29. Aquatic Scorecard.

3. Aquatic Zone (100 pts max)				points
A.	Emergent and Floating-leaf Plants	Percent of Shoreline frontage	75-100	40
			50-74	30
			25-49	20
			1-24	10
			0	0
B.	Submerged Plants	abundant plant growth		35
		scattered plants		15
		absent		0
		can't see		0
C.	Openings in plant beds	no unnatural openings		5
		human-made channels/openings		0
D.	Overhead woody habitat	shoreline vegetation hangs over water		10
		no overhanging vegetation		0
E.	Downed woody habitat	dead tree limbs and branches		10
		no woody habitat present		0

A. Percent of lot frontage with emergent and floating-leaf plants.

Within the Aquatic Zone, estimate how much of the shore length (frontage), contains emergent and floating-leaf plants (Figure 30). Surveyors don't need to measure or map these plant beds, but simply estimate, using Figure 21, the shoreline extent where these plants occur. The lakeward extent of these plant beds will vary with water depth and other factors and therefore is not a feature that is scored in this assessment.

Figure 30. Aquatic emergent + floating

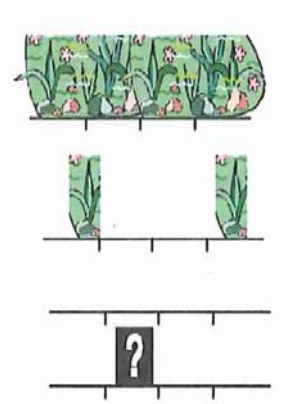


Percent of Lot	Description within the Aquatic Zone.	Points
75-100%	Emergent &/or floating-leaved plants present along at least 3/4 of lot.	40
50-74%	Emergent &/or floating-leaved plants present along at least 1/2 but less than 3/4 of lot.	30
25-49%	Emergent &/or floating-leaved plants present along at least ¼ but less than ½ of lot.	20
1-24%	Emergent &/or floating-leaved plants present along less than ¼ of lot.	10
0%	No emergent or floating-leaf plants present.	0

B. Submerged plant growth coverage.

Estimate the amount of submerged plant growth within the Aquatic Zone (Figures 31).

Figure 31. Submerged plants.

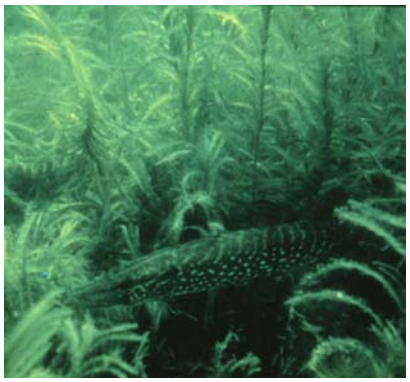


Description within the Aquatic Zone.	**Points**
Abundant submerged plant growth forming moderate to dense beds, often covering lake bottom.	35
Sparsely scattered submerged plants; lake bottom mostly open.	15
Submerged plants absent.	0
Submerged plants may or may not be present; can't see into water.	0

Note that it can be difficult to see submerged plants if water clarity is low and/or if there is wave action. Because this survey is a rapid assessment, surveyors are not asked to sample submerged plants with rakes, but simply visually estimate submerged plant abundance (Figures 32, 33). This feature may be best scored by the actual homeowner who likely has the most knowledge about the aquatic zone directly adjacent to their property. If surveyors cannot directly view the submerged plants, they should select the "can't see" option on the scorecard and that information will be incorporated into the data interpretation.

Figure 32. Scattered submerged plant growth

Figure 33. Abundant submerged plant growth



C. Fragmentation of emergent and floating-leaf plant beds

Record whether any plant beds have any unnatural openings such as boat channels or other cleared areas around docks and swim beaches. Note that plant beds may have natural openings (Figures 34,35) and it can be difficult to determine the difference between natural and unnatural openings (36,37). Unnatural openings are most easily detected if they have

sharp, rectangular edges (such as boat channels).

Openings in Plant Beds	**Points**
Plant beds appear undisturbed; no human-made channels.	5
Human-made channels in plant beds.	0
No emergent, floating or submerged plants present.	0

Figure 34. Natural opening in emergent (giant cane) bed.

Figure 35. Natural opening in water lily bed.

Figure 36. Un-natural opening in bulrush bed.

Figure 37. Un-natural opening in water lily bed.

D. **Presence of overhead woody habitat**

Record the presence of overhanging trees and branches (Figure 38) that extend into the Aquatic Zone.

Figure 38. Overhead woody habitat.

Overhead woody habitat.	**Points**
Shoreline trees and/or shrubs hang over water.	10
No overhanging trees or shrubs.	0

E. Presence of downed woody habitat.

Record the presence of downed woody habitat (Figure 39) in the Aquatic Zone adjacent to the developed lot. Surveyors may include trees, limbs and branches that are entirely in the water as well as woody habitat that is partly or entirely on the shoreline.

Figure 39. Downed woody habitat.

Downed woody habitat.	**Points**
Tree limbs and/or branches in water.	10
No woody habitat present in water.	0

OTHER ITEMS TO RECORD

Volunteer groups may elect to record additional information at each developed lot. This extra information may be useful for lake planning but will not be used in the scoring. Initially surveyors may think of numerous items to record, but remember that every item included will take additional survey time. Carefully consider how extra information will be used before including it in the assessment. Examples of other items to consider recording are provided in Appendix 4.

CHAPTER 4. REFERENCE SITES AND QUALITY CONTROL

What does "high quality" lakeshore habitat look like? The answer to this question will depend on where you live in Minnesota and the specific site conditions of a lakeshore lot.

Natural habitat may appear different at different sites on a lake or river. For consistency, it is helpful for surveyors to first view and discuss site conditions at undeveloped reference sites on the lake stretch they plan to assess. These reference sites will serve as models for how developed lots likely appeared before vegetation was removed for homes and other structures. Because of site conditions, some undeveloped reference sites may score less than 100 points in the Land (upland and shoreline) and/or Aquatic zones. It is helpful for surveyors to recognize such areas of the lake where achieving the maximum score of 100 is not feasible.

Along lakeshores with steep hills, houses may be difficult to see from the water. Surveyors may need to refer to plat or tax parcel maps, or local knowledge, to determine the locations of developed lots. During the assessment of the Upland Zone, surveyors may not be able to determine whether portions of the understory have been converted to turf grass or artificial surfaces. Unless the home owner is involved in the assessment, surveyors will need to record only what they can view from the water and make a notation that this site was not fully viewable.

Some Lakeshore Areas where the maximum habitat score is not achievable include:

1. Shoreline zone with natural sand beach: Lake Shores that receive heavy wave activity and where the substrate is primarily sand may naturally lack vegetation. It may be difficult to determine if sand beaches at developed sites are natural or man-made. Surveyors may look for nearby undeveloped lots to help determine what the natural shoreline should look like.

2. Aquatic Zone with steep drop-off: Within the Aquatic Zone of these sites, the water depth may increase naturally, creating a steep drop-off. As a result, in-lake plants may be restricted to a very narrow band that may be only a few feet in width from shore. Surveyors will need to use caution when comparing vegetation at these sites with sites that have broad shallow aquatic zones. The absence of in-lake vegetation at these steep drop-off sites may be natural, whereas absence of in-lake vegetation at other sites may be due to human activities.

3. Aquatic Zone with high wave action: Along unprotected shorelines that receive a high amount of wave action, aquatic plants may not be well established. These sites often contain naturally sandy or rocky substrates. Surveyors should note if a developed lot occurs along a high wind energy shoreline because the in-lake plant community may be naturally sparse at such locations.

4. **Aquatic Zone with flowing water:** Aquatic plants will grow in flowing water but may be less abundant than in calm water. Particularly along river stretches – Surveyors may find few plants in the aquatic zone.

Volunteer groups may identify other types of sites on a particular lake that require special consideration.

1. **House is located only a few feet from lake:** Some older homes may have been built only a few feet from the water's edge and it may be difficult to identify an Upland and a Shoreline Zone. In this case, we recommend scoring the entire Land Zone (water's edge to house) as the Upland Zone and eliminating the Shoreline Zone Score.

2. **House set-back if much greater than most houses on lake:** Some homes may be built much farther from the water's edge than the other homes on the lake. For comparison purposes, we recommend that surveyors use a similar lakeward distance for scoring. For example, if most homes are set 150 feet from the lake and one home is set 500 feet from lake, surveyors should only include the first 150 feet from the lake in the Upland Zone.

3. **Road separates house from lake:** If a shoreline stretch includes lots that are separated from the lake by a road, surveyors elect to include the water's edge to the road as the Land Zone.

4. **Multi-residential / commercial lots:** Surveyors may elect to distinguish multi-residential (town homes, condominiums) and commercial lots (resorts, restaurants, marinas) from single residential lots. Lot scores within similar categories can be compared.

QUALITY CONTROL

PRE-SURVEY STANDARDIZATION *(OR "CLASSROOM TRAINING")*

A "pre-survey" standardization can be conducted to help ensure that all surveyors are recording similar information when they observe a site. The survey organizers obtain photographs of 5 to 20 developed lots. The entire volunteer group meets to view these photographs and independently "Score" each site. The survey organizers review the results and select sites for group discussion. It is particularly important to discuss sites where volunteers did not agree on scores. This "trial run" of the actual survey provides an opportunity for volunteers to better understand how to score each aspect of the three Shoreline Zones. Survey organizers may also encourage volunteers to bring a photograph of their own lot to the meeting for this trial scoring process.

SURVEY TEAM SPOT CHECKS

In addition to their assigned lake or river stretch, each survey team is responsible for evaluating some of the developed sites that were assessed by a different survey team on the lake. These spot checks provide a second assessment for the selected lots. The purpose of the spot check is to determine if two different samples provide similar scores. Depending on the number of teams and number of developed lots, the survey organizers may elect to conduct spot checks at 5% to 10% of the lots).

CHAPTER 5. DATA MANAGEMENT

TAKING CARE OF THE DATA

Each Team Leader collects the Score cards for their team and reviews the cards for missing data and/or duplicate entries. They also ensure that the photographs for each site are clearly labeled with the appropriate site number. Score cards are delivered to the Survey Organizers.

Survey Organizers may tally the score cards by hand or may elect to enter data into an spreadsheet or database for analysis. If GIS expertise is available, data can be portrayed in map format. Survey teams return completed field forms, photographs, and (if used) GPS units to the survey coordinator.

UNDERSTANDING, REPORTING AND USING THE DATA

Biological data can be difficult to interpret and use. The scoring system is intended to minimize the amount of interpretation needed for each Shoreline Zone and also provides a relatively easy way to compare different lots. Information from this assessment can be used by individual lot owners to understand how their lake lot management compares to others and how it compares to undeveloped reference lots.

Survey groups are encouraged to report their summarized results at lake association meeting or publish results in your organization's newsletter. Keep in mind that the ultimate goal of these surveys is to increase interest and awareness about good shoreline management. There are ways to summarize the results without singling out, or identifying, individual homeowners. This is particularly important for lots that score low. An example summary report is provided in Appendix 5. Data may be summarized in table and/or map format.

Types of information that can be summarized for each lake include:

1. Number of developed lots surveyed
2. Average Upland and Aquatic Scores for surveyed lots
3. Locations of developed lots that are good examples of good shoreland management (high scores).
4. Locations of developed lots that would most benefit from vegetation restoration (low scores)

The Minnesota Department of Natural Resources has numerous resources to help you restore or improve the habitat of your shoreland. To learn more about lakeshore management and

shoreland protection and restoration check out *Restore Your Shore* and *Lakescaping for Wildlife and Water Quality* (see *http://www.dnr.state.mn.us/shorelandmgmt* for information*).*

CHAPTER 6. GLOSSARY

Abundant submerged plant growth – underwater plants cover much of the lake or river bottom; plants may vary in height; In general, there is more plant growth than open space on the lake or river bottom.

Artificial beach: includes both imported sand and zones cleared of natural vegetation to create a beach.

Duff: is the fermentation and humus layer of the forest floor. It includes decaying leaves, pine needles, branches and other cast-off vegetative material.

Emergent: aquatic plants that are rooted in wet soils and typically below the water's surface with leaves, stems and flowers that are typically above the water's surface. Common emergent aquatic plants in Minnesota include cattails and bulrush. Some emergent aquatic plants, like wild rice, begin growth as submerged plants but emerge above the water by mid-summer.

Floating-leaf: aquatic plants that are rooted in the lake or river substrate and have their lower portions submersed in water and leaves that float on the water surface. Common floating-leaved plants in Minnesota are water lilies, also known as lily pads.

Impervious surface: means a constructed hard surface that prevents or retard entry of water into the soil; includes materials like cement, asphalt, roofing and other building materials. The amount of impervious surface generally grows with increasing urbanization.

Lakeshore: is the area comprised of the shoreland, shoreline and the near-shore.

Lawn: stretch of open, mowed, grass-covered land.

Littoral zone: the shallow transition zone between dry land and the open water area of a pond, lake or river. In Minnesota waters, this zone extends from the shore to a depth of about 15 feet, depending on water clarity. The shallow water, abundant light, and nutrient-rich sediment provide ideal conditions for plant growth. Aquatic plants, in turn, provide food and habitat for many animals such as fish, frogs, birds, muskrats, turtles, insects and snails. Protecting the littoral zone is important for fish and other animal populations.

Natural Ground Cover: vegetation exists in a wild state or the plant community is substantially unaltered; includes un-mowed grasses and wildflowers, mosses, tree leaves and needles, rocks or sand that have not been planted or placed by humans. On some sites, vegetation that is not native to Minnesota may be considered "natural" ground cover because it has invaded the site on its own and has not been planted. While native vegetation is preferred to non-native plants,

the non-native plants may at least provide some habitat benefit and erosion control, compared to impervious surfaces or other unnatural cover.

Pavement: any impervious ground cover, including driveways, roads and impermeable patios.

Retaining wall: vertical or nearly vertical structures constructed of masonry, rock, timber pilings, concrete or other durable materials.

Riprap: loose stones or boulders placed artificially to prevent shoreline erosion.

Scattered submerged plant growth - underwater plants are present but cover little of the lake or river bottom; plants may vary in height; In general, there is less plant growth than open space on the lake or river bottom.

Shore impact zone: means land located between the ordinary high water level of a public water and a line parallel to it at a setback of 50 percent of the structure setback, but not less than 50 feet. This area serves as the primary shoreline buffer.

Shoreland: is defined as Minnesota Rule 6120, which for lakes is that land located within 1000 feet of the ordinary high water level. Some local governments use a distance of 1320 feet. The methods in this protocol use land located within 1320 feet of the ordinary high water level in order to buffer the state-defined shoreland area.

Shoreline: the edge of a body of water and, alternatively, used here with regard to fish and wildlife habitat to refer to the narrow band around the lake centered on the land-water interface.

Structures: any non-resident, non-commercial building, such as sheds, garages or boat houses.

Submerged: aquatic plants with stems and leaves that grow primarily beneath the surface of the water; these plants may produce flowers, fruits, and some leaves that float on the water surface or emerge above the water. Submerged plants may be rooted in the lake or river substrate or may drift freely in the water column.

Understory: the forest layer between the main canopy trees and the ground cover. This layer consists of shrubs and immature trees and saplings that are shorter than the main canopy level. Understory vegetation provides shelter for a wide range of animals and birds. When gaps form in the canopy, the understory trees may take advantage of the opening and grow to fill in the canopy.

Waypoint: a reference point or set of coordinates that precisely identifies a location; most GPS receivers allow the user to set, store and reference multiple waypoints. In practical use, GPS devise displays can point to, or give specific direction to pre-set waypoints. Specified routes

may be established with multiple waypoints. Waypoints may be set while a GPS user is physically positioned at the desired waypoint. Waypoints may also be set by entering data in the GPS receiver or into map software on a personal computer.

Woody habitat: whole trees, as well as limbs, branches and leaf litter, that have fallen into the lake or river from the adjacent shoreline, or have been washed to a site by wave action. These materials provide physical structure that is used as habitat for aquatic organisms and they may also alter water movements, particularly in flowing water.

APPENDIX 1. EQUIPMENT CHECKLIST

Score Your Shore Equipment Checklist			
Boat and Accessories		**Paperwork**	
☐	Boat or canoe	☐	Clipboard
☐	Life jackets (pfd's)	☐	Lake contour map
☐	Seat cushion	☐	Field data sheets
☐	First aid kit	☐	Pencils
☐	*Trolling motor*	**Personal Gear**	
☐	*Push pole*	☐	*Polarized sunglasses*
☐		☐	*Rainwear*
☐		☐	*Chest or hip waders*
☐		☐	*Wide-brimmed hat*
Electronics		☐	*Sunscreen*
☐	Digital camera	☐	*Bug repellant*
☐	*Cell phone*	☐	*Lunch, water*
☐	*Depth finder*	☐	*Hand towels*
☐	*GPS*	*(Italics indicate optional equipment)*	
☐	*12 volt adapter or extra batteries for GPS*		

APPENDIX 2. PRINTABLE FIELD DATA COLLECTION FORMS

Field data sheets are provided on the following pages:

1. Site Description Form (1 side)
2. Score Your Shore Field Form (2 sides)

Score Your Shore - Site Details Form (1 of ____)

LAKE: _____

Survey Date: _____ Surveyors: _____

Site #	Landowner	X coord	Y coord	Photo #(s)	comments

Score Your Shore field form side 1 LAKE: _____ pg. __ of ___

Survey DATE: _____ Surveyors: _____

1. Upland Zone					Site Number										
			% of lot	points											
A	Upland trees		75-100	*25*											
			50-74	*18*											
			25-49	*13*											
			1-24	*9*											
			0	*0*											
B	Upland shrubs		75-100	*20*											
			50-74	*15*											
			25-49	*10*											
			1-24	*5*											
			0	*0*											
C	Upland ground cover	Naturally Vegetated Ground	75-100	*20*											
			50-74	*15*											
			25-49	*10*											
			1-24	*5*											
			0	*0*											
		Mowed, Bare or Impervious Surface	75-100	*0*											
			50-74	*0*											
			25-49	*0*											
			1-24	*0*											
			0	*0*											
			SCORE →												

2. Shoreline Zone					Site Number										
			% of lot	points											
A	Shoreline Trees/Shrubs		75-100	*20*											
			50-74	*15*											
			25-49	*10*											
			1-24	*5*											
			0	*0*											
B	Shoreline Ground Cover	Naturally Vegetated Ground	75-100	*15*											
			50-74	*12*											
			25-49	*7*											
			1-24	*4*											
			0	*0*											
		Mowed, Bare or Impervious Surface	75-100	*0*											
			50-74	*0*											
			25-49	*0*											
			1-24	*0*											
			0	*0*											
			SCORE →												

Score Your Shore field form side 2 LAKE: _____ pg. __ of ___

Survey DATE: _____ Surveyors: _____

3. Aquatic Zone				points	Site Number									
A	Emergent and Floating	Percent of shoreline frontage	75-100	40										
			50-74	30										
			25-49	20										
			1-24	10										
			0	0										
B	Submerged plants	abundant		35										
		scattered		15										
		absent		0										
		can't see		0										
C	Openings in plant beds	no unnatural openings		5										
		human-made channels/openings		0										
D	Overhead Woody Habitat	shoreline vegetation hangs over water		10										
		no overhanging vegetation		0										
E	Downed Woody Habitat	dead tree limbs and branches		10										
		no woody habitat		0										
		SCORE →												

NOTES

APPENDIX 3. EXAMPLES OF COMPLETED FIELD DATA FORMS.

Score Your Shore - Site Details Form (1 of 1)

LAKE: **Mystery**

Survey Date: **15 July 2010** Surveyors: **T. Smith, J. Meier, S. Meier, B. Maryland**

Site #	Landowner	X coord	Y coord	Photo #(s)	comments
1	Smith			1,2	
2	Haroldson			3	
3	McIntosh			4,5	
4	Johnson			6	house for sale
5	Meier			7	
6	Olson			8,9	requested copy of survey results
7	Linwood			10	
8	Jones			11	
9	Walker			12	interested in joining lake association
10	Edwards			13	

Score Your Shore field form side 1 LAKE: **Mystery** pg. **1 of 20**

Survey DATE: **15 July 2010** Surveyors: **Smith, Meier, Meirer, Maryland**

1. Upland Zone				Site Number									
			% of lot	points	1	2	3	4	5	6	7	8	9	10
A	**Upland trees**		75-100	*25*				25						
			50-74	*18*	18				18					
			25-49	*13*			13							
			1-24	*9*								9		9
			0	*0*						0	0		0	
B	**Upland shrubs**		75-100	*20*										20
			50-74	*15*							15			
			25-49	*10*	10							10		
			1-24	*5*		5	5	5						
			0	*0*					0	0			0	
C	**Upland ground cover**	Naturally Vegetated Ground	75-100	*20*		20				20				
			50-74	*15*				15			15			15
			25-49	*10*	10									
			1-24	*5*			5						5	
			0	*0*					0			0		
		Mowed, Bare or Impervious Surface	75-100	*0*			0		0			0	0	
			50-74	*0*	0									
			25-49	*0*										
			1-24	*0*				0			0			0
			0	*0*		0				0				
			SCORE →		**38**	**20**	**23**	**45**	**18**	**20**	**30**	**19**	**5**	**44**

2. Shoreline Zone				Site Number									
			% of lot	points	1	2	3	4	5	6	7	8	9	10
A	**Shoreline Trees/Shrubs**		75-100	*20*		20	20							
			50-74	*15*						15				
			25-49	*10*				10			10			10
			1-24	*5*	5				5			5	5	
			0	*0*										
B	**Shoreline Ground Cover**	Naturally Vegetated Ground	75-100	*15*			15							
			50-74	*12*		12								
			25-49	*7*	7				7			7		
			1-24	*4*				4		4	4		4	4
			0	*0*										
		Mowed, Bare or Impervious Surface	75-100	*0*				0		0	0		0	0
			50-74	*0*	0				0			0		
			25-49	*0*		0								
			1-24	*0*										
			0	*0*			0							
			SCORE →		**12**	**32**	**35**	**14**	**12**	**19**	**14**	**12**	**9**	**14**

Score Your Shore field form side 2 LAKE: **Mystery** pg. **2 of 20**

Survey DATE: **15 July 2010** Surveyors: **Smith, Meier, Meirer, Maryland**

					Site Number									
3. Aquatic Zone				*points*	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	**Emergent and Floating**	Percent of shoreline frontage	75-100	*40*				40						
			50-74	*30*	30	30						30		
			25-49	*20*							20		20	20
			1-24	*10*			10			10				
			0	*0*					0					
B	**Submerged plants**	abundant		*35*		35		35			35			
		scattered		*15*	15				15	15		15	15	15
		absent		*0*			0							
		can't see		*0*										
C	**Openings in plant beds**	no unnatural openings		*5*			5		5	5	5	5		
		human-made channels/openings		*0*	0	0		0					0	0
D	**Overhead Woody Habitat**	shoreline vegetation hangs over water		*10*			10					10		
		no overhanging vegetation		*0*	0			0	0	0	0		0	0
E	**Downed Woody Habitat**	dead tree limbs and branches		*10*		10						10	10	
		no woody habitat		*0*	0		0	0	0	0	0			0
			SCORE →		45	75	25	75	20	30	60	70	45	35

NOTES

APPENDIX 4. OPTIONAL FEATURES TO RECORD.

1. Landowner with a question.
   As you boat to each site, some property owners will likely have questions about what you are doing. After you talk with the owner, you may want to make a note that you discussed the assessment project with them. They may have requests for follow-up information, including how their lot was scored. Adding a checkbox to the main data form can help you track these types of correspondences and provide follow-up information in a timely manner.

2. Presence of dock(s) at site.
   Recording whether or not a dock is present at each developed lot may be a useful way to indicate the general amount of use a particular Aquatic Zone area receives. The absence of a dock generally indicates that there is less recreational activity at a site compared to a lot with one or more docks. It may be useful for the volunteer group to summarize the total number of lots with docks compared to lots with no docks.

   Some groups are more specifically interested in assessing the numbers and types of docks and other structures in the Aquatic Zone adjacent to developed lots. This becomes a more complicated and time-consuming task. There are a wide variety of dock shapes, sizes and arrangements and it can be difficult to record this type of information in a rapid assessment. Additionally, merely noting the numeric information on docks may provide little comparative information if you are not also describing details on dock lengths and widths.

3. Presence of non-native vegetation.

4. Potential erosion

5. Wildlife species observed (Canada geese vs. great blue heron)

APPENDIX 5. EXAMPLE SUMMARY REPORT

Beautiful Lake 2010 Volunteer Shoreline Habitat Survey

In May, 30 volunteers attended a training session to learn how to use the new "Score Your Shore" tool to assess habitat on lakeshores. On July, 15 of those volunteers participated in a lakewide survey of habitat on Beautiful Lake. Volunteers worked in 4 teams and surveyed the lakeshore by boats. They visited several undeveloped sites to see what types of habitat might naturally occur on the lake. They then visited 57 developed lots and scored the remaining habitat in the upland, shoreline and aquatic zones.

70% of lot scored in the "moderate" to "very high" range for upland habitat. Most of these lots had trees along at least 50% of the shore with only small areas converted to turf grass. This is encouraging news for the lake because good upland management will help protect the lake water quality.

While the upland areas usually scored high, only a few lots (25%) had "moderate" to "very high" shoreline habitat. This is the zone immediately adjacent to the lake. Most lots lacked any natural vegetation buffer in this zone and had mowed grass right up to the water edge. Fortunately, this is one of the simplest areas to revegetate, simply by stopping mowing in this zone (which frees up time for barbequing!). By allowing plants to regrow along this zone, landowners can provide a transition zone of habitat for a wide variety of birds, amphibians and other wildlife, and also add back a protective vegetation buffer.

In the lake, about 80% of the sites in front of developed lots contained at least some bulrush and/or water lilies. Most of the sites that lacked plants occurred on the wind-swept north shore where it is difficult for plants for grow. Most anglers know that these emergent and floating-leaf plants are very important for fish and they also provide habitat for frogs and invertebrates. Let's all work to protect these valuable plant beds.

5 sites that scored the highest for upland and shoreline habitat were nominated for our 2010 Good Stewardship Award. These landowners will be presented with awards at our September Annual Meeting.

You can "Score Your Shore" to learn how much habitat remains by your lake home. You can compare your results to the lakewide survey.

APPENDIX 6. SOURCES FOR LAKE BASE MAPS

Lake contour (depth) maps: Minnesota Department of Natural Resources

http://www.dnr.state.mn.us/lakefind/index.html

County tax parcel maps: check with local county, examples given below.

Aitkin County: http://gisweb.co.aitkin.mn.us/wf2_aitkinpublic/Default.aspx

Beltrami County: http://maps.co.beltrami.mn.us/BeltramiCX_public/CXviewer.htm

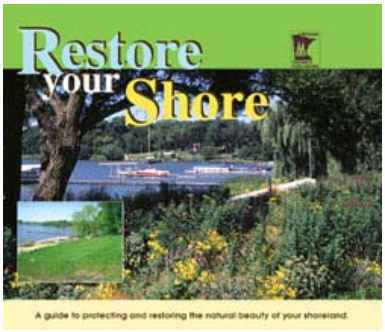
Cass County: http://www.co.cass.mn.us/cassmnpublic/Default.aspx

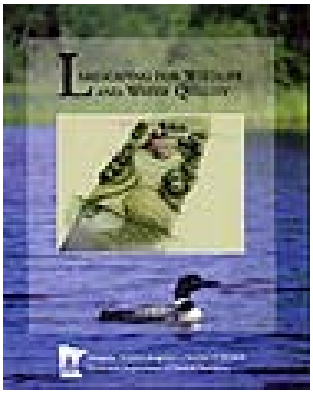
Hubbard County: http://www.co.hubbard.mn.us/ (click on "parcel data")

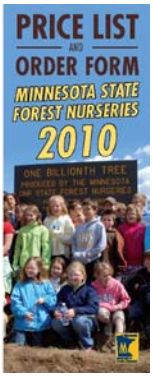
Itasca County: http://www.co.itasca.mn.us/ (click on "interactive maps")

Morrison County:
http://beacon.schneidercorp.com/Application.aspx?AppID=104&LayerID=1435&PageTypeID=1&PageID=949

APPENDIX 7. ADDITIONAL RESOURCES FOR SHORELAND MANAGEMENT







Minnesota Department of Natural Resources Website http://www.dnr.state.mn.us

Minnesota Pollution Control Agency http://www.pca.state.mn.us/water/lake.html

Minnesota Shoreland Management Resource Guide http://shorelandmanagement.org/

University of MN Extension Service Shoreland Education http://www.extension.umn.edu/Shoreland/

University of WI Extension – Water Resources Education http://clean-water.uwex.edu/