Minnesota's Vanishing Natural Shorelines: A Loss that Contributes to Degraded Lake Quality

A Summary Report from the Natural Shoreland Partnership

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This report was formulated out of discussions with non-profit organizational leaders and government (state and local) natural resource professionals concerned about the continuing loss of shoreline vegetation, which serves as the best defense against the loss of clean water, habitat, lakeshore character, and recreation.

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Executive Summary

Minnesota's lakes are in trouble and the situation is urgent. About half of Minnesota's natural shorelines have been lost. In some areas, the loss has been greater, and natural shoreline continues to vanish at a fast rate. We are losing lake water quality, and maybe even the ability to swim and recreate in our lakes. We are losing valuable habitat for fish – and loons, frogs, butterflies and more. We are losing the beauty of shoreland grasses waving in the breeze and ducks paddling through a stand of bulrush. We are losing the unique character of Minnesota. It is critical that we act, and act now, to protect our vanishing healthy shoreland and help recover what has been lost.



We know that natural shoreline loss is a problem. We also know that the status quo is not working. Despite fifty years of state shoreline vegetation standards and local government regulation, the system has failed to adequately protect our natural shorelines. Additional efforts such as education and enforcement have been only marginally successful.

After listening to many people and organizations about protecting and restoring shorelines, several reoccurring themes emerged. First, local government staff, at the forefront of property owner interactions, need support and additional technical guidance to promote and facilitate shoreline restoration. Second, there is evidence that civic engagement approaches can effectively shift social norms towards protecting and restoring natural shorelines. However, such approaches take a long time to be successful, and require a continuous and focused champion to gain and sustain momentum. Third, effective partnerships from neighboring states may be models to advance protection and restoration of natural shorelines.

The problem's large scale means there are no easy solutions. We suggest additional discussions and explorations on the following questions:

- 1. How can the magnitude of the loss of natural shoreline, with the associated negative consequences to lake quality, be communicated with the general public and those that own lakeshore property across the state?
- 2. What types of strategies, programs, or initiatives whether at the local, regional, or statewide level demonstrate success in shoreland restoration? How can we emulate those strategies?
- 3. What additional social science on the social norms of lakeshore homeowners will be helpful to better understand their awareness, attitudes, and obligations to act to protect and restore shoreline?

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Definitions

Natural shorelands – developed and undeveloped shoreland with (1) a substantial portion of the shoreline frontage with trees, shrubs, and natural ground cover, and (2) an aquatic zone with limited alteration and intact plant stands and woody habitat.

Healthy shoreland – "one that is sustainable – that is, it has the ability to maintain its structure (organization) and function (vigor) over time in the face of external stress (resilience)."¹

Social norm – "shared standards of acceptable behavior by groups. Social norms can both be informal understandings that govern the behavior of members of a society, as well as be codified into rules and laws. Social normative influences or social norms, are deemed to be powerful drivers of human behavioral changes and well organized and incorporated by major theories which explain human behavior."²



¹ Costanza, R., and M. Mageau. 1999. What is a healthy ecosystem. Aquatic Ecology 33:105-115.

² https://en.wikipedia.org/wiki/Social_norm

The Nature of Lakes

Once something is lost, it is often hard and costly to recover. This is true for lakes. Water quality restoration projects for lakes are often measured in the millions of dollars. And unfortunately, lake water quality may fail to recover even after water pollution sources are eliminated or substantially reduced. For Minnesota lakes, phosphorus is the limiting nutrient for algae production³. Phosphorus pollution accelerates the rate of lake aging, otherwise known as eutrophication⁴. This means more frequent noxious algae blooms and fish kills, excessive plant growth, and loss of water clarity. Once in a lake phosphorus continues to cycle, degrading lake quality for a long time⁵. Eutrophication can also alter oxygen dynamics within a lake as dissolved oxygen is consumed by bacteria as they feed on dead algae and other organisms⁶.

While water quality restoration is very difficult and often cost-prohibitive, fish and wildlife habitat and scenic character are more easily recovered with low-cost, no-mow approaches or with professional expertise at a manageable cost. If private property owners tap into existing lakescaping information or professional assistance, they can recover their natural shoreland lot by lot, lake by lake. For many lakes, natural shoreland restoration can also help to maintain or improve lake water quality.

Minnesota's lake shorelands will require a dual approach: 1) protecting natural shorelands and 2) recovering these shorelands where they have been lost. First, a quick review of the benefits of natural shorelands.

Benefits of Natural Shorelands

For surface waters, land conditions closest to the water greatly influence water quality. This proximity principle is key to understanding the value of natural shorelands—they are the first and last defense to protect lake and river quality. Natural shorelands are corridors of diverse vegetation along rivers, streams, and lakes which help protect water quality by providing a transition between upland development and adjoining water. Abundant, diverse vegetation holds and filters runoff; stabilizes lakeshores and riverbanks; reduces erosion and limits sedimentation; provides habitat for fish and wildlife; and offers scenic screening of shoreline development⁷.

³ Carpenter, S. R. 2008. Phosphorus control is critical to mitigating eutrophication. Proceedings of the National Academy of Science of the United States of America 105:11039-11040.

⁴ Smith et al. 2014. Comment: Cultural eutrophication of natural lakes in the United States is real and widespread. Limnology and Oceanography 59:2217-2225.

⁵ Osgood, D. 2016. Internal loading sustains lake phosphorus impairment. Lakeline 10-12.

⁶ There are only a few Minnesota lakes that have recovered after phosphorus pollution was substantially reduced. For example, Trout Lake in Coleraine received untreated wastewater from 1910 to 1987, but water quality gradually rebounded after wastewater treatment began in 1987. Deep lakes with low rates of phosphorus recycling are more likely to recover after large reductions in external pollution loading than shallow lakes that generally have high rates of phosphorus recycling from sediments. The reason is that deep lakes stratify during the summer trapping phosphorus in the hypolimnion, except during spring and fall turnover, which is not the case for shallow lakes. ⁷ Bentrup, G. 2008. *Conservation buffers: design guidelines for buffers, corridors, and greenways.* Gen. Tech. Rep. SRS-109, U.S. Department of Agriculture, Forest Service, Southern Research Station, Asheville, NC.

Plants growing along the shore slow the movement of rainwater runoff. Shore vegetation allows sediment contained in the runoff to settle out and water to infiltrate into the ground near where it falls. Pollutant removal increases with increasing vegetation cover. Shoreline vegetation, such as bulrush, also reduces bank and shoreline erosion. These plants dampen the force of waves, and their deep roots hold the shoreline together. Trees are an important component of natural shorelands. They provide shade, privacy screening, and wildlife habitat. Downed wood, from small branches to whole trees, supplies important habitat for fishes, frogs, turtles, waterbirds, insects, and mammals. Near-shore downed trees also blunt waves and ice action that scours the shore.



A vegetated shoreline provides benefits besides water quality protection as well. Natural shorelines adapt better to changes in precipitation and changing lake levels, as well as to intense rainfall events. Natural shorelines cost less to maintain both for bank stabilization and scenic benefits. A shoreline buffer, with thoughtfully pruned trees and shrubs, provides a beautiful picture frame for the lake that screens the view of the neighbors.

Loss of Water Quality

Small additions of phosphorus, a plant nutrient rich in Minnesota soils, can lead to large reductions in water clarity. Just one pound of phosphorus added to the lake along shore can produce 500 pounds of algae near the dock and on the swimming beach.

While many lakeshore owners leave or restore native vegetation along the shore, some homeowners plant and mow a lawn down to the lake. The loss of shoreline vegetation leads to high pollution runoff and increased soil erosion. A 'lawn to lake' shoreline allows 7 to 9 times more phosphorus to enter the lake than a more naturally vegetated shoreline⁸. While the amount of phosphorus entering the lake from shoreline lots varies due to soil, slope, and other site-specific conditions, the average pollution from a 'lawn to lake' lot has been estimated at 0.2 pounds of phosphorus per summer compared to 0.03 pounds per summer for a lot with a native vegetated shoreline buffer. This increase in nutrient pollution can result in the generation of 100 pounds of algae along one shore lot compared to just 15 pounds under natural conditions. This runoff pollution accumulates around a lake, often creating serious water quality problems. This problem is especially noticeable in those lakes with small watersheds and little or no surface water outflow. The 'lawn to lake' management style also fragments the shoreline, making it vulnerable to waves from wind and boat traffic. The shallow roots of turf are insufficient to hold the soil, leading to shore and bank erosion.



⁸ Radomski, P. J., and K. Van Assche. 2014. *Lakeshore Living: Designing Lake Places and Communities in the Footprints of Environmental Writers*. Michigan State University Press, East Lansing.

The lake's watershed to lake size ratio (W:L) explains where the loss of natural shorelines is most important⁹. Research found that lakes with large W:L ratios had a low proportion of their total phosphorus (TP) load due to the loss of natural shorelines. For these lakes, on average 1.5% of the total load came from lakeshore residential lawns and development. However, for lakes with low W:L ratios, on average 19% of the total pollutant load was attributed to lakeshore residential lawns and development, with some lakes having a high proportion of the pollutant load due to the loss of their natural shorelines. Lakes with medium W:L ratios had intermediate results; for these lakes, on average 10% of the lake's TP pollution load was coming from lakeshore residential lawns and development.

The results demonstrate the consequential phosphorus pollution from the loss of natural shorelines for lakes with small or medium watersheds. About half of Minnesota lakes have small or medium W:L ratios, so strategies that prioritize the restoration and protection of these sensitive riparian areas are needed to address this source of lake pollution.



Loss of Water Infiltration

The loss of natural shorelands, with corresponding increases in impervious surfaces and lawns, increases both the amount of runoff and the quantity of pollutants and nutrients reaching lakes and rivers¹⁰. Our failure to manage rainwater results in erosion and sedimentation, which in turn triggers a series of processes that reduce water and habitat quality. Stormwater runoff is considered a major source of water pollution, and may be responsible for considerable water quality impairment. Perhaps the single greatest threat to lakes from sediment is as a carrier of phosphorus to the lake. In residential areas, the largest source of phosphorus entering lakes comes from lawn and impervious surface runoff. Rainwater runoff originates from streets, driveways, parking lots, roofs, and other impervious surfaces. Water flowing over these surfaces

 ⁹ Radomski, P. 2023. Use of Score-the-Shore, Lakes of Phosphorus Sensitivity Significance, and existing reported phosphorus yields from lawn-to-lake and natural shorelines to approximate riparian phosphorus loading.
 ¹⁰ Schueler, T. R. 2003. *Impacts of Impervious Cover on Aquatic Systems*. Watershed Protection Research Monograph No. 1, Center for Watershed Protection, Ellicott City, MD.

picks up dirt, nutrients, pesticides, toxic chemicals, pet waste, and other pollutants. Rainwater that does not infiltrate into the ground or evaporate runs downhill to lakes, wetlands, or rivers.

Rainwater runoff from developed 'lawn to lake' managed shorelines was measured 5 to 10 times higher than from forested shorelines, with a high percentage of storms resulting in runoff. Lawns and urban soils are often very compacted and may act like impervious surfaces in increasing rainwater runoff. Many lakeshore sites have been heavily graded during construction. The depressions and swales that would normally retard runoff are often graded over, the topsoil removed, and the underlying soil compacted, making a flat lawn that acts like pavement in its inability to infiltrate and reduce stormwater runoff. There is a direct relationship between impervious surface coverage and phosphorus runoff pollution. As impervious surface coverage exceeds 10-12 percent of the watershed (which is typical for suburban/urban Minnesota lakes) without a comprehensive approach to manage rainwater, water quality is generally negatively impacted.

Loss of Fish and Wildlife

The loss of natural shorelands has a profound effect on fish and wildlife. Many Minnesota lakes are in poor biological condition because of the loss of fish and wildlife habitat¹¹, and over one hundred lakes have been listed for aquatic life impairment¹². Fish diversity and abundance are altered with the loss of shoreland health¹³.

Aquatic plant losses eliminate fish and wildlife habitat. Unhealthy shorelands lead to nutrient pollution, increased water turbidity and reduced deepwater oxygen supplies; these conditions impact both shallow water sight-feeding fish like panfish and bass and deepwater fish like cisco and lake trout which require abundant oxygen in the cold, deep waters. Changes in aquatic plant



¹¹ U.S. EPA. 2009. National Lakes Assessment: A Collaborative Survey of the Nation's Lakes. U.S. Environmental Protection Agency, Publication EPA-841-R-09-001, Office of Water and Office of Research and Development, Washington, D.C.

¹² https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list

¹³ DNR. 2018. Stressors to biological communities in Minnesota's lakes. Minnesota Department of Natural Resources, Division of Fish and Wildlife.

communities may also occur with shoreline alterations. Riprap and retaining walls are expensive and negatively affect lakes by creating a barrier between upland areas and the shoreline environment¹⁴. Poor treatment of the shoreline often corresponds to poor treatment of the aquatic zone. Developed shorelines often have less floating-leaf and emergent vegetative cover than undeveloped shorelines. Elimination of this vegetation also eliminates food and cover for a variety of insects, birds, and amphibians.

Fragmented habitat forces wildlife to spend extra time and energy seeking access to nesting, basking, and feeding sites. Trees, shrubs, and the forest understory near the shore have declined over time along many developed shorelines. This change in shoreline habitat negatively affects wildlife – although geese appear to appreciate the space, and create a nuisance with their droppings, aggressive behavior, and noise. Loons, however, will not likely nest on a lawn or a beach; they prefer to nest near shore on vegetated hummocks, small islands, or masses of emergent vegetation. The loss of trees along shore means fewer trees fall into the water. Biologists have determined that this loss of trees due to development will negatively affect fish populations for centuries¹⁵.

There is also a definitive link between impervious surface cover and fish. Sedimentation and toxic pollutant runoff to streams and lakes increase with imperviousness, and lead to reduced fish reproductive success and survival. The winter use of salt for sidewalks, driveways, and road deicing results in increasing sodium and chloride concentrations in lakes, which at high concentrations can harm plants, frogs, fish, and other organisms.



State of Lake Shorelands in Minnesota

The Minnesota DNR developed a rapid assessment method for objectively evaluating shoreland health for lakes¹⁶. The Score-the-Shore survey protocol was designed to (1) determine a lakewide

¹⁴ Riprap should only be used where necessary and never to replace a stable, naturally vegetated shoreline. See: <u>https://files.dnr.state.mn.us/publications/waters/shoreline_alterations_lakescaping.pdf</u>

¹⁵ Roth et al. 2007. Linking terrestrial and aquatic ecosystems: the role of woody habitat in lake food webs. Ecological Modelling 203:439-452.

¹⁶ Perleberg, D., P. Radomski, S. Simon, K. Carlson, C. Millaway, J. Knopik, and B. Holbrook. 2019. Minnesota Lake Plant Survey Manual, version 3, for use by Fisheries Section, EWR Lake Unit, and EWR Minnesota Biological Survey Unit. Minnesota Department of Natural Resources. Ecological and Water Resources Division.

lakeshore habitat score with modest precision; (2) detect changes over time, and (3) compare lakewide lakeshore habitat scores to regional patterns and trends.

DNR biologists have conducted these surveys on 785 lakes across the state in association with MPCA's watershed-based monitoring schedule. Each site on the lake receives a relative measure of the extent of the natural shoreland present at the site¹⁷.

The results from this sample of lakes indicate that Minnesota has currently lost 40 to 50% of its natural shorelands. Lakes in central Minnesota have lost the most natural shorelands (Figure 1). In this region of the state, about 28% of the lakes had shores that scored low for protection of natural shoreland. Northern Minnesota was more likely to have lakes with high scores. In all regions of the state, most lakes received moderate scores. However, this does not tell the whole story. Recomputing lake scores for only developed shores (parcels with structures) indicated even worse results – for most lakes the developed shore was rated low or very low (Figure 2). A greater percentage of northern Minnesota lakes still had high or moderate scores (48%) compared to central Minnesota lakes (32%), indicating a slight regional difference in shoreland stewardship.

The rate of natural shoreline loss is estimated to be 1 to 2% per year¹⁸. At this rate of loss, a majority of Minnesota shorelines will soon be damaged unable to protect water quality and providing fish and wildlife habitat.



¹⁷ Given that the social norm for shoreland stewardship likely falls on a continuum from a preference for suburban/urban lawn to a deference for nature with a preference for a more natural setting and healthy shoreland, the average of the site scores is used to assign the lake's Shoreland Stewardship Quality class (a 'High' classification indicates a lake with a lot of natural shoreland present and a 'Low' or 'Very Low' score indicates a lake with little natural shoreland remaining).

¹⁸ This estimate is based on past losses of nearshore vegetation and assuming concurrent shoreline losses (Radomski 2006).



Figure 1. Score-the-Shore survey results by DNR administrative region.





The Paradox

The Minnesota Legislature has recognized the benefits of natural shorelines by enacting policies to protect them. Minnesota Statutes specify policies to conserve and use water resources in the best interests of its people, and to promote the public health, safety, and welfare. It is also the policy of the state to promote the retention and conservation of all water falling from the sky in the areas where it falls. Natural shorelands are critical in achieving these policies, so statewide shoreland development standards (Minnesota Rule 6120) include provisions to protect shorelines from destructive alteration. However, the state of lake shorelands is dire. Regulations have not stopped shoreline alterations, lot by lot, year by year, and lake by lake.

Lakeshore property owners value healthy lakes and clean water¹⁹. But, there is a paradox: a portion of this population's actions are inconsistent with lake protection. To effectively address the loss of natural shoreland, we need to better understand what is driving the removal of natural shorelines and preference for suburban lawns in lake country. Addressing the contradictions between values and actions will require an entirely new approach. This is THE PROBLEM we hope to address.

The science and data are available; lack of information is not the issue. The connection between behavior (both individual and collective), knowledge and values is the issue, and understanding and making this connection is critically important. In addition to revised regulations, we believe a bottom-up, community approach is necessary to provide a more comprehensive solution to this environmental problem.



¹⁹ Eckman, K., M. Blickenderfer, and S. Henry. 2012. Native Shoreland Buffer Incentives (NSBI) Project: Final Report—Social Research and Efficacy Outcomes. University of Minnesota Water Resources Center.

Overview of Efforts to Limit Loss of Natural Shorelands

Decline in state agency technical guidance for private property restoration

There are several agencies and organizations that invest in protecting against natural shoreland loss or assisting with the restoration of shoreland. However, there has also been a significant decline of agency expertise available for shoreland protection and restoration. The DNR and the University of Minnesota Extension are notable examples of such technical expertise loss. With shifting priorities, this expertise is no longer available to private lakeshore property owners requesting assistance on shoreline restoration. The DNR Legacy Fund Restoration Evaluation Report²⁰ noted that practitioners wanted more trainings to learn from experts. The report also recommended consistent minimum design criteria for lakeshore projects developed with guidance from the few state agency staff with this expertise. Similarly, the DNR 2020 County Shoreland Activity Summary Report²¹ reported local government staff requesting more training on shoreline vegetation restoration and professional guidance on land alteration best management practices. Clearly, there is a need for more technical guidance to local government staff on topics related to restoring shoreline.



Decline in state agency funding for private property restoration projects The DNR phased out direct grants to property owners for shoreline restoration projects.

State shoreland vegetation standards are ineffective at protecting natural shorelands

²⁰ https://www.dnr.state.mn.us/legacy/restoration-evaluation.html

²¹ <u>https://files.dnr.state.mn.us/waters/watermgmt_section/shoreland/county-shoreland-activities-summary.pdf</u>

Under the Shoreland Management Act, the DNR establishes shoreland regulations and sets the shoreland development standards for local governments. Counties and cities implement those regulations through local zoning. This approach has a long history in Minnesota. The Shoreland Management Act was passed through bipartisan legislation in 1969. The State's standards and associated criteria were intended to preserve and enhance the quality of surface waters and conserve the economic and natural environmental values of shorelands. State and local government officials have long recognized and acknowledged limitations of an exclusively rule-based approach to protect natural shorelands. The State's standards prohibit the clear cutting of vegetation along the shore and on bluffs and allow limited cutting in certain poorly defined situations. There are no requirements for restoration once vegetation has been removed. These shoreland vegetation standards are difficult to enforce due to the cost of monitoring, the scale of non-compliance, and the limited resources of the county and city government. In addition, the loss of natural shorelands is often gradual or due to the actions of past property owners.

DNR efforts to promote protection and restoration of natural shorelands

In addition to oversight of shoreland ordinance administration, the DNR encourages voluntary efforts of natural shoreland protection. In the early 2000s, the DNR promoted natural shorelines through their "Our Waters-Our Choices" project. The DNR also developed "Restore Your Shore", a do-it-youself tool for shoreland owners and professionals to guide shoreland restoration and protection projects²². Similarly, the DNR created "Score Your Shore", a tool for evaluating habitat on lake lots²³. Finally, the DNR Shoreland Program highlights and promotes examples of innovative, voluntary higher shoreland standards that local governments have implemented. These include higher standards for shoreline vegetation protection and restoration.

Tribal Resource Management Agencies

The protection of water, land, forest, fish, plants, and other natural and cultural resources present on reservations and beyond is a key mission of these agencies. Their responsibilities and values include protecting the many natural resources for the use of future generations. While tribal management of natural resources appears similar to DNR management, as we understand, tribal management incorporates local ecological knowledge in a cultural context that recognizes a reciprocal relationship with the rest of nature²⁴. For example, wild rice is a sacred tradition, and the protection of wild rice is critical, and wild rice harvests are regulated.

University of Minnesota Extension

University of Minnesota Extension has engaged in several shoreland protection and restoration initiatives over the past 20 years, including the Minnesota Shoreland Management Resource Guide²⁵, which provided information and resources related to sustainable shoreland management practices. Extension also created the Itasca Shoreland Advisors Program, in collaboration with Itasca Waters²⁶, as a model for engaging local communities in shoreland protection and restoration activities. Extension currently provides information on a variety of shoreland topics

²² <u>https://www.dnr.state.mn.us/rys/index.html</u>

²³ https://www.dnr.state.mn.us/scoreyourshore/index.html

²⁴ Bussey, J., M. A. Davenport, M. R. Emery, Marla, and C. Carroll. 2016. A lot of it comes from the heart: the nature and integration of ecological knowledge in tribal and nontribal forest management. Journal of Forestry 114:97-107.

²⁵ <u>https://www.shorelandmanagement.org</u>

²⁶ <u>https://itascawaters.org</u>

to educate shoreland property owners on how to protect and preserve water quality by following best management practices (BMPs) for their property²⁷.

Recently, Extension has ramped up programming to address aquatic invasive species (AIS) concerns in Minnesota. The AIS Detectors program, launched in 2017, is a partnership between Extension and the Minnesota Aquatic Invasive Species Research Center. The AIS Detectors Core Course and volunteer program empowers Minnesotans to become part of the solution to aquatic invasive species problems by engaging with their communities to share knowledge and best practices. Other offerings of the AIS Detectors program include a virtual course to teach non-professionals about aquatic invasive species management (AIS Management 101), an annual aquatic invasive species early detection event (Starry Trek), a free webinar series, and more²⁸.

Local Resource Agencies (Soil & Water Conservation Districts, Watershed Organizations, Environmental Services, etc.)

These local resource agencies provide a critical connection to citizens on the protection and restoration of natural shorelands. They provide excellent information on lake stewardship in print and online. They have knowledge of local values, organizations, networks and ways of leveraging local capacity that others do not. Resource agency staff assist property owners with technical information, design, cost share, and implementation of stormwater, erosion control, and natural shoreland projects.

Local Governments with zoning authority (counties, cities, townships)

Local governments implement the shoreland standards through local zoning ordinances and are the regulatory authority for land use on the land (above the ordinary highwater level). Their work includes administration and enforcement of local shoreland ordinances (e.g., construction, sewer systems, drainage, stormwater management, land alterations, and vegetation removal) and other work on shoreland property that is relevant to water quality.

Many local governments are understaffed in relation to the demand of services. They approve plans and permits for development and work in the shoreland, but often do not have the time to review that the work done was in compliance with the permit or ordinance. Variances are often seen as one of the bigger problems with lake shoreland management. Some local administrators see them as an opportunity to improve shoreland conditions; for example, shoreline restoration for a granted variance may be an appropriate condition to mitigate impacts of the proposed activity. There are also some variance requests that get approved that should have never been approved.

Minnesota Lakes and Rivers Advocates (MLR)

Minnesota Lakes and Rivers Advocates is a non-profit advocacy group focused on protecting Minnesota's lake and river heritage for current and future generations by forging powerful links between lake advocates and policy makers. MLR seeks to leverage the important contributions that lake home and cabin owners and lake associations can make to the preservation of our lakes and rivers.

²⁷ https://extension.umn.edu/lakes-and-wetlands/shoreland-properties

²⁸ <u>www.aisdetectors.org</u>

In the 1990s, through property owner surveys and reviews of taxing data, MLR saw evidence that as property tax pressure on shorelines grew, owners were forced to subdivide and sell shoreline property because it had become unaffordable. In the decade from 2000 to 2010 the average size of a seasonal lot fell by almost 50%, to about 40 acres. To slow this trend and help protect water quality, MLR worked to drive down the class rate on seasonal recreational property until today it is the same as a Homestead. They also worked to extend the Sustainable Forest Incentive Act (SFIA) and the Managed Forest Class rebates and tax reductions to include property adjacent to water. MLR continues to work to create a property tax refund or other incentive to encourage people to go beyond current statutes and manage their shoreline in a way that protects water quality and increases habitat.

In addition, MLR recently launched the Lake Steward program to support lake associations in their efforts to educate shoreland owners and create a shoreland preservation ethic. Shoreland owners that meet 10 criteria for lake stewardship are awarded a beautiful Lake Steward sign to put on their dock. The sign, in addition to rewarding the stewards, helps to shift the social norm (see 'social proof' below). The program was popular this summer, with over ten lake associations in various parts of the state participating and hundreds of site visits (the primary shoreland owner educational opportunity) completed. The Lake Steward program creates partnership opportunities with local resource managers and state agency professionals. The Board of the city of East Gull Lake voted to include language promoting Lake Steward on the permit applications for shoreland development. MLR will work to expand the Lake Steward program in 2022 and thereafter.



Freshwater Society

The mission of the Freshwater Society is to inspire and empower people to value and preserve our freshwater resources. Since 1968, Freshwater has been a leading public nonprofit organization dedicated to preserving freshwater resources and their surrounding watersheds.

The Freshwater Society has a program that certifies Minnesota Water Stewards, who then go on to volunteer their time for watershed districts, cities, counties, and environmental groups; participate on city and local government boards; influence policy; and improve the health of our waters²⁹. The program is a partnership between the Freshwater Society and participating cities, counties, watershed management organizations and non-profits³⁰. Since the Freshwater Society developed the Minnesota Water Stewards program in 2013, more than 400 Stewards have been certified and are volunteering their time. These Minnesota Water Stewards have: connected with thousands of people through outreach and educational events; installed or planned hundreds of projects, including raingardens, rain barrels, cisterns, dry creek beds, permeable driveways, prairie restorations, home water audits, school gardens, and library education programs; created art that informs, educates, and inspires others to take action for water; and prevented millions of gallons of polluted stormwater runoff from entering our lakes, rivers, and streams each year.

MN COLA & Lake Associations

MN COLA is a volunteer organization with the mission of preserving, protecting and improving the waters and shorelands of the State of Minnesota through advocacy, education, and sharing of best practices.

Minnesota Coalition of Lake Associations provides information and a regular forum for discussion among lake association members from throughout the state. While all issues of lake life, recreation and environmental protection are topics of interest, recent years have been dominated by efforts to improve actions that prevent the spread of aquatic invasive species. As principal decision makers for private shoreland, Lake Association members and leaders are on the front line to prevent damage to the natural riparian zone by means of Best Management Practices. MN COLA also works closely with MLR for legislative advocacy which includes shoreland issues. There are many lake associations and county lake groups doing excellent work on informing their members about shoreland management issues.

Shifting Perceptions of Shoreland Management

Our traditional approaches to protecting shoreland are insufficient. We need to find approaches that change the social norms around shoreland management and change the perceptions of a healthy shoreland landscape. These norms and perceptions should align with people's stated values of clean water and healthy lakes.

If it is true that the social norm for shoreland stewardship falls on a continuum from a preference for suburban/urban lawn to a deference for nature and a more natural setting and healthy

²⁹ https://freshwater.org/minnesota-water-stewards/

³⁰ https://minnesotawaterstewards.org

shoreland, the question is: how do we inspire more lakehome owners to shift to a desire for an ecologically friendly approach?

Our conservation problems are social problems and solutions will require shifting norms and actions. Collaborative approaches to address conservation may be the most effective way to begin working toward changing human behavior and perceptions. Brown (2011)³¹ stated, "since wicked problems are generated by the society in which they are set, their resolution will necessarily involve changes in the society that produced them."

Some people may change their behavior when they are repeatedly confronted with facts, and most people are receptive to the subtle messaging of social norms. Dr. Everett Rogers (1931-2004), *Diffusion of Innovations*³², studied how new ideas and practices permeate society and why some innovations fail to catch on. Rogers noted that when an innovation successfully spreads out through a community it generally follows an S-shaped pattern of adoption over time. An innovation is initially slow to catch on, then adoption speeds up as word spreads, and finally there is a leveling off of adoption as the innovation saturates the population. The rate of adoption is usually a function of the innovation. If the innovation has advantages over existing practices, is compatible with values and experiences, is less complex, is easy to experiment with, and has high visibility to others in the community, then it is more likely to have a high rate of adoption. Rogers identified several important steps in the diffusion of innovation, and he found that to succeed in adoption a person needs: (1) to learn about an innovation; (2) to be persuaded about the merits of the innovation; (3) to try out the innovation, often with experimentation; and (4) to hear confirmation of the innovation's merits from peers (positive reinforcement). Rogers also grouped people into adopter categories: innovators, early adopters, early majority, late majority, and laggards. Naturally, one

first needs to focus on the innovators and early adopters to advance the S-shaped adoption curve. Open-mind community opinion leaders and professionals that promote innovations help to speed up diffusion.

Dr. Robert Cialdini, *Influence*³³, details seven principles of persuasion, of which six are applicable for promoting natural shorelands. First, <u>reciprocity</u> is when we put ourselves in a position of giving



³¹ Brown, V.A. 2011. Collective inquiry and its wicked problems. In *Tacking Wicked Problems through the*

Transdisciplinary Imagination. Edited by V.A. Brown, J.A. Harris, and J.Y. Russell. Earthscan, Washington, D.C. ³² Rogers, F. M. 2002, Diffusion of Imputations, 5th addition, Erec. New York, NY

³² Rogers, E. M. 2003. *Diffusion of Innovations, 5th edition*. Free Press, New York, NY.

³³ Cialdini, R. B. 2021. Influence: the psychology of persuasion, expanded edition. Harber Collins, New York, NY.

information. This information may come back to us, as often people have an obligation to give when they receive. Second is '<u>liking the messenger</u>', which recognizes that we prefer to say yes to those people we like. Third is <u>social proof</u>, in that we will follow the lead of others (the basis of Rogers's *Diffusion of Innovations*). Another is <u>authority</u>. We want to follow the lead of true experts or genuine authorities that we respect. Next is <u>commitment/consistency</u>. When we commit to somebody, we want to be consistent with that commitment. The sixth is <u>unity</u>. We want to say yes to those who are one of us. If these principles are used honestly and with good intent, we can help others to make good decisions and take positive action for Minnesota lakes. The shorthand for all the above is a 'public relationship', and a group or cluster of interlocking public relationships around an issue is the civic infrastructure.

Minnesota Research

The Native Shoreland Buffer Incentives Project was led by Karlyn Eckman, University of Minnesota³⁴. This project used Knowledge-Attitude-Practice (KAP) surveys to determine the best strategies for implementing a natural buffer incentive program in two Minnesota counties³⁵. This research found that an understanding of the knowledge, attitudes, and practices already in place among shoreland communities could be reinforced and augmented with strategic incentives to do more. Crucially, the KAP surveys served as the foundation for action toward retaining and restoring a natural shoreland and two counties developed very different programs and results based on the research.

The trial buffer incentive program in East Otter Tail County, administered by the county LGU's shoreland technician, used a Lakeshore Landscaping Manual with design templates. Although participants were provided with workshops, printed material, and a customized approach for individual sites, the scope appeared to have been too large for a single administrator to provide the hands-on advice necessary for implementation. The Itasca County response to the KAP information was led by Mary Blickenderfer, UM Extension agent and botanist. She developed a peer-to-peer "Lake Challenge" worksheet that was an effective tool used by lakeshore property owners to act. Neighbors from the lake association and college students made the initial contact with an owner and reviewed a series of possible "challenges." Return visits were aided by the expertise from Extension together with Master Gardeners specially schooled in lakescaping techniques.

Beginning with surveys directed at this specific demographic of lakeshore owners, it was found that the simple offer of cost-shares for specific projects was itself not a major factor in motivation. For those already inclined and challenged to "do the right thing," the most important incentive was the presence of a true expert who could provide trusted details on a project. Although it can be expensive, such an expert was found to be the most cost-effective aspect. Many lake associations have similar programs that are based on neighbors providing advice on some obvious problems, but without the ability to provide complete solutions. An award is typically provided, such as a sign for the dock or mailbox certifying a promise to do good, backed by peers, and showcase projects can be honored once in place. Again, a willing owner

³⁴ Eckman, K., M. Blickenderfer, and S. Henry. 2012. Native Shoreland Buffer Incentives (NSBI) Project: Final Report—Social Research and Efficacy Outcomes. University of Minnesota Water Resources Center.
³⁵ <u>https://www.dnr.state.mn.us/nsbi/index.html</u>

needs project specifics from a natural resource professional, which serves as a motivating incentive to begin.

Drs. Mae Davenport and Amit K. Pradhananga, University of Minnesota, have conducted

extensive research on citizen motivations for engagement in water resources protection. They have found that property owners are more likely to engage in protection when they feel a personal or moral obligation to act and perceive that they have the ability to act³⁶. Personal obligation was found to be activated by conservation strategies that appealed to a person's altruistic values, an existing strong land ethic, and unity to their community. Personal norms were driven by individual awareness of the consequences of water pollution, understanding that water resource protection was a local responsibility, and the ability to act³⁷.





³⁶ Pradhananga, A. K., M. Davenport, and B. Olson. 2015. Landowner motivations for civic engagement in water resources protection. Journal of the American Water Resources Association 51:1600-1612.

³⁷ Pradhananga, A. K., M. A. Davenport, D. C. Fulton, G. M. Maruyama, and D. Current. 2017. An integrated moral obligation model for landowner conservation norms. Society and Natural Resources 30:212-227.

Agents of Change

Changing public perceptions and norms is a large and long term effort. Given the widespread desire for suburban/urban lawn shoreland landscapes, creating an interest in and desire for ecologically friendly landscapes is a daunting task in need of strong leadership. We don't have a clear answer as to what this effort should look like and we hope this paper will encourage a broader conversation of how to effect these changes. We do suggest these considerations in any conversation:

- 1. How can we harness the knowledge, passion, and existing networks of local resource agencies and non-profit organizations to coordinate and amplify efforts?
- 2. What key messages can be consistently delivered across the state and at the local level to build awareness of the problem and to advance property owner desires for natural shoreland landscapes?
- 3. What role should state agencies play?
- 4. What funding is needed to start and sustain this effort?
- 5. What kind of organization, working within what type of structure, and comprised of what people, is needed to implement the needed messages, programs and local assistance leading to this change?

The answers to some of these questions may be found in studying the work of other organizations that have addressed specific social problems. Following are examples with different organizational structures or frameworks that might provide a path forward:

- 1. MADD (Mothers Against Drunk Driving) Independent organization formed for a single, highly-focused mission with funding via grants, corporate and individual donors.
- 2. Midwest lake partnerships Alignment of organizations that collaborate on a shared interest, with members sharing duties in facilitating activities and funding from existing funds or grants.
 - a. The Wisconsin Lakes Partnership consists of the Wisconsin DNR, the University of Wisconsin Extension (specifically *Extension Lakes* - Wisconsin has a robust team of educators housed out of the University of Wisconsin-Stevens Point solely dedicated to preserving Wisconsin's legacy of lakes through education, communication, and collaboration), and Wisconsin Lakes (a non-profit statewide organization consisting of lake association and lake district members whose mission is to develop statewide solutions for the challenges faced by Wisconsin lakes while supporting strong local protection efforts).
 - b. The Michigan Natural Shoreline Partnership mission is to protect Michigan lakes through conservation and restoration of natural shorelines. The partnership is a collaboration of state agencies, academia, nonprofit organizations and private industry, formed in 2008. The partnership believes that a change in shoreline development practices is necessary – away from high impact methods that change the natural riparian condition to healthier and sustainable erosion control practices that restore/preserve the ecological function of the shoreline and effectively stabilize shoreline erosion - and that these changes can include attractive options to lakefront property owners.

Conclusion

We know that the loss of natural shorelines is a problem. We know what we've been doing is inadequate. Top-down control through rules, education, and enforcement is not enough. The magnitude of natural shoreline loss has become clear and it is troubling.

We have talked to many people and organizations, and we have listened to their stories. The messages are clear and consistent. We know there is a need for technical guidance on shoreline restoration and protection. We know there is evidence that a civic engagement approach of shifting social norms and values can be effective – but it won't be easy. And we know there are organizations and partnerships from neighboring states that might serve as models to help guide Minnesota.

Specific actions that could be taken include:

- 1. Strengthen the relationships between the many organizations with interest in protecting and restoring shoreland. These organizations include state government, local government, statewide non-profit organizations (like MLR, Freshwater Society, and MN COLA), and local organizations, such as lake associations and other local civic organizations.
 - a. Work to understand the roles each organization plays in shoreland protection and seek to align these roles to coincide with the strengths and capacity of each organization.
 - b. Make a concerted effort to engage in a dialogue with local organizations to better understand their needs and then use this information to improve guidance, tools, and programs.
- 2. Improve public outreach with a sustained, consistent message from all partner organizations.
- 3. Provide more training and outreach opportunities for key audiences including lakeshore landowners, landscape contractors and consultants.
- 4. Increase one-on-one landowner contacts by supporting grassroots/local efforts and enhancing the capacity of these efforts. Examples of this include the Lake Steward Program, the Master Water Steward Program, and the Lawns to Legumes Program.

Let's take these steps and pursue opportunities to ensure a future with natural shorelines and clean water.