Wisconsin Lakeshore **Restoration**

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The Wisconsin Lakeshore Restoration Project: A Growing Solution to Degraded Shorelines

For many of us, our lakeshore represents the sweep of one's heart, a place filled with memories of growing up, catching fish, watching frogs, and whiling away the sweet summer days. However, during the past few decades especially, the domestication of our shoreland buffers has altered the character of our shores in damaging ways (Bernthal 1997). But do not despair, change is afoot!

People around Wisconsin and beyond have been rethinking what is best for the lakes and for their families. They are taking on the task of restoring their shorelands to a more natural state. Lake residents and organizations, natural resource agencies from the Wisconsin Department of Natural Resources (WDNR) to local land conservation districts, as well as tribal entities, energy companies, and businesses such as resorts and restaurants, have all embraced the idea of restoring shoreland buffers. A lot of great things can come from this effort.

Reestablished shoreland buffers improve wildlife habitat so there is more for our families to enjoy. These shoreland buffers enhance water quality, helping our lakes become healthier and more satisfying for everyone. Often these projects form teams, including local contractors, nurseries, consultants, and others specializing in shoreland work. Miles of shoreline have been returned to more naturalized habitat, with the full complement of structure including trees, shrubs, and ground layers of native sedges, grasses, ferns, and wildflowers.

People have done so, in part, because the restored shores hold a promise of revitalized habitat, and of new areas that are more inviting to green frogs, turtles, mink, otters, and young fish (Cunningham 2000). These renewed shorelands also buffer lakes from increased nutrients and sediments that can reach them through surface water runoff. But how successful have we been at improving ecological conditions, biological diversity, or productivity of damaged lakeshores?

Growth of a Restoration Partnership

Lakeshore property owners and other practitioners are enthusiastic and committed to shoreland buffer reestablishment. But they need additional help from researchers in the form of new data on effective techniques, planting strategies, erosion control measures, and other details of successful restorations. The origins of this project go back to informal discussions between WDNR researchers, land and water conservation staff, and zoning department folks in northern Wisconsin a few years ago. Together they realized that shoreland restoration activities were going on all over the state, yet our understanding of the science behind these endeavors was lacking.

Over the last two years, researchers working with the Wisconsin Lakeshore Restoration Project have been trying to get some answers. This project seeks to quantify the ecological and water quality benefits associated with buffer renewal by measuring the value of fish and wildlife habitat restoration. It is a collaborative partnership that includes shoreland property owners, lake groups, state and county agencies, local plant nurseries, academia, and other partners.

The project compares and contrasts habitat and water quality data between developed and undeveloped lakes that were identified by WDNR researchers for the study. These pairings of lakes share similar lake characteristics like chemistry, size, type, and landscape positioning. Through the project partnership, four developed lakes in the study are getting significant stretches of shoreland buffer restored. Baseline data from these lakes are then compared to untreated controlled sites on the same lake and to reference sites on undeveloped lakes.

This project started in 2007 with several shoreland buffer restorations on Found Lake in Vilas County, an area of Wisconsin that is home to the third-largest concentration of freshwater glacial lakes on the planet. Back in 1999, this 326-acre drainage lake was hit with high winds on the northern shoreline from a major storm. The wind event produced many downed trees, including old growth red and white pines. Several shoreland property owners were left with large gaps in their lakeshore buffer areas. In the aftermath of this storm, lakeshore landowners, natural resource professionals, local lake organizations, area businesses, and others decided they could make a difference for their lake by trying shoreland buffer reestablishment through the Wisconsin Shoreland Restoration Project. The response from the area's lake community was incredible.

First, the project leaders set up a study design between WDNR researchers, Vilas County Land and Water Conservation staff, and Department of Agriculture, Trade and Consumer Protection (DATCP) engineers. Lake group representatives assisted as well. Organizers started pitching the idea of doing shoreland restoration and erosion

control work on waterfront properties using their resources to help riparians. They went to lake association meetings to ask prospective landowners if they would commit to the ten-year length of the study through a conservation contract with county officials.

Several families signed contracts for the conservation plans to move forward. By the spring of 2007, over $40,000 in state grants and other funding had been raised to be used for restoring multiple shoreland buffers. Some 4,500 native plants were placed on different properties located on the north shore of Found Lake during the first field season. Despite a historic drought, curious white-tailed deer, and hungry bunnies, the first six shoreland restoration sites of the Wisconsin Shoreland Restoration Project were established and thriving. An additional eight sites were designed and installed in the 2008 field season. In the first two years of the project, nearly 1,300 feet of continuous shoreline frontage was reestablished.

Another aspect of the project had DATCP staff leading a team in designing shoreline erosion control treatments for some property owners. The team worked together on testing the effectiveness of different treatments on several Found Lake sites, from biologs to ShoreSox®, EnviroLok® bags to soil lifts, rain gardens to straw matting (see Figures 1 and 2).

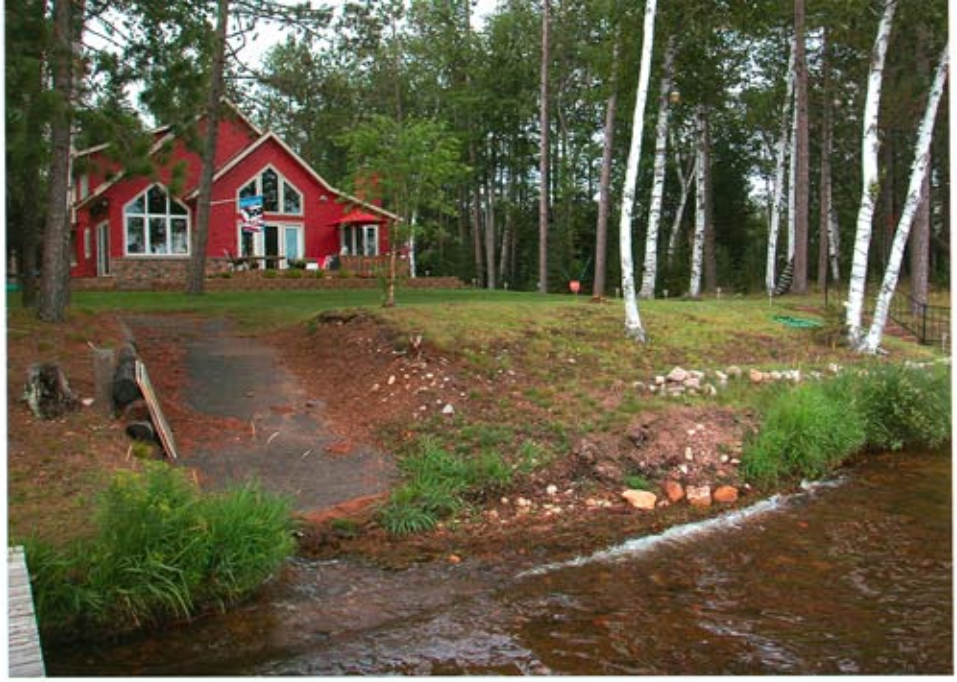

Figure 1. Hvam site on Found Lake before shot; notice spotty turf grass, exposed soil, and erosion problem caused by asphalt boat access.

Figure 2. Hvam site on Found Lake after shot; straw matting with native seed mix woven in replaces boat access and other erosion control and native species plantings in 2008 field season.

So What is the Study Measuring for the Benefit of Fish and Wildlife Habitat?

Biotic surveys included baseline inventories done before the conservation work began. Each portion of targeted shoreline, including restoration, control, and reference sites, was sampled for vegetation characteristics. Surveys for herptiles, breeding birds, small mammals, and furbearers were also completed initially, and then they are repeated annually as the conservation projects continue over the ten-year period of the study. Motion-sensing cameras were deployed on shorelines to record presence and absence of mid- to large-size mammals.

The project also examined the use of woody material on restored plantings. Researchers randomly assembled a set of three-meter by three-meter experimental plots, varying the percentage of woody material area cover from high (50%), to low (25%), to no cover. Woody material was defined as branches $\geq$ 2.5 cm and $\leq$ 10 cm in diameter and $\leq$ 3-meter in length. It was acquired from a recent logging site nearby (see Figure 3).

Each of these woody material plots had an identical suite of native shrubs, grasses, and forbs planted including: two shrubs, sweet-fern (*Comptonia peregrina*) and snowberry (*Symphoricarpos albus*); the grass little bluestem (*Schizachyrium scoparium*); and several wildflowers, barren-strawberry (*Waldsteinia fragarioides*), bee balm (*Monarda fistulosa*), big-leaf aster (*Aster macrophyllus*), and pearly everlasting (*Anaphalis margaritacea*). A total of 30 shrubs and 750 ground cover species

Figure 3. Kobelt site on Found Lake post planting in summer 2007; note woody material plots next to paper birch trees.

were uniquely identified with a numbered metal tag on a wire ring placed around the base of the shrubs and with a six penny nail secured near the ground cover species. The preliminary results indicate that sites with a higher percentage of woody material area covered retain more moisture. Further, soil temperatures varied less on plots with woody material versus no cover (see Figure 4).

The balance of the plantings on these initial sites included native trees, shrubs, grasses, sedges, ferns, and wildflowers that one would expect to encounter on dry, sandy shorelines around northeastern Wisconsin lakes. The plant material also had to be available from local nurseries and growers (i.e., propagation friendly species) and its seed source needed to be from within approximately 150 miles of the study area.

After factoring in the existing vegetation for each site, planting plans and erosion control measures were developed by local planners using the standards laid out in the Natural Resources Conservation Service 580 and 643A codes (NRCS 2005 and 2001). Planting density guidelines for woodland shoreland habitat were used as outlined in the Wisconsin Biology Technical Note 1: Shoreland Habitat (NRCS 2002). Plant numbers were calculated based on the area in square feet to be reestablished and the planting densities in the guidelines (see Table 1). The herbaceous cover layer was comprised of a minimum of 30 percent native grasses (*Poaceae*) and/or sedges (*Carex* species). Sites that had significant amounts of established non-native turf grass were smothered with tarps and black plastic fo rfour to eight weeks. Some sites also had minimal preparation against invasive species like reed canary grass (*Phalaris arundinacea*).

Two essential steps each landowner agreed to in their contracts were temporary fencing and a careful watering regime for the plantings. The restoration team used eight-foot plastic mesh fencing to protect the plantings following their installation. This fencing was held up from above using braided cable extended from t-post to t-post with 12-15 foot spacing between the posts; an occasional existing tree was also used to help anchor the cable, along with corners fortified with 2 x 4" wood supports. Attached to each t-post was a plastic extender fastened to it using inexpensive hose clamps. Zip ties were used to hang the fencing from the cable and to fasten the fencing to the t-posts. Six-inch landscape staples were used to hold the bottom portion of the fencing in place. An overlap (~2 inches) on the ground proved handy in helping to navigate uneven terrain. Rabbits chewed occasional holes in some of the fencing, such that a two-foot strand of chicken wire was needed. It was fastened to the existing fence at ground level all the way around the perimeter. Makeshift doors were fabricated to allow for access.

As one might expect, the watering regime for each site proved essential, especially the first two to four weeks after

Figure 4. Volunteers get an overview and planting directions from project staff prior to a planting in July 2007; note small plastic pool used to temporarily keep bare root stock wet and compost used to help trees and shrubs with organic matter.

Table 1. Shoreland Habitat Planting Densities Used in the Wisconsin Lakeshore Restoration Project.

Layer	*Woodland density*	*Wetland or barrens / Dry prairie / Wet prairie density*
Tree	0.5 - 5 per 100 sq. ft.	0 - 0.2 per 100 sq. ft.
Shrub	1 - 4 per 100 sq. ft.	0.2 - 0.5 per 100 sq. ft.
Herbaceous cover/ground layer	25 - 75 plants per 100 sq. ft.	50 - 100 plants per 100 sq. ft.

Source: Wisconsin Biology Technical Note 1: Shoreland Habitat, p. 4.

planting and through the remainder of the growing season. Plantings were watered a minimum of one to two inches per week, preferably in the early morning or evening hours. Typically, rotary sprinklers were used. For sites without access to a spigot, a portable gas-run generator was set up in the lake to provide water. Project crew members checked the generators and sprinkling systems regularly to maintain good coverage and saturation.

Some of the Lessons Learned

Landowners willing to participate in shoreland restoration were essential partners in the project. Some came to the project looking to address erosion control concerns or to replace the decimated tree canopy from the 1999 storm. Others were interested in enhancing fishing around their near-shore zone. Still others were excited to be doing something along the shoreline that would enhance and maintain water quality in the lake for future generations.

All the landowners in the project to date were excited about the immediate visual changes to their shorelines following the plantings. Where scraggly lawn once met the water's edge now stood appealing native trees, shrubs, and wildflowers. The property owners enjoyed the wildflowers, grasses, and sedges because they attracted birds, butterflies, and other wildlife. One of the landowner's granddaughters even assisted with digging in the plantings at their site, as she was eager to see the trees and shrubs grow with her through the years (see Figure 5).

Another landowner and his family participating in the project have owned their modest lakeside resort since the 1960s. The wind event in 1999 toppled red pines over 100 years old on their site and downed other trees like paper birch, oak, and maple. The family was in awe of the reestablished area, impressed by the scale of the shoreland restoration and by the return of structure to their waterfront vacation retreat.

Other lessons learned from the project include confirmation that 200 ft. (or greater) lot sizes typically provide landowners with enough room to live on the lake comfortably while still maintaining adequate wildlife habitat and suitable water quality. In any case, getting people to change their behavior and finding landowners receptive to the idea of participating in the lakeshore restoration process was an ongoing issue.

Building local expertise with contractors and nurseries for effective shoreland buffer designs and installations was another way this project was put to the test. In addition, creating a reliable funding mechanism for the ten-year duration of the study between multiple agencies was a major hurdle made all the more difficult in today's economic times. Preliminary cost breakdowns were estimated at between $50 and $100 per linear foot of restored buffer back 35 feet from the ordinary high-water mark. Biocontrol and other erosion control techniques were typically costly and logistically challenging on top of these initial buffer expenses.

In 2008, year two of the project, several additional sites were included in the study. Again, all the properties were located on Found Lake. Preliminary work and extensive planning for project sites began on the second and third water bodies in the study, Moon and Lost Lakes, each also in Vilas County. For both of these new lakes, researchers are seeking a minimum of 1500 feet of continuous developed shoreline that can be planted into native shoreland buffer. To date, the Wisconsin Lakeshore Restoration Project has been a growing solution to degraded shorelines. Much of the information from this study is still being analyzed, but soon researchers will have more data on how these reestablished shoreland buffers have contributed to bolstering wildlife habitat and enhancing water quality.

Figure 5. The Kloepfers, accompanied by their granddaughter, at the first site in the Wisconsin Lakeshore Restoration Project in June 2007.

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