BOARD OF WATER AND SOIL RESOURCES

Lakeshores

Document Purpose – This fact sheet is a companion to BWSR's Native Vegetation Establishment and Enhancement Guidelines and provides detailed considerations for project planning and design with an emphasis on vegetation selection, installation and management.

Introduction – Lakeshores are often areas of high wildlife use and can provide water quality improvement and slope stability. It is important that lakeshore buffers are planned in a way that will meet wildlife and water quality goals and result in resilient plantings. Raingardens and vegetated stormwater swales can often be combined with lakeshore projects to maximize water quality benefits.

Site Selection – Projects should be located where they will have the greatest functional water quality or habitat benefits depending on program goals. When selecting projects for wildlife it is important to define specific species that will be targeted by the project. The Minnesota Wildlife Action Plan identifies species of greatest conservation need for different areas of Minnesota. Fact sheets about habitat needs for specific species are also available.

General Planning Considerations – Projects should consider potential stressors for vegetation including active erosion, ice heave potential, influence of boating and wave action. Other planning considerations include slopes, topography, watershed size, soils, vegetation cover, target wildlife species, adjacent corridors and natural areas, as well input from landowners and partners.

Design Considerations for State Funded Projects:

- When state funding is being used, the water quality and habitat benefits of the project should take precedence, acknowledging that some projects may not be able to proceed if landowners are not supportive of the necessary improvements.
- Riprap should not be used in areas where intact native vegetation and ecosystems are present. Rock should only be used when necessary to solve a specific resource concern.
- For BWSR funded projects, lakeshore buffer widths for water quality projects should typically be a minimum of 30 feet landward of the ordinary high-water level. For wildlife habitat projects, buffers should be at least 100 to 330 feet, depending on habitat needs of target wildlife species. Buffers should also cover at least 75% of the shoreline's length.

Shoreline with aquatic plantings in addition to wet meadow and upland vegetation

It can be challenging to successfully establish lakeshore vegetation in standing water. These areas are prone to impacts from waves and predation from muskrats. These plantings are most successful in quiet bays with low wave impacts and where some emergent or floating leaved plants are already growing.

Lakeshore buffers are not designed to infiltrate large flows of water. Raingardens or other infiltration practices may be needed upslope from lakeshore buffer plantings to decrease the overland flow of water.

Continuous buffers provide the greatest value, so retaining walls within buffers should be minimized to the extent possible.

For projects on public lands such as county or city parks it is often challenging to keep plantings from being reduced in size over time through lawn mowing. It can be helpful to use large rocks or metal posts with signs that define the edge of the buffer planting.

Deed restrictions can help ensure that lakeshore conservation projects are maintained into the future. For example, the Stearns County SWCD records a Shoreland Deed Restriction for all new shoreline projects. (See BWSR's "What's Working for Conservation" website under Conservation Planning and Promotion and Site Selection).

Restoration Evaluation Program Recommendations:

The Minnesota Restoration Evaluation Program was established to help ensure the success of state funded restoration projects. The following are key program recommendations for river and stream restoration that provide helpful guidance while planning projects.

Project Teams

The success of lakeshore restoration projects is closely linked to having strong project teams and partnerships.

1) Use multidisciplinary project teams appropriate to project scale/complexity, including environmental planners, stream hydrologists, fisheries biologists, vegetative restoration specialists, hydrogeologists (to address groundwater seeps), and other staff as needed to meet project goals.
2) Engage state/granting agencies, local government units and technical experts early in the planning phase to receive additional technical input about projects.

Project Selection Criteria

Local project managers that are working to identify lakeshore projects to fund should establish consistent minimum design criteria for lakeshore projects, and use these criteria when recruiting, screening, and selecting projects. These criteria will allow screening for projects that provide a base level of environmental benefit aligning with fund goals. Design criteria should be specific to site conditions and constraints. The following are specific recommendations:

1) With guidance from state agencies, local policies should establish minimum design criteria based on programmatic goals for water quality improvements and local conditions. Criteria should be consistent with existing guidance for shoreline restoration established in total maximum daily load or local water plans.
2) Promote the value of established criteria in meeting project goals, using public funding wisely, and leading to successful projects.

Documentation

Project documentation is critical for understanding, tracking and achieving successful restorations. The following are key considerations for documentation:

1) Documenting clear outcome-based goals is crucial for establishing a common understanding and tracking progress.
2) Consistently document restoration project data in a simple and accessible format
3) Ensure that details of implemented actions are recorded and linked to the initial plan
4) Designate one project partner to permanently store project records and data

Structural Design Considerations – Bioengineering techniques should be the first option for the stabilization of lakeshores rather than fabric and rock, to increase water filtration and benefits to wildlife species. Bioengineering techniques used to stabilize slopes can include branch packing, brush layering, brush mattresses, live fascines, cedar revetments and live stakes.

Plant and Seed Selection – A variety of trees, shrubs, grasses, sedges and flowers can be used along shorelines to provide wildlife and water quality functions. Shrubs and various bioengineering techniques are sometimes used if there is a focus on stabilizing soils along steep banks. Planting native trees can help to reduce ice heaves and erosion from wave action.

Medium to high diversity levels (20-40+ species) are typically planted to provide habitat for a variety of wildlife species ranging from pollinators to amphibians, reptiles and bird species. To support pollinators, species should be planted that will provide nectar and pollen sources through the entire growing season.

Trees, shrubs, grasses, forbs, sedges, rushes and ferns are all commonly used as part of shoreline restoration projects. Emergent species (plants that grow in and next to the water) can be an important component. Species should be selected that are native to the area and well adapted to site conditions. The Minnesota DNR's "Restore Your Shore" website is an effective tool for species selection.

Commonly Used Native Shoreland Restoration Species

Trees:	Tamarack, Black spruce, Basswood, Oaks, Maples, Hackberry, Birch, Cherries
Shrubs:	Willows, Dogwoods, Viburnums, Elderberry, Alder, Serviceberries, Prairie plum, High bush cranberry, Buttonbush, False Indigo
Grasses:	Prairie cordgrass, Manna grasses, Fowl bluegrass, Rice-cut grass, Canada blue-joint grass, Big bluestem, Indian grass, Kalm's brome, Prairie brome
Forbs:	Marsh milkweed, Butterfly milkweed, Culver's root, Blue lobelia, Cup plant, Mountain mint, Grass-leaved goldenrod, Joe-pye weed, Boneset, Red-stemmed aster, Swamp aster, Marsh aster, Giant goldenrod, Giant-bur reed, Sweet flag, Wild iris, Common ox-eye, Black-eyed Susan, Stiff goldenrod
Sedges:	Tussock sedge, Bottlebrush sedge, Lake sedge, Slough sedge, Porcupine sedge
Rushes:	Torrey's rush, River bulrush, Soft-stem bulrush, Spike rushes, Green bulrush, Soft rush

Plant Source Recommendations – Local sources of seed and plants are recommended for shoreline projects, as these areas may have direct connections to natural plant communities where genetic interactions may be a consideration. The seed/plant source sequence outlined in Section 2 of the Native Vegetation Establishment and Enhancement Guidelines should be followed.

Vegetation Establishment – Invasive plant species should be thoroughly controlled prior to establishing seed and containerized plants. When a species such as reed canary grass is present, site preparation may take an entire growing season to ensure that it is ready for

Shoreline restoration with native grasses, forbs, sedges and rushes

planting. A variety of techniques are commonly used to establish shoreline vegetation, depending on slopes, moisture levels, and erosion. Seeding is commonly conducted in upland portions of projects, while containerized plants are typically used along the edge of open water for more rapid establishment. Biologs are commonly used along the water's edge to break the force of waves and to prevent erosion as plants establish. Snow fencing is often installed around plantings to deter geese, deer and muskrats that may eat young native plants. A variety of bioengineering techniques may also be used for eroding slopes. When willows and dogwoods are used as part of bioengineering methods, they tend to be most successful when established into saturated soils or well-watered after installation. Containerized plants generally need one inch of water per week from rainfall and/or watering after installation. In some cases, temporary irrigation systems are set up for lakeshore projects.

Operations and Maintenance – Upland portions of plantings may be mowed during the first few years to suppress annual and biennial weeds and promote seedling growth. Hand weeding is commonly conducted in smaller lakeshore plantings to control weeds. Spot herbicide treatment may be used for perennials such as reed canary grass but it is important that aquatic- safe herbicides are applied along shorelines.

Information Sources

A Soil Bioengineering Guide for Streambank and Shoreline Stabilization: www.fs.fed.us/publications/soil-bio-guide/

Restore Your Shore: http://www.dnr.state.mn.us/restoreyourshore/index.html;

Shoreland Information for Property Owners:
https://www.dnr.state.mn.us/waters/watermgmt_section/shoreland/property-owners.html

BWSR What's Working for Conservation Website: https://bwsr.state.mn.us/whats-working-conservation