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MICHIGAN NATURAL SHORELINE PARTNERSHIP

Promoting Natural Shoreline Landscaping to Protect Michigan's Inland Lakes

Certified Natural Shoreline Professional Training Manual

Principles of Natural Landscaping and Erosion Control on Inland Lakes

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Certified Natural Shoreline Professional Training Manual

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Introduction

Michigan's abundance of inland lakes provides seasonal and year-round waterfront living for many Michigan citizens. As important as the shoreline is to Michigan residents, it is equally important to the health of the lake and the fish and wildlife it supports. The shoreline and shallow water areas of a lake provide essential habitat for many fish and wildlife species.

Traditional lakefront landscaping, with lawn to the water's edge, creates problems for the lake ecosystem and waterfront owners. Rainwater carries lawn fertilizer, pet waste, leaves and grass clippings into the lake, adding nutrients that result in algal blooms. Shallow-rooted turf allows the shoreline to easily erode, causing the loss of property. It also attracts nuisance waterfowl such as geese.

Alternative landscaping technologies — such as bioengineered erosion control and naturalized landscape design — can create attractive waterfronts that permit the use of the shoreline while providing the benefits of a natural shoreline. Current and ongoing research shows that these techniques benefit the lake ecosystem by improving fish and wildlife habitat and maintaining water quality.

The *Michigan Natural Shoreline Partnership* was formed in 2008 to promote the use of sustainable landscape technologies and bioengineered erosion control for the protection of Michigan's inland lakes. The Partnership brings together statewide technical expertise and organizational support to address the need for information, education and policy related to shoreline alteration and development. It is a public-private partnership consisting of governmental agencies, industry associations, industry

representatives, academic institutions and environmental and nonprofit organizations actively engaged in promoting sustainable shoreline development. The partnership's mission, objectives and membership information

be found in Appendix I.1. The Certified Natural Shoreline Professional course, training manual, and certification of completion are outcomes of this partnership effort.



Purpose of this course

This course is designed to equip professional landscape, marine, and natural resource contractors to better design, implement and maintain natural shoreline landscapes and erosion control on inland lakes. One might ask, "Why not include streambanks, riverbanks or Great Lakes shorelines?" It is generally agreed that inland lakes present a unique set of physical and biological conditions, as do riverine systems and Great Lakes shorelines. Inland lakes vary greatly in size, depth, orientation to prevailing winds, wave action, boating activity, development density and type. The erosive forces of wave action on inland lake shorelines present a different set of challenges for natural landscape design and erosion control than do the erosive forces of river currents, and the erosive forces of Great Lakes wave action present yet another set of design

challenges. For these reasons and others, this course addresses inland lake shorelines only.

Course components

Certified Natural Shoreline Professional is comprised of three components: a three-day classroom session supported by this training manual, presentations, small group exercises and other resources; a one-day hands-on field experience, or practicum, during which participants construct a demonstration site incorporating natural shoreline landscaping and erosion control; and a certification exam.

Certificate of completion

To receive a certificate of completion for this course and to be included on an official web-based list of Certified Natural Shoreline Professionals, participation in all classroom and field sessions and a passing grade on the exam

is required. Certificates are provided by the Michigan Natural Shoreline Partnership and must be updated every three years through continuing education that is endorsed by the partnership.

Using this training manual

This manual is arranged in twelve chapters with appendices. The final chapter contains five individual shoreline case studies. Words in blue font are defined in the *Glossary of Terms*. Sources of information cited in the text may be found in the *References*. An extensive list of additional readings both in print and online may be found in *Appendix I.2*.



References

- Albert, D. A. 1995. Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. Gen Tech Rep. NC-178. St Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. www.npwrc.usgs.gov/resource/1998/rlandscp/rlandscp.htm.
- American Nursery and Landscape Association. 2004. American Standards for Nursery Stock. ANLA www.anla.org.
- Bartodziej, W.M., S.L. Blood, P.W. Erdmann and T.F. Shevlin. 2008. An Evaluation of Fencing to Challenge Emergent Plant Herbivory (Minnesota). *Ecological Restoration* 26(3):184-186.
- Berc, J. and S. Ailstock. 1989. Shoreline stabilization on Navy property. *Journal of Soil and Water Conservation* 44(6):560-561.
- Borman, S., R. Korth and J. Temte. 1997. *Through the Looking Glass: A Field Guide to Aquatic Plants*. Wisconsin Lakes Partnership, University of Wisconsin-Extension.
- Clinton, William. 1999. Executive Order 13112 of February 3, 1999. Invasive Species. Federal Register/Volume 64, No. 25/Monday, February 8, 1999/Presidential Documents.
- Comer, P.J., D.A. Albert, H.A. Wells, B.L. Hart, J.B. Raab, D.L. Price, D.M. Kashian, P.A. Corner and D.W. Schuen. 1995. Michigan's Native Landscape: As Interpreted from the General Land Office Surveys 1816-1856. Michigan Natural Features Inventory, Lansing, MI. <http://web4.msue.msu.edu/mnfi/>.
- Craul, Phillip J. 1992. *Urban Soil in Landscape Design*. John Wiley & Sons, Inc.
- Craul, Timothy A. and Phillip J. Craul. 2006. *Soil Design Protocols for Landscape Architects and Contractors*. John Wiley & Sons, Inc.
- Doran, J.W. and T.B. Parkin. 1994. Defining and assessing soil quality. pp.1-22. In: J.W. Doran et al. (ed) *Defining soil quality for a sustainable environment*. SSSA Spec. Publ. 35. SSSA, Madison, WI.
- Dunnett, Nigel and Andy Clayden. 2000. Resources: the Raw Materials of Landscape. In: *Landscape and Sustainability*. Edited by John F. Benson and Maggie H. Roe. Spon Press.
- Eagle, A.C., E. M. Hay-Chmielewski, K. T. Cleveland, A. L. Derosier, M. E. Herbert, and R. A. Rustem, Eds. 2005. Michigan's Wildlife Action Plan. Michigan Department of Natural Resources. Lansing, Mich. 1592 pp. www.michigan.gov/dnrwildlifeactionplan.
- Gray, D. and R. Sotir. 1996. *Biotechnical and Soil Bioengineering Slope Stabilization: A Practical Guide for Erosion Control*. John Wiley & Sons, Inc.
- Hanshue, S. 2008. MDNR Fisheries Division, personal communication.
- Harker, D., S. Evans, M. Evans and K. Harker. 1993. *Landscape Restoration Handbook*. United States Golf Association. Lewis Publishers, Ann Arbor, MI.
- Harris, Richard. 1983. *Arboriculture, Care of Trees, Shrubs, and Vines in the Landscape*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- Kortright, F. H. 1957. *The Ducks, Geese and Swans of North America*. The Stackpole Company and Wildlife Management Institute.
- Kost, M.A., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber and K.A. Chapman. 2007. *Natural Communities of Michigan: Classification and Description*. Michigan Natural Features Inventory, Report Number 2007-21, Lansing, MI.
- Lyle, John Tillman. 1999. *Design for Human Ecosystems: Landscape, Land Use, and Natural Resources*. Island Press.

- Melby, Pete and Tom Cathcart. 2002. *Regenerative Design Techniques: Practical Applications in Landscape Design*. John Wiley & Sons, Inc.
- Merrell, K.C., E.A. Howe and S. Warren. 2009. *Examining Shorelines, Littorally*. Lakeline: A Publication of the North American Lake Management Society 29(1):8-13.
- Moss, B. 1998. *Ecology of Fresh Waters: Man and Medium, Past to Future*. Blackwell Science, Oxford.
- National Invasive Species Management Plan. 2001. *Meeting the Invasive Species Challenge*. National Invasive Species Council. January 18, 2001.
www.invasivespeciesinfo.gov.
- Nowak, David J., Daniel E. Crane and Jack C. Stevens. 2006. Air pollution removal by urban trees and shrubs in the United States. *Urban Forestry & Urban Greening*, Vol. 4, Issues 3-4, Pages 115-123.
- National Park Service. www.nps.gov.
- O'Neal, R.P. and G.J. Soulliere. 2006. *Conservation Guidelines for Michigan Lakes and Associated Natural Resources*. Michigan Department of Natural Resources Fisheries Division, Special Report 38.
- Pedosphere.com. 2001. Searchable Keys to Soil Taxonomy. Eighth edition. www.pedosphere.com/resources.
- Plant Conservation Alliance. www.nps.gov/plants.
- Prince George's County, Maryland, Department of Environmental Resources (PGCMDER). 2000. *Bioretention Manual*. Prince George's County, Maryland.
- Radomski, P. and T.J. Goeman. 2001. Consequences of human lakeshore development on emergent and floating-leaf vegetation abundance. *North American Journal of Fisheries Management* 21(1):46-61.
- Reilly, Michael. 1976. *Ecological Uses of Urban Trees*. Unpublished M.L.A. thesis, California State Polytechnic University.
- Robinette, G.O. 1972. *Plants, People and Environmental Quality*. Superintendent of Documents, U.S. Government Printing office, Washington, DC 20402.
- Shaw, D. and R. Schmidt. 2003. *Plants for Stormwater Design*. Minnesota Pollution Control Agency, Saint Paul, MN.
- Soil Survey Staff. 1994. *National Soil Survey Handbook*. USDA Natural Resources Conservation Service, Washington, D.C.
- Soil Survey Staff. 1999. *Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys*. USDA Natural Resources Conservation Service, Agric. Hdbk. 436, U.S. Government Printing Office, Washington, D.C.
- Thompson, J. William and Kim Sorvig. 2000. *Sustainable Landscape Construction: A Guide to Green Building Outdoors*. Island Press.
- Tip of the Mitt Watershed Council. 2007. *Understanding, Living with, and Controlling Shoreline Erosion*. Third edition. Tip of the Mitt Watershed Council, Petoskey, MI.
- Tripp, Elise. 2008. *Sustainable Landscape Development in the Built Environment: Theory and Practices*. Master of Environmental Design Practicum. Michigan State University.
- U.S. Army Corps of Engineers. 1981. *Low Cost Shore Protection: A Property Owner's Guide*.
- USDA Natural Resources Conservation Service. 1996. *Engineering Field Handbook*, Chapter 16: Streambank and Shoreline Protection.
- USDA Natural Resources Conservation Service. 1998. *Keys to Soil Taxonomy*. Eighth edition. Soil Survey Staff.
- USDA Natural Resources Conservation Service. 2006. *Field Indicators of Hydric Soils in the United States*. Edited by G.W. Hunt and L.M. Vasilas.
- USDA Natural Resources Conservation Service. 2007. *National Soil Survey Handbook*, title 430-VI. <http://soils.usda.gov/technical/handbook>.
- Vanderbosch, D. A. and S. M. Galatowitsch. 2010. "An Assessment of Urban Lakeshore Restorations in Minnesota." In *Ecological Restoration* Vol. 28(1):71-80.
- Water and Land Resources Division. 2001. "Live Stake Cutting and Planting Tips". Natural Resources and Parks, King County. <http://dnr.metrokc.gov/wlr/pi/Cutting.htm>.
- Wehrly, K. 2010. MDNRE Institute for Fisheries Research, personal communication.
- Wetzel, R.G. 1983. *Limnology*. Second edition.
- Wisconsin Administrative Code. 2008. *Shore Erosion Control Structures in Navigable Waterways*. Chapter NR 328.
- Woodwell, G. M., R. H. Whittaker, W. A. Reiners, G. E. Likens, C. C. Delwiche, and D. B. Botkin. 1978. "The biota and the World Carbon Budget." In *Science* 199:141-146.



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About the Michigan Natural Shoreline Partnership

The mission of the Michigan Natural Shoreline Partnership (MNSP) is to promote natural shorelines through use of green landscaping technologies and bioengineered erosion control for the protection of Michigan inland lakes. The MNSP is a collaboration of government agencies, academic institutions, private industries, and conservation groups dedicated to the development of shoreline management practices that are beneficial to lake ecosystems and attractive to consumers.



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