Chapter 1

Introduction

Michigan is the Great Lakes State and home to thousands of inland lakes and streams. Residents and visitors alike rely on Michigan's abundant water resources to provide clean, safe drinking water and for a vast array of recreational activities. In addition, Michigan's economic prosperity is dependent on the availability and health of our water resources.

Due to the numerous ways we use our water, it is imperative for us to protect and restore our water resources. To achieve this goal, actively managing stormwater runoff is essential. Stormwater runoff contributes to a variety of impairments to our water resources. This includes polluting our waterways as well as channelizing streambanks and ruining the habitat that animals and plants need to survive.

A view of the Lake Michigan shoreline near Manistee

Low Impact Development (LID) is the cornerstone of stormwater management. LID uses the basic principle that is modeled after nature: manage rainfall where it lands. The outcome of LID is mimicking a site's presettlement hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. Because LID utilizes a variety of useful techniques for controlling runoff, designs can be customized according to local regulatory and resource protection requirements, as well as site constraints.

LID practices offer additional benefits. They can be integrated into the existing infrastructure and are often more cost effective and aesthetically pleasing than traditional, structural stormwater conveyance systems.

Michigan's Water Resources

- Michigan has more fresh water coastline than any other state with 3,126 miles of Great Lakes shoreline.
- Michigan has more than 11,000 inland lakes and more than 36,000 miles of streams.
- You are never more than six miles from a stream or lake.
- Anywhere in Michigan, you are within 85 miles of one of the Great Lakes.
- Michigan ranks fifth in the nation in the number of licensed anglers who contribute $2 billion annually to the economy.
- Michigan ranks third in the nation for the number of registered boats. Recreational boating contributes $2 billion annually to the economy.

Source: State of Michigan

Why this manual was created

This manual provides communities, agencies, builders, developers, and the public with guidance on how to apply LID to new, existing, and redevelopment sites. The manual provides information on integrating LID from the community level down to the site level. It not only contains technical details of best management practices, but also provides a larger scope for managing stormwater through policy decision, including ordinances, master plans, and watershed plans.

This manual is intended to facilitate broad application of LID techniques throughout Michigan. The level of application of LID practices will vary from place to place. Stakeholders can use this manual as technical guidance for how to design, construct, and maintain a specific LID measure (e.g., how to design a rain garden). Others may use the manual as a reference for requiring application of LID in an ordinance to achieve a prescribed standard, such as assuring that the site is designed to mimic presettlement hydrology.

How this manual is organized

This manual is designed to provide the guidance necessary to promote the use of LID throughout Michigan. It is organized into ten chapters with related appendices and checklists.

Chapter 1: Introduction provides information on LID, identifies affected stakeholders, and provides guidance on how to use this manual.

Chapter 2: Stormwater Management in Michigan: Why LID? Describes the overall hydrologic cycle and water quality problems related to stormwater. It also describes in more detail the definition of LID, benefits, and relationships to other environmental programs.

Chapter 3: LID in Michigan summarizes Michigan data for the key determinants and variables that are used in LID design. Included with the descriptions of these determinants and variables are resources for obtaining data.

Chapter 4: Integrating LID at the Community Level discusses ways to effectively incorporate LID into the appropriate elements of a master plan, ordinances, and local municipal programs.

Michigan has more than 36,000 miles of streams that provide numerous recreational opportunities, including kayaking on the Clinton River through downtown Mt. Clemens.

Source: Macomb County Planning and Economic Development

Chapter 5: Incorporating LID into the Site Design Process describes 9 LID-specific steps to consider during the existing site plan review process. It emphasizes the importance of total site design where developers integrate stormwater management at the beginning of the process.

Chapter 6: Nonstructural Best Management Practices describes specific practices that prevent stormwater runoff by integrating planning and site design techniques that preserve natural systems and hydrologic functions, and protects open spaces, wetlands, and stream corridors on a site.

Chapter 7: Structural Best Management Practices describes specific structural practices, their stormwater functions, and design requirements. It provides design guidance for users to determine what structural BMPs to incorporate into a site.

Chapter 8: Special Areas provides detailed information for LID applications in settings where a diverse mix of physical and land use conditions must be confronted, such as contaminated brownfield sites, transportation corridors, and wellhead protection areas.

Chapter 9: Recommended Design Criteria and Methodology discusses the recommended design criteria to consider when designing and constructing BMPs for low impact development.

Chapter 10: Michigan Case Studies highlights numerous successful LID examples throughout Michigan.

Appendices: Includes all of the supplemental information and additional resources that users can access for more LID information. It also includes a model stormwater ordinance that integrates LID techniques.

LID techniques can also be implemented in special areas such as this rain garden along a road in Grayling.

Source: Huron Pines Conservation District

How to use this manual

There are numerous organizations, industries, communities, professionals, and individuals who have an interest in designing and implementing low impact development practices in Michigan. To proactively manage stormwater and protect water quality, it will take the support of all stakeholders involved to successfully communicate, coordinate, and to put LID methods into practice. Although the entire manual is of use to everyone involved in this process, the chapters that may be of the most interest to a given stakeholder are identified in the descriptions below.

Elected officials

Role in LID: Elected officials play an important role by deciding on the extent to which LID will be implemented in their community. Elected officials set the policy. In addition, municipal boards and councils can choose to require the use of LID practices through appropriate ordinances and procedures for a given community. Elected officials need to know that LID is practical, fiscally feasible, and that performance measures can be achieved.

How to use the manual: Elected officials can use Chapters 1 and 2 to learn the LID basics and Chapter 4 to learn the integrated process of LID that includes community planning, site planning, and gaining support for LID.

Towar Rain Gardens, City of East Lansing, MI

Source: Fitzgerald Henne and Associates, Inc.

This LID development at Western Michigan University offers additional benefits such as providing habitat, recreational trails, and improved quality of life.

Source: Fishbeck, Thompson, Carr & Huber, Inc.

Planning Commissions

Role in LID: Planning commissioners have numerous opportunities to encourage implementation of LID in their community. First, the planning commission typically updates and adopts the community's master plan. Incorporating LID into the master plan would be an important step in implementing LID in the community.

The planning commission also reviews new development proposals and proposes language for zoning ordinances. The commission can ensure that zoning and development ordinances allow the use of LID techniques, write LID requirements into ordinances as appropriate for their community, and encourage developers to use LID concepts.

How to use the manual: Like elected officials, the planning commission can use Chapters 1 and 2 to learn the LID basics. In addition, as reviewers of site plans in the community, planning commissioners should be familiar with Chapters 4 and 5 for help with including LID techniques in master plans and for review of site plans. Depending on the level of review by the commission, planning commissioners may need to be familiar with specific design criteria found in Chapters 6 and 7.

Staff Planners/Planning Consultants

Role in LID: Staff planners and/or planning consultants have multiple avenues for encouraging LID implementation in their community. Often it is the staff personnel that meet early on with the development community to

discuss a new development. The staff person could share the community's interest in using LID with the developer during these early meetings. Additionally, staff and planning consultants can be supportive when a developer submits a plan for a LID project.

The staff planner/planning consultant also reviews and comments on the site plan prior to review by the planning commission. Finally, staff planners and/or planning consultants play another role in LID by educating local communities (e.g., planning commission, elected officials) about the opportunity to implement LID in their community.

How to use the manual: Staff planners and planning consultants who are not familiar with LID could benefit from Chapters 1 and 2 to review the LID basics. The most beneficial part of the manual for these stakeholders will be the technical chapters on site planning, green infrastructure, and the process of selecting BMPs (Chapters 5, 6, and 7). They will also want to make use of the individual fact sheets, pull outs, pictures, and graphics that are available in the technical sections of this manual.

Local, County, and State Engineers/ Engineering Consultants/Developers/ Landscape Architects

Role in LID: These stakeholders are either designers of site development or reviewers of the design for some public agency. These stakeholders must be the most familiar with the detailed design methods in the manual.

Beech Park Bioretention Area, Troy, MI
Source: City of Troy

Additionally, municipal and agency engineers or consultants often advise the commissions, boards, or agency management they work for on appropriate design criteria to use in ordinances, standards, and procedures. The design portions of this manual will provide specific design criteria that these stakeholders can adapt and recommend as appropriate to requests from the communities they represent.

How to use the manual: These stakeholders are the most technical stakeholders and will routinely use the technical design standards section of the manual (Chapters 5, 6, 7, and 9). This manual provides design criteria that assists incorporating LID techniques into a site design as well as the basis for reviewers to evaluate LID techniques submitted to them.

Local Public Works/Drain Commission/ Road Commission/Michigan Department of Transportation

Role in LID: These stakeholders are responsible for designing, implementing, and maintaining roads and drains. Road and drain projects represent a major opportunity for implementing LID in Michigan.

How to use the manual: The detailed design criteria in Chapters 6, 7, 8, and 9 are adaptable for use in Michigan's transportation and drainage networks.

Citizens/Business Owners/Watershed and Environmental Organizations Regional Organizations/Other LID Proponents

Role in LID: These are stakeholders that may desire to implement LID practices on sites that they own or have influence over. In some cases, organizations may wish to promote the benefits of LID to interested individuals, groups, and communities.

How to use the manual: Chapters 6, 7, and 9 will be the most useful to those wishing to implement LID practices. Chapters 1, 2, 3, and 10 will be useful to those promoting LID implementation.

Feedback on the manual

Feedback from users is integral in identifying the effectiveness of the manual as well as providing future updates to keep the manual as accurate and relevant as possible. Please submit comments or suggestions to infocenter@semcog.org. For additional copies, this manual is available online as a PDF in color at www.semcog.org.