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# Preface

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Evidence of climate change is increasing across the Michigan, as it is elsewhere in the Great Lakes region, the nation and across the globe. Temperatures in Great Lakes region have shown an average increase of 2.3 degrees during the last third of the last century, while ice cover and snow days declined during that same period. The polar vortex of the winter of 2013-14 is expected to show as a spike on charts, but not to alter overall climate trends. Impacts of climate change vary by region, and observed and anticipated impacts in Michigan are similar to what can be expected across the Great Lakes region overall.

Unless adequate measures are taken, climate change impacts could result in significant losses in the Michigan's coastal wetlands—in terms of quantity and quality. The loss in coastal wetlands portends associated losses in the ecosystem services that coastal wetlands provide: fish and wildlife production; habitat for rare and endangered species; shoreline protection against wind and waves; aesthetics and green space; water storage for flood protection; groundwater recharge; water filtration and pollution control; and carbon sequestration. Paradoxically, there is an even greater need for many wetland ecosystem services under changing climate conditions that are expected to bring more frequent and intense storms and associated flooding, increased wind and wave action, and intensified pollution runoff. Implementing climate adaptation policies and practices for wetlands will ensure that wetlands continue to provide these important ecosystem services, even under changing climate conditions.

When it comes to adaptation, however, there is no single best practice or policy. This toolkit offers a menu of 18 different, yet complementary, preferred strategies and practices. Two general types of practices are provided: *institutional-level* best practices that are more strategic in nature and designed to be incorporated into policy and programming; and *project-level* best practices that are intended to be used by wetland managers as they plan, design, implement and assess on-the-ground wetland restoration and management projects.

The institutional-level practices are designed to assist the State of Michigan, but will likely be helpful for other jurisdictions looking to enhance their policies and programs for wetland adaptation. Similarly, the project-level best practices were designed with Michigan's freshwater coast in mind, but may be useful for a variety of coastal wetlands.

As the field of climate adaptation is still emerging, this toolkit includes practices that have been previously applied and show promise, as well as approaches that are new and have not yet been tried, but were identified by experts as needed for successful coastal wetlands adaptation.

The best practices herein are associated with six principle phases of wetland management, as illustrated in Figure 1. This toolkit suggests the most appropriate phase or phases for implementing each best practice. It also attempts to identify challenges and benefits of each practice so that implementers can anticipate factors that might help or hinder and thereby more efficiently implement the practice.

Where possible, case examples are provided to illustrate where and how that best practice has been used in planning or management.

The best practices in this toolkit are framed as guidance for natural resource planners, regulators and managers within the state of Michigan. Not every practice will be relevant for every project. Some of the ideas and approaches identified herein may already be being implemented by local governments, or wetland managers. Applying just one best practice or policy to a project does not guarantee coastal wetland resiliency to climate change. Conversely, neglecting a single best practice may not compromise adaptation efforts. Optimally, users of this toolkit should consider all of the practices in the context of their responsibilities and select and apply appropriate combination that fits the conditions of a particular natural resource management program or wetland project.

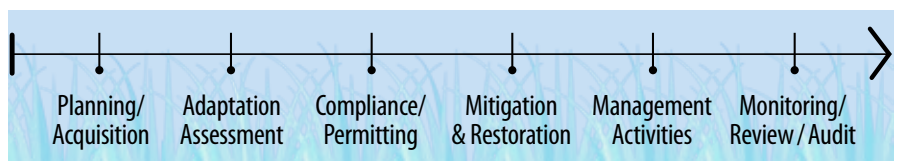


Figure 1: Phases of Wetland Management

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