# Data Use and Trend Analysis to Inform Planning

Use land cover, land use data and spatiotemporal trend analyses to help inform wetland planning

Great Lakes wetlands and shorelines are dynamic systems on short and long timescales. This reflects climatic variability and change as well as changes in land use, water management and other human actions. As water levels rise and fall, wetland plant and animal communities shift in space and composition. Understanding the patterns and processes underlying past changes in wetlands and wetland responses to past changes in climate and weather can help us anticipate possible future changes. This, in turn, can help inform decisions about where to prioritize conservation and restoration projects by identifying areas where wetlands are likely to continue to thrive, where they will thrive if able to shift with changing water levels, and where wetlands are unlikely to survive without massive intervention. This approach can also help to identify areas where limits on allowable land use or changes in existing land use could make the biggest difference for wetland function and persistence. (Also see Best Practice #15 and #17.)

**NOAA's Coastal Change Analysis Program** (CCAP) is a source of nationally standardized inventories of land cover and use data that can be used to determine the extent and location of wetland losses and gains. For Oconto Marsh, CCAP showed that new wetlands were forming along the coast as water levels dropped. This data informs tools like the NOAA Coastal County Snapshots, which show wetland information at the County Level. Wetland-specific information is provided via the U.S. Fish and Wildlife Service administered National Wetlands inventory, the main federal effort at tracking wetland extent nationwide.

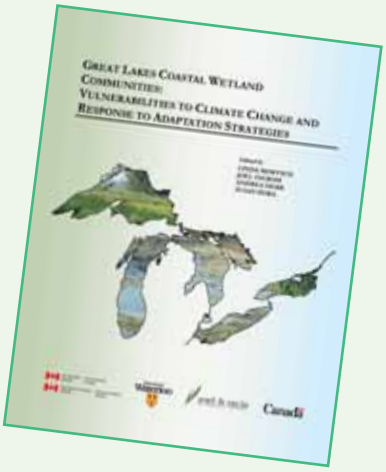
Using data and trend analysis for adaptation-oriented wetlands management and restoration starts with identifying the key drivers of wetland extent and condition in the area of concern (e.g., hydrological regime, development pressures) and the potential sources of information relevant to planning (e.g., hydrological data, land use/land cover data, growth projections).

For historical and recent changes, practitioners can use a diversity of sources including aerial photographs, remote sensing, peer-reviewed and grey literature, interviews, or historical documents to map or analyze changes in land use, lake level, and habitats over space and time, and to look for correlations. Spatiotemporal analyses can lead to a variety of outputs, including maps of past change or correlative models that generate projections of possible future changes.

Climate and weather data can be accessed in spatial or non-spatial formats, and integrated with habitat location, type, and cover information to further refine system understanding and model potential future changes resulting from climate change. Downscale climate models, derived from Global Circulation Models, should be used where available. The goal of downscale models is to connect global scale predictions and regional dynamics to generate regionally specific forecasts. By comparison, weather data are also useful,

but they are gleaned from networks of weather stations, so actual measurements may not be spatially consistent across a given area. A number of groups have used individual station measurements combined with statistical or dynamic modeling to create more fine-grained maps of past weather, but practitioners should be aware of the assumptions underlying these models and use the outputs accordingly.

## *Case Example* | Canadian Great Lakes Coastal Wetlands




Great Lakes lake level change and variability are longstanding realities. With money from Natural Resources Canada's Climate Change Action Fund – Coastal Zone, a consortium of organizations, looked at how vegetation communities, breeding bird communities and fish habitat had changed in association with past lake level changes.

Using GIS-based spatiotemporal trend analyses of historical data, the Climate Change Action Fund – Coastal Zone consortium created a rule-based model for the relationship between the abundance and spatial distribution of wetland plant communities, water depth and past hydrological conditions. Sources of information included historical aerial photographs that showed long-term wetland plant community distribution and composition in relation to lake levels, literature reviews, wetland surveys and stakeholder input.

All wetland types responded to lake level change, although the response was most pronounced in drowned river-mouth wetlands. In all wetlands, drier vegetation types appeared as water levels dropped, but there was an expansion of vegetated wetland area lakeward and an overall increase in total wetland area. On Lakes Erie and Ontario wetlands became less fragmented and complex during dry years while Lake Huron wetlands became more fragmented and diverse. There can be a significant time lag for these effects.

Using the models developed based on responses to historical changes, researchers turned their attention to the future, projecting changes in wetland community under four climate change scenarios. They found that protected lacustrine wetland communities seemed most able to adapt to lake level changes.

## Challenges and Benefits

A good model helps to demystify the changeable nature of wetland systems and highlights the need to plan for climate change impacts or anticipate coastal hazards. Practitioners can use analysis of historic and recent change and correlations to anticipate and prepare for potential future changes. Even a qualitative approach (e.g., comparing historical photographs of wetland health and extent for different lake levels) can facilitate visualization of future options.

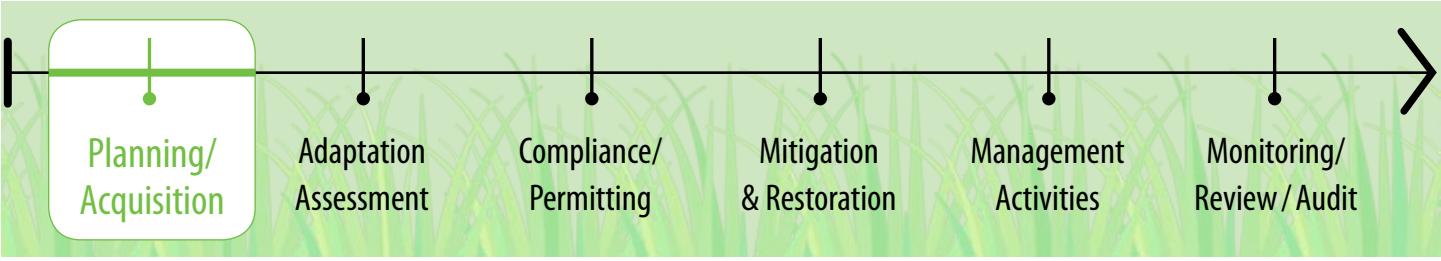
However, model outputs are only as good as the data and assumptions that go into them. Adequate data or the right data may not be available for the modeling or analysis that is desired. Depending on data sources used, trend analysis can require a variety of expertise, and bringing in the right experts and acquiring the right data can be pricey. Further, due to uncertainties about future climatic variability, planning based on past trends should bear in mind that the past is not always the best predictor of what can be expected in the future.

## Who should implement the practice?

Planners and managers should implement this practice with technical experts to perform the analyses.

## When should this practice happen?

Data use and trend analysis should be done early in the planning process. In addition, data use/trend analysis might be useful at other times, as predictions may or may not be realized and new information may need to be assessed as a given project proceeds.




## Tools and Resources

Great Lakes Coastal Wetland Communities: Vulnerabilities to Climate Change and Response to Adaptation Strategies (2006) | **www.env.uwaterloo.ca/research/aird/aird_pub/Great_Lakes_Coastal_Wetlands_Report_2006.pdf**

National Oceanic and Atmospheric Administration – Coastal Change Analysis Program | Provides a nationally standardized database of land cover and land change information for the coastal regions of the United States. | **www.csc.noaa.gov/digitalcoast/data/ccapregional**

NOAA Coastal Services Center, Lake Michigan Basin, Land Cover Change Report, 1985-2010 | One of a series of regional reports examining land cover status in 2010, and changes over the previous several decades, including covering categories from which wetlands were lost or gained. | **www.csc.noaa.gov/digitalcoast/publications/lake-michigan-basin-land-cover-change**

National Oceanic and Atmospheric Administration – Coastal County Snapshots | Fact sheets that provide an easy way to understand complex data. | **www.csc.noaa.gov/snapshots/**

Michigan wetlands map viewer | This free tool provides the public with access to wetland spatial data, allowing users the ability to view, print and export wetland mapping data from their computers. | **www.mcgi.state.mi.us/wetlands/**

National Wetlands Status and Trends – U.S. Fish and Wildlife Service | Provides a series of free, publicly-accessible national, state and regional reports and technical information. | **www.fws.gov/wetlands/Status-and-Trends/**