



Minnesota
Pollution
Control
Agency

Long Term Depressional Wetland Monitoring Sites

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Maintaining an effective monitoring program requires a thorough understanding of all the sources of variability that affect an indicator's ability to detect changes in condition. Indicator results can change over time even when ecological health or condition remains relatively stable and the observed changes are due to natural factors such as weather, succession, or population cycles. A monitoring program must be able to estimate this temporal variability (usually done across years) to gauge whether indicators reflect true changes or trends in condition.

The Minnesota Pollution Control Agency (MPCA) uses the index of biological integrity or IBI to evaluate the condition of depressional wetlands. Specifically, two separate IBIs, one based on plants and one based on macroinvertebrates (aquatic bugs, snails, and leeches), are used to assess wetland condition. Monitoring aquatic plants and animals is an excellent way to determine the health of an ecosystem because they are constantly exposed to the effects of various stressors impacting their environment.

Some types of stressors are site-specific (e.g., polluted runoff, mowing, sedimentation); their intensity, duration, and frequency vary substantially from site to site. Other types of stressors (e.g., atmospheric deposition) as well as climate patterns (e.g., wet vs. dry years) can have a relatively uniform effect on all the sites within a large geographic region. Distinguishing these two types of effects, local vs. regional, as well as understanding the relative contribution of temporal

variability is essential for properly evaluating the effectiveness of policies, regulations, and management activities designed to protect and/or improve wetland condition.

Establishing a set of long term monitoring sites, where indicators are measured on a regular (e.g., annual) basis, is a way to characterize the contribution of regional effects and temporal variability to observed changes in indicators. Selection of long term monitoring sites must be done carefully to ensure that observed changes in the indicator are not due to changes in ecological condition resulting from management activities or stressors at the local scale. Therefore, sites should be located in areas where land use patterns are expected to remain relatively stable. Wetlands located in least-disturbed natural areas (e.g., parks and preserves) are an obvious choice because of the relative certainty that observed changes reflect temporal variability and/or regional effects. It is also important to establish some sites in predominantly urban or agricultural settings so that the interaction between temporal variability and land use can be characterized. However, given the variety of stressors affecting sites in these settings, there is less certainty at these sites that changes in the indicator solely reflect temporal variability and regional effects.

In addition to serving as a benchmark for gauging the effectiveness of policies and projects aiming to restore or protect wetland condition, long term monitoring sites can also serve as sentinels for assessing the impact of global climate

change on wetland condition. In this way, long term monitoring sites can also be used to determine the need to recalibrate existing water quality criteria. If condition in these sites changes dramatically in the absence of concurrent changes in their surrounding landscape, it may be an indication that water quality criteria can no longer be reasonably attained and thus may require adjustment.

For example, biocriteria the MPCA uses to assess depressional wetland condition are determined by the range of IBI scores among regional, least-disturbed reference sites. The lowest IBI score observed among the reference sites serves as the threshold for determining whether or not a wetland is impaired. If long term monitoring sites within this region, particularly those in least-disturbed landscapes, indicated a significant declining trend in condition, it may signify the need to resample plant and macroinvertebrate communities within the previously established set of reference sites and if necessary adjust the IBI-based impairment threshold. Once again, careful consideration would need to be made regarding the changes in condition observed at the long term monitoring sites to ensure that regional effects were largely responsible.

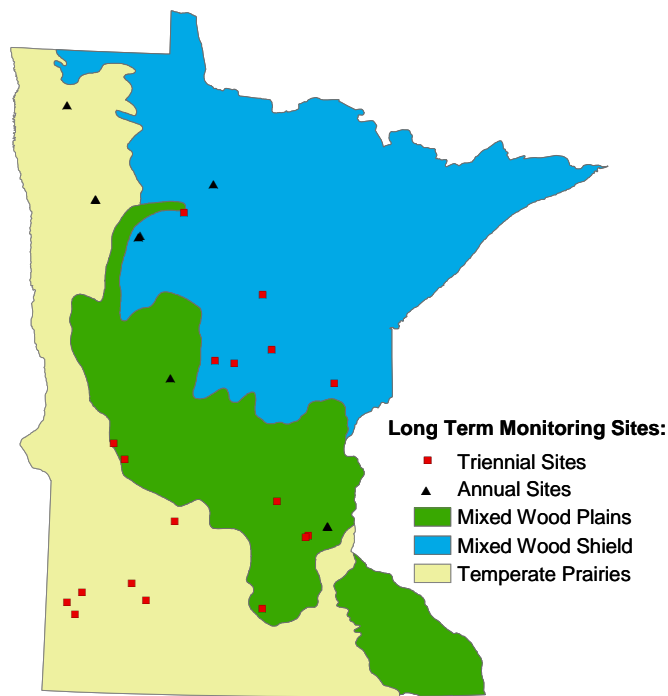
Data utilization

- Characterize temporal variability of indicators.
- Describe cycles or trends in condition resulting from regional effects.
- Determine the impact of global climate change on depressional wetland condition in Minnesota.

Status and next steps

In 2004 the MPCA began designating long term depressional wetland monitoring sites that would be sampled every three years. Six of these ‘Triennial’ sites were selected within each of Minnesota’s three major ecoregions (see map). Sites were located in one of three dominant land use categories (natural, urban, agricultural) where major land use changes were not expected in the foreseeable future. Periodic evaluation of these sites and their watersheds will be required to determine if they are still providing estimates of temporal variability and regional effects. For instance, substitution may be required if site-specific activities or

stressors begin to significantly alter the condition of a long term monitoring site.



In 2007 the MPCA initiated a statewide probabilistic survey of depressional wetland condition (see ‘Comprehensive Wetland Monitoring Survey’ fact sheet). This long term monitoring design utilizes a rotating ecoregion approach to produce statewide results every three years. Since each ecoregion is sampled in a different year, a way was needed to assess whether regional-scale effects disproportionately influence the condition of depressional wetlands in an ecoregion for any given year of the survey. To address this need, a set of sites was randomly selected for monitoring on an annual basis. Three of these ‘Annual’ sites were selected from each of Minnesota’s three major ecoregions (see map).

Contact information

To learn more about the purpose of depressional wetland long term monitoring sites, please contact:

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