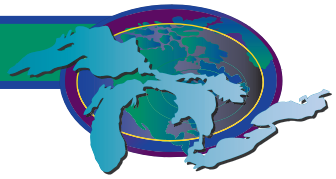

Coastal Wetland Invertebrate Community Health

Indicator #4501

This indicator was last updated in 2005.

Note: This is a progress report towards implementation of this indicator, and it has not yet been put into practice. The following evaluation was constructed using input from investigators collecting invertebrate community composition data from Great Lakes coastal wetlands over the last several years. Neither experimental design nor statistical rigor has been used to specifically address the status and trends of invertebrate communities of coastal wetlands of the five Great Lakes.

Overall Assessment

Status:	**Not Assessed**
Trend:	**Not Assessed**

Lake-by-lake Assessment

Separate lake assessments were not included in the last update of this report.

Purpose

- To directly measure specific components of invertebrate community composition
- To infer the chemical, physical and biological integrity and range of degradation of Great Lakes coastal wetlands

State of the Ecosystem

Development of this indicator is still in progress. Thus, the state of the ecosystem could not be determined using the wetland invertebrate community health indicator during the last 2 years.

Teams of Canadian and American researchers from several research groups (e.g. the Great Lakes Coastal Wetlands Consortium, the Great Lakes Environmental Indicators project investigators, the U.S. Environmental Protection Agency (U.S. EPA) Regional Environmental Monitoring and Assessment Program (REMAP) group of researchers, and others) sampled large numbers of Great Lakes wetlands during the last two years. They have reported an array of invertebrate communities in Great Lakes wetlands in presentations at international meetings, reports, and peer-reviewed journals.

In 2002 the Great Lakes Coastal Wetlands Consortium conducted extensive surveys of wetland invertebrates of the 4 lower Great Lakes. These data are not entirely analyzed to date. However, the Consortium-adopted Index of Biotic Integrity (IBI, Uzarski *et al.* 2004) was applied in wetlands of northern Lake Ontario. The results can be obtained from Environment Canada (Environment Canada and Central Lake Ontario Conservation Authority 2004).

Uzarski *et al.* (2004) collected invertebrate data from 22 wetlands in Lake Michigan and Lake Huron during 1997 through 2001. They determined that wetland invertebrate communities of northern Lakes Michigan and Huron generally produced the highest IBI scores. IBI scores were primarily based on richness and abundance of Odonata, Crustacea plus Mollusca taxa richness, total genera richness, relative abundance Gastropoda, relative abundance Sphaeriidae, Ephemeroptera plus Trichoptera taxa richness, relative abundance Crustacea plus Mollusca, relative abundance Isopoda, Evenness, Shannon Diversity Index, and Simpson Index. Wetlands near Escanaba and Cedarville, Michigan, scored lower than most in the area. A single wetland near the mouth of the Pine River in Mackinac County, MI, consistently scored low, also. In general, all wetlands of Saginaw Bay scored lower than those of northern Lakes Michigan and Huron. However, impacts are more diluted near the outer bay and IBI scores reflect this. Wetlands near Quanicassee and Almeda Beach, MI, consistently scored lower than other Saginaw Bay sites.

Burton and Uzarski (unpublished) also studied drowned river mouth wetlands of eastern Lake Michigan quite extensively since 1998. Invertebrate communities of these systems show linear relationship with latitude. However, this relationship also reflects anthropogenic disturbance. Based on the metrics used (Odonata richness and abundance, Crustacea plus Mollusca richness, rotal genera richness, relative abundance Isopoda, Shannon Index, Simpson Index, Evenness, and relative abundance Ephemeroptera), the sites studied were placed in increasing community health in the order Kalamazoo, Pigeon, Muskegon, White, Pentwater, Pere Marquette, Manistee, Lincoln, and Betsie. The most impacted systems of eastern Lake Michigan are located along southern edge

and impacts decrease to the north.

Wilcox *et al.* (2002) attempted to develop wetland IBIs for the upper Great Lakes using microinvertebrates. While they found attributes that showed promise during a single year, they concluded that natural water level changes were likely to alter communities and invalidate metrics. They found that Siskiwit Bay, Bark Bay, and Port Wing had the greatest overall taxa richness with large catches of cladocerans. They ranked microinvertebrate communities of Fish Creek and Hog Island lower than the other four western Lake Superior sites. Their work in eastern Lake Michigan testing potential metrics placed the sites studied in decreasing community health in the order Lincoln River, Betsie River, Arcadia Lake/Little Manistee River, Pentwater River, and Pere Marquette River. This order was primarily based on the median number of taxa, the median Cladocera genera richness, and also a macroinvertebrate metric (number of adult Trichoptera species).

Pressures

Physical alteration and eutrophication of wetland ecosystems continue to be a threat to invertebrates of Great Lakes coastal wetlands. Both can promote establishment of non-native vegetation, and physical alteration can destroy plant communities altogether while changing the natural hydrology to the system. Invertebrate community composition is directly related to vegetation type and densities; changing either of these components will negatively impact the invertebrate communities.

Comments from the author(s)

Progress on indicator development has been substantial, and implementation of basin-wide sampling to indicate state of the ecosystem should be possible before SOLEC 2006. *[Editor's Note: An updated and implemented version of this indicator was not available by SOLEC 2006].*

Acknowledgments

Authors:

Donald G. Uzarski, Annis Water Resources Institute, Grand Valley State University, Lake Michigan Center, 740 W. Shoreline Dr., Muskegon, MI, 49441; and

Thomas M. Burton, Departments of Zoology and Fisheries and Wildlife, Michigan State University, East Lansing, MI, 48824.

Sources

Environment Canada and Central Lake Ontario Conservation Authority. 2004. *Durham Region Coastal Wetland Monitoring Project: year 2 technical report.* Downsview, ON. ECB-OR.

Uzarski, D.G., Burton, T.M., and Genet, J.A. 2004. Validation and performance of an invertebrate index of biotic integrity for Lakes Huron and Michigan fringing wetlands during a period of lake level decline. *Aquat. Ecosystem Health & Manage.* 7(2):269-288.

Wilcox, D.A., Meeker, J.E., Hudson, P.L., Armitage, B.J., Black, M.G., and Uzarski, D.G. 2002. Hydrologic variability and the application of index of biotic integrity metrics to wetlands: a Great Lakes evaluation. *Wetlands* 22(3):588-615

Last Updated

State of the Great Lakes 2005