

Degradation of Benthos

Significance in Michigan's Areas of Concern

Thirteen AOCs in Michigan have identified Degradation of Benthos as a BUI (all except Deer Lake). This impairment usually results from the biologically-based effects of sediment contamination and is closely related to the restrictions on dredging impairment. This impairment deals with only the surficial layer of sediments where organisms live.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

- An assessment of benthic community, using either MDEQ's SWAS Procedure #51 for wadeable streams or MDEQ's pending rapid assessment procedure for non-wadeable rivers yields a score for the benthic metrics which meets the standards for aquatic life in any 2 successive monitoring cycles (as defined in the two procedures).

OR

In cases where MDEQ procedures are not applicable and benthic degradation is caused by contaminated sediments, this BUI will be considered restored when:

- All remedial actions for known contaminated sediment sites with degraded benthos are completed (except for minor repairs required during operation and maintenance) and monitored according to the approved plan for the site. Remedial actions and monitoring are conducted under authority of state and federal programs, such as the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund), Resource Conservation and Recovery Act, Great Lakes Legacy Act, or Part 201 of Michigan's National Resource and Environmental Protection Act (NREPA) of 1994.

Rationale

Practical Application in Michigan

The AOC program addresses the worst contaminated sites in the Great Lakes. Those AOCs that have degradation of benthos from sediment contamination have specific sites that are being remediated with regulatory programs. Once these specific sites have been remediated, the benthos in the AOC will no longer be among the worst in the Great Lakes so the use impairment can be considered

restored. The reason for identifying degradation of benthos varies across Michigan's AOCs. Benthos in some AOCs is degraded due to non-contaminated sediment deposition, or hydrologic changes in the waterbody. In other AOCs, benthos are degraded due to the effects of contaminated sediments.

The restoration criteria for Degradation of Benthos allows for two different approaches for evaluating restoration success. The first approach employs MDEQ procedures for evaluating benthic community structure in wadeable and non-wadeable streams. Rapid, qualitative biological assessments of wadeable streams and rivers are conducted using SWAS Procedure #51, which compares fish and benthic invertebrate communities at a site to the communities that are expected at an unimpacted, or reference site. This is a key tool used by MDEQ to determine whether waterbodies are attaining Michigan WQS. However, this procedure cannot be used on non-wadeable rivers. The MDEQ has been partnering with Michigan State University to develop and validate a procedure for assessing aquatic communities in non-wadable rivers that the State implemented beginning in 2006. If these procedures are applicable to an AOC, data collected under the monitoring program will be used to evaluate whether benthos has been restored according to the criteria. Where biological assessments are not applicable, the second approach will be used to determine removal of this BUI.

The second approach focuses on benthic degradation from chemical contamination. Contaminated sediments are the primary cause for benthic impairments in AOCs. Sediment remediation and assessment will be accomplished through established programs such as federal Superfund, Resource Conservation and Recovery Act, Great Lakes Legacy Act, and Michigan's NREPA Part 201. Criteria are site specific and are usually based on sediment chemistry or sediment toxicity. In addition to dredging contaminated sediments for remediation, regulatory programs sometimes adopt natural attenuation as the method for addressing contaminated sediments. In both cases, when the final remedial measures are completed, and monitored according to site plans, the BUI will be considered restored. Removal of the BUI will not be contingent on full recovery of the benthic community, which may take many years or even decades.

1991 IJC General Delisting Guideline

When the benthic macroinvertebrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment-associated contaminants is not significantly higher than controls.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above describes application of

specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan conducts remedial actions on contaminated sediments under NREPA Part 201 and other state regulatory authority. The State also cooperates with federal programs that remediate contaminated sediments and restore benthos, such as the U.S. Superfund, the Resource Conservation and Recovery Act, and the Great Lakes Legacy Act programs. In addition, the State has a permit program for dredging and filling of lakes, streams, and wetlands. Through these programs, biologically based effects of contamination could be determined as part of any assessment. Remediation which addresses biological effects occurs on a site-specific basis.

The MDEQ has benthic data from wadeable stream surveys (SWAS Procedure #51) gathered as part of the 5-year rotating basin monitoring in the state. In addition, the State will be starting a monitoring program for benthos in non-wadeable streams as part of the 5-year basin monitoring program beginning in 2006. Data from these surveys, as well as other relevant state monitoring data (e.g. MDNR surveys or special studies by DEQ for lake systems) will be used as applicable for monitoring and assessing restoration of this impairment.

In addition, U.S. EPA GLNPO and the U.S. Geological Survey are working together to identify procedures for developing delisting criteria for BUIs associated with contaminated sediments. The MDEQ will incorporate this guidance, as available and applicable, into the assessment of whether the State's restoration criteria for Degradation of Benthos BUI have been met in Michigan AOCs.

Some local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC chooses to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately address the restoration criteria and meet quality assurance and control requirements, they may be used to demonstrate restoration success.