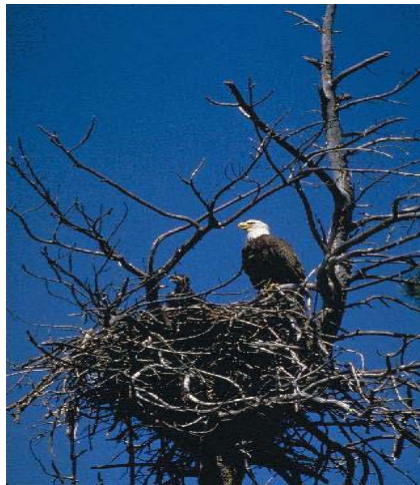


Guidance for Delisting Michigan's Great Lakes Areas of Concern



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Guidance for Delisting Michigan’s Great Lakes Areas of Concern

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Introduction

Background

In 1987, Amendments to the Great Lakes Water Quality Agreement were adopted by the federal governments of the U.S. and Canada. Annex 2 of the amendments listed fourteen different beneficial use impairments (BUIs) which are caused by a detrimental change in the chemical, physical, or biological integrity of the Great Lakes system. It directed the two countries to identify Areas of Concern (AOCs) that do not meet the objectives of the Agreement. Remedial Action Plans addressing the beneficial use impairments were to be prepared for all AOCs. The BUIs provided a tool for describing effects of the contamination, and a means for focusing remedial actions.

The scope of the AOC program is based on the concept that each area has had at least one BUI that is an extraordinary problem; one that sets the area apart from other sites with lesser contamination in the state that are not an AOC.

There are fourteen AOCs in Michigan, with a total of 108 BUIs. Ten of the AOCs are completely within Michigan's borders (Kalamazoo River, Muskegon Lake, White Lake, Manistique River, Deer Lake, Torch Lake, Saginaw River, River Raisin, Rouge River, and Clinton River). Three (the Detroit, St. Clair and St. Marys Rivers) are along the U.S. and Canadian border, and one AOC, Menominee River, is shared with Wisconsin. In the latter four AOCs, responsibility for restoring BUIs is shared among jurisdictions (see Table 1).

There are major differences in geographic scope and contamination in Michigan's AOCs. For example, the Manistique River AOC consists of only the last 1.7 miles of river in Manistique (pop. 3583) and the BUIs are primarily caused by one pollutant - PCB. On the other end of the scale, the Detroit River AOC is a 32 mile long international connecting channel in Detroit (pop. 951,270), with 9 BUIs caused by numerous sources of industrial, municipal, and agricultural contamination on both sides of the border. Details can be found on the web sites of the AOCs at: <http://www.epa.gov/glnpo/aoc/index.html>

Areas of Concern in the Great Lakes-St. Lawrence River Basin



Purpose

When AOCs were originally designated in the late 1980s, no specific, quantitative criteria for listing or delisting these areas were developed. The IJC issued general listing and delisting criteria in 1991 (IJC, 1991), and the U.S. Policy Committee (USPC) issued general guidance on the process for AOC delisting in 2001 (USPC, 2001). These efforts, however, were not specific enough for use in determining restoration of individual BUIs by either the state of Michigan or the U.S. federal government.

In order to direct restoration efforts and develop benchmarks for measuring their success, several AOCs in Michigan began to develop their own individual restoration targets. As they proceeded in developing restoration targets and plans for delisting, the Michigan Department of Environmental Quality (MDEQ) received many requests from AOC Public Advisory Councils for information regarding what criteria would be applied, what approaches are acceptable, and how the delisting process will work when an AOC has restored all of its BUIs.

In response, the MDEQ developed this *Guidance for Delisting Michigan's Great Lakes Areas of Concern*. The purpose of this document is to: 1) provide guidance to AOC communities on the state's process for delisting AOCs; and 2) identify specific quantitative or qualitative criteria which the state will use to determine when BUIs have been restored.

How to Use this Document

The first sections of the document outline the process the state will use to track restoration progress, remove BUIs, and ultimately delist AOCs. These sections identify the key steps and principles for evaluating the status of AOC impairment listings, the process for formally removing BUIs for each AOC, and the steps for requesting and documenting that an AOC is ready for delisting.

The main part of the document is the statewide Criteria for Restoration of Beneficial Use Impairments for Michigan's Great Lakes. The criteria offer Michigan's position on what constitutes restoration of the BUIs, and any BUI that meets these criteria will be considered restored by the state. Assessment of each BUI is integrated with the criteria.

Disclaimer

The Great Lakes Water Quality Agreement is a non-regulatory agreement between the U.S. and Canada, and criteria developed under its auspices are non-regulatory in nature. The criteria in this document may not be used separately in enforcement or regulatory actions under any state or federal law. The restoration criteria are consistent with state and federal regulatory authority, and regulatory actions may be used to achieve these criteria where specific authority exists in state or federal law. Standards and formal guidelines in state and federal law are referenced wherever applicable in the criteria.

Table 1: Michigan AOC/BUI Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Kalamazoo R.	X		X		X	X	X			X	X			X
Muskegon L.	X		X			X	X	X	X	X	X			X
White L.	X		X			X	X	X	X		X			X
Manistique R.	X					X	X			X				X
Menominee R	X		X			X	X			X				X
Torch L.	X			X		X								
Deer L.	X				X									
St. Marys R.	X		X	X	X	X	X	X		X	X			X
Saginaw Bay	X	X	X		X	X	X	X	X	X	X		X	X
St. Clair R.	X	X			X	X	X		X	X	X	X		X
Clinton R.	X		X			X	X	X		X	X			X
Detroit R.	X	X		X		X	X		X	X	X			X
Rouge R.	X		X	X		X	X	X		X	X			X
River Raisin	X		X		X	X	X	X		X	X			X

1 = Restrictions on fish and wildlife consumption	9 = Restrictions on drinking water consumption or taste and odor problems
2 = Tainting of fish and wildlife flavor	10= Beach closings
3 = Degradation of fish and wildlife populations	11= Degradation of aesthetics
4 = Fish tumors or other deformities	12= Added costs to agriculture or industry
5 = Bird or animal deformities or reproductive problems	13= Degradation of phyto- or zooplankton populations
6 = Degradation of benthos	14= Loss of fish and wildlife habitat
7 = Restrictions on dredging activities	
8 = Eutrophication or undesirable algae	

Tracking Restoration of Beneficial Use Impairments

This section describes actions and policy for applying restoration criteria to the BUIs in AOCs and documenting progress toward removal. The MDEQ is committed to a partnership with the local Public Advisory Councils (PACs) and the U.S. EPA in this effort.

- a) Restoration criteria are applied when BUIs identified in each AOC's approved Remedial Action Plan (RAP) are ready for assessment. State AOC staff conduct periodic qualitative reviews of the status of each AOC's BUIs as reported in RAP updates to gauge readiness.
- b) The state's restoration criteria are applied to all BUIs except where locally developed criteria are approved. PACs have the ability to establish restoration criteria that are functionally equivalent to the statewide criteria. Any locally developed criteria are submitted to MDEQ for approval. The PACs are expected to demonstrate how any locally developed criteria are equivalent to the statewide criteria. Approval is based on meeting or exceeding the state's criteria.
- c) State assessments required for each BUI are integrated into the criteria.
- d) Local targets that require assessment beyond what is required for the statewide criteria (e.g., more frequent, different parameters, etc.) are the responsibility of the local PAC, including reporting results to the MDEQ. The MDEQ assists as resources allow.
- e) The MDEQ maintains the official delisting file for each AOC with all finalized BUI restoration/removal records, finalized memos/letters, RAPs, and finalized RAP updates. These files are maintained in the Lansing MDEQ offices and are available to the public.
- f) RAP updates are prepared at least every 2 years for each AOC, and are the primary tool for documenting and communicating progress to the public and agencies. These documents are brief, user-friendly updates (about 10 pages) on recent remedial actions and assessments in the AOC. They are prepared by the MDEQ in consultation with the PAC and USEPA. RAP updates are posted on the AOC web site. They will be prepared according to Table 2.

Table 2: RAP Update Schedule

Note: This schedule is a draft under consideration. It is not yet final.

Every 2 years starting in 2006*	Every 2 years starting in 2007*
Muskegon Lake	Kalamazoo River
White Lake	Menominee River
Manistique River	Deer Lake
Torch Lake	St. Mary's River
Saginaw River/Bay	St. Clair River
Clinton River	Detroit River
Rouge River	River Raisin

*until an AOC is delisted

Removal of Beneficial Use Impairments

This section describes the actions and policies for removing a BUI and documenting that in MDEQ's AOC file. BUIs can be removed individually, in groups, or all at the same time. The MDEQ is committed to a partnership with the local PACs and EPA in this effort.

- a) When the MDEQ AOC coordinator, in consultation with the PAC, determines a BUI is ready for final review of restoration according to the applicable criteria, a team of relevant agency staff is convened to review the documentation and support or not support removal of the BUI. Deliberations are documented with a briefing memo by the MDEQ AOC coordinator to the chief of the Water Bureau, MDEQ.
- b) The team consults with the PAC during the review and a public meeting is held in the AOC. When the public review is completed, the chief of the Water Bureau-MDEQ requests a letter of support from the PAC for the removal of the BUI.
- c) When the technical and public review is complete, a letter is sent from the chief of the Water Bureau MDEQ to EPA to document removal of the BUI(s) and the support of the PAC. The letter requests concurrence with the removal from EPA. The letters from MDEQ, the PAC and EPA are part of the permanent AOC file.
- d) Once documented as removed, there is no further assessment of the BUI in the AOC.
- e) After removal of a BUI, if additional contamination is found in an AOC during routine or other program monitoring, it is addressed on a case-by-case basis by the MDEQ under existing programs. This is not a cause for delaying delisting unless the contamination is indicative that the original BUI was not resolved.
- f) All partners cooperate on publicizing the BUI restoration, as appropriate.

Delisting Areas of Concern

This section outlines the actions necessary to delist an AOC, adopted by the USPC in December, 2001. The 10 steps are the same as those in the USPC's *Delisting Principles and Guidelines* document (USPC, 2001), operationalized for Michigan.

- a) When all BUIs in an AOC have been removed, a draft final RAP report is prepared by the MDEQ in consultation with the PAC and EPA. This step may be concurrent with the removal of BUIs above.
- b) Within 30 days of completing the draft final RAP report, the MDEQ director and the PAC will each submit a letter of recommendation to delist the AOC to the appropriate EPA Regional Administrator.
- c) The USEPA consults with the director of the MDEQ on the draft final RAP report and on the recommendation to delist the AOC. Any revisions resulting from the consultation will be incorporated by the MDEQ and EPA, as appropriate, within 60 days.
- d) Concurrent with step c), the EPA will consult with the Director of the IJC Great Lakes Regional Office on the draft final RAP report and the recommendation to delist the AOC. The regional office will respond within 60 days and revisions will be incorporated by the MDEQ and EPA, as appropriate.
- e) The MDEQ, in consultation with the EPA and the PAC, then holds a public meeting to formally present the draft final RAP report to the public and stakeholders for review and comment. The public comment period will be 60 days and revisions will be incorporated by the MDEQ and EPA, as appropriate.
- f) Taking state agency, USEPA, IJC Great Lakes Regional Office, PAC, and public comments into account, the MDEQ, in consultation with EPA, will prepare a final RAP report. The report will be prepared within 60 days. A summary of comments and responses will also be produced.
- g) The EPA Regional Administrator sends the final RAP report and a letter recommending AOC delisting to the U.S. Department of State and the director of the MDEQ, as well as appropriate Canadian federal and provincial agencies.
- h) The U.S. Secretary of State officially removes the water body from the list of AOCs within 30 days of receipt of the final RAP report.

Draft for Discussion

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- i) Formal notice of delisting and the final RAP report and supporting letter is transmitted to the IJC by the U.S. Secretary of State within 10 days of formal delisting.
- j) All partners cooperate on publicizing and celebrating delisting of the AOC.

Special Considerations

This section addresses a few special cases related to shared jurisdictions, use of special designations, source control, and dispute resolution for the processes outlined above.

- a) The 4-Agency Letter of Commitment processes for delisting and dispute resolution apply to the binational AOCs. Binational restoration targets for these AOCs must be at least functionally equivalent to Michigan's statewide restoration criteria.
- b) Michigan shares jurisdiction for the Menominee River AOC with Wisconsin. If the PAC chooses to develop one set of restoration targets for the AOC, they must be at least functionally equivalent to Michigan's statewide restoration criteria. Michigan's process for removal of BUIs and delisting AOCs applies to the Michigan portion of this AOC.
- c) The formal AOC in Recovery designation is not used in Michigan by the MDEQ. Incremental progress is instead demonstrated by removal of BUIs and regular AOC progress reports
- d) The restoration and removal process for BUIs and the delisting process for AOCs is supported by the MDEQ only for an entire AOC and an entire BUI, not sub-watersheds or portions of BUIs. Progress is shown by removal of BUIs and regular AOC updates.
- e) While the MDEQ only officially supports removal of BUIs or requests for delisting as described in 4 (d) above, PACs may choose other methods of showing and celebrating incremental progress, using local resources.
- f) In some circumstances, monitoring may indicate that full restoration of a BUI has not occurred, even when all remedial actions to address the problem and control sources of pollutants in the AOC have been completed. This could be due to two factors: 1) sources of contaminants are external to the AOC watershed; or 2) the resources affected are still recovering from historical (pre-remediation) affects.

When assessment of a BUI indicates that it does not meet the statewide restoration criteria, and there is indication that it may be due to external pollutant sources, The MDEQ will undertake further investigation of potential contaminant sources to rule out the possibility of an ongoing source within the AOC watershed. If the existence of an impairment is determined to be due to contaminants originating only from sources outside the AOC watershed, it will not preclude removal of BUI and delisting of an AOC.

In addition, the MDEQ will take into account the time of recovery for some resources when evaluating restoration success. For some BUIs, the affected resource may take many years to recover after remedial actions are complete. Full restoration of the impairment may not be required in all cases prior to delisting, if the resource is showing consistent improvement after all necessary remedial actions have been completed.

- g) The AOC boundaries are those shown on the web sites of the AOC program at: <http://www.epa.gov/glnpo/aoc/index.html>. Any subsequent change to the boundaries must be documented and approved by letters from the MDEQ, PAC, and EPA.
- h) Technical issues regarding either removal of a BUI or delisting of an AOC are resolved by MDEQ, EPA, and PAC technical staff. Unresolved technical issues may be elevated to a panel consisting of the chief of the MDEQ Water Bureau, the director of EPA's Great Lakes National Program Office, and the PAC chair, or their designee.

Criteria for Restoration of Beneficial Use Impairments

The following pages contain the specific restoration criteria for each of the 14 BUIs identified in Annex 2 of the 1987 Amendments to the Great Lakes Water Quality Agreement. The criteria for each BUI includes 4 main components:

1. *Significance in Michigan's Areas of Concern:* The number of AOCs affected by the impairment, and other relevant considerations regarding scope.
2. *Restoration Criteria and Assessment:* The specific, measurable goals for guiding restoration, and the monitoring and assessment requirements for demonstrating restoration success.
3. *Rationale:* Relevant rationale for why the specific criteria were selected for Michigan's AOCs and the 1991 general IJC delisting guidelines.
4. *State of Michigan Programs and Authorities for Evaluating Restoration:* A brief overview of the existing state programs and methodologies that will be used by the MDEQ to assess whether the restoration criteria have been met.

The criteria are Michigan's position on what constitutes restoration of the BUIs, and any AOC that meets these criteria will be considered restored by the state. Local PACs may offer alternate criteria which will be reviewed by the state and may be approved if functionally equivalent to, or higher than Michigan's criteria.

A fundamental assumption of the statewide restoration criteria is that sources of pollutants within the AOC watershed which cause any of the BUIs must be controlled before a BUI can be removed and an AOC delisted. Assessment of this step is determined by results from site-specific monitoring of remedial actions or other monitoring in the AOC. If a beneficial use is impaired only due to contaminants originating from sources outside the AOC watershed, it will not preclude removal of BUI and delisting of an AOC (see p. 12, "Special Considerations" (f) for further detail on this issue).

Restrictions on Fish and Wildlife Consumption

Significance in Michigan's Areas of Concern

Fish and wildlife consumption advisories in Michigan are determined by the Michigan Department of Community Health (MDCH), based on levels of contaminant concentrations in fish or wildlife tissue. Currently, all of Michigan's 14 AOCs have consumption advisories for specific contaminants in certain species of fish. No AOCs have advisories for wildlife consumption. Fish consumption advisories range from no human consumption to restrictions on consumption for specific amounts of fish for certain human populations.

Almost all fish consumption advisories are based on levels of polychlorinated biphenyls (PCBs) or mercury which exceed MDCH guidelines. Excessive levels of dioxin result in fish consumption advisories in the Saginaw Bay/River AOC and in the Detroit River AOC. Excessive chlordane is causing fish consumption advisories in the White Lake AOC. Other non-AOC locations in Michigan also have various consumption advisories for these contaminants. There is a statewide consumption advisory for certain fish in all inland lakes due to mercury contamination.

Michigan Restoration Criteria and Assessment

The restoration criteria for this BUI uses a tiered approach for evaluating restoration success. This BUI will be considered restored when:

1. The fish consumption advisories in the AOC are the same or less restrictive than the associated Great Lake.

OR, if the advisory in the AOC is more stringent than the associated Great Lake

2. A comparison study of fish tissue contaminant levels demonstrates that there is no statistically significant difference in fish tissue concentrations of contaminants causing fish consumption advisories in the AOC compared to a control site.

OR, if a comparison study is not feasible because of the lack of a suitable control site

3. Analysis of trend data for fish with consumption advisories shows similar trends to other appropriate Great Lakes trend sites.

When comparison studies (per #2 above) are used to demonstrate restoration of a BUI, the studies will:

- Be designed to control variables known to influence contaminant concentrations such as species, size, age, sample type, and lipids.
- Include a control site which is agreed to by the MDEQ. It will be chosen based on physical, chemical, and biological similarity to the AOC and the 2 sites must be within the same ecoregion (see www.fs.fed.us/institute/ecoregions/na_map.html).
- Use fish samples collected from the AOC and control site within the same timeframe (ideally 1 year).
- Evaluate contaminant levels in the same species of fish from the AOC and the control site to avoid problems with cross-species comparisons. In addition, fish used for comparison studies should be the same species as the consumption advisory.

If there is no statistically significant difference ($\alpha = 0.05$) in fish tissue concentrations of contaminants causing advisories in the AOC compared to a control site, then the BUI has been restored. If there is a significant difference between the AOC and the control site in the comparison study, then an impairment exists.

If a comparison study is not practical for the AOC due to the lack of an appropriate control site, then trend monitoring data (if available) can be used to determine restoration success (as per #3 above). This is likely to be the approach used to evaluate this BUI in the connecting channel AOCs, where there are not appropriate control sites for a comparison study, and where MDEQ has substantial trend monitoring data. If trend analysis of fish with consumption advisories shows similar trends to other appropriate Great Lakes trend sites, this BUI will be considered restored. If trend analysis does not show similarity to other appropriate Great Lakes trends sites, then an impairment exists.

Rationale

Practical Application in Michigan

Restoration of the fish consumption advisory BUI is based on comparison of fish consumption advisories and tissue concentrations in the AOC with the associated Great Lake, not whether or not fish advisories exist in the AOCs or control site.

Comparison of advisories or tissue concentrations to a control site is used because some fish consumption advisories are issued statewide or are due to sources outside an AOC. Because the existence of an advisory may not be due to contaminant sources in an AOC, it should not preclude removal of this BUI. A more stringent advisory in the AOC than the associated Great Lake is an indication that there may be an ongoing contaminant issue within the AOC. In this case, additional source assessment will be conducted to determine whether there are sources of contamination within the AOC.

The MDEQ will consider restoration of this BUI on a case by case basis for AOCs with circumstances that do not fit exactly into the evaluation steps outlined above.

1991 IJC General Delisting Guideline

When contaminant levels in fish and wildlife populations do not exceed current standards, objectives or guidelines, and no public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must not be due to contaminant input from the watershed.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above takes the general guideline and applies specific criteria for restoration based on existing Michigan programs and authorities.

State of Michigan Programs/Authorities for Evaluating Restoration

Michigan assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites defined by the National Pollutant Discharge Elimination System (NPDES) permitting program for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every five years (see Appendix 1 for maps of the basin rotations). One element of the state's monitoring strategy is the enhanced and improved Fish Contaminant Monitoring Program (FCMP).

The specific objectives of the FCMP are to:

1. Determine whether fish from the waters of the state are safe for human consumption.
2. Measure whole fish contamination concentrations in the waters of the state.

3. Assess whether contaminant levels in fish are changing with time.
4. Assist in the identification of waters that may exceed standards and target additional monitoring activities.
5. Evaluate the overall effectiveness of MDEQ programs in reducing contaminant levels in fish.
6. Identify waters of the state that are high quality.
7. Determine if new chemicals are bioaccumulating in fish from Michigan waters.

The FCMP element consists of several components that, in combination, provide data necessary to achieve these objectives. These include:

- Edible fish portion monitoring to support the establishment or delisting of fish consumption advisories;
- Native whole fish trend monitoring;
- Periodic evaluations to expand and improve the state's fish trend monitoring network; and
- Caged fish monitoring for source/problem identification.

Fish contaminant data are used to determine whether fish from waters of the state are safe for human and wildlife consumption, and as a surrogate measure of bioaccumulative contaminants in surface water. Fish tissues are analyzed for bioaccumulative contaminants of concern. These include mercury, PCBs, chlorinated pesticides (e.g. DDT/DDE/DDD), dioxins, and furans. More recently, some fish tissues have been analyzed for polybrominated biphenyl ethers (PBDEs) and perfluorooctane sulfonate (PFOS). Data are reviewed each year to determine whether there are additional new parameters of concern for which the fish should be analyzed.

Fish contaminant studies needed for the assessment of this BUI restoration will be arranged by MDEQ as part of the Michigan FCMP. Timing and study design will be determined by the MDEQ based on available resources.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Tainting of Fish and Wildlife Flavor

Significance in Michigan's Areas of Concern

Three of Michigan's AOCs are listed as either impaired or unknown for fish and wildlife tainting – Detroit River, Saginaw River/Bay, and St. Clair River. The impairment in all of these AOCs is fish, not wildlife, tainting.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

- No more than three reports of fish or wildlife tainting have been made to the Michigan Department of Natural Resources (MDNR) or MDEQ for a period of three years.

OR, if there have been reports of tainting

- A one-time analysis of representative fish species in an AOC in accordance with MDEQ Surface Water Assessment Section (SWAS) Procedure 55 for conducting taste and odor studies indicates that there is no tainting of fish flavor.

Rationale

Practical Application in Michigan

Throughout Michigan, including the AOCs identified above, there have been historical taste and odor complaints related to fish. Tainting has been associated with water quality contaminants such as oils, grease, metals, phenols, PCBs, and wastewater, as well as algae over-abundance from high levels of nutrients.

Surface Water Assessment Section Procedure #55 lays out a specific methodology for evaluating fish tainting in compliance with Rule 55 of the Michigan Water Quality Standards (WQS). Rule 55 states that “waters of the state shall contain no taste-producing or odor-producing substances in concentrations which impair or may impair their use for a public, industrial, or agricultural water supply source, or which impair the palatability of fish ...” This BUI restoration criteria is consistent with Rule 55 of the state WQS and SWAS Procedure #55.

The state has no formal methodology for evaluating wildlife tainting, but none has been reported. The only means of tracking wildlife tainting is through calls or complaints to the MDNR or MDEQ.

1991 IJC General Delisting Guideline

When survey results confirm no tainting of fish or wildlife flavor.

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

If a taste and odor study is necessary in an AOC, the MDEQ will work with the PAC to develop a tainting study according to Procedure #55. Once the assessment is completed, the MDEQ will evaluate whether the data indicates that the restoration criteria for this BUI has been met.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Fish Tumors or Other Deformities

Significance in Michigan's Areas of Concern

Four of Michigan's AOCs are identified as impaired for fish tumors, including: Detroit River, Rouge River, Torch Lake, and St. Mary's River.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

- No reports of fish tumors or deformities due to chemical contaminants have been verified through observation and analysis by the MDNR or MDEQ for a period of five years.

OR, in cases where any tumors have been reported:

- a comparison study of resident benthic fish (e.g., brown bullhead) of comparable age and at maturity (3 years), or of fish species which have historically been associated with this BUI, in the AOC and a non-impacted control site indicates that there is no statistically significant difference (with a 95% confidence interval) in the incidence of liver tumors or deformities.

Rationale

Practical Application in Michigan

Comparing tumor and deformity rates in resident benthic fish species, or historically impacted species, between an AOC and an un-impacted control site allows for the determination of whether this impairment is caused by local contaminant sources within an AOC or is a lakewide problem. Brown bullhead is a particularly good indicator species because it is pollution tolerant and primarily a resident fish. However, it is habitat limited in both the Detroit and Rouge River AOCs, so other benthic species may need to be used in some AOCs to evaluate tumor or deformity prevalence.

Research is on-going to develop background rates for tumor and deformity incidence in the Great Lakes, as well standardized histology and monitoring methods. The MDEQ will incorporate the results of these research efforts, as available and applicable, into the assessment of whether this restoration criterion has been met in Michigan AOCs.

The MDEQ will consider restoration of this BUI on a case by case basis for AOCs with circumstances that do not fit exactly into the evaluation steps outlined above.

1991 IJC General Delisting Guideline

When the incidence rates of fish tumors or other deformities do not exceed rates at un-impacted control sites and when survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers

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

MDEQ will coordinate with the MDNR to determine whether there have been any reports of fish tumors or deformities, verified by the appropriate agency, in the previous 5 years.

If a study of fish tumors and deformities is necessary, the MDEQ will work with the MDNR to develop a study comparing fish tumors in the AOC to an appropriate control site or reference conditions. Once the assessment is complete, the MDEQ will evaluate whether the data indicates that the restoration criteria for this BUI has been met.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Bird or Animal Deformities or Reproductive Problems

Significance in Michigan's Areas of Concern

Six of Michigan's AOCs are listed as either impaired or unknown status for bird and animal deformities (e.g., crossed bills) or reproductive problems (e.g., egg shell thinning), including: River Raisin, St. Clair River, Saginaw River/Bay, St. Marys River, Deer Lake, and Kalamazoo River.

In Saginaw River/Bay, Deer Lake, and Kalamazoo River, past studies have indicated elevated toxic chemical concentrations (e.g., mercury or PCBs) and/or some deformities in birds and other animals. In the other AOCs which list this BUI, the status is either unknown or inconclusive. In most cases, studies on bird and animal deformities have not been done. The species historically impacted are fish eating birds or animals such as bald eagles, herring gulls, common terns, mink, or otter. The contaminants associated with these impacts are primarily the persistent bioaccumulative toxics; PCBs, dioxins, DDT, and mercury.

Michigan Restoration Criteria and Assessment

Restoration of this BUI will be demonstrated using two approaches, depending on the applicability to a particular AOC. The first approach evaluates restoration based on field assessment of birds and/or other wildlife in those AOCs where MDEQ or other MDEQ-approved bird and other wildlife data are available.

The second approach will be applied in those AOCs where bird and other wildlife data are not available, and uses levels of contaminants in fish tissue known to cause reproductive or developmental problems as an indicator of the likelihood that deformities or reproductive problems may exist in the AOC.

Approach 1 – Observational Data and Direct Measurements of Birds and Other Wildlife

- Evaluate observational data of bird and other animal deformities for a minimum of 2 years over a 6-year period. If deformity or reproductive problem rates are not statistically different than inland background levels (at a 95% confidence interval), then the BUI is restored. If the rates are statistically different, or the amount of data are insufficient for analysis, then:
- Evaluate tissue contaminant levels in egg, young, and/or adult wildlife. If contaminant levels are lower than the Lowest Observable Effect Level (LOEL) for that species or are not statistically different than inland control populations (at a 95% confidence interval), then the BUI is restored.

Where direct observation of wildlife and wildlife tissue data are not available, the following approach will be used:

Approach 2: Fish Tissue Contaminant Levels as an Indicator of Deformities or Reproductive Problems

- If fish tissue concentrations of PCBs, dioxins, DDT, or mercury (as determined in the RAP) in the AOC are at or lower than the LOEL known to cause reproductive or developmental problems in fish-eating birds and mammals the use impairment is restored.

OR

- If fish tissue concentrations of PCBs, dioxins, DDT, or mercury in the AOC are not statistically different than the associated Great Lake (at 95% confidence interval), then the BUI is restored. In the connecting channel AOCs, either the upstream and downstream Great Lake may be used for comparison.

Rationale

Practical Application in Michigan

Bird and other animal deformities and reproductive problems have a particular challenge related to criteria for restoration:

- Most of the species involved are only part year residents in an AOC, or have a home range that may include locations outside an AOC. This makes it difficult to attribute deformities or reproductive problems to a specific location.
- There is also a wide variation in how this use impairment was originally determined in Michigan's AOCs.
- Many fish-eating birds and animals such as eagles are long-lived birds. Long after remedial actions have occurred and a site is restored, it is possible for reproductive effects to remain apparent.
- It is very difficult to determine actual prevalence of deformities and reproductive problems. Fox and Bowerman (in press), provide examples of this last point and detail issues with assessments of this BUI.
- In some AOCs with this BUI, the species monitored under MDEQ's wildlife monitoring program do not reside there, so no direct wildlife data are available.

Given the above practical considerations, the statewide criteria for this BUI uses two approaches – one for AOCs where wildlife data are available, and a second

approach where direct wildlife information is not available. In the latter case, contaminant levels in fish tissues are used as an indicator of potential deformities or reproductive problems in the high order, piscivorous species which have historically been impacted by contaminants (e.g., eagles, herring gulls, mink, and otter). Even in the absence of direct wildlife data, if contaminant levels in fish tissue are high, it indicates that the possibility for deformities or reproductive problems in fish-eating wildlife may be higher.

The LOELs are calculated using final surface water criteria for wildlife and the general methodology for translating that to concentrations in fish tissue, both found in the state's water quality standards (MDEQ-WQS).

PCBs, dioxins, DDT, and mercury are the contaminants of concern and each AOC with this BUI may have one or more present. Assessment in each AOC will be based on the relevant contaminant.

The state will consider restoration of this BUI on a case by case basis for AOCs with circumstances that may not fit exactly into the process outlined above.

1991 IJC General Delisting Guideline

When the incidence rates of deformities or reproductive problems in sentinel wildlife species do not exceed background levels in inland control populations

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 assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites defined by the NPDES permitting program for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations). One element of the strategy is wildlife contaminant monitoring.

Wildlife play an important role in monitoring water quality and ecosystem health and can be used to monitor for spatial and temporal trends in contaminant concentrations. Specific life stages may be sampled to provide discrete time

units for determination of temporal trends. Specific geographic regions or watersheds may be targeted for the determination of spatial trends.

The specific objectives of the wildlife contaminant monitoring are to:

1. Determine contaminant levels in wildlife that may be exposed to contaminants from surface waters of the state.
2. Assess whether contaminant levels in fish are changing with time.
3. Assist in the identification of waters that may exceed standards and target additional monitoring activities.
4. Evaluate the overall effectiveness of MDEQ programs in protecting wildlife from toxic contaminants.
5. Assist the MDCH in the establishment or removal of wildlife consumption advisories.
6. Determine whether new chemicals are bioaccumulating in wildlife.

The wildlife contaminant monitoring element currently consists of two components that, in combination, provide data necessary to achieve these objectives. These components include Bald eagle and Herring gull egg monitoring. The bald eagle project began in 1999 and has continued each year since then. Sample collection and analysis of herring gull eggs began in 2002. Wildlife are analyzed for bioaccumulative contaminants of concern, including mercury, PCBs, and chlorinated pesticides (e.g. DDT/DDE/DDD). Data are reviewed each year to determine whether there are additional new parameters of concern for which wildlife should be analyzed.

Another element of the state's monitoring strategy applicable to this BUI is enhanced and improved Fish Contaminant Monitoring Program (FCMP). Fish contaminant data are used to determine whether fish from waters of the state are safe for human and wildlife consumption, and as a surrogate measure of bioaccumulative contaminants in surface water. Fish tissues are analyzed for bioaccumulative contaminants of concern. These include mercury, PCBs, chlorinated pesticides (e.g. DDT/DDE/DDD), dioxins, and furans. More recently, some fish tissues have been analyzed for polybrominated biphenyl ethers (PBDEs) and perfluorooctane sulfonate (PFOS).

Fish contaminant studies needed for the assessment of this BUI restoration will be arranged by MDEQ as part of the Michigan FCMP. Timing and study design will be determined by the MDEQ based on available resources.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements it may be used to demonstrate restoration success.

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. It 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 MDEQ's SWAS Procedure #51 for wadeable streams and/or the pending rapid assessment procedure for non-wadeable rivers, indicates that benthic community structure is not impaired in any 2 of 6 years.

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 and monitored for 2 years according to the approved plan for the site. Remedial actions and monitoring are conducted under authority of federal 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 reasons for identifying degradation of benthos varies across Michigan's AOCs. Benthos in some AOCs are 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 un-impacted, or reference site. This is a key tool used by MDEQ to determine whether waterbodies are attaining Michigan Water Quality Standards. However, until recently this procedure could not be used on nonwadeable rivers. The MDEQ has been partnering with Michigan State University to develop and validate a procedure for assessing aquatic communities in non-wadable rivers which the state plans to implement beginning in 2006. If these procedures are applicable to an AOC, data collected under our monitoring program will be used to evaluate whether benthos has been restored according to the criteria.

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 for 2 years 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 sediments. 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 will be used as applicable for monitoring and assessing restoration of this impairment.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements it may be used to demonstrate restoration success.

Restrictions on Dredging Activities

Significance in Michigan's Areas of Concern

Twelve AOCs in Michigan have identified restrictions on dredging as impaired or potentially impaired (all except Deer Lake and Torch Lake). This BUI addresses the requirement for special handling or disposal of commercial or recreational navigation dredge spoils due to chemical contamination of sediments. This BUI was originally identified for some AOCs based on the existence of contaminated sediments, not on whether there were actual restrictions on dredging in the AOC.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

- There have been no restrictions on routine commercial or recreational navigational dredging by the U.S. Army Corps of Engineers (COE), based on the most recent dredging cycle, such that special handling or use of a confined disposal facility is required for dredge spoils due to chemical contamination.

OR, in cases where dredging restrictions exist

- A comparison of sediment contaminant data from the commercial or recreational navigation channel (at the time of proposed dredging) in the AOC indicates that contaminant levels are not statistically different from other comparable, non-AOC commercial or recreational navigation channels.

Rationale

Practical Application in Michigan

Dredging sediments in the Great Lakes and connected waterways requires state and federal approvals that regulate extent of dredging, disposal of dredge spoils, and pre-dredge studies. Restrictions on dredging is defined as special handling or use of a confined disposal facility is required for dredge spoils due to chemical contamination. Open water disposal of any clean or contaminated dredge spoils in the Great Lakes or connected waterways is not routinely permitted in Michigan. As a result, use of disposal options (e.g., confined disposal facility) other than open water is not automatically a restriction on dredging. This restoration criterion applies only to the commercial and recreational navigational channels in the Great Lakes and connected waterways that are maintained by the COE.

1991 IJC General Delisting Guideline

When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities

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

As part of existing planning and regulatory requirements, the MDEQ and the COE evaluate the environmental impacts associated with any proposed navigational dredging and disposal projects.

In assessing restoration of this BUI, the state, in consultation with the COE and the PAC, will conduct an evaluation of the most recent navigational dredging projects in an AOC to determine whether there have been restrictions on the dredging or disposal due to sediment contamination. For those AOCs where there have been dredging restrictions, the MDEQ will coordinate with the COE to evaluate sediment contaminant data from the commercial or recreational navigation channel and compare it to sediment data collected from other, non-AOC commercial or recreational navigational dredging sites. Comparison will be based on those contaminants which are causing the dredging restrictions. Non-AOC comparison sites will be chosen based on geographic similarity, type of navigation channel and dredging time frame. The state will evaluate whether the AOC commercial or recreational navigation channel sediment has statistically higher levels of contaminants than non-AOC reference navigation channels.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Eutrophication or Undesirable Algae

Significance in Michigan's Areas of Concern

Seven of Michigan's AOCs are listed as impaired due to eutrophication, including: the River Raisin, Rouge River, Clinton River, Saginaw River/Bay, St. Marys River, Muskegon Lake, and White Lake.

Michigan Restoration Criteria and Assessment

An AOC water body will be considered restored from eutrophication impairment if monitoring for two years out of six indicates:

- There are no growths of undesirable algae in quantities which interfere with a water body's "designated uses" as identified in rules R 323.1060 and R 323.1100 of the Michigan water quality standards (WQS) (e.g., inhibits swimming due to the physical presence of algal mats and/or associated odor; inhibits the growth and production of warm water fisheries and/or other indigenous aquatic life and wildlife). Undesirable algae species which may indicate impairment include toxic-producing cyanobacteria (e.g., *Microcystis*), noxious bloom-forming phytoplankton (e.g., *Aphanizomenon*), or benthic algae (e.g., *Cladophora*);

and

- The water body is no longer listed as impaired due to nutrients on Michigan's Section 303(d) list. A list of waterbodies not attaining WQS is submitted to the EPA every 2 years as required under the federal Clean Water Act.

In addition, the MDEQ is in the process of developing nutrient criteria for the state's surface waters which will be adopted into Michigan's WQS. The MDEQ will evaluate restoration of this BUI consistent with the nutrient criteria when they are approved by the USEPA and adopted into rule.

Rationale

Practical Application in Michigan

The MDEQ regulates water pollution under the authority of Part 31 of the NREPA, P.A. 451 of 1994. Designated uses protected under rule R 323.1100, dissolved oxygen standards in R 323.1064, and rule R 323.1060 (plant nutrients) are used to list impaired water bodies on the Section 303(d) list. The AOC restoration criteria are consistent with the state's WQS, and with how the state

identifies waters for inclusion on the Section 303(d) list and subsequent development of total maximum daily load (TMDL) allocations of pollutants. The MDEQ must develop a TMDL for each waterbody listed on the Section 303(d) list which determines how much pollutant load a waterbody can assimilate and still meet WQS.

1991 IJC General Delisting Guideline

When there are no persistent water quality problems (e.g., dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication

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 assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every five years (see Appendix 1 for maps of the basin rotations). One element of the Strategy is expanded and improved water chemistry monitoring. One of the specific objectives of the water chemistry monitoring program is to determine whether nutrients are present in surface waters at levels capable of stimulating the growth of nuisance aquatic plants/algae/slimes.

Under the water chemistry monitoring program, water samples generally are analyzed for nutrients, conventional parameters (temperature, conductivity, suspended solids, pH, dissolved oxygen), total mercury, and trace metals (cadmium, chromium, copper, lead, nickel, zinc). A much smaller number of samples are analyzed for organic contaminants such as PCBs and base neutrals. Other parameters may be included as appropriate at specific locations, including observations of nuisance algae in AOCs with this impairment. Data are reviewed each year to determine whether additional parameters should be added, removed, or analyzed at a greater or lesser frequency.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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

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appropriately addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Restrictions on Drinking Water Consumption or Taste and Odor Problems

Significance in Michigan's Areas of Concern

Five of Michigan's AOCs are listed as impaired due to past restrictions on drinking water, including: White Lake, Saginaw River/Bay, Muskegon Lake, St. Clair River, and Detroit River.

For most AOCs, this BUI was designated due to the need for additional treatment of drinking water in order to meet human health standards and address taste or odor issues. In the St. Clair River, this BUI was originally designated due to shut downs of intakes to drinking water treatment plants due to chemical spills in the river. Intakes have occasionally been shut down in order to let plumes from chemical spills pass the intakes.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when monitoring data for 2 years indicates:

- public surface water supplies meet the current and most stringent human health standards, objectives, or guidelines (at the point of distribution into the water system) for levels of disease-causing organisms, hazardous or toxic chemicals, or radioactive substances; and
- treatment needed to make raw water potable and palatable does not exceed standard treatment methods.

Rationale

Practical Application in Michigan

For the purposes of restoring this impairment, standard treatment methods are those identified in the federal and Michigan Safe Drinking Water Acts. Standard treatment includes filtration, disinfection, coagulation/flocculation, sedimentation, iron removal (if necessary), well field management, new well location, and softening. Standards related to odor and taste are secondary Maximum Contaminant Levels, and are not adopted by Michigan law. Taste and odor concerns are typically tracked by citizen complaints and are investigated at the local level.

1991 IJC General Delisting Guideline

For treated drinking water supplies: 1) when densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances do not exceed human health objectives, standards or guidelines; 2) when taste and odor problems are absent; and 3) when treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e., settling, coagulation, disinfection).

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

The EPA establishes and enforces drinking water standards nationwide. The state adopts and enforces those standards under the Michigan Safe Drinking Water Act (Act 399, 1976 as amended). The MDEQ carries out the Community Public Water Supply program directly, and contracts with local health departments to issue construction permits, oversee the monitoring, and carry out enforcement for Noncommunity Public Water Systems.

Under the Michigan Safe Drinking Water Act, public water suppliers in Michigan must submit regular reports of treated water quality to the MDEQ. The MDEQ will use these reports to evaluate whether this BUI has been restored.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements it may be used to demonstrate restoration success.

Beach Closings

Significance in Michigan's Areas of Concern

Eleven of Michigan's AOCs are listed as impaired due to beach closings from bacterial contaminants, including Raisin River, Detroit River, Rouge River, Clinton River, St. Clair River, Saginaw River/Bay, St. Mary's River, Kalamazoo River, Menominee River, Muskegon Lake, and Manistique River.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when no waterbodies within the AOC are included on the list of impaired waters in the most recent *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report*.

Rationale

Practical Application in Michigan

This restoration criteria is based on Michigan's WQS for bacterial contamination. Rule 323.1062 of Michigan's WQS sets the maximum concentrations of *E. coli* that are acceptable for waters of the state to meet total- and partial-body contact recreation uses. Areas of concern with a Beach Closing BUI have historically dealt with persistent elevation of bacteria levels in their waters.

In accordance with Rule 323.1062 and the Public Health Code (Act 368 of 1978), County Health Departments have the authority to monitor and evaluate public beaches to determine if the water is safe for bathing, swimming, or partial body contact recreation. While beach monitoring is a voluntary program, those county health departments that participate must monitor in accordance with Michigan's WQS. County health departments which monitor public beaches must submit their sampling data to the MDEQ, which tracks monitoring results and uses the data to determine whether water bodies are identified as impaired in the *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report* to the U.S. EPA on Clean Water Act compliance.

1991 IJC General Delisting Guideline

When waters, which are commonly used for total-body contact or partial body-contact recreation, do not exceed standards, objectives, or guidelines for such use.

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 assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations). One element of the strategy is improved support for public beach monitoring.

The specific objectives of the beach monitoring element are to:

1. Support county health departments in determining whether waters of the state are safe for total body contact recreation.
2. Evaluate the effectiveness of MDEQ programs in protecting waters of the state from bacteria/*E. coli* contamination.
3. Develop and maintain a database into which counties can enter their beach monitoring data, and which the public can access for the latest information.

The beach monitoring element consists of two components that, in combination, provide data necessary to achieve these objectives. These include annual grants awarded through a grant application package (GAP), and development and maintenance of a statewide beach database.

Grants are awarded to local governments/county health departments each year to monitor public beaches. The database has been developed and is available on the MDEQ web site. Counties enter data directly into the database.

When no waters in the AOC are identified as impaired (requiring a TMDL or part of a TMDL that has not yet been implemented) in the most recent *Water Quality and Pollution Control in Michigan: Section 303(d) and 305(b) Integrated Report*, this BUI will be considered restored.

Degradation of Aesthetics

Significance in Michigan's Areas of Concern

Ten of Michigan's AOCs are listed as impaired due to aesthetics, including River Raisin, Detroit River, Rouge River, Clinton River, St. Clair River, Saginaw River/Bay, St. Mary's River, Kalamazoo River, Muskegon Lake, and White Lake.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when monitoring data for 2 years within a 6-year period indicates that water bodies in the AOC do not exhibit persistent, high levels of the following "unnatural physical properties" (as defined by Rule 323.1050 of the Michigan Water Quality Standards) in quantities which interfere with the state's designated uses for surface waters:

- turbidity
- color
- oil films
- floating solids
- foams
- settleable solids
- suspended solids
- deposits

For the purposes of this criteria, these 8 properties impair aesthetic values if they are unnatural – meaning those that are manmade (e.g., garbage, sewage), or natural properties which are exacerbated by human-induced activities, (e.g., excessive algae growth from high nutrient loading). Persistent, high levels are those defined as long enough in duration, or elevated to the point of being injurious to any designated use listed under Rule 323.1100 of the Michigan WQS.

Natural physical features which occur in normal ecological cycles (e.g., logjams/woody debris, rooted aquatic plants) are not considered impairments, and in fact serve a valuable role in providing fish and wildlife habitat.

Rationale

Practical Application in Michigan

Evaluation of aesthetic impairments can be subjective, with individuals having different perceptions about what constitutes a nuisance or impairment. The above criteria are focused solely on aesthetic impairments as they relate to water quality, and are consistent with Rule 323.1050 of the Michigan WQS.

In evaluating whether any of the 8 "unnatural physical properties" identified in the restoration criteria are causing an aesthetic impairment, the focus should be on

whether it interferes with a waterbody's designated use (as identified in Rule 323.1100 of the Michigan WQS). The persistence, frequency, and magnitude of the occurrence of these properties are a key part of the consideration regarding whether these problems are significant enough to warrant continued designation as an AOC.

1991 IJC General Delisting Guideline

When the waters are devoid of any substance which produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g., oil slick, surface scum).

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 assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations).

Water bodies are monitored for chemical and biological parameters including, nutrients, conventional parameters (temperature, conductivity, suspended solids, pH, dissolved oxygen), total mercury, and trace metals (cadmium, chromium, copper, lead, nickel, zinc), fish and benthic invertebrate communities. Other parameters may be included as appropriate at specific locations, including observations of "unnatural physical properties" in AOCs with this impairment. Data are reviewed each year to determine whether additional parameters should be added, removed, or analyzed at a greater or lesser frequency.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Added Cost to Agriculture or Industry

Significance in Michigan's Areas of Concern

Only one of Michigan's AOCs, St. Clair River, is listed as impaired due to added costs to agriculture and industry. The designation of this beneficial use impairment in the St. Clair River AOC is tied to costs associated with temporary shut-downs of intakes for drinking water treatment facilities and for Akzo Salt (U.S.) and some food processors in Wallaceburg, Ontario from pollutant spills into the river.

The 1995 Stage 2 RAP for the St. Clair AOC included a locally-derived target for the Added Costs to Agriculture and Industry which addressed costs associated with shut downs of drinking and industrial water intakes.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when the locally-derived restoration target for this BUI, approved by the 4 Agency Management Committee, which oversees shared U.S. and Canadian AOCs, is met. The current target for this BUI, as adopted in the 1995 Stage 2 RAP, is:

- No plant shutdowns attributable to water quality over a two year period.

Rationale

Practical Application in Michigan

Because this BUI was originally designated only in the St. Clair River due to closures of water intakes for drinking water and industrial facilities, the state restoration criteria for this BUI is the same as the locally-derived and approved target. If a new target for this BUI in the St. Clair River is adopted and approved by the 4 Agency Management Committee, the new target will become the state's restoration criteria for this BUI. The 4 Agency Management Committee was created when the governments of Canada and the U.S. signed a Letter of Commitment in 1998 to coordinate and oversee the restoration of shared U.S. and Canadian AOCs.

If any current or future AOC identifies Added Costs to Agriculture or Industry as a BUI, further restoration criteria will be developed by the state to specifically address the causes of impairment, or the state will evaluate locally-derived criteria for consistency with state authorities at the time.

1991 IJC General Delisting Guideline

When there are no additional costs required to treat the water prior to use for agricultural purposes (i.e., including, but not limited to, livestock watering, irrigation, and crop spraying) and industrial purposes (i.e., intended for commercial or industrial applications and noncontact food processing).

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

The state will work with the 4-Party Agencies and the PAC to determine whether information provided by local water treatment plan and industrial facilities which historically incurred additional costs due to water intake pipe closures indicates that this BUI has been restored.

Degradation of Phytoplankton or Zooplankton Populations

Significance in Michigan's Areas of Concern

Only one of Michigan's AOCs, Saginaw River/Bay, is listed as impaired due to the degradation of Phytoplankton and Zooplankton Populations. The BUI was originally designated because of hyper-eutrophication and excessive growths of noxious phytoplankton (e.g., blue green algae) which historically caused restrictions on drinking water in the AOC.

Michigan Restoration Criteria and Assessment

In order to address the causes of degradation to phytoplankton and zooplankton in this AOC, this BUI will be considered restored when:

- The statewide restoration criteria for the BUI *Eutrophication or Undesirable Algae* has been met in Saginaw Bay/River AOC.

Rationale

Practical Application in Michigan

Because this BUI was originally designated only in Saginaw River/Bay AOC due to hyper-eutrophication, the state restoration criteria for this BUI is the same as the criteria for *Eutrophication or Undesirable Algae*.

If any current or future AOC identifies degradation of phyto- or zooplankton populations as a BUI, further restoration criteria will be developed by the state to specifically address the causes of impairment, or the state will evaluate locally-derived criteria for consistency with state water quality standards at the time.

1991 IJC General Delisting Guideline

When phytoplankton and zooplankton 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 phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters

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 assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations). One element of the strategy is expanded and improved water chemistry monitoring. One of the specific objectives of the water chemistry monitoring program is to determine whether nutrients are present in surface waters at levels capable of stimulating the growth of nuisance aquatic plants/algae/slimes.

Under the water chemistry monitoring program, water samples generally are analyzed for nutrients, conventional parameters (temperature, conductivity, suspended solids, pH, dissolved oxygen), total mercury, and trace metals (cadmium, chromium, copper, lead, nickel, zinc). A much smaller number of samples are analyzed for organic contaminants such as PCBs and base neutrals. Other parameters may be included as appropriate at specific locations, including observations of nuisance algae in AOCs with this impairment. Data are reviewed each year to determine whether additional parameters should be added, removed, or analyzed at a greater or lesser frequency.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like 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 addresses the restoration criteria and meets quality assurance/quality control requirements, it may be used to demonstrate restoration success.

Loss of Fish and Wildlife Habitat and Degradation of Fish and Wildlife Populations

These 2 BUIs are being considered together in recognition of the integral relationship between them. For the purpose of assessing restoration, both of these BUIs will use the same criteria-setting process.

Significance in Michigan's Areas of Concern

Twelve AOCs in Michigan have identified Loss of Fish and Wildlife Habitat as a BUI in their RAPs (all except Deer Lake and Torch Lake). Nine AOCs in Michigan have identified Degradation of Fish and Wildlife Populations as a BUI – Kalamazoo River, Muskegon Lake, White Lake, Menominee River, St. Mary's River, Saginaw River/Bay, Clinton River, Rouge River, and River Raisin. Little quantitative information was available to AOCs in the 1980s regarding habitat loss and population degradation, when impairments were first determined. Therefore, there is wide variability in these impairments among the AOCs due to both real variability in habitat and populations as well as variability in initial assessments.

Michigan Restoration Criteria and Assessment

Restoration of this BUI requires that a local habitat or population restoration plan be developed and implemented. The plan must be part of the RAP for the AOC, and contain at least the following components:

- A. A short narrative on historical fish and wildlife habitat or population issues in the AOC, including how habitat or populations have been impaired by water quality.
- B. Description of the impairment(s) and location for each aquatic habitat or population site, or for multiple sites where determined appropriate at the local level to address all habitat or population issues identified in the RAP and RAP updates.
- C. A locally derived restoration goal/target for each critical habitat or population site. Habitat restoration goals may be based on restoration of fish and wildlife populations, if appropriate.
- D. A list of all other ongoing habitat or population planning processes in the AOC, and a description of their relationship to the restoration projects proposed in the plan.
- E. A work plan for restoring each critical aquatic habitat or population site. The work plan should describe specific habitat or population restoration action(s) to be completed, including:

1. Timetable
2. Funding
3. Responsible entities
4. Indicators and monitoring
5. Public involvement

- F. A specific plan for reporting on habitat or population restoration implementation action(s) to the MDEQ.

Removal of this BUI will be based on achievement of full implementation of actions in the above. Habitat values and populations need not be fully restored prior to delisting, as some may take many years to recover after actions are complete. Actions already implemented in AOCs may be reported and evaluated as long as the reports contain all the elements above.

Rationale

Practical Application in Michigan

While most Michigan AOCs have habitat impairments or populations degradation, none were designated as impaired primarily as a result of these. Areas of Concern are widely variable in levels of habitat or population degradation, historical habitat or population types, and current needs for habitat or population restoration. The extent of habitat or population restoration necessary in an AOC will be determined at the local level and documented in the RAP.

The habitat or population restoration plan will determine the type and extent of the restoration necessary to address habitat loss or population degradation issues identified in the RAPs. Individual, AOC-specific restoration plans and criteria will be developed and implemented through a federal/state/local partnership.

Sources of water quality contamination must be controlled before habitat or population restoration is conducted. In some circumstances, habitat degradation is actually contributing to water quality problems, rather than vice versa. In those instances, the workplan should discuss this issue and the remedial actions should be targeted accordingly.

1991 IJC General Delisting Guideline: Loss of Fish and Wildlife Habitat

When the amount and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals have been achieved and protected.

IJC Delisting Guideline: Degradation of Fish and Wildlife Populations:

When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present. An effort must be made to ensure that fish and wildlife objectives for AOCs are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. Further, in the absence of community structure data, this use will be considered restored when fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.

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 Program and Authorities for Evaluating Restoration

Habitat or population restoration projects to address these use impairments will be implemented by a variety of programs at the federal, state, and local level, as determined in the restoration planning process. For the development of local habitat or population restoration plans and criteria, the MDEQ commits to partnering with local AOC groups in the process of determining what those actions should be, and making available the existing monitoring and reporting elements in state programs as applicable.

Michigan assesses water bodies throughout the state on a 5-year basin rotation plan according to the MDEQ's "Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (MDEQ, 1997) and "Michigan Water Quality Strategy Update" (MDEQ, 2005). Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years (see Appendix 1 for maps of the basin rotations). One element of the strategy is expanded and improved monitoring of biological integrity and physical habitat.

This element includes all monitoring conducted for fish and benthic invertebrate community structure, nuisance aquatic plants, algae, and slimes, and assessment of physical habitat. Because biological communities integrate the cumulative effects of multiple environmental stresses, this element is an important tool for evaluating water quality. The MDEQ's goal in conducting the watershed surveys is to assess 80% of the stream and river miles in Michigan over a 5-year period.

The specific objectives of biological integrity and physical habitat monitoring are to:

1. Determine whether waters of the state are attaining standards for aquatic life.

2. Assess the biological integrity of the waters of the state.
3. Determine the extent to which sedimentation in surface waters is impacting indigenous aquatic life.
4. Determine whether the biological integrity of surface waters is changing with time.
5. Assess the effectiveness of best management practices and other restoration efforts in protecting and/or restoring biological integrity and physical habitat.
6. Evaluate the overall effectiveness of MDEQ programs in protecting the biological integrity of surface waters.
7. Identify waters that are high quality, as well as those that are not meeting standards.
8. Identify the waters of the state that are impacted by nuisance aquatic plants, algae, and bacterial slimes.

The biological integrity and physical habitat element consists of several components that, in combination, provide data necessary to achieve these objectives. These include:

- Watershed surveys (consistent with the 5-year basin cycle);
- Development of a rapid assessment procedure for nonwadeable rivers; and
- Development of a trend monitoring procedure for biological communities.

Rapid, qualitative biological assessments of wadeable streams and rivers are conducted using the 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 the MDEQ to determine whether waterbodies are attaining Michigan WQS. However, this procedure cannot be used on nonwadeable rivers. The MDEQ has been partnering with Michigan State University to develop and validate a procedure for assessing aquatic communities in nonwadeable rivers which the state plans to begin implementing in 2006.

The state will support efforts in all AOCs with this BUI to complete the items the checklist above. Support may be both direct, with partnership commitments from the MDEQ and MDNR to specific elements as appropriate, as well as indirect through grants to local AOC partners. Depending on available resources, support for local development of habitat or population restoration plans and criteria may be spread out among AOCs over multiple years.

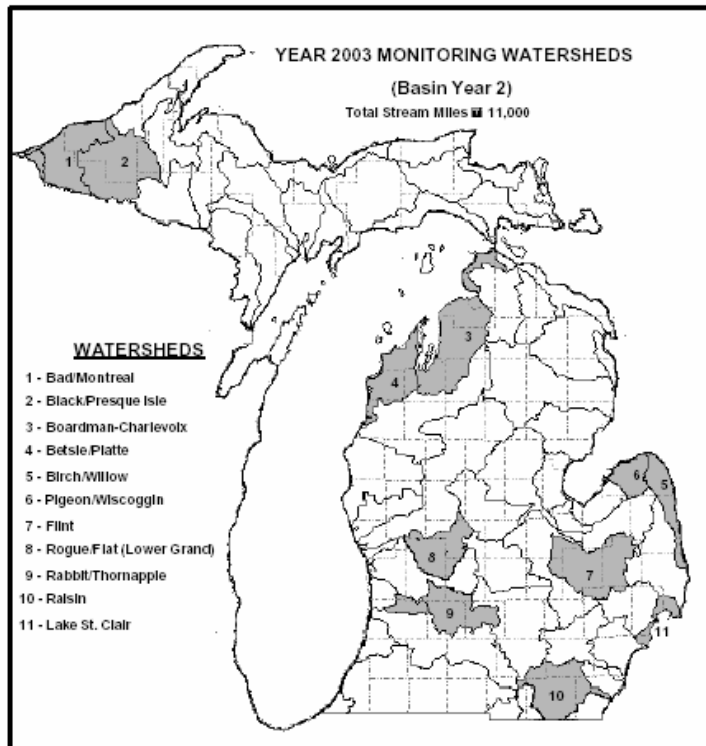
Appendix 1: Five Year Basin Cycle Monitoring

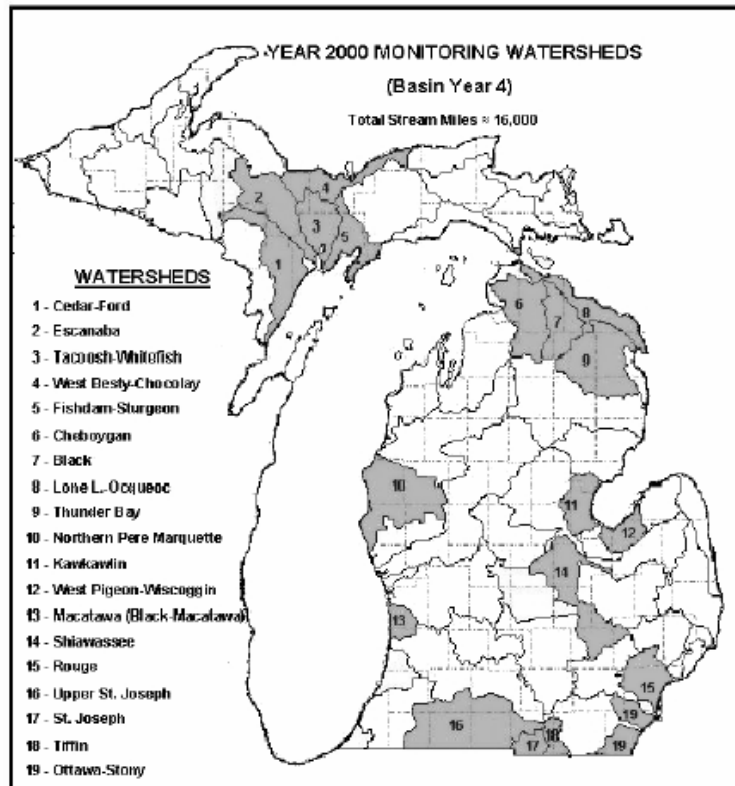
Monitoring and assessment of surface waters in Michigan is primarily the responsibility of the Water Bureau in the MDEQ. In 1997, MDEQ developed the “Strategic Environmental Quality Monitoring Program for Michigan’s Surface Waters” (MDEQ, 1997). This strategy was recently updated in 2005 (Michigan Water Quality Monitoring Strategy Update, April 2005) to reflect current monitoring effort in the state, and to better incorporate U.S. EPA requirements for a comprehensive state monitoring program.

Under our “Strategic Environmental Quality Monitoring Program for Michigan’s Surface Waters” (MDEQ, 1997) and “Michigan Water Quality Strategy Update” (MDEQ, 2005), the MDEQ has divided the state into watershed basins to administer the NPDES and other water quality programs. Each year, a set of targeted watersheds are sampled at selected sites for conventional and toxic pollutants, and biological and physical habitat/morphology indicators. The set of watersheds sampled rotates each year, with each major watershed in the state revisited every 5 years. The following maps indicate which watersheds are sampled in each of the 5-year cycles.

Assessment of AOCs for attainment of restoration criteria will normally be integrated into the 5-year basin monitoring cycle.







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Glossary/Acronyms

303d List: The list of water bodies in the state not meeting designated uses under the Clean Water Act

AOC: Great Lakes Area of Concern

Assessment: Single event data collection to answer a specific question

BUI: Beneficial Use Impairment

COE: U.S. Army Corps of Engineers

DDT: dichlorodiphenyltrichloroethane, a pesticide

Delisting: The process of restoration and subsequent change of status of an AOC

Designated Use: Specific uses for water named in the federal Clean Water Act

Ecoregion: Land units that differ significantly from one another in non-biological characteristics as well as in their related biological components

EPA: U.S. Environmental Protection Agency

FCMP: Fish Contaminant Monitoring Program

4 Agency Letter of Commitment: Signed April 17, 1998 by Environment Canada, Ontario Ministry of the Environment, Michigan Department of Environmental Quality, and U.S. EPA. The Letter committed the agencies to cooperate in the restoration of shared upper connecting channel AOCs and Lake St. Clair under the terms of the Great Lakes Water Quality Agreement. A 4 Agency Management Committee oversees implementation of the commitment.

GAP: Grant application package

Guidance: Informal, non-regulatory narrative to guide the process of restoration

Guidelines: Formal, regulatory numbers for water quality based on standards

LOEL: lowest observable effect level

MDEQ: Michigan Department of Environmental Quality

MDNR: Michigan Department of Natural Resources

Monitoring: Long-term sampling for trend analysis of specific parameters

NPDES: National pollution discharge elimination system

NREPA: state Natural Resources and Environmental Protection Act

PCB: Polychlorinated biphenols

RAP: Remedial Action Plan

Standards: Formal, regulatory numbers for water quality based on state statute

SWAS: Surface Water Assessment Section, Water Bureau, MDEQ

Targets: Informal numbers to guide the process of restoration

TMDL: Total maximum daily load

U.S. EPA: U.S. Environmental Protection Agency

WQS: Water quality standards

The Future

The Michigan Department of Environmental Quality is committed to protecting Michigan's environment and ensuring Michigan's future for all locations in the state, whether or not they are, or were, Areas of Concern. Delisting Areas of Concern is just one step on a continuum in the process of restoring and protecting these sites on the Great Lakes. Reaching this point means all beneficial use impairments have been addressed by state, federal, or local programs and that a site is no longer considered an Area of Concern under the Great Lakes Water Quality Agreement. Public involvement in the Area of Concern program is a critical component of the restoration and delisting process. On-going protection of water resources is essential in Areas of Concern and a key component of that future protection will be continuing and strong local public involvement in partnership with state and federal agencies.

MDEQ AOC Program Contact

For further information on Michigan's Areas of Concern Program, contact:

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