Delisting Guidance and Restoration Targets for Ohio Areas of Concern

Ashtabula River

Cuyahoga River

Black River

Maumee River

Division of Surface Water
Lake Erie Program
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Acknowledgements

This document was developed by the Ohio Environmental Protection Agency (Ohio EPA), Division of Surface Water Lake Erie Program Staff. The original Ohio delisting document was developed in 2005 and has undergone several revisions. This report supersedes all previous versions.

How to reference this document:
Ohio Environmental Protection Agency, 2014. Delisting Guidance and Restoration Targets for Ohio Areas of Concern.

Disclaimer

This document is intended to be used as guidance to assist the local Ohio RAP committees in determining beneficial use restoration targets for their areas of concern. These targets can be adopted in total or part by local Ohio RAP Committees, however, any locally defined targets cannot be any less restrictive than the targets presented in this document and must be endorsed by Ohio EPA. This document does not carry the force of law. Also note that some targets may change as various Ohio EPA rules and regulations are updated or new research becomes available.

This guidance is non-regulatory in nature and should not be construed as standards.
This guidance does not impose any regulatory requirements.

Introduction

The Great Lakes Water Quality Agreement (GLWQA) is an agreement between the U.S. and Canada to address key environmental health issues in the Great Lakes. The most recent Agreement (September 7, 2012) reaffirms actions necessary to restore and delist Areas of Concern (AOCs). The Great Lakes Water Quality Protocol of 2012 specifically addresses Areas of Concern in Annex 1 (the 1987 GLWQA addressed AOCs in Annex 2). The GLWQA identifies fourteen different beneficial use impairments (BUIs) which are defined as a reduction in the chemical, physical or biological integrity of the Waters of the Great Lakes. The GLWQA requires development of Remedial Action Plans (RAPs) to identify the BUIs and causes, development of criteria for restoration of the beneficial uses, implementation of remedial measures, monitoring of the effectiveness of remedial measures and confirmation that restoration of beneficial uses is being achieved. Each of the 43 AOCs contains at least one BUI that represents an extraordinary problem that is measurably worse than most waters in the Great Lakes. The 2012 GLWQA requires progress reporting every three years on the status of BUIs in each AOC, the actions completed or initiated in each AOC during the reporting period, and the remaining actions required in each AOC for removal of the BUIs.

There are four AOCs in Ohio: the lower two miles of the Ashtabula River; the entire Black River watershed; the lower 46.5 miles of the Cuyahoga River, including all tributaries and the adjacent shoreline; and the lower 22 miles of the Maumee River, including several adjacent watersheds that discharge directly to Maumee Bay and Lake Erie. Figure 1 shows the location of Ohio's AOCs.

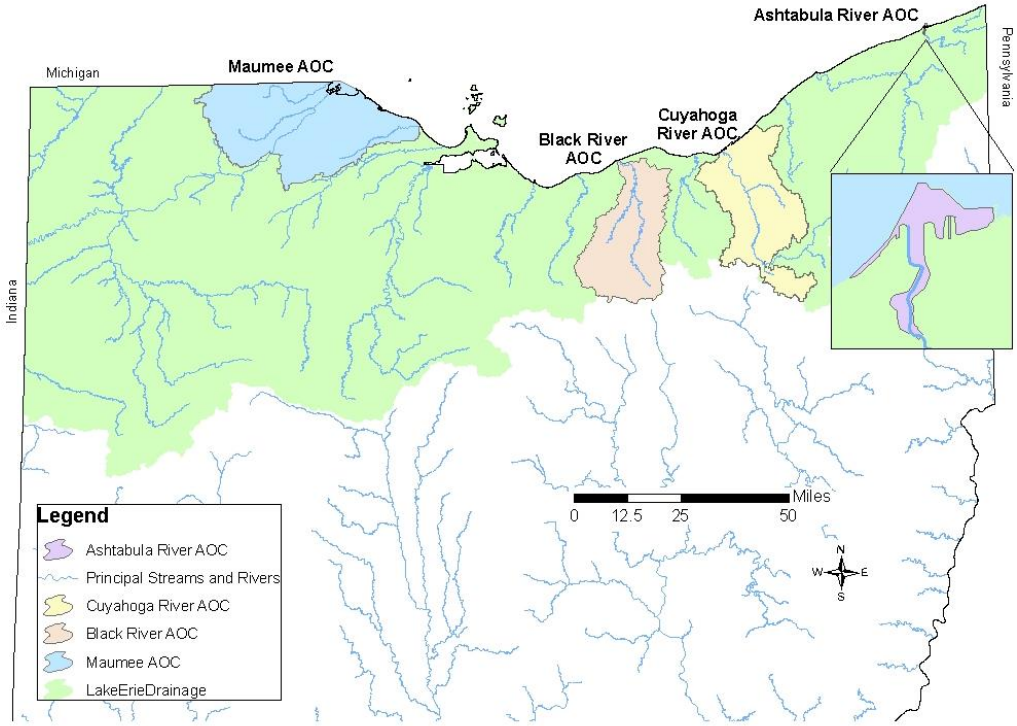

Figure 1 – Location of Ohio Areas of Concern (AOCs)

Ohio EPA, in collaboration with U.S. EPA, is responsible for ensuring that RAPs are implemented in Ohio. Restoring the AOCs requires a collaborative effort with the local businesses, industries, and governments. Local committees in each of the AOCs coordinate the development and implementation of the Remedial Action Plans (RAPs). The local committees in Ohio's AOCs are as follows:

- Ashtabula: Ashtabula RAP Advisory Council
- Black: Black River RAP Coordinating Committee
- Cuyahoga: Cuyahoga River Community Planning Organization (CRCPO)
- Maumee: Partners for Clean Streams (PCS)

When the term "RAP" is used in this document, it is typically referring to the local RAP committee/group, not the document or process. Public involvement is critical to the RAP program in Ohio and each AOC has had significant support, input, and guidance from the local RAP committees.

The RAP groups have completed the initial assessment of impairments to beneficial uses (Stage 1 Reports), identified sources, defined remediation and restoration needs (Stage 2 Reports), and prepared status reports. Projects have been implemented to better define impairments and sources, remediate problems, restore habitat, remove contaminated sediments, and outline plans for strategic action. Efforts are now focused on re-evaluating the current status of each BUI and identifying and implementing the management actions needed to complete restoration of the impaired uses.

Table 1 lists the current impairment status of all the beneficial uses in each Ohio AOC. A beneficial use was listed as impaired if it was impaired anywhere within the boundaries of the AOC. Several of the RAPs have prepared more detailed assessments that evaluate beneficial use impairment by subwatershed within their AOC, which allows for tracking of incremental progress. Incrementally delisting subwatersheds within an AOC when all beneficial uses have been removed for those waters is offered as an option in the United States Policy Committee's (USPC) 2001 Delisting Principles and Guidelines and this approach is recommended for Ohio's larger AOCs with multiple subwatersheds.

Ohio EPA acknowledges that a binational team is currently working on implementing Annex 1 of the 2012 GLWQA and any binational policies developed will supersede the 2001 USPC guidelines. As soon as new binational policy or guidelines are established, Ohio EPA will review and revise this guidance as needed.

Table 1 - Status of Ohio AOC Beneficial Use Impairments

Beneficial Use Impairment		Ashtabula	Black	Cuyahoga	Maumee
BUI 1:	Restrictions on Fish Consumption	Impaired*	Impaired	Impaired	Impaired
	Restrictions on Wildlife Consumption	Not Impaired	Not Impaired	Not Impaired	Impaired
BUI 2:	Tainting of Fish and Wildlife Flavor	Not Impaired	Not Impaired	Not Impaired	Not Impaired
BUI 3:	Degradation of Fish Populations	Impaired*	Impaired	Impaired	Impaired
	Degradation of Wildlife Populations	Not Impaired	Not Impaired	Not Impaired	Impaired
BUI 4:	Fish Tumors or Other Deformities	Impaired	In Recovery	Impaired	Impaired
BUI 5:	Bird or Animal Deformities or Reproductive Problems	Not Impaired	Not Impaired	Not Impaired	Not Impaired
BUI 6:	Degradation of Benthos	Impaired	Impaired	Impaired	Impaired
BUI 7:	Restrictions on Dredging Activities	Impaired	Impaired	Impaired	Impaired
BUI 8:	Eutrophication or Undesirable Algae	Not Impaired	Impaired	Impaired	Impaired
BUI 9:	Restrictions on Drinking Water Consumption or Taste & Odor Problems	Not Impaired	Not Impaired	Not Impaired	Not Impaired
BUI 10:	Beach Closings (Recreational Contact)	Not Impaired	Impaired	Impaired	Impaired
BUI 11:	Degradation of Aesthetics	Not Impaired	Impaired	Impaired	Impaired
BUI 12:	Added Costs to Agriculture or Industry	Not Impaired	Not Impaired	Not Impaired	Impaired
BUI 13:	Degradation of Phytoplankton and Zooplankton Populations	NA	NA	NA	Unknown
BUI 14:	Loss of Fish Habitat	Impaired*	Impaired	Impaired	Impaired
	Loss of Wildlife Habitat	Not Impaired	Not Impaired	Not Impaired	Impaired

*Note: BUI status listed as unknown in previous documents has been defined as impaired, not impaired or NA. *Restoration targets have been met and BUI will be removed in 2014.*

Purpose

This guidance was developed to provide Ohio EPA and the local RAPs with statewide targets for restoring beneficial uses and to identify the steps required for BUI removal and AOC delisting. This guidance also serves to clarify the roles and responsibilities of the Ohio EPA and local RAP committees. When AOCs were originally designated in the late 1980s there were no specific quantitative criteria for listing or delisting these areas. The International Joint Commission (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 U.S. AOC delisting in 2001 (USPC, 2001). These efforts, however, were not specific enough for use by states or local RAP organizations in determining restoration of individual BUIs.

In order to develop Ohio-specific beneficial use restoration targets, Ohio EPA reviewed the original listing/delisting criteria from the IJC and aligned them with State rules and regulations, State policies, or other State guidance whenever possible. This document lays out the minimum beneficial use restoration targets for Ohio. These targets were developed recognizing that delisting an AOC requires restoration to levels equivalent to the current conditions of other Lake Erie watersheds as a whole, not to pristine or pre-settlement conditions. This document is intended to be used by Ohio EPA and the RAP groups as a reference document to establish targets for each AOC. For example, a RAP may select a different target sentinel species or habitat characteristics. Each RAP may choose to adopt all the targets presented in this document for each BUI as their AOC-specific targets or, in collaboration with and endorsement from Ohio EPA, develop other restoration targets that reflect the needs of its AOC.

How to Use this Document

This document updates previous Ohio restoration targets (formerly known as "delisting targets") for BUI removal and outlines the process Ohio EPA and RAPs will follow.

The "*Path to Delisting*" section of this document outlines the process the State and RAPs will use to track restoration progress, remove BUIs, delist subwatersheds, designate an AOC as being in recovery, and delist an AOC. This section also describes conditions where partial restoration is applicable and how RAPs can establish interim restoration milestones. Partial restoration can be applied when all reasonable actions and restoration efforts have been completed, but the targets cannot be met due to ongoing maintenance on the river channel, such as routine navigation dredging and associate impacts to benthos and habitat. Interim restoration milestones are not official federal or state designations but can be established by the local RAPs to celebrate progress.

The *"Restoration Targets for BUIs"* section provides restoration targets for each BUI. The IJC Listing Guideline from 1991 is presented first as the historical baseline for why a beneficial use was considered to be impaired. Next, the State of Ohio Listing Guideline is presented to identify the State regulations, policies or guidance that would need to be exceeded to designate any specific use as impaired. Then the State of Ohio Restoration Target is provided with recommended Potential Data Sources, followed by the Rationale and References. The Potential Data Sources are new with this version of the document and are being provided to assist RAPs by directing the RAP organization toward recommended data needed to evaluate BUI status and justify BUI removal. The "*Appendices"* include excerpts from some of the documents commonly referred to in the text, the hydrologic units applicable to each AOC boundary, and a glossary of acronyms and abbreviations.

RAP participants are encouraged to direct any questions, requests for references, or needs for additional information to the Ohio EPA RAP Coordinator for their AOC.

The Path to Delisting: Recognizing Progress & Maintaining Momentum

The Path to Delisting: Recognizing Progress & Maintaining Momentum

The GLWQA calls for the United States and Canada to develop and implement a systematic and comprehensive ecosystem approach to restore the beneficial uses in each of the designated AOCs. The Remedial Action Plans for each AOC should identify the BUI(s) and causes of impairment, identify the criteria for the restoration of the beneficial use, identify remedial measures to be taken and the entities responsible for implementing the measures, and describe the surveillance and monitoring processes to track effectiveness of remedial measures to confirm BUI beneficial use restoration. Although the specific restoration targets to achieve BUI removal may change over time, developing statewide consistency in BUI listing and AOC delisting will provide certainty for Ohio EPA and our local RAP partners.

The State of Ohio is using "Restoring U.S. Areas of Concern: Delisting Principles and Guidelines" adopted by the U.S. Policy Committee (USPC, December 2001) in combination with the International Joint Commission's Delisting Guidelines (1991) as guidance for the removal of BUIs and delisting Ohio's AOCs. The USPC report was created to show how and when to formally delist AOCs as the implementation of all recommended actions for restoring beneficial uses are completed, and the uses are restored and maintained. These USPC and IJC guidelines offer various options for showing progress, maintaining momentum, and steps toward formal delisting of AOCs including removing BUIs, delisting subwatersheds, recognizing an AOC in recovery phase, and delisting an AOC.

RAPs may also develop their own interim restoration milestones as a roadmap toward BUI removal. By following this path, RAP groups can maintain momentum and progress toward the ultimate goal of delisting the AOC. Given the long time horizons for fully restoring some AOCs, taking the opportunity to re-designate conditions and acknowledge successes with local communities can strengthen the program while recognizing that it may be sometime before delisting can occur. To keep restoration efforts energized locally, RAPs should celebrate, whenever possible, that reasonable and practical efforts are being made to restore the beneficial uses and progress is being made toward delisting their AOC.

Tracking Restoration of Beneficial Uses

This section describes actions and steps for tracking the status of BUIs in AOCs and documenting progress toward removal. Ohio EPA is committed to a partnership with the RAPs and the U.S. EPA in this effort. Timely tracking and reporting of BUI status and updating the restoration needs within the AOC will allow Ohio EPA and U.S. EPA to prioritize current resources and effectively plan future efforts. The tracking procedures and timeframes outlined below are also designed to assist U.S. EPA with the 2012 GLWQA reporting requirements.

1. The AOC boundaries are those shown on Figure 1 and are also available on the Ohio EPA website: http://www.epa.ohio.gov/dsw/lakeerie/index.aspx. If the RAP and Ohio EPA determine that there is rationale to change the boundary, Ohio EPA can submit a written request and documentation to U.S. EPA.

2. State RAP Coordinators will conduct periodic qualitative reviews of the status of each AOC's BUIs as new data become available and report the findings to the local RAP committee. Review and updating of BUI status should occur at least every three years, provided new data has been collected or submitted.

3. Ohio EPA maintains the official files for each AOC with all finalized AOC boundaries, BUI restoration/removal records, finalized memos/letters, finalized RAPs and other reports and updates.

4. Annual RAP updates prepared for each AOC are the primary tool for documenting and communicating progress to the public and agencies. These documents should be brief, user-friendly updates on recent remedial actions and assessments in the AOC. They are prepared by the Ohio EPA RAP Coordinators in consultation with the local RAPs. Updates are posted on the local RAP (if available) and Ohio EPA web sites.

5. Issues regarding either removal of a BUI or delisting of an AOC are to be resolved by Ohio EPA, U.S. EPA, and local RAP staff.

Locally Developed Beneficial Use Restoration Targets

The State's beneficial use restoration targets are applied to all BUIs except where locally developed targets have been developed and endorsed by Ohio EPA. The RAPs have the ability to establish restoration targets that are functionally equivalent to the statewide targets. The RAPs will review the updated beneficial use restoration targets presented in this document and provide Ohio EPA with a letter stating that they intend to utilize the statewide targets in whole or will develop local targets that are functionally equivalent. Ohio EPA RAP Coordinators will work with the RAPs to establish appropriate timeframes for the review and will be directly involved in development of any local restoration targets.

If RAPs elect to establish local targets they are expected to demonstrate how those targets are equivalent to the statewide targets. Any local targets that require assessment beyond what is required for the statewide targets (e.g., more frequent, different parameters) are the responsibility of the local RAP, including reporting results to the Ohio EPA. Ohio EPA will assist as resources allow.

Interim Restoration Milestones

While U.S. EPA and the IJC officially recognize and support only BUI removal, recovering AOCs, and delisting subwatersheds or entire AOCs, RAPs may choose other methods of showing and celebrating incremental progress. For example, a RAP may want to acknowledge when beneficial use restoration targets have been achieved for individual BUIs in a subwatershed or when all management actions have been completed for a single BUI and the ecosystem needs time to recover to meet restoration targets (BUI in recovery). The RAP may develop interim restoration measures or milestones in consultation with Ohio EPA. These milestones will be officially acknowledged by Ohio EPA and can be publicized on the RAP's and Ohio EPA's websites.

Removing a BUI (Beneficial Use Impairment)

This section describes the actions and steps for removing a BUI and documenting these activities in Ohio EPA's AOC file. The BUIs can be removed individually, in groups, or all at the same time. Ohio EPA is committed to working with the local RAPs and U.S. EPA in this effort.

1. When the Ohio EPA RAP Coordinator, in consultation with the RAP, determines a BUI is ready for final review of restoration according to the established restoration targets, a technical review team of relevant Ohio EPA staff is convened to review the documentation and support or not support removal of the BUI. The technical review team consults with the RAP during the review. Deliberations are documented with a briefing memo written by the Ohio EPA RAP Coordinator to the Chief of Ohio EPA Division of Surface Water.

2. Ohio EPA announces a 30-day public review period and makes all documents available on its web site and by request, hosts a public meeting in the AOC, and responds in writing to the public's comments. When the public review is completed, the Chief of Ohio EPA Division of Surface Water requests a letter of support from the RAP for the removal of the BUI.

3. When the technical and public review is complete, a letter is sent from the Chief of Ohio EPA Division of Surface Water to the Director, Great Lakes National Program Office, U.S. EPA along with the support letter from the RAP to document removal of the BUI(s). The letter requests concurrence with the removal from U.S. EPA. The letters from Ohio EPA and the RAP, along with the response letter from U.S. EPA, are part of the permanent AOC file.

4. U.S. EPA notifies Ohio EPA, the RAP and IJC of their concurrence.

5. Once the BUI is documented as removed, there is no further assessment of that BUI in order to delist an AOC. After BUI removal, waters of the state will continue to be monitored as part of Ohio EPA's regular cycle of watershed monitoring and other state monitoring programs. After removal of a BUI, if additional problems are found in an AOC during routine or other program monitoring, it will be addressed on a case-by-case basis by Ohio EPA under other existing programs.

6. All local, state, and federal partners cooperate on publicizing the BUI removal, as appropriate.

Beneficial use impairments can be removed under any of these scenarios:

- Restoration targets have been met and follow up monitoring or other evaluations confirm that the beneficial use has been restored;
- It can be demonstrated that the beneficial use impairment is due to natural rather than human causes;
- It can be demonstrated that the impairment is not limited to the local geographic extent of the AOC, but rather is typical of lake-wide, region-wide, or area-wide conditions *(under this situation, the beneficial use may be incorrectly recognized as impaired); or*
- The impairment is caused by sources outside the AOC. The impairment is not restored, but the impairment classification can be removed or changed to "impaired-not due to local sources." Responsibility for addressing "out of AOC" sources is assigned to another party or program (e.g., Lakewide Management Plan (LaMP), TMDLs, health department).

Delisting a Subwatershed

For AOCs comprised of a number of subwatersheds there may be instances where all beneficial uses are restored for a particular subwatershed. In this instance, the Ohio EPA RAP Coordinator, in consultation with the RAP, may submit a request along with supporting documentation to delist a subwatershed because all its beneficial uses have been restored. Subwatersheds will be 10-digit HUs or Large River Assessment Units (LRAU); an alternate subwatershed unit may be used, provided the Ohio EPA concurs with that determination. The procedure to delist a subwatershed follows the same steps outlined above for removing a BUI.

Partial Restoration

As referenced in the 2001 USPS Guidance document, the IJC has explicitly recognized that there may be some impaired uses that cannot be fully restored for justifiable reasons, and that this should not prohibit the delisting of an AOC. For example, it may not be possible to fully restore some uses because of natural factors (e.g., sedimentation) or social or economic factors. This decision must be based on a combination of timeliness, reasonableness, and "common sense." In these special cases, Ohio EPA and the RAP will need to document the practical and specific reasons why the impaired uses cannot be fully restored. The rationale used should be clearly stated and be fully supportable when requesting this re-designation. For these areas, the impact of such a decision on the adjoining waters and associated management plans and targets (e.g., LaMPs) must be addressed.

If applicable, documentation to support partial restoration should be provided when pursuing designating an AOC in recovery or when delisting an AOC.

Designating an Area of Concern in Recovery

This section outlines the actions necessary to designate an AOC as "in recovery," identified in the GLWQA (2012) and adopted by the USPC (2001). To be designated as an *AOC in Recovery*, all remedial actions identified in the RAP have been implemented and monitoring confirms that recovery is progressing in accordance with the RAP. The steps below are the adapted from USPC's *Delisting Principles and Guidelines* document (USPC, 2001).

The severity of the impairments will influence the rate of recovery. Once all the management actions are complete, the time frame for recovery of the AOC should be agreed upon by the RAP and Ohio EPA, with the understanding that this decision can be revised based on the system's response to the management actions as indicated by post-remedial monitoring. These steps combined will be known as the Recovery Strategy. Entering the "In Recovery" phase must be accompanied by a commitment of governments or other partners to maintain their responsibilities. Governments will continue to undertake environmental improvements as part of their mandates, beyond the needs of the RAPs.

1. When the Ohio EPA RAP Coordinator, in consultation with the RAP, determines that all the management actions are complete and the time frame for recovery can be estimated, the Ohio EPA RAP Coordinator prepares a report that details implemented actions, provides a rationale for recognizing an AOC as being "In Recovery," provides rationale that no additional management actions are expected to be needed, and outlines the proposed monitoring plan to track the recovery. This plan should include pollution prevention or other maintenance issues to reduce the risk of future degradation and ensure that recovery can proceed. This step may be concurrent with the removal of BUIs.

2. The Chief of Ohio EPA Division of Surface Water sends the report and a letter, along with a support letter from the RAP, to U.S. EPA requesting concurrence in designating the RAP as being completely implemented and the AOC in Recovery. U.S. EPA reviews and either approves the request within 60 days, or requests to meet jointly with the RAP and Ohio EPA to resolve any issues, ultimately leading to U.S. EPA concurrence.

3. U.S. EPA notifies Ohio EPA, the RAP and IJC of their concurrence. The letters from Ohio EPA and the RAP, along with the response letter from U.S. EPA, are part of the permanent AOC file.

4. Ohio EPA reports to U.S. EPA at least every three years, provided data is available, on progress toward achieving the beneficial use restoration targets. Based on monitoring results, there could be a need to implement further action(s).

5. All local, state, and federal partners cooperate on publicizing the change in AOC status, as appropriate.

Delisting an Area of Concern

This section outlines the actions necessary to Delist an AOC in Ohio, as adopted by the USPC in December 2001.

1. When all BUIs in an AOC have been removed or partial restoration conditions have been documented, a draft Final RAP Report is prepared by Ohio EPA RAP coordinator, in consultation with the RAP and U.S. EPA. This step may be concurrent with the removing BUIs (described earlier).

2. Within 30 days of completing the draft Final RAP Report, the Ohio EPA Director and the RAP each submit a letter of recommendation to delist the AOC to the U.S. EPA Regional Administrator.

3. The U.S. EPA consults with the Director of Ohio EPA on the draft Final RAP Report and on the recommendation to delist the AOC. Any revisions resulting from the consultation are incorporated by the Ohio EPA and U.S. EPA, as appropriate, within 60 days.

4. Concurrent with step 3, the U.S. EPA consults with the Director of the IJC, Great Lakes Regional Office on the draft Final RAP Report and the recommendation to delist the AOC. The IJC Regional Office responds within 60 days and revisions are incorporated by Ohio EPA and U.S. EPA in consultation with the local RAP, as appropriate, within 60 days.

5. Ohio EPA announces a 60-day public review period and makes all documents available on its web site and by request, hosts a public meeting in the AOC, and responds in writing to the public's comments, in consultation with the RAP and U.S. EPA, as appropriate.

6. Taking state agency, U.S. EPA, IJC Regional Office, RAP, and public comments into account, Ohio EPA and the RAP, in consultation with U.S. EPA, will prepare a Final RAP Report. The report will be prepared within 60 days. The director of Ohio EPA will transmit the Final RAP Report to U.S. EPA, along with the support letter from the RAP.

7. The U.S. 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 Ohio EPA, as well as appropriate Canadian federal and provincial agencies. The letters and Final RAP Report from Ohio EPA, the RAP, and U.S. EPA, are part of the permanent AOC file.

8. 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.

9. Formal notice of delisting and the Final RAP Report and supporting letter(s) is transmitted to the IJC by the U.S. Secretary of State within 10 days of formal delisting.

10. All local, state, and federal partners cooperate on publicizing and celebrating delisting of the AOC.

Restoration Targets for Beneficial Use Impairments

Restoration Targets for Beneficial Use Impairments

The following pages contain the specific restoration targets for each of the 14 BUIs identified in the Great Lakes Water Quality Agreement (GLWQA) Areas of Concern Annex. The write-up for each BUI follows the same format to provide consistency. The IJC Listing Guideline from 1991 is presented first as the historical baseline for why a beneficial use was considered to be impaired. Next, the State of Ohio Listing Guideline is presented emphasizing the State regulations, policies or guidance that would need to be exceeded to designate this use as impaired.

The State of Ohio Restoration Target includes the specific State criteria, standards or guidance that must be met to remove a BUI. Using these guidelines, a RAP can remove a BUI from an entire AOC or develop a strategy to remove the BUI from only specific subwatersheds within the AOC. In some cases, the RAP will have the option of meeting one of several targets to remove the BUI. These targets are separated by an "OR". In other cases, there are several targets, all of which must be met if the beneficial use is to be removed. These targets are connected by an "AND". This section also includes recommended Potential Data Sources to assist RAPs by identifying data needed to evaluate BUI status and justify BUI removal.

The Rationale explains in detail how the targets were chosen and how they relate to Ohio rules, regulations and guidance. All the References consulted are listed so the RAPs can utilize the same references to better understand how a particular restoration target was selected.

The quality and age of data is an important consideration and any BUI removal request must be driven by scientifically defensible data that represents the current conditions in the AOC.

The RAPs have the ability to establish local restoration targets that are functionally equivalent to the statewide targets as described in this document. If a RAP elects to develop local restoration targets, they are expected to demonstrate how the local targets are equivalent to the statewide restoration target and need to be approved by Ohio EPA.

BUI 1: Restrictions on Fish and Wildlife Consumption

IJC Listing Guideline

An impairment will be listed when contaminant levels in fish or wildlife populations exceed current standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:
1) An advisory or restriction to fish or wildlife consumption issued by the Ohio Department of Health in the AOC is more stringent than one meal per month or Lake Erie advisory.

State of Ohio Restoration Target

For Fish Consumption:

In the riverine waters upstream from the lake affected waters (lacustuary or fresh water estuary), the fish consumption advisories issued by the Ohio Department of Health in the AOC are the same or less stringent than one meal per month; **AND**

In the lake affected waters (lacustuary or fresh water estuary), the fish consumption advisories issued by the Ohio Department of Health in the AOC are the same or less stringent than the current Lake Erie advisories; **OR**

If consumption advisories in the AOC are more stringent than the respective state-wide or lake-wide advisories and a study was conducted that demonstrates either (1) the source of contamination originates outside of the AOC or (2) the fish tissue concentrations within the AOC are not statistically different than non-AOC areas, reference sites or region-wide, background concentrations.

For Wildlife Consumption:

Wildlife consumption advisories issued by the Ohio Department of Health in the AOC are the same or less stringent than one meal per month.

Potential Data Sources

- State of Ohio Sport Fish Consumption Advisories www.epa.state.oh.us/dsw/fishadvisory/index.aspx
- Ohio EPA fish tissue data
- Other fish tissue studies

Rationale

While most Ohio sport fish are of high quality and a good source of protein, levels of chemicals such as PCBs, mercury, lead, and other metals and pesticides have been found in some fish from certain waters. To ensure the continued good health of Ohioans, the Ohio Department of Health, in cooperation with the Ohio Environmental Protection Agency and Ohio Department of Natural Resources, issues fish consumption advisories per Chapter 3701 of the Ohio Revised Code. Ohio uses the *Protocol for a Uniform Great Lakes Sport Fish Advisory* (1993) and the 2005 addendum to establish fish consumption

advisories for PCBs and mercury, respectively. These are the contaminants that drive most of the advisories in Ohio waters.

Ohio EPA refers to the area where river and lake water mix as a lacustuary (combination of the terms lacustrine and estuary). These areas could also be described as drowned river mouths (lake water flows into the river essentially "drowning" the river mouth). See Appendix B for more detail and a description of lacustuaries within Ohio's AOCs.

Snapping turtles are currently the only wildlife species with a consumption advisory in effect as issued by the Ohio Department of Health. This advisory was listed based on the results of a one-time study done in 1997. All turtles had high levels of PCB and mercury in fat and liver tissue and advisories stress not eating those portions of the turtle. Currently, turtles from the Black, Ashtabula and Maumee Rivers have a one meal per week advisory for mercury which is similar to the statewide blanket advisory for fish, and not considered impaired. The Ottawa River has a do not eat advisory due to mercury, and it is the only portion of an AOC with a wildlife consumption impairment.

Sources of contaminants originating outside an AOC (upstream, long range transport of contaminants released to the air and deposited in the AOC, from open lake waters, etc.) that result in a fish or wildlife consumption advisory should not impinge on the ability to delist an AOC. In order to document that the BUI can be removed due to sources outside the AOC a pollutant source study or other investigation could be conducted. Alternatively, a comparison study of fish tissue contaminant levels can show that the fish tissue concentrations within the AOC are not statistically different than non-AOC areas or selected reference sites. If a trend analysis shows similarity between the sites, then the BUI should be considered restored. Whenever possible, Ohio EPA will attempt to ensure that another responsible party or existing regulatory program is addressing source control outside the AOC boundaries.

Up-to-date comprehensive fish and wildlife consumption advice is available on the Ohio EPA web page at: www.epa.state.oh.us/dsw/fishadvisory/index.html. In 2003, a general state-wide restriction was issued advising not to eat more than one meal per week of fish caught from any waters in Ohio due to widespread low levels of mercury. This blanket statewide advisory is protective of the most sensitive human populations and pre-empted the listing of other one meal per week advisories that were mostly due to PCBs. In order to keep the fish consumption advisory information as simple as possible, the web page now only lists the more restrictive one month or greater advisories. This does not mean the PCBs have gone away. Therefore, when conducting a study to determine if the local advisories are strictly related to sources from outside an AOC, it is important to examine the actual fish tissue data for the area in question and not just whether an advisory is listed on the web page. In the *Ohio Integrated Report*, beginning in 2006, water body impairments were included based on fish tissue concentrations as related to water quality criteria. Information about fish consumption advisories and where to obtain fish tissue data are available from Ohio EPA at: www.epa.ohio.gov/dsw/fishadvisory/index.aspx. Integrated Reports can be found at www.epa.state.oh.us/dsw/tmdl/OhioIntegratedReport.aspx. Please note that the Integrated Report data are somewhat different than the concentrations that trigger fish consumption advisories and are offered here for informational purposes only. For the BUI restoration targets, we will continue to keep the targets focused on the existence of fish consumption advisories rather than fish tissue concentrations.

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BUI 2: Tainting of Fish and Wildlife Flavor

IJC Listing Guideline

An impairment will be listed when ambient water quality standards (WQS), objectives, or guidelines for the anthropogenic substance(s) known to cause tainting, are being exceeded or survey results have identified tainting of fish or wildlife flavor.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:

1) Levels of compounds associated with tainting exceed Ohio WQS within the Area of Concern and/***or*** 2) Wildlife officials indicate tainting of fish and wildlife flavor is found within the area.

State of Ohio Restoration Target

No WQS exceedences of compounds associated with tainting within the Area of Concern (phenol, 2-chlorophenol, 2,4-dichlorophenol); **AND/OR**

No reports of tainting from wildlife officials

Potential Data Sources

- Ohio EPA water quality surveys
- Ohio DNR wildlife reports or surveys

Rationale

Phenol and chlorinated phenols are the chemicals most often associated with organoleptic (taste and odor) effects. Phenols and related compounds may be present in waste products from oil refineries, coke plants, gas plants, some chemical producing facilities, plastics manufacturing, road surfacing, dyes, disinfectants and various industries and processes that use phenolic substances as raw materials. Concentrations of pure phenol above 15,000-25,000 µg/l have been found to affect taste and odor in fish (Shumway and Palensky, 1973). Phenols react with chlorine to produce chlorinated phenolics. Threshold levels for chlorinated organics above which taste and odor may occur in fish range from 1 µg/l to 84 µg/l. This range was determined by testing rainbow trout after a 48 hour exposure period (U.S.EPA, 1980). Ohio does not have any WQS to protect against fish tainting, but does have the following standards to prevent organoleptic effects in drinking water: 0.1 µg/l of 2-chlorophenol; 0.3 µg/l of 2,4-dichlorophenol; and 1.0 µg/l of phenol. Levels of these compounds below Ohio WQS for drinking water should preclude tainting of fish or wildlife flavor.

One of the best indications of an impairment of BUI 2 is reports of tainting to wildlife officers and managers. While it would be ideal to have both survey information and water quality data for organoleptic chemicals, a survey of wildlife officials should be able to provide adequate information regarding the occurrence of tainting in fish or wildlife flavor.

Elevated phosphorus concentrations that cause algal blooms may in turn cause a taste or odor problem in fish or wildlife. The presence of nuisance plankton populations, such as blue-green algal blooms, and potential impacts to fish and wildlife are assessed under BUI 9 (Eutrophication or Undesirable Algae) and BUI 11 (Degradation of Aesthetics).

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BUI 3: Degradation of Fish and Wildlife Populations

IJC Listing Guideline

An impairment will be listed when fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated, bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:

For Fish:

Biological surveys report that the average score for a 12-digit HU or Large River Assessment Unit (LRAU) (or other agreed upon stream segment or subwatershed) are in significant departure from the State of Ohio's fish community biological criteria and guidelines.

For Wildlife:

State wildlife population or another similar study indicate degraded or absent populations of selected sentinel species.

State of Ohio Restoration Target

This beneficial use will be considered restored when the following conditions are met:

For Fish:

In the riverine areas upstream from the lake affected waters (lacustuary or fresh water estuary), the average Index of Biotic Integrity (IBI) and the average Modified Index of Well Being (MIwb) values within an assessment unit do not significantly diverge from state biological criteria. (See Appendix B for additional information).

Index Type – Site Type	Riverine Fish Population Restoration Targets[1]							
	Erie/Ontario Lake Plain (EOLP)				Huron-Erie Lake Plain (HELP)			
	WWH	EWH	MWH	LRW[2]	WWH	EWH	MWH	LRW[2]
IBI - Headwaters	36	46	20	14	24	46	16	14
IBI – Wading*	34	46	20	14	28	46	16	14
IBI - Boat*	36	44	20	12	30	44	16	12
MIwb – Wading	7.5	8.9	5.7	4.0	6.8	8.9	5.1	4.0
MIwb – Boat	8.2	9.1	5.3	4.5	8.1	9.1	5.2	4.5

**Wading and boat refer to sampling methodology (i.e., wading in shallow water and use of a boat in deeper water)*

[1]Ohio EPA has determined the non-significant departure value for riverine IBI to be 4 points MIwb to be 0.5 points; the targets presented in this table reflect the non-significant departure from Ohio WQS.

[2]Targets for Limited Resource Waters (LRW) are based on benchmarks as there are no criteria in Ohio WQS.

OR

In lake affected waters (lacustuary or fresh water estuary), the average L-IBI and the average MIwb values do not diverge from state guidelines. (See Appendix B for additional information and lacustuary locations in each AOC).

Type	Lacustuary Fish Population Restoration Targets	
	L-IBI	MIwb
Lacustuary	42	8.6
Lacustuary - LRW	16	5.1

For Wildlife:

ODNR's annual Wildlife Population Status Reports or another similar study shows a steady or improving healthy, reproducing population of either terrestrial or avian resident species (e.g. bald eagle, osprey, sandhill crane, river otter) or other AOC appropriate sentinel species for at least 3 of the last 5 years.

Notes

- Ohio EPA has determined non-significant departure to be 4 points and 0.5 points from state WQS for IBI and MIwb values, respectively, for riverine areas. The Riverine Fish Population Restoration Targets listed above reflect the target as a non-significant departure from state WQS.
- Non-significant departure for neither the L-IBI nor the MIwb lacustuary values has been determined and the Lacustuary Fish Population Restoration Targets listed above reflect state WQS values. If non-significant departure values are determined for lacustuaries, these restoration targets may be adjusted.
- Assessment units for the fish populations are the 12-digit HU, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed. If a single assessment unit has multiple criteria that apply to that unit (e.g., wading, boating, lacustuary), then the unit should be evaluated in segments based on each criteria. For the wildlife populations, the AOC should be evaluated as a whole.
- If waters have more than one designated use (i.e., Lacustuary and LRW or MWH) then the lowest target applies.

Potential Data Sources

- Ohio EPA IBI data
- Ohio EPA MIwb data
- ODNR wildlife reports website: www.dnr.state.oh.us/Home/wild_resourcessubhomepage/ResearchandSurveys/tabid/15432/Default.aspx

Rationale

For Fish Populations:

The Ohio Water Quality Standards (WQS; Ohio Administrative Code Chapter 3745-1) consist of designated uses and chemical and biological criteria designed to represent measurable properties of the environment that are consistent with the narrative goals specified by each use designation. Use designations consist of two broad use groups: aquatic life (i.e., aquatic community status) and human health (i.e., water supply, recreational use). Every named waterbody in Ohio has an assigned aquatic

use designation and there are target biological criteria for each use designation. The biocriteria for waterways are codified in the Ohio WQS.

The Lake Erie watershed falls within two ecoregions – geographic regions with unique ecological characteristics. These are the Erie/Ontario Lake Plain (EOLP) and the Huron/Erie Lake Plain (HELP). Chemical and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. This constitutes a "tiered" approach in that varying and graduated levels of protection are provided by each criterion. This hierarchy is especially apparent for the biological criteria. The aquatic life use criteria frequently control the resulting protection and restoration requirements as an emphasis on protecting aquatic life generally results in water quality suitable for all uses. This is why the aquatic life use criteria are emphasized in Ohio EPA biological and water quality reports.

When measuring the status of this BUI, the Index of Biotic Integrity (IBI) and the Modified Index of Well-Being (MIwb) should be used to measure the fish community. The IBI is a multimetric index patterned after an original IBI described by Karr (1981) and Fausch *et al.* (1984). The MIwb is a measure of fish community abundance and diversity using numbers and weight information, and is a modification of the original Index of Well-Being applied to fish community information from the Wabash River (Gammon 1976; Gammon *et al.* 1981). The modification corrects for a predominance and high abundance of fish species tolerant to environmental degradation that would otherwise produce false high readings. There are differences in IBI and MIwb criteria between the two ecoregions where Ohio's AOCs are located - EOLP and HELP. See the table below for values in each ecoregion. Ohio EPA has determined non-significant departure to be 4 points and 0.5 points for the IBI and MIwb values, respectively. These values for the tributaries are considered criteria and adopted in the Ohio WQS. The non-significant departure value is incorporated into the State of Ohio Restoration Targets for fish populations listed above.

In addition to the river habitat areas, two other zones exist - the Lake Erie shoreline and an area where river and lake water mix. Ohio EPA refers to this latter area as a lacustuary (combination of the terms lacustrine and estuary). These areas could also be described as drowned river mouths (lake water flows into the river essentially "drowning" the river mouth). There are no differences in the lacustuary IBI (L-IBI) target between the two ecoregions - EOLP and HELP. There is not a separate MIwb index for the lacustuary; however the target is different than the riverine targets. The L-IBI and MIwb values used to evaluate lacustuaries are guidance and have not yet been finalized or adopted into State rules. No non-significant departure values have been determined for L-IBI and MIwb assessments in lacustuaries so the Lacustuary Fish Population Restoration Targets listed above reflect only state guidance values. If non-significant departure values are determined in the future, the L-IBI and MIwb targets may be adjusted. (See Appendix B for more detail and a description of lacustuaries within Ohio's AOCs.)

For the purpose of this restoration target, the IBI and L-IBI values should be averaged across a designated assessment unit. This process should be repeated for the MIwb values. If a single assessment unit has multiple criteria that apply to that unit (e.g. wading, boating, lacustuary), then the unit should be evaluated in segments based on each criteria. For consistency with other Ohio EPA programs, it is recommended that 12-digit HU or Large River Assessment Unit (LRAU) be used. RAPs may elect to use an alternate assessment unit, provided the proposed assessment unit will result in an equivalent evaluation of the conditions and Ohio EPA concurs with that determination.

The calculated average value for an assessment unit needs to meet the IBI, L-IBI and the MIwb target value in order for the BUI to be removable for that assessment unit. Assessment unit averages should NOT be averaged to determine BUI impairment status for an AOC.
Ohio EPA recommends the following guidelines for averaging data:

1. If multiple assessments were conducted at an individual site during a single year or field season, the results should be evaluated to determine an average for each individual site. Otherwise, use the most current data available for each site, collected within the last 10 years.
2. The averages for individual sites (as calculated in #1) should be combined with other sites within the same assessment unit to determine the overall average value for the assessment unit. The overall assessment unit average can be based on data from different years as long as all data is no older than 10 years.

For BUI assessments, if any single sampling site is 50% or less of the target, then the whole assessment unit may be considered impaired. These conditions may be indicative of a hotspot being present and additional investigation and, potentially, restoration actions may be needed.

For Wildlife Populations:

Healthy wildlife populations depend on good habitat, so restoration of the Loss of Fish and Wildlife Habitat (BUI 14) is vital for the restoration of wildlife populations. In order to reach the restoration target for wildlife populations, habitat maintenance and improvement need to be emphasized. On private lands, efforts are geared toward incentive programs to improve habitat, especially for agricultural and woodland landowners.

Habitat manipulation (i.e. creation, enhancement, etc.) is practiced more directly on public land owned by local, state and regional park districts and government agencies. Public lands are important for wildlife production and for recreation. Some of the best hunting, trapping, and wildlife observation opportunities in Ohio occur on state wildlife areas. Because more than 90 percent of the state's original wetlands have been lost to development, wetlands represent an especially critical habitat type, and needs to receive special attention in order to maintain populations.

Recent state efforts have involved wild turkeys, bald eagles, river otters, and peregrine falcons. Great blue heron, bald eagle, osprey, and river otter are some of the top-level fish eating predatory animals of the Lake Erie watershed and are good indicators of surface water based ecosystem health. As such, they are considered to be primary sentinel species in Ohio. Population studies of these birds and mammals indicate that their numbers are increasing, due to successful reintroduction efforts and declining levels of pollution.

Each year the Ohio Department of Natural Resources Division of Wildlife uses various methods to monitor Ohio's wildlife species. Their annual Wildlife Population Status Report presents results of those surveys and up-to-date information about select wildlife species in Ohio. These reports or other similar studies should be utilized to determine the status of the wildlife portion of this BUI.

It should be noted that most of the suggested sentinel species require a larger area than one 12-digit HU or large river assessment unit (LRAU) to support healthy, sustainable populations. The wildlife portion of this BUI should be evaluated based on the AOC as a whole, not by assessment units or watersheds.

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BUI 4: Fish Tumors or Other Deformities

IJC Listing Guideline

An impairment will be listed when incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:

DELTs (Deformities, Eroded Fins, Lesions and Tumors) or bullhead liver tumor incidence levels exceed regional target values or values found in either Lake Erie fish populations and are due to contaminant sources from within the boundaries of the AOC.

State of Ohio Restoration Target

The average DELT values within the assessment unit do not exceed either:

- DELT values of 3% (lacustuary and boat sites), or
- DELT values 1.3% (wading sites);

AND

Where brown bullheads are present, the liver tumor prevalence rate (i.e., neoplastic or preneoplastic liver tumors) should not exceed 5%.

Notes

- Two studies are currently underway to determine the background rates for tumor and deformity incidence rates in Ohio AOCs. Once the studies are complete, Ohio EPA will review the results and determine if the current target should be revised.
- Assessment units for DELTs are the 12-digit HU, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed.
- Brown bullhead liver tumor prevalence rates are evaluated in specified stream reaches within the AOC where populations are likely to be present.

Potential Data Sources

- Ohio EPA biological surveys
- Other regional, state/federal or local fish studies

Rationale

For Deformities, Eroded Fins, Lesions and Tumors (DELTs):

DELTs are typically recorded when conducting fish community surveys. Information on external anomalies is noted because many are either caused or exacerbated by environmental factors and often indicate the presence of multiple sublethal stressors. Morphological abnormalities are uncommon in unimpacted natural fish populations. DELTs are one of the metrics used to determine Ohio's Index of Biotic Integrity (IBI). The metric is designed to provide a score (5, 3 or 1) as part of the overall index. The DELT target percentage of 3.0% (lacustuary and boat sites) and 1.3% (free flowing and wading sites)

are based on the 75th percentile at reference sites and is used to determine a score of '3' for the DELT metric of the IBI. The previous DELT target (2008 Delisting Targets for Ohio Areas of Concern) for this BUI utilized the 90th percentile (highest expected score) to set the DELT target at 0.5% (lacustuary/boat sites) and 0.1% (free flowing and wading sites).

The decision to revise the DELT target was based on a review of available DELT data from Ohio's Lake Erie watersheds and consideration of overall AOC objectives. For the purpose of this restoration target, the DELT values should be averaged across a designated assessment unit. For consistency with other Ohio EPA programs, it is recommended that 12-digit HU or Large River Assessment Unit (LRAU) be used. RAPs may elect to use an alternative assessment unit, provided that Ohio EPA concurs with that determination. If a single assessment unit has multiple criteria that apply to that unit (e.g., wading, boating, lacustuary), then the unit should be evaluated in segments based on each criteria.

The calculated average value for an assessment unit needs to meet the target value in order for the BUI to be removable for that assessment unit. The calculated average value of each assessment unit in the AOC needs to meet the target value in order for the BUI to be removable for the AOC. Assessment unit averages should NOT be averaged to determine BUI impairment status for an AOC.

Ohio EPA recommends the following guidelines for averaging data:

1. If multiple samples were collected at an individual site during a single year or field season, the results should be evaluated to determine an average for each individual site. Otherwise, use the most current data available for each site, collected within the last 10 years
2. The averages for individual sites (as calculated in #1) should be combined with other sites within the same assessment unit to determine the overall average value for the assessment unit. The overall assessment unit average can be based on data from different years.

If results from any single sample for a site exceeds a level of 2 times the applicable target value then the whole assessment unit is considered impaired. This condition may be indicative of a hotspot being present and additional investigation and, potentially, restoration actions may be needed.

For Bullhead Liver Tumors:

High occurrences of both external and internal (liver) tumors in fish have been associated with carcinogens in sediment and water at a variety of AOCs on the Great Lakes and many other locations in North America (Baumann, 1998). Numerous field and laboratory investigations have demonstrated a cause and effect relationship between carcinogens, particularly PAHs, and liver cancer in fish. As these studies have typically been conducted over a stream reach and produced data for the entire reach, rather than from specific sites within a reach, the averaging of results is not applicable.

A study by Baumann evaluated brown bullhead at lower Great Lakes Canadian AOCs and Interconnecting Waterways (Baumann 2010) and determined that some preneoplastic lesions never develop into liver tumors and should not be used as an impairment criterion and the study attempted to develop an impairment criterion based only on neoplastic lesions. Based on analysis of about 1150 brown bullhead, Baumann assigned a tumor prevalence of 2% as a delisting criterion for the study. However, Baumann found some AOC sites with tumor prevalence rate of 4% (Wheatley Harbor and Bay of Quinte) to a 5% tumor prevalence rate for a hypothetical site with 100 individuals were not significantly different than the assigned delisting criterion of 2%. It appeared from the Baumann report that statistically observing a difference of background values of up to 5% liver tumor prevalence was not possible.

Based on review of available data, including the Baumann report, the Ohio AOC restoration target for liver tumors in bullheads is set at a 5% tumor prevalence rate to account for the statistically observable difference value documented by Baumann plus any hepatic alterations/preneoplasms that could develop into liver tumors.

Ohio EPA has identified the lacustuary zones of the following streams and reaches for the evaluation of brown bullhead liver tumor incidence rates. Ashtabula River was evaluated by USFWS in 2011 and the rest were sampled as part of an Ohio EPA GLRI project in 2012-2013.

AOC Stream Reaches Where Brown Bullhead are Likely to be Present	
Maumee AOC	Mainstem/Swan Creek
	Ottawa River
	Duck/Otter Creek
	Wolf Creek
	Cedar Creek
	Turtle Creek
	Toussaint/Packer Creek
Black River AOC	Upper Black River
	Lower Black River
Cuyahoga River AOC	Mainstem/Marina
	Old Channel
	Euclid Creek
Ashtabula River AOC	Mainstem

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BUI 5: Bird or Animal Deformities or Reproductive Problems

IJC Listing Guideline

An impairment will be listed when wildlife survey data confirm the presence of deformities (e.g., cross-bill syndrome) or other reproductive problems (e.g., egg-shell thinning) in sentinel wildlife species.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:
Bird or animal deformities or reproductive problems of sentinel species, due to sources within the AOC, are documented by wildlife managers.

State of Ohio Restoration Target

No reports of wildlife population deformities or reproductive problems from wildlife officials resulting from contaminants within the AOC.

Potential Data Sources

- State or local wildlife surveys or reports

Rationale

Great blue heron, bald eagle, osprey, mink, and river otter are the top-level fish eating predatory animals of the Lake Erie watershed and are good indicators of ecosystem health. As such, they are considered to be the primary sentinel species in Ohio. Population studies of these species indicate that their numbers are increasing, due to successful re-introduction efforts and declining levels of pollution. However, these and other animals may continue to be impacted, particularly by legacy pollutants such as PCBs, and their reproductive health may be impaired. Reproductive impairments cannot be clearly understood without considering the factors that cause them. Wildlife officials, managers, and other organizations should be able to provide adequate information regarding the status of these populations and the presence or absence of deformities and reproductive problems.

No impairments of this BUI have been identified in any of Ohio's AOCs.

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BUI 6: Degradation of Benthos

IJC Listing Guideline

An impairment will be listed when benthic macroinvertebrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated, bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:
Biological surveys report that the average score for a 12-digit HU or Large River Assessment Unit (or other agreed upon stream segment or subwatershed) are in significant departure from the State of Ohio's macroinvertebrate community biological criteria or guidelines.

State of Ohio Restoration Target

In the riverine areas upstream from the lake affected waters (lacustuary or fresh water estuary), the average of the Invertebrate Community Index (ICI) values within the assessment unit do not significantly diverge from state biological criteria; **AND**

In lake affected waters (lacustuary or fresh water estuary), the average of the L-ICI values do not diverge from state guidelines. (See Appendix B for additional information);

		Invertebrate Community Index (ICI) Restoration Target			
Index Type – Site Type	**WWH**	**EWH**	**MWH**	**LRW[3]**	**Lacustuary[4]**
Riverine[1]	30	42	18	4	NA
Lacustuary[2]	NA	NA	NA	12	34

[1]Ohio EPA has determined the non-significant departure value for riverine ICIs to be 4 points and the targets presented in this table reflect the non-significant departure from Ohio WQS.
[2]Non-significant departure for the lacustuary ICI value has not yet been determined. A study is currently underway in to determine lacustuary criteria in Ohio. Once the study is complete, Ohio EPA will review the results and determine if the current target should be revised.
[3]Targets for Limited Resource Waters (LRW) are based on benchmarks as there are no criteria in Ohio WQS.
[4] The ICI target for lacustuaries is based on an Ohio EPA study in 1994 that identified 34 as a value considered an attainable goal for the Lake Erie lacustuaries given the current altered habitat conditions in the absence of excessive sedimentation and water column enrichment or toxicity.

AND
(Maumee AOC only) In Maumee Bay, *Hexagenia* (burrowing mayflies nymphs) measured on a three year moving average (collected April to June) should range between 101 to 400 nymphs/m^2, with the ideal range between 201 and 300 nymphs/m^2.

Note

- Assessment units are the 12-digit HU, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed.
- If waters have more than one designated use (i.e., Lacustuary and LRW or MWH) then the

lowest target applies.

- This BUI will not be evaluated for ICI in waters that are routinely dredged as it is unrealistic for a healthy benthos community to be restored under these conditions.

Potential Data Sources

- Ohio EPA ICI data
- Ohio EPA Mayfly data
- Other Mayfly data

Rationale

The Ohio Water Quality Standards (WQS; Ohio Administrative Code Chapter 3745-1) consist of designated uses and chemical and biological criteria designed to represent measurable properties of the environment that are consistent with the narrative goals specified by each use designation. Use designations consist of two broad use groups: aquatic life (i.e., aquatic community status) and human life (i.e., water supply, recreational use).

Every named waterbody in Ohio has an assigned aquatic use designation and there are target biological criteria for each use designation. The biocriteria for waterways are codified in the Ohio WQS.

Chemical and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. This constitutes a "tiered" approach in that varying and graduated levels of protection are provided by each criterion. This hierarchy is especially apparent for the biological criteria. The aquatic life use criteria frequently control the resulting protection and restoration requirements as an emphasis on protecting aquatic life generally results in water quality suitable for all uses. This is why the aquatic life use criteria are emphasized in Ohio EPA biological and water quality reports (see Appendix B).

When measuring the status of this BUI, the Invertebrate Community Index (ICI) should be used to assess the macroinvertebrate community characteristics. The ICI is a multi-metric index patterned after an original Index of Biological Integrity (IBI) for fish communities described by Karr (1981) and Fausch et al. (1984). The ICI was developed by Ohio EPA and further described by DeShon (1995). There are no differences in ICI criteria between the two ecoregions where Ohio's AOCs are located - EOLP and HELP. For warm water habitat the WQS criteria is 34 for ICI. Ohio EPA has determined non-significant departure from ICI values to be 4 points. The ICI values for the tributaries are considered biological water quality criteria and adopted in the State WQS. Currently, there are no WQS for ICI in Limited Resources Waters but Ohio EPA has developed LRW benchmarks and these values were used for the restoration targets in riverine and lacustuary LRW waters.

In addition to the river habitat areas, two other zones exist - the Lake Erie shoreline and an area where river and lake water mix. Ohio EPA refers to this latter area as a lacustuary (combination of the terms lacustrine and estuary). These areas could also be described as drowned river mouths (lake water flows into the river essentially "drowning" the river mouth). There are no differences in lacustuary ICI (L-ICI) guidelines between the two ecoregions - EOLP and HELP. For L-ICI, the BUI restoration target is 34 as a non-significant departure value for L-ICI has not yet been determined. The ICI values for the lacustuaries are guidance and have not yet been finalized or adopted into State rules (see Appendix B for more detail and a description of lacustuaries within Ohio's AOCs).

For the purpose of this restoration target, the ICI values should be averaged across a designated assessment unit. If a single assessment unit has multiple criteria that apply to that unit (e.g., wading, boating, lacustuary), then the unit should be evaluated in segments based on each criteria. For consistency with other Ohio EPA programs, it is recommended that 12-digit HU or Large River Assessment Unit (LRAU) be used. RAPs may elect to use an alternate assessment unit, provided the proposed assessment unit will result in an equivalent evaluation of the conditions and Ohio EPA concurs with that determination.

The calculated average value for an assessment unit needs to meet the target value in order for the BUI to be removable for that assessment unit. The calculated average value of each assessment unit in the AOC needs to meet the target value in order for the BUI to be removable for the AOC. Assessment unit averages should NOT be averaged to determine BUI impairment status for an AOC.

Ohio EPA recommends the following guidelines for averaging data:

1. If multiple assessments were conducted at an individual site during a single year or field season, the results should be evaluated to determine an average for each individual site. Otherwise, use the most current data available for each site, collected within the last 10 years.
2. The averages for individual sites (as calculated in #1) should be combined with other sites within the same assessment unit to determine the overall average value for the assessment unit. The overall assessment unit average can be based on data from different years as long as all data is no older than 10 years.

For BUI assessments, if any single sampling site is 50% or less of the target, then the whole assessment unit may be considered impaired. These conditions may be indicative of a hotspot being present and additional investigation and, potentially, restoration actions may be needed.

For those areas where collection of L-ICI data is not possible or appropriate (e.g., open water areas, bays), the status of the BUI may be measured using the population density of *Hexagenia* (burrowing mayflies) nymphs in the spring prior to “hatching”. In Ohio, this is applicable only to the Maumee AOC. Measuring a "moving" average is more likely than individual yearly averages to reflect long-term changes in water and sediment quality. In addition, because three-year moving averages appear to reveal well the underlying long-term trend in population density, they, rather than annual averages, should be used to determine the extent to which the *Hexagenia* metric is attaining the target density (Kreiger, 2004).

Based on studies of the Lake Erie Western Basin, it is believed that the *Hexagenia* densities between 201 and 300 should be scored as "Excellent" and then bracketed above and below by two separate ranges of densities between 101 to 200 and 301 to 400 that should be scored as "Good." That is, a low density of mayflies will not sustain the Lake Erie fishery, but high densities of mayflies indicate over-enrichment and potential dissolved oxygen problems. For the purpose of this restoration target, the desired population density is between 101 and 400 nymphs /m^2, with the ideal range between 201 and 300 (Kreiger, 2004).

The IJC lists a second condition for impairment of this beneficial use regarding sediment toxicity. Because Ohio EPA has a comprehensive multi-metric index for evaluating the health of the macroinvertebrate community, it has been determined that (in Ohio) it is not necessary to measure the toxicity of the sediments via bioassays. The ICI and L-ICI metrics indicate if a community is being

impacted. If there is determined to be an impact, then sediment and water quality evaluations should be conducted by Ohio EPA, as necessary, to determine the source and the appropriate management measures will be identified to restore the community health.

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BUI 7: Restrictions on Navigational Dredging Activities

IJC Listing Guideline

An impairment will be listed when contaminants in sediments exceed standards, criteria or guidelines such that there are restrictions on dredging or disposal activities.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:
Contaminants in sediment exceed sediment quality guidelines used by the State such that there are restrictions on navigational dredging or disposal activities.

State of Ohio Restoration Target

There are no restrictions on navigational dredging or disposal activities due to contaminants in sediment, such that sediments are suitable for upland reuse/disposal, **OR** sediments meet Ohio EPA guidelines for open water disposal.

Notes

- Navigational dredging refers to dredging of a federally designated ship channel and historically dredged stretches of a river to enable the passage of commercial and/or recreational vessels. Restrictions to disposal activities refer to the prohibition of open lake disposal or upland re-use of dredged materials due to chemical contamination or biological toxicity of the sediment.
- This does not include the maintenance dredging of private marinas, slips, docks, etc. However, if sediment contaminant concentrations in these areas are a source of contamination that precludes attainment of remedial dredging goals of federally designated ship channels and historically dredged stretches of a river, then dredging of private marinas, slips, docks, etc. may be necessary.

Potential Data Sources

- U.S. Army Corps of Engineers sediment characterization studies
- Other sediment characterization studies

Rationale

This BUI specifically addresses areas within the boundaries of AOCs that are historically dredged to maintain navigable depths for commercial and/or recreational vessels. While this beneficial use addresses restrictions on dredging or disposal activities:

1) Precautionary seasonal restrictions on dredging to prevent real or anticipated impacts to spawning fish, avian or macroinvertebrate species is not considered to be a cause for impairment;
2) Local restrictions due to local detrimental effects of the dredging operation (increased turbidity, noise, channel restrictions, etc.) are not considered to be a cause for impairment; and
3) If open lake disposal is restricted solely due to volume, this beneficial use would not be considered to be impaired.

Ohio EPA does not have sediment standards. However, the Agency follows the *Great Lakes Dredged Materials Testing and Evaluation Manual* and *Inland Testing Manual.* Both of these manuals were

prepared by U.S. EPA and the U.S Army Corps of Engineers in 1998 to address testing for dredged sediments that are proposed for disposal in waters of the U.S. These manuals present a tiered approach that look at bulk sediment concentrations via elutriate analysis, bioassays (toxicity) and bioaccumulation. Determination of suitability of sediment for open lake disposal in Lake Erie is based on the processes identified in these manuals. These manuals serve as guidance for determining if sediments are causing environmental impacts, if certain restrictions are necessary during a navigational dredging activity to prevent/minimize further impact, if sediments can be disposed of in the open lake, or if sediments are suitable for upland beneficial reuse. All navigational dredging and disposal projects are reviewed by the Ohio EPA, under the authority of Clean Water Act Section 401, to ensure protection of water quality.

For evaluation of other disposal methods, Ohio EPA, Division of Surface Water currently utilizes its 2010 *Guidance on Evaluating Sediment Contaminant Results* to determine proper management or disposal options for contaminated sediment. This guidance details how contaminated sediment can be assessed using a tiered approach (screening, evaluating and testing) and is available online at http://www.epa.ohio.gov/portals/35/guidance/sediment_evaluation_jan10.pdf.

Ohio EPA is presently developing General Permits specifically for upland re-use and/or disposal of dredged material. These General Permits will specify constituent levels required for different uses of dredge material and consider different exposure potentials. Once these General Permits are finalized, Ohio EPA will review the restoration target for this BUI and consider revisions as appropriate.

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BUI 8: Eutrophication or Undesirable Algae

IJC Listing Guideline

An impairment will be listed when there are persistent water quality problems (e.g., dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity) attributed to cultural (human-induced) eutrophication.

State of Ohio Listing Guideline

The beneficial use shall be listed as impaired if:

Dissolved oxygen levels do not meet minimum criteria established in Ohio Water Quality Standards (WQS) for the stream segment of concern, and the cause is due to excessive nutrient loading or excessive levels of oxygen demanding substances; **AND/OR**

Nutrients entering the waters as a results of human activity create nuisance growths of aquatic weeds or algae (Ohio WQS, Chapter 3745-1-04(E) of the Ohio Administrative Code – *see Appendix A*)

State of Ohio Restoration Target

This use will be considered restored when the follow conditions are met:

For Riverine waters (upstream of lacustuary or fresh water estuary):

When the Trophic Index (a tool included in Ohio's Nutrient Reduction Strategy (Ohio EPA, 2013) demonstrates that conditions are not impaired as a result of excessive algal growth due to sources of nutrients; **OR**

If the Trophic Index is not available, then no persistent nuisance growth of algae, such as filamentous *Cladophora*, or blooms of blue-green algae have been observed within the last three years due to sources of nutrients from within the AOC.

For Lake affected waters (lacustuary or fresh water estuary):

When waters meet the minimum and the average dissolved oxygen criteria listed in the Ohio WQS, Chapter 3745-7 (See Appendix A for more information);

Dissolved Oxygen Restoration Targets		
Designated Use	**OMZM[1] (mg/L)**	**OMZA[2] (mg/L)**
WWH	4.0	5.0
EWH	5.0	6.0
MWH	3.0[3]	4.0
LRW	2.0	3.0
Federally Designated Shipping Channels	1.5	NA

[1] *OMZM = outside mixing zone minimum.*

[2] *OMZA = outside mixing zone average defined as the minimum twenty-four-hour average.*

[3] *The dissolved oxygen minimum at any time criterion for modified warmwater habitats in the Huron/Erie Lake Plain ecoregion, as identified in rules 3745-1-08 to 3745-1-30 of the Administrative Code, is 2.5 mg/l.*

AND
No persistent nuisance growth of algae, such as filamentous *Cladophora*, or blooms of blue-green algae have been observed within the last three years due to sources of nutrients from within the AOC.

Note

- Water quality problems due to nutrient loadings originating outside of the AOC will not be considered a BUI impairment and will be addressed by other programs as described in the rationale.
- Persistent algal growths are considered to be those that occurs frequently (annually, multiple times during the season) and that impact the public use of the river.
- If waters have more than one designated use (i.e., shipping channel and LRW or MWH) then the lowest target applies.

Data Sources

- Ohio EPA water quality surveys
- Other local or federal surveys

Rationale

Eutrophic waters can represent a natural stage in the aging of a water body. For example, as a lake fills in it becomes shallower, warmer and more susceptible to supporting excessive growths of aquatic vegetation and algae. However, in many cases, the eutrophication process is accelerated by human activities that cause increased nutrient and sediment loading. Impacts on the water body could be low dissolved oxygen concentrations, elevated phosphorus and nitrogen concentrations, excessive vegetation, algal blooms, taste and odor problems in drinking water, and high turbidity. Eutrophication is considered a BUI impairment if it is caused by human activity. Eutrophication directly impacts several BUIs, including BUI 9 (Restrictions on Drinking Water Consumption or Taste & Odor Problems), BUI 10 (Beach Closings), BUI 11 (Degradation of Aesthetics), and BUI 13 (Degradation of Plankton Populations). In general, all algae related issues should be addressed by this BUI unless there are BUI-specific targets (e.g., beach advisories due to algal toxins).

Nutrient enrichment is a major water quality problem in Ohio and throughout the nation. While efforts to control nutrient enrichment over the past 30 years have yielded some positive results, current evidence shows the need to develop newer solutions and improve the effectiveness and efficiency of existing strategies to reduce nutrient in our waterways. Nutrient pollution is caused by an excess of phosphorus and/or nitrogen in the aquatic environment. Excess nutrients in the aquatic environment can cause algal blooms that are larger in volume, and occur with greater frequency and duration, than they would in an environment without excess nutrients. The Ohio 2012 Integrated Report (Ohio EPA, 2012) lists nutrients as one of the leading causes of impairment to rivers and streams in Ohio, with 60% of listed waters impaired entirely, or in part, by nutrients.

Recently, Lake Erie has experienced a resurgence of harmful algal blooms of blue-green algae impacting both the Western and Central Basin waters. Ohio Phosphorus Taskforce Phase I Report (2010) concluded that there are multiple contributors to phosphorus into Lake Erie but agriculture is the leading source and key to achieving substantive reductions. Climate change (increased temperatures and more intensive storms), increased dissolved reactive phosphorus loadings, and the invasion of dreissenid mussels (zebra and quagga) have all been identified as potential factors.

State and federal governments have launched a number of voluntary and regulatory programs to address nutrient management. Ohio's EPA, Department of Agriculture and Department of Natural Resources released the Ohio Nutrient Reduction Strategy in June 2013. The Strategy provides a comprehensive picture of nutrient management activities for both point and nonpoint sources in Ohio. To assess nutrient impacts to aquatic use in streams, Ohio EPA has developed a Trophic Index that incorporates dissolved oxygen regime, nitrogen and phosphorus concentrations, benthic algal biomass (chlorophyll a) and biological community into a multi-metric scoring system. The index is intended for use in free-flowing streams and was not designed for Lake Erie or the lacustuary waters. Information about the criterion and scoring is contained in Ohio's Nutrient Reduction Strategy, available at www.epa.ohio.gov/Portals/35/wqs/ONRS_final_jun13.pdf.

Considering the significant State and Federal initiatives underway to address nutrient runoff, restoration efforts under the AOC program should be focused on local sources of impairment.

Eutrophication can be a localized problem in certain segments of streams that may be downstream sources of high levels of nutrients (either point or nonpoint), loadings of oxygen demanding substances or in areas of little circulation and low flow. In some areas, the natural stream channel has been dredged and deepened to accommodate shipping. If it is documented that this deepening is responsible for the failure to meet WQS, this area would not be considered impaired under this target due to nutrient loading. However, should the opportunity arise to alter the stream morphology back to a more natural state, the RAP should encourage this option.

Specifically for the Cuyahoga River, exceptions for the dissolved oxygen criteria are included in OAC 3745-1-26 for the LRW waters identified as the Cuyahoga river ship channel (river mile 5.6 @ the Newburgh and South Shore RR Bridge to the Cleveland harbor portion of Lake Erie). According to the rule, "the physical habitat of the channel and the prevailing background dissolved oxygen regime are insufficient to support any resemblance of the warmwater habitat aquatic life use designation. A use attainability analysis has been conducted and indicated the extant fauna is substantially degraded and the potential for recovery of the fauna to the level characteristic of other Laker Erie river mouth is precluded by irretrievable human induced conditions. However, the ship channel is used by fish as a migratory route in the spring months. This seasonal and stream flow related uses shall be recognized and protected through this rule." The section E(3)(a) of the rule describes the following exception related to dissolved oxygen, "The limited resource water dissolved oxygen criterion shall be 1.5 mg/L minimum. No dissolved oxygen average criteria apply." Section E(5) states "These standards reflect the desire for restoring and maintaining multiple uses of the ship channel expressed by the Cuyahoga River Remedial Action Plan Coordinating Committee. All parties, private and public, who contribute to the dissolved oxygen problem may share a responsibility in the study and attainment of these standards. The dissolved oxygen criteria established in paragraph (E)(3) of this rule are intended to be the minimum planning targets for the remedial action planning process to use in evaluating beneficial use restoration."

Based on the Cuyahoga rule, we believe it is appropriate to utilize the Cuyahoga shipping channel dissolved oxygen criteria as the BUI restoration target for the federally designated shipping channels in the Black, Maumee and Ashtabula AOCs. It should be noted that if waters have more than one designated use then the lowest target applies and for lacustuary waters with no other use designation, dissolved oxygen will not be evaluated.

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Ohio EPA. 1999. Association between nutrients, habitat and the aquatic biota in Ohio rivers and streams. Ohio EPA Technical Bulletin MAS/1999-1-1 (Available at: epa.ohio.gov/portals/35/documents/assoc_load.pdf)

Ohio EPA. 2000. Legal and technical basis for nutrient target values used in TMDL projects. (Available at: www.epa.state.oh.us/dsw/guidance/guidance)

Ohio EPA. 1999. Phosphorus in Lake Erie basin. (Available at: www.epa.ohio.gov/portals/35/policy/01_11r.pdf)

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Ohio EPA. 2013. Ohio Nutrient Reduction Strategy. (Available at: www.epa.ohio.gov/Portals/35/wqs/ONRS_final_jun13.pdf)

Restoring United States Great Lakes Areas of Concern: Delisting Principles and Guidelines. Adopted by the U.S. Policy Committee, December 2001.

Thoma, R.F and T. P. Simon. 2002. Correlation between nutrient stimulation and presence of omnivorous fish along the Lake Erie nearshore. Pages 187-199 *In* T.P. Simon [ED] Biological response signatures: Indicator patterns using aquatic communities. CRC Press, Boca Raton, FL.

BUI 9: Restrictions on Drinking Water Consumption or Taste & Odor Problems

IJC Listing Guideline

An impairment will be listed when treated drinking water supplies are impacted to the extent that:

1) Densities of disease-causing organisms, concentrations of hazardous or toxic chemicals, or radioactive substances exceed human health standards, objectives or guidelines; **OR**
2) Taste and odor problems are present; **OR**
3) Treatment needed to make raw water suitable for drinking is beyond the standard treatment (i.e., settling, coagulation, disinfection) used in comparable portions of the Great Lakes which are not degraded.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if any of the following apply and are due to degradation of surface water raw water quality caused by contaminant sources or activities from within the AOC:

1) Any chronic advisories or restrictions to drinking water consumption are imposed by the Ohio EPA, the Ohio Department of Health, or the community water system, **AND/OR**
2) Additional treatment beyond "standard" is necessary to remove pathogens, hazardous or toxic chemicals, or radioactive substances, to make the raw water suitable for human consumption. This includes taste and odor, if the additional treatment is specifically necessary to control taste and odor problems, **AND/OR**
3) Chronic taste and/or odor complaints have been documented by the water system operator and are due to human activities within the AOC and not the result of treatment processes (e.g., chlorination.)

Notes

- Any water consumption advisories imposed due to water line breaks, equipment failures, or operator error would not be considered an impairment.
- Surface water sources (rivers, lakes and streams) are, by definition, open systems and can be subject to periodic adverse conditions. Occasional taste or odor complaints will not constitute an impairment unless they are determined to be chronic.
- Ohio EPA Division of Drinking and Ground water staff should be consulted to assist with evaluation of whether taste and/or odor complaint are chronic and represent an impairment of this BUI.

State of Ohio Restoration Target

No chronic consumption advisories or taste or odor complaints in the finished water, due to degradation of raw water quality caused by contaminant sources or activities within the AOC, for any community water system using standard or conventional treatment and drawing water from within the AOC.

Potential Data Sources

- Ohio Integrated Water Quality Report: http://epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx
- State of Ohio Drinking Water Advisories for Public Water Systems: www.epa.state.oh.us/ddagw/pws/advisory_map.aspx
- Data or reports from Ohio public water systems

Rationale

According to the IJC Listing Guidelines, an impairment for this beneficial use takes into account human health issues related to treated drinking water as well as the aesthetics (taste/odor) of the treated drinking water. Drinking water that is completely safe for human consumption may not be palatable for drinking because of taste or odor. Also of concern to the IJC is the use of treatment techniques beyond what is considered standard (settling, coagulation, disinfection). It is extremely important to note that all water systems getting their water from a surface water source must include the filtration of that surface water. Filtration may not be considered standard by the original IJC guidelines, but is required treatment even for systems utilizing a pristine stream as the raw water source (OAC 3745-81-73).

For State of Ohio Drinking Water Advisories:

Drinking water advisories issued by Ohio EPA and/or a community public water system are one of the key indicators of impairment for this BUI. All community public water systems in Ohio are regulated by the Ohio EPA, according to the Safe Drinking Water Act, and must submit regular reports of treated water quality to the Ohio EPA. When evaluating the advisories, consideration should be given to the severity/duration and the underlying cause of the restriction or advisory (*i.e., was the restriction or advisory issued because of a raw water quality problem that originated within the AOC?).*

For Indicators of Taste and Odor Problems:

There are finished water standards (Secondary Maximum Contaminant Levels) for taste related compounds and odors although very few water systems currently conduct odor threshold monitoring and taste is very subjective to the consumer. The best measures to evaluate taste and odor for this BUI are the number of citizen complaints which are tracked by the water system and the cause and duration of those taste and odor problems.

References

Hartig, J., D. Rathke, D. Williams. 1990. How Clean is Clean in the Great Lakes Areas Of Concern? - Report from the 1988 IAGLR Symposium. J. Great Lakes Res. 16(1):169-179.

International Joint Commission. 2012. Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983 and on November 18, 1987. (Available at: www.ijc.org/en_/Great_Lakes_Water_Quality)

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Ohio Administrative Code 3745-81-73 (Requires water systems that use a surface water source to provide conventional filtration, direct filtration, slow sand filtration or other filtration technology.)

Restoring United States Areas of Concern: Delisting Principles and Guidelines. Adopted by the United States Policy Committee Dec. 6, 2001

BUI 10: Beach Closings (Recreation Use)

IJC Listing Guideline

An impairment will be listed when waters, which are commonly used for total-body contact or partial-body contact recreation, exceed standards, objectives, or guidelines for such use.

State of Ohio Listing Guideline

Using the recreation use designations listed in the Ohio WQS for the water body segments being assessed, this beneficial use shall be listed as impaired if any of the following occur:

Public Bathing Beaches:

Bathing beach advisories are posted for more than 10 percent of the recreational season due to bacterial contamination (*E. coli)* OR advisories are posted for more than 10 percent of the recreational season for due to algal toxins. **OR**

Primary Contact Recreation (Class A):

Class A waterbodies within the AOC are included on Ohio's most recent Clean Water Act Section 303(d) list of impaired waters for recreational use due to bacterial contamination (*E. coli*) AND combined sewer overflows (CSOs) are either not present or not being addressed. **OR**

Chemical Contaminant (all waters):

A state or local government agency has issued a warning to avoid contact with the water due to the presence of a chemical of concern, such as PCB or PAH.

Note

- Ohio's water quality standards define the recreation season as May 1 through October 31, though Lake Erie beach monitoring typically is focused between Memorial Day and Labor Day weekends. The recreation season applies only to the public bathing beaches and Class A conditions, not the Chemical Contaminant condition.

State of Ohio Restoration Target

This beneficial use shall be considered restored when the following conditions are met for public bathing beaches, Class A waters and chemical contaminant contact advisories:

Public Bathing Beaches:

This BUI will be considered restored when posted advisory days due to bacterial contamination (*E. coli*) do not exceed 10 percent (or 19 days) of the recreation season; AND posted advisory days due to algal toxins do not exceed 10 percent (or 19 days) of the recreation season. This target must be met in 3 out of the most recent 5 years; **OR**

In cases where public bathing beaches within the AOC have posted advisory days for either bacterial contamination (*E. coli*) or algal toxins that exceed 10 percent of the recreation season and CSOs are the primary cause, the BUI will be considered restored when the bacterial impacts from CSOs are being addressed under an approved long term control plan or other legally-binding document.

Primary Contact Recreation (Class A):
No Class A waterbodies within the AOC are included on Ohio's most recent 303(d) list of impaired waters due to bacterial contamination (*E. coli*) **OR**

If Class A waterbodies within the AOC are on the list of non-attaining waters because of bacterial contamination (*E. coli*) due to the presence of Combined Sewer Overflows (CSOs) this BUI will be considered restored when the bacterial impacts from CSOs are being addressed under an approved long term control plan or other legally-binding document; **AND**

If Class A waterbodies within the AOC are on the list of non-attaining waters because of bacterial contamination (*E. coli*) due to the presence of non-point source pollution, this BUI will be considered restored when a TMDL is approved and the State and RAP can document that the level of bacterial contamination is not significantly worse that similar watersheds.

Chemical Contaminant (all waters):
No local or state contact advisories related to the presence of a chemical contaminant exist.

Note

- In Ohio, popular paddling streams with identified public access points have been designated as Class A primary contact recreation streams. The Class A designation extends from the most upstream identified public access point to the mouth. Primary contact recreation stream segments are defined in the Ohio Administrative Code 3745-1-07 and, in most cases; do not include the entirety of any Ohio AOC.

Potential Data Sources

- Ohio EPA and other local bacteria surveys
- Ohio EPA CSO/SSO database
- State and local algal toxin monitoring/advisory postings
- ODH Beachguard website: publicapps.odh.ohio.gov/BeachGuardPublic/Default.aspx
- Ohio EPA Harmful Algal Bloom (HAB) website: www.app.epa.ohio.gov/gis/mapportal/hab.htm

Rationale

The BUI title of "beach closings" severely limits its use when applied to the Areas of Concern. Many of the AOCs do not actually have beaches, but they do have areas where people frequently contact the water during recreational activities. Therefore, it is much more appropriate and protective of human health to expand the assessment for this BUI to more than just beach areas. Based on the IJC listing guidance, it does appear that the original intention of this BUI was to look at bacteria content in commonly used recreational waters, not just beaches. Ohio WQS for recreational use have changed since the previous targets were written; therefore this target has been updated to reflect the current method of measuring bacteria in Ohio (now measured by e *coli* instead of fecal). The algal toxin target is new and was added to address an increasing concern for Lake Erie.

This BUI should be applied only to public bathing beaches, including inland lake public beaches that are routinely monitored, and Primary Contact Class A stream segments, as these are the areas that Ohio has determined to be heavily used or could support frequent primary contact activities. Class A streams and rivers are specifically designated in Ohio's water quality standards (Ohio Administrative Code 3745-1-07

table 7-16). Class B and C streams and rivers and those with a secondary contact recreation use designation do not meet the definition in the IJC's Listing Guideline of "commonly used" waters. Appendix D contains a list of public bathing beaches and the Class A stream segments in each AOC where this BUI applies.

Combining Ohio EPA's comprehensive stream monitoring and local health department monitoring data provides a comprehensive look at bacteria levels in waters across the AOCs and the state. Bacterial contamination represents a pervasive statewide problem and one that is exacerbated by weather. For example, in the 2012 Ohio Integrated Water Quality Monitoring and Assessment Report (which contains the 303(d) list of impaired waters), only 7% of the 12-digit assessment units attained the Recreation Use. Ohio has also completed a number of TMDLs to address bacteria impairments and additional assessments will be required in the future. As of 2012, TMDLs had been completed in 22% of assessment units and were needed in an additional 27%.

Sources of bacteria can include package plants, CSO/Sanitary Sewer Overflows (SSOs), home sewage treatment systems (HSTSs), commercial on-site systems, land application of organic materials, storm water, concentrated animal feeding operations (CAFOs) and other livestock operations, and permitted wastewater treatment plants (WWTPs). These sources are present across Ohio AOC's and the tools to manage and address each source range from regulatory to voluntary actions.

An evaluation of failing HSTSs in Ohio provides an illustration of how many of these sources are not unique to AOCs but represent basin-wide or statewide issues. According to the Ohio Department of Health Report (January 2013): *Household Sewage Treatment System Failures in Ohio*, approximately 31% of all household sewage treatment systems throughout the state are failing to some degree. This report provides a summary of local health department survey responses for the 2012 Clean Watershed Needs Survey.

The revised restoration targets for this BUI were designed to identify sources of contamination within the AOCs that represent extraordinary problems that can be addressed through implementation at the local level. It is also important to recognize the numerous ongoing efforts to address these widespread issues including Ohio's TMDL program, local health department efforts to identify and correct failing septic systems, targeted state funding and programs to address unsewered areas, and non-point source reduction programs. Additionally, communities have made tremendous investments to address storm water and correct CSO/SSO issues and will continue to reduce sources of contamination as the long term control plans are implemented.

References

International Joint Commission. 2012. Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983 and on November 18, 1987. (Available at: www.ijc.org/en_/Great_Lakes_Water_Quality)

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Restoring United States Great Lakes Areas of Concern: Delisting Principles and Guidelines. Adopted by the U.S. Policy Committee December 2001.

USEPA. 2002. Great Lakes Strategy 2002: A Plan for the New Millennium.

BUI 11: Degradation of Aesthetics

IJC Listing Guideline

When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g., oil slick, surface scum).

State of Ohio Listing Guideline

Ohio has not established numeric criteria that directly relate to this BUI. Based on Ohio water quality criteria applicable to all waters (OAC 3745-1-04, sections A-C), this beneficial use shall be listed as impaired when human activity routinely causes any of the following persistent conditions:

- Sludge deposits
- Oil sheens, scum and other objectionable materials
- Materials that produce color, odor, or other nuisances.

State of Ohio Restoration Target

This beneficial use will be considered restored when the following conditions are met:

There are no observed ongoing occurrences of sludge deposits, oil sheens, scum and other objectionable materials; specifically materials that produce color, odor, or other nuisances. **OR**

If Combined Sewer Overflows (CSOs) are a significant cause of aesthetic impairments and the CSOs are being addressed under an approved long term control plan or other legally-binding document, this BUI may be considered restored. Where long-term remedies may take several years to be fully implemented, it may be necessary to develop short-term control strategies. **AND**

If Municipal Separate Storm Sewer Systems (MS4s) are a significant cause of aesthetic impairments and the MS4 is regulated under an NPDES Permit or other legally-binding document, this BUI may be considered restored.

Notes

- Aesthetic impairments due to algae or excessive nutrient loading will be addressed under BUI 8.
- Natural physical features (e.g., woody debris, logjams, rootwads) and excessive turbidity following storm events or due to agricultural activities are not considered an impairment under this BUI.

Potential Data Sources

- Ohio EPA water quality surveys
- Local water quality surveys or reports
- Ohio EPA or local CSO discharge reports
- U.S. Coast Guard spill reports

Rationale

The Degradation of Aesthetics Beneficial Use Impairment (BUI) is more subjective than the other beneficial use impairments. The targets listed above were developed to address aesthetic conditions that interfere with public access or use of the water. OAC 3745-1-04 is provided in Appendix A.

Many of the persistent conditions identified in the listing guideline can be attributed to the presence of active Combined Sewer Overflows (CSOs). Combined sewers were built to collect sanitary and industrial wastewater, as well as storm water runoff, and transport this combined wastewater to treatment facilities. During dry weather, they are designed to transport all flow to the treatment plant. When it rains, the volume of storm water and wastewater may exceed the capacity of the combined sewers or of the treatment plant. When this happens, the combined sewers are designed to allow a portion of the combined wastewater to overflow into the nearest ditch, stream, river or lake. This is a combined sewer overflow (CSO). Ohio has about 1,280 known CSOs in 89 remaining communities (February 2011), ranging from small, rural villages to large metropolitan areas. In 1994, U.S. EPA published the national CSO Control Policy. Working from the national policy, Ohio EPA issued its CSO Control Strategy in 1995. The primary goals of Ohio's Strategy are to control CSOs so that they do not significantly contribute to violations of water quality standards or impairment of designated uses and to minimize the total loading of pollutants discharged during wet weather.

Ohio EPA continues to implement CSO controls through provisions included in NPDES permits and using orders and consent agreements when appropriate. The NPDES permits for our CSO communities require them to implement nine minimum technology-based controls to address CSO problems before long-term measures are taken. USEPA's Guidance for the Nine Control Measures is available online (http://cfpub.epa.gov/npdes/cso/guidedocs.cfm). Requirements to develop and implement Long Term Control Plans (LTCPs) are also included where appropriate. In 2007, U.S. EPA adopted a new definition for the Water Safe for Swimming Measure, which sets goals to address the water quality and human health impacts of CSOs. The new definition sets a goal of incorporating an implementation schedule of approved projects into an appropriate enforceable mechanism, including a permit or enforcement order, with specific dates and milestones for 75% of the nation's CSO communities.

Another existing mechanism to address storm water debris and other contaminants is regulation through the MS4 program. Polluted storm water runoff is commonly transported through Municipal Separate Storm Sewer Systems (MS4s), which often discharge untreated waters into local water bodies. Regulated MS4s need to prevent harmful pollutants, litter and other debris from being washed or dumped into local watebodies. Jurisdictions must obtain a NPDES permit and develop a storm water management program. One of the requirements is to develop and implement a storm water management program (SWMP) to reduce the contamination of storm water runoff and prohibit illicit discharges.

If the RAP identifies debris or other objectionable materials as the primary cause of aesthetic impairment under this BUI, a debris harvester, a regularly scheduled clean-up effort, or other short-term collection or prevention program may be utilized to address the BUI until a LTCP has been approved and substantial implementation is underway.

Degradation of aesthetics due to excessive nutrient and eutrophication are addressed under BUI 8 (Eutrophication or Undesirable Algae). It is important to acknowledge that aesthetics is very subjective and the public will perceive conditions and impaired use differently, based on expectations and experience. It will be important for the RAP to consider multiple lines of evidence for restoration of this

beneficial use, including U.S. Coast Guard Spill Reports, Ohio EPA TSD reports and other data sets to document that any degraded conditions are not chronic and are not caused by local sources.

References

International Joint Commission. 2012. Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983 and on November 18, 1987. (Available at: www.ijc.org/en_/Great_Lakes_Water_Quality)

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Restoring United States Areas of Concern: Delisting Principles and Guidelines. Adopted by the United States Policy Committee Dec. 6, 2001.

BUI 12: Added Costs to Agriculture or Industry

IJC Listing Guideline

An impairment will be listed when there are 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) or industrial purposes (i.e., intended for commercial or industrial applications and non-contact food processing).

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:
1) Additional costs are incurred by the user to treat the water from the AOC prior to use for agricultural purposes (i.e., including but not limited to, livestock watering, irrigation and crop-spraying) and the additional treatment is due to persistent water quality problems resulting from human activities within the boundaries of the AOC. **AND/OR**

2) Additional costs are incurred by the user to treat the water from the AOC for industrial purposes (i.e., intended for commercial or industrial applications and non-contact food processing) and the need for the additional treatment is due to persistent water quality problems resulting from human activities occurring within the boundaries of the AOC.

State of Ohio Restoration Target

No additional costs (due to human activities within the AOC) are necessary to treat water from the AOC prior to agricultural, commercial or industrial use.

Potential Data Source

- Local survey of agricultural and industrial water users

Rationale

The potential uses of water for agricultural, commercial and industrial purposes can cover a wide range of possibilities and, therefore, a wide range of treatment options, and finally a wide range of treatment costs. Additional treatment must be due to persistent water quality problems and due to human related activities within the AOC. Only one of Ohio's RAPs has identified this beneficial use as impaired in their AOC. This target only applies to the Ottawa River in the Maumee AOC.

References

Hartig, J., D. Rathke and D. Williams. 1990. How Clean is Clean in the Great Lakes Areas Of Concern? - Report from the 1988 IAGLR Symposium, J. Great Lakes Res. 16(1):169-179.

International Joint Commission. 2012. Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983 and on November 18, 1987. (Available at: www.ijc.org/en_/Great_Lakes_Water_Quality)

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Restoring United States Areas of Concern: Delisting Principles and Guidelines. Adopted by the United States Policy Committee Dec. 6, 2001.

BUI 13: Degradation of Phytoplankton and Zooplankton Populations

IJC Listing Guideline

An impairment will be listed when phytoplankton and zooplankton community structure significantly diverges from un-impacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when relevant, field-validated, phytoplankton or zooplankton bioassays (e.g. Ceriodaphnia, algal fractionation bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:
The fish community assessment indicates impairment.

State of Ohio Restoration Target

Ohio EPA considers this BUI to be related to bays or lakes rather than streams; thus it applies only to Maumee Bay in the Maumee AOC and is not applicable to other Ohio AOCs. This use will be considered restored for Maumee Bay when BUI 3 is not impaired for fish populations.

Note

- Aesthetic impairments due to algae or excessive nutrient loading are addressed under BUI 8.

Potential Data Sources

- Ohio EPA biological surveys
- Ohio EPA Lake Erie nearshore assessments
- Other local or federal surveys

Rationale

Plankton are small organisms, both plants (phyto-) and animals (zoo-), that live in the water column. They possess limited or no ability to swim against currents, but move with the water. Periphyton are organisms that are attached to underwater surfaces and therefore, by definition, are not considered to be plankton. Phytoplankton forms the base of the aquatic food web. Much of the energy captured by phytoplankton is consumed by zooplankton that, in turn, are eaten by larger organisms such as larger zooplankton, benthos and fish. The beneficial use of plankton communities is the conversion of solar energy to chemical energy (biomass), the incorporation of nutrients into biomass and the conveyance of these materials to normal, diverse fish and wildlife communities, and ultimately to human populations. In order to function most efficiently in this role, the plankton community must be balanced and adaptive to change. An impairment would be a decrease in the ability of the plankton communities to perform these functions.

Aquatic ecosystems require a diverse and healthy plankton community as virtually all species of fish feed on plankton as some point in their life cycle. The restoration target for this BUI utilizes fish community indices (via BUI 3) as a surrogate for plankton population health since direct indicators for plankton communities are not currently available. It is assumed that waters achieving the target biological indices for fish are supported by a healthy and diverse lower trophic level, including plankton.

There are natural annual cycles for plankton within a healthy waterbody with boom and bust periods where diatoms, blue-green algae, green algae and zooplankton dominate. The presence of nuisance plankton populations, such as blue-green algal blooms are common in the Maumee Bay and other bays and lakes and will be addressed under BUI 8 (Eutrophication and Undesirable Algae).

In 2010, Ohio EPA initiated a nearshore monitoring program on Lake Erie, including the harbors, bays and lacustuary zones, and monitoring includes water chemistry, phytoplankton and zooplankton. Historically, Ohio EPA biological surveys have not included plankton so there is a lack of historical population data against which to compare recent data. In 2007, ODNR Division of Wildlife began conducting annual surveys in the western basin to assess the composition and abundance of the fish community in the nearshore of Lake Erie. As part of a 2010 GLRI grant, Ohio EPA partnered with ODNR to complete a cooperative project with the University of Toledo to develop a design for nearshore fish community sampling in Lake Erie. The survey included sites in and near Maumee Bay and fish community and water chemistry results that can be used to evaluate this BUI in conjunction with other data and surveys. Once sufficient plankton data is collected, Ohio EPA will review the results and determine if the current target should be revised or refined.

At this time, we intend to continue listing the status of this BUI as “Not Applicable” for both riverine and lacustuary waters as is the case with the Ashtabula, Black and Cuyahoga River AOCs. Maumee Bay in the Maumee AOC is the only area that should be evaluated for this BUI.

References

International Joint Commission. 2012. Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983 and on November 18, 1987. (Available at: www.ijc.org/en_/Great_Lakes_Water_Quality)

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Restoring United States Great Lakes Areas of Concern: Delisting Principles and Guidelines. Adopted by the U.S. Policy Committee, December 2001.

U.S. EPA. 2002. Great Lakes Strategy 2002: A Plan for the New Millennium.

BUI 14: Loss of Fish and Wildlife Habitat

IJC Listing Guideline

An impairment will be listed when fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to perturbation in the physical, chemical or biological integrity of the Boundary Waters, including wetlands.

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:

For Fish:

Biological surveys report that the average score for a 12-digit HU or Large River Assessment Unit (or other agreed upon stream segment or subwatershed) are in departure from the State of Ohio's Qualitative Habitat Evaluation Index (QHEI) guidelines.

For Wildlife:

The wildlife population component of BUI #3 is impaired and insufficient or poor quality habitat is identified as the cause of that impairment. If the wildlife component of BUI 3 (Fish and Wildlife Populations) is not designated as impaired then this beneficial use should not be listed as impaired.

State of Ohio Restoration Target

This beneficial use will be considered restored when the following conditions are met:

For Fish (aquatic habitat):

In the riverine areas upstream from the lake affected waters (lacustuary or fresh water estuary), the average Qualitative Habitat Evaluation Index (QHEI) value within an assessment unit do not diverge from state biological guidelines. **OR**

In lake affected waters (lacustuary or fresh water estuary), the average Lake Qualitative Habitat Evaluation Index (L-QHEI) value does not diverge from state biological guidelines (See Appendix B for additional detail information and lacustuary locations in each AOC).

Index Type – Site Type	Qualitative Habitat Evaluation Index (QHEI) Restoration Targets				
	WWH	EWH	MWH[1]	LRW[2]	Lacustuary
Riverine	60	75	50	NA	NA
Lacustuary[3]	NA	NA	NA	NA	55

[1] *For MWH waters, a QHEI score of ≥ 50 is considered an acceptable target based on relationships observed between fish community health and habitat. If MWH waters cannot attain the QHEI target due to degradation or physical modifications that cannot be reasonable and cost effectively rectified, then these waters should not preclude the BUI from being removed in the AOC.*

[2] *For LRW waters, a QHEI evaluation is not applicable. LRW designations are waters that have been found to lack the potential for any resemblance of any other aquatic life habitat as determined by the biological criteria through a use attainability analysis such that the extant fauna is substantially degraded and that the potential for recovery of the fauna to the level characteristic of any other aquatic life habitat is realistically precluded due to natural background conditions or irretrievable human-induced conditions.*

[3] *For the Lake Erie shoreline and lacustuary areas, a L-QHEI ≥ 55 is considered an acceptable target (Thoma, 2006 and personal communication with Roger Thoma, 2013).*

For Wildlife (terrestrial and wetland habitat):

If the AOC is not impaired for the Wildlife Populations component of BUI 3 then it will be considered "not impaired" for the Wildlife Habitat component of BUI 14. **OR**
If the AOC is impaired for Wildlife Populations component of BUI 3 and insufficient or poor quality habitat is identified as the cause, then the following targets applies:

- At least 10% terrestrial habitat land cover (NLCD classes: forest, shrubland, and herbaceous upland)
- At least 2% wetland habitat land cover (NLCD classes: woody and emergent wetlands)

Notes

- Assessment units for the fish habitat are the 12-digit HU, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed. For the wildlife habitat, the AOC should be evaluated as a whole.
- Local RAPs need to develop Fish and Wildlife Habitat Restoration Plans to recommend the type and location of restoration that needs to be done to remove this BUI. The plan needs to be approved by Ohio EPA.
- If waters have more than one designated use (i.e., Lacustuary and LRW or MWH) then the lowest target applies.

Potential Data Sources

- Ohio EPA QHEI data
- National Land Cover Database

Rationale

Habitat can be defined as the natural ecological conditions in which organisms live and reproduce. Habitat is also the interaction between numerous environmental factors, such as but not limited to, temperature, moisture, availability of food, and security from predation. Any disruption of a single factor or combination of factors can cause dire impacts to the quality of habitat for native species.

The IJC listing guideline states that there should be no loss of habitat for either fish or wildlife due to disproportionate or undue alterations in the chemical, physical or biological components of the waters of the AOC, including wetlands. Many Great Lakes states, including Ohio, have also emphasized terrestrial wildlife habitat quality issues, in addition to the impacts to the "waters of the AOC" identified by the IJC. For the purpose of evaluating this BUI, habitat has been sub-divided into three general categories: aquatic, terrestrial and wetland.

For Fish (aquatic habitat) Assessment:

The Ohio Water Quality Standards (WQS; Ohio Administrative Code Chapter 3745-1) consist of designated uses and chemical and biological criteria designed to represent measurable properties of the environment that are consistent with the narrative goals specified by each use designation. Use designations consist of two broad use groups: aquatic life (i.e., aquatic community status) and human health (i.e., water supply, recreational use).

Every named public waterbody in Ohio has an assigned aquatic use designation and there are target biological criteria for each use designation. The biocriteria for waterways are codified in the Ohio WQS.

The Lake Erie watershed falls within two ecoregions – geographic regions with unique ecological characteristics. These are the Erie/Ontario Lake Plain (EOLP) and the Huron/Erie Lake Plain (HELP).

Chemical and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. This constitutes a "tiered" approach in that varying and graduated levels of protection are provided by each criterion. This hierarchy is especially apparent for the biological criteria. The aquatic life use criteria frequently control the resulting protection and restoration requirements as an emphasis on protecting aquatic life generally results in water quality suitable for all uses. This is why the aquatic life use criteria are emphasized in Ohio EPA biological and water quality reports (see Appendix A).

When measuring the status of fish habitat component of this BUI, Qualitative Habitat Evaluation Index (QHEI) or Lake Quality Habitat Evaluation Index (L-QHEI) should be used to assess fish habitat quality. The QHEI and L-QHEI are multi-metric indices. There are no differences in QHEI or L-QHEI values between the two ecoregions where Ohio's AOCs are located - EOLP and HELP.

For free-flowing areas (upstream of lacustuaries) with EWH or WWH designations, the QHEI should be used and Ohio EPA has determined the state's water quality QHEI guidance value to be equal to or greater than 60. This value is considered to be guidance as it has not yet been finalized or adopted in the Ohio WQS but this value represents a level of aquatic habitat that does not limit fish population quality.

MWH designations are waters that have been the subject of a use attainability analysis and have been found to be incapable of supporting and maintaining a balanced, integrated, adaptive community of warmwater organisms due to irretrievable modifications of the physical habitat. Such modifications are of a long-lasting duration (i.e., twenty years or longer) and may include the following examples, extensive stream channel modifications, sections 401/404 modifications, and extensive permanent impoundments. For both riverine and lacustuary waters, a QHEI target of 50 is recommended based on relationships observed between fish community health and habitat and this value represents a level of aquatic habitat that does not limit fish population quality. If MWH waters cannot attain the QHEI target due to degradation or physical modifications that cannot be reasonable and cost effectively rectified, then these waters should not preclude the BUI from being removed in the AOC.

In addition to the river habitat areas, two other zones exist - the Lake Erie shoreline and an area where river and lake water mix. Ohio EPA refers to this latter area as a lacustuary (combination of the terms lacustrine and estuary). These areas could also be described as drowned river mouths (lake water flows into the river essentially "drowning" the river mouth). A methodology to conduct a QHEI along the Lake Erie shoreline and in the lacustuary areas (L-QHEI) has been developed, but no quality assessment tiering system has been formally defined; nonetheless, the index can be used as an indicator of whether or not these areas are potentially degraded.

The L-QHEI values for the lacustuaries and shoreline areas are guidance and have not yet been finalized or adopted into State rules. However, based on previous Ohio EPA work, an L-QHEI of 55 or greater is considered the point at which fish communities can attain warmwater habitat criteria and should be considered an acceptable BUI restoration target for these waters (Thoma, 2006 and personal communication with Roger Thoma, 2013). Guidance on conducting QHEI's in this area and background data is available from Ohio EPA, Division of Surface Water. Appendix B provides additional detail and a description of lacustuaries.

For the purpose of this restoration target, the QHEI values should be averaged across a designated assessment unit. If a single assessment unit has multiple criteria that apply to that unit (e.g. free-flowing areas, lacustuary), then the unit should be evaluated in applicable segments, based on each criteria. For consistency with other Ohio EPA programs, it is recommended that 12-digit HU or Large River Assessment Unit (LRAU) be used. RAPs may elect to use an alternate assessment unit, provided the proposed assessment unit will result in an equivalent evaluation of the conditions and Ohio EPA concurs with that determination.

The calculated average value for an assessment unit needs to meet the target value in order for the BUI to be removable for fish habitat in that assessment unit. Assessment unit averages should NOT be averaged to determine BUI impairment status for an AOC.

Ohio EPA recommends the following guidelines for averaging data:

1. If multiple assessments were conducted at an individual site during a single year or field season, the results should be evaluated to determine an average for each individual site unless the assessments were conducted prior to and after riverbank activities, like determining the effectiveness of riverbank habitat improvements. In these situations, the most current assessment data should be used.
2. The averages for individual sites (as calculated in #1) should be combined with other sites within the same assessment unit to determine the overall average value for the assessment unit. The overall assessment unit average can be based on data from different years as long as all data is no older than 10 years.

For Wildlife (terrestrial and wetland habitat) Assessment:

In order to produce healthy wildlife populations, wildlife ecosystems require diverse and healthy habitats. While aquatic habitat assessment methodologies have been a proven tool in monitoring aquatic habitat potential, little data is available on terrestrial or amphibian habitat evaluations associated with the water resource. The restoration target for the wildlife habitat component of this BUI now considers this linkage and utilizes wildlife population measures (via BUI 3) as a surrogate for an initial assessment of wildlife habitat quality since direct indicators for non-aquatic habitat are not currently available. If there is no impairment for the wildlife component of BUI 3, it is assumed that habitat quality is sufficient and wildlife habitat would not be considered to be impaired.

If the wildlife population component of BUI 3 is listed as impaired and degraded or insufficient habitat is the cause of the impairment, the wildlife component of this BUI should be listed as impaired and Ohio RAP organizations should utilize indirect assessments through the use of land cover type for measuring progress toward and removal of this impairment.

Ohio EPA evaluated the 2006 National Land Cover Database (NLCD 2006) to identify regional land cover percentages in the Lake Erie coastal watersheds as designated by the 8 digit HU boundaries. Across the Ohio Lake Erie watershed, land use percentages vary widely from east to west. Prior to European settlement, much of the Ohio Lake Erie basin was heavily forested except for the western parts where the Great Black Swamp was located. Over time, many forests were cleared and wetlands were drained to facilitate the industrialization of cities and industries and to provide agricultural land. In Ohio's Lake Erie watersheds, industrialization mainly occurred around the mouths of major rivers but the more western watersheds experienced extensive conversion of forests and expansive tracts of wetlands to

agricultural land. Figure 2 below shows Ohio's Lake Erie coastal watersheds. Figure 3 illustrates a comparison between cultivated land cover and forested land cover in these watersheds.

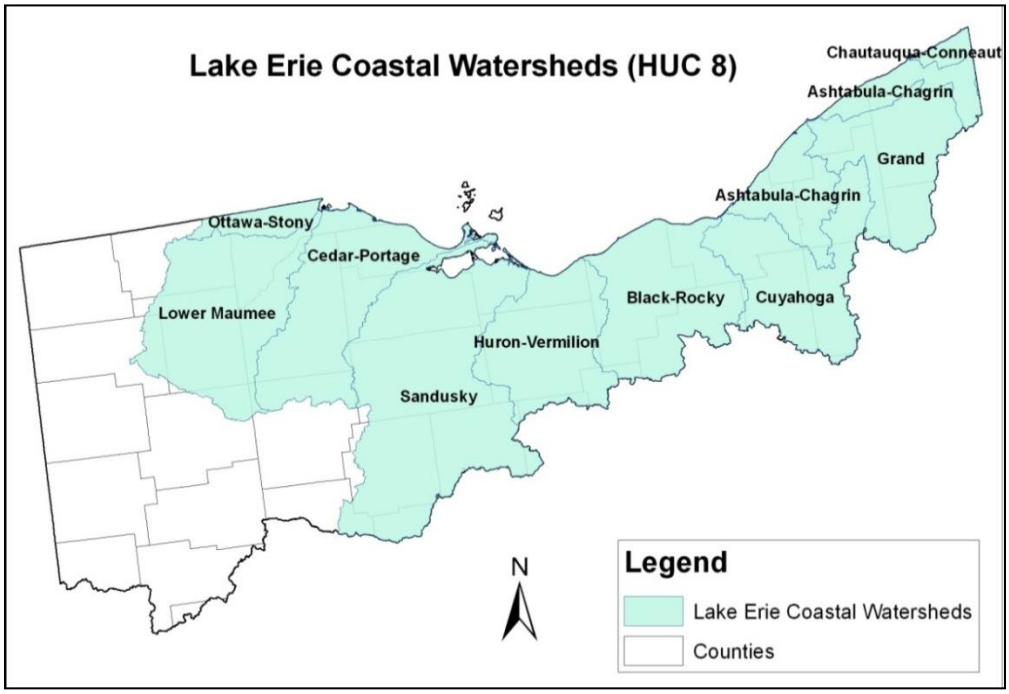

Figure 2. Lake Erie Coastal Watersheds

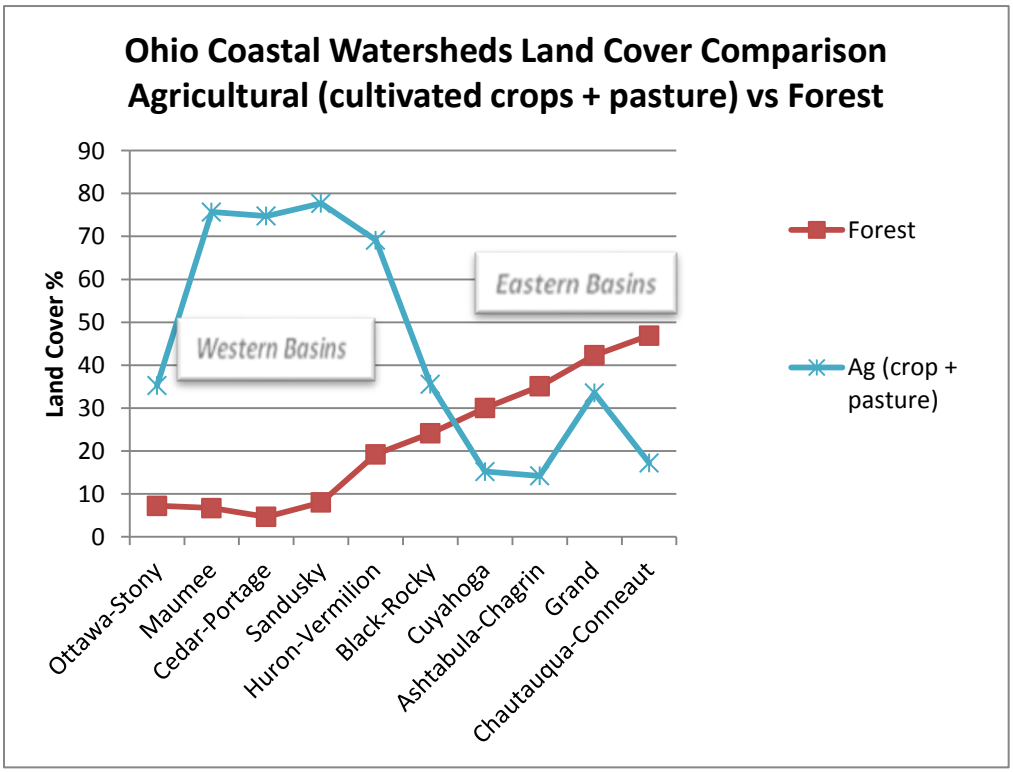

Figure 3. Land Cover Comparison (Agricultural vs. Forest) in Ohio Lake Erie Coastal Watersheds

As shown in Figure 3, the land cover percentages for forest and agricultural use are similar at the Black-Rocky watershed. This shows that across the Ohio Lake Erie basin, the Black-Rocky HUC-8 basin is the transition point where predominantly forested watersheds change to predominantly agricultural watersheds. The eastern watersheds average 32.5% forested cover and 25.1% agricultural (cultivated crops and pasture/hay). The western watersheds average only 8.8% forested cover but 74.0% agricultural (cultivated crops and pasture/hay).

Although the Black River AOC had previously listed the wildlife habitat component of this BUI as impaired, the wildlife population component of BUI #3 is not listed as an impairment, therefore sufficient habitat is present in the Black River AOC to sustain healthy and reproducing wildlife populations. Consequently, based in the new targets, the only Ohio AOC impaired for wildlife habitat is the Maumee AOC. In order to determine background land use numbers for this AOC, the land cover in the western coastal HUC-8 watersheds was evaluated to develop sub-regional targets. Sub-regional target development was necessary due to the disparity of land uses across the greater Ohio Lake Erie basin region.

The BUI 14 Wildlife Habitat target is based on the presence of two categories of land use cover: Terrestrial Habitat Cover and Wetland Habitat Cover. The Terrestrial Habitat Cover target incorporates the sum of 3 forest and 2 shrubland/herbaceous upland cover types and their land use percentages within the Lake Erie coastal watersheds into a combined target category called Terrestrial Habitat Cover.

The sum of the 8 wetland classifications and their use percentages within the Lake Erie coastal watersheds are combined into a target category called Wetland Habitat Cover. The Wildlife Habitat restoration targets were created based on the NLCD 2006 land cover averages for the Western Lake Erie Coastal watersheds and are summarized in Table 2 for both Terrestrial and Wetland Habitat Cover.

Wetlands serve as both aquatic and terrestrial habitats and a certain amount of acreage is critical for watershed health. Higher quality wetlands are also desirable as measured by the Ohio Rapid Assessment Method and as compared to Ohio wetland standards. Wetland acreage lost in Ohio has been extensive as these lands were drained and/or filled to accommodate human development and agricultural needs. It has been widely documented that 90% of Ohio's original wetlands have disappeared. Of particular concern is the loss of much of the Great Black Swamp, mostly located in northwest Ohio. The Great Black Swamp at about 5000mi^2 was once about the size of Connecticut or roughly about 10% of the landmass of the state of Ohio. Today, only about 5%, or 250 mi^2, of the original Great Black Swamp remains. Protection of remaining wetlands in these areas as well as the whole of the state of Ohio should be a high priority.

Table 2. Land Cover Targets for Western Basin AOCs

Cover Type, in %	Western Basin AOC Targets
Wetland Habitat Cover BUI Removal Target (all types)	**2%**
Terrestrial Habitat Cover BUI Removal Target *(sum of Forest and Shrubland and Herbaceous Upland Cover)*	**10%**
- Forest (all types)	9%
- Shrubland and Herbaceous Upland	1%

In addition to developing fish and wildlife habitat, it is important to ensure that reasonable protection is in place for existing unimpacted habitat areas, followed by restoration or rehabilitation of degraded habitat areas. The beneficial use restoration process should include a maintenance plan to reduce the risk of future degradation. Adjacent land use practices can have considerable impact on water quality and habitat.

The development of the greater Lake Erie basin has caused fish and wildlife habitat areas to suffer. As development pressures increase, more aquatic, terrestrial and wetland habitats will be impacted, but the state strives to limit those impacts or it allows for mitigation of those impacts. A moratorium on future development or returning developed lands to pristine conditions is not, nor can it be, the goal in restoring this beneficial use. Ohio's restoration targets were designed to provide a realistic goal that considers current land use and the needed balance between future development and preservation/restoration of natural habitats.

Most wildlife population and habitat goals set by wildlife managers are typically based on areas much larger than the AOC boundaries. Each RAP will have to establish a vision for their aquatic, terrestrial and wetland habitats that can be achieved in their AOC based on original habitat, amount and type of habitat that has been irreplaceably lost, how their AOC may fit into the larger regional picture for such things as importance of a migratory corridor or important bird area, and what can reasonably be protected or restored.

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Appendices

Appendix A: Ohio Water Quality Standards (Ohio Administrative Code 3745-1)

Water quality standards contain two distinct elements: designated uses and numerical or narrative criteria designed to protect and measure attainment of the uses. Rules 3745-1-01 to 37451-07 of the Ohio Water Quality Standards apply to all surface waters of the State of Ohio. Rules 3745-1-08 to 3745-1-30 define the use designations applicable to the river and stream segments around the state. Additional chemical-specific criteria applicable within the Lake Erie drainage basin are contained in rules 3745-1-31 and 3745-1-33. The water quality criteria applicable to a specific water body are determined by identifying the use designations assigned to that water body in Rules 3745-1-08 to 3745-1-30, then referring to Rule 3745-1-07 and 3745-1-33 for criteria protective of those use designations. The following are excerpts from OAC 3745-1.

OAC 3745-1-01 Purpose and Applicability

(A) It is the purpose of these water quality standards, Chapter 3745-1 of the Administrative Code, to establish minimum water quality requirements for all surface waters of the state, thereby protecting public health and welfare; and to enhance, improve and maintain water quality as provided under the laws of the state of Ohio, section 6111.041 of the Revised Code, the federal Clean Water Act, 33 U.S.C. section 1251 et seq., and rules adopted thereunder.

(B) Whenever two or more use designations apply to the same surface water, the more stringent criteria of each use designation will apply.

(C) These water quality standards will apply to all surface waters of the state except as provided in paragraph (D), (E), or (F) of this rule. Compliance schedules may be granted pursuant to rule 3745-33-05 of the Administrative Code.

(D) These water quality standards will not apply to water bodies when the flow is less than the critical low-flow values determined in rule 3745-2-05 of the Administrative Code.

(E) The following exceptions will apply only to the specific water quality criteria involved in each case for a reasonable period of time as determined by the director.

(1) Whenever chemicals are applied for control of aquatic plants or animals, notice must be given to the director before chemicals are applied. The director, upon receiving such notice, may order that chemicals not be applied if he concludes that the proposed application would pose an unreasonable danger to human or aquatic life. The application of pesticides registered under the Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 136 et seq.) are permitted without notification to the director when:

(a) The pesticide is applied consistent with label instructions; and
(i) The application is to a pond with a surface area equal to or less than five acres; and
(ii) The application is not within one mile upstream of a public water supply intake or within one mile of a reservoir public water supply intake; and
(iii) The application is not to any wetland, borrow pit, quarry or water body used for public swimming.

(b) The pesticide is applied under the direction of a local health department or other government agency in a mosquito abatement program.

(2) Whenever dredging or construction activities occur on or near water bodies or during the period of time when the aftereffects of dredging or construction activities degrade water quality and such activities have been authorized by the United States army corps of engineers and/or by a 401 water quality certification or an isolated wetland permit issued by the Ohio environmental protection agency.

(3) Whenever coal remining permits are issued pursuant to section 301(p) of the act. This exception applies to pH, iron and manganese for the duration of the remining activity. This exception applies only if: there is a demonstrated potential for improved water quality from the remining operation; and no degradation of existing instream conditions occurs.

(F) Temporary variances. The director may grant temporary variances from compliance with water quality criteria applicable by this chapter pursuant to rule 3745-33-07 of the Administrative Code.

3745-1-04 Criteria applicable to all waters

(this section is included in its entirety)

The following general water quality criteria shall apply to all surface waters of the state including mixing zones. To every extent practical and possible as determined by the director, these waters shall be:

(A) Free from suspended solids or other substances that enter the waters as a result of human activity and that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life;

(B) Free from floating debris, oil, scum and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or cause degradation;

(C) Free from materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance;

(D) Free from substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone;

(E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae;

(F) Free from public health nuisances associated with raw or poorly treated sewage. A public heath nuisance shall be deemed to exist when the conditions set forth in paragraph (F)(1) of this rule are demonstrated.

(1) An inspection conducted by, or under the supervision of, Ohio EPA or a sanitarian registered under Chapter 4736. of the Revised Code documents odor, color and/or other visual manifestations of raw or poorly treated sewage; and

(a) Water samples exceed five thousand fecal coliform counts per one hundred milliliters (either MPN or MF) in two or more samples when five or fewer samples are collected, or in more than twenty per cent of the samples when more than five samples are taken; or
(b) Water samples exceed five hundred seventy-six E. coli counts per one hundred milliliters in two or more samples when five or fewer samples are collected, or in more than twenty per cent of the samples when more than five samples are taken.

(2) Paragraph (F)(1) of this rule may be used by the appropriate authorities to document the existence of unsanitary conditions as described in section 6117.34 of the Revised Code, but does not preclude the use of other evidence of unsanitary conditions for the purposes described in section 6117.34 of the Revised Code.

(G) For the purposes of applying paragraph (F) of this rule the collection of water samples shall adhere to the following specifications:

(1) The samples shall be collected when flow is representative of steady state dry weather conditions, i.e., base flow or delayed flow, and

(2) The samples shall be collected at least two hours apart, and

(3) The samples shall be collected over a time period not to exceed thirty days.

(H) Nothing in paragraph (F) or (G) of this rule shall limit or otherwise change the applicability of paragraphs (A) to (E) of this rule.

3745-1-07 Water Use Designations and Statewide Criteria

(this section is NOT included in its entirety)

(A) Water quality standards contain two distinct elements: designated uses; and numerical or narrative criteria designed to protect and measure attainment of the uses.

(1) Each water body in the state is assigned one or more aquatic life habitat use designations. Each water body may be assigned one or more water supply use designations and/or one recreational use designation. These use designations are defined in paragraph (B) of this rule. Water bodies are assigned use designations in rules 3745-1-08 to 3745-1-32 of the Administrative Code. In addition, water bodies are assigned designations as described in paragraphs (B)(1)(a), (B)(1)(c), (B)(3)(a), (B)(4)(a) and (B)(4)(b) of this rule and in the antidegradation rule (rule 3745-1-05 of the Administrative Code).

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(6) Biological criteria presented in table 7-15 of this rule provide a direct measure of attainment of the warmwater habitat, exceptional warmwater habitat and modified warmwater habitat aquatic life uses. Biological criteria and the exceptions to chemical-specific or whole-effluent criteria allowed by this paragraph do not apply to any other use designations.

(B) Use designations are defined as follows:

(1) Aquatic life habitat

(a) "Warmwater" - these are waters capable of supporting and maintaining a balanced, integrated, adaptive community of warmwater aquatic organisms having a species composition, diversity, and functional organization comparable to the twenty-fifth percentile of the identified reference sites within each of the following ecoregions: the interior plateau ecoregion, the Erie/Ontario lake plains ecoregion, the western Allegheny plateau ecoregion and the eastern corn belt plains ecoregion. For the Huron/Erie lake plains ecoregion, the comparable species composition, diversity and functional organization are based upon the ninetieth percentile of all sites within the ecoregion. For all ecoregions, the attributes of species composition, diversity and functional organization will be measured using the index of biotic integrity, the modified index of well-being and the invertebrate community index as defined in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters," as cited in paragraph (B) of rule 3745-1-03 of the Administrative Code. In addition to those water body segments designated in rules 3745-1-08 to 3745-1-32 of the Administrative Code, all upground storage reservoirs are designated warmwater habitats. Attainment of this use designation (except for upground storage reservoirs) is based on the criteria in table 7-15 of this rule. A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code.

(b) "Limited warmwater" - these are waters that were temporarily designated in the 1978 water quality standards as not meeting specific warmwater habitat criteria. Criteria for the support of this use designation are the same as the criteria for the support of the use designation warmwater habitat. However, individual criteria are varied on a case-by-case basis and supersede the criteria for warmwater habitat where applicable. Any exceptions from warmwater habitat criteria apply only to specific criteria during specified time periods and/or flow conditions. The adjusted criteria and conditions for specified stream segments are denoted as comments in rules 3745-1-08 to 3745-1-30 of the Administrative Code. Stream segments currently designated limited warmwater habitats will undergo use attainability analyses and will be redesignated other aquatic life habitats. No additional stream segments will be designated limited warmwater habitats.

(c) "Exceptional warmwater" - these are waters capable of supporting and maintaining an exceptional or unusual community of warmwater aquatic organisms having a species composition, diversity, and functional organization comparable to the seventy-fifth percentile of the identified reference sites on a statewide basis. The attributes of species composition, diversity and functional organization will be measured using the index of biotic integrity, the modified index of well-being and the invertebrate community index as defined in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters," as cited in paragraph (B) of rule 3745-1-03 of the Administrative Code. In addition to those water body segments designated in rules 3745-1-08 to 3745-1-32 of the Administrative Code, all lakes and reservoirs, except upground storage reservoirs, are designated exceptional warmwater habitats. Attainment of this use designation (except for lakes and reservoirs) is based on the criteria in table 7-15 of this rule. A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code.

(d) "Modified warmwater" - these are waters that have been the subject of a use attainability analysis and have been found to be incapable of supporting and maintaining a balanced, integrated, adaptive community of warmwater organisms due to irretrievable modifications of the physical habitat. Such modifications are of a long-lasting duration (i.e., twenty years or longer) and may include the following examples: extensive stream channel modification activities permitted under sections 401 and 404 of the act or Chapter 6131. of the Revised Code, extensive sedimentation resulting from abandoned mine land runoff, and extensive permanent impoundment of free-flowing water bodies. The attributes of species composition, diversity and functional organization will be measured using the index of biotic integrity, the modified index of well-being and the invertebrate community index as defined in "Biological Criteria for the Protection of Aquatic Life: Volume II, Users Manual for Biological Field Assessment of Ohio Surface Waters," as cited in paragraph (B) of rule 3745-1-03 of the Administrative Code. Attainment of this use designation is based on the criteria in table 7-15 of this rule. Each water body designated modified warmwater habitat will be listed in the appropriate use designation rule (rules 3745-1-08 to 3745-1-32 of the Administrative Code) and will be identified by ecoregion and type of physical habitat modification as listed in table 7-15 of this rule. The modified warmwater habitat designation can be applied only to those waters that do not attain the warmwater habitat biological criteria in table 7-15 of this rule because of irretrievable modifications of the physical habitat. All water body segments designated modified warmwater habitat will be reviewed on a triennial basis (or sooner) to determine whether the use designation should be changed. A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code.

(e) "Seasonal salmonid" - these are rivers, streams and embayments capable of supporting the passage of salmonids from October to May and are water bodies large enough to support recreational fishing. This use will be in effect the months of October to May. Another aquatic life habitat use designation will be enforced the remainder of the year (June to September). A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code.

(f) "Coldwater" - these are waters that meet one or both of the characteristics described in paragraphs (B)(1)(f)(i) and (B)(1)(f)(ii) of this rule. A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code.

(i) "Coldwater habitat, inland trout streams" - these are waters which support trout stocking and management under the auspices of the Ohio department of natural resources, division of wildlife, excluding waters in lake run stocking programs, lake or reservoir stocking programs, experimental or trial stocking programs, and put and take programs on waters without, or without the potential restoration of, natural coldwater attributes of temperature and flow. The director shall designate these waters in consultation with the director of the Ohio department of natural resources.

(ii) "Coldwater habitat, native fauna" - these are waters capable of supporting populations of native coldwater fish and associated vertebrate and invertebrate organisms and plants on an annual basis. The director shall designate these waters based upon results of use attainability analyses.

(g) "Limited resource water" - these are waters that have been the subject of a use attainability analysis and have been found to lack the potential for any resemblance of any other aquatic life habitat as determined by the biological criteria in table 7-15 of this rule. The use attainability analysis must demonstrate that the extant fauna is substantially degraded and that the potential for recovery of the fauna to the level characteristic of any other aquatic life habitat is realistically precluded due to natural background conditions or irretrievable human-induced conditions. For water bodies in the Lake Erie drainage basin, the designation of water bodies as limited resource waters shall include demonstrations that the “Outside Mixing Zone Average” water quality criteria and values and chronic whole effluent toxicity levels are not necessary to protect the designated uses and aquatic life pursuant to rule 3745-1-35 of the Administrative Code. All water body segments designated limited resource water will be reviewed on a triennial basis (or sooner) to determine whether the use designation should be changed. Limited resource waters are also termed nuisance prevention for some water bodies designated in rules 3745-1-08 to 3745-1-30 of the Administrative Code. A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code. Waters designated limited resource water will be assigned one or more of the following causative factors. These causative factors will be listed as comments in rules 3745-1-08 to 3745-1-30 of the Administrative Code.

(i) "Acid mine drainage" - these are surface waters with sustained pH values below 4.1 s.u. or with intermittently acidic conditions combined with severe streambed siltation, and have a demonstrated biological performance below that of the modified warmwater habitat biological criteria.

(ii) "Small drainageway maintenance" - these are highly modified surface water drainageways (usually less than three square miles in drainage area) that do not possess the stream morphology and habitat characteristics necessary to support any other aquatic life habitat use. The potential for habitat improvements must be precluded due to regular stream channel maintenance required for drainage purposes.

(iii) Other specified conditions.

Table 7-1. Statewide water quality criteria for the protection of aquatic life. Page 1 of 2

Chemical	**Form**[1]	**Units**[2]	**IMZM**[3]	**OMZM**[3]	**OMZA**[3]
Ammonia-N (WWH)	T	mg/l	--	Table 7-2	Table 7-5
Ammonia-N (EWH)	T	mg/l	--	Table 7-3	Table 7-6
Ammonia-N (MWH)	T	mg/l	--	Table 7-2	Table 7-7
Ammonia-N (SSH[4])	T	mg/l	--	Table 7-4	a
Ammonia-N (CWH)	T	mg/l	--	Table 7-4	Table 7-8
Ammonia-N (LRW)	T	mg/l	--	Table 7-2	--
Arsenic	D[6]	µg/l	680	340	150
Arsenic	TR[7]	µg/l	680	340	150
Cadmium[8]					
Chlorine					
(WWH, EWH, MWH, CWH)	R	µg/l	--	19	11
Chlorine (LRW)	R	µg/l	--	19	--
Chlorine (SSH[4])	R	µg/l	--	b	b
Chromium[8]					
Chromium VI	D	µg/l	31	16	11
Copper[8]					
Cyanide					
(Lake Erie drainage basin)	free	µg/l	44	22	5.2
(Ohio river drainage basin)					
(WWH, EWH, MWH)	free	µg/l	92	46	12
(LRW)	free	µg/l	92	46	--
(SSH[4], CWH)	free	µg/l	45	22	5.2
Dieldrin	T	µg/l	0.47	0.24	0.056
Dissolved oxygen[5] (WWH)	T	mg/l	--	4.0	5.0
Dissolved oxygen[5] (EWH)	T	mg/l	--	5.0	6.0
Dissolved oxygen[5] (MWH)	T	mg/l	--	3.0[c]	4.0
Dissolved oxygen[5] (SSH[4])	T	mg/l	--	a	a
Dissolved oxygen[5] (CWH)	T	mg/l	--	6.0	7.0
Dissolved oxygen[5] (LRW)	T	mg/l	--	2.0	3.0
Dissolved solids	T	mg/l	--	--	1500[d]
Endrin	T	µg/l	0.17	0.086	0.036
Lead[8]					
Lindane	T	µg/l	1.9	0.95	--
Mercury	D[6]	µg/l	2.9	1.4	0.77
Mercury	TR[7]	µg/l	3.4	1.7	0.91
Nickel[8]					
Parathion	T	µg/l	0.13	0.065	0.013

Table 7-1. Statewide water quality criteria for the protection of aquatic life. Page 2 of 2

Chemical	**Form**[1]	**Units**[2]	**IMZM**[3]	**OMZM**[3]	**OMZA**[3]
Pentachlorophenol[9]					
pH (WWH, MWH)	--	s.u.	--	--	6.5-9.0
pH (EWH, CWH)	--	s.u.	--	--	e
pH (SSH[4])	--	s.u.	--	--	a
pH (LRW)	--	s.u.	--	--	6.5-9.0[f]
Selenium	D[6]	µg/l	--	--	4.6
Selenium	TR[7]	µg/l	--	--	5.0
Temperature (WWH, MWH)	--	^{o}F(^{o}C)	--	Table 7-14	Table 7-14
Temperature (EWH, CWH)	--	^{o}F(^{o}C)	--	g	g
Temperature (SSH[4])	--	^{o}F(^{o}C)	--	a	a
Temperature (LRW)	--	^{o}F(^{o}C)	--	98(37)	94(34)
Zinc[8]					

[1] *D = dissolved; R = total residual; T = total; TR = total recoverable.*

[2] *mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion); s.u. = standard units; ^{o}F = degrees fahrenheit; ^{o}C = degrees celsius.*

[3] *IMZM = inside mixing zone maximum; OMZM = outside mixing zone maximum; OMZA = outside mixing zone average.*

[4] *This aquatic life habitat use designation is in effect only during the months of October to May.*

[5] *For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average.*

[6] *These criteria are implemented by multiplying them by a translator approved by the director pursuant to rule 3745-2-04 of the Administrative Code.*

[7] *These criteria apply in the absence of a translator approved by the director pursuant to rule 3745-2-04 of the Administrative Code.*

[8] *These criteria are water hardness dependent. See table 7-9 of this rule.*

[9] *These criteria are water pH dependent. See table 7-10 of this rule.*

[a] *This criterion is the same as that for the aquatic life use designation in effect June to September. See footnote 4.*

[b] *No chlorine is to be discharged.*

[c] *The dissolved oxygen minimum at any time criterion for modified warmwater habitats in the Huron/Erie lake plain ecoregion, as identified in rules 3745-1-08 to 3745-1-30 of the Administrative Code, is 2.5 mg/l.*

[d] *Equivalent 25°C specific conductance value is 2400 micromhos/cm.*

[e] *pH is to be 6.5-9.0, with no change within that range attributable to human-induced conditions.*

[f] *Acid mine drainage streams over sandstone geotype are exempt from the pH criterion.*

[g] *At no time shall the water temperature exceed the temperature which would occur if there were no temperature change attributable to human activities.*

Appendix B: Ecoregional Biological Criteria

Attainment and non-attainment of aquatic life use is determined by using biological criteria as outlined in Ohio Administrative Code 3745-1-07. The aquatic life uses found in Ohio's Areas of Concern are:

Warm Water Habitat (WWH)
This use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; this use represents the principal restoration target for the majority of water resource management efforts in Ohio.

Exceptional Warm Water Habitat (EWH)
This use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (i.e., declining species); this use designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources. Biological criteria for EWH apply uniformly across the state.

Modified Warm Water Habitat (MWH)
This use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable and where the activities have been sanctioned and permitted by state and/or federal law; the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat. Biological criteria for MWH were derived from a separate set of habitat modified reference sites and are stratified across five ecoregions and three major modification types: channelization, run-of-river impoundments, and extensive sedimentation due to non-acidic mine drainage.

Coldwater Habitat (CWH)
This use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing put-and-take fishery on a year round basis which is further sanctioned by the Ohio Department of Natural Resources (ODNR) Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall. No specific biological criteria have been developed for the CWH use although the WWH biocriteria are viewed as attainable for CWH designated streams.

Limited Resource Water Habitat (LRW)
This use applies to small streams (usually <3 sq. mi. drainage area) and other water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported. Such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (i.e., true ephemeral streams), or other irretrievably altered waterways.

Seasonal Salmonid Habitat (SSH)
This use applies to rivers, streams and embayments capable of supporting the passage of salmonids from October to May, and includes water bodies large enough to support recreational fishing. This use will be in effect the months of October to May. Another aquatic life habitat use designation will be enforced the remainder of the year (June to September). A temporary variance to the criteria associated with this use designation may be granted as described in paragraph (F) of rule 3745-1-01 of the Administrative Code.

The biological community performance measures that are used to determine attainment or non-attainment for each of these habitat types are the Index of Biotic Integrity (IBI) and the Modified Index of Well-Being (MIwb), both of which are based on fish community characteristics, and the Invertebrate Community Index (ICI) which is based on macroinvertebrate community characteristics. IBI and ICI are multi-metric indices patterned after an original IBI described by Karr (1981) and Fausch et al. (1984). The MIwb is a measure of the fish community abundance and diversity using numbers and weight information from a variety of Midwest Rivers (Gammon 1976, Gammon et al. 1981). The MIwb is a modification of the Index of Well-Being (IWB) and corrects the problem of relatively high scores at degraded sites. Thirteen highly pollution tolerant species, exotics and hybrids are eliminated from the numbers and biomass components of the IWB, but the tolerant and exotic species are included in the Shannon Index component of the MIwb calculations. The modification eliminates the undesired effect caused by high abundance (in both numbers and biomass) of tolerant species, but retains the influence in the Shannon indices.

Attainment of an aquatic life use is “full” if all three of the above indices meet the applicable criteria, “partial” if at least one of the indices does not attain and performance does not fall below the fair category, and “non” if all indices either fail to attain or any index indicates a poor or very poor performance.

The quality of the physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by Ohio EPA for streams and rivers in Ohio (Rankin 1989, Rankin 1995). Various attributes of the available habitat are scored based on the relative importance of each to the existence of viable, diverse aquatic faunas. Evaluations of the type and quality of substrate, amount of in-stream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to determine the QHEI score which generally ranges from 20 to 100 in Ohio.

The QHEI is used to evaluate the characteristics of a stream segment, as opposed to only the habitat characteristics of a single sampling site. As such, individual sites may have poorer physical habitat due to localized disturbances yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided that water quality conditions are not limiting. QHEI scores from hundreds of segments throughout the state have indicated that values greater than 60 are generally conducive to existence of warmwater faunas. Scores greater than 75 frequently typify habitat conditions that have the ability to support exceptional warmwater faunas.

The following table includes the IBI, ICI, MIwb, and QHEI criteria scores that have been set as BUI restoration targets. These scores are based on the aquatic life habitat use designation and the ecoregion for each stream. Ecoregions are classification of the landscape by region. They are large landscape areas defined by climate, physical characteristics of the landscape, and the plants and animals

that are able to live there. Ecoregions contain many different physical settings and biological communities, which occur in predictable patterns (Land by the Lakes: Nearshore Terrestrial Ecosystems, Holland & Reid, 1997). Ohio's areas of concern are primarily included in two ecoregions: Huron-Erie Lake Plain (HELP) and Erie/Ontario Lake Plain (EOLP). Ohio's Areas of Concern and their relative location to each ecoregion can be seen in the map on the following page.

The river mouth areas of the streams present a transition zone between river habitat and lake habitat. For Lake Erie, these areas are typically drowned river mouths where lake and river waters mix, currents slow, and in many cases, have been artificially deepened for navigation. Ohio EPA refers to these areas as lacustuaries (a combination of the words lacustrine and estuary)or freshwater estuaries. The lacustuaries extend upstream approximately to the point where the river reaches lake level. Table B-2 lists the approximate boundaries of the lacustuaries for each of Ohio's AOCs. Because they represent a habitat different than both the river and the lake, Ohio EPA has developed separate sampling methods and biological indices for these areas. The L-QHEI was developed for lacustuary and nearshore habitat assessments. Based on extensive analyses conducted by OEPA (Thoma) an L-QHEI of 55 or greater is considered the point at which fish communities can attain warmwater habitat criteria (Thoma, 2006 and personal communication with Roger Thoma, 2013). The draft indices for the lacustuary and nearshore areas are presented in Table B-3 and should be considered guidance only. Background scores for each AOC are available from Ohio EPA.

Table B-1. Stream Evaluation Criteria and Benchmarks by Ecoregion

Index Type – Site Type	Erie/Ontario Lake Plain (EOLP)				Huron-Erie Lake Plain (HELP)			
	WWH	EWH	MWH	LRW[1]	WWH	EWH	MWH	LRW[1]
IBI - Headwaters	40	50	24	18	28	50	20	18
IBI – Wading*	38	50	24	18	32	50	20	18
IBI - Boat*	40	48	24	16	34	48	20	16
MIwb – Wading	7.9	9.4	6.2	4.5	7.3	9.4	5.6	4.5
MIwb – Boat	8.7	9.6	5.8	5.0	8.6	9.6	5.7	5.0
ICI	34	46	22	8	34	46	22	8
QHEI	60	75	-	-	60	75	-	-

**Wading and boat refer to sampling methodology (i.e., wading in shallow water and use of a boat in deeper water)*

[1] *Limited Resource Waters (LRW) are benchmarks as there currently are no criteria in Ohio WQS.*

Table B-2. Delineation of Lake Erie Lacustuaries (freshwater estuaries)*

Stream	Lacustuary Length (Miles)#	Stream	Lacustuary Length (Miles)#
Halfway Creek^	3.29	Wolf Creek/Williams Ditch	2.27
Silver Creek^	1.25	Cedar Creek^	6.0
Shantee Creek^*	1.57	Crane Creek	5.9
Ottawa River	9.0	Turtle Creek	4.2
Swan Creek	3.4	Packer Creek	3.45
Delaware Creek^	0.23	Toussaint River	9.7
Maumee River	15.0	Toussaint Creek	7.9
Detwiler Ditch	0.62	Rusha Creek	4.0
Grassy Creek	1.01	Black River	6.6
Duck Creek	1.9	Cuyahoga River	7.0
Otter Creek	2.0	Euclid Creek^	0.3
Berger Ditch^	1.6	Ashtabula River	2.5

 # Lacustuary lengths are approximate and fluctuate with lake levels and wind direction. The lengths presented here are based on Ohio EPA field observations
^ Length was determined by Dennis Mishne (Ohio EPA-2013/14) based on analytical data and map observations.
** Lacustuary is for the lower Shantee Creek (the original cut off channel) in Detwiler 12-digit HUC.*

Table B-3. Evaluation Guidelines for Lake Erie Lacustuary and Nearshore[1]

Type	IBI	MIwb	ICI	L- QHEI[2]
Lacustuary	42	8.6	42	55
Nearshore (rubble)	42	8.9	N/A	55
Nearshore (sand)	31	7.2	N/A	55
Lacustuary - LRW	16	5.1	12	-

[1]Based on Thoma, 1999.
[2]For the Lake Erie shoreline and lacustuary areas, a L-QHEI ≥55 is considered an acceptable target (Thoma, 2006 and personal communication with Roger Thoma, 2013). Guidance on conducting QHEI's in this area and background data is available from Ohio EPA, Division of Surface Water.

Appendix C: HUCs in Ohio's Areas of Concern

An assessment unit provides a practicable way to summarize water quality data and to convey information about the inferred status of the waterway being evaluated. Comparisons between assessment units are useful in water quality management; therefore, some consistency between assessment units is desirable. Ohio EPA commonly uses the 12-digit hydrologic unit code (HUC). Ohio AOCs cover all or part of 68 12-digit HUCs. Information about most of these HUCs is available in Ohio EPA's Integrated Water Quality Monitoring and Assessment Report (2012).

Maumee Area of Concern

HUC 12	HU 10 NAME	HU 12 NAME
04100001 03 01	Ottawa River-Frontal Lake Erie	Shantee Creek
04100001 03 02	Ottawa River-Frontal Lake Erie	Halfway Creek
04100001 03 03	Ottawa River-Frontal Lake Erie	Prairie Ditch
04100001 03 04	Ottawa River-Frontal Lake Erie	Headwaters Tenmile Creek
04100001 03 05	Ottawa River-Frontal Lake Erie	North Tenmile Creek
04100001 03 06	Ottawa River-Frontal Lake Erie	Tenmile Creek
04100001 03 07	Ottawa River-Frontal Lake Erie	Heldman Ditch-Ottawa River
04100001 03 08	Ottawa River-Frontal Lake Erie	Sibley Creek-Ottawa River
04100001 03 09	Ottawa River-Frontal Lake Erie	Detwiler Ditch-Frontal Lake Erie
04100009 07 01	Upper Swan Creek	Ai Creek
04100009 07 02	Upper Swan Creek	Fewless Creek-Swan Creek
04100009 07 03	Upper Swan Creek	Gale Run-Swan Creek
04100009 08 01	Lower Swan Creek	Upper Blue Creek
04100009 08 02	Lower Swan Creek	Lower Blue Creek
04100009 08 03	Lower Swan Creek	Wolf Creek
04100009 08 04	Lower Swan Creek	Heilman Ditch-Swan Creek
04100009 09 01	Grassy Creek-Maumee River	Grassy Creek Diversion
04100009 09 02	Grassy Creek-Maumee River	Grassy Creek
04100009 09 03	Grassy Creek-Maumee River	Crooked Creek-Maumee River
04100009 09 04	Grassy Creek-Maumee River	Delaware Creek-Maumee River
04100010 07 01	Cedar Creek-Frontal Lake Erie	Turtle Creek-Frontal Lake Erie
04100010 07 02	Cedar Creek-Frontal Lake Erie	Crane Creek-Frontal Lake Erie
04100010 07 03	Cedar Creek-Frontal Lake Erie	Cedar Creek-Frontal Lake Erie
04100010 07 04	Cedar Creek-Frontal Lake Erie	Wolf Creek-Frontal Lake Erie
04100010 07 05	Cedar Creek-Frontal Lake Erie	Berger Ditch
04100010 07 06	Cedar Creek-Frontal Lake Erie	Otter Creek-Frontal Lake Erie
04100010 06 01	Toussaint Creek	Upper Toussaint Creek
04100010 06 02	Toussaint Creek	Packer Creek
04100010 06 03	Toussaint Creek	Lower Toussaint Creek

Black River Area of Concern

HUC 12	HU 10 NAME	HU 12 NAME
04110001 03 01	Headwaters East Branch Black River	East Fork of East Branch Black River
04110001 03 02	Headwaters East Branch Black River	Headwaters West Fork East Branch Black River
04110001 03 03	Headwaters East Branch Black River	Coon Creek-East Branch Black River
04110001 04 01	East Branch Black River	Town of Litchfield-East Branch Black River
04110001 04 02	East Branch Black River	Salt Creek-East Branch Black River
04110001 04 03	East Branch Black River	Willow Creek
04110001 04 04	East Branch Black River	Jackson Ditch-East Branch Black River
04110001 05 01	West Branch Black River	Charlemont Creek
04110001 05 02	West Branch Black River	Upper West Branch Black River
04110001 05 03	West Branch Black River	Wellington Creek
04110001 05 04	West Branch Black River	Middle West Branch Black River
04110001 05 05	West Branch Black River	Plum Creek
04110001 05 06	West Branch Black River	Lower West Branch Black River
04110001 06 01	Black River	French Creek
04110001 06 02	Black River	Black River

Cuyahoga River Area of Concern

HUC 12	HU 10 NAME	HU 12 NAME
04110002 03 02	Little Cuyahoga River-Cuyahoga River	Mogadore Reservoir-Little Cuyahoga River
04110002 03 03	Little Cuyahoga River-Cuyahoga River	Wingfoot Lake outlet-Little Cuyahoga River
04110002 03 04	Little Cuyahoga River-Cuyahoga River	City of Akron-Little Cuyahoga River
04110002 03 05	Little Cuyahoga River-Cuyahoga River	Fish Creek-Cuyahoga River
04110002 04 01	Yellow Creek-Cuyahoga River	Mud Brook
04110002 04 02	Yellow Creek-Cuyahoga River	Yellow Creek
04110002 04 03	Yellow Creek-Cuyahoga River	Furnace Run
04110002 04 04	Yellow Creek-Cuyahoga River	Brandywine Creek
04110002 04 05	Yellow Creek-Cuyahoga River	Boston Run-Cuyahoga River
04110002 05 01	Tinkers Creek-Cuyahoga River	Pond Brook
04110002 05 02	Tinkers Creek-Cuyahoga River	Headwaters Tinkers Creek
04110002 05 03	Tinkers Creek-Cuyahoga River	Headwaters Chippewa Creek
04110002 05 04	Tinkers Creek-Cuyahoga River	Town of Twinsburg-Tinkers Creek
04110002 05 05	Tinkers Creek-Cuyahoga River	Willow Lake-Cuyahoga River
04110002 06 01	Big Creek-Cuyahoga River	Mill Creek
04110002 06 02	Big Creek-Cuyahoga River	Village of Independence-Cuyahoga River
04110002 06 03	Big Creek-Cuyahoga River	Big Creek
04110002 06 04	Big Creek-Cuyahoga River	Cuyahoga Heights-Cuyahoga River
04110002 06 05	Big Creek-Cuyahoga River	City of Cleveland-Cuyahoga River

Ashtabula River Area of Concern

HUC 12	HU 10 NAME	HU 12 NAME
04110003 01 05	Ashtabula River	Lower Ashtabula River
04110003 02 01	Arcola Creek-Frontal Lake Erie	Indian Creek-Frontal Lake Erie
04110003 05 03	Euclid Creek-Frontal Lake Erie	Euclid Creek
04110003 05 04	Euclid Creek-Frontal Lake Erie	Doan Brook-Frontal Lake Erie
04120101 06 06	Conneaut Creek-Frontal Lake Erie	Town of North Kingsville-Frontal Lake Erie

Appendix D: Recreational Waters Water Quality Standards and Designated Waters

Ohio's water quality standards for recreation use were revised in 2009. These standards are now defined as shown below.

Recreation Use Waters: Categories and Bacteria Standards			
Recreation Use	**Description**	***E coli* density (counts/100 ml)**	
		Seasonal Geometric Mean	**Sample Maximum[1]**
Bathing Waters	Waters heavily used for swimming. Applies to all waters where a lifeguard or bathhouse is present, and waters designated BW. Applies to Lake Erie.	126	235 [a]
Primary Contact	Waters suitable for one or more full-body contact activities such as wading, swimming, boating, water skiing, canoeing, etc. Categorized by Class A, B or C	-	-
- Class A	Waters that support or potentially support frequent primary contact activities. All lakes with improved access points and waters designated in Table 7-16 of rule 3745-1-07.	126	298
- Class B	Waters that support or potentially support occasional primary contact activities. All surface waters are designated Class B unless otherwise designated.	161	523
- Class C	Waters that support or potentially support infrequent primary contact activities. Includes all water body segments with drainage areas less than 3.1 square miles and defined as a "historically channelized watercourse" unless specifically otherwise designated.	206	940
Secondary Contact	Waters for reasons of insufficient depth and limited access result in minimal exposure potential to pathogens. These waters are designated in rules 3745-1-08 through 3745-1-30.	1030	1030

[1] *Except as noted in footnote a, these criteria shall not be exceeded in more than ten per cent of the samples taken during any thirty-day period. (OAC 3745-1-07 Table 7-13)*
[a] *This criterion shall be used for beach and bathing water advisories.*

The restoration targets for BUI #10 Beach Closings should be applied to public bathing beaches, including the inland lake public beaches that are routinely monitored, and Primary Contact Class A stream segments, as these are the areas that Ohio has determined to be heavily used or could support frequent primary contact activities. Class A streams and rivers are specifically designated in Ohio's water quality standards (Ohio Administrative Code 3745-1-07 table 7-16). Class B and C streams and rivers and those with a secondary contact recreation use designation do not meet the definition in the

IJC's Listing Guideline of "commonly used" waters. The areas where BUI #10 applies in each AOC are as follows.

Public Bathing Beaches in Ohio AOCs		
AOC	**Beach**	**Location**
Black AOC	Lakeview Beach 41.46378 -82.19608	Located west of the mouth of Black River on Lake Erie
Black AOC	Century Beach 41.47794 -82.15412	Located east of the mouth of the Black River on Lake Erie
Black AOC	Findley Lake State Park Beach 41.135171 -82.214320	Located on Findley Lake in Findley Lake State Park on the West Branch of the Black River
Cuyahoga AOC	Edgewater Beach 41.48783 -81.74802	Located west of the mouth of the Cuyahoga River on Lake Erie
Cuyahoga AOC	Villa Angela State Park 41.58709 -81.56419	Located within Cleveland Lakefront State Park, immediately adjacent to the Euclid Creek confluence with Lake Erie on its eastern side
Cuyahoga AOC	Euclid State Park 41.58606 -81.56928	Located within Cleveland Lakefront State Park, immediately adjacent to Euclid Creek confluence with Lake Erie on its western side
Cuyahoga AOC	Shoreby Club Beach 41.558 -81.605	Located in Bratenahl
Maumee AOC	Maumee Bay State Park (Lake Erie beach) 41.6858 -83.3781	Located at the mouth of Wolf Creek/Berger Ditch on Lake Erie
Maumee AOC	Maumee Bay State Park (inland beach) 41.68576 -83.37911	Located within state park
Maumee AOC	Olander Park Beach 41.69073 -083.7105	Located within Olander Park
Ashtabula AOC	Lakeshore Park 41.90837 -80.77437	Located east of the mouth of the Ashtabula River on Lake Erie
Ashtabula AOC	Walnut Beach 41.90147 -80.80966	Located west of the mouth of the Ashtabula River on Lake Erie

Class A Stream Segments in Ohio AOCs				
Water body name	**Flows into**	**Drainage basin**	**Segment Description**	**Length (RMs)**
Ashtabula River	Lake Erie	Ashtabula	East Branch/West Branch confluence (RM 27.55) to the mouth	27.55
Black River	Lake Erie	Black	East Branch/West Branch confluence (RM 15.55) to the mouth	15.55
Black River, East Branch	Black River	Black	State Route 162 east of Spencer (RM 38.73) to the mouth	38.73
Black River, West Branch	Black River	Black	Hughes Road southeast of Oberlin (RM 18.1) to the mouth	18.1
Cuyahoga River	Lake Erie	Cuyahoga	SR 87 (RM 87.26) to the mouth	87.26
Tinkers Creek	Cuyahoga River	Cuyahoga	Hawthorne Parkway at Richmond Road (RM 8.75) to the mouth	8.75
Maumee River	Maumee Bay	Maumee	Bend Road south of Bend (RM 76.22) to the mouth	76.22

The Ohio Department of Health (ODH), the state agency responsible for monitoring and tracking beach water quality, maintains a web site at www.odh.ohio.gov/odhprograms/eh/bbeach/beachmon.aspx that lists seasonal bacteria counts and postings at all public beaches along Lake Erie and at inland lakes that are monitored. The recreational season is defined as May 1 through October 31.

Several contact advisories have been posted by the ODH due to the presence of PCBs or PAHs. For the Ottawa River (Maumee AOC), ODH has posted a DO NOT WADE OR SWIM contact advisory for the Eastern Interstate 475 bridge to Lake Erie (Lucas County) segment of the stream due to the presence of high levels of PCBs. A contact advisory due to PAHs, posted in 1983 in the lower Black River, was lifted in 2004.

Appendix E: Acronyms and Abbreviations

The acronyms and abbreviations below are commonly used in Ohio's RAP communities and are found throughout this document.

A

AOC	Area of Concern

B

BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BUI	Beneficial Use Impairment
BUIA	Beneficial Use Impairment Assessment

C

CDF	Confined Disposal Facility
CSO	Combined Sewer Overflow
CWH	Coldwater Habitat

D

DDE	DDT metabolite
DDT	Banned pesticide associated with bird and animal deformities and reproductive problems
DELT	Deformities, Eroded Fins, Lesions, and Tumors
DNR	Department of Natural Resources

E

EIS	Environmental Impact Study
EOLP	Erie-Ontario Lake Plain Ecoregion
ESA	Environmental Site Assessment
EWH	Exceptional Warmwater Habitat

G

GIS	Geographical Information System
GLWQA	Great Lakes Water Quality Agreement

H

HELP	Huron-Erie Lake Plain Ecoregion
Hg	Mercury
HUC	Hydrologic Unit Code

I

IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
IJC	International Joint Commission

L

LaMP	Lakewide Management Plan
LOEC	Lowest Observable Effect Concentration
LRW	Limited Resource Water

M

Mg/l	Milligrams per Liter
MGD	Million Gallons per Day
MIwb	Modified Index of Well Being
MWH	Modified Warmwater Habitat

N

NOEC	No Observable Effect Concentration
NPDES	National Pollutant Discharge Elimination System

O

ODA	Ohio Department of Agriculture
ODNR	Ohio Department of Natural Resources
ODH	Ohio Department of Health

P

PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEL	Probable Effect Level

Q

QHEI	Qualitative Habitat Evaluation Index

R

RAP	Remedial Action Plan

S

SSO	Sanitary Sewer Overflow
SWCD	Soil and Water Conservation District

T

TEL	Threshold Effect Level
TMDL	Total Maximum Daily Load Limits

U

µg/kg	Micrograms per Kilogram
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USPC	United States Policy Committee

V

VAP	Voluntary Action Program

W

WQ	Water Quality
WQS	Water Quality Standards (Ohio Administrative Code 3745-1)
WWH	Warmwater Habitat
WWTP	Wastewater Treatment Plant