GREAT LAKES NATIONAL PROGRAM OFFICE
CHICAGO, IL 60604

June 30, 2026

Joy Mulinex, Executive Director
Ohio Lake Erie Commission
P. O. Box 1049
Columbus, Ohio 43216

Dear Ms. Mulinex:

Thank you for your June 25, 2026, request to remove the *Degradation of Benthos* Beneficial Use Impairment (BUI) at the Black River Area of Concern (AOC). As you know, we share your desire to restore all the Great Lakes AOCs and to formally delist them.

Based upon a review of your submittal and supporting data, EPA hereby approves your request to remove this BUI from the Black River AOC. EPA will notify the International Joint Commission of this significant positive environmental change at this AOC.

We congratulate you and your staff as well as the many federal, state, and local partners who have been instrumental in achieving this environmental improvement. Removal of this last BUI will benefit not only the people who live and work in the AOC, but all the residents of Ohio and the Great Lakes basin as well.

We look forward to the continuation of this productive relationship with your agency, the Ohio Environmental Protection Agency, and the Black River AOC Advisory Committee as we work together to delist this AOC in the months to come. If you have any further questions, please contact me at (312) 886-0124 or your staff can contact Leah Medley at (312) 886-1307.

Sincerely,

Teresa Seidel, Director
Great Lakes National Program Office

cc: Holly Tucker, OEPA
Kristina Patterson, OLEC
Hannah Boesinger, OLEC
Raj Bejankiwar, IJC

June 25, 2026

Teresa Seidel, Director
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard (G-17J)
Chicago, IL 60604-3511

RE: Black River Area of Concern (AOC) Degradation of Benthos Beneficial Use Impairment (BUI) Removal Action

Dear Director Seidel,

In partnership with the Ohio EPA and the Black River AOC Community Advisory Committee, the Ohio Lake Erie Commission recommends the removal of the *Degradation of Benthos* BUI from the Black River AOC.

Significant investments in the Black River to create fish and benthic macroinvertebrate habitat and address contaminated riparian sediment have occurred under the AOC Program. This removal recommendation is the result of these investments as well as investments through the Great Lakes Restoration Initiative and the efforts by many partners in the Black River AOC since its 1987 designation. If the U.S. EPA concurs with this recommendation, this BUI removal will be the ninth and final BUI removed in the Black River AOC. The attached report explains in detail the justification for this recommendation.

The Commission appreciates the close working relationship with U.S. EPA and the local AOC Advisory Committee and looks forward delisting the Black River AOC.

Sincerely,

Joy Mulinex

Joy Mulinex
Executive Director, Ohio Lake Erie Commission

Enclosure
cc: Holly Tucker, Ohio EPA
Kristina Patterson, OLEC
Leah Medley, USEPA- GLNPO
Julie Carter, USEPA-GLNPO
Matthew Pawlowski, USEPA-GLNPO
Hannah Boesinger, OLEC

Removal Recommendation for the Degradation of Benthos Beneficial Use Impairment from the Black River Area of Concern

June 2026

Ohio Lake Erie Commission | Environmental Protection Agency

BLACK RIVER

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Purpose

The purpose of this document is to recommend the removal of the Degradation of Benthos Beneficial Use Impairment (BUI) from the Black River Area of Concern (AOC). This document provides information and documentation of benthic macroinvertebrate (benthos) community assessments and measures the results against applicable State of Ohio Area of Concern BUI restoration targets. Other relevant information and evaluations are also provided to contextualize the current BUI status.

Background

The Black River, located in northeast Ohio, flows into Lake Erie's central basin at the city of Lorain (Figure 1). During industrial development in the early 20th Century, "the Black River, once majestic and teeming with life, became an inhospitable conduit of sewage, sediments, and toxic contaminants to the lake" (Black River Remedial Action Plan Coordination Committee [BRCC], 1994). In 1987, the International Joint Commission (IJC) designated the Black River as one of 43 AOCs in the Great Lakes basin. The original Black River AOC was limited to the lower 6.2 miles of the Black River mainstem (Figure 2) due, in part, to the prevalence of fish tumors that were the result of "a legacy of contaminated sediments, mainly polynuclear aromatic hydrocarbons" (BRCC, 1994). Much of the environmental degradation that impaired the lower Black River was due to contaminants released from steel production in the city of Lorain. This was a predominant factor that led the IJC to list the Black River as an AOC (BRCC, 2011). The BRCC was formed in September 1991 to investigate the BUIs, develop strategies to remediate the causes and sources of BUIs for their eventual removal and to delist the AOC. In 1994, the Black River AOC was expanded to include the entire Black River watershed during the development of the Black River Stage 1 Report because the sources resulting in some BUIs were in the upper portions of the Black River watershed (BRCC, 1994). The Stage 1 Report was approved in 1994, and the Stage 2 Report was approved in 2011.

Based on improvements documented in the upstream subwatershed areas and adjustments made to Ohio's BUI Restoration Targets, the Ohio Environmental Protection Agency (Ohio EPA) and the Black River AOC Advisory Committee (BRAC) re-evaluated the boundary of the AOC in 2015. They determined that the upper portions of the Black River were similar to regional conditions and therefore were not significantly impacting the BUI status in the mainstem as thought in 1994 when the boundary was expanded. Therefore, the Black River AOC was re-delineated into two 12-digit hydrologic units (HU) and two beaches: French Creek HU (HUC 04110001 06 01), Black River HU (HUC 04110001 06 02) (the lower 15 miles of the Black River mainstem), Century Beach, and Lakeview Beach. The Black River AOC encompasses 74 square miles, while the entire Black River watershed contains 470 square miles.

Nine of the 14 BUIs were identified as impaired for the Black River AOC. Eight of the BUIs have been removed:

- #1 Restrictions on Fish and Wildlife Consumption REMOVED 2016
- #3 Degradation of Fish and Wildlife Populations REMOVED 2025
- #4 Fish Tumors or Other Deformities REMOVED 2023
- #7 Restrictions on Dredging Activities REMOVED 2022
- #8 Eutrophication & Undesirable Algae REMOVED 2016
- #10 Beach Closings (Recreational Use) REMOVED 2024
- #11 Degradation of Aesthetics REMOVED 2021
- #14 Loss of Fish and Wildlife Habitat REMOVED 2025

Remaining impaired BUIs:

- #6 Degradation of Benthos

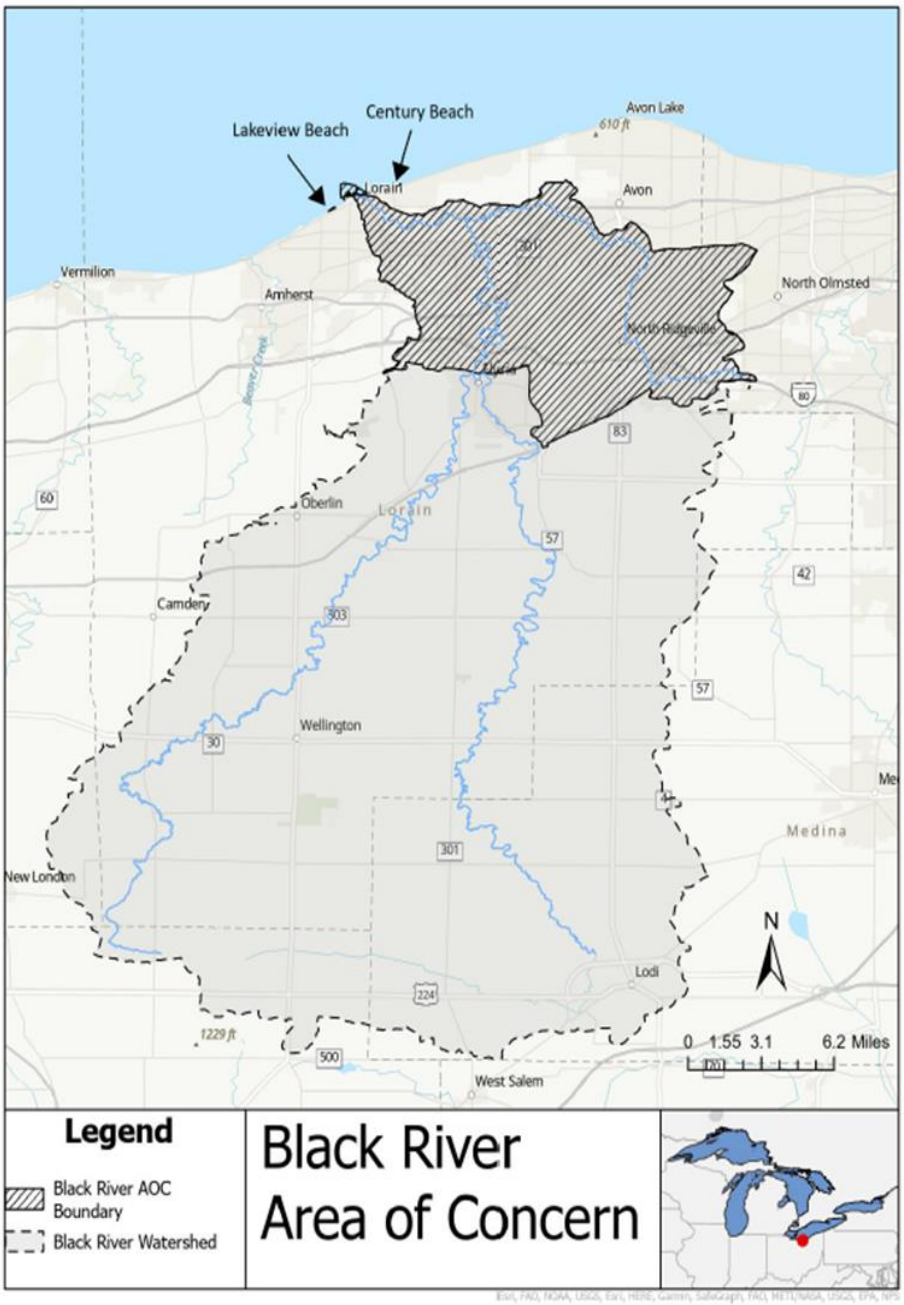

Figure 1. Black River AOC boundary.

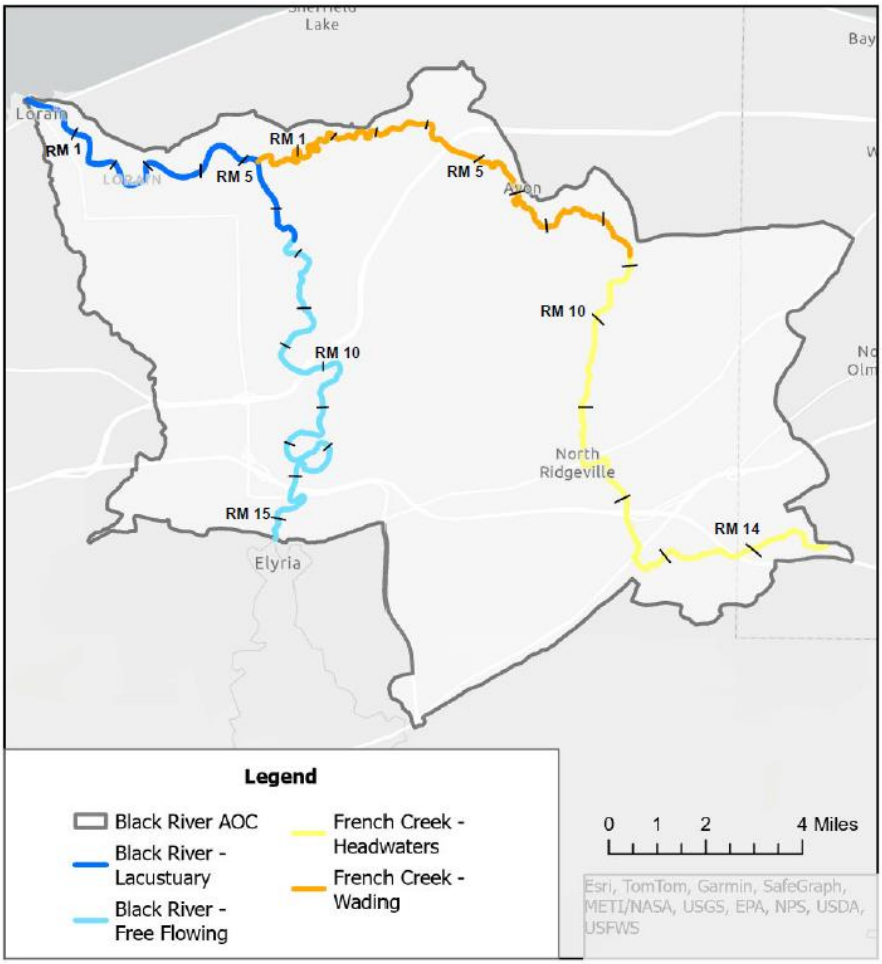

Figure 2. Black River and French Creek River Miles (RMs).

Degradation of Benthos BUI Impairment Listing and Sources of Impairment

Benthic macroinvertebrates (benthos) are bottom dwelling aquatic organisms that are commonly used as indicators of biological conditions in waterbodies. Benthos are reliable indicators because they spend all or most of their lives in water, are easy to collect, and differ in their tolerance to pollution (U.S. EPA, 2025a). They are also used to evaluate the effects of the stressors to which they are exposed due to their limited mobility.

The Degradation of Benthos BUI was determined to be impaired in French Creek and the Black River mainstem in the Remedial Action Plan (RAP) Stage 1 Report based on the IJC listing criteria. The criteria stated that this BUI should be listed as impaired when "macroinvertebrate community structure significantly diverges from unimpacted control sites located in Ohio of comparable physical and chemical characteristics; this will also be considered impaired if toxicity (defined by bioassays) of sediment-associated contaminants is higher than controls" (BRCC, 1994).

Ohio EPA data collected in 1992 (Ohio EPA, 1994) were used in the Stage 1 Report to determine the impairment status and to identify potential sources of contamination. The report found the degraded benthos communities in the Black River mainstem to be related to high turbidity and sedimentation and lack of sufficient habitat. Excess sedimentation can negatively affect benthos communities by changing substrate suitability, increasing drift, and affecting respiration and feeding (Mulat & Mekoya. 2024). High sedimentation is one of the most notable stressors of freshwater benthos communities (Davis et al., 2018). Primary sources of sediment to the Black River and French Creek were identified as non-point sources, erosion, and agricultural runoff. The report showed that there were no contaminants in the Black River or French Creek water columns that would be associated with observed impacts on benthos communities, although sediment data from French Creek and the Black River mainstem revealed organic and inorganic contaminants that may affect benthic communities, based on 1992 Ohio EPA data (BRCC, 1994). Potential sources of the organic and inorganic sediment contaminants included industrial discharges, municipal discharges, stormwater runoff, and pesticide loadings from agricultural and urban runoff.

The Stage 2 Report served to further identify sources of BUI impairment in the Black River AOC and strategies to restore them. The report identified lack of high-quality in-stream habitat and embeddedness/high suspended solid load from upstream areas as the primary causes of impairment for the Degradation of Benthos BUI in the Black River mainstem (BRCC, 2011). Low dissolved oxygen levels, attributed to the maintained depth of the Federal Navigation Channel and sediment oxygen demand, were linked to degraded fish populations but not degraded benthos population in the Stage 2 Report. However, other technical documents have associated low dissolved oxygen and degraded benthos population in the Black River lacustuary (Ohio EPA, 1999). Identifying the primary sources of impairment in French Creek was challenging due to limited data, but high sediment/silt loads were determined to be the most likely source. The reports cited that suburbanization and infringement upon riparian corridors degrading high-quality habitats and low flow conditions due to flat terrain, likely negatively affected benthic communities. Multiple BUI restoration strategies were outlined in the Stage 2 report that ultimately informed the development of the Management Action (MA) List in 2017. The relevant MA projects and additional restoration projects completed outside of the AOC program will be discussed later in this document.

Ohio EPA has published three Technical Support Documents (TSDs) evaluating the Biological and Water Quality Study of biology and water quality of the Black River basin (Ohio EPA, 1994, 1999, and 2016). Information in the 1992 TSD was used heavily when creating the Stage 1 Report to determine BUI impairment statuses and identify sources of the impairments, as previously discussed. The 1997 and 2012 TSDs provided the AOC Program with additional data to inform BUI statuses and sources of impairment.

The 1992 TSD concluded that conditions in the Black River mainstem had generally improved since the 1980's and that "contaminated sediment problems in the lake affected area of the river have been addressed through removal" (Ohio EPA, 1994). Benthic communities in the free-flowing section of the river (river miles [RMs] 6.6 to 15) were good, except for one site within the mixing zone of the Elyria

Wastewater Treatment Plant (WWTP (RM 10.6). Benthos community scores in the lacustuary were significantly lower and reflective of lake-affected conditions (lessening of current and (consider using "less varied" habitat conditions). The benthic communities were not indicative of acute toxicity from adjacent discharges and landfills, although an oil sheen in the natural substrates was observed during the 1992 sampling at most lacustuary sites.

The lower section of French Creek was assessed in the 1992 TSD. Water quality in French Creek was found to be comparable to 1982 conditions. The French Creek WWTP (formerly named the North Ridgeville WWTP) located near RM 2.8 was not believed to be impacting downstream benthos communities, but nearby and recently constructed fly ash landfill was. The ICI near RM 3.2 dipped from 40 in 1982 to 22 in 1992, likely due to metal contamination from the fly ash disposal site.

The second TSD published by the Ohio EPA in 1999 assessed the Black River basin, including French Creek, in 1997 and 1998. Water quality in the Black River mainstem had improved since the 1980s due to improvements of the Elyria WWTP. Benthic communities in the free-flowing section of the river were generally good, while the communities in the lacustuary section remained fair to poor. The primary causes of biological impairments in the Black River lacustuary were low dissolved oxygen concentration derived from pollutant loadings, and sediment contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs) as the secondary cause. Low dissolved oxygen in the lacustuary may be caused by the "loadings of pollutants from both point and non-point sources, temperature regimes, and the physical and hydrologic characteristics of the river itself, especially since the estuary of the river is highly modified through dredging and shoreline modifications in order to accommodate navigation and industry" (Ohio EPA, 1999) (Figure 3).

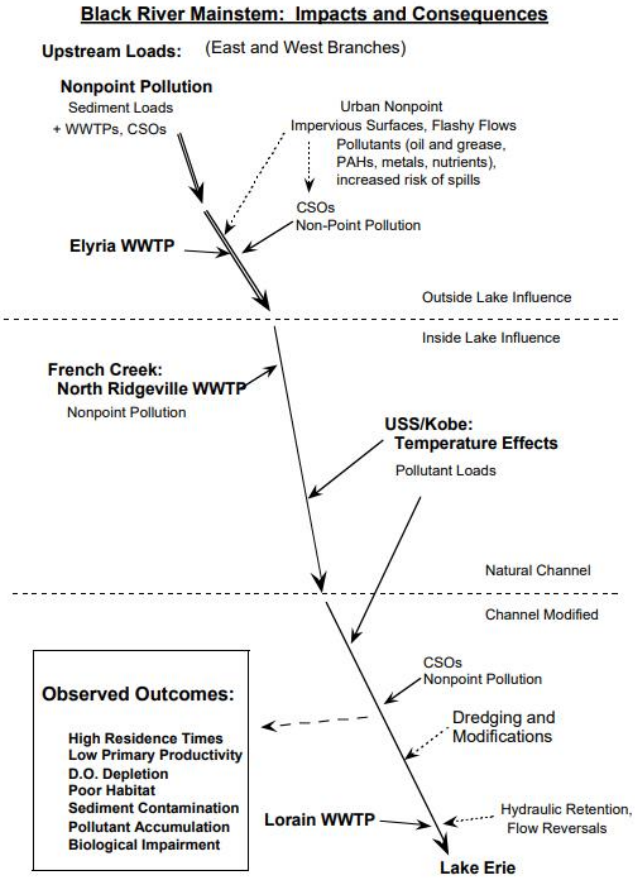

Figure 3. Black River Impacts and Consequences Schematic (Ohio EPA, 1999).

Water quality in French Creek remained largely unchanged in the 1997 TSD. Toxic pesticide compounds and elevated concentrations of copper in the French Creek were found in sediment samples and was likely a legacy of past agricultural practices in the watershed. Elevated zinc concentrations were detected below the French Creek WWTP and were attributed to point source discharge. As a result, benthos communities remained consistent from previous studies, scoring from fair to good in the lower 5.5 miles of the river.

A TMDL for the Black River watershed was completed by the Ohio EPA in 2008. The analysis included the Black River mainstem, French Creek, and three upstream sub-watersheds outside of the AOC associated with the east and west branches of the Black River. The goals of the TMDL were to identify key issues associated with the impairments and pollutant sources, determine water quality conditions that will result in all streams meeting their designated uses, and provide information to stakeholders to facilitate activities to improve water quality (Ohio EPA, 2008). An updated TMDL based on the data collected in 2012-2013 is in progress and is anticipated to be finalized in the coming years. This document will provide updated nutrient analysis to the Black River that reflects current conditions and land use.

Causes for impairments within the Black River mainstem identified in the 2008 TMDL included nutrients, siltation, organic enrichment/dissolved oxygen, unknown toxicity, other habitat alterations, and bacteria (Ohio EPA, 2008). Sediment, in particular, is one of the most dominant stressors due to its impact on the physical habitat of aquatic communities (Ohio EPA, 1999b). Stormwater, agricultural practices, and streambank erosion and the primary mechanisms for sediment deposition in the Black River watershed (Ohio EPA, 2008). A significant amount of the nutrients and sediment in the Black River mainstem originates from the upper watershed, outside of the AOC boundary, as reflected in the TMDL (Ohio EPA, 2008). These sources are related to agricultural runoff, numerous point source discharges, and home sewage treatment systems throughout the watershed (Figure 4). A total yearly reduction of 320,500 pounds (lbs.) of nitrate-nitrogen, 41,700 lbs. of phosphorus, and 3,930 tons of total suspended solids (TSS) from outside of the AOC is required to meet the goals outlined in the 2008 TMDL.

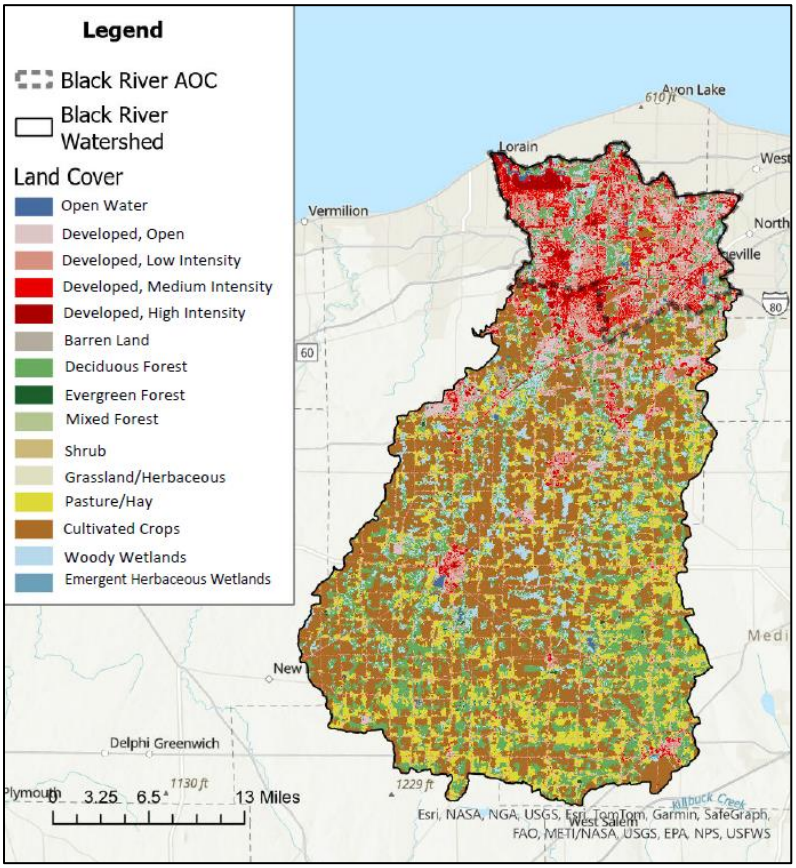

Figure 4. Black River Watershed Land Cover (2023).

Nutrient sources within the AOC include industrial point sources, major municipal point sources, and combined sewer overflows or CSOs (Ohio EPA, 2008). The AOC is dominated by urban, suburban, and industrial land uses (Figure 4). In addition to identifying and evaluating sources of water quality impairment, the TMDL proposes solutions to bring those waters into attainment with water quality standards. Some of the recommendations for improvement include “restoring stream habitat in

agricultural areas; eliminating pervasive bacteria problems; reducing impacts from permitted dischargers; and managing stormwater quantity and quality in developing areas" (Ohio EPA, 2008). Within the AOC boundary (including French Creek), a yearly reduction of 134,191 pounds (lbs.) of nitrate-nitrogen, 13,487 lbs. of phosphorus, and 1,455 tons of TSS are required to meet the goals.

The 2012 TSD showed that benthic population scores in the Black River lacustuary were poor, with the cited cause of impairment as "other flow regime alterations" and source as "habitat modification other than hydromodification". Benthic communities in the Black River mainstem (riverine) were generally good, apart from the site below Elyria WWTP (RM 9.8). The cause of impairment was determined to be elevated specific conductance and nutrients/eutrophication originating from the Elyria WWTP. The headwater section of French Creek exhibited poor benthic community scores, caused by insufficient habitat conditions and evidence of septic discharges into the upper reach of French Creek.

To further assess conditions and possible sources of impairment in the Black River lacustuary, an in-depth evaluation of fish and benthos communities and fish habitat was completed by Midwest Biodiversity Institute (MBI) in 2021. MBI collected new data and compiled existing Ohio EPA data from 2010 to 2020 to determine the likely sources of impairment for the associated BUIs and consider trends over time. The evaluation determined the benthic communities were impaired within the lacustuary portion of the Black River and were generally not improving over time. The report supported previous evidence provided by the Ohio EPA (Ohio EPA, 2016) that there were no acute stressors in the water column. Elevated conductivity values associated with elevated total dissolved solids (TDS) from the Elyria WWTP were determined to be negatively affecting benthic communities, specifically mayfly populations, in the upper Black River lacustuary. Additionally, the evaluation did not reflect acute sediment toxicity for benthos, but some degree of low-level chronic toxicity may have been present based on 2017 sediment data. Sediment data shows that PAHs are decreasing over time, and that no PAH compounds exceeded the Threshold Effect Concentration (Table 1) (MacDonald et al., 2000). While the observed low-level sediment toxicity may have been negatively impacting benthos in the Black River lacustuary, the evaluation determined that organic enrichment, related to dissolved oxygen fluctuations and nutrients rather than toxic indicators, was having a more widespread and severe impact on the Black River lacustuary benthic community.

Table 1. Black River lacustuary sediment PAH concentrations.

PAH Compound	Year Sampled					
	1988	1992	1997	2013	2017	2020
Phenanthrene	390	2.6	0.89	0.33	0.58	0.16
Fluoranthene	220	3.7	1.86	0.83	1.7	0.46
Benzo(a)anthracene	51	1.6	1.02	0.36	0.71	0.16
Benzo(a)pyrene	43	1.7	0.88	0.46	0.68	0.24

State of Ohio Restoration Target and Removal Criteria

The BUI removal and restoration targets in Ohio's AOCs are guided by the "Delisting Guidance and Restoration Targets for Ohio Areas of Concern," updated most recently in 2023. Ohio's current listing criteria for benthos states that a listing of "Impaired" shall occur 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 BUI Restoration Targets for macroinvertebrate community" (Ohio EPA & Ohio Lake Erie Commission, 2023).

The U.S. Policy Committee's Delisting Principals and Guidelines and Delisting Guidance and Restoration Targets for Ohio Areas of Concern (Appendix A) states that a BUI can be removed under any of the following circumstances:

- Removal 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 BUI 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 are assigned to another party or program, e.g., Lakewide Management Plan, TMDLs, or health department.)

Degradation of Benthos BUI Restoration Target

In the riverine areas, upstream from the lake affected waters (lacustuary or freshwater estuary), the average of the combined quantitative Invertebrate Community Index (ICI) values and the numerically converted qualitative values within the assessment unit do not significantly diverge from the State of Ohio's BUI Restoration Targets for macroinvertebrate community;

AND

In lake affected waters (lacustuary or freshwater estuary), the average of the combined quantitative L-ICI values and the numerically converted qualitative values do not significantly diverge from the State of Ohio's BUI Restoration Targets for macroinvertebrate community. (See Appendix B for additional information);

OR

In waters where benthic degradation has been attributed to the contaminated sediments, this BUI can be considered restored in these areas when the remedial action(s) to address the contaminated sediments have been implemented to the extent practicable and the associated remediation goals have been achieved.

Table 2. Ohio AOC Benthos BUI targets.				
	Invertebrate Community Index (ICI) Restoration Target			
Site Type	**EWH**	**WWH**	**MWH**	**LRW [1]**
Riverine [2]	42	30	22	8
Lacustuary [3 4]	34	34	34	12

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

When measuring the status of this BUI, the quantitative Invertebrate Community Index (ICI) and the qualitative narrative evaluations should be used to assess the macroinvertebrate community characteristics.

Qualitative narrative macroinvertebrate sampling based on Ohio EPA protocol does not yield a numeric value. Since a large number of the sites only have qualitative narrative data for macroinvertebrates, a numeric equivalent has been outlined for each narrative value. The table below should be used to make a narrative to numeric conversion. Once converted the numeric value should be averaged with any other qualitative and quantitative data for an overall assessment unit average; resulting in one value for determining status for that assessment unit.

Table 3. Qualitative Macroinvertebrate Narrative Conversion.	
Narrative Evaluation	**Equivalent Value for Averaging Narratives**
Exceptional	46
Very Good	42
Good	34
Marginally Good/Moderately Good	30
Fair	21
Non-significant Departure/Low Fair	13
Poor	8
Very Poor	6

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 the former as the Nearshore Area and the 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. A non-significant departure value for L-ICI has not yet been determined. The ICI values for the

[1] BUI restoration targets for MWH and LRW are based on benchmarks as there are no criteria in Ohio WQS. The narrative evaluation is not applicable for LRW; if other criteria exist in the assessment unit it should be used.
[2] Ohio EPA has determined the WQS non-significant departure value for EWH and WWH riverine ICIs to be 4 points; the BUI restoration targets presented in this table are based on the values of the non-significant departure from Ohio WQS.
[3] Non-significant departure for the lacustuary ICI value (L-ICI) has not yet been determined.
[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.

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).

The restoration target for this BUI was developed from Water Quality Standards (WQS) and guidance for macroinvertebrate community evaluation, but the restoration targets are not the same as the WQS or guidance. These differences include: 1) the non-significant departure values were used to set the restoration target (where appropriate) and 2) metric scores are averaged across an assessment unit for each aquatic life use. Additional information on how to calculate the average index value for comparison to the restoration target follows.

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. Each AOC's site conditions will need to be evaluated using the lacustuary evaluation guidance but will need to consider its applicability and if local targets will need to be established or how and/or if conditions are similar to regional conditions. 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 restoration target set for ICI and L-ICI for this BUI to be removable for that assessment unit. The calculated average value of each assessment unit in the AOC needs to meet the restoration 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 annual 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 restoration target assessments, if any single ICI sample is 50% or less of the target or any single narrative is "Very Poor", 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. If a sampling site significantly lowers the assessment unit average due to site conditions that are not representative of the assessment unit (i.e., highway interchange) or are highly impacted by the surrounding land use that will likely not be removed/altered (i.e.,

commercial development), then that site should not prohibit this BUI from being removed. Instead, these sites may be removed from the status determination data set and a new status will be calculated without these non-representative, non-restorable sites included.

Summary of BUI Remedial Plans and Non-AOC Specific Actions

As previously outlined, several variables within the Black River AOC have been associated with the Degradation of Benthos BUI. Many of these variables were also noted to have impacts on the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs, which were removed from the Black River AOC in 2025 (OLEC, 2025). Loss of habitat and embeddedness/high suspended solids were acknowledged in the Stage 1 and Stage 2 Reports to be the primary factors driving the degraded benthos communities in the Black River mainstem. Additionally, sediment toxicity due to industrial discharges and land use was historically associated with degraded biological health and communities in both the Black River and French Creek. Sediment toxicity and water quality impairments in the Black River were most notably observed in 1982 when zero miles of the river mainstem were in attainment of the Warm Water Habitat Aquatic Life Use (Ohio EPA, 1994). A 2010-2020 MBI review of data did not observe water column toxicity or acute sediment toxicity in the lower Black River but cited organic enrichment as being the most notable cause for low benthos community scores.

The Black River has been at the industrial center of the city of Lorain since the late 1800s. Multiple steel plants flanked the shorelines, discharging untreated wastewater to the river and using it to transport raw and finished materials via ships (Figure 5). The lower 2.6 RMs of the Black River are designated as a Federal Navigation Channel to accommodate development and facilitate shipping and commerce (United States Army Corps of Engineers [USACE], 2024). The Federal Navigation Channel's shoreline, and a significant portion of the rest of the lacustuary, is comprised of vertical steel bulkheads that protect shoreline and ensure channel stability (URS, 2009). The Federal Navigation Chanel is routinely dredged by USACE and therefore, the Degradation of Benthos BUI will not be evaluated in this section because it is unrealistic for a healthy benthic community to be restored under these conditions.

Figure 5. Steel plants along River Miles 2 to 5 of the Black River.

The French Creek watershed is exhibiting rapid development and was also noted as having an unknown source of toxicity in the lower watershed in the 1994 and 1999 Ohio EPA Technical Support Documents (Ohio EPA, 1994 & 1999). The 1999 document states that "the presence of toxic pesticide compounds and elevated concentrations of copper in the French Creek sediment samples is likely the legacy of past agricultural practices in the French Creek watershed. These compounds were typically used in agriculture to control pest organisms and may take some time to fully diminish in the ecosystem. However, the elevated zinc concentrations detected below the French Creek WWTP can be attributed to the point source discharge with some certainty" (Ohio EPA, 1999). The toxicity was believed to be causing biological impairments in lower French Creek.

Since the 1980s, multiple efforts have been completed to identify and reduce the toxic inputs, remove contaminated sediment from the Black River, increase fish and benthic habitat, and improve water quality. The Black River AOC Advisory Committee and other local stakeholders produced two restoration plans to inform the recovery of the AOC: the Lower Black River Ecological Restoration Master Plan and the state-endorsed Black River Watershed Action Plan (WAP) (Znidarsic & Coldwater Consulting LLC., 2012). These plans helped inform the Black River AOC's list of necessary measures to restore the BUIs: the Management Action (MA) List. Significant investments outside of the MA List were also made to improve the overall conditions within the Black River AOC.

Watershed Action Plan

Watershed Action Plans (WAP), now called Non-Point Source Implementation Strategic Plans (NPS-IS Plan), are locally driven plans to inventory and evaluate resources, identify problems, and propose targeted actions within watersheds. In 2011, a WAP was completed for the Black River watershed, including the Black River mainstem and French Creek sub-watersheds. In addition to evaluating resources and problems, the plan included goals and action items to address the identified problems.

The causes and sources of impairment in the Black River mainstem and French Creek as outlined in the WAP can be seen in Table 1. Reducing streambank erosion, managing stormwater runoff, removing/repairing/replacing home sewage treatment systems (HSTS), improving instream and riparian habitat, and preserving existing green space were broad goals outlined to address the sources of impairment in both sub-watersheds. The plan outlined objectives and action items for each goal, providing a data-driven and detailed strategy for addressing the impairments. The Black River WAP was included in the Stage 2 Report as an ongoing restoration and protection strategy for remaining BUIs.

Table 4. WAP Impairments in Black River and French Creek.

Note: Causes and Sources of Impairment were obtained from a variety of sources, including: TMDL Report (Ohio EPA), Watershed Inventory (Section III of this report), and Biological and Water Quality Monitoring Reports (Ohio EPA).	**Causes of Impairment**								
	Siltation & Habitat Loss				**Excessive nutrients/ bacteria/low dissolved oxygen**				**Priority Organic Compounds & Heavy Metals**
	Sources of Impairment								
Sub-Watershed	**Channelization, Hydromodification & Stream Bank Erosion**	**Riparian Removal**	**Urban Runoff & Storm Sewers**	**Crop & Pasture Runoff**	**Crop & Pasture Runoff**	**Failing HSTSs**	**WWTP & CSOs**	**Urban Runoff & Storm Sewers**	**Industrial Point & Non-Point Sources**
Black River Mainstem	✓	✓	✓			✓	✓	✓	✓
French Creek	✓	✓	✓			✓	✓	✓	✓

Lower Black River Ecological Restoration Master Plan

The Lower Black River Ecological Master Plan was created by local, state, and federal representatives to define specific actions to restore ecological health and stimulate economic development in the Lower Black River (URS & Thoma, 2009). The plan highlighted the previous successes of cleaning up and largely eliminating legacy contaminated sediment, as discussed later in this document, but also recognized that its purpose is not to return the Black River to pristine conditions. The plan was "designed to incorporate the economic needs of the city with the environmental needs of the Black River system" (URS & Thoma, 2009).

The proposed actions in the plan generally focused on improving, protecting, and restoring fish and benthos health and aquatic, riparian, and terrestrial habitat. These actions were broken down into three categories: Restoration Actions, Enhancement Actions, and Protection Actions. Restoration Actions included projects to create new habitats, such as bulkhead fish shelves, and restore areas where habitat had been lost. Invasive species control and planting submerged vegetation were proposed projects in the Enhancement Project category. Protection Actions included the conservation

easements acquisitions, best management practices for developers, and suggested regulatory protections. Several of these projects helped inform the AOC's MA List, including "Install Fish Shelves to Create Fish Habitat at Feasible Locations" and "Slag Pile Remediation and Stabilization". While several of the projects and strategies outlined in the Master Plan and abovementioned WAP have been implemented and are discussed in the following sub-sections, many are still pending and should be considered for implementation outside of the AOC Program.

Black River Sediment Remediation

Black River sediment had been heavily contaminated with metals and PAHs by discharges predominately from steel production and the steel mill coking plant (RMs 4-5) that ceased operations in the early 1980s. The elevated levels of PAHs and other contaminants negatively impacted benthos health and community compositions. Contaminants in sediment and within the water column contributed to the dominance of pollution tolerant fish species, low IBI and MIwb scores, and high fish tumor and other deformities rates in the Black River lacustuary in the 1980s (Ohio EPA, 1992). Under a consent decree from U.S. EPA, U.S. Steel removed over 50,000 cubic yards of PAH-contaminated sediment, along with other contaminants, within a 0.8-mile stretch of the Black River near the company's steel mill coking plant complex (Figure 5 (BRCC 1994, U.S. EPA 2021a).

Several post-remediation studies have shown biological improvements on the Black River. The incidence of external lesions and fish tumors was significantly reduced post-remediation, and fish community scores increased. U.S. EPA conducted sediment sampling at 13 sites on the Black River mainstem in 1992. Sediment samples were analyzed for metals, base-neutral-acid extractable compounds (BNAs) that include PAHs, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and pesticides. The 1992 sediment sampling results revealed that most of the PAH contamination had been removed (BRCC, 1994).

Ford Road Industrial Landfill Site

The Ford Road Industrial Landfill Site is a 15-acre inactive facility on the north edge of Elyria (RM 10.8) (Figure 9). The Black River runs east of the landfill. Several industries dumped municipal and industrial waste at the landfill until it closed in 1974. In the late 1970s, Ohio EPA found that contaminated liquid was seeping into the Black River from a localized area in the landfill's northeastern corner. During an investigation of the site, it was determined that PCB-contaminated motor oil was migrating to the Black River. U.S. EPA, Ohio EPA, and the responsible party group worked together to complete a remedial investigation and to remediate the site. Soil contaminated with PCBs and chlorinated solvents was removed from the northeast corner of the site near the Black River. Landfill waste was removed, and all remaining waste is contained under at least two feet of clean clay soil cap material within the landfill. The remedy also improved surface water control and included installation of a sedimentation pond to catch stormwater runoff. The site is under long-term operation and maintenance and is not an AOC issue. The U.S. EPA routinely completes five-year reviews to ensure remedy effectiveness (U.S. EPA, 2021b).

Republic Steel Corporation Quarry Superfund Site

The Republic Steel Corporation Quarry Superfund Site is located near the Black River in Elyria (Black River West Branch RM 1.7) (Figure 6). It consists of a five-acre quarry containing water and seven acres of fenced land surrounding the quarry. From 1950 to 1975, Republic Steel Corporation (Republic Steel) discharged about 200,000 gallons per day of waste pickle liquor and rinse water into the quarry. Sampling later confirmed groundwater beneath the site was contaminated with metals. In 1977, Republic Steel sold the quarry and surrounding land to the city of Elyria. U.S. EPA placed the site on its Superfund program National Priorities List (NPL) of hazardous waste sites in June 1986. U.S. EPA's cleanup at the site consisted of removing contaminated soil and sediment, monitoring groundwater, and performing a fish study to determine health risks. As a result of a five-year review completed at the site in 1998 to verify the protectiveness of the remedy, the cleanup was expanded to include groundwater monitoring, repairing, and inspecting the site fence, posting signs, and limiting the use and access to the site. U.S. EPA removed this site from the NPL in November 2002 and continues to perform five-year reviews of the site remedy. These reviews ensure that the remedy remains protective of public health and the environment, and function as intended by site decision documents. The sixth scheduled five-year review occurred in 2023 (U.S. EPA 2023b). This site continues to be regulated by the Ohio EPA Division of Environmental Response and Revitalization and is not an AOC issue.

Figure 6. Locations of Black River Beneficial Use Impairment Actions.

Wastewater Infrastructure Improvements

Elevated bacterial concentrations in streams can have negative impacts on benthic communities by depleting dissolved oxygen levels and introducing pathogens (Yesilay et al., 2023). Slightly degraded benthic communities have been observed downstream of the Elyria Wastewater Treatment Plant and have been attributed to increased TSS loading (MBI, 2021). Reducing bacterial contamination and TSS loading to the Black River and its tributaries has been a critical step in improving water quality to benefit humans and aquatic life. Multiple projects and programs to improve wastewater treatment infrastructure and conveyance, to help reduce bacterial contamination, have occurred or are planned to occur throughout the AOC.

Three wastewater treatment plants have effluent discharge points within the Black River AOC boundary, including the French Creek, Black River, and city of Elyria wastewater treatment plants. The

effluent and treatment bypasses at these plants may contribute to bacterial loading in the Black River. The communities treated by the Black River and French Creek wastewater treatment plants convey wastewater through separate sanitary and storm sewers, while the city of Elyria utilizes separate sewers and combined sewers (U.S. EPA, 2023a). Sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs) can occur during wet-weather events, contributing *E. coli* loads to French Creek and the Black River (Ohio EPA, n.d.). Sanitary cross connections to the storm sewers, inflow, infiltration, and blocked sanitary sewers can cause dry-weather sanitary sewage discharge to waterways as well. Municipalities are responsible for maintaining these sewer systems, including mitigation of the above-mentioned dry-weather sources of contamination. Sewer relining and SSO and CSO abatement projects are ongoing through portions of the AOC, which will significantly reduce the volumes of untreated sanitary sewage entering the Black River and its adjacent shoreline (City of Lorain, n.d.).

Limited conveyance and treatment capacity of wastewater infrastructure, as well as aging infrastructure, are widespread issues throughout the state of Ohio (Ohio ASCE, 2021). Within the Black River AOC, all three wastewater treatment plants have made recent upgrades to their treatment system or have plans to do so (AWWA, 2020; MacMillan, 2023; City of Lorain, n.d.). Bacterial loading to the Black River should continue to decrease through the implementation of these infrastructure projects, which should contribute to heathier benthos communities by reducing TSS and nutrient contributions and improving dissolved oxygen concentrations (Albini et al., 2023).

On November 9, 2022, the city of Elyria entered into a CSO Long-term Control Plan (LTCP) consent decree with the United States and the State of Ohio to complete a series of capital projects designed to control discharges of untreated sewage from its sewer system into the Black River. Under the consent decree and other regulatory programs, SSOs will be eliminated and CSOs and untreated bypasses will be significantly reduced. Construction of the various projects is expected to be completed in 2044 and will reduce the fecal contamination load to the Black River and improve the river's water quality.

Lorain County Public Health began a HSTS Operation and Maintenance program in 2024 to "protect water quality in Lorain County by identifying and minimizing the impact household sewage treatment systems have on the environment and to increase homeowner knowledge of their systems" (Lorain County Public Health, n.d.). Under this program, permits are required for the over 18,000 HSTSs in Lorain County. Inspections and/or proof of operations and maintenance are required under this permit. If Inadequacies or exceedances in effluent concentrations are observed, a service provider will be required to make the necessary repairs. This program will be critical in addressing water quality issues in the Black River AOC related to bacterial loading. While the AOC program primarily focuses on addressing legacy sediment contamination and insufficient fish and benthos habitat, the additional work carried out under the LTCP, HSTS Program, and by WWTPs will continue improvements beyond the AOC-focused efforts.

Degradation of Benthos Related Management Actions

Reclamation Site and Restoration of Seep Site

The city of Lorain owns approximately 260 acres of former RTI Coke Works property, located to the north of Republic Steel and south of the Black River between RMs 3 and 5 (Figure 7). Over 200 acres of the city owned property, referred to as the Reclamation Site, contained disposed steel slag and other by-products of steelmaking. In order to restore and revegetate the Reclamation Site, the city of Lorain implemented a project to cap and cover to contain the slag and steel byproducts on approximately 40 acres in the Black River riparian areas between RMs 4 and 5 (Figure 8). Additionally, a remedial treatment system between RMs 4.7 and 5.0 to collect contaminated groundwater and prevent it from seeping into the Black River was constructed. These two projects were included on the 2017 U.S. EPA approved MA list and were constructed within the same project footprint. Other portions of the 200-acre city owned property were restored prior to the completion of the MA list. The Reclamation Site project goals were to reduce infiltration, manage direct runoff, minimize surface erosion, and enhance previous wetland restoration efforts (US EPA, 2025). This entire project was completed in 2020 (Figure 9).

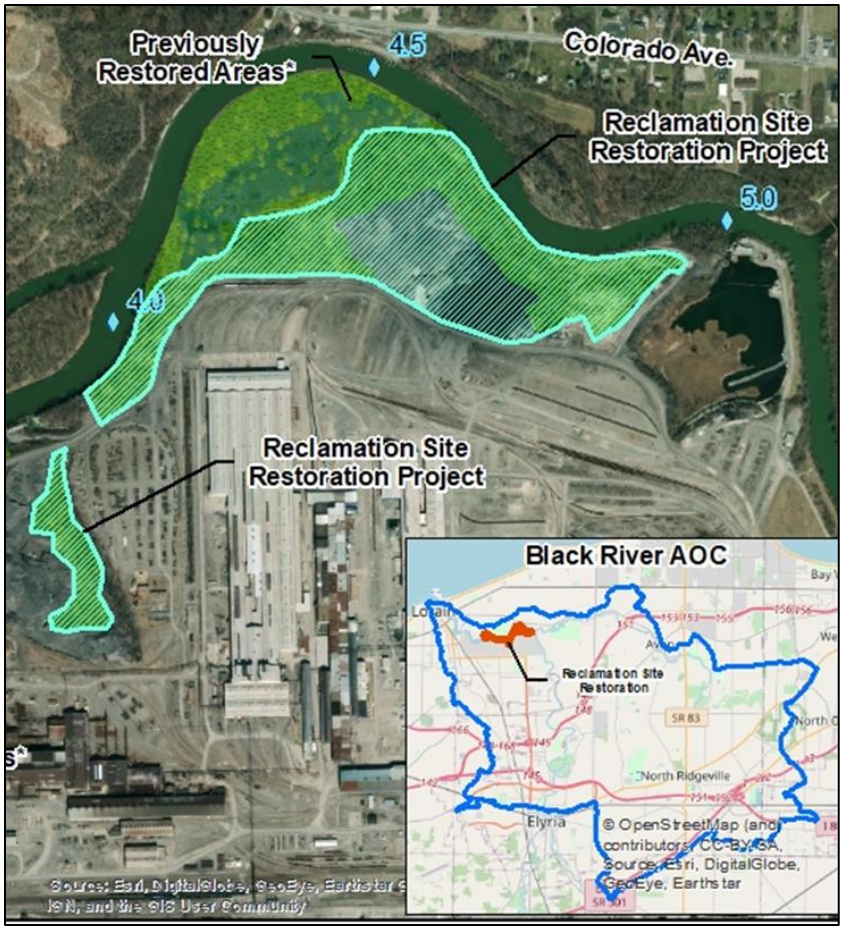

Figure 7. City of Lorain Reclamation Site Restoration Project.

Figure 8. Reclamation Site during capping.

Figure 9. Reclamation Site after construction.

In 2022, the city of Lorain identified an additional 14 acres of the Reclamation Site with exposed steel slag that required restoration. The additional work was completed in June 2024 and concluded the city of Lorain's 114 acre-restoration of uncovered steel slag that had been deposited in the riparian

zone of the Black River. This project is a long-term source control measure to prevent contaminated runoff from entering the Black River and will continue to improve the river's biological health.

French Creek Toxicity Study

The United States Army Corps of Engineers (USACE) and Ohio EPA reported evidence of degraded and impaired biological communities and a potentially unknown source of contamination in French Creek (U.S. Army Corps of Engineers, Buffalo District, 2004; Ohio EPA, 1999). Ohio EPA TSDs also associated degraded benthos communities with the presence of legacy pesticides and metal contamination from the now closed fly ash disposal facility (Ohio EPA, 1994 and 1999). To evaluate the hypothesized contamination, U.S. Fish and Wildlife Service conducted a study in 2018 to evaluate surface water and bottom sediment samples for contaminants, identify potential sources and spatial extent of contaminants in French Creek, and investigate relationships between potential contaminant exposure and biological impairments (U.S. Fish and Wildlife Service, 2019).

The toxicity study concluded that there is limited evidence that French Creek is a source of metals, organochlorine pesticide, organophosphate pesticide, PAH, or PCB contamination in the broader Black River watershed. The study indicated that there was insubstantial evidence that any biological impairments in French Creek were related to sediment or water column contamination. Furthermore, there was no evidence that downstream of the French Creek WWTP, near RM 3.2, was more contaminated than other wadable sites as reported in the 1990s.

Black River Fish Shelves

Fish habitat creation in the Black River lacustuary was a primary focus of the AOC Program. The installation of fish shelves was recommended in the MA List, Stage 2 Report, Lower Black River Ecological Restoration Master Plan, and Black River Watershed Action Plan, as discussed earlier in this section. While Degradation of Fish Populations and Loss of Fish Habitat were the primary BUIs addressed with the installation of fish shelves, benthic communities may also benefit from them. A total of 1.6 miles of instream habitat structures were created in the lower Black River (between the mouth and RM 4), consisting of MA and non-MA projects (Figures 10 and 11). These projects, and the length of fish shelves installed, were summarized in the Assessment of the Fish and Macroinvertebrate Assemblages, Habitat, and Water Quality in the Black River Lacustuary 2010-20 Report by Midwest Biodiversity Institute (MBI) as follows:

1. The Black River Restoration Project, funded by the American Recovery & Reinvestment Act (completed 2012).

- Fish shelf construction on south bank between RMs 4.0 and 4.4.
- Fish habitat restoration along south bank between RMs 3.2 and 3.3 and RMs 3.0 and 3.2.

2. The Lower Black River Fish Habitat Restoration Project (Phase I), funded by the Great Lakes Restoration Initiative (GLRI) and administered by NOAA (completed in 2011).

- Fish habitat restoration along approximately 2,700 linear feet of the south bank of the river from approximately RM 3.2 to RM 3.7.

- Fish habitat restoration along approximately 1,700 linear feet of the north bank of the river from approximately RM 3.7 to 4.0, including 320 linear feet of fish habitat shelves, 60 fish habitat structures, natural bank stabilization, and invasive species removal.
- Fish habitat restoration along approximately 545 linear feet of the south bank of the river near RM 4.6.

3. The Lower Black River Fish Habitat Restoration Project (Phase II), funded by the GLRI and administered by NOAA (completed in 2011).

- Fish habitat restoration along approximately 130 linear feet of the south bank of the river near RM 4.7.
- Fish habitat restoration along approximately 1,570 linear feet of the south bank of Monkey Island, including natural bank stabilization and approximately 0.3 acres of invasive species removal.
- Fish habitat restoration along approximately 557 linear feet of the south bank of the river near RM 3.1.

4. The Black River Landing & Heron Rookery Habitat Restoration Project (Rookery/Landing), funded by the GLRI and administered by NOAA (completed in 2015).

- Fish habitat restoration along approximately 370 linear feet of the west bank at the Black River Landing, including natural bank stabilization and riparian restoration.
- Fish habitat restoration along approximately 1,000 linear feet of the south bank of the river near RM 3.0, including natural bank stabilization and fish habitat shelves.

5. Lorain Sailing and Yacht Club Bulkhead Repair and Fish Habitat, funded by the GLRI (completed in 2018).

- Hybridized fish habitat restoration along approximately 450 linear feet of sheet pile bulkhead near RM 0.2, including affixing rock and hardwood against the replaced bulkhead to replicate more natural features.

6. Lorain Port Authority Fish Shelves, funded by Section 401 mitigation funds (completed in 2015)

- Construction of approximately 800 feet of underwater habitat shelf Lorain Port Authority's Black River Landing Site.

7. City of Lorain Fish Shelves, funded through GLRI (completed in 2021) (not shown on Figure 9)

- Fish shelf construction along south bank between RMs 4.6 and 4.8.

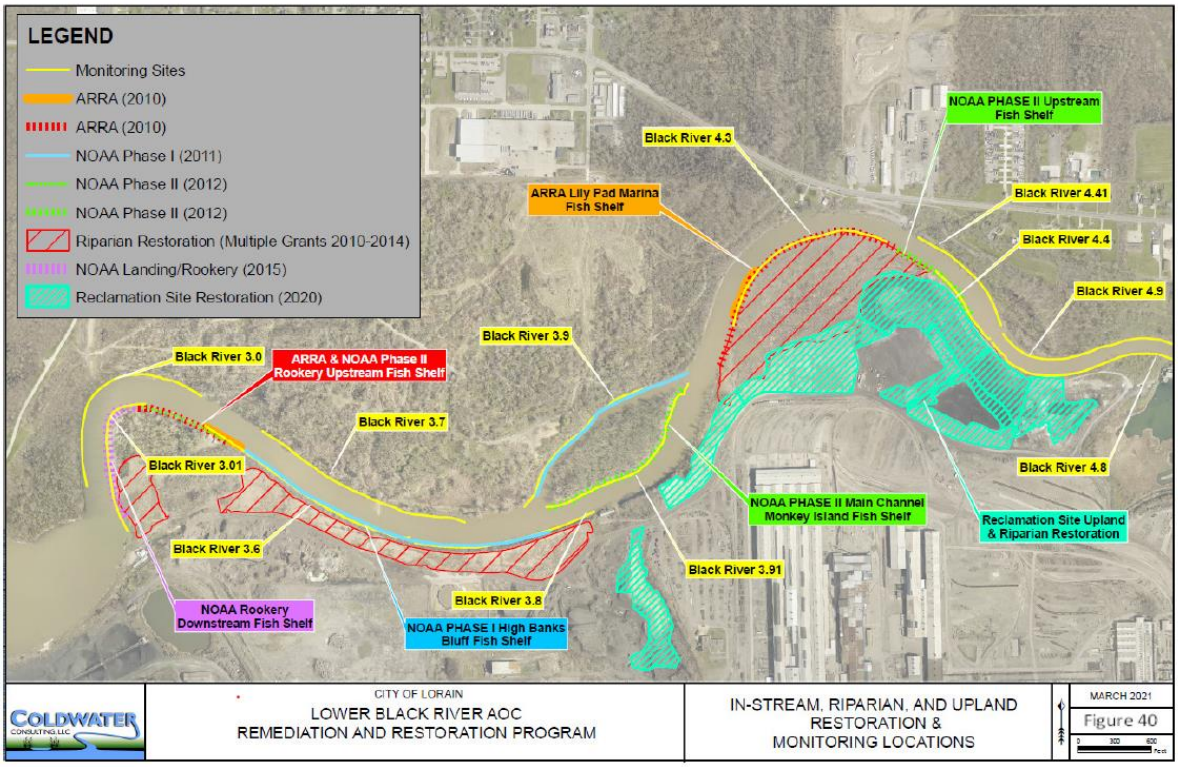

Figure 10. Locations of Black River Fish Shelves in the Upper Lacustuary.

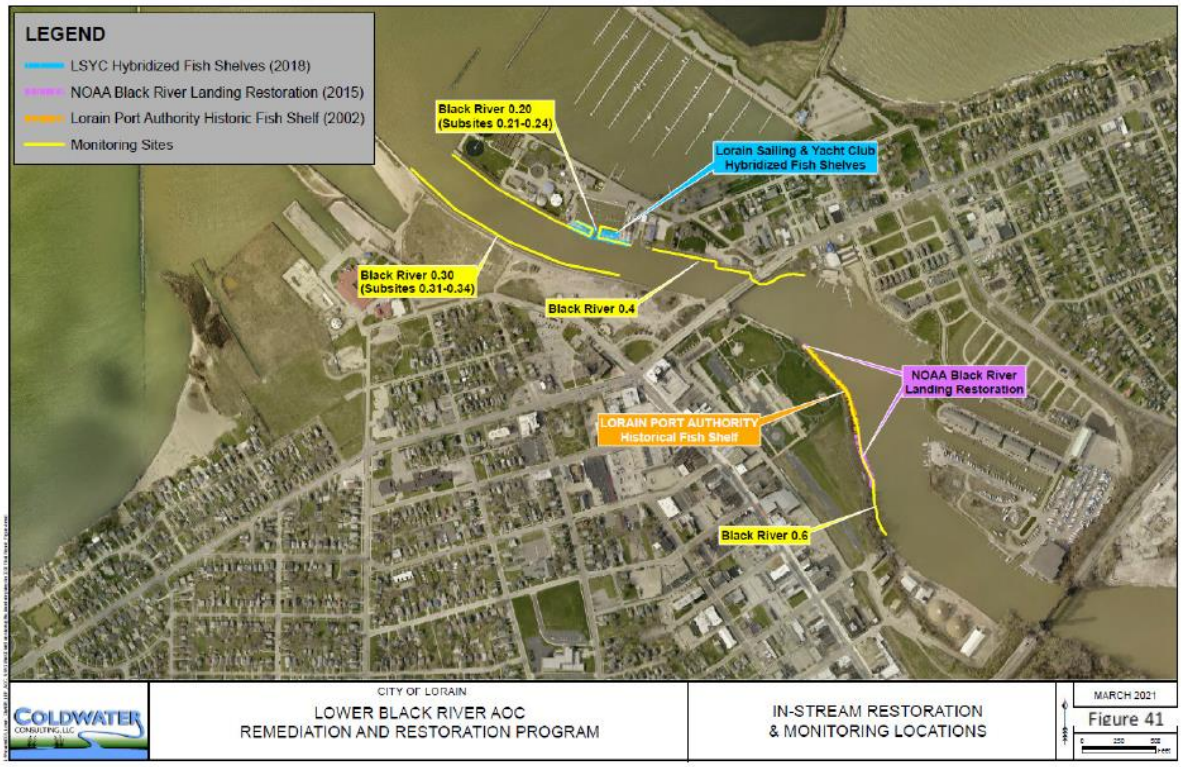

Figure 11. Locations of Black River Fish Shelves in the Lower Lacustuary.

As previously discussed, a comprehensive review of the benthos and fish communities and fish habitat in the Black River lacustuary was conducted by MBI between 2010 and 2020 (MBI, 2021). In addition to evaluating BUI statuses and sources of impairment, the report also assessed the effectiveness of restoration actions taken to improve habitat (MBI, 2021). This was done by comparing pre- and post-restoration assessment results and by comparing the post-monitoring results to historic baselines.

The results of the assessments showed that the fish populations and habitat had likely improved because of the restoration efforts. Improved fish habitat (Lacustuary QHEI [L-QHEI]) and assemblage measures (L-IBI and MIwb) and slight increases in the proportion of sensitive fish species were observed in the lacustuary since the installation of the fish shelves. Improvements in benthic community scores (L-ICI) within the upper lacustuary (RMs 3 to approximately 6.6) have been observed since 2010 and were believed to have been related to increasing lake levels and decreasing TDS loads from the Elyria WWTP. Water quality impairments, such as nutrient and TDS loadings, were likely limiting the improvements to both fish and benthos communities in the Black River lacustuary.

Benthic Community Evaluation

To evaluate the status of the Degradation of Benthos BUI, the most current benthos survey data (ICI/L-ICI) available for each site collected within the last 10 years and averaged across each assessment unit were compared to the state's restoration targets (Table 5). Scores for individual sites can be seen in Appendix B. The aquatic life use designation for all assessed segments of the Black River and French Creek within the AOC is Warmwater Habitat (WWH).

Table 5. Black River AOC Benthic Community BUI Scores.

	ICI Targets and Assessment Unit Scores		
Site Type	**WWH Targets**	**Black River**	**French Creek**
Riverine	30	45	30
Lacustuary	34	20	-

= meeting BUI removal target = not meeting BUI removal target

A total of six locations along the riverine/free-flowing section of the Black River were sampled between 2015-2023. The averaged score of the Black River riverine section was 45, exceeding the riverine BUI target of 30. Conversely, the average score of 20 for the Black River lacustuary did not meet the BUI removal target of 34.

All nine sites assessed for benthos in French Creek were considered riverine sites. The average ICI of 30 is meeting the BUI removal target.

Ohio Lacustuary Benthos Community Assessment

While historic data suggests widescale impairments to benthic communities in lacustuaries across Ohio, the need for a recent, comparable, holistic dataset was required to properly evaluate the current state of benthos in Ohio lacustuaries. The Ohio AOC Program completed an assessment of Ohio AOC and non-AOC lacustuaries in 2025 by evaluating benthic macroinvertebrate communities across 43 sites in 25 Ohio lacustuaries (Figure 12). Sixteen of the lacustuaries were located within AOCs, and the remaining 9 were located in non-AOCs.

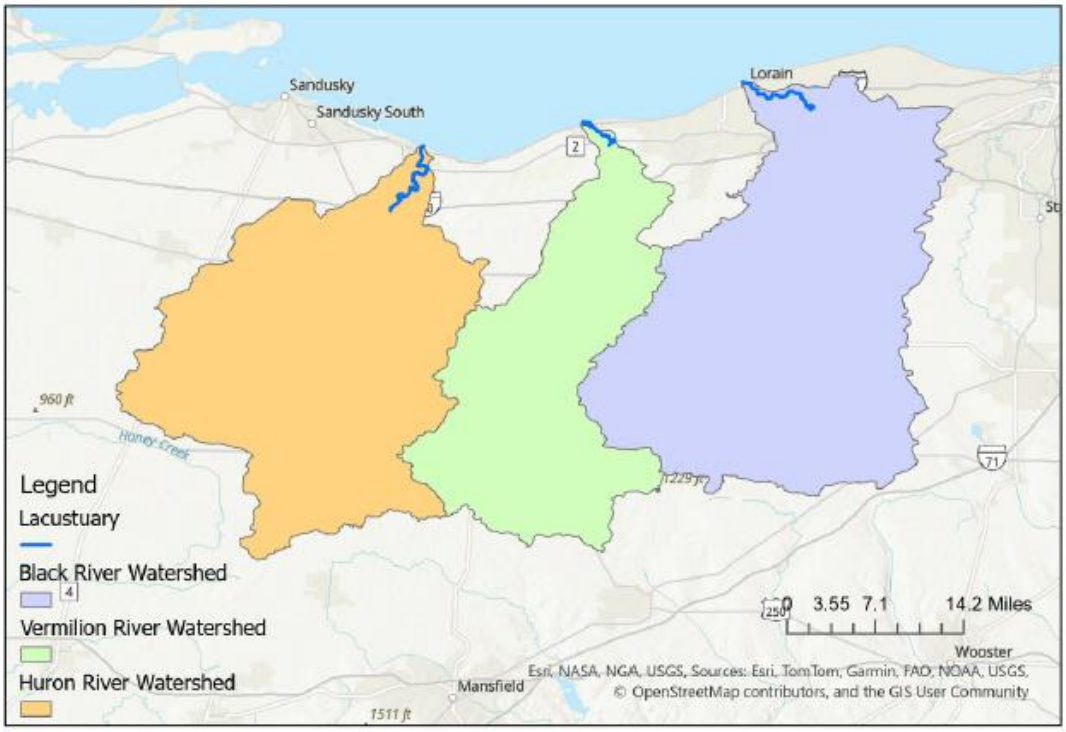

Figure 12. Map of the Black River and Similar Watersheds.

Results from the Ohio-wide assessment showed the lacustuaries average L-ICI scores were marginally higher outside of an AOC with an average score of 23 compared to 21 for sites within AOCs. Overall, Welch's two-sample t-test indicated that benthos community scores did not differ significantly between AOC and non-AOC lacustuaries ($t = -0.35$, $df = 29.3$, $p = 0.73$). Only 2 of the 9 non-AOC lacustuaries met the L-ICI BUI restoration target of 34, and only 3 of the 19 non-AOC individual sites scored a 34 or higher. This indicates that impaired benthos communities are not exclusive to Ohio AOCs, but rather a region-wide issue.

Two non-AOC lacustuaries that were comparable to the Black River AOC lacustuary in terms of watershed size and similar mix of land uses, (predominantly agricultural followed by forested/developed) (Appendix C) were evaluated in more detail. These comparable lacustuaries were the Vermilion and Huron rivers (Figure 13). The assessment for direct comparison with the Black resulted in L-ICI averages of 17 for the Vermillion River, 16 for the Huron River, and 20 for the Black River (Table 6). The highest individual score was observed at Black River RM 5.2, and the lowest at Huron RM 6.6. Low to non-detect flows and some degree of siltation were observed at all sampling

sites across the three lacustuaries, which can contribute to degraded benthos communities. Additionally, river margin quality was rated fair to poor at all sites and there was an overall lack of high-quality habitat. This further supports that degraded benthos communities are consistent with non-AOCs lacustuaries, and that benthos communities and habitat features in the Black River lacustuary are comparable to non-AOCs.

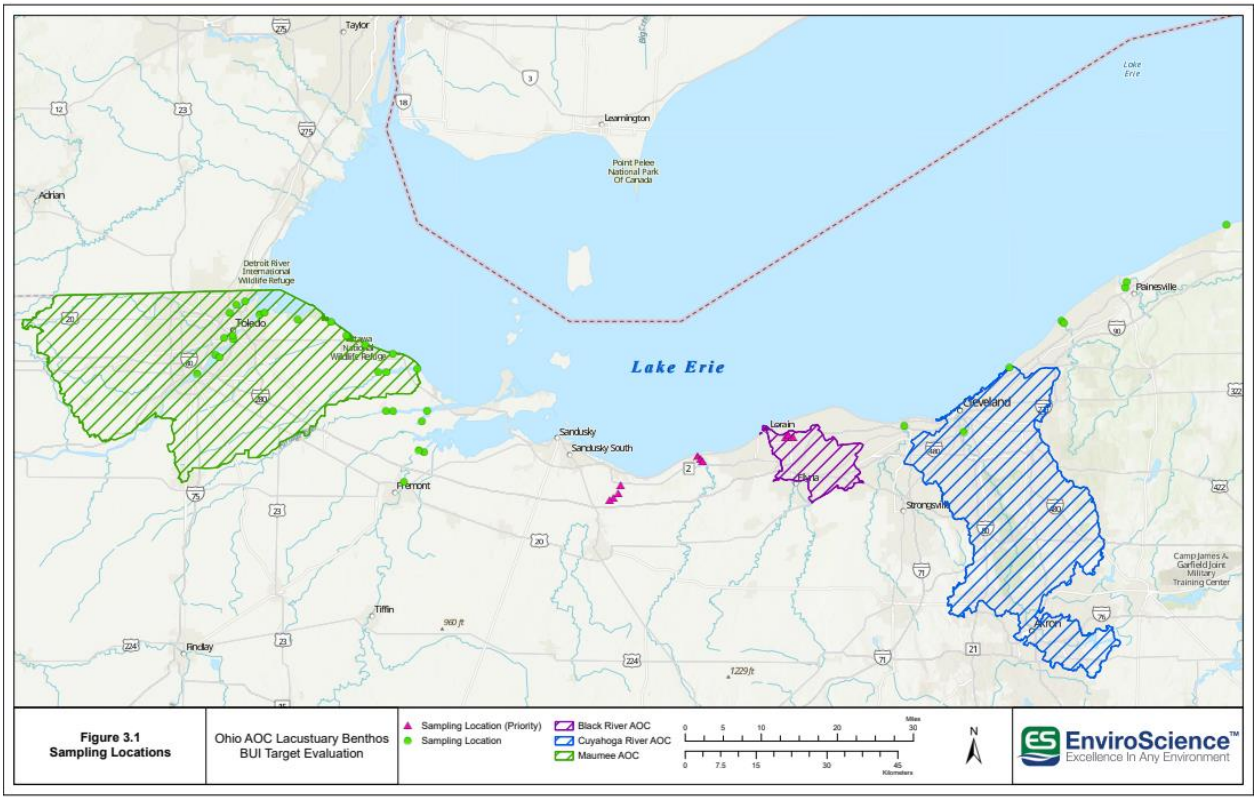

Figure 13. Ohio Lacustuary Benthos Assessment Map of Sampling Sites.

Table 6. Black River Comparable Lacustuary L-ICI Results.			
Lacustuary	**RM**	**L-ICI**	**Assessment Unit L-ICI Average**
Vermillion River	0.9	20	**17**
Vermillion River	1.5	16	
Vermillion River	1.9	16	
Huron River	3.2	12	**16**
Huron River	5.2	16	
Huron River	6.6	10	
Huron River	7.9	26	
Black River	3.8	16	**20**
Black River	4.4	16	
Black River	5.2	28	

Conclusion

Black River

The results of the Degradation of Benthos BUI evaluation determined that the riverine section of the Black River was not impaired. This is likely related to good habitat marked by no channelization, boulder-cobble-gravel substrates, moderate to high sinuosity, and deep pools. During the 2023 MBI assessment at three free-flowing sites, tolerant organisms were observed in low numbers throughout the free-flowing reach. This section of the Black River has historically not been impaired for the Degradation of Benthos BUI, but some improvements in benthic communities have been observed over time. There was an increase in the number of mayfly taxa as compared to 2015 assessments, and the overall average ICI increased from 32.5 in 2012 (Ohio EPA, 2016) to the most current average of 45.

The BUI evaluation determined that the Degradation of Benthos BUI was impaired in the Black River lacustuary. As discussed earlier in the report, the primary variables negatively affecting the benthos community in the lacustuary were identified and included elevated levels of TSS/TDS and nutrients and insufficient in water habitat. These variables are commonly observed in other Ohio rivers and estuaries. The Ohio EPA listed habitat modification, nutrient enrichment, hydromodification, sedimentation/ siltation and organic enrichment as the top reasons for aquatic life impairments across Ohio's watersheds and large rivers (Ohio EPA, 2022).

Based on International Joint Commission and U.S. EPA, as incorporated into Ohio's Delisting Guidance and Restoration Targets for Ohio Areas of Concern, a BUI can be removed if 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. The 2025 Ohio Lacustuary Benthos Assessment provided evidence that degraded benthic communities are commonly observed across Ohio lacustuaries.

A significant portion of the nutrients and sediment in the Black River's lacustuary originate from outside of the AOC, as outlined in the 2008 TMDL and Black River WAP. Objectives to reduce nutrients and sedimentation throughout the watershed have been identified in these documents but should be implemented outside of the AOC Program. Regulatory control measures, such as the Ohio EPA's NPDES, CSO, and Stormwater MS4 programs, should be used to address point-source pollution issues. Methods to reduce non-point source pollution are outlined in Ohio EPA's Nonpoint Source Pollution Control Program plan, the voluntary 319 Program, and other state programs. Within the Black River watershed, recommended measures to reduce nutrient and sediment loading generally include implementing agricultural best management practices, stabilizing stream banks, enhancing/creating wetlands and riparian habitat, and resolving failing septic systems. The Black River Watershed Action Plan lists Ohio EPA Section 319(h) Non-point Source Program, Ohio EPA Surface Water Improvement Fund, and local stormwater districts as potential programs and funding sources to implement non-point source projects. Projects to improve water quality should continue to be a priority within the Black River AOC and larger watershed for instream biology to fully recover.

There have been significant investments within the Black River AOC to improve benthic communities and habitat, particularly within the Black River lacustuary. The AOC Program has completed all MAs along the Black River to remediate legacy contaminated sediment, created 1.6 miles of fish habitat, stabilized 3.3 miles of riverbank, and restored 36 acres of wetlands and 103 acres of upland/riparian habitat. Benthos impairments in the Black River lacustuary are primarily related to limited habitat and degraded water quality. Sediment and water column toxicity has decreased significantly as a result of AOC and non-AOC related activities, but evidence suggests that low level chronic toxicity may still be present in some areas. While BUI removal is still recommended based on the evidence outlined in this document, future infrastructure work, remediation of remaining exposed steel slag, habitat restoration, and water quality improvements should be considered and should occur outside of the AOC Program.

French Creek

French Creek meets the restoration targets for the Degradation of Benthos BUI. The 2019 French Creek Toxicity Study did not detect sediment or water column toxicity, which supports the recent recovery of the fish and benthos communities in the lower section of French Creek (RMs 0.5 to 6.9). Benthic community scores ranged between fair to good within that section. Poor benthos communities were observed in the one headwater section of French Creek, most likely relating to insufficient habitat. Future habitat improvement projects should be considered in the headwater section of French Creek to help improve fish and benthos communities. Overall, the benthos BUI removal target of 30 was met in French Creek.

Recommendation

Based upon the findings of the BUI evaluation, the Ohio Lake Erie Commission and Ohio EPA recommend the removal of the Degradation of Benthos BUI from the Black River AOC based on the following conditions:

- The Degradation of Benthos BUI restoration targets are met in French Creek and the riverine section of the Black River.
- Degraded benthic communities are observed in most lacustuaries across Ohio; therefore, the impairment is not exclusive to the Black River AOC but rather typical of region-wide conditions. When compared with two similar and nearby non-AOC watersheds, the benthic community in the Black River scored marginally better.
- Water quality impairments are likely limiting full biological recovery in the Black River lacustuary. A significant portion of nutrient and sediment loading originates from outside of the AOC boundary and the lesser loading from inside of the AOC is largely related to surrounding land use and infrastructure issues. Those issues need to be addressed through other programs. Activities to improve water quality have been identified and are recommended to occur outside of the program, including the city of Elyria LTCP and local MS4 plans.

A three-week public comment period was issued by Ohio EPA and Ohio Lake Erie Commission for the Draft BUI Removal Recommendation from May 27 through June 18, 2026. No public comments were received. A letter of support for the removal of the Degradation of Benthos BUI from the Black River AOC Advisory Committee can be found in Appendix D.

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Appendix A. 2026 BUI Restoration Target

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 BUI Restoration Targets for macroinvertebrate community.

State of Ohio Restoration Target

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

In the riverine areas, upstream from the lake affected waters (lacustuary or freshwater estuary), the average of the combined quantitative Invertebrate Community Index (ICI) values and the numerically converted qualitative values within the assessment unit do not significantly diverge from the State of Ohio's BUI Restoration Targets for macroinvertebrate community;

AND

In lake affected waters (lacustuary or freshwater estuary), the average of the combined quantitative L-ICI values and the numerically converted qualitative values do not significantly diverge from the State of Ohio's BUI Restoration Targets for macroinvertebrate community. (See Appendix B for additional information);

Site Type	Invertebrate Community Index (ICI) Restoration Target			
	EWH	WWH	MWH	LRW[3]
Riverine[1]	42	30	22	8
Lacustuary[24]	34	34	34	12

[1]Ohio EPA has determined the WQS non-significant departure value for EWH and WWH riverine ICIs to be 4 points; the BUI restoration targets presented in this table are based on the values of the non-significant departure from Ohio WQS.
[2]Non-significant departure for the lacustuary ICI value (L-ICI) has not yet been determined.
[3]BUI restoration targets for MWH and LRW are based on benchmarks as there are no criteria in Ohio WQS. The narrative evaluation is not applicable for LRW; if other criteria exist in the assessment unit it should be used.
[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 (Ohio EPA, 1995; Thoma, 1999).

OR

In waters where benthic degradation has been attributed to contaminated sediments, this BUI can be considered restored in these areas when the remedial action(s) to address the contaminated

sediments have been implemented to the extent practicable and the associated remediation goals have been achieved. *(Applicable in contaminated sediment areas only)*

OR (*Maumee AOC only)*
In Maumee Bay, *Hexagenia* (burrowing mayfly 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

- If both qualitative (narrative) and quantitative (ICI) data were collected at the same time for the same sample site; only the quantitative (ICI) data should be used to determine status.
- Assessment units can have qualitative (narrative) and quantitative (ICI) data that were collected at different sites. All sites within the same assessment unit should be averaged together when determining the overall average value for that assessment unit.
- The overall assessment unit average can be based on data from different years.
- Assessment units are the 12-digit HU, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed.
- 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.
- Examples of remedial programs that could be used to address contaminated sediment impacts to benthic community health include, but are not limited to Superfund, Resource Conservation and Recovery Act (RCRA) or Great Lakes Legacy Act (GLLA).

Potential Data Sources

- Ohio EPA ICI data
- Ohio EPA Mayfly data
- Other Mayfly data
- Other ICI and qualitative Level 3 Credible Date (e.g., data collected by state certified data collectors or federal agencies)
- US EPA, Ohio EPA sediment 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 quantitative Invertebrate Community Index (ICI) and the qualitative narrative evaluations should be used to assess the macroinvertebrate community characteristics.

Qualitative narrative macroinvertebrate sampling based on Ohio EPA protocol does not yield a numeric value. Since a large number of the sites only have qualitative narrative data for macroinvertebrates, a numeric equivalent has been outlined for each narrative value. The table below should be used to make a narrative to numeric conversion. Once converted, the numeric value should be averaged with any other qualitative and quantitative data for an overall assessment unit average; resulting in one value for determining status for that assessment unit.

Qualitative Macroinvertebrate Narrative Conversion	
Narrative Evaluation	**Equivalent Value for Averaging Narratives**
Exceptional	46
Very Good	42
Good	34
Marginally Good/Moderately Good	30
Fair	21
Non-significant Departure/Low Fair	13
Poor	8
Very Poor	6

The quantitative 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. Ohio EPA has determined non-significant departure for EWH and WWH 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 Modified Warmwater Habitat (MWH) or Limited Resources Waters (LRW) but benchmarks or narrative values were used as a basis for the BUI restoration targets in riverine and lacustuary waters.

In addition to the river habitat areas, two other zones exist – the area where the river the lake water mix and Lake Erie shoreline. The Lake Erie Shoreline Area designation applies to areas of open waters/bays where the water depth is equal to or less than three meters. This area was previously referred to as the Nearshore Area; however, Ohio EPA has modified how its monitors/measures Lake Erie and its bays. Ohio EPA refers to the area where the river and lake mix as a lacustuary (combination of the terms lacustrine and estuary). The lacustuary 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. A non-significant departure value for L-ICI has not yet been determined. (see Appendix B for more detail and a description of lacustuaries within Ohio's AOCs). Since a shoreline ICI (LE-ICI) has not been developed, an evaluation of *Hexagenia* (burrowing mayfly nymphs) should be used as a BUI restoration target for shoreline areas.

The restoration target for this BUI was developed from WQS and guidance for macroinvertebrate community evaluation, but the restoration targets are not the same as the WQS or guidance. These differences include: 1) the non-significant departure values were used to set the restoration target (where appropriate) and 2) metric scores are averaged across an assessment unit for each aquatic life use. Additional information on how to calculate the average index value for comparison to the restoration target follows.

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. Each AOC's site conditions will need to be evaluated using the lacustuary evaluation guidance but will need to consider its applicability and if local targets will need to be established or how and/or if conditions are similar to regional conditions. 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 restoration target set for ICI and L-ICI for this BUI to be removable for that assessment unit. The calculated average value of each assessment unit in the AOC needs to meet the restoration 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 AOC Program 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 annual 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 restoration target assessments, if any single ICI sample is 50% or less of the target or any single narrative is "Very Poor", then the whole assessment unit <u>may</u> be considered impaired. These conditions may be indicative of a hotspot being present and additional investigation and, potentially, restoration actions may be needed. If a sampling site significantly lowers the assessment unit average due to site conditions that are not representative of the assessment unit (i.e., highway interchange) or are highly impacted by the surrounding land use that will likely not be removed/altered (i.e., commercial development), then that site should not prohibit this BUI from

being removed. Instead, these sites may be removed from the status determination data set and a new status will be calculated without these non-representative, non-restorable sites included.

For shoreline areas (e.g., open water areas, bays), the status of the BUI should 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 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).

Ohio's BUI restoration target for the Degradation of Benthos includes multiple pathways for removal. The first pathway utilizes an established comprehensive multi-metric set of indices (ICI, L-ICI) for evaluating the health of the macroinvertebrate community. The second pathway is only applicable in the open waters of Maumee Bay within the Maumee AOC. This pathway is based on the density of the *Hexagenia* (burrowing mayflies) nymphs. Both of these pathways are described above and are applicable to those areas that do not have an impairment due to contamination in sediments.

The third pathway, added in version 3.0 (2017) of this Guidance, addresses areas where chemical contamination in sediments has been identified as the primary cause of the impaired benthos in those areas. This BUI removal pathway recognizes that each contaminated sediment project will have project-specific remedial goals for contaminated sediments. After remedial actions to achieve remedial goals have been implemented, the primary cause of the BUI impairment in that area will have been addressed. However, the recovery of the benthic communities to the level necessary to achieve the restoration target may take an extended period of time. That extended period should not preclude the removal of the Degradation of Benthos BUI in areas where contaminated sediments have been addressed. Therefore, when a remedial action to address sediment contamination has been completed in accordance with its approved plan and confirmed with applicable post-remedy confirmation sampling to verify that a contaminated sediment project's remedial goals have been achieved to the extent practicable, this BUI can be considered restored provided the areas where contaminated sediment were not the primary cause also meet their respective BUI restoration target.

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Appendix B. Benthic Community Site Scores

Table B1. Black River Free Flowing Benthos Scores by RM.				
		ICI		
RM	Collector	2015	2023	Most Recent
15.1	MBI	-	46	**46**
11.6	MBI	54	-	**54**
10.7	MBI	-	46	**46**
9.9	MBI	42	-	**42**
8.38	MBI	-	44	**44**
7	MBI	40	-	**40**
Average				**45**

Table B2. Black River Lacustuary Benthos Scores by RM.					
		L-ICI			
RM	Collector	2017	2023	2025	Most Recent
6.1	MBI	-	52	-	**52**
5.21+	MBI	-	30	-	**30**
5.2+	EnviroScience	-	-	28	**28**
4.85*	MBI	11	-	-	**11**
4.4	EnviroScience	-	-	16	**16**
4.2*	MBI	10	-	-	**10**
3.8	EnviroScience	-	-	16	**16**
3.65*	MBI	12	-	-	**12**
3.4	MBI	-	14	-	**14**
3.0*	MBI	11.3	-	-	**11.3**
Average					**20**

* = multiple L-ICI scores were collected within 0.2 miles of each other during the same year. These scores were aggregated to produce one representative value per site.

Table B3. French Creek Free Flowing Benthos Scores.				
		ICI		
RM	Collector	2017	2023	Most Recent
10	MBI	-	8	**8**
6.9	FWS/EnviroScience	33.3	-	**33.3**
6.1	MBI	-	34	**34**
5.5	FWS/EnviroScience	24.7	-	**24.7**
4.5	FWS/EnviroScience	26	-	**26**
3.7	MBI	-	40	**40**
3.2	FWS/EnviroScience	31.3	-	**31.3**
2.3	MBI	-	36	**36**
0.54	MBI	-	36	**36**
Average				**30**

Appendix C. Land Use of Black River and Similar Watersheds

Table C1. Land Uses by Watershed (2021)			
Land Use Type	Black River	Vermilion River	Huron River
Developed	25%	10%	13%
Forested	18%	19%	13%
Agricultural	50%	65%	72%
Other	7%	5%	2%

Appendix D. Letter of Support Black River AOC Advisory Committee

Black River Advisory Committee
Lorain County Conservation District | Facilitating Organization
42110 Russia Rd., Elyria, OH 44035
blackriveraoc@gmail.com
(440) 406-3365

June 26, 2026

Mr. John Logue, Director
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, OH 43216-1049

Joy Mulinex, Executive Director
Ohio Lake Erie Commission
P.O. Box 1049
Columbus, OH 43216-1049

Re: *Removal of Beneficial Use Impairments – Degradation of Benthos from the Black River Area of Concern*

Dear Directors Logue and Mulinex:

The Black River Area of Concern (AOC) Advisory Committee (BRAC), representing an array of agencies, nonprofits, and the public, offers its support to the Ohio Lake Erie Commission in their recommendation to remove the Beneficial Use Impairments for Degradation of Benthos from the Black River AOC.

BRAC has reviewed the available data, materials, and documents for the BUI removals in the Black River AOC over the previous year. Based on the information provided to the BRAC and the additional efforts made by Ohio EPA to address questions and comments during our discussions, the Advisory Committee has voted unanimously to support the request for its removal.

If Ohio Lake Erie Commission and Ohio EPA concur that the removal of this beneficial use impairment is warranted, BRAC requests the agencies to proceed with the process of removing this BUI from the Black River AOC.

We congratulate you and your staff as well as the many federal, state, and local partners who have been instrumental in achieving this environmental improvement. Removal of this last BUI will benefit not only the people who live and work in the AOC, but all the residents of Ohio and the Great Lakes basin as well. We look forward to the continuation of this productive relationship with your agency as we work together to delist this AOC in the year to come.

Sincerely,

Donald C. Romancak
Chair, Black River AOC Advisory Committee
Lorain County Storm Water and Community Development Coordinator
440-328-2325