

Removal Recommendation for the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat Beneficial Use Impairments from the Black River Area of Concern



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Lake Erie
Commission

Environmental
Protection Agency



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Purpose

The purpose of this document is to recommend the removal of the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat Beneficial Use Impairments (BUIs) from the Black River Area of Concern (AOC). This document provides information and documentation of fish populations and habitat 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 (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. Six of the BUIs have been removed:

- #1 Restrictions on Fish and Wildlife Consumption REMOVED 2016
- #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

Remaining impaired BUIs:

- #3 Degradation of Fish and Wildlife Populations
- #6 Degradation of Benthos
- #14 Loss of Fish and Wildlife Habitat



Figure 1. Black River AOC boundary

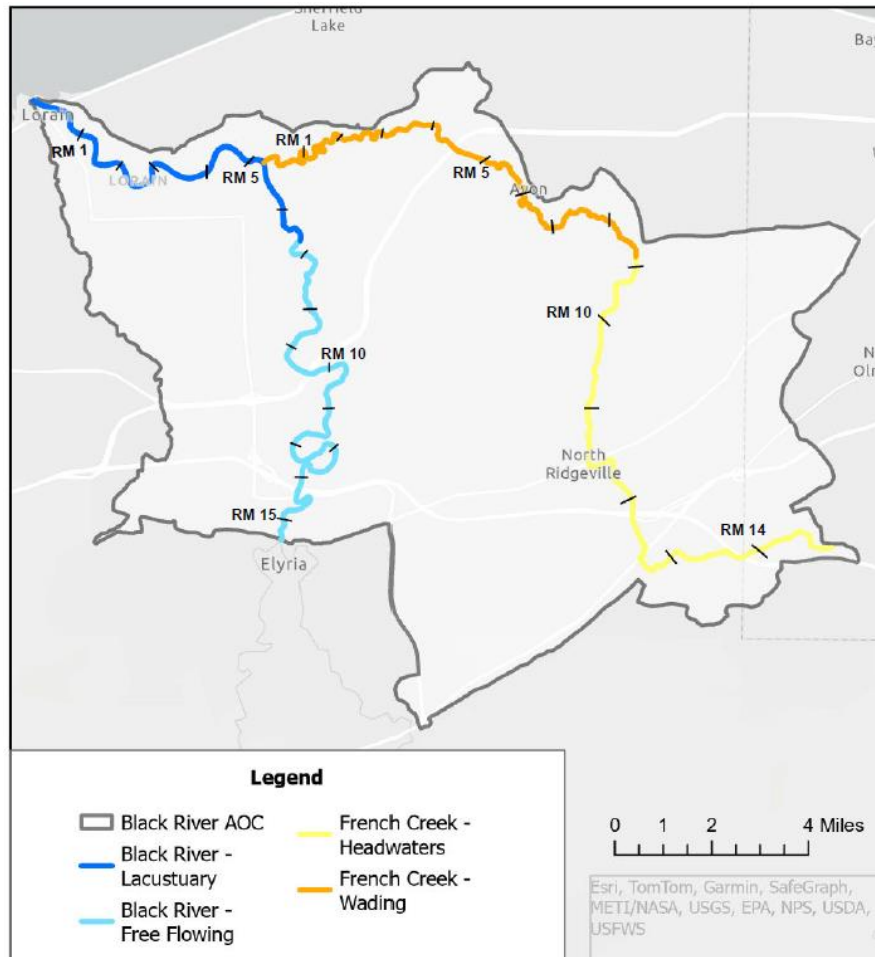


Figure 2. Black River and French Creek RMs

BUI Listing Criteria and Impairment Listing

Degradation of Fish and Wildlife Populations

The Degradation of Fish and Wildlife Populations BUI was determined to be impaired for fish populations in the Black River 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 “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” (BRCC, 1994). The report found the degraded fish populations in the Black River mainstem to be related to high turbidity and sedimentation and lack of sufficient habitat. Turbidity can negatively affect fish health and populations by clogging fish gills, hindering visibility, reducing disease resistance, and altering egg and larval development (U.S. EPA, 2021). Primary sources of sediment to the Black River and French Creek were identified as non-point sources, erosion, and agricultural runoff. The report also stated there were no contaminants in the Black River or French Creek water columns that “would be

associated with observed impacts on fish populations”, although sediment data from French Creek revealed organic and inorganic contaminants that may affect certain fish species based on 1992 Ohio EPA data (BRCC, 1994). 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 low dissolved oxygen due to the maintained depth of ship channel and sediment oxygen demand, 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 Fish Populations BUI in the Black River mainstem (BRCC, 2011). Suburbanization and infringement upon riparian corridor affecting high-quality habitats and low flow conditions due to flat terrain were the causes of impairment cited for French Creek. 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.

The Stage 1 report concluded that there was not enough data to determine whether wildlife populations were impaired in the Black River AOC, and that further evaluation tools were needed. More recent data was evaluated in the Stage 2 report, which concluded that the wildlife portion of the Degradation of Fish and Wildlife Populations BUI was not impaired based on the following: “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. Population studies of these birds and mammals indicate that their numbers are increasing, due to successful reintroduction efforts and declining levels of pollution” (BRCC, 2011).

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 fish populations 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 (LRAU) (or other agreed upon stream segment or subwatershed) are in significant departure from the State of Ohio’s BUI Restoration Targets for fish community” (Ohio EPA & Ohio Lake Erie Commission, 2023). For wildlife populations, the BUI is considered “Impaired” if the State wildlife population or another similar study indicate degraded or absent populations of selected sentinel species.

Loss of Fish and Wildlife Habitat

The Loss of Fish and Wildlife Habitat BUI was determined to be impaired in the RAP Stage 1 report based on the IJC listing criteria. Based on the criteria, the BUI should be listed as “Impaired” when “fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a perturbation in the physical, chemical, or biological integrity of the Boundary Waters, including wetlands” (BRCC, 1994). Primary causes of impairment in the Black River mainstem were cited as dredge activities, channel bank protective measures, and flow modifications. Causes of impairment specific to French Creek were not identified, although excessive sedimentation and flow modifications were cited as possible causes throughout the remainder of the AOC.

The Stage 2 Report indicated that the free-flowing section of the Black River (River Miles [RMs] 6.6 - 15) and the wading section of French Creek (mouth – RM 8) were not impaired for the Loss of Fish and Wildlife Habitat BUI. The Black River lacustrine (mouth – RM 6.6) and headwater section of French Creek were determined to be impaired and not have sufficient high-quality fish habitat (BRCC, 2011).

Ohio's current listing criteria for the fish habitat component of this BUI 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 departure from the State of Ohio's BUI Restoration Targets for habitat." (Ohio EPA & Ohio Lake Erie Commission, 2023). The wildlife habitat component of this BUI is considered "impaired" if insufficient or poor quality habitat is identified as the cause of the Degradation of Wildlife Populations BUI. If the wildlife component of Fish and Wildlife Populations is not designated as impaired, then this beneficial use should not be listed as impaired. Because the Black River AOC is not impaired for wildlife populations, it is also not impaired for wildlife habitat.

State of Ohio Restoration Target and Removal Criteria

The U.S. EPA's and Delisting Principles and Guidelines and Ohio AOC BUI Restoration Target guidance (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 Fish and Wildlife Populations

The current restoration targets for the Degradation of Fish and Wildlife Populations BUI state that this beneficial use can be removed when the following conditions are met:

For Fish: In the riverine areas upstream from the lake affected waters (lacustrine 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 the State of Ohio's BUI Restoration Targets for fish community.

Table 1. Riverine Fish Population Restoration Targets								
Index Type – Site Type	Erie/Ontario Lake Plain (EOLP)				Huron-Erie Lake Plain (HELP)			
	EWB	WWH	MWH	LRW	EWB	WWH	MWH	LRW
IBI - Headwaters	46	36	24	18	46	24	20	18
IBI – Wading*	46	34	24	18	46	28	20	18
IBI - Boat*	44	36	24	16	44	30	20	16
MIwb – Wading	8.9	7.5	6.2	4.5	8.9	6.8	5.6	4.5
MIwb – Boat	9.1	8.2	5.8	5.0	9.1	8.1	5.7	5.0
EWB = Exceptional Warmwater Habitat, WWH = Warmwater Habitat, MWH = Modified Warmwater Habitat, LRW = Limited Resource Water								

AND

In lake affected waters (lacustrine or fresh water estuary), the average L-IBI/N-IBI and the average MIwb values do not significantly diverge from the State of Ohio's BUI Restoration Targets for fish community. (See Appendix B for additional information and lacustrine/nearshore locations in each AOC).

Table 2. Lacustrine and Nearshore Fish Population BUI Restoration Targets				
Type	EWB	WWH	MWH	LRW
IBI – Lacustrine (L-IBI)	42	42	27	16
IBI – Nearshore (hard bottom) (N-IBI-hard)	42	42	NA	NA
IBI – Nearshore (soft bottom) (N-IBI-soft)	31	31	NA	NA
MIwb – Lacustrine (L-MIwb)	8.6	8.6	6.6	5.1
MIwb – Nearshore (hard bottom)(N-MIwb-soft)	8.9	8.9	NA	NA
MIwb – Nearshore (soft bottom) (N-MIwb-soft)	7.2	7.2	NA	NA

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 multi-metric index patterned after an original IBI described by Karr (1981) and Fausch et al. (1984). It should also be noted that Ohio EPA has a Low-End Scoring Adjustment as a part of its guidelines for IBI evaluations. Many of these adjustments are based on a low number of fish collected in a sample; however, even with sufficient sample numbers in some cases this metric score may still be manually adjusted. The low-end adjustments to the score may affect the assessment unit averages. The metric conditions for these sites should be consulted if the assessment unit is impaired to determine what actions are needed to improve the site. For more information on this adjustment, see the Ohio EPA 2014 references.

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. However, the MIwb metric is not applicable to sample locations with drainage areas of 20.0 square miles or less. When averaging the MIwb values for the assessment unit this needs to be taken into consideration. The status should be determined based on assessment unit averages for only those sites with applicable MIwb values. The absence of a MIwb value (for this reason) does not affect the status and will not make an assessment unit impaired.

For Wildlife: Ohio Department of Natural Resource'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, and river otter) or other AOC appropriate sentinel species for at least 3 of the last 5 years.

Loss of Fish Habitat

The current restoration targets for the Loss of Fish and Wildlife Habitat BUI state that 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 (lacustrary or fresh water estuary), the average Qualitative Habitat Evaluation Index (QHEI) value within an assessment unit do not significantly diverge from the State of Ohio's BUI Restoration Targets for habitat.

AND

In lake affected waters (lacustrary or fresh water estuary), the average Lacustrary Qualitative Habitat Evaluation Index (L-QHEI) or Nearshore Qualitative Habitat Evaluation Index (N-QHEI) values does not significantly diverge from the State of Ohio's BUI Restoration Targets for habitat.

Table 3. Qualitative Habitat Evaluation Index (QHEI) Restoration Targets				
Site Type	EPH	WWH	MWH	LRW
Riverine – headwaters	70	55	43	NA
Riverine	75	60	45	NA
Lacustrary² (L-QHEI)	55	55	<i>n/a</i>	<i>n/a</i>
Nearshore³ (N-QHEI)	50	50	<i>n/a</i>	<i>n/a</i>

When measuring the status of this BUI, the Qualitative Habitat Evaluation Index (QHEI), Lake Quality Habitat Evaluation Index (L-QHEI) or Nearshore Quality Habitat Evaluation Index (N-QHEI) are used to assess habitat quality. The QHEI, L-QHEI, and N-QHEI are multi-metric indices.

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)

Summary of BUI Remedial Plans and Actions

As previously outlined, several variables within the Black River AOC have been associated with the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs. Habitat deficiencies due to hardened shorelines and water quality impairments within the lacustuary were acknowledged in the Stage 1 and 2 RAPs to be the primary factors driving the Black River lacustuary BUIs. 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).

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 3). 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).



Figure 3. Steel plants along RMs 2-5 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 Wastewater Treatment Plant (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 habitat, and improve water quality. A Total Daily Maximum Load (TMDL) was produced for the Black River watershed to identify stressors and recommend strategies for improving water quality (Ohio EPA, 2008). The Black River AOC Advisory Committee and other local stakeholders produced two remediation 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) (Ohio EPA, 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.

Total Daily Maximum Load

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 included nutrients, siltation, organic enrichment/dissolved oxygen, unknown toxicity, other habitat alterations, and bacteria (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 TMDL.

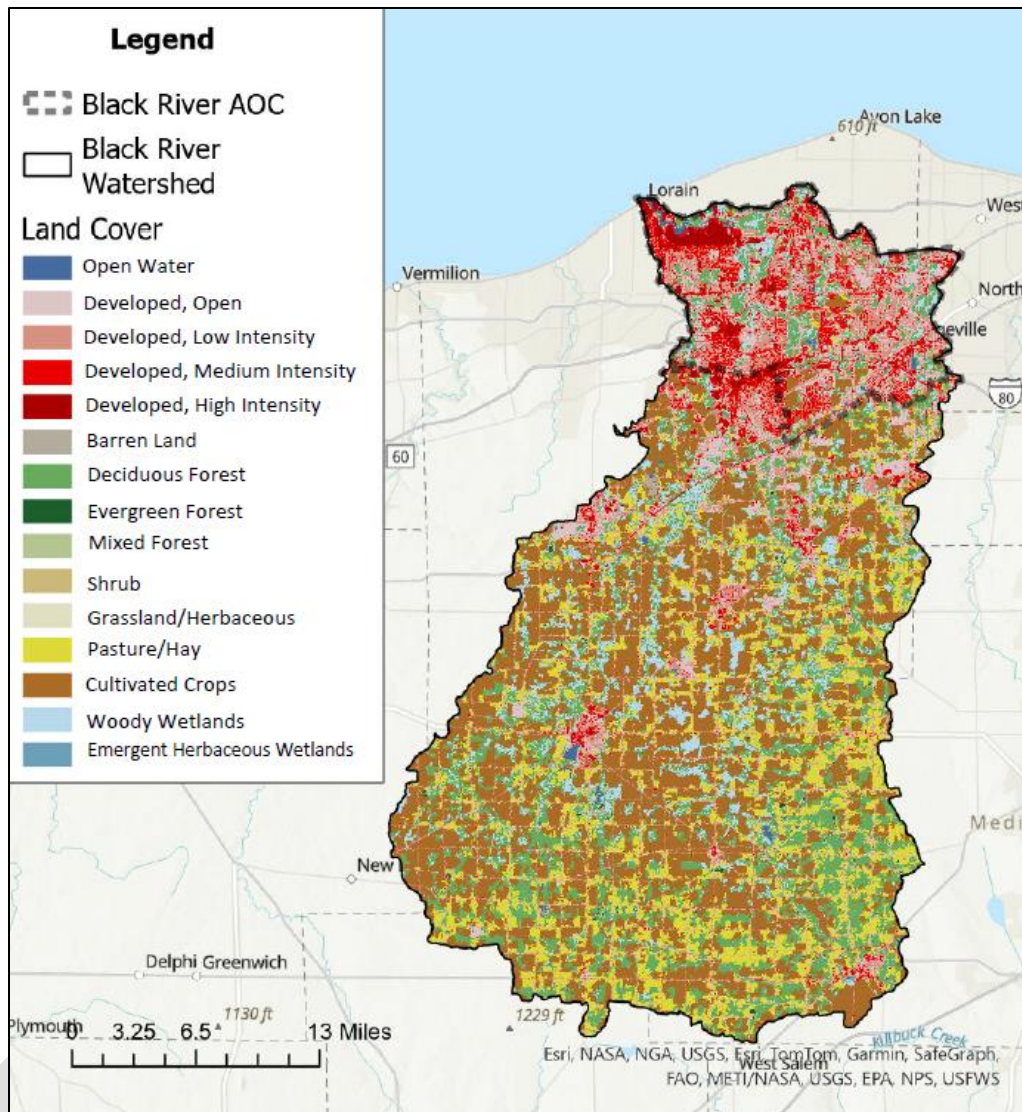


Figure 4. Black River Watershed Land Cover (2023)

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.

Watershed Action Plan

Watershed Action Plans, now often called Non-Point Source Implementation Strategic Plan (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 RAP 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 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 MAP 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.

Wastewater Infrastructure Improvements

Elevated bacterial concentrations in streams can have negative impacts on fish communities by depleting dissolved oxygen levels and introducing pathogens (Yesilay et al., 2023) and reducing bacterial contamination 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 and combined sewer overflows (SSOs and 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 healthier fish communities by reducing diseases and mortality rates (Immanuel Suresh et al., 2022).

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.

Black River Sediment Remediation

Black River sediment had been heavily contaminated with metals and polycyclic aromatic hydrocarbons (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 fish 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 lacustrary 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 reduced significantly post-remediation, and fish community scores increased. U.S. EPA conducted sediment sampling at thirteen 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).

Reclamation 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 5). 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 6). This project was included on the 2017 U.S. EPA approved MAP list. Other portions of the 200-acre city owned property were restored prior to the completion of the MAP 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 project was completed in 2020 (Figure 7).

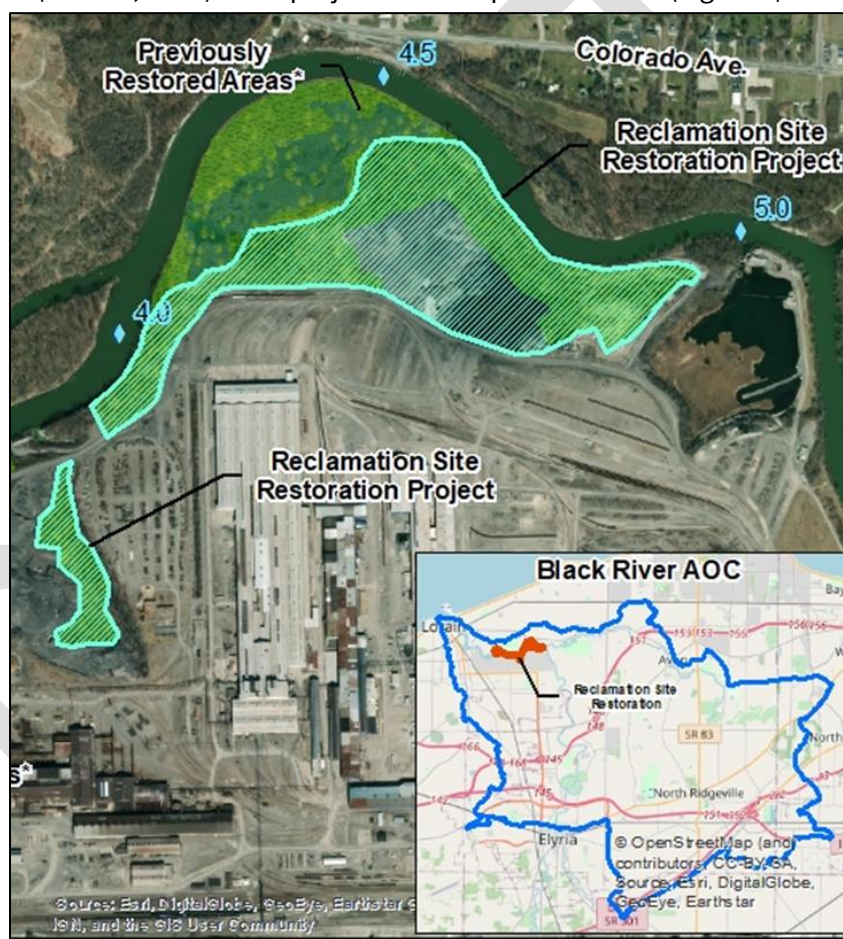


Figure 5. City of Lorain Reclamation Site Restoration Project



Figure 6. Reclamation Site during capping



Figure 7. 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 expected to reduce contaminated runoff to the Black River and continue to improve the river's biological health.

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 8). 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 8). 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 8. Locations of Black River BUI Actions

French Creek Toxicity Study

The Ohio EPA and USACE 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). 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.

Federal Navigation Channel Routine Dredging

The removal of historically contaminated sediment within the Black River's Federal Navigation Channel (mouth to RM 2.6) has largely occurred over time through routine operation and maintenance dredging. The USACE maintains the 27-foot depth of the federal navigation channel by periodic operation and maintenance dredging. USACE anticipates the need to dredge an estimated total of approximately 100,000 cubic yards of sediment from the Lorain Harbor and the Federal Navigation Channel annually. Historically, dredged sediment was placed in the Lorain Harbor Confined Disposal Facility. In 2024, the city of Lorain completed construction of the Black River Dredged Material Reuse Facility, located within the city owned Reclamation Site. Scows hydraulically unload the dredged material and pump it about one mile upland to be dewatered. The upland dewatering is performed using innovative dewatering systems called GeoPools. Once sufficiently dewatered, the residual solids are excavated and reused as marketable soil.

The removal of contaminated sediment through routine dredging and the site-specific remediation projects previously discussed has benefited biological health, in certain respects. Brown bullhead tumors and fish deformities in the Black River Lacustrary were below the removal targets for the Fish Tumors and Other Deformities BUIs. Formally referred to as the "River of Tumors", the Black River lacustrary has exhibited a reduction in toxic concentrations as reflected in the removal of the Fish Tumors and Other Deformities (2023) and Restriction of Navigation Dredging (2022) BUIs.

Routine dredging and the general structure of Federal Navigation Channels can also negatively impact other measures of ecological health, such as fish and benthos communities and fish habitat. The Stage 1 Report cited dredge activities, channel bank protective measures, and flow modifications as the cause of impairment for the Loss of Fish and Wildlife Habitat BUI. The Federal Navigation Channel within the lacustrary is considered a major constraint on restoration efforts (Znidarsic & Coldwater Consulting, 2011). With over 70% of the shoreline in the channel comprised of vertical steel/concrete

walls or modified rip rap, the potential for aquatic vegetation growth is limited. Routine dredging of the Federal Navigation Channel can negatively affect fish habitat and populations by disturbing instream habitat, increasing suspended sediment, disrupting vegetation establishment, and altering flow regimes (Freedman et al., 2012). Dredging can also affect a primary food source for fish: benthic macroinvertebrates. Significant reductions in benthic macroinvertebrate community abundance and taxonomic richness and diversity have been observed after dredging (Grygoruk et al., 2015).

Black River Fish Shelves

Fish habitat creation in the Black River lacustrary was a primary focus of the AOC program. The installation of fish shelves was recommended in the MAP List, Stage 2 RAP, Lower Black River Ecological Restoration Master Plan, and Black River Watershed Action Plan, as discussed earlier in this section. 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 MAP and non-MAP projects (Figures 9 and 10). 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 Lacustrary 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 4.0-4.4
 - 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 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 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 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 funded by the GLRI (completed 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 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 2021) (not shown on Figure 9)

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

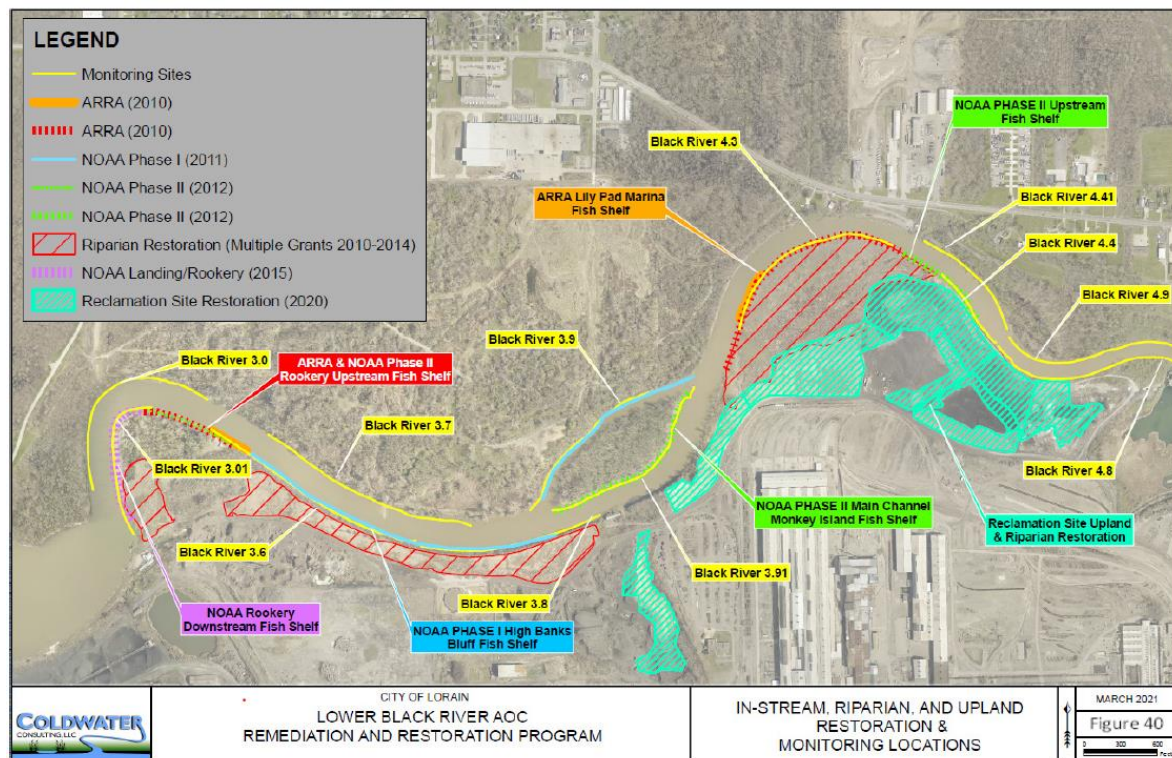


Figure 9. Locations of Black River Fish Shelves in Upper Lacustuary

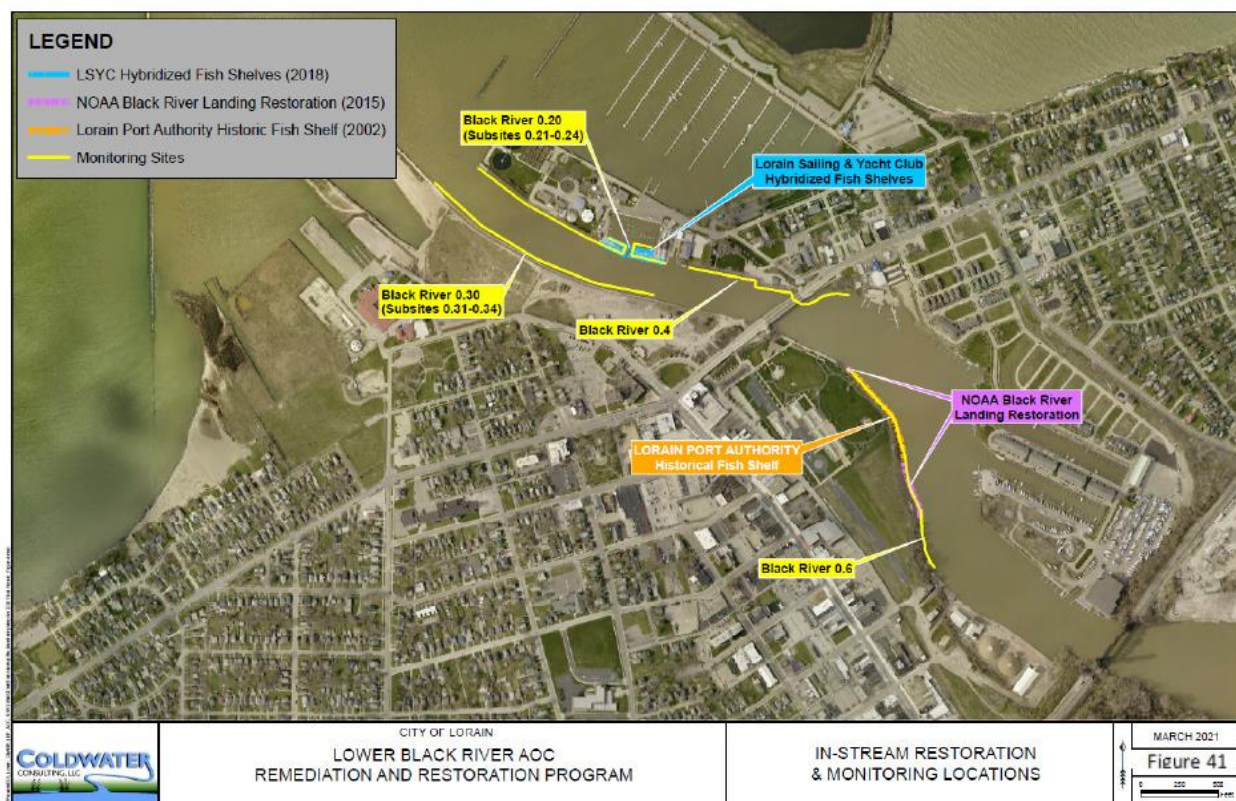


Figure 10. Locations of Black River Fish Shelves in Lower Lacustuary

Comprehensive assessments of the benthos and fish communities and fish habitat in the Black River lacustuary were conducted by Midwest Biodiversity Institute between 2010-2020 (MBI, 2021). The purpose of these assessments was to determine the BUI conditions, evaluate the effectiveness of restoration actions taken to improve habitat and address legacy chemical contamination, and to identify widespread responsible stressors (MBI, 2021). This was done by comparing pre- and post-restoration assessment results and by comparing the post-monitoring results to historic baselines. Sediment and water column data was collected to evaluate for contamination and identify possible stressors. The assessments also served to evaluate the status of the Degradation of Fish and Wildlife Populations, Loss of Fish and Wildlife Habitat, Degradation of Benthos Populations, and Fish Tumors and Other Deformities BUIs.

The results of the assessments showed that the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs were still impaired but had likely improved as a result of the restoration efforts. Improved fish habitat (Lacustuary QHEI[L-QHEI]) and assemblage measures (L-IBI and Mlwb) and slight increases in the proportion of sensitive fish species were observed in the lacustuary since the installation of the fish shelves. There was an increased fish species richness of 25% in certain reaches.

Sediment data showed that chronic toxic stressors may still be present, but they are likely localized and impact fish and benthos less severely than organic enrichment. Toxic stressors did not appear to

have significant impacts on fish health based on the removal of the Fish Tumors and Other Deformities BUI in 2023, where the brown bullhead tumor rate was 0% in the Black River lacustuary. Whole body fish tissue analyses conducted by USFWS in 2020 showed that multiple contaminants (lead, mercury, PAHs, PCBs, DDT, DDE, and dieldrin) were generally lower in fish in the Black River compared to a non-AOC control site. The MBI assessments concluded that ongoing nutrients, dissolved solids, and siltation were limiting the full potential of the fish shelves and contributing to the Degradation of Fish and Wildlife Populations BUI.

Fish Populations Evaluation

To evaluate the status of the Degradation of Fish and Wildlife Populations BUI, the most current fish survey data (IBI/L-IBI and MIwb) available for each site collected within the last 10 years and averaged across each assessment unit were compared to the state's restoration targets (Tables 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).

Site Type	IBI/L-IBI Target	IBI/L-IBI Average	MIwb Target	MIwb Average
Black River – Lacustuary*	42	35.5	8.6	7.7
Black River (Free flowing) – Boat	36	41.5	8.2	8.7
Black River (Free flowing) – Wading	34	36.5	7.5	8.9
French Creek - Wading	34	34.4	7.5	7.6
French Creek - Headwaters	36	38	N/A	N/A
* = uses L-QHEI				

Based on the evaluation, the Black River free-flowing section (RMs 6.6-15) meets the Fish Populations removal targets at both wading and boat sites. No MAPs occurred within this section as fish populations have historically met BUI restoration targets. The most recent fish community assessment (2023) confirmed that fish populations range from good to excellent based on Ohio's WWH biocriteria. Conversely, the Black River lacustuary (mouth – RM 6.2) did not meet the restoration targets of 42 (L-IBI) and 8.6 (L-QHEI). Lower scores within this section were generally related to low numbers of sensitive species and cyprinid species. Both site types in French Creek meet their respective targets.

Fish Habitat Evaluation

The most current fish habitat survey data (QHEI/L-QHEI) available for each site and averaged across each assessment unit was compared to the state's restoration targets to evaluate the status of the Loss of Fish and Wildlife Habitat BUI (Tables 7 and 8).

Table 6. Black River AOC Fish Habitat Averages and BUI Targets		
Site Type	QHEI/L-QHEI Target	QHEI/L-QHEI
Black River – Riverine	60	81.5
French Creek - Headwaters	55	41
French Creek - Riverine	60	70.3
Black River – Lacustuary*	55	42.6
* = uses L-QHEI		

The evaluation determined that the free-flowing section of the Black River had an average QHEI of 81.1, meeting the restoration target of 60. This section of river generally had good to excellent development, substrate, instream cover, and sinuosity, and no channelization. The lacustuary section of the Black River had an average L-QHEI of 42.6 and failed to meet the restoration target of 55. The lacustuary had minimal vegetation, which is a critical characteristic to support fish populations. Individual sites in proximity to the fish habitat creation projects tended to receive higher QHEI scores that met the restoration targets, demonstrating that habitat improvement occurred in the Black River lacustuary where feasible.

The riverine section of French Creek (mouth to RM 8.5) meets the restoration target of 60. Habitat in the riverine section varied but was generally characterized by good substrate composition and adequate instream cover. The headwater section of French Creek (upstream of RM 8.5) had a QHEI score of 41, failing to meet the restoration target of 60. The assessed section was considered channelized with poor riffle development. The gradient of the assessed headwater site was low with slow to moderate current velocity.

Conclusion

Black River

The results of the Degradation of Fish and Wildlife Populations BUI evaluation determined that the free-flowing section of the Black River was not impaired. The free-flowing section of the Black River is marked by good fish habitat and higher dissolved oxygen compared to the lacustuary.

The evaluation determined that the Degradation of Fish and Wildlife Populations BUI was impaired in the Black River lacustuary. Based on Ohio's Delisting Guidance and Restoration Targets for Ohio Areas of Concern, a BUI can be removed if the impairment is caused by sources outside the AOC. The 2021 MBI report concluded that the AOC's restoration efforts, primarily the fish shelves, positively affected the fish populations within the lacustuary but excess nutrients and TSS in the water column were

likely limiting the full recovery. As outlined in the 2008 TMDL and Black River WAP, a significant portion of the nutrients and sediment in the lacustrine originate from outside of the AOC. 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 programs, can be used for point-source pollution. Methods to reduce non-point source pollution are outlined in Ohio EPA's Nonpoint Source Pollution Control Program plan. Within the Black River watershed, recommended measures to reduce nutrient and TSS loading generally include implementing farming best management practices, stabilizing stream banks, enhancing/creating wetlands and riparian habitat, and resolving failing HSTs. The Black River WAP 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.

Limited habitat is also negatively impacting fish populations within the Black River lacustrine. The Loss of Fish and Wildlife Habitat BUI was determined to be impaired within the lacustrine based on recent data. Aquatic vegetation, a critical component of fish habitat, was virtually nonexistent and the most notable cause of the low L-QHEI scores. The Federal Navigation Channel and its routine dredging of the lower 2.6 RMs and vertical steel bulkheads are likely a significant source of biological and habitat impairments in a portion of the Black River lacustrine and a major barrier for restoration efforts, as discussed earlier in this document.

There have been significant investments within the Black River AOC to improve fish populations and habitat, particularly within the Black River lacustrine. The Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs have improved overall, but certain areas remain impaired due to the previously discussed variables. The AOC program has completed all MAPs along the Black River to remediate legacy contaminated sediment, create 1.6 miles of fish habitat, stabilize 3.3 miles of riverbank, and restore 36 acres of wetlands and 103 acres of upland/riparian habitat. Fish habitat in the Black River lacustrine is limited due to hardened shorelines and historic and ongoing land use issues. Fish population impairments in the Black River lacustrine are primarily related to limited fish habitat, consistent disturbance, 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. 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

The Degradation of Fish and Wildlife Populations BUI meets removal targets in all sections of French Creek. The 2019 French Creek Toxicity Study did not detect sediment or water column toxicity, which supports the recent recovery of the fish populations. While the restoration target for the Degradation

of Fish and Wildlife Populations BUI in French Creek headwaters has been met, the target for Loss of Fish and Wildlife Habitat has not. One headwaters site (RM 9.97) was evaluated for fish habitat in 2023, resulting in a score of 41. The site has not recovered from the historic channelization and the substrates are inundated with silty sand and fine gravel. Historic habitat data from 2012 and not used in the BUI evaluation shows nearby reaches at RMs 9.02 and 10.41 scoring a 49.5 and 57, respectively (Ohio EPA, 2012). The conditions leading to the non-attainment of the Fish Habitat target in French Creek headwaters are likely related to current and historic land use, and evidence supports that insufficient habitat in headwater streams is not limited to the geographic extent of the AOC boundary.

The French Creek watershed historically contained intermediate to major percentages of cropland, suburban, and commercial land uses (BRCC, 1994). Significant portions of French Creek were channelized to accommodate agricultural and suburban growth. Headwaters, in particular, are highly vulnerable to modifications due to their small size and lower flow volumes compared to larger streams (Stroud Water Research Center, 2008). Today, the French Creek watershed is considered one of 12 rapidly developing watersheds across the state by the Ohio MS4 Program (Ohio EPA, 2021). These rapidly developing watersheds contain streams that were identified as being particularly at risk due to development and associated land use impacts on water quality. The Ohio EPA noted that the developed land use in the French Creek watershed “negatively affects habitat quality, primarily in that siltation from runoff results in embedded riffles. Also, stormwater runoff, development near the stream banks, and loss of riparian habitat facilitated bank erosion” (Ohio EPA, 1999). Approximately 72% of land in the French Creek watershed is currently developed, compared to 55% in 2000. Moderate to high intensity development specifically has doubled during that timeframe; currently comprising 22% of the total land use. The Ohio AOC program and Black River AOC Advisory Committee were unable to identify a viable habitat restoration project within the French Creek headwaters, primarily due to the high percentage of private land use.

As stated in the United States Delisting Principles and Guidance (U.S. Policy Committee, 2001) and Ohio’s Delisting Guidance and Restoration Targets for Ohio Areas of Concern (OLEC, 2023), a BUI can be removed if “it can be demonstrated that the impairment is not limited to the local geographic extent, but rather is typical of lake-wide, region-wide, or area-wide conditions”. There is evidence to suggest that headwater streams impaired for fish habitat (QHEI) are commonly observed throughout Ohio within the Lake Erie basin.

Forty out of 105 non-AOC headwater streams within Ohio’s Lake Erie basin do not meet the fish habitat target of a 55 (Appendix C). Channelization is the primary reason cited for the low QHEI scores in the majority of the non-attaining headwater streams as indicated by their associated Ohio EPA technical support documents. Channelization in these streams is particularly common in watersheds with high agricultural land use but has also been noted in more developed watersheds. Quarry Creek, a headwater stream located outside of the Black River AOC and only 8.25 miles from French Creek, received a QHEI score of 34 in 2015. The Quarry Creek watershed is comprised of forested, urban, and industrial land uses. A recovering channel, low sinuosity, and silty substrates were attributes contributing to the low QHEI, similar to the conditions observed in the French Creek headwaters.

The West Branch Rocky River is considered a rapidly developing watershed by the Ohio MS4 program and is the only non-AOC watershed in the Lake Erie Basin on this list (Ohio EPA, 2021). Several of the headwater streams within the watershed have failed to meet fish habitat restoration targets in certain segments, including Plum Creek and Granger Ditch. While some of the insufficient habitat in these headwaters is related to natural conditions, channelization is cited as a primary reason for the degraded QHEI scores.

The BUI target for fish habitat is not met in the French Creek headwaters, and it has been shown that historic and ongoing land use issues, similar to those observed in other Ohio watersheds, are the primary source of impairment. A viable project to address this impairment was not identified by the AOC program and Black River AOC Advisory Committee, but future habitat restoration improvements should be considered outside of the AOC program.

Recommendation

Based upon the findings of the BUI evaluation, the Ohio Lake Erie Commission and Ohio EPA recommend the removal of the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs from the Black River AOC based on the following conditions:

- Wildlife populations were not considered impaired in the Black River AOC and therefore the wildlife components of the Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat BUIs are met.
- The Degradation of Fish and Wildlife Populations BUI restoration targets for fish populations are met in French Creek and the free-flowing section of the Black River.
- Loss of Fish and Wildlife Habitat BUI restoration targets are met in the non-headwater section of French Creek and free-flowing section of the Black River.
- Improvements to fish population and habitat scores in the Black River lacustrary have been observed as a direct result of AOC restoration work.
- Water quality impairments are likely limiting full biological recovery in the Black River lacustrary. A significant portion of nutrient and TSS 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.
- The Black River's Federal Navigation Channel limits the potential for sufficient fish habitat due to its vertical steel shorelines and routine dredging in 2.6 miles of the river.
- Insufficient fish habitat in the headwater section of French Creek is related to land use/channelization. Non-AOC headwaters in Ohio's Lake Erie Basin have similar QHEI scores and attributes as French Creek, suggesting that loss of fish habitat in this type of area is not an AOC-specific problem.

- No viable habitat projects in French Creek headwaters were identified by the AOC program and Advisory Committee due to the extent of the impairment and limitations due to private land use.
- All MAPs identified to address the BUIs have been completed.

A three-week public comment period was issued by Ohio EPA and Ohio Lake Erie Commission for the Draft BUI Removals Recommendation between July 30th and August 20th, 2025. Public comments will be available in Appendix D. A letter of support by the Black River AOC Advisory Committee will be included in Appendix E.

DRAFT

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Appendix A - 2023 Delisting Guidance

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 BUI Restoration Targets for fish community.

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 (lacustrary 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 the State of Ohio's BUI Restoration Targets for fish community. (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)			
	EWB	WWB	MWB	LRW ²	EWB	WWB	MWB	LRW ²
IBI - Headwaters	46	36	24	18	46	24	20	18
IBI – Wading*	46	34	24	18	46	28	20	18
IBI - Boat*	44	36	24	16	44	30	20	16
MIwb – Wading	8.9	7.5	6.2	4.5	8.9	6.8	5.6	4.5
MIwb – Boat	9.1	8.2	5.8	5.0	9.1	8.1	5.7	5.0

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

¹Ohio EPA has determined the WQS non-significant departure value for EWB and WWB riverine IBI to be 4 points MIwb to be 0.5 points; the BUI restoration targets presented in this table are based on the values of non-significant departure from Ohio WQS.

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

AND

In lake affected waters (lacustrary or fresh water estuary), the average L-IBI/N-IBI and the average MIwb values do not significantly diverge from the State of Ohio's BUI Restoration Targets for fish community. (See Appendix B for additional information and lacustrary/nearshore locations in each AOC).

Lacustrary and Nearshore Fish Population BUI Restoration Targets ¹				
Type	EWB	WWH	MWH ²	LRW
IBI – Lacustrary (L-IBI)	42	42	27	16
IBI – Nearshore (hard bottom) (N-IBI-hard)	42	42	NA	NA
IBI – Nearshore (soft bottom) (N-IBI-soft)	31	31	NA	NA
MIwb – Lacustrary (L-MIwb)	8.6	8.6	6.6	5.1
MIwb – Nearshore (hard bottom)(N-MIwb-soft)	8.9	8.9	NA	NA
MIwb – Nearshore (soft bottom) (N-MIwb-soft)	7.2	7.2	NA	NA

¹ Based on Thoma, 1999.

² There are no specific WQS or criteria for MWH Lacustrary; however, for regular streams, Ohio EPA's general expectation for MWH is that they meet a narrative rating of Fair. Therefore the MWH BUI restoration targets above are based on conversions from narrative equivalents.

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, and 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 WQS.
- Non-significant departure for neither the L-IBI nor the MIwb lacustrary values has been determined and the Lacustrary Fish Population Restoration Targets listed above reflect state WQS values. If non-significant departure values are determined for lacustraries, 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, lacustrary), 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., Lacustrary and LRW or MWH) then the lowest target applies.

Potential Data Sources

- Ohio EPA IBI data
- Ohio EPA MIwb data
- ODNR wildlife reports

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). It should also be noted that Ohio EPA has a Low-End Scoring Adjustment as a part of its guidelines for IBI evaluations. Many of these adjustments are based on a low number of fish collected in a sample; however even with sufficient sample numbers in some cases this metric score may still be manually adjusted. The low-end adjustments to the score may affect the assessment unit averages. The metric conditions for these sites should be consulted if the assessment unit is impaired to determine what actions are needed to improve the site. For more information on this adjustment, see the Ohio EPA 2014 references.

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. However, the MIwb metric is not applicable to sample locations with drainage areas of 20.0 square miles or less. When averaging the MIwb values for the assessment unit this needs to be taken into consideration. The status should be determined based on assessment unit averages for only those sites with applicable MIwb values. The absence of a MIwb value (for this reason) does not affect the status and will not make an assessment unit impaired.

There are differences in IBI and MIwb criteria between the two ecoregions where Ohio’s AOCs are located – EOLP and HELP. See the table in the target box 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 for EWH and WWH. These values for the tributaries are considered criteria and adopted in the Ohio WQS.

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 as a lacustruary (combination of the terms lacustrine and estuary). The lacustruary 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 nearshore IBI (N-IBI) or the lacustruary IBI (L-IBI) target between the two ecoregions – EOLP and HELP. There is not a separate MIwb index for the lacustruary; however, the target is different than the riverine targets. There is no MIwb index for the nearshore area. The L-IBI, N-IBI and MIwb values used to evaluate lacustruaries and nearshore areas are guidance and is not established within State rules.—No non-significant departure values have been determined for L-IBI, N-IBI and MIwb assessments in lacustruaries and nearshore areas. If non-significant departure values are determined in the future, the L-IBI, N-IBI and MIwb targets may be adjusted. (See Appendix B for more detail and a description of lacustruaries within Ohio’s AOCs.). Each AOC’s site conditions will need to be evaluated using the lacustruary 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.

The restoration target for this BUI was developed from WQS and guidance for fish 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 IBI, L-IBI, and N-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, lacustruary), 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. AOCs 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 IBI, L-IBI, N-IBI and the MIwb for this 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 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 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. 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/alterd (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 calculated without these non-representative, non-restorable sites included.

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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- Ohio EPA. 1995. Development of Biological Indices Using Macroinvertebrates in Ohio Nearshore Waters, Harbors, and Lacustraries of Lake Erie in Order to Evaluate Water Quality. Final Grant Report in fulfillment of LEPP-06-94. Division of Surface Water Ecological Assessment Unit, Columbus, OH.
- Restoring United States Great Lakes Areas of Concern: Delisting Principles and Guidelines. Adopted by the U.S. Policy Committee, December 2001.

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 BUI Restoration Targets for habitat.

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 (lacustrary or fresh water estuary), the average Qualitative Habitat Evaluation Index (QHEI) value within an assessment unit do not significantly diverge from the State of Ohio's BUI Restoration Targets for habitat.

AND

In lake affected waters (lacustrary or fresh water estuary), the average Lacustrary Qualitative Habitat Evaluation Index (L-QHEI) or Nearshore Qualitative Habitat Evaluation Index (N-QHEI) values do not significantly diverge from the State of Ohio's BUI Restoration Targets for habitat (See Appendix B for additional detail information and lacustrary/nearshore locations in each AOC).

Qualitative Habitat Evaluation Index (QHEI) Restoration Targets

Site Type	EWB	WWH	MWH	LRW ¹
Riverine – headwaters	70	55	43	NA
Riverine	75	60	45	NA
Lacustrary ² (L-QHEI)	55	55	n/a	n/a
Nearshore ³ (N-QHEI)	50	50	n/a	n/a

¹ For LRW waters, a QHEI evaluation is not applicable. See Rationale for details.

² For the lacustrary areas, a L-QHEI ≥ 55 is considered an acceptable target (Thoma, 2006 and personal communication with Roger Thoma, 2013).

³ For the nearshore areas, a N-QHEI ≥ 50 is considered an acceptable target (Thoma, 2006).

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 AOCs are encouraged 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 should be approved by Ohio EPA.

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 this BUI, the Qualitative Habitat Evaluation Index (QHEI), Lake Quality Habitat Evaluation Index (L-QHEI) or Nearshore Quality Habitat Evaluation Index (N-QHEI) are used to assess habitat quality. The QHEI, L-QHEI, and N-QHEI are multi-metric indices. There are no differences in index values between the two ecoregions where Ohio's AOCs are located - EOLP and HELP. All QHEI values are considered to be guidance as they have not yet been finalized or adopted in the Ohio WQS but represent a level of aquatic habitat that does not limit fish population quality.

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.

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 lacustruary (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 (N-QHEI) and in the lacustruary areas (L-QHEI) has been developed, but no quality assessment tiering system has been formally defined in WQS.

The L-QHEI and N-QHEI values for the lacustruaries and nearshore 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 a N-QHEI ≥ 50 are 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). Each AOC's site conditions will need to be evaluated using the lacustruary 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. 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 lacustruaries.

The restoration target for this BUI was developed from WQS and guidance for habitat 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 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, lacustruary), 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 restoration target value set for QHEI, L-QHEI and N-QHEI for this BUI to be removable for fish habitat in 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 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 BUI restoration target assessments, if any single QHEI 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 calculated without these non-representative, non-restorable sites included.

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.

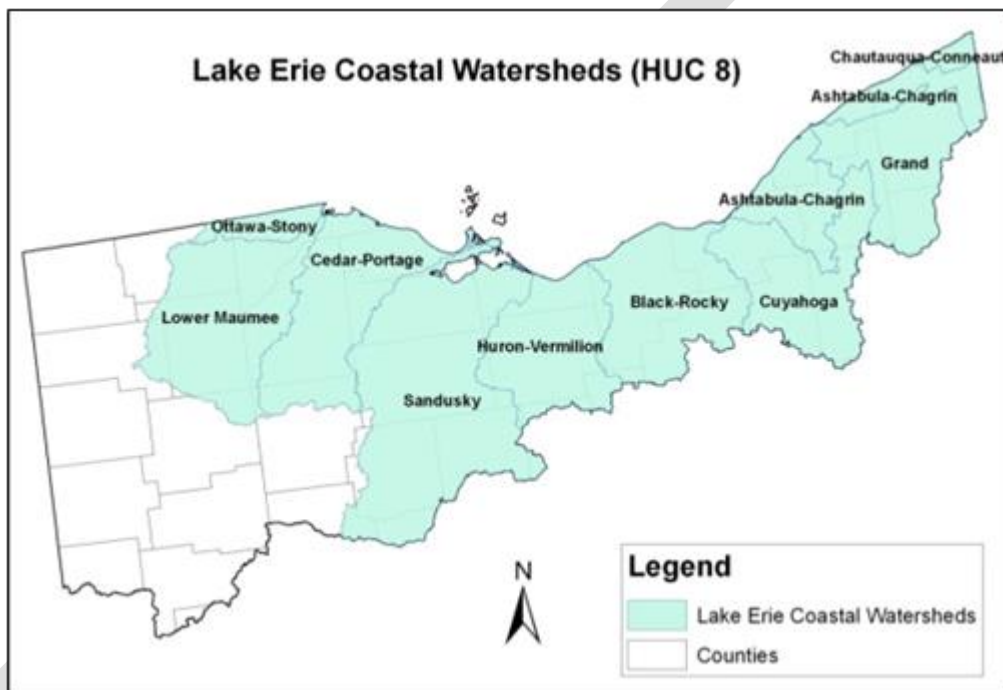


Figure 2. Lake Erie Coastal Watersheds

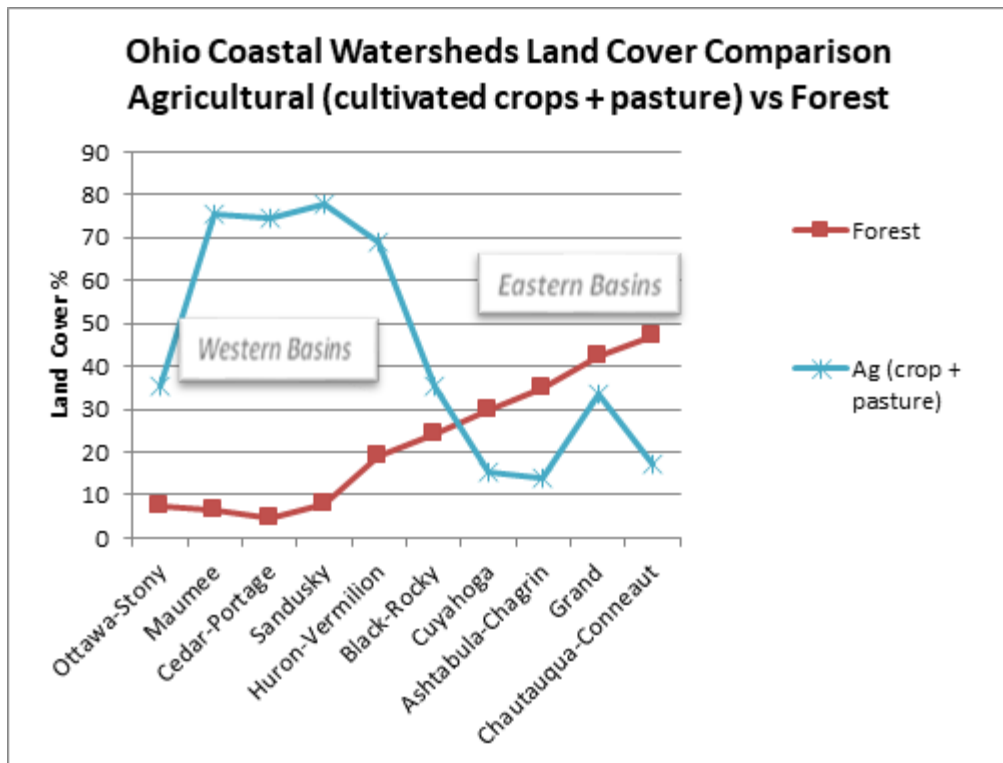


Figure 3. Land Cover Comparison (Agricultural vs. Forest) in Ohio Lake Erie Coastal Watersheds

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 5000mi² 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 mi², 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 <i>(sum of Forest and Shrubland and Herbaceous Upland Cover)</i>	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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Appendix B –Fish Populations and Habitat Data

Table B1. Black River Free-Flowing Data								
River Mile	Sampler	Method	Date	IBI	MIwb	IBI Seasonal Average	MIwb Seasonal Average	QHEI
15.2	MBI	Boat	10/04/2023	46	9.5	40	8.5	72.8
		Boat	7/11/2023	34	7.5			
11.6	MBI	Wading	7/22/2015	42	9.5	42	9.4	91
		Wading	8/24/2015	42	9.3			
10.77	MBI	Boat	7/10/2023	46	10.4	40	9.4	84.5
		Boat	9/6/2023	34	8.4			
9.9	MBI	Boat	7/21/2015	32	8.7	33	9.15	83
		Boat	8/25/2015	34	9.6			
8.38	MBI	Boat	7/10/2023	42	9.3	44	8.7	76.8
		Boat	9/6/2023	46	8.1			
7.7	MBI	Boat	7/23/2015	42	8.3	40	8.35	78.5
		Boat	8/25/2015	38	8.4			
Boat Sites Average						39.4	8.8	81.1
Wading Sites Average						42	9.4	

Table B2. Black River Lacustrary Fish Populations and Habitat Data							
Black River RM	Sampler	Date	L-IBI	MIwb	L-IBI Seasonal Average	MIwb Seasonal Average	QHEI
6.16	MBI	7/12/2023	28	8.5	29	8.3	51.7
		10/4/2023	30	8.1			
5.5	USFWS	8/5/2021	38	7.1	38	7.1	34
5.21	MBI	08/21/2020	36	8	34	7.15	42
		10/06/2020	32	6.3			
5.2	MBI	07/12/2023	44	8.1	40	7.5	43.5
		09/07/2023	36	6.9			
5.0	USFWS	8/5/2021	38	7.6	38	7.6	39
4.9	MBI	08/21/2020	34	7.5	34	7.2	43.5
		10/06/2020	34	6.9			
4.8	MBI	08/21/2020	36	7.9	37	7.8	44
		10/06/2020	38	7.7			
4.5	USFWS	8/5/2021	38	7.9	38	7.9	32
4.4	MBI	08/21/2020	29	6.5	32.5	6.65	46.5
		10/06/2020	36	6.8			
4.3	MBI	08/21/2020	30	8.4	36	8.05	59.5

		10/07/2020	42	7.7			
Black River RM	Sampler	Date	L-IBI	MIwb	L-IBI Seasonal Average	MIwb Seasonal Average	QHEI
4.1	MBI	08/22/2020	32	7.9	35	7.5	53
		10/07/2020	38	7.1			
4.0	USFWS	8/5/2021	34	7.9	34	7.9	46
3.91	MBI	08/22/2020	36	7.9	33	7.2	56.5
		10/07/2020	30	6.5			
3.9	MBI	08/22/2020	40	8.7	38	7.7	53
		10/07/2020	36	6.7			
3.8	MBI	08/22/2020	36	8.6	36	8	56.3
		10/07/2020	36	7.4			
3.7	MBI	08/22/2020	32	8.9	34	8	44.8
		10/09/2020	36	7			
3.31	MBI	07/12/2023	32	9.1	32	8.3	57.8
		09/07/2023	32	7.4			
3.2	USFWS	8/6/2021	31	7.3	31	7.3	44.5
3.01	MBI	08/22/2020	34	8.2	37.5	8.1	40
		10/09/2020	41	7.9			
3.0	MBI	08/20/2020	38	8.4	38	8	48
		10/09/2020	38	7.6			
2.5	USFWS	8/6/2021	34	8.1	34	8.1	31.5
2.3	MBI	07/28/2020	34	7.3	39	8.1	34.5
		10/09/2020	44	8.8			
2.0	MBI	07/28/2020	38	8.7	38	8.5	27.3
		10/09/2020	38	8.2			
1.7	MBI	09/07/2023	37	7.9	38	8.4	43.5
		09/11/2023	39	8.9			
1.6	MBI	07/28/2020	36	6.5	39	7.3	30.2
		10/08/2020	42	8.1			
1.4	MBI	07/28/2020	40	8.2	38	7.8	30.2
		10/08/2020	36	7.3			
0.6	MBI	07/11/2023	40	9.2	39	8.6	58.5
		09/07/2023	38	8			
0.54	USFWS	8/6/2021	38	8.2	38	8.2	32
0.4	MBI	07/28/2020	31	6.5	32	6.3	30.5
		10/08/2020	33	6			
0.2	MBI	2020	32.5	6.1	32.5	6.1	23
Black River Lacustuary Average					35.5	7.7	42.6

Table B3. French Creek Fish Populations and Habitat Data					
French Creek RM	Sampler	Method	IBI	MIwb	QHEI
9.97	MBI	Headwater	38	N/A	41
6.9	USFWS	Wading	27	6.23	69.13
6.1	USFWS	Wading	34.5	7.26	65.63
5.5	USFWS	Wading	37.5	8.07	76.38
4.5	USFWS	Wading	39	8.11	44.75
4	USFWS	Wading	35	7.68	49.75
3.2	USFWS	Wading	28.5	7.21	64.38
2.5	USFWS	Wading	35	8.41	75.13
0.54	USFWS	Wading	38.5	8.13	75.88
Average for Wading Sites			34.3	7.6	60.8
Average for Headwater Sites			38	N/A	41

Appendix C – Non-AOC Headwaters QHEI Scores

Table C1. Non-AOC Headwaters QHEI Scores					
Stream Name	Year	Station	River Mile	Drainage Area	QHEI
Abram Creek (13-002-000)	2014	T01W76	3.15	6.8	62
Abram Creek (13-002-000)	2014	T01P13	1.9	8.9	61.8
Abram Creek (13-002-000)	2014	501830	0.84	9.7	62
Abram Creek (13-002-000)	2014	T01S04	0.3	10.1	59
Arcola Creek (07-011-000)	2015	A01K18	7.4	7.8	56
Arcola Creek (07-011-000)	2015	A01W22	7.05	7.9	49
Arcola Creek (07-011-000)	2015	A01W24	5.04	11.1	44
Arcola Creek (07-011-000)	2015	A01W25	2.02	19.8	59.5
Arcola Creek (07-011-000)	2015	A01K17	0.7	19.9	52
Baker Creek (13-202-000)	2014	T01S13	0.3	5.8	63.3
Baldwin Creek (13-101-000)	2014	T01W53	3.53	6.6	56.8
Baldwin Creek (13-101-000)	2014	501650	2.61	8.3	60.5
Baldwin Creek (13-101-000)	2014	T01W59	1.13	9.6	61.3
Baldwin Creek (13-101-000)	2014	T01G01	0.38	10	69.5
Baldwin Creek (13-101-000)	2014	301231	0.1	10	59.3
Beaver Creek (20-003-000)	2015	303263	13.75	6.3	54.5
Beaver Creek (20-003-000)	2015	Y01S26	11.02	11.6	51
Blodgett Creek (13-200-003)	2014	T01A17	1.61	3.1	58.8
Blodgett Creek (13-200-003)	2014	T01A23	0.17	4.1	58
Broadway Creek (13-200-013)	2014	302574	0.28	2	67.3
Brownhelm Creek (20-100-000)	2015	303268	0.9	5.2	50.5
Buck Creek (21-006-000)	2023	Y01S10	1.06	19.6	84.8
Buck Run (05-045-003)	2023	U05S03	0.2	3.8	50.5
Bull Creek (16-102-000)	2008	S01K10	8.45	8.3	43.5
Bull Creek (16-102-000)	2008	S99Q05	3.9	19	56.5
Cahoon Creek (13-004-000)	2014	T01P21	0.08	5.4	58.3
Caswell Ditch (05-051-004)	2023	U05W37	0.85	3.4	41
Champion Creek (13-200-009)	2014	T01A55	0.01	7.8	69.8
Chappel Creek (12-007-000)	2023	K01G26	14.07	9.4	78.8
Chappel Creek (12-007-000)	2023	K01G25	7.33	18.3	71.5
Clayton Ditch (12-200-001)	2023	K01G16	0.01	16.3	67.5
Clear Creek (21-007-000)	2023	Y01S11	0.59	12	78
Cold Creek (05-050-000)	2023	300670	0.36	2.9	49
Cole Creek (12-101-000)	2023	K01W20	6.52	7.7	82
Coon Creek (16-006-002)	2008	S02K06	0.34	7.8	30.5
Cossett Creek (13-203-000)	2014	T01K12	0.2	4.1	63.3
Cowles Creek (07-007-000)	2015	502700	7.24	6.8	73.5
Cowles Creek (07-007-000)	2015	502710	4.83	11.2	51.5

Table C1. Non-AOC Headwaters QHEI Scores					
Stream Name	Year	Station	River Mile	Drainage Area	QHEI
Cowles Creek (07-007-000)	2015	502720	3.56	12.5	73.5
Cowles Creek (07-007-000)	2015	A01P17	0.9	14.2	73
Darby Creek (12-009-000)	2023	K01S16	0.35	4.4	45.3
East Branch Huron River (12-100-000)	2023	K01W22	24.67	7.8	73
East Branch Huron River (12-100-000)	2023	K01G21	19.11	16.2	78.5
East Branch Portage River (16-105-000)	2008	S01K21	19.17	9.4	43
East Branch Portage River (16-105-000)	2008	300373	16.1	12.3	47.5
East Branch Portage River (16-105-000)	2008	S01S30	12.47	15.3	51
East Branch Portage River (16-105-000)	2008	S01P37	10.38	18.4	58.5
East Branch Portage River (16-105-000)	2008	S01P03	9.6	18.7	47.5
East Branch Rocky River (13-100-000)	2014	302627	30.8	7.3	71
East Branch Rocky River (13-100-000)	2014	T01A52	29.22	8.9	80.5
East Branch Rocky River (13-100-000)	2014	501660	26.63	14.3	64.8
East Branch Vermilion River (21-003-000)	2023	Y01G15	8.31	16.8	64
East Fork Vermilion River (21-002-000)	2023	Y01G09	10.87	8.8	65.5
East Fork Vermilion River (21-002-000)	2023	300077	7.41	16.9	70.3
Frankenburg Creek (21-002-001)	2023	Y01G10	0.16	7.5	68.5
Frink Run (12-203-000)	2023	303492	7.15	9.3	39
Granger Ditch (13-208-000)	2014	302577	1.75	7.8	45.5
Granger Ditch (13-208-000)	2014	302576	0.2	13.3	49.3
Healy Creek (13-104-000)	2014	501630	0.7	4.9	68.3
Indian Creek (07-008-000)	2015	303272	3.65	5.1	62
Indian Creek (07-008-000)	2015	303107	0.65	15.3	55.5
Indian Creek (21-004-000)	2015	Y01G21	0.36	9.2	74.3
Little Pickerel Creek (05-049-000)	2023	201385	2	5.5	43.5
Little South Creek (05-044-001)	2023	U05K01	0.53	7.4	39.8
Mallet Creek (13-204-000)	2014	T01K13	3.5	13.7	57
Mallet Creek (13-204-000)	2014	T01S14	0.72	16.1	62.8
Marsh Creek (03-026-000)	2015	303281	1.5	5.6	61.5
Marsh Run (12-210-000)	2023	K01K19	3.7	11.4	50.5
Martin Run (20-004-000)	2015	303269	2.35	2.3	67
Martin Run (20-004-000)	2015	303270	0.9	5.3	57.5
Meggins Creek (12-202-000)	2023	K01W24	0.59	8.2	56.3
Mud Run (Huron Co.) (12-207-000)	2023	303491	6.42	5.9	61.8
Mud Run (Huron Co.) (12-207-000)	2023	K01W15	1.38	14.9	65.5
Needles Creek (16-104-000)	2008	300511	8.35	11.3	33.5
Needles Creek (16-104-000)	2008	S01P30	5.14	17	44.5
Ninemile Creek (16-003-000)	2008	S02K02	5	7.9	26
Ninemile Creek (16-003-000)	2008	S02K01	2.93	9.6	43.5
North Branch Portage River (16-007-000)	2008	S01K03	25.85	8.1	31

Table C1. Non-AOC Headwaters QHEI Scores						
Stream Name	Year	Station	River Mile	Drainage Area	QHEI	
North Branch Portage River (16-007-000)	2008	S01K02	21.96	14.3	27.5	
Norwalk Creek (12-103-000)	2023	K01W23	5.56	6.4	54	
Norwalk Creek (12-103-000)	2023	K01S13	1.9	10.2	55	
Old Woman Creek (12-005-000)	2023	K01G04	8.33	8.4	68.5	
Pipe Creek (05-052-000)	2023	U05K17	8.18	14.7	61	
Pipe Creek (05-052-000)	2023	U05K16	6.66	18.4	61	
Plum Brook (12-003-000)	2023	K01K06	1.9	6.3	55	
Plum Creek (13-021-000)	2014	T01K11	8.5	7.6	51.5	
Plum Creek (13-201-000)	2014	T01A33	4.92	14.3	65	
Plum Creek (13-201-000)	2014	T01P23	2.5	16.2	69.8	
Plum Creek (13-201-000)	2014	501950	0.25	17.6	69.5	
Plum Creek (13-206-000)	2014	501840	3.02	8.8	69.5	
Plum Creek (13-206-000)	2014	T01K14	2.5	10.4	70.8	
Plum Creek (13-206-000)	2014	302573	0.5	12.1	73.8	
Porter Creek (13-003-000)	2014	T01P20	0.1	8.3	68.3	
Quarry Creek (20-101-000)	2015	303271	0.25	5.1	34.5	
Raccoon Creek (05-045-000)	2023	U05S01	13.26	9.9	67.8	
Raccoon Creek (05-045-000)	2023	U05P04	11.32	12.7	62.8	
Raccoon Creek (05-045-000)	2023	U05W10	10.18	13.8	70.3	
Rader Creek (16-104-001)	2008	S01S26	10.94	7.3	37.5	
Rader Creek (16-104-001)	2008	S01S24	5.2	18.1	35	
Rattlesnake Creek (12-001-003)	2023	K01W34	2.37	8.3	69.5	
Rattlesnake Creek (12-001-003)	2023	K01W36	0.23	17.7	74.8	
Red Brook (07-009-000)	2015	303273	2.3	7.9	57	
Red Mill Creek (Trib. To Lake Erie (Rm 1151.47)) (07-024-000)	2015	303280	1.7	6.3	71	
Remson Creek (13-207-000)	2014	302575	0.6	14.4	70.8	
Rocky Ford (16-103-000)	2008	S01K12	21.12	7.6	39.5	
Rocky Ford (16-103-000)	2008	S01K11	19.53	16.2	58	
Royer Ditch (05-109-000)	2023	U04K07	6.85	15.2	20.5	
Sawmill Creek (12-004-000)	2023	K01K21	1.1	13.5	63.3	
Seymour Creek (12-201-000)	2023	K01W27	0.13	16.4	61.5	
Slate Run (12-206-000)	2023	K01W16	10.42	12.2	72.5	
Smokey Run (07-100-001)	2015	A01P05	0.2	6.1	64	
Snyders Ditch (05-051-005)	2023	U05S08	0.38	9.6	60.5	
South Branch Portage River (16-100-000)	2008	S01K07	24.77	7	48	
South Branch Portage River (16-100-000)	2008	S01K06	22.58	17	56	
South Creek (05-044-000)	2023	U05G01	7.92	7.1	66	
South Creek (05-044-000)	2023	U05K05	4.04	18.1	45.5	
Southwest Branch Vermilion River (21-005-000)	2023	Y01W03	5.6	7.3	56.3	

Table C1. Non-AOC Headwaters QHEI Scores						
Stream Name	Year	Station	River Mile	Drainage Area	QHEI	
Southwest Branch Vermilion River (21-005-000)	2023	Y01W05	3.81	15.9	72.8	
Squires Squamm Ditch (Trib To Beaver (9.41)) (20-003-002)	2015	303266	1.3	5.5	50	
Strong Creek (05-047-000)	2023	U05K11	2.02	4.6	57.3	
Sugar Creek (12-008-000)	2023	K01G28	3.54	5.6	68	
Sugar Creek (16-006-000)	2008	S02K05	21.31	12	34.5	
Sugar Creek (16-006-000)	2008	201092	18.5	17	38.5	
Trib To E Br Rocky (Rm 12.1) (13-100-015)	2014	302632	0.1	1.7	78	
Trib To E Br Rocky (Rm 25.4) (13-100-011)	2014	302629	0.1	2.9	69.5	
Trib To Rocky Ford Creek (Rm 10.75/1.99) (16-103-004)	2008	201106	1.8	7.5	48.5	
Trib. To Arcola Creek (0.22) (07-011-002)	2015	303277	0.2	3.3	48	
Trib. To Arcola Creek (4.32) (07-011-003)	2015	303278	0.1	4.9	61	
Trib. To Buck Creek (Rm 4.92) (21-006-001)	2023	Y01G29	0.09	9.5	62.3	
Trib. To Conneaut (13.61) (07-100-006)	2015	303290	0.2	1.4	61.5	
Trib. To Conneaut (14.82) (07-100-007)	2015	303291	0.85	1	78.5	
Trib. To Conneaut (4.67) (07-100-004)	2015	303292	0.7	2.8	59	
Trib. To Conneaut (7.39) (07-100-005)	2015	303293	0.1	1.7	66.8	
Trib. To Conneaut Creek (17.1) (07-100-003)	2015	303289	0.3	3.6	73	
Trib. To Conneaut Creek (17.1) (07-100-003)	2015	303397	0.15	3.6	87	
Trib. To Cowles Creek (0.20) (07-007-001)	2015	303274	0.9	5.6	55.5	
Trib. To E. Br. Vermilion R. (Rm 8.20) (21-003-001)	2023	501350	1.05	9.5	72.3	
Trib. To E. Fk. Vermilion R. (Rm 8.47) (21-002-002)	2023	Y01G11	0.7	2.8	58.8	
Trib. To Ferguson Ditch (Rm 1.52) (05-100-001)	2023	304337	0.75	6	42.8	
Trib. To Frink Run (Rm 5.83) (12-203-001)	2023	303493	2.01	9	43	
Trib. To Holliday Lake Trib. (Rm 2.80) (12-200-003)	2023	K01G22	0.17	5.4	68.8	
Trib. To Indian Creek (3.53) (07-008-001)	2015	303275	0.15	4.5	71	
Trib. To Lake Erie (1117.00) (07-026-000)	2015	303295	0.2	1.9	47	
Trib. To Lake Erie (1124.54) (07-025-000)	2015	303296	0.3	1.8	62	
Trib. To Lake Erie (Rm 1148.35) (07-022-000)	2015	303279	0.65	4	47	
Trib. To Norwalk Creek (Rm 0.38) (12-103-001)	2023	K01G20	1.62	8.3	75	
Trib. To Old Woman Creek (Rm 3.70) (12-005-001)	2023	K01G01	0.69	10.1	45.5	
Trib. To Rattlesnake Creek (Rm 0.30) (12-001-004)	2023	501080	1.38	3.8	70.3	
Trib. To Rocky Ford Creek (Rm 10.75) (16-103-003)	2008	S01K13	3.57	8.9	41.5	
Trib. To Rocky Ford Creek (Rm 10.75) (16-103-003)	2008	201105	2	18.7	39.5	
Trib. To Sandusky Bay (31.1) (05-062-000)	2023	304339	0.7	5.5	40.5	
Trib. To Smokey Run (0.31) (07-100-008)	2015	303294	0.55	3.3	72	
Trib. To Southwest Branch (Rm 5.35) (21-005-003)	2023	Y01Q15	0.6	4.1	60	
Trib. To Vermilion R. (Rm 24.35) (21-001-004)	2023	Y01G13	4.01	9.8	77.5	
Trib. To Vermilion R. (Rm 54.62) (21-001-007)	2023	Y01G30	0.48	5.6	68.5	
Trib. To Vermilion R. (Rm 63.52) (21-001-008)	2023	Y01W01	0.3	4.1	60.5	

Table C1. Non-AOC Headwaters QHEI Scores					
Stream Name	Year	Station	River Mile	Drainage Area	QHEI
Trib. To Vermilion R. (Rm 8.29) (21-001-001)	2023	Y01Q10	0.9	8.1	52
Trib. To W. Br. Huron R. (Rm 23.09) (12-200-002)	2023	K01P10	2.97	14	76.5
Turkey Creek (07-200-000)	2015	A01P03	1.37	7.8	70
Village Creek (12-001-001)	2023	K01G19	1.12	10.5	58.8
Walnut Creek (12-200-006)	2023	K01P13	0.98	9.8	64
West Branch Huron River (12-200-000)	2023	K01G10	47.47	10.8	49
West Branch Rocky River (13-200-000)	2014	501940	33.55	9.1	69
West Branch Rocky River (13-200-000)	2014	301181	32.26	11.4	73.5
Westerhouse Ditch (05-105-000)	2023	U04K04	0.63	16.2	75
Wheeler Creek (07-006-000)	2015	303276	2.75	6.8	70
Whitman Creek (07-012-000)	2015	303297	1.2	1.6	57
Whitman Creek (07-012-000)	2015	A01P15	0.06	8.5	58.5
Willow Creek (20-005-000)	2015	303267	1.25	10.7	52.5
Wolf Creek (16-005-000)	2008	S02K04	6.51	9.2	40.5

Appendix C – Public Comment

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Appendix D – Letter of Support Black River AOC
Community Advisory Committee

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