UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
GREAT LAKES NATIONAL PROGRAM OFFICE
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CHICAGO, IL 60604-3590

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

Dear Ms. Mulinex:

Thank you for your September 5, 2023 request to remove the *Fish Tumors or Other Deformities* Beneficial Use Impairment (BUI) at the Black River Area of Concern (AOC). As you know, we share your desire to restore all the Great Lakes AOCs and to formally delist them.

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

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

We look forward to the continuation of this productive relationship with your agency, the Ohio Environmental Protection Agency, and the Black River AOC Advisory Committee as we work together to delist this AOC in the years to come. If you have any further questions, please contact me at (312) 353-8320 or your staff can contact Leah Medley at (312) 886-1307.

Sincerely,

CHRISTOPHER R KORLESKI
Digitally signed by CHRISTOPHER KORLESKI
Date: 2023.10.16 13:36:39 -05'00'

Chris Korleski, Director
Great Lakes National Program Office

cc: Mark Johnson, OEPA
Lynn Garrity, OLEC
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Raj Bejankiwar, IJC

Removal Recommendation for the Fish Tumors or Other Deformities Beneficial Use Impairment in the Black River AOC

September 2023

Lake Erie Commission

BLACK RIVER

Ohio Environmental Protection Agency

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Purpose

The purpose of this document is to recommend the removal of the Fish Tumor and Other Deformities (DELTs) Beneficial Use Impairment (BUI) from the Black River Area of Concern (AOC). This document provides information and documentation of fish tumors and deformities, eroded fins, lesions, and tumors (DELT) assessments and measures the results of the assessments against applicable State of Ohio Area of Concern BUI Restoration Targets.

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 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 (Lorain County Community Development Department [LCCDD], 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 Park Beach, and Lakeview Park Beach.

Nine of the 14 BUIs were identified as impaired for the Black River AOC. Five of the BUIs remain impaired:

- Fish Consumption – REMOVED 2016
- Degradation of Fish Populations
- Fish Tumors or Other Deformities
- Degradation of Benthos
- Restrictions on Dredging Activities - REMOVED 2022
- Degradation of Aesthetics – REMOVED 2021
- Eutrophication & Undesirable Algae - REMOVED 2016
- Beach Closings (Recreational Use)
- Loss of Fish Habitat

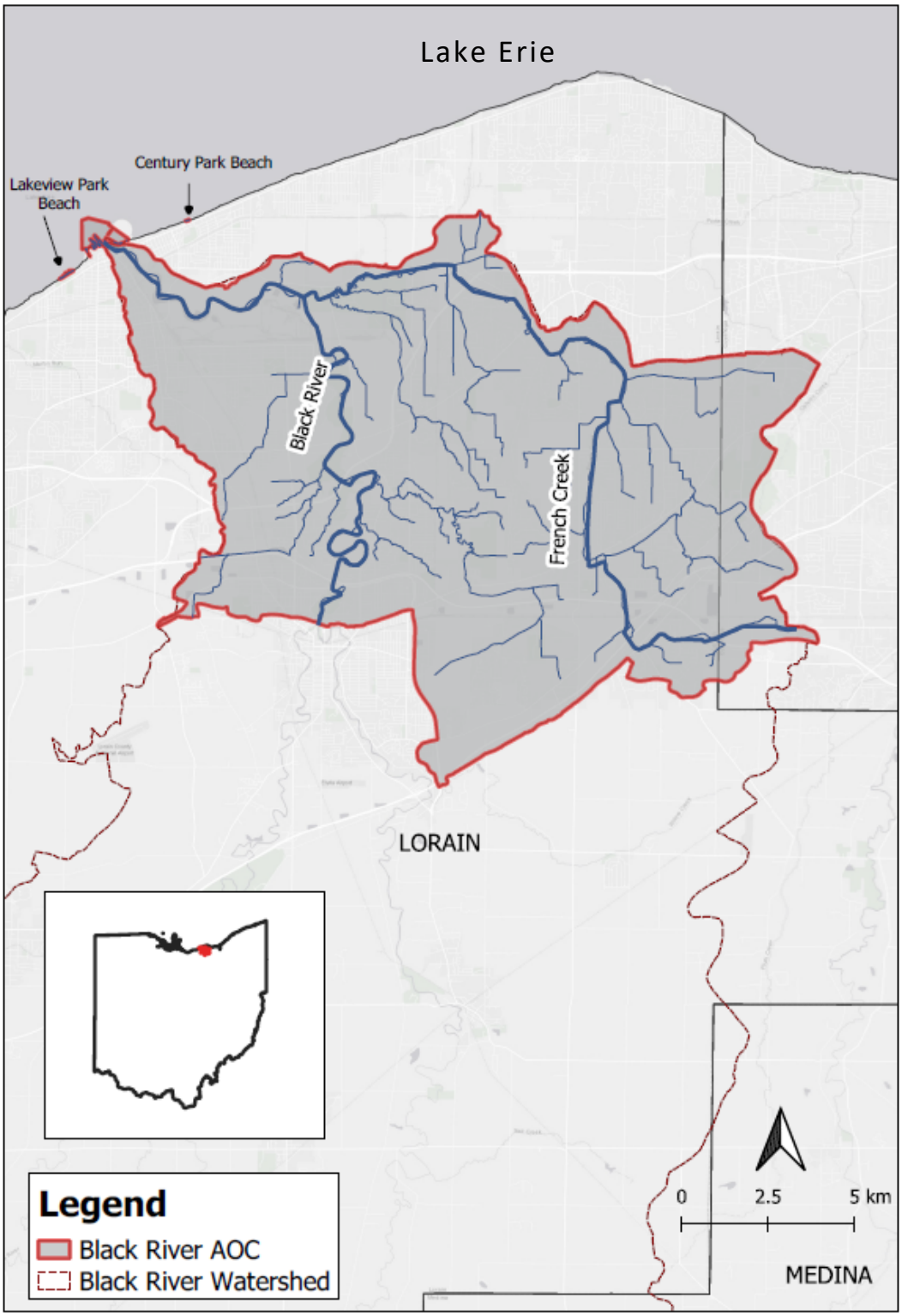

Figure 1. Map of Black River AOC

BUI Listing Criteria and Impairment Listing for Fish Tumors or Other Deformities

The Fish Tumors and Other Deformities BUI was determined to be impaired 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 "incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers." The report found the presence of fish DELTs and tumors to be caused by inorganic and organic toxins including polycyclic aromatic hydrocarbons (PAHs) found in the industrial sections of the watershed (BRCC, 1994). The report also stated that the fish DELTs and tumors were likely limited to areas of the basin where concentrated contaminants exist.

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 2020. Ohio's current listing criteria for this BUI states that a listing of impaired shall occur if "DELTs or bullhead liver tumor incidence levels exceed regional target values or values found in either Lake Erie fish populations and are due to contaminant sources from within the boundaries of the AOC" (Ohio EPA & Ohio Lake Erie Commission, 2020).

In 2004, the Fish Tumors and Other Deformities BUI was redesignated to *In-Recovery Phase*. It was determined sufficient progress in the BUI, marked by a significant reduction of fish tumors and DELTs in previously contaminated reaches of the Black River. The observed reduction was a result of a contaminated sediment dredging project that occurred between 1989 and 1990 under a 1985 Consent Decree with the U.S. EPA. While the progress was not enough to remove the BUI, the "re-designation was an important first step in demonstrating the improvements to the Black River Area of Concern" (BRCC, 2004). The Stage 2 RAP report identified the BUI as being In Recovery and recommended that studies be conducted to evaluate fish tumors and DELTs in the Black River and French Creek.

State of Ohio Restoration Target and Removal Criteria

The Ohio AOC Delisting 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.)

The current restoration targets for the Fish Tumors and Other Deformities BUI states this beneficial use can be removed when the average DELT values within each assessment unit do not exceed:

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

And

- Where brown bullheads are present, the liver tumor prevalence rate in fish 3 years or older (i.e., neoplastic or preneoplastic liver tumors) should not exceed 5%.

Assessment units (AUs) for DELTs are the 12-digit HUC, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed. In this case, the French Creek HU (HUC 04110001 06 01) and Black River HU (HUC 04110001 06 02) are the AUs that are evaluated. DELT frequencies from the entire AU are averaged into one value for lacustuary and boat sites, and one value for wading and headwater sites.

Ohio EPA fish sampling protocols are used to determine the status of this BUI. This protocol records observed external anomalies or DELT data when conducting fish community surveys. Although external anomalies can be caused by non-environmental reasons such as spawning stress or injuries, many anomalies are either caused or exacerbated by environmental factors and often indicate the presence of multiple sublethal stressors. Both external and internal (specifically liver) tumors in fish have been associated with carcinogens in sediment. For this reason, Ohio's AOC Program also included brown bullhead, which are typically benthic and in close proximity to sediments, in its removal criteria for this BUI. Brown bullhead populations are only assessed for liver tumors from the lacustuary segment of the Black River AU based on the BUI Restoration Target.

The BUI Restoration Target also states that if results from any single sample for a site exceeds a level of two times the applicable target value, then the whole assessment unit is considered impaired. This condition may be indicative of a hotspot being present and additional investigation and potential restoration actions may be needed.

Summary of BUI Remedial Actions

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 3). 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 site's northeast corner near the Black River. Landfill waste was removed, and all

remaining waste is contained under at least two feet of a 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 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, Ohio (Black River West Branch RM 1.7) (Figure 3). 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 next scheduled five-year review will be in 2023 (U.S. EPA 2020). This site continues to be regulated by other programs at Ohio EPA.

Black River Sediment Remediation

Black River sediment had been heavily contaminated with metals and PAHs by discharges predominately from steel production and the steel mill coking plant that ceased operations in the early 1980s. The elevated levels of PAHs severely impacted fish communities. Extensive studies over the years have established a link between high sediment PAH concentrations and liver cancers in bullhead and external deformities in other fish populations. Within the Great Lakes, the Black River was known as the "River of Fish Tumors" (IJC, 1997). Under a 1985 consent decree from U.S. EPA, U.S. Steel removed over 50,000 cubic yards of PAH-contaminated sediment within a 0.8 mile reach of the Black River near the company's steel mill coking plant complex (Figure 2) (BRCC 1994, U.S. EPA 2021a).

Several post-remediation studies have been conducted on the Black River. The incidence of external lesions and fish tumors was reduced significantly post-remediation. 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). Additional sediment sampling was conducted in the fall of 1997, and fish samples were collected in the spring of 1998. The results of the 1998 fish study, eight years after the sediment dredging took place, showed that liver tumors were at

their lowest documented levels, and that the percentage of fish with normal healthy livers was almost seventy percent, as opposed to twenty percent in the early 1980s (Baumann & Harshbarger, 1998).

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 4.0 and 5.0 (Figures 2 and 3). Over 200 acres of the city owned property, referred to as the Reclamation Site, contained disposed steel slag and other steelmaking by-products. To restore and revegetate the Reclamation Site, the city of Lorain implemented a project to cap and cover the slag and steel byproducts on approximately 40 acres in the Black River riparian areas. This project was included on the 2017 U.S. EPA approved Management Action Project list. Its goals were to reduce infiltration, manage direct runoff, minimize surface erosion, and enhance previous wetland restoration efforts. The project was substantially completed in September 2020.

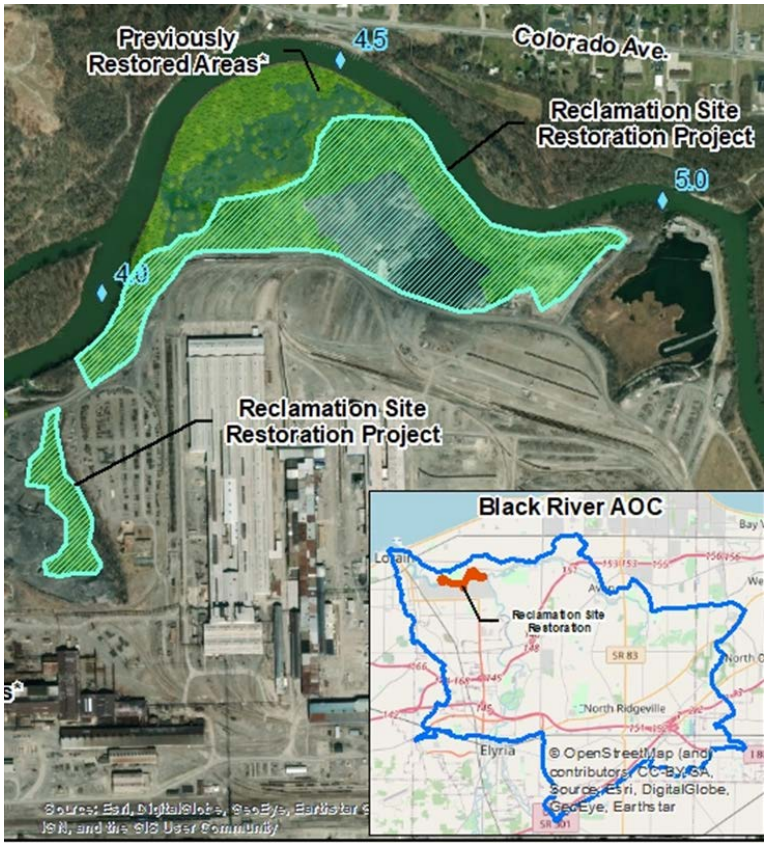

Figure 2. City of Lorain Reclamation Site Restoration Project

In 2022, the city of Lorain identified an additional 14 acres of the Reclamation Site with exposed steel slag that required restoration. The expected completion date of this project is the end of 2023 which will conclude the city of Lorain's 114 acre-restoration of uncovered steel slag that had been deposited in the riparian zone of the Black River.

Figure 3. Locations of Black River BUI Actions

French Creek Contaminant Source Investigation

In 2004, the Ohio EPA and U.S. Army Corps of Engineers 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 (FWS) 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). While this study was primarily designed in relation to the impairments of the fish and benthos populations BUIs, the results also helped inform the evaluation of the Fish Tumors or Other Deformities BUI.

The contaminant source investigation concluded that there was limited evidence that French Creek was a source of metal, organochlorine pesticide, orthophosphate pesticide, PAH, or PCB contamination in the broader Black River watershed. This study indicates that French Creek is not a significant contributor of the contaminants primarily responsible for internal neoplastic tumors and DELTs in fish.

DELT Anomaly Assessments in the Black River AOC

Between 2012 and 2021, fish community assessments occurred at 47 sites in the Black River AOC; 37 in the Black River and 10 in French Creek (Figure 4) (Tables 1 and 2) which assessed 24,131 total individuals. Of the ten assessments in French Creek, only one wading site observed a DELTs frequency above the 1.3% restoration target for wading sites. The DELT average for French Creek was 1.03% for the boat site and 0.38% for wading sites, well below the respective 3% and 1.3% targets.

DELT anomalies were observed in 99 of 18,349 total fish collected from the Black River, and only five of the 66 individual assessments yielded average DELT frequencies above the restoration targets. Furthermore, the DELT frequency averages for the Black River AU were below their respective removal targets on 34 of 37 total assessment sites. The DELT frequency average for the Black River within the AOC was 1.1% for boat and lacustuary sites, and 0.5% for wading and headwater sites. These boat/lacustuary and wading/headwater averages were below the respective restoration targets. Additionally, the 2012-2021 DELT frequency average from the Black River within the AOC boundary were significantly less than the 1982 and 1992 averages of 5.7% and 5.3%. In 1982, the DELT frequency average for boat and lacustuary sites was 5.7%: nearly double the 3.0% removal target. The DELT frequencies in 2020-2021 for the Black River AU of 1.1% for boat and lacustuary sites and 0.5% for wading sites were well below the respective 3.0% removal and 1.3 % removal targets (Table 3).

One assessment site yielded a DELT frequency greater than two times the restoration target. One electrofishing pass was conducted at RM 6.1 in 2021, resulting in a DELT frequency of 11.4%. Per the State of Ohio AOC Removal Criteria, the observed DELT frequency at RM 6.1 can be considered a hotspot and cause the Black River assessment unit to be considered impaired. The impairment observed at the site required an additional investigation to identify any potential causes of the DELTs.

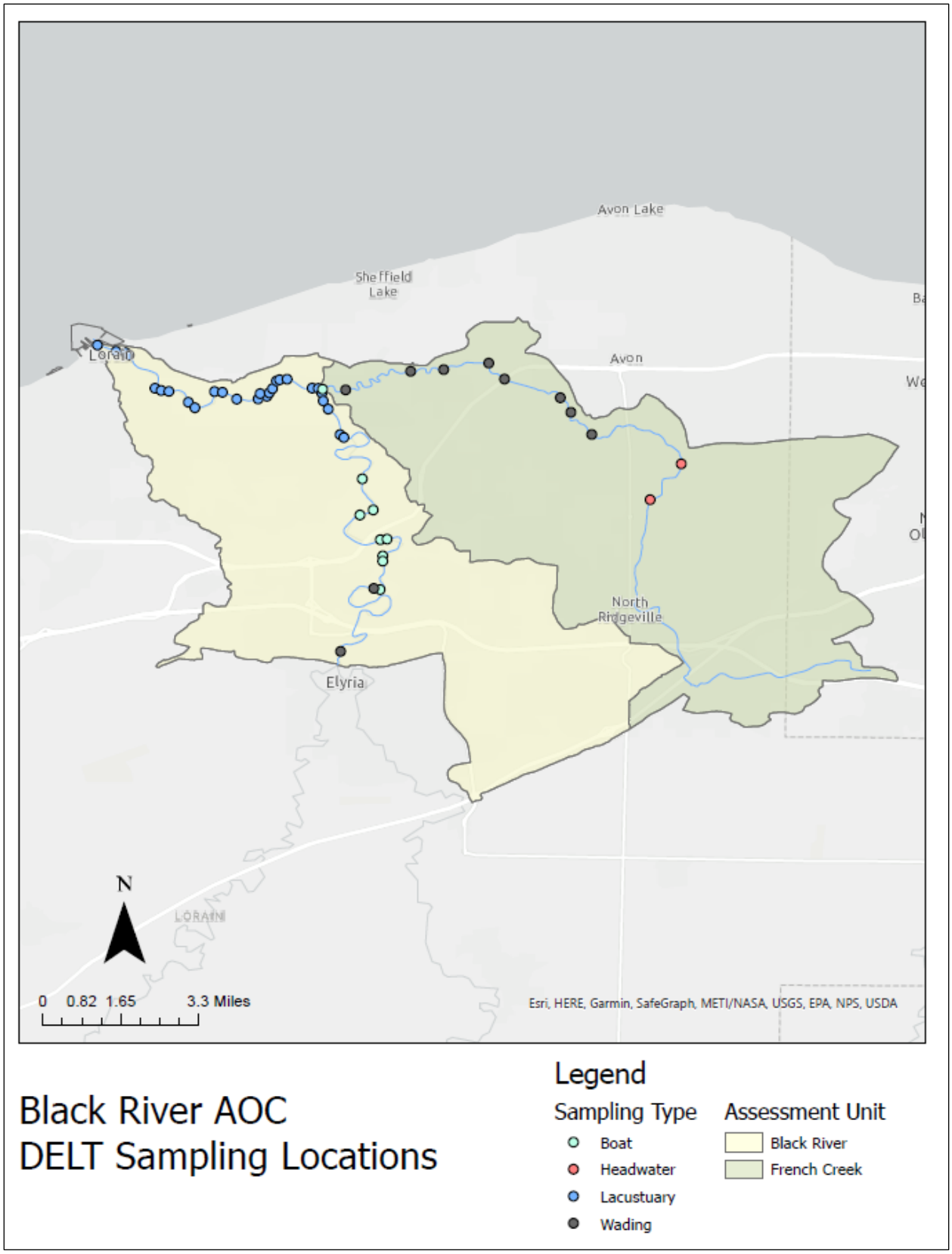

Figure 4. Map of Black AOC DELT sampling locations

Table 1. French Creek DELT Anomaly by River Mile						
River Mile	**Year Assessed**	**Pass**	**Number of Individual Fish assessed**	**Number of DELTs Observed**	**DELT Frequency %**	**Seasonal Average %**
10.41	2012	1	275	0	0.0%	0.0%
9.02	2012	1	114	0	0.0%	0.0%
6.9	2017	1	305	0	0.0%	0.0%
6.1	2017	1	273	0	0.0%	0.0%
	2017	2	433	0	0.0%	
5.5	2017	1	425	0	0.0%	0.0%
	2017	2	382	0	0.0%	
4.5	2017	1	314	0	0.0%	0.0%
	2017	2	809	0	0.0%	
4	2017	1	376	6	1.6%	2.2%
	2017	2	184	5	2.7%	
3.2	2017	1	305	1	0.3%	0.8%
	2017	2	251	3	1.2%	
2.5	2017	1	380	1	0.3%	0.1%
	2017	2	355	0	0.0%	
0.54	2017	1	267	0	0.0%	0.4%
	2017	2	141	1	0.7%	
0.1*	2015	1	44	0	0.0%	1.0%
	2015	2	86	0	0.0%	
	2015	3	63	2	3.1%	
Total Boat	-	-	**193**	**2**	-	**1.03%**
Total Wading and Headwater	-	-	**5589**	**17**	-	**0.3%**

*** = Boat site**

Table 2. Black River DELT Anomaly by River Mile					
River Mile	**Date Assessed**	**Number of fish assessed**	**Number of DELTs Observed**	**DELT Frequency %**	**Seasonal Average %**
14.95*	**9/1/2015**	**1103**	**0**	**0.0%**	**0.1%**
	8/6/2015	**604**	**1**	**0.2%**	
11.6*	**7/22/2015**	**355**	**5**	**1.4%**	**1.0%**
	8/24/2015	**618**	**4**	**0.6%**	
11.5	7/10/2012	162	0	0.0%	0.0%
	9/12/2012	335	0	0.0%	
10.85	7/22/2015	200	9	4.5%	2.9%
	8/28/2015	381	5	1.3%	
10.7	7/10/2012	323	0	0.0%	0.0%
	9/12/2012	468	0	0.0%	
9.9	7/21/2015	109	3	2.8%	2.5%
	8/25/2015	275	6	2.2%	
9.8	7/10/2012	239	0	0.0%	0.0%
	9/12/2012	390	0	0.0%	
8.7	7/23/2015	287	0	0.0%	0.1%
	8/25/2015	442	1	0.2%	
8.35	7/11/2012	332	0	0.0%	0.4%
	9/13/2012	335	3	0.9%	
7.7	7/23/2015	111	0	0.0%	0.1%
	8/25/2015	621	1	0.2%	
6.2	7/23/2015	46	0	0.0%	0.8%
	9/1/2015	195	3	1.5%	
6.1	8/5/2021	35	4	11.4%	11.4%
5.5	8/5/2021	40	0	0.0%	0.0%
5.4	6/20/2012	135	1	0.7%	0.6%
	7/31/2012	251	1	0.4%	
5.2	8/21/2020	336	0	0.0%	0.2%
	10/6/2020	224	1	0.4%	
5	8/5/2021	84	2	2.4%	2.4%
4.9	8/21/2020	394	0	0.0%	0.5%
	10/6/2020	188	2	1.1%	
4.5	8/5/2021	120	4	3.3%	3.3%
4.4	8/21/2020	106	0	0.0%	1.1%
	10/6/2020	100	2	2.1%	
4.3	8/21/2020	330	0	0.0%	0.2%
	10/7/2020	356	1	0.3%	

River Mile	Date Assessed	Number of fish assessed	Number of DELTs Observed	DELT Frequency %	Seasonal Average %
4.1	8/22/2020	334	0	0.0%	0.0%
	10/7/2020	250	0	0.0%	
4	8/5/2021	59	2	3.4%	3.4%
3.91	8/22/2020	160	0	0.0%	0.0%
	10/7/2020	199	0	0.0%	
3.9	8/22/2020	278	0	0.0%	0.0%
	10/7/2020	371	0	0.0%	
3.8	8/22/2020	215	0	0.0%	0.0%
	10/7/2020	281	0	0.0%	
3.52	8/20/2020	457	4	0.9%	0.5%
	10/9/2020	480	1	0.2%	
3.2	8/6/2021	148	3	2.0%	2.0%
3	8/20/2020	375	3	0.8%	0.7%
	10/9/2020	747	4	0.5%	
2.5	8/6/2021	145	1	0.7%	0.7%
2.3	7/28/2020	155	3	2.0%	1.3%
	10/9/2020	168	1	0.6%	
2	7/28/2020	149	0	0.0%	0.3%
	10/9/2020	209	1	0.5%	
1.7	7/27/2020	164	1	0.7%	0.4%
	10/8/2020	430	0	0.0%	
1.5	7/28/2020	371	6	1.6%	1.0%
	10/8/2020	468	2	0.4%	
0.6	7/28/2020	363	2	0.6%	0.8%
	10/8/2020	219	2	1.0%	
0.54	8/6/2021	202	3	1.5%	1.5%
0.4	7/28/2020	69	1	1.7%	0.9%
	10/8/2020	48	0	0.0%	
0.1	8/20/2020	91	0	0.0%	0.0%
	10/8/2020	114	0	0.0%	
Total Boat and Lacustuary		15669	89		1.1%
Total Wading		2680	10		0.5%

*** = Wading site**

Table 3. Black River Lacustuary and Mainstem Historical DELT Frequencies		
Year	**Number of assessment sites**	**DELT Frequency**
1982	15	5.7%
1992	16	5.3%
1997	14	2.0%
2012-2021*	37	1.1%

* = dataset used for BUI evaluation

Additional DELT Evaluation

RM 6.1 of the Black River is located immediately downstream of the Black River Reservation, and approximately 1 mile upstream of the Reclamation Site. The 2021 assessment of RM 6.1 resulted in the collection of only 35 fish, four of which possessed DELT anomalies. The total fish collected at this site was significantly less than the average number of fish collected (232) throughout the lacustuary portion of the Black River. Because of the sample size, the DELT frequency observed during the single 2021 electrofishing pass may not be reflective of the true DELT frequency at RM 6.1.

Figure 5. Black River RM 6.1

While a low sample size may be the primary influence of the elevated DELT frequency, other sources may also be causing increased DELTs. Identifying potential contributing sources of pollution in the Black River can provide further information on potential causes of an elevated DELT frequency. Directly relating DELTs to a distinct pollution source is challenging due to the general nature of fish movement.

A desktop analysis and coordination with state, federal, and local agencies was conducted to provide a general evaluation of any potential sources of contamination. Two potential sources were identified.

Adjacent industrial sites where construction and other types of debris are stored were identified near the DELT sampling site at RM 6.1. Stormwater runoff from these industrial sites may be entering Black River near RM 6.1. Further review of site conditions and any associated permitting would be addressed through local jurisdictions.

The Elyria wastewater treatment plant (WWTP), located at RM 10.6, discharges to the Black River. Sanitary sewer overflows (SSOs), combined sewer overflows (CSOs), and bypasses from the Elyria WWTP, may discharge untreated or partially treated wastewater to the Black River and its tributaries. These discharges can cause adverse human and environmental health impacts. While upstream CSO, SSO, and WWTP bypass occurrences cannot be directly linked to the DELTs observed at RM 6.1, their notable water quality impacts may be a potential cause of DELTs. Additionally, elevated DELT frequencies would likely be observed at sampling locations between RMs 6.1 and 10.6 if untreated or partially treated wastewater from the city of Elyria was the primary cause of the RM 6.1 hotspot.

On November 9, 2022, the city of Elyria entered into a 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 greatly improve the water quality of the Black River, which should help improve the overall in-stream biological health.

The observed elevated DELT frequency at one site may be a result of small sample size and/or other potential sources of contamination, and DELT observations will continue to be included in future monitoring activities. The Ohio AOC restoration targets and criteria were met to remove this BUI impairment for the Black River assessment unit.

Brown Bullhead Liver Tumor Assessment

Assessments were conducted in the Black River AU in 2021 by the FWS to determine the current status of the prevalence of brown bullhead liver tumors. As recommended by Blazer et al. (2009), only neoplastic lesions were included in the calculation of tumor prevalence. Blazer et al. (2009) recommended that foci of cellular alterations and other proliferative liver lesions should be documented but not included in the calculation of liver tumor prevalence until further studies have been conducted to determine which lesions are preneoplastic in brown bullhead liver cancer initiation.

The lower five RMs of the Black River lacustuary has been evaluated in 1998, 2012, 2013 and 2021. Eight sites were sampled in 2021, resulting in the collection of 39 brown bullhead with a mean age of 4.6 ± 1.4

years (Table 4); zero of which contained liver tumors. The 2021 bullhead tumor rate of 0% met the restoration target of 5%.

Table 4. Black River AOC Brown Bullhead Liver Tumor Data					
Date	**Sample Size**	**Mean Length**	**Mean Age (yr. ± std. dev.)**	**Liver tumors Count**	**Liver Neoplasms**
5/4/1998	45	-	4.9 ± 1.6	4	8.9%
8/15/2012; 5/21/2013	70	338.6 ± 5.4	5.8 ± 0.3	8	11.4%
5/13-5/14/2021	39	315.8 ± 42.3	4.6 ± 1.4	0	0.0%

Conclusion

Incidence of DELT anomalies in fish communities in the Black River assessment unit met the 1.3% restoration target for wading sites and 3.0% for the boat and lacustuary reaches within the AOC.

A DELT frequency above the BUI Restoration Target was observed in 2021 at RM 6.1 in the Black River that would consider the full Black River AU impaired. Due to the small sample size at this assessment site and the potential of contributing sources that cannot be specifically identified but may impact these conditions, the Black River AU is considered not impaired for DELTs as an AOC. Continued monitoring of conditions and watershed impacts are recommended to be considered from local and state programs that are outside of the AOC program.

Incidence of DELT anomalies in fish communities from the French Creek assessment unit met the 1.3% restoration target for wading sites and 3.0% restoration target for the boat site. The French Creek AU is not impaired for DELTs and met the BUI restoration target.

The Black River, once referred to as the “river of tumors” exhibited brown bullhead liver tumor prevalence rates between 22% to 39% in the 1980s (Baumann & Harshbarger, 1998). The brown bullhead liver tumor prevalence rate of 0.0% in the Black River lacustuary from the data evaluated met the 5% restoration target and demonstrated how conditions within the AOC have improved over time.

Recommendation

Based upon improvements in the conditions of the Black River resulting from the actions that have occurred over the past three decades, and findings of the BUI evaluation associated with DELTS and Fish Tumors data, the Ohio Lake Erie Commission and Ohio EPA recommend the removal of the Fish Tumors or Other Deformities BUI from the Black River AOC.

A three-week public comment period was issued by Ohio EPA and Ohio Lake Erie Commission for the Draft BUI Removal Recommendation on July 13, 2023. No public comments were received (Appendix A). A letter of support by the Black River AOC Advisory Committee was received and is provided in Appendix B.

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Appendix A - 2020 Delisting Guidance

BUI 4: Fish Tumors or Other Deformities

IJC Listing Guideline

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

State of Ohio Listing Guideline

This beneficial use shall be listed as impaired if:

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

State of Ohio Restoration Target

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

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

AND

Where brown bullheads are present, the liver tumor prevalence rate in fish 3 years or older (i.e., neoplastic or preneoplastic liver tumors) should not exceed 5%.

Notes

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

Potential Data Sources

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

Rationale

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

DELTs are typically recorded when conducting fish community surveys. Information on external anomalies is noted because many are either caused or exacerbated by environmental factors and often indicate the presence of multiple sublethal stressors. Morphological abnormalities are uncommon in unimpacted natural fish populations. DELTs are one of the metrics used to determine Ohio's Index of Biotic Integrity (IBI). The metric is designed to provide a score (5, 3 or 1) as part of the overall index. The DELT target percentage of 3.0% (lacustuary and boat sites) and 1.3% (free flowing, headwater and 34

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

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

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

Ohio EPA recommends the following guidelines for averaging data:

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

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

For Bullhead Liver Tumors:

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

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

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

Ohio EPA has identified the lacustuary zones of the following streams and reaches for the evaluation of brown bullhead liver tumor incidence rates.

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

Ashtabula River was evaluated by the FWS in 2011 and the other AOC lacustuary zones were sampled as part of an Ohio EPA GLRI project in 2012-2013. The technology for evaluating tumors is evolving. Any studies conducted for BUI evaluation should strive to follow the current industry protocols for collection and analysis.

Appendix B – Public Comment

A public comment period for the Draft BUI Removal Document for the Black River AOC Fish Tumors or Other Deformities was held from July 13 through August 3, 2023. No public comments were received.

Appendix C

Letter of Support Black River AOC Community Advisory Committee

BLACK RIVER

August 31, 2023

Ms. Anne M. Vogel, Director
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, OH 43216-1049

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

Re: ***Removal of Beneficial Use Impairment - Fish Tumors or Other Deformities from Black River Area of Concern***

Dear Directors Vogel and Mulinex:

The Black River Area of Concern (AOC) Advisory Committee, representing an array of agencies, nonprofits and the public, offers its support to the Ohio Lake Erie Commission in their recommendation to remove Beneficial Use Impairment for Fish Tumors or Other Deformities from the Black River AOC.

The Advisory Committee has reviewed available data, materials, and documents for the removal in the Black River AOC for this BUI. Based up on the information provided, the Advisory Committee has voted unanimously to support the request for its removal. We want to praise the work of Hannah Boesinger and her colleagues in working to answer concerns and help our committee investigate some of the findings that support the recommendation. Her efforts made our final vote one of the easiest we have had in my time as chair.

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

With the removal of this BUI, the following impairments will remain in the Black River AOC.

- Degradation of Fish Populations
- Degradation of Benthos
- Beach Closings (Recreational Contact)
- Loss of Fish Habitat

The Black River AOC Advisory Committee looks forward to continuing to work with the Commission and Ohio EPA to remove the remaining impairments leading to the delisting of the Black River Area of Concern.

Sincerely,

Donald C. Romancak
Chair, Black River AOC Advisory Committee