



John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

July 15, 2016

Chris Korleski, Director
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 West Jackson Blvd. (G-17J)
Chicago, Illinois 60604-3511

Dear Mr. Korleski:

Ohio EPA and the Black River AOC Advisory Committee are requesting concurrence with the recommendation to remove two beneficial use impairments, Fish & Wildlife Consumption and Eutrophication & Undesirable Algae, in the Black River AOC. The enclosed removal recommendations provide detailed assessments for both BUIs and outline the rationales for the BUI removals. The package also contains a letter of support from the Black River AOC Advisory Committee.

Ohio EPA worked with the local AOC Advisory Committee to develop the removal recommendations and conducted a public meeting on May 25, 2016, to inform the public about the recommendation and to solicit comment. No formal comments/concerns were brought to our attention.

The resources provided by the Great Lakes National Program Office and the Great Lakes Restoration Initiative have been vital in the restoration of Ohio's AOCs and have led us to this historic milestone in the Black River. We look forward to working with the U.S. EPA and the AOC Advisory Committee to remove the six remaining BUIs and ultimately delist the Black River AOC.

Sincerely,

A handwritten signature in black ink, appearing to read "Craig W. Butler", is written over a faint, circular stamp or watermark.

Craig W. Butler
Director

Enclosure

cc: Tiffani Kavalec, Division of Surface Water Chief



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

11 OCT 2016

Mr. Craig Butler
Director
Ohio Environmental Protection Agency
50 West Town Street, Suite 700
P.O. Box 1049
Columbus, OH 43216-1049

Dear Mr. Butler:

Thank you for your July 15, 2016, request to remove the "Restrictions on Fish and Wildlife Consumption" and "Eutrophication or Undesirable Algae" Beneficial Use Impairments (BUIs) from the Black River Area of Concern (AOC) in Ohio. As you know, we share your desire to restore all of the Great Lakes AOCs and to formally delist them.

Based upon a review of your submittal and the supporting data, the U.S. Environmental Protection Agency hereby approves your two BUI removal requests for the Black River AOC. In addition, 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 worked so hard and been instrumental in achieving these important environmental improvements. Removal of these BUIs will benefit not only the people who live and work in the Black River AOC, but all the residents of Ohio and the Great Lakes basin as well.

We look forward to the continuation of this important and productive relationship with your agency and the local coordinating committee as we work together to fully restore all of Ohio's AOCs. If you have any further questions, please contact me at (312) 353-4891, or your staff may contact John Perrecone, at (312) 353-1149.

Sincerely,

A handwritten signature in blue ink, appearing to read "Chris Korleski".

Chris Korleski, Director
Great Lakes National Program Office

cc: Russ Gibson, Ohio EPA-DSW Manager
Tiffani Kavalec, Ohio EPA-DSW Chief
Ted Conlin, Ohio EPA
Donald C. Romancak, Black River AOC Advisory Committee Chair
Raj Bejankiwar, IJC
Wendy Carney, EPA, GLNPO
Kristen Isom, EPA, GLNPO

Removal Recommendation for the Eutrophication or Undesirable Algae Beneficial Use Impairment (BUI) in the Black River Area of Concern

Background

The Black River AOC now includes the Outer Harbor, the near Lake Erie shoreline, the Black River mainstem lacustrine (or fresh water estuary (mouth to River Mile 6.2)), the Black River riverine or free-flowing reach (River Mile 6.2 to River Mile 14.95) and the French Creek sub-basin (Figure 1). Since the inception of the AOC process in the Black River, the Eutrophication or Undesirable Algae BUI listing has undergone changes.

The Eutrophication or Undesirable Algae BUI

This beneficial use contains two components, persistent problems with eutrophication (low dissolved oxygen) and persistent problems with aquatic weeds or nuisance algal blooms. Problems with aquatic weeds or nuisance algae are a component of this BUI if the problems are frequent and impact the public use of the water resource.

Eutrophication typically occurs from high nutrient levels or oxygen demanding substances and can be experienced in areas of little circulation and low flow. The issues of concern for the eutrophication component of this BUI are 1) the persistence of dissolved oxygen problems and 2) if the removal of this BUI can be supported if low dissolved oxygen levels are seasonally documented in heavily modified navigation channels and the modifications are a major contributing factor to eutrophication. Specific concentrations for dissolved oxygen have been set by Ohio in the water quality standards (WQS) and these criteria are used as targets for removal of the eutrophication component.

Impairment Listing Criteria

The original listing guideline, used in the Black River AOC Stage 1 Report, stated that this beneficial use will be listed as impaired “when there are persistent water quality problems (e.g., dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.”

The current State of Ohio AOC guidance document states that this beneficial use will be listed as impaired if:

- Dissolved oxygen levels do not meet minimum criteria established in Ohio Water Quality Standards, WQS, for the stream segment of concern, and the cause is

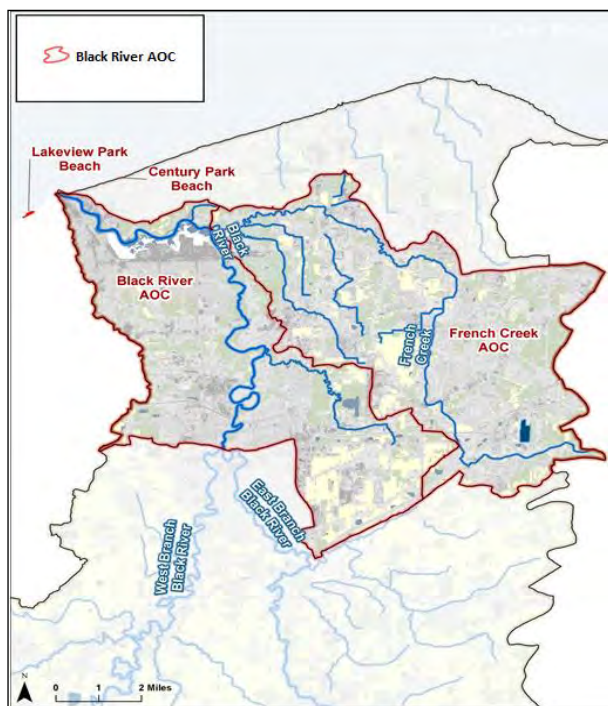


Figure 1. Black River AOC

due to excessive nutrient loading or excessive levels of oxygen demanding substances;

AND/OR

- Nutrients entering the waters as a result of human activity create nuisance growths of aquatic weeds or algae.

The statewide water quality criteria for dissolved oxygen can be seen in Table 1. For the eutrophication component removal target for dissolved oxygen in AOC lacustrine waters, the seasonal average dissolved oxygen value within an assessment unit must meet the Outside Mixing Zone Average (OMZA) value.

Table 1. Ohio EPA Dissolved Oxygen WQS	
Designated Use	Dissolved Oxygen, OMZA Criteria (mg/L)
Exceptional Warmwater Habitat Sites	6.0
Warmwater Habitat Sites (Applies to the all waters of the Black River AOC)	5.0
Modified Warmwater Habitat Sites	4.0
Limited Resource Waters	3.0

History of the Eutrophication or Undesirable Algae BUI in the Black River AOC

Although there have been no documented persistent problems with nuisance growths of either aquatic weeds or algal blooms and therefore no impairment for that component, changes to the eutrophication component listing have occurred since the beginning of the AOC process.

In their 1994 Stage 1 Report, the Black River AOC Advisory Committee determined there was a 'potential for impairment' for eutrophication in the mainstem, based on dissolved oxygen levels documented in Ohio EPA's 1993 *Biological and Water Quality Study of the Black River (with selected tributaries) and Beaver Creek*.

1993 Ohio EPA Water Quality Report

The 1993 report showed an improvement in seasonal average dissolved oxygen concentrations in 1992 compared to what was found in 1982 (Figure 2).

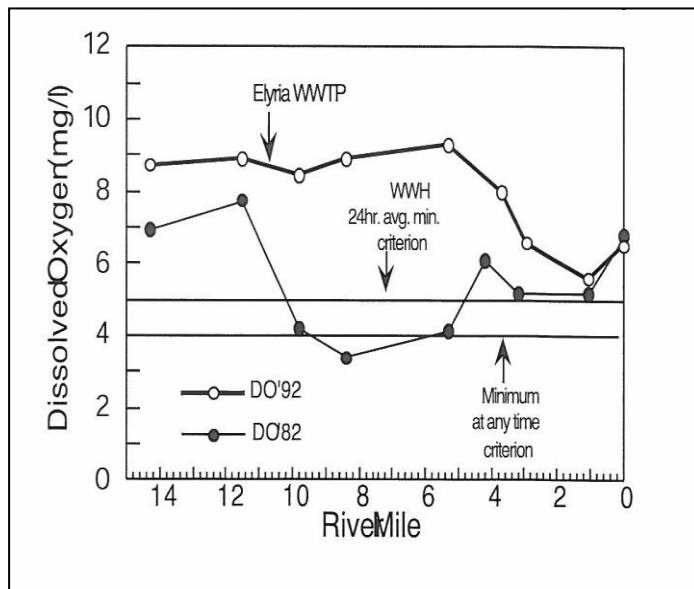


Figure 2. Seasonal average dissolved oxygen concentrations in the Black River mainstem by river mile in 1982 and 1992 (from Ohio EPA 1993)

A few 1-meter depth sites in 1992 (Tables 2 and 3) failed to meet Ohio WQS in effect at the time and the 1993 water quality report listed thirteen violations of water quality standards in surface, mid-depth and bottom waters of the Black River lacustrine (Table 4).

Table 2. 1992 Black River Lacustrary Navigation Channel Dissolved Oxygen

River Mile	Date	Dissolved Oxygen, mg/l				Depth, in feet
		1 meter depth	Depth Profile Study			
			Surface	Mid-depth	Bottom	
0.01	7/8/1992	6.8	6.5	7.1	7.0	35
	8/6/1992	6.9	7.1	7.0	6.6	35
	8/12/1992	6.6	7.3	6.8	5.6	35
	9/9/1992	5.7	5.9	5.9	5.6	35
	9/17/1992	6.4	6.8	6.2	6.2	33
	10/1/1992	6.3	5.95	6.1	6.9	34
	Seasonal Average by depth	6.45	6.59	6.52	6.32	
	Seasonal Average River Mile 0.01	6.47				
1.05	7/8/1992	4.5	6.0	5.5	2.1	35
	8/6/1992	7.0	7.9	6.7	6.3	32
	8/12/1992	6.6	7.1	6.5	6.3	32
	9/9/1992	4.1	4.7	4.4	3.3	33
	9/17/1992	4.8	4.9	4.6	3.75	31
	10/1/1992	6.1	6.3	6.0	5.95	34
	Seasonal Average by depth	5.52	6.15	5.62	4.62 +	
	Seasonal Average River Mile 1.05	5.78				
1.80	7/8/1992	3.9	5.2	4.3	2.2	30
	8/6/1992	7.1	7.5	6.7	7.1	32
	8/12/1992	5.5	6.0	5.9	4.8	35
	9/9/1992	4.6	5.2	5.0	3.7	33
	9/17/1992	4.7	5.1	4.9	4.3	33
	10/1/1992	6.2	6.2	5.95	6.5	32
	Seasonal Average by depth	5.33	5.87	5.46	4.77 +	
	Seasonal Average River Mile 1.80	5.36				
2.90	7/8/1992	5.4				15
	8/6/1992	7.4	7.5	7.3	7.4	19
	8/12/1992	7.6	7.0		8.3	12
	9/9/1992	5.75	5.7		5.8	12
	9/17/1992	5.75	5.5		6.0	14
	10/1/1992	6.9	6.3		7.5	13
	Seasonal Average by depth	6.47	6.40	7.30	7.00	
	Seasonal Average River Mile 2.90	6.65				
All Lacustrary Navigation Channel Seasonal Average		5.94				
BOLD Listed in 1993 water quality reports as exceedance of average dissolved oxygen water quality criteria (5.0 mg/l)						
BOLD Listed in 1993 water quality report as exceedance of minimum dissolved oxygen water quality criteria (4.0 mg/l)						
BOLD + Failed current eutrophication component removal criteria				NR Depth measurements were not recorded		

**Table 4. 1992 Black River Lacustuary Upstream of Navigation Channel
Dissolved Oxygen**

River Mile	Date	Dissolved Oxygen, mg/l				Depth, in feet
		1 meter depth	Depth Profile Study			
			Surface	Mid-depth	Bottom	
3.70	7/8/1992	8.7				7
	8/6/1992	8.35	8.5		8.2	9
	8/12/1992	9.5	9.7		9.3	10
	9/9/1992	6.7	6.7		6.7	10
	9/17/1992	7.0				NR
	10/1/1992	7.5				NR
	<i>Seasonal Average by depth</i>	7.96	8.30		8.07	
	<i>Seasonal Average River Mile 3.70</i>	8.07				
4.80	7/8/1992	12.7				5
	8/6/1992	8.3				10
	8/12/1992	7.85	7.9		7.8	8
	9/9/1992	6.9				10
	9/17/1992	7.8				7
	10/1/1992	9.7				NR
	<i>Seasonal Average by depth</i>	8.88				
	<i>Seasonal Average River Mile 4.80</i>	8.62				
5.30	7/8/1992	14.4				4
	8/6/1992	8.7				NR
	8/12/1992	8.0				5
	9/9/1992	7.4				NR
	9/17/1992	7.8				NR
	10/1/1992	9.5				NR
	<i>Seasonal Average River Mile 5.30</i>	9.30				
<i>All Lacustuary Upstream of Navigation Channel Seasonal Average by depth</i>		7.13	6.54	5.94	5.97	
<i>All Lacustuary Upstream of Navigation Channel Seasonal Average</i>		8.52				
NR Depth measurements were not recorded						

Table 4. Exceedances (Violations) of Ohio EPA Dissolved Oxygen Warmwater Habitat criteria (OAC 3745-1) in the Black River Mainstem, from Ohio EPA 1993.					
Area	River Mile	Water Column	Concentration, in mg/L	Violation	
Black River Mainstem-1992	1.05	Bottom	2.1	Minimum D.O. Water Quality Criterion	
			3.3		
			3.75		
		Middle	4.4	24-Hour Average D.O. Water Quality Criterion	
			4.6		
			4.7		
	Surface	4.9			
		1.80	Bottom	2.2	Minimum D.O. Water Quality Criterion
				3.7	
	4.8				
	Middle		4.3	24-Hour Average D.O. Water Quality Criterion	
		4.9			

The violations for dissolved oxygen from the 1993 report coupled with the improvements from 1982 were instrumental in the AOC Committee's original determination of a 'potential' for impairment. (The 1993 listing of the violations of the 24-hour average dissolved oxygen water quality criteria appeared to be based on single readings and not based on 24-hour average values as intended in Ohio WQSs.)

1998 Ohio EPA Water Quality Report

A subsequent water quality report in 1998, based on 1997 data (Tables 5 and 6), continued to document low dissolved oxygen in the bottom waters of the lower lacustrary and two violations of the Warmwater Habitat Outside Mixing Zone Minimum Criteria of 4.0 mg/L were noted (Table 7) although it appears that four violations could have been noted. The low dissolved oxygen concentrations occurred during the summer months and were cited as one reason that the Black River was assessed as being in non-attainment of biological water quality criteria.

Table 5. 1997 Black River Navigation Channel Lacustrary Dissolved Oxygen					
River Mile	Date	Dissolved Oxygen, mg/l			Channel Depth
		1 meter depth	Depth Profile Study		
			Surface	Bottom	
0.01	6/30/1997	6.85			35
	7/16/1997		8.32	5.33	33
	7/24/1997	6.12			37
	8/26/1997	8.68			33
	9/4/1997		5.85	6.30	26
	Seasonal Average by depth	7.22	7.08	5.82	
	Seasonal Average by River Mile	6.78			
0.42	6/30/1997	6.67			31
	7/16/1997		10.23	3.74	33
	7/24/1997	5.74			31
	8/26/1997	6.70			33
	9/4/1997		5.52	5.50	23
	Seasonal Average by depth	6.37	7.88	4.62 +	
	Seasonal Average by River Mile	6.30			
2.24	6/30/1997	5.53			29
	7/16/1997		6.36	3.85	23
	7/24/1997	5.12			32
	8/26/1997	7.06			30
	9/4/1997		5.33	3.57	23
	Seasonal Average by depth	5.90	5.85	3.71 +	
	Seasonal Average by River Mile	5.26			
2.90	6/30/1997	6.72			14
	7/16/1997		7.91	4.75	13
	7/24/1997	5.76			14
	8/26/1997	8.14			13
	9/4/1997		6.16	6.53	16
	Seasonal Average by depth	6.87	7.04	5.64	
	Seasonal Average by River Mile	6.57			
All Site Average		6.23			
Bold Listed in 1999 water quality report as exceedance of minimum dissolved oxygen water quality criteria (4.0 mg/l)					
+ Failed eutrophication component removal criteria			NR	Depth Not Recorded	

Table 6. 1997 Black River Lacustrary Upstream of Navigation Channel Dissolved Oxygen					
River Mile	Date	Dissolved Oxygen, mg/l			Channel Depth
		1 meter depth	Depth Profile Study		
			Surface	Bottom	
4.50	6/30/1997	10.60			NR
	7/16/1997	8.87			NR
	7/24/1997	6.00			11
	8/26/1997	8.80			4
	9/4/1997		10.66	2.04	10
	<i>Seasonal Average by depth</i>	8.57			
	<i>Seasonal Average by River Mile</i>	7.83			
5.30	7/16/1997	13.23			NR
	7/24/1997	8.49			NR
	8/26/1997	8.25			NR
	<i>Seasonal Average</i>	9.99			
6.20	6/30/1997	8.27			NR
	7/16/1997	11.20			NR
	7/24/1997	9.11			NR
	8/26/1997	8.37			NR
	9/4/1997	11.52			NR
	<i>Seasonal Average</i>	9.69			
<i>All Site Average</i>		8.96			
Violations issued for Warmwater Habitat Water Quality Criteria					

Table 7. Exceedances of Ohio EPA Warmwater Habitat Criteria (OAC 3745-1) in the Black River Mainstem, 1997				
Stream Name	River Mile	Water Level	D.O., in mg/l	Violation
Black River Mainstem-1997	4.5	Bottom	2.04	Warmwater Habitat OMZM Criteria of 4.0 mg/L
	2.24	Bottom	3.57	

The bottom layer at River Mile 4.50 on September 4, 1997 had the lowest dissolved oxygen concentration (2.04 mg/l) during the 1997 study. Coincidentally, the surface layer at this site on the same date had a dissolved oxygen concentration (10.66 mg/L) which exceeds the criterion for exceptional warmwater habitat sites. In addition, this site is about 0.6 mile downstream of the mouth of French Creek and the dissolved oxygen concentration of the closest French Creek site on that day (River Mile 0.40) was 10.89 mg/l also exceeding the criterion for exceptional warmwater habitat sites. As no bottom level dissolved oxygen values in 1992 were below 6.7 mg/l and all samples in 1997 were at or above 6.0 mg/L, it is suspected that a sampling error may have caused the low value seen at this site where the dissolved oxygen probe was held at a level less than 0.5 meter above the bottom. The daily mean river flow on the date of the sampling was only 15 cfs and if the meter was held closer than 0.5 meter from the bottom at this time of very low flow, the dissolved oxygen reading, without benefit of significant upstream flow, would be affected by bacterial respiration and normal sediment oxygen demand. Another explanation could be that during the assessment, the dissolved oxygen probe may have been on the bottom or touched the bottom then retrieved to the

proper depth and that some of the sediment coated the probe membrane. Regardless, the average of the surface and bottom layer dissolved oxygen values at this site on this day averaged 6.35 mg/L which exceeds warmwater habitat water quality criteria and even exceeds exceptional warmwater habitat criteria.

In 2002, the AOC Advisory Committee reviewed the 1997 Ohio EPA water quality report and because of the continued listing of dissolved oxygen violations determined that the eutrophication component was impaired in the Black River lacustrine. With the BUI listing criteria in effect at the time, it appeared that the change in status of this BUI from a 'potential for impairment' to impaired was warranted.

Impairment Removal Criteria

The 2016 revision to the Ohio AOC delisting guidance document states that BUIs can be removed under any of the following circumstances:

- Restoration targets have been met and follow up monitoring or other evaluations confirm that the beneficial use has been restored;
- It can be demonstrated that the 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 is assigned to another party or program (e.g., Lakewide Management Plan (LaMP), TMDLs, health department).

It is the intent of this document to demonstrate that current conditions in the AOC meet applicable restoration targets. This BUI has two components, an eutrophication component and an undesirable algae component. Riverine waters and lacustrine waters have separate pathways to meet restoration targets. In riverine waters, only the algal component targets apply. The Ohio guidance document states that the algal component of this BUI will be considered restored when "no persistent nuisance growth of algae, such as filamentous *Cladophora*, or blooms of blue-green algae have been documented within the last three years due to sources of nutrients from within the AOC." For lacustrines, both the algal and eutrophication components apply. Aside from meeting the algal component criteria, the Ohio guidance states that this BUI can be considered restored when "the seasonal average dissolved oxygen value within an assessment unit meets the OMZA criteria listed in the Ohio WQS, Chapter 3745-7." Numeric criteria for dissolved oxygen have been developed for the state of Ohio WQSs to protect aquatic life. All streams in the Black River AOC, including the lacustrine and free-flowing reaches of the mainstem are designated as warmwater habitat streams; therefore a seasonal average of 5.0 mg/l dissolved oxygen is the restoration target for the eutrophication component of this BUI.

The Ohio delisting guidance document does offer that if a deepening of a river channel for navigational purposes is "responsible for the failure to meet WQS, this area would not be considered impaired under this target due to nutrient loading." In addition, the

phenomenon of low dissolved oxygen levels is seasonal and not due to either “excessive nutrient loading or excessive levels of oxygen demanding substances” (Ohio EPA 2015). The low values are due to the river’s morphology (lacustrine), modifications made to facilitate commercial ship traffic and water column stratification that occurs during times of low river flows which are typically seen during the late summer months. Ohio EPA’s 2008 Black River TMDL report determined that when the shipping channel is not stratified, the dissolved oxygen WQS criteria (and therefore the removal criterion for the eutrophication component) are achievable.

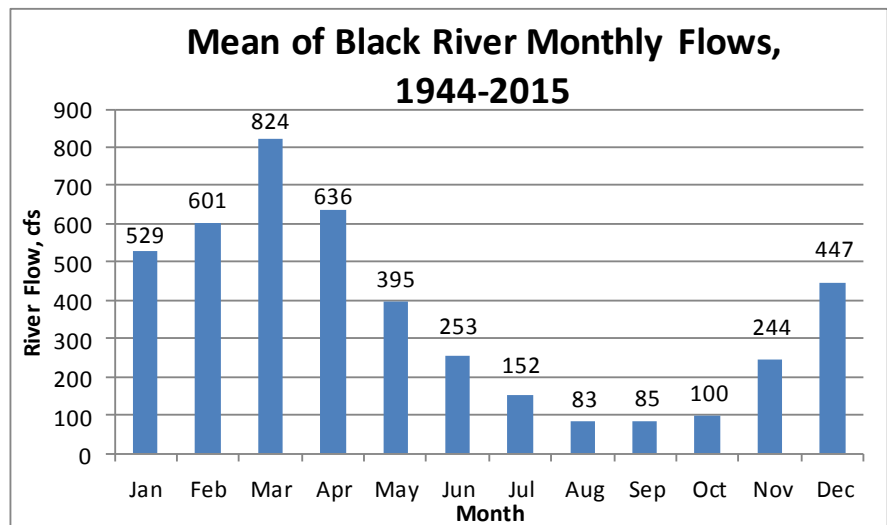


Figure 3 shows that the lowest mean monthly river flows for the Black River from 1944 to 2015 are between July and October. (USGS website). Coincidentally, the summer months of late June to October are typically when Ohio EPA routinely conducts water quality assessments.

Figure 3. Mean of Black River Monthly Flows (USGS)

The river flows during the sampling events of 1992 and 1997 can be seen in Table 8. In 1992 and 1997, the lowest bottom level dissolved oxygen results generally coincide when river flows were low.

1992		1997	
Date	Daily Mean River Flow, cfs	Date	Daily Mean River Flow, cfs
7/8/1992	15	6/30/1997	33
8/6/1992	213	7/16/1997	16
8/12/1992	81	7/24/1997	11
9/9/1992	70	8/26/1997	173
9/17/1992	47	9/4/1997	17
10/1/1992	60		

Data Review vs. Impairment Removal Criteria

Undesirable Algae Component

Although there have been occasional algal blooms in the waters of the Black River AOC, no persistent nuisance growths of aquatic weeds or algae, such as filamentous Cladophora, or blooms of blue-green algae have ever been documented in the Outer Harbor, the Black River mainstem (lacustrine and the free-flowing reach) or the French Creek sub-basin. Therefore, the AOC meets the removal criteria for the undesirable algae component of this BUI.

Eutrophication Component

The eutrophication component of this BUI deals with a depletion of dissolved oxygen in the lacustrine waters of the AOC.

French Creek Sub-basin

An unknown length of the lower part of the French Creek mainstem is within the lacustrine zone, but the exact terminus of the French Creek lacustrine zone has not been determined. Since a part of French Creek is lacustrine, the seasonal average dissolved oxygen removal criterion of 5 mg/l applies to that portion. The 1997 Ohio EPA water quality data shows that all French Creek sites met Ohio’s seasonal dissolved oxygen removal target. Again in 2012, all sites in the French Creek basin met the seasonal average eutrophication removal target. Since all French Creek sites met applicable eutrophication removal criteria, the undetermined French Creek lacustrine segment also met BUI removal criteria for the eutrophication component of this BUI. (Table 9)

Table 9. French Creek Dissolved Oxygen					
1997			2012		
River Mile	Date	D.O. (mg/l)	River Mile	Date	D.O. (mg/l)
0.40	6/30/1997	7.39	0.54	6/11/2012	8.14
	7/16/1997	6.75		6/27/2012	11.15
	7/24/1997	7.70		6/28/2012	4.52
	8/26/1997	8.06		7/16/2012	8.25
	9/4/1997	10.89		7/26/2012	7.14
	Seasonal Average	8.16		9/05/2012	7.37
3.20	6/30/1997	6.70		10/10/2012	12.23
	7/16/1997	6.36		10/25/2012	9.67
	7/24/1997	6.10		Seasonal Average	8.56
	8/26/1997	8.12		3.20	6/28/2012
	9/4/1997	15.27	7/16/2012		5.67
	Seasonal Average	8.51	10/10/2012		12.38
		Seasonal Average	8.98		
6.10	6/30/1997	6.71	5.50	6/28/2012	10.85
	7/16/1997	6.71		7/16/2012	9.89
	7/24/1997	8.03		10/10/2012	13.56
	8/26/1997	8.30		Seasonal Average	11.43
	9/4/1997	11.43	9.02	6/28/2012	10.09
	Seasonal Average	8.24		7/16/2012	6.37
		10/10/2012		12.18	
		Seasonal Average		9.55	
1997 All Site Seasonal Average	8.30	10.41	6/28/2012	11.84	
			7/16/2012	16.11	
			10/10/2012	11.63	
			Seasonal Average	13.19	
		2012 All Site Seasonal Average	10.14		

Lacustrine reach of the Black River mainstem

The Black River lacustrine, including the federal navigation channel, is the only area of the Black River AOC that has been designated as impaired for the eutrophication component of this BUI.

2012 Data

A field assessment of the Black River was conducted in 2012. A report on the data generated from this assessment has not been issued by the time of this removal

recommendation but from the data, every site assessed in the Black River lacustuary exceeded the 5.0 mg/l dissolved oxygen. (Table 10)

Table 10. 2012 Black River Lacustuary Dissolved Oxygen					
Navigation Channel			Upstream of Navigation Channel		
River Mile	Date	D.O., 1 meter depth, mg/l	River Mile	Date	D.O., 1 meter depth, mg/l
0.3	7/23/2012	9.32	4.81	7/23/2012	8.24
0.9	7/23/2012	8.82		10/4/2012	9.06
	9/11/2012	7.25		<i>Seasonal Average</i>	<i>8.65</i>
	<i>Seasonal Average</i>	<i>8.04</i>	5.41	7/23/2012	6.29
1.65	7/23/2012	8.55		9/11/2012	8.24
	9/11/2012	5.78		10/4/2012	9.10
	10/4/2012	8.65		<i>Seasonal Average</i>	<i>7.88</i>
	<i>Seasonal Average</i>	<i>7.66</i>	6.2	6/28/2012	10.65
3.7	7/23/2012	7.65		7/16/2012	11.90
	9/11/2012	7.89		10/10/2012	10.16
	10/4/2012	8.31		<i>Seasonal Average</i>	<i>10.90</i>
	<i>Seasonal Average</i>	<i>7.95</i>			
Navigation Channel Seasonal Average		8.02	Upstream Navigation Channel Seasonal		9.21
All Sites Seasonal Average					8.56

Discussion

This BUI contains two components, persistent problems with nuisance algae and persistent problems with dissolved oxygen, or eutrophication. The Black River AOC includes the near Lake Erie shoreline, the Outer Harbor and the free-flowing and lacustrine reaches of French Creek and the Black River mainstem.

No persistent nuisance growths of algae have been documented in any areas of the Black River AOC, therefore, the removal criteria for the undesirable algae component of this BUI has been met. In addition, the dissolved oxygen levels in all areas of French Creek in 1997 and 2012 met eutrophication removal criteria.

Based upon Ohio EPA reports, the eutrophication component of this BUI in the Black River mainstem was, over time, listed as not impaired but having a ‘potential for impairment’ in 1992 and then listed as impaired in 2002. The AOC Committee’s original impaired but with potential listing and then the impaired listing were based on Ohio EPA’s reporting of water quality exceedances for dissolved oxygen.

The question concerning the removal of the eutrophication component of this BUI is twofold; the persistence of any eutrophication (dissolved oxygen) problem and the effect of heavily modified and lacustrine channels on dissolved oxygen, especially in late summer and in the bottom water layers. The average width of the Black River mainstem in the lacustuary, upstream of the lacustuary is 135 feet. Aside of the Turning Basin, which is 1150 feet wide, the average width of the ship channel is 317 feet.

The Black River AOC Advisory Committee and Ohio EPA believe that any problems with eutrophication in the Black River mainstem are not persistent and due to the modified nature of the mainstem and low flows. Upstream of the ship channel, the width of the mainstem rarely exceeds 150 feet and is typically only a few feet to nine feet in depth. In the altered and maintained ship channel reach, the typical width doubles and the depth increases to about 27 feet. In most reaches of the ship channel, the river banks have been hard-armored with steel or wooden pilings.

Only the bottom waters in the Black River mainstem failed to meet seasonal average criteria for dissolved oxygen at specific sites (RM 1.05 and 1.80 in 1992 and RM 0.42 and 2.24 in 1997). All four of these locations are within the navigation channel with channel depths between 30 and 35 feet.

When reviewing the data concerning the Eutrophication component of this BUI, Ohio EPA and the Black River AOC Advisory Committee also considered the protection of aquatic life which is the intent of both Ohio's WQS for dissolved oxygen and the eutrophication component of this BUI.

	Index	1992	2012
Black River Lacustuary	L-IBI	29.7	38.4
	MIwb	6.90	8.49
Black River Upstream of Lacustuary	IBI	27.5	43.2
	MIwb	7.80	9.70
French Creek	IBI	24	33.8
	MIwb	6.40	7.60

Fish Communities

Since 1992, the fish community indices, Lacustuary Index of Biotic Integrity (L-IBI) and Modified Index of Well-being (MIwb) have shown considerable improvement. The L-IBI and MIwb scores now represent 91-120% of the

removal targets for the Fish Community BUI (Table 11). By comparison, aquatic habitat index scores, as measured by Lacustuary Qualitative Habitat Index (L-QHEI) has shown a slight decrease from 1992 (52.7) to 2012 (44.2). This demonstrates that dissolved oxygen is not limiting performance of the fish communities in the lacustuary.

Benthic Macroinvertebrate Communities

While the benthic community scores (Invertebrate Community Index) have improved in French Creek and remained relatively constant in the riverine reach of the Black River mainstem, the benthic community performance in lacustuary (Lacustuary Invertebrate Community Index) has degraded from 1992. (Table 12) Ohio EPA and the Black River AOC Advisory Committee believes this degradation is not due to eutrophication but due to excessive sediment loads that smother benthic habitat sites as well as periodic dredging operations in the maintained ship channel reach that decimate existing benthic communities and destroy benthic habitat.

Area (Index)	1992	2012
Black River Lacustuary (L-ICI)	22	15.9
Black River Upstream of Lacustuary (ICI)	34	32.5
French Creek (ICI)	22	33.6

Conclusions

Ohio EPA and the AOC Coordinating Committee have reviewed all applicable data and have determined that specific instances of low dissolved oxygen in 1992 and 1997 were mainly due to low flow conditions in a highly modified river reach and that an impairment for eutrophication may have been inappropriate. Regardless, Ohio EPA and the Advisory Committee have determined, based on 2012 data, that all components of the removal criteria for the Eutrophication or Undesirable Algae BUI have been met:

- There have been no documented persistent problems with nuisance aquatic weeds or undesirable algae in any riverine areas of the Black River AOC,
- There have been no documented persistent problems with nuisance aquatic weeds or undesirable algae in any lacustrine areas of the Black River AOC and
- The 2012 seasonal average dissolved oxygen levels in lacustrine reaches of French Creek and the Black River mainstem not only exceeded the eutrophication dissolved oxygen target for warmwater habitat streams (5.0 mg/L), the values exceeded the eutrophication dissolved oxygen target (6.0 mg/L) for exceptional warmwater habitat streams.

In addition, fish community performance in the lower Black River and French Creek have improved and fish community indices are approaching removal criteria for fish community component of the Degradation of Fish and Wildlife Communities BUI.

Recommendation

Ohio EPA and the Black River AOC Advisory Committee recommend the removal of the Eutrophication or Undesirable Algae BUI from the Black River AOC. This recommendation to remove the Eutrophication or Undesirable Algae BUI from the Black River AOC is made in accordance with the process and criteria set forth in the Delisting Targets for Ohio Areas of Concern (Ohio EPA, 2016). Both the Black River AOC Advisory Committee and Ohio EPA request concurrence with this recommendation.

The data and this removal recommendation were discussed with the Black River AOC Advisory Committee at their February 26, 2015 Committee meeting. At the March 31, 2015 meeting, the AOC Committee voted to proceed with the removal of this impairment.

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Appendices

Appendix A - Ohio BUI #8 Removal Guidance

BUI 8: Eutrophication or Undesirable Algae

IJC Listing Guideline

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

State of Ohio Listing Guideline

The beneficial use shall be listed as impaired if:

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

Nutrients entering the waters as a results of human activity create nuisance growths of aquatic weeds or algae

State of Ohio Restoration Target

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

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

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

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

In the lacustrine waters of the mainstem of the Maumee River, Black River, Cuyahoga River, and Ashtabula River and of Maumee Bay the seasonal average dissolved oxygen value within an assessment unit meets the OMZA criteria listed in the Ohio WQS, Chapter 3745-7;

Dissolved Oxygen Restoration Targets	
Designated Use	OMZA ¹ (mg/L)
EWH	6.0
WWH	5.0
MWH	4.0
LRW	3.0
Federally Designated Shipping Channels	NA

¹ OMZA = outside mixing zone average defined as the minimum twenty-four-hour average.

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

from within the AOC.

Note

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

Data Sources

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

Rationale

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

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

Recently, Lake Erie has experienced a resurgence of harmful algal blooms of blue-green algae impacting both the Western and Central Basin waters. Ohio Phosphorus Taskforce Phase I Report (2010) concluded that there are multiple contributors to phosphorus into Lake Erie.

Considering the significant State and Federal initiatives underway to address nutrient runoff, restoration efforts under the AOC program should be focused on local sources of impairment. State and federal governments have launched a number of voluntary and regulatory programs to address nutrient management with \$1.5B invested since 2011. Ohio EPA and the Departments of Agriculture and Natural

Resources released the Ohio Nutrient Reduction Strategy in June 2013. The Strategy provides a comprehensive picture of nutrient management activities for both point and nonpoint sources in Ohio.

To assess nutrient impacts to aquatic use in streams, Ohio EPA initially developed a Trophic Index but is now pursuing a Stream Nutrient Assessment Procedure [SNAP]. Therefore, until this methodology is finalized the restoration target for the riverine areas will rely on the narrative condition described above. Once the new nutrient assessment procedure is finalized and adopted, Ohio EPA will review the restoration target for this BUI and consider revisions as appropriate.

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

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

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

Appendix B

Black River Mean Daily Flow during sampling event years by day, cfs															
Day	1992					1997					2012				
	June	July	August	September	October	June	July	August	September	June	July	August	September	October	
1		30	4460	95	60		128	9.6	21		9.5	13	16	32	
2		25	1070	71			113	9	21		9.4	12	128	57	
3		72	396	220			55	8.5	24		127	10	21	250	
4		33	325	667			37	15	17		62	809	36	241	
5		22	415	334			28	17			36	14	37	141	
6		17	213	150			24	14			46	10	24	739	
7		14	134	98			22	12			31	9	20	429	
8		15	106	67			20	11			21	7.5	259	214	
9		13	87	70			53	10			16	14	200	121	
10		37	99	553			37	9.4			13	44	105	76	
11		45	128	845			29	16			11	24	55		
12		84	81	360			23	12			9.8	13	33		
13		724	98	167			22	33			9.4	11	24		
14		1950	96	104			19	23			9.6	57	23		
15		2570	117	76			18	55			9.6	28	19		
16		3840	348	59			16	149			9.7	15	16		
17		3380	498	47			14	787			8.5	13	14		
18		4470	194	71			14	597			7.3	12	40		
19		2690	139	83			13	254			23	9.7	28		
20		626	105	224			11	116			26	9.2	17		
21		417	77	250			11	84			15	15	15		
22		384	58	805			12	229			13	15	159		
23		292	45	1300			11	162			11	12	167		
24		1450	174	550			11	110			901	9.6	89		
25		2040	338	250			11	173			809	7.9	60		
26		819	96	120			20	173			909	6.8	267		
27		648	130	160			16	122			25	42	338		
28		425	869	130			20	68		10	47	39	126		
29		394	876	90			17	46		10	42	24	65		
30	42	1300	370	74		33	12	33		10	27	21	44		
31		5040	160				11	25			17	14			
	1992 Sampling Season Average of Mean Daily Flow				583.9	1997 Sampling Season Average of Mean Daily Flow				64.9	2012 Sampling Season Average of Mean Daily Flow				89.8