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

OCT 16 2019

Laurie A. Stevenson, Director
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

Dear Ms. Stevenson:

Thank you for your September 16, 2019 request to remove the "Fish Tumors or Other Deformities" Beneficial Use Impairment (BUI) at the Ashtabula River Area of Concern (AOC) located in the City of Ashtabula, OH. 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 the supporting data, the U.S. Environmental Protection Agency (EPA) approves your request to remove this BUI from the Ashtabula River AOC. EPA will notify the International Joint Commission (IJC) 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 Ashtabula River AOC, but all 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 Ohio Lake Erie Commission 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,

Chris Korleski, Director
Great Lakes National Program Office

cc: Lynn Garrity, Ohio Lake Erie Commission
Raj Bejankiwar, IJC

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Laurie A. Stevenson, Director

SEP 16 2019

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

RE: Ashtabula River Area of Concern (AOC) Restriction on Fish Tumors and Other Deformities Beneficial Use Impairment (BUI) Removal Action

Dear Director Korleski:

The State of Ohio and Ohio EPA are dedicated to the restoration and protection of all waterbodies in the state, including Lake Erie and its tributary river systems. A legacy of the industrial past led four Ohio river systems to be designated as Areas of Concern (AOCs) by the International Joint Commission.

In the last two decades, remarkable progress has been made in the Ashtabula River AOC, as a result of partnerships and hard work through the AOC Advisory Committee, partner organizations, the State of Ohio and working with our federal partners. Ohio EPA and the Ashtabula River AOC Advisory Committee are requesting your concurrence with the enclosed recommendation to remove the Fish Tumors and Other Deformities BUI in the Ashtabula River AOC.

The Ashtabula River has come a long way from when it was designated a Great Lakes AOC. With this BUI removal recommendation, only one BUI will remain for removal as the Ashtabula River moves toward its path for Delisting as an Area of Concern. We anticipate more improvements to come for these remaining activities in the Ashtabula, and we look forward to working with the U.S.EPA and the Ashtabula River Advisory Committee to reach those milestones.

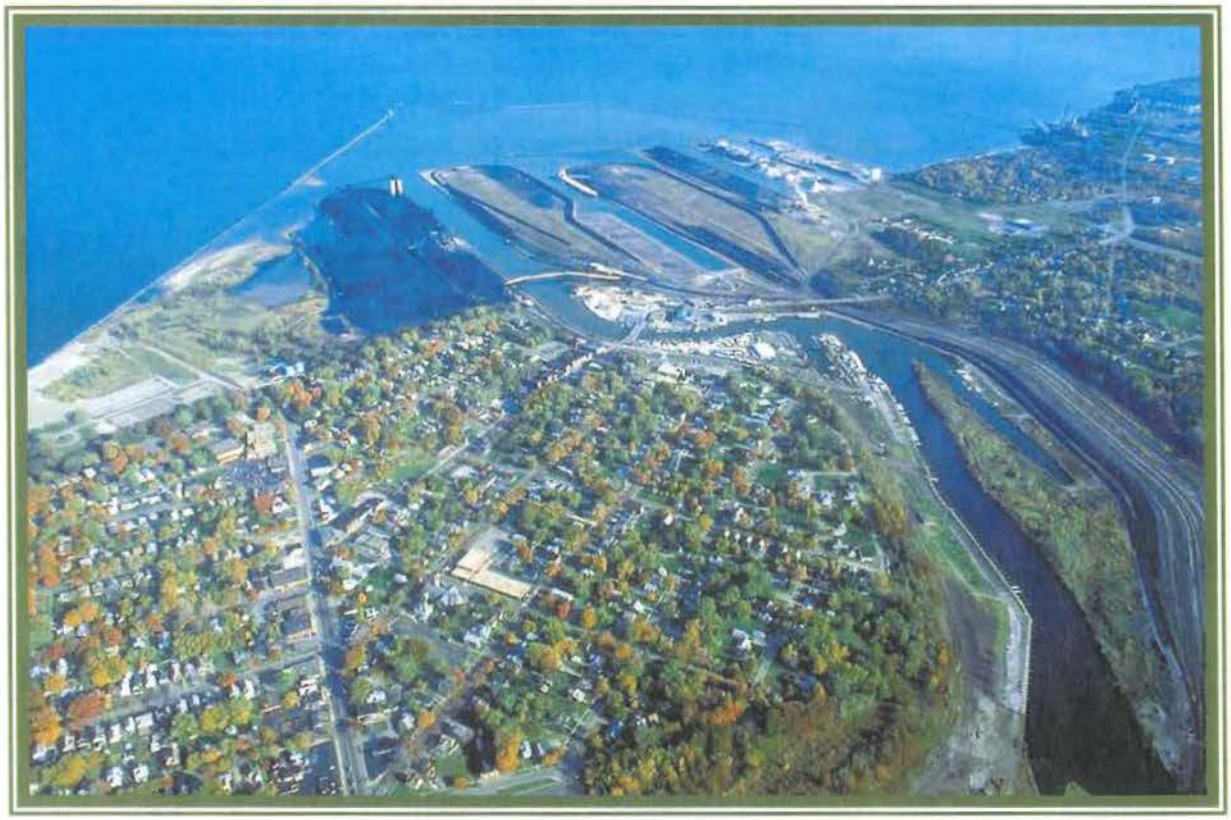
Sincerely,

Laurie A. Stevenson
Director

Enclosure

cc: Lynn Garrity
Leah Medley, USEPA-GLNPO

Removal Recommendation for the Fish Tumors and Other Deformities Beneficial Use Impairment in the Ashtabula River AOC



The Lower Ashtabula River
From US Department of the Interior web page

Ashtabula River Area of Concern

September, 2019

Ohio Environmental Protection Agency

ASHTABULA RIVER

Table of Contents

Background

The Ashtabula River lies in northeast Ohio, flowing into Lake Erie's central basin at the city of Ashtabula. Its drainage basin covers 137 square miles, with 8.9 square miles in western Pennsylvania. Major tributaries include Fields Brook, Hubbard Run, and Ashtabula Creek. Native American inhabitants referred to the river as the Hash-tah-buh-lah or "river of many fish." The city of Ashtabula, with an estimated population of 19,124 (2010 Census, http://censusviewer.com/city/OH/Ashtabula) is the only significant urban and industrialized center in the watershed, the rest of the drainage basin being predominantly rural and agricultural.

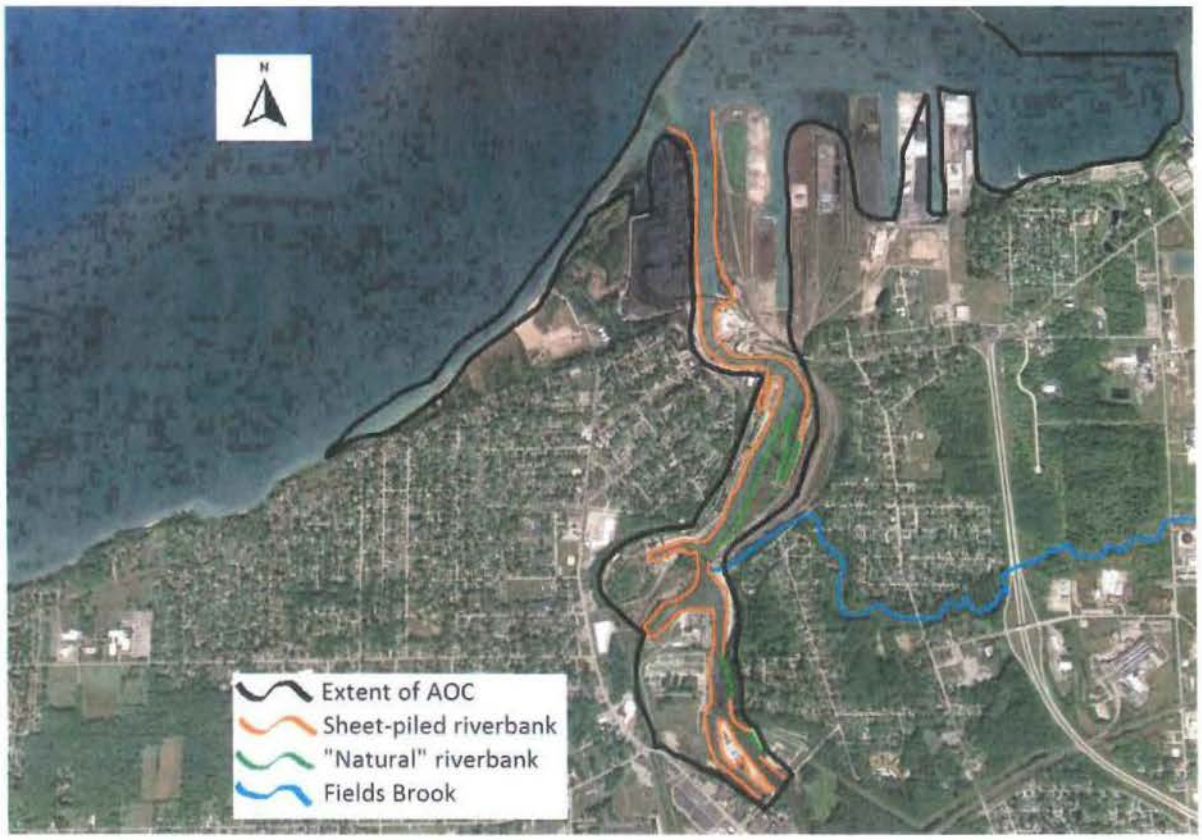


Figure 1: Ashtabula River AOC

The Ashtabula River, upstream of the city of Ashtabula, has been designated an Ohio Scenic River due to pristine natural features including wooded riparian corridors and diverse communities of wildlife. Beginning in the early 1800s, the lower Ashtabula River was widened and deepened into a deep draft harbor to accommodate commercial shipping and shipbuilding enterprises. The land adjacent to the lower river became lined with train tracks to accommodate the rail transport enterprises that handled the inland movement of the coal and iron ore. The riverbanks were hardened with wood and steel sheet-piling to protect from riverbank erosion and to provide commercial ship dockage. Now, almost no natural riverbank habitat remains in the lower river (Figure 1), as the sheet-piled riverbanks now provide dockage for numerous recreation boating marinas.

In the mid-1900s several chemical production companies began operation along Fields Brook, which is a tributary to the lower river (Figure 1). Over time, discharges from these facilities left Fields Brook and the lower Ashtabula River heavily contaminated with polychlorinated biphenyls (PCBs), chlorinated benzene compounds, chlorinated ethenes, hexachlorobutadiene, polynuclear aromatic hydrocarbons (PAHs), and metals. Fields Brook was named a Superfund site in 1983

and it was determined that industrial discharges from chemical industries and waste disposal sites contaminated Fields Brook and was the main source of contamination to the lower Ashtabula River.

Under the 1987 Great Lakes Water Quality Agreement, the lower two miles of the Ashtabula River were designated as a Great Lakes Area of Concern (AOC). In 1988 the newly formed Ashtabula River Remedial Action Plan (RAP) Advisory Council agreed to focus upon an AOC defined as the lower 2.5 miles of the Ashtabula River, Ashtabula Harbor and the adjacent Lake Erie nearshore. The entire mainstem within the AOC is a lacustuary or freshwater estuary. In this area, river flow can be affected by adverse weather patterns and water levels of Lake Erie, with river flows slowing, occasionally stopping, or even reversing at times.

A variety of agencies and organizations contributed to the Ashtabula River RAP including the Ashtabula River Partnership, Ohio Environmental Protection Agency (Ohio EPA), Ohio Sea Grant College Program, Ashtabula Soil and Water Conservation District, US Army Corps of Engineers, US Environmental Protection Agency, angler groups, local businesses and industries, marinas, port industries, local governments, economic development offices, Kent State University, and citizens.

Six beneficial use impairments (BUIs) were initially identified for the Ashtabula River AOC by the RAP Advisory Council. In 2014, that list was reduced to three when Restrictions on Fish and Wildlife Consumption, Degradation of Fish and Wildlife Populations, and Loss of Fish and Wildlife Habitat were removed. In 2017, Degradation of Benthos was removed. Currently, the two remaining BUIs in the Ashtabula AOC are:

- Fish Tumors and Other Deformities, BUI 4,
- Restrictions on Dredging Activities, BUI 7.

The Fish Tumors and Other Deformities beneficial use was listed as impaired by the Ashtabula River AOC Advisory Council in their Stage 1 Report of 1991 (Ohio EPA 1991). In the Stage 1 Report, the Advisory Council noted that:

- A community of brown bullhead catfish had "a high incidence of lip and skin tumors and precancerous conditions" and
- At the time, preliminary results of a US Fish and Wildlife Service study 'found skins cancers and external anomalies on 40 to 50 percent of the fish in the harbor and river."

The Stage 1 Report presumed the impairment was likely due to PAHs from coal dust coming from a coal handling facility on the west bank of the river at the mouth. The Stage 1 Report stated that "black material lining the bottom sand ripples was noted in large amounts." However, subsequent studies revealed that soils of the floodplain/wetland area of the Fields Brook tributary were contaminated with PCBs, hexachlorobenzene, and other organic and inorganic contaminants, and Fields Brook was placed on the National Priorities List of uncontrolled hazardous sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on September 8, 1983. It was determined that industrial discharges from chemical industries and waste disposal sites had contaminated Fields Brook and was the main source of contamination to the Ashtabula River AOC.

Remediation activities at the Fields Brook Superfund Site were completed by 2003 through the actions of the Potentially Responsible Parties (PRPs) to prevent recontamination of Fields Brook and the nearby Ashtabula River AOC. Remediation of contaminated sediment in the Ashtabula River mainstem occurred with the Great Lakes Legacy Act dredging operation of 2005-2007 when 500,000 cubic yards of sediment containing an estimated 25,000 pounds of PCBs and other contaminants were removed from the river bottom. Following in 2008, the Water Resource and Development Act sponsored dredging was completed, removing 130,000 cubic yards of lesser

contaminated sediments from the 5th Street Bridge to the harbor. A second remedial dredging operation was completed in 2013, which removed 12,000 cubic yards of PCB and diesel-range organic sediment contamination from the North Slip site at Jack's Marine. Also in 2013, under the Great Lakes Restoration Initiative, an additional 114,000 cubic yards were dredged from the upper and lower river. Other Strategic Navigation Channel Operation and Maintenance dredging has occurred in 2009, 2011, 2013, 2015, 2017 and planned for 2019, each from the outer harbor, lake approach channel and river mouth to ensure future navigation activities.

BUI Listing Criteria and the Impaired Listing for Fish Tumors and Other Deformities BUI in the AOC

The Ashtabula River Advisory Council listed the impairment for the Fish Tumor and Other Deformities BUI in their 1991 Stage 1 Report, according to the listing criteria in effect at the time which came from the International Joint Commission (IJC). The IJC listing 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 Ohio EPA Lake Erie Unit and AOC Coordinators developed a BUI delisting guidance document, "Delisting Guidance and Restoration Targets for Ohio Areas of Concern" which has been updated twice, most recently in 2017. The current listing criteria for this BUI states that a listing of impaired shall occur 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." Under this criteria, the impaired listing has remained.

The Ohio guidance 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.)

Fish Tumors and Other Deformities BUI Removal Criteria

The current removal targets, specific for the Fish Tumors and Other Deformities BUI, states this beneficial use impairment can be removed in a lacustuary when the average DELT (deformities, eroded fins, lesions or tumors) values within the assessment unit do not exceed:

- DELT values of 3% (lacustuary and boat 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 for DELTs are the 12-digit HUC, Large River Assessment Unit (LRAU) or other agreed upon stream segment or subwatershed. In this case, the Lower Ashtabula HUC 12

(041100030105) is the evaluated assessment unit. Ohio EPA 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, information on external anomalies is recorded by Ohio EPA because 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 included brown bullhead, which are typically benthic and in close proximity to sediments, in its removal criteria for this BUI.

DELT Anomaly Assessments in the Ashtabula River AOC

Between 2011 and 2018, assessments occurred at 7 sites in the Ashtabula River AOC, which assessed 3022 individuals. DELTs were observed in 33 fish and only one of the assessments yielded average DELT frequencies above the removal target. Some sites were assessed in multiple years, but only the most current results for each site are used (Table 1). The DELT average for the reach of the mainstem in the AOC is only 1.08%, well below the current removal target.

Table 1. Current Ashtabula River AOC DELT Anomaly by River Mile

Station	River Mile	Sampling Date	Number of Individuals assessed	Number of External Anomalies Observed	% of DELT Frequency	Seasonal Average %
A01S23	0.6	6/29/2011	184	2	1.09%	0.54%
		9/13/2011	149	0	0.00%	
301397	0.9	6/28/2011	204	3	1.47%	1.08%
		9/13/2011	145	1	0.69%	
300381	1.1	6/28/2011	259	11	4.25%	2.12%
		9/12/2011	87	0	0.00%	
301776	1.2	6/6/2018	228	2	0.88%	0.88%
A01K02	1.3	6/6/2018	420	7	1.67%	1.67%
301777	1.6	6/29/2011	271	3	1.11%	0.55%
		9/13/2011	491	0	0.00%	
502790	2.3	6/28/2011	266	2	0.75%	0.69%
		9/13/2011	318	2	0.63%	
		Total	3022	33		1.08%

As can be seen in Table 1 above, the current data suggest that the incidence of DELT anomalies in the Ashtabula River fish community meets the removal target of 3%.

Brown Bullhead Liver Tumor Assessments

To determine the current status of the prevalence of brown bullhead liver tumors, assessments were conducted in the Ashtabula River AOC in 2011. Conneaut Creek, a non-AOC, was used as a reference stream to evaluate whether or not the impairment was limited to the AOC. As recommended by Blazer et al (2009), only neoplastic lesions (hepatocellular adenoma, hepatocellular carcinoma, cholangioma, and cholangiocarcinoma) were included in the calculation of tumor prevalence. Blazer et al (2009) recommended that foci of cellular alterations and other proliterative 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.

Results from the 2011 Ashtabula River AOC and 2011 and 2013 Conneaut Creek liver tumor assessments were included in the USGS 2014 document *Assessment of the Fish Tumor Beneficial Use Impairment in Brown Bullhead (Ameiurus nebulosus) at Selected Great Lakes Areas of*

Concern (available at https://pubs.usgs.gov/of/2014/1105/pdf/ofr2014-1105.pdf). The overall tumor prevalence rate in the Ashtabula River AOC was 7.5%, and 2.5% in Conneaut Creek. However, there is a growing body of evidence (Rutter 2010, Mahmood et al. 2014, Blazer et al. 2016 and 2018) that covariates influence the prevalence of neoplasms in fish. For example, evidence indicates that liver tumor prevalence increases with the age of fish (Baumann et al., 1990, Baumann, 1992, Baumann et al., 1996, Baumann et al., 2000, Pinkney et al., 2001, Blazer et al., 2009, Blazer et al 2018). Thus, it was postulated that the overall mean age of 7.2 years for fish from the Ashtabula in 2011, as compared to the mean age of 5.9 years of fish from Conneaut Creek in 2011 and 2013, might be why the overall liver tumor rates in the Ashtabula River AOC were higher and differed from the overall liver tumor rates in Conneaut Creek. Also, because the average age of the fish was 7.2 years, many of the fish would have been exposed to pre-remedy conditions and contaminated sediment (i.e. the Legacy Act dredging was only 4-6 years before the 2011 sampling).

Thus, additional sampling was conducted in 2016. A larger sample size consisting of 150 bullheads was collected from each site to allow for age consideration and, with the timing of this study being 9-11 years after the Legacy Act dredging, it was anticipated that a lower tumor incidence rate would be realized. Results from the 2016 Ashtabula River AOC and Conneaut Creek liver tumor assessments were included in the USGS 2018 document *Assessment of Skin and Liver Neoplasms in Brown Bullhead (Ameiurus nebulous) Collected at the Ashtabula River Area of Concern and Associated Reference Site, Ohio, in 2016* (available at https://doi.org/10.3133/ofr20181072). The liver tumor prevalence rate for bullhead in the Ashtabula River AOC in 2016 was 7.3% and mean age was six, both slightly lower than in 2011 (Table 2). The overall liver tumor prevalence rate in Conneaut Creek in 2016 was 4.7% and mean age was six, both higher than the overall 2011 and 2013 liver tumor prevalence rate and age.

Table 2 Ashtabula River AOC and Reference Site Brown Bullhead Liver Tumor Data

Type	Stream	Sample Date	# Individuals	Mean Age	Liver Neoplasms
Area of Concern	Ashtabula River	05/23/2000[1]	44	4.9	6.8%
		04/22/2011[2]	20	7.7	7.5%
		10/04/2011[2]	19	6.7	
		05/17/2016[3]	150	6	7.3%
Reference Site	Conneaut Creek	04/26/2011[2]	20	7.0	2.5%
		10/05/2011[2]	20	6.7	
		05/06/2013[2]	40	4.9	
		05/18/2016[3]	150	6	4.7%

Data from the following: 1 Blazer et al 2009, 2 Blazer et al 2014, and 3 Blazer et al 2018

The statistical methodology conducted to compare the Ashtabula River AOC liver tumor prevalence to that of the reference site, Conneaut Creek, followed the methodology used for the Presque Isle Bay, Pennsylvania and Niagara River, New York, AOCs (Pennsylvania Department of Environmental Protection 2012 and New York State Department of Environmental Conservation 2015). Bioequivalence testing was used to evaluate whether or not neoplastic liver tumor prevalence rates in the Ashtabula River AOC were equal to those in Conneaut Creek for each age class (Figures 2 and 3). A Bayes logistic regression was fit to the data across the 2011 and 2016 sampling years and both the Ashtabula River and Conneaut Creek sites. The posterior distributions on the model parameters were used to predict liver tumor prevalence rates, calculate the difference in the proportions of liver tumors, and construct the associated credible intervals.

The closer the estimates are to 0 on the Y axis, the more equivalence between the two populations. Estimates above zero indicate that the proportion of bullhead with liver tumors are higher in the

Ashtabula River AOC than in Conneaut Creek, and those below zero indicate that the estimated liver tumor prevalence rates are lower in the Ashtabula River than in Conneaut Creek. The error bars represent the 95% Bayesian credible intervals associated with each of the estimates and reflect precision in the estimate. The blue, red, and green bounds on the graph are defined as follows:

- $\pm\delta = \hat{\pi}_{CON} - \hat{\pi}_{CON}$ (blue) are the bounds around the variability expected within a sample site (i.e. when Conneaut was compared to itself, as suggested by Rutter 2010);

- $\pm\delta = 0.05$ (red) are the bounds around the variability when the proportion of tumor rates are within 5% of each other; and

- $\pm\delta = 0.05 + 95\%$ percentile $\hat{\pi}_{CON} - \hat{\pi}_{CON}$ (green) are the bounds around the variability if both of the above bounds (blue + red) were applied, as suggested by Rutter (2010).

The 2016 bullhead liver tumor prevalence rates are declared equivalent between the Ashtabula River AOC and Conneaut Creek, accounting for variability, when the estimated difference in tumor rates and credible intervals fall within the chosen bounds.

Bioequivalence results indicate the following: 1) in 2011 liver tumor prevalence rates in the Ashtabula River AOC were higher than those in Conneaut Creek (in Figure 2 the estimates in 2011 are shifted progressively higher as one reads from left to right), 2) more equivalence in 2016 than in 2011 (in Figure 3 estimates are close to 0 on the Y axis in 2016 than in 2011), and 3) the 2016 liver tumor prevalence rates are consistently estimated to be nearly equivalent between the Ashtabula River AOC and Conneaut Creek among all age classes (in Figure 3 all 2016 estimates are close to 0 on the Y axis). Note that while there is a high degree of precision in the estimates (i.e. credible intervals fall within most or all Bayesian credible bounds) for younger aged fish (e.g., ages 4-6 in 2016), equivalence cannot be precisely measured in older fish (as evidenced by the wide range between the lower and upper bounds). This is due to smaller sample sizes, likely because there are fewer older fish in the system due to the life expectancy of bullhead. There also is less precision in 2011 than in 2016, which is due to the smaller sample size in 2011.

Figure 2. 2011 Bioequivalence

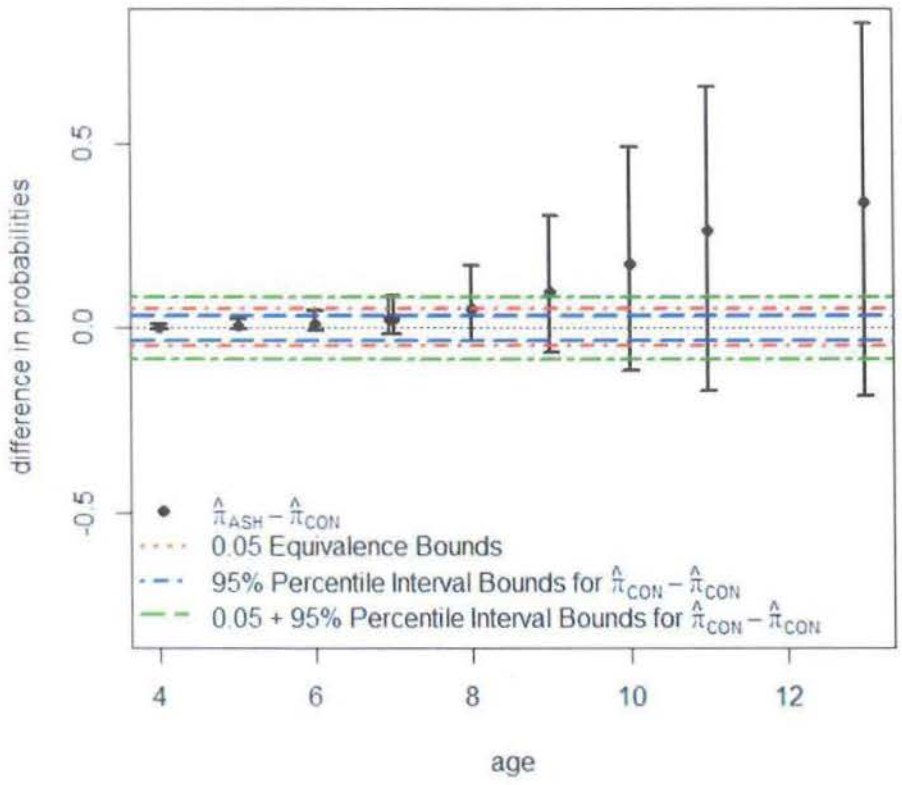
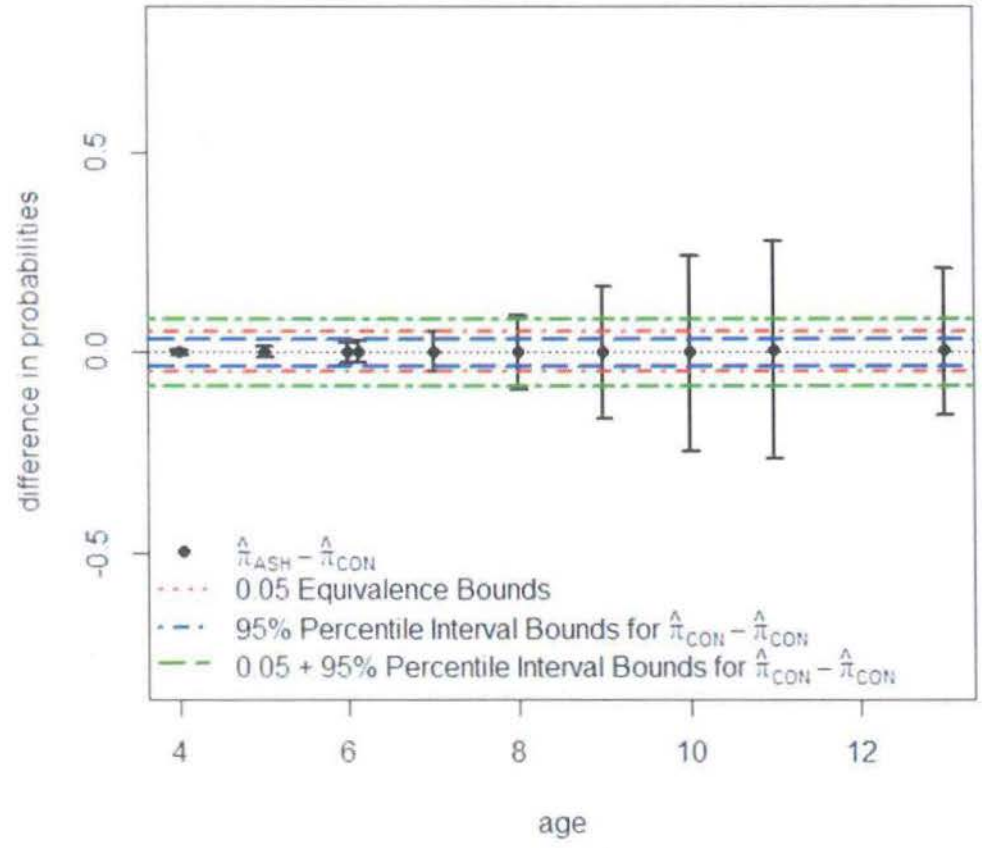


Figure 3. 2016 Bioequivalence



Conclusion

The 2016 Ashtabula River AOC liver tumor prevalence results exceed the 5 percent removal target. However, based on the bioequivalence results, which indicate liver tumor prevalence rates are consistently estimated to be nearly equivalent between the Ashtabula River AOC and Conneaut Creek, it has been demonstrated that the impairment is not limited to the local geographic extent of the AOC, but rather is typical of lake-wide, region-wide, or area-wide conditions. The recommended path for BUI removal is based upon keeping current BUI removal target of 5% and utilizing the alternative BUI removal scenario as identified on page 4. As the bioequivalence results indicate liver tumor prevalence, exceeding 5 percent, is not limited to the Ashtabula River and is typical of U.S. Lake Erie shoreline wide conditions (Baumann et al 2000 and Blazer et al 2009), removal of the Fish Tumors and Other Deformities BUI is warranted.

A public meeting was hosted by Ohio EPA and Ohio Lake Erie Commission on August 26, 2019, followed by a 14-day public review period, to present the proposed removal of BUI 4 in the Ashtabula River AOC. No public comments were received.

Recommendation

Ohio EPA and Ashtabula River AOC Advisory Council request concurrence with the recommendation to remove the Fish Tumors and Other Deformities BUI from the Ashtabula River AOC as the following conditions are being met:

- DELT anomalies, at 0.10%, for the fish communities of the Ashtabula River AOC meet the target for DELT anomalies (3% for lacustuaries).
- Bioequivalence between the Ashtabula River AOC and the Conneaut Creek reference site brown bullhead liver tumor prevalence rates demonstrates the impairment is not limited to the local geographic extent of the AOC, but rather is typical of U.S. Lake Erie shoreline wide conditions and as such, removal is warranted.

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Appendices

Appendix A

2017 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 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 USFWS 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: Letter of Support Ashtabula River AOC Advisory Committee

September 3, 2019

Ms. Laurie Stevenson, Director
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, OH 43216-1049

Dear Director Stevenson:

The Ashtabula River Area of Concern (AOC) Advisory Council has reviewed available data, materials and documents for the Fish Tumors and Other Deformities beneficial use impairment (BUI) in the Ashtabula River AOC. The Advisory Council has determined that all applicable data meets or exceeds the State of Ohio removal criteria for this BUI and has voted to support its removal.

If Ohio EPA concurs that the removal of this beneficial use impairment is warranted, the AOC Advisory Council requests the agency to proceed with the process of submitting this removal recommendation.

With this BUI removal, the following impairments will remain in the Ashtabula River AOC:

- BUI #7: Restrictions on Dredging Activities

The Ashtabula River AOC Advisory Council will continue its efforts to restore conditions for the remaining impairments leading to their removal and ultimately, the complete restoration of the Ashtabula River Area of Concern.

Sincerely,

Fred Leitert, Co-Chair
Ashtabula River AOC Advisory Council
Ashtabula River Area of Concern

Matthew Smith, Co-Chair
Ashtabula River AOC Advisory Council
Ashtabula River Area of Concern