

# Eighteenmile Creek Area of Concern

## Updates to Beneficial Use Impairment Removal Criteria

October 2020



Niagara County Soil and Water Conservation District



## Summary

Developing an effective approach to addressing Beneficial Use Impairments (BUI) requires clear and measurable removal criteria. From 2018 to 2020, the Eighteenmile Creek coordination team, which includes the Niagara County Soil and Water Conservation District (NCSWCD), United States Environmental Protection Agency (USEPA), and New York State Department of Environmental Conservation (NYSDEC), worked closely with BUI technical review leads and subject matter experts from United States Geological Survey (USGS), United States Army Corps of Engineers (USACE), and United States Fish and Wildlife Service (USFWS) to review the existing BUI removal targets listed in the Eighteenmile Creek Remedial Action Plan Stage II Update (2011) and develop updated removal criteria where necessary. Several factors specific to Eighteenmile Creek were considered, including previous assessments, end points that can be directly measured within the AOC, and using regional reference sites when appropriate.

After preliminary review, revised criteria for BUIs 3) Degradation of Fish and Wildlife Populations, and 5) Bird or Animal Deformities or Reproductive Problems were approved by the Remedial Advisory Committee (RAC) and submitted to USEPA Great Lakes National Programs Office (GLNPO) in August 2019. Updated criteria for BUIs 1) Restrictions on Fish and Wildlife Consumption, and 6) Degradation of Benthos followed with RAC and GLNPO approval in August 2020. Restrictions on Dredging BUI was not included in this summary, since the BUI was removed from the AOC in September 2020. Table 1 presents the finalized removal criteria, while the remainder of this document includes a detailed discussion of the rationale behind removal criteria changes for the Eighteenmile Creek AOC.

<b>Table 1: Final Eighteenmile Creek AOC BUI Removal Criteria</b>
<p><b>Restrictions on Fish and Wildlife Consumption</b>                      There are no AOC-specific fish and wildlife consumption advisories issued by New York State</p>
<p><b>Degradation of Fish and Wildlife Populations</b>                      Fish community metrics (e.g., diversity, abundance, biomass, and condition) are similar to reference site(s); <b>AND</b>                      Benthic macroinvertebrate community composition is within the range expected and similar to reference site condition; <b>AND</b>                      PCB concentrations in fish tissue and other prey are below thresholds likely to result in acute toxicity to fish or piscivorous wildlife (birds and mammals).</p>
<p><b>Bird or Animal Deformities or Reproductive Problems</b>                      PCB concentrations in fish tissue from comparable functional feeding groups are similar to reference site(s); <b>OR</b>                      PCB concentrations in fish and other prey are below tissue concentrations known to cause deformities or reproductive impairment in piscivorous wildlife.</p>
<p><b>Degradation of Benthos</b>                      Benthic macroinvertebrate communities are “non-impacted” or “slightly impacted” according to NYSDEC indices; <b>OR</b>                      Benthic macroinvertebrate community condition is similar to unimpacted control sites of comparable physical and chemical characteristics; <b>AND</b>                      Toxicity of sediment-associated contaminants is similar to unimpacted control sites of comparable physical and chemical characteristics</p>

## Discussion of BUI Removal Criteria Changes

### BUI 1 Restrictions on Fish and Wildlife Consumption

#### Old Criteria:

1. There are no AOC-specific fish and wildlife consumption advisories issued by New York State; **AND**
2. Contaminant levels in fish and wildlife must not be due to contaminant input from the watershed upstream of Burt Dam.

#### 2020 Final Criteria:

1. There are no AOC-specific fish and wildlife consumption advisories issued by New York State

#### Criteria Change Discussion:

The current fish consumption advice for Eighteenmile Creek – above and below Burt Dam is “Don’t Eat” any fish due to PCB contamination.

There are no issues with the first part of this removal criteria. Removal of any AOC specific fish and wildlife consumption advisories indicates that the New York Department of Health (NYSDOH) guidelines for a specific advisory are not being exceeded, and where required, remedial work is completed, and more than two sampling events that show less contaminant burden in fish from the AOC and its upper watershed. In order to remove the consumption advisory NYS DOH generally requires two years’ worth of data. However, the Eighteenmile Creek AOC is located downstream of the Eighteenmile Creek Superfund Site. The requirements for relaxing advisories for waterbodies associated with a superfund site are more stringent. NYS DOH requires completion of all investigations, remedial/clean-up activities, and multiple years’ worth of post remediation fish tissue data showing lower contaminant levels in fish. This is to prevent premature relaxation of an advisory in response to a decreasing trend in fish contamination, when dredging, flooding or other disturbance of upstream contaminated sediments could resuspend COCs and contaminate fish downstream (an example of this occurred in the Hudson River). This inherently allows the second criterion of this BUI (which is not measurable) to be removed since NYSDOH requires remedial work to be complete before relaxation of an advisory can occur.

The current fish consumption advisory for Eighteenmile Creek is based on 1992 fish collections that showed elevated PCB concentrations in fish taken from above and below Burt Dam. NYS DOH is currently in the process of reviewing the results of the 2018 USEPA Superfund sampling event. Preliminary review of the 2018 fish tissue results indicates continued elevated PCB concentrations in fish taken from both above and below Burt Dam. In fall 2018, NYSDEC collected 52 fish samples from Eighteenmile Creek below Burt Dam for the Toxic Substance Monitoring Program. The fish collected were 10 Brown Trout, 10 Chinook Salmon, 10 Coho Salmon, 10 Rainbow Trout, 3 Largemouth Bass, and 9 Pumpkinseed. Brown Trout, Chinook Salmon, Coho Salmon and Rainbow Trout are Lake Ontario fish with short term residence in Eighteenmile Creek, primarily for spawning. Largemouth Bass and Pumpkinseed are likely resident fish. None of the Brown Trout, Chinook Salmon, Coho Salmon or Rainbow Trout (steelhead) collected from Eighteenmile Creek, which are fish expected to be from Lake Ontario, exceeded the DOH guideline of 1 ppm for a specific PCB advisory. Among the resident fish, PCB concentrations in all three largemouth bass exceeded the DOH guideline of 1 ppm for a specific advisory, and two of the three fish had concentrations over 2 ppm. Average PCB concentration in the pumpkinseed was 0.70 ppm. These data have been shared with NYSDOH for their review. Baseline fish sampling through the AOC program occurred in 2012 to assess several BUIs. Samples consisted of bullhead, sunfish and crayfish were collected below Burt Dam, between Newfane Dam and Burt Dam, and above Newfane Dam. In general, PCB levels were the most elevated further upstream and decreased further downstream.

It’s possible to have different consumption advisories above and below Burt Dam, but it would require sampling fish from both sides of the dam (including the area nearest to the source of contamination) to show differences

in contaminant levels. However, this may not be feasible since sampling results from 2018 continue to show elevated PCB levels in fish above and below Burt Dam. If fish above Burt Dam continue to have elevated PCB levels, it is very likely that resident fish below Burt Dam will still be impacted by upstream PCBs transported downstream by the water flowing over the dam. Thus, additional samples collected in the immediate future will likely show similar elevated levels.

**Table 2: Criteria Changes for BUI 1 Restrictions on Fish and Wildlife Consumption**

Old BUI Criteria	2020 Final Criteria	Rationale
There are no AOC-specific fish and wildlife consumption advisories issued by New York State; <b>AND</b>	There are no AOC-specific fish and wildlife consumption advisories issued by New York State	No change made to this criterion. The original BUI criterion is suitable for meeting the IJC delisting guideline and protecting fish/wildlife. The BUI may be removed when NYSDOH removes all AOC specific consumption advisories within the AOC. There are only fish consumption advisories listed for the creek, no wildlife consumption advisories have been identified.
Contaminant levels in fish and wildlife must not be due to contaminant input from the watershed upstream of Burt Dam.	(No criteria)	This part of the criteria is not measurable or specific. In addition to not being measurable or specific, the NYSDOH have stated they will not relax a consumption advisory until remedial work is complete.

### BUI 3 Degradation of Fish and Wildlife Populations

#### Old Criteria:

1. Fish and wildlife diversity, abundance, and condition are statistically similar to diversity, abundance and condition of populations at non- AOC control sites; **AND**
2. PCB levels in bottom-dwelling fish do not exceed the critical PCB tissue concentration for effects on fish (440 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ] of weight; Dyer et al. 2000).

#### 2020 Final Criteria:

1. Fish community metrics (e.g., diversity, abundance, biomass, and condition) are similar to reference site(s); **AND**
2. Benthic macroinvertebrate community composition is within the range expected and similar to reference site condition; **AND**
3. PCB concentrations in fish tissue and other prey are below thresholds likely to result in acute toxicity to fish or piscivorous wildlife (birds and mammals).

#### Criteria Change Discussion:

Historically there is very little wildlife population data for the AOC, making statistical comparisons to reference areas difficult. It should be noted that although Loss of Fish and Wildlife habitat (BUI #14) is not considered impaired for this AOC, large populations of piscivorous wildlife are unlikely to be present due to the small overall size of the AOC, including a narrow zone of upland habitat. As a result, previous wildlife surveys have been primarily qualitative in nature, and any future wildlife surveys would likely encounter the same limitation. For example, after a recent habitat assessment, researchers concluded that even with an expanded study area to include the stream corridor upstream of the AOC between Burt and Newfane Dams, it was unlikely enough mink would be captured for a robust statistical analysis.

As written, the second current criterion is intended to identify risks to aquatic biota and is not designed to be protective of piscivorous birds and mammals. The tissue concentration referenced (440 ug/kg Dyer et al. 2000), is a screening criterion for chronic effects and may not be appropriate for assessing acute toxicity which could reduce populations of fish and wildlife.

The new criteria take into consideration that fish populations in the AOC and reference sites are relatively abundant, allowing for direct comparison of community indicators. This is reflected in the first proposed criterion which is relatively unchanged, the focus remains on relevant fish community metrics: diversity, abundance and condition (biomass has been added). Wildlife population metrics have been removed from this criterion.

Because of the limited population sizes of wildlife species of interest, alternative methods are needed to evaluate potential AOC related population impacts. Another population limiting factor could be loss of habitat, but if loss of fish and wildlife habitat is suspected as a cause of population degradation, BUI #14 would also be impaired. As stated in the 1997 RAP, "Because a considerable percentage of the Area of Concern is largely undisturbed and provides excellent habitat, this indicator is considered to be unimpaired". This leaves evaluation of prey communities, and consideration of toxicity thresholds, both of which are the focus of the proposed criteria. Presence of fish and benthic communities similar to non-AOC reference areas are not proof of healthy wildlife populations but demonstrate that AOC conditions are not impacting lower trophic levels. In addition, if PCBs do not accumulate to concentrations associated with population level impacts (acute toxicity endpoint\*) to fish and wildlife, this BUI can be restored.

\*Specific concentration endpoints will need to be determined through a review of current literature, other AOC metrics, superfund documents including risk assessments, and other relevant sources. Criteria will likely vary among species being assessed, i.e. some species may be more sensitive to PCBs. Numeric criteria should be updated as appropriate based on sound scientific justification.

**Table 3: Criteria Changes for BUI 3 Degradation of Fish and Wildlife Populations**

Old BUI Criteria	2020 Final Criteria	Rationale
Fish and wildlife diversity, abundance, and condition are statistically similar to diversity, abundance and condition of populations at non- AOC control sites; AND	Fish community metrics (e.g., diversity, abundance, biomass, and condition) are similar to reference site(s); <b>AND</b>	Fish populations are still being assessed under this new removal criteria. The largest change made to this part of the BUI is removing wildlife comparisons between the AOC and reference (or control) sites. Since the AOC is too small to complete many wildlife surveys, alternative approaches are needed to assess communities that support wildlife populations.

PCB levels in bottom-dwelling fish do not exceed the critical PCB tissue concentration for effects on fish (440 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ] of weight; Dyer et al. 2000).	Benthic macroinvertebrate community composition is within the range expected and similar to reference site condition; <b>AND</b>	Change to this part of the criteria focused largely on assessing the benthic community to support fish and wildlife populations and act as an indicator species. Specific issues with the benthic macroinvertebrate community should be focused toward the Degradation of Benthos BUI.
(No criteria)	PCB concentrations in fish tissue and other prey are below thresholds likely to result in acute toxicity to fish or piscivorous wildlife (birds and mammals).	To address population level impacts this criterion references acute toxicity endpoints and is distinct from BUI 5 criteria meant to address reproductive problems or deformities.

## BUI 5 Bird or Animal Deformities or Reproductive Problems

### Old Criteria:

1. No reports of wildlife population deformities or reproductive problems from wildlife officials above expected natural background levels; **AND**
2. Contaminant levels in bottom-dwelling fish do not exceed the level established for the protection of fish-eating wildlife (NYSDEC Fish Flesh Criteria); **OR**
3. In the absence of fish data, the toxicity of sediment-associated contaminants does not exceed levels associated with adverse effects on wildlife (NYSDEC Fish & Wildlife Bioaccumulation Sediment Criteria).

### 2020 Final Criteria:

1. PCB concentrations in fish tissue from comparable functional feeding groups are similar to reference site(s); **OR**
2. PCB concentrations in fish and other prey are below tissue concentrations known to cause deformities or reproductive impairment in piscivorous wildlife.

### Criteria Change Discussion:

While it does not appear that any reports of wildlife population deformities or reproductive problems have been received to date, it is also not a metric that has been actively assessed. Any survey conducted to assess rates of deformities and reproductive problems would likely encounter the same issue discussed above for wildlife surveys at Eighteenmile Creek AOC. Likewise, expected regional background levels are not well known. Though it could be stated that this BUI criterion has been met, it could be viewed as an achievement by default.

A second issue with the current criteria is the reference to the NYSDEC Fish Flesh Criteria (0.11mg/kg for PCBs). The concern is that this value may not be attainable under regional conditions. Even the long-time reference site at Oak Orchard Creek, has exceeded this value in multiple instances.

The last of the current criteria provides a backup criterion in the case that fish data is unavailable. This is unnecessary, as there is an extensive database of historic and current fish tissue records. In general, metrics which are closer to the species of interest, are preferred over metrics which are further removed. In this case, wildlife prey provides a measurement endpoint at least one step closer than sediment.

The first notable change removes the first current criterion regarding population deformities beyond natural background levels. Any reports of deformities or reproductive problems, or lack thereof, should still be considered in the final justification for BUI removal. For the reasons cited above (data availability and relevance), the revised criteria focus on bird and animal prey species. The proposed first criterion, in keeping with IJC guidance, is consistent with the overall goal of returning AOC's to regional conditions. The focus is expanded from just "bottom-dwelling fish" to "comparable functional feeding groups". This allows for a more complete assessment of fish tissue concentrations consistent with historic and future fish collection strategies, while still acknowledging the tendency of bottom-dwelling fish to accumulate greater amounts of PCBs. The proposed second criterion provides a future path for BUI removal in the case that there are observable differences in PCB concentrations between the AOC and reference areas, but AOC concentrations are still below levels associated with deformities or reproductive impairment in piscivorous wildlife\*.

\*Specific concentration endpoints will need to be determined through a review of current literature, other AOC metrics, superfund documents including risk assessments, and other relevant sources. Criteria will likely vary among species being assessed and may be different from levels associated with BUI #3 population impacts. Numeric criteria should be updated as appropriate based on sound scientific justification.

**Table 4: Criteria Changes for BUI 5 Bird or Animal Deformities or Reproductive Problems**

Old BUI Criteria	2020 Final Criteria	Rationale
No reports of wildlife population deformities or reproductive problems from wildlife officials above expected natural background levels; <b>AND</b>	PCB concentrations in fish tissue from comparable functional feeding groups are similar to reference site(s); <b>OR</b>	Finding deformity reports and comparing them to 'natural background levels' is too vague to keep as a removal criterion. Fish within the AOC are measurable and can be directly compared to a non-AOC reference site.
Contaminant levels in bottom-dwelling fish do not exceed the level established for the protection of fish-eating wildlife (NYSDEC Fish Flesh Criteria); <b>OR</b>	PCB concentrations in fish and other prey are below tissue concentrations known to cause deformities or reproductive impairment in piscivorous wildlife.	Since wildlife aren't able to be directly compared between the AOC and a reference site, this criterion will be satisfied when prey needed to model bioaccumulation models are below limits that would cause impairment to mink or other sensitive wildlife.
In the absence of fish data, the toxicity of sediment-associated contaminants does not exceed levels associated with adverse effects on wildlife (NYSDEC Fish & Wildlife Bioaccumulation Sediment Criteria).	(No criteria)	This criterion was removed because the AOC has plenty of fish and other prey data available that can be used for assessments.

## BUI 6 Degradation of Benthos

### Old Criteria:

1. Benthic macroinvertebrate communities are "non-impacted" or "slightly impacted" according to NYSDEC indices; **OR**
2. In the absence of NYSDEC data, riffle habitats require benthic macroinvertebrate communities with a species richness higher than 20, EPT richness greater than 6, a biotic index value greater than 4.51, and a percent model affinity greater than 50; **OR**
3. In the absence of benthic community data, this use will be considered restored when the level of toxic contaminants in sediments is not significantly higher than controls.

### 2020 Final Criteria:

1. Benthic macroinvertebrate communities are "non-impacted" or "slightly impacted" according to NYSDEC indices; **OR**
2. Benthic macroinvertebrate community condition is similar to unimpacted control sites of comparable physical and chemical characteristics; **AND**
3. Toxicity of sediment-associated contaminants is similar to unimpacted control sites of comparable physical and chemical characteristics.

### Criteria Change Discussion:

In 2013, Ecology and Environment conducted a baseline benthic macroinvertebrate community study to evaluate current health of benthic macroinvertebrate communities in Eighteenmile Creek. In this assessment, two riffle and three pool habitats were sampled to determine a biological assessment profile (BAP) as well as toxicity for each site. Results indicated little to no impairment within the AOC boundaries, suggesting possible BUI removal.

A follow-up study was completed by USGS and NYSDEC (2017) to confirm the 2013 results and address methodology issues (Not identifying all invertebrates to a genus or species level, applying a correction factor to riffle habitats below a dam, limited amount of sample replicates and not having reference site). Toxicity and community assessments were performed at Eighteenmile Creek and Oak Orchard Creek. Results of this study suggest benthic communities and toxicity testing are statistically similar between the two creeks. Despite these findings, the upstream-most AOC site consistently scored poorly in all analyses, which suggests that localized sediment toxicity may exist in the AOC, even if large scale differences between the AOC and a comparable reference stream are minimal.

Using the 2017 study to assess impairment status in Eighteenmile Creek AOC removal criteria shows that neither Eighteenmile or Oak Orchard Creek meet the current removal criteria. Macroinvertebrate communities ranged from moderate to non-impacted according to NYSDEC indices. The second criteria refers to riffle habitats that are not representative of the entire AOC (riffle habitat is only found directly below Burt Dam). Lastly, the third criteria uses sediment chemistry data that is not a direct indicator of sediment toxicity that can lead to the degradation of benthos.

In order to support the USACE BUI data gap analysis, new criteria were written that are attainable and follow guidance from the IJC and other NYS AOCs. The revised criteria were drafted by Scott George (USGS) with concurrence from Brian Duffy (NYSDEC Biomonitoring Unit), and Beth Hinchey Malloy (GLNPO TRL), with final approval by the RAC.

**Table 5: Criteria Changes for BUI 6 Degradation of Benthos**

Old BUI Criteria	2020 Final Criteria	Rationale
Benthic macroinvertebrate communities are “non-impacted” or “slightly impacted” according to NYSDEC indices; OR	1) Benthic macroinvertebrate communities are “non-impacted” or “slightly impacted” according to NYSDEC indices; <b>OR</b>	No change made to this criterion. Community condition should be primary measuring stick for this BUI and NYSDEC Biological Assessment Profile (BAP) has been used as preferred metric in other NY AOCs. If this criterion cannot be met, the second criterion below comparing community condition AND sediment toxicity to a reference location can be used to remove the BUI.
In the absence of NYSDEC data, riffle habitats require benthic macroinvertebrate communities with a species richness higher than 20, EPT richness greater than 6, a biotic index value less than 4.51, and a percent model affinity greater than 50; OR	2a) Benthic macroinvertebrate community condition is similar to unimpacted control sites of comparable physical and chemical characteristics; <b>AND</b>	The majority of the AOC is not riffle habitat – thus the original criterion is not representative of the AOC. The new criterion is based on IJC criteria and allows for comparison with a comparable reference stream (likely Oak Orchard Creek). This is important in case criterion 1 is unattainable due to non-AOC regional stressors. Note the “AND” which also requires sediment toxicity criterion 2b to be met.
In the absence of benthic community data, this use will be considered restored when the level of toxic contaminants in sediments is not significantly higher than controls.	2b) Toxicity of sediment-associated contaminants is similar to unimpacted control sites of comparable physical and chemical characteristics	The original criterion references actual sediment contaminant levels – whereas most/all other NY AOCs have used sediment toxicity (to benthic organisms) via laboratory bioassays. The new criterion is more in line with the IJC criteria and those used in other NY AOCs. The inclusion of sediment toxicity ensures that any noted community impairment is not derived from contaminated sediments.