Removal Recommendation

Beneficial Use Impairment 11: Degradation of Aesthetics

Buffalo River Area of Concern
July 16, 2018

Submitted by:

New York State Department of Environmental Conservation, Buffalo-Niagara Waterkeeper, Erie County Department of Environment & Planning

Acknowledgements

We would like to thank the following individuals and agencies for their assistance in writing this Beneficial Use Impairment Removal Recommendation:

Buffalo River
Remedial Action Plan

Buffalo Niagara Waterkeeper
R. Josephine Johnson
Katherine Winkler
Joseph Gould
Margaux Valenti, Esq.
Kerrie Gallo

New York State Department of Environmental Conservation
Jennifer Dunn
Michael Kuzia-Carmel
Ryan Tomko

Erie County Department of Environment and Planning
Vicki Haas
Bonnie Lawrence

Buffalo River Remedial Advisory Committee Chair
Dave Gianturco

Table of Contents

Acknowledgements i
List of Acronyms 1
1. Introduction and Report Purpose 2
2. Background and Beneficial Use Impairment Removal 3
2.1 Buffalo River Area of Concern History 3
2.2 Beneficial Use Impairment 11: Degradation of Aesthetics 7
2.3 BUI Removal Criteria 7
3. Assessments and Actions Supporting BUI Removal 8
3.1 Buffalo Sewer Authority Long Term Control Plan: Action A 9
3.2 Buffalo Green Code: Action B 9
3.3 Habitat Action Plan: Action C 10
3.4 Buffalo Niagara Waterkeeper Shoreline Sweeps: Action D 10
3.5 Public Perception and Usage 11
4. Monitoring Success of Assessments and Actions Supporting BUI Removal 13
4.1 Verification: Action A 13
4.2 Verification: Action B 13
4.3 Verification: Action C 14
4.4 Verification: Action D 16
4.5 Record of Improved Public Perception 16
5. Public Consultation 18
6. Conclusions 19
7. References 19
Appendix A 21
Buffalo Sewer Authority Long Term Control Plan Projected Timeline 21
Appendix B 22
Public Perception Survey Results 22

List of Acronyms

AOC	Area of Concern
BNW	Buffalo Niagara Waterkeeper
BSA	Buffalo Sewer Authority
BUI	Beneficial Use Impairment
COC	Contaminant of Concern
CSO	Combined Sewer Overflow
ECDEP	Erie County Department of Environment and Planning
GLC	Great Lakes Commission
GLLA	Great Lakes Legacy Act
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement
IJC	International Joint Commission
LTCP	Long Term Control Plan
LWRP	Local Waterfront Revitalization Plan
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York State Department of Environmental Conservation
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
RAC	Remedial Advisory Committee
RAP	Remedial Action Plan
UDO	Unified Development Ordinance
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WWTP	Wastewater Treatment Plant

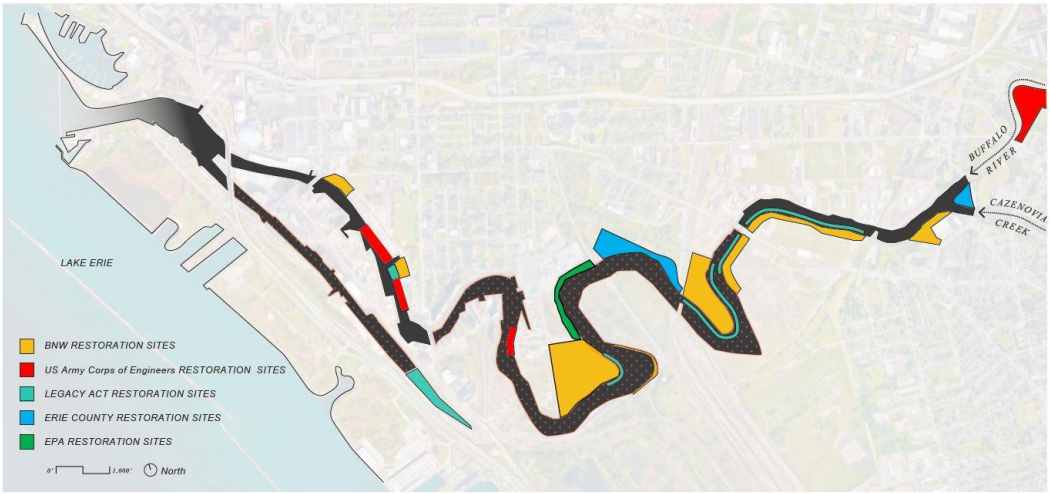
1. Introduction and Report Purpose

The purpose of this report is to remove the Beneficial Use Impairment (BUI) 11: “Degradation of Aesthetics” from the Buffalo River Area of Concern (AOC). The Buffalo River Remedial Advisory Committee (RAC) proposes changing the status of this BUI from “Impaired” to “Not Impaired”. Included in this document are the assessments and actions which support the removal targets for this BUI.

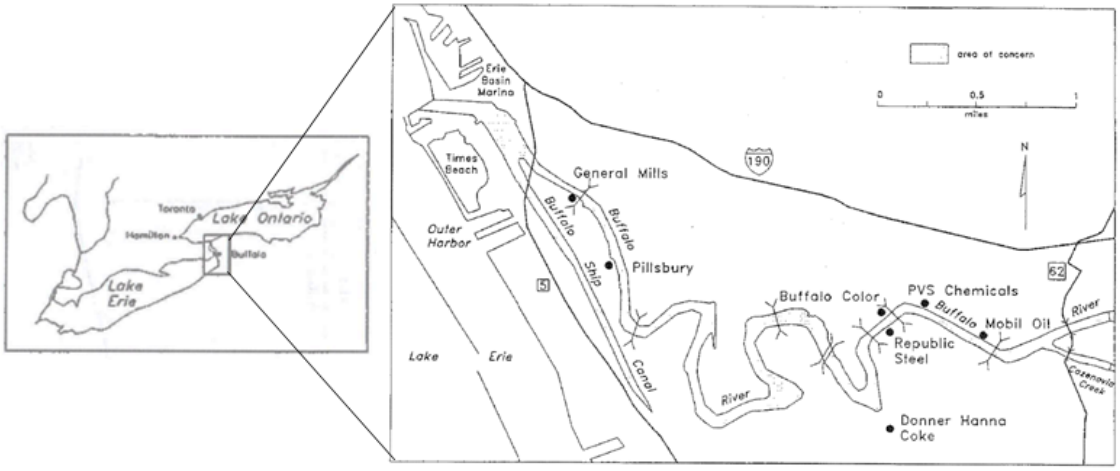
Under the Great Lakes Water Quality Agreement (GLWQA), the International Joint Commission (IJC) identified 43 AOCs in the Great Lakes Basin as *"geographic areas designated by the Parties* [IJC] *where significant impairment of beneficial uses has occurred as a result of human activities at the local level."* As identified in Annex 2 of the GLWQA in 1987, up to fourteen BUIs, or indicators of degraded water and habitat quality, are used to evaluate the condition of an AOC. Currently, Buffalo River AOC has 9 out of 14 potential BUIs.[1]

Buffalo River AOC BUIs:

- Restrictions on Fish & Wildlife Consumption
- Tainting of Fish & Wildlife Flavor
- Degradation of Fish & Wildlife Populations
- Fish Tumors & Other Deformities
- Bird or Animal Deformities or Reproductive Problems
- Degradation of Benthos
- Restrictions on Dredging
- **Degradation of Aesthetics**
- Loss of Fish & Wildlife Habitat



[1] (U.S. Environmental Protection Agency, 2018)



ni., 2.3
ions

It is important to note this is the first BUI recommended for removal since the Buffalo River was declared an AOC. The report serves to document key achievements resulting from the RAC's decades of work and restoration efforts. The removal of a BUI is a milestone that calls for celebration; however, the RAC does not suggest that the Buffalo River is restored to pristine conditions, or has a "clean bill of health". The RAC will continue to advocate and implement additional restoration actions for the remaining BUIs, and well after the delisting of the AOC.

2. Background and Beneficial Use Impairment Removal

2.1 Buffalo River Area of Concern History

Figure 2. The relative location of former major industries along the Buffalo River. Taken from the Buffalo River RAP, 1989.

The Buffalo River AOC is located in the City of Buffalo, Erie County, in Western New York State. The River flows from the east and discharges into Lake Erie near the head of the Niagara River. The Buffalo River AOC extends from the mouth of the Buffalo River to the farthest point upstream at which the backwater condition exists during Lake Erie's highest monthly average lake level.[2] The impact area is 6.2 miles (10 km) in length, and the AOC also includes the entire 1.4 mile (2.3 km) stretch of the City Ship Canal, located adjacent to the River.[3] This area has a rich industrial history, which

[2] (New York State Department of Environmental Conservation, 1989)
[3] (Buffalo Niagara Riverkeeper, 2005)

has contributed to many identified issues including pollution, contaminated sediments, and habitat loss.

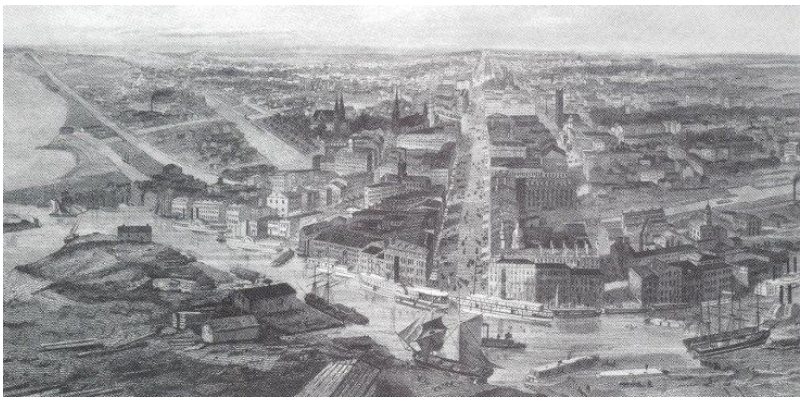


Figure 3. Buffalo River and waterfront in 1853. Taken from WNY Heritage Press, courtesy of Henry Baxter.

The Buffalo River drainage area is 446 mi^2 (1155 km^2). The primary upstream tributaries which feed the Buffalo River are Buffalo Creek, Cazenovia Creek, and Cayuga Creek. Historically, the Buffalo River was less than four feet deep and surrounded by marsh habitat, but was then extensively widened and deepened to accommodate shipping and industry.[4] Currently, the majority of the lower Buffalo River is a federally navigable waterway of 22 feet below low water datum, to facilitate safe passage of deep-draft shipping vessels. Annual surveys are conducted by the United States Army Corps of Engineers (USACE) to determine the amount of maintenance dredging required, typically equating to 140,000 cubic yards of sediment every two years.[5]

Buffalo, New York was a prominent city for industry throughout the nineteenth and twentieth centuries. Prior to railroad expansion, the mouth of the Buffalo River was the easternmost port for Great Lakes shipping before the Niagara Falls. The completion of the Erie Canal in 1825 drastically reduced the costs and time necessary to ship goods to the Midwest from New York City. The invention of the grain elevator by Joseph Dart even further revolutionized industrial growth. As such, the Buffalo River became an ideal location for many industries dependent on shipping. Unfortunately, many of these industries were also the dominant cause of pollution to the Buffalo River and Lake Erie as they used the waterways to dispose of their waste. Notable resident industries on the River included Buffalo Color Corporation (formerly a part of Allied Chemical Corporation), Mobil Oil, Donna-Hanner Coke, Republic Steel, and General Mills. These industries released aniline-based

Stock, Bond and Curb Markets Complete in This Edition

FINANCIAL

BUFFALO EVENING NEWS

VOL. XCVI—NO. 91 THIRTY PAGES BUFFALO, N. Y., FRIDAY, JULY 27, 1928 PRICE TWO CENTS

1 DEAD, 28 BURNED, 3 BOATS LOST AS OIL FIRE SWEEPS BUFFALO RIVER

HEENEY IS GAME BUT OUTCLASSED

Tunney, Debonair and Cool, Chops Foe to Ribbons, Landing Almost at Will, Until Referee Calls Halt.

River of Fire Engulfs Oil Tanker McColl and It Blows Up

MEN LEAP FOR LIVES AS FIREBOAT BURNS

Engineer Thomas J. Lynch Drowns in Sea of Flames—Waterfront Area Menaced When Blaze Spreads Over Stream.

HOOVER IS CHEERED IN SAN FRANCISCO

DEPUTY CHIEF CROTTY SAVES THREE FIREMEN

Figure 4. Front page of Buffalo Evening News, July 27, 1928. Courtesy of the Buffalo and Erie County Public Library microfilm collection.

[4] (Sauer, 1979)

[5] (U.S. Army Corps of Engineers, Buffalo District, 2010)

dyes, oil, and chemicals of concern (COC) directly into the River.[6]

Industrial pollutants discharged into the River contribute to poor water quality and degraded ecological health. The suite of contaminants commonly referred to as COCs include: polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), lead (Pb), and mercury (Hg).[7] Additional pollutants included: oil slicks, raw sewage, thermal pollution from industrial cooling, pesticides (such as chlordane, DDT and its metabolites), ammonia (NH_3), and acids leading to low pH.[8] At peak industry, the River had a documented pH level of 3.5, although the River was alleged to have pH level of 2.0 and temperatures of 100°F (though these data cannot be verified).[9] The Buffalo River has had four water-based fires, the first of which caused an oil tanker to explode, and burned for nearly three days in July 1928. The final documented fire occurred in 1968.[10]

Figure 5. President Lyndon B. Johnson and First Lady Claudia "Ladybird" Johnson visited Lake Erie and the Buffalo River in 1966. Taken from LBJ Presidential Library.

Local residents had long-standing concerns about the water pollution in Lake Erie and the Buffalo River and these issues gained national attention in 1966. The National Wildlife Foundation awarded the 1966 Water Conservationist of the Year to Stanley Spisiak, a jeweler by trade and environmental advocate at heart. At the awards ceremony, he invited First Lady Claudia Alta "Ladybird" Johnson to visit Buffalo and see the effects of water pollution firsthand. On August 25, 1966, Ladybird and President Lyndon B. Johnson toured Lake Erie and the Buffalo River with Mr. Spisiak and were appalled at the sludge taken directly from the open water. The President signed an Executive Order banning open disposal of pollutants, and this moment sparked numerous other water quality protections, nationally.[11] In 1973, the United States Environmental Protection Agency (USEPA) conducted research on industrial discharges on urban waters using the Buffalo River as a model. They found dissolved oxygen

[6] (Sauer, 1979)
[7] (Environ International Corporation, Mactec Engineering & Consulting Inc., Limnotech, 2011)
[8] (New York State Department of Environmental Conservation, 1989)
[9] (Sauer, 1979)
[10] (Buffalo Courier Express Archives, 1828-1982)
[11] (Sanders, 2012)

levels were virtually nonexistent, and the River was not biologically suitable for fish and wildlife.[12]

> "Through the heart of Buffalo wanders the city's most whimsical thoroughfare, Buffalo River. It is a sluggish, inky stream, choked with chemical poisons, littered with trash. But it is an artery of commerce and industry, though almost unknown to the people of Buffalo, except that they cross is here and there on a bridge. Along its ugly banks lies wasteland you can buy for 20,000 an acre—if the owner happens to be in a mood for selling." – Oviatt M'Connell, New York Times 1934

In 1989, the Buffalo River RAC formed to address issues within the AOC. This group of concerned citizens, scientists, and stakeholders, along with the New York State Department of Environmental Conservation (NYSDEC) wrote a combined Stage I and II Remedial Action Plan (RAP) for the Buffalo River AOC. The goal of the RAP is "*to restore and maintain the chemical, physical, and biological integrity of the Buffalo River ecosystem in accordance with the Great Lakes Water Quality Agreement."* The combined Stage I and II RAP identified BUIs that were Impaired, their likely causes, and presented remedial actions to address them. The Stage III RAP will eventually verify that all remedial actions have been met and recommend the delisting of the Buffalo River AOC.

The best use water classification for the Buffalo River is for fish survival, which in 1989 was considered a Class D waterway.[13] The best use for the Buffalo River is still fish survival, however, that is now considered a Class C waterway by NYSDEC.[14] Although the best usage reflects fish survival, the State Department of Health has fish consumption advisories in place for the Buffalo River. Primary contact and drinking water are not recommended uses for the Buffalo River.

To date, approximately $48.5 million in funds from the Great Lakes Restoration Initiative (GLRI) alone has been used towards the remediation of the Buffalo River. Numerous research projects have been conducted on the River in the decades since it was declared an AOC, encompassing various disciplines including biology, geology, hydrology, community ecology, and socioeconomics. Under the Great Lakes Legacy Act (GLLA), 1,045,000 cubic yards of contaminated sediment were removed from the Buffalo River in a two-phase dredging effort.[15] This extensive dredging effort served to supplement, not replace routine maintenance dredging that occurs every other year in the federally navigable waterway. Abatement of sewage discharges through Buffalo Sewer Authority's (BSA) Long Term Control Plan (LTCP) and the City of Buffalo's Unified Development Ordinance (UDO, commonly referred to as the "Green Code") will contribute to the eventual delisting of the Buffalo River AOC. Extensive habitat

[12] (Sargent, 1975)
[13] (New York State Department of Environmental Conservation, 1989)
[14] (N.Y. Comp. Codes R. & Regs., 2017)
[15] (Great Lakes Mud, 2018)

restoration projects, continued stewardship of the River by community, and increasingly favorable perception all supplement restoration of the Buffalo River.

2.2 Beneficial Use Impairment 11: Degradation of Aesthetics

In the original RAP, BUI 11: Degradation of Aesthetics was listed as Not Impaired. The RAC justified this because the Buffalo River is a naturally turbid system and the typical debris encountered was of natural origin from storm events. They stated that water quality-related aesthetics were Not Impaired although abandoned buildings and blight contributed to visual aesthetics. At the time oil slicks, dye inputs, and other industrial impairments had already ceased with the loss of the source industries.[16] In 2003, the environmental advocacy non-profit Buffalo Niagara Riverkeeper (currently named Buffalo Niagara Waterkeeper [BNW]) assumed the role of RAC coordinator from NYSDEC. In the following year, 2004, the RAC re-evaluated each BUI status and concluded that BUI 11: Degradation of Aesthetics was Impaired due to sewage inputs from combined sewer overflows (CSO, see section 3.1 for further detail).[17]

Figure 6. Habitat planting at "RiverBend 2", a site along the Buffalo River. Taken by BNW, 2015.

2.3 BUI Removal Criteria[18]

Under the GLWQA, this BUI can be removed when AOC waters are devoid of any substance which produces a persistent objectional deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum). The key removal criteria identified by the RAC, as stated in the

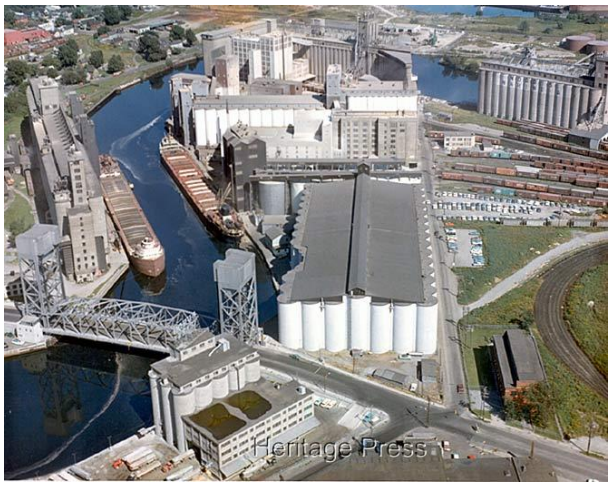


Figure 7. Visible oil sheens in the Buffalo River. Taken from Western New York Heritage Press, date unknown.

[16] (New York State Department of Environmental Conservation, 1989)
[17] (Buffalo Niagara Riverkeeper, 2005)
[18] (Buffalo Niagara Riverkeeper, 2014)

Buffalo River Monitoring Plan (2014) are as follows:

"Minimize debris, general litter, floatables, or biological and chemical contaminants in the river through the signing of the Buffalo Sewer Authority's Long Term Control Plan and the application of Best Management Practices through the adoption of the City of Buffalo Green Code by the Common Council."

The key criteria agreed upon by the RAC elaborates, *"Through the adoption and implementation of this fundamental framework we will see a continuous increase in aesthetic quality of the Buffalo River. This will be the start of a long process of reducing and eliminating inputs through both point and non-point sources pollution. Furthermore, it was determined by the working group that this is the best means of reducing the known or likely causes of impairment that have historically plagued the Buffalo River."*

Based on the RAC's assessment and recommendations to the agencies, NYSDEC and USEPA subsequently approved the re-designation of this BUI and the suggested removal criteria.

3. Assessments and Actions Supporting BUI Removal

Turbidity is not part of the BUI 11 removal criteria in the Buffalo River, even though it is a key criterion under the GLWQA. The Buffalo River AOC feeds into Lake Erie, which is subject to seiche events. Seiche events occur when high winds create a large standing wave. The shallow morphology and position in relation to the common prevailing winds are ideal conditions for seiches on eastern Lake Erie. Wind-driven seiches often cause the Buffalo River to function similar to an estuary, and ensure bidirectional flow and suspension of sediments.[19] Sediment contributions from the upper watershed also lead to high turbidity. Turbidity is not an AOC-specific problem, and therefore, is not assessed as a removal criterion herein. The removal criteria required to remove BUI 11 from Impaired to Not Impaired were identified through RAC consensus in 2014. These have been achieved and are described below.

In addition to CSO effluent, there are upstream inputs from failing septic systems and agriculture.[20] It is recognized that abatement of these upstream nonpoint sources of bacteria are essential for full ecological restoration; however, reduction of CSO inputs has been specifically identified as a necessary step in AOC recovery. Therefore, adoption into State Pollutant Discharge Elimination System (SPDES) permit of a LTCP by BSA to guide future CSO abatement was identified by NYSDEC in its "Management Actions" letter as an additional community commitment to the AOC's restoration. The

[19] (Irvine, Stein, & Singer, 1990)
[20] (Pettibone & Irvine, 1996)

RAC continues to advocate for abatement of upstream inputs of pollutants outside of the AOC Program.

3.1 Buffalo Sewer Authority Long Term Control Plan: Action A[21]

The City of Buffalo has combined sewer infrastructure to collect and treat wastewater. In a combined sewer system, all sanitary waste from buildings and stormwater run-off from streets and parking lots are sent to a wastewater treatment plant (WWTP) through the same collection system. Typically, combined waste is treated at the WWTP (undergoing primary and secondary treatment) before being discharged into waterways. However, in times of heavy rain or snowmelt events, the inundated pipes divert excess volume of water directly into the waterways without treatment. Currently the City of Buffalo has 52 CSOs, 15 of which are located along the Buffalo River and six of which are along its tributary Cazenovia Creek.

The City of Buffalo submitted their LTCP to the USEPA in 2012. After public feedback and NYSDEC/USEPA comments, they redrafted the Plan in 2014. The LTCP consists of both green and gray infrastructure to improve stormwater management, and thereby reduce frequency of CSO events. Proposed tactics to reduce CSO events include reducing impermeable surfaces, building retention tanks to hold stormwater until the WWTP can treat more volume, weir modifications, and increased green infrastructure. Implementation of the LTCP will reduce the frequency of CSO events in the Buffalo River to approximately six annual events in contrast to the current mean of 69 events. Completion of the LTCP will cost approximately 380 million dollars over a 20-year period on a staggered schedule. Further improvements in water quality aesthetics are expected as the LTCP progresses. A summary implementation schedule is in Appendix A.

3.2 Buffalo Green Code: Action B[22]

As an additional community commitment not considered an AOC management action, the City of Buffalo recently underwent a thorough and extensive planning effort resulting in a modernized form-based zoning code (UDO), and is commonly referred to as the "Green Code." This was a community-driven effort led by the City of Buffalo's office of Strategic Planning, to update and modernize the City’s zoning to allow for economic development, environmental protection and restoration, and community development. There had not been a comprehensive zoning update in the City of Buffalo since 1953. In total, 242 public meetings were held to solicit input for the UDO. The final UDO contains more stringent land setbacks, which are vegetative buffers between development and shorelines. Any development that is incompatible with the setback requirement requires a variance from the planning board.

As per the adopted Green Code, no building may be within 25 feet of the Buffalo River unless it has a water-dependent use. Additionally, commercial parcels within the

[21] (Malcolm Pirnie: Arcadis; GHD, 2014)
[22] (City of Buffalo, 2016)

Buffalo River Corridor require a minimum 100 foot setback where the 50 foot vegetative buffer adjacent to the shore must consist of native plants. The native vegetation buffers along the Buffalo River will help capture stormwater run-off, silt, and debris that contribute to turbidity. The increased filtration will also lessen the loads on the stormwater collection, which will reduce frequency of CSO events in heavy rainfall.

3.3 Habitat Action Plan: Action C[23]

To address the Impaired BUI 14: Loss of Fish and Wildlife Habitat, an AOC management action for a Habitat Action Plan was created by the RAC in 2014. The primary objective of the Habitat Action Plan was to restore "*a minimum 25% of the AOC shoreline to natural slope, shallows, and aquatic native vegetation, including naturalizing areas of the City Ship Canal shoreline*" where 25% = 19,941 linear feet. The stated objective would enhance the native vegetation and in-water vegetation of the River, thereby improving water quality as well as fish and wildlife habitat. As stated, increased vegetative buffers reduce pollutant and excess silt loads into the River as well. To ensure that habitat restoration occurred in source areas, several upstream sites have been restored and/or included in the Plan, thereby lowering inputs leading to poor water quality.

Several invested partners and agencies of the RAC have been implementing the Habitat Action Plan since its release, namely: BNW, Erie County Department of Environment and Planning (ECDEP), USACE, NYSDEC, USFWS and USEPA. These agencies have worked with numerous public and private landowners and advisors to achieve restoration goals at each site. All of the habitat restoration sites were made possible through Great Lakes Restoration Initiative funding, and BNW-lead restoration sites were funded by GLRI through a partnership with the Great Lakes Commission (GLC) and National Oceanic and Atmospheric Administration (NOAA).

Figure 8. The Bailey Avenue habitat restoration site identified in the Habitat Action Plan. This site restores approximately 765 linear feet of shoreline and the inlet opens up additional fish habitat. Taken from ECDEP, 2017.

3.4 Buffalo Niagara Waterkeeper Shoreline Sweeps: Action D

Since 2007, Buffalo Niagara Waterkeeper has hosted waterway cleanup events. These occur throughout the Niagara River watershed; however, this document

[23] (Buffalo River Remedial Advisory Committee, 2013)

describes the effort exerted within the Buffalo River AOC and its upstream sources (Cazenovia Creek, Cayuga Creek, Buffalo River upstream of the AOC) only. The spring shoreline sweep is the largest single-day shoreline cleanup in Western New York. From 2007-2015 cleanups occurred biannually: in April and September. In 2016, BNW continued the larger April event and then hosted smaller events every month until October.

3.5 Public Perception and Usage

In the last five to ten years, there has been an economic revitalization in the City of Buffalo. Recreational use has expanded throughout the downtown district and along the City's waterfront including the Buffalo River, with many businesses opening in the vicinity of the River. Recognizing that the business community has a vital role in stewardship, BNW and ECDEP invited Buffalo River business owners to a community meeting in September 2017 to brainstorm long-term stewardship mechanisms.

Figure 9. Buffalo River on a typical summer weekend in 2017, which is strikingly different from a typical weekend before restoration. Courtesy of Joe Cascio, 2017.

In 2018, surveys were distributed to the general public for their perception regarding aesthetics of the River and fish consumption. Questionnaires had ten questions; four of which related directly to the BUI 11. The remaining questions described the individual's typical use of the River (recreational, business, or residential), and fish consumption in the River (regarding BUI 2: Tainting of Fish and Wildlife Flavor). Feedback was solicited in person at regional events including angler events and environmental fairs, and electronically distributed through social media. Survey answers were accepted from January 19-April 21 of 2018 by BNW and ECDEP. These dates were selected because they coincided with two well-trafficked outreach events: the Greater Niagara Region Fishing Exposition in Niagara Falls NY, and Earth Day events (including BNW spring shoreline sweep). A summary of the results is in Appendix B.

Two separate photographs were discovered in the Buffalo and Erie County Public Library archives entitled “Signs of Spring in the Buffalo River”, but taken nearly 50 years apart (1904 and 1951). These photographs show freighters navigating the channel for industrial use. Spring in the Buffalo River now also signifies the blossoming of trees and return of wildlife, rather than simply the return of industrial barges in the channel. To accentuate how drastically “Signs of Spring” have changed over the last century, a photograph contest was held by BNW in April 2018.

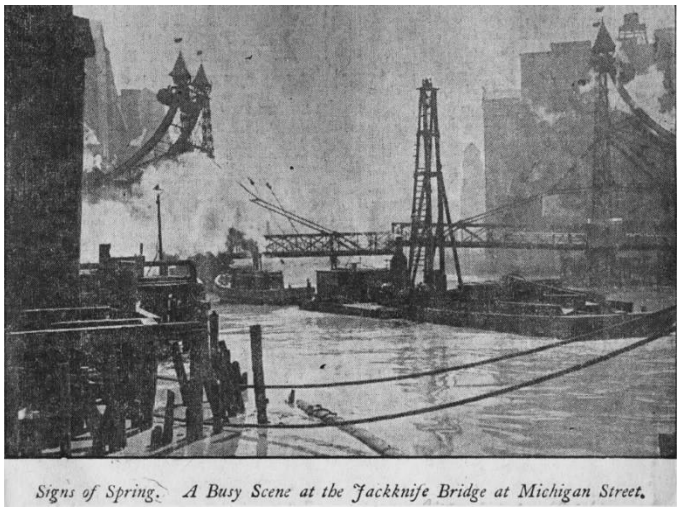


Figure 10. May 24, 1904. Courier Express, courtesy of Buffalo and Erie County Public Library.

Figure 11. April 1951. Buffalo Businesses Magazine, courtesy of Buffalo and Erie County Public Library.

Figure 12. The winning photograph from the Signs of Spring in the Buffalo River contest shows geese lined up on pilings in the AOC. In cooler weather, birds often stand on one leg to minimize heat loss. Courtesy of Rene T. van Ee, April, 2018.

4. Monitoring Success of Assessments and Actions Supporting BUI Removal

4.1 Verification: Action A[24]

The LTCP consists of three main elements:

1. Revised Foundation Projects which were selected through cost-benefit analysis and public input (including certain weir modifications, downspout disconnection pilots, and constructing three storage tanks in the City; two of which are adjacent to the Buffalo River with a combined 0.5 million gallon capacity).

2. Gray Infrastructure Projects (including increasing pipe capacity and construction of storage increases for three CSOs on the Buffalo River).

3. Green Infrastructure Projects (continued downspout disconnections, rain gardens, and other green infrastructure projects; 319 acres in the Buffalo River sewershed area will receive green infrastructure updates).

The current baseline frequency for the Buffalo River is 69 annual CSO events. To reach a Level of Compliance with the LTCP with water quality standards, the frequency of CSO discharge events in the Buffalo River should be no more than 12 annual events. Completion of the LTCP will reduce the frequency to six annual events in the Buffalo River, which equates to approximately 178.8 million gallons of untreated sewage released in contrast to the current estimation of 379 million gallons. Final completion of the LTCP is expected in 2034; however, several gray infrastructure projects (retention facilities) have been implemented and have already improved the WWTP's capacity to treat wastewater and reduce the volume and frequency of overflows to the river.

4.2 Verification: Action B[25]

The Green Code was adopted as law as of April 3, 2017. The required waterfront yard buffer width and stormwater management plans will improve water quality throughout the City of Buffalo. The adoption of the Green Code is a win for the Buffalo River because future development will no longer be approved immediately on the waterfront, which lowers shoreline resilience of the corridor. The Green Code also provides strategies and best management

Figure 13. Photograph before invasive species treatment at the toe of Katherine Street Peninsula. Most of the visible vegetation is knotweed or tree-of-heaven, except for the large willow trees.

[24] (Malcolm Pirnie: Arcadis; GHD, 2014)
[25] (City of Buffalo, 2016)

practices for green infrastructure that developers can reference in the future.

The Green Code also consists of best management practices for brownfield areas, a general environmental impact statement, and the City of Buffalo's Local Waterfront Revitalization Plan (LWRP; still in drafting stages) which all have strong requirements that protect water quality and natural resources once these components are fully implemented. The LWRP will guide development in Buffalo's waterfront area to be consistent with local and regional priorities and plans. The LWRP identified ten goals to protect natural resources, and a waterfront action plan.[26] Members of the RAC continue to assist in the drafting and public comment period of the LWRP to ensure that the best interests of the Buffalo River are represented.

4.3 Verification: Action C[27]

Thirteen habitat restoration sites were selected as a result of the Habitat Action Plan, and all are projected to be completed as of August 2019. These projects highlight the success of years of inter-agency, private, and public collaboration. Monitoring needs differ for each project, but all habitat restoration sites have a period of establishment, and any plantings that do not succeed in that period will be replaced. These habitat restoration sites primarily meet the goals for BUI 14: Degradation of Fish and Wildlife Habitat. However, increased native vegetation buffers are a supplementary management action for BUI 11 as well.

Figure 14. Trees ready for installation following invasive species treatment at the Toe of Katherine Street. Turtle nesting habitat was also created at this site.

The 25% restoration goal describes a bare minimum of habitat restoration, but in reality this target will be exceeded and will continue to increase as the Buffalo River is restored. Additional projects include in-water vegetation plantings from the GLLA of 2012 and Seneca Bluffs, an Erie County Park upstream of the AOC. The restoration of upstream sites reduces sediment pollutant loadings and negative water quality impacts

[26] (City of Buffalo, 2017)
[27] (Buffalo River Remedial Advisory Committee, 2013)

from outside the AOC. In total, 21,179 linear feet and 71.5 upland acres will be restored in the Buffalo River AOC. The total estimated cost as of March 2018 was $22,025,000.[28]

Figure 15. Three barges of large woody debris were removed from the "Blue Tower Turning Basin" site. The debris was removed from this site before in-water habitat was planted. A rootwad chain and floating boom system was then installed to deflect additional accumulation of debris.

The RAC actively seeks innovative ways to improve water quality and habitat connectivity of the Buffalo River corridor. For example, a floating boom was installed at the Blue Tower Turning Basin habitat restoration site to deflect natural debris so that it does not accumulate and kill in-water vegetation. Turtle nesting habitats have been installed at several habitat restoration areas throughout the corridor. Lessons learned from completed sites, including the plant species that most frequently thrive, and ways to deter beaver and deer damage are applied to new sites. The high visibility of completed sites has encouraged additional business owners to implement projects on their property. In the last five years, landowners have contacted the RAC to volunteer their sites for access and improvements. The owner of a historic grain silo on the River has even used their shoreline as a workforce training area for youth interested in careers in ecology.

Continued stewardship of these sites is necessary to ensure success of the habitat sites. The RAC is striving to develop a mechanism for long-term stewardship and invasive species management for the AOC corridor in the next few years. Increasing habitat connectivity is necessary to reduce re-establishment of invasive species and provide a corridor for wildlife.

[28] Projects summary table from March 2018 RAC meeting

4.4 Verification: Action D

Volunteer waterway cleanups facilitated by BNW have occurred biannually (April and September) from 2007-2015. There was such high demand to participate in these cleanup efforts that BNW shifted to a monthly cleanup in 2016. Each year, during the April shoreline sweep kick-off, approximately 2,000 people volunteer throughout Western New York. Generally 200-400 volunteers, or 10-20% of the participants, volunteer at sites in the Buffalo River AOC or its tributaries. Each volunteer collects approximately one bag of debris weighing about 20 pounds, but they oftentimes retrieve tires or illegally dumped construction materials as well.

For the remainder of the season monthly waterway cleanups occur (May-October) throughout the larger watershed. These smaller events usually contain a core group of participants, generally 20-25 volunteers at each site. Although site locations vary, there are always AOC sites included in the rotation. In 2016, five monthly cleanups were held at Seneca Bluffs, a key habitat site managed by ECDEP. Monthly waterway cleanups will continue in the AOC for the foreseeable future extending well past the delisting process for the Buffalo River. This continued stewardship effort helps to fill maintenance gaps while promoting civic pride and shared ownership of the Buffalo River.

Figure 16. Volunteers from a Shoreline Sweep at Seneca Bluffs, an Erie County Park. May 2nd, 2012. Courtesy of Sara Johnson winner of a photograph contest in 2012.

4.5 Record of Improved Public Perception

Public perception of the Buffalo River has improved favorably over the years. Once regarded simply as a tool to facilitate trade and industry, the River is now recognized as a natural resource and community asset. Environmental restoration,

economic revitalization, and successful outreach efforts have led to improved public perception.

In 2003-2004, a study was conducted to observe how frequently the public visited the Buffalo River.[29] For three hours at a time, observers on a boat noted how many people they saw in or alongside the River on randomized days between July and September. On numerous occasions, they did not encounter a single person. In total, they observed 887 people over a 73 day period. After correcting for days that were not sampled, this equated to approximately 6,862 unique visits in 2003 and 5,922 in 2004. It was not in the capacity of the Buffalo River RAC to replicate this study; however, it is conceivable that one could observe 887 people utilizing the Buffalo River AOC in a single summer weekend in 2018.

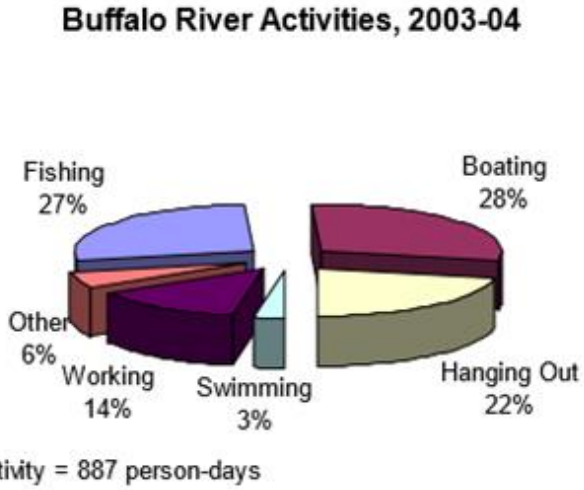


Figure 17. Summary of popular use activities of the Buffalo River in 2003-2004. "Hanging Out" is defined as any recreational use that is not described by other categories, such as walking, sitting with a friend, eating lunch. Taken from Irvine et al. 2005.

Public surveys were distributed to better understand how the public perceives Buffalo River's current status. This approach was modeled off other AOCs that have removed BUI 11. As noted above, surveys were distributed in person and through online social media from January to April of 2018 by BNW, coinciding with dates of major environmental events in the watershed. Survey results revealed that 87.9% of respondents visit the Buffalo River for recreational purposes (biking, walking, boating, going to concerts and restaurants) and 89.1% have noticed improvements on the state of the Buffalo River in the last five years (since GLLA dredging activities occurred). The Buffalo River results are particularly informative because 88.3% of respondents have lived in the area for more than 16 years. In regards to water quality aesthetics, 57.9% of respondents would rate the Buffalo River as good-to-fair. Natural debris (wood, weeds or dead fish) and plastic debris/litter were reported (186 and 182 indications respectively) most frequently by visitors in the last year compared to oil sheens or CSO inputs (31 and 38 indications respectively). The full survey results are included as Appendix B.

ECDEP regularly hosts volunteer events on County Parks including Seneca Bluffs and Red Jacket. For the last five years (2012-17), Friends of Reinstein Woods, NYSDEC, ECDEP, and USFWS have hosted a program called "A Day in the Life of the Buffalo River". This program brings students out to various sections of the AOC and upstream tributaries to sample water quality parameters and macroinvertebrates

[29] (Irvine, et al., 2005)

inhabiting the river bottom. This program has successfully engaged hundreds of students while also providing a snapshot of water quality.

An integral part of BNW's mission is to connect people to water and protect water quality. BNW initially formed as Friends of the Buffalo River, to facilitate the RAP process for the Buffalo River AOC, and a major component of this is outreach in the Buffalo River and surrounding watershed. BNW runs a citizen science program called Riverwatch where volunteers conduct monthly monitoring of streams in their neighborhood and also provide a network of "Eyes on the Water" to report pollution or improper land uses on these waterways. Free paddle tours are hosted by BNW throughout the summer on the Buffalo River.

Figure 18. The original 1989 RAC logo was updated for a RAC sticker in 2018.

As a direct result of the Buffalo River business owner meeting in 2017, new stakeholders have joined the RAC. Several business owners have offered their staff time and monies as a mechanism for future stewardship efforts. Some river-adjacent business owners already have green infrastructure projects on their properties, and others have allowed site access for AOC restoration projects. Notably, many business owners along the River have stated that without the collapse of larger industry and the environmental restoration that has occurred since, it would not have been possible to start a small business along the waterfront. Continued engagement with the private sector community will facilitate the future of the Buffalo River, and will have an immeasurably positive effect through the financial recognition of the importance of ecological integrity.

5. Public Consultation

The RAC held a public comment period from May 1, 2018 through May 31, 2018. There was one hard copy of the draft removal report available at each of the 36 Buffalo & Erie County Public Library branches, containing instructions on where to submit a public comment. The report was promoted through BNW virtual newsletters, in person at all BNW outreach events, and via social media. There were 97 "unique" views of the draft removal report (coming from different Internet Provider addresses) during the 30-day comment period. Additionally, each social media post had a reach of approximately 600-1,000 unique individuals online. Buffalo Congressman Brian Higgins "retweeted" the public report, further sharing the milestone with an additional 22,700 followers on social media. A record of successful public consultation is included as Appendix C.

On May 3, 2018, a public meeting was held at the Central Buffalo & Erie County Public Library. The meeting included an interactive poster session demonstrating each of the Actions and Assessments Supporting BUI Removal (described in the present report), as well as a formal presentation on the AOC Program and purpose of the Buffalo River RAC. Sixteen members of the public and two news media outlets attended

the public meeting. Spectrum News took video footage for a television interview, while WBFO News took audio for a radio interview and online news article.

Unfortunately, no written comments were received on the removal report. However, the RAC consulted the public and encouraged comments to the maximum extent practicable. The lack of formal comments was not due to a lack of public consultation, but perhaps may be indicative of the generally increased perception about the aesthetics and status of the Buffalo River.

6. Conclusions

Through implementation of one AOC management action to adopt and implement a Habitat Restoration Plan, as well as community commitments such as the BSA's LCTP, the Buffalo Green Code, and ongoing volunteer efforts from Buffalo River AOC stakeholders, the Degradation of Aesthetics along the Buffalo River has been significantly mitigated. The RAC has unanimously determined that the Degradation of Aesthetics BUI has met the criteria for removal to the maximum extent practicable, and is in accordance with IJC guidelines. The RAC fully supports and NYSDEC concurs with the recommendation that the Degradation of Aesthetics BUI for the Buffalo River AOC be removed from the list of Impaired BUIs.

The RAC will continue to promote and facilitate additional endeavors to complement AOC restoration of the Buffalo River including but not limited to: inter-agency habitat restoration, volunteer waterway cleanups, and public engagement and stewardship.

7. References

Buffalo Courier Express Archives. (1828-1982). Grosvenor Reference Division Microfilm Collections. Buffalo, NY: Buffalo and Erie County Public Library (N.Y.).

Buffalo Niagara Riverkeeper. (2005). *Buffalo River Remedial Action Plan: 2005 Status Report.* Buffalo, NY: Prepared for Buffalo River Remedial Advisory Committee.

Buffalo Niagara Riverkeeper. (2014). *Buffalo River Area of Concern: A Monitoring Plan for the Delisting of "Impaired" Benefecial Use Impairments.* Buffalo, NY: Buffalo River Remedial Advisory Committee.

Buffalo River Remedial Advisory Committee. (2013). *Habitat Action Plan.* Buffalo, NY: Buffalo Niagara Riverkeeper. Retrieved from https://bnwaterkeeper.org/wp-content/uploads/2009/07/NRRHRS_HAB_83.pdf

Cass, C. (2017, July). Burning Rivers: A Tale of American Industry, Ingenuity, and Negligence Along the Great Lakes. Buffalo, NY: Great Moments in Western Civilization Cooperative.

City of Buffalo. (2016). *Unified Development Ordinance.* Office of Strategic Planning, Buffalo, NY.

City of Buffalo. (2017). *Draft Local Waterfront Revitalization Program: Summary.* Buffalo, NY.

Environ International Corporation, Mactec Engineering & Consulting Inc., Limnotech. (2011). *Feasibility Study for the Buffalo River, New York.* Buffalo, NY: Prepared for Buffalo River Great Lakes Legacy Act Project Coordination Team.

Great Lakes Mud. (2018). *Buffalo River Area of Concern*. Retrieved from Great Lakes Mud: http://www.greatlakesmud.org/buffalo-river---buffalo-river-aoc.html

Irvine, K., Snyder, R., Diggins, T., Sinn, B., Chuey, C., Jedlicka, J., & Barraet O'Neill, J. (2005). *Assessment of Potential Aquatic Habitat Restoration Sites in the Buffalo River Area of Concern.* Buffalo, NY: Published for New York State Department of Environmental Conservation.

Irvine, K., Stein, G., & Singer, J. (1990). *An Environmental Guidebook to the Buffalo River.* Buffalo, NY.

Malcolm Pirnie: Arcadis; GHD. (2014). *Long Term Control Plan - FINAL.* Buffalo, NY: Published for Buffalo Sewer Authority.

N.Y. Comp. Codes R. & Regs. (2017). Class C fresh surface waters. *6 CRR-NY 701.8*.

New York State Department of Environmental Conservation. (1989). *Buffalo River Remedial Action Plan.* Buffalo, NY.

Pettibone, G., & Irvine, K. (1996). Levels and Sources of Indicator Bacteria Assoicated with the Buffalo River "Area of Concern," Buffalo, New York. *Journal of Great Lakes Research, 22*(4), 896-905.

Sanders, B. (2012). *A retrospective on Stanley Spisiak: a man with a mission*. Retrieved from U.S. Army: https://www.army.mil/article/89945/a_retrospective_on_stanley_spisiak_a_man_with_a_mission

Sargent, D. (1975). *Water Pollution Investigation: Buffalo River.* Chicago, IL: Prepared for U.S. Environmental Protection Agency Regions II & V.

Sauer, D. (1979). *An Environmental History of the Buffalo River.* Buffalo, NY: Buffalo Color Corporation.

U.S. Army Corps of Engineers, Buffalo District. (2010). *Buffalo Harbor Dredging Environmental Assessment.* Buffalo, NY.

U.S. Environmental Protection Agency. (2018, March). *Buffalo River Area of Concern*. Retrieved from https://www.epa.gov/great-lakes-aocs

Appendix A

Buffalo Sewer Authority Long Term Control Plan Projected Timeline

Implementation schedule for Revised Foundation Projects, Gray and Green Infrastructure Projects in the BSA LTCP. Taken from Malcolm Pirnie, Arcadis, GHD, 2014.

Figure ES-8: BSA CSO LTCP
Implementation Schedule - Recommended Plan

Project	Receiving Water	Description	Years 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
LTCP Regulatory Approval			▲																					
Phase 1 Projects	Varies	Rnd/Lang RTC Projects (see Table 11-11)																						
		Construction																						
		Operations/Optimization (RTC)																						
Foundation Projects																								
CSO 016 Storage	Erie Basin	*Completed (In-Line Storage see Table 11-11)*																						
Foundation 1	Buffalo River	Smith St Storage																						
		(see Table 11-11)																						
Foundation 2	Varies	SPP Optimization (see Table 11-11)																						
		(20 projects)																						
		(conveyance facilities)																						
Foundation 3	Varies	Remaining RTC (see Table 11-11)																						
		(14 sites)																						
Foundation 4	Buffalo River	Hamburg Drain Optimizations																						
		(see Table 11-11)																						
	Buffalo River	Hamburg Drain Storage																						
		(see Table 11-11)																						
Green Projects																								
Green Pilot Projects	Varies	267-acres of GI control (See GI Master Plan)																						
		Construction																						
		PCM																						
Green 2	Varies	410-acres of GI control																						
Green 3	Varies	875-acres of GI control																						
Green 4	Varies	263-acres of GI control																						
WWTP																								
NFA Project	Niagara River	Alternative C2 from NFA																						
Gray Projects																								
014/015	Erie Basin	In-line storage and optimization																						
		(see Section 12.3)																						
013	Black Rock Canal	Satellite storage, conveyance, FM & PS																						
		(see Section 12.3)																						
North Relief	Black Rock Canal	Interceptor (see Section 12.3)																						
010, 008/010, 061, 004	Black Rock Canal	Underflow capacity upsizing																						
		(see Section 12.3)																						
SPP 337 (053)	Scajaquada Creek	Satellite storage, conveyance, FM & PS																						
		(see Section 12.3)																						
SPP 336 a + b (053)	Scajaquada Creek	Satellite storage, conveyance, FM & PS																						
		(see Section 12.3)																						
Jefferson & Florida (SPP 170B - CSO 053)	Scajaquada Creek	Satellite storage, convey & FM																						
		(see Section 12.3)																						
055	Niagara River	Satellite storage, conveyance, FM & PS																						
		(see Section 12.3)																						
028/044/047	Buffalo River/ Cazenovia Creek-C	Satellite storage, conveyance, FM & PS																						
		(storage at Tops from CSO 47 west)																						
		(see Section 12.3)																						
052	Buffalo River	Satellite storage, conveyance, FM & PS																						
		(see Section 12.3)																						
064	Buffalo River	Satellite storage, conveyance, FM & PS																						
		(see Section 12.3)																						
Submit PCM Plan				▲																				
Overall PCM																								

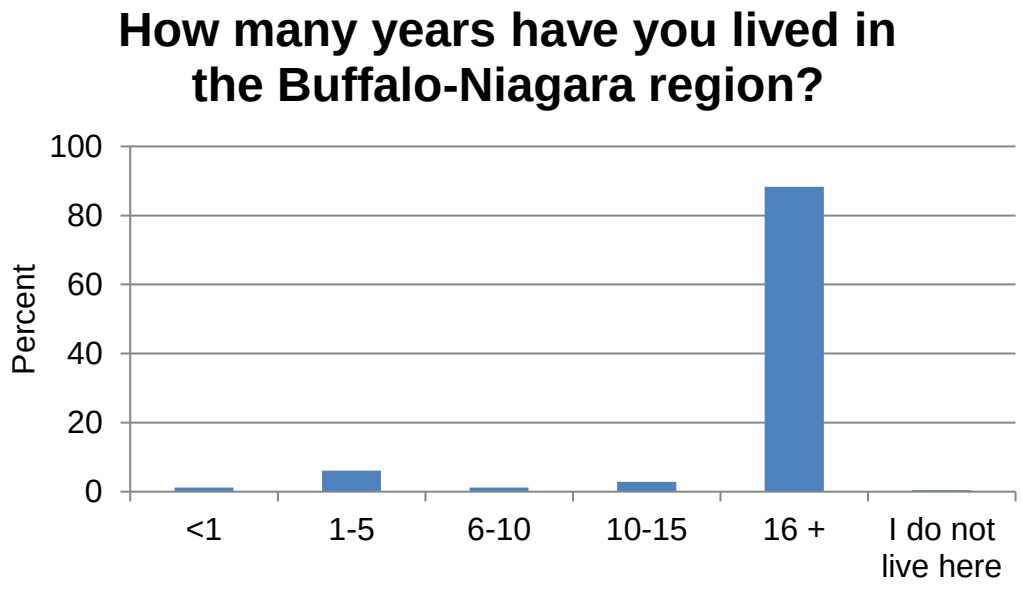
KEY
Engineering
Construction
PCM/Optimization

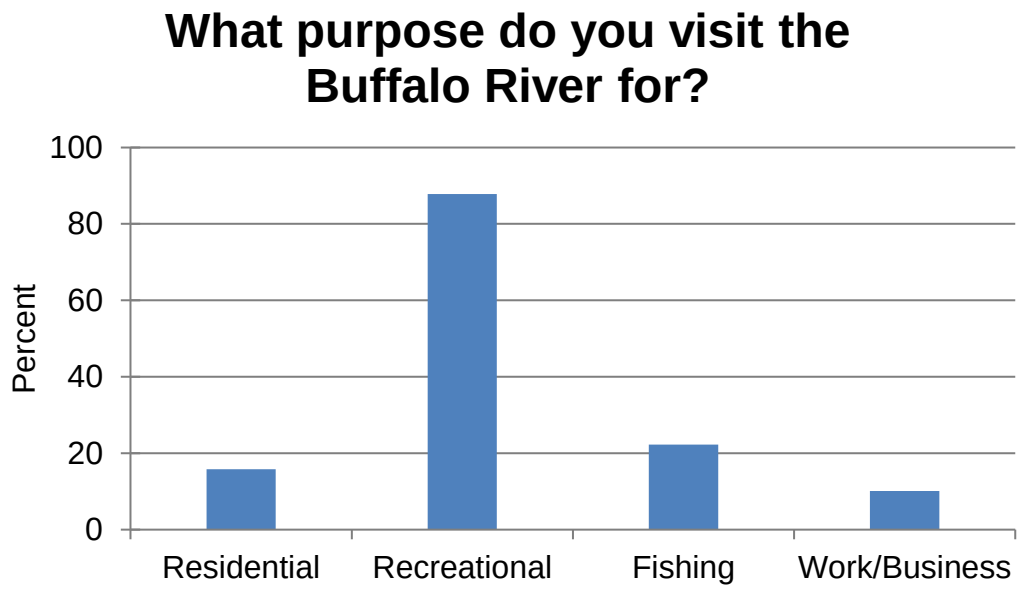
NOTE: The BSA reserves the right to substitute projects within the same general timeframe as the projects listed in the schedule, either by implementing a project of equal cost value or one that achieves the same benefit as the original project.

Appendix B

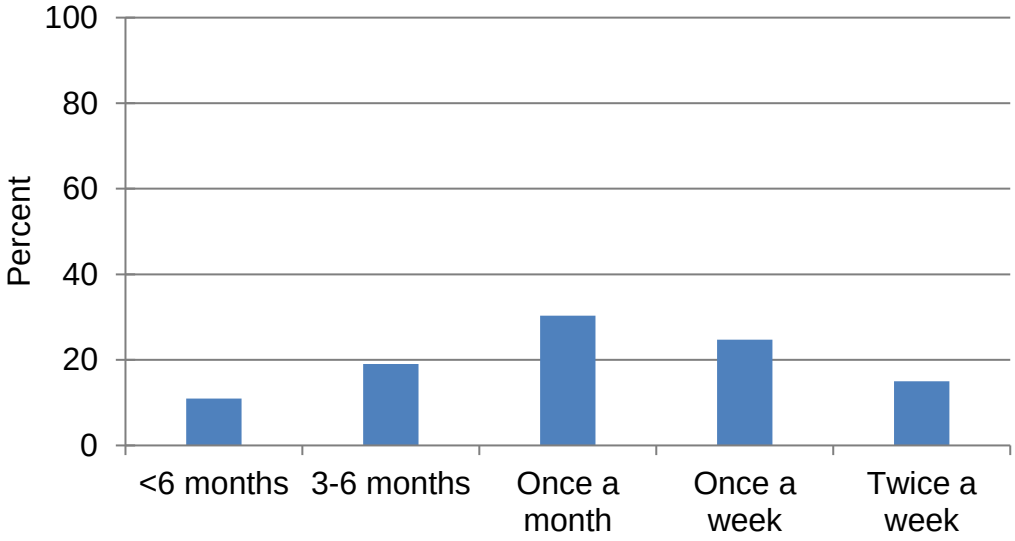
Public Perception Survey Results

Preliminary results from the public perception survey distributed by BNW and ECDEP in 2018. Survey distribution began at the Greater Niagara Fishing Exposition on January 19th and continued until the April 21st (coinciding with Earth Day events). There were 247 responses in total (53% collected in person and 47% collected online).

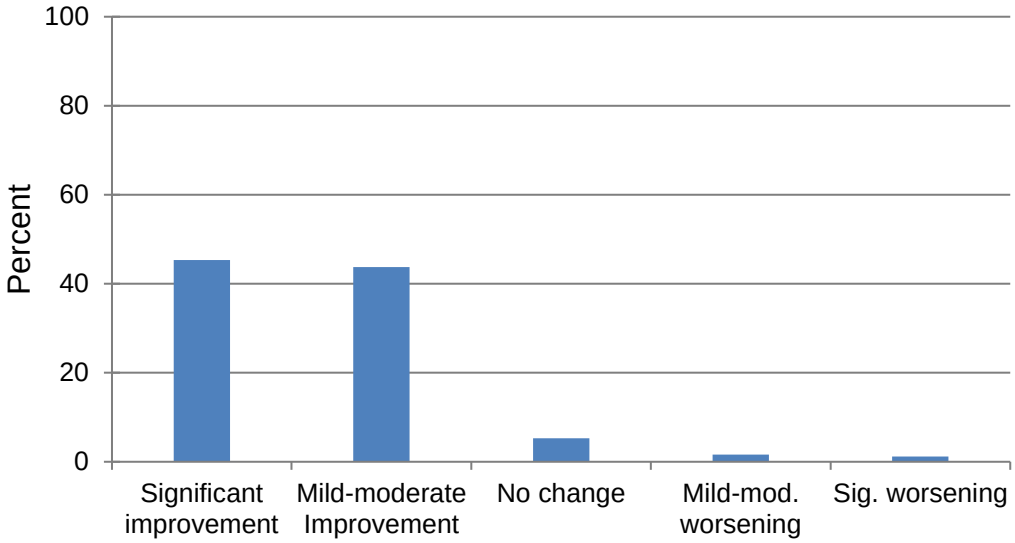




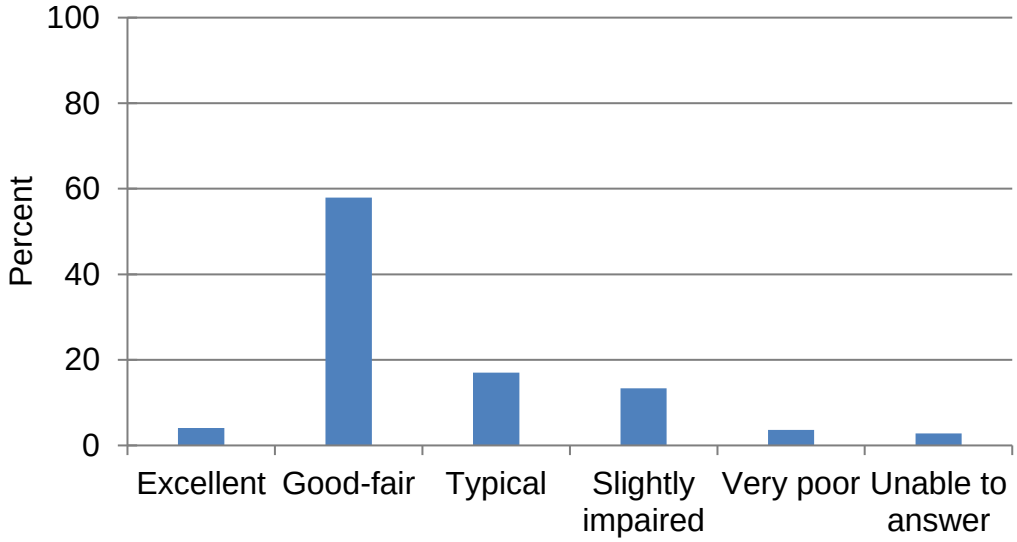
How often do you visit the Buffalo River?



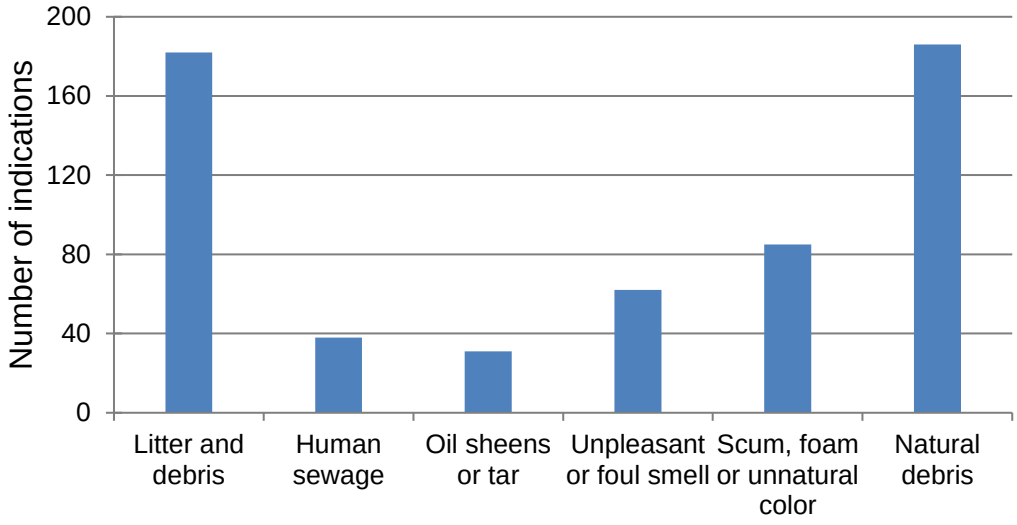
What changes have you noticed in the last five years?

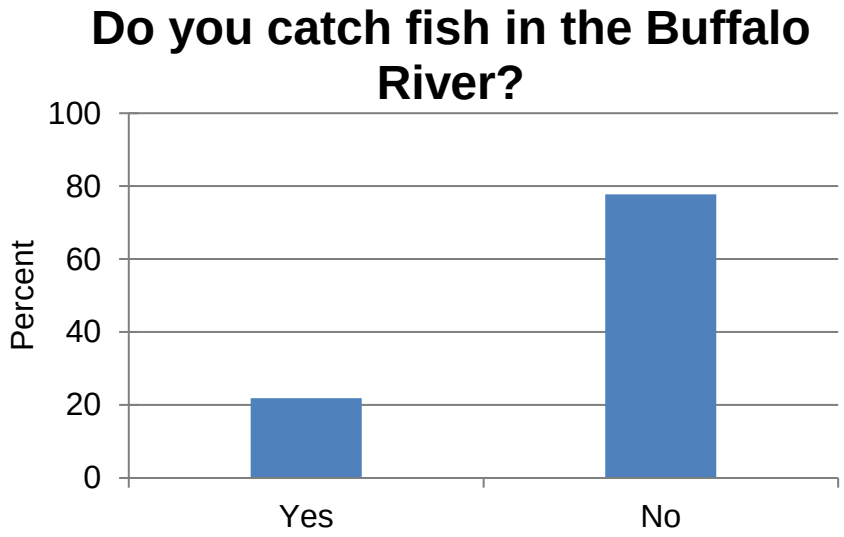


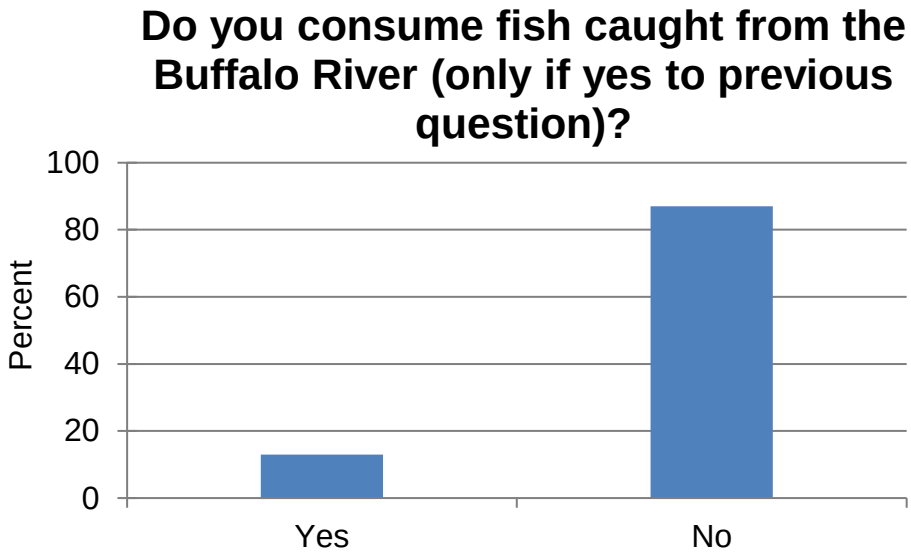
How would you describe the visual appearance of the Buffalo River?



Please indicate if you have encountered any of the following in the Buffalo River in the last year. Check all that apply.







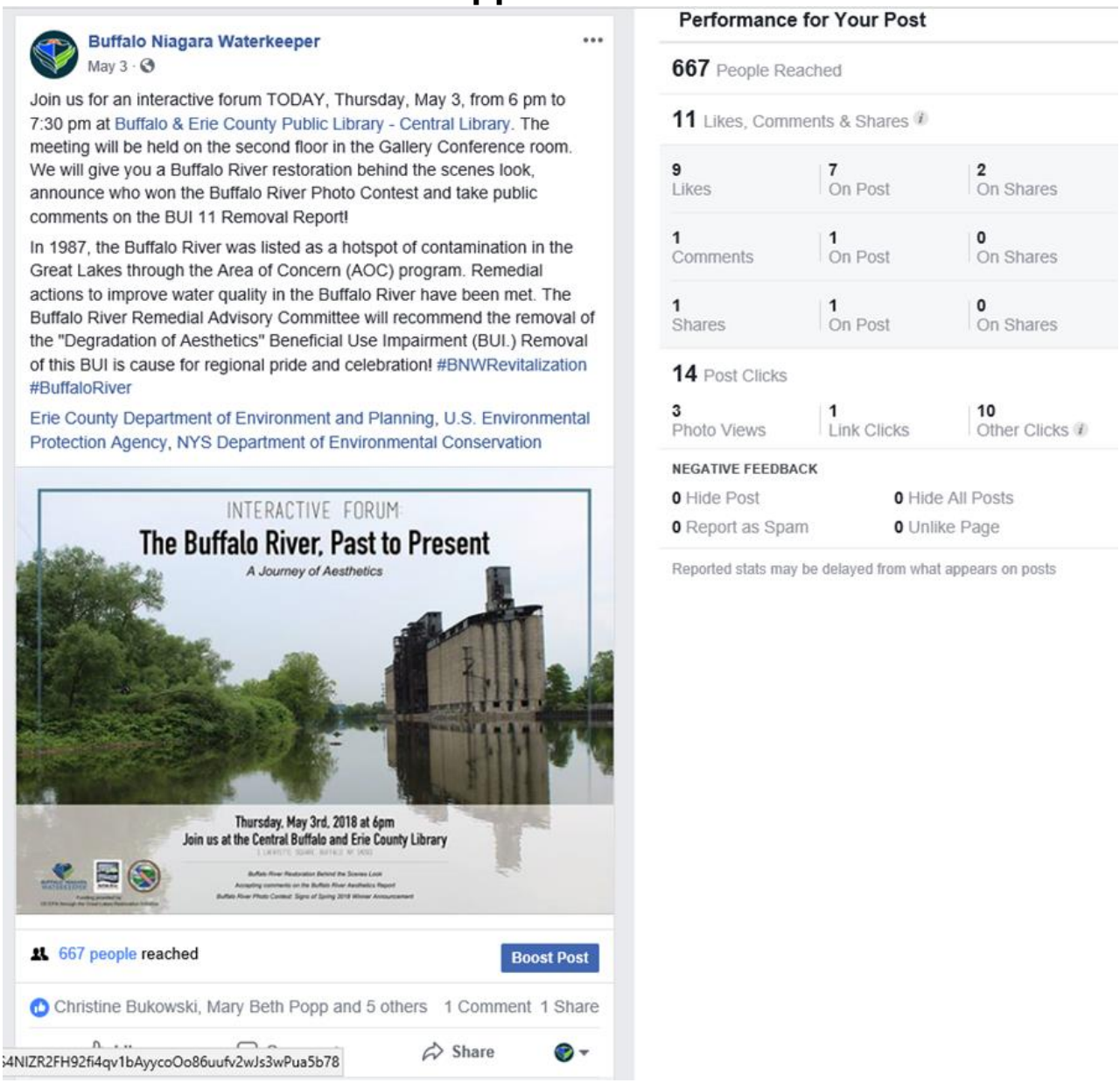
If you consume fish, what type or species do you eat?

Answers: walleye (3), perch (4), rainbow trout (2), bass (1), sunfish (1) from a total of **six** survey respondents. One additional respondent noted they consume fish caught from the Buffalo River that a family member catches, but was unsure what species. Six respondents specifically mentioned they do not consume fish caught locally due to pollution and/or NYS fish consumption advisories.

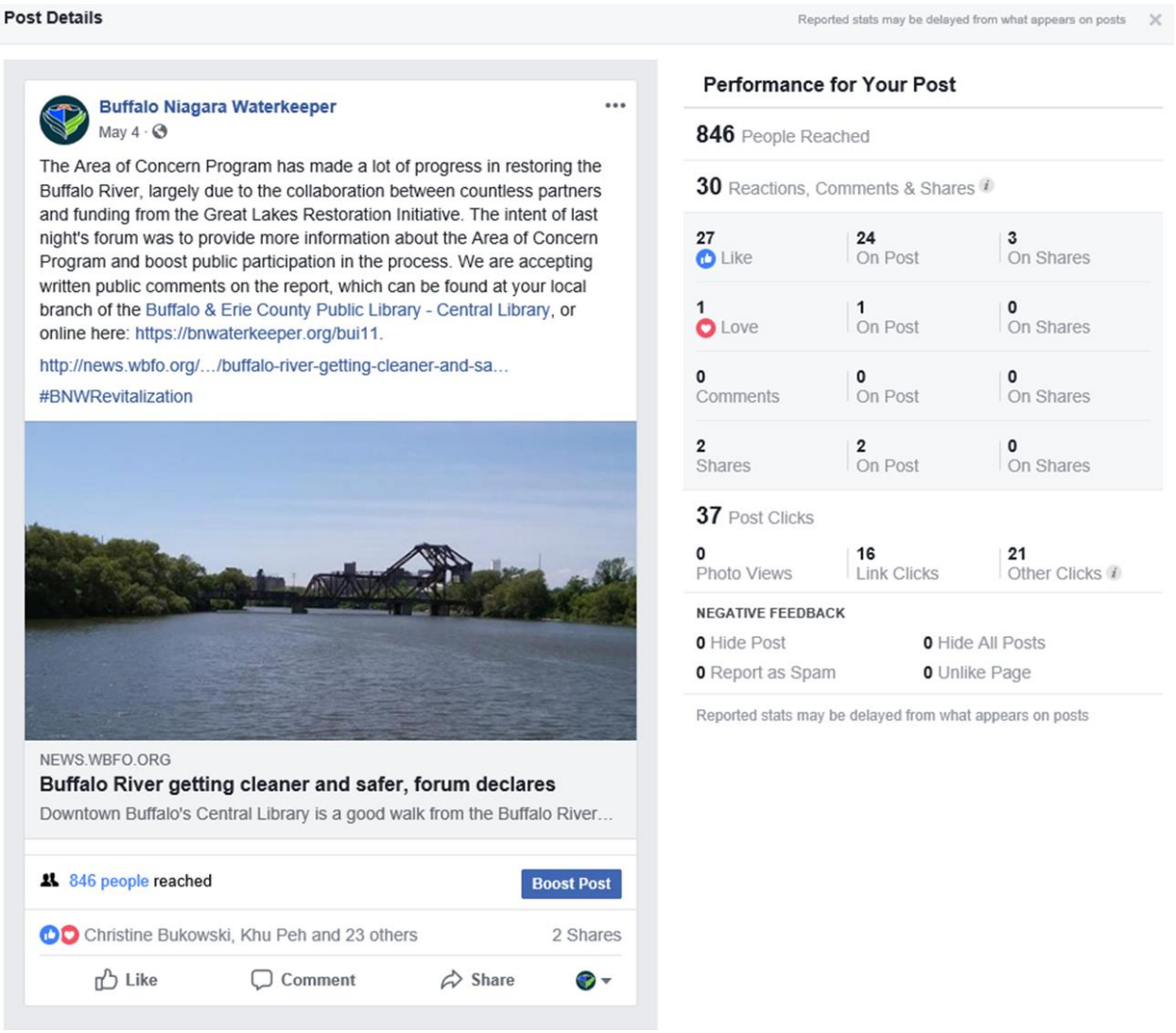
If you consume fish from the Buffalo River, have you ever noticed a tainting of flavor in the flesh? Please include the length, weight, type of fish, and the tainted flavor to the best of your ability.

Answers: No (**seven** respondents), One respondent indicated a fish they caught from the Buffalo River had discolored flesh and they discarded it without consuming.

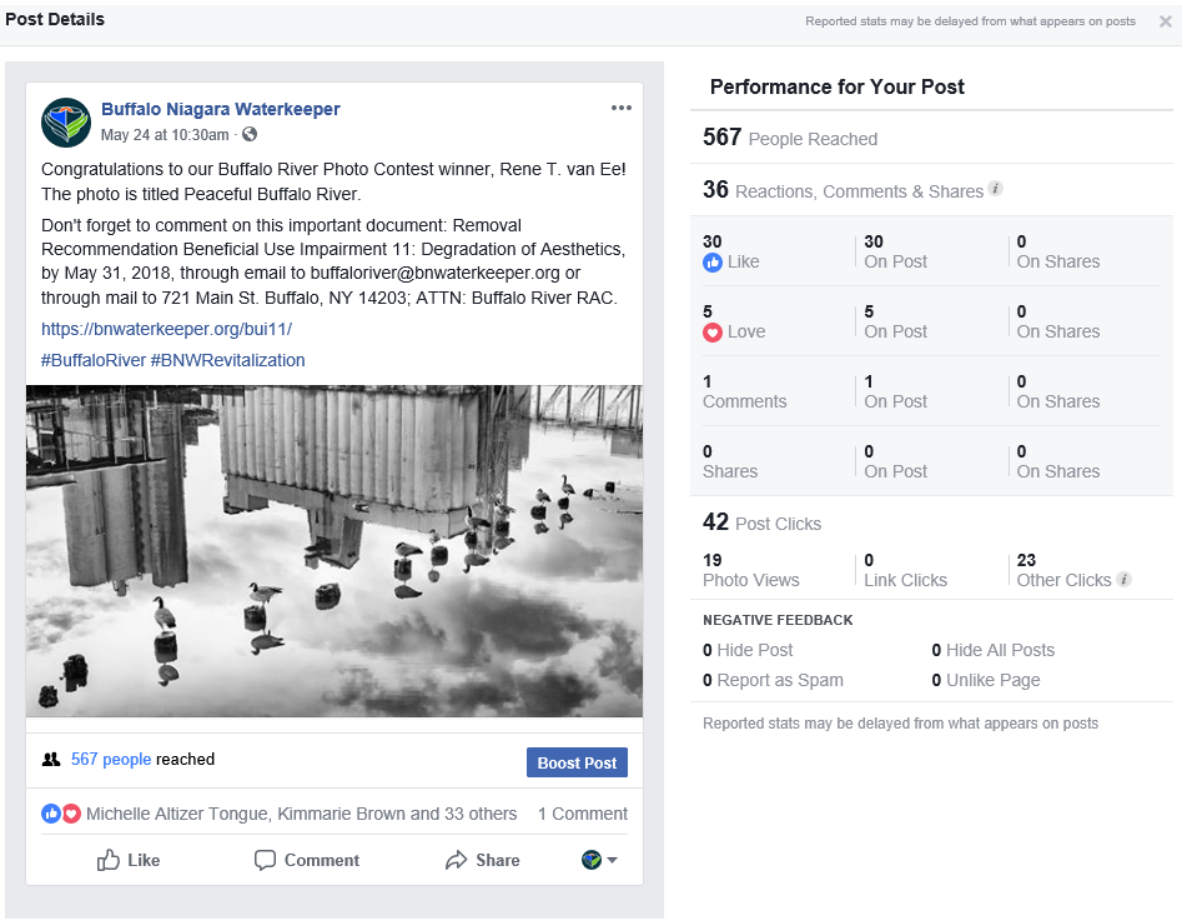
Appendix C



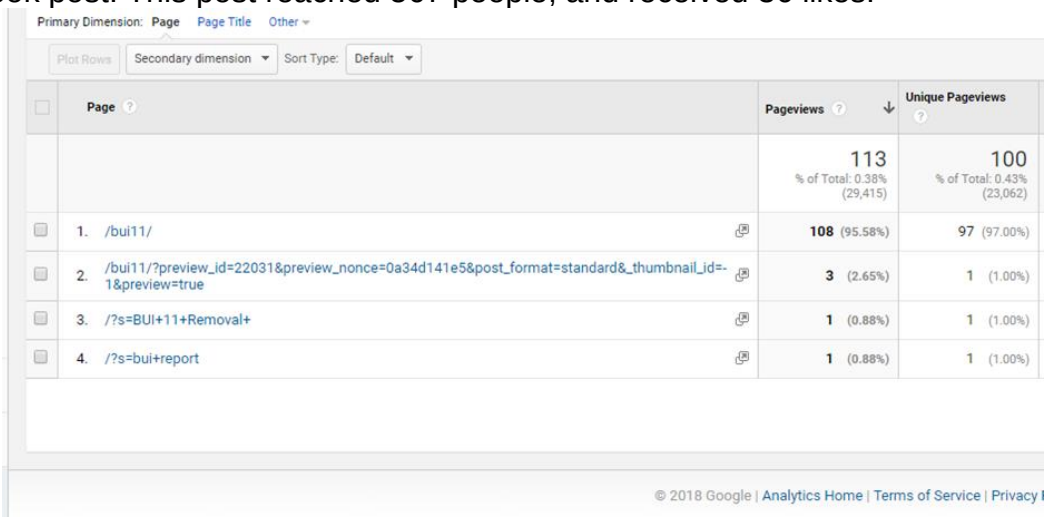
On May 3, 2018, BNW posted a virtual reminder about the public meeting. This post reached 667 Facebook users and received 11 likes. The meeting was also promoted through Twitter and Instagram posts, flyer distribution throughout the City of Buffalo, and at volunteer events throughout April of 2018.



On May 4, 2018, BNW shared the website on the WBFO news coverage of the public meeting. This Facebook post clarified that the purpose of the meeting was to increase public participation in the AOC Program. There was a total reach of 846 Facebook users, and 27 likes on this post.



On May 24, 2018 BNW reminded the public submit a comment on BUI 11 through a Facebook post. This post reached 567 people, and received 36 likes.



There were 97 unique page views of the BUI 11 Removal Report between May 1-31, 2018. The report can be found at: https://bnwaterkeeper.org/bui11/