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

Stephen Galarneau, Director
Office of Great Waters – Great Lakes & Mississippi River
Wisconsin Department of Natural Resources
PO Box 7921
Madison, WI 53707-7921

Dear Mr. Galarneau:

Thank you for your September 7, 2021 request to remove the *Degradation of Aesthetics* Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC) located near Milwaukee, WI. As you know, we share your desire to restore all the Great Lakes AOCs and to formally delist them.

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

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

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

Sincerely,

CHRISTOPHER KORLESKI

Digitally signed by CHRISTOPHER KORLESKI
Date: 2021.09.08 16:50:26 -05'00'

Chris Korleski, Director
Great Lakes National Program Office

cc: Kendra Axness, WDNR
Brennan Dow, WDNR
Rebecca Fedak, WDNR
Olivia Colaianni, WDNR
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State of Wisconsin
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September 7, 2021

Chris Korleski, Director
Great Lakes National Program Office
U.S. Environmental Protection Agency
77 West Jackson Boulevard (G-17J)
Chicago IL 60604-3507

Subject: Removal of the Degradation of Aesthetics Beneficial Use Impairment in the Milwaukee Estuary Area of Concern

Dear Mr. Korleski:

The Wisconsin Department of Natural Resources (WDNR) requests the U.S. Environmental Protection Agency (U.S. EPA) Great Lakes National Program Office's (GLNPO's) concurrence with the removal of the Degradation of Aesthetics Beneficial Use Impairment (BUI) in the Milwaukee Estuary Area of Concern (AOC).

Wisconsin DNR has assessed the status of the Degradation of Aesthetics BUI in accordance with the approach and BUI removal target set forth in the 2016 Milwaukee Estuary AOC Remedial Action Plan. We are pleased to report that all actions associated with this impairment have been completed and the target has been met. We held a 30-day public comment period for the removal recommendation document. Overall, feedback from stakeholders and the public was positive, with three written comments received. As a result, we are requesting the Degradation of Aesthetics BUI be removed from the list of impairments in the Milwaukee Estuary AOC.

The enclosed Degradation of Aesthetics Beneficial Use Impairment Removal Recommendation document provides the information to support the removal recommendation. Letters of support are also enclosed and were provided by the Community Advisory Committee, Management Action Implementation Team, City of Milwaukee, Milwaukee County Parks, Milwaukee Metropolitan Sewerage District, and Milwaukee Riverkeeper.

We value our continuing partnership in the AOC Program and look forward to working closely with U.S. EPA GLNPO in the removal of BUIs and the delisting of Wisconsin's AOCs. If you need additional information, please contact Brennan Dow, WDNR, at 920-366-1371, Rebecca Fedak, WDNR, 920-207-8380, or you may contact me.

Sincerely,

Stephen G. Galarneau, Director
Office of Great Waters – *Great Lakes and Mississippi River*
Wisconsin Department of Natural Resources
608-266-1956
Stephen.Galarneau@Wisconsin.gov

Cc: Kendra Axness, WDNR
Brennan Dow, WDNR
Rebecca Fedak, WDNR
Olivia Colaianni, WDNR
Todd Nettesheim, USEPA
Marc Tuchman, USEPA
Amy Pelka, USEPA
Leah Medley, USEPA
Megan O'Brien, USEPA

Enclosures:

Removal Recommendation for the Degradation of Aesthetics Beneficial Use Impairment in the Milwaukee Estuary Area of Concern

Milwaukee Estuary Area of Concern
Beneficial Use Impairment Removal Recommendation:
Degradation of Aesthetics

SEPTEMBER 2021

Wisconsin Department of Natural Resources

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Brennan Dow, Milwaukee Estuary Area of Concern Coordinator, WDNR
Kendra Axness, LAMP and AOC Coordinator, WDNR
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Rebecca Fedak, North Region Basin Supervisor, WDNR
Stacy Hron, Lake Michigan Program Coordinator, WDNR

Cover Photo: Before and after aesthetics pictures of Emmber Lane Bridge. Taken by Cheryl Nenn from Milwaukee Riverkeeper and presented at the April 27th, 2017 and June 27th, 2019 Community Advisory Committee meetings.

Acknowledgements

The Wisconsin Department of Natural Resources (WDNR) would like to acknowledge the support provided by the Milwaukee Estuary Area of Concern (AOC) stakeholders in the development of the Degradation of Aesthetics Beneficial Use Impairment Removal Recommendation Document. Your local input and associated efforts were an invaluable part of the process to remove the AOC's first beneficial use impairment (BUI) and reflects the incredible ongoing efforts that will enable us to continue forging the path to delisting.

Disclaimer

The Great Lakes Water Quality Agreement (GLWQA) is a non-regulatory agreement between the United States and Canada, and criteria developed under its auspices are non-regulatory. The actions identified in this document were needed to meet BUI removal targets leading to the delisting of the AOC.

Executive Summary

The Degradation of Aesthetics BUI was identified for the Milwaukee Estuary Area of Concern due to poor visual quality of the waterways and highly modified adjacent land. Likely causes of the impairment included surface water debris, oil and grease, and overdevelopment along the estuary (Galarneau *et. al.,* 1994). The Degradation of Aesthetics impairment can be removed when monitoring data within the AOC and/or surveys collected by multiple observers for any two consecutive year period indicate that water bodies in the AOC do not exhibit unacceptable levels of the following properties found in quantities which interfere with the Water Quality Standards for Surface Waters: substances causing objectionable deposits on the shore or bed of the water; floating or submerged debris, oil, scum, or other material; or materials producing color, odor, taste, or unsightliness (Hron, 2016).

Various federal and state water quality policies, local initiatives, and volunteer programs have been implemented since the 1970s to improve the visual and physical water quality throughout the Milwaukee Estuary, including but not limited to: The Clean Water Act, Regional Water Quality Management Plan (RWQMP), Deep Tunnel System, Lynyrd Skymmr, Menomonee River Concrete Removal, Trash Wheel, and green infrastructures and spaces. The WDNR and local stakeholders ran a volunteer aesthetics monitoring program from 2015-2017, and results indicate there is no longer an aesthetics impairment. The WDNR shared these findings with U.S. Environmental Protection Agency's (USEPA) Great Lakes National Program Office (GLNPO), Milwaukee Estuary AOC Community Advisory Committee (CAC), and local stakeholders, and agreed as a whole that the evidence supports the removal of the Milwaukee Estuary AOC's Aesthetics BUI.

Given the aesthetic improvements, results from monitoring efforts and local stakeholder support, the WDNR proposes to remove the Degradation of Aesthetics BUI in the Milwaukee Estuary AOC.

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Purpose

The purpose of this document is to provide evidence that supports removal of the Degradation of Aesthetics (Aesthetics) Beneficial Use Impairment (BUI) within the Milwaukee Estuary Area of Concern (AOC). This document describes the rules, policies, and projects that have contributed to aesthetic improvements within the AOC and explains the rationale for the recommendation to remove this BUI. More information on the AOC can be found on the WDNR website at: https://dnr.wi.gov/topic/GreatLakes/milwaukee.html.

Background

Rationale for AOC Designation

AOCs are defined in the 2012 *Great Lake Water Quality Agreement* (GLWQA) as geographic areas, designated by the Parties (the United States and Canada), where the public is not able to fully use, enjoy, or benefit from their water resources in a safe way as a result of detrimental human impacts to the environment. The Milwaukee Estuary was designated an AOC under the GLWQA in 1987 because of historical discharges of toxic contaminants such as PCBs, PAHs, and heavy metals within AOC waters. While legacy sediment contamination was the primary reason for designation as an AOC, additional sources of impairments were habitat loss and fragmentation as well as degraded water quality due to combined sewer overflows and runoff pollution. Of the 14 possible impairments listed in the GLWQA, the Milwaukee Estuary AOC has 11, identified in the *1991 Milwaukee Estuary Remedial Action Plan* (RAP) and listed below.

- Restrictions on dredging activities
- Fish tumors or other deformities
- Bird or animal deformities or reproductive problems
- Restrictions on fish and wildlife consumption
- Degradation of benthos
- Degradation of phytoplankton and zooplankton populations
- Loss of fish and wildlife habitat
- Degradation of fish and wildlife populations
- Beach closings (Recreational restrictions)
- Eutrophication or undesirable algae
- Degradation of aesthetics

AOC Boundary

The original boundaries of the AOC included the lower three miles of the Milwaukee River downstream of North Avenue Dam; the lower three miles of the Menomonee River downstream of 35th Street; the lower two and one half miles of the Kinnickinnic River downstream of Chase Avenue; the inner and outer harbors; and the nearshore waters of Lake Michigan, bounded by a line extending north from Sheridan Park to the city of Milwaukee's Linnwood water intake. In 2008, the boundaries of the AOC were expanded on the Milwaukee and Little Menomonee Rivers for the purposes of addressing sites that contributed significant loads of contaminated sediments to the estuary. The extended boundary lines now include the Milwaukee River up to Bridge Road on Cedar Creek and up to W Brown Deer Road on the Little Menomonee River (Figure 1).

Figure 1. Milwaukee Estuary Area of Concern Boundaries.

Rationale for BUI Listing

This beneficial use was considered impaired at the time of AOC designation because of the poor visual quality of the polluted waterways and highly modified adjacent land. Likely causes of the impairment included surface water debris, oil and grease, and overdevelopment along the estuary (Galarneau *et. al*., 1994). After storms and subsequent combined sewer overflows, considerable debris was seen throughout the estuary and near almost every storm sewer outfall. Both Illinois and Michigan complained that the debris from Milwaukee's combined sewer overflows affected their beaches as well, resulting in a lawsuit during 1972. Floating litter significantly degraded the aesthetic value and recreational enjoyment of urban waterways. Possible sources of floatable trash included illegal dumping of trash into streams, littering, ill-maintained dumpsters, improper streambank modifications, sanitary and combined sewer overflows, marine sources and recreational users, and stormwater runoff.

The city of Milwaukee became an industrial center as machine shops, meat packing companies, brick manufacturers, breweries, granaries, sailing mast manufacturers, tanneries, and coal docks were established during the 1800s and early 1900s (Galarneau *et.al*.,1994). As more industries were established along waterways and as Milwaukee grew into a manufacturing hub through the first part of the twentieth century, both water pollution and loss of natural landscapes contributed to the degradation of aesthetics.

The aesthetic problems in the AOC were compounded by the destructive treatment of the waterways through the 1800s. Milwaukee's rivers were a dumping ground for pollution as well as raw sewage. Persistent complaints of odors led to the construction of the first combined sewers in the 1880s, and the first sewage treatment plant for the City of Milwaukee at Jones Island in 1925 (Galarneau *et.al*.,1994). During the mid-1900s, many stream beds were straightened and lined with concrete and communities grew without consideration for green spaces, resulting in overdevelopment along the estuary and tributaries. In the early 2000s, partners and agencies throughout the AOC came together to begin addressing the overdevelopment issues by removing the concrete from riverways and creating green spaces and infrastructures.

BUI Removal Criteria

Removal criteria for this BUI were established in 2008 and subsequently revised in 2016 with input from technical experts, local stakeholders, and the public (Table 1). These changes were crafted to include the monitoring strategy developed, which included additional language regarding multiple observations, two consecutive survey seasons, and significant or persistent issues identified by surveys during the 2015-2017 volunteer aesthetic monitoring program. These changes brought the target in line with the current knowledge and approach to this impairment (Hron, 2016). The removal criteria have been met and the supporting evidence is provided in subsequent sections.

Table 1. Revised target table for the Milwaukee Estuary AOC Aesthetics BUI.

Target (Updated 2016)
This removal target is consistent with Chapter NR 102, Wisconsin Administrative Code, Water Quality Standards for Surface Waters. Delisting shall occur when monitoring data within the AOC and/or surveys collected by multiple observers for any two consecutive year period indicates that water bodies in the AOC do not exhibit unacceptable levels of the following properties in quantities which interfere with the Water Quality Standards for Surface Waters: a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water shall not be present in such amounts as to interfere with public rights in waters of the state. b) Floating or submerged debris, oil, scum, or other material shall not be present in such amounts as to interfere with public rights in waters of the state. c) Materials producing color, odor, taste, or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state. The following target will also be met to determine when restoration has occurred: • Corrective action plans are in-place and being implemented for significant, persistent issues contributing to the degradation of aesthetics within the AOC identified via aesthetics monitoring/surveys.

Progress Made to Improve Aesthetic Conditions

The following describes initiatives at the federal, state, and local level that have improved aesthetic conditions within the Milwaukee Estuary AOC. Many projects completed within the AOC have contributed to significant reductions in debris, oil, and grease in local waterways. Additionally, planning and redevelopment activities by the City of Milwaukee, Milwaukee County, Milwaukee Metropolitan Sewerage District (MMSD), and others have mitigated overdevelopment along the estuary, through the removal of concrete in natural streambeds and the inclusion of green spaces, contributing to the improvement of aesthetic conditions in the AOC.

MMSD's Five Low Flow Barriers and Menomonee River Concrete Removal projects are AOC management actions that were completed as Loss of Fish and Wildlife Habitat BUI projects. While the primary focus of these projects was to address fish passage issues on the Menomonee River, they both also addressed aesthetic concerns (i.e. overdevelopment along the estuary and lack of green space) referenced in the early versions of the RAP (Dow & Hron, 2021). In comparison, MMSD's Lynyrd Skymmr, Milwaukee Riverkeeper's (MRK) Adopt-a-River (AAR) Program and Annual River Cleanup, and the proposed Harbor District's Trash Wheel project are all actions that are being completed outside the AOC Program. While these actions take place within the boundaries of the AOC, the actions are led directly by stakeholders for the purpose of contributing to the broader picture of addressing pollution and debris issues in an urbanized area. These projects demonstrate that stakeholders in Milwaukee have been improving, and will continue to improve, the health of an urbanized estuary.

Clean Water Act

In 1948, Congress enacted the Federal Water Pollution Act which was later renamed the Clean Water Act in 1972. This act regulates pollutant discharges into waters of the United States while also regulating surface water quality standards, making it unlawful to discharge pollutants without a permit from an original point source into public waterways (USEPA, 2020). This act,

and USEPA's implementation of pollution control programs, regulated the dumping of material waste into the tributaries of Lake Michigan, reducing objectional deposits in the AOC. The Clean Water Act led to substantial improvements in wastewater treatment which in turn improved surface water quality.

Regional Water Quality Management Plan

The Southeastern Wisconsin Regional Planning Commission's (SEWRPC) Regional Water Quality Management Plan (RWQMP) was originally published in 1979 in partnership between SEWRPC, MMSD, and WDNR. In order to achieve, to the extent practicable, a 'fishable and swimmable' standard for all waterways in the greater Milwaukee River watershed, the RWQMP provides recommendations for land use changes as well as the reduction of both point and non-point source pollution (SEWRPC, 2008, 2013). These regional water quality improvements reduce the amount of pollution entering the AOC, thereby improving aesthetics.

Urban Nonpoint Source Pollution Abatement Measures and Stormwater Programs

It is recommended by the urban nonpoint source pollution abatement measures that implemented controls are consistent with the Wis. Admin. Code. Ch. NR 151: Runoff Management's Standards. Municipalities in the RWQMP were recommended to address the following: control of construction site erosion; control of stormwater pollution from areas of existing and planned urban development, redevelopment, and infill; and infiltration of stormwater runoff from areas of new development. These recommendations and implementation of the aforementioned practices will ultimately continue to address nutrient and contaminant loading into the watershed as well as improve water quality in the AOC.

Menomonee River Concrete and Five Low Flow Barriers Removal

The removal of the Menomonee River Concrete and Five Low Flow Barriers, completed by MMSD and partners, created multiple benefits for the Milwaukee Estuary AOC. These projects addressed the overdevelopment along the estuary, which contributed to the improvement of aesthetics along the AOC's waterways.

To improve flood carrying capacity, in 1965, the Menomonee River was deepened and lined with approximately 4,600 feet of concrete (Figure 2) (MMSD, 2016). This modification to the stream bed and banks resulted in a native fish and wildlife movement barrier as well as a hazard to the navigational and recreational uses of the river.

In 2016, with funding from the Great Lakes Restoration Initiative (GLRI), U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS) , WDNR, and MMSD, approximately 0.5 miles of steep concrete channel were removed and the banks of the Menomonee River were revegetated (MMSD, 2016) (Figure 3). This project re-connected 37 miles of tributaries to Lake Michigan (MMSD, 2016).

The enhancement of the Menomonee River, located in one of the Milwaukee Estuary AOC's most urbanized and populated areas, has attracted more people to the river (Figure 4). The primary goal of this project was to address the Loss of Fish and Wildlife Habitat BUI in the Milwaukee Estuary AOC; but, the project had many secondary benefits: it addressed overdevelopment along the estuary (and in doing so improved the area's aesthetics), addressed recreational uses, restored in-stream habitat, improved fish passage, and sustained fish populations and riparian plant communities.

Figure 2. Concrete slabs along the Menomonee River before concrete removal (MMSD, 2013).

Figure 3. Removal of concrete slabs on the Menomonee River (MMSD, 2016).

Figure 4. The Menomonee River after concrete slabs were removed and riparian vegetation was established (MMSD, 2016).

Along with the Menomonee River concrete removal project, MMSD removed five low flow artificial fish passage barriers in the Menomonee River channel between 2015 – 2016 (WDNR, 2016). MMSD worked with several members of the AOC's technical team including the WDNR, SEWRPC, U.S. Geological Survey (USGS), MRK, Trout Unlimited, Friends of Hoyt Park, and Milwaukee County Parks Dept on this project. The following figure depicts the five low flow barrier locations (Figure 5).

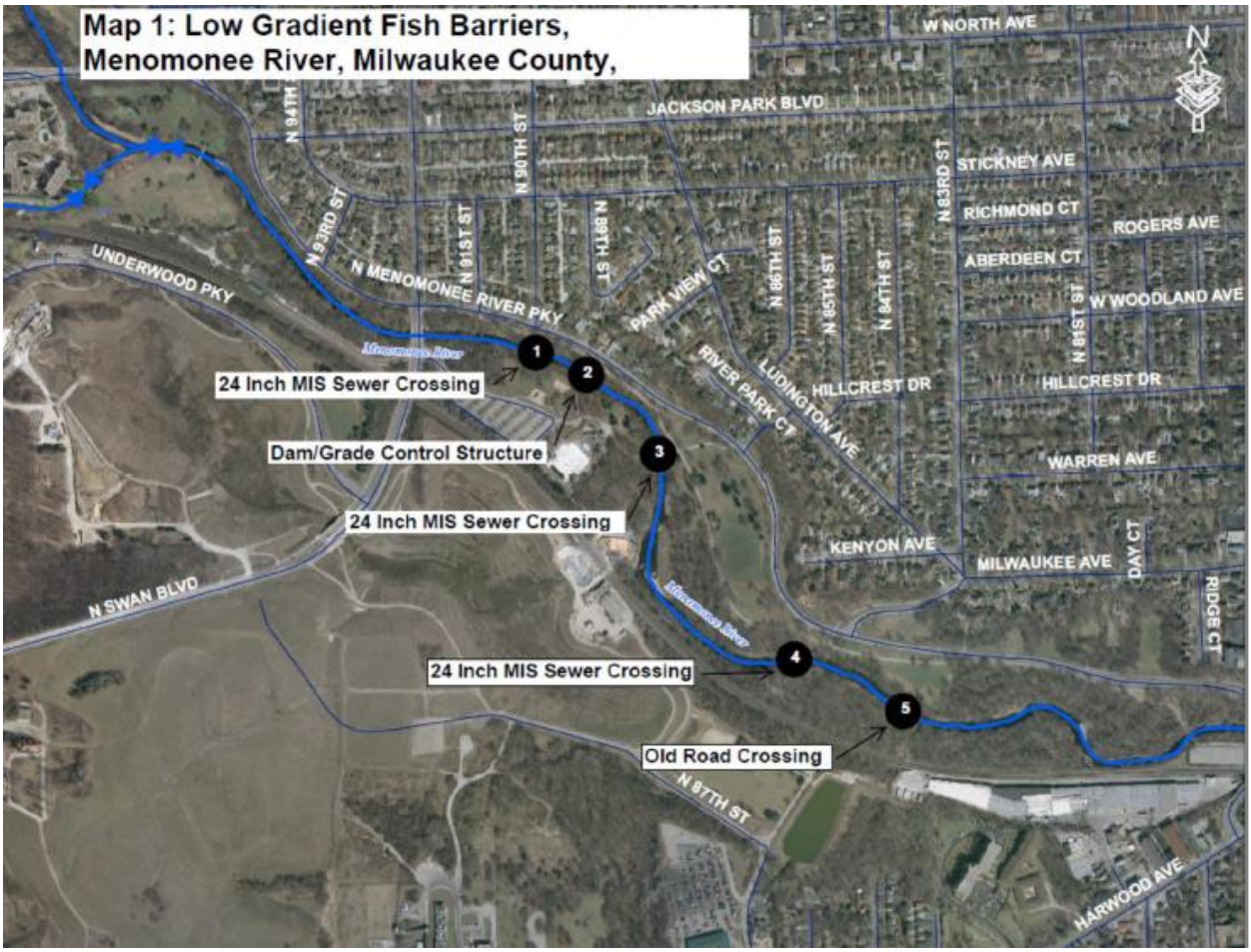

Figure 5. The five low flow barriers on the Menomonee River (Menomonee River between N 90th Street (extended) and N 84th Street (extended)) (WDNR, 2016).

MMSD's project to remove the five low flow fish passage barriers in the Menomonee River channel had numerous benefits. The project primarily focused on the Loss of Fish and Wildlife Habitat management action, but secondarily benefited the Degradation of Aesthetics BUI. For example, the removal of these barriers allowed for aquatic environments to flourish, easier public access to waterways, and increased recreational activities such as fishing.

Deep Tunnel System

In 1972, the Metropolitan Sewerage Commission of Milwaukee County and the City of Milwaukee Commission were sued by the State of Illinois due to an accumulation of Milwaukee's sewer overflow trash on Illinois and Michigan's shorelines. This legal battle resulted in an agreement between MMSD and WDNR to reduce sewer overflows through the construction of over 28.5 miles of deep tunnels, reaching outward from Wauwatosa, West Allis and the Village of Shorewood (MMSD, 2014). This deep tunnel system, which began operation in 1993, serves as a sewer overflow trap, storing roughly 521 million gallons of untreated wastewater until reclamation facilities have the capacity to treat it, preventing basement

backups and sewer overflows into local waterways (MMSD, 2014). The deep tunnel system has also reduced the amount of trash that reaches the waterways.

Since 1994, this deep tunnel system has captured 98.4% of stormwater and wastewater entering the regional sewer system, reducing sewer overflows from an average of 50-60 per year to an average of 2.4 per year, preventing more than 125 billion gallons of polluted water from entering Lake Michigan (MMSD, 2014).

Trash Deflector Bar Project

This area of the Menomonee River has been positively impacted by not only MMSD's deep tunnel system, but MRK's trash deflector bar as well. Some of the main financial contributors were Forest County Potawatomi, Wisconsin Coastal Management Program, MN Valley Business Improvement District, Cargill, City of Milwaukee, Port of Milwaukee, and Gillen Marine Construction, LLC. In 2010, the bar was placed in the Menomonee River at the N Emmber Lane bridge's corner to assist in deterring the accumulation of trash in this former ship turning basin (Figure 6).

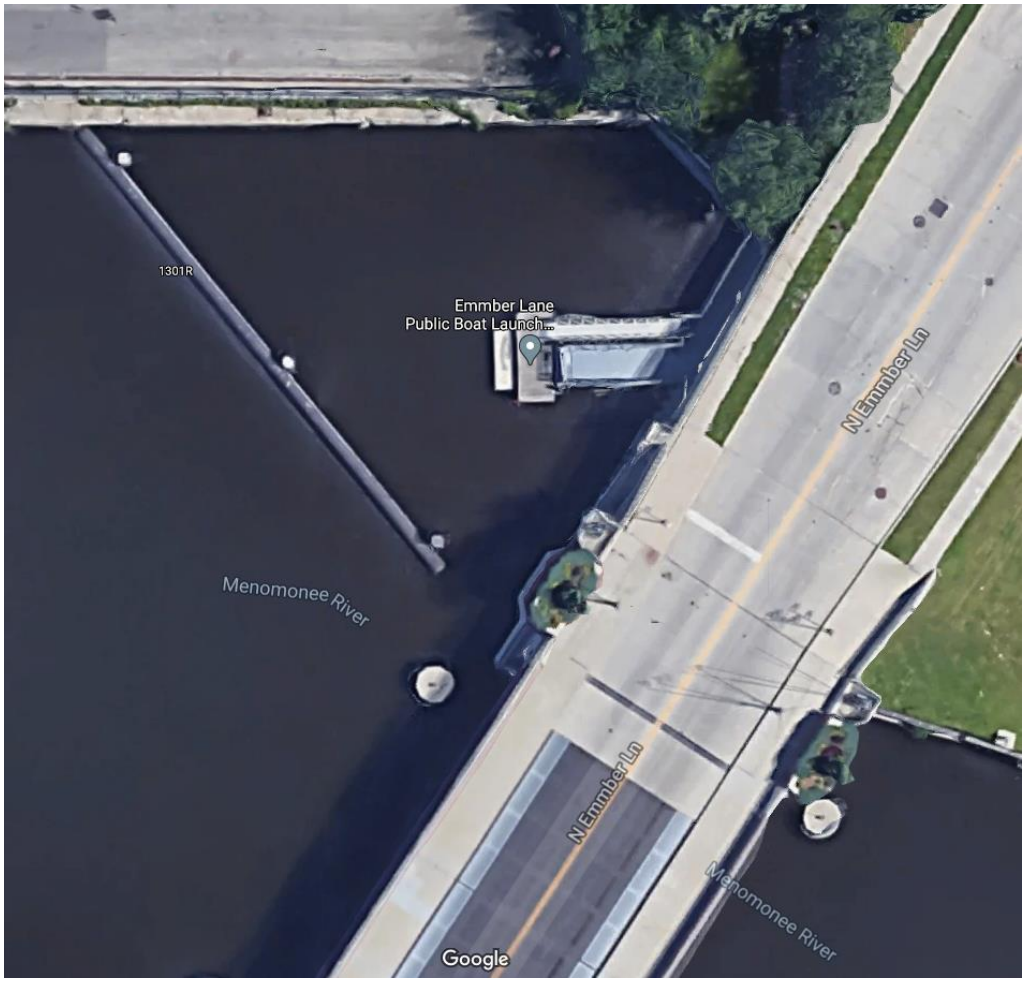

Figure 6. Aerial view of the trash deflector bar located on N Emmber Lane in the Menomonee River (Google, 2021).

The result of placing the trash bar in this corner was to deflect trash to the deeper part of the Menomonee River where it could be collected by the MMSD River Skimmer. This area had historically been a problem area, which was difficult to clean up. The project created a cleaner space, which includes a non-motorized boat launch that was constructed in 2010 and retrofitted in 2012 with a lower floating pier section. Although not completed with AOC funds, because it prevents trash from accumulating in one location, this project helped to address the degraded aesthetics impairment.

MMSD's deep tunnel system and MRK's trash deflector bar addressed Milwaukee Estuary AOC's aesthetic impairment by visibly decreasing the amount of litter and raw sewage entering the waterways, such as the N. Emmber Lane's road crossing on the Menomonee River (Figure 7).

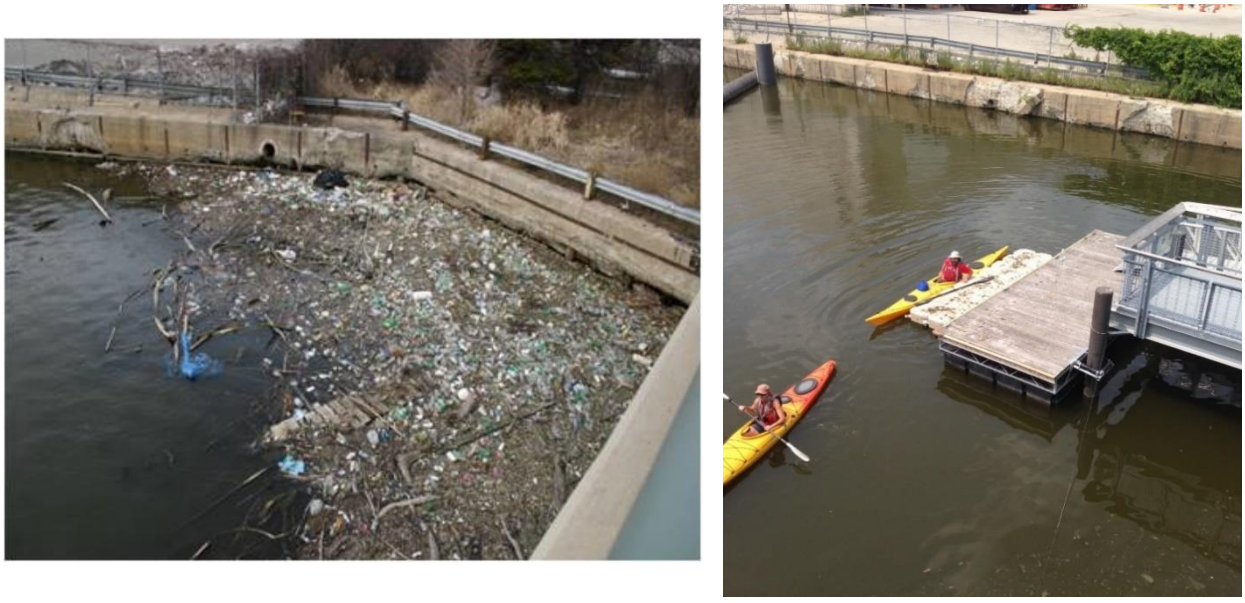

Figure 7. A comparison of N. Emmber Lane bridge in 2009 before any construction, and in 2010 after the inclusion of MMSD's deep tunnel system and MRK's trash deflector bar addressing sewer overflow debris (Nenn, 2021).

MMSD WPDES Permit

Regulatory permitting processes contribute significantly to AOC restoration efforts. MMSD's permit covers combined sewer overflow (CSO) events and contains two CSO performance standards: one related to CSO volume (capture and delivery of no less than 85% by volume, of the combined sewage collected in the combined sewer system) and the other related to the number of CSO events (no more than six combined sewer overflow discharge events per year) (MMSD, 2020). In order to satisfy a CSO objective, either of these two performance standards must be met. MMSD continues to meet these performance standards through contributing to the reduction of untreated sewage from entering the waterways by following nine minimum controls and developing long-term CSO control plans (LTCP). For more information, consult chapter six of MMSD's *Conveyance Report*.

Along with these standards and controls, quarterly reports must be submitted by MMSD to the WDNR stating all discharges that took place that quarter at each CSO outfall location and analytical testing results from wastewater sampling at drop shaft junction chambers. MMSD has significantly contributed to reducing overflows by increasing pump and sewer storage capacity. Past MMSD projects primarily aimed to reduce overflows from either the separate sewer area or the combined sewer area including increase capacity to pump from the inline storage system (ISS) to Jones Island Wastewater Treatment Plant, increase South Shore wastewater treatment plant capacity, and add metropolitan interceptor system sewer capacity as needed. These actions and projects within the AOC have contributed to the reduction of CSOs, and in turn have improved the AOC waterway's aesthetics.

Volunteer Aesthetic Monitoring Program

Background

In 2012, a volunteer aesthetics monitoring program was piloted in the Milwaukee Estuary AOC (O'Shea, 2012). Several partner organizations, such as the Alliance for the Great Lakes (AGL) and Urban Ecology Center (UEC) assisted in the development of the project and initial volunteer monitoring base. Lessons learned from this pilot program helped refine surveys, protocols, and assessment methodology for a citizen-based monitoring program that started in 2015. WDNR, in collaboration with MRK and CAC, created and implemented a citizen-based monitoring program designed to assess public perception of aesthetics in the AOC. The monitoring program sought to determine whether users in the AOC found that "substances causing objectionable deposits on the shore or bed of the water;" "floating or submerged debris, oil, scum, or other material;" or "materials producing color, odor, taste, or unsightliness" were present in amounts that prevented access, enjoyment, or use of water in the AOC (Figure 8 & Figure 9).

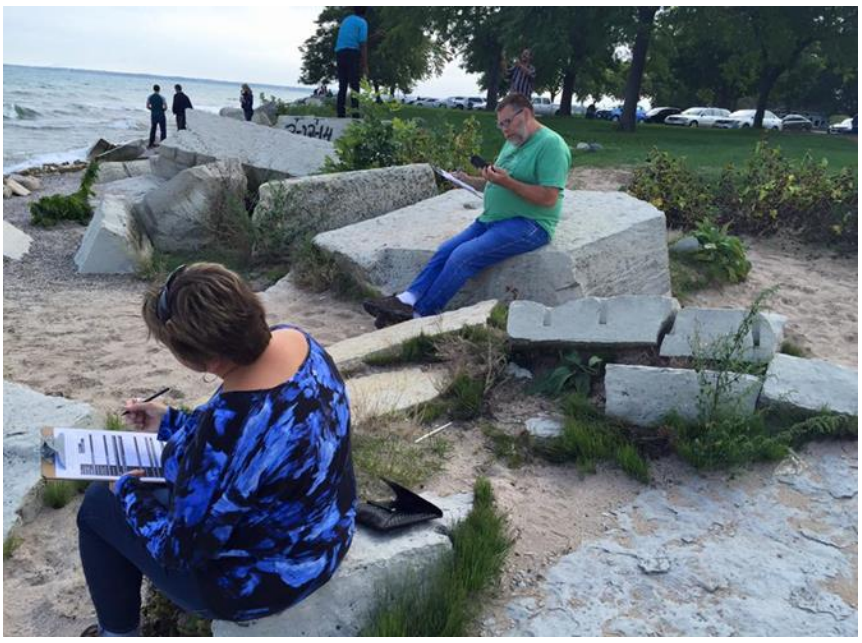

Figure 8. Volunteers filling out data monitoring forms at Bradford Beach site (MRK, 2016).

Figure 9. Volunteers filling out data monitoring forms at South Shore Beach site (MRK, 2016).

Methods

In 2015, a Quality Assurance Project Plan (QAPP) documented the necessary requirements for a successful volunteer aesthetic monitoring program. The survey assessment tool and methodology for this work was developed in collaboration with social scientists in WDNR's former Science Services Bureau. Both methodology and quality measures are documented within the QAPP (Appendix F. Quality Assurance Project Plan for Volunteer Aesthetics Monitoring: Milwaukee Estuary Area of Concern & Lower Fox River – Green Bay Area of Concern). Monitoring occurred from 2015-2017 at nine locations (Figure 10) comprising three beach sites (Bradford, South Shore, and Bayview) and two sites on each river (Menomonee, Milwaukee, and Kinnickinnic). Sites were chosen to be relatively evenly distributed through the AOC with consideration of safety concerns and public access.

Milwaukee Riverkeeper staff recruited and trained volunteers in monitoring protocols each year. Volunteers monitored these sites from March-October, completing 1,416 surveys over the three-year period. They scored the overall Aesthetic Impression of the site, with 0 = Very pleasing and 4 = Very displeasing. The more detailed Aesthetic Assessment consisted of a series of questions regarding the presence of seven unpleasant substances or conditions in the water or on the shoreline: water color, floating or submerged garbage, other substances in the water, shoreline garbage, nuisance animals, nuisance vegetation, and shoreline substances. The volunteers stated whether a substance (e.g. floating garbage) was present, what type it was (household waste, building materials, medical waste, etc.), and whether that substance would prevent them from accessing, enjoying, or using the water. Each unpleasant substance or condition was given a score of 1 if it would negatively impact the volunteer's experience of the

water, and 0 if it would not. The scores for each of the seven possibilities were summed, giving a total Aesthetic Assessment Score of 0-7. The higher the score, the more substances were present that would prevent water access or enjoyment. A survey data sheet is reproduced in Appendix C.

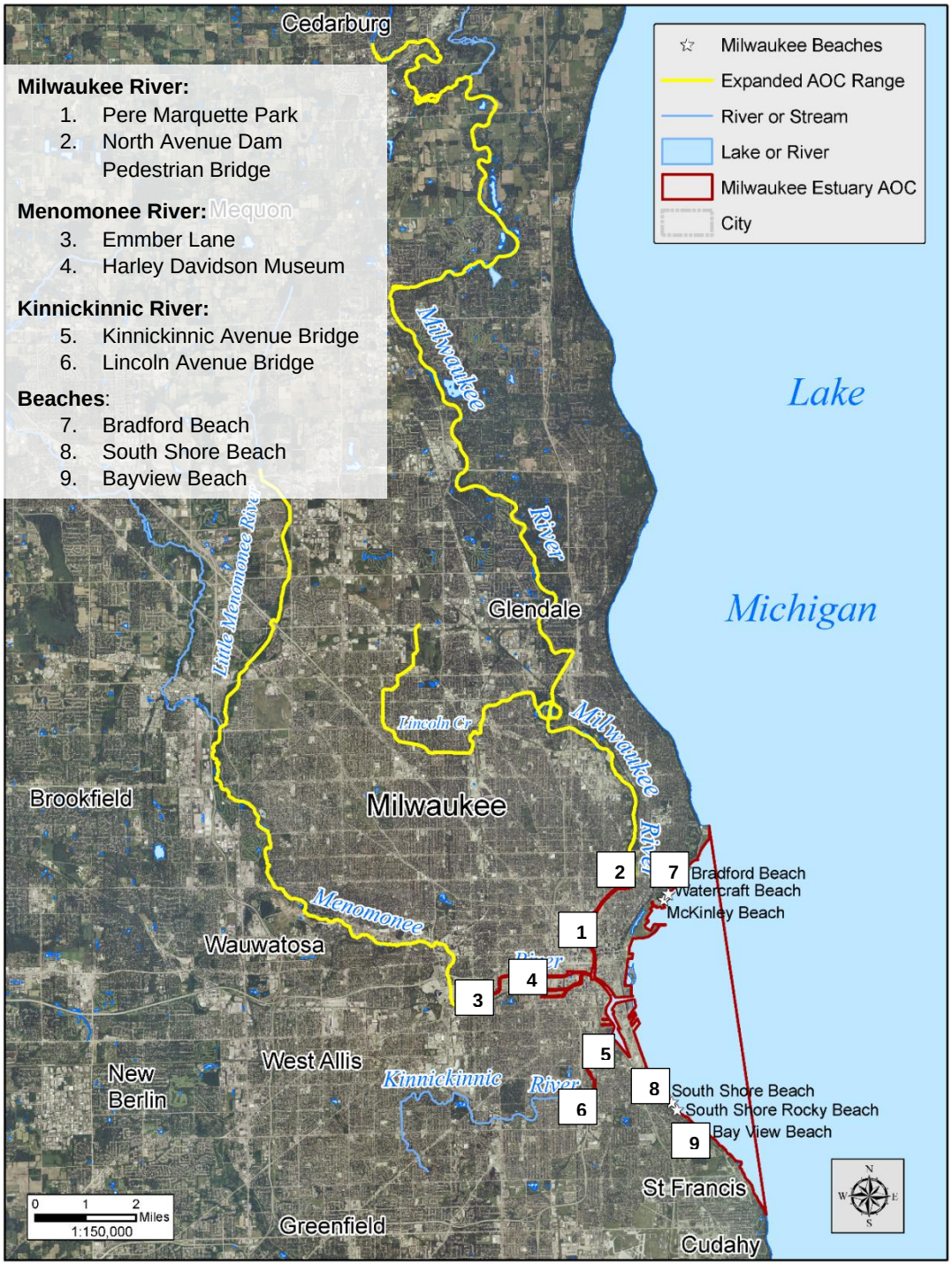

Figure 10. Map showing the reaches of the Milwaukee Estuary AOC and monitor sites. Refer to Appendix F. Quality Assurance Project Plan for Volunteer Aesthetics Monitoring: Milwaukee Estuary Area of Concern & Lower Fox River – Green Bay Area of Concern for specifics on each monitor site.

The percentages of surveys identifying each substance or condition present at each site are shown in Table 2. The mean Aesthetic Impression and Aesthetic Assessment scores were calculated for each site from the responses of all volunteers throughout the monitoring season each year (higher scores indicating a more aesthetically displeasing site) and are shown in Table 3 and Figures 11 and 12.

The scores and percentages were averaged over the three years and evaluated according to three criteria (O'Shea and Hron 2015):

- Sites with individual aesthetic parameters that are classified as aesthetically displeasing in ≥ 75% of total monitor data sheets.
- The arithmetic mean overall aesthetic impression score of ≥ 3.
- The arithmetic mean assessment score of ≥ 4.

These thresholds were set to reflect a "C grade": 75% for the percentage of surveys; a three on the Aesthetic Impression scale of 1-4; and a four on the Aesthetic Assessment scale of 0-7. If any of the sights exceed all three of the threshold values, corrective action would be needed.

To address concerns regarding assessment language; potential of observers to become habituated to degraded conditions; and questions surrounding data analysis and selected thresholds, WDNR's Bureau of Environmental Analysis and Sustainability completed additional analysis on survey data in the form of Adjacent Categories Ordinal Logit regression. Two different models were used to assess the importance of drivers of aesthetic impression ratings and observer habituation. A detailed description of each of these models and corresponding results can be found in Appendix G.

Results

The selected aesthetic parameters were chosen as being often visualized by the community as unpleasant. Results for the following data are broken down into nine location sites. Less than 75% of surveys at each location were scored as displeasing by respondents. Therefore, the data are in favor of meeting the removal criteria of the Aesthetics BUI (Table 2 - Table 4 and Figure 11 - Figure 12).

Taken in whole, all nine survey sites were observed to not exceed any of the three action criteria in the 2015-2017 survey period (Table 4).

Table 2. Percentage of surveys scored as being displeasing for each survey parameter during the years of 2015 – 2017.

Site Location	Color	Floating or Submerged Garbage	Water Substances	Shoreline Garbage	Problem Animals	Problem Vegetation	Shoreline Substances	Average
Bay View Beach	4.6	2.8	0.7	5.4	5.6	2.6	1.5	**3.3**
Harley Davidson Museum	13.0	1.8	2.5	2.7	0.7	-	2.5	**3.9**
Bradford Beach	5.6	1.3	0.8	1.3	1.0	1.3	-	**1.9**
Emmber Lane	22.2	28.1	5.6	27.5	17.2	6.0	5.6	**16.0**
Kinnickinnic Avenue Bridge	23.1	29.9	5.8	23.3	0.6	7.2	5.8	**13.7**
Lincoln Avenue Bridge	32.4	22.9	4.3	20.4	0.6	17.8	4.0	**14.6**
North Avenue Pedestrian Bridge	13.3	5.8	3.0	7.8	1.5	2.2	3.0	**5.2**
Pere Marquette Park	16.2	6.3	0.6	6.8	-	-	3.9	**6.8**
South Shore Beach	3.8	-	-	6.9	2.0	0.6	3.7	**3.4**
Average	**14.9**	**12.4**	**2.9**	**11.3**	**3.7**	**5.4**	**3.8**	

Table 3. Mean individual assessment and impression survey scores during the years of 2015 – 2017.

Site Location	Mean Impression Scores (threshold score of ≥ 3)			Average	Mean Assessment Scores (threshold score of ≥ 4)			Average
	2015	2016	2017		2015	2016	2017	
Bay View Beach	0.8	0.6	0.6	0.6	0.3	0.2	0.2	0.2
Harley Davidson Museum	0.7	1.1	1.2	1.0	0.2	0.2	0.3	0.2
Bradford Beach	0.2	0.6	0.7	0.5	-	0.2	0.1	0.1
Emmber Lane	2.5	2.4	2.2	2.4	1.1	1.3	0.9	1.1
Kinnickinnic Avenue Bridge	1.3	2.0	2.4	1.9	0.4	1.0	1.5	1.0
Lincoln Avenue Bridge	1.1	1.8	1.8	1.6	0.6	1.1	1.3	1.0
North Avenue Pedestrian Bridge	0.8	0.9	0.7	0.8	0.1	0.4	0.6	0.4
Pere Marquette Park	1.1	1.0	1.2	1.1	0.4	0.4	0.4	0.4
South Shore Beach	0.5	0.5	0.2	0.4	0.2	0.2	0.1	0.2

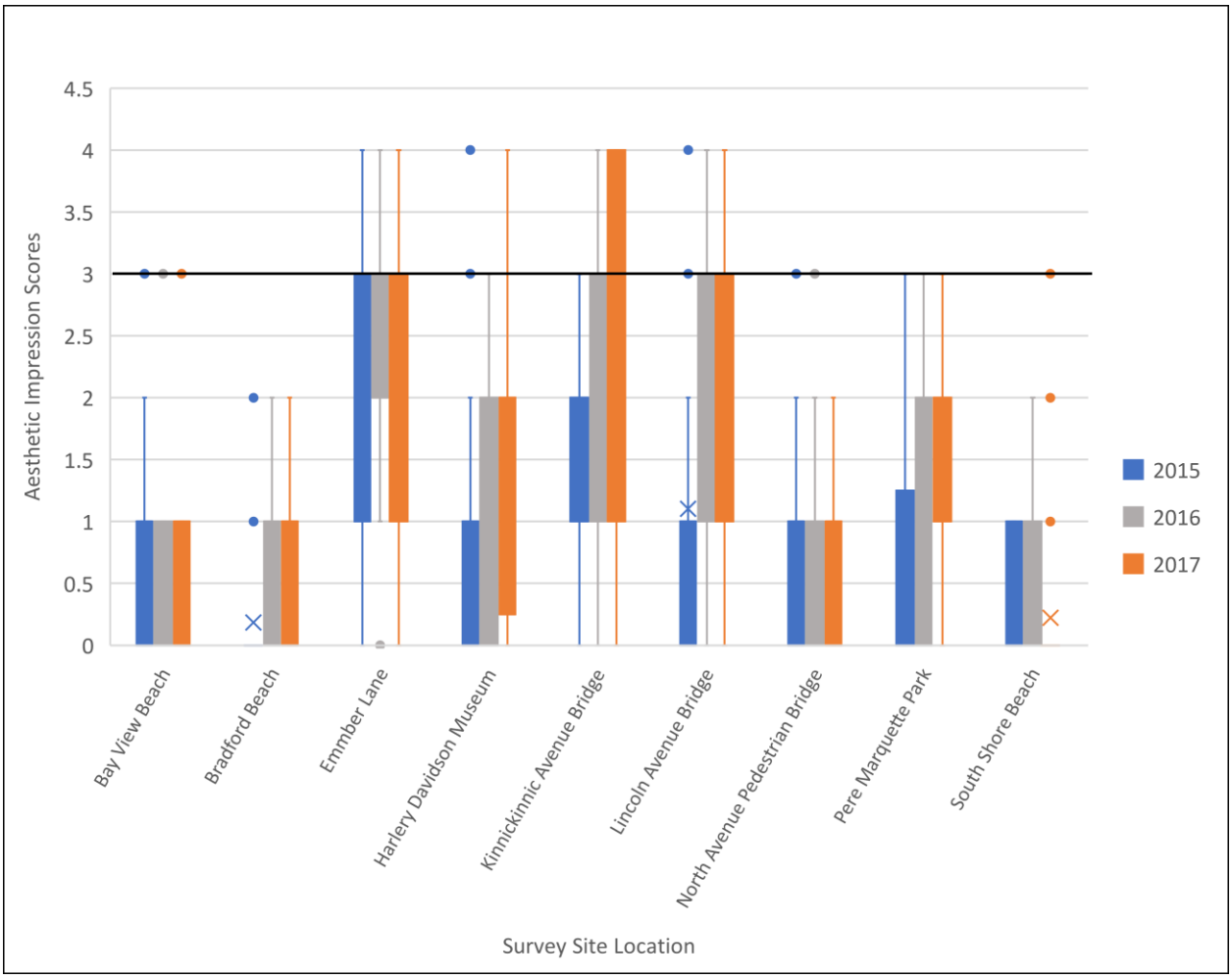

Figure 11. 2015 – 2017 Milwaukee Estuary AOC mean impression survey data scores with a threshold, indicated with a black line, of less than or equal to three. The bars represent the range of the central 50% of the data scores, the extended lines represent the range of the remaining data, the “X” represents median value of data scores, and the dots indicate outlier data.

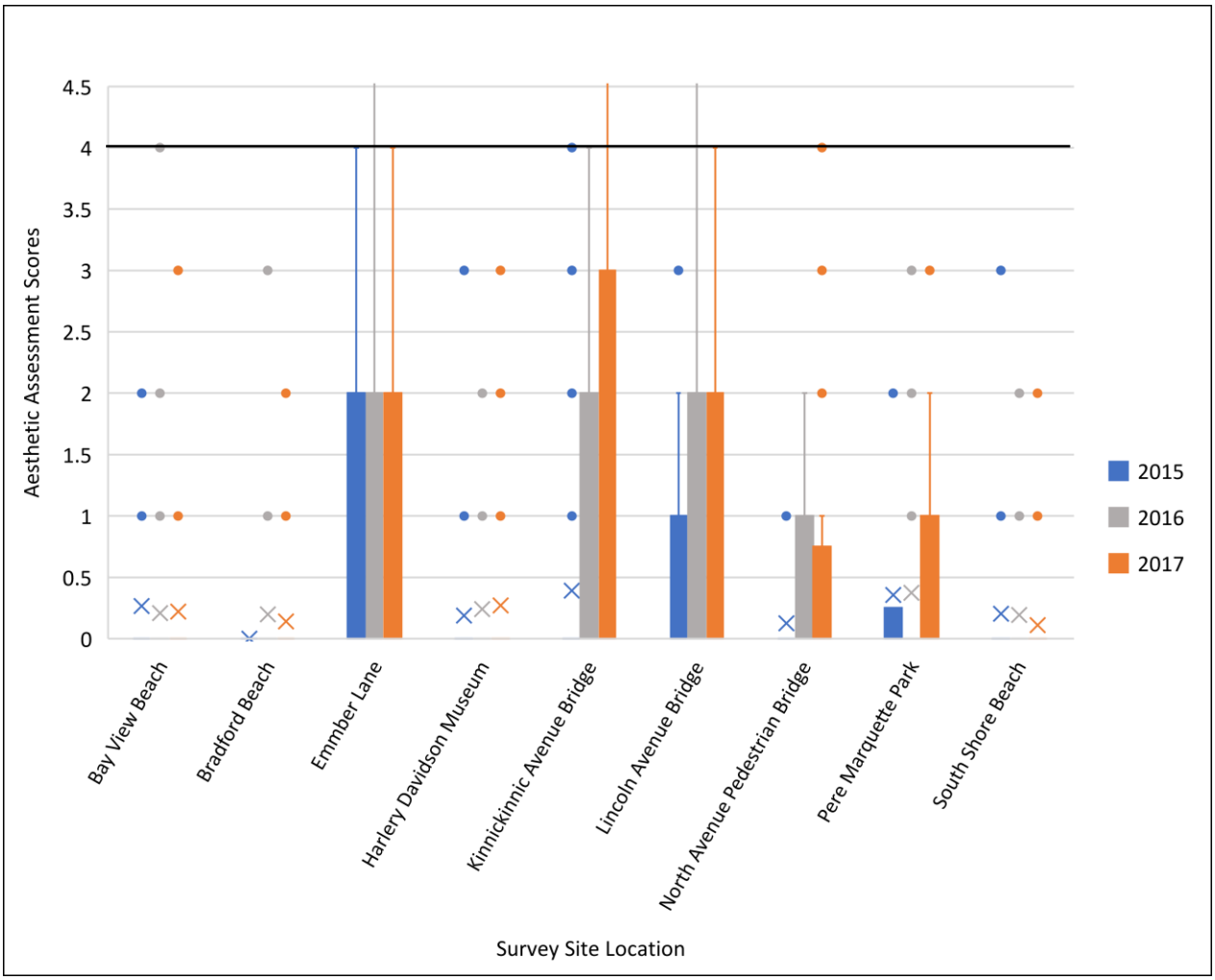

Figure 12. 2015 – 2017 Milwaukee Estuary AOC mean assessment survey data scores with a threshold, indicated with a black line, of less than or equal to four. The bars represent the range of the central 50% of the data scores, the extended lines represent the range of the remaining data, the “X” represents median value of data scores, and the dots indicate outlier data.

Table 4. Volunteer Aesthetic Monitoring Program survey results, exceeding threshold criteria, during the years of 2015 – 2017.

Station	Average Aesthetic Impression Score ≥ 3	Average Aesthetic Assessment Score ≥ 4	≥ 75% surveys indicating objectionable substance(s)	Total # Action Criteria Exceeded
Bay View Beach	-	-	-	**0**
Harley Davidson Museum	-	-	-	**0**
Bradford Beach	-	-	-	**0**
Emmber Lane	-	-	-	**0**
Kinnickinnic Avenue Bridge	-	-	-	**0**
Lincoln Avenue Bridge	-	-	-	**0**
North Avenue Pedestrian Bridge	-	-	-	**0**
Pere Marquette Park	-	-	-	**0**
South Shore Beach	-	-	-	**0**
Total	**0**	**0**	**0**	

Results of the aesthetic monitoring within the Milwaukee Estuary AOC between 2015-2017 showed that the individual aesthetic percentages (Table 2), mean impression scores (Table 3 & Figure 11), and mean assessment scores (Table 3 & Figure 12) were all under their thresholds (Table 4); therefore, the data are in favor of removing this BUI.

Results from the additional analyses to address public concerns (Beardmore, 2021; Appendix G) provided the following takeaways.

- The first analysis (described as “Model One” in Appendix G) found that, all else being equal, the effect of time on observations was minimal. Rather than becoming habituated to degraded conditions at individual sites across survey years, observations where volunteers had previously evaluated the site received slightly, but statistically significant, lower aesthetic impression ratings. This suggests that observers were perhaps more critical of degraded aesthetic quality after the first survey year, contrary to public concerns.
- Model One also determined that in most cases there is no significant difference between the presence of an objectionable substance at levels that do not prevent access, use, or enjoyment and the absence of that substance. From these results, scoring impairments based on a given substances impairment (i.e. prevention of access, use or enjoyment) is a valid and reasonable approach for the Milwaukee Estuary AOC.
- While not a concern raised by the public, model one also determined that animal-related problems and nuisance vegetation did not contribute to worse aesthetics impression scores. This indicates that continued efforts in the AOC to improve aesthetics after removal of this BUI should focus on water clarity and color and garbage and other substances in the water and on the shore.

- The second analysis (described as “Model Two” in Appendix G) demonstrated the nonlinear effect of multiple objectionable substances. As the number of substances present increases, their effects are not merely additive, but also interact to have a total effect that is greater than the sum of the individual effects. Not surprisingly, this model does not imply that a specific management threshold for the frequency of observed objectionable substances exists, but it does imply that reducing the likelihood of multiple occurrences of objectionable substances at a given location would lead to the greatest gains in aesthetic quality. The model was able to demonstrate that future and/or continued efforts by partners should be focused on sites that had the greatest number of aesthetically displeasing substances rather than sites with only one consistent objectionable substance identified.

In summary, these additional analyses indicated that the survey design was reasonable and appropriate to determine status of the BUI and provided additional helpful insights for managers looking to make continued improvements to aesthetics in the AOC after removal of the impairment.

Milwaukee Estuary AOC Partners’ Ongoing Efforts to Address Aesthetic and Pollution Issues

The Milwaukee Estuary AOC’s aesthetics improved over the years due to the sustained and multi-faceted efforts of AOC partners. Their commitment to ongoing projects and programs such as the Lynyrd Skymmr, AAR, river cleanups, proposition of a trash wheel, and introduction of green spaces and infrastructures, will ensure that these aesthetic improvements will be maintained and enhanced in the future.

Lynyrd Skymmr

MMSD created the Milwaukee River Skimmer Program and a skimmer vessel, named Lynyrd Skymmr, due to the poor water quality and considerable amount of debris in Milwaukee’s downtown rivers after storm events (Chapman, 2020). The Lynyrd Skymmr has contributed to the AOC’s aesthetic improvements through its cleanup projects. From mid-April through mid-November every year, the Lynyrd Skymmr operates three to four days each week removing floating debris from all three of Milwaukee’s rivers – Milwaukee, Menomonee, and Kinnickinnic – including: the entire Inner Harbor and lower estuary; the Menomonee River up to 13th Street; the Milwaukee River up to the Humboldt Avenue Bridge; and the Kinnickinnic River up to Lincoln Avenue. Since 2014, the Lynyrd Skymmr has removed almost 9,000 cubic yards (yd^3) of material from Milwaukee’s rivers, averaging 1,465 yd^3 per year (Table 5). This average collection per year equates to approximately 37 front-end loader garbage trucks.

Table 5. Annual Skimmer Statistics (Chapman, 2020).

Year	Number of Days in Operation	Material Removed (yd^3)	Number of Special Support Events	Name of Event
2019	122	1,485	1	MKE River Challenge
2018	111	1,540	1	MKE River Challenge
2017	128	1,545	NA	NA
2016	126	1,487	5	Lake Front Art Festival, MKE Kayak Historical Tour, Riverwest 24, Lake Michigan Days, and MKE River Challenge
2015	123	1,292	3	NA
2014	105	1,445	4	NA

The Milwaukee River Skimmer Program relies on support from many local partners[1] aiming to improve the quality of life for residents by restoring Milwaukee's waterways and enhancing recreational opportunities (Chapman, 2020). These local partners provide financial support for skimmer usage training; project management services; general operations, fuel, storage, insurance coverage, and maintenance services for the Lynyrd Skymmr; debris removal, cleanup, and hauling services for special area events (i.e. Summerfest) (Figure 13). These activities have contributed to aesthetic improvements in the Milwaukee Estuary AOC.

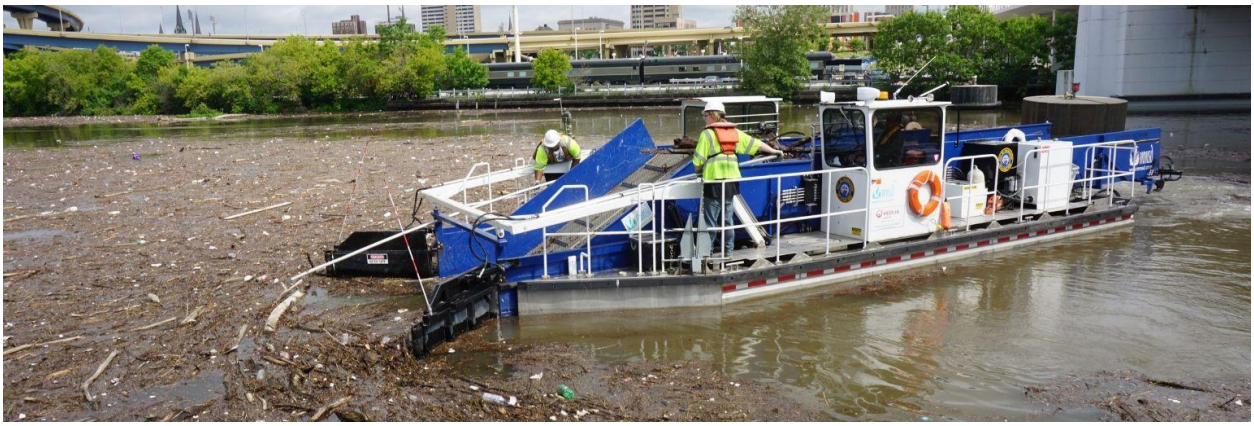

Figure 13. Milwaukee Metropolitan Sewerage District's river skimmer (Lynyrd Skymmr) cleaning up garbage and floating debris in the Menomonee River near the N 6th Street bridge (Vitrano, 2019).

[1] City of Milwaukee Department of Public Works; the Port of Milwaukee; the Milwaukee Community Service Corps; Veolia Water Milwaukee, LLC; and the Milwaukee Riverwalk District.

Adopt-A-River and River Cleanups

MRK is one of many organizations working to create sustainable programs and projects to reduce trash, restore wildlife habitat, and improve aesthetics along the AOC's rivers. With sponsorship from MMSD, MRK runs the Adopt-A-River (AAR) program in which river adopters agree to a two-year term and hold a minimum of two cleanups per year (Figure 14). The Adopt-A-River Program Map (Figure 15) is accessible to the public and includes information on which groups have adopted a river, adoptable river reaches, and background information on types of debris and litter that are collected (MRK, 2017).

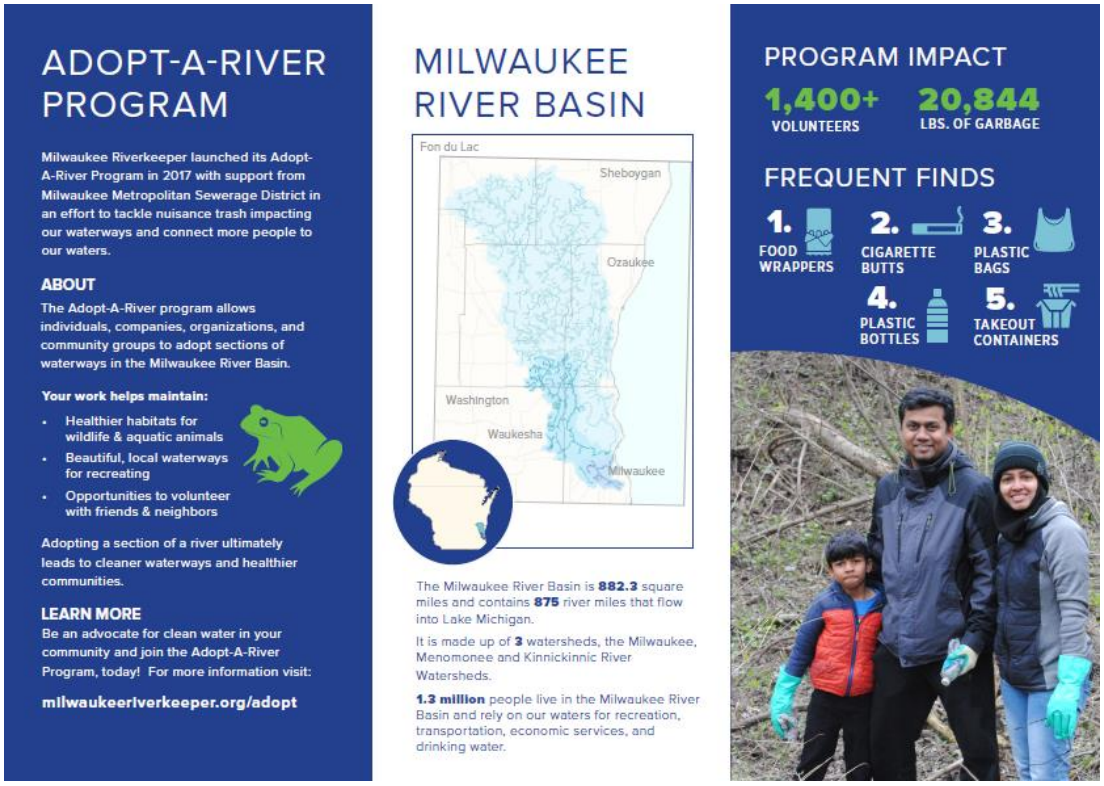

Figure 14. Milwaukee Riverkeeper's 2020 Adopt-A-River Program Brochure (Mendez, 2021).

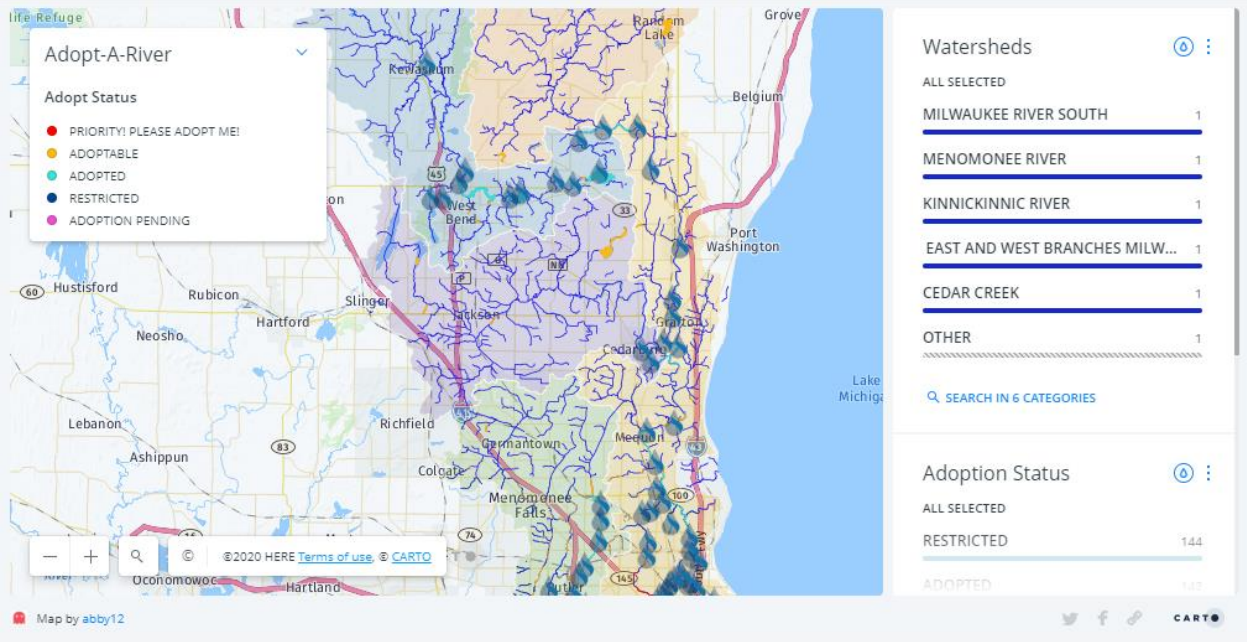

Figure 15. Adopt-A-River Interactive Program Map located on the MRK website (MRK, 2017).

Over the years, 94 miles of river have been adopted by 121 people or groups (Mendez, 2021). In 2019, more than 20,000 pounds of trash were removed from the AOC's rivers (Table 6). In 2020, 20% of the trash collected were plastic bags, 15% were food wrappers, and 11% were plastic bottles (Mendez, 2021). The AAR Program will continue to improve the AOC's aesthetics by lessening the waterways' debris and litter buildup.

Table 6. Milwaukee Riverkeeper's Cleanup Data from 2017 - 2020 (Mendez, 2021).

Program	Year	Number of Volunteers	Pounds of Trash	Number of Cleanups
Adopt-A-River	2020*	56	825	28
Adopt-A-River	2019	1,482	20,854	134
Adopt-A-River	2018	1,363	16,267	79
Adopt-A-River	2017	335	2,880	27

*The Number of Volunteers and cleanup goals were impacted by COVID-19.

MRK has also been holding Spring Cleanups since 1995. The Spring Cleanup is one of the largest volunteer events in southeast Wisconsin and generates nearly 4,000 volunteers at 70+ sites along Milwaukee's three rivers (MRK, 2020). The 2021 in-person Spring Cleanup involved over 3,500 volunteers at 85 sites (volunteer numbers limited due to COVID). This annual cleanup helps restore and improve aesthetics along Milwaukee's waterways, ultimately assisting in the removal of the aesthetics impairment. MRK also holds special river cleanups throughout the year in problem areas. For example, MRK held 5+ years of "crane" cleanups to remove decades of heavy trash in the lower Kinnickinnic River along with many other community partners, including Sixteenth Street Community Health Center, and fall cleanups are often held

in the Mequon-Thiensville Dam impoundment due to lower water levels and greater ease in removing large debris (Figure 16).

Figure 16. MRK's 2005 crane cleanup on the KK River due to its nomination for the American Rivers Most Endangered River list (Nenn, 2021).

Trash Collector

In 2020, Harbor District Inc., with partners MMSD, City of Milwaukee Department of Public Works, Business Improvement District #35, and MRK, was awarded GLRI funding for design, construction, and installation of a "trash collector" on the Kinnickinnic River. Floating booms will capture trash and debris, funneling them to a conveyor belt, which will then lift debris into a nearby dumpster. It is estimated that the system will collect approximately 75 tons of trash annually from the river, contributing to improved aesthetics in Milwaukee's waterways (Harbor District, 2016) (Figure 17).

Figure 17. Harbor District Inc.'s proposed area for the Trash Collector (Harbor District, 2016).

Green Space and Green Infrastructure

Milwaukee's waterways were once lined with private industries and had an abundance of accumulated litter and limited public access to recreating along the water. To create accessible public green space and green infrastructure (GI) in the AOC, public development efforts addressed the aesthetically displeasing urban landscape (Hron, 2016). Contributors to these efforts include Milwaukee County Parks (MCP), City of Milwaukee, MMSD, Harbor District, Menomonee Valley Partners (MVP), Sixteenth Street Community Health Centers (SSCHC), and many more.

MCP manages over 9,000 acres of land, including nine beaches along the shores of Lake Michigan which roughly equates to 25 miles of river and four beaches (Milwaukee County Parks, 2019). The creation of green space and public access by MCP has contributed to addressing overdevelopment issues in the AOC.

MMSD has taken initiative in addressing runoff within the AOC by creating a GI Partnership Program. The program offers incentive funding on a per-gallon captured, reimbursement basis for a host of green infrastructure strategies designed to capture and clean water where it falls (MMSD, 2021). Public, not-for-profit, and private sector organizations within eligible municipalities can apply for MMSD funding. This funding is awarded to organizations to mitigate water pollution by creating green solutions. Examples of innovative green solutions include new rain gardens, bioswales, green roofs, and a variety of techniques that help capture and harness rain and melting snow. Along with MMSD's GI Partnership Program, there is a Green Solutions Program. The Green Solutions Program provides a financial incentive to the municipalities

MMSD serves for implementation of GI and combined sewer separation to help achieve Total Maximum Daily Load (TMDL) compliance (MMSD, 2021).

The City of Milwaukee recognized the opportunity to provide continuous pedestrian river access in the Third Ward and Downtown neighborhoods, which started building during the 1990's. The Milwaukee Riverwalk system, constructed through public-private partnership, created attractive, easily accessible networking of waterfront paths along the harbor and the Milwaukee River, which has since been expanded to include portions of the Menomonee and Kinnickinnic Rivers with the help of partners like the Harbor District and MVP. This system takes into consideration the aesthetics of adjacent land use, river edge conditions, landscaping, stormwater management, and upland and aquatic habitat. Ultimately, these actions allowed for aesthetic improvements such as: safety, visibility, sustainability, and unique aesthetic from the Milwaukee River. The Riverwalk encourages people to engage with the rivers, providing a breather from the surrounding urban landscape. For more information, visit the following documents: *Harbor District's Riverwalk Design Standards* and *Menomonee Valley Riverwalk Design Standards*.

These larger efforts have drawn people to Milwaukee's riverfronts to enjoy activities and events that have not been as abundant historically. These spaces host festivals, live music, winter and summer sporting events, kayak and boat tours, and gatherings.

Public Involvement and Stakeholder Recommendations

Based on the results of the volunteer monitoring program described in this BUI removal, the AOC Coordinator and Community Advisory Committee held a public meeting in June 2019 to discuss the proposed BUI removal. Participants of the Community Advisory Committee meeting expressed support for the removal of this BUI by a majority vote. Letters of support provided by Milwaukee Estuary AOC stakeholders can be found in Appendix H.

Upon drafting the BUI removal document, a 30-day public comment period was held from May 21 to June 21, 2021. The draft document was placed on the WDNR Milwaukee Estuary AOC webpage and a notice was distributed via GovDelivery (Appendix I). WDNR responded to all questions and comments received which were generally in support of BUI removal.

Conclusions

In summary, the monitoring results and scores showed no exceedance of the pre-determined individual aesthetic percentages, mean impression, and mean assessment thresholds, indicating there is no longer an impairment. The 2015-2017 monitoring program satisfied the period specified in the 2016 *Milwaukee Estuary AOC RAP*. The displeasing aesthetics parameters in the Aesthetics BUI removal criteria did not exceed the action criteria adopted by the local stakeholders nor interfere with the public rights in waters of the state. Thus, no management actions are necessary to meet BUI removal criteria.

Significant improvements that have positively affected AOC aesthetics have been made by local partners and stakeholders, including clean-up programs (i.e. Lynyrd Skymmr, River Cleanups, and AAR), Milwaukee's commitment to GI implementation and riverfront access, and funding for habitat projects that returned portions of the rivers to more natural conditions. As a result, WDNR and local stakeholders recommend removal of this BUI.

Removal Statement

The Wisconsin Department of Natural Resources Area of Concern staff recommend the removal of the Degradation of Aesthetics Beneficial Use Impairment from the Milwaukee Estuary Area of Concern.

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Appendices

Appendix A. List of Acronyms

Appendix B. List of Definitions

Appendix C. Milwaukee Estuary Volunteer Aesthetics Monitoring Data Sheet

Appendix D. Volunteer Aesthetics Monitoring Data Sheet Scoring Key

Appendix E. Volunteer Information and Waiver Form

Appendix F. Quality Assurance Project Plan for Volunteer Aesthetics Monitoring: Milwaukee Estuary Area of Concern & Lower Fox River – Green Bay Area of Concern

Appendix G. Memo: Beneficial Use Impairment: Degradation of Aesthetics – MKE Data Analysis

Appendix H. Letters of Support for BUI Removal

Appendix I. GovDelivery Announcement for Public Comment Period

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Appendix A. List of Acronyms

AAR	Adopt-A-River
AGL	Alliance for the Great Lakes
AOC	Area of Concern
BUI	Beneficial Use Impairment
CAC	Community Advisory Committee
CSO	Combined Sewer Overflow
GI	Green Infrastructure
GLLA	Great Lakes Legacy Act
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement
ISS	Inline Storage System
MCP	Milwaukee County Parks
MMSD	Metropolitan Sewerage District
MRK	Milwaukee Riverkeeper
MVP	Menomonee Valley Partners
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
QAPP	Quality Assurance Project Plan
RAP	Remedial Action Plan
RP	Responsible Party
RWQMP	Regional Water Quality Management Plan
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SSHC	Sixteenth Street Community Health Centers
TMDL	Total Maximum Daily Load
UEC	Urban Ecology Center
USACE	Unites States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

USFWS	Unites States Fish and Wildlife Services
USGS	United States Geological Survey
WALUP	Water and Land Use Plan
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollutant Discharge Elimination System

Appendix B. List of Definitions

Area of Concern

A region where legacy pollution— from industrial, agricultural, and urban sources— severely interferes with the public's use of water resources for activities such as swimming and fishing. Defined by Annex 2 of the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement as "geographic areas that fail to meet the general or specific objectives of the Agreement where such failure has caused or is likely to cause impairment of beneficial use of the area's ability to support aquatic life." These areas are the "most contaminated" areas of the Great Lakes, and the goal of the AOC program is to bring these areas to a point at which they are not environmentally degraded more than other comparable areas of the Great Lakes. When that point has been reached, the AOC can be removed from the list of AOCs in the Annex, or "delisted."

Beneficial Use Impairment (BUI)

A "beneficial use" is any way that a water body can improve the quality of life for humans or for fish and wildlife (for example, providing fish that are safe to eat). If the beneficial use is unavailable due to environmental problems (for example if it is unsafe to eat the fish because of contamination) then that use is impaired. The International Joint Commission provided a list of 14 possible beneficial use impairments in the 1987 Great Lakes Water Quality Agreement amendment.

Delisting Target

Specific goals and objectives established for beneficial use impairments, with measurable indicators to track progress and determine when delisting can occur.

Remedial Action Plan (RAP)

According to the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement, a RAP is a document that provides "a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern…" RAPs are required to be submitted to the International Joint Commission at three stages: Stage 1: Problem definition Stage 2: When remedial and regulatory measures are selected Stage 3: When monitoring indicates that identified beneficial uses have been restored. Note that a renegotiated Great Lakes Water Quality Agreement was signed in 2012 by the U.S. and Canada which removed the "stage" terminology from the AOC Annex, and simply requires Remedial Action Plans to be "developed, periodically updated, and implemented for each AOC."

Appendix C. Milwaukee Estuary Volunteer Aesthetics Monitoring Data Sheet

Milwaukee Volunteer Aesthetics Monitoring Data Sheet

Please answer all questions on the datasheet completely and to the best of your ability.
DNR cannot use incomplete data sheets in station data analysis.

If you have questions or to return this survey, please contact <insert contractor's name and contact info>

Form revision date: 02/11/15

1. Your name:		**2. Station name:**	
3. Monitoring date:	m m / d d / y y	**4. Start time (include AM/PM):**	
5. Water conditions:	Calm	Slight movement	Moderate flow or waves	Rough or fast flowing
6. Water level:	High	Normal	Low

Overall aesthetic impression of site

7. Overall, how aesthetically pleasing do you find the site?

Circle one of the following:	**Very pleasing**	**Somewhat pleasing**	**Neither pleasing nor displeasing**	**Somewhat displeasing**	**Very displeasing**

Please describe. List any factors that make it pleasing or not pleasing.

Objectionable deposits in/characteristics of the water

8a. Is the color or clarity of the water unattractive?

Yes **No**

If yes, please describe:

8b. If yes to 8a, does the unattractive water color or clarity prevent you from accessing, enjoying, or using the water?

Yes **No**

9. For water color and clarity, please circle the answer choice that best describes the present appearance. For water surface, please circle any applicable attributes.

A. Water Color:	Colorless	Red	Green	Brown	Other (please indicate)_____
B. Water Clarity:	Completely clear	Fairly clear	Fairly cloudy	Completely cloudy	
C. Water Surface: (Circle all that apply)	Normal	Oily sheen	Foamy	Floating aquatic plants	
	Natural debris	Neon green sheen	Other (please indicate)_____		

10a. Is there floating or submerged garbage present in the water?

Yes **No**

If yes, circle visible item(s):

Building materials	Medical items	Household waste	Sewage-related litter	
Food-related litter	Fishing-related litter	Other (please indicate)_____		

10b. If yes to 10a, does the garbage in the water prevent you from accessing, enjoying, or using the water?

Yes **No**

11a. Are any other substances present in the water that are not specifically mentioned on this form?

Yes **No**

If yes, list what:

11b. If yes to 11a, do these other substances in the water prevent you from accessing, enjoying, or using the water?

Yes **No**

12a. Is there garbage along the shoreline?

	Yes	No

If yes, circle type(s):

Building materials | Medical items | Household waste | Sewage-related litter

Food-related litter | Fishing-related litter | Other (please indicate)_____

12b. If yes to 12a, does the shoreline garbage prevent you from accessing, enjoying, or using the water?

Yes	No

13a. Along the shoreline, are there problem animals or problems caused by animals?

Yes	No

If yes, list type(s):

13b. If yes to 13a, do these animal-related problems prevent you from accessing, enjoying, or using the water?

Yes	No

14a. Is there nuisance vegetation along the shoreline?

Yes	No

If yes, list type and amount if known:

14b. If yes to 14a, does this nuisance vegetation prevent you from accessing, enjoying, or using the water?

Yes	No

15a. Are there any other shoreline substances that are not specifically mentioned on this form ?

Yes	No

If yes, list type(s):

15b. Do these other shoreline substances prevent you from accessing, enjoying, or using the water?

Yes	No

Objectionable deposits on the shoreline

16. Have you previously evaluated this station? Yes No

If you have previously evaluated this station, what changes if any have you noticed in the aesthetic quality of the water or along the shoreline since your last visit?

Comments: Please include anything else you thought should be reported while completing this survey.

Additional feedback

17. END TIME:

For volunteer coordinator/DNR use only

Date the data sheet was reviewed by DNR:		**Check box if data sheet meets quality control requirements** ☐
Aesthetic impression score (for DNR use only):		
Assessment score (for DNR use only):		

QA/QC

Appendix D. Volunteer Aesthetics Monitoring Data Sheet Scoring Key

Volunteer Aesthetics Monitoring Data Sheet Scoring Key

Please answer all questions on the datasheet completely and to the best of your ability.
DNR cannot use incomplete data sheets in station data analysis.

If you have questions or to return this survey, please contact <insert contractor's name and contact info>

Form revision date: 02/11/15

1. Your name:		**2. Station name:**	
3. Monitoring date:	m m / d d / y y	**4. Start time (include AM/PM):**	
5. Water conditions:	Calm	Slight movement	Moderate flow or waves	Rough or fast flowing
6. Water level:	High	Normal	Low

Overall aesthetic impression of site

7. Overall, how aesthetically pleasing do you find the site?

Circle one of the following:

Very pleasing (0)	**Somewhat pleasing (1)**	**Neither pleasing nor displeasing (2)**	**Somewhat displeasing (3)**	**Very displeasing (4)**

Please describe. List any factors that make it pleasing or not pleasing.

Objectionable deposits in/characteristics of the water

8a. Is the color or clarity of the water unattractive?

Yes	**No**

If yes, please describe:

8b. If yes to 8a, does the unattractive water color or clarity prevent you from accessing, enjoying, or using the water?

Yes (1)	**No (0)**

9. Please describe the characteristics of the water during this particular visit.

A. Water Color:	Colorless	Red	Green	Brown	Other (please indicate)_____
B. Water Clarity:	Completely clear	Fairly clear	Fairly cloudy	Completely cloudy	
C. Water Surface: (Choose all that apply)	Normal	Oily sheen	Foamy	Floating aquatic plants	
	Natural debris	Neon green sheen	Other (please indicate)_____		

10a. Is there floating or submerged garbage present in the water?

Yes	**No**

If yes, circle visible item(s):

Building materials	Medical items	Household waste	Sewage-related litter
Food-related litter	Fishing-related litter	Other (please indicate)_____	

10b. If yes to 10a, does the garbage in the water prevent you from accessing, enjoying, or using the water?

Yes (1)	**No (0)**

11a. Are any other substances present in the water that are not specifically mentioned on this form?

Yes	**No**

If yes, list what:

11b. If yes to 11a, do these other substances in the water prevent you from accessing, enjoying, or using the water?

Yes (1)	**No (0)**

12a. Is there garbage along the shoreline?

	Yes	No
If yes, circle type(s):		

Building materials | Medical items | Household waste | Sewage-related litter

Food-related litter | Fishing-related litter | Other (please indicate)_____

12b. If yes to 12a, does the shoreline garbage prevent you from accessing, enjoying, or using the water?

Yes (1)	No (0)

13a. Along the shoreline, are there problem animals or problems caused by animals?

	Yes	No
If yes, list type(s):		

13b. If yes to 13a, do these animal-related problems prevent you from accessing, enjoying, or using the water?

Yes (1)	No (0)

14a. Is there nuisance vegetation along the shoreline?

	Yes	No
If yes, list type and amount if known:		

14b. If yes to 14a, does this nuisance vegetation prevent you from accessing, enjoying, or using the water?

	Yes (1)	No (0)
If yes, list type(s):		

15a. Are there any other shoreline substances that are not specifically mentioned on this form ?

	Yes	No
If yes, please type(s):		

15b. Do these other shoreline substances prevent you from accessing, enjoying, or using the water?

Yes (1)	No (0)

Objectionable deposits on the shoreline

16. Have you previously evaluated this station?	Yes	No
If you have previously evaluated this station, what changes if any have you noticed in the aesthetic quality of the water or along the shoreline since your last visit?		
Comments: Please include anything else you thought should be reported while completing this survey.		

Additional feedback

17. END TIME:

For volunteer coordinator/DNR use only

Date the data sheet was reviewed by <contractor>:		**Check box if data sheet meets quality control requirements** ☐
Aesthetic impression score (for DNR use only):		
Assessment score (for DNR use only):		

QA/QC

Appendix E. Volunteer Information and Waiver Form

Aesthetics Monitoring Volunteer Information

Name _____ Date of birth: _____

Address _____

City, State, Zip _____

County _____ How long have you lived in the county? _____

Phone Number _____

E-mail _____

Attended training by _____ on _____
Trainer's Name Date

Photo Release

I agree that any photos or video taken of me while participating in a volunteer monitoring activity may be used by the State of Wisconsin, its agencies, and its subdivisions in brochures, news articles, websites, and other media sources.

_____ _____
Signature of participant Date

_____ _____
Signature of parent or guardian (if under 18 years old) Date

Appendix F. Quality Assurance Project Plan for Volunteer Aesthetics Monitoring: Milwaukee Estuary Area of Concern & Lower Fox River – Green Bay Area of Concern

Quality Assurance Project Plan

For

Volunteer Aesthetics Monitoring:
Milwaukee Estuary Area of Concern
&
Lower Fox River – Green Bay Area of Concern

Prepared by:
Megan O'Shea & Stacy Hron
Wisconsin Department of Natural Resources

Prepared for:
Wisconsin Department of Natural Resources – Office of Great Lakes
Grant # GL-00-E00712-1
CAC_4_2011
CAC_6_2012

Revision 4
April 2015

WDNR 2012 Citizen Advisory Committee Capacity Grant
Grant Name: Citizen Monitoring of Degraded Aesthetics

Approvals: **Date:**

_____ _____
Megan O'Shea, *Lower Fox River – Green Bay AOC Coordinator*

_____ _____
Stacy Hron, Milwaukee Estuary AOC Coordinator

_____ _____
Donalea Dinsmore, *WDNR Quality Assurance Coordinator*

_____ _____
Jordan Petchenik, WDNR Social Scientist

EPA Grant Acknowlegement:

_____ _____
Jennifer Conner, GLNPO Grant Manager

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Distribution List

The following individuals will receive electronic copies of the approved Quality Assurance Project Plan (QAPP) and subsequent revisions:

Megan O'Shea, Lower Fox River – Green Bay Area of Concern Coordinator – Wisconsin Department of Natural Resources
Stacy Hron, Milwaukee Estuary Area of Concern Coordinator – Wisconsin Department of Natural Resources
Kendra Axness, LAMP, AOC and Outreach Coordinator – Wisconsin Department of Natural Resources
Molli MacDonald, SWIMS Database Manager – Wisconsin Department of Natural Resources
Donalea Dinsmore, Great Lakes Quality Assurance Coordinator, Wisconsin Department of Natural Resources
Jordan Petchenik, Social Science Researcher – Wisconsin Department of Natural Resources

Additionally, the QAPP is available to anyone upon request. An electronic version of the QAPP will also be associated with the project location in the SWIMS database.

Executive Summary

In order to assess the status of an Area of Concern (AOC) related impairment, volunteers from the Lower Fox River – Green Bay and Milwaukee Estuary AOCs evaluate the aesthetic quality of a station, providing a means to assess public perception and any correlation between aesthetics and water quality improvements made.

In order to remove the AOC designation, all beneficial use impairments (BUIs) must be addressed, in accordance with targets set in DNR Remedial Action Plans. To determine the status of this impairment, DNR developed an aesthetics monitoring program. The intent of this program is to gain a better understanding of the public's perception of whether there are aesthetic issues that limit use or discourage access to the AOC waterways. Benefits of this approach include expanding public participation in AOC activities, generating needed data at minimal cost, and incorporating public perceptions in evaluation of this BUI. Grants to local nonprofits assist in recruiting, training and deploying aesthetics monitoring volunteers. These groups also help ensure good quality data is being generated and retained in the state water quality database. Results from this program will be incorporated into the removal strategy for this BUI.

This revision to the 2012 Quality Assurance Project Plan reflects lessons learned from the pilot year that will help ensure the overall success of the program.

1. Project Scope

This section of the plan describes the need for the project and the qualifications necessary in order for useable data to be obtained as part of the project.

Problem Definition

The Degraded Aesthetics BUI delisting targets reference monitoring data and/or surveys within the AOC. Several partners collect water quality data at locations throughout the AOCs, including Milwaukee Metropolitan Sewerage District's (MMSD) and the Green Bay Metropolitan Sewerage District's ambient monitoring programs. However, no information is collected on aesthetic parameters including "floating or submerged debris, oil, scum" or "materials producing color, odor, taste or unsightliness" detailed in Water Quality Standards for Surface Waters (WI Administrative Code NR 102) and in the delisting targets. Decisions about the aesthetic quality of water are also subjective in nature and involve personal interpretation of what is an "unacceptable level" or an "objectionable" amount that would interfere with public rights or impair use. This QAPP outlines a monitoring protocol that determines in a more empirical way whether there are aesthetic problems in an Area of Concern.

Project Organization

This project will be led by the respective AOC Coordinators with assistance from a Volunteer Monitor Coordinator. In the Lower Fox River – Green Bay AOC, the Volunteer Monitor Coordinator will be a Limited Term Employee of the Department of Natural Resources. In the Milwaukee Estuary, AOC the Volunteer Monitor Coordinator will be a staff member of a grantee partner. The aesthetics project team, known henceforth as the project team, consists of the following:

AOC Coordinators (DNR):

- Ensure that reporting for the program is completed as required by applicable grant agreements.
- Review and incorporate program results into Remedial Action Plan.
- Oversee the project and Volunteer Monitor Coordinator. Assure that project work is being completed.
- Coordinate team communication.
- Revise the QAPP as necessary.
- Assist with program evaluation at the end of the calendar year.
- Analyze possible data trends/interpret data.

Volunteer Monitor Coordinator:

- Recruits volunteers for monitoring.
- Trains/orients volunteers for the project according to the QAPP specifications.

- Responsible for meeting applicable QAPP specifications and ensures other project team members they coordinate are meeting those specifications as well.
- Tracks volunteer activity at monitoring stations.
- Responsible for ensuring station data is entered into the provided Excel workbook and that copies of data sheets are uploaded into SWIMS in accordance with grant agreements.
- Manages volunteers and serves as their point of contact.
- Completes quarterly and final reporting as required.
- Reports any problems to AOC Coordinator.
- Provides support and congruency in contract organizations' volunteer training.
- Works with DNR database manager (Lisa Helmuth and/or Molli MacDonald) to troubleshoot any problems encountered with the SWIMS database.
- Assists with program evaluation at the end of the calendar year.

Social Science Researcher (DNR)

- Ensures accommodation with DNR's strategic information needs, per Manual Code 1511.1.
- Acts as a source of assistance in the design of questionnaires, sampling techniques, interviewing, reliability estimation, and interpretation of results.
- Approves surveys prior to their implementation.

During project development and project initiation in 2012, the project team collaborated with the Urban Ecology Center and Alliance for the Great Lakes in developing the project plan, recruiting and training volunteers and data collection. As the project proceeds, additional citizen groups and volunteers may participate in the project.

Project Objectives

1. Evaluate the current status of AOC aesthetics relative to the delisting targets.
2. Identify factors, if any, contributing to degraded aesthetics in AOC.
3. Where feasible, use the results to define projects to improve aesthetics at specific locations.
4. Expand public participation in the AOC through monitoring.

Monitoring Station Selection

Monitoring stations for the project have been chosen with the goal of being relatively evenly distributed throughout the AOC. Several other practical considerations have been taken into account in station selection, including safety concerns and public access. DNR also plans to allow citizens/stakeholders to suggest additional monitoring locations, and DNR will try to accommodate those suggestions when possible.

Project/Task Description and Schedule

Approach

The information collected will be used to assess public perception of discrete monitoring stations within the AOCs. Through the questions on the data sheet, volunteers will describe their overall experience when visiting the stations. Maps of the stations and data sheets are located in Appendix A and Appendix B, respectively, and can be found in the SWIMS database. Because this project is ultimately asking for opinions, it is important that each station have multiple perspectives surveying at different times of the year. In order to achieve this goal, each station will be monitored by at least 30 different volunteers throughout the monitoring season, which runs from April through October. Ideally, a group of dedicated volunteers will monitor at all the assigned stations after being trained.

Because we want to obtain diverse perspectives about the aesthetic conditions at a site, multiple visits by a single volunteer at a monitoring station are not as desirable as having that same volunteer monitor each of the stations once. If a volunteer does monitor a station more than once, his or her scores will be weighted accordingly so that no one observer can bias the data set at a station. If participants volunteer in a group, each member must fill out his/her own evaluation independently from the rest of the group. Once the volunteer is finished filling out the data sheet, the volunteer coordinator will collect the data sheet, ensure it meets quality control requirements, provide a copy of the original data sheet to DNR, and enter it (or ensure that the grantee partner enters it) into the SWIMS database.

In order for the data forms to be considered complete, all numbered fields on the data form must be answered. Incomplete data sheets will be flagged for quality control issues and will not be included in quantitative data analysis. (See Quality Control Requirements below.)

The AOC Coordinator chooses final station locations based on public access, ease of reaching the shoreline, and safety considerations. In Green Bay, there are monitoring stations along the Fox River and the Bay. In Milwaukee, there are sites on each river in the AOC (Milwaukee, Menomonee, Kinnickinnic) as well as beaches along the lakefront. A map of the monitoring sites for each AOC can be found in Appendix A. Volunteers will have an opportunity to sign up for stations during training with oversight by the appropriate Volunteer Monitoring Coordinator to ensure each station selected has at least 30 different volunteers assigned to over the course of the monitoring season.

The Volunteer Monitoring Coordinator will compile the quality controlled data sheets and enter all the data into a provided Excel workbook by the end of the calendar year. They will also scan and upload all of the data sheets into SWIMS as pdf documents.

Tasks and Timeline

- March/April – Volunteer Monitoring Coordinators recruit and train volunteers.

- April through October – Volunteers monitor stations and send forms into the Volunteer Monitoring Coordinator; Volunteer Monitoring Coordinator tracks monitoring activity and checks over data sheets for completeness and uploads PDF copies into SWIMs monthly; Quality controlled data is entered into the Excel workbook provided by the AOC Coordinator.
- September through October – AOC Coordinator and volunteer coordinator/s evaluate program to ensure necessary data are collected and goals are being met.

For the purposes of this project, the monitoring season runs from April through October. Monitoring intervals are spring (April/May), summer (June/July/August), fall (September/October) and may be used to help in assisting that the stations are being monitored consistently throughout the monitoring season.

Volunteer Monitoring Coordinator Roles & Responsibilities

DNR may select a grantee or hire a Limited Term Employee to assist in administering the program and to coordinate volunteers. For the grantee partner, the Scope of Work accompanying their contract will state responsibilities and requirements for the project implementation. For Limited Term Employees, a position description will describe the tasks that the staff person will perform.

Volunteers need not have a scientific background to participate in the program. The Volunteer Monitoring Coordinators will recruit local volunteers and will ensure that all participants are trained in monitoring protocols. Before training any volunteers or participants, the Volunteer Monitoring Coordinator is required to get approval from the AOC Coordinator for the training content. Volunteer coordinators also need to keep track of volunteers' monitoring activities, and make sure that there is a volunteer intake form (Appendix C) on file for that individual. The Volunteer Monitoring Coordinator should ensure that volunteers are familiar with the following before monitoring:

- Rationale for the monitoring program.
- Describe aesthetics program objectives.
- Locations of the monitoring stations.
- Safety considerations.

Volunteer Monitoring Coordinators will be cautious not to introduce any bias by showing images to explain what is considered aesthetically pleasing or displeasing. However, supporting materials may be used (i.e., defining water level figures, invasive species information). A set of tips to be used during the training and for volunteers to reference in the field if they have questions on how to fill out their data sheets is in Appendix D.

The grantee partner will be held responsible for ensuring that the provisions in their Scope of Work for the grant agreement are followed, including monthly review of data sheets. Volunteer coordinators are responsible for ensuring volunteers are completely filling out data

sheets, as incomplete sheets affect the usability of the data. The grantee is also held responsible for entering the data correctly into the Excel workbook and uploading information into the SWIMS database. To this end, they are required to obtain SWIMS training and a WAMS ID.

Volunteers will be responsible for creating their own schedule, but the Volunteer Monitoring Coordinators should ensure that each station is monitored throughout the monitoring season (April-October). Volunteers will be asked to complete a data sheet comprised of observation-based questions. Each volunteer needs to complete a separate data sheet for each observation at each station.

Documentation and Records

Field Records

All participants will fill out a data sheet in the field. At a minimum, all numbered questions on the data form must be answered. The white space on the form serves as a visual cue for the volunteer and anyone reviewing the form that there should be data recorded in that space. All field data sheets will be stored in the SWIMS database, according to DNR's instructions.

Project Records and Records Retention

Each volunteer will be asked to fill out a volunteer intake form (Appendix C) and any liability waivers required by the DNR or grantee partner before being trained and deployed to monitoring stations. DNR will receive copies of all completed data forms, and the forms will be scanned and stored in the SWIMS database. Any grantee partner is required to keep copies (electronic or hard copies) of monitoring forms on file for at least two years, as they can be audited by either the state or the federal government.

Progress Reporting

Throughout the monitoring season quarterly reports will be prepared for project and grant reporting and will include information specified in the grant agreements. For grantee partners, a final report will also be prepared. This will include: the information specified in their scope of work, final copies of the Excel workbook (provided electronically), a summary of the station analysis from the workbook with any data deficiencies identified, identification of any sites exceeding decision thresholds and any suggestions or observations for program or station evaluation. At the end of the monitoring season, the AOC Coordinator will determine whether enough data was obtained during the monitoring season to overall AOC data analysis. The AOC Coordinator will report any overall AOC results in the RAP Update.

2. Data Management and Oversight

This section describes data use and interpretation.

Sample Process Design (Experimental Design)

Because of the subjective nature of what is considered aesthetically pleasing, a unique sampling design is needed. To understand whether or not a station is aesthetically pleasing, more than one volunteer's opinion is needed. The goal will be to have at least 30 individuals visit each station throughout the monitoring season to capture different environmental conditions such as early spring thaw/runoff and higher summer temperatures. Volunteers will have an opportunity to choose among pre-determined stations in each AOC. They will be asked to sign up to monitor stations during training. At the monitoring station, volunteers will fill out a data sheet comprised of observation questions. The data sheet is located in Appendix B.

Data Acquisition Requirements (Non-direct Measurements)

The AOC Coordinator will determine the monitoring stations, a map of which can be found in Appendix A. The volunteer coordinator will associate volunteer names with monitoring stations visited so that it can be demonstrated that at least 30 individuals monitored each site.

Quality Control Requirements

Although there is not control over the volunteers' perceptions, there are a few controls necessary to standardize the methods.

- All dedicated volunteers should receive training before they make and record field observations.
- Volunteer Monitoring Coordinators need to receive training from a DNR staff member before they upload files into SWIMS.
- Volunteer Monitoring Coordinators need to check each form for completeness and errors before entering the data into the Excel workbook and uploading PDFs to SWIMS. They should rectify any issues before entering the data into the Excel workbook. Once the Volunteer Monitoring Coordinator receives the data sheet, he/she should review it and note the date that the sheet was reviewed on the appropriate field on the data sheet.
- The AOC Coordinator will periodically query the project in SWIMS to check the uploaded PDF documents for completeness.
- Volunteers will be given a standardized location for each site so that the area being evaluated is consistent among individuals.
- Monthly, the Volunteer Monitoring Coordinator shall scan or photocopy data sheets by station chronologically (one file per station), upload to SWIMS, and notify the AOC Coordinator. As part of the invoicing process for the grantee partner, DNR will require this to be completed before payment can be remitted.

Data Management

Volunteer Monitoring Coordinators will be provided with an Excel workbook to enter field data into and be trained to upload files into SWIMS. At random times throughout the year, the AOC Coordinator will review data from the project to ensure data is being entered into the Excel workbook and uploaded correctly. If errors are made, the AOC Coordinator will follow up with the volunteer coordinator and outline what needs to be done to correct the data.

Assessment/Oversight

The Volunteer Monitoring Coordinators will check in with volunteers via email or other means to make sure they are visiting their stations throughout the course of the season. DNR will monitor SWIMS to ensure data sheets are being uploaded according to the timeframe specified in the Scope of Work or in correspondence. The AOC Coordinator will review a draft of the Excel workbook once the Volunteer Monitoring Coordinator has begun data entry to ensure it is being entered correctly.

Email addresses for Volunteer Coordinators will be provided during training and on the data sheet. Throughout the season, the AOC Coordinator will monitor incoming data sheets to verify the number of surveys completed at each site will be enough to meet minimum qualifications for assessment.

Reports to Management

The Volunteer Monitoring Coordinator will report any issues encountered to the AOC Coordinator. The AOC Coordinator will confer with the WDNR Social Scientist throughout the monitoring season as needed. The Volunteer Monitoring Coordinators will be required to complete quarterly updates that specify the following:

- Project budget and amount of the funds expended to date (this can be approximate if an invoice is not yet available);
- Progress on deliverables and work accomplished during the quarter and any problems that were encountered and how they were resolved,
- Their planned tasks/deliverables for the next quarter, and
- Volunteer activity, tracked by station (a template will be provided for this purpose). Activities planned for next quarter.

The grantee partner will provide this to the AOC Coordinator according to the terms specified in the Scope of Work. The AOC Coordinator will enter quarterly updates into the SWIMS database. The findings will also be shared with the AOC stakeholders and the volunteers. The AOC Coordinator will incorporate the results of the project into future Remedial Action Plan updates, as appropriate.

Reconciliation with Data Quality Objectives

Data collected through the program will be assessed based on individual stations and the overall AOC. The evaluation process is described below.

Individual Station Assessment

- Only forms that pass quality control can be used in station assessment. Volunteers will be encouraged to review their data sheet for completeness before giving it to the contracted volunteer coordinator. Volunteer coordinators will review incoming data sheets on a monthly basis, as required by contract. If the grantee partner, upon review, discovers an omission on the data sheet, then he/she should try to retrieve that information from the volunteer. Once a month has passed since the data sheet was completed, DNR assumes that the data cannot accurately be retrieved from the volunteer and the form will be flagged for quality control and will not be included in assessment. The data sheet will be marked "QC Flagged" and retained with any others in a PDF file in SWIMS.
- Additionally, station locations must be identified on the data form. If the grantee partner does not confirm site location with the volunteer within a month of its completion, then the form will be flagged for quality control as explained above and will not be included in assessment.
- The Volunteer Monitoring Coordinator will fill in the last two fields on the data sheet: aesthetic impression score and assessment score using the values calculated in the Excel workbook.
- Once DNR receives the scanned or hard copy of raw data, DNR will verify that forms are complete.
- Scoring of data sheets follows the scoring key (Appendix E). There are eight scored questions in the 2015 data sheet revision (7 excluding aesthetic impression). The scoring will be imbedded within the Excel workbook.
- Calculate median, mode, and mean for aesthetic impression score (Q7) and for assessment score (scored questions 8-15). The calculations will be imbedded within the Excel workbook.
- Final data analysis/assessment will only be done once there are at least 30 completed data sheets from different volunteers for each station that cover the full range of the monitoring season, April through October. Data can be compiled over multiple years unless known restoration affects the conditions in the area.
- The aesthetic impression score (question 7) is a value on a scale of 0-4 (see scoring key in Appendix E).
- The assessment score is comprised of the remaining questions. All previous data sheets will have their assessment scores transformed so that they correspond to the number of scored questions on the 2015 version of the data sheet. There are seven scored questions for this component.

Stations whose data has gone through the above-outlined quality control process will go through the following screening threshold to determine whether they may be potentially impaired. These screenings will be imbedded within the Excel workbook. Any data sheet that was flagged for quality control issues will also be reviewed as part of a qualitative review to determine if it can inform any issues regarding the station or process. A station may need management actions implemented for degraded aesthetics when at least one of the following has occurred:

- The arithmetic mean overall aesthetic impression score is ≥3, or
- The arithmetic mean assessment score is ≥4 (using the 2015 conversion criteria for older forms)
- Sites with an individual aesthetic parameters (e.g., shoreline garbage) that are classified as aesthetically displeasing in ≥75% of total quality controlled surveys

Additionally, because stations were selected in part based on safety considerations, DNR will develop a way for people to submit other locations that they think should be evaluated for aesthetic parameters in the AOC. These additional sites will be considered for monitoring by Department staff. If a site is added, DNR will then partner with volunteers to monitor those sites in a way that safeguards participants' physical well-being.

Identifying Potential Management Actions:

1. In the Volunteer Monitoring Coordinator's final report to be compiled after data analysis is complete, any stations where decision thresholds are exceeded will be identified along with a description of what the problem appears to be.
2. Where feasible, suggest recommendations for management actions, which may include but are not limited to: community clean-up days, placement of garbage cans or creating newly landscaped areas to encourage animals to congregate in certain areas and reduce runoff.

Overall AOC Assessment*:*

- The data from the individual site assessments and the final report from the Volunteer Coordinator will be used to inform the decisions about the BUI status and possible management actions as part of the RAP process.

Appendices

Appendix A: Map of Monitoring Stations

Appendix B: Volunteer Aesthetics Monitoring Data Sheet

Appendix C: Volunteer Intake Form

Appendix D: Volunteer Aesthetics Monitoring Tip Sheet

Appendix E: Scoring Key

Aesthetics Monitoring Stations

Please keep in mind…

- Your safety is important! Please do not trespass, and make sure you feel safe at all times.
- Take someone else with you, if you can. If you cannot, let someone know where you're going and when you expect to return. Check in with that person so that they know you're safe.

For an interactive map to see the sites in more detail, go to http://goo.gl/maps/zW76z.

Milwaukee River – *Pere Marquette Park Station*

Description: Pere Marquette park is located on the west bank of the Milwaukee River in downtown Milwaukee between State St. and Kilbourn Ave. Stand on the river viewing platform at Pere Marquette when you're filling out the data form.

Parking: There is street parking on Old World Third Street .

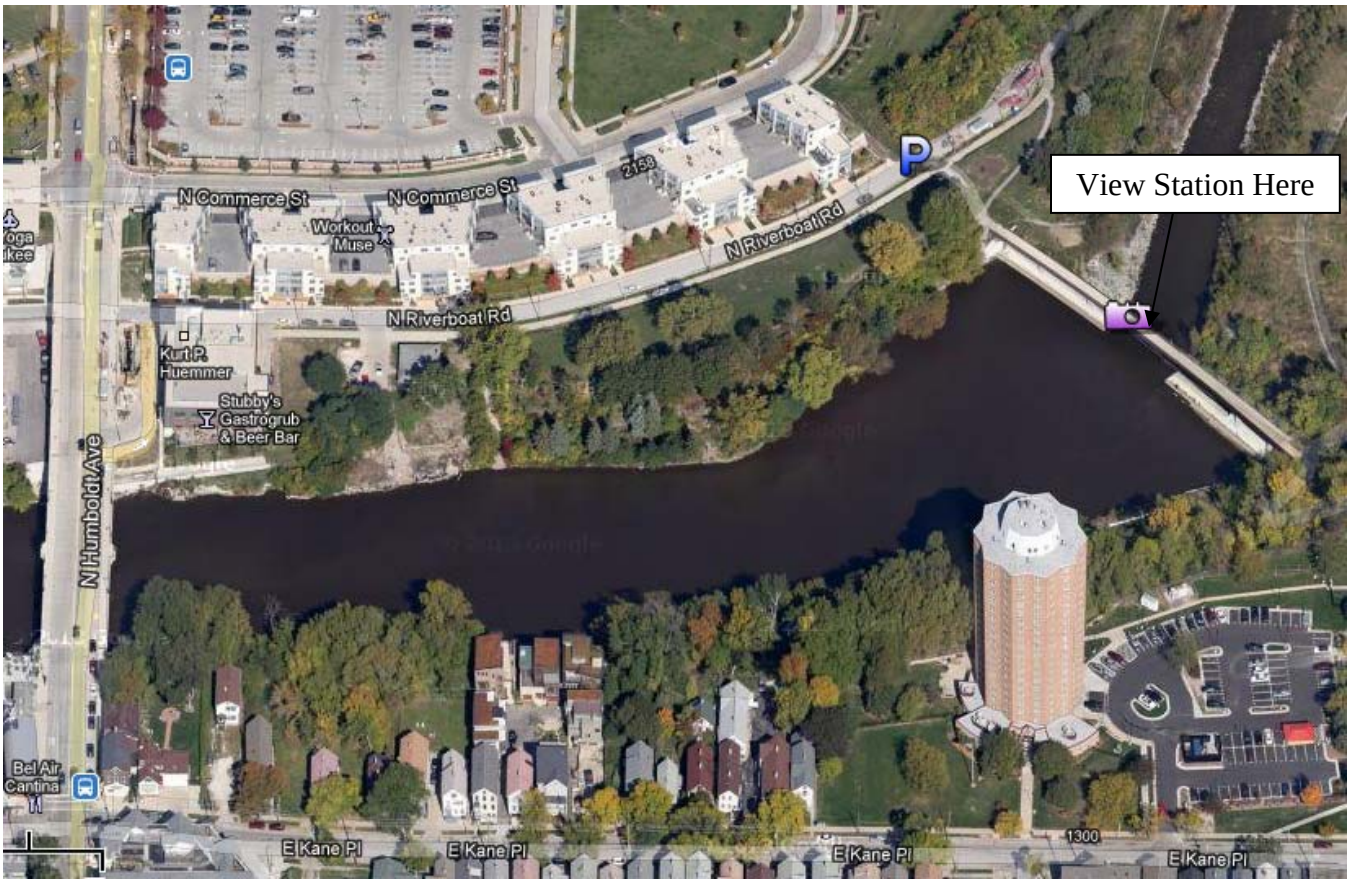
Map:

Milwaukee River – *North Avenue Dam Pedestrian Bridge Station*

Description: This station is easily accessed from Riverboat Road near Commerce Street. Stand on the middle of pedestrian bridge, facing downstream (the wider side of the river, looking toward downtown) when you're filling out the data form.

Parking: Street parking is available on Riverboat Road. A trail at the end of the road leads to the pedestrian bridge.

Map:



Kinnickinnic River – *Kinnickinnic Ave. Bridge Station*

Description: This station is on the S. Kinnickinnic Avenue bridge that goes over the KK River. Stand on the sidewalk on the east side of the bridge, looking downstream (east) when you're filling out the data form.

Parking: Street parking is available on Stewart Street, the next cross street south of the bridge and on S. Kinnickinnic Ave., north of the bridge.

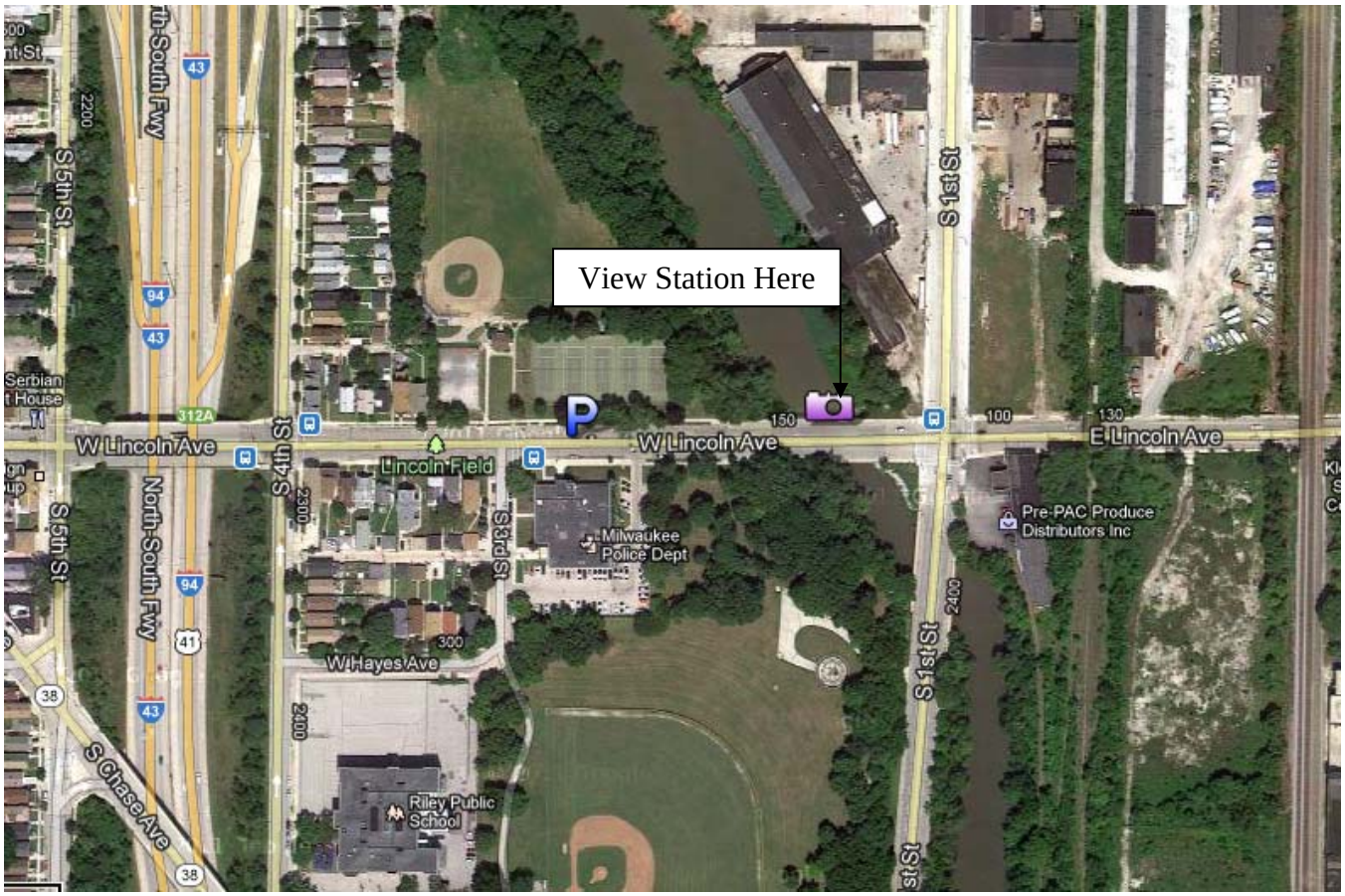
Map:

Kinnickinnic River – *Lincoln Avenue Bridge Station*

Description: This station is on the Lincoln Avenue bridge that goes over the KK River. Stand on the sidewalk on the north side of the bridge, looking downstream (north) when you're filling out the data form.

Parking: It is safer to park on the same side of the road as the station (north side of Lincoln Ave.), since then you will not have to cross the street. Street parking is near the tennis courts. Street parking is also available on 3rd St., on the west side of the Police Dept. building.

Map:



Menomonee River – *Emmber Lane Station*

Description: This station is in the Menomonee Valley, and is easily accessed by Canal Street. Stand down by the canoe launch when you're filling out the data form. You should be able to see a deflector structure in the water, and the upstream side of the River.

Parking: Public street parking is available near the site, north of the river on Emmber Lane.

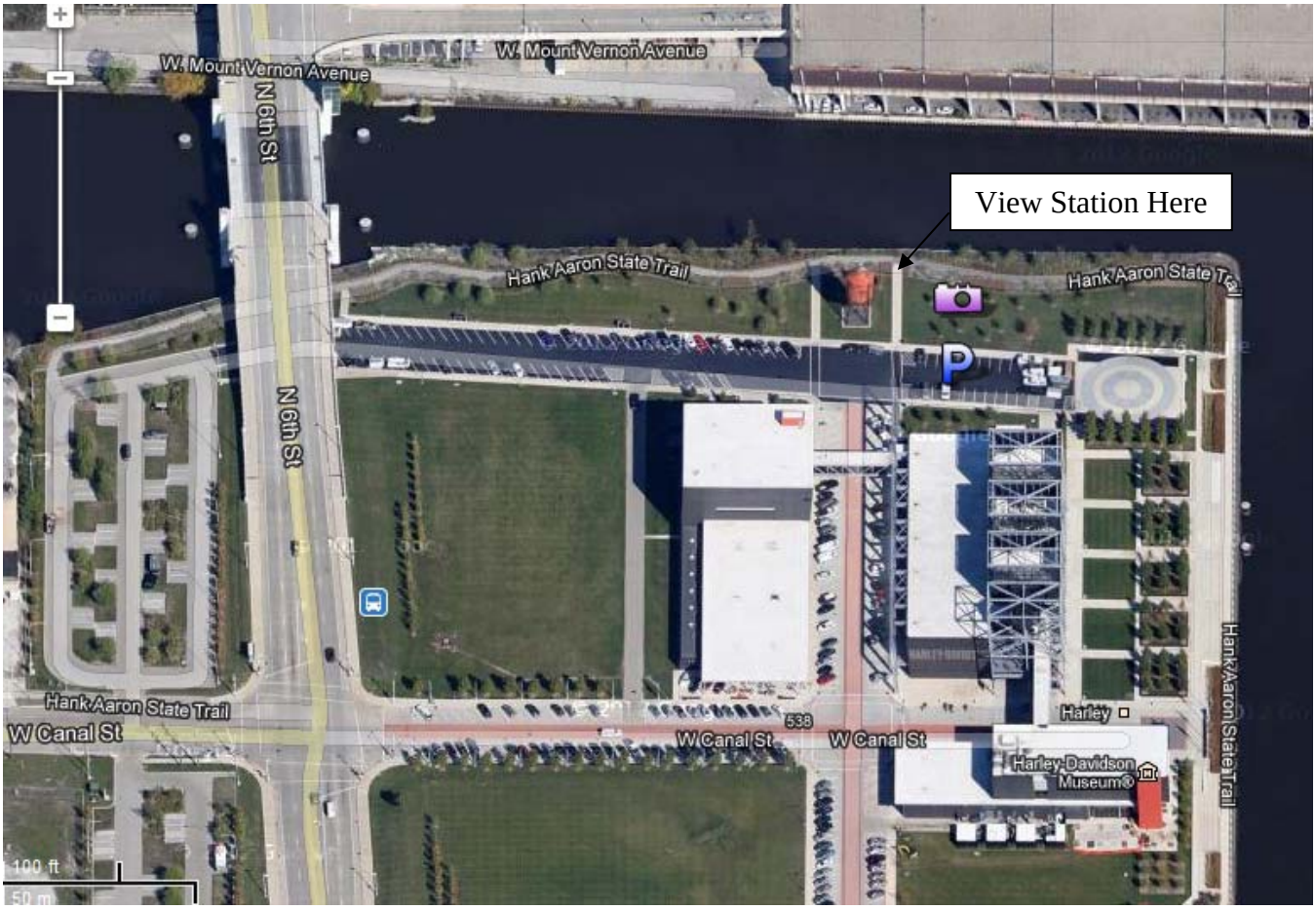
Map:

Menomonee River – *Harley Davidson Museum Station*

Description: This site is located along the Hank Aaron State Trail, adjacent to the Harley Davidson Museum Campus. Stand just to the east of the orange tower when you're filling out the data form.

Parking: Turn east on Canal St. from 6th St. Turn left off of Canal St. and head toward the orange tower. Park in the lot.

Map:

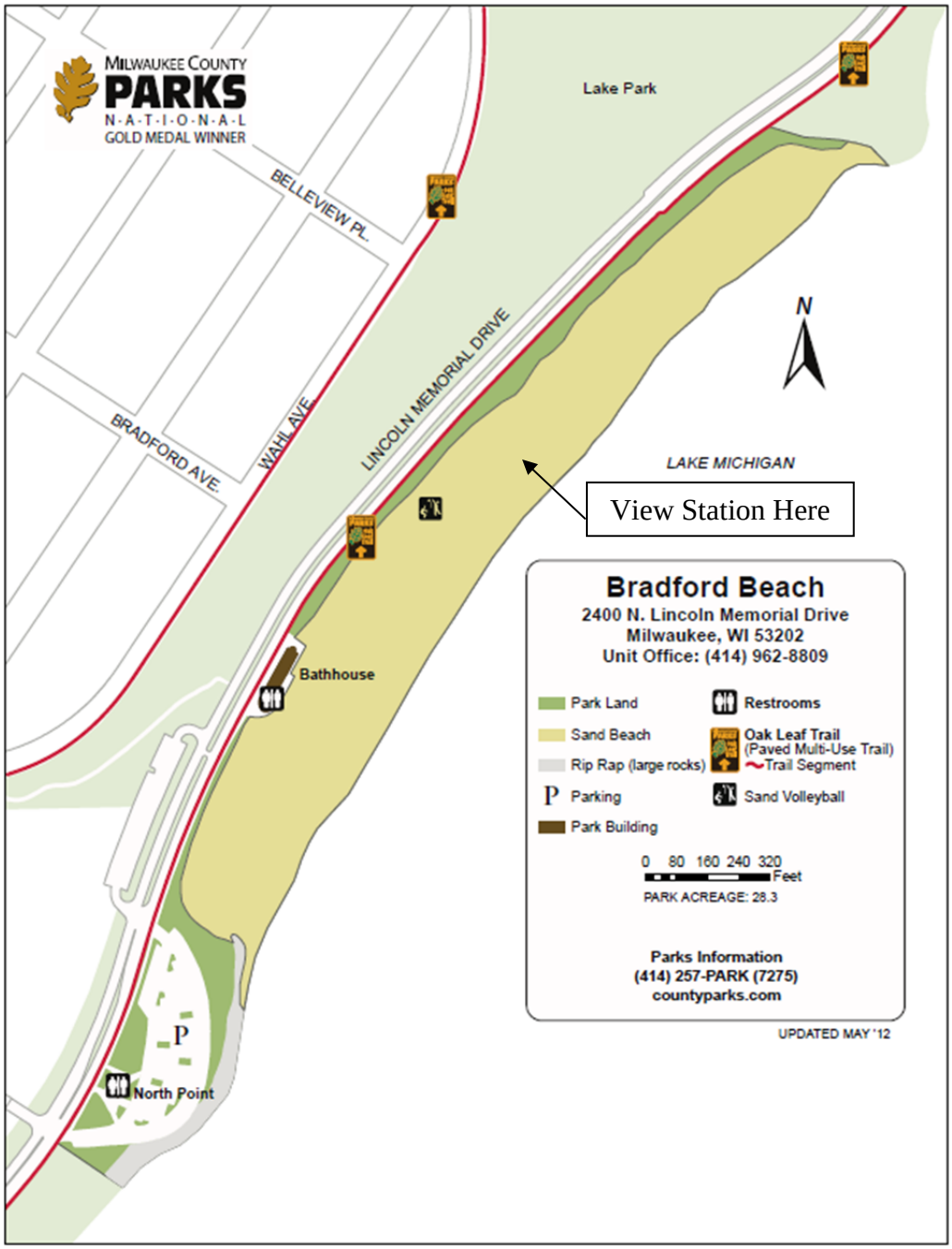


Beach/Lakeshore – Bradford Beach Station

Description: This site is located along the lakeshore at Bradford Beach. Stand near the midpoint of the beach when filling out the data form.

Parking: Street parking is available along Lincoln Memorial Drive to the north of the beach and in a lot across Lincoln Memorial Drive to the south of the beach.

Map:



Beach/Lakeshore – South Shore Beach Station

Description: This site is located along the lakeshore at South Shore Park. Stand on the gravel path on the rock jetty between the playground and the rocky beach when filling out the data form.

Parking: Street parking is available along South Shore Drive.

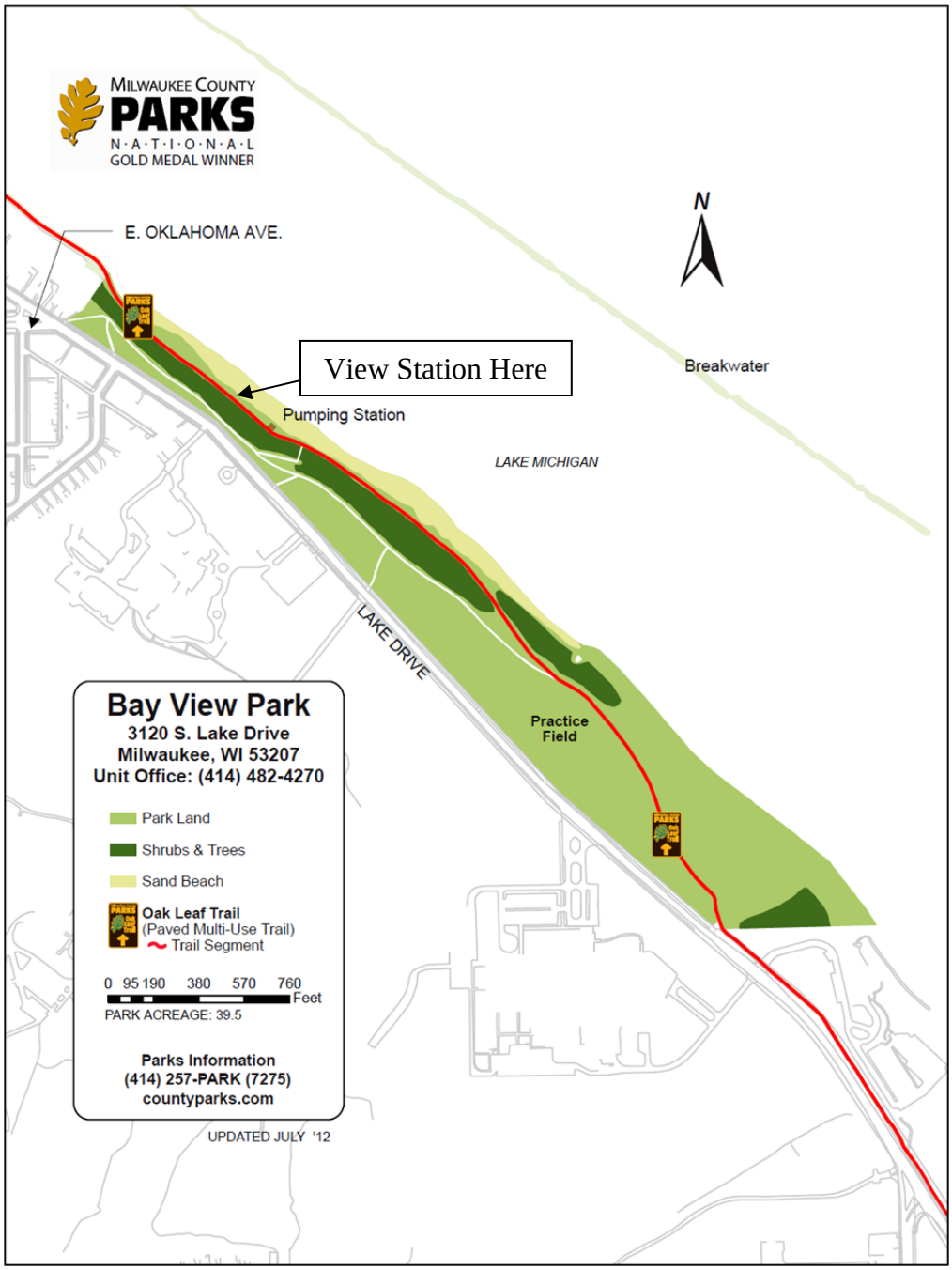
Map:

Beach/Lakeshore – Bay View Beach Station

Description: This site is located along the lakeshore at Bay View Park. Stand near the white post next to the trail at the bottom of the hill when filling out the data form.

Parking: Street parking is available along Lake Drive.

Map:



Milwaukee Volunteer Aesthetics Monitoring Data Sheet

Please answer all questions on the datasheet completely and to the best of your ability.
DNR cannot use incomplete data sheets in station data analysis.

If you have questions or to return this survey, please contact <insert contractor's name and contact info>

Form revision date: 02/11/15

1. Your name:		**2. Station name:**	
3. Monitoring date:	m m / d d / y y	**4. Start time (include AM/PM):**	
5. Water conditions:	Calm	Slight movement	Moderate flow or waves	Rough or fast flowing
6. Water level:	High	Normal	Low

Overall aesthetic impression of site

7. Overall, how aesthetically pleasing do you find the site?

Circle one of the following:	**Very pleasing**	**Somewhat pleasing**	**Neither pleasing nor displeasing**	**Somewhat displeasing**	**Very displeasing**

Please describe. List any factors that make it pleasing or not pleasing.

Objectionable deposits in/characteristics of the water

8a. Is the color or clarity of the water unattractive?

Yes **No**

If yes, please describe:

8b. If yes to 8a, does the unattractive water color or clarity prevent you from accessing, enjoying, or using the water?

Yes **No**

9. For water color and clarity, please circle the answer choice that best describes the present appearance. For water surface, please circle any applicable attributes.

A. Water Color:	Colorless	Red	Green	Brown	Other (please indicate)_____
B. Water Clarity:	Completely clear	Fairly clear	Fairly cloudy	Completely cloudy	
C. Water Surface: (Circle all that apply)	Normal	Oily sheen	Foamy	Floating aquatic plants	
	Natural debris	Neon green sheen	Other (please indicate)_____		

10a. Is there floating or submerged garbage present in the water?

Yes **No**

If yes, circle visible item(s):

Building materials	Medical items	Household waste	Sewage-related litter	
Food-related litter	Fishing-related litter	Other (please indicate)_____		

10b. If yes to 10a, does the garbage in the water prevent you from accessing, enjoying, or using the water?

Yes **No**

11a. Are any other substances present in the water that are not specifically mentioned on this form?

Yes **No**

If yes, list what:

11b. If yes to 11a, do these other substances in the water prevent you from accessing, enjoying, or using the water?

Yes **No**

12a. Is there garbage along the shoreline?

	Yes	No

If yes, circle type(s):

Building materials | Medical items | Household waste | Sewage-related litter

Food-related litter | Fishing-related litter | Other (please indicate)_____

12b. If yes to 12a, does the shoreline garbage prevent you from accessing, enjoying, or using the water?

Yes	No

13a. Along the shoreline, are there problem animals or problems caused by animals?

Yes	No

If yes, list type(s):

13b. If yes to 13a, do these animal-related problems prevent you from accessing, enjoying, or using the water?

Yes	No

14a. Is there nuisance vegetation along the shoreline?

Yes	No

If yes, list type and amount if known:

14b. If yes to 14a, does this nuisance vegetation prevent you from accessing, enjoying, or using the water?

Yes	No

15a. Are there any other shoreline substances that are not specifically mentioned on this form ?

Yes	No

If yes, list type(s):

15b. Do these other shoreline substances prevent you from accessing, enjoying, or using the water?

Yes	No

Objectionable deposits on the shoreline

16. Have you previously evaluated this station? Yes No

If you have previously evaluated this station, what changes if any have you noticed in the aesthetic quality of the water or along the shoreline since your last visit?

Comments: Please include anything else you thought should be reported while completing this survey.

Additional feedback

17. END TIME:

For volunteer coordinator/DNR use only

Date the data sheet was reviewed by DNR:		**Check box if data sheet meets quality control requirements** ☐
Aesthetic impression score (for DNR use only):		
Assessment score (for DNR use only):		

QA/QC

Aesthetics Monitoring Volunteer Information

Name _____ Date of birth: _____

Address _____

City, State, Zip _____

County _____ How long have you lived in the county? _____

Phone Number _____

E-mail _____

Attended training by _____ on _____
Trainer's Name Date

Photo Release

I agree that any photos or video taken of me while participating in a volunteer monitoring activity may be used by the State of Wisconsin, its agencies, and its subdivisions in brochures, news articles, websites, and other media sources.

_____ _____
Signature of participant Date

_____ _____
Signature of parent or guardian (if under 18 years old) Date

Volunteer Aesthetics Monitoring – Datasheet Tips

Purpose of data collection: This information will be used by DNR to determine if aesthetics is impaired in specific locations and overall for the <insert AOC name>. The information that you collect may also be used to determine whether specific actions could or should be carried out at specific stations to improve their appearance.

Due to the subjective nature of appearance**, it is necessary that you complete <u>all</u> questions on the form in a way that will be easy for another person to understand what your impression of the station is.**

For all questions, please indicate the answer choice or choices that you think best describes the conditions at the station while you are there. Keep in mind that we're interested in what you think, and that for many of these questions, there isn't a "correct" answer.

Please refrain from double counting things you observe at the station (see question-specific advice below).

Think of the datasheet as a way of letting DNR know if there are things that bother you about the appearance of the water and adjacent area at this station. To do this, you'll go through a series of questions that asks you about whether particular items or characteristics are present, and whether they prevent you from being able to access, use, or enjoy the water.

The following are tips that are specific to particular issues that have come up during monitoring.

Q1. Your name

One person; one data sheet. Because of the subjectivity of most of the questions, only one person may fill out a datasheet. If there are multiple people present at the site, please fill out separate datasheets and don't consult each other or compare answers while you are filling out the forms. The answers on the form should reflect your own individual perception of the station.

Q2. Station Name/Location

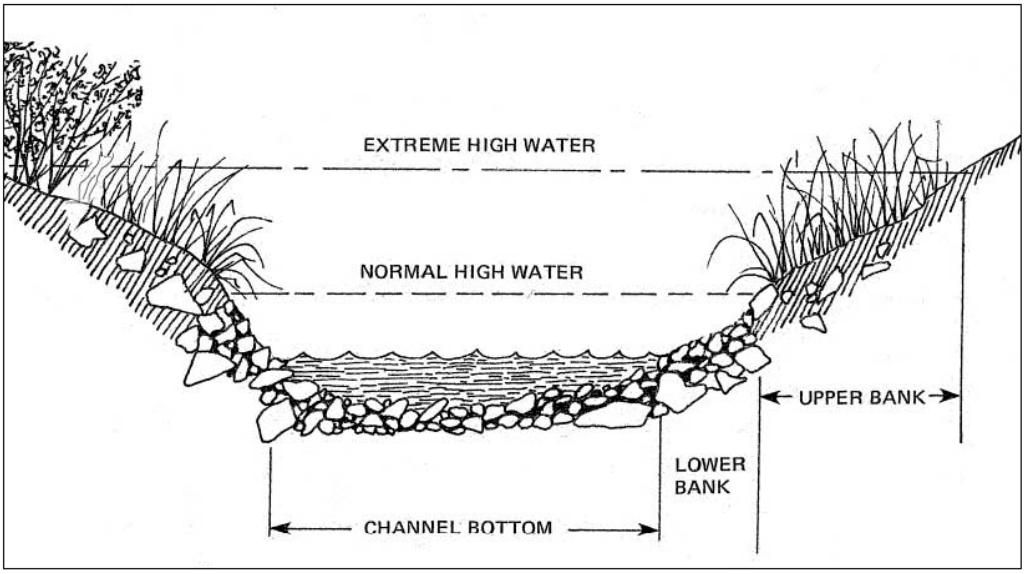
The station name you fill out on the sheet must be one of the designated stations for monitoring. The volunteer coordinator should have provided you with this information during the training you received.

Q6. Water level

Some things consider when answering this question:

- Look to see if terrestrial vegetation along banks is submerged. The terrestrial vegetation will end at the normal high water mark.

- Look for water stains on rocks or bridge abutments. Water will stain rocks if it flows over or by them for an extended period of time. If you see stains above the level of water in the stream during your visit, the level is likely low.



This diagram shows a cross section of a typical streambank, demarcating the upper and lower banks.

Q10a and Q12a. Floating or submerged garbage and shoreline garbage

Below are some examples of the types of items that would be included in the categories that are listed on the data sheet.

Type	**Building materials**	**Medical items**	**Household waste**	**Sewage-related**	**Food-related litter**	**Fishing-related**	**Other**
Example	Pieces of wood, siding	Syringes	Household trash, plastic bags	Condoms, tampons	Food packing, beverage containers	Fishing line, nets, lures	Anything else

Q11 and Q15. Other substances

Please use these questions to tell us about anything else that hasn't been captured in your responses to the other questions, especially if it blocks your ability to access or enjoy the water. However, PLEASE DON'T LIST THE SAME ISSUE TWICE ON THE DATA SHEET! This is what we mean by "double counting."

Once you have filled out your data sheet, double check to make sure it is complete. Please return your completed forms to the volunteer coordinator as soon as possible—ideally within a month of completion.

Thank You!

Volunteer Aesthetics Monitoring Data Sheet Scoring Key

Please answer all questions on the datasheet completely and to the best of your ability.
DNR cannot use incomplete data sheets in station data analysis.

If you have questions or to return this survey, please contact <insert contractor's name and contact info>

Form revision date: 02/11/15

1. Your name:		**2. Station name:**	
3. Monitoring date:	m m / d d / y y	**4. Start time (include AM/PM):**	
5. Water conditions:	Calm	Slight movement	Moderate flow or waves	Rough or fast flowing
6. Water level:	High	Normal	Low

Overall aesthetic impression of site

7. Overall, how aesthetically pleasing do you find the site?

Circle one of the following:

Very pleasing (0)	**Somewhat pleasing (1)**	**Neither pleasing nor displeasing (2)**	**Somewhat displeasing (3)**	**Very displeasing (4)**

Please describe. List any factors that make it pleasing or not pleasing.

Objectionable deposits in/characteristics of the water

8a. Is the color or clarity of the water unattractive?

Yes	**No**

If yes, please describe:

8b. If yes to 8a, does the unattractive water color or clarity prevent you from accessing, enjoying, or using the water?

Yes (1)	**No (0)**

9. Please describe the characteristics of the water during this particular visit.

A. Water Color:	Colorless	Red	Green	Brown	Other (please indicate)_____
B. Water Clarity:	Completely clear	Fairly clear	Fairly cloudy	Completely cloudy	
C. Water Surface: (Choose all that apply)	Normal	Oily sheen	Foamy	Floating aquatic plants	
	Natural debris	Neon green sheen	Other (please indicate)_____		

10a. Is there floating or submerged garbage present in the water?

Yes	**No**

If yes, circle visible item(s):

Building materials	Medical items	Household waste	Sewage-related litter
Food-related litter	Fishing-related litter	Other (please indicate)_____	

10b. If yes to 10a, does the garbage in the water prevent you from accessing, enjoying, or using the water?

Yes (1)	**No (0)**

11a. Are any other substances present in the water that are not specifically mentioned on this form?

Yes	**No**

If yes, list what:

11b. If yes to 11a, do these other substances in the water prevent you from accessing, enjoying, or using the water?

Yes (1)	**No (0)**

12a. Is there garbage along the shoreline?

	Yes	No
If yes, circle type(s):		

Building materials | Medical items | Household waste | Sewage-related litter

Food-related litter | Fishing-related litter | Other (please indicate)_____

12b. If yes to 12a, does the shoreline garbage prevent you from accessing, enjoying, or using the water?

Yes (1)	No (0)

13a. Along the shoreline, are there problem animals or problems caused by animals?

	Yes	No
If yes, list type(s):		

13b. If yes to 13a, do these animal-related problems prevent you from accessing, enjoying, or using the water?

Yes (1)	No (0)

14a. Is there nuisance vegetation along the shoreline?

	Yes	No
If yes, list type and amount if known:		

14b. If yes to 14a, does this nuisance vegetation prevent you from accessing, enjoying, or using the water?

	Yes (1)	No (0)
If yes, list type(s):		

15a. Are there any other shoreline substances that are not specifically mentioned on this form ?

	Yes	No
If yes, please type(s):		

15b. Do these other shoreline substances prevent you from accessing, enjoying, or using the water?

Yes (1)	No (0)

Objectionable deposits on the shoreline

16. Have you previously evaluated this station?	Yes	No
If you have previously evaluated this station, what changes if any have you noticed in the aesthetic quality of the water or along the shoreline since your last visit?		
Comments: Please include anything else you thought should be reported while completing this survey.		

Additional feedback

17. END TIME:

For volunteer coordinator/DNR use only

Date the data sheet was reviewed by <contractor>:		**Check box if data sheet meets quality control requirements** ☐
Aesthetic impression score (for DNR use only):		
Assessment score (for DNR use only):		

QA/QC

Appendix G. Memo: Beneficial Use Impairment: Degradation of Aesthetics – MKE Data Analysis

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 3 August 2021

TO: Office of Great Waters, OG/3

FROM: Ben Beardmore, Analysis Services, EA/7

SUBJECT: Beneficial Use Impairment: Degradation of Aesthetics – MKE data analysis

In July 2021, the Office of Great Waters asked the Analysis Services Section to review and address some methodological concerns raised by reviewers of the draft Lower Green Bay and Fox River Area of Concern Beneficial Use Impairment Removal Recommendation. While the above concerns were directed towards the Lower Green Bay and Fox River Area of Concern, the same methodology was also applied in the Milwaukee Area of Concern (AOC). This memo responds to the request and presents additional analyses to address the reviewers' concerns.

The concerns raised by reviewers included the following:

1. Appropriateness of the questions used in the evaluation rubric. Concerns center on ambiguous language (e.g., "use the water") and questions that include multiple elements for interpretation ("make the area unpleasant *or* block your ability to access *or* use the water"), which make interpretation of results difficult at best. Another issue of concern is that the questions target the aesthetics of conditions of the public access site rather than the water in which the Beneficial Use Impairment (BUI) is designated.
2. The potential for observers to become habituated to degraded conditions. Even if the survey represents, a random sample of observers, if those observers have been desensitized from long-term observation to degraded conditions, then any slight improvement may bias the perception of the observer.
3. Appropriateness of setting a threshold for each element at a level where it, "prevent(s) you from accessing, enjoying, or using the water." The concern was raised that preventing use of the water would require a strong enough aversion to provoke an all or none response rather than simply a diminishment of enjoyment.
4. Appropriateness of relying on averages to meet thresholds of impairment. Relying on averages would require the offending element to be frequently present at many locations and on many occasions. This concern centers on setting thresholds that make it unlikely for an AOC to be classified as not meeting the Aesthetic beneficial use.
5. Appropriateness of setting a threshold for observations of a single objectionable element of greater than 75%. Concerns were raised that objectionable conditions are conceivably additive. For example, dates in which water clarity is poor may not coincide with dates where shoreline garbage is present, i.e. the objectionable condition may vary from date to date resulting in an objectionable state more frequently than any single condition occurs.

The first of these concerns can be addressed simply by stating that the evaluation rubric was not designed to be so granular as to differentiate among uses, nor to separate impairments to access, use and enjoyment. In this case, the inclusion of multiple elements for evaluation in the question sought to broaden the applicability to ensure relevance to all observers. Rather than constraining the question to "users" of the resource, this wording also allows for "access" and "enjoyment." Regardless, concerns about question wording is somewhat moot, as the data have been collected. While the reviewers' concerns that the focus of the rubric was on aesthetics rather than the underlying conditions of impairment are relevant to the overall decision regarding the removal of the beneficial use impairment, this concern is beyond the scope of this particular evaluation, which focuses only on the aesthetic aspect of the issue.

To address the remaining concerns, some insights can be gained from additional analyses. The remainder of this memo presents the analyses conducted using the Milwaukee Area of Concern data with the anticipation that similar analyses will be forthcoming for the Lower Green Bay and Fox River AOC.

Concerns two through five have in common that they underscore the drivers of aesthetic impression ratings provided by observers. To assess the importance of these drivers, I conducted a series of Adjacent Categories Ordinal Logit regression analyses (Agresti, 1989) in which the dependent variable, the aesthetic impression rating, was predicted by different drivers. Of note is that no single model addresses all reviewer concerns, as parameters are more likely to be confounded due to correlations among the dependent variables as the number of parameters increases. Nevertheless, these types of models are useful for addressing the concern about the reliance on average ratings, because the parameters provide measures of the relative contribution of each element to a rating score, allowing one to assess the extent to which that element would improve (or reduce) the aesthetic quality depending on its starting conditions. This focus on how ratings change relative to a baseline addresses concerns about observer habituation to a particular condition by deprecating the absolute value of the rating. Furthermore, the inclusion of all 225 observers as repeated measures addresses collinearities associated with observations by a single individual, in other words, multiple ratings by the same individual are not treated as independent from one another.

Model 1

The first analysis focused on the issue of reliance on setting thresholds for each element at a level where it, "prevent(s) you from accessing, enjoying, or using the water." For this model, I included all available dependent variables as main effects. In so doing, this model accounts for variation in aesthetic ratings that can be attributed to elements that may be beyond the scope of efforts to address aesthetic impairments, such as the effects of water level, the qualities of a particular station, or whether the station had been previously evaluated by an observer.

Most attributes were entered into the model as categorical variables to provide precise point estimates rather than linear approximations. Within each attribute, all parameters are centered around a mean of zero, such that negative values indicate levels that contribute to more displeasing ratings while positive values contribute to more pleasing ratings, all else being equal (Bech and Gyrd-Hansen, 2005). Model parameters are given in Table 1, and the effect of each attribute was considered statistically significant at $p<0.05$.

The model constants trended towards negative values for higher (more pleasing) ratings, which indicate that all else being equal, the other parameters in the model all increase aesthetic ratings. That said, the constant for a "very displeasing" rating does not follow the trend in the other four values, suggesting some reluctance on the part of observers to select this extreme value. This result highlights an issue of non-extreme response bias (Liu et al., 2017). In other words, observers had a tendency to avoid the "very displeasing" rating level to a certain extent even with other factors accounted for. This bias may therefore reduce the likelihood of an impaired site meeting a threshold based on that rating.

All else being equal, the year in which the observation took place came close to meeting the criterion for statistical significance (Table 1). In other words, **the effect of time on observations was minimal**. That said, the parameters for 2016 and 2017 were negative, suggesting that if anything, observers were perhaps more critical of the aesthetic quality after the first year of the study, which is contrary to the concern that they become desensitized over time. One should note, that the insignificant terms on this attribute do not imply that there were no improvements over time, only that improvements over time can be attributed to changes in the levels of other attributes included in the model.

Table 1: Ordinal logit model to predict aesthetic impression rating (R^2=0.56)

Attributes	Levels		Beta	s.e.	Wald	p-value
Constants	Very displeasing		-0.2951	0.3495	313.2748	1.50E-66
	Somewhat displeasing		1.0819	0.1951		
	Neither pleasing nor displeasing		0.3883	0.0873		
	Somewhat pleasing		0.3671	0.1776		
	Very pleasing		-1.5423	0.3554		
YEAR		2015	0.123	0.0511	5.82	0.054
		2016	-0.0596	0.0466		
		2017	-0.0634	0.0504		
Station	Bay View Beach		0.3884	0.119	172.5051	3.80E-33
	Bradford Beach		0.6959	0.1312		
	Emmber Lane		-1.058	0.0992		
	Harley Davidson Museum		-0.0978	0.0957		
	Kinnickinnic Avenue Bridge		-0.7132	0.0896		
	Lincoln Avenue Bridge		-0.302	0.0934		
	North Avenue Pedestrian Bridge		0.324	0.1018		
	Pere Marquette Park		0.001	0.0964		
	South Shore Beach		0.7617	0.1362		
Water Level Rating	(1=Low; 2=Normal; 3=High)		0.1377	0.0528	6.7894	0.0092
Previous evaluation	No		-0.1564	0.0382	16.7849	4.20E-05
	Yes		0.1564	0.0382		
Clarity Rating	(1=Completely Cloudy; 2=Somewhat Cloudy; 3=Somewhat Clear; 4=Completely Clear)		0.1664	0.045	13.6858	0.00022
Color / clarity	Not present		0.2787	0.0556	49.3044	2.00E-11
	Present		0.1337	0.0756		
	Prevents use or enjoyment		-0.4124	0.068		
Floating/submerged garbage	Not present		0.261	0.0574	30.8825	2.00E-07
	Present		0.1585	0.0575		
	Prevents use or enjoyment		-0.4195	0.0773		
Other substance in water	Not present		0.1162	0.083	9.3307	0.0094
	Present		0.2909	0.0956		
	Prevents use or enjoyment		-0.4071	0.1484		
Garbage on shore	Not present		0.2561	0.0545	22.69	1.20E-05
	Present		-0.0576	0.0542		
	Prevents use or enjoyment		-0.1986	0.0747		
Animal-related problems	Not present		0.1459	0.0823	5.0297	0.081
	Present		-0.1038	0.0973		
	Prevents use or enjoyment		-0.0421	0.1374		
Nuisance vegetation	Not present		0.0742	0.0657	2.2183	0.33
	Present		-0.0709	0.0761		
	Prevents use or enjoyment		-0.0033	0.1022		
Other shoreline substances	Not present		0.1638	0.069	6.0371	0.049
	Present		0.0809	0.0862		
	Prevents use or enjoyment		-0.2447	0.1172		

Some attributes were included in the model to account for their effect on aesthetic impression despite being beyond the scope of any management effort. Parameters for station, water level, and previous evaluation had statistically significant effects on aesthetic ratings. The significance of the location of the observations illustrates that aesthetic impressions are place-dependent, and that considerable variation in these ratings may simply reflect invariant differences among the stations. All else being equal, higher water was associated with more pleasing ratings, and subsequent evaluations of a site tended to also result in marginally more pleasing ratings.

Having accounted for these additional influences on aesthetic impressions, the remaining attributes focus on the water clarity measures and the presence of objectionable substances recorded during the observers' evaluations. These latter attributes were recoded as categorical variables having three levels, based on being (1) absent, (2) present but not preventing access, use or enjoyment, or (3) present and preventing access, use or enjoyment. Parameter estimates can be found in Table 1. **Statistically significant issues included the water clarity measured by the observer, their identification of a color or clarity problem, floating/submerged garbage, other substances in the water, garbage on the shore, and other substances on the shore. Animal-related problems and nuisance vegetation did not meet the criterion for statistical significance.**

A concern raised by reviewers was the reliance on presence of objectionable substances at a level that prevents access, use or enjoyment, where the mere presence of an objectionable substance may result in aesthetic impairment. Figure 1 provides a visual on the relative difference in the effect of that threshold on aesthetic impression compared to the effects of simple presence of the substance or its absence. **The model does not suggest there is a "right" threshold, but illustrates that in most cases, there is no significant difference between the presence of an objectionable substance at levels that do not prevent access, use or enjoyment and the absence of the substance.** One exception to this finding, however, holds for garbage on the shoreline, for which mere presence detracts from the aesthetic rating to a similar degree as when it constrains access, use or enjoyment. As noted above, animal-related problems and nuisance vegetation show no significant differences among the three levels.

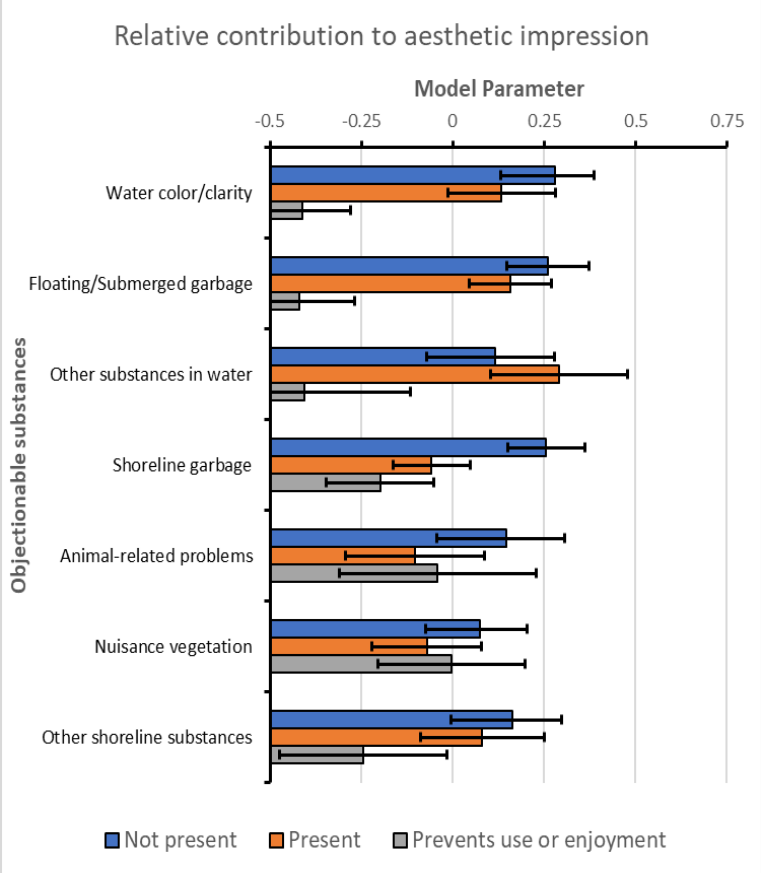


Figure 1: Model parameters for objectionable substances showing relative contributions of each level to aesthetic impression rating score.

Of direct relevance to establishing the thresholds for consideration to remove the impaired status is the weight applied to each of the objectionable substances listed. The model highlights that some substances are more important than others when considering aesthetic quality. Based on the range of parameter values within each substance, one can calculate a relative importance score which is a simplified measure of the contribution that an attribute makes to the aesthetic rating across the range of values for which it is observed (Table 2). When considering the full model, one can see that 29 percent of an observed aesthetic rating can be attributed to the model constants, which is typical of this model type, and is related to unobserved factors. Twenty percent of the rating is due to the location at which the

rating is made, with other statistically significant attributes ranging in their contributions from three percent to 7.6 percent. If focusing only on the listed objectionable substances, these values can be rescaled by redistributing the proportion of the total importance attributable to them, so they sum to 100 percent as presented in the third column of Table 2. **These finding suggest that greater emphasis on garbage and other substances both in the water and along shore, rather than animal and nuisance vegetation problems would align better with observers' impressions of water quality than would giving equal weight to each of the identified issues.**

Table 2: Relative importance of Model 1 attributes to aesthetic impression rating.

	Relative Importance	
	All model parameters	Objectionable substances
Year	2.1%	
Location	20.1%	
Water Level Rating	3.0%	
Previous Evaluation	3.5%	
Clarity Rating	5.5%	
Water color/clarity problem	7.6%	20.8%
Floating/Submerged garbage	7.5%	20.4%
Other substances in water	7.7%	21.0%
Shoreline garbage	5.0%	13.7%
Animal-related problems	2.8%	7.5%
Nuisance vegetation	1.6%	4.3%
Other shoreline substances	4.5%	12.3%
Constants	29.0%	
Total	100.0%	100.0%

Model 2

A second model was developed to focus on the issue of interactions among objectionable substances to assess the implications of these additive effects on the appropriateness of setting a threshold for observations of any single objectionable element of greater than 75%. For this model, the scores established in the draft report were used as predictors of aesthetic impression rating. In other words, if an objectionable substance was found to prevent access, use or enjoyment, it was coded as one, otherwise zero. I also included an additional attribute coded as the sum of all the scores in the model.

This simplified model, while not accounting for as many influences as the previous one, highlights the importance of the combined effects of multiple objective substances present at once. Table 3 illustrates these results. Indeed, the number of objectionable substances present *and* preventing access, use or enjoyment accounted for 28 percent of the variance observed in aesthetic ratings, compared to less than 3.3 percent of individual substances (Table 3). These findings suggest that, all else being equal, placing an emphasis on reducing occurrences where multiple objectionable substances are observed would substantially improve aesthetic impressions. That said, there is no number of substances within the available range that offers a clear point of optimality above zero. Figure 2 plots the point estimates for the total score and illustrates that while aesthetic impressions worsen as the number of objectionable substances preventing access, use, and enjoyment increases, that magnitude of the effect diminishes as the number increases. **Therefore, the greatest improvements to the aesthetic quality of a site occurs when the number of co-occurring issues is reduced to zero.** For impaired sites with multiple substances preventing access, use or enjoyment, the amount of aesthetic improvement increases more dramatically with each additional substance that is removed. These analyses do not assess whether 75 percent is an appropriate threshold. It does, however, provide information about the effect of additional substances on aesthetic impression, and thresholds may be set for individual substances at levels that reduce the likelihood of co-occurrence with other substances.

Table 3: Ordinal logit model to predict aesthetic impression rating (R^2=0.62)

Attributes		Beta	s.e.	Wald	p-value	Importance
Constants	Very Displeasing	-3.6159	0.2066	576.9679	1.50E-123	32.5%
	Somewhat Displeasing	-0.5123	0.0744			
	Neither Pleasing nor Displeasing	0.267	0.0871			
	Somewhat Pleasing	1.8931	0.0876			
	Very Pleasing	1.9682	0.0937			
Objectionable substance prevents access/use/enjoyment	Water color/clarity problem	-1.2603	0.1013	154.7673	1.60E-35	7.3%
	Floating/Submerged garbage	-1.3633	0.124	120.7837	4.30E-28	7.9%
	Other substances in water	-0.723	0.2099	11.8621	0.00057	4.2%
	Shoreline garbage	-0.8347	0.1156	52.0999	5.30E-13	4.9%
	Animal-related problems	-0.969	0.179	29.3125	6.20E-08	5.6%
	Nuisance vegetation	-0.6827	0.1511	20.4113	6.20E-06	4.0%
	Other shoreline substances	-0.9965	0.1655	36.2665	1.70E-09	5.8%
Total number present		0.5326	0.0421	159.7148	1.30E-36	27.9%

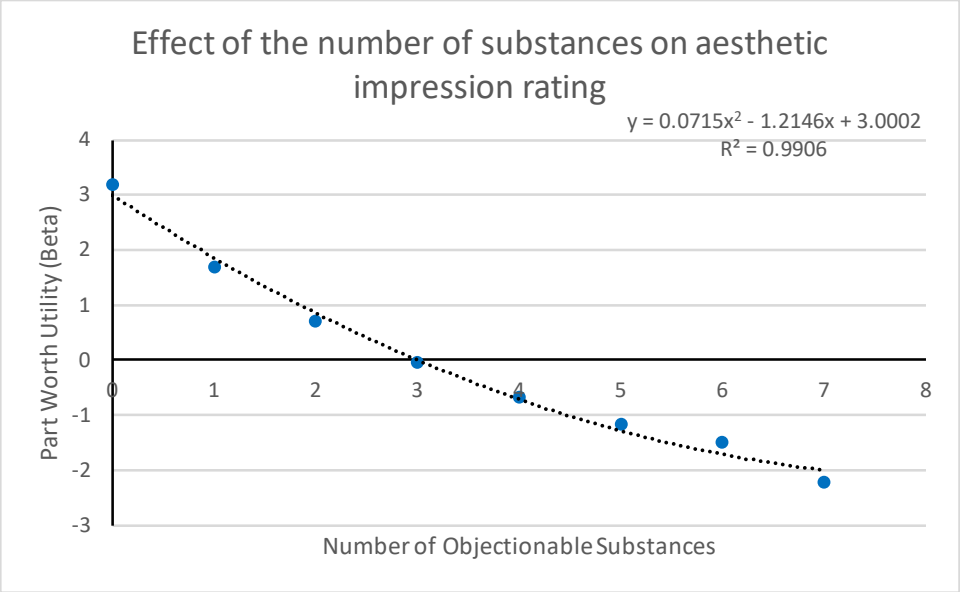


Figure 2: Point estimates of the relative contribution of the number of objectionable substances that co-occur at a site to aesthetic impression rating.

Conclusions

Reviewers raised five main concerns about the Green Bay and Lower Fox River Area of Concern Beneficial Use Impairment Removal Recommendation. The first concern centered on the questions included in the assessment form used by volunteer observers to evaluate the aesthetic conditions of each site. Overall, this concern reflects reviewers' desires for greater specificity in the constructs assessed by each question, and in so doing, broadening the scope of the assessment beyond aesthetic aspects of the impairment designation. Ultimately, however, this concern is moot for two reasons. The first reason is that the form is fit for its intended use (i.e., for volunteer assessments of aesthetic impressions.) The second is that the form provided the only data with which to assess the aesthetic component of the AOC.

The remaining concerns speak to implied assumptions about how volunteer (and public) perceptions of aesthetic qualities were considered in setting criteria used to set thresholds for removal of the BUI. The models presented in this memo tests most of these assumptions as follows:

1. Model 1 found that rather than becoming habituated to degraded conditions, all else being equal, observations where volunteers had previously evaluated the site received slightly, but statistically significantly, lower aesthetic impression ratings.
2. Model 1 also found that for objectionable substances centered in the water (color / clarity, floating/submerged garbage, and other substance in water) presence at levels associated with prevention of access, use and enjoyment had a statistically significant impact on aesthetic impression relative to their absence. For shore based objectionable substances (shoreline garbage, animal-related problems, nuisance vegetation, and other shoreline substances), significant difference were also not found between the mere presence and absence of each substance. In some cases (animal-related problems and nuisance vegetation), the substances failed to show a statistically significant effect on aesthetic impression at all. From these results, it would seem that scoring impairments based on substances impairment (i.e., prevention) of access, use or enjoyment) is a reasonable, if simple, approach. That said, the model clearly demonstrates that objectionable substances differ in their importance to the aesthetic quality of a site.
3. Model 2 demonstrated the nonlinear effect of multiple objectionable substances. As the number of substances present increases, their effects are not merely additive, but also interact to have a total effect that is greater than the sum of the individual effects. This model does not imply a specific threshold for the frequency of an objectionable substance being present to be considered a management concern, but it does imply that setting such a threshold to reduce the likelihood of a substances occurrence in concert with other objectionable substances would lead to the greatest gains in aesthetic quality.

References

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Liu, M., Harbaugh, A. G., Harring, J. R., & Hancock, G. R. (2017). The effect of extreme response and non-extreme response styles on testing measurement invariance. *Frontiers in Psychology*, *8*, 726. https://doi.org/10.3389/fpsyg.2017.00726

Appendix H. Letters of Support for BUI Removal

August 30, 2021

Brennan Dow
Milwaukee Estuary AOC Coordinator
1027 W St. Paul Avenue
Milwaukee, WI 53233

Dear Mr. Dow,

On behalf of the Community Advisory Committee (CAC), we are pleased to support Wisconsin Department of Natural Resources' (WDNR) proposal to remove the first Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC), the Degradation of Aesthetics BUI. The CAC is the recognized community voice known for synthesizing community and technical input and crafting well-informed comments on AOC projects and progress toward delisting beneficial use impairments. Our goals are to strive for environmental justice in everything we do and every AOC decision that is made; to translate AOC projects and related activities for all; to create community awareness and interest in all AOC projects; and to build a community voice in planning and decision-making relating to all AOC projects. Delisting the aesthetics impairment represents tremendous work by the community towards addressing legacy pollution and destruction of our waterways that contributed to the AOC designation in 1987. While a lot of work has been accomplished to approve the aesthetics of our AOC waterways, much work remains to ensure that our waters are fishable, swimmable, and drinkable for everyone in our community.

The Milwaukee Estuary AOC community has taken on the call to action to clean up our AOC through various federal and state water quality policies, local initiatives, and volunteer programs to improve the visual and physical water quality throughout the Milwaukee Estuary. Milwaukee Riverkeeper has been organizing spring river cleanups since 1995, which draw thousands of volunteers to dozens of sites within the AOC each year, and has engaged over 125 community groups to Adopt-a-River since 2017. MMSD operates the Lynyrd Skimmer, which cleans up floatable trash from the waterways in the AOC. The Harbor District is working on designing a trash wheel, which will mechanically remove floatable trash from the lower Kinnickinnic River in the near future.

In addition, the CAC, Milwaukee Riverkeeper and Urban Ecology Center worked with WDNR and other local stakeholders to implement a volunteer aesthetics monitoring program from 2015-2017 within the original AOC boundary, where a diverse group of community members assessed the visual condition and water quality of AOC rivers and Lake beaches. The CAC was involved in ensuring that the community was engaged and involved in the process.

The WDNR shared these aesthetic survey findings with the Milwaukee Estuary AOC CAC and other local stakeholders over the last several years. The CAC supports WDNR in their determination that the evidence supports the removal of the Milwaukee Estuary AOC's

Degradation of Aesthetics BUI. We appreciate past and ongoing efforts by many AOC partners and community members who have contributed to this delisting, and will continue to contribute their time and effort in improving the aesthetics of the AOC in the future. The CAC is dedicated to ensuring that we clean up AOC waters, improve swimming conditions at local beaches, restore ecosystems for fish and aquatic life, and ensure community engagement throughout the process.

Respectfully,
Demetria Smith
Demetria Smith
Committee Chair
The Milwaukee River Estuary Area of Concern Community Advisory Committee

August 16, 2021

Brennan Dow
Milwaukee Estuary and Sheboygan River
Area of Concern Coordinator
Office of Great Waters – Lake Michigan, Lake Superior
and Mississippi River
Wisconsin Department of Natural Resources
1027 West St. Paul Avenue
Milwaukee, WI 53233

Dear Mr. Dow:

The Management Action Implementation Team (MAIT) is pleased to join the Wisconsin Department of Natural Resources in initiating the process to remove the first Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC), the Degradation of Aesthetics BUI. The MAIT partners have a shared vision of AOC restoration and an approach of collaboration. It is the intent of all to complete projects that benefit and improve the AOC, Lake Michigan and in turn the community.

We concur that the evidence supports the removal of the Milwaukee Estuary AOC's Degradation of Aesthetics BUI. We appreciate the previous and ongoing efforts by many partners who have contributed and will continue to contribute their time and effort in improving the aesthetics of the AOC and Milwaukee River Basin through advocacy, restoration, and education. The MAIT looks forward to the removal of this BUI.

Sincerely,

Kevin L. Shafer
MAIT Chair
Executive Director, Milwaukee Metropolitan Sewerage District

Vicki Elkin
MAIT Vice Chair
Executive Director, Fund for Lake Michigan

August 17, 2021

Brennan Dow
Milwaukee Estuary AOC Coordinator
1027 W St. Paul Avenue
Milwaukee, WI 53233

Dear Mr. Dow,

On behalf of Milwaukee Riverkeeper, we are pleased to join the Wisconsin Department of Natural Resources (WDNR) in initiating the process to remove the first Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC), the Degradation of Aesthetics BUI. Milwaukee Riverkeeper has worked on efforts to clean-up the Milwaukee AOC since we were founded as an organization in 1995. This monumental achievement represents tremendous work by the community towards addressing historical modifications and legacy pollution of our waterways that contributed to the AOC designation in 1987.

The Milwaukee Estuary AOC community has taken on the call to action to clean up our AOC through various federal and state water quality policies, local initiatives, and volunteer programs to improve the visual and physical water quality throughout the Milwaukee Estuary. Milwaukee Riverkeeper has been organizing spring river cleanups since 1995, which draw thousands of volunteers to dozens of sites within the AOC each year. In 2017, Riverkeeper started an Adopt-a-River program, with financial support from MMSD, to allow for more regular cleanup of our area waters by local neighborhood groups, community organizations, and businesses. Riverkeeper has also worked on local efforts to address nuisance trash in different areas of our river system where engineered changes led to trash accumulation. We led efforts to fundraise for and construct a trash barrier and canoe launch at an old turning basin at the northwest corner of where the Emmber Lane Bridge crosses over the Menomonee River.

Milwaukee Riverkeeper also worked with WDNR and other local stakeholders to implement a volunteer aesthetics monitoring program from 2015-2017 within the original AOC boundary. We recruited a diverse group of community members to assess the visual condition and water quality of our rivers and Lake beaches. It was important to engage the community in gathering scientific data to support the expert opinions of state and federal staff, and to measure the impact of projects aimed at reducing sewage overflows and trash loading to local waterways.

The WDNR shared these aesthetic survey findings with the Milwaukee Estuary AOC Community Advisory Committee (CAC) and other local stakeholders. Milwaukee Riverkeeper concurs that

the evidence supports the removal of the Milwaukee Estuary AOC's Degradation of Aesthetics BUI. We appreciate past and ongoing efforts by many of our volunteers and partners who have contributed to this delisting, and will continue to contribute their time and effort in improving the aesthetics of the AOC and Milwaukee River Basin in the future through advocacy, restoration, and education. Milwaukee Riverkeeper looks forward to celebrating the removal of this BUI.

Sincerely,

Cheryl Nenn
Riverkeeper

Cc: Jennifer Bolger Breceda, Executive Director

MMSD
PARTNERS FOR A CLEANER ENVIRONMENT

Kevin L. Shafer, P.E.
Executive Director

August 9, 2021

Brennan Dow
Milwaukee Estuary and Sheboygan River
Area of Concern Coordinator
Office of Great Waters – Lake Michigan, Lake Superior
and Mississippi River
Wisconsin Department of Natural Resources
1027 West St. Paul Avenue
Milwaukee, WI 53233

Dear Mr. Dow:

The Milwaukee Metropolitan Sewerage District (MMSD) is pleased to join the Wisconsin Department of Natural Resources in initiating the process to remove the first Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC), the Degradation of Aesthetics BUI. This achievement represents significant progress towards addressing historical modifications and legacy pollutants that contributed to the AOC designation in 1987.

We concur that the evidence supports the removal of the Milwaukee Estuary AOC's Degradation of Aesthetics BUI. We appreciate the previous and ongoing efforts by many partners who have contributed and will continue to contribute their time and effort in improving the aesthetics of the AOC and Milwaukee River Basin through advocacy, restoration, and education. MMSD looks forward to the removal of this BUI.

Sincerely,

Kevin L. Shafer, P.E.
Executive Director

August 16, 2021

Milwaukee County Parks
9480 Watertown Plank Rd.
Wauwatosa, WI 53226
(414) 257-PARK

Brennan Dow
Milwaukee Estuary AOC Coordinator
1027 W St. Paul Avenue
Milwaukee, WI 53233

Dear Mr. Dow,

Milwaukee County Parks is pleased to join the Wisconsin Department of Natural Resources (WDNR) in initiating the process to remove the first Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC), the Degradation of Aesthetics BUI. This monumental achievement represents the amount of progress made towards addressing historical modifications and legacy pollutants that contributed to the AOC designation in 1987.

The Milwaukee Estuary AOC community has taken on the call to action through various federal and state water quality policies, local initiatives, and volunteer programs to improve the visual and physical water quality throughout the Milwaukee Estuary. The WDNR and local stakeholders initiated a volunteer aesthetics monitoring program from 2015-2017 focusing on areas within the original AOC boundary to assess aesthetic conditions.

The WDNR shared these findings with the Milwaukee Estuary AOC Community Advisory Committee (CAC) and local stakeholders. We concur that the evidence supports the removal of the Milwaukee Estuary AOC's Degradation of Aesthetics BUI. We appreciate the previous and ongoing efforts by many partners who have contributed and will continue to contribute their time and effort in improving the aesthetics of the AOC and Milwaukee River Basin through advocacy, restoration, and education. Milwaukee County Parks looks forward to celebrating the removal of this BUI.

Sincerely,

Guy Smith

Guy Smith
Executive Director
Milwaukee County Parks

City of Milwaukee

Department of City Development
City Plan Commission
Redevelopment Authority of the City of Milwaukee
Neighborhood Improvement Development Corporation

Lafayette L. Crump
Commissioner

Vanessa L. Koster
Deputy Commissioner

August 16, 2021

Brennan Dow
Milwaukee Estuary AOC Coordinator
1027 W St. Paul Avenue
Milwaukee, WI 53233

Dear Mr. Dow,

The City of Milwaukee is pleased to support the Wisconsin Department of Natural Resources (WDNR) request to remove the first Beneficial Use Impairment (BUI) from the Milwaukee Estuary Area of Concern (AOC), the Degradation of Aesthetics BUI. This monumental achievement represents significant progress towards addressing historical modifications and legacy pollutants that contributed to the AOC designation in 1987.

The Milwaukee Estuary AOC community has worked diligently through various federal and state water quality policies, local initiatives, and volunteer programs to improve the visual and physical water quality throughout the Milwaukee Estuary. Specifically, the WDNR and local stakeholders initiated a volunteer aesthetics monitoring program from 2015-2017 focusing on areas within the original AOC boundary to assess aesthetic conditions.

The WDNR shared these findings with the Milwaukee Estuary AOC Community Advisory Committee (CAC) and local stakeholders. The City of Milwaukee concurs that the evidence supports the removal of the Milwaukee Estuary AOC's Degradation of Aesthetics BUI. We appreciate the previous and ongoing efforts by many partners who have contributed and will continue to contribute their time and effort in improving the aesthetics of the AOC and Milwaukee River Basin through advocacy, restoration, and education. The City of Milwaukee looks forward to celebrating the removal of this BUI.

Sincerely,

David P. Misky
Assistant Executive Director
Department of City Development

Appendix I. GovDelivery Announcement for Public Comment Period

Milwaukee Estuary Area Of Concern

DNR Seeking Public Comments On Proposal To Remove Impairment In Milwaukee Estuary AOC

Comments Due June 21

Milwaukee Riverkeeper volunteers at an Adopt-A-River cleanup event on the Kinnickinnic River, using a crane to remove decades of heavy trash in the lower KK River. / Photo Credit: Cheryl Nenn, Milwaukee Riverkeeper

The Wisconsin Department of Natural Resources (DNR) is seeking public comments on its recommendation to remove the Degradation of Aesthetics Beneficial Use Impairment from the Milwaukee Estuary Area of Concern.

After the Milwaukee Estuary was listed as an Area of Concern (AOC) in 1987, the Remedial Action Plan identified "degradation of aesthetics" as one of 11 environmental problems, called beneficial use impairments in the AOC program.

Degraded aesthetics was included among the impairments due to poor visual quality of the polluted waterways and over development along the estuary. Combined sewer overflows and urban runoff carried debris, trash, oil and grease into waterways. Many stream beds were straightened and lined with concrete and communities grew without consideration for green spaces, resulting in over development and limited shoreline access and public spaces. Additional factors included odor problems attributed to the decomposition of organic material and emissions from industries. These factors had limited recreational use and diminished scenic value of the waters within the AOC boundaries.

To date, several federal and state water quality regulations, local initiatives and volunteer programs have been implemented to reduce pollution and improve water quality throughout the Milwaukee Estuary. For example, the federal Clean Water Act and regional and local water quality management plans are in place to regulate pollution from industrial and urban sources. Additionally, planning and redevelopment activities by the City of Milwaukee, Milwaukee County, Milwaukee Metropolitan Sewerage District (MMSD) and others have improved the visual appearance of waterways in the AOC boundaries by removing concrete in natural streambeds, increasing public green space and recreational opportunities with shoreline redevelopment, and restoring fish and wildlife habitats.

Another example of aesthetic improvements is MMSD's Deep Tunnel System, which captures and stores 98.4% of stormwater and wastewater entering the regional sewer system until it can be treated. This has significantly reduced sewer overflows and reduced the amount of trash that reaches waterways. Municipalities also have trash collector devices in place to remove debris from waterways.

An aesthetics monitoring program was conducted over several years by partners in the AOC to collect water quality data and to gauge public perceptions of aesthetic values through surveys. This data was evaluated, and results showed that the aesthetics of the AOC have improved. Results showed that removal targets are being met and multiple lines of evidence support a recommendation to remove this impairment from the AOC. The results of monitoring data and support from a team of technical experts, agency partners and local stakeholders support this recommendation.

The removal recommendation document is available for public review and comments now until **June 21, 2021** at this link.

Send questions and comments to:
Brennan Dow, Milwaukee Estuary AOC Coordinator

Brennan.Dow@wisconsin.gov
920-366-1371 (cell)

AOC Background

The Milwaukee Estuary was designated as one of 43 sites on the Great Lakes with significant environmental damage by the United States and Canada under the Great Lakes Water Quality Agreement. The AOC boundaries include polluted reaches of the Milwaukee, Menomonee and Kinnickinnic Rivers; the inner and outer harbors; and the nearshore waters of Lake Michigan, bounded by a line extending north from Sheridan Park to the city of Milwaukee's Linnwood water intake.

Once all impairments have met their targets and are removed, the Milwaukee Estuary can be removed from the list of most polluted sites on the Great Lakes. Federal Great Lakes Restoration Initiative funding, first launched in 2010, helps AOCs clean up pollution and restore waterways.