

**Remedial Action Plan
Stage 2 Addendum**

Niagara River Area of Concern

January 2012

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Addendum to Stage 2 Remedial Action Plan Niagara River Area of Concern

I. Purpose

This document briefly (a) outlines the existing Beneficial Use Impairments (BUIs), the purported causes and potential remedies as described in the Remedial Action Plan's (RAP) Combined Stage 1/2 Report published September 1994, and (b) tentatively identifies a series of project-specific actions, either regulatory or non-regulatory, needed to accomplish the remedies and to ultimately justify re-designation of the BUI.

This document will be used to assist government and non-government organizations in focusing their efforts and funding opportunities on the most immediate "action-oriented" projects needed within the AOC, or its contributing watershed. Because this document has not undergone an extensive public consultation process, it should be considered as a preliminary planning piece of the overall RAP, subject to future changes as needed. In addition, this document will be used to support a more thorough strategic re-evaluation and planning process, currently underway in each AOC, in order to prioritize implementation projects specifically designed to address BUI removal targets, and to direct public and non-public support as appropriate.

II. RAP Management, Coordination and Stewardship

The New York State Department of Environmental Conservation (DEC) is currently funded via USEPA to coordinate the Niagara River RAP through the end of 2014. However because the contract was only partially funded, additional funding will be needed to continue the coordination beyond 2012. Contact person is Mark Filipski at (716) 851-7130.

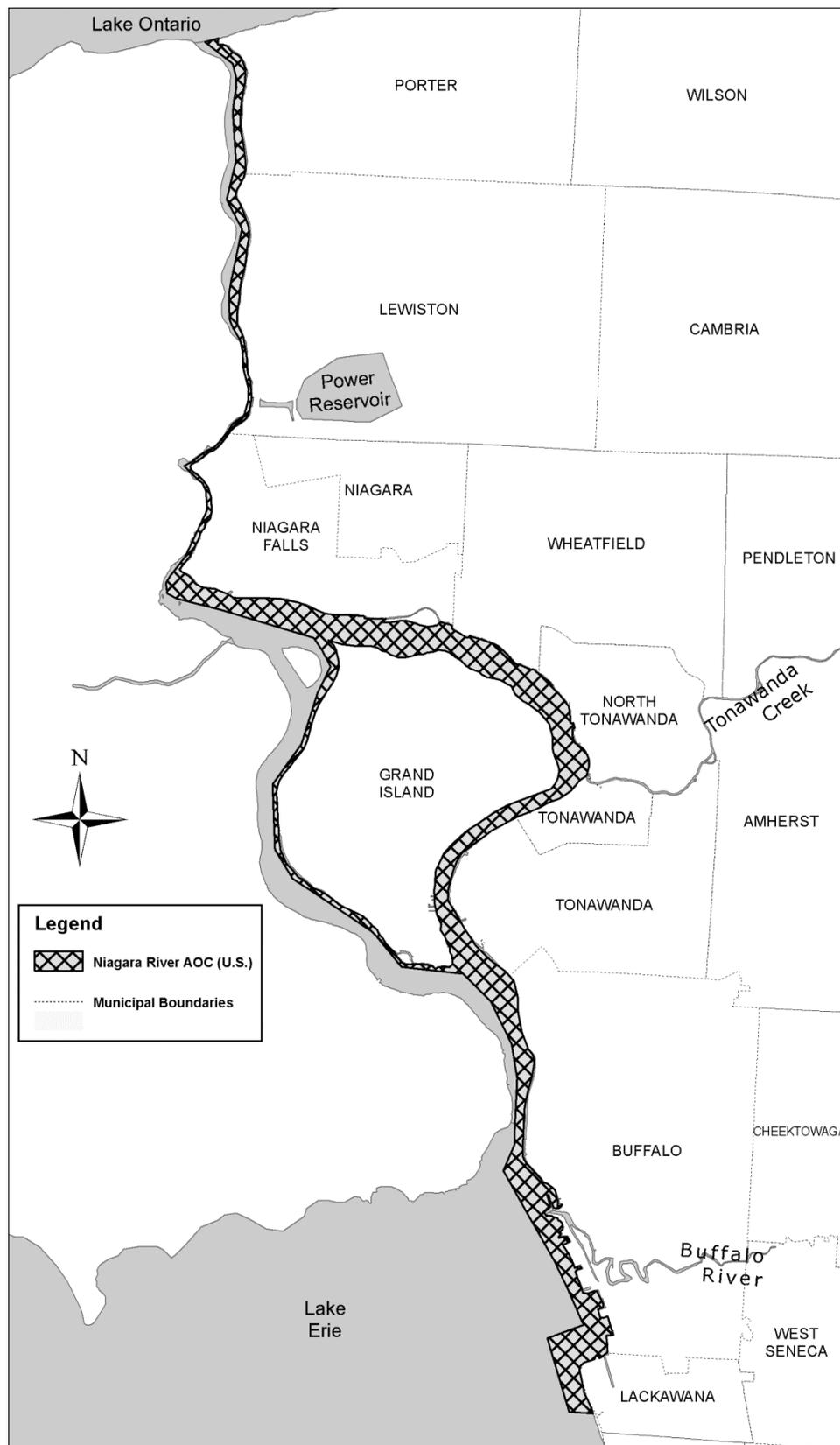
Because the Niagara River AOC is a binational AOC, the DEC is coordinating technical assessments and regulatory efforts with the Canadian Niagara River RAP managers.

The following efforts will support and enhance the ability to address the Niagara River's beneficial use impairments.

- The "Four Parties" (Environment Canada, U. S. Environmental Protection Agency Region II, Ontario Ministry of the Environment, and the New York State Department of Environmental Conservation) must consider the future direction of the very successful Niagara River Toxics Management Plan (NRTMP)¹ so that it can continue to cost-effectively provide relevant data on concentrations of chemicals in the river and assist in tracking down sources when necessary.
- Stewardship of data on the Niagara River must be enhanced. A repository of all known data would increase the efficiency of future analyses. Resources are also needed to conduct data synthesis and then make correlations to the beneficial use impairment indicators.

¹ The NRTMP is operated by Environment Canada under a bi-national agreement between the Four Parties. It involves the ongoing collection and analysis of water and suspended solids samples at the head (Fort Erie) and the mouth (Niagara-on-the-Lake) of the Niagara River. Its purpose is to measure concentrations of chemicals in the river in order to determine loads of contaminants and report on trends.

Figure 1 – U.S. Portion of the Niagara River Area of Concern



- Efforts are needed to increase public interest and support for the RAP, and to broaden representation on the Remedial Advisory Committee.
- Establishment of a definite inland boundary for the Area of Concern should be considered.

III. Current Beneficial Use Impairments, Likely Causes, Planned Remedies, Specific Actions

Introduction

For the seven beneficial use impairments, this section presents the known or suspected causes and the specific actions necessary to address each cause. Two sources of contamination, hazardous waste sites and sediments, contribute to many of the causes of BUIs (see Table 1). Appendix A provides additional information regarding actions to address these two sources.

The Niagara River RAP originally assigned a status of “likely impaired” to two of the BUIs, Degradation of Fish and Wildlife Populations and Bird or Animal Deformities or Reproductive Problems. As of December 2011, the status of these two BUIs has been changed to “impaired.” This Stage 2 Addendum reflects that change.

Definitions

The development of the Niagara River RAP included the identification of specific **Goals** for the River.

Impairments prevent attainment of the goals. (In this sense, “impairments” may not exactly correspond to the 14 Beneficial Use Impairments listed in the Great Lakes Water Quality Agreement, some of which are more accurately described as indicators of an impairment.)

Each impairment has one or more **Causes**. A cause may be a specific pollutant such as a chemical substance, or a condition such as a lack of suitable habitat.

Each cause will have one or more **Sources**. This is usually the actual source of a pollutant, but when a specific condition is identified as a cause, it is the origin of the condition.

“Specific goals of the Remedial Action Plan are the protection and enhancement of human health, fish and wildlife, aesthetics and recreation, and the economy of the Niagara River Area of Concern.”

– Niagara River RAP

Table 1 – Beneficial Use Impairment Causes and Sources Identified in the 1994 RAP

Impairment	Causes	Known Sources	Potential Sources
Restrictions on Fish and Wildlife Consumption	PCBs, mirex, chlordane, dioxin and dibenzofuran <i>(Note: current fish consumption advisories no longer list chlordane and dibenzofuran as chemicals of concern.)</i>	-Embayment and tributary sediments -Hazardous waste sites	-Inflow to Niagara River -Bottom sediments -Groundwater
Fish tumors and other deformities	Polynuclear aromatic hydrocarbons (PAHs)	-Inflow to Niagara River -Hazardous waste sites	-Bottom sediments -Combined sewer overflows -Groundwater
Degradation of benthos	PCBs, Hexachlorocyclohexane (BHC)	-Embayment and tributary sediments -Hazardous waste sites	-Inflow to Niagara River -Bottom sediments -Combined sewer overflows -Groundwater
Restrictions on dredging	Metals and cyanide	-Bottom sediments	-Inflow to Niagara River -Hazardous waste sites -Combined sewer overflows -Groundwater -Urban runoff -Soil Erosion
Loss of fish and Wildlife habitat	Physical disturbance	-Bulkheading -Filling -Marine development -Water diversion -Tributary migration barriers -Loss of shoreline forest cover	

“Likely Impaired” BUIs:

Degradation of Fish and Wildlife Populations	RAP states that no “likely causes” were identified. See discussion below for possible causes.	Not applicable	Not applicable
Bird or Animal Deformities or Reproductive Problems	PCBs, BHC, dioxin, dieldrin, chlordane, DDT, DDE, hexachlorobenzene	-Embayment and tributary sediments (for PCBs, BHC, dioxin and hexachlorobenzene) -Hazardous waste sites (for all except chlordane)	-Inflow to Niagara River (for all except dioxin and hexachlorobenzene) -Bottom sediments (for all except dioxin and dieldrin) -Combined sewer overflows (only for BHC) -Groundwater (for all except PCBs, dioxin and dieldrin)

A. BUI – Restrictions on Fish and Wildlife Consumption

Restrictions on fish consumption exist for the entire River and its tributaries. The causes vary. For the Upper River, the only advisory is against consuming carp due to PCB contamination (an exception is Cayuga Creek, where the restriction applies to all species due to dioxin). For the Lower River, restrictions apply to a number of species and PCBs, mirex and dioxin are all contributing chemicals.

1. Known or Suspected Cause – PCBs

The RAP identified inflow from Lake Erie, embayment and tributary sediments, and a number of hazardous waste sites as sources of PCBs to the Niagara River.

(a.) Work Completed and Under Way

- (1) • Completed remediation of 36 of 44 hazardous waste sites found to be potential sources for contaminant migration to the Niagara River (see Appendix A)
- (2) • Remediation is under way at the eight remaining hazardous waste sites having the potential for contaminant migration to the Niagara River (see Appendix A)
- (3) • Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)
- (4) • “Xenobiotics in Fish from New York’s Great Lakes International Waters” – This NYSDEC project will produce additional data for a fish contaminant trend analysis (see item 6)
- (5) • “Reassessment of Niagara River Area of Concern Sources of Contamination” – A NYSDEC project that will focus on loadings from hazardous waste sites, permitted wastewater discharges, and major tributaries

(b.) Management Actions Needed

ASSESSMENT

- (6) • Complete a trend analysis of existing fish contaminant data
- (7) • Evaluate the extent to which sources of PCBs within the AOC contribute to the impairment in comparison to outside sources
- (8) • Conduct needed sediment assessments in:
 - depositional zones in the River
 - certain tributaries

REMEDIATION

- (9) • Complete remediation of eight hazardous waste sites (currently under way, see Appendix A)
- (10) • If necessary, develop and implement a strategy to address sediment PCB contamination

VERIFICATION

- (11) • Continue periodic fish sampling and analysis

2. Known or Suspected Cause – Mirex

The RAP states that mirex was detected in sediments in and downstream of the Tonawanda area, and at several hazardous waste sites (102nd Street Landfill and Occidental Chemical’s “S” Area, Niagara Plant and Hyde Park sites). It was also found in one groundwater sample collected near the 102nd Street Landfill.

(a.) Work Completed and Under Way

- (12) • Completed remediation of the listed hazardous waste sites
- (13) • Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)

(b.) Management Actions Needed

ASSESSMENT

- (14) • Determine whether mirex is still present in groundwater near the 102nd Street Landfill (see RAP, page 5-42)
- (15) • Conduct needed sediment assessments, especially in Cayuga Creek and the Little Niagara River

REMEDIATION

- (16) • If necessary, develop and implement a strategy to address sediment mirex contamination

3. Known or Suspected Cause – Dioxin

The RAP noted that dioxin had been detected in sediments at the Pettit Flume and 102nd Street embayments, and at the mouth of Gill Creek. It had also been detected at several hazardous waste sites: Love Canal, 102nd Street Landfill and Occidental Chemical's Durez, Niagara Plant and Hyde Park sites.

(a.) Work Completed and Under Way

- (17) • Completed remediation of the listed hazardous waste sites
- (18) • Sediment remediation projects completed:
 - 102nd Street Embayment (1998)
 - Pettit Cove (1995, 2000)
 - Gill Creek (1992, 1998)
- (19) • A reassessment is under way for the Pettit Flume. It will seek to identify the source(s) of possible continuing loadings of dioxin to the Pettit Creek Cove.

(b.) Management Actions Needed

ASSESSMENT

- (20) • Conduct needed sediment assessments, especially in Pettit Creek Cove, Fisherman's Park, Cayuga Creek and the Little Niagara River

REMEDIATION

- (21) • Address any identified sources of continuing loadings to the Pettit Creek Cove
- (22) • If necessary, develop and implement a strategy to address sediment dioxin contamination

B. BUI – Fish Tumors and Other Deformities

The extent to which this impairment exists in the AOC is not known. Reports of fish tumors occurring above natural background levels in localized study areas in the upper River led to the determination of impairment for the 1994 RAP. However, this finding was actually based on only two localized studies, and the RAP states that “additional research is necessary to more comprehensively address the question of the extent of this impairment indicator in the Niagara River.”

PAH contamination in sediment was identified as a likely cause of the BUI, though possibly not the only cause.

1. Known or Suspected Cause – PAHs

The RAP states that PAHs were present in the inflow to the Niagara River, in river sediments, and at numerous hazardous waste sites. It had also been detected in the influent to the Buffalo Sewer Authority WWTP and in groundwater in the Buffalo-Lackawanna and Niagara Falls areas.

In addition, normal surface water runoff is a known source of PAHs to the River.

(a.) Work Completed and Under Way

- (23) • Completed remediation of 36 of 44 hazardous waste sites found to be potential sources for contaminant migration to the Niagara River (see Appendix A)
- (24) • Remediation is under way at the eight remaining hazardous waste sites having the potential for contaminant migration to the Niagara River (see Appendix A)
- (25) • Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)
- (26) • A USFWS study of fish tumor prevalence is under way. The anticipated completion date is late 2013.

(b.) Management Actions Needed

The following actions would be needed if the USFWS study finds that tumor rates are unacceptable.

ASSESSMENT

- (27) • Implement actions (if not yet under way) to locate sources of PAHs:
 - Determine whether PAHs are still present in surface and groundwater at levels that exceed NYS water quality standards
- (28) • Conduct needed sediment assessments in:
 - depositional zones in the River
 - certain tributaries
- (29) • Assess levels of PAHs present in storm sewer discharges

REMEDIATION

- (30) • Complete the remediation of eight hazardous waste sites (see Appendix A)
- (31) • Develop and implement a strategy to address other sources of PAH contamination if necessary

C. BUI – Degradation of Benthos

This impairment was found to exist at certain tributary mouths and nearshore areas based on the observed macroinvertebrate community structure and sediment toxicity testing. The likely cause of the impairment is Hexachlorocyclohexane (BHC) and PCB contamination in the sediment.

The RAP states that benthos is not impaired in the main channel of the River due to the absence of substantial deposits of fine-grained sediments. However, observations since the publication of the RAP show that the amount of fine-grained sediment present is probably larger than anticipated. Therefore, an evaluation of benthos in some locations within the main channel may be needed.

Regardless of the specific causes of this BUI, the following management actions would help in assessing progress toward its restoration:

- (32) • Through routine NYSDEC monitoring, and possibly supplemental surveys at selected depositional zones, major tributary mouths and main channel locations, determine the current level of impact to macroinvertebrate community structure
- (33) - An assessment of progress toward restoration might be made by comparing the current community structure and abundance of macroinvertebrates to non-impacted areas and to historical data
- (34) • The U.S. Geological Survey is conducting a project at a number of AOCs that could provide valuable information if resources are available to expand it to include the Niagara River. The project involves analysis of contaminant levels in a combination of colonial waterbird species (herons, cormorants, gulls, and terns) and tree swallows to assess local contaminant exposure, and the resulting impacts. Study of tree swallows is especially valuable for assessing sediment contamination.
- (35) • Determine whether priority contaminants in sediments are bioaccumulating in fish inhabiting selected sediment depositional zones, using methodology described in the RAP (see page 4-71)
- (36) - An alternative project using the Ontario Ministry of the Environment’s caged mussel bioaccumulation data might be possible

1. Known or Suspected Cause – PCBs

The RAP identified inflow from Lake Erie, embayment and tributary sediments, and a number of hazardous waste sites as sources of PCBs to the Niagara River.

(a.) Work Completed and Under Way

- (37) • Completed remediation of 36 of 44 hazardous waste sites found to be potential sources for contaminant migration to the Niagara River (see Appendix A)
- (38) • Remediation is under way at the eight remaining hazardous waste sites having the potential for contaminant migration to the Niagara River (see Appendix A)
- (39) • Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)

(b.) Management Actions Needed

ASSESSMENT

- (40) • Conduct needed sediment assessments in:
- depositional zones in the River
 - certain tributaries

REMEDIATION

- (41) • Complete the remediation of eight hazardous waste sites (see Appendix A)
- (42) • If macroinvertebrate community structure is more than slightly impacted, develop and implement a strategy to address sediment PCB contamination

2. Known or Suspected Cause – Hexachlorocyclohexane (BHC)

The RAP notes that BHC was detected in the inflow to the Niagara River, in sediments along the River and near the mouths of Cayuga and Gill Creeks, and in the following hazardous waste sites: Charles Gibson, Niagara County Refuse Disposal, Love Canal, 102nd Street Landfill, DuPont’s Niagara Plant, Olin’s Niagara Plant, and Occidental Chemical’s “S” Area, Niagara Plant and Hyde Park sites. It was also detected in groundwater in the Niagara Falls area, in the influent to the Buffalo Sewer Authority WWTP, and in limited amounts in discharges from a number of WWTPs.

(a.) Work Completed and Under Way

- (43) • Completed remediation of the listed hazardous waste sites
- (44) • Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)
- (45) • Since 2000, the Buffalo Sewer Authority has invested over \$40 million into the development of its Long-Term Control Plan for combined sewer overflows (CSOs) and ongoing construction of CSO controls and improvements

(b.) Management Actions Needed

ASSESSMENT

- (46) • Determine whether BHC is still present in groundwater in the “Niagara Falls Sub-area” (see RAP, page 5-46 and table 5.12)
- (47) • Determine whether BHC is still present in the effluent from the Niagara River WWTPs (see RAP, page 5-46); if so, actions will be needed to evaluate adding effluent limits for BHC, and to address untreated discharges from sanitary or combined sewer overflows
- (48) • Conduct needed sediment assessments in:
- depositional zones in the River
 - certain tributaries

REMEDIATION

- (49) • If necessary, develop and implement a strategy to address sediment BHC contamination
- If necessary, implement actions to address sanitary and combined sewer overflows
- (50) - Actions identified in Long-Term Control Plans for combined sewer overflows
- (51) - Green infrastructure projects to reduce impervious surface run-off, in turn reducing the volume of storm water entering sewers

D. BUI – Restrictions on Dredging Activities

Dredging is necessary in the Buffalo Harbor and the Black Rock Canal for the purpose of commercial navigation. Open lake disposal of this sediment is not possible likely due to the high levels of metals and cyanide present.

Note: regardless of specific causes, and in addition to the sediment-related actions listed for the individual BUIs, fully addressing contaminated sediments throughout the AOC might require the following actions:

- (52)
 - Evaluate existing sediment data from the Buffalo State College project – This project included collection and digitization of data related to river sediment, water quality, sediment elutriate, sewer and stormwater runoff, surface water, and biota. The sediment data should be evaluated for data gaps and should be compared to New York state criteria.
- (53)
 - Develop a sediment remediation Feasibility Study for the Niagara River and tributaries based on existing data and the results of new assessments

Also, Legacy Act projects are currently under way in the Buffalo River and Smokes Creek. NYSDEC is requesting Legacy Act assistance to address other Niagara River and tributary areas, beginning with the Black Rock canal, Little Niagara River, and Scajaquada Creek up to Mirror Lake.

1. Known or Suspected Cause – Metals and cyanide

The RAP states that these substances were present in the inflow to the Niagara River, at hazardous waste sites, and in limited amounts in discharges from municipal and industrial WWTPs. They were also detected in groundwater, and thought to be present in urban runoff and eroded materials from the watershed.

(a.) Work Completed and Under Way

- (54)
 - Completed remediation of 36 of 44 hazardous waste sites found to be potential sources for contaminant migration to the Niagara River (see Appendix A)
- (55)
 - Remediation is under way at the eight remaining hazardous waste sites having the potential for contaminant migration to the Niagara River (see Appendix A)
- (56)
 - Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)
- (57)
 - The U.S. Army Corps of Engineers has compiled existing sediment and water quality data to support an investigation of the extent and severity of sediment contamination within the federal navigation channel

(b.) Management Actions Needed

ASSESSMENT

- (58)
 - Determine whether the contaminants are still present in the effluent from Niagara River WWTPs that could impact the navigation channel (Buffalo Sewer Authority plant, Erie County Sewer District No. 6 plant); if so, actions will be needed to evaluate adding effluent limits for specific contaminants of concern, and to address untreated discharges from sanitary or combined sewer overflows

- (59) • Evaluate federal navigation channel zones that exceed authorized depth – Determine the last time these areas were dredged and evaluate the probability of having to dredge them again. If the probability is low, it may be possible to exclude these zones from the areas requiring “routine” navigation dredging, which are the subject the delisting criterion.
- (60) • Conduct sediment assessments in the federal navigation channel and in other areas where dredging may be required for commercial or recreational navigation

REMEDIATION

- (61) • If necessary, develop and implement a strategy to address contaminated sediment in the federal navigation channel and other areas requiring dredging
- (62) • Complete remediation of hazardous waste sites that could impact the navigation channel (currently under way): Buffalo Color Corporation, Mobil Oil, and Bethlehem Steel
- (63) • If necessary, implement actions to address sanitary and combined sewer overflows
 - (64) - Actions identified in Long-Term Control Plans for combined sewer overflows
 - (65) - Green infrastructure projects to reduce impervious surface run-off, in turn reducing the volume of storm water entering sewers

E. BUI – Loss of Fish and Wildlife Habitat

Habitat loss has occurred to a lesser degree in the lower River than in the upper River, where the loss has been dramatic. The most noticeable loss was that of submerged aquatic vegetation (SAV), emergent marsh, shrub wetland and wooded wetland adjacent to the River. Significant loss of shoreline habitats including areas of beach, mudflat and cobble shore had also occurred. Forested shoreline was also greatly reduced along the upper river.

Habitat loss was caused by human activities such as bulkheading, filling, dredging, development of marinas and private docks, water diversion, and the creation of barriers to migration on tributaries.

Loss of Fish and Wildlife Habitat

Examples of Specific Impacts of Physical Disturbances

Major Wetlands

The following large coastal wetlands connected to the Upper Niagara River have been lost or degraded, impacting spawning/nursery habitat for many species of fish:

- Rattlesnake Island Marsh – Buried with fill and waste; now known as Cherry Farm
- Buckhorn Island Marsh – Marsh vegetation altered by water level changes; significantly reduced open water habitat
- Beaver Island Marsh – Partly buried with fill and partly dredged

Degradation/loss of major nearshore shallow-water habitats

- Squaw Island embayments – Former large shallow embayments in a high velocity section of the upper River likely provided velocity refuge and spawning/nursery habitat for many fish species. They were filled with waste and mostly lost as fish habitat.
- Gratwick-Riverside Park – This former large shallow embayment in the upper River, which likely contained emergent vegetation, was mostly filled with waste, destroying spawning/nursery habitat for many species of fish
- 102nd Street embayment (and adjacent embayments) – Another large shallow embayment located in the upper River, likely containing emergent vegetation, was mostly filled with waste, impacting spawning/nursery habitat for many species of fish
- Buffalo Avenue River Shoreline – A series of shallow embayments with vegetation, rocky substrate, wetlands and offshore islands, was filled for the Niagara Power Project and the Robert Moses Parkway, impacting habitats for many species of fish

Impediments to fish migration

Construction of the Black Rock Canal constricted the River channel and increased water velocities in an already narrow part of the River. Filling along the Ontario shoreline and placement of the Peace Bridge piers also contributed to increasing water velocities. Very high water velocities, combined with the loss of nearshore habitat where velocities are typically reduced, likely restricts upstream migration of fish to Lake Erie, thus reducing habitat and temperature/forage options for some fish species.

Construction of the Black Rock lock created an impediment to upstream migration of fish to Lake Erie via the Black Rock Canal.

Impassable barriers are located on many Niagara River tributaries, precluding use of some tributary habitats by fish.

Reduction of natural patterns of sediment transport

Navigational dredging in the Buffalo River and Buffalo Harbor, combined with steel-making waste disposal in Lake Erie, has likely reduced the natural transport of sediments to the upper River. Transported sand and silt normally help to replace sediments lost to erosion and provide nutrients and substrate for submerged aquatic plant growth.

1. Known or Suspected Cause – Physical disturbances

Disturbances include dredging, filling, bulkheading, diversion of water, and clearing of forested shoreline.

(a.) Work Completed and Under Way

Note: this is not a complete list. See Appendix B for additional completed habitat restoration projects.

- (66) • Buffalo Niagara Riverkeeper completed a habitat assessment and conservation framework for both the Buffalo River and Niagara River Areas of Concern in 2008
- (67) • “Niagara Habitat Conservation Strategy” – This Buffalo Niagara Riverkeeper project is expected to recommend measurable targets for habitat restoration as well as specific habitat restoration projects.
- (68) • Niagara River Gorge Rim Ecological Restoration Study – Wild Ones Niagara Falls and River Region Chapter is conducting this study, which includes an ecological inventory of the gorge rim.
- (69) • Niagara River Riparian Restoration Program – Buffalo Niagara Riverkeeper coordinates with willing riparian landowners to develop forest buffers or other habitat features such as rain gardens, small-scale soft shoreline stabilization, meadows, and wetlands on their property.
- (70) • Ferry Landing acquisition – NYSDEC has received a grant to purchase 1.7 acres located along the East shore of Grand Island. The parcel has 500 feet of shoreline, of which 170 feet is gravel beach. It is one of the last remaining undeveloped areas of privately owned shoreline on the Niagara River.
- (71) • During the relicensing of the Niagara Power Project, the New York Power Authority agreed to complete eight habitat improvement projects, most of which are currently under way:
 - Strawberry Island Restoration
 - Frog Island Restoration
 - Motor Island Shoreline Protection
 - Beaver Island Wetland Restoration
 - Invasive Species Control – Buckhorn/Tifft Marshes
 - Osprey Nesting on the Niagara River
 - Common Tern Nesting (complete)
 - Installation of Fish Habitat/Attraction Structures (complete)

(b.) Management Actions Needed

- Policy needs
 - (72) - Recognizing that the highest priority should be the protection of existing quality habitat areas, evaluate methods for protecting the priority habitats through regulation or other land-use controls
 - (73) ▪ Research other Great Lakes states’ approaches to protecting habitat
 - (74) - Investigate possible alternatives for mitigating shoreline hardening through NYSDEC’s permitting process
 - (75) - Promote opportunities to soften hardened shoreline and integrate bioengineering approaches to erosion control (opportunities could be triggered by permit applications)

- (76)
 - Provide educational opportunities to municipalities and other stakeholders on soft bioengineering of shorelines and the associated ecosystem service benefits and potential economic benefits to communities
 - Possibilities include innovative designs of habitat features to retrofit in areas of bank armor; and creating areas for native plant regeneration that would not compromise resistive properties of stabilized banks or shoreline. This approach can apply to near shore areas as well. Natural submerged structure in the river provides models for replication that would allow for natural deposition and subsequent recruitment of submerged aquatic vegetation, which is lacking.
- (77)
 - Conduct educational outreach to the general public on these topics
- (78)
 - Identify and support pilot projects to demonstrate the benefits of softening shoreline and of bioengineering approaches to erosion control
- Planning needs
 - (79) - Maintain a GIS database of SAV habitat in the Outer Harbor/Upper River
 - (80) - Create invasive species control strategies for priority habitats (see the list attached to the delisting criteria)
 - Adopt protocol and methodology from the National Invasive Species (IS) Council and NYS IS Council for IS control and management that identifies IS as a stressor to habitat and involves a staged approach to addressing IS (prevention, early detection/rapid response, eradication, mapping/inventory, control/management, and monitoring).
 - (81) - Create and implement conservation measures for the priority habitats, where achievable
 - (82) ▪ Create and implement a long-term conservation strategy for the Upper Niagara River Island Complex (Strawberry, Motor, Beaver Islands)
 - (83) ▪ Perform an ecosystem inventory of the Niagara Gorge; create and implement a long-term conservation strategy
 - (84) - Support the completion of Buffalo Niagara Riverkeeper’s Niagara Habitat Conservation Strategy project. Upon its completion, reevaluate the target in criterion no. 2 for the amount of coastal wetland to be created or restored
- Assessment
 - (85) - Conduct mapping (occurrence and density) of invasive species communities in and adjacent to priority habitats
 - (86) - Use historical information to determine the overall amount of coastal wetland area lost since 1927
 - (87) - Evaluate the sufficiency of the priority habitats that were listed in the 1994 RAP, and update the list of habitats that should be protected and be subject to the requirement for conservation measures where achievable
 - (88) - Determine whether regulatory protection exists for the “Other Priority Habitats” (see the list accompanying the delisting criteria)

- Restoration
 - (89) - Implement habitat conservation projects (e.g., habitat restoration, land acquisition, management, and implementation of regulatory protections) in the priority Niagara River AOC habitats, other critical habitats identified through Buffalo Niagara Riverkeeper's Niagara Habitat Conservation Strategy project, and other areas as necessary to meet the first and second delisting criteria

Potential Niagara River AOC Habitat Creation and Conservation Projects

Note:

- This list is not meant to be exhaustive or exclusive.
- Protecting existing quality habitat areas should be considered a higher priority than implementing these projects.

- (90)
 - Create coastal wetland habitats – Construct wetlands within existing upland areas bordering the Niagara River or its tributaries and establish hydrologic connections with those waters. Possible areas include (but are not limited to):
 - Approximately 100 acres adjacent to the Niagara River on Grand Island south of Ransom Road and west of East River Road
 - Approximately 100 acres north of Ransom Road and west of East River Road (potentially connecting with Gun Creek)
 - Approximately 50 acres adjacent to the Niagara River on Grand Island south of East River Road and about 1 mile east of Baseline Road
 - Approximately 25 acres adjacent to the Niagara River in the southeastern portion of Beaver Island State Park (north of the loop road and south of the golf course)
 - Several acres adjacent to Cayuga Creek just north of Pine Ave. (adjoins an existing wetland and meandering stream channel)
 - Several acres adjacent to Bergholtz Creek on what appears to be property owned by the 93rd Street School in Niagara Falls
 - Those additional areas that will be defined within the Niagara Habitat Conservation Strategy
- (91)
 - Plant native trees and shrubs in the Upper River Island Complex to provide habitat and to act as a seed bank.
- (92)
 - Investigate methods to further protect SAV and wetlands in the Upper River Island Complex (restricting boating, etc.). One possibility may be to map these areas as state wetlands, providing protection under New York's Freshwater Wetlands Act.
- (93)
 - Restore SAV in nearshore shallows at Spicer Creek embayment. If possible, implement measures to mitigate the effect of water level fluctuations in the embayment.
- (94)
 - Create additional fish attraction structures in the River
- (95)
 - Create wetlands at the mouths of tributaries
- (96)
 - Identify grassland for protection or enhancement
- (97)
 - Explore opportunities to minimize bird strikes on power lines

F. BUI – Degradation of Fish and Wildlife Populations

At the time of the development of the RAP, fish and wildlife populations clearly had declined from historic levels. However, this impairment was considered “likely” due to a lack of sufficient evidence to show whether the habitat and toxicity issues specific to the area of concern were significant enough to be the cause of the declines. In December 2011, a decision was made to change its status to “impaired.”

Possible causes of declines in fish populations are human-induced alterations to the River, significant water diversions and withdrawals, exotic species introductions and contaminants. Possible causes for loss of wildlife population are uptake of contaminants, loss and degradation of physical habitat, and human disturbance. However, the RAP stated that no *likely* causes of declining populations were identified.

1. Known or Suspected Cause –

No known causes identified. See list of possible causes directly above.

(a.) Work Completed and Under Way

- (98) • Ongoing U.S. Fish and Wildlife Service studies will enhance understanding of the status of Lake Sturgeon (listed as Threatened in New York State) and Lake Trout populations and reproduction:
- (99) - Evaluation of Niagara River and Bar Benthic Habitat Using Side Scan Sonar and GIS Modeling – High resolution mapping of the bottom profile/substrate in the Niagara River and the Niagara Bar will help identify habitat locations that lake sturgeon, lake trout, and other native species are likely to use for spawning or rearing.
- (100) - Habitat use, movement and genetic composition of lake trout in the Niagara River and Niagara Bar – This study involves tagging and monitoring lake trout to identify high quality spawning habitat areas, and using genetic differences between hatchery strains to identify the source (hatchery strain or wild) of documented natural reproduction.
- (101) - Identification of lake sturgeon spawning habitat in the lower Niagara River and Bar – A sturgeon tagging project conducted in the 1990s suggested locations in the lower River and on the Niagara Bar that could be spawning habitat. However, only ten adults were tagged and not all were actively spawning. This study will use updated radio tracking technology and tag approximately 40 adults to obtain more detailed data on spawning locations and habitat.
- (102) - Lower Niagara River Lake sturgeon population status assessment – The Niagara River has one of the few remaining remnant populations of lake sturgeon in Lake Ontario. A late 1990s study indicated that the lake sturgeon population is recovering, but a more complete status assessment is needed. This project will estimate population abundance and survival, determine age class structure, improve habitat suitability models and assess lake sturgeon diet in the lower River and Niagara Bar. A standardized mark-recapture protocol will be followed to gain estimates of lake sturgeon abundance and survival.
- (103) - Characterization of the Niagara River larval fish community – The objective of this project is to describe the composition and distribution of larval fish in all habitat types of the lower Niagara River. Reproductive success of many fish species in the river is poorly understood. A spatial and temporal assessment of

fish larvae in the lower Niagara will lead to a better understanding of the River's role in supporting spawning and nursery areas.

(b.) Management Actions Needed

PLANNING

- (104) • Support the development of Fish Community Objectives and Environmental Objectives for the Niagara River to guide sustainable management of the fishery

ASSESSMENT

- (105) • Conduct needed sediment assessments, then develop and implement a strategy to address contamination if necessary
- (106) • Benthic macroinvertebrates surveys
- Conduct a survey to assess the current status of the macroinvertebrate community
 - Identify existing effective benthic community biological indices for various types of habitat in the Niagara River and tributaries, or develop new ones if necessary
 - Compare the current status of contaminated sites to non-impaired (reference) sites
 - Compare the current status of selected benthic groups (e.g. unionids) with available historical data to determine trends
 - Develop biotope maps for the benthic community to estimate the diversity of habitats and select valuable habitats (e.g. species-rich areas or sites with rare species) for future monitoring.
- (107) • Assess the current community structure of sentinel amphibian species in riverine habitats of the AOC
- (108) • Assess Lake sturgeon populations (under way) and muskellunge populations
- (109) • Assess trends in nesting success of common tern, herons, and osprey
- (110) • If implemented, the U.S. Geological Survey project examining contaminant levels in colonial waterbirds and tree swallows would provide information on population-level impacts (see the project description under the Degradation of Benthos BUI)

RESTORATION

- (111) • Develop and implement a post-remedial unionid restoration plan
- (112) - Implement test plots for transfer and restoration of native unionid populations from tributaries to river habitats to evaluate viability of population sustainability in historic habitat locations
- (113) • If necessary, establish long-term lake sturgeon/muskellunge restoration plans
- (114) • If necessary, create additional quality nesting habitat for common tern, herons, and osprey

MONITORING

- (115) • Develop and implement long-term monitoring plans for:
- Unionids
 - Lake Sturgeon and muskellunge
 - Common tern, herons, and osprey
- [Note: monitoring already exists for common tern and osprey]

G. BUI – Bird or Animal Deformities or Reproductive Problems

During development of the RAP, no data were found that indicated the presence of bird or animal deformities or reproductive problems. The impairment was considered “likely” though due to the levels of contaminants that had been found in both young-of-the-year and adult fish, specifically:

- the exceedance in young-of-the-year fish of PCB, BHC, hexachlorobenzene and dioxin fish flesh criteria for the protection of wildlife, and
- the exceedance in adult fish of PCB, DDT, DDE, dieldrin, chlordane and dioxin fish flesh criteria for the protection of wildlife

In December 2011, a decision was made to change the status of this BUI to “impaired.”

Regardless of the specific causes of this BUI, the following projects are needed to assess progress toward its restoration:

- (116) • Conduct a study of contaminant levels in mink livers
- (117) • Partner with Environment Canada for future herring gull egg monitoring efforts. Evaluate whether past Canadian findings apply to the U.S. side.
- (118) • If implemented, the U.S. Geological Survey project examining contaminant levels in colonial waterbirds and tree swallows would provide information on reproductive impacts (see the project description under the Degradation of Benthos BUI)

1. Known or Suspected Cause – PCBs

See the actions listed for PCBs under the Degradation of Benthos BUI.

2. Known or Suspected Cause – BHC

See the actions listed for BHC under the Degradation of Benthos BUI.

3. Known or Suspected Cause – Hexachlorobenzene

The RAP states that hexachlorobenzene was detected in sediments along the river, at the Pettit Flume embayment and at the mouth of Gill Creek. It was also found in groundwater near the Power Authority conduits and in the following hazardous waste sites: Bethlehem Steel, Charles Gibson, Niagara County Refuse Disposal, Love Canal, 102nd Street Landfill, DuPont’s Niagara Plant and Necco Park sites, and Occidental Chemical’s “S” Area, Durez, Niagara Plant and Hyde Park sites.

(a.) Work Completed and Under Way

- (119) • Completed remediation of the listed hazardous waste sites, with the exception of Bethlehem Steel
- (120) • Remediation of the Bethlehem Steel site is under way
- (121) • Contaminated sediment removal projects have previously been completed in Pettit Creek Cove and Gill Creek, plus a number of other locations (see Appendix A)

(b.) Management Actions Needed

ASSESSMENT

- (122) • Determine whether hexachlorobenzene is still present in groundwater near the New York Power Authority conduits (see RAP page 5-47)
- (123) • Conduct needed sediment assessments, especially to reassess Pettit Creek Cove and Gill Creek

REMEDIATION

- (124) • Complete the remediation of the Bethlehem Steel site (currently under way)
- (125) • If necessary, develop and implement a strategy to address sediment hexachlorobenzene contamination

4. Known or Suspected Cause – Dioxin, DDT & DDE, Dieldrin, and Chlordane
Sources for these substances included inflow to the Niagara River, hazardous waste sites, sediments and groundwater.

(a.) Work Completed and Under Way

- (126) • Completed remediation of 36 of 44 hazardous waste sites found to be potential sources for contaminant migration to the Niagara River (see Appendix A)
- (127) • Remediation is under way at the eight remaining hazardous waste sites having the potential for contaminant migration to the Niagara River (see Appendix A)
- (128) • Projects addressing sediment contamination have been completed at 14 locations (see Appendix A)

(b.) Management Actions Needed

ASSESSMENT

- (129) • Conduct needed sediment assessments

REMEDIATION

- (130) • Complete remediation of eight hazardous waste sites (currently under way)
- (131) • If necessary, develop and implement a strategy to address these contaminants in sediment

Appendix A – Source Information

1. Hazardous Waste Sites

The information below is based on the *2010 Progress Update: Reduction of Toxics Loadings to the Niagara River from Hazardous Waste Sites in the United States* published by the U.S. Environmental Protection Agency and NYSDEC. Details on the progress of remediation at sites requiring completion are available in that report.

a.) Sites requiring completion

The eight hazardous waste sites with remediation under way, but not yet complete are:

Mobil Oil	City of Buffalo
Buffalo Color Corporation Plant Site	City of Buffalo
Bethlehem Steel Corporation	City of Lackawanna
Tonawanda Coke Corporation	Town of Tonawanda
Spaulding Fiber	City of Tonawanda
Frontier Chemical - Royal Avenue	City of Niagara Falls
Niacet Corporation	City of Niagara Falls
Vanadium Corporation	Town of Niagara

b.) All sites

The RAP originally listed 31 hazardous waste sites found to be potential sources for contaminant migration to the Niagara River (Table 2). An additional 13 sites not listed in the RAP were also found to be potential sources of contaminants to the River. Remediation is now complete at eight of those 13 sites as shown in Tables 3 and 4. Figure 2 shows the location of all 44 sites.

Table 2 – Hazardous Waste Sites Listed in the RAP

Site Code	Site Name	Site Code	Site Name
915003B	Allied Specialty Chemical	932019A	OCC – S Area
915004	Allied Chemical	932020	Love Canal
915009	Bethlehem Steel	932021	OCC – Hyde Park
915012	Buffalo Color	932022	OCC – 102 St. Landfill
915016	Columbus McKinnon	932026	Niagara Co. Refuse Disposal Landfill
915031	River Road Site	932031	Olin – 102 St. Landfill
915034	MacNaughton-Brooks	932040	Reichold Varcum
915040	Mobil Oil	932047	DuPont – Necco Park
915052	Squaw Island	932051	Olin – Niagara Plant
915054	Alltift Landfill	932052	Bell Aerospace
915055	Tonawanda Coke	932060	Gratwick- Riverside Park
915063	Cherry Farm	932063	Charles Gibson Site
915080	Times Beach	932080B	Buffalo Ave. PASNY
932013	DuPont – Niagara Plant	932081	Griffon Park
932018	OCC – Durez	932096	Solvent Chemical
932019	OCC – Niagara Plant		

Note: sites listed in bold text have remediation under way but not yet complete.

Table 3 – Additional sites where remediation is complete

Site Code	Site Name
N/A	CECOS International
932053	Stauffer Chemical
932043	Frontier Chemical – Pendleton
915141A & B	Iroquois Gas – Westwood Pharmaceutical
932100	Booth Oil
915167	Fourth Street Site
C915194	Former Buffalo Service Center
V00619/C915204	Steelfields Site (Former Republic/LTV Steel)

Table 4 – Additional sites where remediation is under way

Site Code	Site Name
932001	Vanadium Corporation
V00373	Niacet Corporation
C915230 C915231 C915232	Buffalo Color Corporation – Areas A, B, C, E
932110	Frontier Chemical – Niagara Falls
915050/E915050	Spaulding Fiber

2. Sediments

a.) Great Lakes Legacy Act

Legacy Act projects are currently under way in the Buffalo River and Smokes Creek. NYSDEC is also requesting Legacy Act assistance to address other Niagara River and tributary areas, beginning with the Black Rock canal, Little Niagara River, and Scajaquada Creek up to Mirror Lake.

b.) Completed Projects

Table 5 lists contaminated sediment remediation projects that have addressed potential sources of contamination to the Niagara River AOC. The approximate locations of the projects are shown in Figure 3.

c.) Known Projects Under Way or Planned

Table 6 lists projects that are currently under way or in the planning stage.

Figure 2 – Hazardous Waste Sites



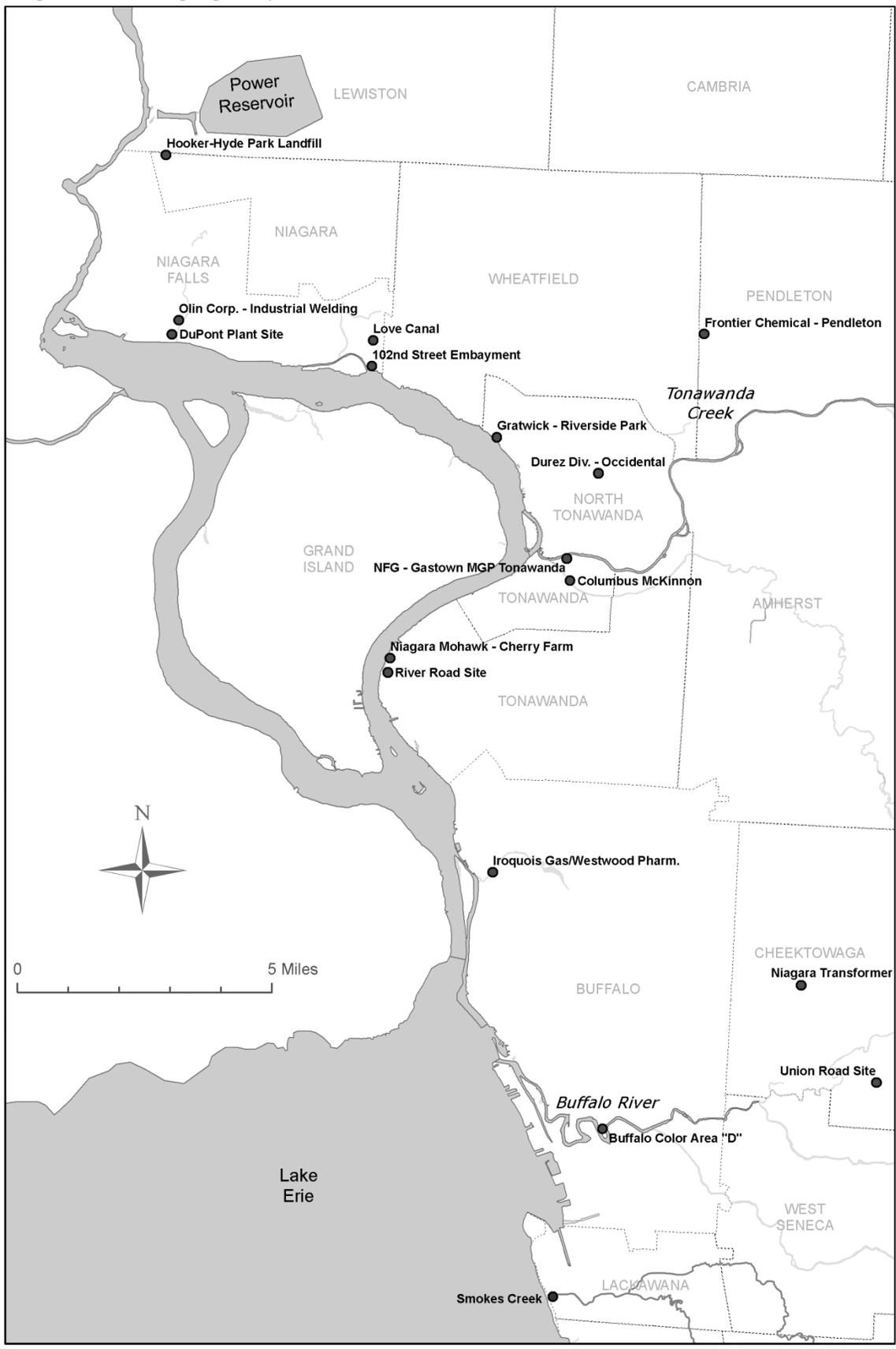
Table 5 – Completed Sediment Remediation

Project	Location	Waterbody	Action	Date Complete
Niagara County				
Occidental Chemical – Durez	North Tonawanda	Pettit Cove (Niagara River)	Removal - 15,070 CY	1995
			Maintenance dredging – 250 CY	2000
Gratwick-Riverside Park	North Tonawanda	Niagara River	Capping of contaminated sediment	2001
Love Canal	Niagara Falls	Black and Bergholtz Creeks	Removal - 17,200 CY	1990
Gill Creek – between Buffalo Ave. and Robert Moses Parkway	Niagara Falls	Gill Creek	Removal of contaminated sediment to bedrock	1982
Dupont Plant Site	Niagara Falls	Gill Creek	Removal - 8,000 CY	1992
Olin Corp. - Industrial Welding Site	Niagara Falls	Gill Creek	Removal - 7,000 CY	1998
102nd Street Embayment	Niagara Falls	Niagara River	Removal - 25,436 CY	1998
Bloody Run Creek-Hyde Park Landfill	Lewiston	Bloody Run Creek	Approx. 27,000 CY removed from the above ground portion of the Creek	1993
<i>Site farther removed from the River:</i>				
Frontier Chemical Pendleton	Pendleton	Quarry Lake, Bull Creek flows nearby	Removal – 36,000 CY	1996
Erie County				
Buffalo Color-Area D	Buffalo	Buffalo River	Removal - 44,000 CY	1998
Iroquois Gas/Westwood Pharmaceutical	Buffalo	Scajaquada Creek	Removal - 19,000 CY plus capping	1999
Smokes Creek (partial)	Lackawanna	Smokes Creek	Removal - 42,850 CY	2009
Cherry Farm/River Road sites	Tonawanda	Niagara River	Removal - 42,700 CY plus capping of some sediment close to shore	1998
Columbus McKinnon	Tonawanda (City)	Ellicott Creek	Removal - 2,349 CY	1995
<i>Sites farther removed from the River:</i>				
Niagara Transformer	Cheektowaga	Ditches leading to a storm sewer that discharges to the Buffalo River	Removal of PCB contaminated material from ditches and sewer Total of 11,500 CY remediated	1997
Union Road Site	Cheektowaga	Slate Bottom Creek, which drains into Cayuga Creek	Removal – 5,600 CY	1996

Table 6 – Projects Under Way or Planned

Project	Location	Action
Buffalo River	Buffalo	Phase 1 – U.S. Army Corps of Engineers enhanced navigational dredging is under way and expected to be complete by December 31, 2012. Phase 2 – Legacy Act funded dredging is expected to start in fall 2012 and take one to two years to complete.
Smokes Creek (Legacy Act)	Lackawanna	EPA conducted sampling in November 2011. An estimated 65,000 CY of sediment may need to be addressed.
NFG - Gastown MGP Tonawanda	Tonawanda (City)	Planned project in Tonawanda Creek; not extensive

Figure 3 - Dredging Project Locations



Appendix B – Habitat Restoration/Enhancement Projects

Table 7 – Examples of Completed Projects

Project	Date	Description
Buckhorn Island Marsh Habitat Restoration	1996 - 1999	Riparian, wetland, and aquatic habitat. Restoration of 6000+ feet of channel with dredging to restore open water habitat. Two dikes and weirs were constructed for water level maintenance.
Tiftt Marsh Preserve	1999	Beaver control, increased open water and riparian habitat, plantings of emergent vegetation. Restoration of 9000+ feet of channel dredging to restore open water. Also planted giant bur-reed which is utilized by birds.
Tiftt Marsh Restoration Project	2006	To restore open water habitat to this monotypic coastal cattail marsh, excavated five open water areas totaling 7.2 acres with the removal and storage of approximately 24, 000 cubic yards of wetland soil for future use. Planted of 1.3 acres of islands to buttonbush.
Beaver Island Wetland Restoration NYPA project	2011	Consisted of the removal of fill placed at a former riverine wetland, site grading, and invasive species-control to help restore hemi-marsh and shallow pools to the Beaver Island shoreline. Diverse native vegetation was planted to provide food and cover for wildlife.
East River Wetland at Beaver Island State Park	2004	Measures to protect against erosion
Strawberry Island		Multiple project have been completed to protect this island from erosion and restore aquatic habitat, which provides waterbird nesting, resting, and feeding habitat, and fish spawning, nursery, and foraging habitat.
Upper Niagara Fish Attraction Structures NYPA project	2008	Four structures placed in the upper River – One shallow-water structure used a stone-and-log groin design, while three deep-water structures used a boulder field, rock-wing saddleback, or rock slope design.
102nd St Embayment Shallows	1998	Replaced shallow water habitat (SAV beds) after contaminated sediment removal.
Spicer Creek Acquisition	2004	NYSDEC
Union Ship Canal	2011	Restored ecological areas and features, such as reef groupings, benthic substrates, submerged and emergent wetland plantings, and an inland embayment area.
Deveaux Woods Property		Purchase of 51 acres to create a new state park. Protects 5 acres of old growth forest

Appendix C – Niagara River Area of Concern Delisting Criteria

Note: the status of BUIs 3 and 5 was changed from likely impaired to impaired in December 2011. All the beneficial uses listed below are now considered impaired.

Beneficial Use Impairment	Delisting Criteria
1. Restrictions on Fish and Wildlife Consumption	<p>No AOC-specific consumption advisories are in effect, OR</p> <p>Levels of contaminants in resident game species of fish and wildlife do not exceed U.S. Food and Drug Administration action levels and New York State human health criteria.</p>
<p>3. Degradation of Fish and Wildlife Populations</p> <p>(Modified January 2012)</p>	<p>The Degradation of Benthos BUI is removed or in recovery</p> <p>The Loss of Fish and Wildlife Habitat BUI is removed or in recovery</p> <p>The Bird or Animal Deformities or Reproductive Problems BUI is removed or in recovery</p> <p>Maintenance of fish community populations on the U.S. side of the River at levels that meet fish community objectives identified through a binational fisheries management plan</p> <p>Healthy, reproducing populations are observed of sentinel native species representing the range of trophic levels within the aquatic ecosystem. Specifically, over a five-year period improving trends are observed in:</p> <ul style="list-style-type: none"> - the community structure of native mollusk populations (an indicator of water quality, benthic habitat and lower-level fish, bird, reptile and mammal food chain integrity) - populations of Northern leopard frog, American toad, and bullfrog (an indicator of water quality, habitat and mid-level fish, bird, reptile and mammal food chain integrity) - populations of native/restored Lake Sturgeon and muskellunge (an indicator of top aquatic food chain integrity) - nesting success of common tern, herons (all species), and osprey (an indicator of top aquatic food chain integrity)
4. Fish Tumors or Other Deformities	<p>Rates of tumors and other deformities are not statistically higher than Great Lakes regional target rates developed by experts based on tumor and deformity incidence data from across the Great Lakes.</p>
<p>5. Bird or Animal Deformities or Reproductive Problems</p> <p>(Modified January 2012)</p>	<p>Levels of contaminants in Herring Gull and Double-crested Cormorant eggs collected within the Niagara River AOC are not significantly higher than in eggs collected at other locations throughout the Great Lakes basin.</p> <p>Levels of contaminants in mink livers collected within the Niagara River AOC are not significantly higher than in those collected throughout the western Lake Ontario region.</p>

Beneficial Use Impairment	Delisting Criteria
6. Degradation of Benthos	<p>The benthic macroinvertebrate community structure is non-impacted or slightly impacted according to NYSDEC indices (Bode et al., 1996) at selected sediment depositional zones.</p> <p>All known AOC areas of sediment contamination at concentrations exceeding New York State Class A sediment quality thresholds* (indicating chronic toxicity to aquatic life) have been remediated or scheduled for remediation.</p> <p>Priority contaminants in sediments show no statistically significant bioaccumulation in fish inhabiting selected sediment depositional zones.</p>
7. Restrictions on Dredging Activities	<p>There are no restrictions on routine commercial or recreational navigation dredging by the U.S. Army Corps of Engineers (COE) or another entity across any part of the AOC, such that no special management measures or use of a confined disposal facility are required for the dredged material due to chemical contamination.</p>
14. Loss of Fish and Wildlife Habitat (Modified January 2012)	<p>Areas of existing natural shoreline (including nearshore beds of aquatic vegetation) are protected and additional currently hardened/degraded shoreline is enhanced so that a minimum of 25 percent of the U.S. shoreline within the AOC has habitat value, based on the presence of natural slope, shallows, or aquatic (emergent and submerged) native vegetation.</p> <p>Coastal wetlands are created or restored to achieve a net increase in area equal to a minimum of ten percent of the wetland area lost since 1927. For this purpose, coastal wetlands will include wetlands along the shoreline of both the River and the lower reaches of tributaries.</p> <p>The eight habitat improvement projects that the New York Power Authority agreed to implement in the 2007 relicensing settlement for the Niagara Power Project are complete.</p> <p>Priority Niagara River AOC habitats (see attached list) are protected through available land-use controls; conservation measures are implemented where achievable (e.g., land acquisition, regulatory protections, and long-term strategies).</p> <p>For the priority habitats, existing communities of invasive species have been mapped and invasives control strategies have been adopted.</p>

* Sediment quality thresholds are found in NYSDEC Division of Water Technical & Operational Guidance Series 5.1.9.

Priority Niagara River AOC Habitats

(Note: this list may be modified to include additional priority habitats after consultation with the Niagara River Remedial Advisory Committee.)

NYS Regulated Wetlands

Tifft Street Wetland (BU-7)
 Tifft Farm Wetland (BU-15)
 Republic Steel Wetland (BU-1)
 Times Beach Wetland (BU-3)
 Beaver Island Wetland (BW-1)
 East River Wetland (BW-2)
 Cherry Farm Wetland (BW-8)
 Spicer Creek Wetland (TW-12)
 Sunken Island Wetland (TW-18)
 Burnt Ship Creek Wetland (TW-19)
 Buckhorn Island State Park Wetland (TW-20)

Department of State Significant Coastal Habitats

Smoke Creek Shoals
 Small Boat Harbor
 Tifft Farm Nature Preserve
 Times Beach Diked Disposal Site
 North Buffalo Harbor
 Strawberry Island-Motor Island Shallows
 Grand Island Tributaries
 Buckhorn Island Wetlands
 Buckhorn Island Tern Colony
 Buckhorn Island-Goat Island Rapids
 Lower Niagara River Rapids

Other Priority Habitats

South Harbor area - south of Small Boat Harbor (ducks, geese, snowy owls)
 LaSalle Park (pelagic birds; gulls)
 Sand/gravel spit at end of Donnelly's Pier (tern nesting, possible muskellunge spawning)
 Bird Island Pier (gulls, terns, shorebirds, ducks, marshbirds; bass, pike, muskellunge)
 Black Rock Canal (Bird Island Pier species plus phalaropes)
 Grand Island: open fields and thorn thicket along East River shore
 Cherry Farm landfill
 Gratwick Park landfill, Niagara County landfill, 102nd St. landfill
 Goat Island and Three Sisters Islands (migratory shorebirds, landbirds; wintering gulls)
 Niagara Gorge and DeVeaux Woods
 NYPA Pumped Storage Reservoir
 Fort Niagara State Park woodland (migrating land birds)

PROPOSED ADDITION: Stella Niagara Property

Appendix D – List of Management Actions

Table 8 – Niagara River AOC Beneficial Use Impairments: Status and Actions Needed for Removal

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
1. Restrictions on Fish and Wildlife Consumption	Impaired	<p>“Reassessment of Niagara River Area of Concern Sources of Contamination” – A NYSDEC project that will focus on loadings from hazardous waste sites, permitted wastewater discharges, and major tributaries</p> <p>Complete a trend analysis of existing fish contaminant data</p> <p>Evaluate the extent to which sources of PCBs within the AOC contribute to the impairment in comparison to outside sources</p> <p>Address any identified sources of continuing loadings to the Pettit Creek Cove</p> <p>Conduct needed sediment assessments in depositional zones in the River and certain tributaries</p> <p>Determine whether mirex is still present in groundwater near the 102nd Street Landfill (see RAP, page 5-42)</p> <p>Complete remediation of eight hazardous waste sites (currently under way, see Appendix A)</p> <p>If necessary, develop and implement a strategy to address sediment PCB contamination</p> <p>If necessary, develop and implement a strategy to address sediment mirex contamination</p> <p>If necessary, develop and implement a strategy to address sediment dioxin contamination</p> <p>Continue periodic fish sampling and analysis</p>	NYSDEC	\$900,000 EPA-funded	5+ years

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
2. Tainting of Fish and Wildlife Flavor	Not impaired	N/A			
3. Degradation of Fish and Wildlife Populations	Impaired	<p>Support the development of Fish Community Objectives and Environmental Objectives for the Niagara River to guide sustainable management of the fishery</p> <p>Conduct needed sediment assessments, then develop and implement a strategy to address contamination if necessary</p> <p>Benthic macroinvertebrates surveys</p> <ul style="list-style-type: none"> - Conduct a survey to assess the current status of the macroinvertebrate community - Identify existing effective benthic community biological indices for various types of habitat in the Niagara River and tributaries, or develop new ones if necessary - Compare the current status of contaminated sites to non-impaired (reference) sites - Compare the current status of selected benthic groups (e.g. unionids) with available historical data to determine trends - Develop biotope maps for the benthic community to estimate the diversity of habitats and select valuable habitats (e.g. species-rich areas or sites with rare species) for future monitoring. <p>Assess the current community structure of sentinel amphibian species in riverine habitats of the AOC</p> <p>Assess Lake sturgeon populations (under way) and muskellunge populations</p> <p>Assess trends in nesting success of common tern, herons, and osprey</p> <p>If implemented, the U.S. Geological Survey project examining contaminant levels in colonial waterbirds and</p>			5+ years

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
		<p>tree swallows would provide information on population-level impacts (see the project description under the Degradation of Benthos BUI)</p> <p>Develop and implement a post-remedial unionid restoration plan</p> <p>Implement test plots for transfer and restoration of native unionid populations from tributaries to river habitats to evaluate viability of population sustainability in historic habitat locations</p> <p>If necessary, establish long-term lake sturgeon/muskellunge restoration plans</p> <p>If necessary, create additional quality nesting habitat for common tern, herons, and osprey</p> <p>Develop and implement long-term monitoring plans for: unionids; Lake Sturgeon and muskellunge; common tern, herons, and osprey</p>			
4. Fish Tumors or Other Deformities	Impaired	<p>Complete the USFWS study of fish tumor prevalence. The anticipated completion date is late 2013</p> <p>The following actions would be needed if the USFWS study finds that tumor rates are unacceptable:</p> <p>Implement actions (if not yet under way) to locate sources of PAHs</p> <p>Determine whether PAHs are still present in surface and groundwater at levels that exceed NYS water quality standards</p> <p>Conduct needed sediment assessments in depositional zones in the River and certain tributaries</p> <p>Assess levels of PAHs present in storm sewer discharges</p>			2 – 5 years

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
		<p>Complete the remediation of eight hazardous waste sites (see Appendix A)</p> <p>Develop and implement a strategy to address other sources of PAH contamination if necessary</p>			
5. Bird or Animal Deformities or Reproductive Problems	Impaired	<p>Conduct a study of contaminant levels in mink livers</p> <p>Partner with Environment Canada for future herring gull egg monitoring efforts. Evaluate whether past Canadian findings apply to the U.S. side.</p> <p>If implemented, the U.S. Geological Survey project examining contaminant levels in colonial waterbirds and tree swallows would provide information on reproductive impacts (see the project description under the Degradation of Benthos BUI)</p> <p>Determine whether hexachlorobenzene is still present in groundwater near the New York Power Authority conduits (see RAP page 5-47)</p> <p>Conduct needed sediment assessments, especially to reassess Pettit Creek Cove and Gill Creek</p> <p>Complete remediation of eight hazardous waste sites (currently under way)</p> <p>If necessary, develop and implement a strategy to address sediment contamination with hexachlorobenzene, Dioxin, DDT & DDE, Dieldrin, and Chlordane</p>			2 – 5 years
6. Degradation of Benthos	Impaired	<p>Through routine NYSDEC monitoring, and possibly supplemental surveys at selected depositional zones, major tributary mouths and main channel locations, determine the current level of impact to macroinvertebrate community structure</p> <p>The U.S. Geological Survey is conducting a project at a number of AOCs that could provide valuable information</p>			5+ years

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
		<p>if resources are available to expand it to include the Niagara River. The project involves analysis of contaminant levels in a combination of colonial waterbird species (herons, cormorants, gulls, and terns) and tree swallows to assess local contaminant exposure, and the resulting impacts. Study of tree swallows is especially valuable for assessing sediment contamination.</p> <p>Determine whether priority contaminants in sediments are bioaccumulating in fish inhabiting selected sediment depositional zones, using methodology described in the RAP (see page 4-71)</p> <p>Conduct needed sediment assessments in depositional zones in the River and certain tributaries</p> <p>Complete the remediation of eight hazardous waste sites (see Appendix A)</p> <p>If macroinvertebrate community structure is more than slightly impacted, develop and implement a strategy to address sediment PCB contamination</p> <p>Determine whether BHC is still present in groundwater in the “Niagara Falls Sub-area”</p> <p>Determine whether BHC is still present in the effluent from the Niagara River WWTPs (see RAP, page 5-46)</p> <p>If necessary, develop and implement a strategy to address sediment BHC contamination</p> <p>If necessary, implement actions to address sanitary and combined sewer overflows: actions identified in Long-Term Control Plans for combined sewer overflows; green infrastructure projects to reduce impervious surface runoff, in turn reducing the volume of storm water entering sewers</p>			

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
7. Restrictions on Dredging Activities	Impaired	<p>Evaluate existing sediment data from the Buffalo State College project – This project included collection and digitization of data related to river sediment, water quality, sediment elutriate, sewer and stormwater runoff, surface water, and biota. The sediment data should be evaluated for data gaps and should be compared to New York state criteria</p> <p>Determine whether the contaminants are still present in the effluent from Niagara River WWTPs that could impact the navigation channel</p> <p>Evaluate federal navigation channel zones that exceed authorized depth –Determine the last time these areas were dredged and evaluate the probability of having to dredge them again. If the probability is low, it may be possible to exclude these zones from the areas requiring “routine” navigation dredging, which are the subject the delisting criterion.</p> <p>Conduct sediment assessments in the federal navigation channel and in other areas where dredging may be required for commercial or recreational navigation</p> <p>If necessary, develop and implement a strategy to address contaminated sediment in the federal navigation channel and other areas requiring dredging</p> <p>Develop a sediment remediation Feasibility Study for the Niagara River and tributaries based on existing data and the results of new assessments</p> <p>Complete remediation of hazardous waste sites that could impact the navigation channel (currently under way): Buffalo Color Corporation, Mobil Oil, and Bethlehem Steel</p>			5+ years

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
		If necessary, implement actions to address sanitary and combined sewer overflows: actions identified in Long-Term Control Plans for combined sewer overflows; green infrastructure projects to reduce impervious surface runoff, in turn reducing the volume of storm water entering sewers			
8. Eutrophication or Undesirable Algae	Not impaired	N/A			
9. Drinking Water Consumption Restrictions, or Taste and Odor Problems	Not impaired	N/A			
10. Beach Closings	Not impaired	N/A			
11. Degradation of Aesthetics	Not impaired	N/A			
12. Added Costs to Agriculture or Industry	Not impaired	N/A			
13. Degradation of Phytoplankton and Zooplankton Populations	Not impaired	N/A			
14. Loss of Fish and Wildlife Habitat	Impaired	<p>Evaluate methods for protecting the priority habitats through regulation or other land-use controls</p> <p>Investigate possible alternatives for mitigating shoreline hardening through NYSDEC's permitting process</p> <p>Promote opportunities to soften hardened shoreline and integrate bioengineering approaches to erosion control</p> <p>Provide educational opportunities to municipalities and other stakeholders on soft bioengineering of shorelines and the associated ecosystem service benefits and</p>			5+ years

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
		<p>potential economic benefits to communities</p> <p>Identify and support pilot projects to demonstrate the benefits of softening shoreline and of bioengineering approaches to erosion control</p> <p>Maintain a GIS database of SAV habitat in the Outer Harbor/Upper River</p> <p>Create invasive species control strategies for priority habitats (see the list attached to the delisting criteria)</p> <p>Create and implement conservation measures for the priority habitats, where achievable</p> <p>Create and implement a long-term conservation strategy for the Upper Niagara River Island Complex (Strawberry, Motor, Beaver Islands)</p> <p>Perform an ecosystem inventory of the Niagara Gorge; create and implement a long-term conservation strategy</p> <p>Support the completion of Buffalo Niagara Riverkeeper's Niagara Habitat Conservation Strategy project.</p> <p>Conduct mapping (occurrence and density) of invasive species communities in and adjacent to priority habitats</p> <p>Use historical information to determine the overall amount of coastal wetland area lost since 1927</p> <p>Evaluate the sufficiency of the priority habitats that were listed in the 1994 RAP, and update the list of habitats that should be protected and be subject to the requirement for conservation measures where achievable</p> <p>Determine whether regulatory protection exists for the "Other Priority Habitats" (see the list accompanying the delisting criteria)</p>			

BUI	Current Status	Additional Needs	Potential Lead Organization	Est. \$/Source	Years needed to complete BUI Removal
		Implement habitat conservation projects (e.g., habitat restoration, land acquisition, management, and implementation of regulatory protections) in the priority Niagara River AOC habitats, other critical habitats identified through Buffalo Niagara Riverkeeper's Niagara Habitat Conservation Strategy project, and other areas as necessary to meet the first and second delisting criteria			