Cayuga Creek

Watershed Restoration Road Map

The Cayuga Creek Watershed Restoration Roadmap

March 2009

Prepared for:

U.S. ARMY CORPS OF ENGINEERS

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1 Introduction

The Restoration Roadmap provides a path with a series of options for agencies, activist citizens' groups, private enterprises, and non-governmental organizations to select and implement restoration projects.

The Cayuga Creek Watershed Restoration Roadmap represents the synthesis of known and available information regarding the impairments and environmental health of the watershed. The intent of the document is not to thoroughly summarize what others have previously reported as an update to their efforts, rather to be succinctly informative of existing conditions and impairments, and then to provide a variety of project types that can be implemented across the watershed to address those impairments.

Persistent environmental contamination and pervasive habitat alterations within the watershed raises questions regarding issues of human health, resource management, ecological integrity and sustainability, and outdoor public recreational opportunities.

1.1 Overview of Watershed

Cayuga Creek is a tributary to the Niagara River and lies within the Erie-Niagara drainage basin of western New York State in Niagara County, New York. The two main sub-watersheds are Cayuga Creek and Bergholtz Creek. The headwaters of the 8.8-mile long Cayuga Creek main-stem originate off of the Niagara Escarpment in the Town of Lewiston near the hamlet of Pekin. From this point the creek flows southward through the Tuscarora Nation and Town of Wheatfield. The creek crosses under Walmore Road onto the Niagara Falls Air Reserve Station complex and continues southward through the Town of Niagara, and the City of Niagara Falls where it joins its

major tributary Bergholtz Creek before continuing south to join the Little Niagara River opposite Cayuga Island. Bergholtz Creek's headwaters originate at the Niagara Escarpment in the Town of Cambria. The 11.4-mile long main channel flows to the southwest until it crosses Niagara Road where it turns to the west toward the confluence with Cayuga Creek. The entire watershed drains approximately 38 square miles.

Land use across the watershed is characterized by agricultural, commercial, residential, and urban areas. As recently reported by Gould, Irvine, and Perrelli (Buffalo State College, 2009) 2005 land use mapping indicates that agriculture still accounts for the majority of land use (approximately 40%), followed by residential (approximately 21%), forest cover (approximately 11%) and commercial (approximately 10%). The entire watershed has minimal topographic relief and is underlain by glacial lacustrine deposits of poorly drained clay soils. With the exception of small patches of early-to-late successional wooded areas, predominant vegetation cover is comprised of managed communities and disturbed early successional communities (e.g.., old field, shrubland, young-aged woodland). The northern portion of the watershed is largely agricultural, rural residential, some mapped wetlands, and scattered forest cover. The middle and lower watershed transitions from rural/agricultural to suburban/residential and commercial land uses. Cayuga Creek flows through the Niagara Falls Air Reserve Station, where the channel and landscape have been highly modified. Cayuga Creek then flows through small, fragmented woodlands and woodlots, and residential neighborhoods in the middle watershed before flowing through an urbanized landscape associated with the city of Niagara Falls near its confluence with the Little Niagara River. Bergholtz Creek flows through densely settled residential areas in its final approximately two miles.

1.2 Description and Purpose of Document

The Restoration Roadmap has been developed from the current understanding of what is known regarding the environmental status of the watershed. Information and data previously developed by state and federal agencies, New York State Department of Environmental Conservation (NYSDEC), U.S. Fish and Wildlife (USFWS), U.S. Environmental Protection Agency – Great Lakes National Program Office (GLNPO), U.S. Army Corps of Engineers (USACE), academic institutions (Buffalo State College), industry New York Power Authority

A bibliography of studies, reports, investigations, and other information related to the Cayuga Creek watershed can be found at www.bnriverkeeper.org.

(NYPA), and non-governmental groups (Buffalo Niagara Riverkeeper) was collected and reviewed to more clearly understand existing conditions as they relate to the physical, chemical, and biological health of the creek.

Purpose

The purpose for preparing the Roadmap is to support and direct future efforts to improve the health of the watershed. Specifically, the Restoration Roadmap provides a suite of project types that can be implemented to address known watershed impairments. The restoration projects described in Section 7 are complementary to each projects and will contribute to meeting multiple watershed objectives.

Goals

The overall goal of the Restoration Roadmap is to eliminate or remediate known impairments within the Cayuga Creek watershed by outlining a variety of activities that – together – comprise an additive and interactive process for restoring the health of the system and by identifying a listing of projects that can be implemented within the next 10 years. Each project identified in the Restoration Roadmap is expected to lead to incremental improvement, restoration, and/or enhancement of ecological, physical, and recreational resources. Each project will contribute to reducing or eliminating one or more impairments in the watershed. The focus of the projects is on the following environmental categories:

- Stream bank stabilization and erosion control;
- Habitat conservation and restoration;
- Storm water management; and
- Contaminant reduction.

Objectives

Specific Restoration Roadmap objectives are as follows

Stream Bank Stabilization and Erosion Control

- Reduce the percentage of eroding stream banks within watershed; and therefore reducing sediment loading, turbidity, and sedimentation.
- Riparian slopes and streambanks are stabilized and riparian plant communities are restored by using a combination of bioengineering methods to also promote ecological diversity and functional uplift.
- Sediment and nutrient loading from development and agricultural activities, which degrade water quality and aquatic habitat function, are controlled and minimized.
- Severity, frequency, and duration of high turbidity events in Cayuga and Bergholtz creeks are reduced from 2008 levels.

Habitat Conservation and Restoration

- Additional submerged and emergent habitat structure is created and complexity of existing structure is enhanced while accommodating recreational boating.
- With the ultimate goal of creating a sustainable fishery, the life cycle needs of fish and other aquatic organisms are supported by: creating and enhancing in-channel habitat structure and aquatic vegetation communities, and eliminating sediment contamination.
- Where practicable, high water flows are re-connected to remaining undeveloped floodplains and to undeveloped areas that could function as floodplain.
- Riparian zone acreage and overall widths of riparian buffers are increased within; riparian area hydrologic and ecological functions are restored or enhanced.
- Invasive species control and management plan is implemented substantially reducing the numbers and densities across the watershed.

Stormwater Management

- Phosphorus pollution is reduced and Bergholtz Creek is delisted from the from 303(d) list.
- Pathogen pollution is reduced and Bergholtz Creek is de-listed from the 303(d) list.
- Flooding risk to Cayuga Village is reduced and stream banks in the vicinity and downstream of the Village are stabilized.
- Off-channel and fringe wetlands are protected, enhanced, restored, and/or created for flood water detention, flood flow dissipation, and expanded riparian habitat.
- Within the constraints imposed by existing land use patterns, watershed stream channels are restored to more closely resemble the channel form of natural streams. Channel realignment is conducted in coordination with riparian habitat restoration planning and design.
- Sanitary sewer overflows (SSOs) in watershed are rehabilitated.

Contaminant Reduction

- Extent of dioxin contamination is determined and remediation completed to allow de-listing of Cayuga Creek from 303(d) list.
- Extent of PCB contamination is determined and remediation completed to allow de-listing of Bergholtz Creek from 303(d) list.
- Current levels and spatial distribution of sediments of other contaminants such as metals and pesticides are determined. Any necessary remediation is planned and implemented.

2 Watershed Impairments

Niagara River Area of Concern

The Restoration Roadmap objectives listed above are consistent with regional efforts such as the Niagara River Area of Concern (AOC) Remedial Action Plan. Achieving these objectives will contribute to delisting Cayuga and Bergholtz Creeks from the AOC RAP beneficial use impairments and the 303(d) impaired waterbodies lists.

It has long been recognized that stresses on the Cayuga Creek watershed are contributing to the impairment of beneficial uses (BUIs) of the Niagara River. The BUIs listed as impaired within the Niagara River AOC are summarized below in Table 1. The recently developed delisting criteria are also provided for each of the impaired BUIs.

AOC delisting criteria are a set of target environmental conditions that include measurable and locally-derived indicators for measuring success toward the delisting of BUIs. Once a set of delisting criteria have been met for a particular BUI through remedial or restorative activities, the removal of the impairment can be recommended.

Table 1 Niagara River RAP Beneficial Use Impairments, Status and Delisting Criteria

Beneficial Use Impairment	Status	Delisting Criteria
Restrictions on Fish and Wildlife Consumption	Impaired	Restrictions on fish and wildlife consumption in the AOC due to watershed or in-place contaminants are absent. No public health advisories are in effect for human consumption that are due to watershed or AOC specific sources.
		Contaminant levels created by anthropogenic chemicals due to watershed or in-place contaminants do not exceed current standards, objectives, or guidelines in resident fish and wildlife.
		Any remaining restrictions on fish and wildlife consumption are due to upstream or downstream sources that are addressed by other management plans such as Lakewide Management Plans (LaMPs).

Table 1 Niagara River RAP Beneficial Use Impairments, Status and Delisting Criteria

Beneficial Use Impairment	Status	Delisting Criteria
Degradation of Fish and Wildlife Populations	Impaired	Environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical, and biological habitat present.
		Fish populations meet applicable Index of Biological Integrity (IBI) and wildlife populations have healthy reproducing populations of eagle, mink, otter, or other sentinel species.
Fish Tumors or Other Deformities	Impaired	Incidence rates of fish tumors or other deformities do not exceed rates at un-impacted control sites.
		Survey data confirm the absence of neoplastic or pre-neoplastic liver tumors in bullheads or suckers as compared to control sites.
		No reproductive deformities in observed resident species as compared to control sites.
Bird/Animal Deformities or Reproductive Problems	Impaired	Wetlands support healthy communities of significant species and no reports of deformities from wildlife officials. Exceptions may apply to limited background effects.
		Incidence rates, if present, of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species do not exceed background levels of inland control populations.
Degradation of Benthos	Impaired	Benthic macro-invertebrate community structure does not significantly diverge from un-impacted control sites of comparable physical and chemical characteristics.
		In the absence of community structure data, the toxicity of sediment-associated contaminants is not significantly higher than controls at un-impacted sites.
Restrictions on Dredging Activities	Impaired	Concentrations of metals, trace organic compounds and nutrients in the sediment within the AOC (located within the actual or potential dredging areas and current shipping routes) do not exceed the sediment quality standards, criteria, or guidelines for acceptable dredge and disposal material (lowest effect levels) to the maximum extent practicable. Exceptions apply where background concentrations exceed levels. Consideration for beneficial reuse of sediments is to be taken into account.
		When sediment criteria are exceeded, any restrictions on dredging are specific to in-place conditions located within the actual or potential dredging areas and current shipping routes and are not attributable to current AOC watershed contributions. Restricted dredging activities are registered with and have appropriate authority approval. Restrictions do not contribute to other use impairments and assure that beneficial uses are protected.

Table 1 Niagara River RAP Beneficial Use Impairments, Status and Delisting Criteria

Beneficial Use Impairment	Status	Delisting Criteria
		For public swimming beaches, the waters must be free of chemical substances capable of creating toxic reactions or irritations to skin/membranes, must achieve numerical and clarity standards for safety, and must be free of public health advisories.
		In the absence of community structure data, plankton bioassays confirm no toxicity impact in ambient waters (i.e. no growth inhibition).
Loss of Fish and Wildlife Habitat	Impaired	Amounts and quality of physical, chemical, and biological habitat (including wetlands, riparian vegetation, and buffers) are adequate for fish and wildlife management goals (achieved and protected).
		Experts do not identify habitat loss as a cause for non-attainment of Fish and Wildlife management goals.

New York State (NYSDEC) Surface Water Impairments

The New York State 303(d) list of impaired waterbodies includes the following for the Cayuga Creek Watershed:

- Dioxin contamination in Cayuga Creek
- PCB contamination of Bergholtz Creek
- Excessive phosphorus in Bergholtz Creek
- Excessive pathogens in Bergholtz Creek

NYS 305(b) List of Priority Waterbodies includes the following impairments for Cayuga and Bergholtz Creeks from elevated levels of nickel and zinc.

Cayuga Creek Watershed Report Card

The Cayuga Creek Report Card (NYPA 2006), which was created by the Cayuga Creek Restoration Steering Committee made up of citizens, Tuscarora Environmental Program, Niagara County, and a variety of local, state, and federal agencies and led by Buffalo Niagara Riverkeeper, points out the major impairments to the watershed. In summary, the Report Card assesses the overall health of the watershed by evaluating successes, current conditions, and goals for improving the quality of the primary environmental elements within the watershed. Elements, or categories, include water quality, fish and wildlife, public access and recreation,

environmental access and public involvement, land use and planning, and contamination. Most scores are in the “fair” and “poor” range, however, many have trends indicating recent progress. While most trends have been stable or steady, land use and development have contributed to the overall decline in environmental quality. Overall, the Report Card summarizes that there is much room for improvement within the watershed. .

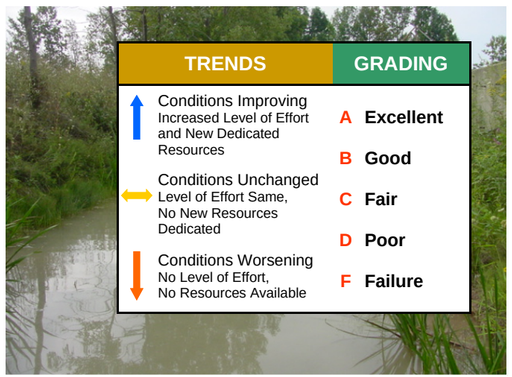
REPORT CARD

The Cayuga Creek Watershed Report Card was created by the Cayuga Creek Restoration Steering Committee, led by Buffalo Niagara Riverkeeper. Committee members included local municipalities, Niagara County, US Fish & Wildlife Service, NYS Department of Environmental Conservation, US Army Corps of Engineers, Tuscarora Nation, New York Power Authority, LaSalle Pride, Niagara University, and Niagara Co. Soil & Water Conservation Service.

The purpose of this Report Card is to give a brief overview of the health, improvements and current conditions of the Cayuga Creek Watershed, which includes Cayuga and Bergholtz Creeks and their tributaries. Scientific data and research referenced in this Report Card is available at our website: www.BNRiverkeeper.org.

The Report Card offers six indicators related to the health of the watershed: 1) Water Quality; 2) Fish and Wildlife; 3) Public Access and Recreation; 4) Environmental Education & Public Involvement; 5) Land Use & Planning; and 6) Contamination.

Each indicator has been broken down further into several categories and graded on progress. The last column identifies action steps or immediate concerns that need to be addressed.



TRENDS	GRADING
↑ Conditions Improving Increased Level of Effort and New Dedicated Resources	A Excellent
↔ Conditions Unchanged Level of Effort Same, No New Resources Dedicated	B Good
	C Fair
	D Poor
↓ Conditions Worsening No Level of Effort, No Resources Available	F Failure

WHAT IS A WATERSHED?

A watershed is the land area that drains to a common waterway, such as a creek, river, or lake. Watersheds include the creeks, upland areas, and the "riparian" areas adjacent to the creeks. Riparian zones can provide many important functions for stream and waterbody protection. A well vegetated riparian area can stabilize the stream banks, prevent erosion and filter pollutants that may have otherwise entered the creek from runoff.

CAYUGA CREEK WATERSHED

Cayuga Creek drains approximately 34 square miles of land in Niagara County, NY. Tributary streams to Cayuga Creek include Bergholtz and stretches of Black and Sawyer Creeks. The watershed includes portions of the Towns of Lewiston, Wheatfield, Niagara and Cambria; the Tuscarora Nation; and the City of Niagara Falls. Cayuga Creek eventually drains into the upper Niagara River via the Little River.

MAJOR PROBLEMS

1. Fish consumption advisories
2. Poor water quality
3. Contaminated sediment
4. Poor fish habitat
5. Limited public access

HOW CAN YOU HELP?

- Participate in Riverkeeper's Creek Clean-Up events
- Educate yourself on the importance of clean water & riparian habitat
- Spread the word in your community
- Talk to your elected officials
- Volunteer to become a Riverwatch Captain

	CATEGORIES	GRADE	SUCCESSES AND IMPROVEMENTS	CURRENT CONDITIONS	TREND	STEPS NEEDED FOR PROBLEM RESOLUTION
WATER QUALITY	**Overall Water Quality in Cayuga and Bergholtz Creeks**	D	• The Water Quality monitoring conducted by Niagara Co. Soil and Water Conservation will provide much needed baseline data on the health of the watershed • Conversion to municipal sewer systems dramatically reduced bacteria levels since the 1970's • Volunteer water quality monitoring in Cayuga and Bergholtz Creeks is conducted by Buffalo Niagara Riverkeeper through the Riverwatch Program	• Cayuga and Bergholtz Creeks are classified as Class C waterbodies by NYSDEC • Both are listed as impaired due to fish consumption restrictions • Macroinvertebrate community is dominated by pollution tolerant organisms	↔	• Implement nonpoint source (agricultural and other runoff) pollution abatement practices in the watershed • Coordinate the water quality monitoring programs in the watershed, including surface and groundwater testing
	Point and Nonpoint Source Discharges	C	• WNY Stormwater Coalition is mapping discharge points along creeks for EPA Phase II compliance • Agriculture Environmental Management (AEM) Program has been implemented to document and prioritize water quality impairments within agricultural areas	• Bergholtz Creek is impaired due to pathogens and phosphorus from urban and agricultural runoff • Results from stormwater mapping will identify discharge points along the creeks • Freshwater discharge from LaFarge Quarry	↑	• Track down and remediate illicit discharges • Promote Agriculture Environmental Management (AEM) Program for farms in Cayuga Creek watershed • Fully implement Stormwater Phase II regulations
	Erosion and Flooding	C	• Buffalo State College has identified creek shoreline areas in need of restoration and stabilization • Towns in the watershed have drainage and debris removal plans to reduce and remove blockages to streamflow which can lead to erosion and flooding	• Localized erosion sites remain • Commitment from the City of Niagara Falls to implement debris removal • Woody debris jams causing erosion and flow restrictions	↑	• Implement Niagara Falls debris removal plans • Continue research to define targeted shoreline erosion areas for restoration • Continue Town drainage work to be consistent with proposed habitat restoration
FISH AND WILDLIFE	**Fish and Wildlife Habitat**	C	• Watershed inventories of aquatic habitat including fish barriers (NYPA 2005, Buffalo State College 2005) will be used to help guide watershed management activities, such as debris removal and bank stabilization • Natural Resources Damage Settlements will be applied for habitat restoration of Cayuga Creek	• Historic channel alterations (dredging and straightening) resulted in loss of wetlands, alterations to the timing and magnitude of stream flow, and poor aquatic habitat • Poor riparian buffers and habitat fragmentation in developed areas of the watershed	↑	• Identify and protect critical watershed habitat • Encourage riparian buffers along the creeks in the watershed • Implement Natural Resources Damage Settlement funds • Restore and create wetlands where possible • Utilize volunteers for habitat restoration efforts
	Fish and Wildlife Diversity and Populations	B	• Fish and wildlife surveys conducted on the Niagara Falls Air Reserve Station provided needed baseline data on the diversity of fish and wildlife species found in Cayuga Creek within the airbase • NYSDEC conducted an investigation to determine if habitat in Cayuga Creek is suitable for pirate perch • Biological control of purple loosestrife by USFWS	• Black, Bergholtz, and Cayuga Creeks support a warm-water fishery (bass, sunfish, carp, etc.) • Good waterfowl habitat in lower portions of the creeks • Watershed has historically served as a refugium for some Midwestern species that have not been found elsewhere in the Niagara River drainage basin • Rare species found in watershed (Devil crayfish, western chorus frog)	↔	• Control invasive plant species such as purple loosestrife, Eurasian milfoil, *Phragmites* and Japanese knotweed • Update fish and wildlife surveys throughout the watershed to include invasive species impacts • Research possibilities for pirate perch restoration program
	Contaminant Levels in Fish and Wildlife	D	• Biomonitoring studies using fish and mussels were conducted by various agencies to examine contaminants in the watershed • NYSDEC conducted sampling of juvenile fish from creeks to assess the successes of remediation efforts	• PCB and dioxin hotspots continue to negatively affect contaminant levels in fish and wildlife • Fish consumption advisories continue to be a problem in the watershed	↑	• Continue contaminant source identification surveys

How Would YOU Grade the Cayuga Creek Watershed?

We want to hear from you! This Citizens' Report Card will help us understand your concerns as we work to restore areas of Cayuga & Bergholtz Creek and areas within the watershed.

Cayuga Creek Citizens' Report Card

"Class"	Grade (A-F)
Access Is it easy to get to the shoreline? Is there public land to enjoy?	
Fishing Do you catch fish in the creeks? Are there many species? Do they appear healthy?	
Boating Is the water quality and appearance good for boating or canoeing?	
Aesthetics Are there trash, odor or other problems?	
Other_____ What other conditions of Cayuga and Bergholtz Creeks would you find worth grading?	

Comments: _____

Name: _____

Address: _____

Email/phone: _____

Thanks for your input! For more information, email Buffalo Niagara Riverkeeper at rdrake@BNRiverkeeper.org or call 716.852.7483.

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	CATEGORIES	GRADE	SUCCESSES AND IMPROVEMENTS	CURRENT CONDITIONS	TREND	STEPS NEEDED FOR PROBLEM RESOLUTION
PUBLIC ACCESS AND RECREATION	**Public Access to the River and Creeks**	D	• Buffalo Niagara Riverkeeper completed and published the Cayuga Creek Canoe Trail Design and Brochure • Griffon Park was improved to provide access to Cayuga and Bergholtz Creeks via the Little River • Cambria Town Park will provide access to Bergholtz Creek	• Limited access in non-navigable areas due to private property along creeks • Sunken pylons cause problems for boating • Canoe, kayak and public marina access near the mouth of Cayuga Creek	↔	• Conduct acquisition of land or conservation easements • Further investigate the potential for enhanced recreational opportunities in the upper watershed
	Aesthetics of the Creeks and Adjacent Riparian Areas	C	• Two very successful shoreline clean ups are conducted each year through the efforts of hundreds of volunteers • The City of Niagara Falls has conducted debris removal efforts	• Unsightly bank protection measures are still prevalent	↑	• Educate riparian land owners in proper shoreline stewardship along the creeks
ENVIRONMENTAL EDUCATION AND PUBLIC INVOLVEMENT	**Public Awareness/Appreciation of the Watershed**	C	• Local environmental organizations raise public awareness by conducting ongoing programs throughout the watershed • Earth Day events focused upon water quality issues and educating thousands of families through print media • Ongoing education of creekside homeowners and businesses regarding the need to improve creek health	• Not all residents are fully aware of watershed issues • Creekside landowners contribute to surface water pollution through improper disposal of yard waste	↑	• Conduct updated, free-flowing communication and increase opportunities for community feedback regarding watershed policies • Seek increased support from all forms of local media to inform the public • Present watershed information at local festivals such as Boom Days and Canal Fest
	Environmental Stewardship	B	• LaSalle Pride, a local community organization, is very active in the watershed • Riverkeeper's Riverwatch Program, a volunteer monitoring effort, includes stations in Cayuga and Bergholtz Creek • Cleanup events engage hundreds of local residents in environmental stewardship activities	• Limited public involvement in watershed planning and other environmental programs • Lack of opportunity for residents to be involved in restoration	↑	• Update this Report Card periodically • Continue training Riverwatch monitors • Develop Riverwatch campaigns including stormdrain stenciling, education and water testing
LAND USE & PLANNING	**Land Use & Development**	C	• Municipalities in the watershed have new & updated comprehensive plans with an environmental focus • Programs associated with agricultural areas in the watershed have been implemented to promote the conservation and improvement of resources on working lands	• Land use in the watershed varies widely from residential and agricultural to commercial and industrial • Residential development pressures continue throughout the upper watershed which may threaten habitat, open space and public access	↓	• Implement recommendations in municipal master plans • Acquire land or conservation easements in the watershed • Encourage best management practices (BMPs are techniques used to prevent or reduce nonpoint source pollution)
	Cultural Heritage	C	• The Tuscarora Nation is collecting local indigenous oral histories regarding Cayuga Creek • Development of a Historic Properties Management Plan by the NYPA in areas of the watershed • Participation of the Haudenosaunee Environmental Task Force in Cayuga Restoration Efforts	• Cultural and historic points of interest are unmarked and unidentified • Limited access to water by various ethnic groups for musical, artistic and spiritual growth • Customary uses of the creek are impaired by water quality and fish advisories	↔	• Inventory and protect cultural and historic features in the watershed • Create programs for the interpretation and celebration of Cayuga Creek history, culture and heritage
CONTAMINATION	**Contaminated Sediments in Cayuga and Bergholtz Creeks**	D	• Remediation of historical sediment contamination in Cayuga and Bergholtz Creeks • Decreasing levels of contamination in sediments • Ongoing monitoring programs sample water, sediment, and aquatic organisms in the watershed to identify contaminant hot spots and to assess current remediation efforts	• Sediment contamination continues to impair water quality • Data suggests that possible sources of contamination are still present	↔	• Continue monitoring for upstream sources • Conduct additional remediation of any contamination sources found
	Inactive Hazardous Waste Sites	C	• Delisting of Love Canal from EPA's National Priorities List • Reductions in pollutant loading from sites	• Long-term operations and maintenance plans in place • Off-site contaminant migration has generally been controlled • Unknown sources still remain	↑	• Conduct and maintain remediation of Hazardous Waste Sites and Brownfields • Continue contaminant source track downs through the Niagara River Toxics Management Plan

WHY SHOULD YOU CARE ABOUT THE CAYUGA CREEK WATERSHED?

Maintaining a healthy watershed has positive environmental, social and economic impacts. Healthy creeks improve the quality of life for residents in terms of waterfront access, recreation opportunities and public health. As land development pressures increase throughout the watershed, citizens should be aware of the potential impacts of these pressures on their creeks and the fish and wildlife that depend on them. A healthy stream restores and preserves property values for surrounding communities and can improve the capacity for local ecotourism efforts in the watershed, such as hiking, biking, birding, fishing, boating, and other outdoor recreation. And a healthy river invites further investment into a community by local industry and other water dependent or enhanced businesses.

This Report Card was produced by Buffalo Niagara Riverkeeper with funding provided by the New York Power Authority.

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Cayuga Creek Watershed
Niagara County, New York

REPORT CARD

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3 Strategy Supporting Restoration and Project Identification

The Restoration Roadmap represents a strategy to achieve specific goals and objectives associated with watershed-scale resource enhancement and restoration. The applied strategy is a practical approach to address biological impairments and their solutions from site-specific project activity to watershed and system-wide uplift. Where ecological impairments are part of an interconnected whole so are solutions. Within existing land use and infrastructure, projects have been conceived to address multiple categories of watershed health. For example, stream bank stabilization, riparian area function, and in-channel habitat may all be improved by a single project. Since not all problems can be addressed completely at one time, impairments and specific site problems will be solved incrementally.

An important aspect of the Restoration Roadmap is that it recommends an adaptive management strategy, that allows for adjustment of restoration methods and techniques over time as local experience informs which needs are greatest and what approaches to problems work best in this specific watershed.

A range of projects has been developed to deal with the mosaic of restoration challenges that beset the watershed. Some projects can be designed and implemented in the short-term while others may take several years to be fully implemented.

Projects need to be planned and implemented in logical sequence. Many sites have multiple impairments that require prioritization. For example, contamination issues may affect in-channel habitat improvements in some locations.

4 Healthy Watersheds – Defined

Supporting the overall approach for developing the Restoration Roadmap is the understanding of landscape ecology and the interconnections and interrelationships between the physical and biological components, including human communities. Rivers, streams, and lakes have been referred to as the "lifeblood" of watersheds and our environment. The interactions between waterways and the surrounding lands – the flow of nutrients, sediments, pollutants; terrestrial and aquatic wildlife persistence; human uses and environmental responses to those uses - determine the health and sustainability of watersheds.

Increasingly, watershed protection and the restoration of disturbed and degraded natural resources are seen as vital to sustainable economic growth and maintaining acceptable standards of living because ecosystems provide essential services such as clean water, fresh air, healthy soils, and livable climate.

The quality, function, and disposition of healthy rivers lie in the headlands and tributaries within their watersheds, not just in the larger, more visible streams. Generally, a healthy watershed is one where there is balance between human needs, water use, and the availability of clean water, all of which contribute to conditions of viable and self-sustaining natural plant and animal communities.

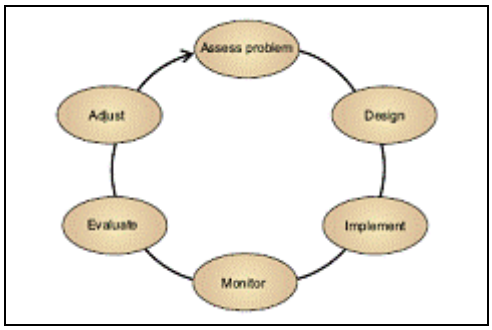
5 Healthy Cayuga Creek Watershed – Defined

Achieving the goals and objectives of the Restoration Roadmap will require active stewardship, and a commitment to initiate and complete the recovery of aquatic, riparian, wetland habitats, and long-term management of the natural resources occurring within the watershed.

The vision for developing the Restoration Roadmap and therefore achieving a healthy and self-sustaining watershed is one founded in hope and on realistic projections for restoration. Hope stems from the knowledge that a healthy, sustainable watershed will improve the quality of life within the Western New York region. Hope is also spurred on by recent work and progress within the watershed. The reality is that a healthy watershed will require persistence, collaboration, commitment, a reasonable set of restoration trajectories, monitoring, and adaptability.

The major, and perhaps even drastic, environmental changes that have occurred over the past 200 years have altered the occurrence, condition, size, and composition of natural communities and have also consequently modified peoples' relationships to the land. Clearly, many of these changes are unalterable and a restoration strategy based upon returning to "pre-settlement" conditions is problematic at best. It is understood that many current land management practices and urbanization have caused changes that are irreversible. However as our understanding of the need for sustainable and balanced natural environments has become more common, the science of restoration ecology has developed effective tools for working in impaired urban watersheds. Communities are also becoming more aware and demanding of the specific social, economic, environmental, and health benefits that arise from healthy watersheds.

Maintaining the Restoration Roadmap as a living document over time will support the continuation of actively implementing restoration projects and will help track our own successes and failures through monitoring. Active and adaptive monitoring will remedy failures and rectify project approaches for better future design and construction.



Adaptive Management Process

The Cayuga Creek watershed will be considered "healthy" when the following conditions have been met.

Contaminated sediments are eliminated or remediated to safe levels
The Beneficial Use Impairments (BUIs) for the Niagara River Remedial Action Plan (RAP) are delisted.
Cayuga and Bergholtz Creeks have been removed from the State's impaired waterbody lists (303(d) and 305(b).
Sustained efforts have been undertaken to conserve and restore wildlife and fisheries habitat, to increase public awareness of the need for preservation, conservation, restoration, and enhancement of habitat. Projects will involve a variety of habitat types to create diverse landscape elements in the watershed, including habitat in streams, wetlands, stream banks and riparian areas, and uplands.
Excessively eroding stream banks have been substantially reduced to create measureable reductions in turbidity and sedimentation.
Point and nonpoint sources of storm water have been removed, retrofitted, and/or managed to reduce pollution.

The identification and development of projects for the Restoration Roadmap (see Section 7) was completed with the full understanding that some historic changes to the watershed are irreversible and, therefore recommendations have been developed to improve the overall form and function of the system, mimicking more pristine conditions while working under the confines of the dynamic cultural landscape.

6 Summary of Selected Environmental Conditions

Stormwater Management

The Cayuga Creek watershed has been characterized by extensive modifications to its channels and riparian areas. Such changes have contributed to flooding problems and poor water quality. Development of the watershed for agricultural, residential, commercial and industrial land uses has substantially modified the way precipitation runs off the land to the streams within the watershed, producing higher and more sudden peak flows.

The two most important issues related to stormwater and its management are polluted runoff and flooding. Pollution from stormwater is a contributing factor related to the listing of Bergholtz Creek being on the New York State 303(d) list of impaired waters for both excess phosphorus and pathogens. The identified source in both cases is urban runoff. Although significant improvements were made by eliminating failing septic systems in parts of the watershed, sanitary sewer overflows (SSOs) continue to contribute nutrients and pathogens from untreated wastewater. Agricultural activities have also been cited as contributing to water quality degradation, especially agricultural management practices such as improper nutrient management techniques, absence of adequate riparian buffers, and lack of silo leachate control.

The Cayuga Village mobile home park was flooded twice during the winter of 1998, when Cayuga Creek overflowed its banks south of Porter Road. The floodwaters backed up the storm drains for Cayuga Village. The causes of the flooding were determined to be redirected flows from the West Branch Tributary and alteration of the Cayuga Creek channel downstream of Porter Road. Industrial and residential development of the lower and middle portions of the watershed have resulted in more impervious surface area and higher and faster peak runoff flows. Development has also led to disconnecting stream channels from their floodplains and the loss of riparian and other wetlands that otherwise would act to store rainfall and retard runoff. Additionally, large woody debris and blocked culverts in some locations can act to back up flow and potentially lead to localized flooding.

Stream Bank Stabilization and Erosion Control

Stream channels, stream banks, and multiple aspects of land use and management over broad areas of the watershed have undergone considerable modifications since settlement since the mid-1800's. As identified in the Cayuga Creek, Niagara County, NY 516(e) Sediment Transport/Delivery Model report (Gould et al, 2009), between 1958 and 2005 urban land use increased by 13% and agricultural land use decreased by 30% and became more fragmented. Even by 1958, there was a relatively small amount of forest land. Stream morphology, land cover and management, removal of native riparian woody and herbaceous vegetation, loss of connection to floodplains, conversion of wetlands, and construction of agricultural and stormwater drainage systems have greatly altered the hydrology and hydraulics of the watershed.

It is no surprise then, that at least three studies in the last 5 years have found significant areas of streambank instability and excessive erosion Baird 2005, Frothingham and Brown 2005, and URS et al 2005). In the upper watershed, mowed yards and agricultural crops are planted adjacent to the stream banks soil is exposed on stream banks, resulting in eroding banks and turbid

water in the upper portions of the creek. In the lower watershed, poor bank stability, and a lack of a natural riparian corridor are common. One study found that bank erosion and instability threatens structures. Fallen trees and other debris, including appliances and other garbage, have caused jams and worsened streambank erosion problems on occasion.

Erosion and sedimentation degrade aquatic and riparian habitat, degrade water quality, and negatively impact the quality of recreational experiences.

Habitat Availability and Quality: Status of Habitat Conservation and Restoration

The ecological condition and environmental status within the watershed has largely been defined by predominant land uses, land management practices, and industry and manufacturing. The overall extent and ecological integrity of the remaining biological communities, and quantity and quality of in-stream and riparian habitats are the direct result of land alteration that has occurred since the mid-1800s. Most habitat loss throughout the watershed was directly associated with development of public and private land prior to 1950, principally for farming. Agriculture remains a substantial land use within the watershed today, despite conversion to other land uses in recent decades.

Cayuga Creek and its primary tributaries have been subject to severe disturbance associated with road building, channel straightening and deepening (for flood control and conveyance), and contamination from point and non point sources. The dredging of Black and Bergholtz Creeks in the late 1980's to remove channel bed load and slope soils adversely affected channel depth-to-width ratio, floodplain topography, native soils, and riparian vegetation in these areas. All existing in-channel and off-channel vegetation within and along the creeks was eliminated, increasing

downstream turbidity (USFWS 2005). Most reaches in the area of dredging have been disconnected with their floodplain and off-channel riparian features. The present Cayuga Creek channel downstream of confluence with Bergholtz Creek is deepened and widened within the limitations imposed by residential structures, culverts and roadways. Riparian corridor alteration and deforestation has resulted in the colonization of early successional plant communities including invasive species. Habitat quality is poor in most reaches for fish, benthic organisms, and reptiles and amphibians.

There are areas within the watershed where enhancement and restoration of natural habitat are feasible. Despite sediment contamination and other stressors associated with channel and riparian degradation, vacant parcels, utility corridors and rights of way, parkland, wetlands, and existing public and private conservation areas have potential for preservation, conservation, restoration, or enhancement. Relatively large riparian sites with potential for larger scale habitat improvements include: Jayne Park, Griffith Park, the Weber Property, several NYSDEC wetlands, and the LaSalle Conservation Club.

Other smaller, but more numerous locations could offer cumulative benefits, despite their lack of connection to each other or to larger habitats. Such location include: stream-side residential and publicly managed landscapes, off-channel fringe wetlands, bridge and utility crossings, road rights of way, and commercial parcels.

Contaminant Reduction

The Cayuga Creek watershed has a long history of agricultural and industrial land uses, including use of pesticides and disposal and spills of hazardous materials on the land. Some amounts of these toxic materials eventually have been transported to the creek. Although remediation has been performed over the years to reduce the volume and concentration of contaminated sediments, some remain at levels that cause Cayuga and Bergholtz Creeks to be impaired. The Niagara River AOC RAP, which includes the Cayuga Creek watershed, shows beneficial use impairments for restrictions on fish consumption due to contaminants (USEPA 2008). The Final

2008 *New York State Section 303(d) List of Impaired/TMDL Waters* list shows Cayuga Creek impaired due to dioxin contaminated sediment and Bergholtz Creek impaired due to PCB contaminated sediments (NYSDEC 2008).

Historically, dioxin contamination was detected in sediments in both Bergholtz and Black Creeks. The source of the dioxin was the Love Canal area. In 1987, dioxin contaminated sediment was dredged from the lower portion of Black Creek and Bergholtz Creek between Black and Cayuga Creeks; clean fill was replaced in the streambed (Niagara County Department of Planning Development, and Tourism 1997). It appears that Cayuga Creek is not a source of dioxins and furans or pesticides to the Little Niagara River. The Little Niagara may be contributing to these concentrations in Cayuga Creek from the periodic backflows that occur within the Niagara River from the power generation. It does appear that Cayuga Creek is a source of PAHs and PCBs to the Little Niagara River, but not the only source (NYSDEC 2006).

According to the 2002 Priority Waterbodies List published by NYSDEC, the contaminant of concern in Bergholtz Creek is PCBs (NYSDEC 2005). PCBs in the creek have been attributed to an inactive hazardous waste site within its watershed, namely Bell Aerospace Textron. Remedial systems for the Bell Aerospace site were brought online from 1993-1999 (USEPA 2001). PCB concentrations in Bergholtz Creek appear to be negatively impacting fish. PISCES sampling from 2005 confirms that PCBs continues to be an issue in Bergholtz Creek (USAF 2007).

Watershed Data Management

Numerous studies have been completed over the past 30+ years within the watershed, ranging from (as examples) sediment and water quality sampling to locating eroded stream banks, studying the backwater effects of the operation of the New York Power Authority hydropower project on water levels in Cayuga and Bergholtz creeks, and conducting a field stream assessment along Cayuga Creek (Stream Visual Assessment Protocol, Buffalo State College). Over 70 studies and reports were collected to support the development of the Roadmap. The data collection process has been conducted by a variety of agencies and other entities and has not generally been ac-

complished to allow for a comprehensive understanding of overall conditions or apparent trends in the watershed over time. For instance, from the perspective of sediment contamination, no one organization houses all of the sampling information such as what types of samples were collected, how samples were collected, what constituents were analyzed, where samples were taken, and what on-going monitoring may be on-going in the watershed.

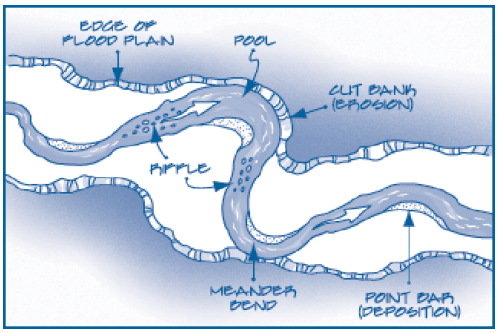
There is an existing need to organize, calibrate, and globally evaluate the various environmental, chemical, biological, and land use information in an interactive watershed database. In October 2006, Buffalo State College made significant strides in this direction by compiling a substantial amount of information into a GIS-based database. Since its development, additional work has been completed that should be added to the database. Additionally, the database can be enhanced with respect to ability to manipulate data. For example, current contaminated sediment data do not allow for an understanding of the extent of contaminated sediments or existence of legacy sediments.

Cayuga Creek

Watershed Restoration Road Map

1. Channel Alignment Restoration

Historic aerial photography dating back to the late 1930's and USGS topographic mapping (year) suggests that the channel form we see today is similar to what was mapped 80+ years ago. Channel form and in-channel structure has not significantly changed in the last century with the exception of increased surface water inputs due to greater areas of impervious surfaces, especially in the middle and lower watershed. While channel form (the overall lateral position of stream location, including meanders, straight reaches, and where a stream channel flows within the watershed) is remarkably similar to the early 1900s, it is evident from field observations along Cayuga and Bergholtz creeks that long reaches of stream have been modified through straightening and deepening.



Restoring stream sinuosity will provide more natural stream flow dynamics and will create habitat that has long been absent from the watershed.

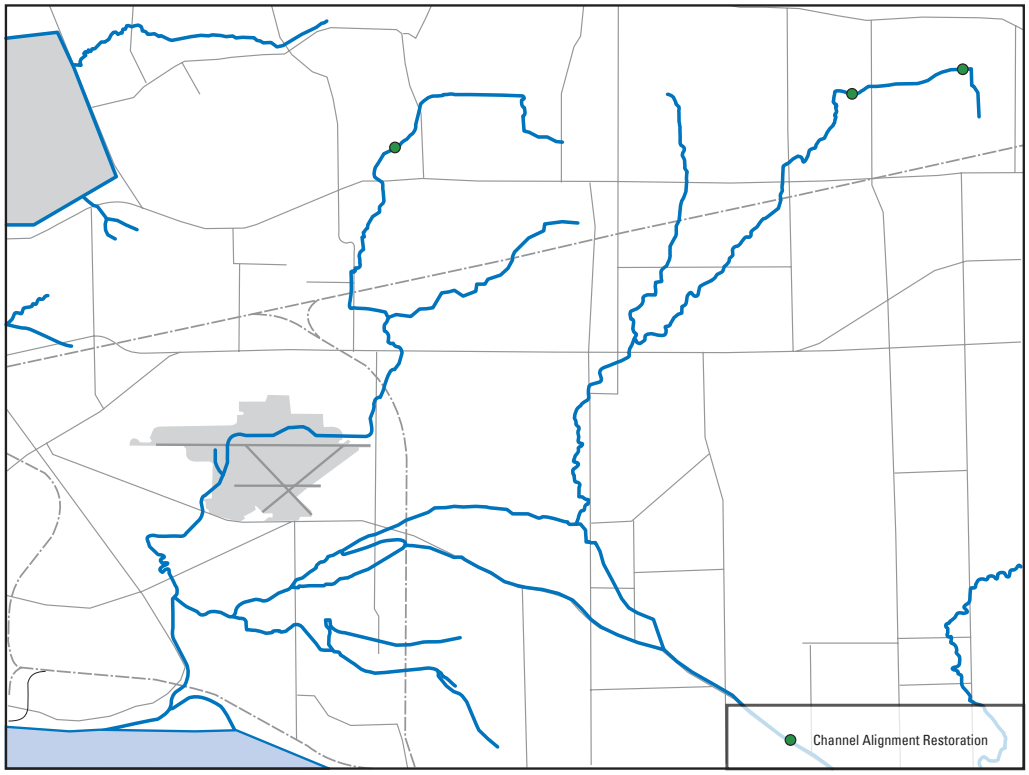
Natural streams typically exhibit meanders and are rarely straight. The "straightness" of the stream channels suggests active disturbances that likely occurred in the late 19th and early 20th centuries.

Stream straightening and deepening probably occurred as a result of road construction/ditch creation activities to help to drain farm fields, keep roads from flooding, and to allow for greater flood flows to be carried downstream faster.

Project sequencing will involve examining a number of factors including parcel and ownership information, active land management on-site and in vicinity, soils and substrate, stream flow characteristics in site area, floodplain characteristics, local topography, modeling of upstream and downstream areas to determine flow velocity and stream stage effects, as well as others.

Benefits

Restores channel hydraulic regime (pool:riffle:pool); creates more variable hydraulic environment; improves channel widths where there is over-widening; restores more appropriate sediment transport characteristics, expands creek length within the watershed, provides potential for connecting to riparian zones or wetlands or undeveloped areas, and creates/restores greater diversity of in-channel habitat and structure.



Potential Project Locations

An initial list of locations has been identified based upon existing channel straightness, lack of development in the immediate vicinity of the stream channel, and larger parcel sizes/reduced number of property owners. Ultimately, landowner agreement will need to be secured. Work at each project location will include field work, modeling, determination of upstream/downstream effects, and design prior to construction.

2. In-Channel Habitat Diversity

In areas just upstream of Little Niagara River, the creek channels are wide and channel depths are deep but there is little in-channel structure. In-channel dimensions, hydraulic regime, and vertical profile have been modified greatly by human disturbance over a very long time period. These projects involve evaluating specific stretches of stream channel in order to create and enhance submerged and emergent structure to increase habitat complexity for fish, amphibians, reptiles, wading birds, benthic organisms, etc. The increase in structural complexity will also influence local stream flow characteristics that will then increase diversity in the hydraulic environment. In-Channel Habitat Diversity will not interfere with recreational boating activities within the waterway. Materials that can be used to increase in-channel structure include pinned logs, large stone, hydraulic cover stones, and large woody debris (LWD). Constructed features using natural materials could include LUNKERS, bendways, cantilever stone bendways, and others.

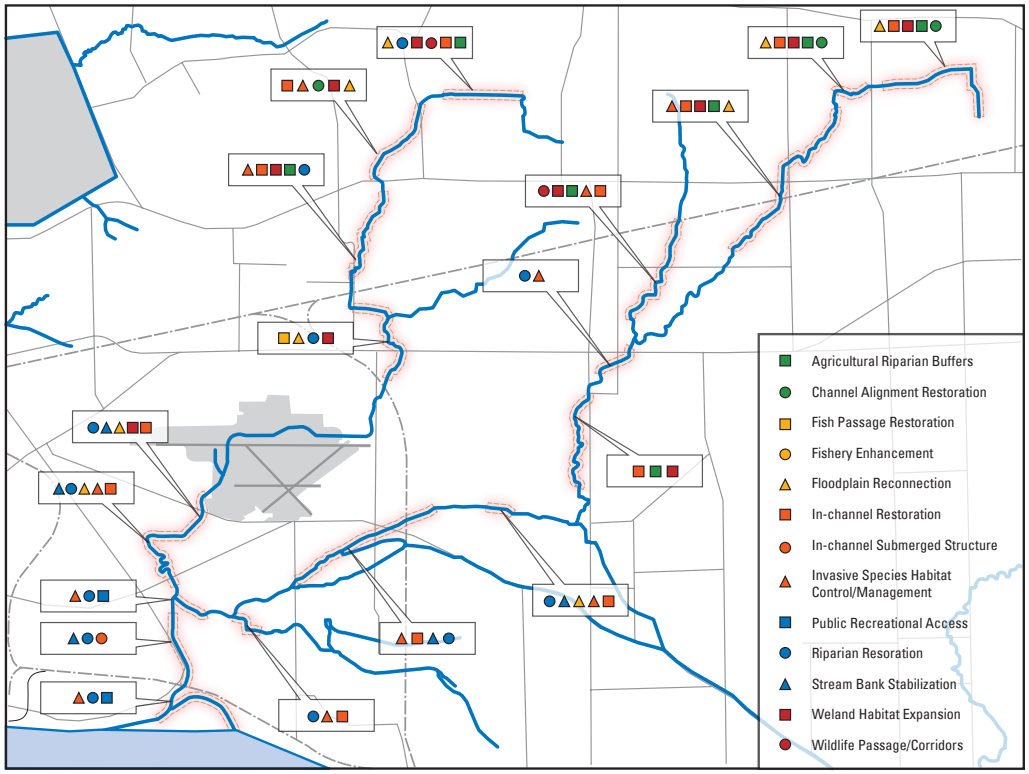
These projects will create greater diversity within the stream channels both above and under the water.

Benefits

Enhances, diversifies, restores, and creates habitat structure for a variety of fish species and other wildlife, aquatic macrophytes, and improves/expands habitat functions. A secondary benefit arising from more in-channel habitat will be the increase in opportunities to view wildlife by recreationists.

Locked Log for Shade and In-channel Habitat Diversity

In-channel habitat diversity projects specifically focus on the lower portions of Cayuga and Bergholtz creeks



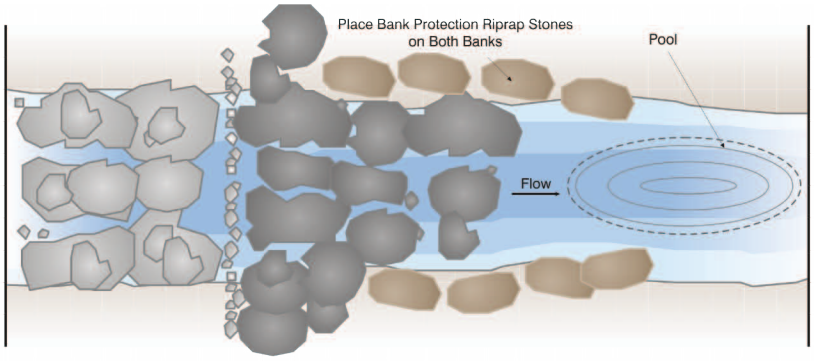
Potential Project Locations

Areas identified include: upstream from the confluence of Cayuga Creek with Little Niagara River; adjacent to Jayne Park on Little Niagara River; Cayuga Creek downstream from confluence with Bergholtz Creek; and Bergholtz Creek upstream of confluence with Cayuga Creek.

3. In-Channel Restoration

Because of the straightening of streambeds over time most reaches of stream are too deep, stream banks are unstable, channels are over-widened, and there is little hydraulic diversity. Areas that would be candidates for this type of project include those reaches of stream where surrounding land uses prohibit or restrict floodplain re-connection or channel alignment restoration. As a consequence of the restrictions imposed by adjacent land uses on restoration options, these projects will examine the vertical, horizontal, and longitudinal profiles of stream reaches and develop restoration features within the existing banks of streams. Buffalo State College has recently completed a Stream Visual Assessment Protocol (SVAP), which will help to identify specific reaches in need of in-channel restoration.

In-channel restoration focuses on creating or restoring in-channel flow regimes (pool, riffle, run) and more natural and better functioning channel widths and depths which will result in restoring and enhancing habitat functions and values.



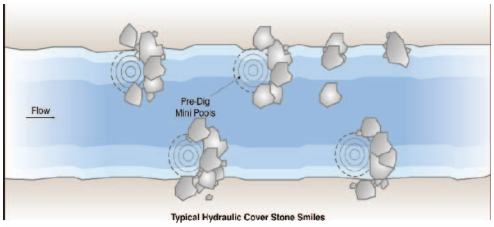
Engineered Rock Riffle

Benefits

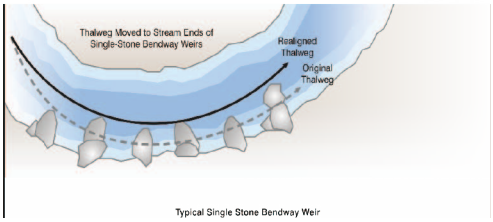
Restores natural sediment transport; creates in-stream variability of habitat (riffle, pool, run, backwater areas); increases oxygen concentrations within the water column; enhances diversity and health of aquatic flora, benthic organisms, fish communities, waterfowl, and amphibians. Restored channel reaches increase opportunities for wildlife viewing and enhance aesthetics of stream and riparian areas. Degraded sections of channel would benefit from restoration of hydraulic form and functions even if riparian habitat uplift opportunities are minimal. A secondary benefit would be increased educational opportunities for demonstrating stream restoration, aquatic ecology, restoration monitoring, etc., thereby, increasing the understanding of children and other citizens of their surroundings and how they function.

Straightening of streams often causes stream beds to deepen, which then causes instability of banks and increased erosion.

Project sequencing will involve some evaluation of existing data to: determine the need for further analysis to support engineering design of restoration features, determine stream stage effects of design (to ensure no adverse upstream-downstream effects occur as a result of design), and to identify appropriate features and numbers and sizes of features. There may be some areas in the upper watershed that will not need detailed design and engineering where creeks are smaller with lower volumes and velocities. Some features applicable include engineered rock riffles (ERR), grade control, stone or log channel constrictors, live siltation, and locked logs.

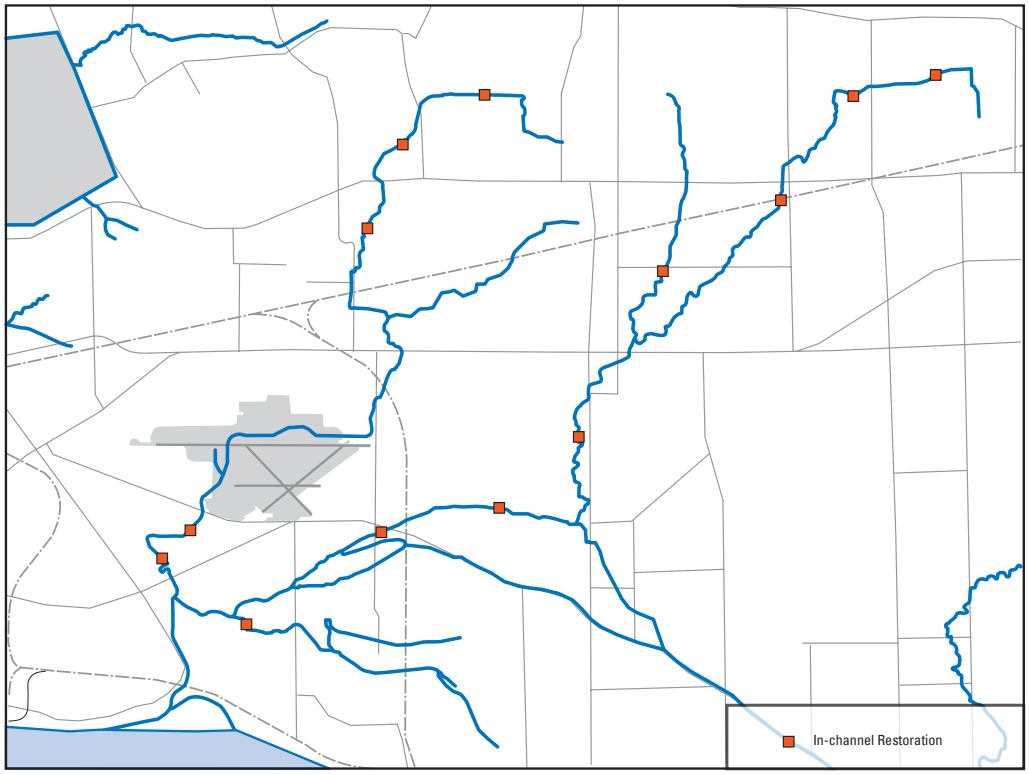


Typical Hydraulic Cover Stone Smiles



Typical Single Stone Bendway Weir

Potential Project Locations



Fish passage barriers have been located in Cayuga Creek

4. Fish Passage Restoration

Previous studies have located and mapped specific locations where there are fish passage barriers in Cayuga Creek. Obstructions within the channel such as old bridge footings, culverts, collected debris within the stream channel, and other materials or structures impede the upstream movement of fish from downstream areas, and in some cases might restrict downstream movement depending on season and water flow in the stream. Often times the fish passage barriers also restrict recreational boating passage as well. Movement within streams is important to fish species for finding food and cover, for avoiding predators, and for spawning and rearing.

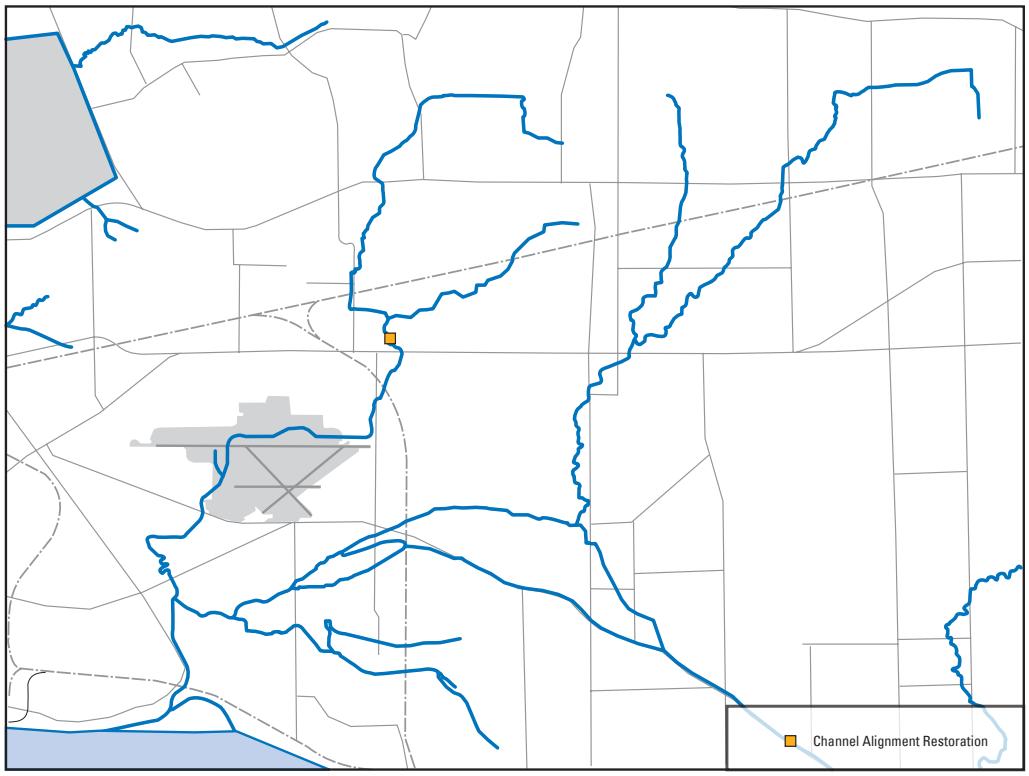
Barriers that block fish movement can interrupt spawning or seasonal movements, restrict access to preferred habitat or food resources, increase the chance of predation and disease, and fragment populations.

Benefits

Expands upstream-downstream movement of fish, increases fish numbers and diversity in upstream areas, decreases chances of population fragmentation, and expands biological and ecological values of the creek. In combination with other types of projects such as Wetland Habitat Expansion, In-channel Restoration, and Floodplain Re-connection projects, fish barrier removal would increase the ecological and functional values within the watershed and enhance fishery sustainability.

Previous efforts for mapping fish barriers appear to have occurred only along Cayuga Creek within the watershed. Fish Passage Restoration projects include the surveying of Bergholtz Creek to map additional fish passage barriers, and the removal of barriers within watershed streams or installation of some form of fish passage device. Project sequencing is likely to involve the evaluation of each barrier to determine the best way to remove the obstruction or to develop and install features that allow fish passage with the barrier in-place. The removal of barriers should account for potential changes in stream flow and incorporate appropriate substrates and structure.

Potential Project Locations



5. Fishery Enhancement

Studies and direct observations indicate that the majority of the streams within the watershed lack functional, in-stream habitat. This project type calls for implementing a fishery enhancement plan that would design and construct in-channel habitat features with an emphasis on aquatic vegetation communities to support life cycle needs of fish, with the ultimate goal of creating a sustainable fishery. Fishery enhancement features could be constructed anywhere within the watershed in coordination with other enhancement and restorative measures. In-channel fishery habitat enhancement requires integration with other features (channel constriction in over-widened locations, submerged aquatic structure, riparian shade, contaminant reduction) to be successful. Contaminant reduction measures are critical in concert with habitat enhancement/restoration efforts to reduce bioavailability and bioaccumulation of contaminants within the ecosystem.

Fishery enhancement focuses on habitat requirements for native aquatic macrophytes, benthic organisms, and beneficial aquatic insects to enhance the functions of the stream ecosystem in support of a sustainable and diverse fish community.

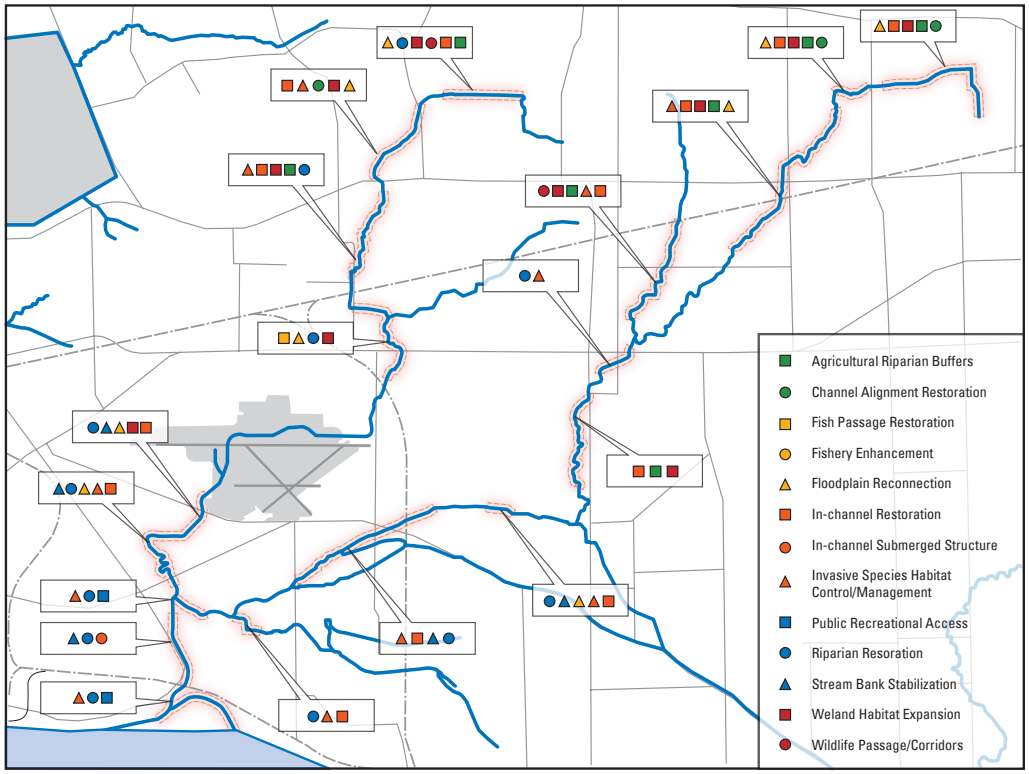
Benefits

Implements a watershed-wide trans-trophic and physical approach to restore the fish communities within the primary streams. A sustainable fishery will also translate to a sustainable aquatic ecosystem and open up watershed streams for additional recreational opportunities, and strengthen public awareness and stewardship. Restoration of submerged macrophytes could enhance the phyto-remediation capacity of communities within the water column thereby improving water quality. Enhancement of predator-prey relationships of those organisms associated with aquatic vegetation will increase the diversity of and dynamics within the food web.

Specific projects include in-channel planting of native submerged and emergent macrophytes; and integration of aquatic plants species with all bioengineering design for slope stabilization, off-channel wetlands and submerged aquatic structure

A sustainable fishery translates to additional recreational and educational opportunities and strengthens stewardship.

Potential Project Locations



6. Agricultural Riparian Buffers

These riparian restoration and enhancement activities are designed to focus on establishing or expanding length and width of buffer zones within the active agricultural landscape. This type of project is similar to the Riparian Restoration category but with the understanding that there are different land management requirements in the agricultural landscape versus the more developed urban/suburban landscape.

Agricultural riparian buffers are designed to primarily reduce sediment and nutrient loading by attenuating the erosive forces of storm water runoff with habitat values as a secondary benefit.

Soil erosion caused by farming and drainage practices along the channel or within ditches contributes to turbidity caused by suspended sediments originating from fine clay surface soils. Lack of effective riparian buffer in the upper watershed is a primary vector for chemical and organic fertilizers and pesticide loading.

Due to historic land clearing and current farming practices there are long stretches where there are little or no riparian corridors within the agricultural portion of the watershed

Benefits

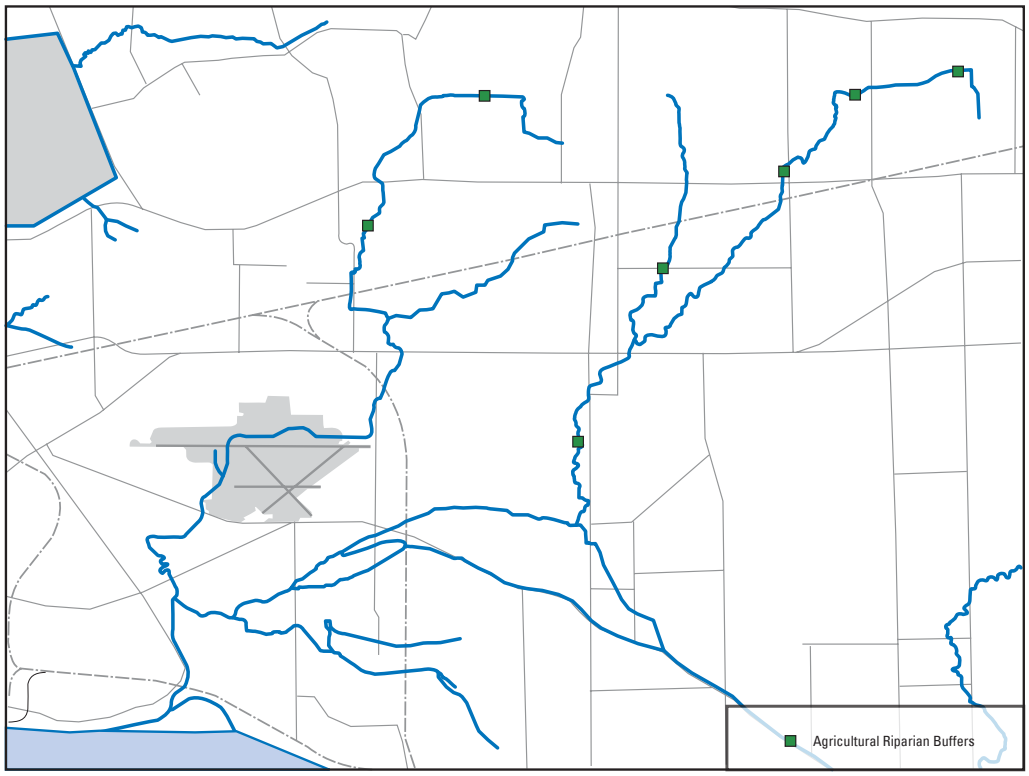
Benefits associated with these projects: reduction in nonpoint source pollutant and sediment loading, improvement of water quality, slowing the movement of stormwater from land surface to watercourse, stabilizing stream banks, reducing erosion, expanding wildlife habitat, creating greater areas of contiguous wildlife passage habitat, and controling invasive species.

Sediment and nutrient loading tend to be high in active farming landscapes that do not have established riparian buffers.

As the percentage of roots in stream banks and shorelines increases, erosion decreases.

Agricultural land use in the upper watershed provides significant opportunities to implement best management practices (BMP) such as vegetative buffers for riparian habitat as well as sediment, nutrient and erosion control. BMP applications successfully protect stream channels by stabilizing soil. Water quality is improved by the establishment of specialized native plant species designed to abate the velocity of storm water flows and absorb chemical and sediment pollutants.

Potential Project Locations



Riparian areas slow the flow of water from landside to stream and from overbank flows from the stream. These areas filter and hold water for later. Vegetation helps build and maintain riparian corridors, stream banks, and shorelines. Diversity of plant growth increases soil strength and stabilizes stream banks. Water quality is enhanced when sediment is trapped and incorporated in riparian areas.

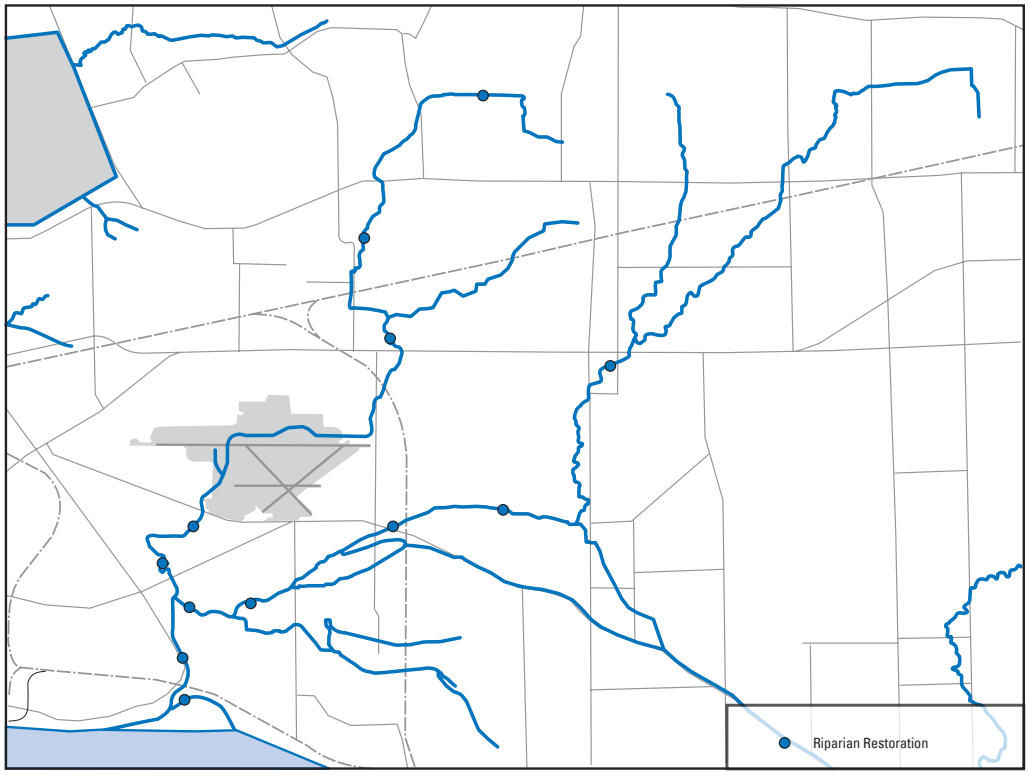
7. Riparian Restoration

Riparian restoration projects will focus on establishing, expanding, enhancing, and restoring riparian habitat within the developed (urban/suburban) landscape. The scope of these projects may involve surveying specific riparian areas to determine best applications, invasive species control, planting/creation of emergent zones, homeowner awareness programs, and culling some soft wood species (cottonwood, silver maples, American elm, box elder, tree of heaven) and planting hard woods (bur oak, red oak, pin oak, American sycamore, hackberry, basswood, filbert).

Benefits

Benefits associated with these projects are expected to increase habitat complexity and structure, reduce nonpoint source pollutant and sediment loading, improve water quality, stabilize stream banks, reduce erosion, slow movement of stormwater from land surface to watercourse, expand wildlife habitat, create greater areas of contiguous wildlife passage habitat, control invasive species, enhance recreational experience from the water and along the stream bank, and reduce loss of property from erosion.

Potential Project Locations



8. Floodplain Reconnection

Functioning floodplains are either non-existent or there is little connectivity between stream flows and floodplain areas. This condition can result in the greater propensity for downstream flooding; erosion of stream banks creating unstable bank conditions; and the movement of storm flows downstream as opposed to local flood storage and groundwater recharge. This project type will evaluate areas within the watershed for the viability of re-connecting surface stream flows to remaining undeveloped floodplains, and undeveloped areas that could function as floodplain.

Project sequencing will include evaluating locations to determine the feasibility of capturing flood water, sediments, and nutrients. Given landowner approval or the purchase or property for this purpose, subsequent work will involve the modeling and design of natural flood flow storage areas to maximize detention-retention and to improve water quality while simultaneously creating/restoring habitat. Stream flow modeling will have to occur to understand potential upstream-downstream effects. Construction of project will follow.

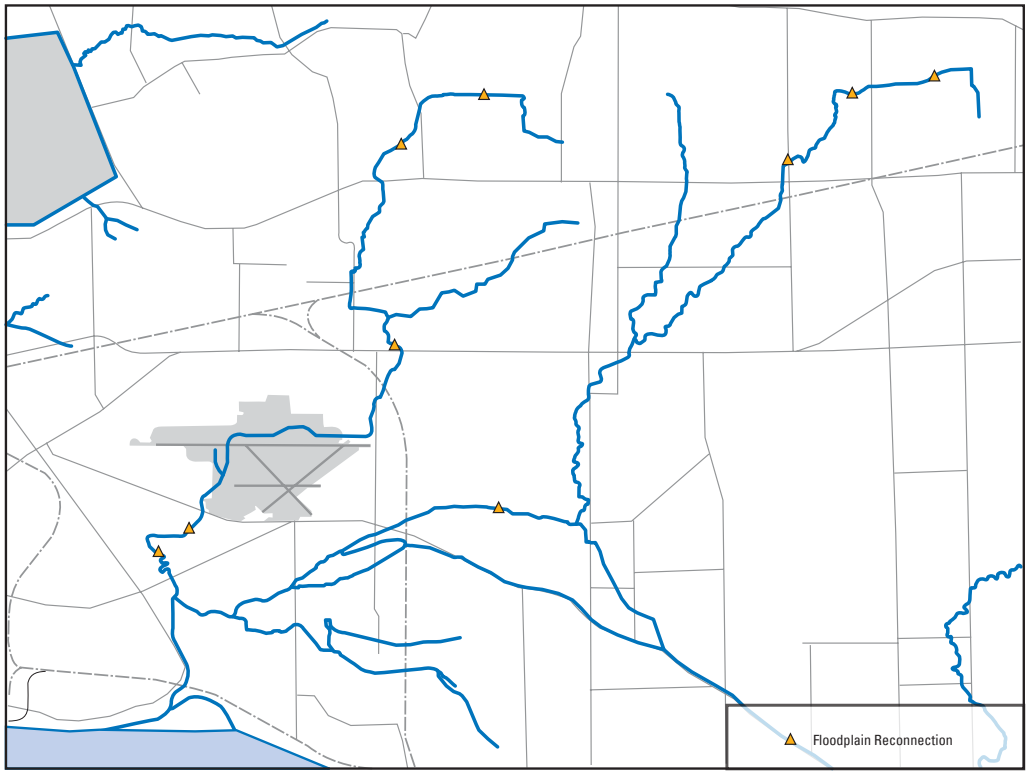
Floodplains play a critical role within watersheds by dissipating and storing flood waters, decreasing erosion by reducing flow velocities, and trapping sediments, pollutants and excess nutrients, thereby enhancing water quality.

Benefits

Overall increase in area of functioning floodplain within the watershed, and expansion of wetland or bottomland habitat. Additional active floodplains with connection to stream flow can have positive effects for water storage, improvement in water quality, reduction in sediment loading, creation of wildlife habitat, localized flood control, and expansion of wildlife corridors.

Proactive floodplain and watershed management strives to consider multiple objective alternatives (flood protection, habitat values, recreational benefits) in order to develop the best protection, restoration, and implementation strategy in any given location (EPA, 2005).

Potential Project Locations



9. Invasive Species Control and Management

The goal of this project type is to control the spread of invasive species within the watershed and manage those areas where invasive plants have become established. The objectives are to reduce the number of invasive species; reduce the area they inhabit; eradicate where feasible; and develop an overall long-term management plan.

Field observations indicate that the control of invasive plant species along watershed streams is manageable. An invasive species mapping and control plan can be developed and implemented quickly.

"On a global basis...the two great destroyers of biodiversity are, first habitat destruction and, second, invasion by exotic species" —E.O. Wilson

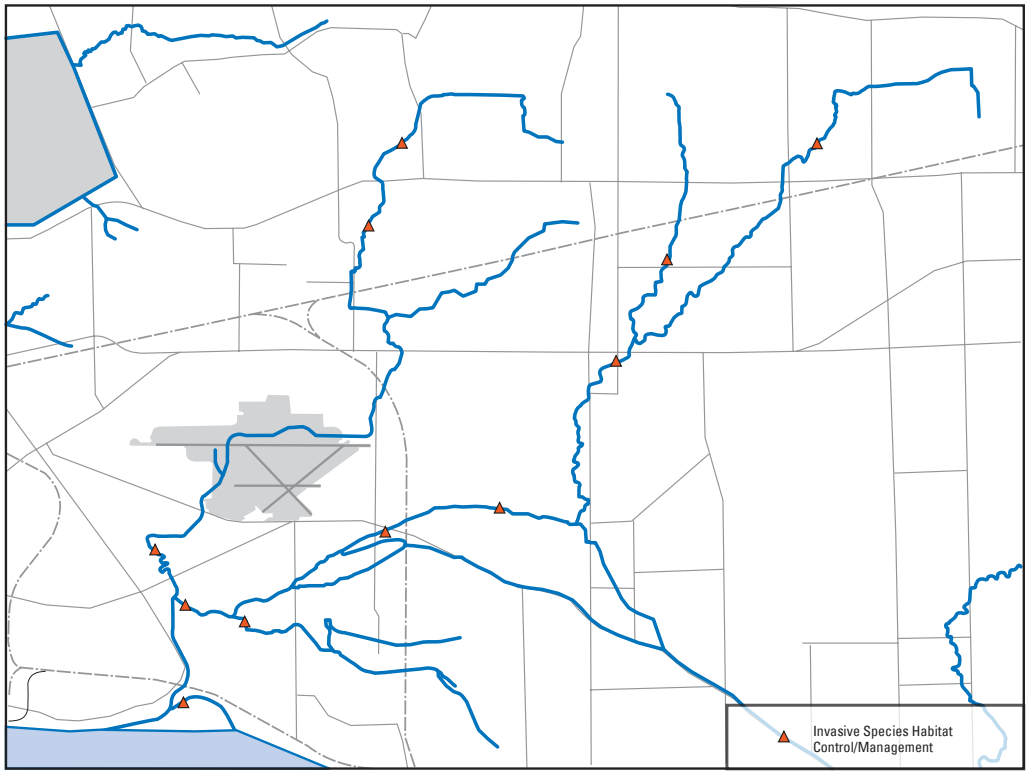
Meaningful progress can be made at local levels (specific stretches of stream) or broader levels such sub-watershed or across the entire watershed. Project sequencing will first involve the identification and mapping of invasive plant species, followed by the completion of a watershed invasive species control plan. Coordination will occur with the New York State PRISM program on expanding public awareness; areas for the implementation of control measures will be prioritized, and restoration plans will be developed for re-establishing appropriate vegetation after removal of invasive species. Site-specific work would be completed as volunteers and funds are available.

Invasive species upset the biological and ecological balance of communities and habitats; they reduce biological diversity, degrade habitat functions and values, lower amounts of available wildlife forage, and decrease soil and stream bank stability.

Benefits

Protecting and enhancing habitat for mammals, bird, amphibians, reptiles and insects; increasing botanical diversity; stabilizing soils and stream banks; reducing erosion and sediment loading, enhancing water quality from improved riparian vegetation; managing landscapes against continued spread of invasive species by increasing cover with native species.

Potential Project Locations



10. Wetland Habitat Expansion

The overall goals of this project type are to increase protected wetland acreage and increase the quality, functions, and values of wetland habitats within the watershed. The goals are expected to be met by conservation and protection of existing wetlands, restoration and enhancement of degraded wetlands, restoration of areas that were historically wetlands, and creation. This project type will involve developing a watershed-scale plan for off-channel and fringe wetland protection, enhancement, creation or restoration; and restoring functional capacities associated with flood attenuation and riparian habitat.

Expanding wetland habitat in key locations will increase critical wildlife habitat, improve water quality, increase natural flood water retention, increase watershed capacity for sediment and nutrient retention, and provide additional recreational/educational opportunities.

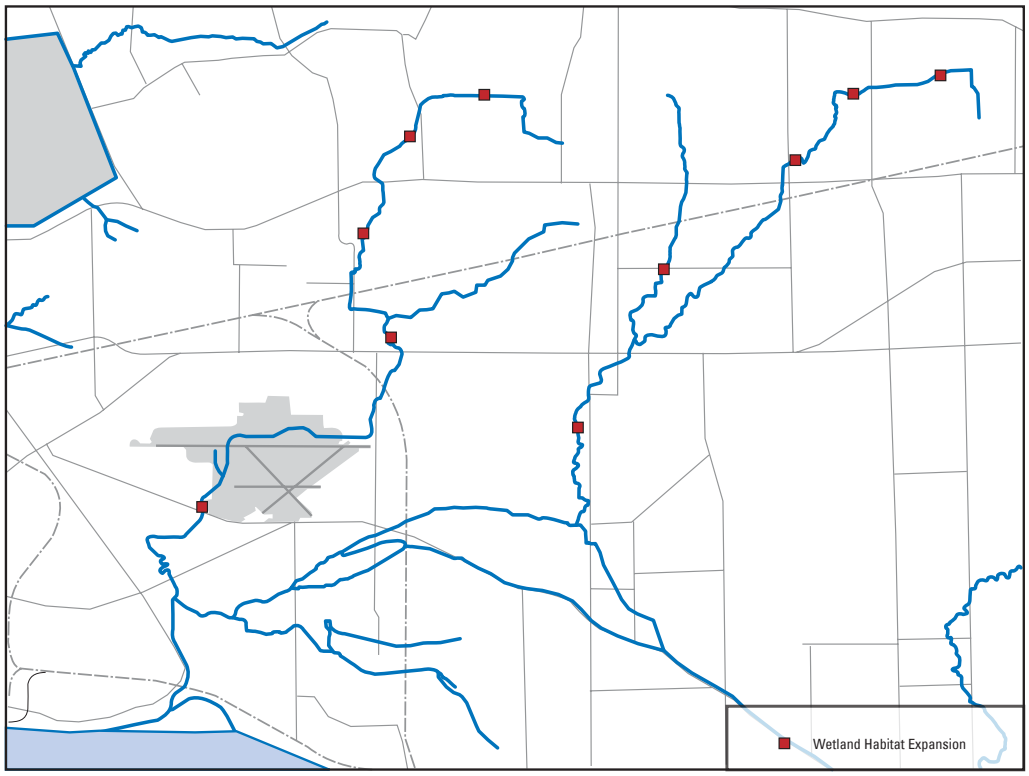
Benefits

Overall increase in ecological function and biological diversity within the watershed. Off-channel fringe wetlands and riparian aquatic habitats provide nursery functions for amphibians and beneficial insect pollinators that complement a healthy food web for a variety of species.

These systems also contribute to the reduction in sediment loading to the stream, slow flood flows by temporarily storing floodwaters and storm water runoff, improve water quality, prevent or moderate erosion, and increase local groundwater recharge rates. Wetlands also have aesthetic, educational, and recreational values.

Potential locations has been identified as candidates, followed by selection of demonstration sites. Project sequencing can follow with prioritization of candidate sites can be accomplished using GIS analysis of physical and municipal attributes of land use, landscape position, vegetative cover types, hydrology, ownership, and size of parcels adjacent to watershed streams. The screening process will determine specific restoration opportunities and features; the need for design, engineering, and additional modeling; and project costs. Construction of demonstration project will follow. Issues of land acquisition, easements, and management will need to be accomplished on a case-by-case basis.

Potential Project Locations



11 Public Access/Recreation

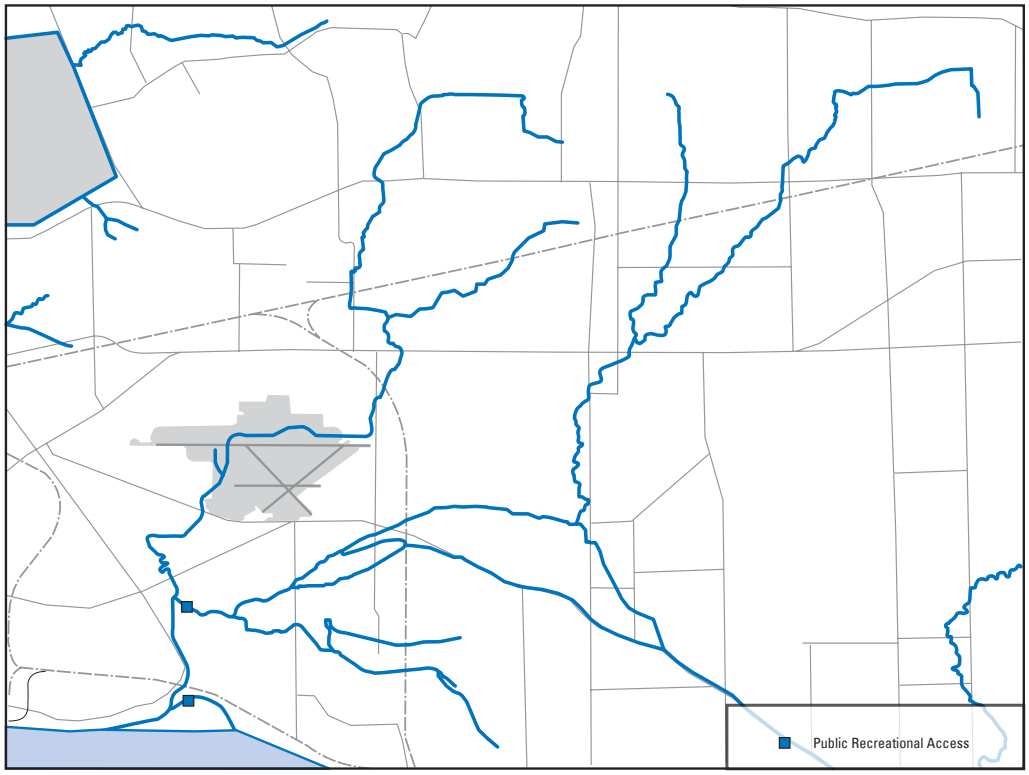
Stewardship is a critical element for achieving success and realizing the goal of a healthy and sustainable watershed. Public awareness of, and access to, local natural resources creates momentum for the common and shared belief that watershed resources should be managed and restored. This project type focuses on identifying locations for construction of secure public access near the confluence of Cayuga Creek and Little River and in locations upstream to expand opportunities for boating, passive wildlife observation, fishing, and hiking along designated reaches within the riparian corridor. Public access can be enhanced with interpretive signage or informational kiosks on a variety of subjects such as cultural history, natural resources, ecology, restoration projects, etc. These efforts will support the creation of a "water trail" or "canoe trail".

Public access and outdoor recreational opportunities increase awareness of watershed resources and their importance. Increasing access for canoeing, fishing, and bird and wildlife viewing will provide active "links" between people and their surrounding environment.

"Amount spent by Americans on the purchase of canoes and kayaks in 1996: $99.1 million. Protection of our water bodies can enhance local economies by providing recreational opportunities."—Lerner and Poole, 1999

Benefits

There are a myriad of cumulative benefits beyond those that are immediate and tangible that arise from expanding public access and recreational opportunities. Increased use of watershed creeks for a variety of pursuits will sharpen public awareness of the status of our natural resources and all they have to offer. The construction of additional public access points will expand the concept of Cayuga and Bergholtz creeks as being recreational destinations. Access along the watershed waterways will create connections between the variety of projects and efforts proposed in this document such as float trips to observe stream bank stabilization and riparian restoration projects, or wetland expansion or invasive species management projects. These benefits can expect to encourage stewardship and efforts to achieve sustainability.



Potential Project Locations

Niagara County and the City of Niagara Falls will be constructing the LaSalle Canoe Trail sometime in 2009. This project has been designed to enhance public use, and support environmental restoration and education. Elements of the project include a canoe launch, targeted tree removal, and interpretive signage. The development of a water trail will encourage recreational use of the creeks while providing opportunities for environmental education.

12. Wildlife Corridors Expansion

Wildlife corridors provide migration, cover, and forage routes for wildlife species within developed landscapes where intact habitats are often scattered, fragmented, and small.

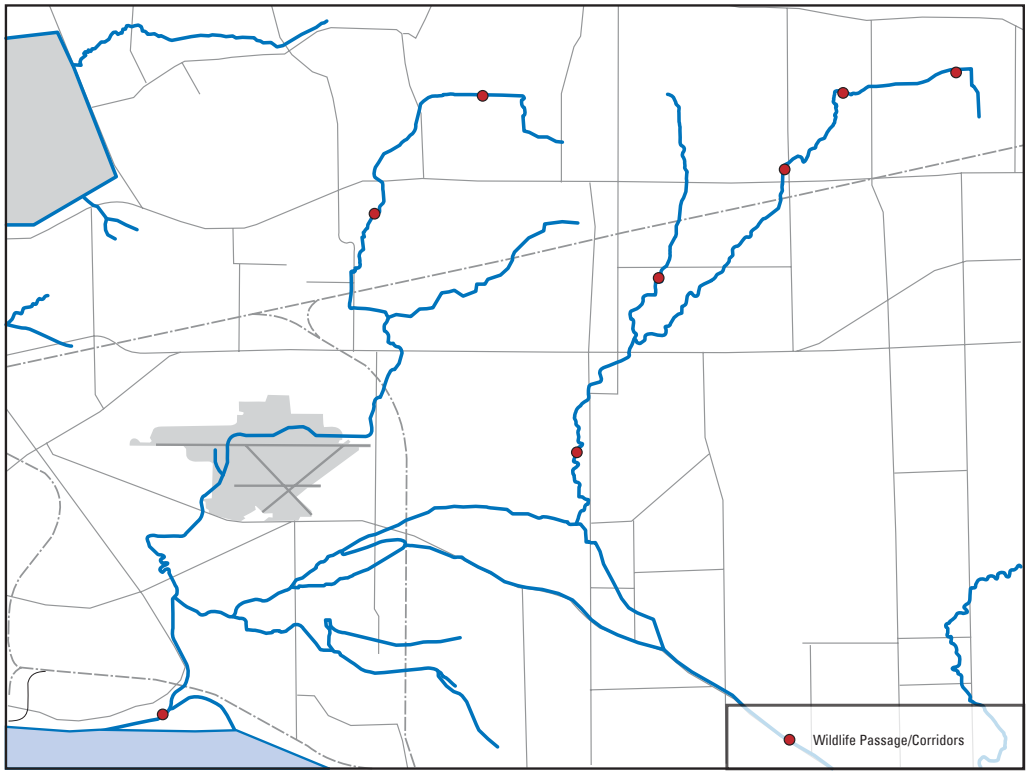
The current matrix of land uses and the historic predominance of agriculture in the watershed have created an existing landscape that is largely characterized as developed and disturbed. Only a small amount of the watershed is forested or remains in some state of "natural" condition. Those areas that represent wildlife habitat are fragmented and widely dispersed. This project type will address the need for increasing wildlife corridors to allow for the safe movement of wildlife between forage and cover habitats. The first stage will involve evaluating those areas that currently are undeveloped and their proximity to existing, intact wildlife habitats to determine the practicality of creating habitat within the undeveloped land and thereby expanding habitat to be contiguous to existing habitats. A survey of locations should be completed in concert with landowner outreach to determine the most opportune locations based upon intensity of restoration required, landowner interest, and the suitability for connecting to other intact habitats. The second phase of corridor expansion will be to determine habitat creation/restoration needs and features, the need for design, and materials required.

Benefits

Increased riparian and landscape connectivity for greater freedom of protected movement for wildlife species throughout portions of the watershed. Greater connectivity of habitats will provide additional access to forage, cover, and expands home ranges for various species. Corridors should result in increase in greater localized species richness, increase the carrying capacity for wildlife species within the watershed, restore riparian area functions, and enhance passive wildlife observation opportunities.

Site-specific projects can be developed, taking in into account adjacent land uses, ownership and management, and connectivity to other natural resources such as parks, natural areas, and other riparian areas to create corridors for wildlife movement and cover. Project sequencing will involve landowner buy-in and consideration of the complexity of design and construction. For example, some locations may only require the development of a planting plan and then the planting of vegetation. Other locations may require some limited design and earthwork to establish appropriate topography and elevations.

Potential Project Locations



13. Stream Bank Stabilization

Erosion and unstable stream banks have been identified as a serious impairment and an impediment to improving water quality, restoring riparian corridors, and creating conditions suitable for a healthy watershed. Stream bank erosion may contribute to elevated turbidity levels and bank instability. Some stream banks between Porter Road and Niagara Falls Boulevard are eroding excessively (Baird 2005); some banks are undercut. Agricultural, residential, and commercial land uses have all contributed to stream channel and bank alterations, and reduction in riparian zones. Erosion in the lower portion of the watershed may be caused at least in part by daily fluctuations in water stage due to operation of the NYPA power project. Unstable and eroding stream banks contribute to increased sediment loading, reducing filtering capacity of banks and riparian zones, tree falls, property loss, unsafe access, loss of transition habitat (buffer between stream and upland), and modifications to channel cross-sections.

Stream bank stabilization projects can occur anywhere in the watershed and will focus on reclaiming stream banks by enhancing stability with bank re-contouring and toe protection, riparian vegetation, and other erosion control measures.

The historic straightening of stream channels and resulting deepening of channel beds have increased instability of watershed stream banks.

Project sequencing can vary depending on funding, severity of erosion and therefore need for design and use of heavy equipment, and overall length of stream bank identified as a single project. An initial project could include conducting a survey along principal streams in the watershed to identify severity of erosion and bank instability to develop mapping and stabilization approaches for the various categories of bank failure severity, types of failures, and associated design solutions. Construction of stabilization features will require permit review and landowner consent.

Benefits

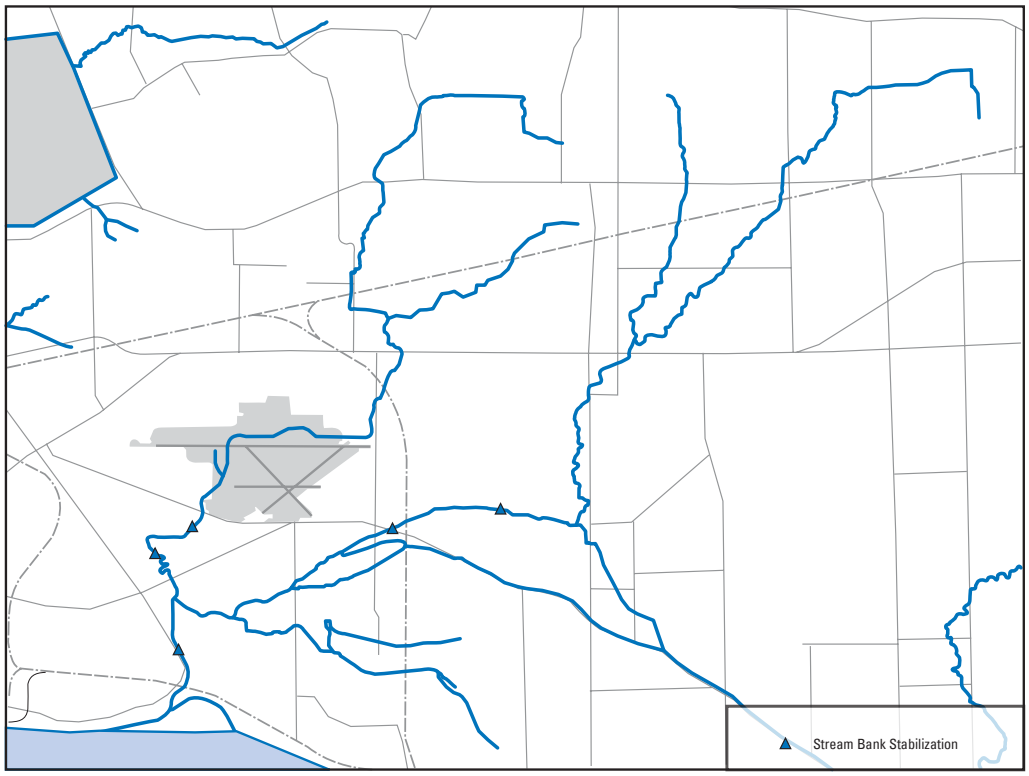
Stabilized/reclaimed stream banks will reduce downstream sediment loads and therefore decrease sedimentation rates and improve water quality. Additional benefits include riparian buffer installation or expansion, increased capacity to filter runoff from upland areas, increased habitat complexity and structure, and associated wildlife benefits.

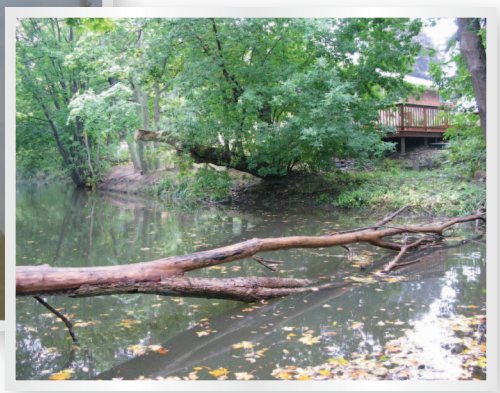
Stabilized stream banks will reduce erosion and sediment loading, improve water quality, reduce property loss, create-restore-enhance-protect habitat, and reduce probability of invasive species establishment.

As the majority of the lower watershed is bordered by residential properties, a property owners' residential stream bank protection guidance could be developed and published and then distributed to homeowners with creek frontage. Recommendations would include appropriate riparian zone plantings, removal of invasive plant species and non-native plants with limited soil stabilization characteristics, and alternatives to direct piping roof drains and sump pumps to the creeks.

The residential property stream bank protection program project could also entail subsidizing the purchase of materials recommended for use in stream bank stabilization such as stone, nursery stock, geo-textiles, erosion control mats, etc. Depending on level of funding, the program could also offer stream bank construction days where a crew provides assistance to homeowners, upon homeowner request, with heavy equipment and materials to facilitate construction.

Potential Project Locations





14. Debris Removal

There is debris in many areas throughout the streams within the watershed. Trash and debris such as tires, barrels, abandoned building materials, large concrete blocks, old pipes, and downed trees have been observed at numerous locations in Cayuga Creek and Bergholtz Creek. Improperly disposed trash is an eyesore that detracts from the outdoor experience of canoeing, fishing, or walking along stream banks. Additionally, downed trees can reduce accessibility of the upper reaches of the creeks to recreational canoeists and kayakers. In some extreme cases, debris and sediment deposition can reduce stream conveyance enough to result in localized stream overflows and flooding of adjacent properties.

Removal of trash and other debris will initiate other restoration activities within the watershed. Debris removal projects can be completed relatively quickly and provide immediate visual and functional enhancement.

Benefits

Removal of stream debris would contribute to a more healthful and aesthetically pleasing aspect to the stream for recreational purposes. In addition, removal of debris would be a starting point for more complex in-channel and stream bank restoration projects. Removal of downed trees and sediment deposits might reduce the potential for localized flooding during extreme flow events.

A debris and trash removal project could be performed by volunteers. Equipment needs would include waders, trash bags, and canoes for transport. In some cases, additional support in the form of heavy equipment might be needed for removal of larger items such as large barrels or sediment mounds. Deadfall trees and other large woody debris would be selectively cleared and snagged to alleviate flooding risks while providing for in-channel structure for aquatic habitat.

15. Stormwater Management

Reduce/Eliminate SSOs

The Cayuga Creek watershed suffers from occasional direct sewage loads from sanitary sewer overflows (SSOs). These discharges contribute pathogens and biological oxygen demand (BOD) to Cayuga and Bergholtz Creeks. Bergholtz Creek is listed as impaired on the 2008 Section 303(d) List for pathogens with the listed source as urban runoff. The Niagara Falls Water Board (NFWB) Sanitary Sewer System Management Plan (August 2007) is directed with addressing SSOs. The plan was prepared in response to the Board's State Pollutant Discharge Elimination System (SPDES) discharge permit which required that NFWB implement Best Management Practices (BMPs) for SSOs.

The Niagara Falls Water Board developed a Sanitary Sewer System Management Plan that includes the long-term rehabilitation of Sanitary Sewer Overflows within the watershed.

Benefits

Reduction in loading of pathogens and biological oxygen demand. Ultimately, correcting SSO problems would lead to a significant reduction in bacteria loadings and make the streams more compatible with recreational uses and help make progress towards a 303(d) delisting of Bergholtz Creek.

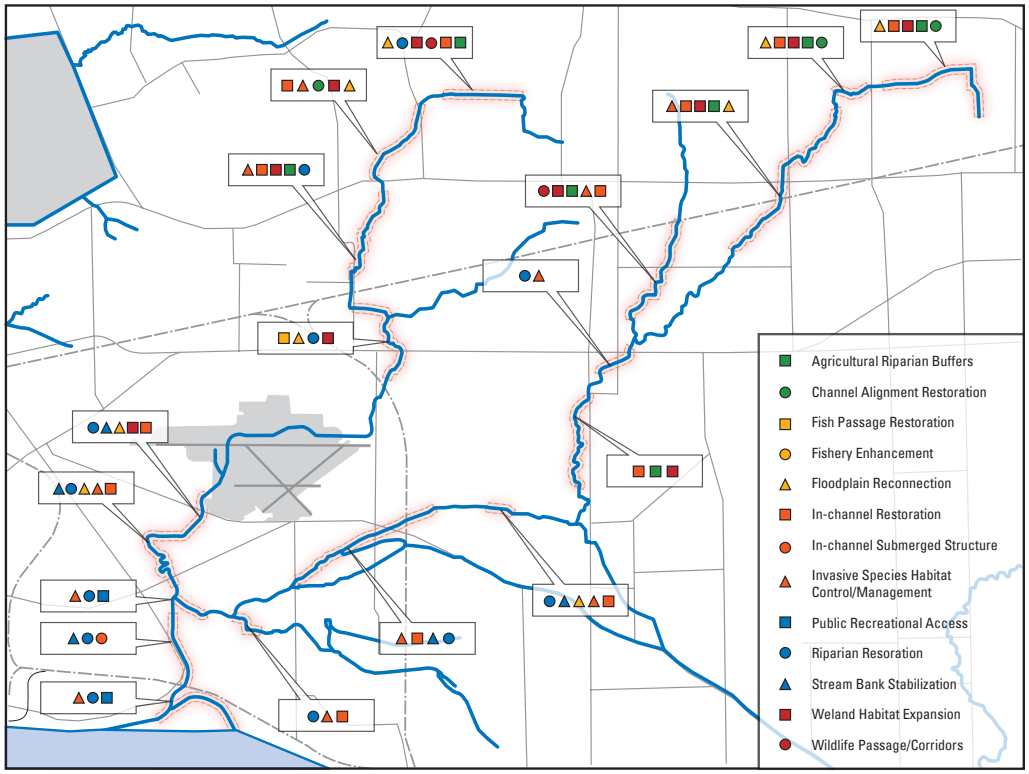
The permit also required the NFWB to submit an approvable engineering report with a work plan for additional studies, a plan for correction and maintenance, and schedule for eliminating SSOs. The plan includes a variety of detailed rehabilitation measures, at various locations in the sewer-shed including:

- Sewer cleaning;
- Root treatment;
- Spot excavation and repair;
- Cutting laterals protruding into sanitary sewer mains;
- Correcting cross-connections to the stormwater system;
- Spot pipe replacement with cured-in-place pipe (CIPP);
- Grouting cracked pipes and open joints; and
- Manhole rehabilitation.

With an anticipated annual funding level of $330,000, the rehabilitation work is scheduled to be completed in 14 years from initiation.

Potential Project Locations

This project is underway per the plan prepared by NFWB. Additional funding would accelerate the schedule of the Sanitary Sewer System Management Plan and thus achieve pathogen load reductions to Cayuga and Bergholtz Creeks in a shorter time frame.



16. Stormwater Management

Reduction in Flooding Risks

High flow in Cayuga Creek resulted in flooding of the Cayuga Village Trailer Park in 1998. A storm drain located on the Weber property is connected with the adjacent Cayuga Village storm sewer downstream. During the flood event, Cayuga Creek overflowed onto the Weber property. Stormwater flow draining from the Weber property overwhelmed the storm sewer system such that stormwater collecting in Cayuga Village was unable to drain to Cayuga Creek. This project type combines the creation of a new combined stormwater management design with wetland habitat restoration.

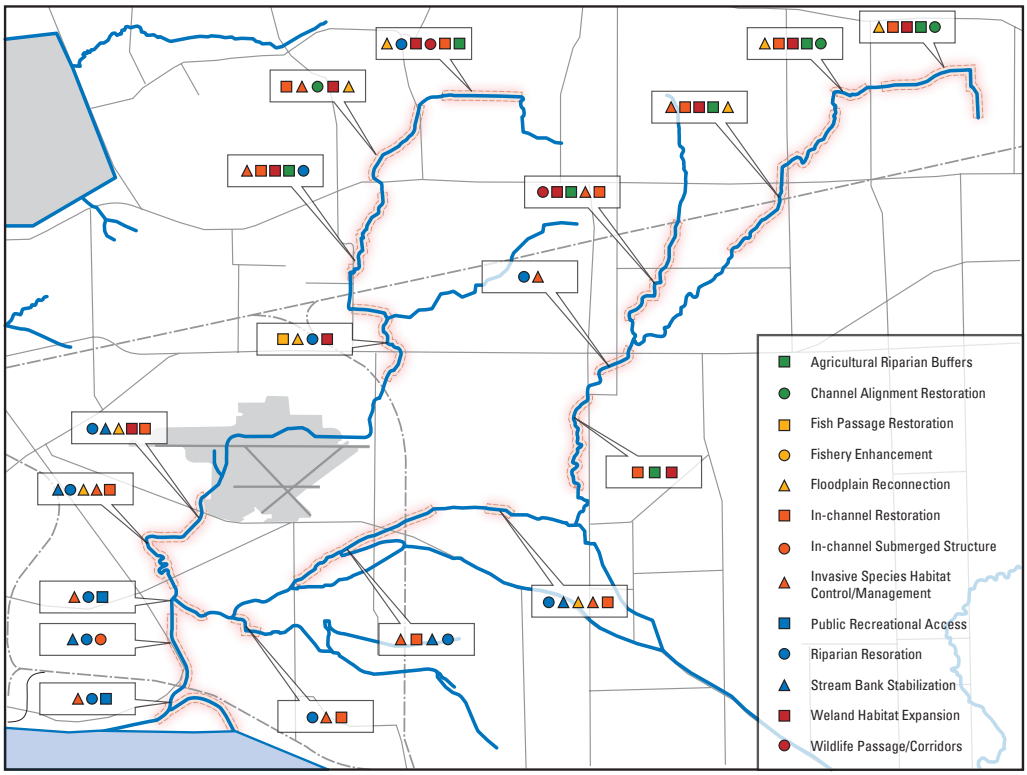
The combined stormwater management/wetland habitat restoration project would reduce or eliminate the contribution of stormwater from the Weber property to the stormwater piping serving Cayuga Village while creating/restoring wetland habitat. The adequacy of the Cayuga Village stormwater drainage will be evaluated and piping re-sized as necessary.

The re-design of the storm sewer system servicing Cayuga Village can combine traditional stormwater management solutions with habitat restoration.

Benefits

Reduced potential for property damage related to flooding. The addition of restored wetland will offer expanded flow detention capacity along with increasing habitat diversity and wildlife functions and values.

Potential Project Locations



17. GIS-based Watershed Database

General

For environmental and ecological restoration planning, there is a great advantage associated with the large number of studies that have been conducted within the watershed. The "catch" however is that there has been little opportunity to tie all the information together to develop a thorough and interactive understanding of conditions and the changes that have occurred in the watershed. This project will continue the efforts of Buffalo State College and will update and maintain the existing centralized, GIS database to contain all relevant information including historic sampling results. Future sampling results and source reports (from all entities) should be added to this system. This website supported system should be updated routinely into the future to maintain functionality and power of analysis. Related information such as areas of erosion, invasive species locations, riparian restoration projects, and remedial actions will be added to the database to support a comprehensive, geographic-based understanding of what has and is occurring in the watershed.

This watershed-wide project calls for the creation of an interactive watershed database that will store all relevant watershed information to assist decision-making, planning, development of implementation strategies, and monitoring.

Benefits

Reduced potential for property damage related to flooding. The addition of restored wetland will offer expanded flow detention capacity along with increasing habitat diversity and wildlife functions and values.

One use of the watershed database would be to develop a comprehensive understanding of the nature and extent of contaminated sediments in the watershed.

A specific use for the watershed database is described below.

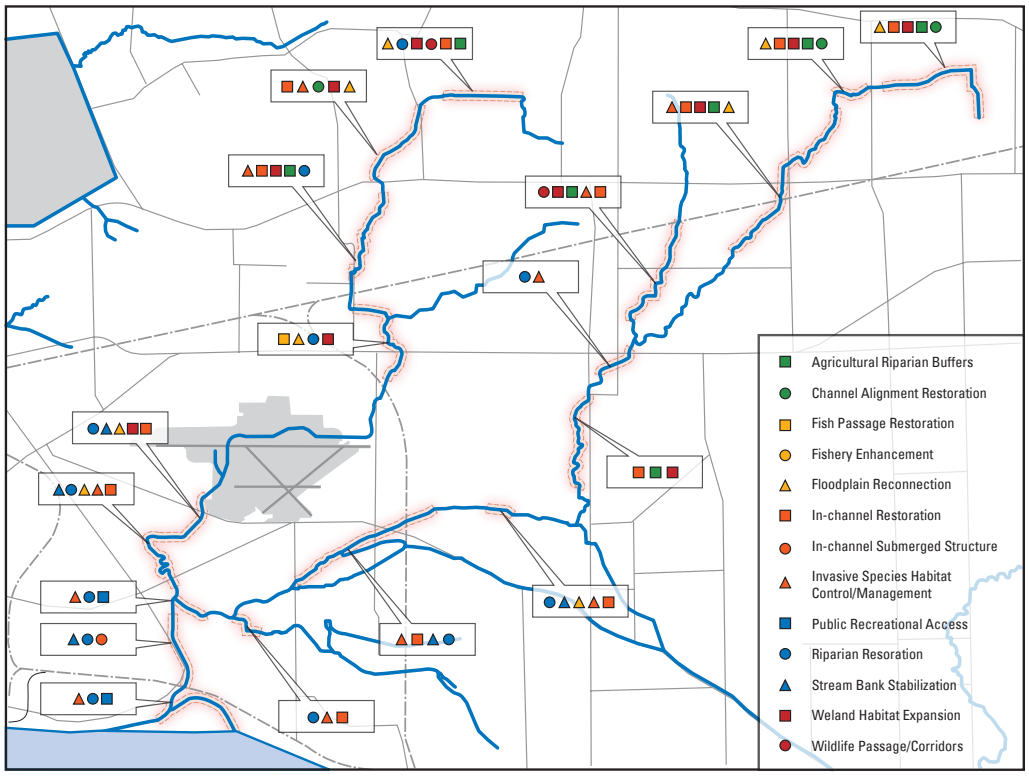
Sediment Contamination and Remediation of Impairments

Specifically, this project will add recent sampling data to the existing GIS database and standardize contamination data to geographic profiles on the extent of contaminated sediments. The understanding of what data are useable and any trends will support the development of a sampling and analysis plan to address buried legacy sediments in watershed creeks particularly in areas of potential restoration. A thorough understanding of existing and past hazardous material discharges and disposal is needed to support informed selection of sediment sampling sites, as well as helping to determine continuing and persistent sources of contamination, and to identify and prioritize specific projects in the future.

An interactive watershed database provides a single-source tool housing all available information on potential sediment contamination generators, and historic/ongoing sampling efforts. This will provide a powerful and adaptive tool for better decision-making.

As an example the following information could be added to the existing sediment data to increase analytical power of the database: (1) recent sediment sampling data; (2) water quality data from ongoing FBNR volunteer monitoring; (3) available long-term monitoring being performed at remediated hazardous waste sites within the watershed; (4) NYSDEC Rotating Integrated Basin Study (RIBS) data from 2005/06, as available; (5) include sampling that performed as part of the Restoration Plan and Environmental Assessment for the Love Canal (USFWS 2005), as applicable.

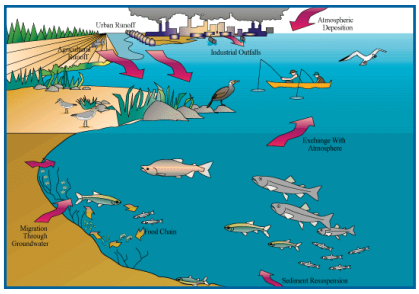
Potential Project Locations



17. Contaminant Reduction

Contaminant reduction within the watershed will significantly progress the process of delisting the Niagara River AOC BUIs and address other impairments such as water quality, fish consumption advisories, contaminants in wildlife, and limited recreational opportunities.

Cayuga and Bergholtz creeks have fish consumption impairments as described in the NYS 303(d) impaired waterbodies list. The consumption advisories extend from the confluence with Little Niagara River Cayuga Creek to the first impassible barrier in each creek. Cayuga Creek is listed for dioxin-contaminated sediment and Bergholtz Creek is listed for PCBs-contaminated sediment. Previous sampling efforts also indicated high levels of PAHs in creek sediment. PCBs and dioxins are legacy contaminants from past industrial practices and contamination at Love Canal. Contaminants contribute to a number of BUIs within the Niagara AOC RAP. According to the 2007 NRTMP, the water quality of Niagara River has improved significantly since 1987. Of the 18 "Priority Toxics" listed in the Niagara River Toxics Management Plan (NRTMP): mirex, hexachlorobenzene (HCB), PAHs, dieldrin, DDT, PCBs, mercury, and dioxins still exceed criteria (one or more water quality, sediment, or biological) and are recommended for further study. It is noted these contaminant sources can be from multiple sources, other than Cayuga Creek. Recent studies indicate the Little Niagara River could contribute some contamination to Cayuga Creek.



Benefits

Benefits associated with this project type include eventual delisting of Cayuga and Bergholtz Creeks for contaminated sediments. Determining locations of contaminated sediments would also facilitate any other project that would require disturbing the stream bottom. Quantifying potential recontamination from Little Niagara River to surface sediments is important to designing habitat restoration projects.

Project sequencing could follow the steps below:

- Updating and maintaining existing centralized GIS database to standardize historic sampling results and to track monitoring results;
- Develop a plan to quantify the types and extent of contamination and the potential contribution from legacy sediments, a general approach would be to

  Collect sediment cores along transects at locations along the creek to identify contributions from current and historical sources.

  Cores could be taken right and left bank and center channel.

  Samples could be taken at various depths depending on field observations.

  Transects would be located near the mouth of Cayuga Creek, Cayuga Creek downstream and upstream of the confluence of Bergholtz Creek, Bergholtz Creek downstream of NFARS influence and upstream of Sawyer Creek.
- Perform remedial investigation of sediments, bank soils, and stormwater along Cayuga and Bergholtz Creeks to get comprehensive understanding of sediment and contaminant transport; use data in SWAT model.

Potential Project Locations