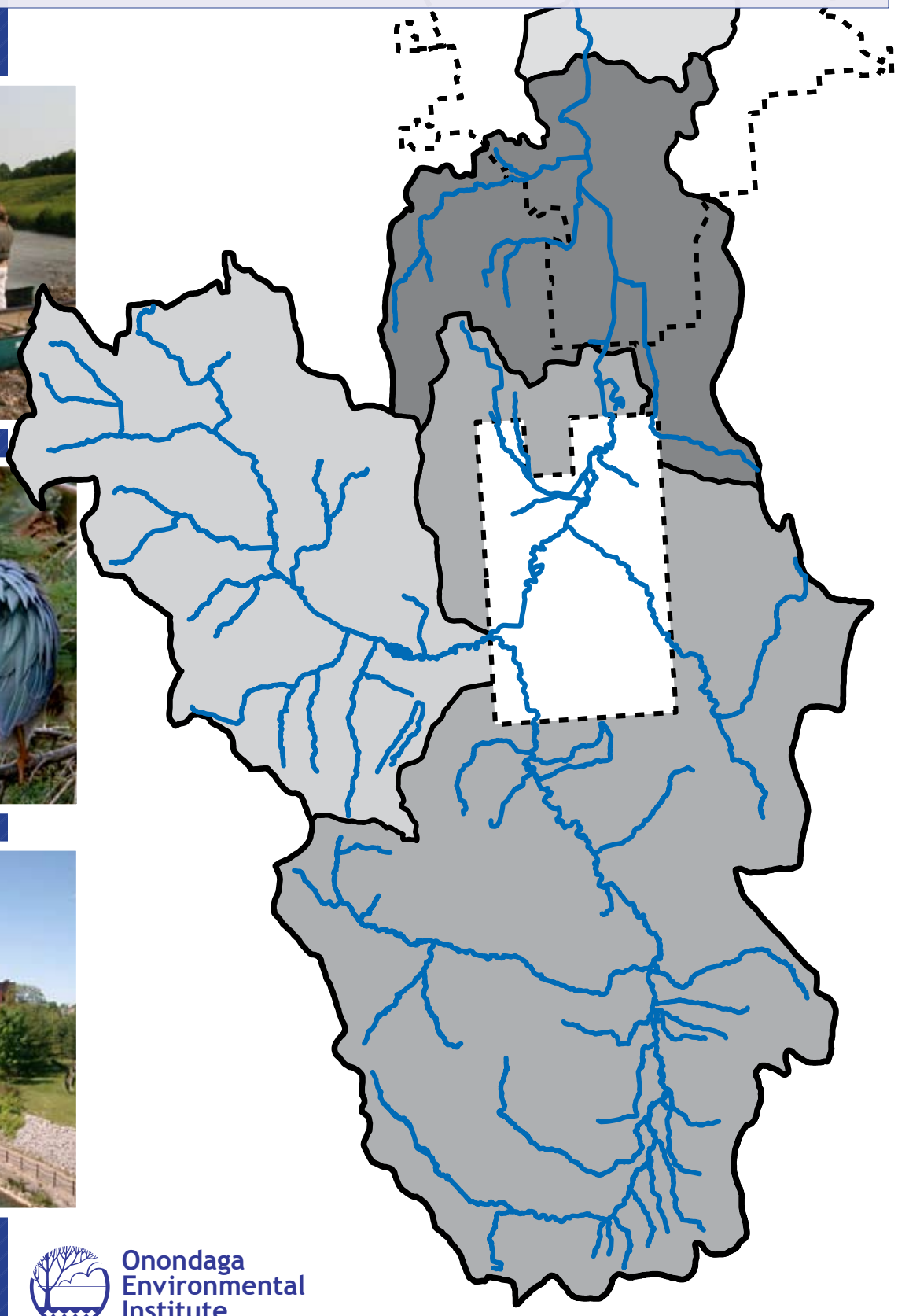
onondaga creek

CONCEPTUAL REVITALIZATION PLAN
DRAFT 3, APRIL 2009

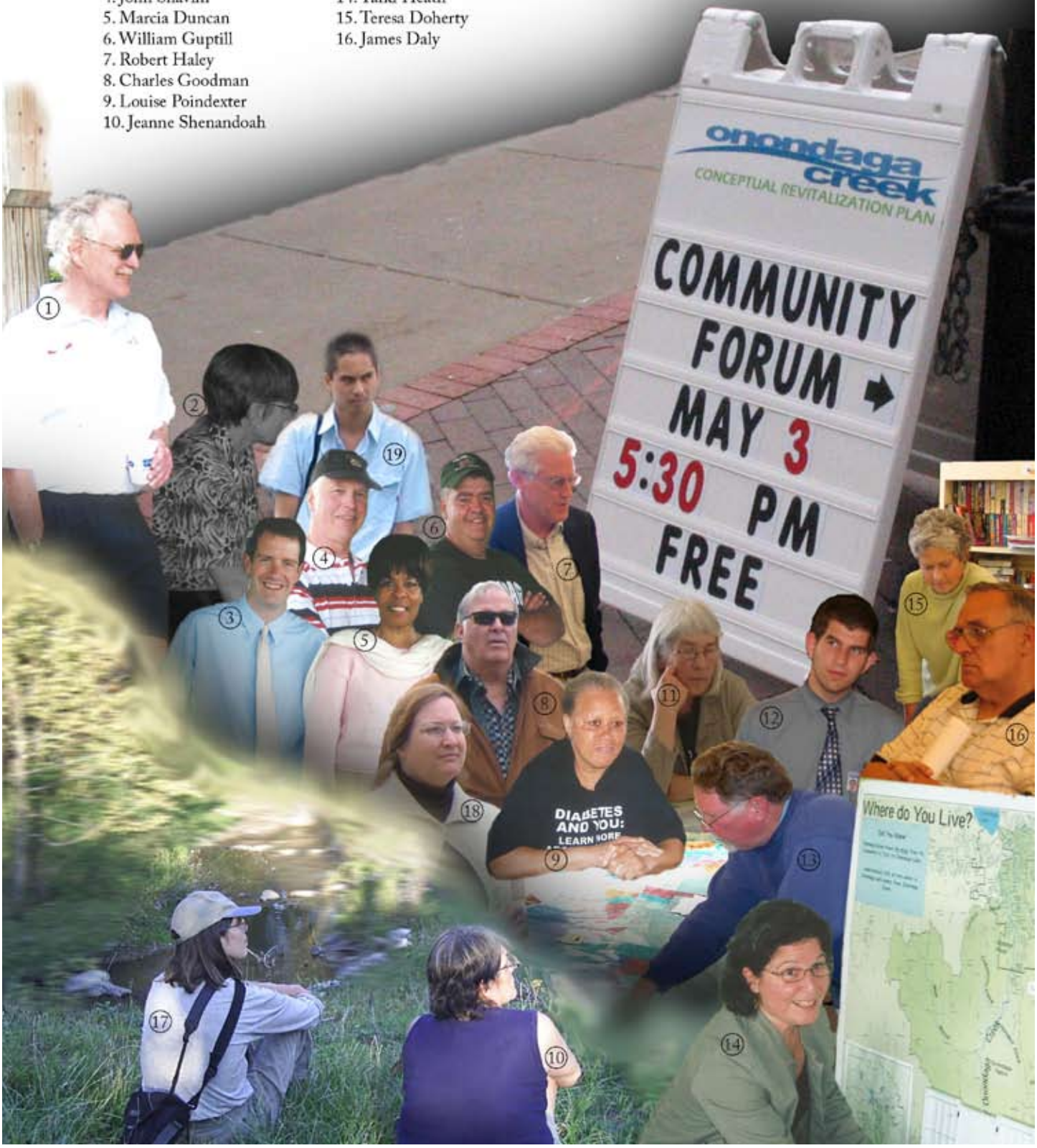


Onondaga Environmental Institute

Onondaga Creek Working Group

The Onondaga Creek Conceptual Revitalization Plan would not have been possible without the dedication and committment embodied by the members of the Onondaga Creek Work Group. The OCRP Project Team would like to extend a sincere thank you for your continued service!

1. Robert Dougherty
2. Claire Fisher
3. Steve Kearney
4. John Snavlin
5. Marcia Duncan
6. William Guptill
7. Robert Haley
8. Charles Goodman
9. Louise Poindexter
10. Jeanne Shenandoah
11. Kitty Burns
12. Paul Mercurio
13. Knowlton Foote
14. Tarki Heath
15. Teresa Doherty
16. James Daly
17. Catherine Landis, SUNY ESF Graduate Student
18. Janet Marsden, SUNY ESF Graduate Student
19. Bruno Takahashi, SUNY ESF Graduate Student



Onondaga Creek Conceptual Revitalization Plan was produced by Onondaga Environmental Institute as a work product of the Onondaga Creek Conceptual Revitalization Plan Project (OCRP). Visit www.esf.edu/onondagacreek for more information.

The **Onondaga Lake Partnership** (OLP) sponsors the Onondaga Creek Conceptual Revitalization Plan Project with federal funds from Congressman James T. Walsh granted through the U.S. Environmental Protection Agency.

Visit www.onlakepartners.org for more information about the OLP.

Contributing Authors | Atlantic States Legal Foundation: Samuel Sage

Cornell Cooperative Extension of Onondaga County (CCE): Amy Samuels, Kelly Somerlot

Onondaga Environmental Institute (OEI): Samuel Gordon, Edward Michalenko, Meredith Perreault

State University of New York College of Environmental Science and Forestry (SUNY ESF): Tanushree Chowdhury, Richard Smardon

Graphic Design | Samuel Gordon and Julia Renn, Onondaga Environmental Institute

Acknowledgements

Onondaga Creek Working Group

Community participants in Onondaga Creek Working Group and Goal and Issue Solicitation Meetings

OCRP Project Team

OEI Staff: Tyler Andre, Brigit Burt, Daniel Gefell, Samuel Gordon, Robert Griffiths, Donald Hughes, Stephanie Johnson, Nancy Kaiser, Julia Renn, Joan Cope Savage, Carla Wiemers

OEI Interns: Tim Jones, Dylan Smith

OEI Former Staff: Clark Burdick, Jennifer Fredenberg, Lindsay Speer

ESF Graduate Students: Janet Marsden, Bruno Takahashi

Onondaga Creek Community Forums Facilitator: Kim Farrell • **Kim Farrell Consulting, Inc.**

Onondaga Creek Resource Experts: Steven Nann • **City of Syracuse Department of Engineering**; Cathy Keenan • **Natural Resources Conservation Service**; Diane Carlton and David Lemmon • **New York State Department of Environmental Conservation** (NYSDEC); Mark Schaub • **Onondaga County Soil and Water Conservation District**; Emanuel Carter, Virginia Collins, Theodore Endreny, Myrna Hall, Maren King, Catherine Landis, Donald Leopold, Karin Limburg, Neil Ringler, and Kathy Stribley • **SUNY ESF**; Jacob Bendix • **Syracuse University**; William Kappel • **U.S. Geological Survey** (USGS)

Onondaga Creek Stakeholder Meeting Facilitators: Amy Samuels and Kelly Somerlot • **CCE**; Judith Mower • **J.C. Mower Consulting, Inc.**; Kim Farrell • **Kim Farrell Consulting, Inc.**; Diane Carlton and Stephanie Harrington • **NYSDEC**; Richard Smardon • **SUNY ESF**; Edward Bogucz • **Syracuse Center of Excellence**; Theodore Brown, Thomas Perreault, Sarah Pralle • **Syracuse University**

U.S. Environmental Protection Agency Region 2: Seth Ausubel and Christopher Dere

Stakeholder Meeting Sponsors: COR Development Company, Hancock & Estabrook, LLP, and Wachovia Securities

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onondaga creek CONCEPTUAL REVITALIZATION PLAN

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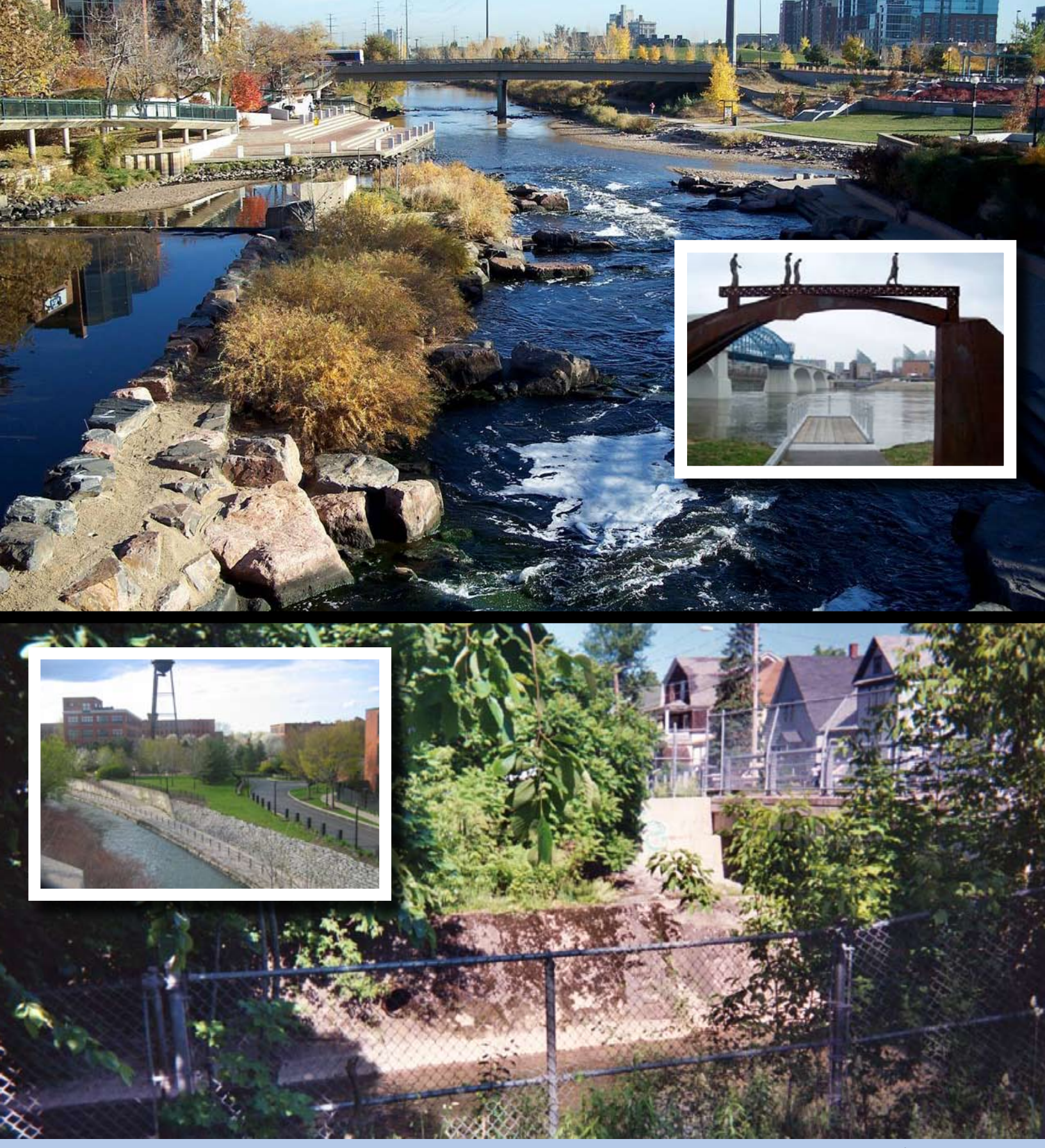


Urban centers all over the world have rediscovered their waterways. The phenomenon known as "waterfront revitalization" has reconnected people to water in cities across the United States and has served as a means for environmental, social, and economic enhancement. Photos: South Platte River in Denver, Colorado, top; Tennessee River, Chattanooga, Tennessee, top inset; Onondaga Creek at Newell Street, Syracuse, bottom; Onondaga Creek at Franklin Square, Syracuse, bottom inset. (Photo credits: Richard Smardon and OEI)

Executive Summary:

An overview for all readers

Purpose

The Onondaga Creek Conceptual Revitalization Plan (OCRP) presents to the public and government decision-makers a conceptual plan for renewing the creek and transforming its corridor into an attractive asset. The case for revitalization is strong. The creek has changed dramatically over the past two hundred years. The symptoms of historic urban and rural change continue to impact the health of the creek and restrict the ability to use and enjoy it. The result is a creek in need of new and flexible solutions for revitalization.

The OCRP is conceptual, meaning the people who created it were asked to "think big" and generate ideas for the future of Onondaga Creek. The Onondaga Creek Working Group was formed to advise and direct writing of the OCRP. They are a volunteer group, from many different backgrounds, who live or work in the Onondaga Creek watershed. Some ideas in the OCRP might never happen, others will happen quickly. Most will occur gradually and need plenty of community support and patience. Overall, revitalization will take a long time. Yet it can be accomplished, one step at a time, especially using shared community goals and a smart strategy. This, then, is the purpose of the OCRP project:

- To discover community goals, and from those goals, create a plan, and
- Use the plan to guide improvements to environmental, social, and economic conditions along Onondaga Creek.

The OCRP does not request or demand any financial commitments; funding sources must be determined once next steps are selected and put into practice. Funding is uncertain at this time, yet the cost of doing nothing is arguably greater for future generations. Without action now, benefits of revitalization may never be realized.

conceptual: *based on ideas, formed from reasoning and imagination*

revitalization: *the act of giving new life or vigor to something*

There are many possible benefits of creek revitalization:

- Generating renewal in surrounding neighborhoods
- Creating recreation and education opportunities
- Forming new cooperative ways to manage Onondaga Creek as a treasured resource
- Adding the creek back into the urban landscape as a natural place
- Linking diverse communities
- Fostering economic growth and development
- Promoting local pride
- Restoring and protecting the natural environment

To realize benefits, the OCRP must be put into practice. Key next steps are:
1) Continuing the Onondaga Creek Working Group, to act as a community voice to guide revitalization and engage the public in continued discussion, and
2) Begining demonstration or pilot projects that show the public real results.

Existing Conditions and Problems

Onondaga Creek begins in southern Onondaga County, near Tully, New York and flows approximately twenty-seven miles north, through Syracuse, to its outlet in Onondaga Lake. The Onondaga Creek watershed (see Figure E.1) is part of the larger Onondaga Lake watershed. Water from the creek and lake eventually drains to Lake Ontario.

As the City of Syracuse grew in the creek's floodplain, the creek was altered for sewage disposal and flood prevention. Using the creek to carry sewage in the past has left a legacy of continuing water quality problems today. Results from water quality testing consistently show bacteria levels higher than New York State standards, especially in the portion of the creek that flows through downtown Syracuse. Rerouting the creek from its natural curves into a deep, straight, concrete and block lined channel reduced floods but greatly changed the creek's physical form and plant and animal life. During heavy rains and snow melts in the city, deep, fast flowing water in the creek channel presents drowning hazards. Consequently, creek access was restricted by chain-link fence in the second half of the twentieth century.

Industrial salt extraction may have caused or worsened muddy springs, or mudboils, in the Tully Valley, in addition to leaving the land prone to sinking. In their most active period, the mudboils released thirty tons of sediment daily into the creek. In addition to mudboils, sediment is added to the creek by landslides, streambank erosion, and stormwater runoff from the land. Sediment aggravates turbid or muddy conditions in Onondaga Creek.

The way land is used will need to be addressed to revitalize Onondaga Creek. Nonpoint source pollution is carried to Onondaga Creek and its tributary streams via runoff over the land. Nonpoint source pollution includes sediment, nutrients, and pesticides which impair water quality. Polluted runoff reaches the creek quickly when wetlands are filled and streambank plants and trees are cut down or stripped away. In urban portions of the watershed, roads, roofs, and other hard surfaces increase the amount and speed at which stormwater runs to the creek, lessening water quality. New solutions are needed to address these kinds of problems, like the introduction of green infrastructure in urban areas and the implementation of best management practices in rural areas.

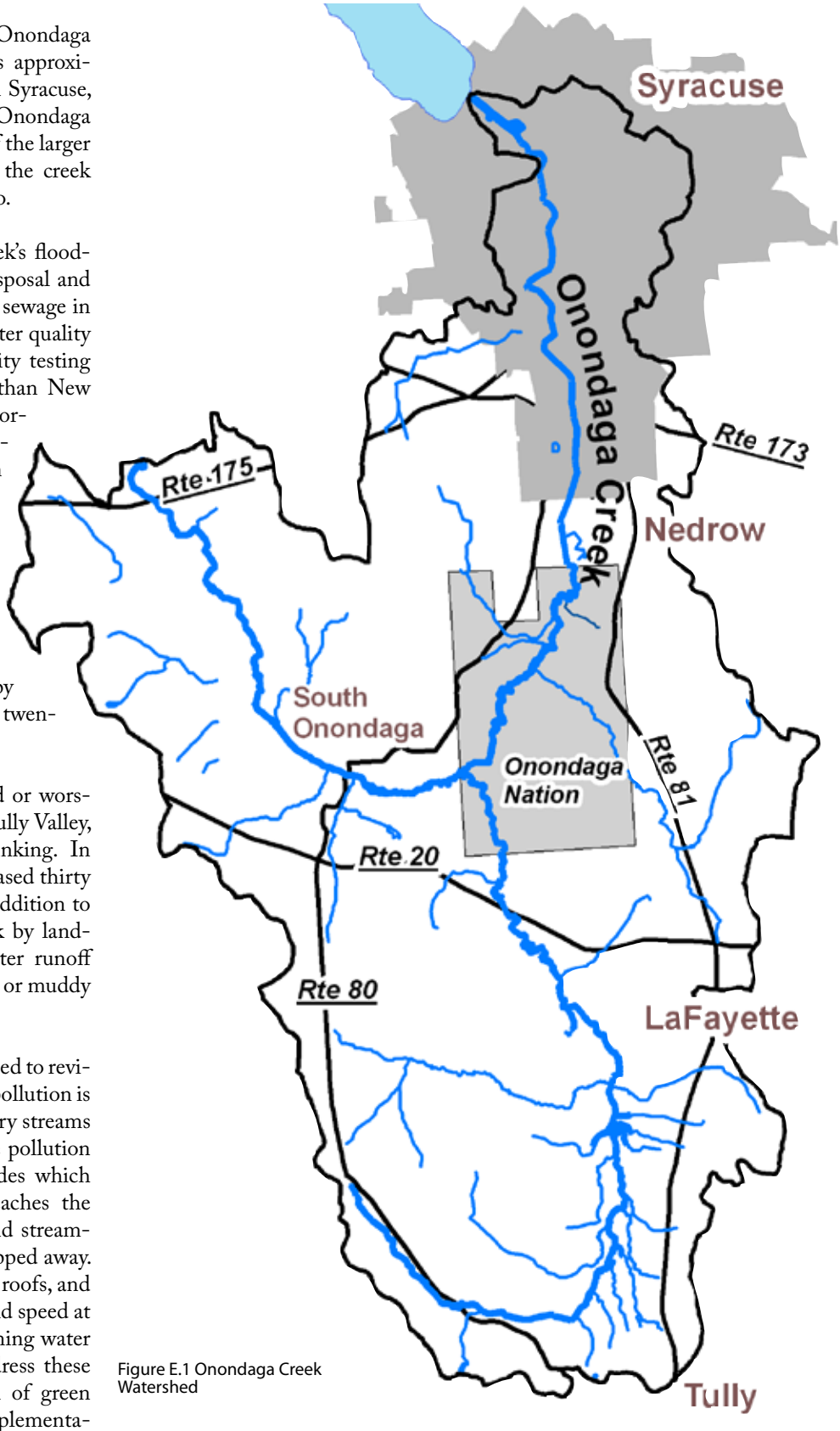


Figure E.1 Onondaga Creek Watershed

watershed:
the area of land that drains into a specific waterbody

green infrastructure:
managing storm-water to mimic natural processes to percolate or reuse on-site runoff

best management practices:
methods that prevent or reduce water pollution from nonpoint sources

Existing conditions on Onondaga Creek, from top to bottom: At Armory Square, roofs and parking lots speed stormwater to the creek. Chain-link fence restricts access in Syracuse for safety purposes. Turbid water in the creek in Tully Valley. Near the headwaters of Onondaga Creek, rocks armor the bank next to natural falls at Woodmancy Road. (Photo credits: Knowlton Foote and OEI)

Salt mining was performed in the Tully Valley for nearly one hundred years (1889-1986) by injecting water through deep wells into underground salt deposits. The brine solution was brought to the surface and piped by gravity-feed to the shore of Onondaga Lake where the salt was used in soda ash production via the Solvay Process. By the early 1960s, water was no longer injected into the ground, the drilling of wells and rock fracturing allowed upper groundwaters to infiltrate and dissolve lower salt deposits. Photo: Tully Historical Society.

Drivers and Goals – A guiding image for Onondaga Creek's future

A comprehensive vision for the future of Onondaga Creek is a key finding of the OCRP. A series of meetings with the public and stakeholder organizations posed open-ended questions to participants to gather visions (or goals) and concerns for the future of Onondaga Creek. These visions and concerns underpin the conceptual plan and will guide creek revitalization. All of the visions and concerns from over 350 meeting participants were sorted into top themes:

Vision: Recreation in a clean, natural waterway and fishing opportunities from a healthy fishery.

Concerns: Lack of funding; government apathy or inability to achieve the goals desired; sewage and sewage treatment; and pollution and garbage.

The Working Group established drivers and goals for Onondaga Creek revitalization. The drivers act as key areas of focus. The goals describe where the creek should be in the future. The drivers and goals were developed by the Working Group after studying the condition of Onondaga Creek and listening to the public during community meetings.

The goals are meant to function as a guiding image for Onondaga Creek revitalization; in other words, the goals are meant to be strived for, or worked towards – they represent the vision for the future of Onondaga Creek. Time will be needed to achieve all of the goals; some sections of the creek will realize goals before others. Each of the five drivers (water quality; human health and safety; ecological health and habitat; access, recreation and use; and education) is represented by an illustration and an explanation in italics, appearing on this page. The drivers and goals reflect what the community said, as illustrated by direct quotes received during public meetings.

Goals are listed on the facing page. They have been shortened and simplified from their original wording. The original version can be found in Chapter 5 of the OCRP.

stakeholders:
those who have a share or an interest in an issue

water quality:

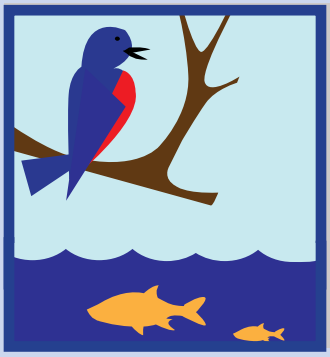
Improving the biological, chemical, and physical conditions of Onondaga Creek (often measured by a waterbody's ability to support life).

"Good water quality everyone can share and enjoy. (S)omething to be proud of."

human health & safety:

Fostering a state of wellbeing for people in the Onondaga Creek watershed, free from risk and disease.

"Can we enjoy the creek and still protect the environment - people need to feel safe/secure using the corridor."



ecological health & habitat:

Fostering an environment for native species (plants and animals) that provides safe food and water.

"The creek becomes wonderful habitat for fish, birds and other animals."

access, recreation, & use:

Allowing everyday activities and enjoyment in and around Onondaga Creek.

"Travel along entire creek from lake to headwaters- have a path, nice lighting, banners, benches, programmed spaces."

education:

Sharing knowledge about Onondaga Creek and its environs.

"… I would like to see the creek used as an educational tool for surrounding school communities."

Goal A. Throughout the watershed, achieve water quality to the standard that:

- supports varied fish and wildlife and
- supports types of recreation that put people in contact with the creek.

Goal B. Water should be clear and attractive, free of garbage.

Goal A. Achieve water quality so that human contact with water is safe.
Goal B. Reduce the possibility for drowning, damaging floods, and liability.
Goal C. In the City, make a new policy for the fence along Onondaga Creek. The policy must balance the need for safety and access.

Goal A. For the whole creek system, increase the presence, extent, and types of plant life along the banks of Onondaga Creek. In turn, this increases fish, wildlife and bird diversity in the creek corridor.
Goal B. System-wide, restore the natural conditions and environment for fish that prefer or require cold water at times during their life span. Trout are an example of cold water fish. At the least, no changes to the creek corridor should make conditions worse or stop cold water fish from moving up- or down-stream.
Goal C. Increase the ability of wetlands to perform their natural functions, such as storing water and providing habitat. Restore wetlands by reconnecting wetland areas to the creek.
Goal D. Use native species of plants, fish and animals in restoration projects.

Goal A. Throughout the watershed, establish a system of linking trails to connect rural and urban neighborhoods.
Goal B. Add, maintain, and protect open spaces, along the Onondaga Creek corridor and its tributaries.
Goal C. Make creek access a priority for both urban and rural land use decisions.
Goal D. Local governments should establish ways to manage land and coordinate recreation/access projects to support a naturalized, attractive creek.
Goal E. Throughout watershed, governments must adopt a new commitment to Onondaga Creek revitalization.

Goal A. Provide varied educational experiences and opportunities for all ages.

- Use signs, including signs that mark watershed boundaries
- Use outdoor education centers
- Strengthen existing community educational facilities
- Use interpretive trails
- Use gardens with diverse plants
- Use community creek restoration projects and clean-ups
- Use teaching materials specific to the Onondaga Creek watershed

diversity:
the variety of organisms found within a specified region

habitat:
the environment where a population lives; it includes all things an organism needs to survive

native species:
an animal or plant that originated in a particular place or region

tributary:
a stream that flows into another, larger body of water

open space:
land that is not intensively developed for agricultural, commercial, residential, or industrial use

Recommendations - Process steps and pilot projects

Recommended Process Steps

Based on the experience of other communities, the process of creek revitalization is rarely quick; nor does it follow a straight line. Revitalization will be a long-term process, accomplished in many steps. Each project builds on the momentum from previous successful projects. Continued momentum encourages others to lend support and resources. For this to happen, many processes must occur at the same time.

Key next steps:

- **Continue the Onondaga Creek Working Group. The Working Group is the cornerstone of putting revitalization into practice. The Working Group can act as the community voice of the watershed, starting and coordinating projects with a clear process open to the public. Many of the following process steps can be started and coordinated at the Working Group table.**
- **Start work to achieve the watershed goals.**
- **Coordinate ongoing projects that affect Onondaga Creek.**
- **Communicate OCRP goals to build community support for creek revitalization.**
- **Continue to gather data to learn as much as possible about the Onondaga Creek watershed.**
- **Commence an outreach program to the governments within the Onondaga Creek watershed. Program objectives could include the initiation of steps towards the crafting of intermunicipal agreements; establishing land management practices that support a naturalized, attractive creek; and introducing tools available to municipalities for the prioritization of creek and tributary protection as possible strategies for dealing with difficult problems like nonpoint source pollution and stormwater management.**
- **Create a funding strategy. An important need exists for a group capable of long-range thinking to coordinate the funding strategy. Financial resources must be used wisely to meet as many stakeholder goals as possible. Fundraising and coordinating public/private partnerships are another key aspect of the funding strategy.**
- **Start action on demonstration projects. Demonstration projects mobilize community activity and show tangible results to the public.**

Recommended Pilot Projects

A pilot projects list was developed during the process of drafting the OCRP, see Table E.1. Projects are arranged from easier to implement (#1) to more difficult to implement (#11). Corresponding drivers are listed by number. In the last three columns, the shading shows where projects are most appropriate for sections of Onondaga Creek; urban, rural and transitional (the section of Onondaga Creek that transitions between rural and urban). Pilot projects are intended to meet more than one driver and work towards multiple goals of the OCRP. As stated, the Working Group is an appropriate group to plan projects and use resources effectively so that projects meet as many goals as possible.

intermunicipal agreement:
agreements between governments to cooperate on land use planning and regulation

Table E.1 Recommended Pilot Projects

	Recommended Pilot Projects	Description	Action Items	Revitalization Maps, By Letter	Corresponding Drivers*	Urban	Transitional	Rural
1	Living fence demonstration project	Create a natural barrier with shrubs, trees, or other vegetation next to the creek, to act as a barrier instead of fencing.		E, F2	2,5			
2	Alter the bankside mowing regime	Allow plant growth near the edge of the creek, to benefit fish and wildlife habitat, instead of frequent mowing.		E	3,5			
3	Shade tree planting pilot project	Plant shade trees in the riparian areas of Onondaga Creek to provide habitat and moderate water temperature.		A, C, E, F2, G/H, K, L	1,3,5			
4	Green infrastructure demonstration site	Manage stormwater runoff by integrating soils and vegetation into the landscape.		E, F, L	1,3,5			
5	Comprehensive littering education pilot program	Develop and present litter prevention education to both school children and watershed residents.			1,2,3,5			
6	Non-native species control, native plants restoration at hot spots	Remove non-native plants and replace with native plants, in areas where non-native species have become well established.		A, E, F, G/H, I, L	3,5			
7	Rural/agricultural BMP demonstration site	Install and practice innovative rural best management practices to manage runoff; site should be accessible for local landowners to assess function.		A, C, G/H, I, J, K, M	1,2,3			
8	Trail creation/ connection demonstration site	Create new and/or connect existing recreation trails where desired in a visible, accessible place, near Onondaga Creek.		E, F2, L	4			
9	Conservation easement/access demonstration site	Institute a conservation easement/ access site with a willing private landowner; site should be accessible for local landowners to assess function.		E, C, G/H, L	3,4			
10	Flood and stormwater retention demonstration site	Install a basin that retains stormwater for infiltration, pollution reduction and downstream water quality improvements.		E, F2	1,2,3			
11	Channel modification demonstration site	Returning a stream channel section to as natural a condition as possible, given current constraints, while creating a safer, stable, non-erosive channel.		E, F	2,3			

*Drivers: 1) water quality, 2) human health and safety, 3) ecological health and habitat, 4) access, recreation and use, and 5) education

The Onondaga Creek Conceptual Revitalization Plan Chapter byChapter

sustainability: *meeting the needs of the present without compromising the ability of future generations to meet their own needs*

channelization: *human engineering to enlarge or straighten river channels to protect existing channels or adjacent structures*

The content of the OCRP is divided into nine chapters. References, an abbreviations list and a glossary are found at the end of the document. Appendices that support OCRP content and provide further information accompany the document on compact disk. The Forward and Chapter 1 explain the purpose of the OCRP, who was involved in creating it, and why it is needed.

Chapters 2, 3, and 4 set the stage for understanding OCRP results. The overview of Onondaga Creek's history in Chapter 2 provides critical background for understanding the current state of Onondaga Creek. Chapter 3 explains existing conditions of Onondaga Creek based on a series of Onondaga Creek Fact Sheets prepared by the Onondaga Environmental Institute (OEI). The fact sheets are contained in Appendix B. Chapter 4 documents the process of creating the OCRP. This chapter is meant for those interested in how technical information, public education, public meetings, and the Working Group were put together and their role in plan creation.

Chapter 5 documents results; it is the heart of the OCRP. Technical results are listed, including the plan itself, the Onondaga Creek Fact Sheets, and the Case Studies Guide (complete text in Appendix C), which provides examples of projects from other river revitalizations around the United States. Public education events are listed and mapped. A brief summary of results from the community meetings are presented in Chapter 5, more results are found in Appendix G. Building on the community vision and technical information, the Working Group developed revitalization maps and watershed goals. Their substantial effort forms the bulk of Chapter 5.

Chapter 6 is a strategy to evaluate ongoing projects in the Onondaga Creek corridor. This chapter suggests that finding similarities between projects and the OCRP will promote collaboration among decision makers and stakeholders. In addition to coordinating with ongoing projects in the creek corridor, many factors will need to be addressed to put the OCRP into practice. Factors include flood management, safety issues, and rural and urban development. Taking these factors into consideration, Chapter 7 identifies constraints and data gaps that will affect Onondaga Creek revitalization. Constraints restrict the ability to act. In the Onondaga Creek watershed, constraints include fragmented government and community, current funding priorities, water quality and channelization. Data gaps, or missing information about the watershed, are significant; however, identification of constraints and data gaps leads to opportunities and solutions for revitalization.

Smart strategies are needed to put the OCRP into action. Strategies must maximize available funding and meet as many stakeholder goals as possible. Four types of strategies are identified and examined in Chapter 8: finding revitalization opportunities in existing land use patterns; establishing design, sustainability and ecological standards to guide future projects; exploring intermunicipal agreements between governments to manage the watershed; and seeking sources of funding. Within each, options are suggested that communities can adopt to achieve the goals of the OCRP; many require cooperation with urban and rural private landowners.

Finally, Chapter 9 reviews the content of prior chapters and presents next steps for creek revitalization. Process steps and pilot projects are described in this chapter. The OCRP serves as a starting point for meaningful change for Onondaga Creek. By setting and striving for goals, the community accepts both the challenges and opportunities possible through revitalization. Continued action is needed, particularly community participation, landowner interest and cooperation, and building a coalition between watershed citizens and government agencies at the local, state, and federal level. The OCRP is a conceptual plan, but also an invitation to watershed stakeholders for continued involvement and action.

Photos facing page: Onondaga Creek at the Inner Harbor, Syracuse. (Photo credits: Knowlton Foote and Lee Gechas)

Part of a revitalization planning map created by the Onondaga Creek Working Group in May and June 2007. Symbols on yellow cards represent revitalization options for Onondaga Creek and its corridor. Revitalization maps and a symbols key are in **Chapter 5: Revitalization Plan - Results**.

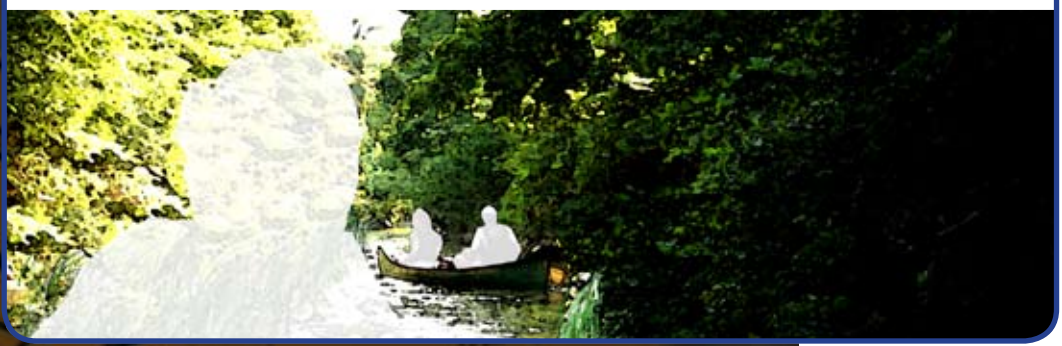
Forward

The Onondaga Creek corridor cuts a broad swath through much of the center of southern Onondaga County. Once an important artery for wildlife and a sustaining force for the Onondaga Nation, it gradually became a wastewater conveyance stream, largely channelized and converted into an open linear sewer. The *Onondaga Creek Conceptual Revitalization Plan* (OCRP), presents to the public, developers, and government decision makers, a conceptual plan for how to remake this corridor into an attractive asset for the community. The hope is that this plan will serve as a catalyst for invigorated civic pride and economic, social, cultural, spiritual, and environmental renewal.

The OCRP is the culmination of countless hours of work undertaken by many individuals (see acknowledgements) over the past three years. Many participants have long felt Onondaga Creek was long overdue for a new look at its potential for revitalization. The document before you represents the output from this effort and presents you with a comprehensive view of the potential and how conditions can be changed for the better along the length of Onondaga Creek.

The OCRP is a first and necessary step towards developing community consensus and promoting an action plan for the corridor. The OCRP is not meant as a detailed lot–by-lot analysis of future design of the corridor, but a more comprehensive and schematic rendering of segments of the corridor based on history, culture, economics, and imagination. The resulting recommendations are intended to be implemented incrementally and over a substantial period of time. Implementation will proceed through the careful collaboration of the public and private sectors. The basis for the OCRP was to consider what the corridor once was; and to envision what it could be for our collective future. No one expects a recreation of what might have existed two centuries or more ago; historical restoration in a technical sense would not be possible or indeed desirable. However, it is important to accommodate the past functions into a plan that serves the needs for the twenty-first century.

You should read the document, think about it, discuss it with friends and colleagues, and then let the community know your thoughts. This is a living document prepared in a relatively short time frame by interested persons, it will evolve and continue to be relevant through your interest, support, comments and suggestions, which are always welcome and greatly appreciated, thank you.



CHAPTER 1:
Introduction

The Onondaga Creek Conceptual Revitalization Plan

The Onondaga Creek Conceptual Revitalization Plan (OCRP) was conducted to initiate a *revitalization* planning process for the Onondaga Creek Watershed. This plan represents a best effort towards transforming different, and at times disparate, ideas and priorities into a common vision. The document attempts to accommodate all ideas rather than compromise any single thought.[1] The plan emphasizes common themes received from the *community* through the Onondaga Creek Working Group and other public meetings throughout the planning process. The themes reflect the consistent expression of a vision for a clean, natural creek reintegrated into everyday experience through recreational and educational opportunities. The OCRP is intended to guide future public policy decisions and expenditures as the vision is implemented throughout the corridor. Public desire for reconnection to Onondaga Creek necessitates a commitment to maintaining publicly-owned lands along the creek corridor.

As much of the corridor is in private ownership, many future decisions will be made by individual property owners setting land use priorities for single parcels or small tracts of land. Haphazard development can be addressed by realizing that we all need to work together, in some cases through enhanced regulatory action, and in others, through volunteer participation (i.e., carrots and sticks). As is discussed elsewhere, these ideas are in the formative stage and will require additional public discussion to build consensus before projects can be implemented.[2] *Implementation* is the most critical issue facing us. The OCRP can help transform our collective vision into reality and convert good ideas on paper into progress on the ground.

[1] Paraphrase of a quotation by T. Allen Comp (2003).

[2] See various parts of Chapter 8.

What is the Onondaga Creek Conceptual Revitalization Plan?

Project Goal

The goal of the OCRP project is to develop a community-based revitalization plan for the Onondaga Creek *watershed*, providing a guide for future development, water quality, and *habitat* improvements that can enhance environmental, social, and economic conditions along Onondaga Creek.

Project Area

The project area of the OCRP is the Onondaga Creek watershed in Onondaga County, New York. Figure 1.1 illustrates the watershed in relation to the City of Syracuse, the Onondaga Nation and nearby towns. Figure 1.2 illustrates the watershed location in Onondaga County and regionally, as part of the Seneca-Oneida-Oswego river basin. The *headwaters* of Onondaga Creek originate in southern Onondaga County, near Tully; the creek flows north to its outlet in Onondaga Lake, and eventually drains into Lake Ontario.

Project Sponsorship and Funding

The Onondaga Lake Partnership (OLP) sponsors the OCRP project with funds from the U.S. Environmental Protection Agency (USEPA).

Project Participants

Two groups are responsible for completing the OCRP. The first, the Onondaga Creek Working Group is a diverse cross-section of volunteers who live or work in the Onondaga Creek watershed, and has assisted in developing and reviewing the OCRP. Members are from Syracuse, Nedrow, the Onondaga Nation, LaFayette and Tully. Table 1.1 lists Onondaga Creek Working Group members as of March, 2008.

The second group, Project Team, completed several project objectives for the OCRP: established and facilitated the Onondaga Creek Working Group; compiled a comprehensive inventory of information pertinent to the characterization of the Onondaga Creek watershed; solicited and compiled issues and goals from a broad spectrum of community members and stakeholder groups; assisted the Working Group in development of the conceptual revitalization plan; and produced the plan document.

Figure 1.1 Onondaga Creek Watershed

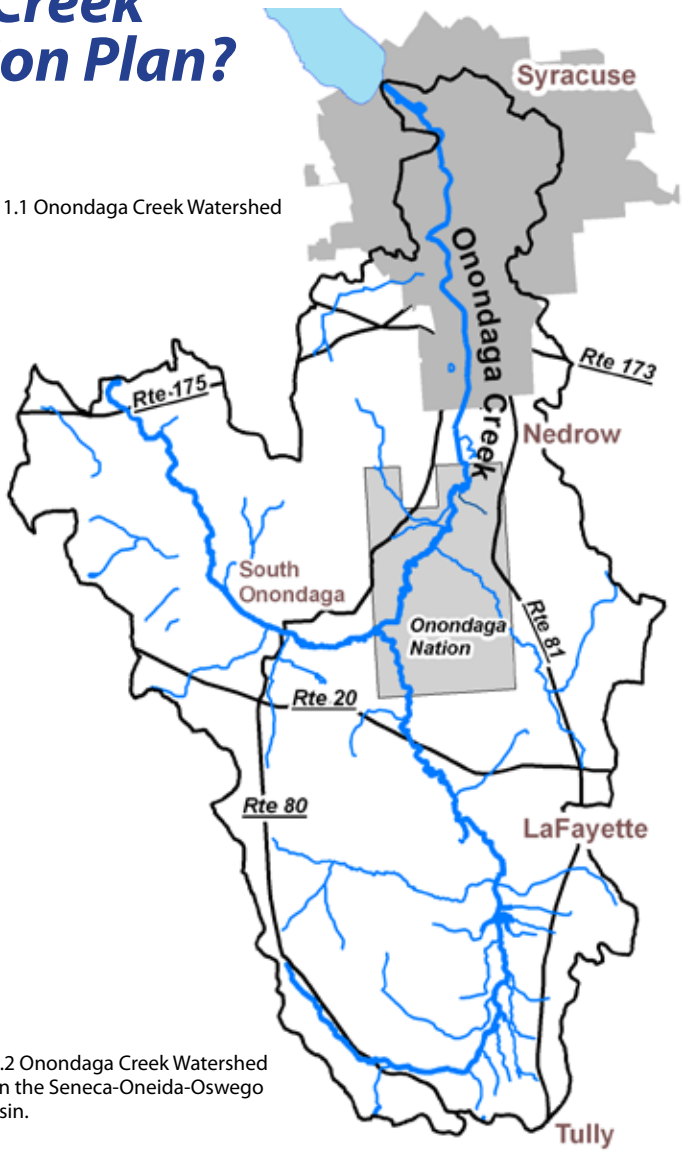


Figure 1.2 Onondaga Creek Watershed nested in the Seneca-Oneida-Oswego River Basin.

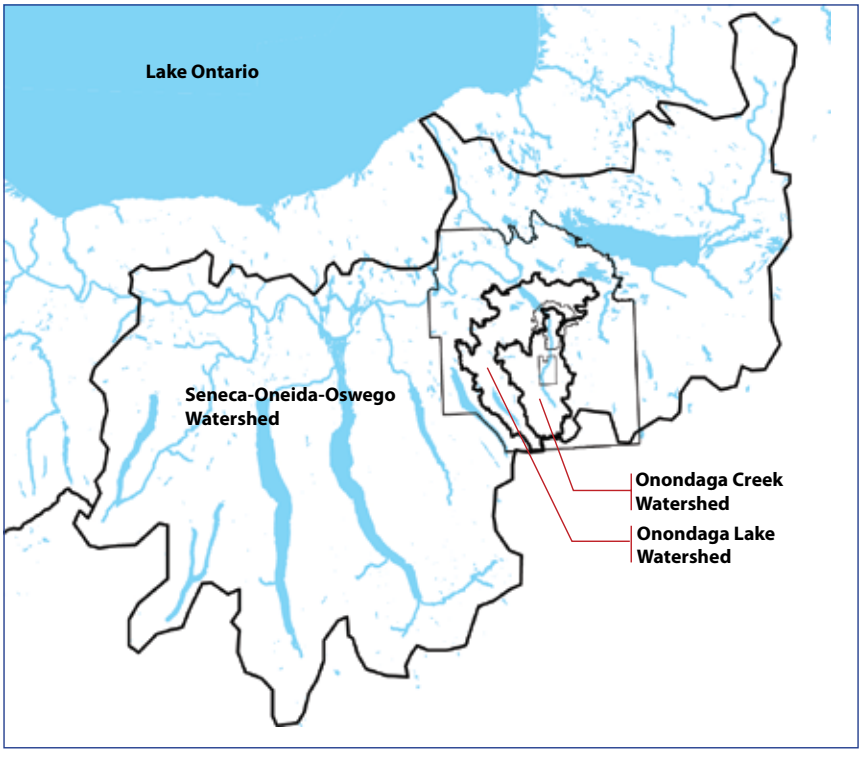


Table 1.1 Onondaga Creek Working Group Members

Name	Organization(s), Geographic Area or Constituency Represented
Stream Segment:	The Business District (Kirkpatrick St. to W. Onondaga St. and Clinton St.)
Charles Goodman	Franklin Square resident, business community representative
Claire Fisher	President, Fisher Associates
Robert Haley	Arcitect, Ashley-McGraw, American Institute of Architects; Vice President, Board of Directors, FOCUS Greater Syracuse; Eastside resident
Steve Kearney	Senior Urban Planner, Office of Economic Development, City of Syracuse
Paul Mercurio	Neighborhood Planner, Department of Community Development, City of Syracuse, Eastside resident
Stream Segment:	The Southside (from W. Onondaga and Clinton to Brighton Ave.)
Marcia Duncan	Salvation Army Adult Rehabilitation Center Counselor; Southside area resident; Creekside property owner
Louise Poindexter	Board of Directors, Syracuse United Neighborhoods; Partnership for Onondaga Creek; Southside resident
Stream Segment:	The Valley (from W. Brighton Ave. to Dorwin Ave.)
Teresa Doherty	Educator, Corcoran High School
Robert Dougherty	Facilitator, Tomorrow's Neighborhoods Today (TNT) Area 4 – Valley; Valley Junior Athletic Association; Valley area resident
Stream Segment:	Nedrow (from Dorwin Ave. to the Onondaga Nation Boundary)
James Daly	Anglers Association of Onondaga; Valley Men's Club; Waterfowlers Association; Nedrow area resident
Stream Segment:	Onondaga Nation
Jeanne Shenandoah	Haudenosaunee Environmental Task Force; Onondaga Nation resident
Stream Segment:	West Branch (the West Branch to the Onondaga Nation Boundary)
William Guptill	Guptill Farms; South Onondaga/West Branch resident
Stream Segment:	LaFayette (South of the Onondaga Nation to Otisco Road)
Knowlton Foote	Town of LaFayette Environmental and Conservation Advisory Board; LaFayette area resident
Kitty Burns	Otisco area resident, along Rattlesnake Gulf
Stream Segment:	Tully Valley (South of Otisco Road)
Tarki Heath	Educator; Partnership for Onondaga Creek; Tully area resident
John Snavlin	Snavlin farms; Tully Town Council; Tully area resident

Mandate and Authority

The mandate of the Project Team and Working Group was to develop the OCRP, based on community input and technical information. The Project Team was responsible for producing the draft plan document and executing the OCRP work plan (see Appendix A). The Working Group's responsibility was to review the draft plan to ensure that it accurately reflected their ideas, recommendations, and intentions for the future of Onondaga Creek, and to guide the document revision process. The Working Group is an all-volunteer committee made up of interested persons who live or work in the Onondaga Creek watershed, each member has a stake in the future of Onondaga Creek. Working Group members' authority rests in their ability to act as *stakeholders* and as informal representatives to the diverse communities throughout the Onondaga Creek watershed.[3] The plan document was delivered to the OLP, which may choose to incorporate the conceptual plan into the overall management plan for Onondaga Lake.

OCRP Project Team members:

Samuel Sage, Atlantic States Legal Foundation (ASLF)
Lee Gechas, Canopy
William Owens, City of Syracuse
Amy Samuels, Cornell Cooperative Extension of Onondaga County (CCE)
Ed Michalenko and Meredith Perreault, Onondaga Environmental Institute
Richard Smardon and graduate students, SUNY College of Environmental Science and Forestry (SUNY ESF)

[3]US EPA (2001) defines stakeholders as those who have a share or an interest in an issue.

Why do we need a plan?

Community *visioning* is a powerful tool for managing change. Its primary purpose is to unite the community around common goals. Visioning can also help a community reach agreement on it's biggest challenges, how the choices it makes might affects it's future, and how it can balance these pressures in the face of change. Visioning projects give local government leaders direction on where the community wants to be in the future (Portland Vision 2007).

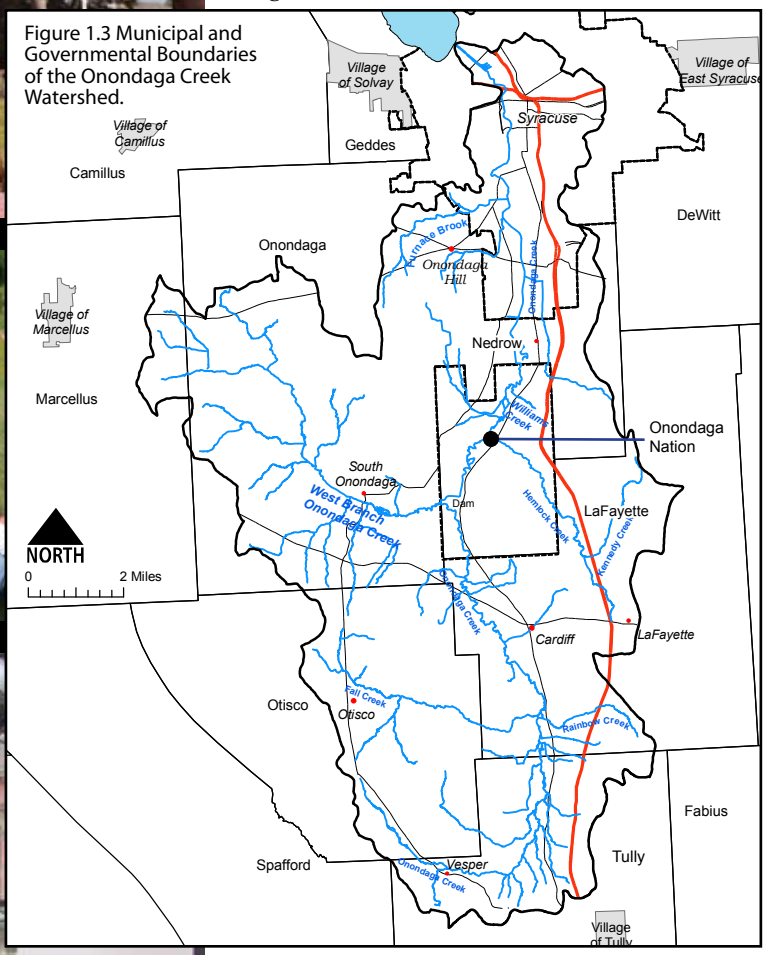


Figure 1.3 Municipal and Governmental Boundaries of the Onondaga Creek Watershed.

Managing local land use can be a means towards protecting the environment; in turn environmental protection provides lasting economic and social benefits. The Onondaga Creek watershed encompasses five towns, the City of Syracuse and the Onondaga Nation (see Figure 1.3); each entity is responsible for affecting its own land use and enforcing/encouraging environmental protection. The governmental entities have varied approaches towards managing the sub-watershed within their jurisdiction; some municipal plans reference importance of the Creek, others do not. A coordinated planning effort will lead to identification of common goals amongst diverse interests, and outline a process towards achieving those goals in revitalizing Onondaga Creek. A clear need exists in the Onondaga Creek watershed for integrated planning to attain and sustain economic, aesthetic, recreational, ecological, and regulatory goals and for coordinated efforts for targeted study and restoration of various aspects of the system.

Usual symptoms of unmanaged watersheds include unchecked suburban sprawl, scarred landscapes, aesthetically unpleasing vistas, traffic congestion, and loss of greenspace, in particular, *wetlands* and *riparian* habitat, exacerbated flooding, and poor air and water quality. Watershed management is a complex process that requires knowledge of point source and *nonpoint source pollution*; the interconnection between land use decisions and water quality; and their resultant effects on the health of aquatic *ecosystems*. While the combined sewerage system and aging *infrastructure* of the central city are significant challenges (point source), so too is the management of *runoff* from farmland, lawns, roads, parking lots, and roofs (nonpoint source). Nonpoint source pollution is the leading cause of water pollution in the United States today (Coyle 2005).

The City of Syracuse and Onondaga County have proposed a creek walk through the city that would connect with the Onondaga County Parks and Recreation Department's planned Loop the Lake trail system, and potentially be a key segment of the New York State vision of a continuous Erie Canal trail extending from Albany to Buffalo. In the City of Syracuse, the creek is currently largely *channelized*, providing very little wetland and *floodplain* habitat. Significantly improved water quality in the waterway would enhance aesthetic and recreational enjoyment of the proposed creek walk. Several recent studies completed for the City of Syracuse have referenced the importance of restoring the creek as a primary component for the revitalization of the city. The Syracuse Sustainable Design Assessment Team (SDAT) report states, "More than any other major civic project, this project has the potential to create a new civic identity and amenity that could possibly reverse the severe disinvestment in this part of the city, create new cultural linkages, and entice new development into the city.... Great new parks and public amenities could be constructed along this waterway. It can,

in effect, become the city's new cultural heritage corridor" (Giattina et al. 2006).

Revitalization within the Onondaga Lake watershed is a priority of the Onondaga Lake Partnership (OLP). The OLP is sponsoring several on-going pollution mitigation projects concerning the Tully mudboils and nonpoint source pollution control in the Onondaga Creek watershed. The impetus for these projects was to reduce pollutant loads to Onondaga Lake, but they also serve to improve water quality in the creek. Integration of projects within the Onondaga Creek watershed that have been conceived or designed for *restoration* purposes would provide added cultural and environmental benefits. Environmental enhancement of the Onondaga Lake watershed is also a concern of the Onondaga Nation and the Haudenosaunee people, as their cultural heritage is intrinsically linked to the ecological integrity of the watershed. The Onondaga Nation considers restoration of the Onondaga Creek watershed a priority.

What is a Conceptual Plan?

The OCRP is intended to reflect the collective hopes and dreams of the citizens of Central New York in relation to the creek corridor. The plan is *conceptual* in that its recommendations were born from community input and have not been subjected to rigorous professional and technical analysis; this will need to happen as the plan moves toward implementation. Revitalization implies that this and future efforts are not limited to the creek itself; nor to the stream banks, but rather how proper planning can serve as a catalyst for comprehensive neighborhood and land use changes.

The Role of Public Participation

Public participation is a fundamental element of the OCRP project. The Onondaga Creek Working Group is a citizen-based, volunteer watershed group convened to develop the OCRP. The OCRP Project Team, aided by advice from the Working Group, conducted public participation meetings and events through the first half of the OCRP process, using a variety of methods. Methodology is summarized in Chapter 4. This plan will also undergo a period of intense public scrutiny upon its release for public review and comment.

Public participation is a direct method through which citizens exercise their power to act (Briand 2007). The USEPA (USEPA 2005a) defines public participation as a two-way process of outreach and involvement; stakeholders receive information, and participate in programs and decision-making processes.

Plans based on collaborative participation have demonstrated greater long-term successes. The goal in the OCRP process was to capitalize on the beneficial impacts of public participation in order to empower citizens to create a successful, well-supported revitalization plan for Onondaga Creek.

Understanding the system

As part of the OCRP planning process, the Onondaga Creek system was characterized; chapters 2 and 3 summarize data-gathering efforts for both the history and current state of the creek. Watershed characterization is a technical term for the task of understanding current conditions. USEPA (2005b) promotes characterization to identify and understand possible causes of impacts seen in the watershed. Characterizing the watershed allows for the development of effective management strategies to meet goals for revitalization (USEPA 2005b).

A keen understanding of historical and current conditions is critical to creating a plan for the future of a waterway (USEPA 2005b, Smardon et al. 1996). Studying historical information helps to establish prior conditions of a river and its watershed, such as changes in the channel and *biota*, including conditions that have been lost, or are even irreversible. Consequently, research findings help to define options for restoration (Palmer et al. 2005, Wohl et al. 2005).

Conclusion

Onondaga Creek flows through disparate economic, social, and environmental contexts on its way from the Tully Valley to Onondaga Lake. The OCRP project was conceived under the premise that sound technical understanding of the watershed combined with open public participation can lead to effective strategies that achieve the community's vision and enhance the ecological integrity of the system. Over the past thirty months, input was collected from the public and various stakeholders; baseline information[4] about the corridor was compiled and assessed; goals and recommendations from the Working Group were formulated into plan components. The resulting plan provides a unified and comprehensive[5] dialogue for the ongoing restoration of one of Central New York's most important assets. This plan is a vital first step towards the revitalization of the Onondaga Creek corridor.

The act of giving new life or vigor to something is known as revitalization.

[4] This data included both natural and cultural history – from pre-European to post-European. See Chapters 2 and 3.

[5] **Comprehensive refers to the following aspects:** **1.** geographically north to south, **2.** general public stakeholders, any interested parties, **3.** characterization and assessment of multiple parameters, **4.** governmental/ jurisdictional involvement (village, town, city, county, and the Onondaga Nation).

Watershed Planning: a new approach

"(T)he new watershed approach is inherently civic...(T)he idea that long-term protection and restoration of such complex ecosystems [watersheds], …requires citizens to develop a sense of genuine ownership and a protective civic ethic. Local knowledge, relationships, and initiative are essential to develop effective strategies for reducing nonpoint sources of pollution, as well as to generate the political will to assume the costs of upgrading sewage treatment or altering sensitive land-use policies. Diverse stakeholders must develop a shared vision and find ways to collaborate: farmers upstream with boaters and … environmentalists with developers, scientists and regulators with lay citizens and students. Peer education is also critical… Since the health of watersheds depends on the everyday choices of citizens (lawn care, trash disposal, household chemical use), public education plays a central role in the watershed approach. Because watershed boundaries do not dovetail neatly with local political jurisdictions and watershed problems do not conform to segmented agency authority, a civic network strategy, combined with interagency collaboration, is essential ."

- Sirianni 2006, p19-20

Environmental law, especially when dealing with water quality considerations, has undergone continuous evolution since the federal government became involved at the end of the nineteenth century. Initial concerns were principally related to navigation as waterways were the most important means of transportation and anything that interfered with this function also impaired economic activity. Beginning at roughly the same time, knowledge of disease transmission improved and so public health considerations came to the fore. For example, Onondaga Creek was first channelized, not for flood protection, but to create a swiftly running creek that could carry human and animal waste away from the population and to Onondaga Lake. Eventually, other uses and concerns were recognized for our waters and we created a legal system that allowed for pollution unless you could prove that a specific usage was causing a specific degradation. Thus it was necessary to prove that an action caused impairment.

By 1972 our waterways were in dismal condition and existing law was not allowing for clean-up. At that point Congress, over the veto of President Nixon, passed new and radically different legislation. The Federal Water Pollution Act Amendments of 1972, public law 92-500, changed the basis for action by going to purely technological standards that must be met by dischargers – municipal and industrial alike. During subsequent amendments to the law in 1977, the name of the law was changed to the Clean Water Act (CWA). After several decades and many billions of public and uncounted private dollars spent on water pollution control, our waterways are much cleaner, fish have returned to rivers and streams, and gross pollution has been eliminated. However, these so-called "command and control" regulatory approaches had their limitations and for the last decade other approaches have been tried; some based on incentives rather than punitive measures.

Preventive Strategies

One approach involved using preventative strategies; which are predicated on the idea that by changing industrial processes one can eliminate or reduce discharge before it is released into the water. This approach has been successful. Another emergent issue is how to mitigate diffuse or nonpoint sources (NPS) of pollution. By and large NPS pollution is carried by runoff from the land. It is much more difficult to control than point-source pollution, because land use decisions are usually controlled by each individual property owner. An amendment to the CWA tried to address the impacts of NPS pollution by calling on the states and USEPA to designate impaired waters for which additional study and analysis needed to be performed.[7]

Restoring Biological Integrity

By using a combination of "carrots and sticks" and different kinds of technology, great progress has been made in cleaning up the nation's

waters. However, this regulatory approach is concerned with the chemical and to a lesser extent the physical integrity of the water and not its biological integrity. Mending and restoring aquatic ecosystems requires a more holistic approach. In many ways, Congress had enacted a comprehensive regulatory strategy as the 1972 law included ambitious goals that called for restoring the biological integrity of our waters and wetlands. The original law contains various provisions that called for basin-wide approaches for dealing with waterways.[8] Since 1972, different federal administrations have stressed various parts of the CWA, and enforcement activities have intensified and relaxed. Funding priorities have further limited some of the more holistic ecosystem-wide approaches as different interest groups have lobbied for provisions that protected their interests.

Watershed and Sub-Watershed Planning

Thinking has gradually evolved to where we now realize, the perhaps obvious idea, that procuring clean water is much more than an engineering exercise.[9] Two issues stand out. For one, a restored water body is more than clean water. It involves habitat for fish and other aquatic flora and fauna, it involves riparian vegetation, it involves human interactions, and it involves beauty. For another, arriving at an end point becomes an exercise in democracy: diverse stakeholders are the key to successful planning. This stems from the public's knowledge and aspirations, but also as the key motivators to the political system.

Before looking at examples of how this watershed approach has been and can be used, we should also mention other programs and priorities that were long ignored in considering our waterways and are now being integrated into planning efforts. Two items in particular come to mind and serve as part of the impetus for revitalizing the Onondaga Creek corridor. These two approaches are largely independent of each other, but clearly require similar thinking. First is the interest by many stakeholders in restoration of fishery resources either for recreational or cultural reasons.[10] Oftentimes, certain fish species can serve as "sentinel" or "indicator" organisms whose survival indicates that all water quality and habitat conditions are suitable, thereby, signaling the system is functioning properly. The second is what has been a grassroots effort in the United States and increasingly around the world to look at waterway restoration.[11] Many communities, for many different reasons, have come together and begun to look at their rivers and lakes and understand how they can be an enhanced resource for their community.[12]

Perhaps the best known and grandest attempt at watershed-wide management is the long term program to restore the Chesapeake Bay through the government sponsored Chesapeake Bay Program of USEPA[13] and from a civic perspective through the Alliance for the Chesapeake Bay.[14] This model initiative has resulted in extensive collaborative efforts around the United States in such diverse areas as Puget Sound, Long Island Sound, and Onondaga Lake.[15]

Smaller watersheds are of perhaps more interesting for the purpose of the OCRP. Some of the exciting initiatives occurring across the United States can be located within annual reports of the USEPA Targeted Watersheds Grant Program.[16] These grants are awarded to citizen groups to assist in efforts to protect and restore watersheds. Example locations with similarities to Onondaga Creek include:

Charles River (Massachusetts)
Ipswich River (Massachusetts)
Kalamazoo River (Michigan)
Long Island Sound
(Connecticut and New York)
Passaic River (New Jersey and New York)
Raritan River (New Jersey)

In New York, perhaps the most successful effort has been in the Bronx River Watershed, although the efforts within New York City and those of Westchester County are still not totally integrated. This effort has been included as one of the case studies summarized in Appendix C. Another reference is the chapter in **Groundswell** published as a collection of civic actions to save places around the United States that was compiled by Alix Hopkins for the Trust for Public Land.[17]

[7] This analysis requires the preparation of so-called *TMDLs*, total maximum daily loads.

[8] See especially sections 208 and 305(b). Provisions dealing with geographically specific areas such as the Great Lakes are also considered.

[9] A provocative article that framed some of the ideas in this chapter is by Carmen Sirianni, *Can a Federal Regulator Become a Civic Enabler? Watersheds at the U. S. Environmental Protection Agency*, National Civic Review, Fall 2006, pages 17-34.

[10] The definition of restoration/enhancement of fisheries resources is controversial and is further described within the OCRP.

[11] Chapter 1 and 8 discuss both revitalization and restoration.

[12] See the appendix showing various case studies. More of these can be found on the OCRP website.

[13] Created by citizen pressure that lead to action by Congress and was not an initiative of EPA.

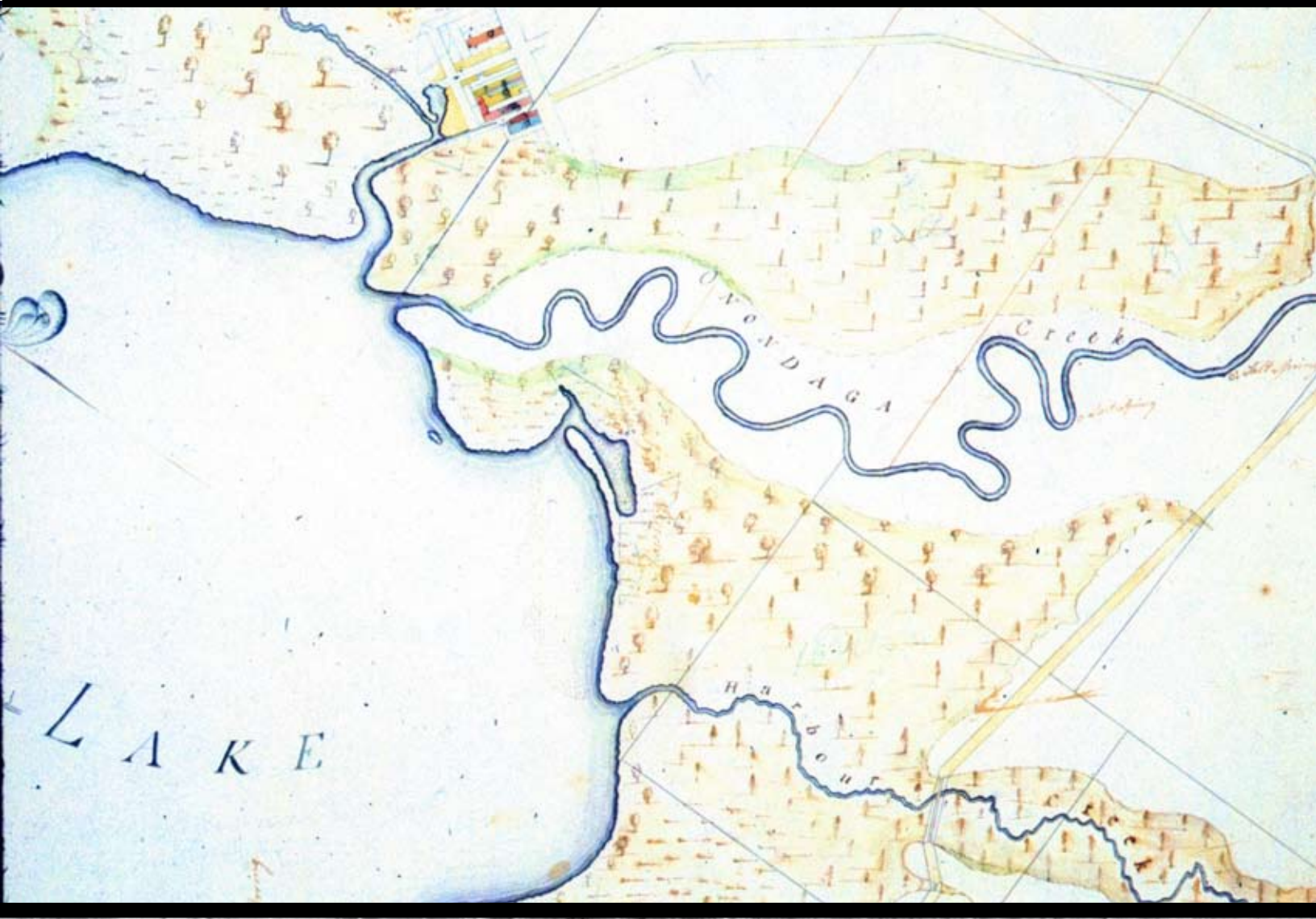
[14] For more on these two programs see the websites of these two agencies.

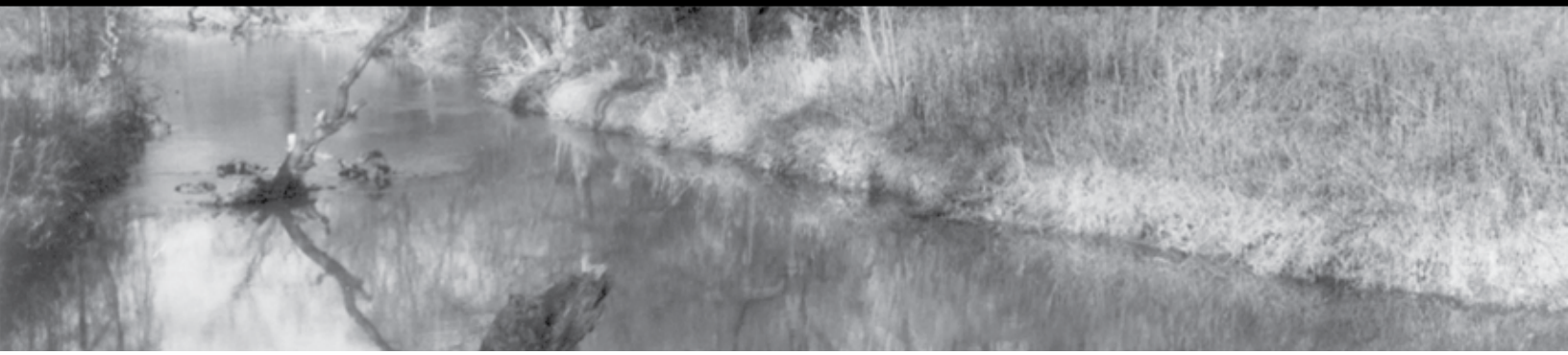
[15] In fact, the OCRP was funded by and may become part of the overall efforts of the Onondaga Lake Partnership.

[16] Information on this and other USEPA programs can be found on the USEPA website. The most useful publication is EPA 840-R-06-001 which is the *Targeted Watersheds Grant 2005 Annual Report.*

[17] Alix W. Hopkins, *Groundswell: Stories of Saving Places, Finding Community*, published by the Trust for Public Lands, 2005. Chapter 6 relates to the Bronx River Project. This book is available at Onondaga County Public Library.


DERRICK & WELL, TULLY FARMS, N.Y.


ONONDAGA
Creek
LAKE



CHAPTER 2:
Onondaga Creek
Geography and Historical Context

First Nation

The Onondaga Creek Watershed has been part of the Onondaga Nation since time immemorial. The Onondaga Nation's relationship to this region is explained in the opening statement of their Land Rights Action (2005), quoted below. Historical and cultural information about the Onondaga Nation can be found at their website: http://www.onondaganation.org/.

"The Onondaga People wish to bring about a healing between themselves and all others who live in this region that has been the homeland of the Onondaga Nation since the dawn of time. The Nation and its people have a unique spiritual, cultural, and historic relationship with the land, which is embodied in Gayanashagowa, the Great Law of Peace.This relationship goes far beyond federal and state legal concepts of ownership, possession or legal rights. The people are one with the land, and consider themselves stewards of it. It is the duty of the Nation's leaders to work for a healing of this land, to protect it, and to pass it on to future generations."

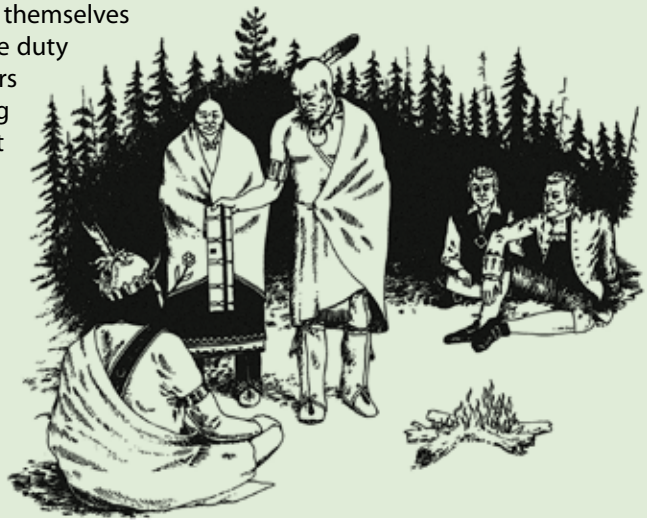


image: John Kahionhes Fadden, Clear Light Publishers, 1986

11,000 Years Ago

pre-european settlement

Creek cuts side tributaries; main bed forms among the glacial debris. Forest development in the watershed. Haudenosaunee practiced hunting, fishing and forest management.

The following section was excerpted from the Onondaga Creek Fact Sheet: Geography Onondaga Environmental Institute, January, 2007. (The complete fact sheet is in Appendix B)

Physical Setting

The Onondaga Creek valley was formed by glaciers that created a *terminal moraine* at its headwaters in Tully. Currently, the maximum creek length is estimated in a range of 27.1 to 27.4 miles (Coon 2005) to 33.04 miles (USGS and USEPA 2004). Historically the creek was more sinuous and much longer. In 1927, the section upstream (south) of Seneca Road (Turnpike) was reported to have a "tortuous channel [of] about 28 miles (Holmes 1927)." The companion section from Seneca Turnpike downstream (north) to the outlet is currently (in 2006) around six miles. Due to dynamic changes in meanders through relatively flat land, channel shape and length can change quickly in the non-engineered sections of the creek, so lengths should be viewed as approximate. The combined length of at least 34 miles around 1927 is significantly longer than the current approximation of 27.2 miles. This demonstrates that projects that increased the creek depth and channeled its banks also shortened its overall length.

In southern Onondaga County, steeply-sloped tributaries with waterfalls, rapid flow, and stream bank erosion feed the upland headwaters of Onondaga Creek, all characteristics of the hanging valleys of the Appalachian Plateau. The tributaries receive water from forested and agricultural uplands and drop steeply, with periodic waterfalls, to the two main branches in the valley bottoms that join to form the creek's main channel (see figure 2.1).

The two branch valley bottoms and the main channel are on an ancient lakebed, (Kappel and Miller 2005) surfaced with silt loams and wetland soils (Hutton 1977). On that relatively flat surface, the two creek branches join near the southwest border of the Onondaga Nation, through which the main branch meanders northward, passing through a flood control dam about 518 meters (1,699 feet) downstream of the junction between the two branches (Higgins 2005).

Downstream of the Onondaga Nation, an engineered, incised channel controls creek flow through urban areas in the Town of Onondaga and the City of Syracuse. The artificially deep and sloped channel was built to make the water run faster, as well as deeper, in order to flush sewer wastes from the system and to reduce or eliminate floods in populated areas. The creek outlet is part of the Inner Harbor on Onondaga Lake, and located on the lake shoreline between the Metropolitan Syracuse Wastewater Treatment Plant (Metro) to its west and Carousel Mall to its east. Onondaga Creek contributes nearly forty percent of the water flowing into Onondaga Lake (EcoLogic LLC 2003). From Onondaga Lake the waters join with the Seneca-Oneida-Oswego River basin. Onondaga Lake drains to the Seneca River, which joins the Oneida River at the Three Rivers junction at Phoenix, New York, to form the Oswego River, a major tributary of Lake Ontario.

1780

Commercial salt extraction began. Settlers practiced deforestation: fuel for salt industry, timber for construction, ash for potash production.

1700

1695

early settlement

Salmon and eels documented in Onondaga Lake by Jesuit Missionaries.

Timeline not to scale

1,000 Years Ago

pre-european settlement

Pine, fir, hemlock, elm, birch, hickory trees leave pollen in creek outflow to Onondaga Lake. Low-impact agriculture produced corn, beans, and squash.

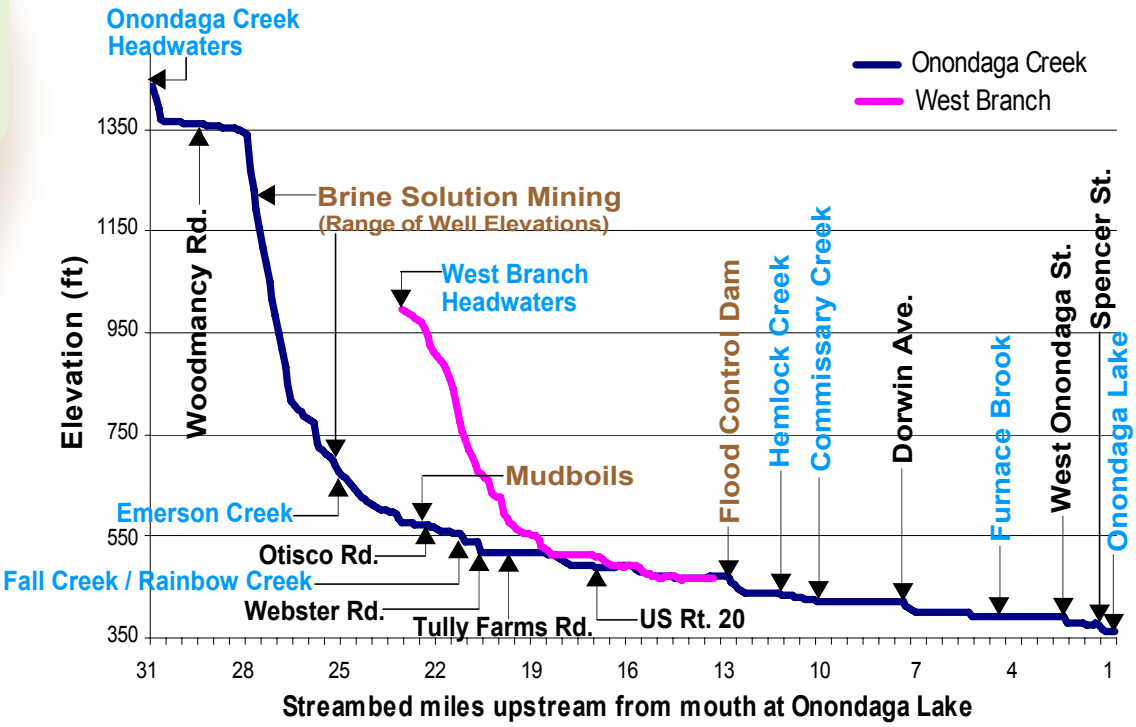
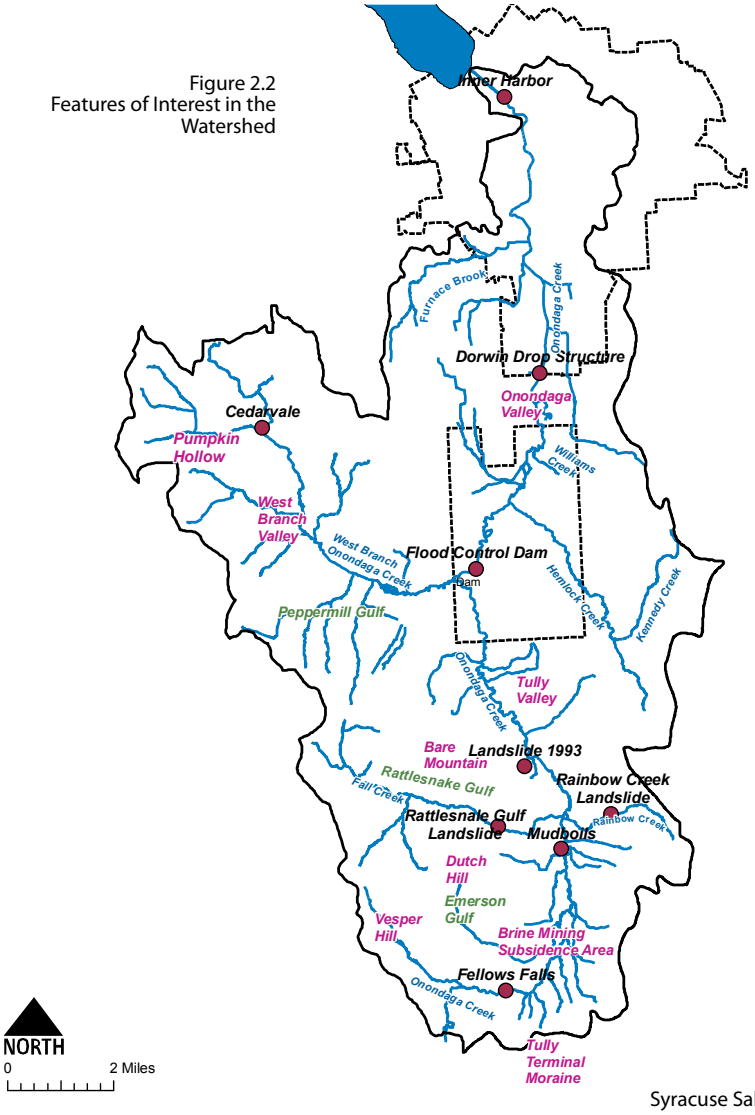


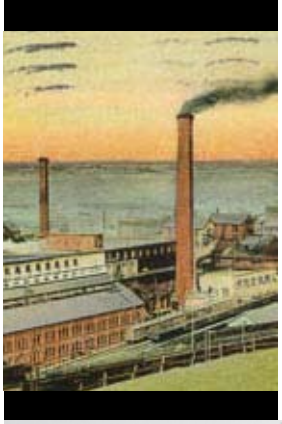
Figure 2.1 Vertical Profile of Onondaga Creek including West Branch

Early Development And Industry

Starting in the late 1700s and throughout the 1800s, European settlers came to the area in great numbers, facilitated by development of the Erie Canal, and drawn by the salt industry and agriculture. The Onondaga Valley was heavily utilized for grain production, orchards and later, dairy farming. The forests of the valley bottom and side slopes were cleared for agriculture (Nyland et al. 1986). By the mid-1800s, a salt industry developed in Syracuse; first for a multitude of uses, then primarily for soda ash production (Kappel 2000). Over-exploitation of *brine aquifers* in Syracuse spurred the late 1880s discovery of halite (rock salt) 1100-1400 feet below the surface at the southern end of the Tully Valley. From 1889 to 1986, the Solvay Process Company, becoming Allied Signal and now Honeywell International, mined approximately 200 million tons of salt, removing 150 feet of salt deposits (marked as Brine Solution Mining on Figure 2.1 and Brine Mining Subsidence Area on Figure 2.2). Removal of the deposits caused the land surface to collapse as early as 1920. These and larger collapses in the 1940s resulted in land subsidence visible in the Tully Valley today (Yanosky and Kappel 1997). Additionally, phenomena known as mudboils continually discharge sediment into Onondaga Creek in the Tully Valley. The mudboils were first observed in the 1890s and later caused water quality problems downstream for Onondaga Creek (See Chapter 3).

Figure 2.2
Features of Interest in the Watershed





Photos:
Syracuse Salt Industry

1896
Deforestation in the southern part of county leading to flood.

1894
Increased water flowing through the sewer system to creek.

1868
First sewage commission created.

1867
Onondaga Creek commission created. Goal: straighten creek from State pump house to the Lake.

1865
'Great freshet' flood in creek.

1822-23
Erie Canal constructed across creek, Onondaga Lake level lowered.

early development & industry

1800

Flooding And Waste Treatment *(Figure 2.3)*

Photo:
Flooding in Nedro circa 1950

Nine miles of the creek are within the City of Syracuse. In the early 1800s, mills were built along the water within the city, especially along the Seneca Turnpike, for processing grain raised in the Onondaga Valley (Munson 1969). City leaders were concerned with flooding and human waste in Onondaga Creek in the 1860s. The first sewage commission was created in 1868 and the right to use the creek for sewage disposal was established in 1872. Beginning as early as 1854, the process of straightening sections of Onondaga Creek commenced to speed the removal of sewage. In 1901-1902 flooding caused much property damage, followed by a 1915 flood with 50% more damage. This in turn led to more channel straightening and deepening. A major flood in 1920 led to the City of Syracuse's 1927 report on flood-control. The report was used throughout the 20th century by the City of Syracuse, the State of New York and the Army Corps of Engineers to guide policy and construction (Holmes 1927). Flooding has occurred, though more rarely, since the 1927 designs were implemented with the construction of a dam in 1949 up until the last *channelization* in 1963 (see Figure 2.3).

Water quality and waste treatment are recurring themes in the City's relationship to Onondaga Creek. The first Syracuse waste treatment facility was built in 1924 with two trunklines paralleling Onondaga Creek. The trunklines carried sewage and stormwater to the treatment facility. These pipes were equipped with *combined sewer overflow* (CSO) points that released into Onondaga Creek when the pipes reached capacity. The waste treatment facility was quickly outgrown. Debate continued until 1954 about appropriate technology and location for a new sewage treatment plant. The current treatment plant, called Metro, is located on the southeast shore of Onondaga Lake. Construction and upgrades have occurred in a series of stages from 1956 to the present. Onondaga County acquired treatment responsibilities from the City of Syracuse in 1954 and maintenance responsibility for the main interceptor sewer in 1971. Atlantic States Legal Foundation (ASLF) initiated a citizens' lawsuit against Onondaga County in 1986 over Clean Water Act violations in Onondaga Lake. In 1998, ASLF, New York State and Onondaga County settled litigation with an *amended consent judgment* (ACJ) to implement a schedule for sewage treatment plant improvements at Metro plus a commitment to address bacteria problems caused by CSOs along several tributaries. This work is proceeding and there have been significant improvements in lake water quality due to the improvements.

The Onondaga Creek watershed changed through a rich cultural past. Complex hydrological and water quality changes have resulted in a need for a multi-faceted approach to creek and watershed management.

flooding and waste treatment

1900

1920 City had flood of highest recorded velocity.

1922 Sewage diverted away from Inner Harbor.

1924-25 Sewage disposal plant built.

1948 Over 80 Allied brine pipeline breaks into creek over next 37 years.

1949 Onondaga flood control dam built on Onondaga Nation.

1950 Mudboils documented as active in Tully Valley.

1963-69 Fencing installed in city of Syracuse along the creek.

1974 Onondaga creek floods; banks overflowed in Syracuse. 1000 people evacuated.

1979 Alled brine linebreak at north end of Onondaga Nation causes fish kill.

Documentation of water quality violation in creek due to coliform bacteria.

1986 Allied brine mining is discontinued in Tully Valley. 200 million tons of salt have been removed.

1987 Continuous mudboil activity documented.

1991 Fish kill documented; caused by either CSO overflow or toxic waste dumping.

1991-94 Mudboils add tons of sediment to creek and Lake. OLMC mudboil remediation projects begin.

1998 Federal judge signs Amended Concent Judgement (ACJ) ordering Onondaga County wastewater treatment improvements.

2000

present

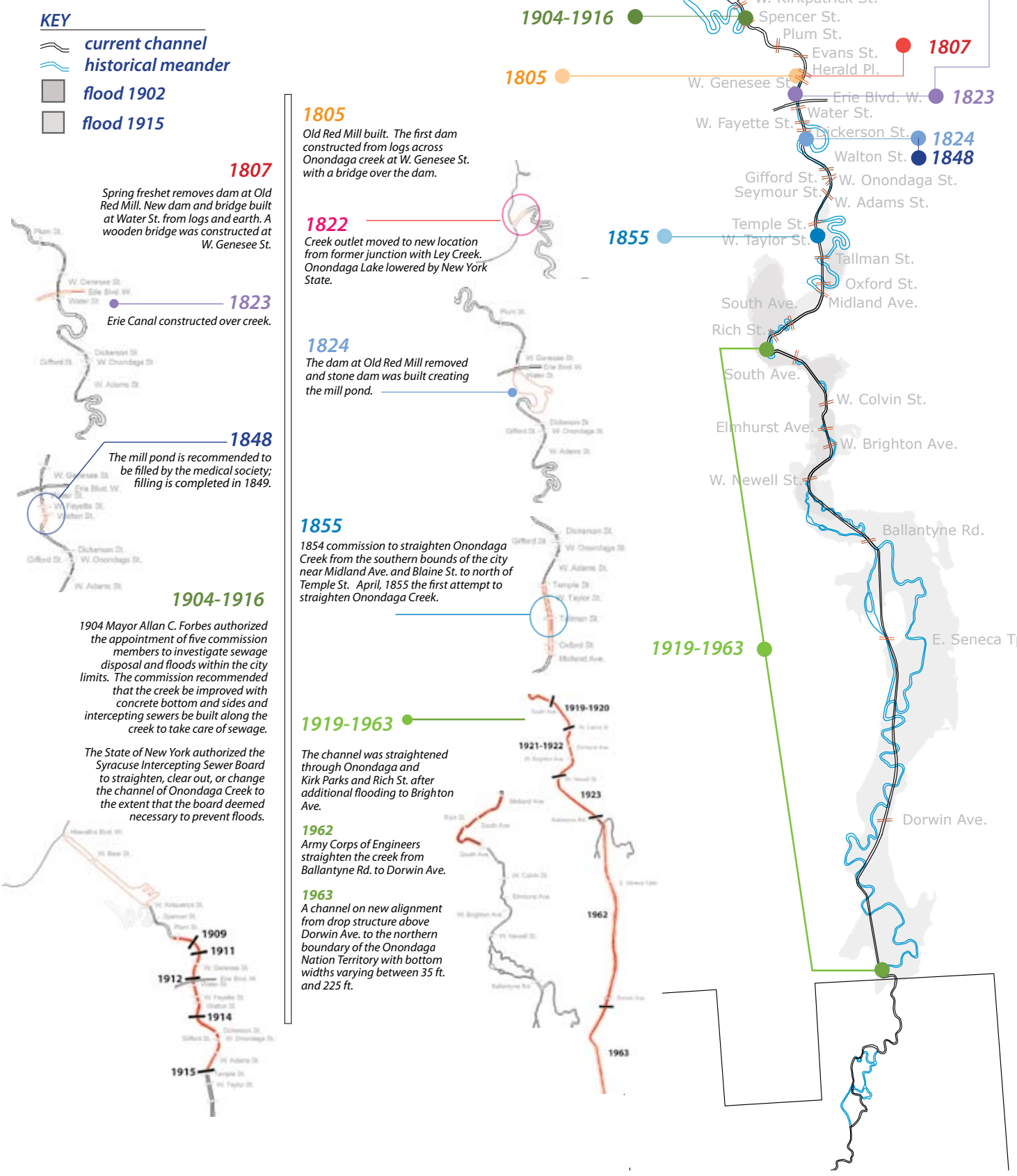
2004 ACJ projects implemented: Construction and installation of Metro plant upgrades. Midland RTF construction begins.

2005 Onondaga Creek Working Group convenes.

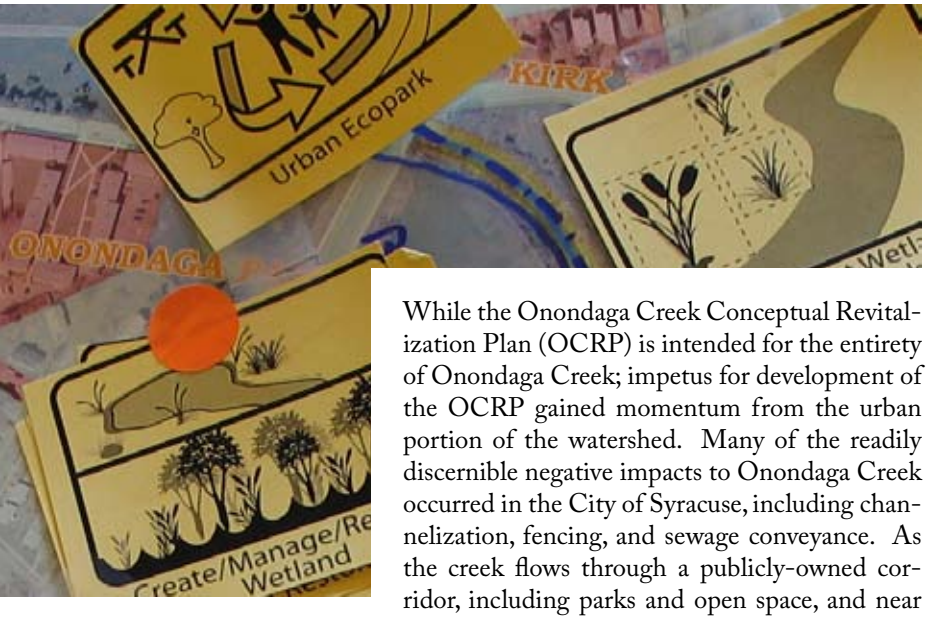
The timeline was created by Tanushree Chowdhury, SUNY ESF Environmental Studies, based on data gathered and compiled by Joan Cope Savage and Dylan Smith, Onondaga Environmental Institute

Figure 2.3

Onondaga Creek Channelization



Onondaga Creek in the City of Syracuse: Growing awareness of a natural urban asset.



"The creek has always been treated as an obstacle - built over, covered, neglected, dumped in!

Moving from that to a wide swath of publicly owned space will take a very long time - 100 years perhaps but it will be worth it"

MOST Stakeholder Meeting, March 2007

While the Onondaga Creek Conceptual Revitalization Plan (OCRP) is intended for the entirety of Onondaga Creek; impetus for development of the OCRP gained momentum from the urban portion of the watershed. Many of the readily discernible negative impacts to Onondaga Creek occurred in the City of Syracuse, including channelization, fencing, and sewage conveyance. As the creek flows through a publicly-owned corridor, including parks and open space, and near homes and businesses, many urban residents had opportunities to reconsider the city's relationship to Onondaga Creek. This narrative describes the growing awareness of Onondaga Creek as an urban asset.

Onondaga Creek is viewed in Syracuse as a neglected and polluted waterway, yet a strong urban community voice has advocated for its potential as a natural resource over the last decade. The Syracuse Post-Standard newspaper is a good barometer of commonly held ideas about Onondaga Creek. Headlines for Onondaga Creek news articles demonstrate the view of neglect: "Long history of ignoring creek hides city bridges", "Young find themselves by aiding 'lost cause'", and "Untapped potential: unsightly creek yields large array of trout" (Kelly 2004, Kirst 2005, 2006). The fact that news headlines were generated in the local paper, however, means community groups and organizations have advocated for the creek.

After 150 years of alteration for sewage conveyance and flood control, the year 2000 may be considered the turning point for seeing Onondaga Creek as an untapped urban asset. That year the Partnership for Onondaga Creek formed and Michael Houck, a nationally known urban greenspace expert, toured Onondaga Creek on a visit to Syracuse. He noted Onondaga Creek's great potential and pointed out that other cities have successfully reclaimed urban waterways. Houck's visit inspired greenspace advocates to organize an urban canoe trip in 2001, inviting school children and Syracuse elected officials. Cornell Cooperative Extension of Onondaga County organized the city's first creek cleanup of litter and debris in 2002, now an annual event. (Canopy and Smardon 2003)

Two community groups in particular worked to raise local awareness regarding Onondaga Creek, the Partnership for Onondaga Creek and Canopy. The struggle to reconcile municipal sewage treatment practices with the requirements of the federal Clean Water Act drew attention to Onondaga Creek's poor water quality. In 1998, an amended consent judgment settled locally initiated litigation over water quality violations in Onondaga Lake. The amended consent judgment, among other mandates, required Onondaga County to address bacteria problems in Onondaga Lake tributaries, including Onondaga Creek. Subsequently, the Partnership for Onondaga Creek formed in 2000 in opposition to a county proposed regional treatment (combined sewer overflow disinfection) facility (RTF) on Syracuse's south side, in a neighborhood of more than 70% African-American residents. The Onondaga Nation, Atlantic States Legal Foundation and the local chapter of the Sierra Club joined the Partnership to oppose the sewage treatment facility (Onondaga Nation 2007). The Partnership viewed the facility as unjust, but their mission statement also stressed their willingness to work to protect all waters within the Onondaga Creek watershed from further degradation. The Partnership has presented itself in the role of protector of Onondaga Creek and the community (Adams 2003). The Partnership still fills that role in the present, working on behalf of the neighborhood and the creek.

Some members of the Partnership for Onondaga Creek also belonged to Canopy, an umbrella organization for parks and greenspace advocates throughout the city. During 2003, Canopy took an especially active role in raising awareness about Onondaga Creek's potential for renewal, organizing an educational forum and canoe trips. The canoe trips generated media articles in which residents and visitors alike noted that Onondaga Creek appears neglected.

Syracuse Common Council President Bea Gonzalez wrote an editorial comment for the Post-Standard about her canoe experience, where she

characterized the creek as a "lost treasure" that is "a resource well worth restoring" (Gonzalez, 2003). Piotr Parasiewicz, a Cornell professor who specializes in urban stream restoration, participated in a Canopy-organized canoe trip. Dr. Parasiewicz also saw potential, and expressed his dismay at a school building that had turned its back on the creek, stating "This is the saddest picture I have ever seen…Kids should be playing near the water. They should see the resource in front of their door." He recommended starting with the "first building blocks of the ecosystem" by allowing natural flora and fauna to return to the creek, along with its natural flow (Weiner, 2003).

Viewing the creek as a natural resource gained public momentum every year since 2000. The dialogue expanded from events and popular press to reports generated by local organizations and academia. In 2004, Forging Our Community's United Strength Greater Syracuse (FOCUS), a local nonprofit organization, produced a report of recommendations from a series of meetings on water and waterways. Onondaga Creek was specifically considered in the report, along with Onondaga Lake and the Erie Canal. In 2006, the City of Syracuse with several partners applied for and received a visit from a Sustainable Design Assessment Team (SDAT), volunteer design experts sponsored by the American Institute of Architects. Onondaga Creek figured in two of the three main recommendations in the SDAT report, notably to "develop an environmental corridor along Onondaga Creek that supports neighborhoods, the city, and the land" (Giattina et al. 2006, p 50).

The City of Syracuse responded to the public's changing view of the creek. City of Syracuse Mayor Matthew Driscoll created an Office of Creek Development in March 2005. The Mayor's initiative was designed to bring together stakeholders to achieve community consensus on creek restoration and development (Driscoll 2005). The city has moved forward on the Onondaga Creek Walk, a pedestrian/multiuse path that follows the creek corridor. A small segment of creek walk has been constructed in Franklin Square. Two new phases of the creek walk have been planned to extend the existing creek walk from the Inner Harbor southward through the city.

The Onondaga Nation is located in the Onondaga Creek watershed; the creek is a tributary of Onondaga Lake. The ecological integrity of the Onondaga Lake watershed is of profound importance to the cultural identity of the Onondaga people, as well as the League of the Haudenosaunee. In March 2005, the Onondaga Nation sued the state of New York and other parties in a land rights action for illegal land takings and damage inflicted on Central New York's environment. The Nation's leaders state it is their duty to work for healing and protection of this land, so as to pass it on to future generations (Onondaga Nation 2007). A series of educational meetings in Syracuse, coordinated by the Neighbors of Onondaga Nation in 2006, informed the public of the significance of the land rights action and heightened awareness of local environmental conditions, including Onondaga Creek (NOON 2007).

In 2007, Onondaga Environmental Institute (OEI) conducted an analysis of Onondaga County's bacteria monitoring data for Onondaga Creek. Results showed that dry weather sewage releases were significant and RTFs would not remedy bacteria problems in the creek (OEI 2008). Shortly thereafter, the newly elected County Executive, Ms. Joanie Mahoney abandoned constructing the remaining RTFs in favor of alternative CSO control strategies including combinations of sewer separation, storage, pump and treat at METRO, and green infrastructure. The County Executive's bold redirection of local CSO control policy was well received by regulators, scientists, and activists alike, thereby instilling a sense of excitement towards the future amongst the community.

Concurrently, academics at the State University of New York College of Environmental Science and Forestry (SUNY ESF) added Onondaga Creek to their research agenda. Professor Emanuel Carter conducted landscape architecture design studios for the urban sections of Onondaga Creek in 2002 and 2004. A federal grant in 2002 initiated study of Onondaga Creek as part of an urban stream restoration study co-lead by Professors Theodore Endreny and Donald Leopold. Both initiatives have generated journal articles, theses, and designs that advance the concept of reclaiming the creek as a natural urban asset.

Professor Richard Smardon compiled results from the SUNY ESF workshop associated with Canopy's Visions of Onondaga Creek Forum in 2003. Several elements of OEI's Onondaga Creek Conceptual Revitalization Plan project (OCRP) were based on recommendations from the workshop. OEI conducted further public visioning forums and stakeholder organization meetings in 2006 and 2007; over 350 people attended the meetings. A meeting participant at the MOST Stakeholder Meeting in 2007 articulated the view of moving Onondaga Creek from neglected obstacle to civic resource:

> "The creek has always been treated as an obstacle-built over, covered, neglected, dumped in! Moving from that to a wide swath of publicly owned space will take a very long time-100 years perhaps but it will be worth it"

A comprehensive community vision for the future of Onondaga Creek is a key finding of the OCRP: participants desired recreation in a clean, natural waterway, including fishing opportunities from a healthy fishery (see Chapter 5).

In sum, while Onondaga Creek has been conceptualized as neglected and in distress, the collective community voice emphasized its potential for many years. The dialogue consistently emphasized protection from degradation, naturalization, and reclaiming the creek as a natural resource for Syracuse. The vision compiled for the OCRP confirmed the momentum towards considering Onondaga Creek as an urban asset worth restoring to a clean, more natural state for community enjoyment and benefit.


Mad River Canoe

CHAPTER 3:
The State of Onondaga Creek:
Findings

The overview of Onondaga Creek's history in Chapter 2 provides critical background for understanding the current state of Onondaga Creek. As the city grew in the creek's *floodplain*, modifications were made to its natural form for sewage disposal and flood prevention. Using the creek as a sewage conduit in the past left a legacy of persistent water quality problems today. Channelizing the creek in the city made flood prevention possible but profoundly impacted both the physical characteristics and *biota*. Fast flows in the creek channel caused drowning hazards and prompted restrictions to creek access in the second half of the twentieth century.

At the creek's headwaters near Tully, salt extraction for industrial uses may have exacerbated the Tully Valley mudboils, in addition to leaving parts of the valley prone to *subsidence*. In their most active period, the mudboils discharged tons of sediment daily into the creek. In addition to mudboils; landslides, streambank erosion, and *runoff* contribute large sediment loads to the creekbed. Sediment is resuspended during storm events and aggravates *turbid*, or muddy conditions in Onondaga Creek.

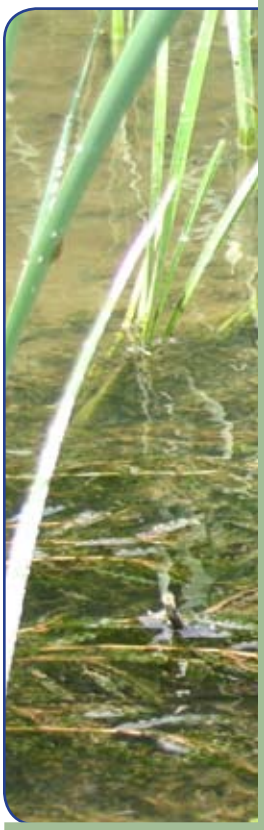
To revitalize Onondaga Creek, land use choices from the past will need to be addressed as challenges. *Nonpoint source pollution*, carried to Onondaga Creek and its *tributaries* via runoff over the land, degrades water quality. Polluted runoff reaches the creek quickly when creek-side vegetation is reduced or stripped away. In urban portions of the watershed, runoff pollution is magnified by *impervious cover*; roads, roofs, and other hard surfaces that speed stormwater to the creek. Flexible and innovative solutions will be needed to address these kinds of problems.

The following summary explains existing conditions of Onondaga Creek based on a literature review performed by the Onondaga Environmental Institute (OEI) in 2005 and 2006. From the literature review OEI staff assembled a series of fact sheets, which the Onondaga Creek Working Group reviewed in the autumn of 2006.[1] The Working Group used the fact sheets to aid plan development and suggested revisions. The revised versions of the fact sheets (also based on Onondaga Lake Partnership review) are contained in Appendix B; they provide a more thorough treatment of the state of Onondaga Creek than the following summary, and contain complete references. The headings of Chapter 3 correspond with the titles of the associated fact sheets. Readers interested in more detail are encouraged to read Appendix B.

[1] The Onondaga Creek Fact Sheets are located in Appendix B.

Water quality: *findings*

Water Quality: The biological, chemical, and physical conditions of a waterbody, often measured by its ability to support life.



- Since the late 1980's, numerous organizations have collected water quality data for a specific set of parameters, especially in the urban portion of Onondaga Creek. Onondaga County conducts extensive monitoring and in the last few years, has made water quality data available on their website (http://www.ongov.net/WEP/). Fewer water quality data are available for the upper sections of the watershed, with the least amount of data available for the West Branch. Project Watershed Central New York, sponsored by the local chapter of the Izaak Walton League and the State University of New York College of Environmental Science and Forestry, conducts similar water quality testing by working with school groups. The data are posted on the website: http://www.projectwatershed.org/
- The most common water quality parameters monitored in the creek are temperature, salinity, dissolved oxygen, turbidity, phosphorus, alkalinity, and bacterial indicators of pathogens (for example, fecal coliform bacteria).
- Monitoring data for metal and organic chemicals, like those found in pesticides are lacking. While mercury is one of the main pollutants in Onondaga Lake, Onondaga Creek's compliance with mercury standards is unknown. Information is scarce on toxic substances, such as *carcinogenic hydrocarbons* or *heavy metals* in the sediments that make up the channel of Onondaga Creek. No data are available for dissolved pharmaceuticals, caffeine, or chlorine by-products, which indicate sewer inputs to the system.
- Currently, pathogens impair water quality in Onondaga Creek. Pathogens are disease-causing microorganisms. Data analysis shows persistent *exceedances* of the New York State standard for fecal coliform, an indicator bacteria used to assess pathogen contamination from sewage discharge to the creek. Exceedances in the creek occur most regularly at Spencer and Kirkpatrick Street sampling sites, including during periods of dry weather. Exceedances occur on 75 percent of dry weather days, revealing that pathogen contamination, while certainly exacerbated by wet weather and combined sewer overflow (CSO) releases, may also be due to Syracuse's old, leaky sewer network. Some of the oldest sewer pipes are downtown, dating to the nineteenth century. These older pipes typically consist of red brick and clay tile which are fragile and easily crack, break, or are invaded by tree roots, and therefore, are likely to leak during dry weather conditions, and receive large volumes of water when the ground is saturated. Illegal sanitary sewer connections to storm pipes may also be a factor. The exact causes are unknown, although other cities have conducted dye studies and other tests to find contamination sources.
- The rural watershed has less data regarding bacterial indicators of pathogens. Storm event sampling by Onondaga County at Route 20 reveals high levels of fecal coliforms. Intense rainstorms result in greater concentrations of bacteria in the creek. The bacteria source, whether septic leakage or wild or domestic animal wastes, is unknown. Other areas, for example, in the Owasco Lake watershed, have conducted DNA testing to determine the source. Current conditions indicate contact recreation on Onondaga Creek may not be safe many days of the year, especially in lower, urban reaches.

Alkalinity is a measurement of ions that control the *pH* of water. From these measurements we can determine if the creek is acidic or alkaline. Onondaga Creek is dominated by carbonate-enriched glacial sediments, making the water somewhat alkaline. The creek has a stable pH, is not susceptible to acid rain, and remains mostly in an acceptable range for fish populations. On occasion the creek exceeds the New York State standard for pH. Hemlock Creek is a notable exception to this stability. Here the pH is variable and samplings below a landfill site show drops in pH towards acidity greater than those seen at other sampling sites. How this affects resident aquatic life is unknown.

Temperature in Onondaga Creek varies from freezing in the winter to the high 70s (degrees Fahrenheit) in the summer. Temperature is influenced by vegetation on the creek banks, where shading keeps water cool in the summer; the channel form; input from carbonate springs and tributaries; and domestic or industrial wastewater, including input from storm sewers. Highest temperatures in the summer are found at sampling sites with the least vegetative cover and a shallow, wide channel, the conditions found at Dorwin Avenue. Temperatures in the summer are often inhospitable to trout at Dorwin Avenue (summer temperatures equaled or exceeded 77°F in 1995, 1998, and 1999). Summer temperatures stay cool in upper parts of the watershed. At the Spencer and Kirkpatrick Street sampling sites just north of Franklin Square saline springs discharge groundwater to the creek having a cooling effect on warmer surface waters from the middle reaches.

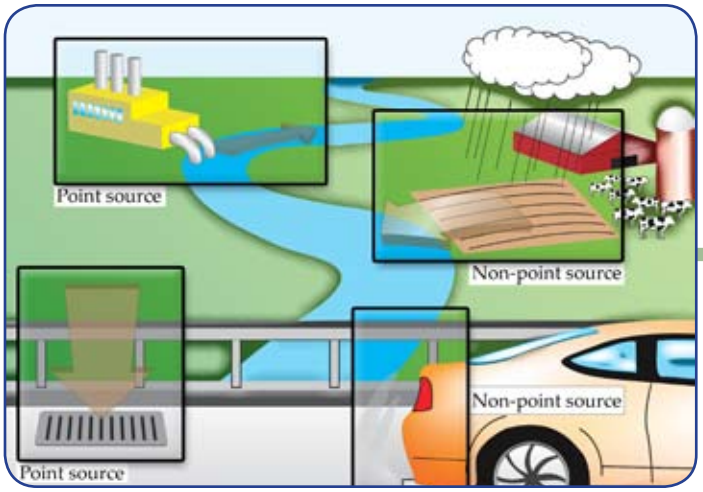


Figure 3.1 Potential sources of nonpoint and point source pollution.

Salinity levels are notably high in Onondaga Creek. Salinity is a measure of the concentration of salts in water. Common salt is comprised of sodium and chloride. Recent data from the Mohawk River provide a rough basis for comparison. Above the mudboils, sodium and chloride concentrations in Onondaga Creek are comparable to the Mohawk River (average sodium [13.2mg/L] and chloride [20.4mg/L] concentrations). As Onondaga Creek flows past the mudboils and the site of the 1993 Tully Valley landslide, sodium (175-340mg/L) and chloride (270-525mg/L) concentrations are considerably higher than levels in the Mohawk River. Salinity levels increase again between Spencer and Kirkpatrick Streets, due to a salt spring in the creek bed. Road salt contributes salt to the creek; however, compared to the groundwater inputs, street salt is not a major contributor. The impact of Onondaga Creek's salinity on aquatic life is unstudied.

Dissolved oxygen (DO) in the creek is critical to all aquatic life. Temperature and salinity influence DO; higher temperatures and salinity result in less DO in the water. New York State has DO standards for streams, depending on a stream's classification. The DO level in Onondaga Creek is generally healthy (7-15mg/L) throughout its length, supporting the needs of aquatic life. Historical data suggest the Inner Harbor may be one exception; waters near the bottom were below the minimum oxygen standard in the mid-1990s (more recent data are not available).

Phosphorus is another essential nutrient, especially for plants, that exists in natural waters in a variety of forms. High concentrations in water bodies can lead to *eutrophication*, which means excessive plant growth and algae blooms and the potential for widespread variation in oxygen levels[2]. Differing forms of phosphorus are released to Onondaga Creek in runoff, over land and through storm and combined sewers, either attached to sediment or as a constituent of fertilizers, detergents, and human and animal waste. It is another type of nonpoint source pollution. Phosphorus concentrations in Onondaga Creek appear to be high enough to cause excessive plant growth. Onondaga Creek is a major contributor of phosphorus to Onondaga Lake. The daily or yearly amount of phosphorus added to Onondaga Creek is referred to as loading. The phosphorus load is lower in Onondaga Creek tributaries than the main channel. In the main channel, the loading is higher downstream of the mudboils, higher still in the urban segments of the creek than rural. The exact sources of phosphorus loading in Onondaga Creek have not been identified.

Nitrogen is an essential nutrient for all forms of life. However, excess quantities can be detrimental to aquatic systems. Nitrogen enters waterways in several forms, via several pathways, in particular fertilizers (residential and agricultural) and animal wastes mixing with storm runoff. Human waste, from leaky sewer and septic systems and atmospheric deposition from fossil fuel combustion are additional sources. Nitrogen is one of the elements of concern when nonpoint source pollution impairs water quality (see Figure 3.1). High levels of organic nitrogen are found in Onondaga Creek during storm events, likely from the inputs listed above. Just as excessive amounts of certain forms of nitrogen can be toxic to humans (like ammonia or nitrate), fish are also affected. New York State has standards for ammonia, nitrite and nitrate in surface water. Onondaga Creek does not have noteworthy exceedances of the standards. However, occasionally ammonia reaches concentrations close to and nitrite exceeds the standards in the city. Very little data are available about nitrogen outside of the city, making it difficult to draw meaningful conclusions.

Turbidity measures particles, or sediment, in the water column. Water clarity is a persistent challenge in Onondaga Creek. Turbid water is unattractive, detrimental to aquatic life and interferes with recreation on or in the water. The mudboils and landslide erosion are the largest contributors to Onondaga Creek's turbidity in the upper part of the watershed. Urban inputs, from storm sewers and CSOs, contribute turbidity to Onondaga Creek. Sediment deposits remain in the lined creek channel from mudboils, landslides, bank erosion, and runoff inputs and are re-suspended during storm events. Resuspension muddies the creek waters and obscures the bottom from view.

[2] Diminished oxygen levels are due to excessive decay of *detritus*, dead or decaying organic matter.

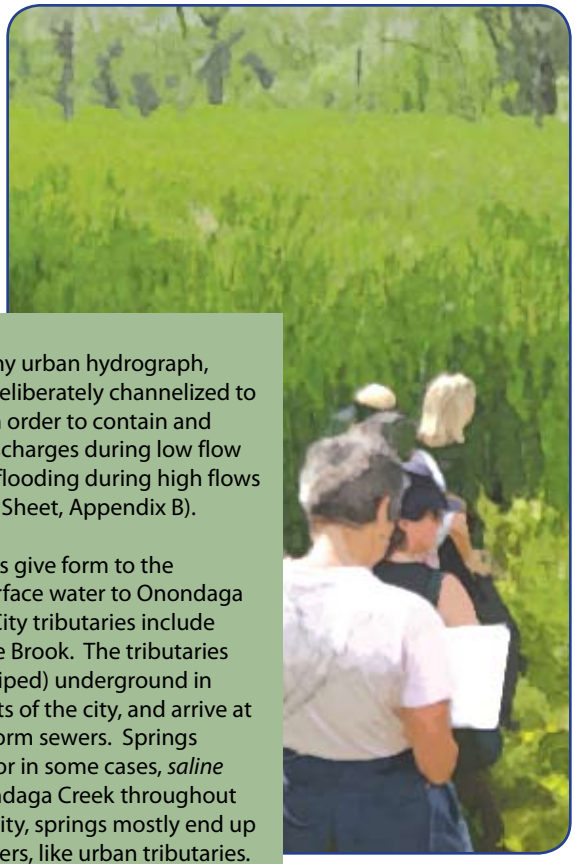
Fish and aquatic habitat: findings

aquatic habitat: environments characterized by the presence of standing or flowing water.

- An aquatic *ecosystem* is characterized by the interactions between plants, animals and their physical and chemical surroundings. Fish *communities* are usually determined by type of habitat and water quality conditions such as water temperature and oxygen levels. Fish communities are not static; and so can vary from place to place and change over time.
- *Habitat* and water quality make dramatic natural changes from the small, steep headwater tributaries to the mouth of Onondaga Creek. Human induced influences, noted under Hydrology, also impact the watershed. Both contribute to shifts in the fish communities and habitat conditions along the creek *gradient,* or slope.
- Scientists use several categories to group fish into communities or assemblages. A few types of assemblages are temperature preference, diet, or movement pattern. In the Onondaga Creek fact sheets, OEI uses temperature preference (cold, cool or warm water) to describe fish assemblages in Onondaga Creek.
- OEI reviewed data from 15 fish surveys conducted in the Onondaga Creek watershed between 1982 and 2005. Results are interpreted in a map of the watershed (see Fish Fact Sheet). Thirty-four fish species were identified, divided into fairly distinct cold and warm water fish assemblages. Survey results indicate a warm-water fish community exists in the city, downstream of Dorwin Avenue. These fish include bluegill, large mouth bass and other fish species that are also found in Onondaga Lake. A coldwater assemblage occurs south of Dorwin Avenue, upstream in rural sections of the watershed; coincident with those stream stretches that remain natural and have not been channelized. This assemblage includes brown trout (a non-native trout), sculpins, creek chub, dace and white sucker. Wild brook trout were found in appreciable numbers only in small, upper watershed tributaries, including Furnace Brook. The water can be too cold for brown trout in these tributaries. Competition in upper reaches of the creek's main stem between the two trout species favors brown trout. Both trout are stocked in Onondaga Creek for anglers; brown trout are stocked in greater numbers.
- There are a few barriers to fish movement in Onondaga Creek, particularly at Dorwin Avenue (the *drop structure*, see Flood Control). Modification or removal must take into consideration that fish communities will transform as warm and cool water species can spread upstream.
- Significant levels of mercury, *PCBs* and *DDT* were found in white perch, white sucker, and brown trout in a New York State DEC analysis in 1989. Fish were collected from two sites along Onondaga Creek, Webster Road and Spencer Street. These data are old and no further information was located among the available literature. The source of contamination is unknown.
- Public meeting participants expressed interest in reestablishing or protecting *native species* along Onondaga Creek. The possibilities for *restoration* or support of native fish communities vary depending on the species. Some migrating species, e.g. lake sturgeon, Atlantic salmon or American eel, require coordination with habitat improvement efforts throughout the Seneca-Oneida-Oswego system. Other species (e.g., brook trout), may be successfully protected through habitat and water quality improvements and discontinuing the stocking of brown trout. Any restoration or protection effort will require public support, focused goals and further study.
- Various researchers completed different types of *habitat assessments* on various stretches of Onondaga Creek between 1981 and 2005. Results were compiled based on a habitat index using a ranking scale. A map interprets compiled results (see Aquatic Habitat Fact Sheet). Much of the main creek channel was assessed as having poor/fair habitat scores. The most degraded habitat conditions, represented by the worst scores, were located in Vesper, near the old mill impoundment on Route 80, and in Syracuse downstream of Newell Street. Least degraded conditions, represented by high scores, are in Tully Valley, on the main stem of Onondaga Creek, between Woodmancy Road and the mudboils. The next highest scores were found from Route 20 downstream to the flood control dam on the Onondaga Nation. The OEI literature review revealed that much of the watershed, including most of the West Branch and tributaries, had not been assessed.
- Causes of degradation identified in the assessments include channelization, barriers and impoundments, bank erosion, the mudboils, mining, denuded or reduced riparian vegetation, and runoff pollution.

Hydrology: *findings*

The study of the occurrence, distribution, and circulation of the natural waters of the earth.



- Despite human modifications to Onondaga Creek such as channelization (artificial straightening of the creek channel), destruction of wetlands, elimination of creekside vegetation and damming, the creek still functions based on the natural hydrologic cycle. The hydrologic cycle governs the water level and flow rates in the creek, see Figure 3.2.
- Onondaga Creek water flow is measured at U.S. Geological Survey (USGS) gaging stations currently located where the creek intersects with Route 20 (near Cardiff), Dorwin Avenue, and Spencer Street in Syracuse. This information provides a picture of water levels and flow rates in Onondaga Creek, especially in the city. Less data are available for upper, rural parts of the watershed.
- USGS flow data, combined with precipitation data, show Onondaga Creek's general yearly flow cycle: from late fall to spring the ground is frozen or saturated and plants and trees are dormant; water runs quickly over the ground to the creek; which has a high base flow and rises quickly during rain storms and/or snow melt events. From summer to mid-fall, rain is intercepted by vegetation or percolates into the ground; less water is in the creek channel (a low base flow) and the creek does not rise as noticeably from rain events.
- Heavy rainstorms usually cause peak flows (when stream discharge is at its highest point), but rapid snow melt during warm weather can also result in peak flow (usually March and April). Rain on existing snow pack has produced the highest peak flow recorded on Onondaga Creek March 13, 1920 (Holmes 1927).
- Onondaga Creek is characterized by a flashy urban *hydrograph*, which means rapid, high rises throughout the city during rainstorms. Water runs more quickly to Onondaga Creek in the city for several related reasons: the urban area has more impervious cover (roofs and paved areas that do not allow infiltration) than the rural part of the watershed; consequently less soil and vegetation are present to intercept rainfall before it runs off towards the creek; and this resulting runoff, or stormwater, is directed to the creek via a network of separated or combined sewer pipes.
- Compounding the flashy urban hydrograph, Onondaga Creek was deliberately channelized to create faster currents in order to contain and remove raw sewage discharges during low flow periods and to control flooding during high flows (see Flood Control Fact Sheet, Appendix B).
- Over sixty-six tributaries give form to the watershed and feed surface water to Onondaga Creek's main channel. City tributaries include Cold Brook and Furnace Brook. The tributaries are mostly culverted (piped) underground in densely developed parts of the city, and arrive at Onondaga Creek via storm sewers. Springs provide another fresh, or in some cases, *saline* water source into Onondaga Creek throughout the watershed. In the city, springs mostly end up culverted to storm sewers, like urban tributaries.

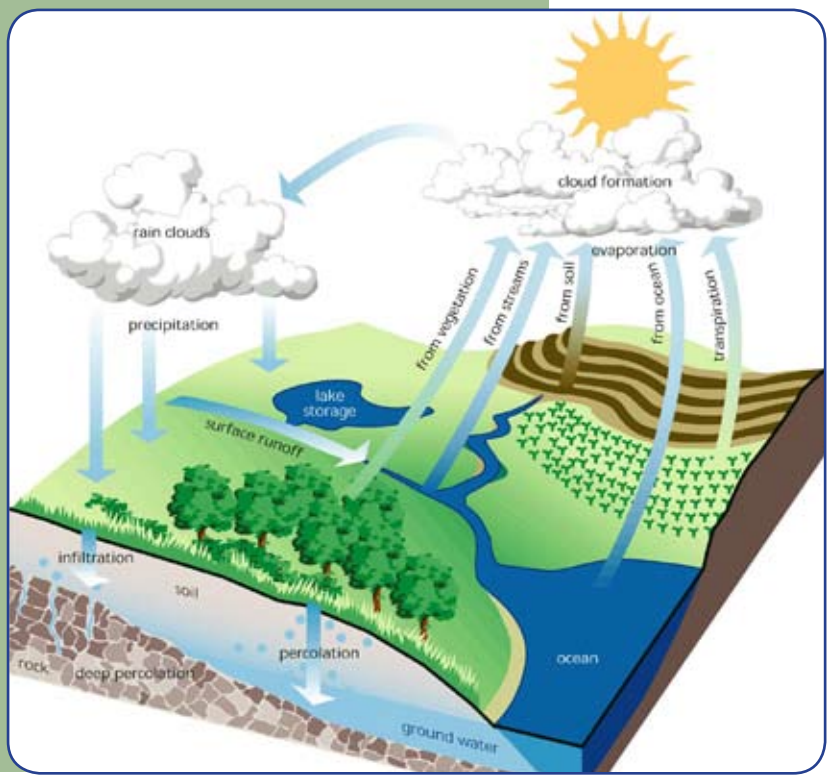


Figure 3.2 Hydrologic Cycle (FISRWG, 1998)

Flood control: *findings*

Measures taken to aid in the prevention of floods

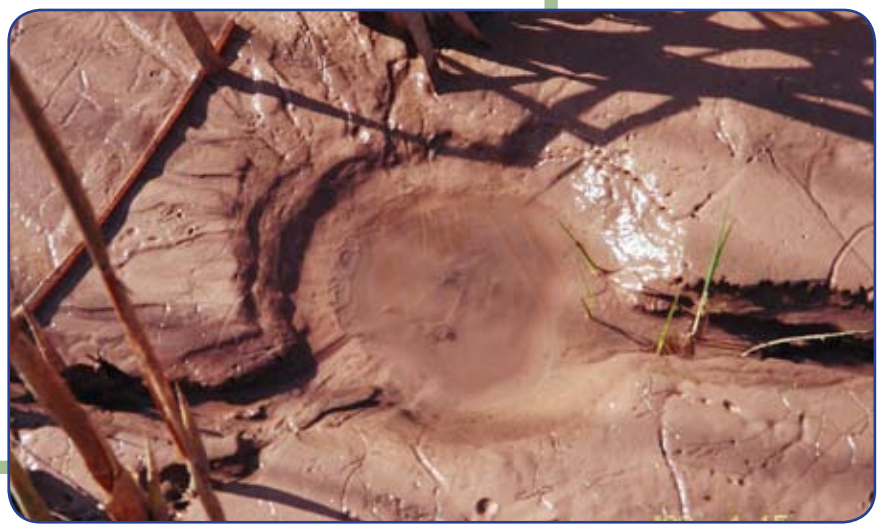
- A sizable portion of Syracuse was developed on the former natural *floodplain* of Onondaga Creek and its tributaries. South of Syracuse, a portion of Nedrow, which is part of the Town of Onondaga, was developed on creek floodplain. The growing city began altering the creek channel beginning in the 1850s. Early straightening by channelization on Onondaga Creek was intended to move raw sewage more quickly to Onondaga Lake.
- Later channelization projects were intended to protect the citizens of Syracuse from regular flooding. A key planning effort, resulting in the 1927 report by the Syracuse Intercepting Sewer Board and G.D. Holmes, emphasized three floods that occurred during a period of *deforestation* in Onondaga County. Since then reforestation, due to a decline in farming, has increased forest cover in the Onondaga Creek watershed.
- Based on the Holmes report, the Army Corps of Engineers built several flood control projects on the creek after World War II, including the Onondaga Flood Control Dam on the Onondaga Nation (1949), the *drop structure* at Dorwin Avenue (1950), and channelization between the northern border of the Onondaga Nation and Ballantyne Road (1950,1963). The dam was designed for a maximum flood volume that has not occurred. The dam is now an essential part of flood control, however alternative measures could be engineered to serve the same function if the dam was modified or removed.
- Flood control projects have been mostly successful; in recent decades, creek flooding rarely endangers or inconveniences citizens of Syracuse and Nedrow. Flood control requires constant maintenance, typically performed by highway departments. In the south, tributaries to Onondaga Creek such as those at State Route 1A and the Tully Farms Road bridge can *aggrade* causing flooding.
- There are negative side effects for flood protection, both for humans and the creek ecosystem.
  - The Onondaga Nation must contend with the loss of land use due to placement of the large flood control dam. The flood control dam and the drop structure at Dorwin both act as barriers to fish migration and boating.
  - Physical access and opportunities to interact with the creek are now restricted in the channelized corridor (e.g., boating, wading). The smooth bottom and sides and deeply cut channel increases water speed, reduces personal safety, and eliminates habitat for vegetation, invertebrates, and fish.
  - Fallen trees are routinely removed in the channelized part of the creek. While considered dangerous "strainers" by boaters, fallen trees serve a natural function of slowing water and creating habitat for aquatic life. Natural flood control features, such as floodplains and wetlands are eliminated in channelized sections.
  - On the stream banks, vegetative growth is restricted and mowing is frequent in channelized sections south of Ballantyne Avenue. This reduces habitat for insects, birds, and wildlife. The lack of vegetation reduces shade; channelization has produced a wide open, shallow stream profile, thus the high water temperatures noted above under water quality are prohibitive to cold-water fish, such as trout, in the summer. Currently, the straight, mowed creek channel in this area defaults to illegal use by all-terrain vehicle riders, thereby disturbing adjacent residents (Anonymous 2008). The mowing regime is executed by the New York State Department of Environmental Conservation and inspected by the U.S. Army Corps of Engineers.

Tully Valley mudboils: *findings*

The muddy springs near Onondaga Creek in Tully Valley

- The Tully Valley mudboils are muddy springs located near Onondaga Creek south of Otisco Road in LaFayette, New York. The area of concentrated mudboils and related land subsidence is known as the Mudboil Depression Area (MDA). The MDA is currently 5 acres in size. Timing and location of new mudboils can be unpredictable; "rogue" mudboils have appeared outside of the MDA. The first documented occurrence of mudboils near Onondaga Creek was in 1899, as reported in the Syracuse Post-Standard (1899).
- The mudboils discharge a combination of water, liquefied sediment and dissolved mineral salts at the land surface. *Artesian groundwater* causes the mudboils to flow and forcefully discharge subsurface sediment. As the groundwater erodes and removes fine-grained sediment from below the land surface, the land subsides causing fractures in the unconsolidated sediments that can lead to further mudboil activity. Mudboils are a rare geologic phenomenon.
- The former brine mining fields at the Southern edge of the Tully Valley are another site of land surface subsidence, as well as soil and *bedrock* fracturing. Rain, snow melt, and associated runoff seep into the fractured bedrock, where formerly separate *aquifers* interconnect and add greater artesian pressure to the mudboils-aquifer system. Mudboils appear to have been exacerbated by the brine mining activity.
- In the past, sediment-rich mudboils flowed unchecked to Onondaga Creek, creating turbid conditions in the creek. In the early 1990s, the Onondaga Lake Management Conference (OLMC) installed depressurizing wells, a tributary diversion channel and a dam to detain mudboil discharge.[3] The *remedial* work was performed under the direction of the USGS and administered by OEI (formerly the Onondaga Lake Cleanup Corp.). The OLP and OEI currently maintains these installations in consultation with the USGS. The land containing the MDA, the impoundment and depressurizing wells is owned by Honeywell Corporation. Copious sediments from mudboils, landslides, streambank erosion, and runoff deposited in the creek in the past still remain in the creek channel. As noted under *Water Quality*, sediment is resuspended during storm events. The existing sediment bedload is expected to affect creek water quality for several decades.
- Much of the mudboil discharge is now contained behind the dam, creating an impoundment area where detained water maintains *hydraulic* pressure over the mudboils, reducing mudboil flow. A large portion of sediment brought up to the surface via mudboils settles behind the dam. Finer particles flow to Onondaga Creek, continuing to cause turbidity in the creek. Since the early 1990s, mudboils have transitioned from discharging predominately fresh water to more saline groundwater. Brackish to saline mudboils are the most common type occurring currently, discharging water ranging from slightly salty to very salty. This too affects the creek's water quality.
- The amounts of mudboil sediment and saline water released to Onondaga Creek today are much less than the years before remediation work began. However, several considerations must be taken into account for effective mudboil management.
  - The remedial installations must be maintained and monitored.
  - Current maintenance activity is not financially self-sustaining.
  - *Subsidence* and land loss is expected to continue, affecting nearby agricultural fields.
  - Land owner *liability* is unknown, restricting potential public access to the area.

[3]The OLMC was established by Congress in 1990 to develop a management plan for restoring Onondaga Lake. Congress replaced the OLMC with the OLP in 2000.



Access: *findings*

The right to view or enter and make use of something.

- Currently, physical access to Onondaga Creek is restricted. Physical access can be gained three ways: via public access point, by permission from corridor landowners, or through land that appears unused and is neither fenced nor posted against trespass.
- Rurally, much of the Onondaga Creek corridor is private property, restricting physical access to those with permission from the landowner. Physical access can be gained through public right-of-way at some bridge crossings.
- From Nedrow northward, the creek is channelized, currents are swift during high flow periods, and thus access is restricted by chain link fence for public safety. The fences are owned and maintained by government agencies to prevent citizens, especially children, from falling into the channel and potentially drowning; however, some sections of the fence are routinely vandalized to gain access.
- Once legal access is obtained, the right generally exists to navigate the creek in a watercraft, like a canoe or kayak, although current interpretations of state and federal law make this a legally complex issue.
- Permission is needed from the Council of Chiefs to navigate or gain access to Onondaga Creek on the Onondaga Nation.
- Visual access, or ability to view the corridor, is possible from numerous road bridges over the creek and from some urban parks in the Valley neighborhood and in Nedrow. Although Onondaga Creek Boulevard parallels the creek corridor on the Southside of the city, visual access is restricted because of chain-link fencing, brush and depth of the deeply cut creek channel.
- No easy solutions exist to increase physical access to Onondaga Creek. Multiple factors have to be balanced, such as habitat protection, personal safety, landowner liability (whether private or public), flood control needs, and the complex, long-term process of ecological restoration.

Land use and land cover: *findings*

Land use: ***The way in which humans use the earth's surface;***
Land cover: ***Material on the land surface, either natural or human-made.***

Figure 3.5 Relationship between impervious cover and surface runoff (FISRWG 1998).

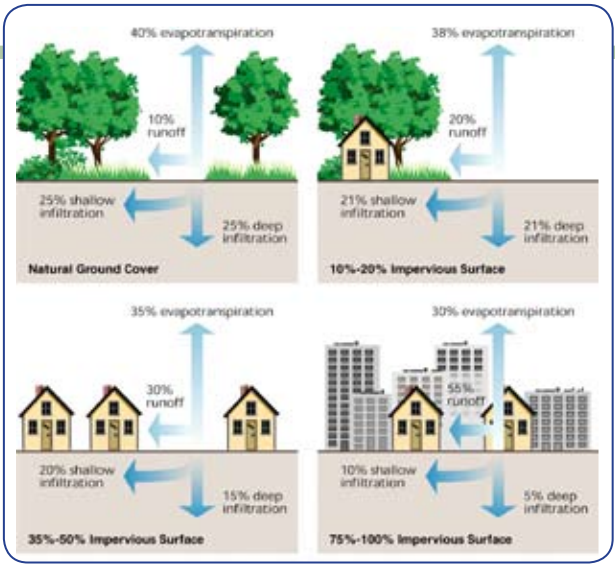
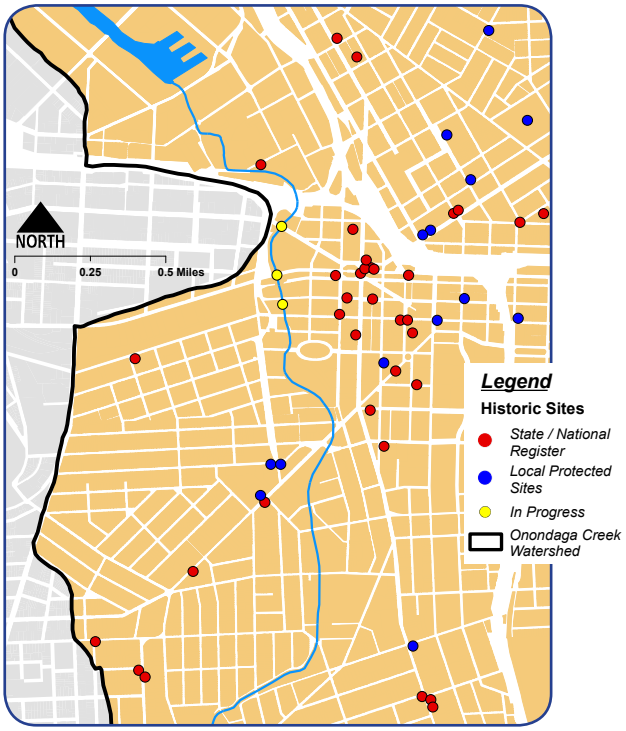


Figure 3.6 Eligible or Registered Historic Sites in Downtown Syracuse.



- The term land use describes human land use, usually related to economic activity. The term land cover describes material, either natural or human-made, on the land surface. On the following pages, two watershed maps compare land use (Figure 3.3) and land cover (Figure 3.4).
- Land uses are primarily agricultural and residential in the rural portion of the Onondaga Creek watershed, including Tully Valley and the West Branch of Onondaga Creek. Land lots tend to be larger; the average agricultural parcel size is about 40 acres, the average residential parcel ranges from two to eight acres.
- In the urban portion of the watershed, from Nedrow through Syracuse, land lots are much smaller, averaging 0.25 acres. There are two distinct types of land use in Syracuse. From its southern border to the edge of the downtown, the city is primarily residential; this is where the greatest population density exists near the creek. Downtown (the central business district, or CBD) is the center of commercial activity, with less residential use.
- Greater concentration of residential and commercial land cover occurs in and near downtown, the northernmost portion of the creek's watershed, readily visible on the land cover map. Greater residential and commercial density correlates to greater impervious surface, see Figure 3.5. Impervious cover increases surface runoff, discussed under Hydrology. Streams can be degraded with as little as 10 percent impervious cover in the watershed (FISRWG 1998).
- In addition to increasing impervious cover and runoff, residential and commercial land use affects Onondaga Creek through placement. In the past, structures (homes and businesses) were built near or even on the banks of Onondaga Creek. In rural areas, farmers maximized field area by planting crops close to the creek's edge. The legacy is a thin buffer between the creek and human land use activity. Current knowledge and practice tells us that *vegetated buffers*, riparian areas and wetlands all serve natural functions protecting the creek from the effects of land use.
- The creek watershed is rich with historic structures, including historic bridges over Onondaga Creek downtown and channel stonework in places such as city parks. Figure 3.6 shows registered historic sites in the Onondaga Creek watershed.

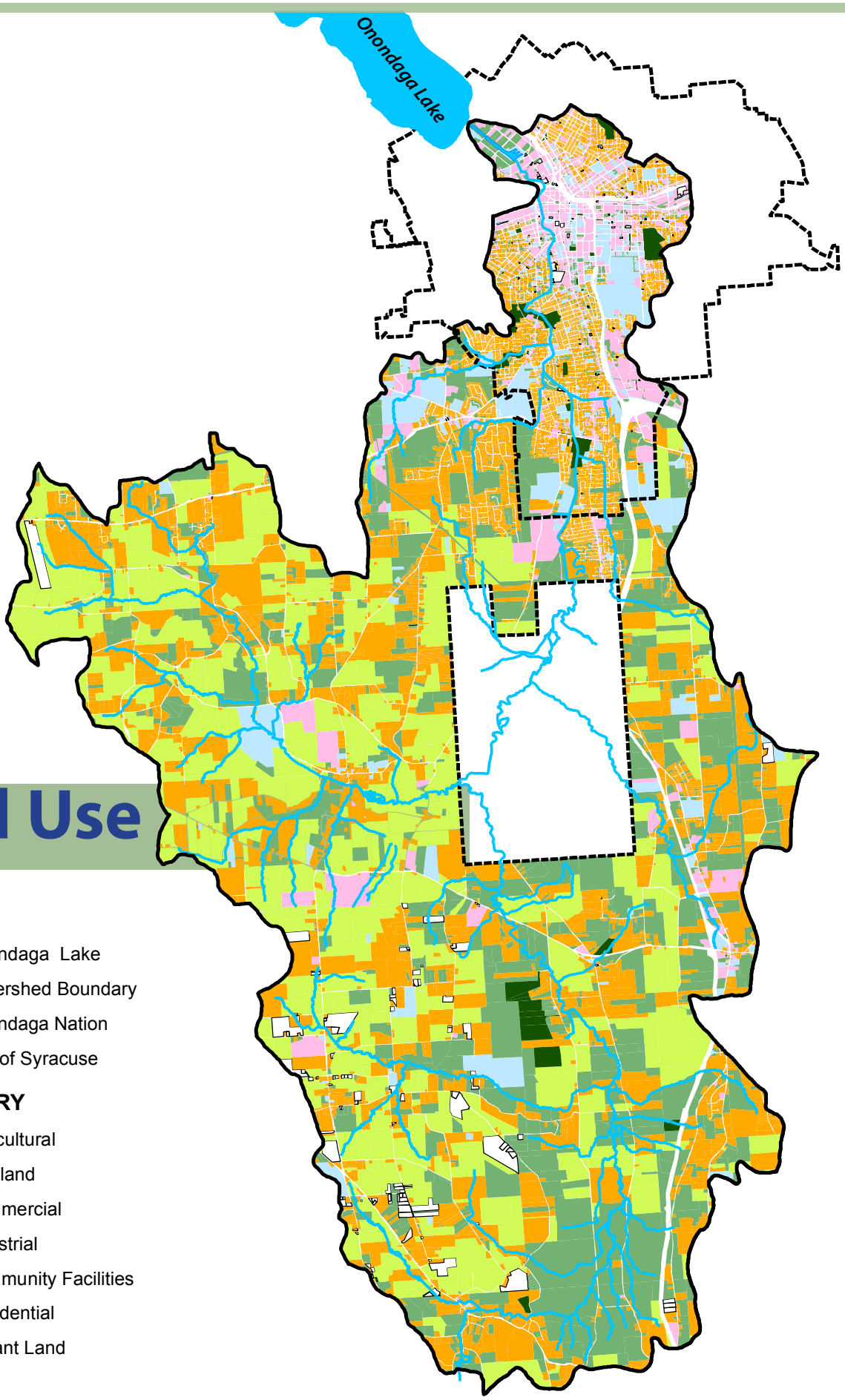


Figure 3.3

Land Use
by Parcel

Legend

- Onondaga Lake
- Watershed Boundary
- Onondaga Nation
- City of Syracuse

CATEGORY

- Agricultural
- Parkland
- Commercial
- Industrial
- Community Facilities
- Residential
- Vacant Land

Category Definitions:

Water - All areas of open water.
Developed - Areas characterized by a high percentage (30 percent or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc).
Barren - Areas characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present.
Forested - Areas characterized by tree cover; tree canopy accounts for 25-100 percent of the cover.
Shrubland - Areas characterized by woody vegetation, generally less than 6 meters tall.
Herbaceous - Areas characterized by herbaceous vegetation, non-woody plants with leaves and stems that die back in winter. Herbaceous vegetation accounts for 75-100 percent of the cover.
Cultivated - Areas characterized by herbaceous vegetation that has been planted. Herbaceous vegetation accounts for 75-100 percent of the cover.
Wetlands - Areas where vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

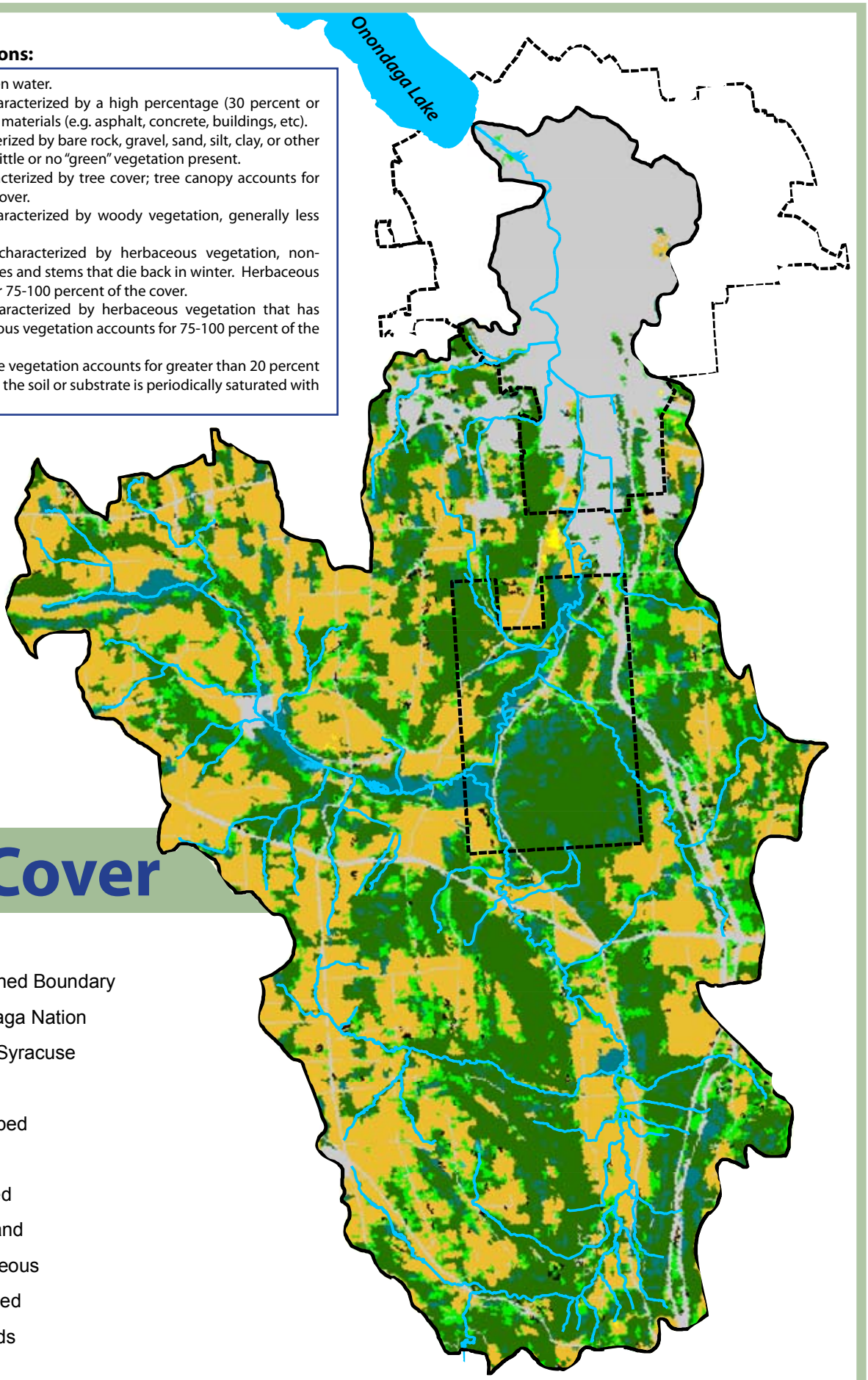


Figure 3.4

Land Cover


onondaga creek
CONCEPTUAL REVITALIZATION PLAN
COMMUNITY
FORUM
MAY 3
5:30 PM
FREE

CHAPTER 4:
*Revitalization Plan Development-**Process***

Chapter 4 describes the development process for the Onondaga Creek Conceptual Revitalization Plan (OCRP). Figure 4.1 illustrates the components that make up the OCRP project. Work completed under each component contributed to the final product, the OCRP. Chapter sections correspond to the project components in Figure 4.1.

Figure 4.1 OCRP Project Components

Photos: Onondaga Creek Workshops

Photos:
Public involvement strategies

Technical Information - Process

A compilation of relevant background information concerning the watershed was a logical first step towards the development of the OCRP. Three reports were completed as described in the workplan: a summary document describing the current state of Onondaga Creek, a description of case studies of successful watershed restoration and planning, and the OCRP. The resulting reports are listed in Chapter 5 and contained in the appendices.

The **Onondaga Creek Fact Sheets** describe the current state of Onondaga Creek. The main points from each sheet are reproduced or summarized in Chapters 2 and 3. To produce the fact sheets, Onondaga Environmental Institute (OEI) staff conducted literature searches and compiled relevant information into documents based on topic areas. OEI staff initially developed a broad list of topic areas. These were then reduced based on material found in the literature search and Dr. Richard Smardon's judgment of what the Onondaga Creek Working Group needed to know to develop the plan options, in his role as group facilitator. OEI employees were asked to focus material found in their literature reviews to key findings and implications for creek revitalization.

Once prepared in draft form, the fact sheets were used as an interactive planning tool with the Working Group. The Working Group reviewed and critiqued each sheet in the second half of 2006. Revisions were incorporated into the fact sheets and a revised, formatted set was given to each Working Group member in January 2007 to refer to in the coming months. The Fact Sheets were used by the Working Group to deepen their understanding of existing conditions (reinforcing that learned via field trips and guest speakers) and to develop options for the revitalization plan.

The **Case Studies Guide: Conceptual Alternatives to Onondaga Creek** was developed to provide the community and decision makers with various examples of stream revitalization throughout the country. Each river is unique; no single example will provide a perfect reference with which to guide local restoration (Williams et al. 1997). However, by examining many projects, answers to local questions can be gleaned from the solutions of others (Riley 1998).[1]

For the **Case Studies Guide**, OEI staff researched and produced the document; Atlantic States Legal Foundation reviewed drafts of the text. Three cases were closely examined: South Platte River in Colorado, the Guadalupe River in California, and the Bronx River in New York. Each case describes river history, current projects and draws lessons for Onondaga Creek revitalization. Twelve short cases are presented, emphasizing one or two salient revitalization examples with web-site links for further exploration. At the end of the document, a resource section provides websites of additional cases organized by state.

Finally, the **Onondaga Creek Conceptual Revitalization Plan** document was produced. The process to create this document is described in the last section of this chapter.

Public Education - Process

Two Project Team members were responsible for conducting public education programs: Cornell Cooperative Extension (CCE) and SUNY College of Environmental Science and Forestry (SUNY ESF). They focused on three types: stewardship-building events, educational presentations and school programs. Canopy, a parks and greenspace advocacy group, complemented the programs with its own event in 2005. All programs were designed to occur before and during the public forum phase of the OCRP and foster public awareness and involvement in Onondaga Creek watershed issues. Adult-oriented programs were also intended to build awareness of and encourage involvement in the plan development process. A table summarizing public education programs conducted for OCRP is in Chapter 5.

Onondaga Creek Fest, sponsored by Canopy, and CCE's Onondaga Creek clean-ups were stewardship-building events.[2] Based in Kirk Park in the City of Syracuse, these events developed awareness of the creek's location and critical issues.[3] The clean-ups called attention to persistent dumping and litter in Onondaga Creek. The Creek Fest was intended to highlight the potential creek revitalization may bring to recreation, community-building, economic development and nature education (Gechas 2005).

Cornell Cooperative Extension held two kinds

[1] A set of well-crafted research questions specifically designed for urban watershed management can be found applied to several cases in Platt R. 2006. Urban watershed management: Sustainability, one stream at a time. Environment. 48(4):26-42.

[2] CCE's Onondaga Creek Clean-ups are ongoing annual events, receiving support from the OLP Outreach Committee and other sponsors.

[3] Onondaga Creek bisects Kirk Park. However, the creek flows through the park in a deep, cement-lined channel; for safety, chain-link fencing prohibits physical access and visual access is restricted due to vegetation growth around the fence.

of education presentations: guided walks and public lectures. Both required research into the natural, cultural and economic history of Onondaga Creek and were designed to raise awareness about the creek and promote participation in the OCRP (Samuels 2005). Guided walks were conducted in the Valley and Franklin Square areas of Syracuse, both with histories of profound human impact on the creek during the nineteenth and early twentieth centuries. Cornell Cooperative Extension gave a public lecture, entitled **Onondaga Creek: A Glimpse of the Past, Present and Future** to interested community groups. The talks were conducted during the early spring of 2006 to advertise upcoming public forums and raise awareness of groups that may not be inclined to attend forums (Samuels pers. comm.).

For public schools, SUNY ESF, in cooperation with the Centers for Nature Education **Nature in the City** series, conducted a program at Elmwood Elementary School and assisted with the development of an educational pilot program at Blodgett School (K-8), in Syracuse. Cornell Cooperative Extension conducted service-learning projects to develop stewardship of Onondaga Creek for school-age children.

Approximately 80 middle school children participated in the Blodgett School pilot program focused on Onondaga Creek. Twice a week in their science classes, students used Onondaga Creek as a case study to review the relationship between humans and the environment in an urban setting. Ms. Jessica Kauffman, a science teacher at Blodgett, conducted the classes in four-week sessions and helped develop the pilot program by aligning material to state learning standards.

Cornell Cooperative Extension led students from Clary Middle School's after-school program in a service-learning project that complimented the students' on-going study of Onondaga Creek. Cornell Cooperative Extension educators offered a two-part program that included hands-on learning activities about watersheds and the impacts of stormwater runoff on waterways such as Onondaga Creek. The students and their teacher, Ms. Susan Savion, stenciled the stormdrains on West Cheltenham Road with the message "Dump No Waste: Drains to Creek" and distributed informational flyers to nearby residences.

Additionally, students from the Dunbar Center of Syracuse participated in a two-part field trip with CCE to learn about stormwater pollution and its impact on Onondaga Creek. The first field trip brought students to the Inner Harbor, where they observed the various types of trash that washes downstream. Then the students worked to raise awareness about the street-creek connection by stenciling the stormdrains along Onondaga Creek Boulevard, which runs adjacent to the creek by Kirk Park.

"I learned why its important not to throw my trash down on the ground because it could get right into the water and hurt the fish and other animals."
- Merajah, sixth grader at Clary Middle School

Photos:
Onondaga Creek Festival

Goal and Issue Solicitation - Process

OEI was responsible for compiling stakeholder goals and issues relevant to the revitalization of the Onondaga Creek watershed, under the advisement of the Working Group. The OCRP Project Team devised two methods to gather goals and concerns: *community* forums and *stakeholder* organization meetings. The two types are described below. The goal was to assess the larger watershed community's visions and concerns for Onondaga Creek, which in turn would assist the Working Group in their development of the revitalization plan. Gathering public *input* prior to the development of the plan allowed themes and goals important to the community to be incorporated into the plan (Firehock et al. 2002). Figure 4.2 was used at the community forums and stakeholder organization meetings to explain what would happen to the input of meeting participants.

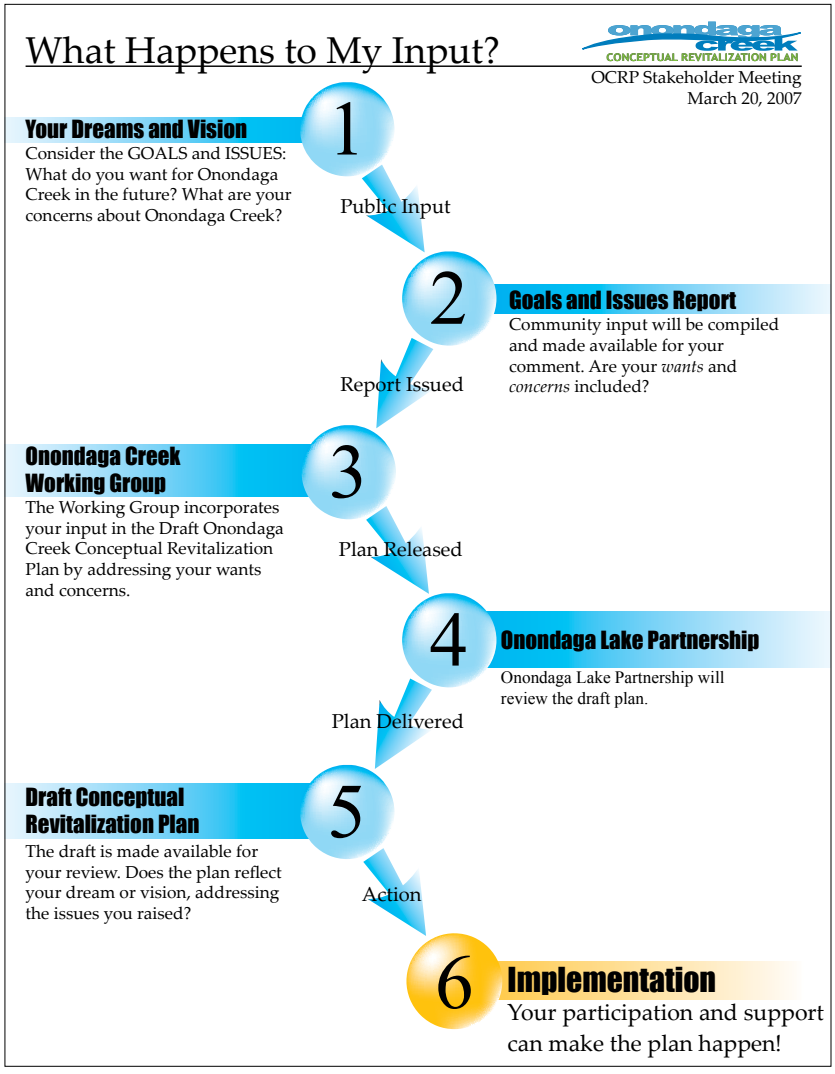


Figure 4.2 "What happens to my input" diagram used for goals & issues meetings

There were several rationales for gathering public input prior to plan development. First, developing the OCRP was to be a lengthy process. Few citizens would be able or willing to fully participate in years of meetings for plan development. However, many more people could be reached in one-time meetings in formats designed for larger groups. These meetings served the purpose of developing visions and priorities (Innes and Booher 2004). Second, implementation of the OCRP is voluntary. Voluntary plans need support and involvement of stakeholders throughout the process, both to develop a sense of ownership and to increase the chance of implementation (Scholz et al. 2002, Smolko et al. 2002).

The Project Team refined the format and conducted the community meetings, in order accomplish the gathering of goals and concerns as stated in the workplan. The Working Group and Project Team brainstormed format and venues for community meetings. Working Group members attended meetings as their schedules allowed.

The Onondaga Creek Community Forums were designed to draw goals and issues from watershed residents and other interested individuals. The meetings were open to the public and marketed as such, through community outreach efforts including: public service announcements; newspaper stories (New Times and The Post Standard); flyer distribution in targeted neighborhoods, via community groups and libraries; "get the word out" kits distributed via email to local organizations (this consisted of a flyer, project information documents and suggested text for newsletters and email notification); community calendars available in the newspaper, television and the web; press releases; and media kits to the local press (samples of these materials are in Appendix H). USEPA's **Getting in Step: A Guide to Watershed Outreach Campaigns** (USEPA 2003a) inspired many of these methods of communication. Several Project Team members visited the editorial board of the local newspaper, presented the project, and requested coverage and support for the project. Project Team members also gave several television and radio interviews in order to publicize the project and the community forums. A communications plan was prepared for the OCRP project in 2005, outlining procedures for communicating with the media and the public (see Appendix H).

Forum locations were distributed within the watershed geographically and according to population density. However, location choice was constrained by size, configuration, parking, availability of facilities that were perceived as accessible and recognizable to the community, and by the need for facility fees to be within the project budget. Five forums were held in the City of Syracuse, two were outside of the city. Forum locations are mapped in Chapter 5. Three types of input were collected from participants at the forums: dot board results, verbal comments (scribed to flip charts), and written responses (from question cards). Dot board data were entered into Microsoft Excel. OEI staff entered verbatim input collected from the flip charts and question cards into a Microsoft Access database. Verbal and written inputs were based on the open-ended questions in Table 4.1. The Project Team's process and rationale for question development is documented in Appendix F. Forum dates, locations, and tally of written input received are reported in Chapter 5. Appendix G has a summary of dot board procedure and results and a compilation of forum input.

Chapter 5 presents graphs that show topics most frequently mentioned in aggregate for the community forums, obtained from written cards completed by participants at each meeting. The methodology for creating the graphs is briefly summarized as follows. All written input, catalogued according to goals or concerns, was analyzed and assigned a one or two word code, identified as a key word that captured the contextual meaning. Key words were generated based on review of the data, rather than created beforehand. The input was grouped by key word for each forum and sorted by frequency. Frequencies were aggregated across forums. Input was then graphed by most frequently occurring key word. This process was influenced by methodologies for analyzing qualitative data: content analysis (see for example USEPA 2002) and grounded theory (see for example Silverman 2003, Strauss 1987).

The second type of meeting, the stakeholder organization meetings, was intended to draw goals and issues from members of organizations, institutions and businesses, in other words, particular groups that would have an interest in Onondaga Creek revitalization. To determine meeting format and groups to approach, OEI staff gathered advice from several community leaders, in government, non-profit and business roles. A summary of advice is available in Appendix H.

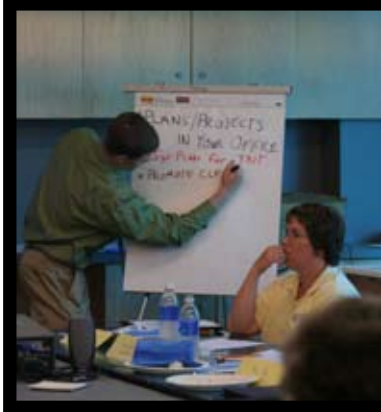
Eight stakeholder organization meetings were held; the majority occurred in the first half of 2007. Six small meetings were distributed among civic and environmental groups with existing meeting schedules. Two large meetings were conducted. The Stakeholder Organization Meeting at the Museum of Science and Technology (MOST) in Armory Square invited over 600 businesses, business interest organizations, religious organizations, academia, and nonprofit and community organizations to contribute their goals and concerns for Onondaga Creek revitalization. About 120 individuals representing over 60 organizations attended. The Onondaga Creek Government Workshop invited elected officials and government agency employees for their revitalization goals and concerns. Marketing efforts followed those of the forums, with the addition of targeted mailings of invitations.

Written responses were the primary type of input collected from participants at the stakeholder meetings. Verbal comments (scribed to flip charts) were collected to the extent practical at each meeting. Treatment of the data followed the same methods described under the Community Forums process. The graphs in Chapter 5 show topics most frequently mentioned, in aggregate from the stakeholder meetings, obtained from questionnaires completed by participants at each meeting.

Question
What is your goal, vision or dream for the Onondaga Creek corridor? What do you want for Onondaga Creek and its surroundings in the future?
What issues or concerns, problems or obstacles, if any, must be overcome or solved before your vision of Onondaga Creek can be achieved?

Table 4.1 Questions used at Onondaga Creek Community Forums

OEI staff communicated to the Working Group the top themes from the Community Forums and the stakeholder organization meetings in fact sheet format (see Appendix G). The Working Group also received copies of Community



Photos:
Community Forums

Forum written input and assisted in categorizing data into themes. The majority of Working Group members gained first-hand experience with community's goals and concerns by attending both types of meetings. Subsequently, the Working Group and Project Team incorporated community input into the plan development process, as described in the next section. Figure 4.3 illustrates the goals and issues solicitation process.

Photos:
Government and
Stakeholder Involvement

Figure 4.3 Goals and Issues solicitation process. Green boxes represent Working Group Actions. Red boxes represent OCRP Project Team actions. Purple boxes represent collaborative results.

Working Group - Process

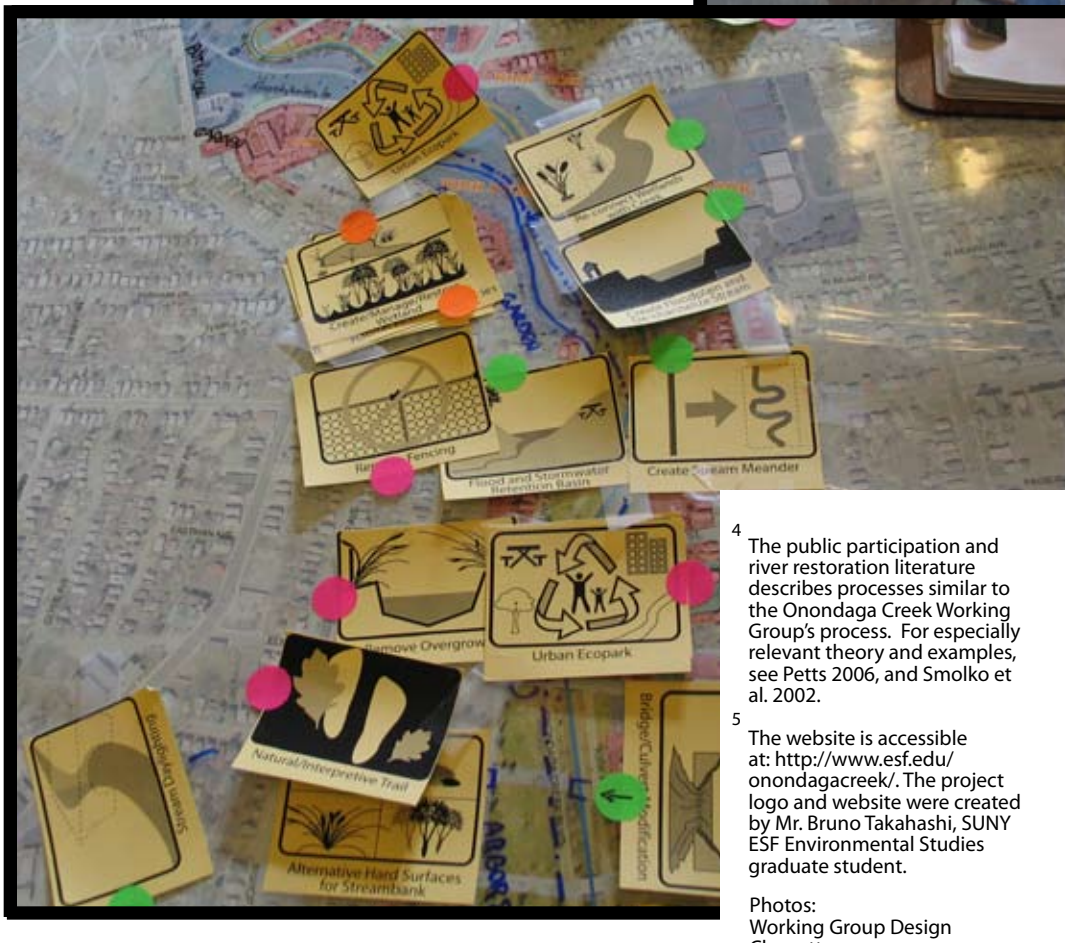
The Onondaga Creek Working Group has met monthly from February 2005 to the present. To revisit the Working Group's membership and mandate, refer to Chapter 1. Figure 4.4 illustrates the Working Group's conceptual revitalization plan development process and the corresponding Project Team process. Appendices D and F contain Working Group and Project Team meeting minutes. The meeting minutes document extensive detail about forming the Working Group, interaction between the Working Group and scientists and practitioners specializing in Onondaga Creek, and each step of the OCRP development process.[4]

Working Group participants were recruited to represent a variety of interests and geographic areas of the Onondaga Creek watershed. Meetings were held monthly, on the first Wednesday evening of the month. All of the meetings were open to the public. To "advertise" the Onondaga Creek Working Group meetings to the public, several types of monthly notifications were sent: emails to a 300-person list (based on sign-up sheets from the community meetings described above), flyers posted in public libraries in the watershed, and placement of announcements during the week prior to the meeting in The Syracuse Post-Standard's community calendar in the Thursday Neighbors section, the Syracuse.com website, Center for Nature Education's EnviroMails, Onondaga Lake Partnership (OLP) web site and the WRVO on-line community calendar. Informal methods of notification about Working Group meetings were used on occasion, particularly handouts and posters at local environmental events and meetings. SUNY ESF sponsored a website[5] which served as an additional source of information to the public.

Learning Phase and Plan Components Development

As preparation to development of the revitalization plan components, the Working Group engaged in a learning process about the Onondaga Creek watershed; members informed each other as they shared information and experience. Additionally, the Working Group added to their existing knowledge by learning from guest speakers at Working Group meetings, selecting and participating in creek-themed field trips, participating in the goals and issues solicitation process and reviewing the Onondaga Creek Fact Sheets.

After the fact sheet review, the Working Group developed the components of the OCRP. First, the Working Group developed and refined drivers, the driving forces or motivators, for revitalization. Next, revitalization options for Onondaga Creek were developed through a series of meetings devoted to specific topics: hydrology, biology and land use/access/recreation. The Project Team invited local scientists and practitioners as resource experts in each topic area to advise the Working Group during options development. The resource experts included individuals from SUNY ESF, Syracuse University and government agencies. Options are listed in Appendix E. With options complete, the Working Group completed a *design charrette*, a planning exercise where ideas for revitalization were placed on a series of maps over two intense sessions.



[4] The public participation and river restoration literature describes processes similar to the Onondaga Creek Working Group's process. For especially relevant theory and examples, see Petts 2006, and Smolko et al. 2002.

[5] The website is accessible at: http://www.esf.edu/onondagacreek/. The project logo and website were created by Mr. Bruno Takahashi, SUNY ESF Environmental Studies graduate student.

Photos:
Working Group Design Charrette

Photos:
Working Group Design Charrette

Map Development

To facilitate the Onondaga Creek Working Group's design charrette, OEI created a set of planning maps, 8-10 feet in length, from aerial images of the Onondaga Creek corridor and its tributaries. OEI also developed a set of 40 cards with graphic representations (symbols) of creek revitalization options. The symbol cards were based on options discussed by the Working Group, gleaned from community input, and references on stream restoration practice (Center for Watershed Protection 2004, FISRWG 1998, Kloss et al. 2006, Pinkham 2000, Westchester County 2007). In addition to the symbol cards, the Working Group used blank cards and markers to customize maps. OEI produced a symbols key to aid their use during the charrettes.

The Working Group worked on the maps over two meetings. They split into three teams: urban, rural and "mixed". The urban team placed their ideas on maps of the creek corridor from the Inner Harbor to Ballantyne Avenue. The "mixed" or transitional team placed ideas on two planning maps: Ballantyne Avenue to the northern border of the Onondaga Nation and the Furnace Brook corridor. The rural team covered the remaining segments. Three team facilitators with community design experience were invited to facilitate each team during map making. The resource experts that assisted with options development were invited to return and advise the teams. For the planning map representing the Onondaga Nation territory area, Ms. Jeanne Shenandoah facilitated input from members of the Onondaga Nation. Sticky notes were used instead of the symbol cards.

Map Review and Project Area Development

The large planning maps were then converted into digital representations by OEI. Symbols, notes and additional drawings were reproduced on the digital versions as placed by the Working Group on the original planning maps. Working Group members each received a tabloid-sized set of the planning maps, to verify and review.

The Project Team grouped revitalization map ideas into project areas. The bundles represent future potential project areas for implementation of revitalization projects. OEI developed themes for each project area based on symbol groupings. Working Group reviewed and voted on their preferred potential project areas, results are described in Chapter 5. The revitalization maps in Chapter 5 are the final products, illustrating the Working Group's symbols, bundled into potential project areas.

Goals and Plan Development

One of the last steps for the Working Group was to develop goals for revitalization over a series of meetings. The Working Group clarified their goals by going through the process of developing drivers, options and revitalization maps beforehand (Smardon pers. comm.).

Based on the Working Group's plan components, the Project Team then developed the text for the OCRP. As part of the plan, the Project Team developed specific action items and pilot projects to support the Working Group's goals and to make recommendations for future steps in creek revitalization. The goals and action items are presented in Chapter 5 and the pilot projects are presented in Chapter 9.[6]

The Working Group's last responsibility was to review and make revisions to the conceptual revitalization plan document. As the OCRP must reflect the ideas and intentions of the Working Group; this last step was an important final review before release of the plan for sponsor and public review.

[6]Although the development process is somewhat different, similar plan components are described in Chapter 4 of *Community-based Watershed Management: Lessons from the National Estuary Program* (USEPA, 2005a).

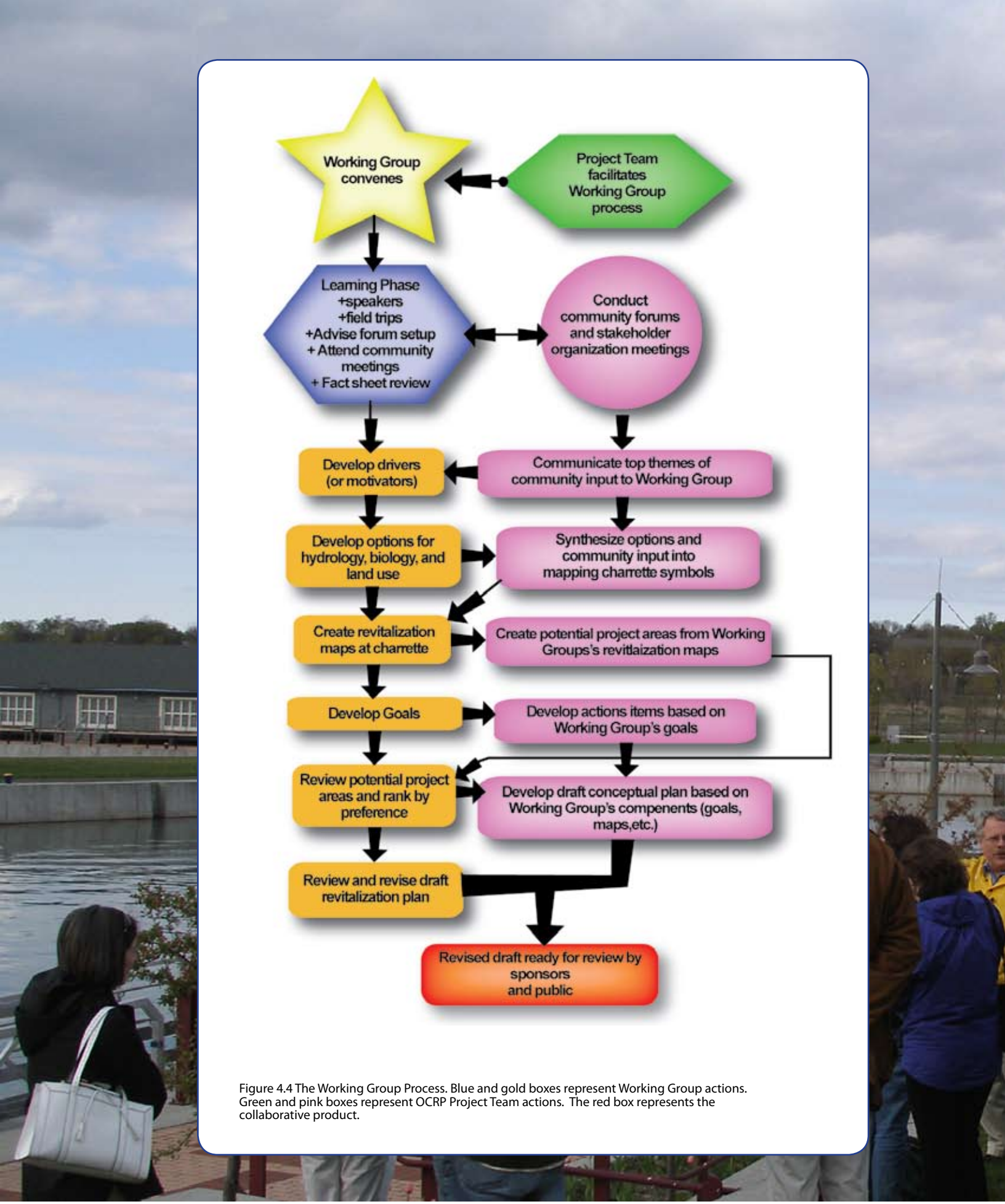


Figure 4.4 The Working Group Process. Blue and gold boxes represent Working Group actions. Green and pink boxes represent OCRP Project Team actions. The red box represents the collaborative product.

CHAPTER 5:
*Revitalization Plan-**Results***

Chapter 5 presents results and recommendations for the Onondaga Creek Conceptual Revitalization Plan (OCRP). Chapter 4, which describes the OCRP development process, is a reference for this chapter. Three project components were performed by the OCRP Project Team and used to inform the Onondaga Creek Working Group as the plan was developed: technical information, public education, and goal and issue solicitation. Most of this chapter presents the Working Group's results, including their revitalization maps and goals for Onondaga Creek.

Goals and concerns shared during public participation events are reflected and incorporated into the results in this chapter. The revitalization maps and watershed goals are conceptual and designed for a long-term process of revitalization. As one Working Group member said: "A man with no vision always returns to his past." The goals are ideals to strive for - they set the stage to think big and to achieve new possibilities for Onondaga Creek.

Public participation is a fundamental element of the OCRP. The "word cloud" below is an informal representation of all of the goals, visions and dreams shared in writing by participants at the Onondaga Creek Community Forums and Stakeholder Organization Meetings. The word cloud gives greater prominence to words that appear more frequently in the text. The word cloud was created in **Wordle**, a software program created by Jonathan Feinberg (accessed from http://www.wordle.net/).

Technical information - Results

Three reports were prepared for the OCRP: the **State of Onondaga Creek Fact Sheets** (see Appendix B); the **Case Studies Guide: Conceptual Alternatives for Onondaga Creek** (see Appendix C); and this document, the **Onondaga Creek Conceptual Revitalization Plan**.

Public education - Results

An extensive public education and awareness program was performed prior to the solicitation of community goals for Onondaga Creek (see Chapter 4). Presentations and events were conducted throughout the watershed to educate both young and old, and to raise citizen consciousness regarding Onondaga Creek. A secondary goal of the public education program was to increase public participation; attendance levels at Community Forums were high among target audiences and locations of the education events and presentations.

Project Team Organization	Stewardship Building Event	Education Presentation	School Program	Location/ Organization	Date
Canopy	■			Onondaga Creek Fest at Kirk Park	July, 2005
Cornell Cooperative Extension	■			Onondaga Creek Clean-up, Kirk Park Area	September, 2005, 2006, 2007
Cornell Cooperative Extension		■		Walking Tour of Onondaga Creek: Franklin Square	July, 2005
Cornell Cooperative Extension		■		Walking Tour of Onondaga Creek: The Valley	August, 2005
Cornell Cooperative Extension		■		Tully Town Board	February, 2006
Cornell Cooperative Extension		■		LaFayette Town Board	March, 2006
Cornell Cooperative Extension		■		Partnership for Onondaga Creek	March, 2006
Cornell Cooperative Extension		■		Inner City Rotary Club	March, 2006
Cornell Cooperative Extension		■		Tomorrow's Neighborhoods Today Area 3- Southside	April, 2006
Cornell Cooperative Extension			■	Dunbar Center Service Learning Projects	Spring 2005, 2006
Cornell Cooperative Extension			■	Clary Middle School Service Learning Project	Spring, 2006
SUNY College of Env. Science and Forestry			■	Elmwood Elementary School Program	Spring, 2006
SUNY College of Env. Science and Forestry			■	Blodgett K-8 School Pilot Science Program	Fall, 2006

Table 5.1 Public education events associated with the OCRP project.

Public participation

As part of the plan development process, the OCRP Project Team conducted numerous public education events, Community Forums and stakeholder organization meetings for the OCRP. Figure 5.1 illustrates the locations of events in and near the Onondaga Creek watershed.

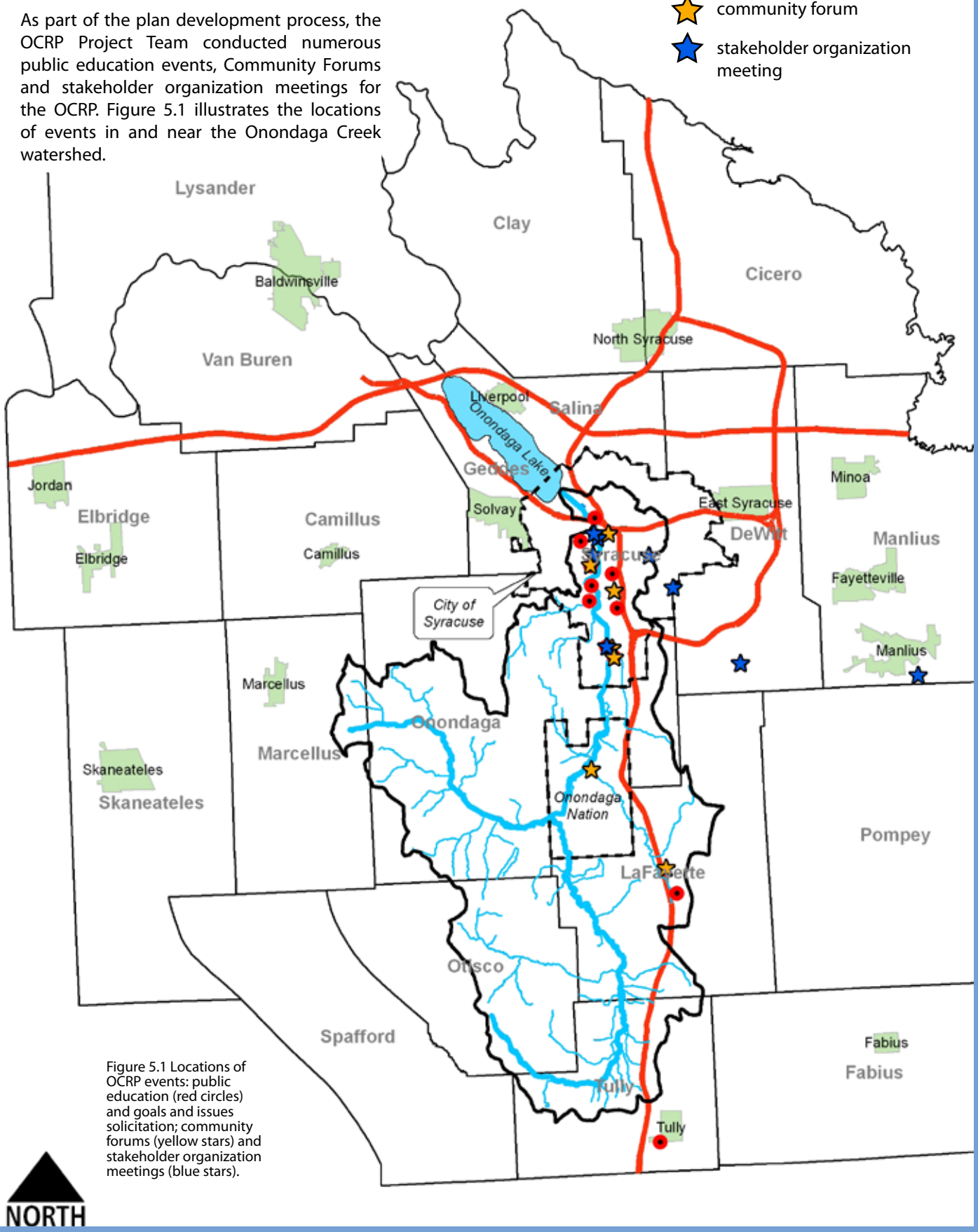
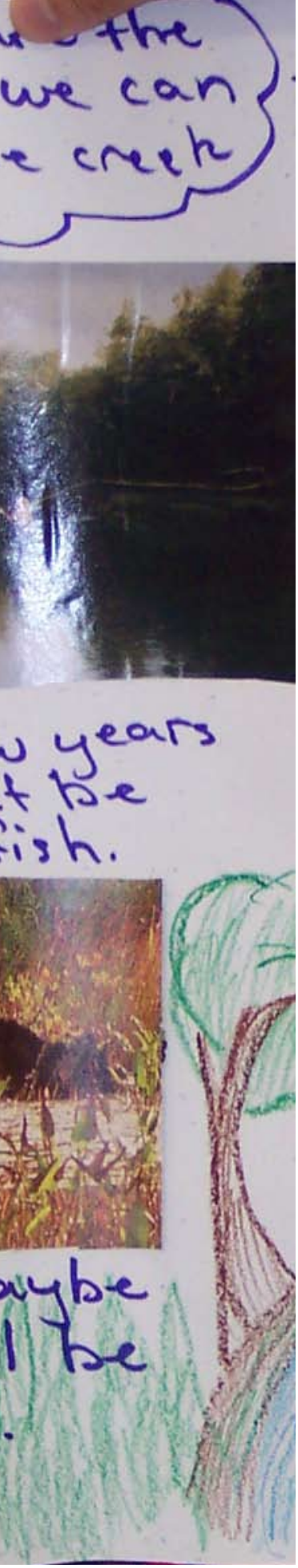


Figure 5.1 Locations of OCRP events: public education (red circles) and goals and issues solicitation; community forums (yellow stars) and stakeholder organization meetings (blue stars).



Community Forums Goals and issues - Results

Onondaga Creek Community Forums

Forum Location	Date	Sets of Goals and Issues Returned
Bob Cecile Center	April 19, 2006	33
City Hall Commons	May 3, 2006	50
LaFayette Community Center	May 18, 2006	34
South Presbyterian Church	May 25, 2006	23
Clary Middle School	July 19, 2006	9
Southwest Community Center	July 20, 2006	19
Onondaga Nation School	July 27, 2006	27
	Total	195

Table 5.2 Onondaga Creek Community Forums: dates, locations and written input received.

Top Ten Aggregate Goals: Community Forums

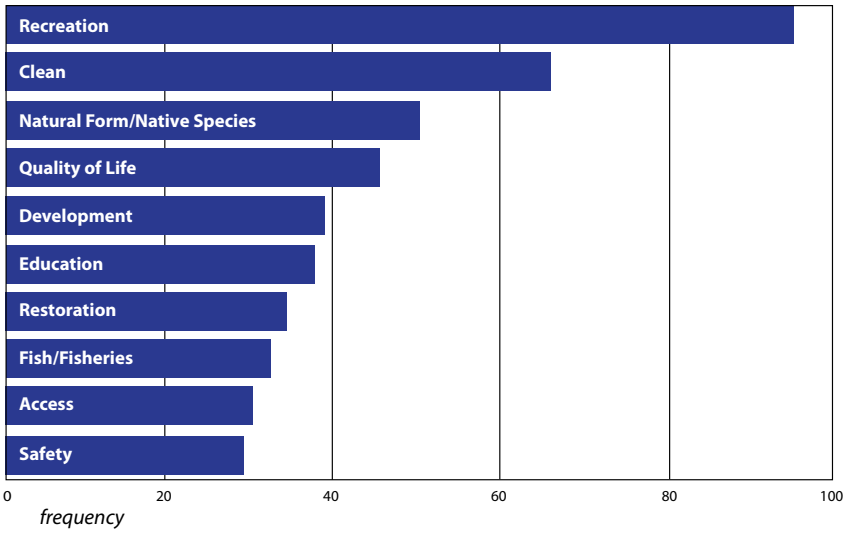


Figure 5.2 Onondaga Creek Community Forums: top ten most frequently mentioned goals, received through written input, in aggregate (see Chapter 4 and Appendix G).

Top Ten Aggregate Concerns: Community Forums

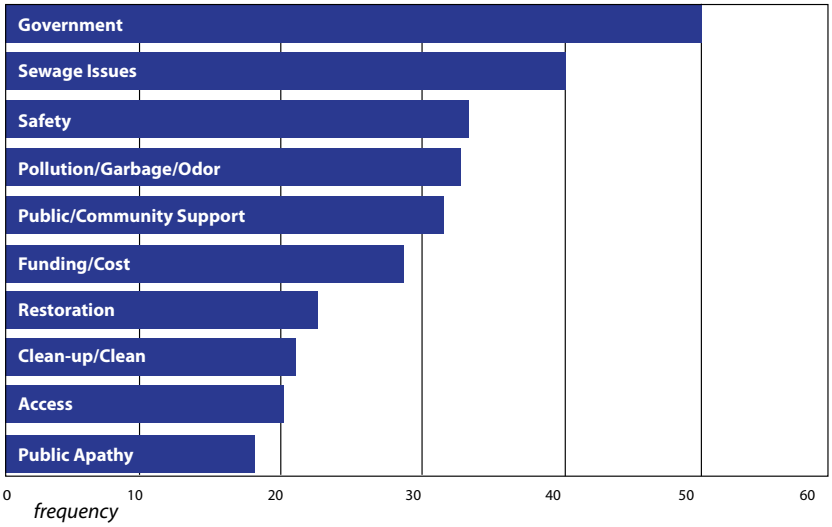


Figure 5.3 Onondaga Creek Community Forums: top ten most frequently mentioned concerns, received through written input, in aggregate.

Stakeholder Organization Meetings Goals and issues - Results

Stakeholder Organization Meetings

Meeting Name	Date	Sets of Goals and Issues Returned
Zen Center	June 13, 2006	5
Canopy	December 16, 2006	13
NAACP	January 25, 2007	3
Trout Unlimited	February 7, 2007	21
Izaak Walton League	February 12, 2007	7
Stakeholder Meeting at the MOST	March 20, 2007	70
Government Workshop	June 14, 2007	29
Syracuse Sunrise Rotary	June 29, 2007	17
	Total	165

Table 5.3 Stakeholder organization meetings: dates, locations and written input received.

Top Ten Aggregate Goals: Stakeholder Meetings

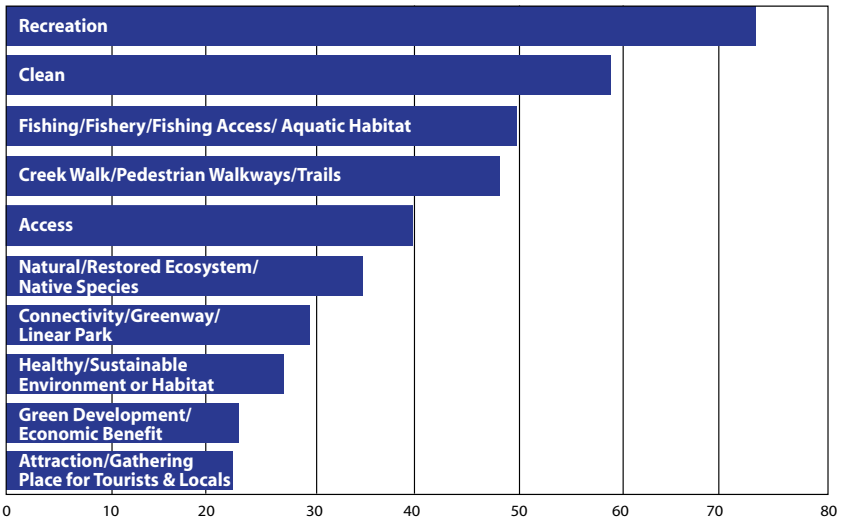


Figure 5.4 Stakeholder Organization Meetings: top ten most frequently mentioned goals, received through written input, in aggregate.

Top Ten Aggregate Concerns: Stakeholder Meetings

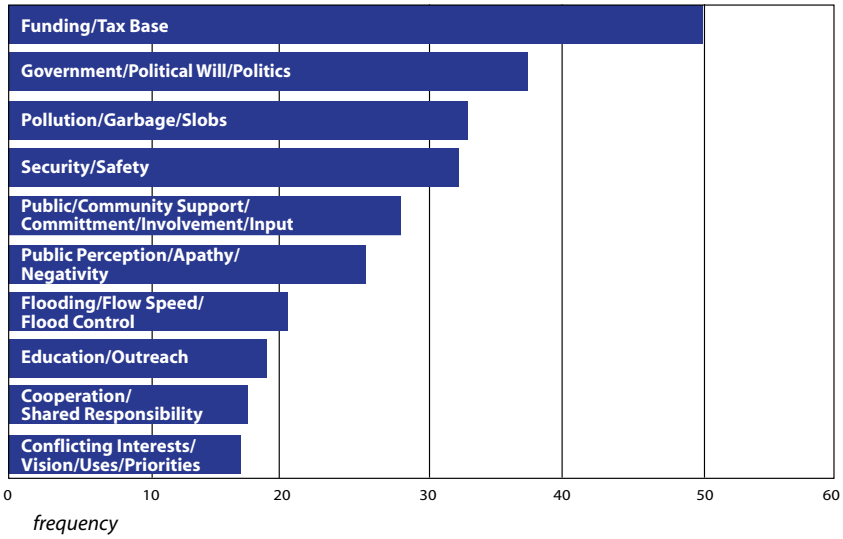
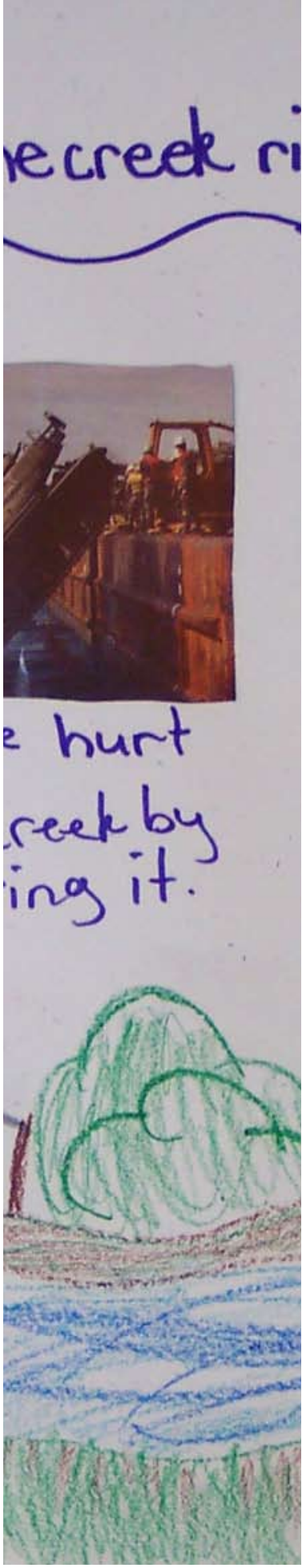


Figure 5.5 Stakeholder Organization Meetings: top ten most frequently mentioned concerns, received through written input, in aggregate.



Working Group - Results

Revitalization Map Series

As part of plan development, the Working Group generated a set of options that represented hydrological, biological and land use/access/recreational options for revitalization. The Working Group used symbols generated by OEI to represent these options during the *design charrette* process in May and June of 2007. The symbols were placed on a series of planning maps during the charrette; map results are found on pages 48-69.[1] The symbols key defines the options and can be found on pages 46 and 47. The process for creating the maps and developing the project areas is described in Chapter 4.

Project areas on the revitalization maps are groupings of symbols that suggest specific areas of work. Adjacent to the maps there are synopses of each project area based on the revitalization map results and notes taken during the design charrette. The project areas do not reflect land purchases, rather they represent areas of focus for future revitalization work. The potential project areas were created for two reasons: first, grouping symbols into project areas ascribes them a recognizable identity for funding and building public support; second, project areas group revitalization ideas so that they are conceptualized holistically. Some recommendations will be easy to implement and others will be more difficult. Grouping easy and difficult ideas together serves as a reminder that the creek and its surrounding watershed are an ecosystem that should receive full revitalization, rather than simply completing "cosmetic" treatments, leaving more difficult projects undone.

Public input and community involvement in project implementation will be essential for success of the plan and any resulting projects.

The revitalization maps are conceptual. Just as at the public input meetings, the Working Group was asked to "think big" about the future of Onondaga Creek. Ideas on paper help move the community and decision makers to revitalization actions. Public input and community involvement in project implementation will be essential for success of the plan and any resulting projects. It should also be noted that broad-scale public access or lengthy trails are not proposed in the privately owned, rural sections of Onondaga Creek. There are fishing access points and interpretive trails proposed in specific areas. Any access on private land must be accomplished with landowner cooperation; otherwise it will not be attempted.

As stated in the Working Group's goals (see the next section of results), a balance between use and protection has to be achieved. Community input indicated that forms of recreation, followed by a clean creek with natural areas and fishing opportunities were the most frequent goal themes for Onondaga Creek. Striking the balance between use and protection will require accommodating the following factors: increasing recreational opportunities, ensuring clean water, protecting natural areas in the watershed, and respecting the rights of private land owners.

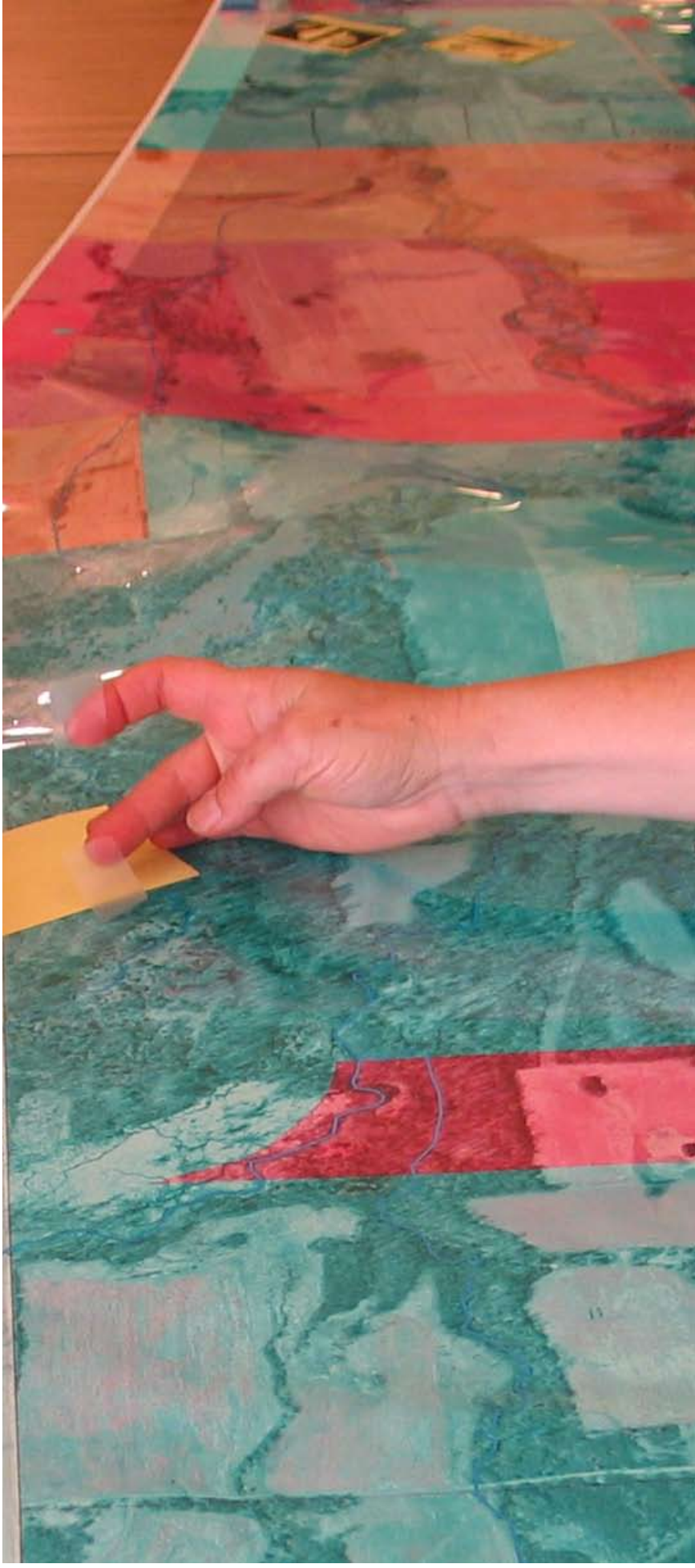
[1] The original planning maps can be viewed by appointment at Onondaga Environmental Institute.

To indicate their preferred project areas, attendees of the October 2007 Working Group meeting placed sets of stars directly on the original revitalization maps to "vote" for their preferred potential project areas. Absent Working Group members were also given the opportunity to send in their votes by mail. Voting results reflect the Working Group's determination for which project areas best reflect plan goals and priorities.

In the urban, transition and rural sections, the Working Group preferred the Southside Area, the South Valley Area and the Onondaga Nation Area, respectively. Created images, or renderings, that represent ideas from the revitalization maps, are included for the Southside Area and the South Valley Area.

Potential Project Area	Map	Votes
Urban Section		
Southside Area	F	21
Botanical Garden Area	F	20
Inner Harbor	F	18
Armory Square	F	12
Clinton Square	F	11
Franklin Square	F	8
Furnace Brook Daylighting Project	F	7
Transition Sections		
South Valley Area	E	31
North Valley Area	E	25
Valley Watershed Biopreserve	E	20
Furnace Brook Watershed	L	20
Rural Sections		
Onondaga Nation Area	D	14
Honeywell Lands South	B,I	13
Fall Creek Area (Blue Hole)	J	12
Mudboils Area	B	8
LaFayette Apple Festival	C	7
Rainbow Creek Area	M	7
Vesper/Headwaters Area	A	6
Kennedy Creek Area	K	6
South Onondaga Area (W. Branch)	G,H	6
Fellows Falls Area	A	5
Honeywell Lands North	C	5
Central LaFayette Area	K	5
Pumpkin Hallow Area (W. Branch)	G,H	5
Tully Farms Byway Signage Project	C	4
Headwaters Gravel Mine	B	2

Table 5.4 Working Group: Potential project area voting results



Symbols Key for Revitalization Maps

Hydrological

Dam Management

Dam Modification
Redesign or modification of existing dam

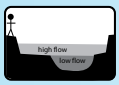
Best Management Practices

RURAL
Best Management Practices

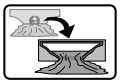
Rural BMP
Strategies for preventing/reducing non-point source pollution in runoff, including created wetlands and vegetated filter strips, barnyard run-off control systems (prevents waste from becoming runoff).

Urban BMP
Strategies for managing stormwater and CSOs, including 'green' practices like rain gardens, urban tree plantings, green roofs (plants on roofs that soak up rainwater), and permeable pavements (pavement that allows infiltration of water).

Stream Channel Modification

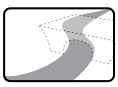


Compound Channel
A stepped channel that accommodates both low and high flow. Results in safer conditions during high flow.



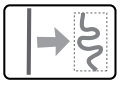
Bridge/Culvert Modification
Modify or replace a culvert that acts as a barrier to fish migration or is undersized, causing water to back up during floods.

Create Floodplain and De-channelize Stream
The practice of returning a steam channel to as natural a condition as possible, given current constraints, while creating a stable, non-erosive channel.



Stream Daylighting
A stream or part of a stream that currently is underground is deliberately uncovered and reestablished in its old channel or in a new channel threaded between existing structures.

Re-create Multiple Channels
Change a single channel into multiple channels, to even stream flow across the length of stream.



Create Stream Meander
Create curves in the stream. This is a change from a channelized system to a more natural system.

Floodplain Realignment

Reconnect Lost Tributaries
Reconnecting a tributary that has been re-routed to stormwater or sewer pipes back to main stream channel.

Flood and Stormwater Retention Basin
Basin that retains stormwater for infiltration, pollution reduction and downstream water quality improvements.

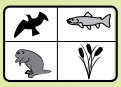
Re-connect Wetlands with Creek Floodplain
Reconnection of wetland drainage systems to creek floodplain, increasing vegetation diversity and flood storage.

Biological

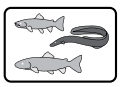
Biological Management

Plant Riparian Shade Trees
Improves and protects water quality and wildlife habitat by moderating stream temperature, stabilizing streambanks, and filtering pollutants.

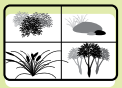
Plant Native Species
Native species are well adapted to the climate and are insect and disease resistant, preferred as habitat and food sources by native wildlife.



Restore Native Floodplain Species
Plants, mammals, fish, birds, reptiles, amphibians, and insects.



Trout/Eel/Salmon Habitat Restoration
Create aquatic habitat conditions that relate to biological requirements and preferences of these organisms.



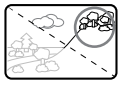
Alternative Hard Surfaces for Streambank
Shrubs, Rocks and Gravel, Plants, Trees.

Control/Remove Invasive Vegetation
Control or remove invasive vegetation.

Biological

Create/Manage/Restore Wetland

Either emergent wetland with gassy/shrubby vegetation, or forested wetland with tree species adapted to wetland soil types.

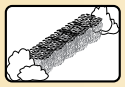


Create/Restore Upland Area

Higher areas upslope of streams, wetlands and riparian zones.

Land Use

Safety/Flood Management

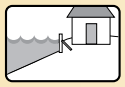


Natural Fence/Barrier

Shrubs, trees or vegetation planted next to the creek, as a barrier.

Improve Lighting

Increase lighting for safe use without causing harm to other species.



Flood-Proof Buildings

Flood-proofing individual structures with barriers, door dams and other measures.

Safety Measures

Can include high water warning lights, signage, fencing.

Recreation/Access

Fishing Access Point

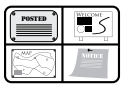
Create public fishing access.

Pedestrian Bridge

Bridge restricted to motor vehicles, intended for pedestrian/bike use.

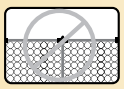
Whitewater Park

Intended for kayak/canoe access, can include construction of stream features that enhance whitewater recreation.



Signage

Can include educational kiosks, nature trail, and directional types of signs.



Remove Chainlink Fencing

Create access or replace with more aesthetic options.

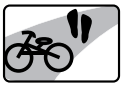
Nature Trail

A natural trail with small interpretive/educational signs.

Remove Overgrowth Above/ Around Creek

Remove excess invasive vegetation.

Kayak/Canoe/Boat Access Point

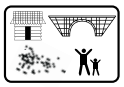


Paved or Gravel Foot/Bike Path

Land Management

Urban Ecopark

A community of businesses that enhance environmental and economic performance by collaborating to manage raw materials, energy, water, and waste.



Cultural/Historic Site

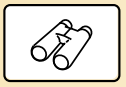
Buildings, sites, land of cultural or historical importance, open to visitation.

Multiple Use Park

Offer open space and recreational opportunities, includes visitor facilities and site improvements.

Urban Creek Preserve

Similar to a Bio Preserve but set in an urban environment. Undeveloped greenspace with minor improvements, facilities. It may be used to connect other greenspace and corridors.



Scenic Use Area

Natural vegetation, some social encounters, some visitor facilities, designed for outdoor recreation.

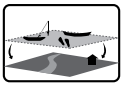
Bio Preserve

Natural vegetation, few social encounters, designed to preserve native plant and animal communities.

Land Acquisition

Creation of Public Park Land

Land purchased by a municipality or organization, managed and kept in a natural state, accessible to the public.



Purchase Private Land Easement

Includes conservation easements, a legal agreement between a landowner and an organization or government that prevents development or preserves scenic, natural values of the land.

MAP A: Vesper to Tully, Main Channel

Vesper/Headwaters Area (From Strong Road, along Route 80, to headwaters)

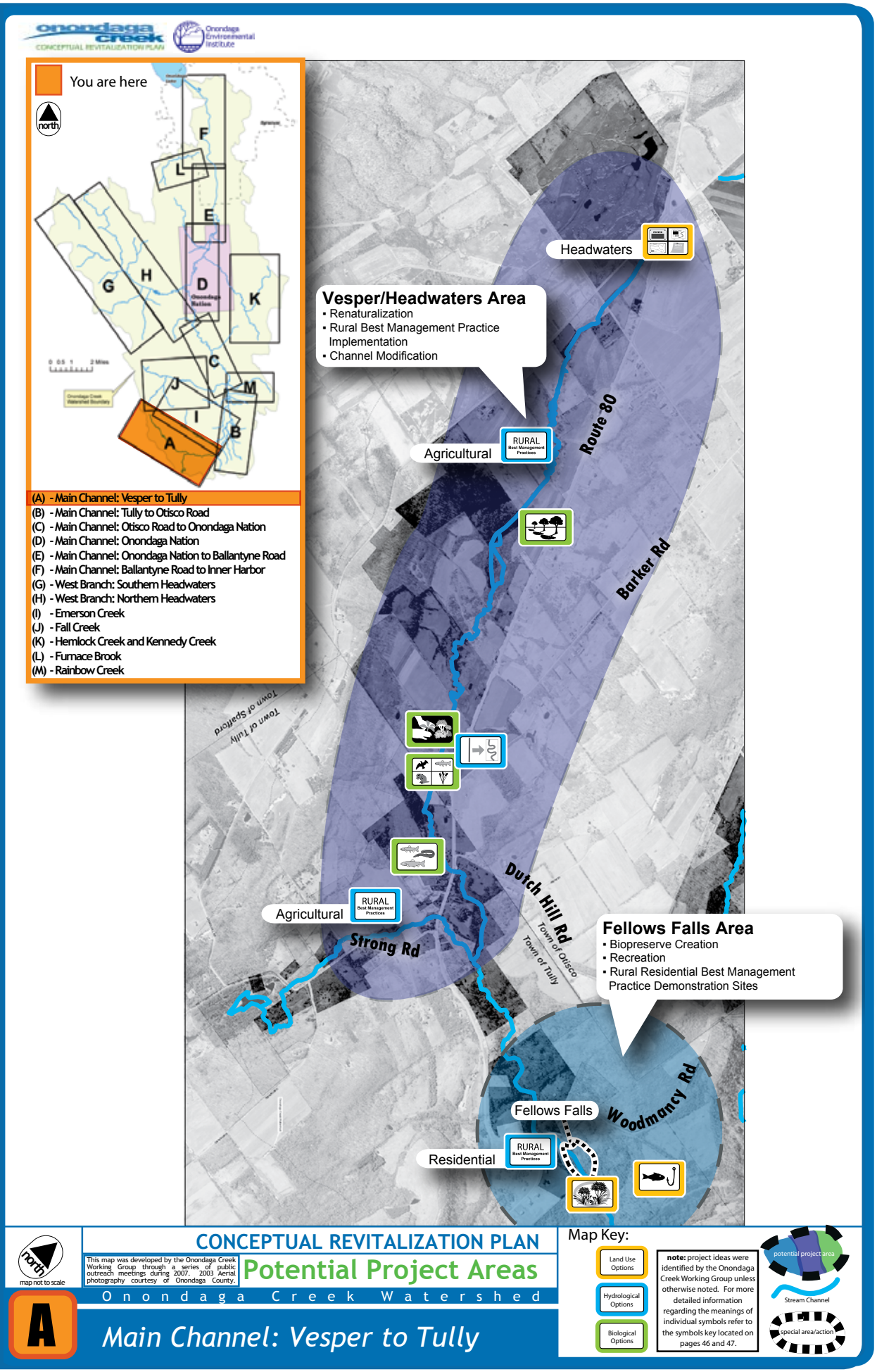
- **Renaturalization**
- **Rural Best Management Practice Implementation**
- **Channel Modification**

This project area encompasses the headwaters to Onondaga Creek's main branch that runs parallel to Route 80. Part of this stream reach is one of two worst reaches for aquatic habitat survey scores (see Aquatic Habitat Fact Sheet, Appendix B). *Renaturalization* ideas here include planting *riparian*, or streambank, shade trees and restoring habitat for *native species*, both terrestrial and aquatic. The Onondaga Creek Working Group's rural map team noted the importance of a continuous riparian buffer here, managed by multiple owners. Agricultural *best management practices* (BMPs) are also recommended in this potential project area. Some BMPs are identical to the above recommendations, for example, establishing a riparian forest buffer. Other BMPs help habitat restoration by managing runoff from agricultural land including nutrients, pesticides and soil erosion (see Appendix I). The stream has been straightened in some sections in this potential project area; reinstituting a meandering form is a long-term recommendation, which will require developing a cooperative relationship with landowners. Lastly, the rural team recommended placement of a sign marking the headwaters of Onondaga Creek on Route 80.

Fellows Falls Area (Woodmancy Road and Route 80 area)

- **Biopreserve Creation**
- **Recreation**
- **Rural Residential Best Management Practice Demonstration Sites**

Fellows Falls is a well-loved spot on the main branch of Onondaga Creek, mentioned in community input as a place for protection (see Appendix G). This potential project area recommends creating a biopreserve to protect the scenic and natural integrity of the falls. Biopreserve creation would necessitate the cooperation of the landowner, Honeywell International, Inc. Fishing access is a recommended recreational use on the stretch of creek in this area. Noting that residential properties back up to the falls along Hidden Falls Road, rural team recommendations also include "residential best management practices". These might include homeowner education about yard waste management, minimizing lawn fertilizer and pesticide use, and establishment and maintenance of adequate vegetation buffers to protect the creek from residential runoff. Capitalizing on Fellows Falls status as a familiar scenic spot on Onondaga Creek, residential best management practices might be established as a demonstration site with willing property owners, providing a model for other rural residential landowners in the watershed. In discussion during map development, the rural team noted that town planning and zoning boards of appeal need to work with landowners and developers for creek revitalization and protection.


onondaga creek
CONCEPTUAL REVITALIZATION PLAN
Onondaga Environmental Institute
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(A) - Main Channel: Vesper to Tully
(B) - Main Channel: Tully to Otisco Road
(C) - Main Channel: Otisco Road to Onondaga Nation
(D) - Main Channel: Onondaga Nation
(E) - Main Channel: Onondaga Nation to Ballantyne Road
(F) - Main Channel: Ballantyne Road to Inner Harbor
(G) - West Branch: Southern Headwaters
(H) - West Branch: Northern Headwaters
(I) - Emerson Creek
(J) - Fall Creek
(K) - Hemlock Creek and Kennedy Creek
(L) - Furnace Brook
(M) - Rainbow Creek
Headwaters
Vesper/Headwaters Area
▪ Renaturalization
▪ Rural Best Management Practice Implementation
▪ Channel Modification
Agricultural
RURAL Best Management Practices
Route 80
Barker Rd
Dutch Hill Rd
Town of Otisco
Town of Tully
Agricultural
RURAL Best Management Practices
Strong Rd
Fellows Falls Area
▪ Biopreserve Creation
▪ Recreation
▪ Rural Residential Best Management Practice Demonstration Sites
Woodmancy Rd
Fellows Falls
Residential
RURAL Best Management Practices
north
map not to scale
CONCEPTUAL REVITALIZATION PLAN
Potential Project Areas
This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.
Onondaga Creek Watershed
A
Main Channel: Vesper to Tully
Map Key:
Land Use Options
Hydrological Options
Biological Options
note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.
potential project area
Stream Channel
special area/action

Mudboils Area (Otisco Road to Town of LaFayette line)

- **Mudboils Maintenance/Sediment Control**
- **Park Creation**
- **Nature Trail Creation**
- **Public Access**
- **Investigate, find solutions for liability issue**

The mudboils area near Otisco Road is an important potential revitalization project area in Tully Valley. The mudboils (see Chapter 3 and Mudboils Fact Sheet, Appendix B) are continuing phenomena near Onondaga Creek that can add fine-grained sediment to the creek channel, affecting water quality. The U.S. Geological Survey (USGS) and Onondaga County Soil and Water Conservation District (OCSWCD) provide technical advice for Onondaga Lake Partnership (OLP) sponsored remediation projects associated with mudboil management. The mudboils will require ongoing remediation into the future. Recommendations in this project area include mudboil maintenance and sediment control, including maintaining the existing remedial settling basin. Recommendations also include investigating purchase of the area from Honeywell International, Inc. to create a county- or state-owned public park. As part of the park, interpretive trails are recommended, creating an educational access site for this unique area. Land subsidence and treacherous conditions at active mudboil sites require an investigation into landowner liability before public access is created. Lastly, reconstructing the bridge at the Otisco Road crossing is recommended.

Headwaters Gravel Mine Area (North of Route 80 near Tully Farms Road)

- **Investigate/follow-up on NYS Department of Environmental Conservation's permit conditions and enforcement**

This project area is identified based on water quality concerns. There is a gravel mine at the headwaters of a small tributary of Onondaga Creek. The mine is owned by Cranesville Block Company, Inc. Wild brook trout were reported in the tributary in the 1990's (see Fish Fact Sheet, Appendix B). The Working Group recommendation is to investigate the status of the New York State Department of Environmental Conservation (NYSDEC) permit for mine operation and enforcement of the permit, to protect this trout stream.

MAP B: Otisco Road to Route 80

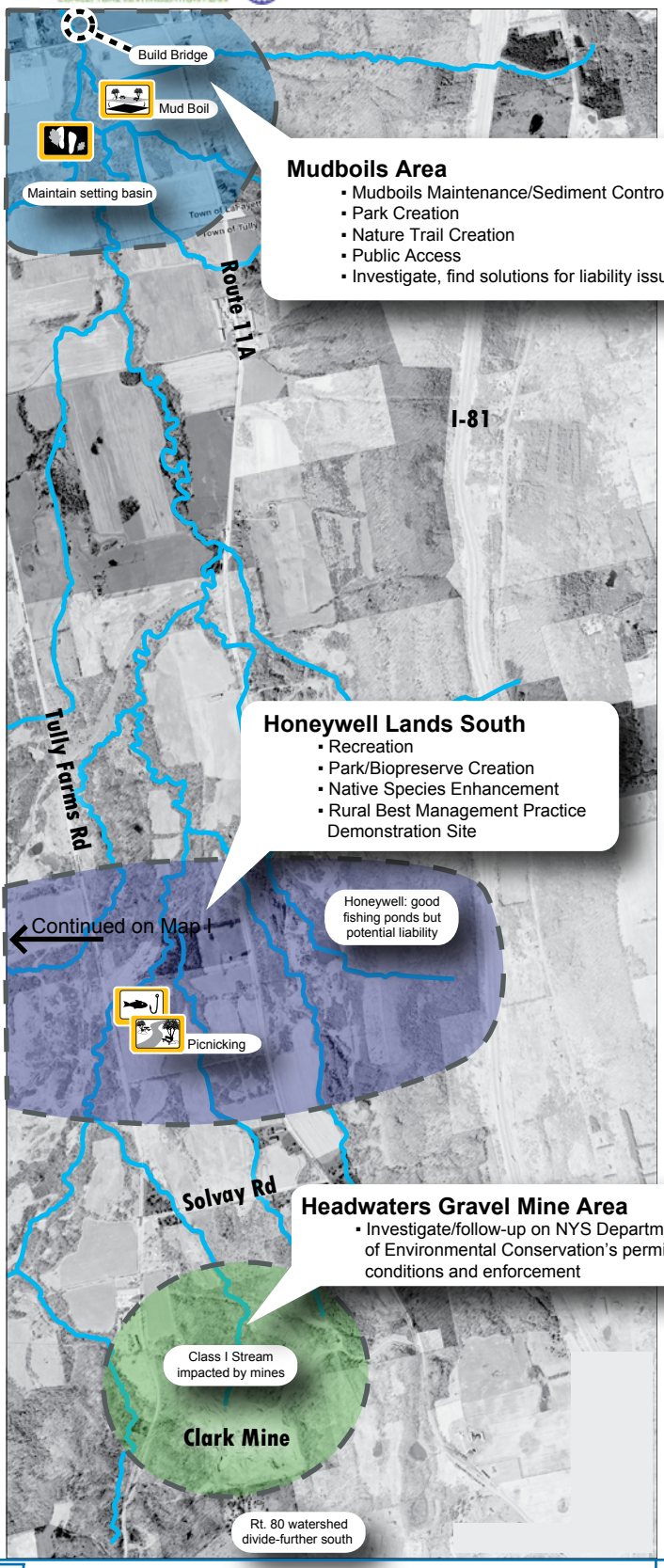
Honeywell Lands South (Overlaps on Map I; I-81, across Tully Farms Road, to near Woodmancy Road)

- **Recreation**
- **Park/Biopreserve Creation**
- **Native Species Enhancement**
- **Rural Best Management Practice Demonstration Sites**

This project area spans maps B and I. Honeywell International, Inc. (Honeywell) owns most of the land in the project area. The rural team identified this area as a potential site for recreation in the form of fishing access points, particularly at the site where Onondaga Creek crosses Tully Farms Road, noting that any access point requires cooperation with the landowners. This road crossing site may also accommodate a small multiple-use park surrounding the fishing access point, including picnicking. Other potential fishing access points in this project area are the Honeywell owned subsidence ponds east of Route 11A; discussion of liability issues is recommended. Creation of a biopreserve was proposed on the Honeywell owned land; the rural team recommended identifying criteria for accomplishing land protection. Another recommendation is to enhance native plant species in the project area with plantings in needed locations; the rural team specifically identified the creek corridor along Route 11A. The rural team recommended practicing agricultural BMPs at this site. Honeywell leases land to local farmers, who use it for grazing and field crops. In cooperation with the farmers and Honeywell, this area might serve as an agricultural BMP demonstration site, acting as a model for other landowners in the watershed.

Figure 5.6 Chesapeake Bay watershed sign on I-81, Virginia.

The Onondaga Creek watershed forms part of the southern boundary of the Seneca-Oneida-Oswego river basin, which drains to Lake Ontario and ultimately to the Saint Lawrence River (refer to Figure 1.2). Directly south of the creek's headwaters, watersheds drain south, to the Susquehanna River and ultimately to the Chesapeake Bay. In recognition of the watershed's unique position, the rural team recommended marking the drainage divide between the St. Lawrence River and the Chesapeake Bay with a sign on Interstate 81 (see Figure 5.6 for a similar example). As this project area borders Interstate 81, this is a potential site for sign placement, perhaps with the sponsorship of Honeywell.



Mudboils Area

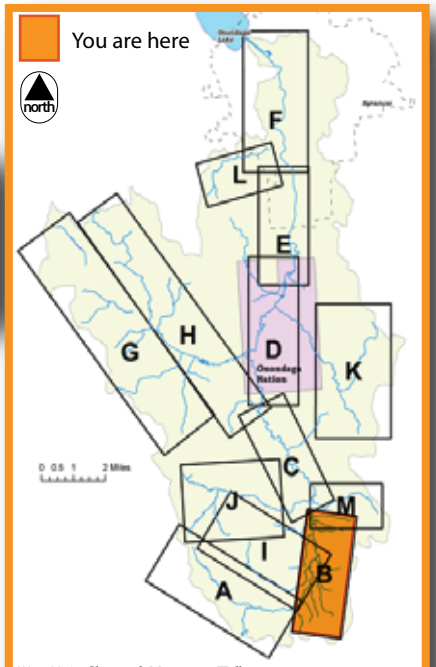
- Mudboils Maintenance/Sediment Control
- Park Creation
- Nature Trail Creation
- Public Access
- Investigate, find solutions for liability issue

Honeywell Lands South

- Recreation
- Park/Biopreserve Creation
- Native Species Enhancement
- Rural Best Management Practice Demonstration Site

Headwaters Gravel Mine Area

- Investigate/follow-up on NYS Department of Environmental Conservation's permit conditions and enforcement



(A) - Main Channel: Vesper to Tully
(B) - Main Channel: Tully to Otisco Road
(C) - Main Channel: Otisco Road to Onondaga Nation
(D) - Main Channel: Onondaga Nation
(E) - Main Channel: Onondaga Nation to Ballantyne Road
(F) - Main Channel: Ballantyne Road to Inner Harbor
(G) - West Branch: Southern Headwaters
(H) - West Branch: Northern Headwaters
(I) - Emerson Creek
(J) - Fall Creek
(K) - Hemlock Creek and Kennedy Creek
(L) - Furnace Brook
(M) - Rainbow Creek

north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN

Potential Project Areas

Onondaga Creek Watershed

B

Main Channel: Tully to Otisco Road

Map Key:

Land Use Options

Hydrological Options

Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area

Stream Channel

special area/action

MAP C: Route 20 to Otisco Road

LaFayette Apple Festival Area (Route 20 to Webster Road)

- **Open Space Creation/Linkages**
- **Recreation**
- **Rural Best Management Practices Demonstration Projects**

The intersection of Route 20 (Cherry Valley Turnpike) and Onondaga Creek presents a number of concepts for revitalization. The rural team recommended sign placement on Route 20 at Onondaga Creek to notify drivers about the watershed. A fishing access point is recommended at the same location. A scenic overlook area is suggested at the intersection of Routes 11A and 20. Save the County Land Trust owns a parcel of land south of the road that might host an interpretive trail. The rural team suggested investigating easements with willing landowners for a fishing access point where the creek crosses Tully Farms Road and extending a natural trail along the creek corridor that links the Save the County Land Trust-owned land and the Apple Festival land. Lastly, the Apple Festival land is another area recommended for agricultural BMP demonstration.

Tully Farms Byway Signage Project (Webster Road to Nichols Road)

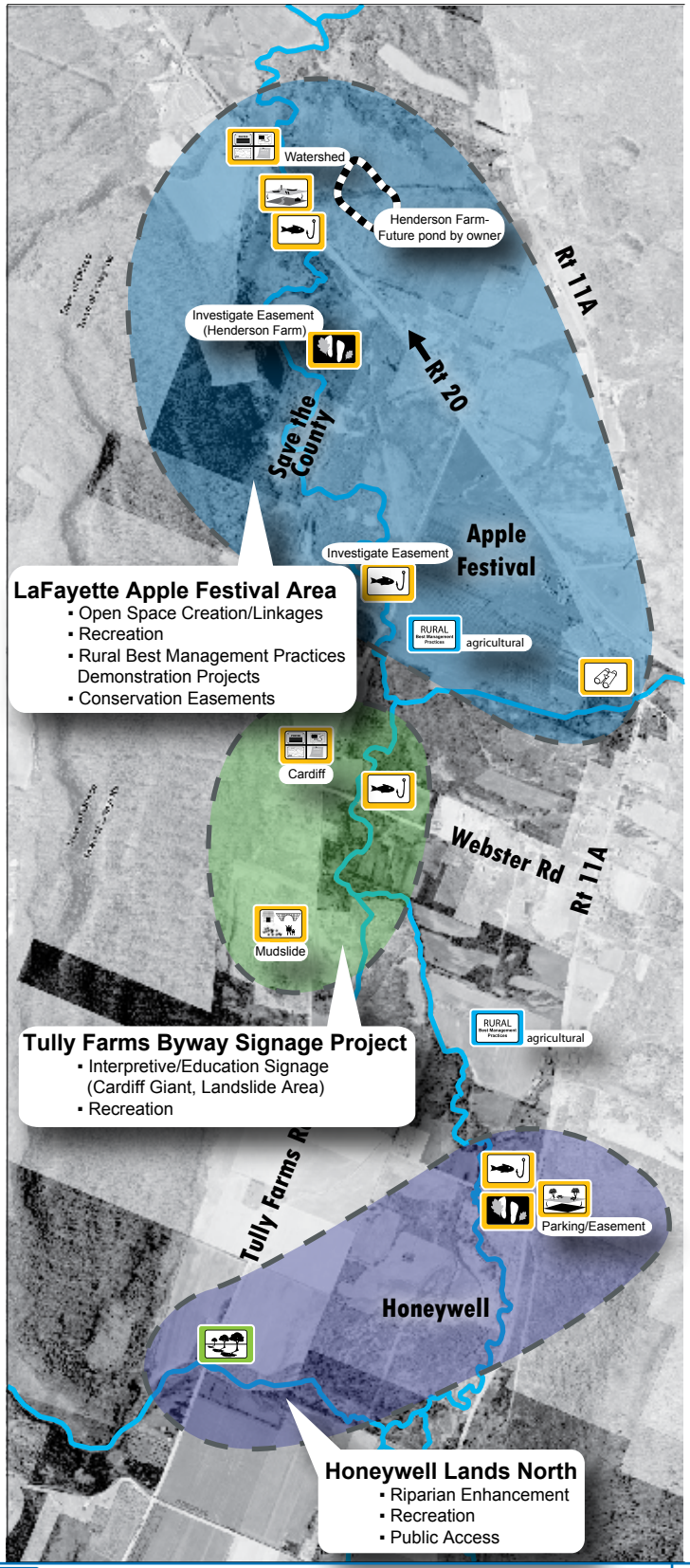
- **Interpretive/Education Signage (Cardiff Giant, Landslide Area)**
- **Recreation**

The rural team proposed marking two sites along Tully Farms Road near Webster Road as part of the history and heritage of the Onondaga Creek watershed. An interpretive sign is proposed at the site of the "discovery" of the Cardiff Giant, a nineteenth century hoax. A cultural/historical site is proposed in the 1993 landslide area.

Honeywell Lands North (Roughly Nichols to Otisco Road)

- **Riparian Enhancement**
- **Recreation**
- **Public Access**

Recommendations for this area include a fishing access point on the main branch of Onondaga Creek on the south side of the Nichols Road crossing. Honeywell owns approximately 90 acres of creek-side land here, which contain protected wetlands and may contain agricultural leases. A parking easement and natural trail are recommended as fishing access enhancements to consider, requiring cooperation from the landowner, neighbors and any leaseholders. At the intersection of Tully Farms Road and Fall Creek, planting riparian trees for shade is recommended, which will also require landowner support and cooperation.



(A) - Main Channel: Vesper to Tully
(B) - Main Channel: Tully to Otisco Road
(C) - Main Channel: Otisco Road to Onondaga Nation
(D) - Main Channel: Onondaga Nation
(E) - Main Channel: Onondaga Nation to Ballantyne Road
(F) - Main Channel: Ballantyne Road to Inner Harbor
(G) - West Branch: Southern Headwaters
(H) - West Branch: Northern Headwaters
(I) - Emerson Creek
(J) - Fall Creek
(K) - Hemlock Creek and Kennedy Creek
(L) - Furnace Brook
(M) - Rainbow Creek

north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN
Potential Project Areas
Onondaga Creek Watershed

C
Main Channel:
Otisco Road to Onondaga Nation

Map Key:
Land Use Options
Hydrological Options
Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area
Stream Channel
special area/action

MAP D: Onondaga Nation

Onondaga Nation

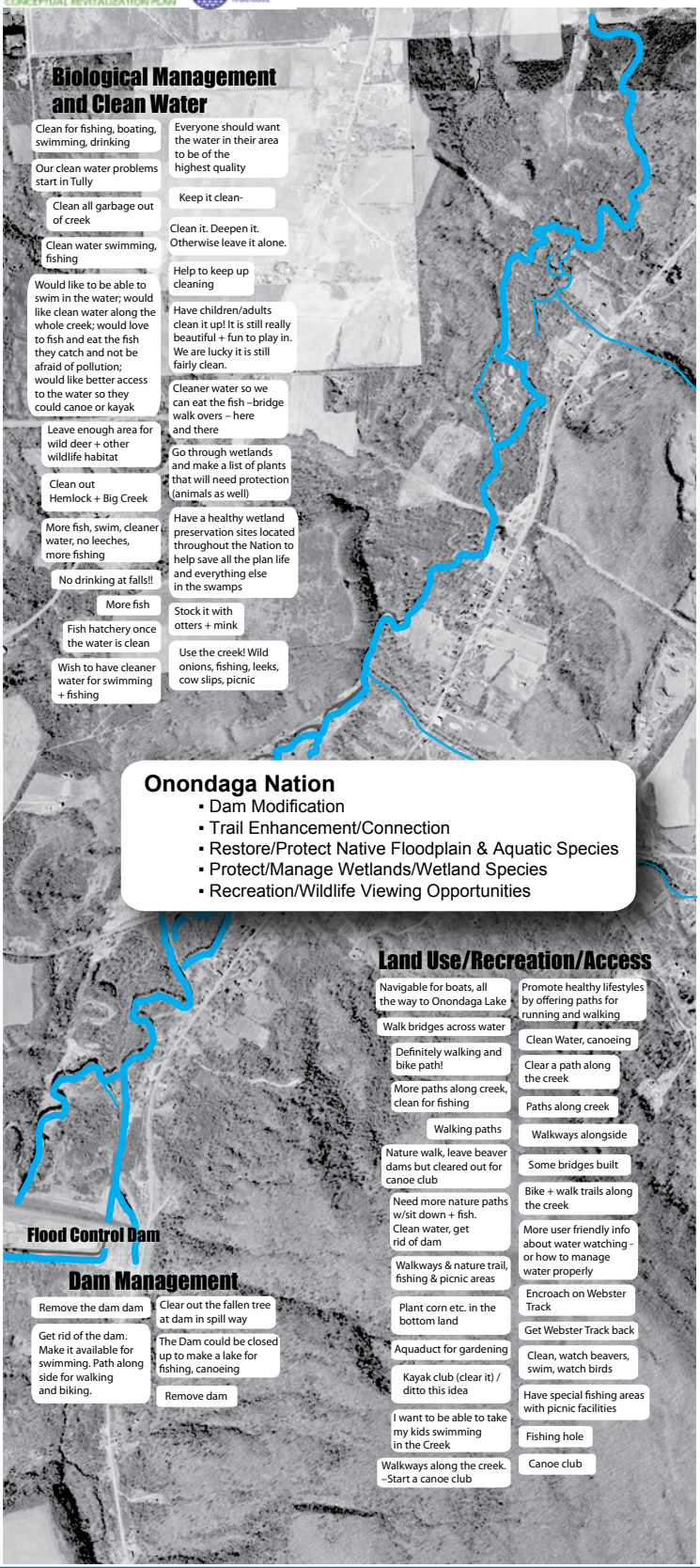
- **Dam Modification**
- **Trails Enhancement/Connection**
- **Restore/Protect Native Floodplain & Aquatic Species**
- **Protect/Manage Wetlands/ Wetland Species**
- **Recreation/Wildlife Viewing Opportunities**

The Onondaga Nation is a *sovereign* nation. Permission is needed from the Onondaga Nation Council of Chiefs to navigate or gain access to Onondaga Creek on the Onondaga Nation (see Chapter 3 and Access Fact Sheet, Appendix B). Onondaga Nation members are solely appropriate to plan and implement creek revitalization within the Onondaga Nation. Implementation of revitalization ideas for Onondaga Creek on the Onondaga Nation will require approval/ authorization of the Onondaga Nation Council of Chiefs.

Ms. Jeanne Shenandoah, an Onondaga Creek Working Group member, facilitated community participation on the Onondaga Nation to complete revitalization map D. Map D represents the creek corridor through the Onondaga Nation. During June and July of 2007, Ms. Shenandoah made the map available at locations on the Onondaga Nation. Instead of using the symbols cards, Onondaga Nation members shared their ideas on sticky notes placed on the map. Ms. Shenandoah returned the map to OEI, where the sticky notes were sorted by theme and transcribed verbatim to a digital version, presented on page 55. Revitalization map D was incorporated into the revitalization map series and used in subsequent Working Group meetings, see Chapter 4 for revitalization map review process.

Via their comments placed on the map, Onondaga recommended changes to the flood control dam, built on the Nation's resident territory by the US Army Corps of Engineers (USACE) in 1949, ranging from removing it to creating a lake behind it for fishing and canoeing.[2] Several recommendations include paths alongside Onondaga Creek, for walking, running and biking, and to promote a healthy lifestyle. Canoeing, kayaking, swimming, fishing access, bridge crossings, nature interpretation and wildlife viewing were additional recreation/access recommendations. Very similar to results from the Community Forums, many recommendations encompass clean water; keeping it clean, having clean water along the whole creek, cleaning out garbage and creating a fish hatchery once the water is clean are examples. Protecting and managing all aspects of the creek ecosystem were recommended, including wetlands, wetland species, wildlife, and edible fish.

[2] An information source for options derived from flood modeling for this dam is Endreny T and M Higgins. 2008. *Adding Radar Rainfall and Calibration to the TR-20 Watershed Model to Improve Dam Removal Flood Analysis.* Journal of Water Resources Planning and Management 134(3):314-317.



(A) - Main Channel: Vesper to Tully
(B) - Main Channel: Tully to Otisco Road
(C) - Main Channel: Otisco Road to Onondaga Nation
(D) - Main Channel: Onondaga Nation
(E) - Main Channel: Onondaga Nation to Ballantyne Road
(F) - Main Channel: Ballantyne Road to Inner Harbor
(G) - West Branch: Southern Headwaters
(H) - West Branch: Northern Headwaters
(I) - Emerson Creek
(J) - Fall Creek
(K) - Hemlock Creek and Kennedy Creek
(L) - Furnace Brook
(M) - Rainbow Creek

north
map not to scale

2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN

Potential Project Areas

Onondaga Creek Watershed

D

Main Channel: Onondaga Nation

Map Key:

Land Use Options

Hydrological Options

Biological Options

potential project area

Stream Channel

special area/action

note: Revitalization ideas for map D were developed on the Onondaga Nation during the summer of 2007; in conjunction with Working Group potential project area map creation. Comments represent individual nation members' visions for the creek.

MAP E: South of Ballantyne Road, Syracuse through Nedrow

Map E spans the "transitional section" of Onondaga Creek, the corridor that transitions between urban and rural parts of the watershed. Furnace Brook, Map L, was also identified as transitional. The design charrette team that worked on these maps identified three main concepts for the transitional area: **preservation**, *renaturalization*, and **education**. They also made the following overall recommendations:

- **Implement urban best management practices** (*green infrastructure*)
- **Create a** compound stream channel, **floodplain, meanders and instream habitat**
- **Re-vegetate channel with native plants**
- **Manage and restore upland areas, creating a *forever wild* biopreserve to protect springs**
- **Create or restore** vernal pools[3]
- Daylight**, or uncover, and restore tributaries**
- **Create trails on both sides of creek and connect the trail system to adjacent public lands**
- **Remove fence and/or replace with** natural fence**, where needed or wanted**
- **Install signs to name creek and tributaries**
- **Create a watershed symbol for Onondaga Creek and its watershed**

[3]Vernal pools are small, seasonal wetland depressions, often critical spawning areas for amphibians.

North Valley Area (Newell Street to W. Cheltenham Road)

- **Channel Modification**
- **Interpretive Trails**
- **Wetland Creation/Enhancement**
- **Stream Daylighting/Reconnection (City Line Creek, Kimber Brook)**
- **Public Access**
- **Educational Collaboration (Clary, McCarthy, VanDuyn, Faith Heritage, Southside Charter, McKinley-Brighton, St James Schools)**

The North Valley potential project area overlaps onto Map F2. The transitional team recommended channel modification in the North Valley project area, including creating a compound channel, reconnecting and daylighting tributaries, for example, Kimber Brook and City Line Creek. The team recommended stream meanders and floodplain reclamation where feasible, for example, near Clary Middle School. Recreation recommendations include fishing and boating access, trail creation, including an interpretive trail in Onondaga Creek's original channel, near Midland Avenue. Wetland restoration and reconnection, *invasive species* control and removal, and reestablishing native aquatic and floodplain species are recommended. The North Valley project area is rich with schools, both public and private. Opportunities for incorporating the creek into school programs include interpretive trails at Van Duyn and Clary schools.

Valley Watershed Biopreserve (Forested slopes of the upland watershed divide throughout the Valley and Nedrow, includes Rand Tract)

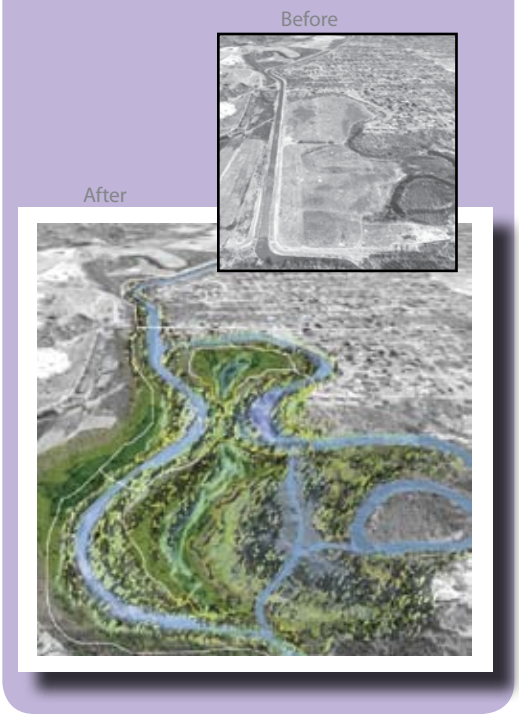
- **Land Acquisition/Biopreserve Creation**
- **Manage/Restore Upland Areas**
- **Trail Connections**

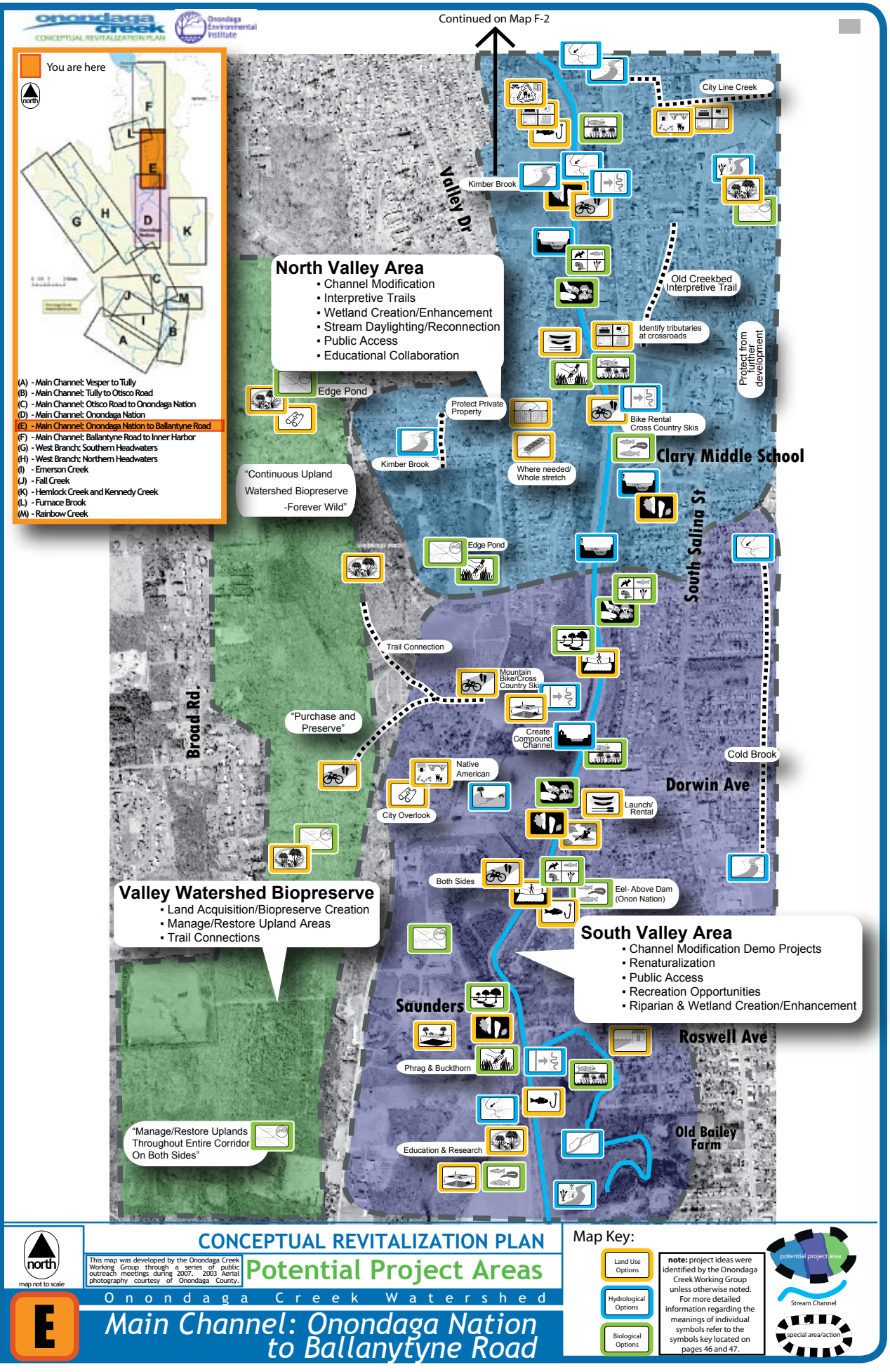
The transitional team recommended creating a *forever wild* biopreserve area in the upland slopes of Nedrow and the Valley neighborhood of Syracuse, bracketing the Onondaga Creek floodplain below. On the western side of the creek corridor, this forested area would be an extension of the Rand Tract. Springs originate in the forested slopes in this section of the creek corridor, influencing water quality in spring-fed tributaries and the creek (see Geography Fact Sheet, Appendix B). Forest protection in these transitional and urban uplands will reduce runoff and improve water quality (Nowak, et al. 2007).

South Valley Area (W. Cheltenham Road through Nedrow)

- **Channel Modification Demonstration Projects**
- **Renaturalization**
- **Public Access**
- **Recreation Opportunities**
- **Riparian and Wetland Creation / Enhancement**

There is ample opportunity to implement stream channel modification projects in the South Valley Area due to the quantity of existing *open space*. The transitional team recommended reconnecting and daylighting tributaries, like Cold Brook and creating a flood/stormwater basin on the west side of the creek corridor near Dorwin Avenue. The USACE channelized the creek between Roswell Avenue and the northern border of the Onondaga Nation in 1963 (see Flood Control Fact Sheet, Appendix B). The transitional team recommended wetlands reconstruction and the reconnection of historical meanders in this area. Water storage creation may allow for creating stream meanders and increasing riparian cover in this channelized and treeless section of Onondaga Creek, increasing habitat for both aquatic and floodplain species. Recreation and access recommendations include park and land easements, trail creation, boat rental, fishing access and pedestrian bridges near Kelley Brothers Park and Longmeadow Drive.




Continued on Map F-2
You are here
north
(A) - Main Channel: Vesper to Tully
(B) - Main Channel: Tully to Otisco Road
(C) - Main Channel: Otisco Road to Onondaga Nation
(D) - Main Channel: Onondaga Nation
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(L) - Furnace Brook
(M) - Rainbow Creek
City Line Creek
Valley Dr
Kimber Brook
North Valley Area
▪ Channel Modification
▪ Interpretive Trails
▪ Wetland Creation/Enhancement
▪ Stream Daylighting/Reconnection
▪ Public Access
▪ Educational Collaboration
Old Creekbed Interpretive Trail
Identify tributaries at crossroads
Protect from further development
Edge Pond
Protect Private Property
Bike Rental Cross Country Skis
Kimber Brook
Where needed/ Whole stretch
Clary Middle School
"Continuous Upland Watershed Biopreserve -Forever Wild"
South Salina St
Edge Pond
Trail Connection
Mountain Bike/Cross Country Ski
Broad Rd.
"Purchase and Preserve"
Create Compound Channel
Cold Brook
Native American
City Overlook
Dorwin Ave
Launch/ Rental
Both Sides
Eel- Above Dam (Onon Nation)
Valley Watershed Biopreserve
▪ Land Acquisition/Biopreserve Creation
▪ Manage/Restore Upland Areas
▪ Trail Connections
South Valley Area
▪ Channel Modification Demo Projects
▪ Renaturalization
▪ Public Access
▪ Recreation Opportunities
▪ Riparian & Wetland Creation/Enhancement
Saunders
Roswell Ave
Phrag & Buckthorn
"Manage/Restore Uplands Throughout Entire Corridor On Both Sides"
Education & Research
Old Bailey Farm
north
map not to scale
CONCEPTUAL REVITALIZATION PLAN
Potential Project Areas
This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.
Onondaga Creek Watershed
E
Main Channel: Onondaga Nation to Ballantyne Road
Map Key:
Land Use Options
Hydrological Options
Biological Options
note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.
potential project area
Stream Channel
special area/action

MAP F1: West Onondaga Street to Inner Harbor

The urban team placed their revitalization ideas on Map F, spanning the Onondaga Creek corridor from the Inner Harbor to Ballantyne Road. Map F is a detailed map with consecutive potential project areas along the length of the creek corridor. The map was split in two for legibility. The urban team made the following overall recommendations:

- **Enhance creek-side signage, including interpretive and historic markers**
- **Define criteria for creating an** urban preserve **to protect Onondaga Creek through the City of Syracuse, qualities that constitute the preserve need to be addressed along the whole corridor**
- **Increase natural percolation and filtration of stormwater into the ground in the urban creek corridor**
- **To address the above concern and reduce carbon monoxide inversions during cold weather, conduct a traffic study to address parking in the creek walk area: do not try to accommodate parking demand in the creek zone**
- **Relating to traffic study, the urban team recommends removing bridges (or convert to pedestrian use) and creating cul-de-sacs, to reduce through-traffic in neighborhoods, and to reduce stream crossings and subsequent need for stream channelization**
- **The creek walk should function as a "spinal cord" connecting lateral bike and pedestrian paths along creek walk that lead into neighborhoods**
- **Fishing access points need to be added in urban parks along Onondaga Creek**
- **Renaturalize urban space, restore native plant and fish communities throughout area, non-native plants should only be found in the arboretum**
- **Shade trees should replace invasive plant species removed from riparian areas**
- **Restore natural springs and daylight former tributaries that run into creek**
- **Create floodplain and maintain flood protection by creating a compound channel**

[4]The West Street Co
Master Plan can be
accessed from: http
syracusethenandno
org/CompPlan/Wes
WestStreetReport.p

Inner Harbor (Onondaga Lakeshore to Spencer Street)

- **Public Access**
- **Habitat Enhancement**
- **Creek-wide migratory corridor throughout area**

The urban team recommended enhancing public access, in the form of a multi-use park and biopreserve in the Inner Harbor, including adding overlooks, boating and fishing access and signage. Habitat enhancement is recommended to establish a creek-wide migratory area (for aquatic and riparian species) through the Inner Harbor. The urban team noted the Inner Harbor's disconnection from downtown. They recommended increasing access and enhancing habitat to emphasize this area as a "jewel".

Franklin Square (Spencer Street to Highway 690)

- **Trail & Habitat Enhancement**
- **Channel Enhancement**
- **Natural & Cultural Historical Interpretation**
- **Maintain continuous riparian canopy cover**

Franklin Square is recommended as an area to maintain continuous riparian canopy cover along the creek, while at the same time enhancing trail connection and natural and cultural interpretation in this historic area. The urban team noted the need to improve the pedestrian corridor under 690 with lighting. Removing overgrowth, particularly invasive species will increase visual access to Onondaga Creek from the creek walk.

Clinton Square Area (Highway 690 to Fayette Street)

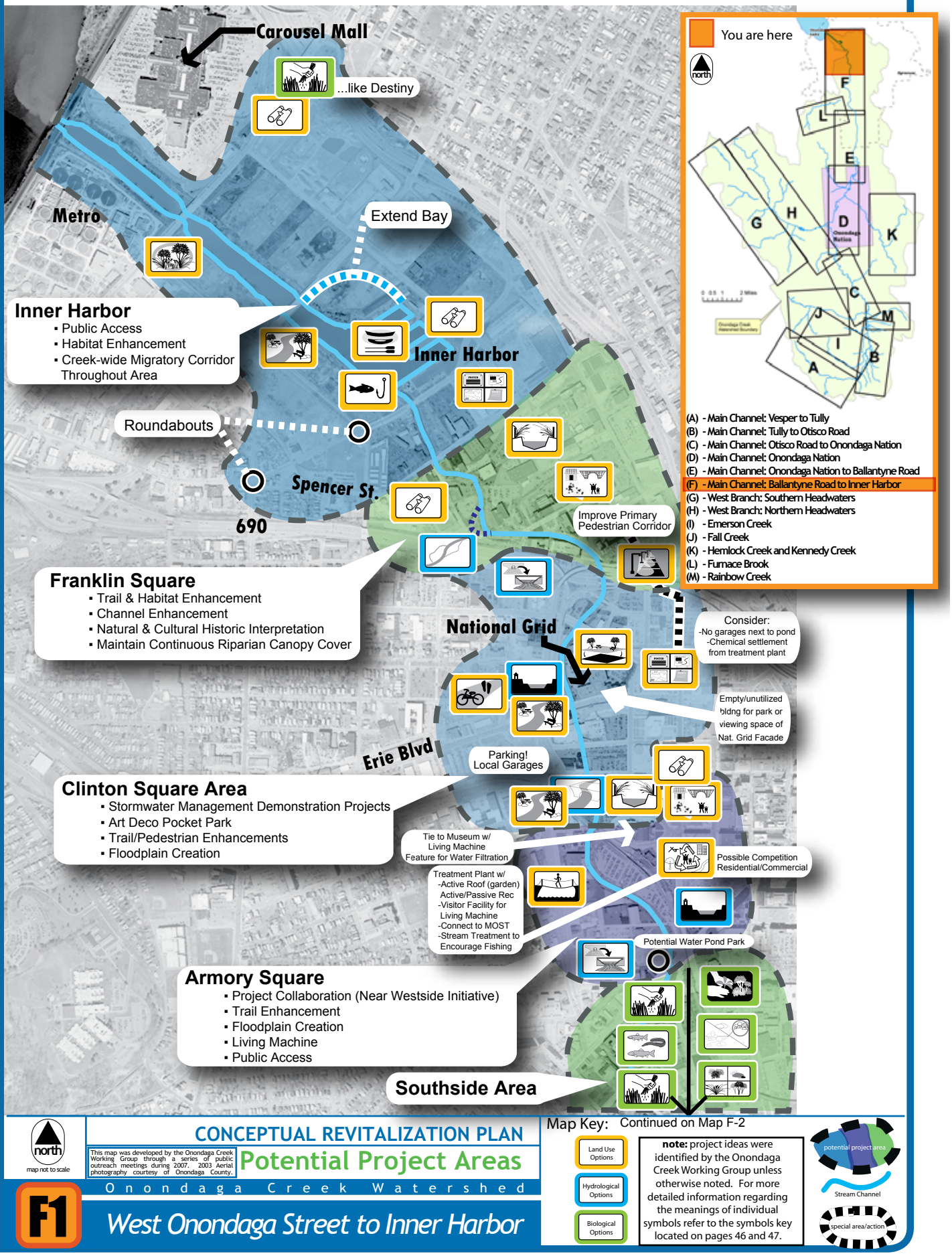
- **Stormwater Management Demonstration Projects**
- **Art Deco Pocket Park**
- **Trail/Pedestrian Enhancements**
- **Floodplain Creation**

The urban team recommends using the *West Street Corridor Master Plan* (Mercurio, 2006) to inform decisions about traffic flow, pedestrian use, park and trail planning and reintegrating the creek into this project area[4]. The urban team recommended stream daylighting and park creation to enhance visual access and capitalize on the prime Art Deco-period architecture of the National Grid building (formerly Niagara Mohawk). The urban team recommended highlighting the historical stonework over Onondaga Creek near Fayette Street (railroad bridge) and West Genesee Street (Erie Canal viaduct). This is a potential area for stormwater management demonstration projects, including working with business owners to increase on-site stormwater filtration. The urban team recommends a *linear park* along Onondaga Creek between Genesee Street and Erie Boulevard.

Armory Square (Fayette Street to West Onondaga Street)

- **Project Collaboration (Near Westside Initiative, etc.)**
- **Trail Enhancement**
- **Floodplain Creation**
- **Living Machine**
- **Public Access**

The urban team recommended bridge and culvert modification at West Onondaga Street and addition of a water pond park. Floodplain creation, using a compound channel, was also recommended. Addition of a pedestrian bridge over Onondaga Creek links Armory Square and the Near Westside and can act as an enhancement to the creek walk, and as a means of collaboration with the Near Westside Initiative. At the time of map creation in 2007, the Clinton Regional Treatment Facility was still planned. The urban team recommended modifying this facility into a *living machine* with a *green roof*, connected to the Museum of Science and Technology as a learning venue. The urban team also recommended converting the parking lot at Armory, next to Onondaga Creek, into a green space, to allow for channel modification and habitat improvement to the creek in this area.



north
map not to scale

CONCEPTUAL REVITALIZATION PLAN

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

Potential Project Areas

Onondaga Creek Watershed

F1 West Onondaga Street to Inner Harbor

Map Key: Continued on Map F-2

Land Use Options

Hydrological Options

Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area

Stream Channel

special area/action

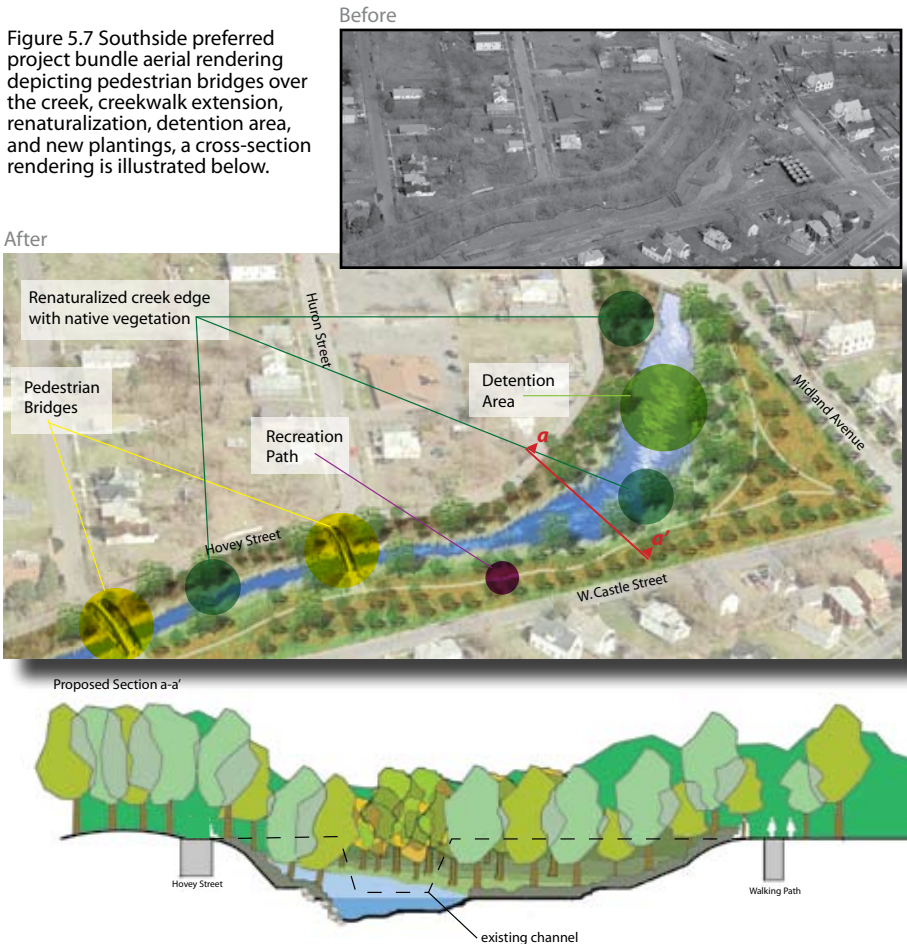
MAP F2: Ballantyne to West Onondaga Street

Southside Area (West Onondaga St. to Kirk Park Northern Boundary)

- **Renaturalization**
- **Channel Modification**
- **Trail/Greenspace Creation**
- **Public Access**
- **Stormwater Management Innovations**

This potential project area spans maps F1 and F2. The urban team envisioned the Southside Area as a key opportunity for urban renaturalization. The creation of a compound channel would enhance both aquatic and terrestrial habitat. Creek renaturalization complements use by nearby residents, through trails and greenspace creation. The urban team recommended a pedestrian bridge near Tallman Street and consideration of replacing the chain-link fencing with natural fencing where needed or wanted. Removal of invasive species and additional floodplain trees are recommended near South Avenue. A multi-use park and creation of a flood and stormwater retention basin is recommended near West Castle Street (see Figure 5.7). To most effectively renaturalize Onondaga Creek in this area, innovative stormwater management solutions will be needed, with involvement and cooperation of local residents.

Figure 5.7 Southside preferred project bundle aerial rendering depicting pedestrian bridges over the creek, creekwalk extension, renaturalization, detention area, and new plantings, a cross-section rendering is illustrated below.



Botanical Garden Area (Kirk Park to Newell Street)

- **Park/Greenspace Showcase Area**
- **Renaturalization**
- **Channel Modification**
- **Stormwater Management Innovations**

Collaboration with the Onondaga Botanical Garden and Arboretum project in this area is a key opportunity to showcase renaturalization and reintegration of Onondaga Creek into this residential community. The recommendations in this area are similar to those for the Southside potential project area. Creek renaturalization through habitat enhancement and channel modification are proposed. Restoration modeling has been conducted for parts of the creek corridor by Dr. Theodore Endreny at SUNY ESF. Figure 5.8 depicts restoration modeling done for the Kirk Park area (for explanation and examples see Appendix L.)

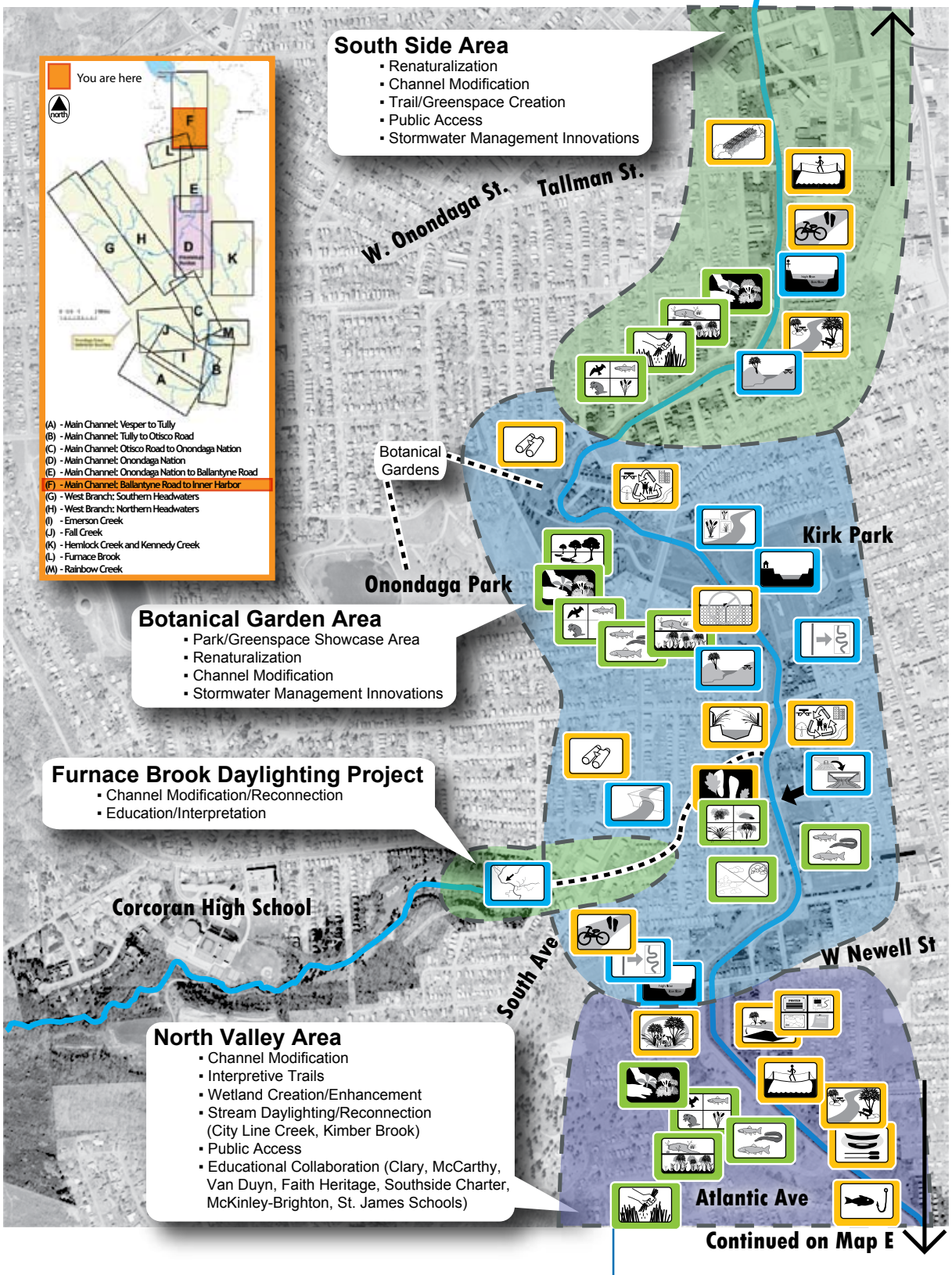
Figure 5.8 Aerial rendering of a potential channel restoration model near South Avenue, bounded by Kirk Park and Lower Onondaga Park Drive (image created by Dr. Theodore Endreny SUNY ESF).

Furnace Brook Daylighting Project (Underground portion of Furnace Brook, roughly Glenwood Avenue to Onondaga Creek Boulevard, near Elmhurst Ave.)

- **Channel Modification Reconnection**
- **Education/Interpretation**

The urban team recommended *daylighting* (uncovering) the culverted portion of Furnace Brook. The team also recommended (on Map L) adding interpretive signage at the point where the brook passes underground.

Continued on Map F-1



Continued on Map E

north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN

Potential Project Areas

Onondaga Creek Watershed

F2

Main Channel: Ballantyne to West Onondaga Street

Map Key:

Land Use Options

Hydrological Options

Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area

Stream Channel

special area/action

MAPS G & H: West Branch of Onondaga Creek

The OCRP Project Team assembled revitalization ideas for the West Branch of Onondaga Creek; the resulting map was reviewed by the Onondaga Creek Working Group.

Pumpkin Hollow – Cedarvale Area (Along Pleasant Valley to Cedarvale Road)

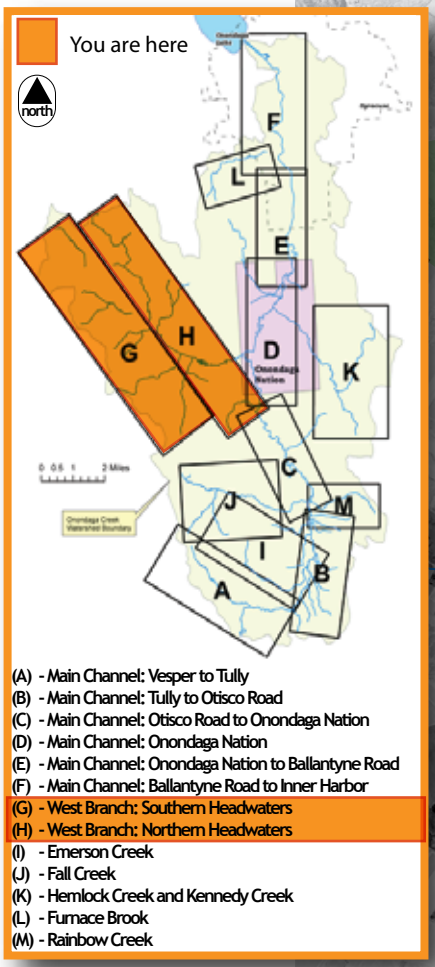
- **Land Easements**
- **Wetland/Floodplain Species Protection and Restoration**
- **Biopreserve Creation**

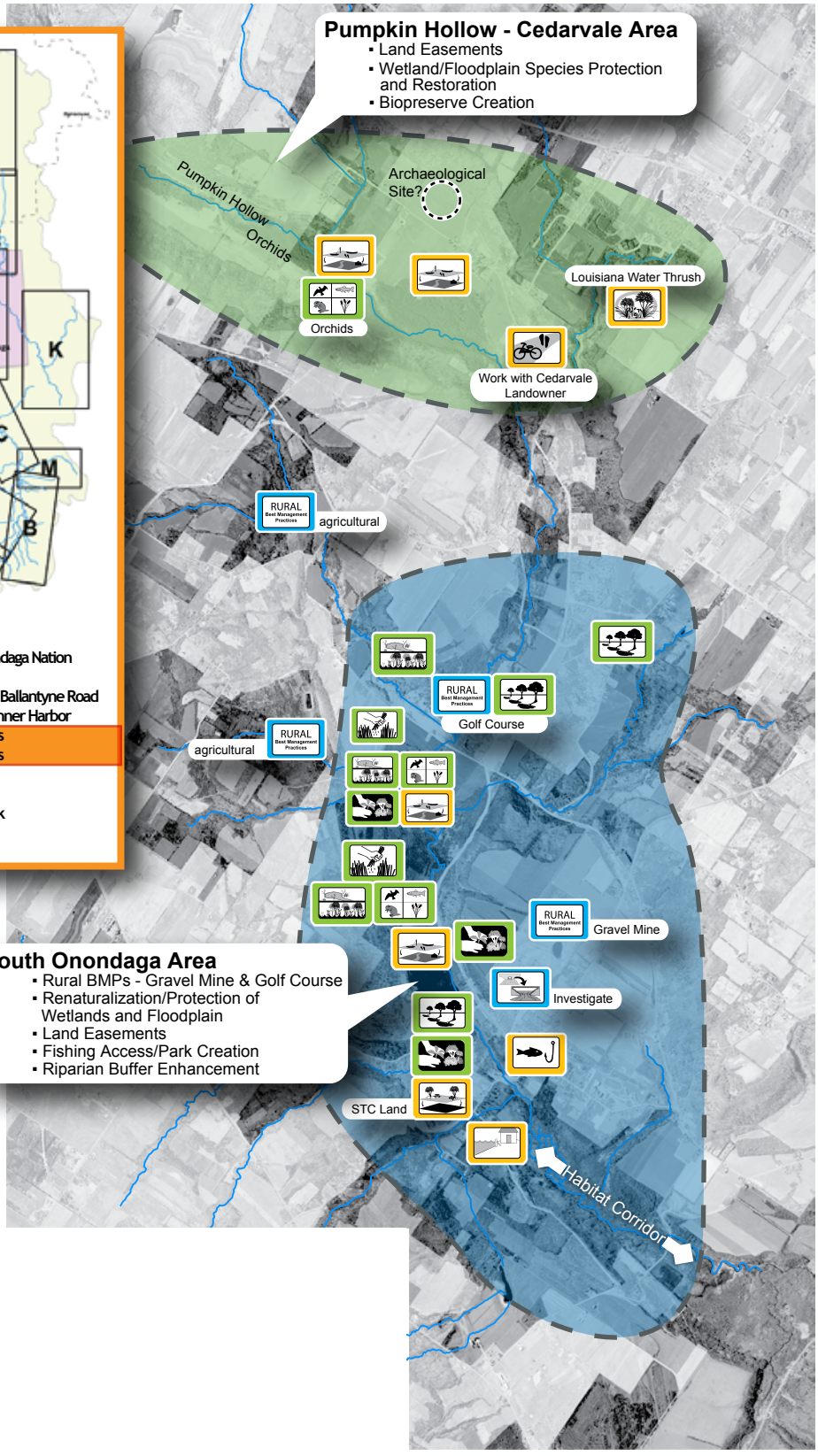
The Project Team recommended working with landowners to explore conservation easements in Pumpkin Hollow and biopreserve creation along Cedarvale Creek, for the purpose of cooperative protection of habitat. The floodplain and wetlands in this potential project area host rare species of orchids. Cedarvale Creek supports nesting areas for the Louisiana Waterthrush, a migrating warbler that breeds along gravel-bottomed streams that flow through hilly, deciduous forests.

South Onondaga Area (Intersection of Route 80/Makyes/Cedarvale Roads)

- **Rural BMPs – Gravel Mine/Golf Course**
- **Renaturalization / Protection of Wetlands and Floodplain**
- **Land Easements**
- **Fishing Access / Park Creation**
- **Riparian Buffer Enhancement**

The Project Team recommends enhancing the riparian buffer along the West Branch and its tributaries, including removing/controlling invasive species, planting riparian shade trees and native plants. Much of the floodplain of the West Branch, roughly from just south of Tanner Road to the western border of the Onondaga Nation, is protected wetland, subsequently wetland renaturalization and effective local protection are recommended here. The Project Team recommends investigating modification of the corrugated metal pipe culvert where the West Branch crosses under Red Mill Road, to naturalize the stream and minimize disruption of aquatic habitat. Save The County Land Trust-owned land at Hogsback Road and Route 80 is a recommended location for fishing access and park creation. The project team recommends working with the golf course and gravel mine owners in this project area to enhance best management practices for stream and wetland protection.





north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN

Potential Project Areas

Onondaga Creek Watershed

GH

West Branch: Southern Headwaters
West Branch: Northern Headwaters

Map Key:

Land Use Options

Hydrological Options

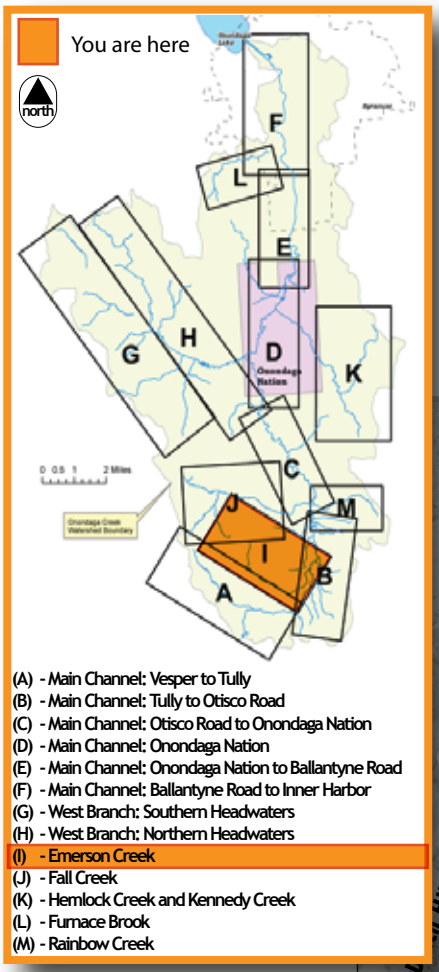
Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area

Stream Channel

special area/action

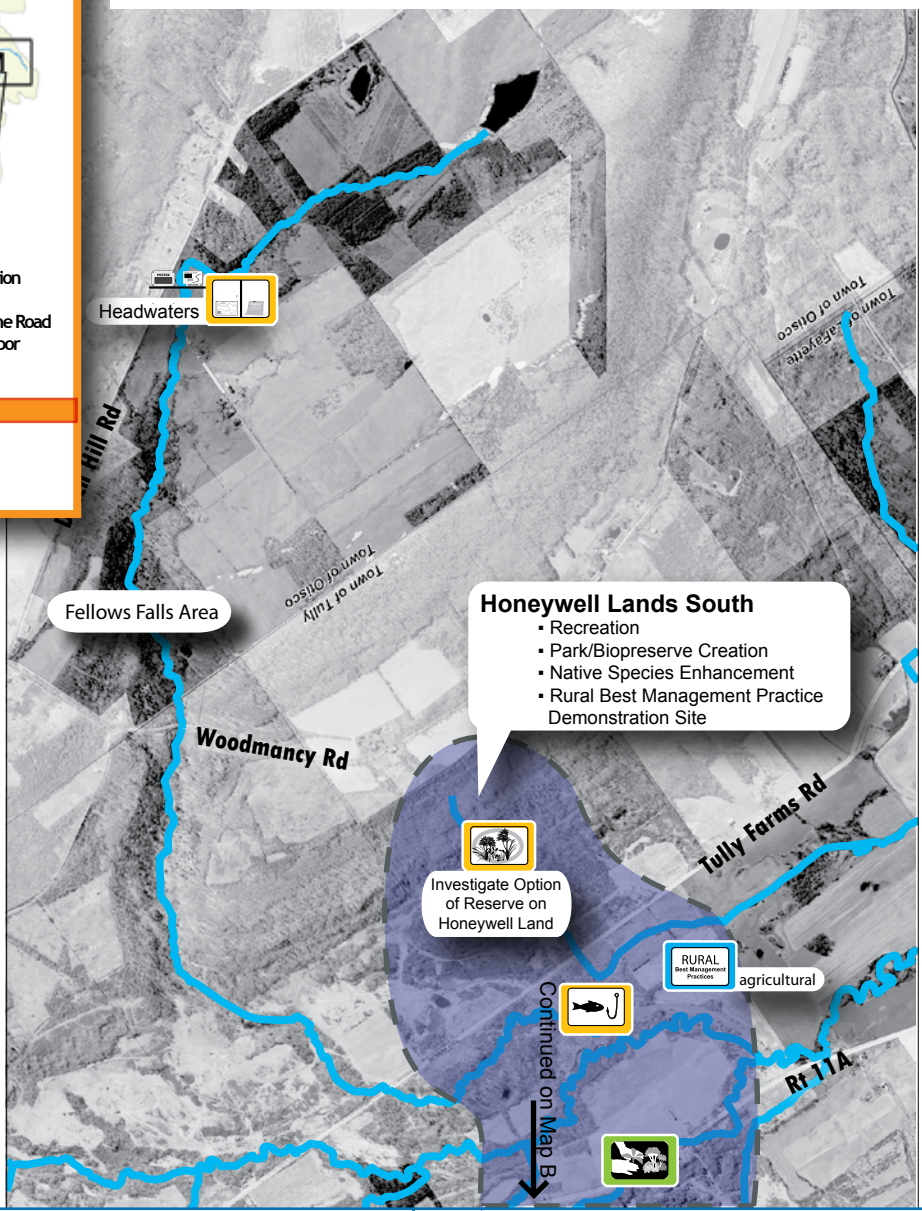


Map I (Emerson Creek)

Honeywell Lands South (Overlaps on Map B; near Woodmancy Road, across Tully Farms Road, to Route 11A)

- **Recreation**
- **Park/Biopreserve Creation**
- **Native Species Enhancement**
- **Rural Best Management Practice Demonstration Sites**

This potential project area is described on map B. Fellows Falls project area is represented on Map A.



north
map not to scale

CONCEPTUAL REVITALIZATION PLAN

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

Potential Project Areas

Onondaga Creek Watershed

I

Emerson Creek

Map Key:

Land Use Options

Hydrological Options

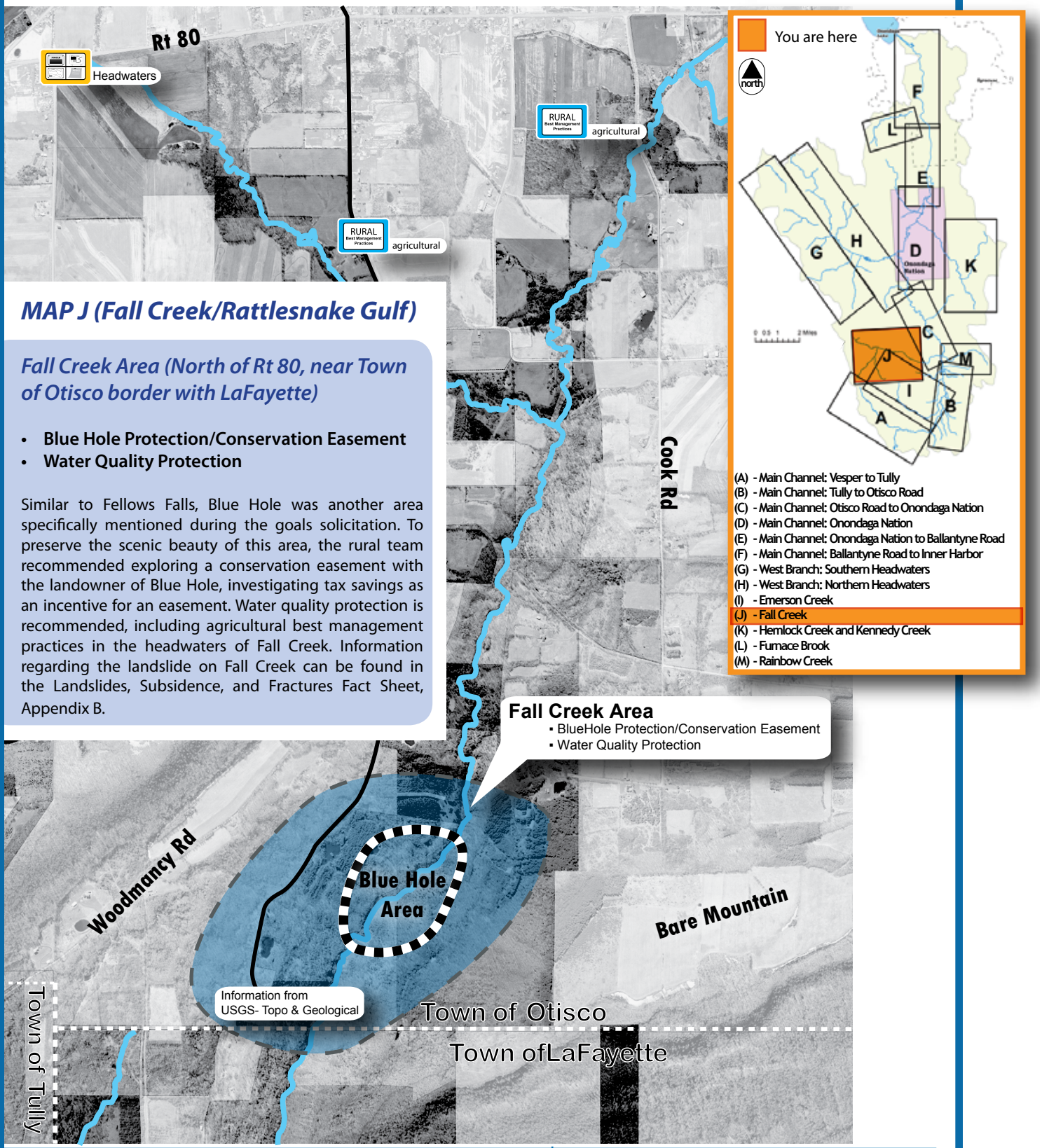
Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area

Stream Channel

special area/action



MAP J (Fall Creek/Rattlesnake Gulf)

Fall Creek Area (North of Rt 80, near Town of Otisco border with LaFayette)

- **Blue Hole Protection/Conservation Easement**
- **Water Quality Protection**

Similar to Fellows Falls, Blue Hole was another area specifically mentioned during the goals solicitation. To preserve the scenic beauty of this area, the rural team recommended exploring a conservation easement with the landowner of Blue Hole, investigating tax savings as an incentive for an easement. Water quality protection is recommended, including agricultural best management practices in the headwaters of Fall Creek. Information regarding the landslide on Fall Creek can be found in the Landslides, Subsidence, and Fractures Fact Sheet, Appendix B.

north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN

Potential Project Areas

Onondaga Creek Watershed

J

Fall Creek

Map Key:

Land Use Options

Hydrological Options

Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area

Stream Channel

special area/action

MAP K: Hemlock and Kennedy Creeks

The OCRP Project Team assembled revitalization ideas for the Hemlock and Kennedy Creeks; the resulting map was reviewed by the Onondaga Creek Working Group.

Kennedy Creek Area (Kennedy headwaters area, across I-81, to eastern border of Onondaga Nation)

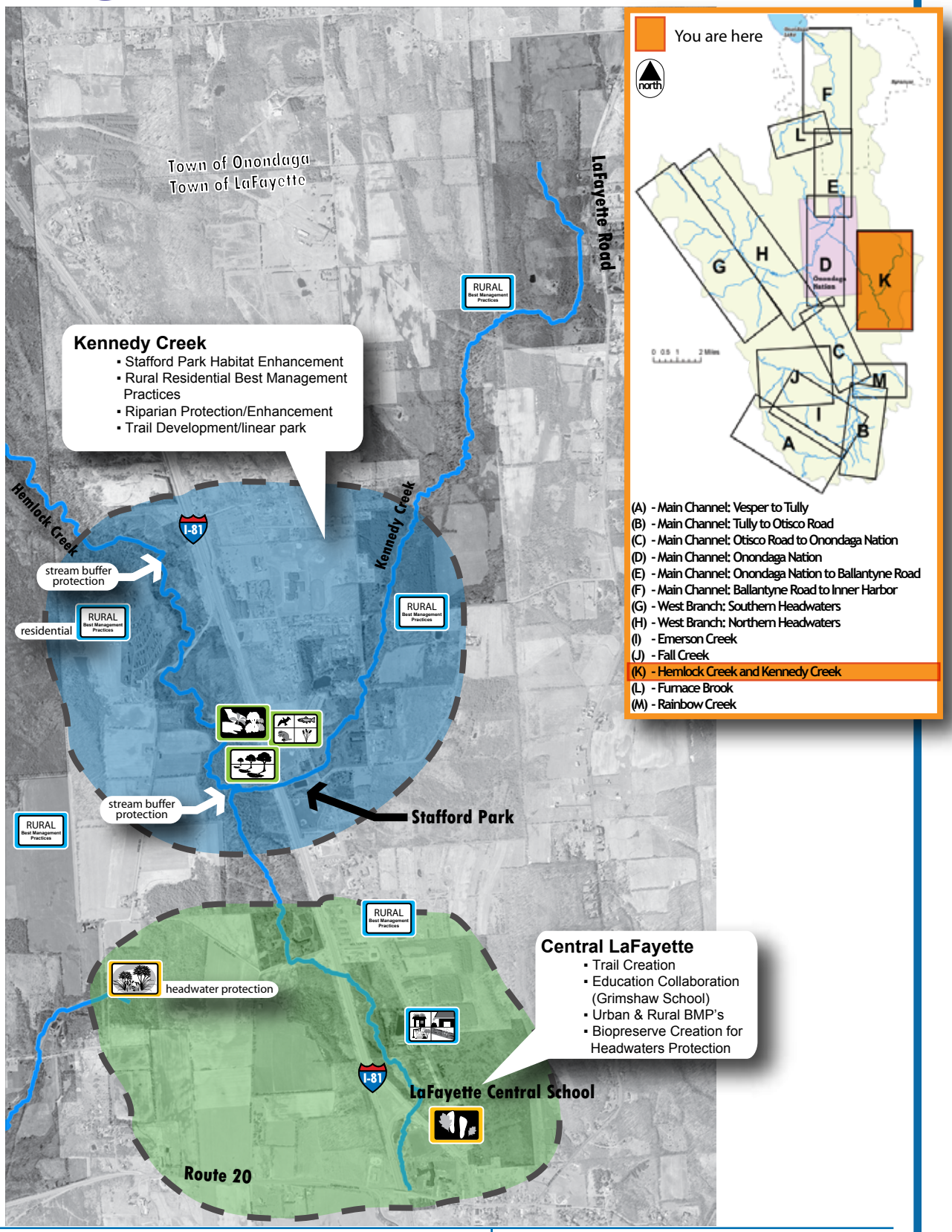
- **Stafford Park Habitat Enhancement**
- **Rural Residential Best Management Practices**
- **Riparian Protection/ Enhancement**
- **Trail Development; Linear Park**

Kennedy Creek bisects Stafford Park in the Town of LaFayette. Project Team recommended habitat enhancement in the creek's riparian zone in the park. Residential best management practices and stream buffer protection for Hemlock Creek on the west side of Interstate 81 were recommended. Water quality protection is particularly recommended in the vicinity of the manufactured housing community near Webb Road. Consideration of interpretive trail or linear park development along Kennedy Creek is recommended, perhaps combined with habitat enhancement efforts in Stafford Park as a means to engage community interest.

Central LaFayette Area (Near intersection of Route 20 and I-81)

- **Trail Creation**
- **Education Collaboration (Grimshaw School)**
- **Urban & Rural Best Management Practices**
- **Biopreserve Creation for Headwaters Protection**

The Central LaFayette potential project area encompasses the headwaters of Hemlock Creek, which is also protected wetland. The Project Team recommended implementing both urban and rural best management practices near the headwaters, along the Interstate 81 and Route 11 corridor. Recommended practices include on-site stormwater management for buildings and parking lots bordering the protected wetland. Creation of an interpretive trail is recommended, in collaboration with Grimshaw Elementary School, at the intersection of Interstate 81 and Route 20.



north
map not to scale

CONCEPTUAL REVITALIZATION PLAN

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

Potential Project Areas

Onondaga Creek Watershed

K

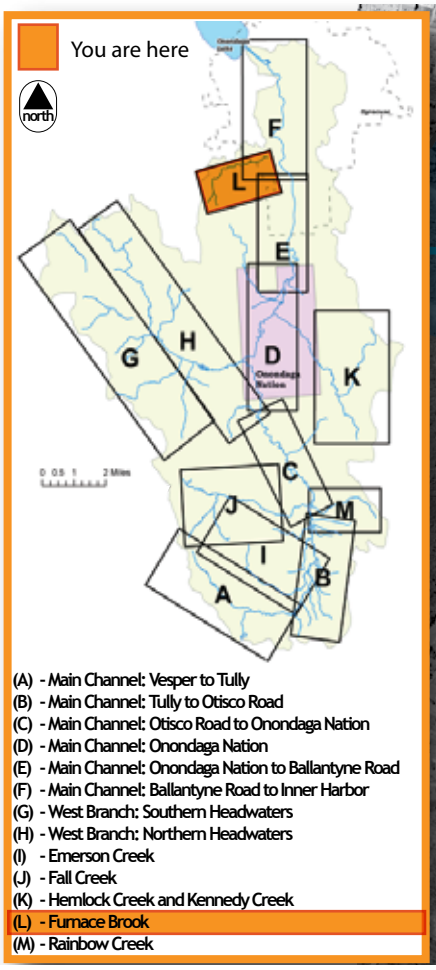
Hemlock Creek and Kennedy Creek

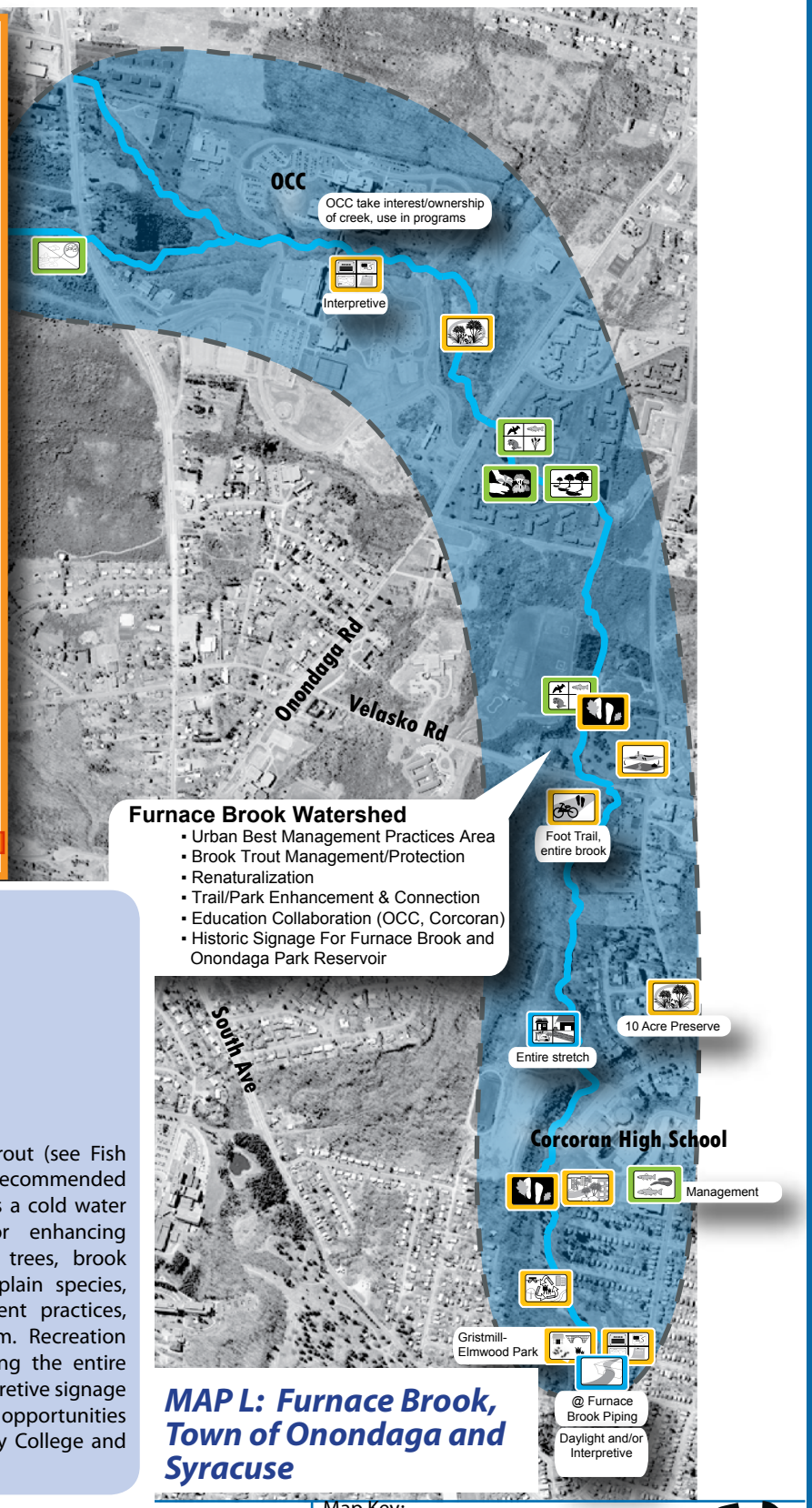
Map Key:

- Land Use Options
- Hydrological Options
- Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area
Stream Channel
special area/action





Furnace Brook Watershed

- **Urban Best Management Practices Area**
- **Brook Trout Management/Protection**
- **Renaturalization**
- **Trail/Park Enhancement & Connection**
- **Educational Collaboration (OCC, Corcoran)**
- **Historic signage for Furnace Brook and Onondaga Park Reservoir**

Furnace Brook supports populations of brook trout (see Fish Fact Sheet, Appendix B). The transitional team recommended protecting and managing all of Furnace Brook as a cold water fishery. Recommendations include adding or enhancing riparian buffer with native plants and shade trees, brook trout management, restoration of native floodplain species, and implementation of urban best management practices, or green infrastructure, along the entire stream. Recreation recommendations include interpretive trails along the entire brook. Education recommendations include interpretive signage near parks and schools and exploring education opportunities in collaboration with both Onondaga Community College and Corcoran High School.

MAP L: Furnace Brook, Town of Onondaga and Syracuse

north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN
Potential Project Areas
Onondaga Creek Watershed

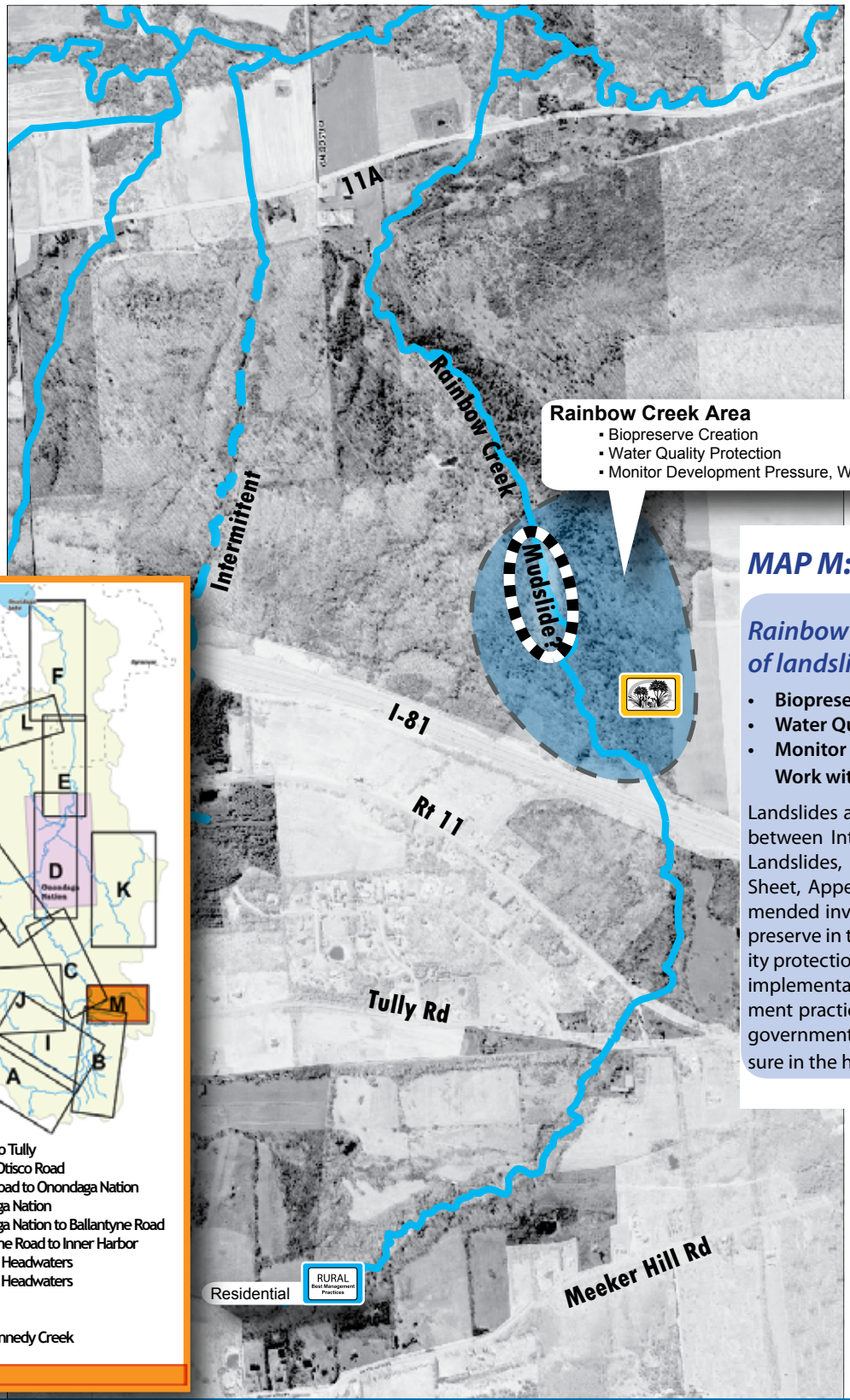
L
Furnace Brook

Map Key:

Land Use Options
Hydrological Options
Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area
Stream Channel
special area/action



Rainbow Creek Area
- Biopreserve Creation
- Water Quality Protection
- Monitor Development Pressure, Work with Towns

(A) - Main Channel: Vesper to Tully
(B) - Main Channel: Tully to Otisco Road
(C) - Main Channel: Otisco Road to Onondaga Nation
(D) - Main Channel: Onondaga Nation
(E) - Main Channel: Onondaga Nation to Ballantyne Road
(F) - Main Channel: Ballantyne Road to Inner Harbor
(G) - West Branch: Southern Headwaters
(H) - West Branch: Northern Headwaters
(I) - Emerson Creek
(J) - Fall Creek
(K) - Hemlock Creek and Kennedy Creek
(L) - Furnace Brook
(M) - Rainbow Creek

MAP M: Rainbow Creek

Rainbow Creek Area (In vicinity of landslide)

- **Biopreserve Creation**
- **Water Quality Protection**
- **Monitor Development Pressure, Work with Towns**

Landslides are on-going on Rainbow Creek, between Interstate 81 and Route 11A (see Landslides, Subsidence and Fractures Fact Sheet, Appendix B). The rural team recommended investigating the creation of a biopreserve in the landslide area for water quality protection. The rural team recommended implementation of residential best management practices and working with area town governments to monitor development pressure in the headwaters of Rainbow Creek.

north
map not to scale

This map was developed by the Onondaga Creek Working Group through a series of public outreach meetings during 2007. 2003 Aerial photography courtesy of Onondaga County.

CONCEPTUAL REVITALIZATION PLAN
Potential Project Areas
Onondaga Creek Watershed

M *Rainbow Creek*

Map Key:
- Land Use Options
- Hydrological Options
- Biological Options

note: project ideas were identified by the Onondaga Creek Working Group unless otherwise noted. For more detailed information regarding the meanings of individual symbols refer to the symbols key located on pages 46 and 47.

potential project area
Stream Channel
special area/action

Working Group -

Results

Watershed Recommendations – Goals and Action Items

Introduction

The Onondaga Creek Working Group developed *drivers* (or motivators) and goals in a process spanning several months (the process is described in Chapter 4). The drivers and goals are descriptors of where the creek should be in the future and were derived from the process of citizen engagement. Both were developed by the Working Group after the group listened to community input during forums and stakeholder organization meetings. The goals are meant to function as a guiding image for Onondaga Creek revitalization.[5] Achieving all of the goals will require considerable time; some sections of the creek will realize goals before others. The five drivers (water quality; human health and safety; ecological health and habitat; access, recreation and use; and education) and associated goals appear in the following sections in bold type to distinguish them as the Working Group's work. Each driver is represented with an icon. The drivers and goals reflect community input, as illustrated at the right by direct quotes received as input during community and stakeholder meetings. Quotes can be read in complete context in Appendix G.

Once the Working Group completed their review process of the goals, the OCRP Project Team developed specific action items. The action items embody the intent of the Working Group and make recommendations for future steps in creek revitalization. Working Group reviewed the action items. Action items appear under goals in regular type to distinguish them as Project Team's work.

[5] The concept of a *guiding image* for the creek is borrowed from Palmer et al. 2005 and is explained further in Chapter 8.

Goal Drivers:

water quality

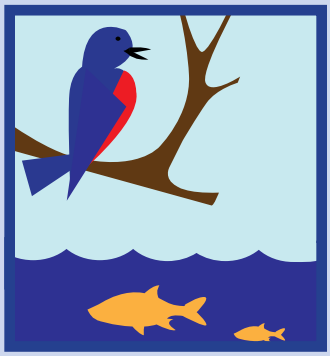
Improving the biological, chemical, and physical conditions of Onondaga Creek (often measured by a waterbody's ability to support life).

"Good water quality everyone can share and enjoy. (S)omething to be proud of."

human health & safety

Fostering a state of wellbeing for people in the Onondaga Creek watershed, free from risk and disease.

"Can we enjoy the creek and still protect the environment - people need to feel safe/secure using the corridor."



ecological health & habitat

Fostering an environment for native species (plants and animals) that provides safe food and water.

"The creek becomes wonderful habitat for fish, birds and other animals."

access, recreation, & use

Allowing everyday activities and enjoyment in and around Onondaga Creek.

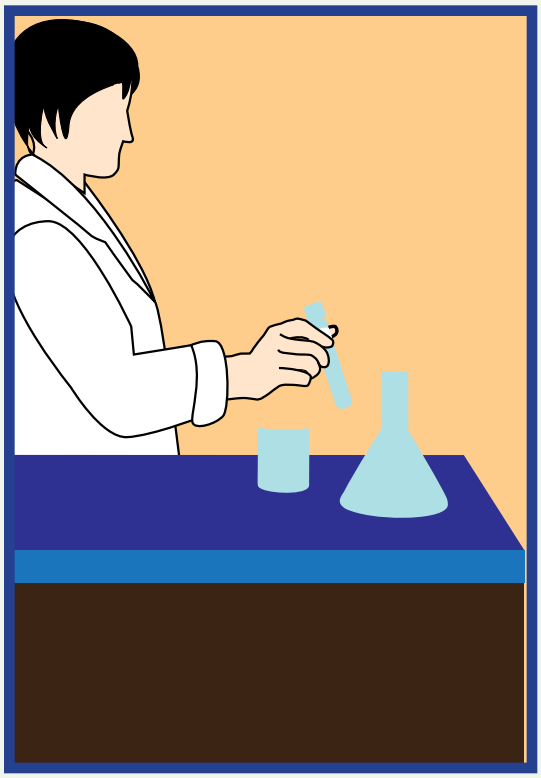
"Travel along entire creek from lake to headwaters- have a path, nice lighting, banners, benches, programmed spaces."

education

Sharing knowledge about Onondaga Creek and its environs.

"… I would like to see the creek used as an educational tool for surrounding school communities."

Water quality



Improving the biological, chemical, and physical conditions of Onondaga Creek (often measured by a waterbody's ability to support life).

A. Achieve *Class B standard* throughout watershed.

- **Achieve water quality that supports diverse fish and wildlife.**
- **Achieve water quality that supports contact recreation.**

Action Items:

1. Petition DEC to reclassify entire watershed to at least class B.
2. Implement performance-based best management practices (BMPs) throughout watershed.[6] Assessment of BMP programs is recommended. See Appendix I for additional recommendations and a list of management measures and practices based on US Environmental Protection Agency (USEPA) guidance documents.
3. Perform continued water quality assessment in Onondaga Creek watershed for full range of water quality parameters. Identify issues/ areas of concern from water quality assessment, and then formulate corrective measures.
4. Conduct complete sewer study for all *jurisdictions* in the Onondaga Creek watershed.
5. Establish intermunicipal stormwater management study/comprehensive program, to meet Phase II requirements for all jurisdictions in the Onondaga Creek watershed.[7] The program should include these components:
    a. Characterize the drainage system: stormwater and *sewersheds*,
    b. Identify and map subwatersheds that go to specific stormdrains/*combined sewer overflows* (CSOs), determine locations where stormwater BMPs will make a substantial difference to water quality.[8]
    c. Develop a menu of remedies that can ameliorate specific conditions; this menu should emphasize application of innovative green infrastructure techniques, such as green roofs, *permeable paving* and *rain gardens*, see Appendix I for more information.
    d. Reduce the volume and rate at which runoff reaches the creek throughout the system with *retention*, *detention*, and redistribution engineering and construction (inclusive of BMPs and green infrastructure).
    e. Incorporate maintenance procedures, especially improved street and storm sewer cleaning.
6. Multiple governments have jurisdiction within the Onondaga Creek watershed. Forms of cooperative *intermunicipal* decision-making about sewer/stormwater management should be explored to make real, lasting improvements to water quality.

B. Water should be clear and attractive, free of garbage.

Action items:

1. Expand cleanup efforts
    a. Establish an adopt-a-creek program with citizen groups, with city/county/town cooperation.
    b. Expand and increase funding for CCE creek cleanup program, tie in additional partners like Onondaga County Resource Recovery Agency (OCCRA).
2. Establish county-wide comprehensive littering education program, including schools. See action items under *Education*. Model program for the Onondaga Creek corridor can be a pilot area. Formulate and fund stormwater/anti-litter education as one comprehensive program, applied to Onondaga Creek corridor. Use existing material and expand to tailor to the creek corridor.
3. Implement anti-dumping campaign through enforcement and education by municipality.
4. To protect water clarity, find management solutions and financial resources for continued mudboil maintenance, including exploring options for public/private partnerships.[9] See Working Group's site-specific recommendations, Revitalization Map B.

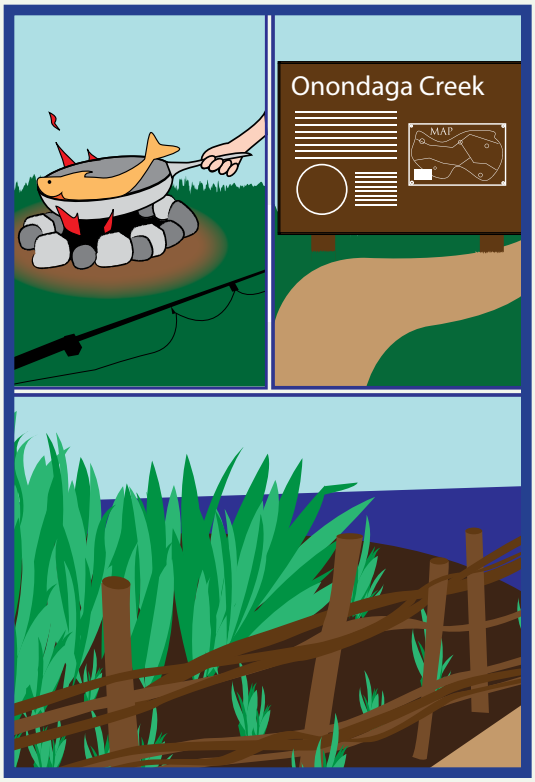
[6] The OCSWCD currently conducts an *Agricultural Environmental Management Program* implementing BMPs on voluntary farms in the Onondaga Creek Watershed.

[7] The Central New York Regional Planning and Development Board currently conducts a stormwater public education and outreach program for most towns and villages in Onondaga County.

[8] Stormwater BMPs are a subset of all BMPs identified in Appendix I.

[9] The OLP sponsors a system of remedial activities including construction of a settling impoundment behind a dam, tributary diversion, and installation of depressurizing groundwater wells. The estimated sediment discharge to Onondaga Creek has been reduced from 30 tons per day to less than one ton per day.

human health & safety



Fostering a state of wellbeing for people in the Onondaga Creek watershed, free from risk and disease.

A. Achieve Class B standard so that human contact with water is safe (see water quality goal).

- **Fish caught in Onondaga Creek should be consumable (or "safe to eat"?).**
- **Avoid adding pollutants to creek by using innovative runoff and stormwater management. Examples are: stormwater filtration (rain gardens) and storage (rain barrels/tanks), Leadership in Energy and Environmental Design (LEED) standards in building design.**

Action Items:

1. Conduct a pathogens source attribution study for the whole watershed (i.e., test disease-causing organisms for their origin; human, birds, livestock, or wild animals).
2. Identify fish-flesh contaminant levels to gauge extent of *body burdens* in Onondaga Creek fish populations.
3. Conduct a *creel*, or perceptual, *survey* of Onondaga Creek fish consumption. If warranted by survey, initiate fish consumption education in the city.
4. Adhere to the LEED Green Building Rating System for Neighborhood Development (LEED-ND) to address stormwater *retrofits* in existing buildings and neighborhood design. The LEED-ND goal is to establish standards for assessing and rewarding environmentally superior development practices. Benefits to human health are inherent in these development practices.[10]
5. Address safety as creek access increases, by investigating whether notification or warning systems are warranted, and if so, select the appropriate types for periods when *flood stage* water and combined or storm sewers are flowing (as these increase potential human contact with pathogens and dangerously high water).[11]

B. Minimize potential for drowning, damaging floods, and liability.

- **Create floodplain in City of Syracuse and Nedrow**
- **Slow stream velocity**
- **Provide renaturalization of shoreline and wetland areas (see *Ecological Health and Habitat* goals)**
- **All of the above are intended to create recreation opportunities (see *Access, Recreation and Use* goals)**

Action Items:

1. Conduct stream network analysis: assess loading of tributaries, conduct hydraulic analysis and determine options from the resulting information.[12] Options should include structural and non-structural ways of accommodating flood waters, including *channel reconfiguration*, renaturalizing, reducing *bank grade*, increasing storage capacity, and slowing the flow rate, especially identifying and using upstream and tributary storage opportunities.
2. Implementation of individual projects should be based on an understanding of the entire creek *hydraulic* regime.
3. Implement education campaign for water safety and flood education/ natural functions of streams/wetlands/floodplains. See action items under *Education* goals.

C. In the city, make a new policy for Onondaga Creek fence that balances the need for safety and access.

Objectives:

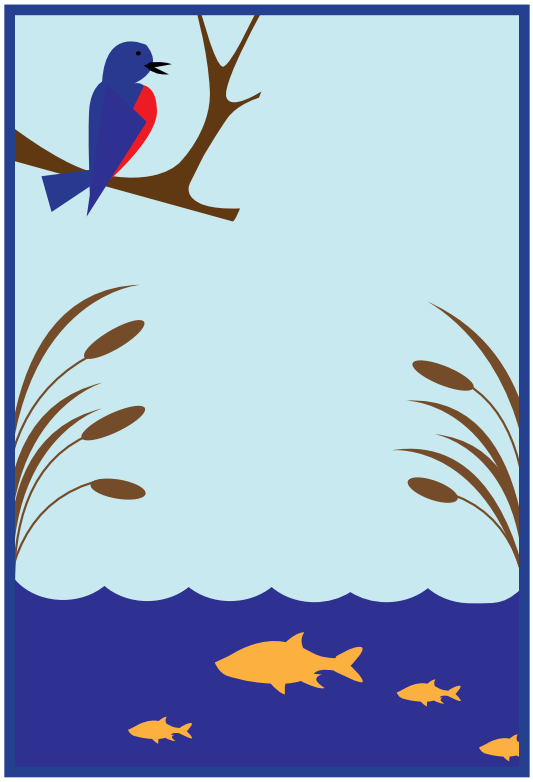
- **Use natural barriers of native plant species**
- **Establish dialog with affected communities**
- **Work with municipal land managers to maintain both new and old fencing**

Action items:

1. Identify historic/*indigenous* plant species capable of serving as alternative natural barriers to chain-link fencing.
2. Develop a natural barrier demonstration site, involving community participation and existing partners, such as CCE's CommuniTree Stewards and Onondaga Earth Corps. Plan for community-based maintenance.
3. Link safety programs to fencing alternatives and creek walk development. Incorporate lighting options that promote safety along with planting programs. Inventory and identify examples of environmentally-sensitive lighting use in United States and Canada, for example, use of motion activated lights. Set-up of neighborhood watch programs, and blue-light emergency phone systems along creek walk.

ecological health & habitat

Fostering an environment for native species (plants and animals) that provides safe food and water.



A. System-wide, increase both native *diversity* of riparian vegetation and extent of canopy to increase fish, wildlife and bird diversity.

Action items:

1. Identify the potential of Onondaga Creek and surroundings as a fish, wildlife, and bird migratory corridor, including past, present, and future use.
2. Perform a vegetation survey, cataloging both current and historic species.
3. Identify *hot spots* where non-native species are well established, requiring an immediate need to control exotics in the creek corridor; implement pilot control programs in hot spots. Use existing programs as resources or as models, especially those of *Adirondack Park Invasive Plant Program*, The Nature Conservancy's *Weed Information Management System*, and *Finger Lakes Partnership for Regional Invasive Species Management* (PRISM) program.
4. Formulate a plan for restoration of native plants to accompany exotic species control. Establish cooperation between local organizations and schools to maximize funding and information resources, such as NYSDEC eradication programs/pilot programs, include flora and fauna.

B. System-wide, restore cold water fish habitat, at a minimum, no alterations to creek corridor should degrade habitat further or impede either down- or up-stream passage of cold water species.
Objectives:

- **American eel restoration is specific objective (see Fish Fact Sheet, Appendix B).** [13]
- **Set sub-goals for stretches where cold water fish habitat restoration is most and least plausible.**

Action items:

1. Identify historic aquatic and riparian fauna in the system; support academic research.
2. Address complete life-cycle habitat needs of cold water fish species, thus moving towards overall ecological recovery of creek system. Survey fish habitat conditions, especially bottom substrates and stream edge conditions throughout corridor.
   a. Conduct an American eel habitat assessment study; cooperate with state and federal efforts for American eel conservation, such as the Atlantic States Marine Fisheries Commission.
   b. Establish programs for restoration or conservation of cold water fish species, including lake sturgeon, Atlantic salmon, and brook trout.[14] All efforts undertaken should be in cooperation with regional agencies and initiatives, such as the NYSDEC, US Fish and Wildlife Service, USGS Tunison Laboratory of Aquatic Science, Eastern Brook Trout Joint Venture, and the Great Lake Consortium.
   3. Involve stakeholders, interested parties, and the public in restoration and conservation initiatives, contamination studies, communicating results, and in decision-making processes.

C. Increase wetland viability and wetland vegetation diversity, restoration by reconnecting drainage systems for wetland areas to other wetlands and creek.

Action items:

1. Identify and survey existing wetlands, as part of a stream network analysis in preparation for wetland reconnection. Survey should include wetlands 1 acre size and larger, soils and land use data.
2. Reclaim and daylight tributaries; slow drainage via network of detention and retention basins (see stormwater recommendations under *Water Quality* action items).
3. Promote community education about naturally functioning wetlands, particularly *disease vectors*, risk, and runoff storage/flood risk reduction.

D. Use native/indigenous species in restoration projects

Action items:

1. Plant selection should consider appropriateness to local system and serve multi-functional purposes, for example, filter runoff, provide bird habitat, and enhance visual aesthetics. High-use sites need special consideration. No *invasive species* should be used.

[10] For more information and resources, see: U.S. Green Building Council et al. 2007. *Pilot Version LEED for Neighborhood Development Rating System.* and Raimi M and Patrick SP et al. 2006. *Understanding the Relationship Between Public Health and the Built Environment.* San Francisco, CA: Design, Community & Environment. Both reports are available from the U.S. Green Building Council website: http://www.usgbc.org/.

[11] Examples from other rivers should be examined in determining safety notification options for Onondaga Creek: the Charles River Watershed Association runs an award-winning water quality notification system using color-coded flags in Boston, Massachusetts (see Platt 2006 and http://www.crwa.org/); the cities of Boulder, Colorado and Lake Lure, North Carolina have flood-warning siren systems.

[12] The SUNY College of Environmental Science and Forestry led by Dr. Theodore Endreny has performed hydrologic investigations along specific stream segments within the City of Syracuse.

[13] American eel is a native fish extirpated from Central New York waters, and not to be confused with the nuisance exotic species known as the lamprey eel.

[14] Corresponding to the recommendation under Human Health and Safety, a system-wide assessment of contamination should be conducted that identifies the system's contaminants, risk level, and potential for contamination of reintroduced fish.

access, recreation, & use

Allowing everyday activities in and around Onondaga Creek.

A. Throughout the watershed, establish a system of trails and linkages that serve to connect rural and urban neighborhoods (the concept of the creek as a "spine"). Objectives:

- **Use unified, standardized signage for directing people to destinations**
- **In the city, establish bike/walkway**
- **Reclaim and daylight tributaries to enhance *connectivity* (see Ecological Health and Habitat goals)**

Action items:

1. Design for maximizing multiple uses and purposes in the watershed. Recreation needs, like trails, must be balanced with habitat/ ecological needs.
2. Employ interdisciplinary technical teams along with stakeholders, interested parties, and the public to establish multi-use standards, and to assist in guidance and integration of ecological and recreation projects.

B. Add, maintain, and protect *open spaces*, along the Onondaga Creek corridor and its tributaries.

- **Tailor open space format to benefit surrounding communities, from preservation of scenic and natural areas to developing urban ecoparks.**
- **Incorporate creative multi-use options in recreation/access planning.**
- **Think broadly and take advantage of existing spatial opportunities, for example, tailor ecopark themes to specific areas.**

C. Make creek access a priority for both urban and rural land use decisions.
Objectives:

- **Incorporate access for boating, fishing and wading/swimming, picnicking and benches, depending on area.**
- **Develop a process to achieve creek access from private land that is acceptable to land owners.**
- **Create appropriate creek-driven development.**

Action items:

1. Identify environmental impacts to access sites and minimize potential for human disturbance. Access points need to be suitable for the area and multiple uses. Multiple types of access should be established, including visual access.
2. Increase fishing access based on local assessment.

D. Establish land management practices and coordinate municipal recreation/access projects to support a naturalized, attractive creek.
Objectives:

- **Identify appropriate uses and enforce against illegal activity.**
- **In urban and rural areas, use native species in riparian zones, instead of mowed grass, crops (see *Ecological Health and Habitat* goals).**
- **Practice *surface runoff mitigation* in urban areas (see *Human Health and Safety* goals)**
- **Plan to separate paved trail from directly beside stream, increase areas of floodplain forest, riparian vegetation in between trails and creek.**
- **Use materials other than concrete or concrete blocks in stream channel.**

E. Throughout watershed, governments must adopt a new commitment to Onondaga Creek revitalization.

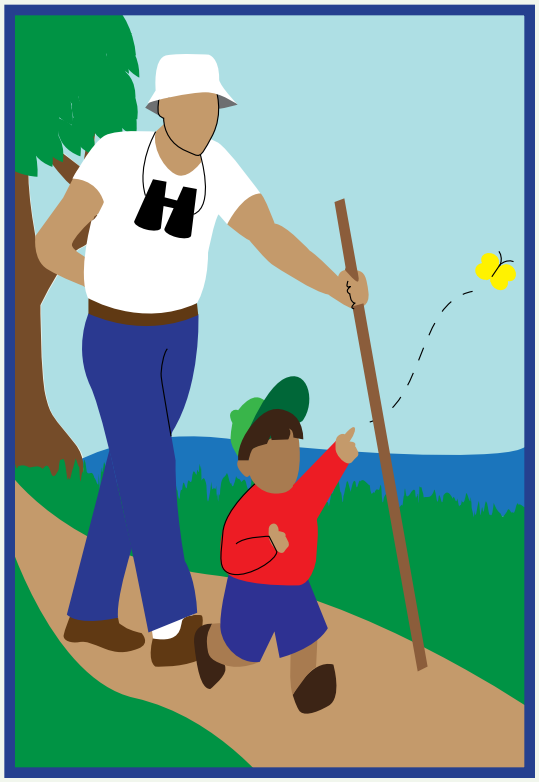
- **Local governments should take steps to recognize creek as a critical area.**
- **Use tools available to municipalities to prioritize creek and tributary protection.**

Action Items:

1. Develop a model for intermunicipal coordination and cooperation (see Chapter 8). Selected model should employ a holistic approach towards Onondaga Creek, which may include functions such as:
   a. Identifying and capitalizing on *synergies* or minimizing conflicts between existing projects and conceptual revitalization plan;
   b. Capturing funding and educational opportunities for municipalities, for example, technical assistance with stormwater regulation compliance;
   c. Promoting municipal project cooperation/coordination;
   d. Evaluating and selecting useful models for municipalities to implement creek revitalization and protection, for example, buffer laws and conservation easements.
2. Define, select, and implement the intermunicipal model as one of the first tasks performed by the Working Group's continuation. Role of intermunicipal entity should be clearly defined, whether predicated on voluntary compliance or having the power to wield "carrots and sticks"' to further creek revitalization.[14]

[14] Areas of importance for intermunicipal cooperation include the sewer system, nonpoint source pollution control, including stormwater runoff.

education



Sharing knowledge about Onondaga Creek and its environs.

A. Provide diverse education experiences and opportunities for multiple audiences, via:

- **Signage, including marking watershed boundaries;**
- **Outdoor education centers;**
- **Strengthening existing community facilities for watershed education;**
- **Interpretive trails;**
- **Gardens with diverse vegetative types;**
- **Community creek restoration projects and clean-ups;**
- **Watershed-specific curricula materials.**

Action items:

1. Working Group continuation should coordinate education efforts of different organizations to identify needs and sources of funding, for example, outdoor education funding through city school rebuilding program.
2. Create a creek *stewardship* program modeled on the Sligo Creek Stewards program in Silver Spring, Maryland.
3. Establish a creek-based *sustainability program*, through SUNY ESF.
4. Address in-school education:
    a. Local teachers need a clearinghouse for creek information and existing curricula.
    b. Litter education is needed in schools, as a cooperative effort with community groups and non-profits, and stream steward programs.


Sustainable Stormwater Management
A Green Street Project


PARK
SYNTHETIC NATURE
LOFT APARTMENTS
CINEMA
WORKSHOPS
RESTAURANTS
ARTIST STUDIOS
MUSIC HALL
VIDEO
GALLERIES
LIVE-WORK
GAMING PAVILIONS
MEDIA LAB
TECHNOLOGY
ARTS
CAFES
LIGHT WALLS
THEATER
DRAWING ROOM
HOTELS
DANCE SCHOOL


WCNY

CHAPTER 6:
Other Local Initiatives

A multitude of local projects are currently underway within the Onondaga Creek watershed and creek corridor and these will undoubtedly increase in the future. Current projects include those related to municipal improvement/public services, transportation, community revitalization, regional planning/visioning, water quality monitoring/protection, and greenspace enhancement. As of 2008, more than 40 different projects and initiatives in the Onondaga Creek corridor were ongoing or pending, each with particular objectives, funding sources, timelines, and managing entities (A full list of ongoing and pending projects can be found in Appendix K). A partial review of these projects demonstrates that many have goals related to those outlined in the Onondaga Creek Conceptual Revitalization Plan (OCRP). Other projects have missions and functions that are not intrinsically related to the creek, but affect the creek, and could thereby hinder or advance the goals of the OCRP.

This chapter focuses on identifying a process for examining interactions between the OCRP and other projects in the watershed. By scrutinizing connections between the OCRP and particular projects, we will foster communications and capitalize on unexpected synergies that further strengthen and motivate our community to implement its vision along the Onondaga Creek corridor. Three different initiatives are evaluated using the process detailed below.

A major step in considering the connections and potential synergies between an existing or proposed project and the recommendations for Onondaga Creek revitalization is to evaluate the project in regards to the five main watershed goals:

1) What are the connections between the project and the OCRP water quality recommendations?
2) What are the connections between the project and the OCRP human health and safety recommendations?
3) What are the connections between the project and the OCRP ecological health and habitat recommendations?
4) What are the connections between the project and the OCRP access, recreation and use recommendations?
5) What are the connections between the project and the OCRP education recommendations?

More specifically, components of the project may be compared to the region-specific Revitalization Maps, as well as the watershed-wide recommendations presented in Chapter 5. To illustrate the synergies and challenges between a project and the revitalization recommendations, three example projects will be discussed in further detail.

Example 1: Onondaga Creek Walk

The Onondaga Creek Walk is planned to be a pedestrian/multi-use path that follows the creek corridor. The first segment of the walk was completed more than a decade ago, by the City of Syracuse, as a creek-side trail through Franklin Square that extends toward Onondaga Lake along the Inner Harbor.

Two new creek walk projects, referred to as Phase I and Phase II, are currently underway to extend the trail southward through the city; and complete the connection to Onondaga Lake. (A third segment, Phase III, will eventually continue the trail to the south boundary of the city at Dorwin Avenue).

Phase I will include construction of the walk from Franklin Square, south to Armory Square and northward along the Inner Harbor to the shore of Onondaga Lake, where the creek walk will eventually link to Onondaga County's proposed Loop the Lake Trail. The Phase I plan has been approved and construction is scheduled to begin in 2008 using state and federal transportation funding.

Phase II will include an additional segment of the trail between Armory Square and Kirk Park (to Colvin Street). Currently, the city has hired an engineering consulting firm, Barton & Loguidice, P.C., to conduct a feasibility study of potential routes and amenities. Funding for Phase I is provided by Federal Highway Administration (SMTC, 2007). Phase II will be funded in a similar manner. Because both phases of the ongoing creek walk project are funded with transportation department dollars, the primary function of the creek walk is to provide an alternative transportation route for walking, jogging, bicycling, and skating according to transportation standards set by the New York State Department of Transportation (NYSDOT) *Highway Design Manual*, American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, and the American Disabilities Act (ADA) *Accessibility Guidelines*.

The project designs will also include improvements to the pedestrian experience, such as lighting, signage, benches, and safety. The city government is aware of the restrictions imposed by the funding source and is seeking complementary funds for additional creek walk enhancements such as trees and other amenities that may not be covered by transportation monies.

Evaluating Watershed-Wide Interactions

1. What are the connections between the Onondaga Creek Walk and the OCRP water quality recommendations?

Under the watershed-wide goals, one recommendation related to water quality is the use of Best Management Practices (BMPs) for the control of storm water. *Channel reconfiguration* and *renaturalization* (see Question #2) of the streambanks will also improve water quality. If design specifications of the creek walk include BMPs that protect the creek from runoff, such as vegetative swales or pervious paving, then the creek walk could accommodate the goals of the OCRP.

2. What are the connections between the project and the OCRP human health and safety recommendations?

Watershed-wide recommendations for human health and safety include modifying the creek velocity through channel reconfiguration and renaturalization of stream banks and floodplains. Placement of the creek walk in relation to the existing stream bank will impact the space and clearance available for any possible future creek channel modifications (including channel-widening, installation of meanders, or reconstruction of floodplain). To avoid precluding future stream channel modification projects, the creek walk should be located to allow setbacks from the creek bank, especially in open areas where it is possible. Conversely, determination and identification of creek segments with the highest feasibility for channel modification may have to be investigated in the near future, in order to assist with the planning needs of many creek-side projects, including the creek walk project. Communication and collaboration will be essential in the preservation of areas and properties suited to future channel reconfiguration projects.

3. What are the connections between the project and the OCRP ecological health and habitat recommendations?

Recommendations listed under the goal of ecological health and habitat include increasing native riparian vegetation for fish and wildlife habitat. The allowance of a buffer zone or allotment of space necessary for a future vegetative strip along the creek's edge, including wetlands and floodplains, could not only help meet this goal, but also accommodate flooding, improve water quality, and increase the aesthetic value and pedestrian experience of using the creek walk.

4. What are the connections between the project and the OCRP access, recreation and use recommendations?

One of the strongest connections or synergies is the role the creek walk will play in terms of creek access, recreation, and use. Specific watershed-wide recommendations under this goal called for the establishment of a trail system that would connect neighborhoods and provide creek access for multiple uses, of which both phases of the creek walk project help achieve.

5. What are the connections between the project and the OCRP education recommendations?

The creek walk has several connections to existing and potential educational features along the creek corridor, in that the creek walk will connect and provide increased access to establishments such as the Museum of Science and Technology (MOST) in Armory Square, a number of local schools, historic sites and museums in downtown Syracuse that highlight past cultural and economic influences on the creek, and numerous parks and natural features that could be used as outdoor learning settings for schools (including access to the creek/riparian corridor at parks for science lessons, stream monitoring lessons, wildlife observation, classroom/public stewardship projects, and access to future features such as the proposed Southside *Onondaga Botanical Garden and Arboretum*).

Evaluating Region-Specific Interactions

In looking at the region-specific recommendations outlined in the plan, the location of the proposed creek walk project stretches across the Franklin Square, Clinton Square, Armory Square, Southside, and Botanical Garden regions or "project bundles." Many OCRP components envisioned for these regions, including scenic use areas, signage, improved lighting, rest stops, pedestrian corridors, foot/bike paths, natural fencing, and pedestrian bridges, are compatible with the components proposed by the creek walk project. However, the question concerning trail placement and space requirements for future hydrological modification particularly pertains to the Southside area and Botanical Garden area, where the creation of meanders, compound channels, and restored wetlands are envisioned.

Further inquiry or investigation into the options and flexibility of the project plans and requirements may lead to the finding that some modifications can be made that would easily reinforce the synergy between the creek walk and the revitalization plan, while other discrepancies or obstacles may be more challenging to overcome because of funding or logistical reasons.

Photographs: Sections of existing creek walk, inner harbor, Syracuse

Example 2: The Connective Corridor

The Connective Corridor initiative, led by Syracuse University, showcases art, culture, and community resources along a 1.5 mile, "L"-shaped strip of the city that connects downtown Syracuse to University Hill. The corridor intersects Onondaga Creek in downtown Syracuse at Fayette Street. The goal of the project is to promote economic development, tourism, and residential growth by investing in historic landmarks, cultural institutions, and private developments within the corridor, including places such as the art district, Columbus Circle, Armory Square, the OnCenter, Everson Museum, and the Fayette-Firefighters Park. An emphasis will be placed on improved transit options within the corridor, not only to provide walking, biking, and riding opportunities, but also to promote interactions between the student population on University Hill and their host city. In addition to a Connective Corridor shuttle bus, investments along the corridor route will also include pedestrian and bike friendly features, unique lighting, public artwork, interactive technology, urban reforestation, and enhanced green spaces. Funding and support for this project is provided by Syracuse University, New York State, federal appropriations from U.S. Congressmen James T. Walsh, U.S. Senators Charles Schumer and Hillary Rodham Clinton, the City of Syracuse, National Grid, and Time Warner Cable.

Evaluating Watershed-Wide Interactions

1. What are the connections between the project and the OCRP water quality recommendations?

Watershed recommendations for water quality suggest using BMPs for storm water management. In addition to using BMPs to prevent storm water runoff from the transportation routes of the Connective Corridor from entering the creek, another potential synergy exists in the possibility of incorporating public art, technology, and innovative storm water management designs. For example, sculpture pieces or public fountains or water features that utilize recycled rainwater can enhance public spaces as well as manage and reuse storm water. Innovative storm water management designs and materials can also combine technology and storm water management with public space enhancement through use of the water in botanical features, green space, and gardens. Such innovative approaches can reduce the volume and rate at which stormwater reaches the creek and improve water quality through greater filtration.

2. What are the connections between the project and the OCRP human health and safety recommendations?

Similar to the creek walk, the placement of the Connective Corridor's transit pathways (at the point they cross the creek) have the potential to conflict with future plans to make hydrological modifications on the creek channel or create a floodplain area. Placement of the transit pathways should be made with these objectives in mind.

3. What are the connections between the project and the OCRP ecological health and habitat recommendations?

The revitalization plan recommends the use of native vegetation. The green space plans and enhancements that are implemented as part of the Connective Corridor can compliment the OCRP by incorporating native species on sites near the creek.

4. What are the connections between the project and the OCRP access, recreation and use recommendations?

From a watershed-wide perspective, the Connective Corridor is similar to the creek walk project in that it supports creek access, recreation, and use. Although the Connective Corridor intersects, rather than paralleling, the creek, it will serve as a vital transportation corridor and linkage between neighborhoods. Additionally, the reforestation and green space development components of the Connective Corridor reflect OCRP recommendations for maintaining open space, and incorporating creative, multi-use options for creek related access and recreation.

5. What are the connections between the project and the OCRP education recommendations?

The Connective Corridor also has the potential to support the watershed-wide recommendations related to education. Features such as signage, markers, kiosks, and informative public art could be coordinated and/or standardized via the OCRP among projects such as the creek walk and the Connective Corridor if information about the cultural, historical and natural ecology of Onondaga Creek is incorporated into the project's interactive technology features (potential examples might include interactive media about the creek or watershed, or public outreach about creek-side facilities, such as nearby sewage treatment facilities).

Evaluating Region-Specific Interactions

Many OCRP components, such as scenic use areas, signage, improved lighting, rest stops, pedestrian corridors, foot bike paths, natural fencing, and pedestrian bridges, are compatible with elements of the Connective Corridor. Examining the region-specific recommendations, the Connective Corridor intersects the creek within the Clinton Square region or "project bundle." The vision for this region included recommendations for storm water management demonstration projects, an art deco pocket park, trail and pedestrian enhancements, and the creation of floodplain. The adjacent Armory Square region envisioned featuring a "Living Machine" exhibit at the MOST that would demonstrate water filtration technologies, as well as promoting cultural and historic sites. These recommendations have the potential to connect strongly to the Connective Corridor's plans for public art, greenspace, multi-use transportation routes, technology features, and focus on historic landmarks.

In this example, the potential for synergies and the similarities in goals and visions is substantial. Consideration of the watershed-wide and regional recommendations of the creek plan can only strengthen the similar goals and visions that the revitalization of Onondaga Creek and the Connective Corridor Initiative both share.

Photograph: Concept for the Connective Corridor developed by Field Operations with CLEAR

www.connectivecorridor.syr.edu

Example 3: The Near Westside Initiative

The Near Westside Initiative Inc., is a non-profit development corporation established with the goal of revitalizing Syracuse's Near Westside (Urban CNY News On-line Edition, 2007 October 15). The boundaries of the Near Westside neighborhood are South Geddes Street on the West, Onondaga Creek on the East, West Fayette Street to the North and West Onondaga Street to the South (Bogucz per. comm.). The Initiative is modeled in part on the highly successful Artist Relocation Program in Paducah, Kentucky and is envisioned as an interdisciplinary creative community of residences and workspaces for artists, designers, technologists and innovators.

The Near Westside Initiative currently involves activities targeted in an eleven-block area of the northeast corner of the broader neighborhood. Former warehouse and commercial structures in three blocks encompassed by West Fayette Street, Wyoming Street, Tully Street and West Street will be constructed or renovated using innovative environmental technologies developed by the Syracuse Center of Excellence in Environmental and Energy Systems. Development of improved residential housing is targeted in an eight-block area around Skiddy Park and Blodgett School (Bogucz pers. comm.). Funding support for this project is provided by federal and state sources and Syracuse University.

Components of the project include:

- Construction of a WCNY broadcast center and education center on a vacant parcel at West and Marcellus Streets;
- Rehabilitation of the Case Supply and Lincoln Supply buildings into mixed-use commercial/residential facilities;
- Construction or rehabilitation of 50 units of affordable "green" housing for current and future city residents in a several-block area located around Blodgett School and Skiddy Park and extending eastward to the Arts, Technology & Design Quarter developments. (Rebuilding the Upstate Economy City-by-City, 2007)

The Near Westside Initiative overlaps with the Armory Square potential project area (See Revitalization Map F1). It can also be reviewed in terms of its potential synergies with watershed-wide recommendations, and prominent and proximate position to the creek as it flows through downtown.

Evaluating Watershed-Wide Interactions

1. What are the connections between the Near Westside Initiative and the OCRP water quality recommendations?

With its emphasis on using green technologies in the construction and rehabilitation of residential and commercial properties, the Near Westside Initiative has the potential for lowering the quantity and improving the quality of storm water runoff generated on the Near Westside. The strategic use of stormwater best management practices such as rain gardens, green roofs, rain barrels, and tree planting in construction and rehabilitation can enable this to happen.

2. What are the connections between the project and the OCRP human health and safety recommendations?

Any new construction or property rehabilitation along the creek in the City of Syracuse should undergo sewer separation so that the storm waters are not co-mingled with sanitary effluent. Reconstruction of the sewer system associated with projects such as the Westside Initiative will reduce the bacteria discharge to Onondaga Creek currently resulting from an old, decaying and leaking combined sewer system. This will ultimately have a profound effect on human health for individuals accessing creek waters. To the extent that the use of *green technologies* reduces storm water runoff and will compliment a separated sewer system, there will be additional water quality improvements, beside pathogen reduction, that make contact with the creek safer.[1]

3. What are the connections between the project and the OCRP ecological health and habitat recommendations?

Similar to the other case study project, the use of native and indigenous plant species in restoration project and community green spaces has the

[1] For an important summary of potential hydraulic impacts of sewer separation on Onondaga Creek, see: Black J and Endreny T. 2006. *Increasing stormwater outfall duration, magnitude and volume through combined sewer separation.* Journal of Hydrologic Engineering 11(5):472-481.

potential to be a strong connection between the Near Westside project and the OCRP recommendations. One specific example might include the potential use of native plants species in the neighborhood reforestation plan currently under development by State University of New York College of Environmental Science and Forestry (SUNY ESF) students.

4. What are the connections between the project and the OCRP access, recreation and use recommendations?

The connection between improving access, recreation and use of Onondaga Creek by residents in the Near Westside may be via linking the neighborhood to Armory Square and the Creek Walk by the pedestrian bridge proposed in the Armory Square project area (see Revitalization Map F1). Another means of access is the Connective Corridor. For example, any signage that links the neighborhood to the Connective Corridor, could potentially link the neighborhood to the creek, if signage to the creek is included in the area of the Connective Corridor that crosses the creek.

5. What are the connections between the project and the OCRP education recommendations?

There is the potential to use green technologies as part of the Near Westside Initiative to engage students and residents in learning about how to protect the creek. For example, students at Blodgett School who are participating in SUNY ESF's program about Onondaga Creek could take a tour of the green technologies as part of the curriculum. Youth participating in an environmental corps on the Near Westside could assist with the design and installation of green technologies such as rain gardens.

While it is unrealistic to assume that every component of every project will inherently match the recommendations of the revitalization plan, a conscious review of similar goals and potential synergies can help to strengthen the long-term viability of the creek corridor via outreach and public education, as well as to promote communication and collaboration among decision-makers, stakeholders, and the public.

Photographs:
Green Infrastructure from the City of Portland Green Street Program

CHAPTER 7:
Constraints

A multitude of factors will need to be addressed in order to move forward with the implementation of the Onondaga Creek Conceptual Revitalization Plan (OCRP) including flood management, safety issues, rural development and impacts of the urban zones through which the creek flows. This chapter surveys constraints and data gaps that will influence steps toward revitalization on Onondaga Creek. Constraints restrict the ability to act. The challenge for the community is to turn existing constraints into opportunities. Constraints and associated opportunities are summarized in Table 7.1.

In many instances, the failure to act is a direct result of missing information. Sometimes, the lack of understanding is so profound, even the questions are unknown. The ongoing watershed characterization of Onondaga Creek affords the opportunity to identify where gaps in collective knowledge exist about the watershed.[1] Identifying data gaps highlights areas where more information will be needed before complete revitalization can be accomplished. Identification of constraints and data gaps leads to solutions for revitalization, as illustrated in Figure 7.1.

[1] Watershed characterization is defined in Chapter 1.

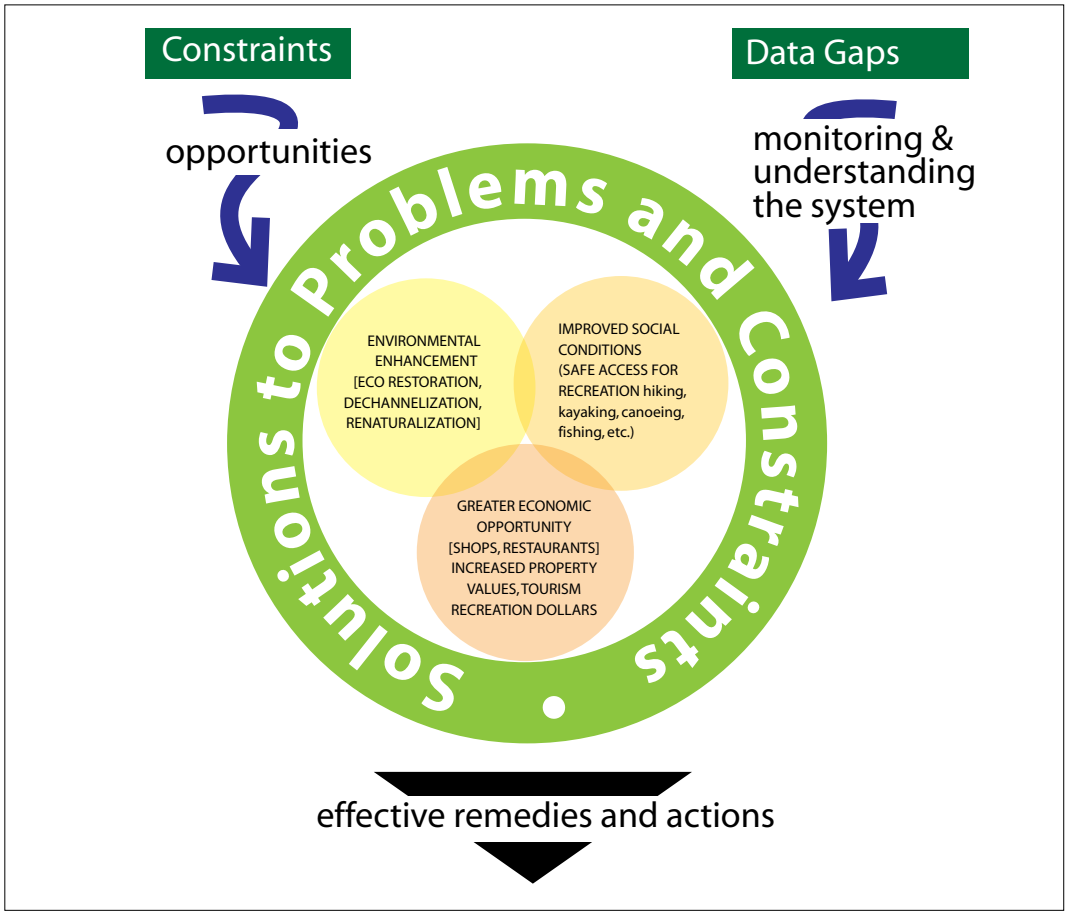


Figure 7.1 Identification of constraints and data gaps can lead to solutions for creek revitalization.

Constraints

Social and Economic Constraints

Fragmented government: jurisdiction, management, liability and land use challenges

The Onondaga Creek watershed is situated within the boundaries of several governmental *jurisdictions* (see Figure 1.3); no single agency is dedicated to regulatory control of Onondaga Creek.

Although the entire watershed is within the historical lands of the Onondaga Nation, and that of environmental concern under the Onondaga Land Rights Action (2005), the current sovereign territory of the Onondaga includes the central portion of the watershed.

No single federal, state, or local agency has regulatory authority over all environmental aspects of Onondaga Creek. Multiple government entities work in the watershed with varied levels of coordination.

Currently no single or umbrella organization exists for the sole purpose of managing the Onondaga Creek watershed. No comprehensive plan exists for the Onondaga Creek watershed.

Several plans, reports and design workshops have considered parts of the corridor or focused on certain aspects of revitalization. They are described in Appendix K. However, past government leadership did not appear to value the linkages between environmental, social and economic conditions. There has been a lack of resources and commitment to develop a comprehensive plan or management effort for Onondaga Creek.

The Onondaga Lake Partnership (OLP) is responsible for managing and overseeing the cleanup of Onondaga Lake; however, minimal attention and resources have been dedicated to the tributaries. The current OLP Management Plan for Onondaga Lake incorporates the Amended Consent Judgment (ACJ) with those sections of the **1993 Plan of Action**[2] that are not pertinent to sewer improvement projects. Recommendations in the current plan for the lake have potential to influence the tributaries. However, the primary focus of the OLP has been implementation of the ACJ. The many projects of the ACJ are intended to meet ambient *water quality standards* in Onondaga Lake.

Notable exceptions are mudboil control and **Agricultural Environmental Management** (AEM) projects. The Natural Resources Conservation Service and the Onondaga County Soil and Water Conservation District conduct a rural AEM program that implements best management practices to reduce nonpoint source pollution (sediments, fertilizers, pesticides) from farms throughout the Onondaga Lake watershed including that of Onondaga Creek. The AEM program does not address urban runoff. The OLP has sponsored, maintains, and is planning additional remedial measures to mitigate mudboil sediment discharges to Onondaga Creek, in cooperation with the U.S. Geological Survey (USGS) as technical advisor (see Chapter 3).

The OLP has authorized the U.S. Army Corps of Engineers to conduct an Onondaga Lake watershed study, which incorporates the watersheds of several lake tributaries, including Onondaga Creek. The study is ongoing.

Aversion to risk, municipal liability and rigid government policies constrain creative solutions to revitalization.

The current channel configuration presents a drowning hazard and sewer releases are a health concern. Legal *liability* hinders municipal incentive to make improvements to the creek corridor. Potential liability may increase as citizens take advantage of improvements and the corridor is more heavily used. Concerns for drowning hazards and associated liability have led the City of Syracuse to strictly control access to the creek.

Historically government agencies have displayed a low level of risk tolerance for the natural process of flooding. This perpetuates the channelized form of Onondaga Creek. The mowing regime in the flood control channel constrains riparian habitat. Policies that include practices such as the stocking of non-native fish for recreational fishing constrain native fish populations, such as brook trout.

No comprehensive or consolidated land use approach currently exists for the Onondaga Creek watershed.

No municipality within the Onondaga Creek watershed possesses *zoning regulations* designed

[2] The **1993 Plan of Action** was drafted under the auspices of the Onondaga Lake Management Conference and was never authorized as mandated by congressional statute.

to protect the ecological integrity of the creek or aesthetic value of rural valleys. Unchecked development in the floodplain, environmentally-sensitive areas, and valley walls has and will continue to degrade water quality, habitat, and landscape views should existing land use policies continue into the future. Conventional building practices increase impervious cover and avoid managing the detrimental effects of runoff. Municipalities often are reluctant to exert land use control measures. Finding a balance between preserving owner property rights and imposing restrictions for the public benefit is a difficult task. Nevertheless, zoning is a tool that municipalities can apply for environmental protection.

Agricultural lands are at risk due to economic pressures resulting in unplanned suburban sprawl. Agricultural lands can be banked, which means land is set aside or not developed for other uses. Federal, state and private land trusts can bank agricultural land through farmland preservation programs.[3] Many farmers cite the banking program incentives are not comparable to future economic development returns.

Fragmented community: lack of capacity to implement meaningful environmental revitalization

Communications are limited both among diverse stakeholders and between geographical neighborhoods along the Onondaga Creek corridor.

The Onondaga Creek watershed is home to a multitude of cultures, people from diverse religious and socio-economic background, and ethnicity. Time constraints and lack of trust among individuals often negatively affects organizations, institutions, and communities. There are limited opportunities for the community to find a common forum to work together, "think like a watershed", and coordinate environmental improvement.[4]

Input gathered from goals and concerns solicitation meetings revealed that Central New Yorkers realize that creek restoration can be an instrument for broader community revitalization. The community in general, however, struggles to capitalize on the connection between environmental enhancement and social improvement.

Many pressing societal needs confront the watershed community, especially in the City of Syracuse. Most community groups and religious organizations are focused on specific missions, for example, housing, public health, and education, without leveraging environmental improvements to enhance their efforts. There are many exceptions, such as the Partnership for Onondaga Creek, the Zen Center of Syracuse, the Dunbar Center, the Neighbors of Onondaga Nation and the Syracuse Peace Council, and the many sport and environmental organizations in the area.

Further, limited coordination between organizations with an environmental mission, including several working within the Onondaga Creek watershed can be identified as a constraint to revitalization, as this prohibits coordination of efforts and pooling of resources.

Budgetary priorities

Current funding priorities constrain implementation of revitalization in the Onondaga Creek corridor. Beyond SUNY College of Environmental Science and Forestry (SUNY ESF)-based research projects, no current funding is dedicated to *channel reconfiguration* and *renaturalization* of Onondaga Creek.[5]

Existing projects pertaining to Onondaga Creek improvements are limited in geographic range (i.e. rural AEM program) and scope (Creek Walk).[6] A flexible, comprehensive funding strategy will be needed over the long term to accomplish creek revitalization that successfully reflects community goals (see Chapter 8).

Historically, economic development projects have overlooked the long-term benefits of repairing existing environmental damage; infrastructure projects have not considered potentials for ecological restoration.

Development throughout the corridor ignores the potential of Onondaga Creek as a waterfront property. Recent building designs along Onondaga Creek fail to capitalize on the economic, social, and environmental benefits observed in other cities that have revitalized their waterways. Current projects, such as the Near Westside Initiative, the Connective Corridor and the Metropolitan Development Association's Creative Communities program have begun to incorporate these concerns into their planning efforts (see Chapter 6). The City of Syracuse plans to implement the Local Waterfront Revitalization Program and develop three sites along the creek.

[3] Some of these programs are described in Chapter 8.

[4] This phrase is inspired by a video documentary of community-based restoration work on the Mattole River in Humboldt County, California.

[5] In particular, research conducted by Dr. Ted Endreny and Dr. Don Leopold and their graduate students.

[6] The Onondaga Creek Walk is funded via New York State Department of Transportation monies that limit the scope of improvements to those that can be considered transportation amenities.

Table 7.1 Transforming constraints into opportunities.

Constraint	Opportunity
Multiple government jurisdictions	• Intermunicipal cooperation • Coordinating watershed group • Implementation of OCRP
Lack of coordinating entity in the watershed	
Lack of comprehensive plan	
Lack of comprehensive land use approach	
Risk aversion/rigid government policies	
Limited communication among watershed stakeholders	
Limited coordination among organizations working in watershed	
Lack of dedicated funding for dechannelization and renaturalization	
Linking economic conditions and ecological integrity of Onondaga Creek	
Municipal legal liability	• Renaturalization and channel reconfiguration • Basin-wide "green" practices to manage storm water: green infrastructure, best management practices • *Infrastructure* improvements (e.g., roads, sewers) • Increase monitoring and assessment
Pathogen contamination	
Fish contamination	
Turbidity and sediment	Mudboil and erosion remediation
Channelization	Channel reconfiguration

Environmental Constraints

Environmental constraints are derived from current conditions in the Onondaga Creek watershed. Chapter 3 provides more detail about current environmental conditions in the watershed.

Water quality/chemistry

The potential for pathogen contamination and turbidity (see sediment quality) restrict human contact with water. Fish contamination constrains human consumption. Multiple combined sewer overflows (CSOs) discharge raw sewage during storm events. The Midland Avenue Regional Treatment Facility is designed to mitigate CSOs, yet will still release partially-treated wastewater into Onondaga Creek when capacity is surpassed during large storm events. Discharge frequency to Onondaga Creek is unknown, however, the potential for release of wastewater containing nitrogen, phosphorus, and small quantities of byproducts of *chlorination* and dechlorination will impact water chemistry of the creek after some storm events.

Sediment quality

Suspended sediment constrains visibility into the creek, preventing swimming and hindering boating and fishing. Fine sediment beds constrain aquatic biota by degrading their habitat, limiting nesting sites and precluding reproduction.

Channelization

Channelization alters or eliminates natural stream habitat and constrains the natural exchange between riparian and aquatic habitats. Lack of riparian vegetation precludes aquatic and riparian biota (e.g., birds, insects, amphibians, plants, reptiles, and mammals). Channelization, combined with *impervious cover*, creates an urban water flow regime that restricts access and ability of aquatic biota to withstand high water flow events.

Acknowledging that constraints exist is the first step towards revitalization. The challenge is to turn them into opportunities. Solutions for transforming constraints into opportunities are proposed in Table 7.1. Opportunities suggested are based on Working Group watershed recommendations listed in Chapter 5.

Data Gaps

The OCRP was developed to translate a community vision for the Onondaga Creek corridor into schematic ideas to serve as a foundation for future revitalization. Consequently, there was a need to characterize the physical, biological, and human attributes of the Onondaga Creek corridor. The resulting data are summarized in Chapter 3 of the OCRP. Further detail is provided in a series of fact sheets contained in Appendix B.

In Appendix M, **Data Gaps**, tables M.1 and M.2 summarize data gaps identified during watershed characterization. Two tables are presented: ecological data gaps and design data gaps. Ecological data gaps represent what is not known about the ecological character of the Onondaga Creek watershed. Design data gaps represent unknowns that may be confronted during design of implementation projects. The data gaps range from unknowns regarding invasive species to the impacts of climate change on the Onondaga Creek watershed.

The Advantages of Monitoring

Watershed monitoring is a critical aspect of revitalization. Monitoring provides information about watershed health and function and the impacts of human activity. Monitoring identifies specific threats and impairments to watershed health. Watershed groups use monitoring information to prioritize their efforts (USEPA 2001).

Monitoring and research are also imperative for measuring success of restoration projects (see Chapter 8). Sometimes, information is transferable from other systems. Frequently, information needs to be watershed specific. In spite of obvious advantages, monitoring is not universal. In a recent evaluation, only ten percent of river restoration efforts in the United States were found to have any form of monitoring or assessment (Bernhardt et al. 2005). This can be attributed to draining of project resources by the end of construction or installation, so that post-monitoring is abandoned (Gillilan et al. 2005). However, without it, restoration managers are unable to determine what needs fixing and what types of projects are accomplishing their stated goals (Bernhardt et al. 2005).

In addition to project monitoring, the data gaps presented in Appendix M illustrate the need for more and better data about the Onondaga Creek watershed. This is prevalent throughout the United States. A 1998 survey found that only twenty-three percent of the nation's rivers and streams are monitored (USEPA 2001). Existing data can be uncoordinated and inconsistent. Finally, biological monitoring is the least common type of monitoring, as reflected in Onondaga Creek watershed data gaps. Biological monitoring assesses the diversity of living organisms and is considered to be the most complete measure of watershed health (USEPA 2001).

In the course of producing the OCRP, much has been learned about the natural and human history of the Onondaga Creek corridor. Learning will continue, particularly with dedicated resources and cooperation. Even though constraints and data gaps exist, much can be done based on what is currently known. More knowledge is not a luxury, but necessary for some steps in the process. The lack of information should not be used to stop progress, but to identify information needs for the future.


existing

CHAPTER 8:
Implementation Strategies

This chapter describes potential strategies for implementing creek revitalization objectives. Four types of strategies are included:

find revitalization opportunities in existing land use patterns;

establish design, sustainability and ecological standards to follow for future projects;

explore intermunicipal agreements as a multi-jurisdictional watershed policy approach;

and finally, seek sources of funding.

The Onondaga Creek Conceptual Revitalization Plan (OCRP), provides potential options for local communities regarding land use and best management practices. This chapter is a presentation of strategies in use elsewhere or in some cases, already practiced in the Onondaga Creek watershed. Each strategy has limitations; no single option is appropriate for the entire watershed. Strategies suggested are purposely kept broad, as many require cooperation with both urban and rural private landowners. Every step forward in creek revitalization must accommodate as many stakeholders as possible and strategically advance shared goals for Onondaga Creek. To accomplish revitalization work that makes the most sense for Onondaga Creek, all strategies require continued community dialog, public participation in implementation, and collaboration among organizations.

Opportunities in Existing Land Use Patterns

Rural Strategies

Strategies for both rural and urban creek revitalization are described in this section. In the case of the rural portion of the Onondaga Creek watershed, revitalization efforts may translate into protective measures: to maintain water quality, riparian areas, wildlife habitat, and scenic vistas and features (e.g., waterfalls). Successful protection efforts occur with cooperation from local landowners and governments. Just as urban homes and businesses flank the creek, sizable portions of the watershed outside of the City of Syracuse are working lands: farms and forests that support rural livelihoods. The West Branch of Onondaga Creek and the upper headwaters of the main branch (Vesper and Tully Valley) are particularly characterized by agricultural land (see Onondaga Creek Fact Sheets Access and Land Use and Land Cover, Appendix B).

These areas form the headwaters of Onondaga Creek and impacts to their surroundings affect the nature of the creek downstream. Headwaters have profound influence on shaping downstream water quantity and quality (Alexander et al. 2007). Additionally, headwaters are vital to maintaining biodiversity of entire river networks; degradation threatens both aquatic and riparian ecosystems downstream (Meyer et al. 2007).

There is value in protecting rural areas as they impact the quality of Onondaga Creek, but also to preserve the benefits of working lands. Protection of farmland can bring benefits to the local community in preserving economic viability, better quality of life and production of local food supply (Lynch 2007). Described below are implementation strategies that may preserve the quality of the creek and a way of life.

Three groups of stream protective measures or programs will be briefly presented here; they are appropriate for the suburban to rural portions of the Onondaga Creek watershed. These groupings include 1) regulatory (mostly for local governments), 2) land acquisition (for local government and land trusts) and 3) assistance programs only available for local landowners (such as agricultural landowners). For a complete listing of other measures and overall planning process please see Smardon et al. (1996), Cylinder et al. (2004), Kusler and Ophiem (1996), Nolon (2003) and WWF (1992).

[1]A CAOD can be established to preserve a wide variety of natural settings such as wetlands, floodplains, critical habitat, including that of rare, threatened or endangered species, important biotic communities and plant assemblages, and unique geologic formations or features such as waterfalls, caves or caverns, ravines, drumlins, moraines escarpments or plateaus. A CAOD can also be used for source water protection of ground or surface waters or watersheds used for drinking water supplies.

Regulatory Measures

Local governments within the Onondaga Creek watershed may consider adopting some of the following measures. A government's ability to use these strategies depends upon the enabling statutes the municipality uses to adopt land use regulations. Some measures can be intermunicipal. Ideally, local governments will use these measures with an updated municipal comprehensive plan.

Conservation Area Overlay District (CAOD)

A Conservation Area Overlay District (CAOD) can protect areas that are ecologically important or sensitive to development (Nolon 2003).[1] Riparian areas adjacent to Onondaga Creek and its tributaries are both. A CAOD is established by municipal zoning law. Some communities such as Penfield and Kingston, in New York State, have used overlay zoning to protect floodplains, scenic and historic areas (Nolon 2003). The broad authority to create this type of zoning, in New York State is found in the Municipal Home Rule Law. This law gives local governments the power to adopt laws relating to their "property, affairs or government", to "the protection and enhancement of [their] physical and visual environment", and to matters delegated to them under the statutes of local governments (New York Municipal Home Rule Law S10 (1)). Furthermore, this law allows local municipalities to "adopt, amend and repeal *zoning regulations* and perform comprehensive or other planning work related to [their] jurisdiction" (New York Municipal Home Rule Law S10 (6) and 10(7)). (Nolon 2003)

If a community is interested in applying a CAOD, the local municipality needs to map the landscape area that the overlay district is to protect. Note, CAOD's are used over existing zoning districts (see Figure 8.1). In areas without zoning, this regulatory measure must be adopted as zoning to create a conservation area district. A model CAOD law for New York was created by the Pace University Land Use Law Center for the Metropolitan Conservation Alliance, a program of the Wildlife Conservation Society (Metropolitan Conservation Alliance 2002, Nolon 2003). The model law contains the criteria for designating these critical areas as identified on the map. This is for an important reason; it provides a solid rationale such as flooding safety, prevention of erosion, protection of habitat; so that the law can

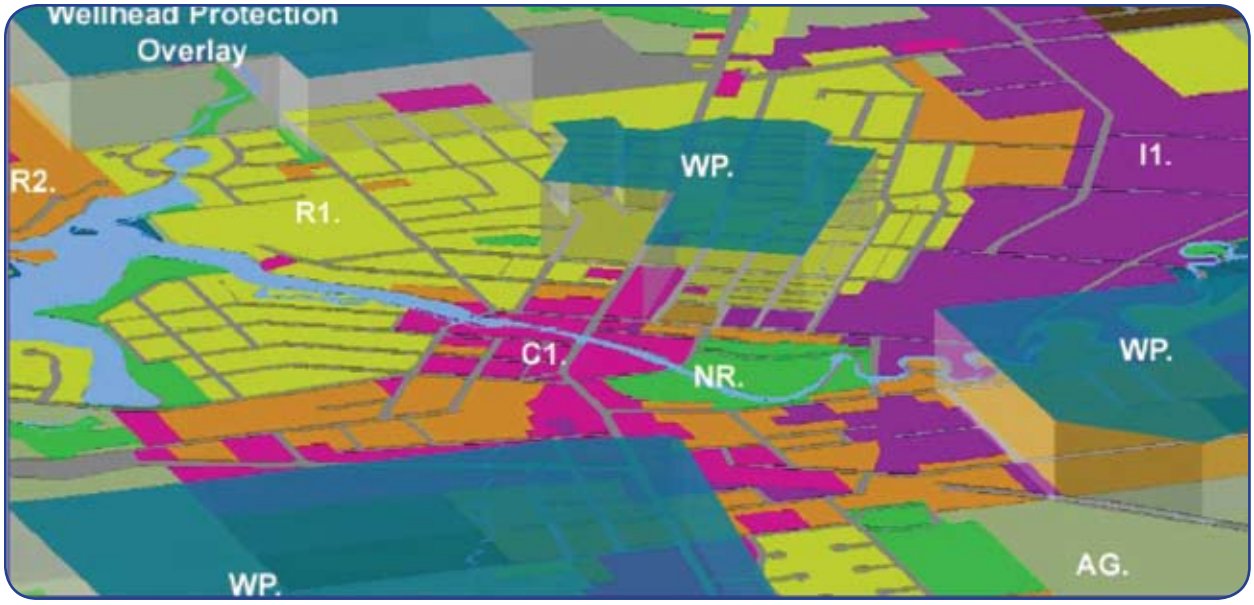


Figure 8.1: Example of wellhead overlay zone map on top of existing zoning (NYS DOS/DEC 2004)

not be easily challenged. There have been cases when so-called "open space zoning" have been challenged as a taking of private property rights (Smardon 1993). The CAOD should set out performance standards to minimize ecological damage to Onondaga Creek, and its tributaries (i.e., no diminishment of floodplain capacity or sediment in excess of a certain amount).

The CAOD can also be intermunicipal, crossing over different town and village jurisdictions. New York State statutes define an intermunicipal overlay district as a "special land use district which incorporates all or a portion of one or more municipalities for the purpose of protecting, enhancing or developing one or more community resources" (New York Town Law s 284, New York Village Law s 7-741, and New York Gen City Law s20-g). More specific information about model CAOD regulations can be found in Nolon (2003 p 226-234).

Erosion and Sediment Control Ordinance

In the upper parts of the Onondaga Creek watershed, much of the impact on water quality is due to excessive sediment runoff from various sources entering the creek and tributaries during storm events. Certain municipal governments need to implement Phase II of the U.S. Clean Water Act by obtaining permits and developing *Stormwater Management Programs.* Local municipalities that have adopted erosion and sediment control ordinances as part of Phase II might update them to maximize protection to Onondaga Creek. Such an ordinance was passed in Yorktown, New York. This ordinance requires individual landowners to obtain a permit for any land-disturbing activities that are not specifically exempted. Each permit application must contain information about site conditions and the proposed activity, together with an erosion and sediment control plan. The only drawback is that a local municipality would need qualified staff time to review such materials. A model regulation is presented with all its various parts in Nolon (2003 p 239-272).

Stream Buffer Strips

Buffer strips are a barrier between conflicting land uses, or as in this case, between development and important community or natural resources such as Onondaga Creek and its tributaries. Located at the edge or boundary between two uses, a stream buffer can reduce conflicts and protect sensitive environments from the negative impacts of development or other incompatible activity. Buffers, in this case, are usually areas of riparian or streamside vegetation, but also can be landscaped berms. By using a variety of planning and zoning tools, Friends of Kayaderosseras Creek are developing a vegetative stream buffer program through five towns with 100 feet as a minimum width, 250 feet whenever possible and 1000 feet in environmentally sensitive areas such as floodplains and those areas with conservation easements (Woolbright 2005). Buffer strips can be combined with conservation easements (see below) or overlay districts.

Non-Regulatory Land Purchase Mechanisms

The following measures can be implemented by local government or state agencies as well as nonprofit organizations such as land trusts.

Land Purchases

Outright purchases can be accomplished through a conservation sale, a fee simple acquisition, or a land donation.

A **conservation sale** involves a landowner selling their property at less than full market value to a public agency or private land trust. The difference between this value and the market price is considered a charitable gift. Landowners receive both monetary compensation and tax benefits. An example would be the Tracy Lake property at the intersection of Tully Farms Road and Route 80 in Tully, which was bought by Save the County Land Trust. The buyer can prevent future development on the property by placing a conservation easement on it (see below).

A **fee simple acquisition** is an outright purchase of land. Once purchased, the land can be leased or sold back to private ownership with attached conservation easements. Governments in New York State can purchase land on a voluntary basis on the authority of the General Municipal Law 247. Local governments in Central New York have been known to purchase land adjacent to creeks to create local public parks (e.g., Marcellus Park along Ninemile Creek).

A **land donation** occurs when landowners donate their property to a public agency or private nonprofit organization (such as a land trust). As with the donation of development rights, parcel donations are considered charitable, allowing a tax benefit. Landowners who donate land sometimes retain the right to use the land for a specified length of time, usually until death, and they may also request a conservation easement protecting the land from development. A parcel in LaFayette, south of the Onondaga Creek-Route 20 crossing, was such a donation to Save the County Land Trust.

Easements

Many state and local governments and private land trusts acquire **conservation easements** (development rights) on properties to preserve land. This requires legally separating the development rights of the property from other property rights, so that further development is prevented. All conservation easements are voluntary and may be permanent or short term. It is in the best interests of land trusts to purchase conservation easements with protections guaranteed in perpetuity, rather than short term easements. Land with a conservation easement can be sold or transformed to others, but the land use is limited by restrictions in the easement. Conservation easements are defined under New York State Consolidated Laws; Environmental Conservation Title 3 ss 49-0301. Conservation easements have and are being used for stream protection in New York State in such locations as: Kayaderossoras Creek in Greenfield, Milton, Malta, Ballston Spa and Saratoga Springs, Clove Creek in the Hudson Highland region, Tug Hill Tomorrow Land Trust, Boquet River near Lake Champlain, Rondout Creek near the Hudson, and within the New York City water supply for the Catskill and Delaware watersheds.

Voluntary agreements are negotiated between the landowner and the local government or land trust. Those holding a conservation easement are responsible for monitoring and enforcing the provisions of the agreement. Allowed uses are usually flexible such as agricultural, limited forestry or recreational use. Land with a conservation easement remains privately owned and managed, but also remains on the tax rolls at a reduced tax appraisal. The value of the development right is generally determined based on the difference between the land value for development and its present non-developed value. The reduced tax appraisal will vary depending on the land values and amount of development pressure of any given municipality. According to federal law, easements donated for conservation purposes must provide "significant public benefit". Very careful documentation of conditions before easement acquisition plus monitoring after is needed according to the National Land Trust Alliance (http//: www.lta.org) and according to several key reference sources (see Barrett and Nagel 1996, Bick and Haney 2001, Diehl and Barrett 1988, and Gustanski and Squires 2000). Locally the Finger Lakes Land Trust has had the most experience with conservation easements. Note that conservation easements can be used in conjunction with stream buffers, conservation land sales and land donations.

Unlike conservation easements, which are restrictive, **fishing access easements** are "positive" easements because they provide access across privately owned land for fishing. The New York State Department of Environmental Conservation (NYSDEC) has acquired many miles of fishing access easements on streams across New York State. They also have a state registry for state held fishing access easements (http://www.dec.ny.gov/), and some fishing books document many of the easement locations. Ninemile Creek in Marcellus and Camillus is a local example of

NYSDEC fishing access easements. Several miles of easement exist starting above the Route 173 railroad bridge overpass and running southward along the creek beyond the village of Camillus. The acquired fishing access easement is 16.5 feet from the centerline of the stream beyond the bank in both directions. If a land owner holds title to both sides of the stream, the easement is a combined 33 feet wide. Access points from public right of ways (e.g., roads) to the fishing access easement are still required, otherwise recreational fishers will be trespassing on private property to get to the fishing easement.

Along Ninemile Creek, for instance, several fishing pullout areas are located off Route 173 that allow such connective access. NYSDEC pays property owners per linear foot for fishing access easements. To be eligible for payment, the creek edges in question have to be surveyed by a licensed surveyor in order to calculate accurate linear footage.

Assistance Programs for Specific Landowners

Special tax, conservation and management programs exist in New York State for agricultural landowners. These programs are summarized in American Farmland Trust's (AFT) **New York Agricultural Landowner Guide** (2001). Only those programs which will provide possible protection of water quality and habitat for Onondaga Creek, its tributaries, and the rural portions of the watershed are discussed below.

The first program is New York State's **Farmland Protection Program**, which provides grants to eligible municipalities to permanently protect land for agriculture. The grants can be used to purchase farmland development rights, thus allowing farming to continue with some of the farmland in conservation easements. This program is coordinated by the New York State Department of Agriculture and Markets. Two farms in Onondaga County have entered the program to date.

New York also has a state-wide, voluntary **Agricultural Environmental Management Program (AEM)**, which helps farmers address environmental issues, reduce liability and meet regulatory requirements. Farmers who participate in AEM receive a substantial cost-sharing arrangement to implement best management practices (BMPs) that address environmental risk. The AEM Program is administered cooperatively by several agencies (AFT 2001). The lead local agency is the Onondaga County Soil and Water Conservation District (OCSWCD). More than 30 farms currently participate in the AEM Program in the Onondaga Lake watershed, assessing risk or implementing BMPs to reduce nonpoint source pollution (sediments, nutrients, pathogens, and pesticides) to Onondaga Creek and Lake. The AEM program offers 95% cost-sharing and is sponsored by the Onondaga Lake Partnership (OCSWCD 2007).

The **Environmental Quality Incentive Program (EQIP)** pays up to 75 percent of the cost for farms to implement structural and management practices on eligible agricultural land. Cost-share payments may be made to help farmers install erosion control measures and agricultural waste management facilities or to establish conservation practices such as nutrient management, manure management, and wild life habitat management (AFT 2001 p 10). In New York, EQIP has been used in combination with other programs to help farmers meet regulatory requirements and improve water quality. Many farms have undergone whole farm planning within the Skaneateles watershed in conjunction with the OCSWCD and the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) to help qualify for EQIP.

The **Conservation Reserve Program (CRP)** encourages farmers to convert highly erodible cropland and other environmentally sensitive land to vegetative cover such as tame or native grasses; plants that benefit wildlife; tree filter strips; or riparian buffers. Participating farms receive annual rental payments for the multi-year term of their contracts (between ten and fifteen years). Cost-share funding is provided for the establishment of the vegetative cover practices. Landowners may also receive funding to fence streams that exclude livestock, build grass waterways or develop shallow water areas for livestock (AFT 2001 p10-11).

The **Wetland Reserve Program (WRP)** restores and protects wetlands on private property. Participating landowners are paid for permanent or temporary conservation easements that establish wetland protection and restoration as the primary use for the duration of the agreement. Landowners can receive as much as 100 percent of the appraised agricultural market value of the property for permanent conservation easements or 75 percent for thirty-year easements. A third option is ten year restoration agreements, which provides 75 percent of the restoration costs without the

"The tendency to view natural phenomena as static events, frozen in time, is a root cause of the aesthetic dilemmas that we face. When nature is seen as a continuum, the argument of what is beautiful or what is less so in the landscape becomes, if not meaningless, then of a very different order of meaning…. Landscapes may be created that are different from the original, but may result, none the less, in diverse and healthy environments…. Human or natural processes are constantly at work modifying the land. The nature of design is one of initiating purposeful and beneficial change, with ecology and people as its indispensable foundation."
–Michael Hough, Cities and Natural Processes p 5

requirement of a conservation easement (AFT 2001 p 11). For every program option, landowners continue to control access to their land. This is a very popular program for landowners with non-active muck farms in Oneida and Oswego Counties. Candace Blumfield, a graduate student at SUNY College of Environmental Science and Forestry (SUNY ESF) has performed a statewide survey of participant satisfaction of the program on behalf of the NRCS in Syracuse.

The **Wildlife Habitat Incentives Program (WHIP)** offers financial incentives to agricultural landowners who maintain habitat for fish and wildlife. Participating landowners work with the NRCS to create wildlife habitat development plans that list goals and practices needed to improve wildlife habitat (AFT 2001 p 11). The NRCS provides up to 75 percent in cost-share assistance. In New York State, most WHIP funding has been used for development of grassland bird habitat.

Urban Strategies

The development of the Onondaga Creek corridor through Onondaga County needs to take into account the issues raised by Hough (left margin); but also the mounting research findings that attribute a rise in property values, and subsequently property tax base near, or proximate, to parks and open space (Crompton 2006). Onondaga Creek flows through some of the most economically disadvantaged neighborhoods within the City of Syracuse that exhibit high rates of disinvestment and abandonment, a plight not uncommon to northeastern "rustbelt" communities. In these neighborhoods the creek has been lamented as an open sewer (Giattina et al. 2006, Adams 2003). The creek corridor and the adjacent vacant lands should be considered part of the neighborhood planning and development process; they can become an integral part of the urban fabric, elevate the quality of life for residents, and become an attraction for visitors (Bonham 2002). A major goal of the revitalization process will be to transform the creek corridor into a "multi-functional, productive, and working landscape that integrate[s] ecology, people, and economy" (Hough 1995).

Many groups and organizations see the creek as an asset. The creek corridor can be enhanced as an urban greenway (*open space*) providing recreational opportunities, new cultural and heritage areas, and protected areas for the natural habitats of indigenous plants and animals (Bonham 2002). At its core, the revitalization of Onondaga Creek will need to consider ecological as well as neighborhood health (including both social and economic concerns).

Within the city, there are possibilities for *renaturalization* along the creek, developing connections to the city's larger open space network, and exploring possibilities for improving the overall health of the urban watershed by employing an integrative and ecological approach to stormwater management. Alternative stormwater systems focus on infiltration and treat stormwater as part of the hydrologic cycle, thereby enhancing aquatic and terrestrial habitats. Natural processes are incorporated into larger urban open-space networks, as BMPs, and are chosen for their specific function and suitability to particular sites (Condon 1999).

Figure 8.2 Green Roof: Solaire Building, New York. Photo: Earth Observatory

The Proximate Principal: higher market values for properties located near a park or open space
The **proximate principle** suggests that the value of a specified amenity (i.e., a park or open space) is at least partially represented in the price of residential properties near it. For example, if home locations adjacent or near Onondaga Creek are desirable, the extra dollars that home buyers are willing to pay for a home in that location represents the increased value of land near the creek. As property values rise, owners typically are required to pay increased property taxes. The additional tax base that is generated from the increase in property values adjacent to an enhanced open space resource may be sufficient to cover the annual cost of acquiring, developing and even maintaining the land. Enhancement of the tax base is a net gain to a city's annual income. In addition to the personal gains enjoyed by those living in close enough proximity to open spaces, an entire community may indirectly benefit from increased municipal expenditures and improvements to open space systems through increases in the tax base. In addition, community residents living outside the zone of a greenway's proximate influence have access to the facility without paying additional taxes for the privilege. (Crompton 2001)

In the more heavily developed zones along the corridor *green infrastructure* practices, like green roofing (see Figure 8.2) and on-site stormwater detention facilities, can be employed. Whenever practical, in order to protect water quality and aquatic habitat, a minimum stream buffer of 100 feet is recommended, especially if filtering pollutants is a goal (Stormwater Manager's Resource Center 2003, Otto et al. 2004). The most important section of a stream buffer is the first 25 feet of land from the edge of the water; development within this zone should be extremely limited. Referred to as the streamside zone, this area includes the stream bank, canopy trees that overhang the stream, and aquatic vegetation along the water's edge (MacBroom 1998, University of Georgia Institute of Ecology 2003, Washington County Soil and Water Conservation District 1999).

Concerns were raised throughout the visioning process regarding future affordability and gentrification along the creek corridor as improvements are made to the creek; especially within those neighborhoods that currently are experiencing disinvestment. This issue can be viewed as two-sided. On the one hand, these areas are a financial drain to the city because of declining tax base and although they may be "affordable;" the housing stock is deteriorating due to deferred maintenance and neglect. Property values fall, which leads to further deterioration. Studies have shown that investment in parks and open space increase the value of surrounding property (Crompton 2006, see text box above).

On the other hand, when property values increase, some lower income and more transient parts of the population may be displaced in the process. This latter concern can be addressed through careful preparation and the implementation of comprehensive neighborhood revitalization tools:

- Promote homeownership with initiatives such as those administered by Home HeadQuarters, Inc., that provide credit counseling, homebuyer education, and down payment and closing cost assistance;
- Strengthen the educational system within city neighborhoods to improve the life chances, or opportunities to improve quality of life, of original neighborhood residents;
- Encourage affordable housing development both for home ownership (as in the case of the Jubilee Homes Land Trust) and for renters (such as those currently operated by Syracuse Model Neighborhood Corporation); and
- Improve connections between neighborhood residents and the economic development engines of the region as well as small-scale business development along neighborhood commercial strips (working in concert with the Southside Innovation Center through Syracuse University) (Kennedy 2001).

The urbanized portions of the Onondaga Creek corridor can be divided into four general segments (further defined into potential project areas by the Project Team): **Lakefront** (Inner Harbor and Franklin Square), **Downtown** (Clinton Square and Armory Square), **Southside** (Southside and the Botanical Garden Area), and the **Valley** (North Valley and South Valley). Each of these areas exhibits a different context for the creek and each will require different design solutions described in relation to the maps that follow (maps identify properties within 500 feet of the creek).

The OCRP is meant to be a guide and a resource for the communities that lie within the Onondaga Creek watershed. Future efforts to implement stream revitalization opportunities in existing land use patterns will require collaboration between multiple local governments, regulatory agencies, private property owners and other stakeholders.

Lakefront: Inner Harbor to Franklin Square

This area is dominated by the DestiNY USA project, Inner Harbor Redevelopment, and the ongoing revitalization of Franklin Square. The vacant land depicted within the DestiNY zone is mostly under the control of the Pyramid Companies and currently is being used as temporary surface parking while the mall expansion is underway. As the expansion has been advertised as a "green project," there should be discussion of incorporating green infrastructure that could include *green roofing*, on-site stormwater management facilities and on-site sewage treatment (*living machines*) to help to mitigate the impacts of the proposed development on water quality in the area.

Legend

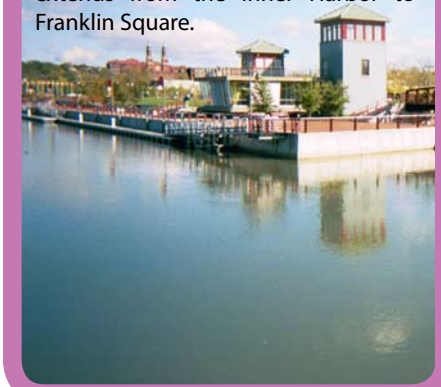
- Interstate

Openspace - 500ft

- Wild, Forested Lands, and Parks
- Recreation
- Vacant Land
- Vacant Farmland
- Cultural Services
- Parking
- Roads
- Creek Watershed
- Parcels Outside Watershed
- Onondaga Creek And Tributaries

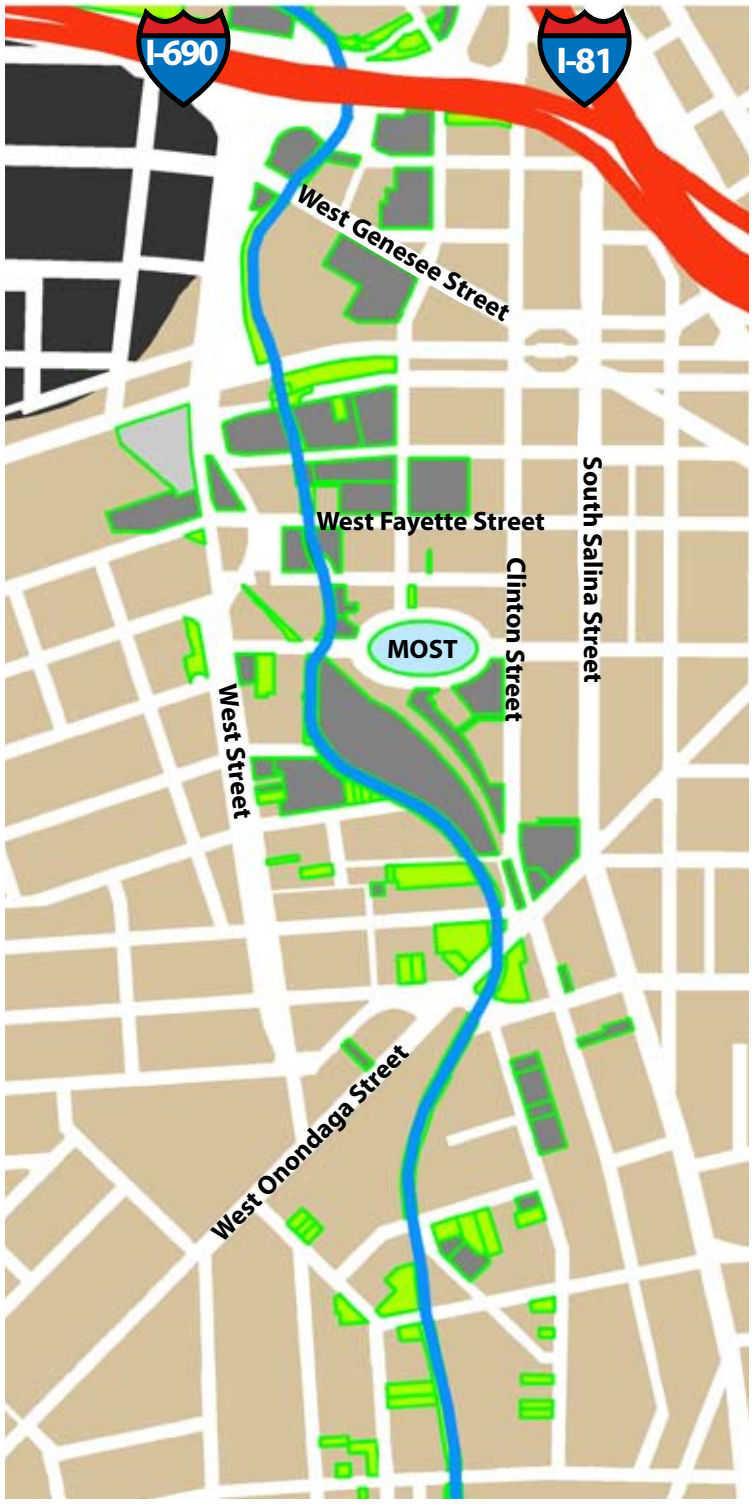
The Inner Harbor area is controlled by the New York State Empire Development Corporation and has been identified as an infill development area. Any new development should remain sensitive to water quality in the area by employing similar green infrastructure techniques as mentioned above. The 25 feet buffer area should be maintained along the water's edge whenever possible, area with larger green zones should maintain the 100 feet buffer.

The Lakefront area of the Onondaga Creek corridor contains the finished portions of the Creek Walk which extends from the Inner Harbor to Franklin Square.



Onondaga Creek joins the Inner Harbor just north of Kirkpatrick Street.

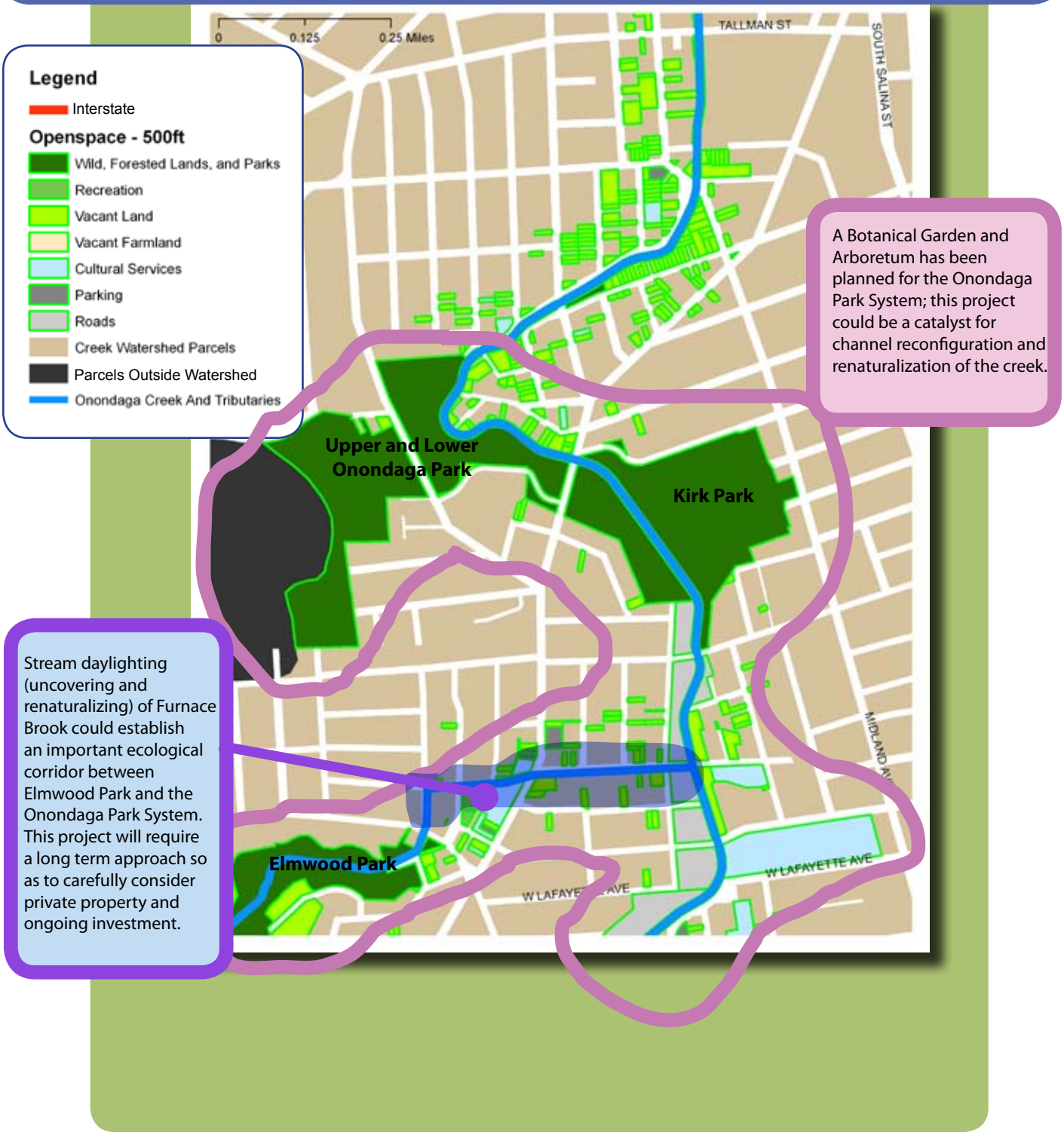
Downtown: Clinton Square and Armory Square



The Downtown area of the Onondaga Creek corridor is the most densely developed portion as it travels along the western edge of downtown Syracuse. The edges of the creek are defined by surface parking lots, parking garages, and office/residential buildings. In this area BMPs should be introduced that help to slow or reduce the amount of stormwater runoff that is reaching the creek. Employing green infrastructure techniques such as green roofing, on-site or streetscape stormwater management facilities, and increasing permeable surfaces within the areas adjacent to the creek could help to decrease the impacts of stormwater on the creek. Economic development projects should capitalize on the presence of the creek by developing promenades, cafes, shops, pocket parks and public art along the corridor. Parking facilities should incorporate BMPs and green infrastructure to improve their ability to capture stormwater and allow for on-site infiltration. The development of the Creek Walk from Armory Square to Franklin Square and the Inner Harbor can be an important catalyst and recreational amenity to spur new downtown residential development as the corridor will eventually link up to the Onondaga Lake Loop the Lake trail.

Southside: Midland RTF to Botantical Garden and Arboretum

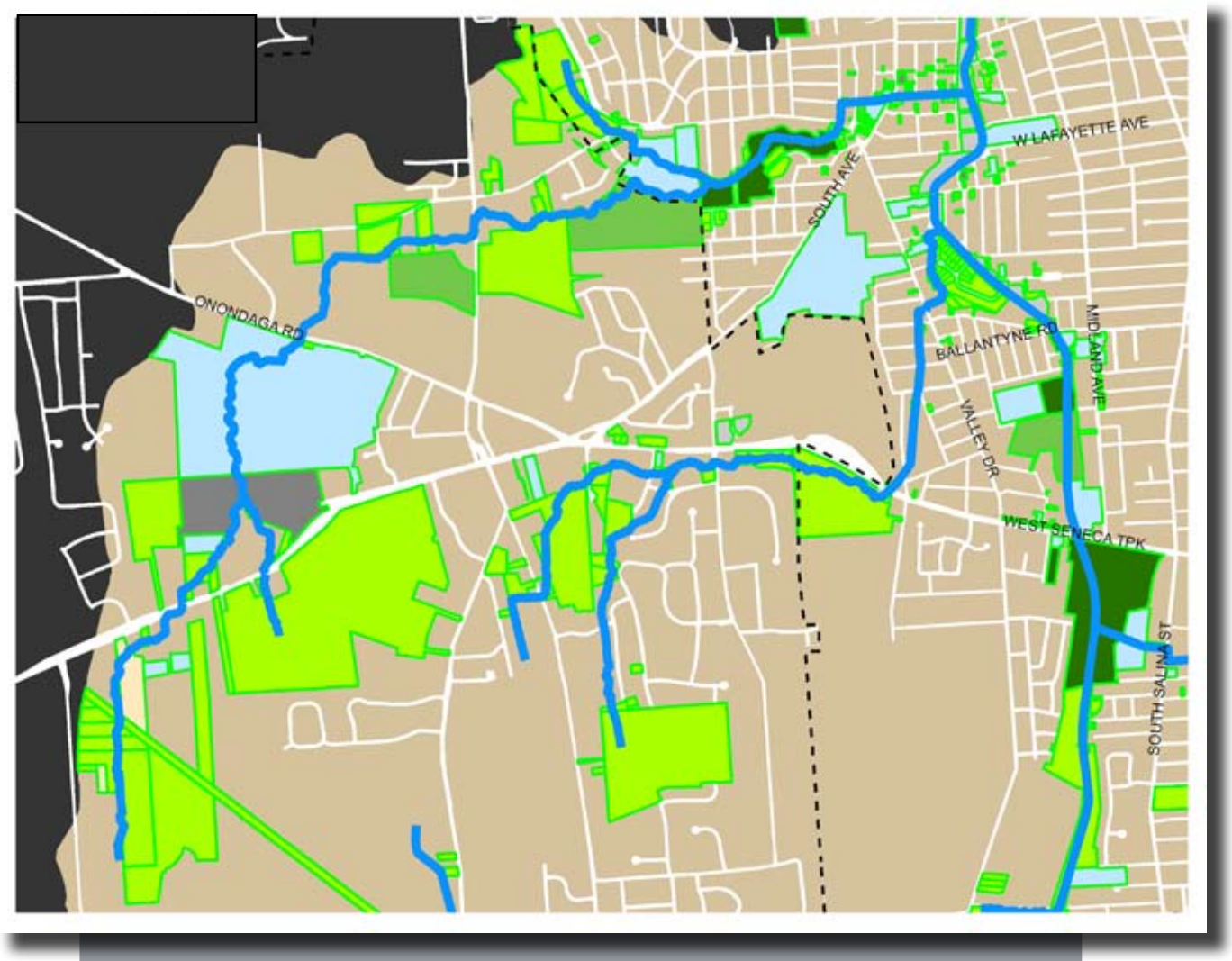
A string of publicly owned and controlled lands border the creek from Tallman Street south through the Onondaga Park System (upper Onondaga, Lower Onondaga, and Kirk Parks) and along Onondaga Creek Boulevard to Ballantyne Road; these lands include parks, school grounds, recreational areas, and vacant land. These areas provide an opportunity for *channel reconfiguration* and renaturalization. Some work has been conducted by SUNY ESF, led by Dr. Theodore Endreny, to engineer possible channel modifications in this area. Green infrastructure techniques should be employed in the adjacent neighborhoods including green roofing, on-site stormwater management facilities like *rain gardens* and rain barrels, as well as permeable pavements to help to improve water quality.



A Botanical Garden and Arboretum has been planned for the Onondaga Park System; this project could be a catalyst for channel reconfiguration and renaturalization of the creek.

Stream daylighting (uncovering and renaturalizing) of Furnace Brook could establish an important ecological corridor between Elmwood Park and the Onondaga Park System. This project will require a long term approach so as to carefully consider private property and ongoing investment.

Valley: North Valley and South Valley



A string of publicly owned and controlled lands border the creek from the intersection of the culverted Furnace Brook with Onondaga Creek south into Nedrow; these lands include parks, school grounds, recreational areas, and vacant land. Collectively, these areas provide a opportunity for channel reconfiguration and renaturalization. Daylighting of Furnace Brook could establish an important ecological corridor from Onondaga Community College through the Corcoran High School campus and Elmwood Park and into the Onondaga Creek corridor. Arsenal Park and lands along the creek from Dorwin Avenue to Route 173 possess ample open space to restore stream meanders and contain *floodplain*. School grounds can be integrated into the creek corridor through specially designed curricula tied to ecological literacy and the health of Onondaga Creek. Green infrastructure techniques should be employed in the adjacent neighborhoods including green roofing, on-site stormwater management facilities like rain gardens and rain barrels, as well as *permeable pavements* to help to improve water quality in the area.

Establishment of Design and Sustainability Standards

"Cities are rediscovering their rivers. For at least the past 30 years, cities and towns have been turning back to their rivers, transforming industrial and derelict land into new parks, residences, and commercial space. The trend appears to be continuing and perhaps even accelerating, with major planning and construction efforts underway in cities around the country. After abusing urban rivers through years of hard use and neglect, we have come to realize they are valuable economic and community assets. While this renaissance movement has been overwhelmingly positive….Too often, the river itself is not considered, an oversight that ignores the possibilities for enhancing the ecological value of the river….To take advantage of this opportunity, we need to effectively integrate ecological considerations with economic and social goals along the nation's urban rivers."

-Rebecca R. Wodder, President American Rivers (Otto et al. 2004, p v-vi)

Revitalization of the Onondaga Creek corridor will require the successful integration of ecological, social and economic concerns. Onondaga Creek flows through rural hinterlands, suburban subdivisions, urban neighborhoods, and downtown districts on its way to Onondaga Lake. Each of these areas has unique characteristics, and will require the utilization of different materials, methods, and strategies for their reclamation. Environmentally sensitive redevelopment of the creek including public amenities such as parks and trails, cultural attractions, commercial buildings, and housing can draw new investments to our region and improve the quality of life for Central New York residents.

Planning must reconcile development, flood control, and recreation with environmental designs and strategies that enhance Onondaga Creek's ecological integrity. In addition, planning for the creek should incorporate green design elements that can help to cultivate environmental *stewardship* through community education that builds the community's awareness of ecological principles (Rhodeside & Harwell Inc. 2006).

Stream buffers are a key design standard for Onondaga Creek; aquatic habitat degradation is caused by loss of *riparian* vegetation along the entire length of the creek (see Aquatic Habitat Fact Sheet, Appendix B). Stream buffers are critical for protecting water quality in rural portions of the creek. Within urban sections of the corridor, a minimum of a 100 feet-wide stream buffer is recommended (see discussion under Urban Strategies, previous section).

The revitalization of the Onondaga Creek corridor should incorporate the following principles adapted from **Ecological Riverfront Design: Restoring Rivers, Connecting Communities** (Otto et al. 2004). These principles were developed after careful study of river initiatives across the United States and can help to guide the successful revitalization and restoration of the creek corridor.

GENERAL PRINCIPLES

General Principle 1: Ecological goals and economic development goals are mutually beneficial

General Principle 2: Protect and restore natural creek features and functions

General Principle 3: Regenerate the creekfront as a human realm

General Principle 4: Compromises and collaboration are necessary to achieve multiple objectives

General Principle 5: Make the process of planning for and designing the Onondaga Creek Corridor broadly participatory

PLANNING PRINCIPLES

Planning Principle 1: Demonstrate characteristics of each community's unique relationship to the creek in the creekfront design

Planning Principle 2: Know the creek ecosystem and plan for a scale larger than the immediate creek corridor (consider the watershed)

Planning Principle 3: Because the creek is dynamic, minimize new floodplain development

Planning Principle 4: Provide for public access, connections, and recreational uses

Planning Principle 5: Celebrate the creek's environmental and cultural history through public education programs, signage, and events

DESIGN PRINCIPLES

Design Principle 1: Preserve natural creek features and functions

Design Principle 2: Buffer sensitive natural areas

Design Principle 3: Restore riparian and in-stream habitats

Design Principle 4: Use nonstructural alternatives to manage water resources (i.e., using plants to stabilize watershed slopes instead of concrete walls)

Design Principle 5: Reduce hardscapes, e.g., paved areas

Design Principle 6: Manage stormwater on site and use nonstructural approaches (i.e., green infrastructure)

Design Principle 7: Balance recreational and public access goals with creek protection

Design Principle 8: Incorporate information about the creek's natural resources and cultural history into the design of creekfront features, public art, and interpretive signs

It is important to consider the interface between the Onondaga Creek corridor and the surrounding geographical context. Once the creek enters Nedrow and the southern reaches of the City of Syracuse a balance will need to be struck between the desire for ecological restoration and the need for neighborhood revitalization. Restoration of the creek itself cannot be separate from the development of a comprehensive vision for the revitalization of urban residential neighborhoods including the development of recreational and open space amenities, transportation alternatives, economic development opportunities, and affordable housing development.

Design of the ultra-urban portions of the creek corridor, where limited opportunities for the regrading of the channel exists, will need to consider adequate safety measures to prevent people from direct access to the steep banks and swift currents of the creek during periods of high flow. Where possible vacant and/or derelict lands that are adjacent to the creek corridor should be considered for their potential to act as additional buffer areas and incorporated as part of the corridor.

Ecological revitalization of the creek can serve as a catalyst for social and economic sustainability for surrounding neighborhoods. Lessons for the urban sections of Onondaga Creek can be drawn from the Bronx River in New York City. The Bronx River Alliance and Sustainable South Bronx are two organizations that are setting the standard for linking river and neighborhood revitalization (see Case Studies Guide, Appendix C).

The rural headwaters sustain all of Onondaga Creek (see Rural Strategies). Sustainable development near the headwaters can be designed to meet the needs of the present without compromising the ability of future generations to meet their own needs (adapted from World Commission on Environment and Development 1987). This includes sustaining healthy streams with good water quality. In rural areas, use of BMPs are an approach to manage agricultural stormwater runoff that can contain manure and pesticide residues (see Appendix I).

Establishment of standards for ecological creek restoration

As a complement to design and sustainability standards, this section presents standards for ecologically successful creek *restoration*. Standards for ecological restoration of Onondaga Creek acknowledge our responsibility not only for human needs, but to meet the needs for other species as well. Creeks and rivers provide ecological structure, the form or "architecture" of diverse habitats for a large range of aquatic and terrestrial species. Anthropogenic, or human-influenced, stressors placed on these ecosystems are growing rapidly, due to climate change, industrialization, overdevelopment, overexploitation, and pollution. Thus there is a critical need for river restoration that maintains ecological structure and reinstates ecosystem function, the processes and interactions that operate within an ecosystem. (Giller 2005)

Many attempts worldwide are being made to redress impacts of human use (and misuse) of freshwater resources; some projects are attracting huge financial investment (Giller 2005). Yet there is little agreement on what constitutes a successful river restoration project (Palmer et al. 2005). In a series of articles in the **Journal of Applied Ecology** in 2005, leading restoration scientists proposed criteria for evaluating river restoration projects. The following standards are borrowed from those articles.[2]

Ecological Standard 1: "A guiding image exists: a dynamic ecological endpoint is identified (in advance) and used to guide the restoration."

The first step in restoration is to identify a guiding image that describes Onondaga Creek as an ecologically healthy river that could exist in its current location. The restoration goal is to move the creek towards its least degraded and most ecologically dynamic, or functionally active, state possible, given the regional context. The goal of re-establishing a coldwater fishery may serve as the guiding image. Sustaining an indigenous coldwater fish such as brook trout would indicate that most ecological requirements have been met.

Ecological Standard 2: "Ecosystems are improved: the ecological conditions of the river are measurably enhanced."

Onondaga Creek will experience measurable changes that move it toward the guiding image. Measurable changes include easily recognizable signs of ecological recovery, such as re-establishing an extirpated fish population and improved water quality and clarity.

[2] Standards are borrowed from Palmer et al. *Standards for ecologically successful river restoration,* and Jansson et al. *Stating mechanisms and refining criteria for ecologically successful river restoration: a comment on Palmer et al. (2005)*, Journal of Applied Ecology, 2005, Issue 42, p208-222.

Ecological Standard 3: "Resilience is increased: the river ecosystem is more self-sustaining than prior to the restoration."

Restoration projects involve reinstatement of natural river processes, such as channel movement, organic matter retention and river-floodplain exchanges. Thus, Onondaga Creek becomes a resilient self-sustaining system, meaning the system has the capacity to recover from rapid change and stress.

Ecological Standard 4: "No lasting harm is done: implementing the restoration does not inflict irreparable harm."

All restoration projects, no matter the degree of intervention, minimize long-term impacts to Onondaga Creek, based on Aldo Leopold's first "rule" of restoration: do no harm. An example of harm as a result of restoration would be if lamprey eel or any other exotic invaders could access the upper reaches of Onondaga Creek should barriers such as the Dorwin *drop structure* be removed.

Ecological Standard 5: "Ecological assessment is completed: some level of both pre- and post-project assessment is conducted and the information is made available."

It is possible to declare restoration project success on Onondaga Creek only by starting with clear project objectives and ending with an evaluation of their achievement. Any pilot or demonstration project would require *efficacy testing* (demonstration of effectiveness), which is contingent upon proper design and pre- and post-monitoring. Information about all outcomes, both negative and positive, must be shared locally, regionally and nationally.

Ecological Standard 6: "The guiding image is supplemented by some description or prediction of the ecological mechanisms by which the intended restoration strategy will achieve its goal. "

The process of predicting intended ecological mechanisms prior to implementing particular restoration strategies for Onondaga Creek may identify potentially conflicting processes and allow for reconsideration of strategies. For instance, certain vegetation for habitat purposes may preclude vistas and cause safety concerns along isolated trails.

Figure 8.3 The most effective river restoration project lies at the nexus of three pillars of success: stakeholder, ecological and learning (adapted from Palmer et al. 2005).

The six standards described for successful river restoration projects focus on ecological criteria. Yet a successful project can be measured in many ways. Success can be measured with the design and sustainability standards described in the previous section or with a set of economic criteria. Meeting multiple goals, including ecological goals, and accommodating as many stakeholders as possible defines the most effective river restoration project. Ideally, ecological success forms one of three pillars for measuring success of river restoration projects. Two additional measures are stakeholder success (stakeholder needs are met) and learning success (advancing the science of river restoration). The most effective restoration lies at the nexus of the three, illustrated by Figure 8.3 (adapted from Palmer et al. 2005). Implementing ecological standards in this context will help lead to a successfully revitalized Onondaga Creek.

Intermunicipal Agreements for Creek Watershed Management

Onondaga Creek passes through the City of Syracuse, the Towns of Tully, Lafayette, Onondaga, several villages, and the Onondaga Nation, a *sovereign* nation. One approach to managing resources that cross municipal boundaries is *intermunicipal agreements* (IMAs). Intermunicipal agreements in the Onondaga Creek watershed are most appropriate for use by local municipal governments. According to the New York State Office of the State Comptroller (NYSOSC) (2003) "Article 5-G of the General Municipal Law (SS119-m through 119-oo) provides broad authority for municipal corporations and districts to cooperate with each other in carrying out their respective responsibilities".[3]

Intermunicipal agreements usually serve as a means of consolidating services, but a number of IMAs have been used for watershed management purposes. Nolon (1999) traces the use of IMAs as far back as 1992 for watershed management purposes with the Mianus River and the Titicus River Watershed in 1995 to more recent uses on Long Island. The NYSOSC has published a **Local Government Management Guide for Intermunicipal Cooperation** (2003) that provides a straight forward step-by-step guide for establishing IMAs. Pace Law School also developed background information on IMAs (Crisalli et al. 2007, Nolon 1999).

Relevant to the OCRP, an IMA is a sound policy that allows municipalities to work together to protect a shared natural resource. IMAs act as a mechanism for members to share resources and co-locate joint funding ventures. For example, IMA members may choose to designate a single grant administrator or share costs and supervision of enforcement personnel for land use regulations. IMAs can be employed to pass protection resolutions for resources such as critical habitats, endangered species, or water supplies. IMAs can also be used to work on mutually beneficial projects, establish joint planning or zoning boards, and adopt compatible zoning laws, comprehensive plans, floodplain and wetland laws, and other land use regulations, including those for corridor development and watershed enhancement. (Crisalli et al. 2007)

The following examples demonstrate how such agreements can be used for watershed management. All four cases are located in New York State.

New York City Watershed Memorandum of Understanding

The first example is the Memorandum of Understanding (MOU) signed in 1997 by New York City with the communities of the Catskill and Delaware Watersheds, US Environmental Protection Agency (USEPA), State of New York and other organizations in exchange for a water filtration avoidance waiver from USEPA. Rather than spend hundreds of millions of dollars on filtering its drinking water supply, this MOU enables a comprehensive watershed protection program to preserve and restore natural filtration conditions as a more cost effective means of maintaining water quality. Watershed management measures included land acquisition, comprehensive planning, disease surveillance and upgrading wastewater treatment plants belonging to other local municipalities that exist along source waters to New York City drinking water supply. Aspects of the New York City MOU that relate to Onondaga Creek include conservation easements along creeks feeding some of the reservoirs, and massive stream restoration work that has been performed by Greene County Soil and Water Conservation District. Some aspects of the program resemble the City of Syracuse's efforts to maintain water quality within the Skaneateles Lake watershed in conjunction with farmers and other landowners, NRCS and the OCSWCD.

[3] Article 5G defines *municipal corporation* as any county, city, town, village, fire or school district, or board of cooperative education services and defines *district* as a county or town improvement district.

Long Island Sound Watershed Intermunicipal Council
In 1999, Long Island Sound's lobster population experienced massive mortalities, resulting in a commercial fishing failure. Populations have not recovered. After several years of study, researchers concluded that pesticides carried by stormwater runoff were one of the catalysts to the population collapse.

Motivated to form that same year, the Long Island Sound Watershed Intermunicipal Council (LISWIC) is made up of 12 cities, towns and villages that drain into the Long Island Sound. The municipalities are all within Westchester County, which is not a member of the LISWIC. The municipalities' IMA describes their goal to collectively make decisions for a cleaner Long Island Sound. The LISWIC shares information regarding development projects that have intermunicipal impacts, resolves disputes over development projects in environmentally-sensitive areas, develops compatible comprehensive plans and regulations, monitors and enforces regulations, and secures and shares funding.

Aware of the severity of stormwater's effect on the sound, LISWIC is exploring the feasibility of forming a regional stormwater management district. While other areas have stormwater utility districts operated at the county or state level, LISWIC is making the innovative proposal of governance by the municipalities themselves through a district board. The district will act as a single, fee-supported regional organization that will plan, fund and implement the stormwater management program for Long Island Sound. The proposed fee structure is a flat rate for single-family households and a pro-rated fee for non-residential properties based on the property's impervious surface area. Once the district is in place, municipalities expect to re-allocate or reduce local taxes currently devoted to stormwater management. (LISWIC updated 2008, Malcolm Pirnie Inc. 2007).

Sauquoit Creek Basin Intermunicipal Commission (SCBIC)
This intermunicipal commission was created in 1999 and consists of six communities including the Towns of New Hartford and Whitestown and the Villages of New York Mills, New Hartford, Yorkville and Whitesboro. The initial stimulus for creation of the Sauquoit Creek Basin Intermunicipal Commission (SCBIC) was flooding (Cleveland 2007), but after incorporating in 2004 the SCBIC focused on stream erosion along with county and state agencies. Future projects may involve other agencies such as the New York State Department of Transportation. The SCBIC has also produced a thorough state-of-the-creek report that identifies creek resources and management issues within the watershed.

The Canandaigua Lake Watershed Council
Canandaigua Lake is located in both of the New York Counties of Ontario and Yates. It is bounded by six municipal corporations, has a total of twelve municipal corporations within the watershed, and two others outside the watershed which use it for water supply. After a multiple year planning period beginning in 1989, the Canandaigua Lake Watershed Council (CLWC) issued a state-of-the-lake report and released several other studies. The CLWC entered into an Agreement for Services with the City of Canandaigua in August of 2001. This agreement also included the Towns of Gorham, South Bristol, Bristol, Canandaigua, Middlesex, Italy, Hopewell, Naples, Potter; Villages of Newark, Palmyra, Naples, and Rushville, and led to the development of an implementation plan for the Canandaigua Watershed that included some 23 different municipal entities.

Since 60,000 people depend on Canandaigua Lake for drinking water, the award-winning CLWC vigorously protects the water quality of the lake and its watershed. The CLWC runs a comprehensive monitoring program capable of stream prioritization based on pollutant loading, thereby focusing management efforts on appropriate tributaries. The council administers programs for stream restoration, compiling and sharing land cover data, capital improvement projects to prevent erosion, agricultural environmental management programs, and septic system regulation enforcement. (Canandaigua Lake Watershed Council 2006) The CLWC set the precedent for subsequent IMAs later established for Keuka Lake and Cayuga Lake watershed management entities as well.

Funding Resources

The OCRP is meant to be a living, working document; in accordance, financial resources will need to be acquired and directed so that elements of the OCRP move towards implementation. Revitalization funding will require careful coordination to meet as many goals as possible. Implementation will require the participation of both the public and private sectors.

As evidenced via the series of community forums and stakeholder organization meetings, the public solidly supports Onondaga Creek revitalization. Revitalization will be a long-term process, accomplished step-by-step. Putting together a community-driven plan, developing implementation strategies and outlining next steps, allows efforts to be systematized, collated, and re-broadcast to the entire community in a way that builds further momentum towards ever larger actions. Success breeds success and encourages others to lend support and resources.

Onondaga Creek has already received resources from the community that were targeted for revitalization efforts; best separated into two categories:

1. Capital and maintenance activities that often occur outside the framework of creek revitalization, but at the same time positively impact the creek corridor and are congruent with the OCRP. Appendix K is a list of ongoing and pending projects in the corridor and many fit into this category.
2. Voluntary efforts being carried out by different organizations or agencies that fit into the framework of the OCRP, although not always determined with the goals of the OCRP in mind. These include OCSWCD's *Agricultural Environmental Management Program*, USGS's *Tully Valley Mudboil Control Program*, various monitoring programs conducted by the NYSDEC, Onondaga County Department of Water Environmental Protection, Upstate Freshwater Institute, and OEI, including that performed on behalf of the Onondaga Nation, the Partnership for Onondaga Creek's advocacy work, rain garden initiatives sponsored by Cornell Cooperative Extension (CCE), Creek clean-ups also under CCE's general auspices, Creek days put on by Canopy, Atlantic States Legal Foundation working with the after school program at the Dunbar Association, the ongoing Izaak Walton League/Project Watershed monitoring program, and SUNY ESF sponsoring a bio-blitz.

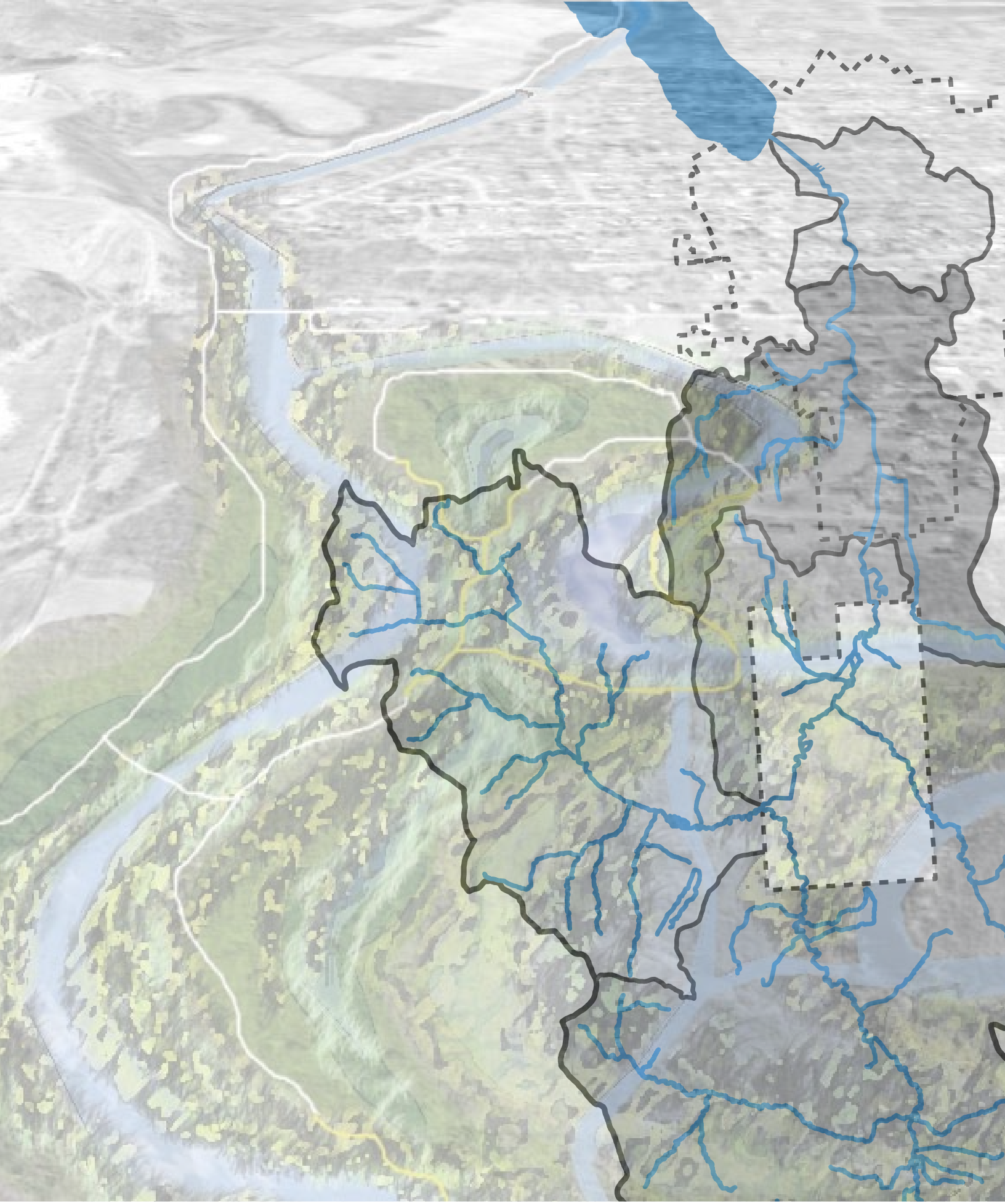
Practically speaking, the OCRP will not be funded and implemented by a single large appropriation. Revitalization will be a multiple-year process, characterized by long-range thinking, using many types of resources to accomplish goals. Elements of the OCRP will be implemented as discussed above and other pieces through dedicated funding made available through the hard work of citizens and government. Creative approaches will be necessary to steer resources towards those projects and recommendations which impart the greatest environmental, social, and economic benefits. The OCRP offers direction for the future revitalization and protection of the Onondaga Creek watershed. Funding mechanisms are just one of the many tools for achieving community goals.

Potential Funding Streams

Appendix N, Funding Sources, contains a table of potential funding streams from federal, state and private sources. The table is adapted from a database accessed on the internet, compiled by the U.S. Department of the Interior National Park Service's Partnership Wild and Scenic Rivers (PWSR) program. The table is intended to serve as an introductory resource; rather than provide an exhaustive list of available funds. Each funding source should be researched to assess eligibility requirements and current availability of funds. Onondaga Environmental Institute welcomes suggested additions to this database.

Conclusion

This chapter can help provide inspiration, ideas, and examples for strategies and resources to accomplish the work of revitalizing the Onondaga Creek corridor. Future efforts to incorporate the strategies described will take place over the long term at many levels, ideally shepherded through a community decision-making process, much like that embodied in the Onondaga Creek Working Group. Chapter 8 is meant to be a resource for this ongoing and evolving dialogue.



CHAPTER 9:
Immediate Next Steps

The Onondaga Creek Conceptual Revitalization Plan (OCRP) presents to the public and government decision-makers a conceptual plan for reinvigorating the creek and its corridor into an attractive asset. The case for revitalization is strong. The character of the creek has changed dramatically over the past two centuries. The symptoms of historic transformation, including urban development and rural land use changes, continue to compromise the ecological health of the creek and restrict access for use and enjoyment. The result is a waterway in need of flexible and innovative solutions for revitalization. Revitalization will be a long-term process, accomplished step-by-step, based on shared community goals for the waterway.

The benefits of revitalization are apparent; these few listed echo the goals of watershed stakeholders. Tangible benefits for the creek corridor include rehabilitating and protecting the natural environment, catalyzing renewal in surrounding neighborhoods, and creating recreation and education opportunities. Intangible benefits include forming new cooperative ways of managing Onondaga Creek as a treasured resource, reintegrating the creek as a natural oasis into the urban landscape, guiding creative renewal, linking communities, and fostering local pride.

To realize benefits, the OCRP must move towards implementation. Key next steps in the OCRP process are: 1) continuance of the Onondaga Creek Working Groups role as a community voice guiding revitalization, thereby serving as a conduit for ongoing public discussion and two-way communication, and 2) implementation of pilot projects, to begin to show the public tangible results. Key next steps are elaborated in sections of this chapter, Process Steps and Pilot Projects.

Prior to discussion of the next steps, OCRP findings are summarized. Primarily, a comprehensive community vision for the future of Onondaga Creek is a key finding of the OCRP. Watershed goals and concerns gathered from stakeholders underpin the conceptual plan components and will guide creek revitalization into the future. Results from the Onondaga Creek Community Forums and Stakeholder Organization Meetings were sorted into most frequent themes. Recreation in a clean, natural waterway and fishing opportunities from a healthy fishery were top goal themes for the future of Onondaga Creek. Concerns were framed as issues or obstacles that needed to be solved to achieve goals. Top themes expressed were lack of funding, government apathy or inability to achieve the goals desired, sewage and sewage treatment, and garbage/pollution.

Building on the community vision, the Onondaga Creek Working Group's results are the heart of the OCRP. The Working Group developed revitalization maps and watershed goals, based on technical information and community goals and concerns. Watershed goals are grouped under five categories, called drivers, identified by the Working Group. The five drivers are water quality; human health and safety; ecological health and habitat; access, recreation and use; and education. The drivers function as the primary motivators, the watershed goals and revitalization maps function as a guiding image for revitalization.

A strategy to evaluate ongoing projects was developed for the OCRP. Many projects are currently underway in the creek corridor. It is unrealistic to assume that every component of each project will readily match the goals of the revitalization plan. Yet a careful review of similar goals and potential synergies between projects and the OCRP promotes collaboration among decision makers and stakeholders. In turn, this may increase project acceptance by the public and strengthen long-term viability of the creek corridor.

In addition to coordinating with ongoing projects in the creek corridor, many factors will need to be addressed to move forward with implementation. Factors include flood management, safety issues, and rural and urban development. The OCRP identified constraints and data gaps that will affect Onondaga Creek revitalization. Constraints restrict the ability to act. In the Onondaga Creek watershed, constraints include fragmented government and community, current funding priorities, water quality and channelization. The challenge of revitalization is to turn existing constraints into opportunities. Understanding both the natural system and the local social and governmental dynamic are critical to developing effective strategies for the future. Data gaps in the watershed are significant; however, identification of constraints and data gaps leads to opportunities and solutions for revitalization.

Cohesive strategies for implementation will leverage funding and meet as many stakeholder goals as possible. Four types of strategies are identified and examined in the OCRP: finding revitalization opportunities in existing land use patterns; establishing design, sustainability and ecological standards to guide future projects; exploring intermunicipal agreements as a multi-jurisdictional watershed policy approach; and seeking sources of funding. Within each, options are suggested that communities can adopt to achieve the goals of the OCRP; many require cooperation with urban and rural private landowners.

The OCRP serves as a foundation for implementing meaningful change for Onondaga Creek. By setting and striving for goals, the community accepts both the challenge and opportunities possible through revitalization. To move forward with the OCRP, key next steps are described in the following sections, Process Steps and Pilot Projects.

Process Steps

Based on experience of other communities, creek revitalization is rarely a quick or linear process. The OCRP emphasizes that revitalization will be long-term, accomplished in incremental steps in multiple arenas. Projects build momentum from other successful projects, which encourages others to lend support and resources. For this to happen, implementation requires multiple processes to occur simultaneously and inform each other as illustrated in Figure 9.1. Key next steps in process are described in the following paragraphs.

The OCRP Project Team recommends continuing the Onondaga Creek Working Group. The Working Group is the cornerstone of implementation. The Working Group can act as the community voice for the watershed, initiating and coordinating projects through a transparent, accessible process. The Working Group functions as an inclusive partnership; fostering communications, and community dialogue. This is not easy to do; debates over priorities and methods of revitalization are inevitable. Uncertainties and delays typically occur when groups with diverse values work together. Yet ideally, resulting efforts enhance both the health of

the creek and the attachment of watershed residents to their creek. (Platt 2006)

To move into the implementation phase, Working Group members will have to make a number of decisions, including:
1. Determining what kind of model is appropriate for the next phase of the Working Group, including the introduction of new members and decision making processes.
2. Define funding mechanism or how to maintain sustainability of effort over the long-term.
3. Ascertain ways to gain government backing and support.
Many of the following process steps can be initiated and coordinated at the Working Group table.

A primary step in the implementation process is to develop, expand, and initiate the action items listed under the watershed goals. The Working Group has a role in determining where to begin. They are well equipped to frame priorities in a long-term strategy for restoring ecological structure and function and continuing community input. Implementing action items is intended as an iterative process; the Working Group should serve as the entity to return to the community soliciting input on project plans and designs.

Coordination of ongoing projects that affect Onondaga Creek is part of the process of revitalization. These projects are varied: rural nonpoint source pollution management, green infrastructure, neighborhood revitalization, creek walk, and local university initiatives. With an eye focused on creek revitalization, oversight by the Working Group, with day-to-day assistance from the OCRP Project Team, can contribute to grounding project plans and designs with public input and technical considerations. Without a creek advocate, many projects that could potentially provide benefit might otherwise not consider Onondaga Creek and the goals of the OCRP.

Communication of OCRP goals builds community support for creek revitalization. The role of the Working Group and Project Team is to share plan components and communicate the correlation of OCRP goals with the community vision. The public's concerns are addressed as part of the implementation process. To address concerns, the public needs a venue to share their input during revitalization steps; the Working Group provides a forum for two-way communication. The public can identify actions seen as counterproductive to the OCRP, discuss concerns, learn

Figure 9.1
Implementation process of OCRP

about the creek, and stay engaged in the long-term process of revitalization. Communication and building support for the OCRP occurs in many ways, some individuals will express support for revitalization by participating in community projects rather than attend meetings or read the OCRP document. Recognizing and tapping into different levels of engagement will be part of the creative process of implementation.

Continuing to gather data and characterize the Onondaga Creek watershed is a critical step in the implementation process. The OCRP identified both ecological and revitalization design data gaps, presented as tables in Appendix M. Ecological data gaps require continued monitoring and study of the watershed; nonprofits, the State of New York College of Environmental Science and Forestry (SUNY ESF), and government agencies, particularly Onondaga County, have ongoing monitoring programs in the watershed. For design data gaps, data can be transferred from other river systems, based on solutions found to similar concerns regarding safety, liability, and best management practices. The Working Group can function as an education forum for the broader community as data gaps are filled.

An outreach program to the many municipalities in the Onondaga Creek watershed is an important step in the implementation process. The OCRP identified intermunicipal agreements as a potential strategy to confront difficult problems

like nonpoint source pollution and stormwater management. With direction from the Working Group, the Project Team can engage local governments to educate about and advocate for revitalization projects and intermunicipal cooperation and agreements.

A strategy for funding is needed; an acute need exists for a coordinating entity capable of long-range thinking. As stated, revitalizing Onondaga Creek will be a long-term process, achieved incrementally. Financial resources need to be leveraged to meet as many stakeholder goals as possible. More will be needed than just funding for specific projects. The Working Group has an invaluable role to play in the next phases of the OCRP, but support is needed to facilitate the group over the long-term. Fundraising and coordinating public/private partnerships are another important aspect of leveraging funds for revitalization.

Lastly, implementation of demonstration, or pilot-projects, is a critical next step in the revitalization process. Demonstration projects fill data gaps, mobilize community activity, and show tangible results. Pilot demonstration projects are described in the next section.

Pilot Projects

The OCRP Project Team developed a pilot projects list during the process of drafting the OCRP. Pilot projects were based on watershed action items and the Working Group's revitalization maps (both are found in Chapter 5). The Project Team worked for a balance between urban and rural projects and easy and difficult projects. The Working Group reviewed and vetted the pilot projects. Their resulting assessment emphasized "low hanging fruit" (easy projects that can be quickly implemented); incorporation of public input; projects with good visibility (so that the public sees tangible benefits); and creating synergy between projects.

Pilot Projects are listed in Table 9.1. Projects are arranged from easier to implement (#1) to more difficult to implement (#11). A brief description follows the name of the project. Reference sources for the suggested projects follow, whether originating from the revitalization maps or the action items. Map letters identify corresponding revitalization maps. Corresponding drivers are listed numerically in the next column. It was noted during Working Group review that most pilot projects might serve an education purpose, thus corresponding to the education driver in the OCRP. In the last three columns, shading signifies project applicability to sections of Onondaga Creek. These columns correspond to the sections used for the revitalization maps: urban, rural and transitional (the section of Onondaga Creek that transitions between rural and urban). In addition to the revitalization maps and action items, the Case Studies Guide (Appendix C) provides examples of projects from other river revitalizations around the United States. Table 9.1 demonstrates that pilot projects can meet multiple drivers. A necessary step of implementation will be consideration of each pilot project's ability to impact multiple goals of the OCRP. As stated, the Working Group is an appropriate forum to plan projects and leverage resources so that projects meet as many goals as possible.

Conclusion

In moving towards implementation, whether OCRP process steps or implementation of pilot projects, requires the interest and motivation of watershed stakeholders. Sustained action is needed, particularly community input, landowner interest and cooperation, and building a coalition between watershed citizens and government agencies at the local, state, and federal level. As noted in Chapter 1, the U.S. Environmental Protection Agency (2001) defines stakeholders as those who have a share or an interest in an issue. The creek flows past homes, farms, schools, and businesses on its way to Onondaga Lake. Revitalization of Onondaga Creek will impact many lives in the watershed.

The OCRP demonstrates that the community vision for Onondaga Creek includes recreation in a clean, natural waterway and fishing opportunities from a healthy fishery. Striving for these goals requires a robust, long-term strategy. The OCRP functions as a guiding image to achieve this long-term strategy. The OCRP is a conceptual plan, but also an invitation to watershed stakeholders for continued involvement and action.

Table 9.1 Recommended Pilot Projects

	Recommended Pilot Projects	Description	Action Items	Revitalization Maps, By Letter	Corresponding Drivers*	Urban	Transitional	Rural
1	Living fence demonstration project	Create a natural barrier with shrubs, trees, or other vegetation next to the creek, to act as a barrier instead of fencing.		E, F2	2,5			
2	Alter the bankside mowing regime	Allow plant growth near the edge of the creek, to benefit fish and wildlife habitat, instead of frequent mowing.		E	3,5			
3	Shade tree planting pilot project	Plant shade trees in the riparian areas of Onondaga Creek to provide habitat and moderate water temperature.		A, C, E, F2, G/H, K, L	1,3,5			
4	Green infrastructure demonstration site	Manage stormwater runoff by integrating soils and vegetation into the landscape.		E, F, L	1,3,5			
5	Comprehensive littering education pilot program	Develop and present litter prevention education to both school children and watershed residents.			1,2,3,5			
6	Non-native species control, native plants restoration at hot spots	Remove non-native plants and replace with native plants, in areas where non-native species have become well established.		A, E, F, G/H, I, L	3,5			
7	Rural/agricultural BMP demonstration site	Install and practice innovative rural best management practices to manage runoff; site should be accessible for local landowners to assess function.		A, C, G/H, I, J, K, M	1,2,3			
8	Trail creation/ connection demonstration site	Create new and/or connect existing recreation trails where desired in a visible, accessible place, near Onondaga Creek.		E, F2, L	4			
9	Conservation easement/access demonstration site	Institute a conservation easement/ access site with a willing private landowner; site should be accessible for local landowners to assess function.		E, C, G/H, L	3,4			
10	Flood and stormwater retention demonstration site	Install a basin that retains stormwater for infiltration, pollution reduction and downstream water quality improvements.		E, F2	1,2,3			
11	Channel modification demonstration site	Returning a stream channel section to as natural a condition as possible, given current constraints, while creating a safer, stable, non-erosive channel.		E, F	2,3			

*Drivers: 1) water quality, 2) human health and safety, 3) ecological health and habitat, 4) access, recreation and use, and 5) education

Abbreviations List

A

AASHTO	American Association of State Highways and Transportation Officials
ACJ	Amended Consent Judgment
ADA	American Disabilities Act
AEM	Agricultural environmental management
AFT	America Farmland Trust
ASLF	Atlantic States Legal Foundation

B

BMP	Best management practices

C

CAOD	Conservation area overlay district
CBD	Central business district
CCE	Cornell Cooperative Extension of Onondaga County
CLWC	Canandaigua Lake (New York) Watershed Council
CNY	Central New York
CRP	Conservation Reserve Program
CSO	Combined sewer overflow
CWA	Clean Water Act

D

DDT	A colorless contact insecticide toxic to humans and animals, d(ichloro)d(iphenyl)t(richloroethane)
DNA	A nucleic acid that carries the genetic information in a cell, deoxyribonucleic acid
DO	Dissolved oxygen
DOI	Department of the Interior
DOS	Department of State

E

EQIP	Environmental Quality Incentive Program

F-G

GSA	United States General Services Administration

H-I

IMA	Inter-municipal agreements

J-L

LISWIC	Long Island Sound Watershed Intermunicipal Council

M

MDA	Metropolitan Development Association
MDA	Mudboil depression area
Metro	Metropolitan Syracuse Wastewater Treatment Plant
MOST	Museum of Science and Technology
MOU	Memorandum of Understanding

N

NEH	National Endowment for the Humanities
NOAA	National Oceanic and Atmospheric Administration
NPS	Non-point source
NRCS	Natural Resources Conservation Service
NYC	New York City
NYS	New York State
NYSDEC	New York State Department of Conservation
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Department of Energy Research and Development
NYSOSC	New York State Office of the State Comptroller

O

OCRP	Onondaga Creek Conceptual Revitalization Plan
OCSWCD	Onondaga County Soil and Water Conservation District
OEI	Onondaga Environmental Institute
OLP	Onondaga Lake Partnership

P

PCB	Polychlorinated biphenyl
pH	A measure of the acidity or alkalinity of a solution
PRISM	Finger Lakes Partnership for Regional Invasive Species Management
Project Team	Onondaga Creek Project Team
PWSR	Interior National Park Services's Partnership Wild and Scenic Rivers

Q-R

RTF	Regional treatment facility

S

SCBIC	Sauquoit Creek Basin Intermunicipal Commission
SDAT	Syracuse Sustainable Design Assessment Team
SUNY ESF	State University of New York College of Environmental Science and Forestry

T

TMDL	Total maximum daily load

U

USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

V-W

WHIP	Wildlife Habitat Incentives Program
Working Group	Onondaga Creek Working Group
WRP	Wetland Reserve Program

X-Z

YBP	Year before present

Glossary

A

Aggrade – to raise the level of a stream bed by the deposition of sediment

Amended consent judgment – a final, binding judgment in a case in which all parties agree to a particular outcome

Aquifer – a geologic formation that is water bearing; water is often accessed for use via wells or springs

Artesian groundwater – groundwater under pressure when tapped by a well and able to rise above the level at which it is first encountered

B

Bank grade – the gradient of a slope on a stream bank

Bedrock – solid rock beneath soil and superficial rock

Best management practices - methods that prevent or reduce water pollution from nonpoint sources

Biota – the plants and animals of a region

Body burden – a measure of total amount of toxic substances that have built up over time in the body of an organism

Brine aquifer – geologic formation characterized bearing water saturated with salt

C

Carcinogenic hydrocarbons – an organic compound containing carbon and hydrogen (for example, fossil fuels) that produce cancer

Channel reconfiguration – a stream restoration practice that involves manipulation of the landscape to reshape/regrade banks

Channelization - human engineering to enlarge or straighten river channels to protect existing channels or adjacent structures

Chlorination – to treat or cause to combine with chlorine; often for the process of water purification

Class B standard – a letter classification assigned by New York State to denote the best uses of a waterbody, the best uses of Class B surface waters are primary and secondary contact recreation and fishing

Combined sewer overflow – an overflow of a sewer that is designed to collect rainwater, runoff, domestic sewage and industrial wastewater in one pipe; usually the overflow discharges to nearby streams

Community – an association of interacting populations, usually defined by the nature of their interaction or the place in which they live

Conceptual - based on ideas, formed from reasoning and imagination

Connectivity – the property of being connected or the degree to which something has connections

Creel survey – also angler survey; a method to gather information on fisheries, by interviewing anglers on their fishing and consumption practices

D

DDT – dichloro-diphenyl-trichloroethane, an insecticide that is toxic to animals and humans, banned in the US since 1972

Deforestation – the state of being cleared of trees

Design charrette - a collaborative planning exercise where design ideas are developed during intense work sessions

Detention – temporary storage of water, to delay water flowing downstream

Disease vectors – plants or animals that harbor or transmit disease organisms or pathogens

Diversity - the variety of organisms found within a specified region

Drop structure – a natural or human-engineered structure that produces a rapid drop in surface water level

E

Ecosystem – a system defined by the interaction of a community of organisms with their physical environment

Eutrophication - excessive plant growth and algae blooms, usually caused by high concentrations of nutrients in a waterbody; can lead to widespread variation in oxygen levels

Exceedance – an instance where a monitored measurement exceeds, or goes over, the state or national water quality standard

F

Flood stage – the elevation at which overflow of the natural banks of a stream begins

Floodplain – a strip of relatively flat and normally dry land alongside a stream that is covered by water during a flood

Forever wild – to enjoy the highest degree of state protection of wild lands

G

Gradient – a part sloping upward or downward

Green roof – plantings, including waterproofing and drainage systems, over existing roof structures to reduce building temperatures and runoff into storm sewer systems

Green infrastructure - managing stormwater to mimic natural processes to percolate or reuse on-site runoff

Green technologies – application of environmental science to conserve natural resources

H

Habitat - the environment where a population lives; it includes all things an organism needs to survive

Habitat assessment – evaluation of the structure of habitat that influences an ecosystem

Headwaters – the source and upper reaches of a stream

Heavy metals – a group of metals, for example mercury or lead, that are harmful when dispersed in the environment

Hot spots – locations where non-native and/or invasive species are well established, but undesirable for that place

Hydraulic – pertaining to water, especially the movement of water

Hydrograph – a graph that shows changes in water flow or level over time

I

Impervious cover – surfaces that cannot absorb or infiltrate rainfall, for example roads and sidewalks

Implementation - to carry out

Indigenous – produced, growing or living naturally in a particular region or environment

Infrastructure – permanent installations required for certain purposes, for example, networks of storm and wastewater sewers

Input – a statement that expresses personal opinion or belief or adds information

Intermunicipal – between governments

Intermunicipal agreement - agreements between governments to cooperate on land use planning and regulation

Invasive species – with respect to a particular ecosystem, any animal or plant that is not native to that ecosystem whose introduction causes economic or environmental harm, or harm to human health

J

Jurisdiction – the territory within which power can be exercised

L

Liability – the state of being legally responsible

Linear park – a strip of public land, usually adjacent to a stream, canal, or railroad bed

Living machine – biological wastewater treatment designed to mimic the cleansing function of natural hydrologic systems

N

Native species – an animal or plant that originated in a particular place or region

Nonpoint source pollution – pollution deposited in streams, rivers, and lakes that comes from many diffuse sources; usually carried by stormwater runoff or snowmelt

O

Open space – land that is not intensively developed for agricultural, commercial, residential, or industrial use

P

PCBs – polychlorinated biphenyls, synthetic organic chemicals once used industrially that are persistent environmental contaminants

Permeable paving – allows precipitation to percolate through or around pavement into the ground

pH – scale that measures hydrogen-ion concentration used to express the acidity or alkalinity of a water sample, 1 being the most acidic and 14 being most basic

R

Rain garden – planted depression that allows rainwater runoff from impervious urban areas like roofs, driveways, walkways, and compacted lawn areas the opportunity to be absorbed, reduces rain runoff and waterway pollution

Remedial – intended as a remedy or solution

Renaturalization – reintroducing native plant and animal communities to a disturbed, degraded, or engineered area (e.g., a meadow, wetland, stream corridor)

Restoration - to shift a damaged ecosystem to a state where ecosystem composition, structure, and function are within a range that is more desirable than current conditions

Retention – the ability to retain, or hold back; a retention basin holds water which then percolates into the ground or evaporates

Retrofits – new parts or equipment, not available at the time of manufacture, added to existing structures or systems

Revitalization - the act of giving new life or vigor to something

Riparian– relating to or living or located on the bank of a natural watercourse or body of water

Runoff – precipitation, snow melt, or irrigation water that runs off the land into surface water

S

Saline – a solution comprised primarily of salt water or having to do with salt

Sewershed – all the land area that is drained by a network of sewers.

Sovereign – autonomous, independent, having authority and control

Stakeholders - those who have a share or interest in an issue

Stewardship – the concept of responsible caretaking based on the premise that humans are managers of resources and are responsible for their condition

Subsidence – downwards shift, sinking, of the Earth's surface

Surface runoff mitigation – efforts made to lessen the runoff of surface water and the pollutants it may contain

Sustainability program – series of workshops, lectures and community activities encouraging awareness of the relationships between human activities and natural systems

Synergies – benefits obtained from combining groups of people or processes

T

Terminal moraine – a hill-like pile of rock rubble deposited at the farthest advance of a glacier

Tributary - a stream that flows into another, larger body of water

Turbid – cloudy or opaque water due to suspended sediments

V

Vegetated buffers – protected areas along stream banks that are planted with native plant communities to help enhance water quality

Visioning – process of identifying future community goals and objectives through public meetings

W

Water quality standards – a law or regulation that consists of the beneficial use(s) of a waterbody, including numeric and narrative water quality criteria necessary to protect the use

Watershed - the area of land that drains into a specific waterbody

Wetlands – an area that is inundated or saturated by surface water or groundwater with frequency and duration sufficient to support vegetation adapted for life under those soil conditions

Z

Zoning regulations – laws that determine where certain land uses can be located, for example commercial, residential or industrial uses

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*The following OEI staff, former staff and interns have provided photographs, maps, graphs and graphics for this document:
Tyler Andre, Clark Burdick, Sam Gordon, Robert Griffiths, Donald Hughes, Stephanie Johnson, Timothy Jones, Edward Michalenko, Meredith Perreault, Julia Renn, Joan Cope Savage, Dylan Smith, Lindsay Speer, Carla Wiemers

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Reference List

A

Adams, C. 2003. Defending our place: protest on the southside of Syracuse. MA Thesis. Syracuse University, Syracuse, NY.

Alexander, R., E. Boyer, R. Smith, G. Schwarz, and R. Moore. 2007. The role of headwater streams in downstream water quality. Journal of the American Water Resources Association 43:41-59.

American Farmland Trust. 2001. New York Agricultural Landowner Guide; To Tax, Conservation, and Management Programs. American Farmland Trust Northeastern Regional Office, Saratoga Springs, NY.

Anonymous. 2008. Letter addressed to Mayor Matt Driscoll; Mr. Kenneth Lynch, NYS DEC; City of Syracuse Zoning Office; and Onondaga Environmental Institute dated January 8, 2008. Syracuse, NY.

B

Barrett, T. S. and S. Nagel. 1996. Model Conservation Easement and Historic Preservation Easement. Land Trust Alliance, Washington DC.

Bernhardt, E. S., M. A. Palmer, J. D. Allan, G. Alexander, K. Barnas, S. Brooks, J. Carr, S. Clayton, C. Dahm, J. Follstad-Shah, D. Galat, S. Gloss, P. Goodwin, D. Hart, B. Hassett, R. Jenkinson, S. Katz, G. M. Kondolf, P. S. Lake, R. Lave, J. L. Meyer, T. K. O'Donnell, L. Pagano, B. Powell, and E. Sudduth. 2005. Synthesizing U.S. River Restoration Efforts. Science 308:636-637.

Bick, S. and H. L. Haney Jr. 2001. The Landowners Guide to Conservation Easements. Kendall Hunt Publishing Company, Dubuque, IA.

Black, J. and T. Endreny. 2006. Increasing stormwater outfall duration, magnitude and volume through combined sewer separation. Journal of Hydrologic Engineering 11:472-481.

Bogucz, E. 2008. Personal communication of OCRP Plan edits transmitted 4/4/2008 to Meredith Perreault of OEI via email by Ana Fernandez. Syracuse Center of Excellence, Syracuse, NY.

Bonham Jr, J. B., G. Spilka, and D. Rastorfer. 2002. Old Cities/ Green Cities Communities Transform Unmanaged Land. American Planning Association Planning Advisory Service, Chicago, IL.

Briand, M. 2007. Democracy at the core: recalling participation's raison d'etre. Accessed from http://www.iap2.org/associations/4748/files/Journal_Issue1_Viewpoint.pdf. Intl. J. Public Partic. (Online) 1:1.

C

Canandaigua Lake Watershed Council. Canandaigua Lake Management Plan. Accessed from http://www.CanandaiguaLake.org/mangplan.htm.

Canandaigua Lake Watershed Council. http://www.CanandaiguaLake.org/index.htm.

Canopy and RC Smardon. 2003. Visions for Onondaga Creek Forum. Workshop summary of State University of New York College of Environmental Science and Forestry Onondaga Creek Forum, Syracuse, NY. April 4.

Cappiella, K., T. Schueler, and T. Wright. 2005. Urban Watershed Forestry Manual. Prepared for USDA Forest Service, Northeastern Area State and Private Forestry. Center for Watershed Protection, Ellicott City, MD.

Center for Watershed Protection. 2003. New York State Stormwater Management Design Manual. August 2003. Prepared for NYS Department of Environmental Conservation. Center for Watershed Protection, Ellicott City, MD.

Center for Watershed Protection. 2004. Urban Stream Repair Practices: Version 1.0. Urban Subwatershed Restoration Manual Series. Manual 4. November 2004. Center for Watershed Protection, Ellicott City, MD.

Center for Watershed Protection. 2007. National Pollutant Removal Performance Database, Version 3. September 2007. Center for Watershed Protection, Ellicott City, MD.

Cleveland, R. A. 2007. Sauquoit Creek Basin Intermunicipal Commission. Accessed from http://www.town.new-hartford.ny.us/documents/SauquoitCreekbasinInteMunicipalCommission.pdf.

Comp, T. 2003. Founder's Statement: AMD&ART A Challenge to Creativity in Reclamation. Accessed from: http://www.amdandart.org/founder.html.

Condon, P. M. and J. Proft, editors. 1999. Sustainable Urban Landscapes The Brentwood Design Charette: Ecological Infrastructure. 3S Printers, Burnaby, British Columbia.

Coon, W. 2005. Personal communication to Joan Cope Savage of the Onondaga Environmental Institute, October 31, 2005. US Geological Survey, Ithaca, NY.

Coyle, K. 2005. Environmental Literacy in America: What Ten years of NEETF/Roper Research and Related Studies Say about Environmental Literacy in the U.S. The National Environmental Education and Training Foundation, Washington D.C.

Crisalli, N., A. Cuomo, T. Kimmel, and M. Worms. 2007. Intermunicipal Cooperation Tools. Accessed from http://appserv.pace.edu/excute.page.cfm?_id=23937. Pace Law School, White Plains, NY.

Crompton, J. L. 2001. The Impact of parks on property values: A review of the empirical evidence. J. Leisure Research 33:1-31.

Crompton, J. L. and S. Nicholls. 2006. An Assessment of Tax Revenues Generated by Homes Proximate to a Greenway. J. Park and Rec. Admn. 24:103-108.

Cylinder, P. D., K. M. Bogdan, A. I. Zohn, and J. B. Butterworth. 2004. Wetlands, Streams and Other Waters: Regulation, Conservation and Mitigation Planning. Slano Press Books, Point Arena, CA.

D

Diehl, J. and T. S. Barrett. 1988. The Conservation Easement Handbook: Managing Land Conservation Easement Programs. Land Trust Alliance, Washington DC.

Driscoll M. 2005 March 2. State of the City Address. Syracuse, NY: City of Syracuse Office of the Mayor.

E

EcoLogic LLC, Quantitative Environmental Analysis LLC, E. Mills, OCWEP, and W. W. Walker. 2003. Onondaga Lake Ambient Monitoring Program 2001 Annual Report and Appendices 1-10, Final - June 2003. Onondaga County Department of Water Environment Protection.

Endreny, T. and M. Higgins. 2008. Adding Radar Rainfall and Calibration to the TR-20 Watershed Model to Improve Dam Removal Flood Analysis. Journal of Water Resources Planning and Management 134:314-317.

Ewing, R., K. Bartholomew, S. Winkelman, J. Walters, and D. Chen. 2007. Growing Cooler: The Evidence on Urban Development and Climate Change. Urban Land Institute, Washington, D.C.

Ewing, R. and R. Kreutzer. 2006. Understanding the Relationship between Public Health and the Built Environment. Prepared by Design, Community & Environment and Lawrence Frank and Company, Inc. for the US Green Building Council, Congress for the New Urbanism, and Natural Resources Defense Council, San Francisco, CA.

Farmland Information Center. 2008. http://www.farmlandinfo.org/farmland_search/index.cfm?function=articleID=29402.

Firehock, K., F. Flanigan, and P. Devlin. 2002. Community Watershed Forums: A Planner's Guide. Alliance for the Chesapeake Bay, Baltimore, MD.

FISRWG. 1998. Stream Corridor Restoration: Principles, Process, and Practices. October 1998. Federal Interagency Stream Restoration Working Group, National Technical Information Service, Washington DC.

Gechas, L. 2005. Please be a part of the Onondaga Creek Fest. Unpublished flyer.

Giattina, C., K. Bowers, A. Mitra, D. Swetlik, and E. Simmons. 2006. Syracuse SDAT Communities Making Connections at the Crossroads of Upstate New York: A Sustainable Design Assessment Team Report. The American Institute of Architects Center for Communities by Design, Washington, D.C.

Giller, P. S. 2005. River restoration: seeking ecological standards, Editor's introduction. J. Applied Ecology 42:201-207.

Gillilan, S., K. Boyd, T. Hoitsma, and M. Kauffman. 2005. Challenges in developing and implementing ecological standards for geomorphic river restoration projects: a practitioners' response to Palmer et al. Journal of Applied Ecology 42:223-227.

Gonzalez B. 2003. Rescuing Onondaga Creek: View from a canoe reveals resource worth protecting. Syracuse Post-Standard. August 6.

Gustanski, J. A. and R. H. Squires. 2000. Protecting the Land: Conservation Easements Past, Present, and Future. Island Press, Washington DC.

Higgins, M. B., Jr. 2005. Automated Calibration of TR-20 with NEXRAD Data to Study Removal of a Flood Control Dam. SUNY College of Environmental Science and Forestry, Syracuse.

Holmes, G. 1927. Onondaga Creek Flood Prevention, Syracuse, NY: Report of Investigation. Prepared for the Syracuse Intercepting Sewer Board. United Printing Company, Syracuse, NY.

Holstein C, ed. 2004 May. Report to the Community: Water and Waterways. Syracuse, NY: FOCUS Greater Syracuse.

Hopkins, A. 2005. Groundswell: Stories of Saving Places, Finding Community. Trust for Public Lands, San Francisco, CA.

Hough, M. 1995. Cities and Natural Process. Routledge, New York, NY.

Hutton, F. Z. and C. E. Rice. 1977. Soil survey of Onondaga County, New York. Metadata available from the Natural Resources Conservation Service at http://soildatamart.nrcs.usda.gov/Survey.aspx?State=NY. US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station, Washington, DC.

Innes, J. and D. Booher. 2004. Reframing public participation: strategies for the 21st century. Planning Theory and Practice 5:419-436.

Jansson, R., H. Backx, A. J. Boulton, M. Dixon, D. Dudgeon, F. M. R. Hughes, K. Nakamura, E. H. Stanley, and K. Tockner. 2005. Stating mechanisms and refining criteria for ecologically successful river restoration: a comment on Palmer et al. (2005). J. Applied Ecology 42:218-222.

Kappel, W. M. 2000. Salt Production in Syracuse, New York ("The Salt City") and the Hydrogeology of the Onondaga Creek Valley. Fact Sheet FS 139-00, US Geological Survey, Ithaca NY.

Kappel, W. M. and T. Miller. 2005. Hydrogeology of the Valley-Fill Aquifer in the Onondaga Trough, Onondaga County, New York. Scientific Investigations Report 2005-5007. US Geological Survey, Ithaca, NY.

Kelly JM. 2004. Untapped potential: Unsightly creek yields large array of trout. Syracuse Post-Standard. October 15.

Kennedy, M. 2001. Gentrification: Practice and Politics. Accessed at www.liscnet.org/resources. Local Initiatives Support Corporation Center for Home Ownership Online Resource Library.

Kirst S. 2006. Long history of ignoring creek hides city bridges. Syracuse Post-Standard. March 10.

Kirst S. 2005. Young find themselves by aiding 'lost cause'. Syracuse Post-Standard. September 14.

Kling, G. W., K. Hayhoe, L. B. Johnson, J. J. Magnuson, S. Polasky, S. K. Robinson, B. J. Shuter, M. M. Wander, D. J. Wuebbles, D. R. Zak, R. L. Lindroth, S. C. Moser, and M. L. Wilson. 2003. Confronting Climate Change in the Great Lakes Region: Impacts on our Communities and Ecosystems. Union of Concerned Scientists, Cambridge, Massachusetts, and Ecological Society of America, Washington, D.C.

Kloss, C., C. Cararusse, and N. Stoner. 2006. Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows. June 2006. Natural Resources Defense Council, New York, NY.

Kusler, J. and T. Ophiem. 1996. Our National Wetland Heritage: A Protection Guide. Environmental Law Institute, Washington DC.

Long Island Sound Watershed Intermunicipal Council. 2008. Updated March 9, 2008. Available from: http://www.liswic.org/index.html.

Lynch, L. 2007. Economic benefits of farmland preservation. Pages 13-23. The Economic Benefits of Land Conservation. The Trust for Public Lands, San Francisco, CA.

MacBroom, J. 1998. The River Book: The Nature and Management of Streams in Glaciated Terranes. Connecticut Department of Environmental Protection Natural Resource Center, Hartford, CT.

Malcolm Pirnie Inc. 2007. Feasibility evaluation of a regional stormwater management district: Executive summary. Prepared for Long Island Sound Watershed Intermunicipal Council. Malcolm Pirnie, Inc., White Plains, NY.

Neighbors of Onondaga Nation (NOON). 2007. Onondaga Land Rights and our Common Future. Accessed from http://www.peacecouncil.net/NOON/commonfuture/.

New York State Office of the State Comptroller. 2003. Local Government Management Guide: Intermunicipal Cooperation. Accessed from http://www.dos.state.ny.us/lgss.inter.html. NYS Office of the State Comptroller, Division of Local Government ad Accountability, Albany, NY.

Nolon, J. R. 1999. Grassroots regionalism through intermunicipal land use compacts. St. John's Law Review 73:1011.

Nolon, J. R. 2003. Open Ground: Effective Local Strategies for Protecting Natural Resources. Environmental Law Institute, Washington DC.

Nowak, D., J. Wang, and T. Endreny. 2007. Environmental and Economic Benefits of Preserving Forests within Urban Areas: Air and Water Quality. Pages 28-47 in The Trust for Public Lands, editor. The Economic Benefits of Land Conservation. The Trust for Public Lands, San Francisco, CA.

Nyland, R. D., W. C. Zipperer, and D. B. Hill. 1986. The Development of Forest Islands in Exurban Central New York State. Landscape and Urban Planning 13:111-123.

NYSDOS, NYSDEC, Hudson River Valley Greenway, NYS Department of Agriculture and Markets, and Office of Parks, Recreation, and Historic Preservation. 2004. Local Open Space Planning Guide. New York State Department of State, Albany, NY.

OCSWCD. 2007. Summary Report 2006-2007: Finger Lakes Non-point Source Pollution Control Program. Onondaga County Soil and Water Conservation District, LaFayette, NY.

OEI. 2008. Onondaga Lake Tributary Assessment. Onondaga Environmental Institute, Syracuse, NY.

Onondaga Nation. 2007. Onondaga Nation and Environmental Stewardship. Accessed from http://www.onondaganation.org/land/stewards.html.

Otto, B., K. McCormick, and M. Leccese. 2004. Ecological Riverfront Design: Restoring Rivers, Connecting Communities. American Planning Association Advisory Service Report Number 518-519. American Planning Association, Chicago, IL.

Palmer, M. A., E. S. Bernhardt, J. D. Allan, P. S. Lake, G. Alexander, S. Brooks, J. Carr, S. Clayton, C. N. Dahm, J. F. Shah, D. L. Galat, S. G. Loss, P. Goodwin, D. D. Hart, B. Hassett, R. Jenkinson, G. M. Kondolf, R. Lave, J. L. Meyer, T. K. O'Donnell, L. Pagano, and E. Sudduth. 2005. Standards for ecologically successful river restoration. J. Applied Ecology 42:208-217.

Palmer, M., C. Reidy Liermann, C. Nilsson, M. Florke, J. Alcamo, P. Lake, and N. Bond. 2008. Climate change and the world's river basins: anticipating management options. Frontiers in Ecology and the Environment 6:81-89.

Pedroli, B., G. de Blust, K. Van Looy, and S. Van Rooij. 2002. Setting targets in strategies for river restoration. Landscape Ecology 17 (Suppl 1):5-18.

Petts, J. 2006. Managing public engagement to optimize learning: reflections from urban river restoration. Human Ecology Review 13:172-180.

Pinkham, R. 2000. Daylighting: New Life for Buried Streams. Rocky Mountain Institute, Old Snowmass, CO.

Platt, R. 2006. Urban watershed management: sustainability, one stream at a time. Environment 48:26-42.

Portland VisionPDX. 2007. Portland 2030: A Vision for the Future. City of Portland visionPDX, Portland, OR.

Rhodeside & Harwell Inc., CH2M Hill, Biohabitats Inc., and Waterscapes/Dreiseitl. 2006. Four Mile Run Restoration Master Plan. March 2006. Prepared for Arlington County and the City of Alexandria. Rhodeside & Harwell, Inc., Alexandria, VA.

Riley, A. 1998. Restoring Streams in Cities: A Guide for Planners, Policymakers and Citizens. Island Press, Washington, D.C.

Samuels, A. 2005. Deliverables for the Onondaga Creek Sub-basin Revitalization Grant. Unpublished document. Cornell Cooperative Extension, Syracuse, NY.

Samuels, A. 2005. Personal communication with Meredith Perreault of OEI via telephone May 24, 2005. Cornell Cooperative Extension, Syracuse, NY.

Scholz, G., J. VanLaarhoven, L. Phipps, D. Favier, and S. Rixon. 2002. Managing for river health: integrating watercourse management, environmental water requirements and community participation. Water Science and Technology 45:209-213.

Schwartz, S. 2006. Riparian Setbacks: Technical Information for Decision Makers. Chagrin River Watershed Partners, Inc., Willoughby, OH.

Silverman, D. 2003. Analyzing Talk and Text. Pages 340-362 in N. K. Denzin and Y. S. Lincoln, editors. Collecting and Interpreting Qualitative Materials. Sage Publications, Thousand Oaks, CA.

Sirianni, C. 2006. Can a Federal Regulator Become a Civic Enabler? Watersheds at the US Environmental Protection Agency. National Civic Review 95:17-34.

Smardon, R. 1993. Chapter 10: Regulation of Sensitive Areas and Resources in R. Smardon and J. Karp, editors. The Legal Landscape: Guidelines for Aesthetic and Environmental Protection. Van Nostrand Rhinehold, New York, NY.

Smardon, R. 2008. Personal communication with Meredith Perreault of OEI via telephone April 28, 2008. SUNY College of Environmental Science and Forestry, Syracuse, NY.

Smardon, R., J. Felleman, and S. Senecah. 1996. Protecting Floodplain Resources: A Guidebook for Communities. Federal Emergency Management Agency publication 268. Federal Interagency Floodplain Management Task Force, Washington DC.

Smolko, B., R. Huberd, and N. Tam-Davis. 2002. Creating meaningful stakeholder involvement in watershed planning in Pierce County, Washington. Journal of the American Water Resources Association 38:981-994.

SMTC. 2007. Transportation Improvement Program for Syracuse Metropolitan Planning Area, 2007-2012. Syracuse Metropolitan Transportation Council, Syracuse, NY.

Spitzer, E. 2007. Rebuilding the Upstate Economy City-by-City: Syracuse-Based Projects. State of New York Executive Chamber Fact Sheet, Albany, NY.

Stolzenberg, N., J. Brady-Connor, and S. Weaver. Undated. Planning and Zoning Techniques for Protecting Quality of Life: Resource Protection Options for Communities. Association of State Wetland Managers, Berne, NY.

Stormwater Manager's Resource Center. 2003. Buffers. Accessed

December 17, 2007 from www.stormwatercenter.net/Model%20Ordinances/Buffers.htm.

Strauss, A. 1987. Qualitative Analysis for Social Scientists. Cambridge University Press, New York.

Syracuse Post Standard. 1899 October 20. "Tully Valley. A Miniature Volcano." Syracuse, New York.

University of Georgia Institute of Ecology. 2003. Tools for Quality Growth: Riparian Buffers. Fact Sheet. Accessed December 1, 2007 at http://outreach.ecology.uga.edu/tools/fact_sheets/riparian%20buffers1.pdf.

Urban CNY News On-line Edition. 2007 October 15. West Side Story: New Initiatives to Transform City's Near Westside. Accessed from http://urbancny.com.

U.S. District Court Northern District of New York. 2005. Onondaga Nation Land Rights Action: Onondaga Nation v. The State of New York; Governor Pataki, in his individual capacity and as Governor of New York State; Onondaga County; the City of Syracuse; Honeywell International, Inc.; Trigen Syracuse Energy Corporation; Clark Concrete Company, Inc.; Valley Realty Development Company, Inc.; Hansen Aggregates North America. Civil Action No. 05-CV-314. March 11, 2005, Amended August 1, 2005., Syracuse, NY.

U.S. Environmental Protection Agency (USEPA). 2001. Protecting and Restoring America's Watersheds: Status, Trends and Initiatives in Watershed Management. EPA-840-R-00-001. June 2001. US Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA. 2002. Community Culture and the Environment: A Guide to Understanding Sense of Place. EPA 842-B-01-003. US Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA. 2003a. Getting in Step: A Guide to Watershed Outreach Campaigns. EPA 841-B-03-002. US Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA. 2003b. National Management Measures to Control Nonpoint Source Pollution from Agriculture. July 2003. EPA 841-B-03-004. US Environmental Protection Agency, Office of Water, Nonpoint Source Control Branch, Washington DC.

USEPA. 2005a. Community-based Watershed Management: Lessons from the National Estuary Program. February 2005. EPA 842-B-05-003. US Environmental Protection Agency, Office of Water, Wetlands, Oceans and Watersheds, Oceans and Coastal Protection Division Washington DC.

USEPA. 2005b. Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters. October 2005. EPA 841-B-05-005. US Environmental Protection Agency, Office of Water, Nonpoint Source Control Branch, Washington DC.

USEPA. 2005c. National Management Measures to Control Nonpoint Source Pollution from Urban Areas. December 2005. EPA 841-B-05-004. US Environmental Protection Agency, Office of Water, Nonpoint Source Control Branch, Washington DC.

USEPA. 2005d. National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution. July 2005. EPA 841-B-05-003. US Environmental Protection Agency, Office of Water, Nonpoint Source Control Branch, Washington DC.

USEPA. 2005e. Using Smart Growth Techniques as Stormwater Best Management Practices. December 2005. EPA 231-B-05-002. US Environmental Protection Agency, Development, Community and Environment Division: Office of Policy, Economics and Innovation, Washington DC.

USEPA. 2007. Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices. December 2007. EPA 841-F-07-006. US Environmental Protection Agency, Office of Water, Nonpoint Source Control Branch, Washington DC.

USEPA, American Rivers, Association of State and Interstate Water Pollution Control Administrators, National Association of Clean Water Agencies, Natural Resources Defense Council, and The Low Impact Development Center. 2008. Managing Wet Weather with Green Infrastructure Action Strategy. January 2008. US Environmental Protection Agency, Washington DC.

US Green Building Council, Congress for the New Urbanism, and Natural Resources Defense Council. 2007. Pilot Version LEED for Neighborhood Development Rating System. US Green Building Council, Washington, D.C.

U.S. Geological Survey (USGS) and USEPA. 2004. National Hydrography Data Set (NHD). Accessed from http://nhdgeo.usgs.gov/metadata/nhd_medium.htm. US Geological Survey.

Washington County Soil and Water Conservation District. 1999. Managing Streamside Areas with Buffers: Tips for Small Acreages in Oregon. Fact Sheet No. 5. January 1999. Accessed from www.or.nrcs.usda.gov/news/factsheets/fs5.pdf.

Weiner M. 2003. Canoeists seek revival of Onondaga Creek. Syracuse Post-Standard. August 18.

Westchester County Department of Planning. 2007. Westchester County: A Guide to Aquatic Buffers. February 2007. Biohabitats Inc., Baltimore, MD.

Williams, J., C. Wood, and M. Dombeck. 1997. Understanding watershed-scale restoration. Pages 1-13 in J. Williams, C. Wood, and M. Dombeck, editors. Watershed Restoration: Principals and Practices. American Fisheries Society, Bethesda, MD.

Wohl, E., P. Angermeier, B. Bledsoe, G. M. Kondolf, L. MacDonnell, D. M. Merritt, M. A. Palmer, N. L. Poff, and D. Tarboton. 2005. River restoration. Water Resources Research 41:W10301.

Woolbright, L. L. 2005. Protecting the Kayaderosseras Creek through better buffers: Recommendations for municipalities. Friends of Kayaderosseras Creek http://www.kayaderosseras.org/Information/BufferPaper%201.htm.

World Commission on Environment and Development. 1987. Our Common Future, Report of the World Commission on Environment and Development. Published as Annex to General Assembly document A/42/427, Development and International Co-operation: Environment, August 2, 1987.

World Wildlife Fund (WWF). 1992. Statewide Wetlands Strategies: A Guide to Protecting and Managing the Resource. Part III, Mechanisms for Protecting and Managing Wetlands, pp63-159. World Wildlife Fund, Washington DC.

Yanosky, T. M. and W. M. Kappel. 1997. Tree Rings Record 100 Years of Hydrologic Change Within a Wetland. US Geological Survey, Ithaca, NY.

The **Onondaga Creek Conceptual Revitalization Plan** was designed using Adobe CS3, a product of Adobe Systems Incorporated. The document is edited in the Chicago style, as presented in **A Manual for Writers of Research Papers, Theses, and Dissertations: Chicago Style for Students and Researchers** (Turabian, 2007, The University of Chicago Press).

Onondaga
Environmental
Institute

102 W. Division Street
3rd Floor
Syracuse, NY 13204
(315) 472-2150