4 Proposed Ecological Restoration Projects

4.1 Development of Conceptual Habitat Restoration Projects

Background

Since the completion of the Buffalo River AOC RAP by NYSDEC in 1989, numerous studies and projects have characterized environmental and ecological conditions within portions of the Buffalo River watershed (including NYSDEC 1993, the Town of West Seneca 1999; Irvine 2005; Buffalo Niagara Riverkeeper 2008; USACE 2008).

Most recently the Buffalo River Great Lakes Legacy Act Project Coordination Team (2010) issued the Draft Final Buffalo River Feasibility Study (FS) (http://www.dec.ny.gov/chemical/54166.html). The FS describes projects designed to address environmental challenges, including contaminated river sediments, poor water quality, a lack of safe public access, and insufficient fish and wildlife habitat in the Buffalo River AOC. Plans include two major environmental dredging projects as well as habitat restoration projects. Figure 1-1 shows the location of the proposed dredging and restoration areas.

The first project, to be performed by the USACE beginning in the spring of 2011, involves dredging contaminated sediments in the federal navigation channel using funds from the Great Lakes Restoration Initiative (GLRI). The second project, to be implemented with oversight of the EPA, would dredge contaminated river sediments outside of the navigation channel. The dredging will take place mostly along the shoreline of the river in targeted areas of a 6.2-mile stretch of the lower Buffalo River and 1.4-mile stretch of the City Ship Canal (i.e., the Buffalo River AOC). This project is being planned and funded through the Great Lakes Legacy Act (GLLA). The GLLA project will follow the USACE dredging of the federal navigation channel after completion of the remedial design.

The landscape adjacent to the waterways within the ERMP focus area includes a mosaic of natural features, highly modified urban land, utility corridors, commercial and industrial facilities, urban infrastructure, parkland, agriculture, and private/residential lands (see Photo 4.1-1). Candidate project locations were assessed with respect to the current physical and ecological attributes and impairments in the context of their landscape position, adjacent land uses, and conditions upstream and downstream of each site.

Photo 4.1-1 Abandoned Grain Elevators and modified stream banks within navigation channel

Photo 4.1-2 Stakeholder site selection meeting

The ERMP process began by soliciting stakeholders' knowledge and concerns to identify where habitat restoration could be accomplished to improve the overall ecological conditions in the AOC and the watershed. The result was a stakeholder-driven process that identified 73 distinct sites where habitat restoration or preservation could potentially be conducted (see Photo 4.1-2).

The candidate habitat restoration sites were evaluated based on the potential to contribute to de-listing one or more of the three habitat-related BUIs within the Buffalo River AOC:

- Degradation of benthos;
- Loss of fish and wildlife habitat; and
- Degradation of fish and wildlife populations.

As described in Section 3, 37 candidate project sites ultimately were selected from the original 73 sites through the use of desktop tools (such as GIS, interpretation of aerial imagery, parcel mapping, land use classifications, etc.) for area and site analyses. The 37 sites were assessed in the field to identify site-specific problems and restoration opportunities. Field data were evaluated to better understand existing conditions and impairments. Based on the relative potential to restore habitat structure and function in aquatic and terrestrial zones, a variety of restoration measures have been proposed for each site.

Assessing Restoration Potential in Various Habitat Zones

Sites were assessed based on the severity of existing ecological impairments and the potential to improve ecological functions through restoration measures that address one or more BUIs. Conditions that stress the biological and physical elements of the sites (see Photo 4.1-3) were identified in the following critical habitat zones:

Photo 4.1-3 Seneca Bluffs lower terrace bank failure with invasive plant understory (Japanese Knotweed and Lesser Celandine)

- **In-Channel** – The area within a stream channel where water flows at least periodically and provides habitat for fish and benthic organisms; important characteristics are the types and degree of structure and complexity (e.g., run habitat vs. run – riffle – pool habitats).

- **Nearshore** – The areas within a stream channel adjacent to shoreline areas; shallow or deep water depending on natural hydraulic processes and the degree of historic disturbance such as channelization; provides habitat for submerged aquatic vegetation and structure for fish.

  (Note: In-channel and nearshore are considered a single habitat zone for the purposes of describing existing site conditions and potential habitat restoration opportunities.)

- **Shoreline** – The areas adjacent to nearshore zone that are variably submerged or exposed depending on season and flow stage; provides transition habitat between stream bank and stream channel. This habitat zone can contain emergent aquatic habitat, fringe wetlands features, gravel bars, and invasive species.

- **Stream Bank** – The area between the shoreline and the inland and upland zones, from toe of bank to top of bank; characterized by steep or moderate slopes. Slope faces can be exposed mineral soil and sediments, covered by vegetation or armored by constructed features such as riprap. Invasive species can be a problem on stream banks, undermining stability and reducing biological diversity. Stream banks influence the quality of nearshore and shoreline habitats.

- **Inland and Upland** – The area extending away from the stream channel and top of stream bank (see Photo 4.1-4); may contain floodplain, wetland, upland, or a combination of these habitats. Provides habitat for terrestrial and wetland species. Cover can be quite variable, including mature canopy tree cover, invasive species, fill and debris piles, active park land, etc. When well vegetated, can establish habitat connectivity between areas by providing wildlife movement corridors.

Photo 4.1-4 Inland and upland area in Urban Brownfield, lower Buffalo River

Field Data Collection to Support Site Characterization and Development of Restoration Potential

Field data were collected on habitat types and the observable conditions across each of the 37 sites selected for field assessment activities. Field data sheets were developed and site information was collected, including:

Field assessments provided the project team with details regarding existing site conditions and potential habitat restoration opportunities within the habitat zones at each of the sites.

- In-channel and nearshore substrate (e.g., bedrock, cobble, and gravel);
- In-channel and nearshore aquatic habitats (run, riffle, pool);
- Shoreline and stream bank characteristics (e.g., shoreline type, shoreline features, soils, natural slope vs. armored);
- Stream bank stability;
- Width of riparian zone;
- Site hydrology;

- Vegetation (e.g., predominant species, identification of strata layers, invasive species); and

- Natural features (oxbow, wetlands, remnant vegetation communities, shoreline fringe wetlands) (see Appendix B for an example of the datasheet used at each site).

While in the field, biologists also conducted a preliminary assessment of restoration opportunities.

Site Descriptions and Conceptual Habitat Restoration Measures

Each of the 26 conceptual habitat restoration projects directly addresses the listed BUIs and improves the overall health of the lower Buffalo River watershed and AOC. These projects are described in detail in Section 4.2. The selected restoration measures focus on natural channel design, bioengineering methods, and techniques selected to restore hydraulic and riparian conditions. The proposed projects would support the regeneration of native plant communities and sustainable fish and wildlife habitats.

Section 4.3 provides information on the prioritization of the 26 restoration projects, including projects upstream of the AOC and those that occur within the AOC. The project team considers the following habitat restoration project sites to be high priorities:

- Stream bank stability,

- Erie County Cayuga Creek Overflow,

- Stiglmeier Park,

- LA-7 Wetland Cheektowaga,

- Thruway to Railway,

- Blue Tower Turning Basin,

- Concrete Central Peninsula,

- Smith Street Park, and

- Katherine Street Peninsula Shoreline adjacent to Smith Street Park.

The conceptual design features provided for each site presented in Section 4.2 have been selected to address observed impairments (e.g., stream bank failures - see Photo 4.1-5) within the affected habitat zones for the purpose of restoring and/or enhancing ecological function. Potential project stakeholders need to rec-

ognize that the proposed conceptual restoration designs identified in this ERMP are located within a highly modified riverine system that is characterized by channel modification, bank reshaping, floodplain disconnection and loss of active floodplain areas, and intensive urbanization within the immediate riverine/riparian corridor. The result of these extensive modifications has led to a variety of impacts, including instances of severe erosion in many locations. Lack of a diverse and functional aquatic ecosystem and continuing stream bank loss are two of the primary impacts.

Although specific restoration opportunities and features are recommended for each site in Section 4.2, design of restoration features for the in-channel and nearshore, shoreline, and stream bank areas would require additional analyses in order to more accurately define the selection, types, and siting of features. It would be critical to integrate various ecosystem restoration methodologies for restoring both hydraulic and biological processes. For instance, the selection of bank armoring and bank stabilization features would be based upon evaluations to:

- Determine effects associated with erosion, sediment transport, flooding and ice dynamics; and

- Effectively restore in-stream and riparian corridor functions and overall benefits for ecological enhancement.

Rigorous investigations would, therefore, determine the types of stream restoration techniques, including the use of bioengineering and structural features.

The restoration measures proposed can generally be categorized as structural and non-structural. Structural measures include resistive and redirective features. Examples of redirective measures would be rock vanes or bendway weirs that cause stream flows to move away from unstable shorelines and stream banks, generally toward the center of the stream. An example of a resistive measure would be longitudinal toe protection where large rocks are placed at the base of stream banks to resist scour erosion. Structural features also include measures such as hydraulic cover stones that provide habitat for aquatic organisms within in-channel and nearshore areas. Nonstructural measures would include restoring native vegetation appropriate to a given habitat zone and/or controlling invasive and other non-native species to improve the habitat values of the vegetative communities of the sites. (For illustrated examples of restoration measures see the USDA Natural Resources Conservation Service [NRCS] *Federal Stream Corridor Restoration Handbook* [http://www.nrcs.usda.gov/technical/stream_restoration].)

Habitat restoration using one or more of the structural and/or non-structural restoration measures would improve biological function through the restoration of natural form, function, and processes within the stream ecosystem.

Photo 4.1-5 Stiglmeier Park bank failure, sediment loading, and loss of riparian habitat

ERMP Utility: Support for Regional Habitat Restoration Implementation

The ERMP builds on the Feasibility Study and related remedial actions by proposing additional and specific habitat restoration actions within the lower Buffalo River watershed. This planning document was developed in order to meet the need of potential project sponsors and stakeholders for a "ready list" of ecological restoration projects. The projects detailed in the ERMP would collectively contribute to restoring natural hydraulic and ecological functions associated with habitat-related BUIs, and improve the ecological integrity and environmental health of the Buffalo River and its tributaries.

Potential habitat restoration projects and descriptions of the proposed project sites are detailed in Section 4.2. Each of the project sites described in Section 4.2 exhibit multiple ecological impairments or degraded habitat elements that warrant immediate restoration. Section 4.3 discusses the proposed projects where the need for restoration is most urgent and those with the greatest potential for improving the ecological health of the Buffalo River and its tributaries.

Inclusion in this master plan demonstrates that a proposed habitat restoration project has been subjected to a detailed process in order to be selected for project development. The process has generally involved:

- Field data collection;
- Pre-planning and planning for locating potential habitat restoration sites;
- Collaboration and outreach with regional stakeholders; and
- Conceptual restoration design.

The completion of this planning effort is expected to support regional habitat restoration efforts. Inclusion in this ERMP should enhance the eligibility for restoration funding from Great Lakes water resources programs (such as the GLRI) and/or other sources. Project sponsors could choose to pursue individual projects or combinations of projects. The restoration projects included in this plan provide project sponsors with the information needed to complete comprehensive proposals for water resource and riparian habitat restoration grants.

Section 4.2 is organized to provide information to potential sponsors of habitat restoration projects that will support them in completing funding applications. Each site description is organized as follows:

- **Site Overview** information: Location, size, ownership, land use, adjacent land uses.

- **Site Description:** Summary description of the site based on field assessment data, photographs. Includes descriptions of the four habitat zones:
  - In-channel and Nearshore
  - Shoreline
  - Stream Bank
  - Inland and Upland.

- **Restoration Opportunities and Actions:** Descriptions of restoration actions for each habitat zone with a list of proposed restoration features and methods.

- **Considerations and Potential Constraints for Restoration:** Issues that should be addressed in the detailed project implementation plans and incorporated into final design, scheduling, and cost estimates. Note that the timing of proposed projects located in the Buffalo River is likely to be affected by the upcoming dredging projects by USACE and EPA.

- **Costs:** Preliminary cost estimates based on recent restoration materials and construction costs as appropriate to the scope and scale of each proposed project. Cost estimates should assist project sponsors when submitting funding proposals. Note that site-specific detailed planning and analysis would be required to finalize the design of restoration features and therefore refine cost estimates, which could ultimately differ from the restoration features and cost estimates presented in this document.

- **Potential Permitting Requirements:** Permits likely to be required to implement the proposed projects are identified. Permits will be required for most, if not all, projects. Detailed permitting information is provided in Section 5.___ and Table 5-1. Project sponsors are urged to discuss permitting requirements with NYSDEC and USACE – Regulatory Branch prior to finalizing project cost and schedule.

Within the ERMP study area, invasive plant communities are a major cause of riparian habitat loss, second only to direct habitat destruction by human activities.

Invasive Species, Ecological Impairment, and Control Strategies

Invasive species warrant special attention due to the threats they pose to ecological integrity and their role in exacerbating riverine and riparian impairments (see Photo 4.1-6). The presence of invasive species is common to all sites and degrades riparian habitat by crowding out native species that contribute important habitat functions. Expanding areas of single or multiple invasive species negatively affect each site. Invasive species severely impair wildlife habitat on all sites, with substantial modifications in cover, structure, and available forage. They also can contribute to the physical degradation of the sites by shading out native species that better protect the soil and stream banks. The most prevalent invasive species observed include:

Photo 4.1-6 Japanese knotweed-dominated riparian area and public access at Bailey Woods

- Japanese knotweed (*Polygonum cuspidatum*);
- Bush honeysuckle (*Lonicera morrowii*);
- Common buckthorn (*Rhamnus cathartica*);
- Mugwort (*Artemisia vulgaris*);
- Common reed (*Phragmites australis*); and
- Tree of heaven (*Ailanthus altissima*).

Photo 4.1-7 Bank failure on West Seneca Developmental Center site along Cazenovia Creek with Japanese knotweed riparian understory

A majority of the sites exhibit extensive stream bank erosion, which contributes to degraded water quality, and negative impacts on: fishery, benthic, and riparian habitats. Stream bank erosion and bank failures, and subsequent sediment loading, are directly linked to the prevalence of invasive plant communities. Invasive plant monocultures such as Japanese knotweed provide minimal soil stabilization and expose surface soils to erosion by eliminating native vegetation layers. Bank failures were evident on sites where invasive plant communities exist along stream banks and inland riparian areas (see Photo 4.1-7). Many inside channel bends, which are not normally susceptible to erosion from scouring flows, were failing due to unstable stream bank soils. Outside channel bends with riparian areas dominated by invasive plants exhibited severe erosion and bank failure. This condition was observed on a number of sites with a variety of land uses, including agricultural land, regulated wetlands, parks, residential, and industrial properties.

The impact of deer and beaver consuming native vegetation was evident on sites. Intensive consumption exacerbates and indirectly causes the accelerated expansion of invasive plants by the elimination of native vegetation cover types. Invasive plants in the study area are unpalatable to deer and beaver. Deer, more than beaver, contribute to significant habitat degradation by over browsing the remaining, fragmented native plant communities. The uncontrolled colonization of invasive plants is exacerbated by the lack of sufficient (deer and beaver) habitat, which is limiting the natural carrying capacity and in turn causing over browsing.

The severity of ecological impacts associated with invasive plant communities varies among the ERMP sites. The approach to control and management of invasive communities on each site will be determined by the quality of the existing natural resources, susceptibility to degradation, potential for regeneration of native plant communities, and recommended restoration features. Four methods of control and management (i.e., mechanical, chemical, biological, and habitat modification) have been identified for application to ERMP sites. Selection of the methods to be used at each site requires further analysis of existing conditions, landscape position, land use, soils, hydrology, and value of nearby habitat. Methods should be selected based on the likelihood they would meet restoration goals and objectives within the project-specific timelines. Final design would likely involve a combination of treatment methods and techniques and would include monitoring protocols to measure results and document biological or habitat functional uplift.

The invasive species location data collected for the ERMP will be provided to the NYS iMapInvasives program (http://www.imapinvasives.org/) at the request of the program's database manager. Buffalo River project sponsors and stakeholders will have access to the database for project planning and design. The New York State Office of Invasive Species Coordination, which is administered by NYSDEC, includes eight regions within the state that have been organized as the Partnership for Regional Invasive Species Management (PRISM). The PRISM consortium was formed to develop, support, and maintain an on-line, GIS-based, all-taxa invasive species mapping tool known as iMapInvasives, which focused on serving the needs of land managers, regional planners, and others working to prevent, control, or manage invasive species. The western New York PRISM is available to provide invasive species control and management information through direct stakeholder collaboration.

Summary

The ERMP has led to the development of conceptual habitat restoration design across 26 sites, and approximately 160 acres and 7 miles of in-channel/nearshore, and stream bank habitat within the approximately 37 stream miles located within the ERMP focus area. The sites occur along each of the primary surface water-courses within the focus area, including the Buffalo River, Buffalo Creek, Cayuga Creek, and Cazenovia Creek. See Section 4.2 for the complete restoration project descriptions.