US Army Corps of Engineers
Buffalo District
BUILDING STRONG

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Seneca Bluffs

Preliminary Restoration Plan

Buffalo River, Buffalo NY

Buffalo District
US ARMY CORPS OF ENGINEERS

Contents

Executive Summary: The purpose of this report is to document the conceptual restoration measures proposed for Seneca Bluffs County Park, Erie County, NY. Restoration measures include stream bank stabilization, reshaping, and enhancement of in-channel and near shore habitat. These measures are designed to protect the shoreline of Seneca Bluffs Park from erosion, create near shore aquatic habitat, reduce invasive species present, and restore native riparian vegetation communities adjacent to the Buffalo River.

Location of Project: Seneca Bluffs is a 15-acre site located along the left descending bank (LDB) of the Buffalo River, upstream of the Seneca Street Bridge in the city of Buffalo (). The site is approximately 6.3 miles upstream from the mouth of the river. The site is one of a series of pocket parks along the Buffalo River owned, developed, and managed by Erie County. Volunteers, with support from the Erie County Department of Parks, maintain the park. Adjacent land uses include residential, commercial, and industrial.

Site Description: Site descriptions are based on observations recorded during 2015 site visits as well as previous site reports by Ecology and Environment (E&E; 2011). The reaches described below are numbered in order from upstream to downstream (Figure 1). The descriptions focus on the left descending bank of the Buffalo River.

General Morphology: The Buffalo River meanders around the project site and forms the northern and western boundary of the property. Channel width ranges from approximately 150 feet at the Seneca Street Bridge to approximately 250 feet upstream at the bend in the river. The river is shallow close to the left descending bank (LDB) shore with average depths from zero to three feet. Water depth increases up to 15 feet near mid channel and along some areas along the right descending bank (RDB). The substrates in the river are composed of fine grained sediments, sand, and gravel. The channel is primarily a long run without the structure to produce riffle and pool features. There is no evidence of aquatic vegetation or emergent wetland areas in-channel. The stream bank throughout most of the site is formed by alluvial deposits of sand and gravel lenses.

Reach 1 – This reach is the most upstream reach of the project site and comprises an island terrace that has been separated from the upland by a backflow channel. Shoreline erosion along this reach is moderate. Several large cottonwood trees are present on the island, however the vegetation community is dominated by Japanese knotweed (*Polygonum cuspidatum)* and common reed (P*hragmites australis*). The backwater channel is moderately incised and does not appear to support robust emergent vegetation as might be expected. This may be due to high flows that scour this area regularly. The upstream end of the backflow channel is choked with sediment and has a variable topography.

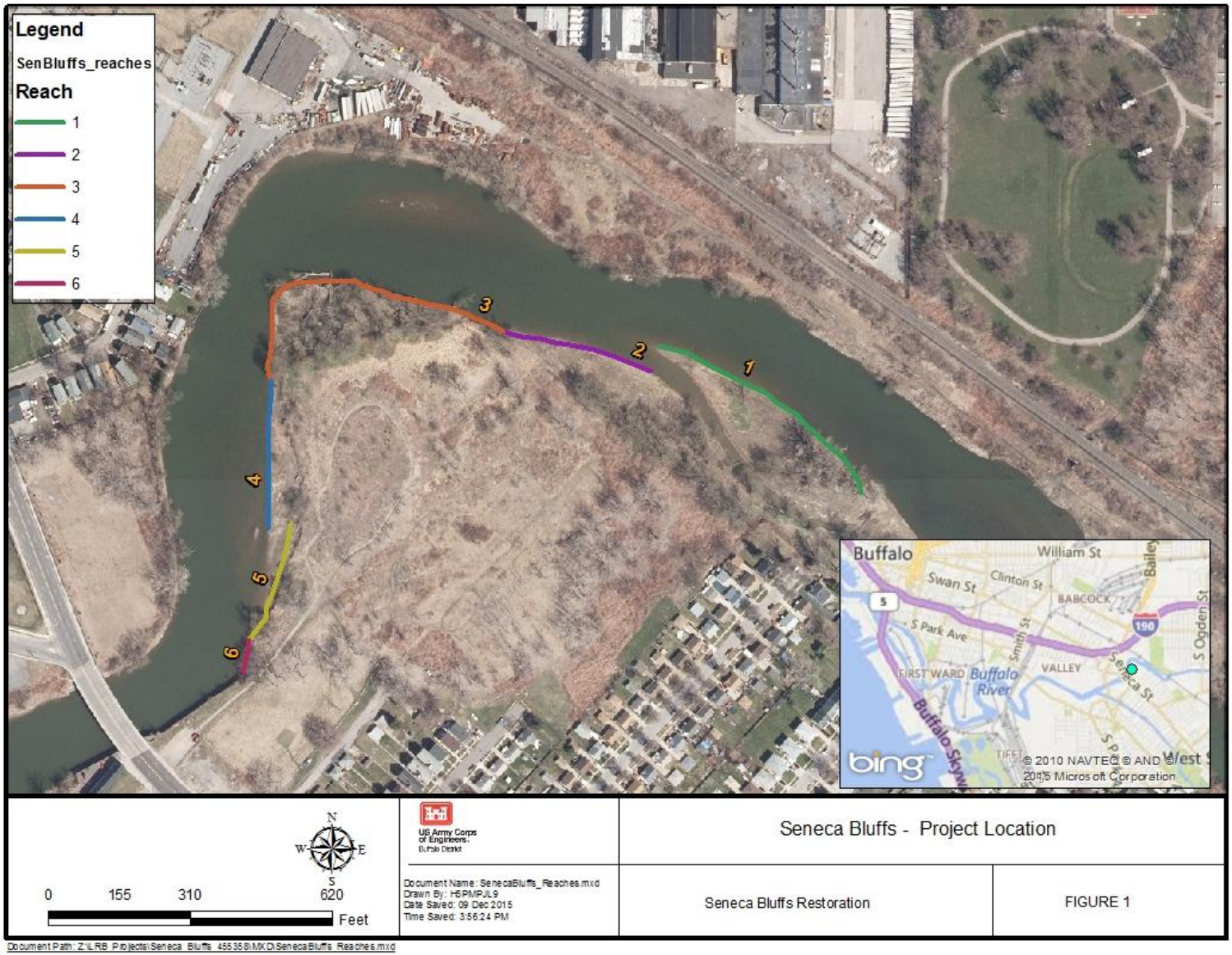

Figure 1. Seneca Bluffs Project Location and Reaches

Reach 2 – This reach is immediately downstream of the terrace island and immediately upstream of the highly eroded inner bend of the Buffalo River. The slope of the shore line is gradual and erosion is not significant. Phragmites dominates the higher elevation areas along the shoreline while Japanese knotweed dominates the areas further inland. A narrow swale runs parallel to the Buffalo River along the toe of the lower terrace and eventually connects with the Buffalo River. This swale is slightly lower than most of the surrounding area and thus maintains more frequent and longer rates of inundation. This is reflected by the presence of less phragmites and knotweed and more native wetland vegetation.

Reach 3 - This reach is characterized by heavy erosion along the bank of the lower terrace. The river bank in this area is vertical and is actively eroding. At some locations the height from top of bank to the toe is 10'. The lower terrace at this location is approximately 100' wide with an understory dominated by knotweed and an overstory of willow.

Reach 4 – The shoreline is narrow in the downstream area from the bridge to the lower terrace with the exception of a broad area of deposition along the base of the bluff feature. This gravel and sediment bar has grown considerably in the last 20 years based on observation and aerial photo interpretation. In early stages of formation, it was an extended shoreline along the LDB but has grown to approximately 80 feet wide and approximately 200 feet long and supports well established shrub and herbaceous species. Although some non-native species are present including purple loosestrife, *Phragmites*, and Japanese knotweed, most of the community is dominated by native species. An overflow channel has formed to the west of the bluff along the toe of the LDB that carries water downstream only during high flow conditions. This channel maintains native emergent vegetation including arrow-head (*Sagittaria latifolia*) and *Polygonum spp*.

The nearly vertical bluff feature adjacent to the overflow channel provides nesting for the northern rough-winged swallow (*Stelgidopteryx serripennis*). The bluff is relatively stable due to its location in relation to the depositional gravel bar located in the nearshore at the toe of the stream bank. However, the bluff may evolve into a naturally sloped bank over time due to the gravel toe protection, stable stream bank vegetation and subsequent reduced undercutting by scouring flows.

Reach 5 – Aside from the first 30' of downstream shoreline that is armored with large stone, this reach is un-armored and vegetated with a mixture of eastern cottonwood (*Populus deltoides*), European black alder (*Alnus glutinosa*), crack willow, box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), common buckthorn (*Rhamnus cathartica*), Japanese knotweed (*Polygonum cuspidatum*), bush honeysuckle (*Lonicera morrowii*), common mugwort (*Artemisia vulgaris*), and native herbaceous species.

Reach 6 - The LDB upstream of the bridge is protected by sheet-pile bulkhead from the bridge to a point approximately 300 feet upstream.

Restoration Methods:

Individual restoration methods are described by reach. General cross-sections are presented in Figures 2 – 10. Refer to Attachment 1 for plan view and cross-section locations.

Table 1. Seneca Bluffs Restoration Methods

Reach	Goals	Restoration Methods
1	Bank stabilization	longitudinal fill stone toe protection, bank shaping, slit trenching
	Near-shore habitat creation	bendway weirs, root wads
	Native riparian species establishment	native species plantings, invasive species treatment
2	Near-shore habitat creation	locked logs
	Wetland restoration	floodplain wetland creation
	Native riparian species establishment	native species plantings, chemical and mechanical invasive treatment,
3	Bank stabilization	longitudinal fill stone toe protection, bank shaping, slit trenching
	Near-shore habitat creation	bendway weirs, root wads
	Native riparian species establishment	native species plantings, invasive species treatment
4	Bank stabilization	locked logs
	Near-shore habitat creation	root wads
	Native riparian species establishment	native species plantings, invasive species treatment
5	Bank stabilization	locked logs
	Near-shore habitat creation	root wads
	Native riparian species establishment	native species plantings, chemical and mechanical invasive treatment,
6	None	None

Reach 1 - The goal of restoration at this reach is to stabilize the eroding bank of the island using longitudinal fill stone toe protection, bank shaping, and slit trenching; diversify flow conditions to create in stream habitat, and reestablish native riparian floodplain vegetation. Stabilization of the eroding bank will be achieved through several methods. Firstly, the bank will be cut back and reshaped to create a low flood plain terrace. Bank reshaping will reduce erosional forces and will also maintain a functional flood plain terrace that would regularly flood during high water events. To further protect the bank, longitudinal fill stone toe protection that will be installed with tie backs trenches at 50' intervals along the river bank. Single stone bendway weirs and root wads will be installed in the bank at approximately 50 foot intervals to diversify flows and provide nearshore habitat. Riprap above the mean high water line will be choked with soil, planted with live stakes, and seeded with native riparian vegetation. Native shrubs (red osier dogwood and willows) will be installed in slit trenches that run parallel to the shoreline. Live stake shrubs will also be installed along the tiebacks perpendicular to the shoreline that will create roughness on the floodplain to increase deposition during flooding events.

Knotweed and *Phragmites* on the island will be mechanically removed and chemically treated. These areas will then be seeded with native herbaceous species.

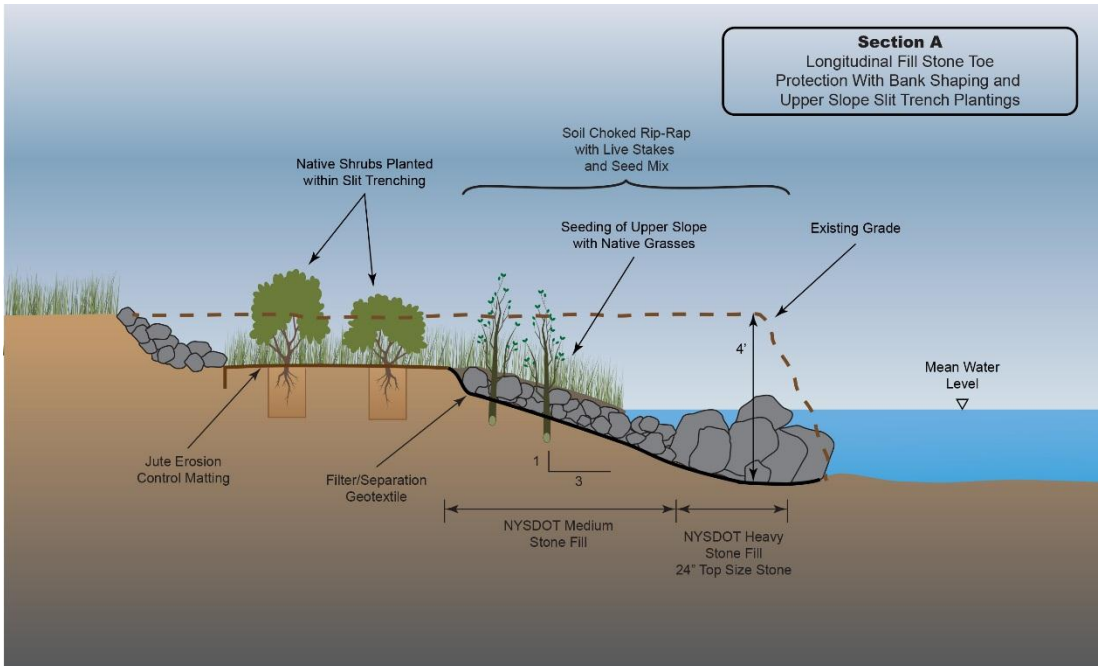

Figure 2. General Cross Section A - Longitudinal Stone Toe Protection with Bank Shaping and Slit Trench Plantings (Reach 1)

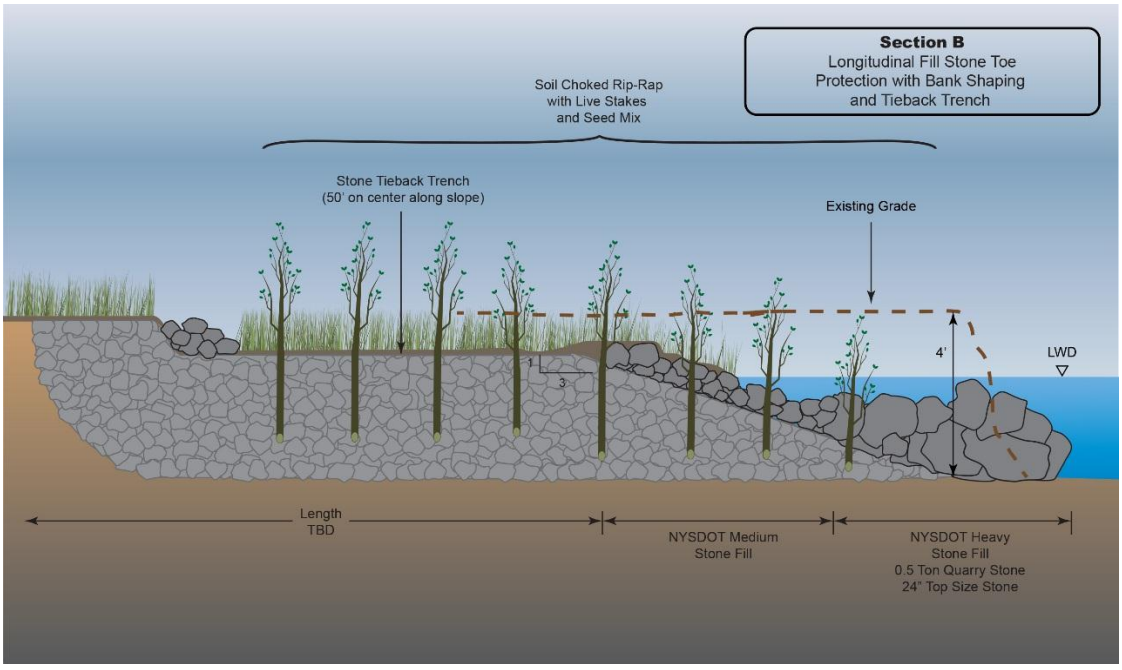

Figure 3. General Cross Section B - Longitudinal Fill Stone Toe Protection Tieback Trench (Reach 1)

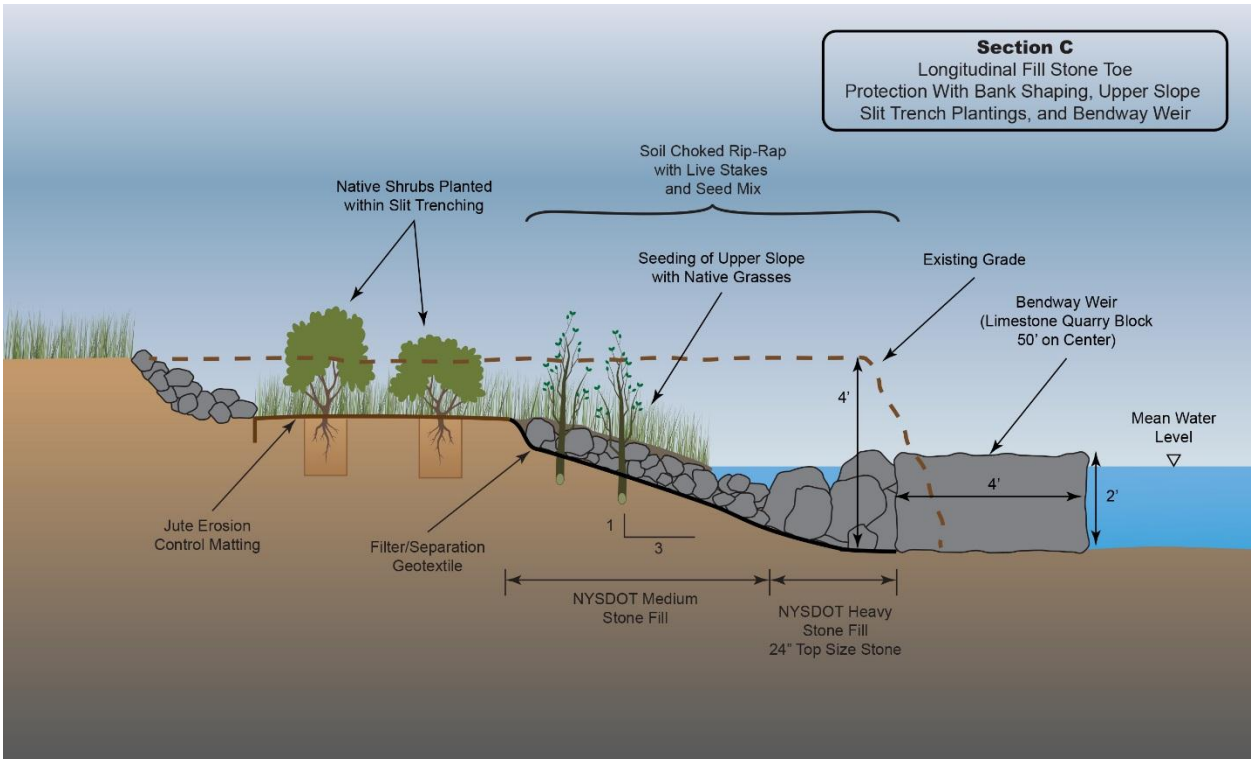

Figure 4. General Cross Section C (Reach 1)

Reach 2 – The goal of restoration at this reach is to create a hydrologically connected floodplain wetlands, enhance nearshore habitat, and restore native riparian communities. Floodplain wetlands will be created by reducing the elevation of part of the floodplain in this area. This will serve the dual purpose of creating hydrologic conditions that support native wetland vegetation and deter *phragmites* re-establishment. Locked logs will be installed along the existing stream bank to improve nearshore habitat. Remnant stands of *phragmites* and Japanese knotweed will be mechanically removed and chemically treated. The entire area will then be seeded and planted with native species.

Reach 3 – The goal of restoration at this reach is to stabilize the severely eroded bank of the lower terrace, enhance nearshore habitat, and restore native riparian communities. The bank will be cut back to an approximate three to one slope and longitudinal fill stone toe protection with tie backs will be installed to protect the toe of the river bank. Bank reshaping will help reduce erosion and improve the riparian habitat. Single stone bendway weirs and root wads will be installed in the bank at approximately 50-foot intervals to diversify flows and provide nearshore habitat. Riprap above the ordinary high water line will be choked with soil, planted with live stakes, and seeded with native riparian vegetation. Native shrubs (red osier dogwood and willows) will be installed in slit trenches that run parallel to the shoreline. Live stake shrubs will also be installed along the tiebacks perpendicular to the shoreline that will create roughness on the floodplain to increase deposition during flooding events. Bank reshaping along this reach will be adjusted to retain mature tree's present within 10 feet of the existing slope crest.

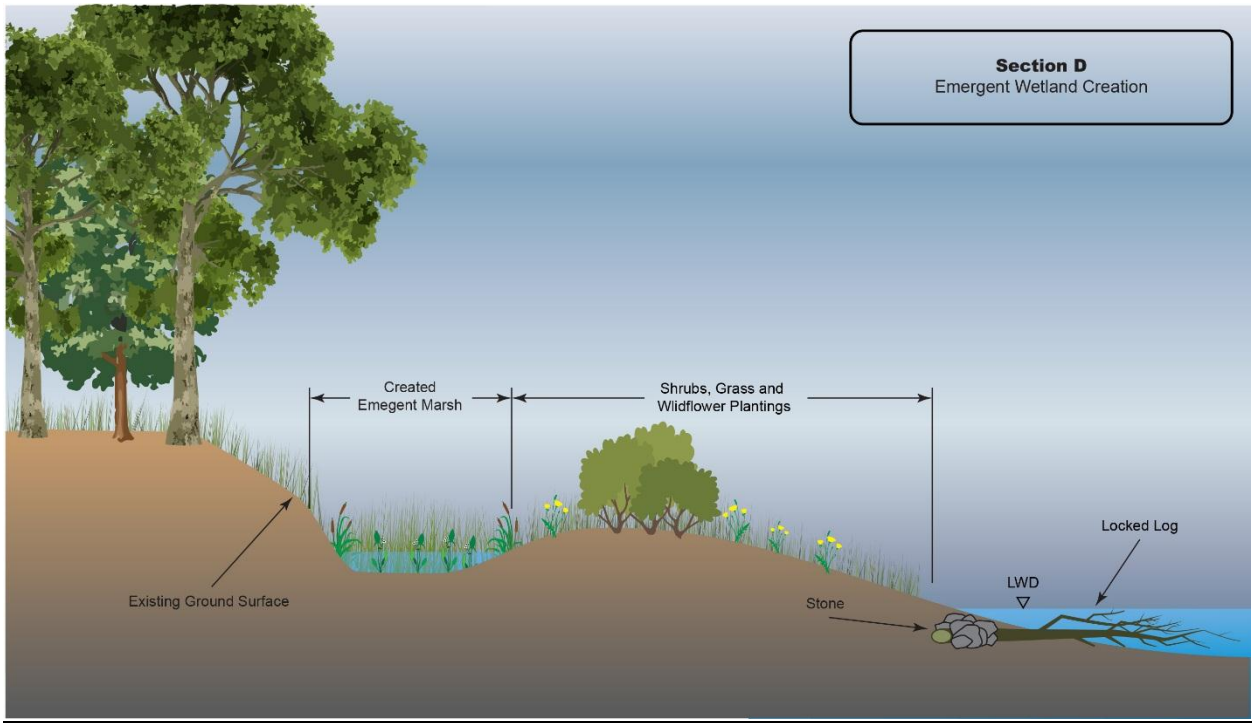

Figure 5. General Cross Section D (Reach 2)

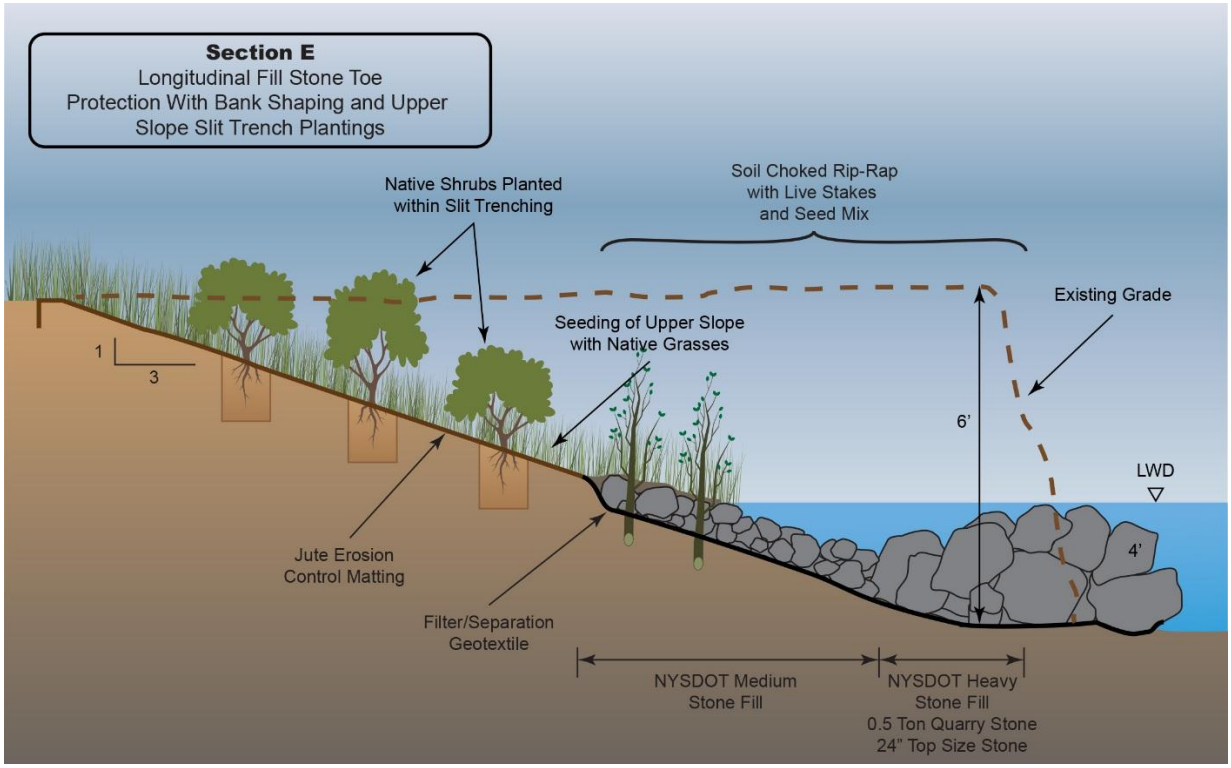

Figure 6. Cross Section E (Reach 3)

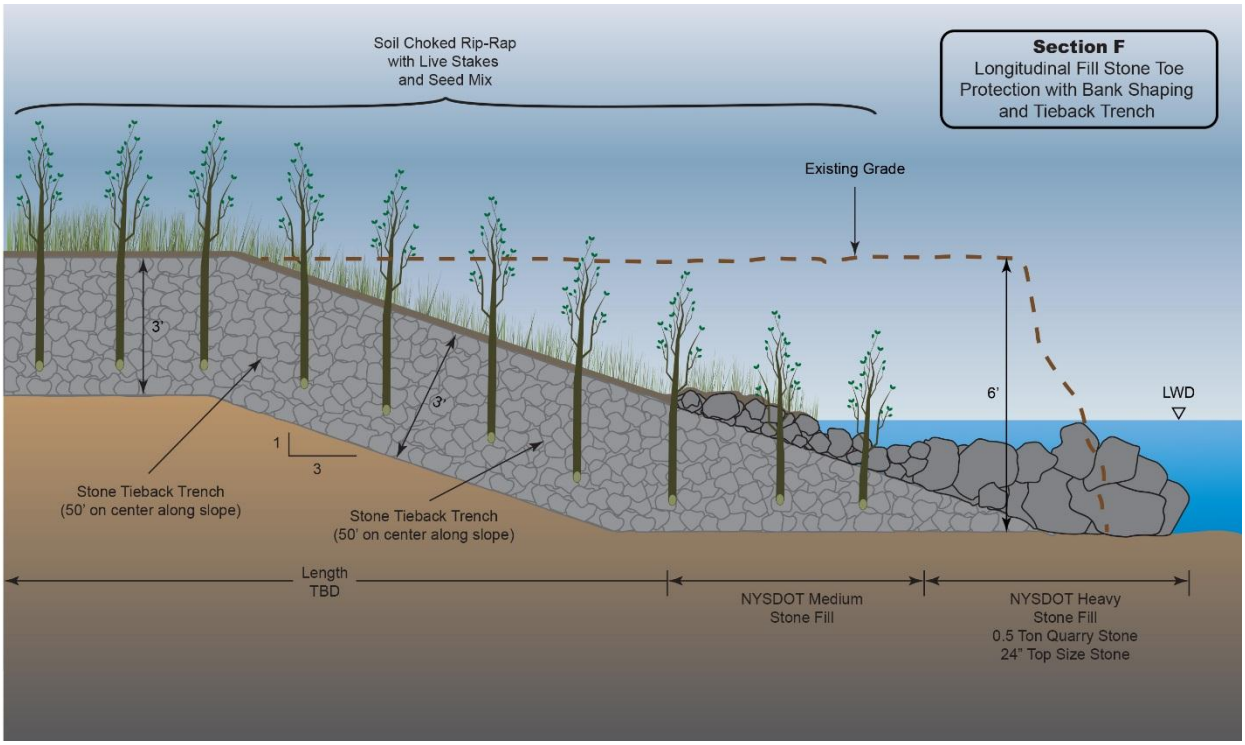

Figure 7. General Cross Section F (Reach 3)

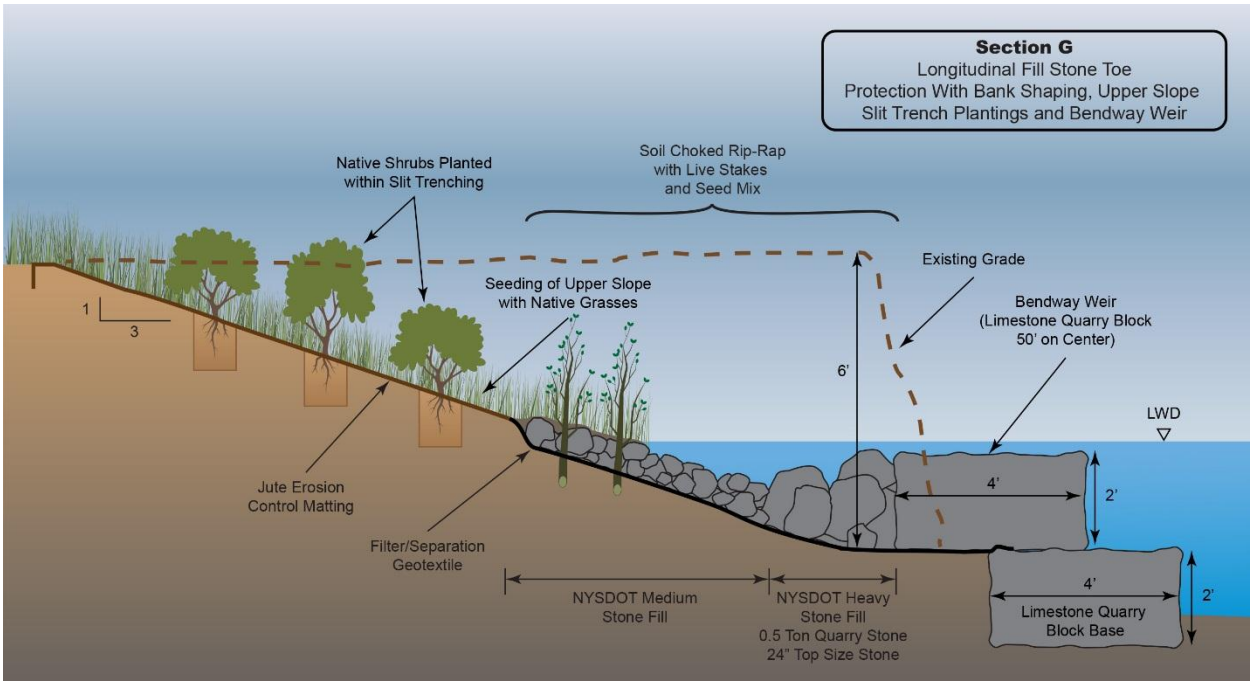

Figure 8. General Cross Section G (Reach 3)

Reach 4 – The goal of restoration at this reach is to maintain the stability of the depositional sand and gravel bar, and enhance the riparian vegetation community it supports. Five to six locked log structures will be installed along the bank to act diverting structures and habitat enhancement features. Plantings of native shrubs and grass species will provide increased substrate stability and habitat diversity. Selective mechanical removal and chemical treatment of invasive species would enhance the habitat value of this reach. Slit trench planting will also be installed on some portions of upper terrace to contribute to its stability and vegetative diversity.

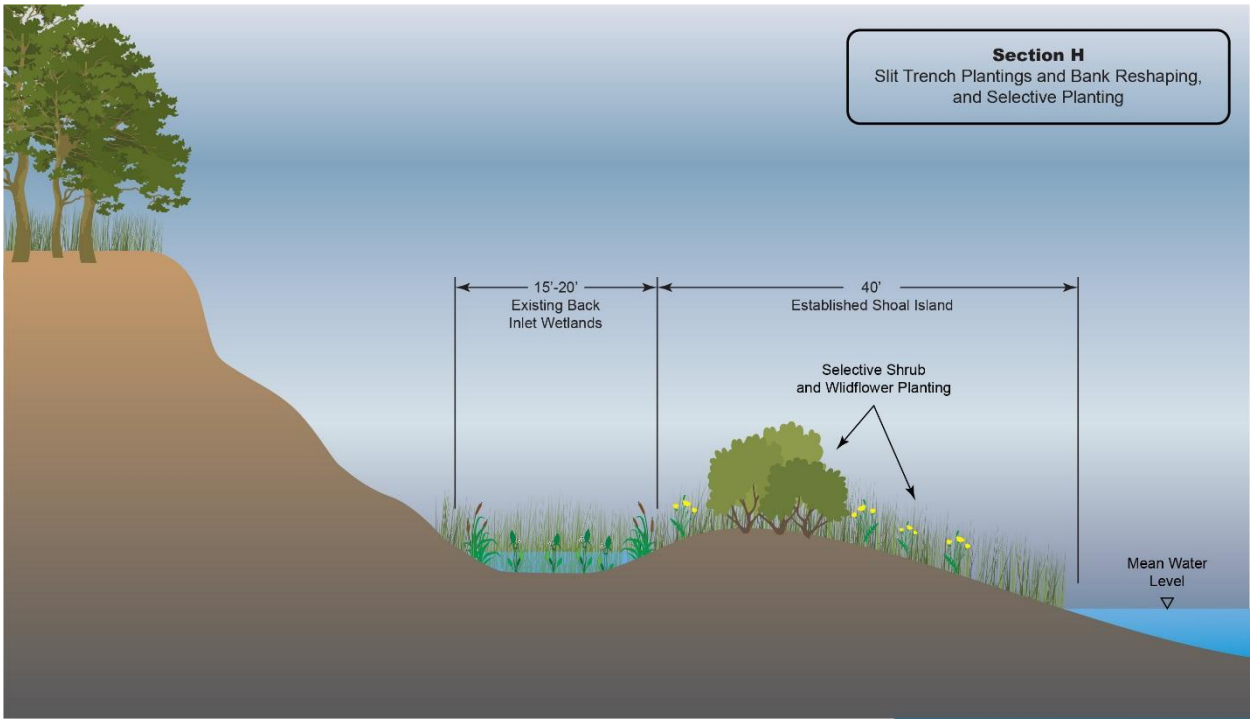

Figure 9. General Cross Section H (Reach 4)

Reach 5– The goal of restoration at this reach is to maintain the stability of the upper terrace and improve aquatic habitat. Slit trench plantings of native shrubs will be installed along the upper slope of the upper terrace to provide increased stability and vegetative diversity. Locked logs will be used to diversify flows, protect the toe of the shoreline, and improve nearshore habitat. Selective mechanical removal and chemical treatment of invasive species would enhance the habitat value of this reach.

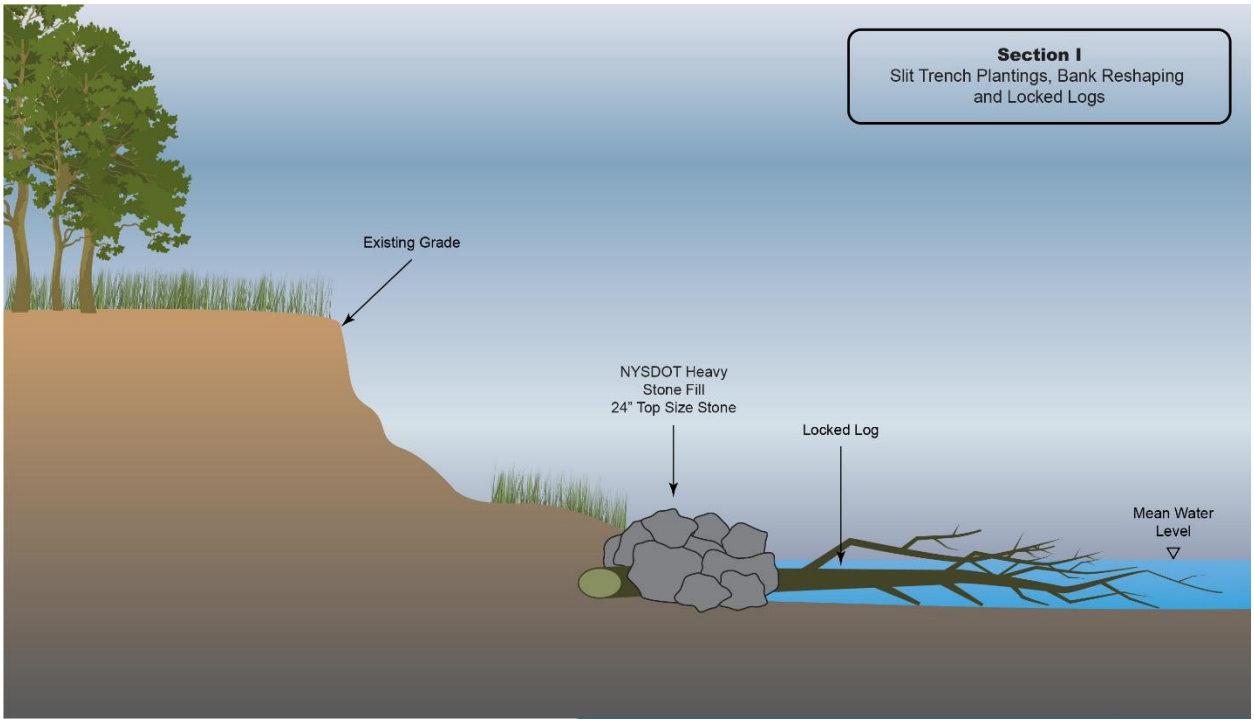

Figure 10. General Cross Section I (Reach 5)

Invasive Species Treatment – As described above, mechanical removal and chemical treatment of invasive plant species will be implemented to reduce the cover and extent of aggressive, non-native vegetation in restoration areas (Figure 11). Treatments will primarily target *Phragmites* and Japanese knotweed.

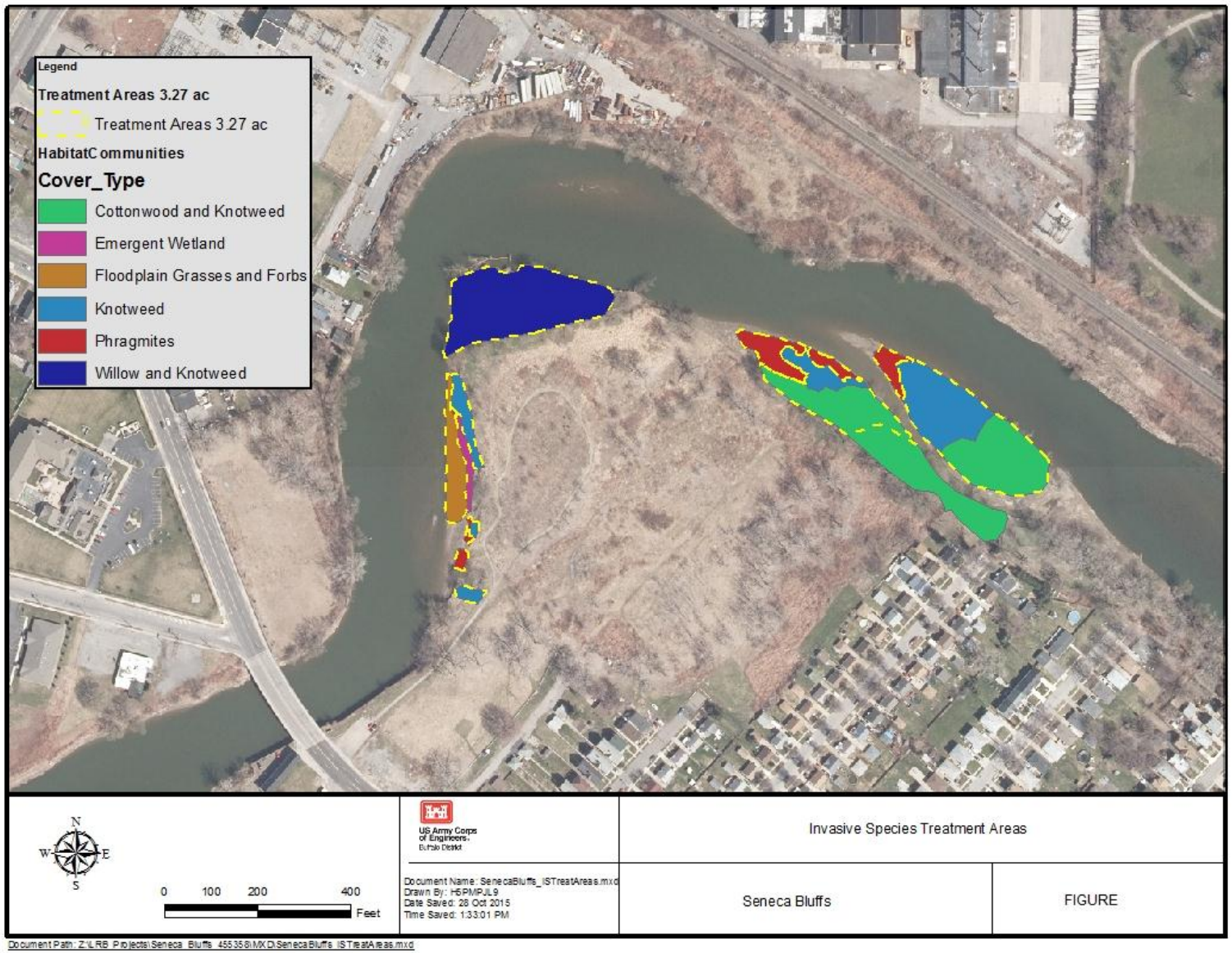

Figure 11. Invasive Species Treatment Areas

References

Ecology and Environment. Buffalo River Ecological Restoration Master Plan. July 2011. Prepared for the U.S. Environmental Protection Agency: Great Lakes National Program Office.

Attachments