

## MEMORANDUM

Date: June 20, 2006

To: Jennifer Zielinski, Center for Watershed Protection

From: Bryon Salladin

**RE: Bronx River Fluvial Geomorphic Assessment**  
Biohabitats Project No. 05039.01

SUBJ: Technical Memorandum

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The purpose of this memorandum is to provide a summary of the findings from Subtask 2.3 Riparian Corridor Restoration and Retrofit Inventory of the Fluvial Geomorphic Assessment of the Bronx River Watershed in New York.

### **Field Methods**

Based on information collected under Task 1 and Subtasks 2.1 and 2.2, Biohabitats identified areas for further assessment and ranking for retrofit and restoration project potential. The assessment examined opportunities for enhanced riparian management, wetland restoration, and stormwater retrofits in the riparian corridor. The primary objective of this task was to identify areas and develop concepts that would result in improved storm water treatment and attenuation prior to discharge into receiving waters. In particular, this task used information developed as part of the USA and sediment source investigation to identify areas where it will be important to look for storage control opportunities that can provide channel protection functions.

Biohabitats visited 15 potential sites in the field. Each site was evaluated for project feasibility, cost, benefit, visibility, and other community factors, such as recreation, attraction of redevelopment activity, etc.

The following criteria assisted in the determination of priority restoration and retrofit project areas within the subwatersheds:

- Riparian areas on Westchester County property were high priority

- Other public property riparian areas were secondary
- Private property riparian areas were considered last

The riparian areas were assessed over the week of May 15 to 17, 2005 in the Bronx River watershed using the Retrofit Inventory Data Sheet developed by the Center for Watershed Protection. Data sheets from the field data collection are included in Appendix A. The following is a list of the areas visited for assessment:

### **Westchester County Jurisdiction**

#### **Bronx River- Upper:**

**Reach 1:** Investigate improvement of stream flow through railroad berm by removing blockage from culvert.

**Reach 2:** Retrofit stormwater management for train station parking lot.

**Reach 8:** Retrofit the tributary entrance into Bronx River at OT-1.

**Reach 3-4:** Reforest and install flow diversion on mainstem.

#### **Davis Brook:**

**Reach 4:** Section upstream of Reach 4 at Westchester County facility stream restoration and stormwater retrofit.

**Reach 8:** Remove decommissioned stone bridge acting as dam and causing aggrading. Opportunity for volunteer trash clean-up with sponsor.

#### **Manhattan Park Brook:**

**Reach 1:** Forest buffer in private golf course.

**Reach 7:** Investigate the possibility of reducing over the road flooding in public park area.

#### **Bronx River – Middle**

**Reach 1b:** Stormwater BMP retrofit at outfall in Parkway Field public park, possible demonstration project.

**Reach 2:** Stream restoration in Scout Field public park.

**Reach 3:** Stabilize stormwater outfall scour hole.

**Reach 3:** Reforest open space along Bronx River Parkway.

Bronx River – Lower

**Reach 1:** Reforest open space along Bronx River Parkway. Install stormwater outfall retrofit on the east side of the Bronx River.

**Private Property**

Davis Brook

**Reach 1:** Stormwater BMP retrofit for parking lot (private property).

**Reach 3:** Stormwater BMP retrofit at private landscaping business.

**Reach 5:** Stormwater BMP retrofit for parking lot (private property).

**Maps and Photographs**

A summary of the photographic data is contained in Appendix B - Table 1. Digital photos are located on the attached CD.

**Summary of Findings**

Retrofit and Restoration Project Site Summary

This section gives an overall summary of each potential retrofit and restoration project site and lists the major issues identified during the assessment.

**Subwatershed: Davis Brook (DB) Figure 1**

County DPW Summary:

The upper Davis Brook site 1 starts in a wooded area between Woods Road and Sprain Brook Parkway east of the Westchester County DPW site. The survey reach extends from its origins at the watershed boundary down to the culvert crossing under Sprain Brook Parkway. Most of Davis Brook in this section flows through a wooded area and is somewhat entrenched with several stormwater outfalls piped to the stream. Other areas are open due to recent construction and powerline right-of-ways. The stream splits above the ROW and half is piped. Encroachment from parking lot construction is prevalent in this

section. Invasive species are common vegetation in some areas, especially in the lower end of the reach. Potential restoration items include the following:

- 1) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 2) Expand/enhance floodplain wetland areas.
- 3) Realign Davis Brook at the upper end of Site 1 into alternate channel that has formed to the east. This would allow for stormwater treatment between the parking lot and stream channel.

#### Landscaping Business Summary:

The Davis Brook site 2 is a 300' section of stream with a wetland seep area south of Lakeview Avenue just east of the intersection with Broadhurst Avenue (Rte 100). Most of Davis Brook in this section flows through a wooded area between two commercial sites and is somewhat encroached upon and entrenched. There is a remnant concrete structure crossing the stream halfway through the reach that is being bypassed around one end. Sediment had accumulated almost to the top of the concrete structure. Invasive species are common with phragmites encompassing the whole wetland seep area. Potential restoration items include the following:

- 1) Replace failing concrete structure with natural channel design grade control structure.
- 2) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 3) Enhance wetland seep area.

#### Rock Gym Summary:

The Davis Brook site 3 starts at the Commerce Street crossing east of the intersection with the Taconic State Parkway. The survey reach flows south between the parkway and a parking lot east of a private business parking lot. Most of Davis Brook in this section is relatively stable but with concerns of surface water input from the adjacent business into the floodplain wetland. Encroachment from parking lot into floodplain wetland occurs in this section. Invasive species are common throughout. Potential restoration items include the following:

- 1) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 2) Expand/enhance floodplain wetland areas.
- 3) Stormwater treatment between the parking lot and floodplain wetland.

**Monument Summary:**

The Davis Brook site 4 starts at the Lakeview Avenue crossing west of the intersection with the Taconic State Parkway. The survey reach flows south between the parkway and a railway east of a private business work yard. Most of Davis Brook in this section is relatively stable but with concerns of surface water pollution from the adjacent business. Encroachment from parking lot construction is prevalent in this section. Invasive species are common throughout. Potential restoration items include the following:

- 4) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 5) Expand/enhance floodplain wetland areas.
- 6) Realign Davis Brook at the upper end of Site 1 into the open parkway area to the east. This would allow for stormwater treatment between the parking lot and stream channel.

**Valhalla Station Summary:**

The Davis Brook site 5 starts from the culvert crossing under Taconic State Parkway and continues south between the parkway and the railway to a water main crossing. Most of Davis Brook in this section is encroached upon from the east by the train station parking lot and the west by the railway berm. The water main crossing culvert has become blocked causing sediment deposition and stream bed accretion above the blockage and erosion on the railway berm. Invasive species are common vegetation in some areas, especially in the lower end of the reach. Trash and debris are common in this reach. Potential restoration items include the following:

- 1) Remove blockage from water main crossing to improve flow and prevent erosion to berm.
- 2) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 3) Expand/enhance floodplain wetland areas.
- 4) Possible stormwater retrofit for stormwater treatment between the train station parking lot and stream channel.

**Subwatershed: Manhattan Park Brook (MP) Figure 2****Old Tarrytown Park Summary:**

Manhattan Park Brook Assessment Site 1 is at the Old Tarrytown Park, south of Old Tarrytown Road just west of Hillside Avenue (Rte 100). The stream flows south from an established red maple swamp on the New York School for the Deaf property.

Approximately 200 feet north of the Old Tarrytown Road crossing a series of gabions has caused ponding, sediment deposition and invasives establishment. The stream is then culverted for 200 feet under the Old Tarrytown Park south of Old Tarrytown Road. There are indications (floatable debris lines) that this culvert is undersized and that the stream flows over the road into the park. Potential restoration items to consider are:

- 1) Channel design to replace gabions with grade control structures.
- 2) Replace culvert and/or daylight stream through Old Tarrytown Park.
- 3) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.

Knollwood Golf Course Summary:

Manhattan Park Brook Assessment Site 2 is on the Knollwood Golf Course, west of Knollwood Road (100A) and north of Knollwood Drive. After being discharged from a golf course pond, the stream flows south and for approximately 200 feet has only mowed grass for riparian vegetation. From here it enters a wooded area where it has been encroached upon by a roadway and has some bank erosion. The stream is then culverted under the golf course parking lot. Stormwater runoff from the parking lot is causing erosion of the stream bank where the stream exits the piped section. Potential restoration items to consider are:

- 1) Stabilize the eroding banks.
- 2) Install stormwater retrofit to capture parking lot runoff and prevent erosion at south end of parking lot.
- 3) Improve riparian buffer by planting native trees and shrubs in open areas along the upper reach.

### **Subwatershed: Bronx River Upper (BRU) Figure 3**

White Plains Summary:

The Bronx River Upper Assessment Site 1 extends from the County Center parking area access bridge crossing north approximately 3400' to the Cemetery Road crossing. The Bronx River flows south on the east side of the Bronx River Parkway for some of this

section and between lanes for the rest of this section. Three tributaries flow into the mainstem from the west two large and one small. The majority of the floodplain along the Bronx River Parkway lacks good vegetative cover and is mowed regularly. There are some existing depression areas that occasionally receive overbank flood waters. Invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. Potential restoration/retrofit items to consider are:

- 1) Widen the riparian buffer by planting native trees and shrubs in open areas along the Bronx River Parkway.
- 2) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 3) Expand/enhance floodplain wetland areas.
- 4) Divert stormwater flow from west bank tributaries and the mainstem Bronx River into retrofit SWM areas in the open areas of the Bronx River Parkway.

#### North White Plains Summary:

The Bronx River Upper Assessment Site 2 extends from the Fisher Lane Bridge crossing south approximately 2400' to the Cemetery Road crossing. The Bronx River flows south on the west side of the North White Plains train station parking area for some of this section and west of the Bronx River Parkway for the rest of this section. Some of the floodplain along the Bronx River Parkway lacks good vegetative cover and is mowed regularly. There are some existing depression areas that occasionally receive overbank flood waters and wetland areas that receive runoff from the south parking lot. Invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. This would be a project site with low feasibility, high public exposure and moderately beneficial. Potential restoration/retrofit items to consider are:

- 1) Widen the riparian buffer by planting native trees and shrubs in open areas along the Bronx River Parkway and in Garth Woods Park.
- 2) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 3) Expand/enhance floodplain wetland areas.
- 4) Divert stormwater flow from the mainstem Bronx River into retrofit SWM areas in the open areas of the Bronx River Parkway.

#### Edge Park Summary:

The Bronx River Upper Assessment Site 3 is a tributary that extends from Edge Park Road east approximately 700' to the confluence with the Bronx River. This reach begins in a wooded area north of Edge Park Road and west of the Bronx River Parkway that receives stormwater from a residential area upslope. A decommissioned railroad berm with a mostly blocked/undersized culvert is causing the area to flood. The culverted stream passes under the Parkway for 250' and resurfaces in the floodplain east of the Parkway. In this section the stream is channelized to the confluence. Invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. Potential restoration/retrofit items to consider are:

- 1) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 2) Expand/enhance floodplain wetland areas east of the Parkway to capture stormwater.
- 3) Divert stormwater flow from the mainstem Bronx River into retrofit SWM areas in the open areas of the Bronx River Parkway.

#### **Subwatershed: Bronx River Middle (BRM) Figure 4**

##### Garth Woods Summary:

The Bronx River Middle Assessment Site 1 is from Harney Road (Bronx River Parkway exit 10) to approximately 1200 feet north of Harney Road. The Bronx River Parkway southbound runs along the west side of the channel and Bronx River Parkway northbound to the east for its whole length. Portions of the floodplain exist east of the Bronx River Parkway and most of this area lacks good vegetative cover and are mowed regularly. Garth Woods Park is a partially open/wooded area in the floodplain between the Parkway north and southbound lanes. Invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. Potential restoration/retrofit items to consider are:

- 4) Widen the riparian buffer by planting native trees and shrubs in open areas along the Bronx River Parkway and in Garth Woods Park.
- 5) Stabilize stormwater outfall in the downstream left floodplain coming from the Parkway northbound lanes near Harney Road.
- 6) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.

- 7) Expand/enhance floodplain wetland areas.
- 8) Realign Bronx River at the upper end of Site 1 into alternate channel that has formed to the east. This would protect the southbound lanes from bank erosion and flooding.
- 9) Divert stormwater drains from roadway/parking at the Church of Our Lady of Fatima to the open area west of the Bronx River Parkway.

#### East Chester Summary:

The Bronx River Middle Assessment Site 2 is from Harney Road (Bronx River Parkway exit 10) to approximately 3000 feet south of Harney Road. The Metro North rail line runs along the west side of the channel and Bronx River Parkway northbound to the east for its whole length. Portions of the floodplain between the Bronx River Parkway and the river lack good vegetative cover and are mowed regularly. To the east the floodplain is generally wooded. There is a short tributary east of the Bronx River formed from an 8' diameter culvert under Harney Road that is highly eroded. Approximately 700' south of the rest area in Assessment Site 2, there is an area of bank erosion threatening the path and eventually the Parkway. Invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. There is a pedestrian path through area and this would be a project site with high public exposure. Potential restoration/retrofit items to consider are:

- 1) Widen the riparian buffer by planting native trees and shrubs in open areas along the Bronx River Parkway.
- 2) Stabilize stormwater outfall in the downstream left floodplain coming from under Harney Road.
- 3) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 4) Expand/enhance floodplain wetland areas and connect stream to floodplain depressions through access channels and deepen depressions for flood storage.
- 5) Realign Bronx River near the lower end of Site 2 into existing floodplain to protect the pedestrian path and Bronx River Parkway lanes from erosion and flooding.

#### Scout/Parkway Field Summary:

The Bronx River Middle Assessment Site 3 is from Midland Avenue to the confluence with Laurel Brook approximately 1000 feet to the south. The Bronx River flows between two parks, Scout Field to the west and Parkway Field to the east. Portions of the floodplain exist as playing fields and therefore have minimal vegetation and are mowed regularly. There is a 24" outfall approximately 300 east of the Bronx River that discharges

stormwater via an open channel. There are some existing wetlands in this floodplain area and invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. This would be a project site with high feasibility, high public exposure and beneficial. Potential restoration/retrofit items to consider are:

- 1) Widen the riparian buffer by planting native trees and shrubs in open areas along the western edge of Parkway Field and the eastern edge of Scout Field.
- 2) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 3) Create stormwater impoundment in floodplain for outfall on south side of Midland Avenue.

### **Subwatershed: Bronx River Lower (BRL) Figure 5**

#### Summary:

The Bronx River Lower Assessment Site 1 begins at the Broad Street crossing and continues south to the Oak Street crossing. The Bronx River Parkway runs along the west side of the channel and the Metro North rail line to the east for its whole length. Portions of the floodplain lack good vegetative cover and are mowed regularly. Invasive species are prevalent throughout the assessment site with Japanese knotweed, multiflora rose, and garlic mustard comprising the majority of the infestation. This would be a project site with high feasibility, high public exposure and beneficial. Potential restoration/retrofit items to consider are:

- 1) Widen the riparian buffer by planting native trees and shrubs in open areas along the Bronx River Parkway.
- 2) Stabilize stormwater outfalls in the downstream left bank.
- 3) Remove and manage the invasive species including but not limited to: Japanese knotweed, multiflora rose, garlic mustard and phragmites.
- 4) Remove unused path section and relocate current path to expand floodplain wetland areas.
- 5) Connect stream to floodplain depressions through access channels and deepen depressions for flood storage.
- 6) Divert stormwater drains from roadway at exit ramp to storage area in cloverleaf.

# APPENDICES

Appendix A: Data Collection Field Sheets

Appendix B: Photographic Documentation Table



## Appendix A: Data Collection Field Sheets



# Appendix B: Photographic Documentation Table



## Index of photos from the Bronx River Retrofit and Restoration Assessment

<b>Picture #</b>	<b>Subwatershed</b>	<b>Site#</b>	<b>Description</b>
1	BRL	1	Start 5/16/2006: Goose in tree
2	BRL	1	Mound (bedrock?) by highway
3	BRL	1	Wet depression adjacent to mound by highway
4	BRL	1	Blocked culverts at start of reach
5	BRL	1	Ponded water in depression between exit and on ramp
6	BRL	1	Wet, low area by highway – expand area for retrofit?
7	BRL	1	Outfall of culvert, with well formed bench
8	BRL	1	Open access for construction
9	BRL	1	Open access for construction
10	BRL	1	Unused path, area for reforestation?
11	BRL	1	Reforestation opportunity?
12	BRL	1	Bank erosion
13	BRL	1	Flooded path
14	BRL	1	Knotweed
15	BRL	1	Storm drain outfall, 4-5 foot diameter
16	BRL	1	Channel from drain (above) 15 ft wide, inactive?
17	BRL	1	Storm drain, 3 ft diameter
18	BRL	1	Active channel, 3 ft width
19	BRL	1	Phragmites/knotweed invasives
20	BRL	1	Mature tree growth
21	BRL	1	Broken outfall
22	BRL	1	Open access for construction, knotweed invasives
23	BRL	1	Highway
24	BRL	1	Highway
25	BRM	3	High water
26	BRM	3	Hardened bank
27	BRM	3	Open access for construction and ponded water
28	BRM	3	Open access for construction
29	BRM	3	Outfall from Tributary - 5 ft diameter
30	BRM	3	Tributary, 10-15 ft wide
31	BRM	3	Wetland area at base of hill
32	BRM	3	Water accessing stream
33	BRM	3	Water accessing stream across path
34	BRM	3	Lack of riparian buffer
35	BRM	3	Lack of riparian buffer
36	BRM	3	Hardened channel and banks
37	BRM	3	Hardened channel and banks, storm drain from parking lot (PL)
38	BRM	3	Flooded path
39	BRM	3	Erosion to path
40	BRM	2	Culvert
41	BRM	2	Bank erosion

<b>Picture #</b>	<b>Subwatershed</b>	<b>Site#</b>	<b>Description</b>
42	BRM	2	Woods (pine trees), possible SWM area
43	BRM	2	DS bridge, backwater, 15ft wide
44	BRM	2	Open access by highway
45	BRM	2	Open access by highway for const., possible SW retention area
46	BRM	2	Concept for other areas, d/s of visitor center
47	BRM	2	Bank erosion
48	BRM	2	Open access for construction
49	BRM	2	Debris line
50	BRM	2	Outfall
51	BRM	2	Outfall
52	BRM	2	Outfall and bank erosion
53	BRM	2	Erosion
54	BRM	2	Outfall by bridge
55	BRM	1	Odd outfall
56	BRM	1	Downslope of outfall
57	BRM	1	Open park, Revegetation opportunity
58	BRM	1	Split
59	BRM	1	Split
60	BRM	1	Channel
61	BRM	1	Channel
62	BRM	1	Outfall into open area
63	BRM	1	Outfall into open area
64	BRM	1	Flooded open area
65	BRM	1	Stormwater path off of PL to flood area down the hill
66	BRM	1	Stormwater path off of PL to flood area down the hill
67	BRM	1	Stormwater path off of PL to flood area down the hill
68	BRM	1	Same parking lot, broken curb
69	BRM	1	Stormwater ponding on road
70	BRM	1	Debris line at edge of open area
71	BRM	1	Ponded water in field
72	BRM	1	Outfall
73	BRM	1	Outfall spillway
74	BRU	1	Gas pipeline next to stream
75	BRU	1	Ponded area east of Bronx River Parkway
76	BRU	1	Hardened drainage ditch, open access
77	BRU	1	Open area for SWM
78	BRU	1	Channel cut from culvert before cement ditch
79	BRU	1	Drainage from bridge, sediment deposit
80	BRU	1	Start Disk 2, end of daylighted cement ditch
81	BRU	1	Open field collecting water, gas line
82	BRU	1	Wetland, invasives control
83	BRU	1	Overall view

<b>Picture #</b>	<b>Subwatershed</b>	<b>Site#</b>	<b>Description</b>
84	BRU	1	Erosion on bank
85	BRU	1	Mowing to edge of bank
86	BRU	1	Open area with manhole
87	BRU	1	Open area with manhole
88	BRU	1	Debris jam
89	BRU	2	Stream bedrock wall
90	BRU	2	Stream, bedrock outcrop
91	BRU	2	Ponded water
92	BRU	2	Erosion/runoff from BRP
93	BRU	2	Rusted barrels
94	BRU	2	Outfall from PL
95	BRU	3	Ponded water close to road
96	BRU	3	Backed up water from culvert
97	BRU	3	Backed up water from culvert
98	BRU	3	Water spilling to open area
99	BRU	3	Buried culvert
100	DB	1	Start 5/17/2006, wetland off of new road
101	DB	1	Storm drain outfall from new road
102	DB	1	DS of new outfall
103	DB	1	Culvert under sprain brook parkway
104	DB	1	Drainage tributary channel to main stem
105	DB	1	Culvert
106	DB	1	Upslope of culvert
107	DB	1	Upstream of inflow to culvert
108	DB	1	Asphalt pushed to edge for parking
109	DB	1	Erosion around storm drain
110	DB	1	Outfall of culvert from under highway
111	DB	1	Channel from outfall
112	DB	1	Outfall from PL, debris jam
113	DB	1	Drain pipe
114	DB	1	Eroded bank
115	DB	1	12 in pipe from PL
116	DB	1	Channel
117	DB	1	12in. Pipe from PL entrenched 5 ft.
118	DB	1	Drain clogged
119	DB	1	Parking lot (PL)
120	DB	2	Flow diverted around dam, 5 feet tall
121	DB	2	Phragmites, invasives control opportunity
122	DB		Relationship of cemetery to stream
123	DB		Culvert at end of R2 and cemetery
124	DB	3	Big parking lot, grassy area - management opportunity?
125	DB	4	Open area by Commerce Street

<b>Picture #</b>	<b>Subwatershed</b>	<b>Site#</b>	<b>Description</b>
126	DB	5	Runoff from PL to stream
127	DB	5	Appliances in stream
128	DB	5	<20ft b/w cars and stream
129	DB	5	Debris jam, much deposition
130	DB	5	Blocked water main crossing
131	DB	5	Erosion and debris over water main
132	DB	5	Erosion over water main
133	DB	5	Damaged outfall
134	DB	5	Backside, 15 feet tall
135	DB	5	PL
136	MPB	1	Water flooded over road to park
137	MPB	1	Erosion at culvert outfall
138	MPB	1	Surface erosion from PI
139	MPB	1	U/S of park at culvert , undersized
140	MPB	2	Scour hole in golf course
141	MPB	2	Bank erosion
142	MPB	2	Lack of riparian vegetation
143	MPB	2	Erosion
144	MPB	2	Cleared wetland area
145	MPB	2	PL
146	MPB	2	25ft. Tall
147	MPB	2	PL