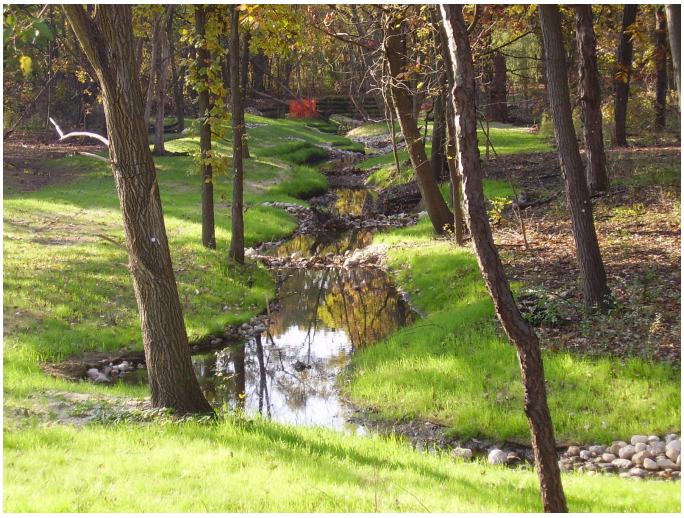
LYMAN WOODS STREAMBANK STABILIZATION PSA 2, PHASES 1 AND 2
TRIBUTARY TO THE EAST BRANCH DUPAGE RIVER
Section 319 Project Report

Illinois EPA Agreement No. 3190323



Illinois Environmental Protection Agency
Bureau of Water
Watershed Management Section

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LYMAN WOODS STREAMBANK STABILIZATION PSA 2, PHASES 1 AND 2
TRIBUTARY TO THE EAST BRANCH DUPAGE RIVER
SECTION 319 FINAL REPORT

ILLINOIS EPA FAA # 3190323

December 2007

Prepared For:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF WATER – WATERSHED MANAGEMENT SECTION
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LYMAN WOODS STREAMBANK STABILIZATION PSA 2, PHASES 1 AND 2

TABLE OF CONTENTS

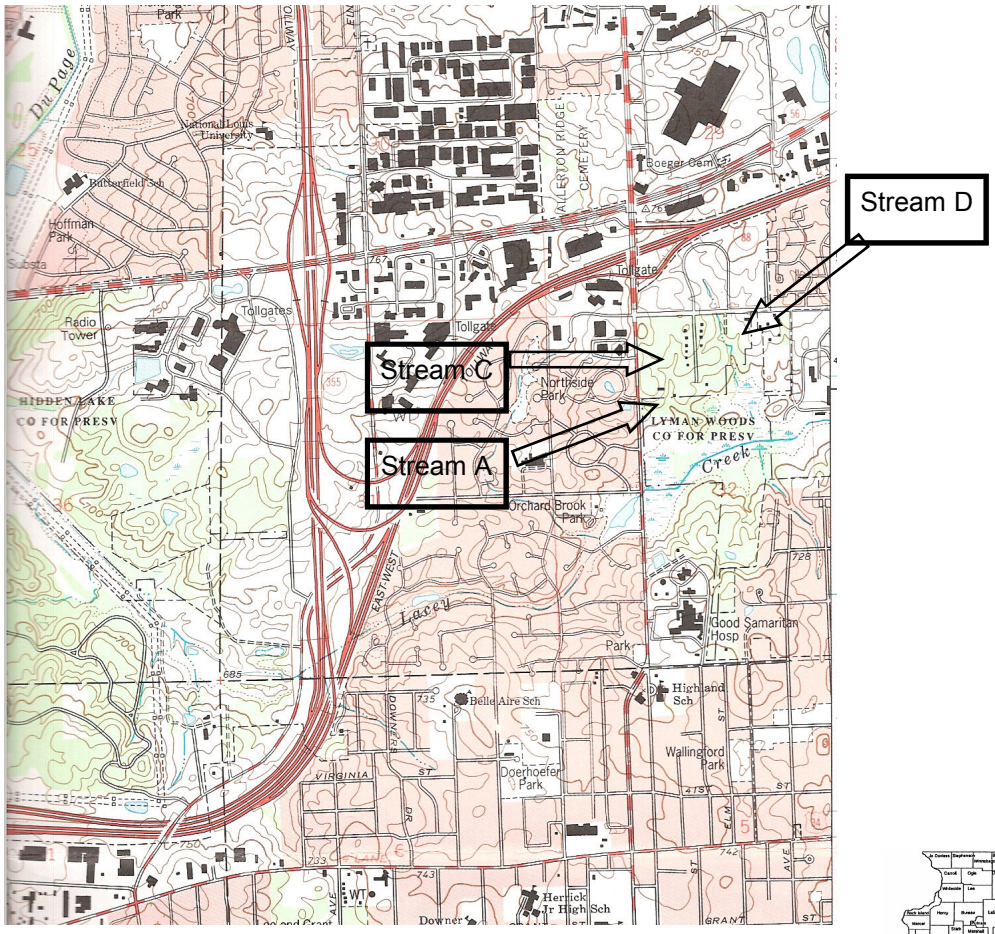
Summary:
The Downers Grove Park District completed the Lyman Woods Streambank Stabilization Project, Site Area # 2, Phases 1 and 2. This project will protect against severe streambank erosion, provide nonpoint source pollution control along Lyman Woods Headwaters, and improve the water quality of Lacey Creek and the downstream East Branch DuPage River. Installed stream stabilization techniques have provided effective and environmentally sound bank protection. The Downers Grove Park District (DGPD) and its agents will provide long-term maintenance for the project site. Public outreach to date includes numerous staff environmental education programs for children and adults at the Lyman Woods Interpretive Center and trial system, a project at the December 2006 Annual Meeting of the Pierce Downers Heritage Alliance (conservation organization) by Living Waters Consultants, and substantial daily vehicular traffic along project signage at 31st Avenue east of Highland Avenue.

Introduction:
The Lyman Woods Streambank Stabilization Project Site Area 2 (PSA 2), Phases 1 & 2 includes over 2,804 linear feet of streambank stabilization and 36 acres of streambank riparian enhancement along three (3) unnamed streams tributary to Lacey Creek and the East Branch DuPage River. The project site is located within Lyman Woods, a 150-acre natural area, located south of 31st Street and east of Highland Avenue in Downers Grove, DuPage County, Illinois. Most of the site is owned by the Downers Grove Park District but a portion of the area is owned by the Forest Preserve District of DuPage County. The three streams which have been stabilized by the project are Streams A, C, and D. Stream D located in the north-central project site area has a watershed area of 115.4 acres. The watershed is primarily located north of 31st Street. Land uses in the stream D watershed primarily include Interstate 88 tollway, commercial land use, and open space. Streams A and C are located in the northwest and west portions of the project area. The combined watershed area for streams A and C is 38.3 acres. Stream A flows into Stream C approximately 600 feet east of Highland Avenue. Land uses in the watershed of streams A and C include single-family residential areas, commercial areas, roads, and open space. Streambank erosion and channel downcutting is severe on each stream. Streambank erosion is occurring in part due to upstream watershed development and past road widening which increases the volume and duration of erosive flows. Other primary causes include high stream gradient (average slopes up to 2%) and encroachment of invasive Buckthorn and Honeysuckle. Each stream channel has incised approximately two to three feet into the landscape. Active channel nickpoints on Streams A and C previously contained vertical grade separations over 2.5 feet deep. Moreover, significant channel widening had previously occurred. Several large trees and mature Oaks have previously fallen into the eroding stream channel. The severe streambank erosion had resulted in significant sediment delivery to the East Branch of the DuPage River.

A primary objective of the Lyman Woods Streambank Stabilization Project was to improve the water quality in the project area and to reduce the sediment loading caused by streambank erosion into Lacey Creek and the East Branch DuPage River. This objective was accomplished in

Project Site Area # 2 (PSA 2) through streambank stabilization along 2,804 linear feet including both banks, installation of numerous grade control structures to prevent and control channel downcutting, removal of invasive shrub species and native plant seeding in 36.06 acres of riparian area, restoration of 0.22 acres of wetland, and installation of native plantings along the stabilized streambanks. The completed BMPs will protect against severe streambank erosion, reduce channel downcutting, provide nonpoint source pollution control along Lacey Creek and improve water quality of the downstream East Branch DuPage River. The nonpoint source pollutants that have been controlled include sediment, suspended solids, phosphorus, and nitrogen. The severe streambank erosion has resulted in significant sediment delivery to the East Branch DuPage River. The Illinois EPA Load Reduction Spreadsheet was utilized to quantify the significant sediment delivery to the East Branch DuPage River as described below under Project Benefits.

Location Map: Wheaton USGS Quadrangle Map.
31st Street and Highland Avenue, Downers Grove, DuPage County, Illinois.



Project Schedule

Table 1 below indicates the project schedule and completion requirements.

Table 1: Project Schedule.
Lyman Woods Streambank Stabilization PSA 2, Phases 1 and 2.
IEPA FAA 3190323.

Action Item	Start Date	Completion Date *
FAA 3190323 Award	July 16, 2004	Jan. 20, 2008
Design Engineering	March 25, 2005	January 25, 2006
Permitting	Sept. 15, 2005	February 6, 2006
Bidding	May 24, 2006	July 20, 2006
Construction Contract Award	July 21, 2006	June 15, 2007
Riparian Invasive Species Removal	August 21, 2006	August 25, 2006
Streambank Stabilization Construction	August 29, 2006	November 3, 2006
Native Plantings	March 15, 2007	May 30, 2007
Project Final Report	Dec. 17, 2007	**Jan. 17, 2008**

* Items in **Bold** are expected completion dates.

Project Description and Stabilization Techniques

The Lyman Woods Streambank Stabilization PSA 2, Phases 1 and 2 included stream stabilization design, permitting assistance, stream construction bid documents, and stream construction observation by Living Waters Consultants, Inc. Project management, riparian invasive species removal design, wetland restoration design, and permitting were provided by team member Planning Resources. Hydrologic and hydraulic modeling was provided by team member Patrick Engineering. The Downers Grove Park District provided administrative assistance, administrative project management, notification of adjacent landowners, limited construction observation, and project publicity. Conservation Land Stewardship, Inc. (CLS) provided construction services. The PSA 2 streambank stabilization substantial completion of construction ended November 3, 2006. Final planting installations were completed by June 15, 2007. Conservation Land Stewardship, Inc. (CLS) is providing native plant maintenance through June 15, 2008. Continued native plant maintenance after June 15, 2008 shall be provided by contractors to be named later, to be hired by the Downers Grove Park District. The best management practices described below were utilized to enhance the riparian corridor and to stabilize the streambanks of the Lyman Woods Headwaters streams A, C and D.

Table 2: Streambank Stabilization Practices.

Streambank Stabilization Quantities for Pollutant Loading Rates

Stabilization Practice	Left Bank (LF)	Right Bank (LF)	Total (LF)
Native Shrub Live Stakes Only (3/LF)	35	0	35
Native Potted Plugs Only (3/LF)	35	50	85
Fiber Roll Toe	108	125	233
Cobble Installation At Storm Pipe Inlets	24	27	51
Rock Check	12	48	60
Rock Vortex Weirs	28	28	56
Rock Vanes	28	28	56
Re-Shaped Slope Only	50	0	50
Tree Rootball	24	8	32
Vegetated Cobble Toe	170	175	345
Widen Bank Only	0	55	55
Stepped Pool	160	160	320
Cabled Shrub Revetment	0	20	20
Fiber Roll Terrace (mid-slope)	25	70	95
Rock Riffles	360	360	720
1-Row A-Jacks / Rock Layer	331	180	511
Lunkers / Rock Layer	0	80	80
Total (LF)	**1390**	**1414**	**2804**

Note: 1) Lengths of BMPs depicted above do not overlap with other BMPs.
2) Total quantities are higher than that depicted. For instance, Rock J-hook 15 LF coincided with Lunkers. To avoid double-counting BMP lengths, rock J-hooks were not omitted from pollutant loading calculations.

Enhancement of Riparian Corridor

Lyman Woods Headwaters Streambank Stabilization included vegetation management with replacement of 36 acres of dense stands on non-native and invasive shrubs and trees (such as Buckthorn and Honeysuckle) with riparian native plant seeding, and limited installation of potted native trees and native potted shrubs. The replacement of undesirable vegetation with native species will prevent loss of bank soils and promotes bank stability. Removal of invasive species will also significantly enhance growth of native grasses, forbs, shrubs and trees which previously were suppressed by invasive plants. This will reduce non-point source pollutant loadings to the downstream East Branch DuPage River. Replacement of invasive species with native grasses, forbs, shrubs and trees will also promote filtration and assimilation of nutrients as well as contaminated runoff that can be discharged from surrounding upland areas. Aquatic habitat diversity along the Lyman Woods Headwaters riparian corridor will be substantially improved.

A-Jacks / Rock Layer and Vegetated Geogrid

Streambank stabilization was the most important BMP to prevent additional soil pollutant transport throughout the Lyman Woods Headwaters and the downstream East Branch DuPage River. In the more severely eroded areas, a-jacks were installed in a trench along the toe of slope and a rock layer was installed above the a-jacks. Above the rock layer, the steeply eroded banks were stabilized by constructing soil-encapsulated lifts using permanent erosion control blanket (NAG C350). The permanent A-Jacks structures have a high energy-dissipation capability. The vegetated geogrid provided long-term erosion control along banks that were typically 4-ft to 5-ft tall with vertical slopes (H:V). These techniques were suited for areas that could not be stabilized with vegetation alone, such as areas with high flow velocities along erodible soils, and where high bank shear stresses and sharp meander bends occur.

Lunkers / Rock Layer and Vegetated Geogrid

Lunkers were used in the tallest and most severely-eroded bank at the project site. Lunkers composed of TREX material were installed in a trench along the toe of slope and a rock layer was installed over the lunkers. Above the rock, the steeply eroded banks were stabilized by constructing five rows of soil-encapsulated lifts using permanent erosion control blanket (NAG C350). The lunkers have a high capability to protect the toe of a steep overlying bank and they can resist washout due to installation of rebar through the lunkers into the subgrade. The vegetated geogrid provided long-term erosion control along a bank which was 8-feet high and vertical in slope. This bank also contained a 90-degree meander bend. The site previously had become so eroded that several trees fell into the stream channel including a 30-inch diam. oak tree. The stabilized bank was constructed at a slope of approximately 2.25:1 to 2.5:1 (H:V).

Rock J-Hooks

Three rock j-hooks were installed along the 90-degree meander bend described under "Lunkers / Rock Layer and Vegetated Geogrid" above. The rock j-hooks will help to deflect flows away from the severely eroded bank described above towards the center of the stream channel. The rock j-hooks will help to dissipate excess stream energy and reduce extremely high erosive forces against the streambanks.

Vegetated Rock Toe, and Vegetated Geogrid or Re-Shaped Slopes

In other severely eroded areas, a rock toe was installed for streambank protection. Although the rock toe does not provide a high energy-dissipation capability, it was utilized not only to deflect flows away from the eroding banks, but also to provide sufficient mass at the base of the slope to protect against slumping and sliding of saturated bank soils. Above the rock toe, the streambanks were stabilized by either constructing vegetated geogrid or by re-shaping the bank to a stable slope. Vegetated geogrid was constructed above the rock, by wrapping soil in soil-encapsulated lifts using permanent erosion control blanket (NAG C350). Re-shaped slope

areas were typically graded to 3:1 (H:V) or flatter, seeded and planted using native vegetation (described below), stabilized with erosion blanket (NAG C150-BN).

Fiber Roll Toe / Fiber Roll Terrace, and Re-Shaped Slopes

Streambanks exhibiting moderate erosion were stabilized by re-shaping bank slopes, installing native plant seed and plugs, erosion control blanket, and providing toe stabilization using coconut (coir) fiber roll. In other locations with taller banks, a fiber roll terrace was constructed by placing fiber roll in a shallow trench at mid-slope. Plant communities were enhanced by removing the non-native / invasive vegetation, as well as introducing rooted plant materials.

Tree Rootball, and Cabled Shrub Revetment

Tree rootballs were installed in moderately eroded areas to deflect flows away from eroding banks. The tree rootballs will increase channel roughness and reduce erosive flow velocities. Tree rootballs also improve aquatic habitat diversity by adding course woody debris. Dense cabled shrub revetments were installed in an undercut bank area to reduce flow velocities in the bank undercut and to filter and promote settling of silt and coarse aggregate materials at the eroded area.

Rock Riffle Structures and Stepped Pool Structures

Control and prevention of channel downcutting was a critical component of project success. A primary process occurring on each stream channel was severe downcutting. Downcutting contributed to significant steepening of banks and severe streambank erosion. Therefore, control of downcutting was critical for long-term bank stabilization. Severe downcutting has been controlled through the installation of rock riffle and stepped pool grade control structures. The constructed riffles and stepped pools not only control and prevent further channel downcutting but also dissipate excess stream energy and reduce extremely high erosive forces against the streambanks. Materials utilized ranged from 0.5-inch subsurface gravel to 18-inch surface boulders. The rock riffle and stepped pool structures also diversify and improve in-stream habitat, improve fish passage opportunities throughout the project site, diversify stream substrate materials, and enhance aesthetics.

Rock Vane, Rock Vortex Weir, Rock Checks

Moderately downcut areas were stabilized with the installation of rock vanes, rock vortex weirs, and/or rock checks. Rock checks were constructed exclusively in eroded side-channel gully areas. Rock checks will facilitate gully stability and accumulation of soil particles to promote growth of native vegetation in the gully area. Rock vanes and rock vortex weirs were installed along the mainstem of each stream channel. The constructed grade control structures not only control and prevent moderate channel downcutting but also dissipate excessive stream energy and reduce erosive forces against the streambanks. Materials utilized ranged from 0.5-inch subsurface gravel to 18-inch surface boulders. The rock weir and rock vane grade control

structures also diversify and improve in-stream habitat, improve fish passage opportunities throughout the project site, diversify stream substrate materials, and enhance aesthetics.

Rock Placement At Storm Pipe Outfall

Existing culvert inlets across Highland Avenue (Stream A) or 31st Street (Stream D) were stabilized with the placement of rock. Downstream of each culvert, a plunge pool occurs where high-velocity flows discharge into the stream channel. Rock placement will protect culvert infrastructure, increase channel roughness to reduce erosive forces, and protect adjacent banks from severe erosion.

Re-Shaped Slope / Native Plantings

Areas exhibiting low erosion were stabilized by re-shaping bank slopes, seeding and planting with native vegetation, and installing erosion control blanket. Plant communities were improved by removing the non-native / invasive vegetation, as well as introducing rooted plant materials. Native plantings will provide improved stability through establishing deeper root systems.

Native Plantings

Proper selection and installation of native plantings and seed is instrumental to project success. Native seed and plantings were installed along all stabilized streambank areas. Effective native plant installations improve long-term streambank stabilization, pollutant filtration, wildlife habitat, dissipation flow energy, and improvement of site aesthetic values. Native plant seed and plug lists are provided in Tables 3 and 4 below. Native shrub live stakes (cut live stems) are intended for shaded areas or areas with high erosive forces (Table 5). Limited installation of ball-and-burlap tree and shrub species are described in Table 6.

Table 3. Native Herbaceous Plant Plugs Species List.

Type 1 (Shoreline) Native Plant Plugs

Scientific Name	Common Name	Percent Of Total
Acorus calamus	sweet flag	8%
Asclepias incarnata	marsh milkweed	4%
Aster novae-anglia	New England aster	4%
Aster simplex	marsh aster	2%
Carex cristatella	crested oval sedge	5%
Carex stipata	common fox sedge	5%
Carex tribuloides	awl-footed oval sedge	6%
Carex vulpinodea	fox sedge	5%

Elymus canadensis	Canada wild rye	6%
Elymus virginicus	Virginia wild rye	6%
Iris virginica	blue flag iris	10%
Juncus torreyi	torrey's rush	3%
Leersia oryziodes	rice cutgrass	4%
Panicum virgatum	switchgrass	12%
Scirpus atrovirens	dark green rush	4%
Scirpus cyperinus	wool grass	3%
Spartina pectinata	prairie cord grass	10%
Verbena hastata	blue vervain	5%
		100%

Type 2 (Middle / Upper Bank) Native Plant Plugs

Scientific Name	Common Name	Percent Of Total
Allium cernuum	nodding wild onion	3%
Aquilegia canadensis	columbine	3%
Aster cordifolius	heartleaved blue wood aster	2%
Aster lateriflorus	side-flowering aster	3%
Aster novae-anglia	New England aster	3%
Ceanothus americanus	New Jersey tea	3%
Echinacea purpurea	purple coneflower	7%
Elymus canadensis	Canada wild rye	6%
Elymus virginica	Virginia wild rye	7%
Eupatorium perfoliatum	boneset	8%
Eupatorium purpureum	sweet joe-pye weed	7%
Geranium maculatum	wild geranium	3%
Helianthus strumusus	sunflower	2%
Lobelia cardinalis	cardinal flower	6%
Lobelia siphilitica	great blue lobelia	5%
Monarda fistulosa	bergamot	3%
Panicum virgatum	switch grass	9%
Parthenium integrifolium	quinine	3%
Penstemon calycosus	smooth penstemon	3%
Solidago gigantea	goldenrod	3%
Solidago speciosa	showy goldenrod	6%
Tradescantia ohiensis	spiderwort	3%
Trillium recurvatum	trillium	2%
		100%

Table 4. Native Plant Seed List.

Type 1 (Shoreline) Native Plant Seed (35 lb/acre)

Scientific Name	Common Name	lb/acre
Aster laevis	smooth aster	5%
Aster novae-angliae	New England aster	5%
Aster simplex	marsh aster	5%
Andropogon gerardii	big bluestem	5%
Carex comosa	bristly sedge	6%
Carex sparganoides	burred sedge	5%
Carex stipata	common fox sedge	5%
Carex vulpinoidea	fox grass	5%
Elymus canadensis	Canada wild rye	5%
Elymus virginicus	Virginia wild rye	5%
Gentiana andrewsii	bottle gentian	5%
Juncus torreyi	torrey's rush	7%
Monarda fistulosa	bergamot	5%
Panicum virgatum	switch grass	8%
Rudbeckia hirta	black-eyed susan	8%
Solidago gigantea	goldenrod	7%
Sorghastrum nutans	indian grass	3%
Spartina pectinata	prairie cord grass	6%
		100% (35 lb/acre)

Type 2 (Middle / Upper Bank) Native Plant Seed (35 lb/acre)

Scientific Name	Common Name	lb/acre
Allium cernuum	nodding wild onion	5%
Andropogon gerardii	big bluestem	6%
Aquilegia canadensis	columbine	5%
Aster cordifolius	heart-leaved blue aster	5%
Aster laevis	smooth aster	5%
Aster novae-angliae	New England aster	5%
Cassia fasciculata	partridge pea	5%
Echinacea purpurea	purple coneflower	7%
Elymus canadensis	Canada wild rye	5%
Elymus virginicus	Virginia wild rye	7%
Eupatorium perfoliatum	boneset	6%

Monarda fistulosa	bergamot	3%
Panicum virgatum	switch grass	7%
Phlox divartica	blue phlox	7%
Ratibida pinnata	yellow coneflower	5%
Rudbeckia hirta	black-eyed susan	8%
Solidago gigantea	goldenrod	5%
Solidago speciosa	showy goldenrod	5%
Veronica fasciculate	ironweed	3%
		100%
		(35 lb/acre)

Table 5. Native Shrub Live Stakes.

Scientific Name	Common Name	Percent Of Total
Cephalanthus occidentalis	button bush	15%
Cornus stolonifera	red-osier dogwood	20%
Cornus racemosa	gray dogwood	15%
Salix interior	sandbar willow	20%
Sambucus canadensis	elderberry	15%
Viburnum lentago	nannyberry viburnum	15%
		100%

Table 6. Potted Native Trees and Shrubs.

Scientific Name	Common Name
Trees (5-gallon)	
Gymnocladus dioica	Kentucky coffee tree
Juglans nigra	Black walnut
Quercus bicolor	swamp white oak
Tilia americana	American linden
Shrubs (3-gallon)	
Cornus obliqua	blue-fruited dogwood
Cornus stolonifera	red-osier dogwood
Rosa palustris	Swamp rose
Salix discolor	pussy willow
Sambucus canadensis	elderberry
Spirea alba	Meadowsweet
Viburnum lentago	nannyberry viburnum

Project Costs and Quantities

A summary of quantities and costs are listed below.

Table 7: Summary of Quantities and Prices.

Item	Item Description	Quantity	Units	Conservation Land Stewardship	
				Unit Cost	Extended Cost
	Grade Control				
1	Rock Vortex Weirs	4	EA	**$ 2,700.00**	**$ 10,800.00**
2	Rock Riffles	16	EA	**$ 4,950.00**	**$ 79,200.00**
3	Rock Vanes	6	EA	**$ 2,950.00**	**$ 17,700.00**
4	Rock Check	10	EA	**$ 550.00**	**$ 5,500.00**
5	Stepped Pool	12	EA	**$ 3,100.00**	**$ 37,200.00**
6	Rock J-Hook	5	EA	**$ 1,550.00**	**$ 7,750.00**
	Toe Stabilization				
7	Fiber Roll	205	LF	**$ 30.00**	**$ 6,150.00**
8	Lunkers / Rock Layer	141	LF	**$ 270.00**	**$ 38,070.00**
9	1-Row A-Jacks / Rock Layer	550	LF	**$ 130.00**	**$ 71,500.00**
10	Vegetated Cobble Toe (Avg. 0.20 CY Rock per LF)	385	LF	**$ 70.00**	**$ 26,950.00**
11	Cabled Shrub Revetment	20	LF	**$ 186.00**	**$ 3,720.00**
12	Cobble Installation At Storm Pipe Inlets	6.49	CY	**$ 75.00**	**$ 487.00**
13	Grout Rock Layer Surface at Lunkers	85	LF	**$ 16.00**	**$ 1,360.00**
	Bank Protection				
14	Vegetated Geogrid (w/ Re-Shape Slope Above Geogrid)	931	LF	**$ 110.00**	**$ 102,410.00**
15	Vegetated Geogrid & Strata Grid 200 (w/ Re-Shape Slope Above Geogrid)	425	LF	**$ 175.00**	**$ 74,375.00**
16	Re-Shaped Slopes	1533	LF	**$ 39.00**	**$ 59,787.00**
17	Fiber Roll Terrace (mid-slope)	145	LF	**$ 28.00**	**$ 4,060.00**
	Work By Hand on Stream D Station 2+50				
18	Cabled Brush Revetment	60	LF	**$ 185.00**	**$ 11,100.00**
	Native Plantings				
19	Native Shrub Live Stakes (3 / LF)	35	LF	**$ 20.00**	**$ 700.00**
20	Native Shrub Live Stakes	143	SF	**$ 3.00**	**$ 429.00**
21	Native Potted Plugs (3 / LF)	50	LF	**$ 13.00**	**$ 650.00**
	Other Habitat				
22	Boulder Placement (18" to 24")	29	EA	**$ 120.00**	**$ 3,480.00**

23	Tree Rootball	5	EA	$ 760.00	$ 3,800.00
24	Cabled Log Placement (no excavation)	10	EA	$ 220.00	$ 2,200.00
	Tree / Debris Removal				
25	Tree Trimming / Limb Removal (Relocate limbs onsite)	2	EA	$ 4,800.00	$ 9,600.00
26	Tree & Log Removal Near Stream Channel (Relocate onsite)				
27	< 6" diam.	7	EA	$ 40.00	$ 280.00
28	6" to 12" diam.	19	EA	$ 160.00	$ 3,040.00
29	12" to 24" diam.	11	EA	$ 300.00	$ 3,300.00
30	24" + diam.	2	EA	$ 600.00	$ 1,200.00
31	Woody Debris Removal	14	CY	$ 80.00	$ 1,120.00
	Other Excavation				
32	Widen Channel Bottom (Widen to 8' Bottom Width)	345	LF	$ 23.00	$ 7,935.00
33	Widen Bank 6 ' Starting 1' Above Channel Bottom / Re-Shape Slope	125	LF	$ 15.00	$ 1,875.00
34	Pool Excavation	3	EA	$ 715.00	$ 2,145.00
	Miscellaneous				
35	Erosion Control	1	LS	$ 5,950.00	$ 5,950.00
36	Construction Access Restoration	1	LS	$ 12,800.00	$ 12,800.00
37	As-built survey	1	LS	$ 9,000.00	$ 9,000.00
38	Japanese Knotweed Removal	1	LS	$ 850.00	$ 850.00
39	Wetland Restoration Area (0.22 ac)	700	LS	$ 3.50	$ 2,450.00
40	Native Seeding (33.82 ac)	36.06	LS	$ 825.00	$ 29,750.00
41	1Year Maintenance of all Native Plant Material	1	LS	$ -	$ -
42	Furnish materials and install Boardwalk	1	LS	$ 30,181.82	$ 30,181.82
42a	Additional Clearing	1	LS	$ 11,318.18	$ 11,318.18
43	Contractor agrees to an Allowance of $22 Linear Feet for subgrade undercuts. **Yes** or No				**Yes**
44	Administrative	1	LS	$ 29,816.00	$ 29,816.00
45	Difference	1	LS	$ 460.00	$ 460.00
CO-1	Cable Gate	1	LS	$ 864.29	$ 864.29
CO-1	Gravel Entrance	1	LS	$ 582.69	$ 582.69
CO-1	Native Shade Tree	1	LS	$ 3,352.00	$ 3,352.00
CO-1	Native Shrub	1	LS	$ 1,531.01	$ 1,531.01
	GRAND TOTAL				$ 738,778.99

Total Contractor Costs: $738,778.99

Table 8: Project Cost Summary.
Lyman Woods Streambank Stabilization PSA 2, Phases 1 and 2.
IEPA FAA 3190323.

Project Cost Summary	Total Cost	Match Amount	Assistance Amount
DIRECT LABOR	$0.00	$0.00	$0.00
Fringe Benefits	$0.00	$0.00	$0.00
Overhead Costs	$0.00	$0.00	$0.00
INDIRECT COSTS	$0.00	$0.00	$0.00
	$0.00	$0.00	$0.00
	$0.00	$0.00	$0.00
EQUIPMENT, MATERIALS, SUPPLIES	$0.00	$0.00	$0.00
Planning Resources / Living Waters Consultants	$113,798.25	$113,798.25	$0.00
Streambank Stabilization by Contractor	$738,779.99	$582,345.99	$156,434.00
SUBCONTRACTS	$852,578.24	$696,144.24	$156,434.00
Totals	$852,578.24	$696,144.24	$156,434.00

Operation and Maintenance Plan

Maintenance of native plantings along the stabilized streambanks and within the riparian corridor is critical to project success. The Downers Grove Park District will take responsibility for the EPA Section 319 grant 10-year Operations & Maintenance agreement for streambank bioengineering protection measures and plant maintenance.

Grade Control, Biotechnical, and Bioengineering Materials Inspections

Bioengineering materials inspections for the constructed streambank stabilization area will occur at least once per year. Repairs will be made as necessary, as determined by the Owner and their designated Representative.

1. Lunkers: Inspections will occur for structural integrity of lunker materials, dislodgement or relocation of rock, if any, or other indications of potential stabilization concerns. According

to the manufacturer, TREX lunker materials are anticipated to maintain structural integrity for a minimum of a few decades.

2. Rock toe, a-jacks toe: Inspections will occur for dislodgement or relocation of a-jacks or rock, if any, or other indications of potential stabilization concerns.
3. Fiber Roll: Inspections will occur for the staking, undercutting, cord fasteners, and integrity of the Fiber Roll.
4. Rock riffles, stepped pools, rock J-hooks, rock vortex weirs, rock vanes, rock check dams: Some rock displacement is expected, but significant relocation of larger rock materials is not desirable. Major relocation of rock will be inspected and noted.
5. Cabled shrub revetment and Tree Rootballs: Stability of the structures and adjacent re-shaped slopes will be inspected. Desirable silt accumulations will be evaluated. Relevant growth of vegetation will be inspected.
6. Re-Shaped Slopes: The performance of the re-shaped slopes to stabilize the site slopes will be inspected. Growth of vegetation and locations requiring additional planting will be inspected. The permanent vegetated geogrid is expected to last several years. The capability of plantings to stabilize the resulting angle of repose will be noted.

Native Plant Maintenance

Native plant maintenance will occur using spot herbicide applications, hand removal of nuisance weeds, and related activities performed at least three times per year per the attached schedule.

Costs

We estimate that the annual site maintenance budget will be approximately $12,000 annually, primarily to control re-introduced invasive species such as Buckthorn (Rhamnus cathartica), and Tartarian Honeysuckle (Lonicera tatarica) from taking over the newly establishing native plants. Expenditures may be higher expenditures during the first three years for native plant maintenance and nuisance weed control as the native plantings become established. Costs for Operations and Maintenance shall be paid by the Owner, the Downers Grove Park District.

Responsibilities

The coordinating party shall be the Downers Grove Park District and their designated Representative. Participating parties will include the Owner's Representative, and professional Contractor services support.

Table 9. Site Maintenance Schedule.

Key to Coordinators and Participants:

Downers Grove Park District = "DGPD"
Consultant = "CT"
Landscape Contractor = "LC"
Volunteers = "VL"

2006

Coordinator	Participants	Activity	early April	early June	mid-July	mid-August
DGPD & CT	CT, LC, VL	Site Construction / Native Plant Installation				X
DGPD & CT	CT, LC, VL	Spot Herbicide / Remove Weeds				X
DGPD & CT	CT, LC, VL	Bioengineering Materials Inspection				X

2007

Coordinator	Participants	Activity	early April	early June	mid-July	mid-August
DGPD & CT	CT, LC, VL	Completion of Native Plant Installation	X	X		
DGPD & CT	CT, LC, VL	Weed-whip and Cut Natives (see Notes)	X			
DGPD & CT	CT, LC, VL	Spot Herbicide / Remove Weeds		X	X	X
DGPD & CT	CT, LC, VL	Bioengineering Materials Inspection	X			X

2008 - 2016 (ongoing)

Coordinator	Participants	Activity	early April	early June	mid-July	mid-August
DGPD & CT	CT, LC, VL	Burn Management for Riparian Area (See areas to avoid burn in Notes below)	X			
DGPD & CT	CT, LC, VL	Weed-whip and Cut Non-Burn Areas	X			
DGPD & CT	CT, LC, VL	Spot Herbicide / Remove Weeds		X		X
DGPD & CT	CT, LC, VL	Bioengineering Materials Inspection	X			

Notes:

1. Herbicides shall include Poast, Roundup, Rodeo (near water), and/or other approved herbicides as conditions allow, applied by a USDA-licensed applicator.
2. Burn management shall occur in addition to herbicide applications as conditions allow, likely beginning 3 years after project installation. Burn management directly along streambanks shall only be allowed in spring (no fall burning) to protect against streambank erosion. Under no circumstances shall burn management be allowed where permanent erosion blanket occurs, including locations with vegetated geogrid. Where burn management cannot occur, or if burn management is not effective, weed-whipping and cutting shall occur annually.
3. Cutting and Mowing of Native Plants should include removal of clippings from the site.
4. No herbicide or pesticide spraying is allowed in critical wetland areas, near T/E species, or the Prairie Kame.

Responsibilities

The Downers Grove Park District Board and their designated Representative shall be responsible for project site maintenance. Participating parties will include the Owner's Representative, and professional Contractor services support.

Project Benefits

Water Quality

Observations since 2006 indicate a growing establishment of temporary cover crop and native plantings following slope stabilization and planting. The banks remained protected and erosion was greatly reduced. The site was also inspected by the author after the floods of August 2007. Stream stabilization did not appear to be significantly affected by the flood events. Selected replacement of invasive trees and shrubs with native species in the 36-acre riparian area will also substantially reduce the loss of bank soils and promote bank soils stability. Native riparian plantings will reduce sheet erosion and mass wasting within the flood zone. This will significantly reduce non-point source pollutant loadings to the downstream East Branch DuPage River.

The Illinois EPA Load Reduction Spreadsheet was used to calculate pollutant loading rates from the project site. Input data included a combined streambank (left and right bank) length of 2,804 linear feet (see Table 2). The project site had previously contributed approximately 222 tons of sediment, 222 pounds of phosphorus, and 445 pounds of nitrogen annually to Lacey Creek and the East Branch DuPage River. These estimates do not include historic sediment loss due to severe channel downcutting which has also occurred at this site. Due to stream stabilization, these pollutant loading rates to Lyman Woods Headwaters have been virtually eliminated at the project site.

Habitat and Riparian Function

- Selected removal of invasive species will allow more desirable and beneficial species to flourish. There were numerous impacts to ecological integrity caused by the previously existing invasive plant species in the riparian zone. Dense stands of invasive shrubs such as common buckthorn and Tartarian honeysuckle previously shaded and out-competed growth of seedlings of bur oak (Quercus macrocarpa). Riparian enhancement will increase sunlight penetration and increase the density of desirable tree and shrub species.

- The proposed riparian planting enhancement will enhance the function of interception of rainfall. Deep-rooted trees and plants have increased absorption properties over the existing riparian species.

- Replacement of invasive riparian plant species with native forbs, grasses, as well as trees and shrubs will enhance pollutant filtration and assimilation of nutrients as well as contaminated runoff discharged from surrounding upland areas, or through the project site. Native groundcover such as grasses and forbs are particularly efficient at trapping sediment in the uptake of phosphorus and nitrogen nutrients which otherwise cause pollution within the waterway. The proposed planting plan will significantly increase the abundance of

groundcover species. Deep-rooted native plant species will increase the uptake of nitrogen from shallow groundwater, improving water quality of the stream.

Public Outreach / Education

- Project Signage (per project plans) placed at 31st Avenue is being utilized to notify motorists, pedestrians, and visitors regarding the project, funding sources, and proposed improvements and activities. It is estimated that thousands of motorists and passersby can view the Project Sign on a daily basis.

- The Downers Grove Park District operates the Interpretive Center at Lyman Woods immediately adjacent to the project site. This modern facility is used by the DGPD Manager of Natural Resources and Interpretive Services, Shannon Forsythe, to offer over 100 educational programs to approximately 2000 children and adults each year. Many of these tours include discussion of stream stabilization and wetland restoration provided by the completed project. For instance, over the last few years, DGPD had incorporated a stream table model and a hike in the 5th grade Wetlands Education Program. All 5th grade students in the local school district had attended the program and hike the stream area each year.

- Press releases regarding completion of the project have occurred in local newspapers.

- A project presentation was provided by the author at the December 6, 2006 Pierce Downers Heritage Alliance Annual Meeting (conservation organization). This meeting had perhaps 80 attendees, and it was also attended by several DGPD staff, DGPD Board members, and members of the Forest Preserve District of DuPage County.

- The Downers Grove Park District Board of Trustees had regularly convened and discussed the completed project in 2006 and 2007 in public meetings. These proceedings were televised on the local cable television programming.

- The Downers Grove Park District monitors all of Lyman Woods and works with volunteers and residents including Pierce Downers Heritage Alliance (PDHA) which is particularly active in protecting and monitoring Lyman Woods.

ATTACHMENT 1: PROJECT PHOTOS

ATTACHMENT 2: PRESS RELEASE