Flood Plain Reclamation to Enhance Resiliency Conserving Land in Urban New Jersey

Rutgers Cooperative Extension
Water Resources Program

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Rutgers Cooperative Extension

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.

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Water Resources Program

The Water Resources Program is one of many specialty programs under Rutgers Cooperative Extension.

Our Mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

The Water Resources Program serves all of New Jersey, working closely with the County Extension Offices.

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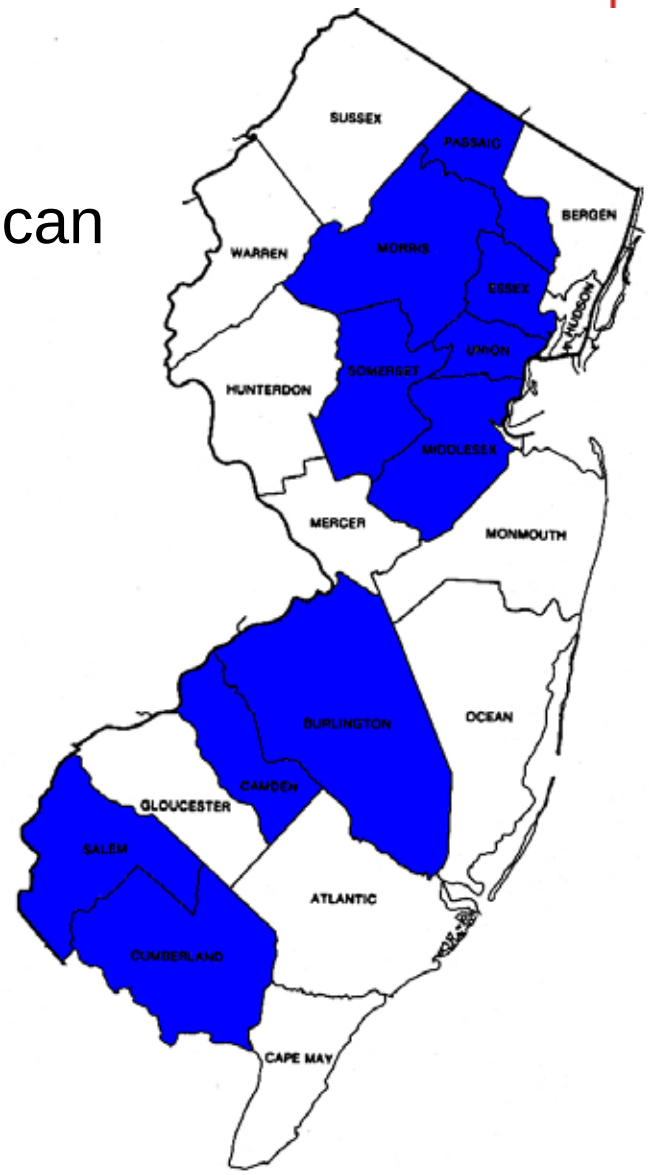
Environmental County Agents

The Environmental County Agents teach people new skills and information so they can make better informed decisions and improvements to their businesses and personal lives.

- Michele Bakacs, Middlesex and Union
- Pat Rector, Morris and Somerset
- Amy Rowe, Essex and Passaic
- Mike Haberland, Camden and Burlington
- Sal Mangiafico, Salem and Cumberland



What is a Flood Plain?

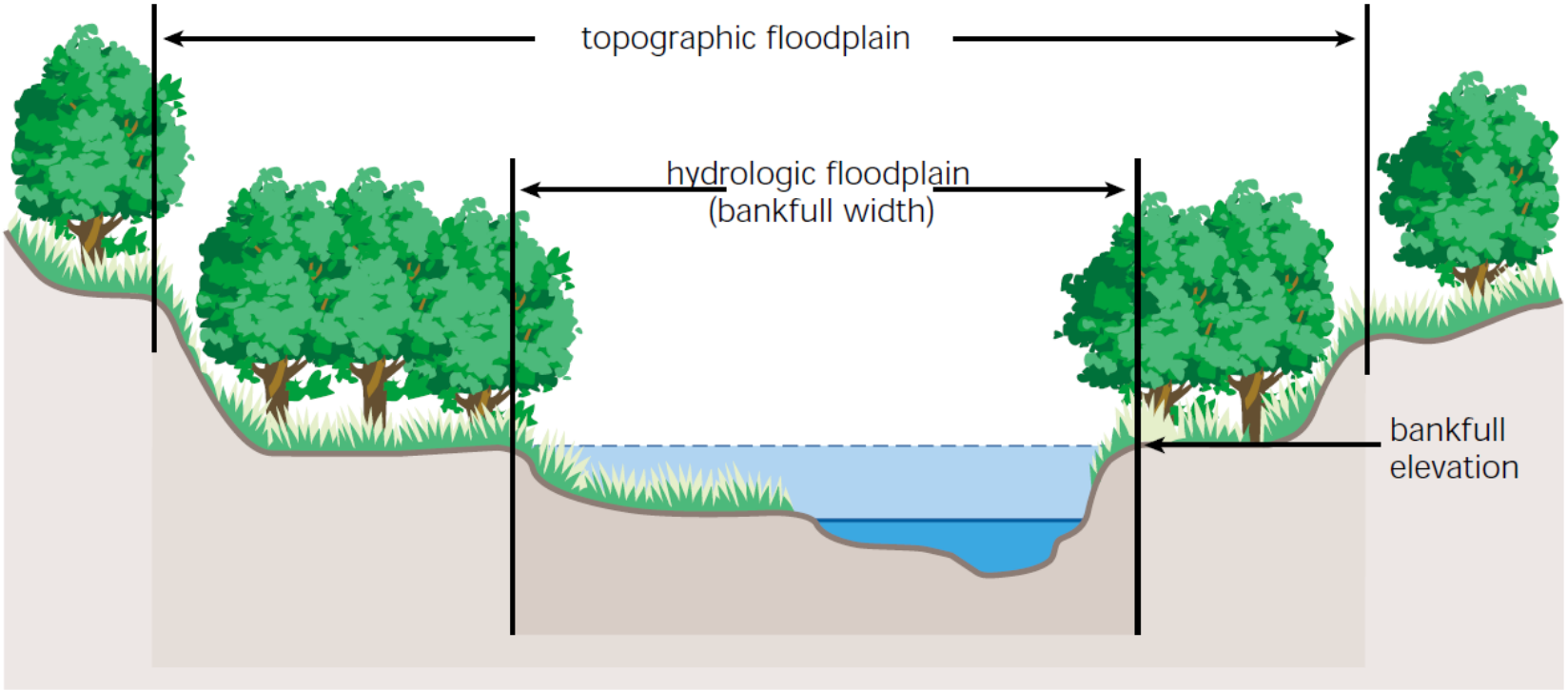


Figure 1.20: Hydrologic and topographic floodplains. *The hydrologic floodplain is defined by bankfull elevation. The topographic floodplain includes the hydrologic floodplain and other lands up to a defined elevation.*

Functions of Flood Plain

- Provides storage during large storm events
- Reduces stream velocities during large storm events
- Buffers development from flooding
- Provides wildlife habitat
- Cleans the water

Building in Flood Plains

- Increases overall flooding by displacing water into other areas
- Greater financial losses through property damage
- Increases risks to human safety

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Altering the Flood Plain

- Streams meander causing natural alterations in the flood plain
- Filling of flood plains for farming, building, and roadways
- As flood plains are reduced stream velocity increase causing back erosion

Pompton Dam and Ramapo River

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Paving Paradise….

- More pavement, more stormwater runoff, more flooding
- NJ has 12.1% impervious cover or 1,055 square miles or 675,200 acres
- 1 inches of rainfall = 18.3 billion gallons of runoff

Where in New Jersey are we?


MAIN ST.

Rescuing Flood Plain Properties

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Now What?...What do you do with a rescued flood plain property?

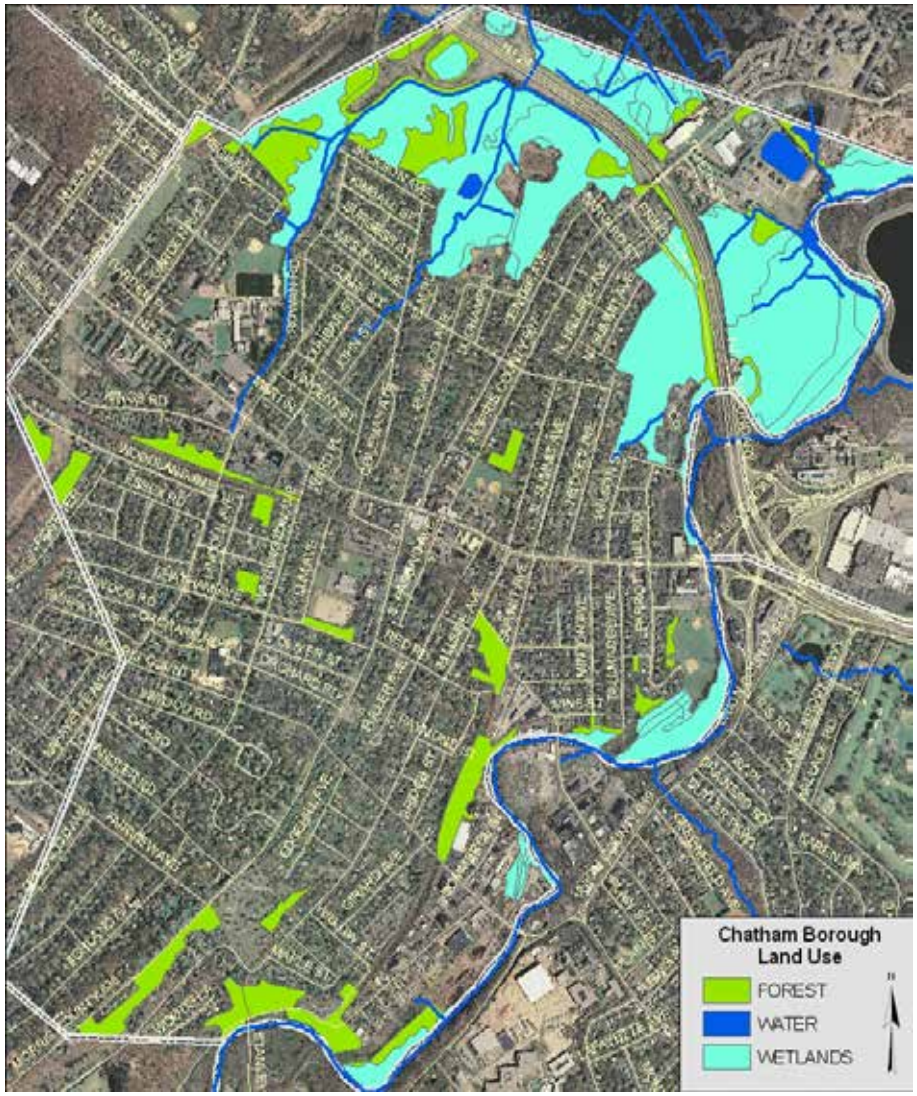
- Remove the homes
- Stabilize the site
- Create a restoration plan that includes:
  - Flood Storage
  - Water Quality Treatment
  - Passive Recreation
  - Wildlife Habitat
  - Open Space

Denville, New Jersey

WE NEED A PLAN!

Map Flood Plain Areas

- Valuable assets for habitat corridors and recreation
  - 78% Urban
  - 6% Forest (~92 acres)
  - 1% Water
  - 15% Wetland (~230 acres)
- Water quality protection
  - Passaic River is northeastern New Jersey's largest source of drinking water
- Remaining sites are continually threatened by encroachment, over-use, concentrated wildlife populations, and invasive exotics



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Make Connections!

- Identify regional open space resources
- Piece together fragmented habitats
- Take advantage of previously underutilized and disturbed sites
- Link to the larger community
- Explore green building, stormwater management and sustainable landscape design
- Create a desire for community awareness and participation

Partner Up!

- Environmental planning and regulatory compliance
- Open space preservation and habitat restoration
- Passive recreation and wildlife observation opportunities by way of trails and interpretive areas
- Restoration and enhancement of wetlands, creeks and river corridors
- Community education and stewardship

Get Community Support!

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It’s all about partners

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It’s all about relationships

It’s all about future generations

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RAHWAY RIVER
FLOOD PLAIN RESTORATION
MASTER PLAN

BOARDWALK OVERLOOK

TRAIL ENTRANCE

Get Funding

- Sell it to FEMA – flood protection, getting people out of harms way
- Sell it to NJ Green Acres – preserving open space
- Sell it to the Wetlands Mitigation Council – restoring wetlands
- Sell it to NOAA – community based restoration project (habitat)
- Sell it to NJDEP – stormwater mitigation Project
- Sell it to local businesses – a feel good way to contribute to their community

Build It!

Use your funding for materials and …

- Get municipality and county to help
- Get the parks department to help
- Get community groups involved
- Get volunteers to help (especially the kids)

Maintain It!

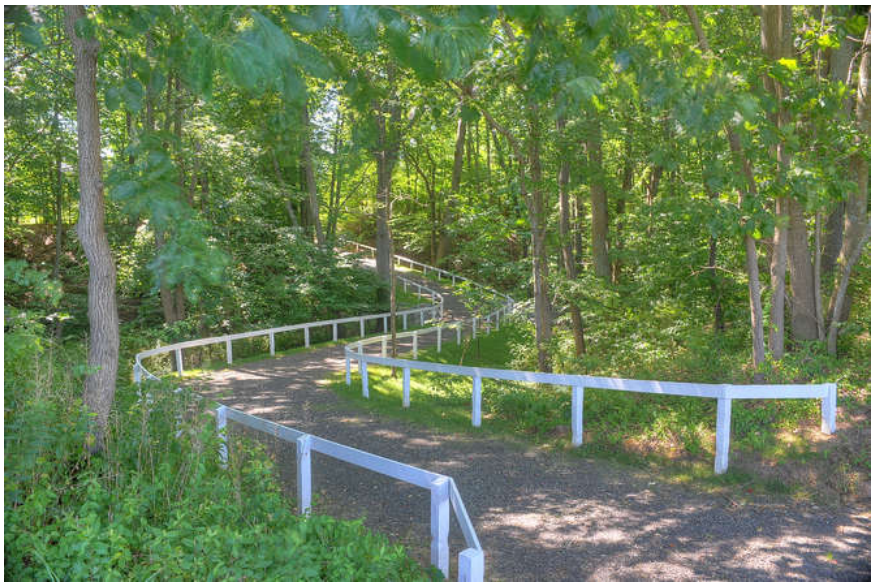
- Everything needs maintenance
- Volunteers can help but someone needs to be responsible for keeping on top of it

FLOOD PLAIN RESTORATION STRATEGIES

Restoring Ecological Function

- Soil erosion control
- Wetland mitigation and restoration
- Streambank and shoreline stabilization
- Stream restoration
- Habitat enhancement
- Greenway and riparian plantings
- Stormwater Best Management Practices (BMPs)
- Watershed restoration

Creating Open Space & Greenways



Developing Passive Recreation Opportunities

Rahway River Flood Plain Restoration

Teaneck Creek Flood Plain Restoration

Hamilton Township Water Resources Plan

Thomas Jefferson Middle School

Rockaway River Flood Plain Reclamation in Denville

CASE STUDIES

Rahway River Urban Flood Plain Restoration Project

- Rahway River Watershed is highly urbanized and subject to frequent flooding.
- FEMA and NJ Green Acres purchased 4 ½ acres of developed flood plain and turned over to City.
- City relocated residents and razed existing buildings.
- Goal was to restore site to natural flood plain, integrate into existing Union County Parks greenway along the river, provide wildlife habitat, and public education/passive recreation.

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Project Site

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Primary Partners

- City of Rahway - Current Property Owner
  - Grant administration
  - Significant in-kind construction contribution
- Union County Parks - Future Property Owner
  - Grant administration
  - Significant in-kind construction contribution
  - Coordinate volunteers
- NY/NJ Baykeeper - Grant Administration, Habitat Restoration, Coordinate Volunteers,
- Rahway River Association - Recruit Volunteers, Long-Term Monitoring
- TRC Omni Environmental Corp. - Design, Grant Writing, Permitting, Construction Mgt., Training and Supervising Volunteers

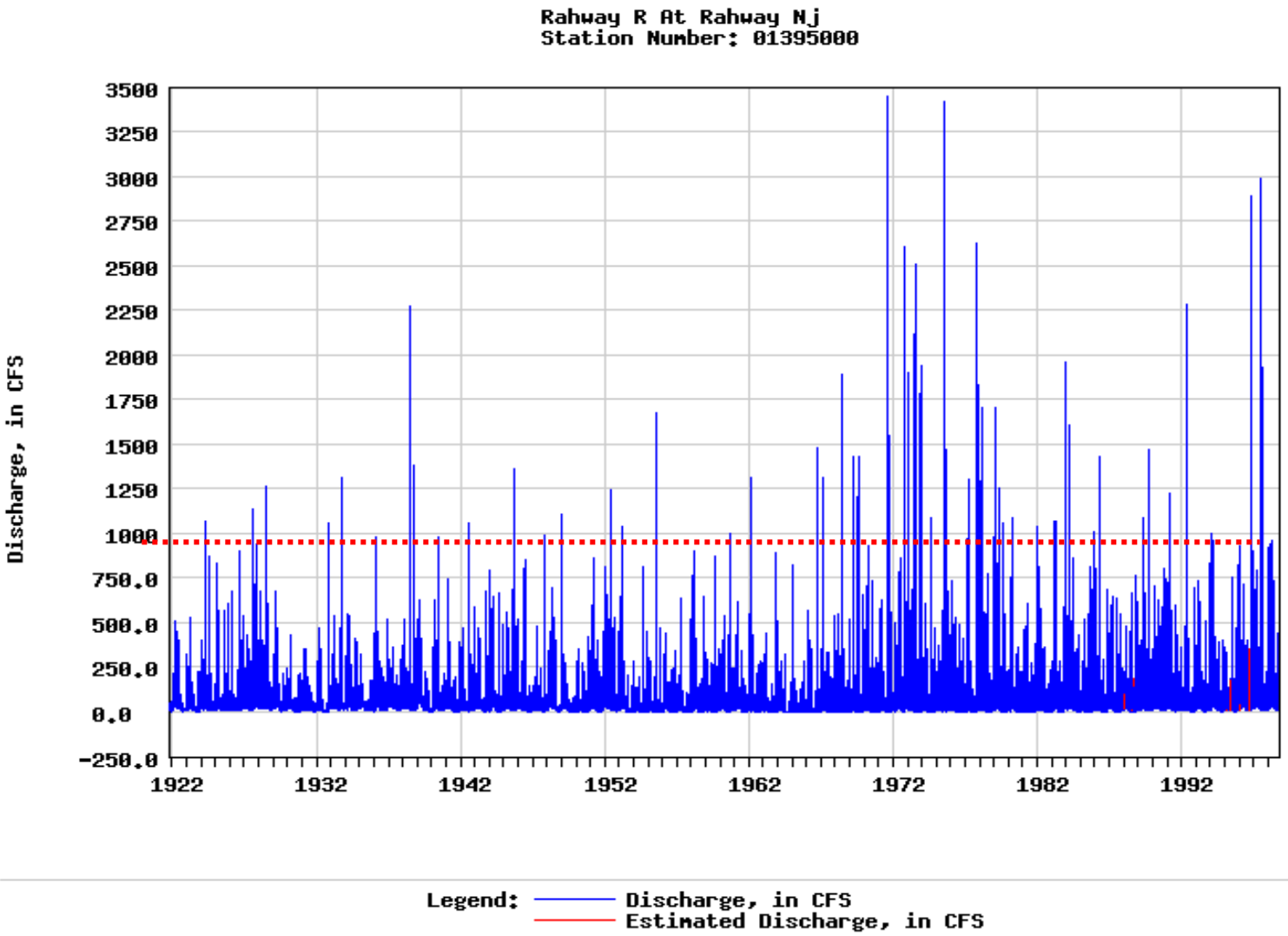
Additional Contributors

- Wetlands Mitigation Council - Funding for design and construction
- NOAA - Funding construction
- NJDEP - Funding construction
- Fish America Foundation - Funding construction
- Merck Foundation - Funding for construction

Riparian Flood Plain Wetlands

- Provide flood buffering and storage.
- Provide wildlife habitat.
- Natural filtering of overland runoff.
- Hydrology:
  - Overland, near surface flow, groundwater
  - Inundation from river
- Soils typically stratified alluvial drift with layers of sand, silt or clay.

Historic River Flows



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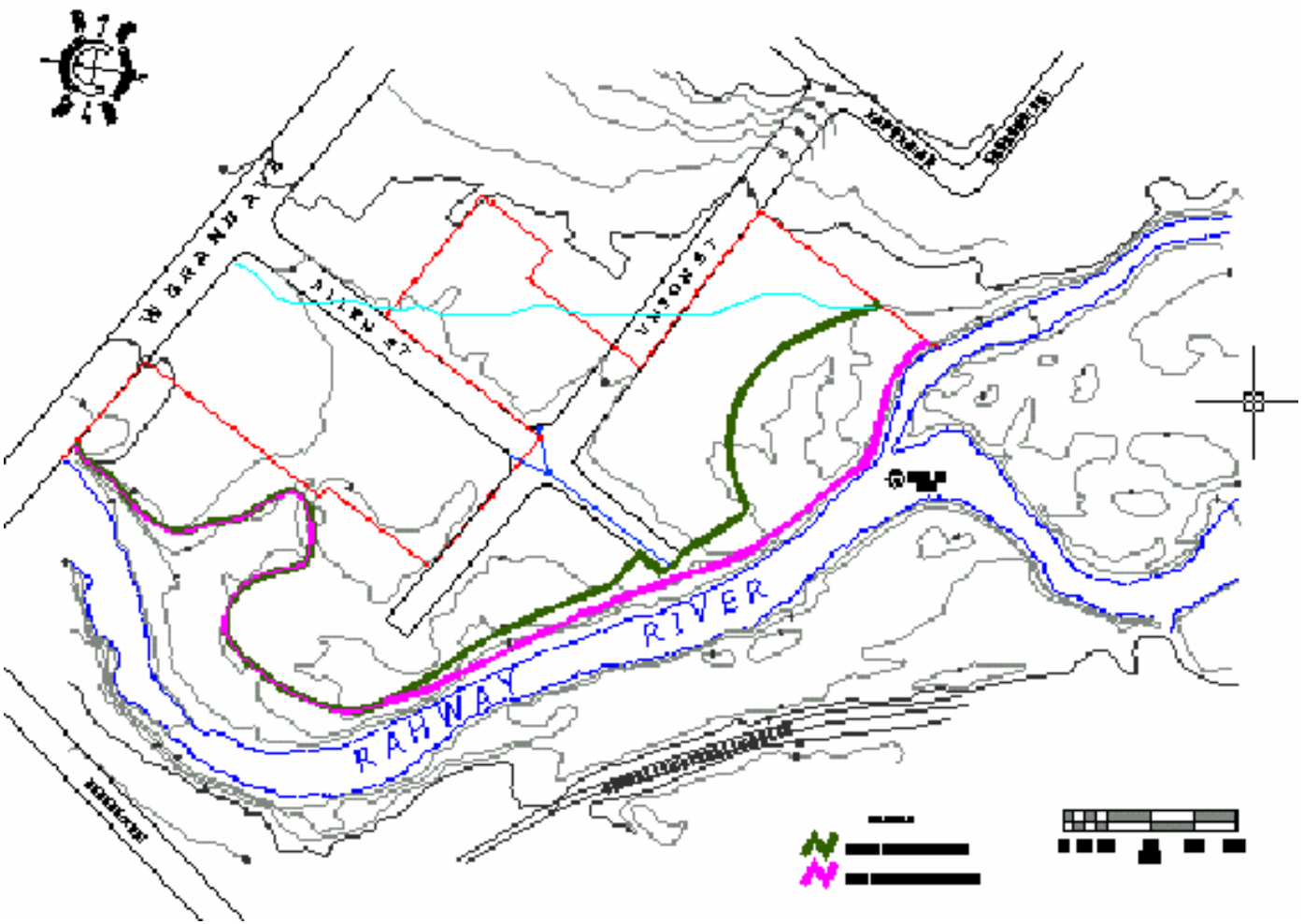
Altered Geology




RAHWAY RIVER
FLOOD PLAIN RESTORATION
MASTER PLAN
BOARDWALK OVERLOOK
FUTURE PEDESTRIAN BRIDGE TO COUNTY PARK
NORTH BRANCH OF THE RAHWAY RIVER
FLOODED AREA
WET POND
WETLAND
TURN AROUND
UNION STREET
UPLAND MEADOW
ALLEN STREET
PARK PARKING
TRANSITION WETLAND
CULVERT
PASSIVE RECREATION AREA
WEST GRAND STREET
TRAIL ENTRANCE
The Reynolds Group Inc.
BAYKEEPER
SITE PLAN
SP-1

Timeline

- 1996 Decision to pursue buyout
- 1997 Green Acres FEMA Application
- 1998 Purchase, develop vision
- 1999 Build support, begin demolition
- 2000 Write grants, remove houses
- 2001 Design, permits, more grants
- 2002 Initial construction, planting
- 2003 Complete construction, planting
- 2004 Begin Long-term monitoring

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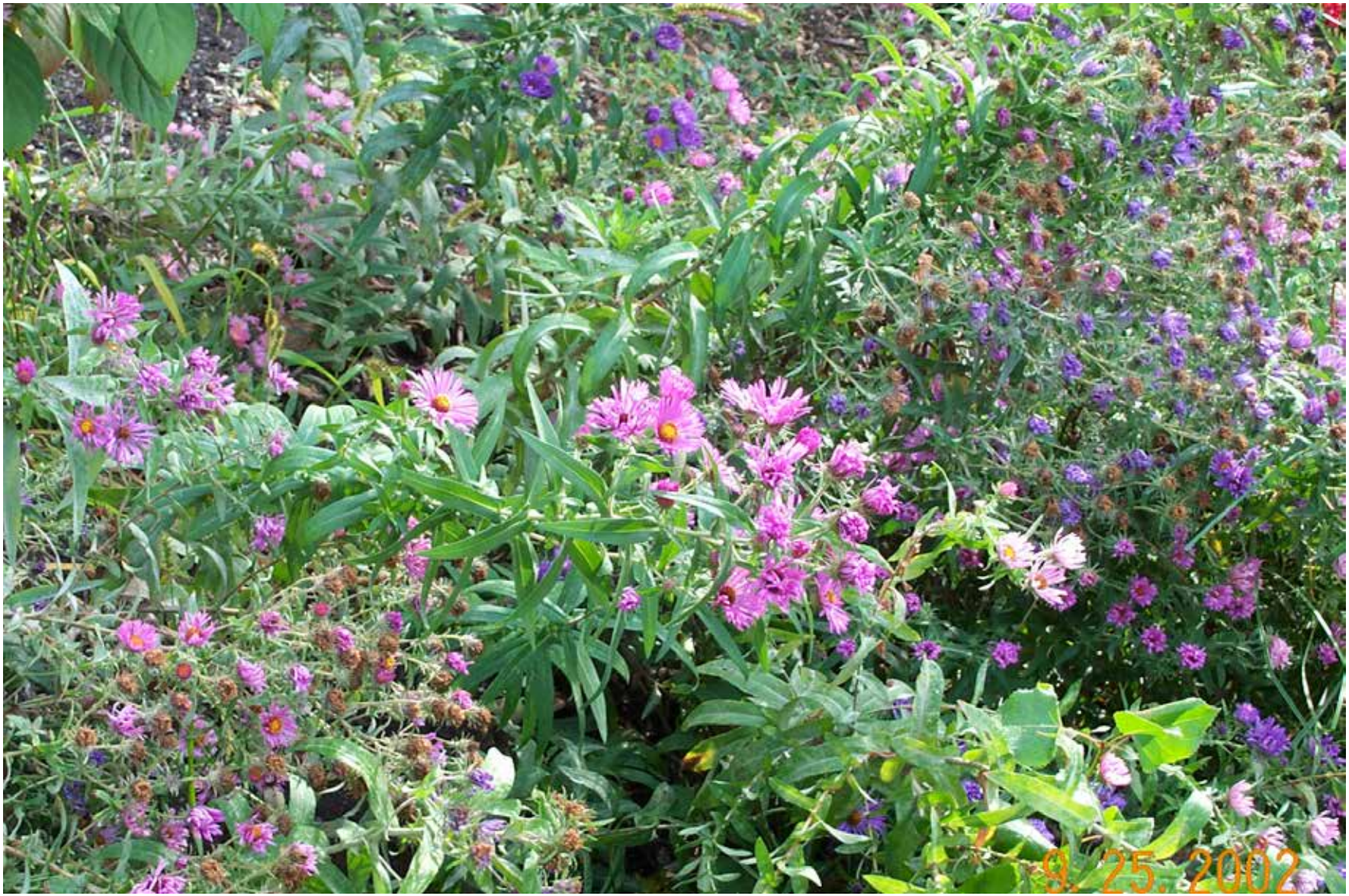

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Conclusions

- A successful urban greenway project is a long, complex process
- Requires a strong partnership with “can do” attitude and strong vision
- Must be willing to be flexible and pursue diverse funding opportunities
- Doesn’t happen by itself- takes a lot of hard work

Teaneck Creek Flood Plain Wetland Restoration

- Partnership between Teaneck Creek Conservancy, Rutgers University Water Resources Program, and Bergen County to prepare a flood plain wetland restoration project including passive recreation, flood storage, and habitat enhancement
- Partnered with US Fish and Wildlife Services for invasive species (*Phragmites australis & Polygonum cuspidatum*) management
- Reconnected stream channel to existing flood plain wetlands
- Managed stormwater runoff to minimize flooding

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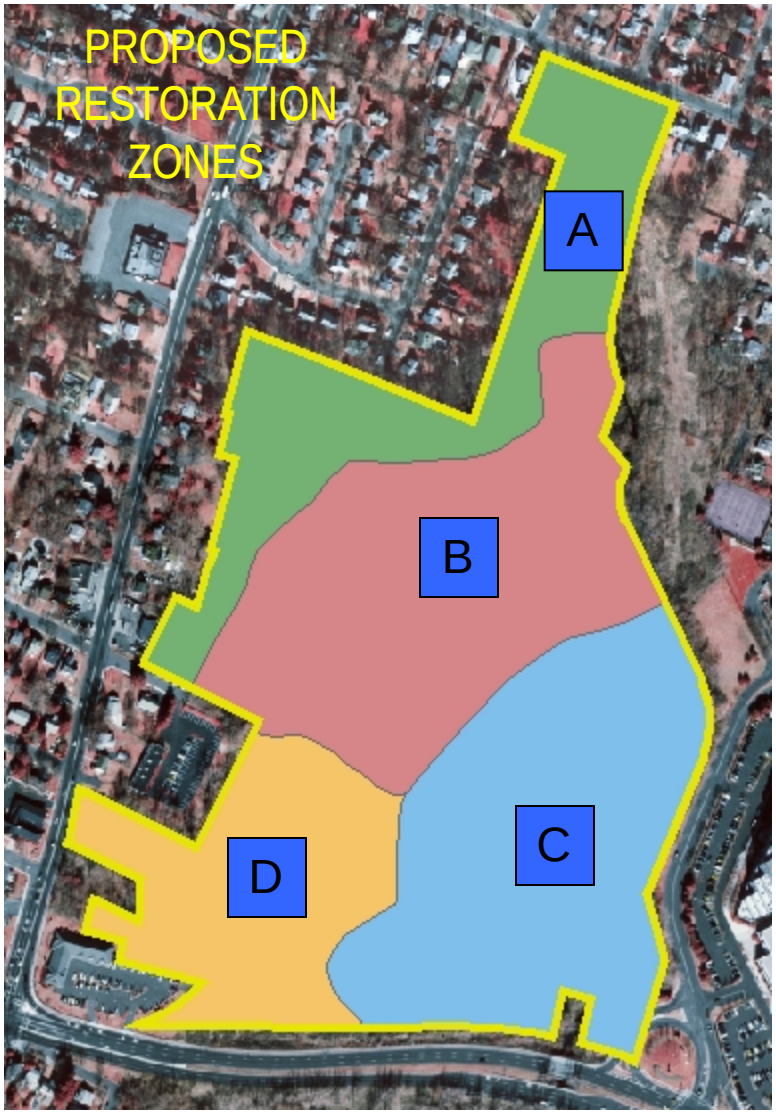
Wetlands Research & Restoration Design



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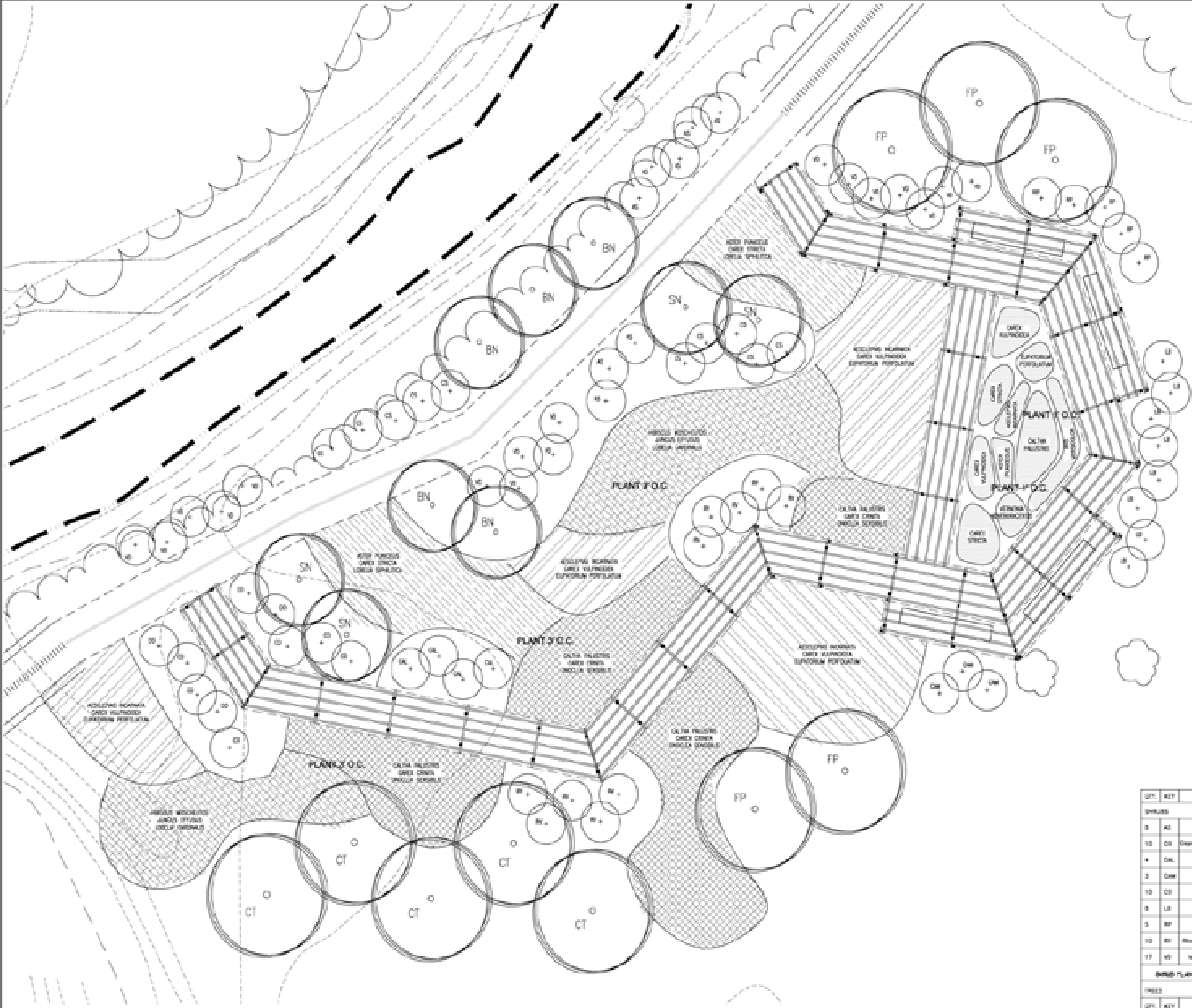
1. HORIZONTAL DATUM IS NORTH AMERICAN DATUM 1927 (NAD27) TEXT OBTAINED FROM GPS

2. VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD29) TEXT OBTAINED FROM GPS



OUTDOOR CLASSROOM PLANTING PLAN (SCALE: 1"=10')

APPLY AT A RATE OF 30 LBS PER ACRE

PCT.	SCIENTIFIC NAME	COMMON NAME
[illegible]	Elymus virginicus	Virginia Wild Rye
[illegible]	Onoclea sensibilis	Sensitive Fern
[illegible]	Carex vulpinoidea	Fox Sedge
[illegible]	Calamagrostis canadensis	Blue Joint Grass
[illegible]	Juncus effusus	Soft Rush
[illegible]	Sparganium eurycarpum	Giant Bur Reed
[illegible]	Verbena hastata	Blue Vervain
[illegible]	Bidens cernua	Nodding Bur Marigold
[illegible]	Scirpus cyperinus	Woolgrass
[illegible]	Sparganium americanum	Eastern Bur Reed
[illegible]	Asclepias incarnata	Swamp Milkweed
[illegible]	Carex lurida	Lurid Sedge
[illegible]	Carex crinita	Fringed Sedge

1 SEED MIX 1 - WETLAND MEADOW

Herbaceous Species: PLANT 3' O.C. IN WETLAND MEADOW			
[illegible]	Asclepias incarnata	Swamp Milkweed	[illegible]
[illegible]	Aster puniceus	Purple Stemmed Aster	[illegible]
[illegible]	Caltha palustris	Marsh Marigold	[illegible]
[illegible]	Carex crinita	Fringed Sedge	[illegible]
[illegible]	Carex stricta	Tussock Sedge	[illegible]
[illegible]	Carex vulpinoidea	Fox Sedge	[illegible]
[illegible]	Eupatorium perfoliatum	Boneset	[illegible]
[illegible]	Hibiscus moscheutos	Rose-mallow	[illegible]
[illegible]	Iris versicolor	Blue Flag	[illegible]
[illegible]	Juncus effusus	Soft Rush	[illegible]
[illegible]	Lobelia cardinalis	Cardinal Flower	[illegible]
[illegible]	Lobelia siphilitica	Great Lobelia	[illegible]
[illegible]	Onoclea sensibilis	Sensitive Fern	[illegible]
[illegible]	Vernonia noveboracensis	New York Ironweed	[illegible]
[illegible]	TOTAL		

1/2 HERBACEOUS SPECIES

QTY.	KEY	BOTANICAL NAME	COMMON NAME	SIZE
SHRUBS				
5	AS	Alnus serrulata	Smooth Alder	18" - 24", #2 or #3 Container
10	CO	Cephalanthus occidentalis	Buttonbush	18" - 24", #2 or #3 Container
4	CAL	Clethra alnifolia	Sweet Pepperbush	18" - 24", #2 or #3 Container
3	CAM	Cornus amomum	Silky Dogwood	18" - 24", #2 or #3 Container
10	CS	Cornus sericea	Redosier Dogwood	18" - 24", #2 or #3 Container
5	LB	Lindera benzoin	Spicebush	18" - 24", #2 or #3 Container
3	RP	Rosa palustris	Swamp Rose	18" - 24", #2 or #3 Container
10	RV	Rhododendron viscosum	Swamp Azalea	18" - 24", #2 or #3 Container
17	VD	Viburnum dentatum	Arrowwood Viburnum	18" - 24", #2 or #3 Container
SHRUB PLANTING AREAS TO BE STABILIZED WITH 3" OF SHREDDED HARDWOOD MULCH.				
TREES				
QTY.	KEY	BOTANICAL NAME	COMMON NAME	SIZE
4	SN	Salix nigra	Black Willow	2.5" - 3" Cal., B & B
5	BN	Betula nigra	River Birch	8' - 10', #15 Container, multi-stem
5	CT	Chamaecyparis thyoides	Atlantic White Cedar	6' - 7', #15 Container
5	FP	Fraxinus pennsylvanica	Green Ash	2.5" - 3" Cal., B & B

REVISIONS

NO.	DATE	DESCRIPTION

DATA PROVIDED BY:
BERGEN COUNTY DEPARTMENT OF PARKS
ONE BERGEN COUNTY PLAZA
FLOOR 4 ROOM 401
HACKENSACK, NEW JERSEY

OUTDOOR CLASSROOM PLANTING PLAN

TEANECK CREEK CONSERVANCY

TRC OMNI ENVIRONMENTAL CORPORATION
Research Park, 321 Wall Street
Princeton, New Jersey 08540
(609) 924-8821
www.TRCsolutions.com

JEREMIAH D. BERGSTROM, CLA, ASLA
NJ LA LIC. # [illegible]

Job No. [illegible]
Drawn: JDB
Checked: PLK
Scale: AS SHOWN
Date: JUNE 20, 2008
Sheet No. 1
Sheet 1 of 1

Hamilton Township (Mercer County)

In June 2011, the Rutgers Cooperative Extension (RCE) Water Resources Program partnered with Hamilton Township (Mercer County) to evaluate watershed and stormwater management issues and to develop recommendations for improving and protecting water resources in the community. The partners are working together to complete a Township-wide evaluation of water resource management needs and to set forth priorities and recommendations for actions needed to address hydrologic issues.

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Hamilton Township (Mercer County)

The recommended actions will support a series of goals established for Hamilton Township in its ongoing efforts to address water resources. These goals include:

- Engage the community in water resource protection
- Manage water quality
- Minimize localized flooding
- Implement Phase II stormwater controls
- Improve stormwater facility maintenance

SOURCE: trentonian.com September 2011

Hamilton Township (Mercer County)

- Development of hydrologic model
- Inventory and assessment of stormwater management basins
- Development of comprehensive GIS database of stormwater infrastructure
- Prepare a stormwater mitigation plan
- Complete an impervious cover analysis
- Develop site suitability analysis (for stormwater BMPs)
- Conduct riparian investigations with Environmental Commission
- Develop and implement property owner education program
- Complete a second rain garden demonstration project
- Continue stormwater basin pilot maintenance program
- Implement stormwater basin retrofits and repairs

Teaneck Creek
Riparian Restoration

Project Location:

Thomas Jefferson Middle School
Teaneck, NJ
Partner: Teaneck Board of Education

Project Summary

- Partnered with Teaneck BOE to complete stabilization and restoration along 100 feet of stream at Thomas Jefferson Middle School
- Completed restoration design plans and permits to reestablish a native “Floodplain Forest” riparian buffer
- Successfully installed in summer 2008
- Partnered with US Fish and Wildlife Services for invasive species (*Japanese Knotweed*) management
- Required a combined engineering and landscape design approach

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QTY.	KEY	BOTANICAL NAME	COMMON NAME	SIZE
SHRUBS				
17	AM	Aronia melanocarpa	Black Chokeberry	18" - 24" [illegible] Container
12	CA	Clethra alnifolia	Sweet Pepperbush	18" - 24" [illegible] Container
59	CAM	Cornus amomum	Silky Dogwood	18" - 24" [illegible] Container
59	CS	Cornus sericea	Redosier Dogwood	18" - 24" [illegible] Container
58	IV	Ilex verticillata	Winterberry Holly	18" - 24" [illegible] Container
12	VP	Viburnum prunifolium	Blackhaw Viburnum	18" - 24" [illegible] Container
11	VT	Viburnum trilobum	Cranberrybush Viburnum	18" - 24" [illegible] Container
57	VD	Viburnum dentatum	Arrowwood Viburnum	18" - 24" [illegible] Container
TREES				
QTY.	KEY	BOTANICAL NAME	COMMON NAME	SIZE
11	AC	Amelanchier canadensis	Shadbush	[illegible] Container, multi-stem
9	BN	Betula nigra	River Birch	[illegible] Container, multi-stem
11	BP	Betula populifolia	Gray Birch	[illegible] Container
4	CO	Celtis occidentalis	Hackberry	[illegible] Cal., B & B
2	FP	Fraxinus pennsylvanica	Green Ash	[illegible] Cal., B & B
6	PO	Platanus occidentalis	Sycamore	[illegible] Cal., B & B
6	QB	Quercus bicolor	Swamp White Oak	[illegible] Cal., B & B
2	SN	Salix nigra	Black Willow	[illegible]
8	TC	Tsuga canadensis	Eastern Hemlock	[illegible] B & B
4	VL	Viburnum lentago	Nannyberry Viburnum	[illegible] Container

PLANTING SCHEDULE

KEY	COVER	DESCRIPTION	COMMENTS
	STREAM EDGE PLANTING	Seed Mix 1	[illegible]

ALL OTHER DISTURBED AREAS TO BE STABILIZED PER SOIL EROSION AND SEDIMENT CONTROL STANDARDS (see SESC Plan)

COCONUT FIBER LOG & STREAM EDGE HERBACEOUS PLANTINGS

QUANTITY	SCIENTIFIC NAME	COMMON NAME	SIZE	QUALITY
400	Calamagrostis canadensis	Blue-joint Grass	2 in.	plug
400	Carex lurida	Shallow Sedge	2 in.	plug
400	Carex vulpinoidea	Fox Sedge	2 in.	plug
400	Iris versicolor	Blue Flag	2 in.	plug
1000	Juncus effusus	Soft Rush	2 in.	plug

INSTALL 12" O.C. WITHIN 2 FT OF WATER'S EDGE

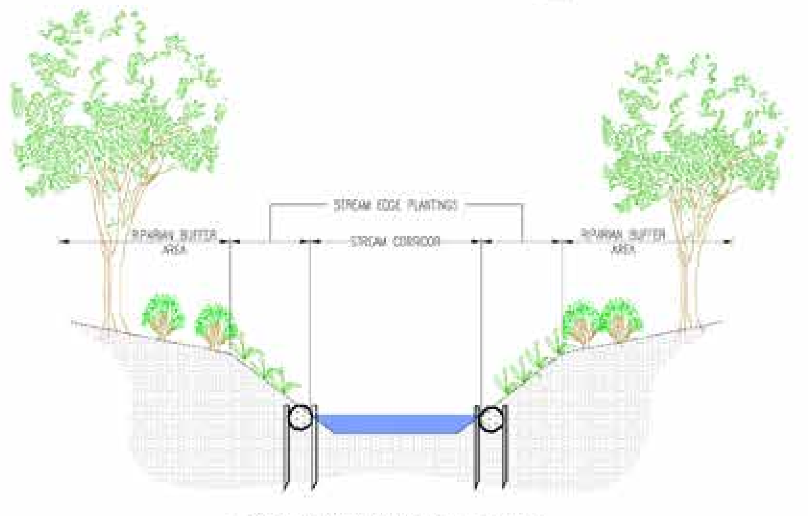
SEED MIX 1 – STREAMBANK SEEDING

PCT.	SCIENTIFIC NAME	COMMON NAME
20%	Agrostis alba	Redtop
20%	Agrostis stolonifera	Creeping Bentgrass
20%	Carex vulpinoidea	Fox Sedge
20%	Poa palustris	Fowl Bluegrass
20%	Puccinellia distans	Weeping alkaligrass

APPLY AT A RATE OF 1 LB PER 1000 SQ. FT.

LIVE STAKINGS FOR ROCK STABILIZATION AREAS

QUANTITY	SCIENTIFIC NAME	COMMON NAME	SIZE
100	Alnus rugosa	Speckled Alder	18-24 in.
100	Cornus amomum	Silky Dogwood	18-24 in.
100	Salix sericea	Silky Willow	18-24 in.
100	Salix nigra	Black Willow	18-24 in.
100	Viburnum dentatum	Arrowwood Viburnum	18-24 in.



1/1 RIPARIAN PLANTING CROSS-SECTION
NTS

TEANECK CREEK RESTORATION PLANTING PLAN

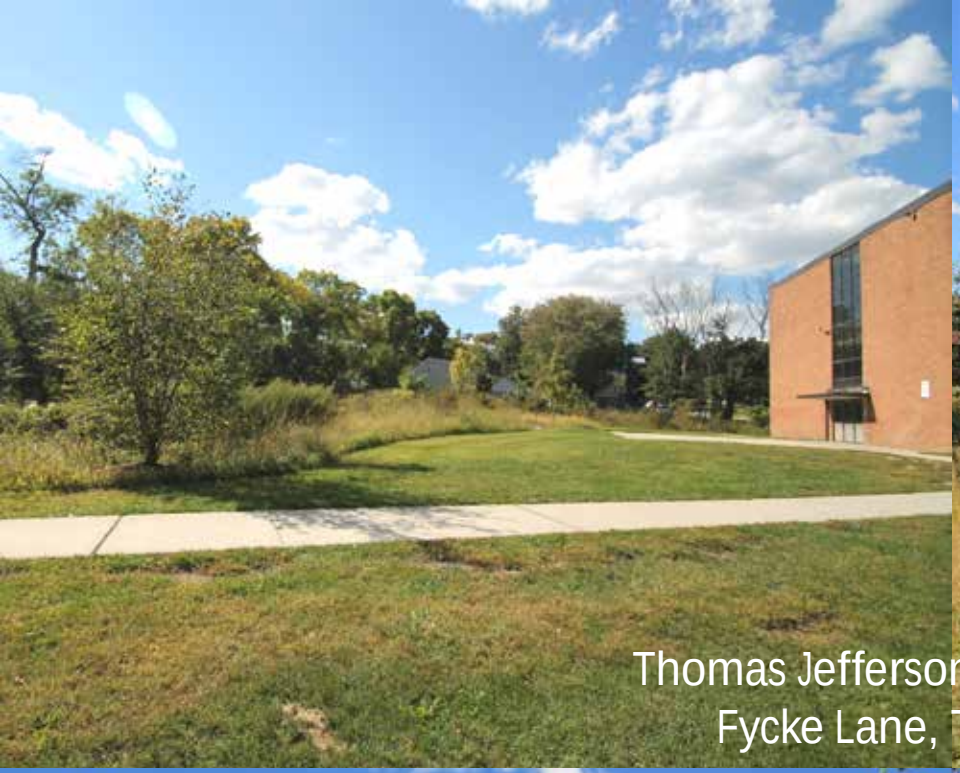
THOMAS JEFFERSON MIDDLE SCHOOL
Block 3820, Lot 1
Teaneck Township
Bergen County, New Jersey

TRC Engineers Inc.

SCALE: 1" = 30'
SHT. NO. 1 of 1

Thomas Jefferson Middle School
Fycke Lane, Teaneck, NJ


Thomas Jefferson Middle School
Fycke Lane, Teaneck, NJ



Thomas Jefferson Middle School
Fycke Lane, Teaneck, NJ

Denville's Rockaway River Flood Plain Restoration

"Owners of 11 homes on Denville's Riverside Drive have finalized agreements to sell their houses to the township, which will demolish the structures under a program administered by Morris County. The vacant land will be permanently preserved as open space…"

"Township officials have met with members of the Rutgers Cooperative Extension Service, who are helping plan the new community gardens with plants that "absorb the water" and serve as a "buffer" to "mitigate future flooding…"

(*nj.com, 2012*)

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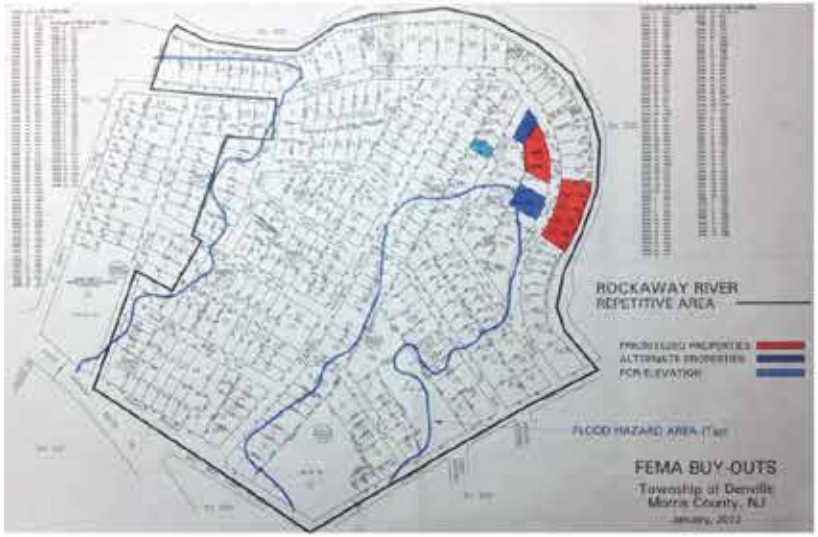
Flood Plain Restoration Project Existing Conditions

Township of Denville, New Jersey

The existing properties currently consist of single-family residential structures with several outbuildings, playsets, and typical suburban landscape vegetation. When these properties are cleared, effort should be given to protect large existing healthy trees (mainly oak and maple) adjacent to the Rockaway River as well as any healthy vegetation along perimeter property lines that will help to buffer the new open space areas from adjacent residential properties.



Flood Plain Restoration Project Proposed Conceptual Plans

Township of Denville, New Jersey

In March, the Morris County freeholders set aside $16 million from the county's open-space fund to buy flood-prone residential properties as it established its flood mitigation program. The program is now
moving forward with the 11 Denville purchases finalized and 56 more approved and in negotiations in Lincoln Park, Parsippany, Pequannock and Riverdale. 'It's impressive how responsive the towns have been on behalf of the residents," said Jennifer McCulloch, coordinator of the program. "We've already encumbered half the funding," she said, reporting that $7.5 million of the $16 million has been allocated. Meanwhile, the Federal Emergency Management Agency's commitment to home purchases as part of the program presently totals $51.18 million, according to data provided by McCulloch. "We still have applications coming in," all from here, she added

Township officials have met with members of the Rutgers Cooperative Extension Service, who are helping plan the new community gardens with plants that "absorb the water" and serve as a "buffer" to "mitigate future flooding," Ward said.

Ward said the township will also be seeking input from neighbors on plans for the vacant land, which might also include nature trails.

Ben Horowitz, The Star-Ledger (December 16, 2012)

PROJECT DESCRIPTION

With the purchase of several flood prone properties located in the floodplain of the Rockaway River, the Township of Denville has the opportunity to enhance open space resources available for its residents and protect the community from future flood damage. The residential properties purchased along Riverside Drive are located within the 100-year flood plain and recently suffered significant damage from flooding. When the Township takes possession of these properties, existing structures will be demolished and removed and the remaining landscape will become part of the open space infrastructure of the Township. This preliminary concept plan for the end uses at each of these properties will enhance the community's ability to appreciate and enjoy the Rockaway River while improving flood storage. Once demolition and clearing of the properties is complete, a series of improvements can be made that will improve access to the River as a recreational resource while improving flood storage. The plan shown here propose several improvements including:

- Canoe/kayak launch access to the Rockaway River
- A series of rain gardens to provide stormwater management & increase flood storage
- A small porous pavement parking area for visitors with canoes and kayaks
- Seating
- Planting of native vegetation

PLANT LIST

Key	Common Name	Botanical Name	Description/Notes
PR	P.J.M. Rhododendron	*Rhododendron x 'PJM'*	Evergreen foliage, showy pink flowers early spring
RN	River Birch	*Betula nigra*	Ornamental bark year round
CF	Flowering Dogwood	*Cornus florida*	Red fall fruit, white blooms in early spring
IG	Inkberry Holly	*Ilex glabra*	Evergreen leaves and dark fruit
PS	Creeping Phlox	*Phlox stolonifera*	Dense-growing groundcover with pink or purple spring blooms
SS	Little Blue Stem	*Schizachyrium scoparium*	Blue tinted grass blades in spring that turn red in fall
AT	Butterfly Milkweed	*Asclepias tuberosa*	Yellow/orange blooms early summer through fall, attracts hummingbirds, bees, butterflies & other insects
HV	Witch-hazel	*Hamamelis virginiana*	Yellow/red flowers in the winter
MV	Sweetbay Magnolia	*Magnolia virginiana*	Evergreen foliage, fragrant white summer blooms

RIVERSIDE DRIVE & SNYDER AVENUE

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Questions?

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