

BARD COLLEGE

REGIONAL GREEN INFRASTRUCTURE DEMONSTRATION PROJECT

A Case Study Addressing Stormwater Management for a Small Watershed

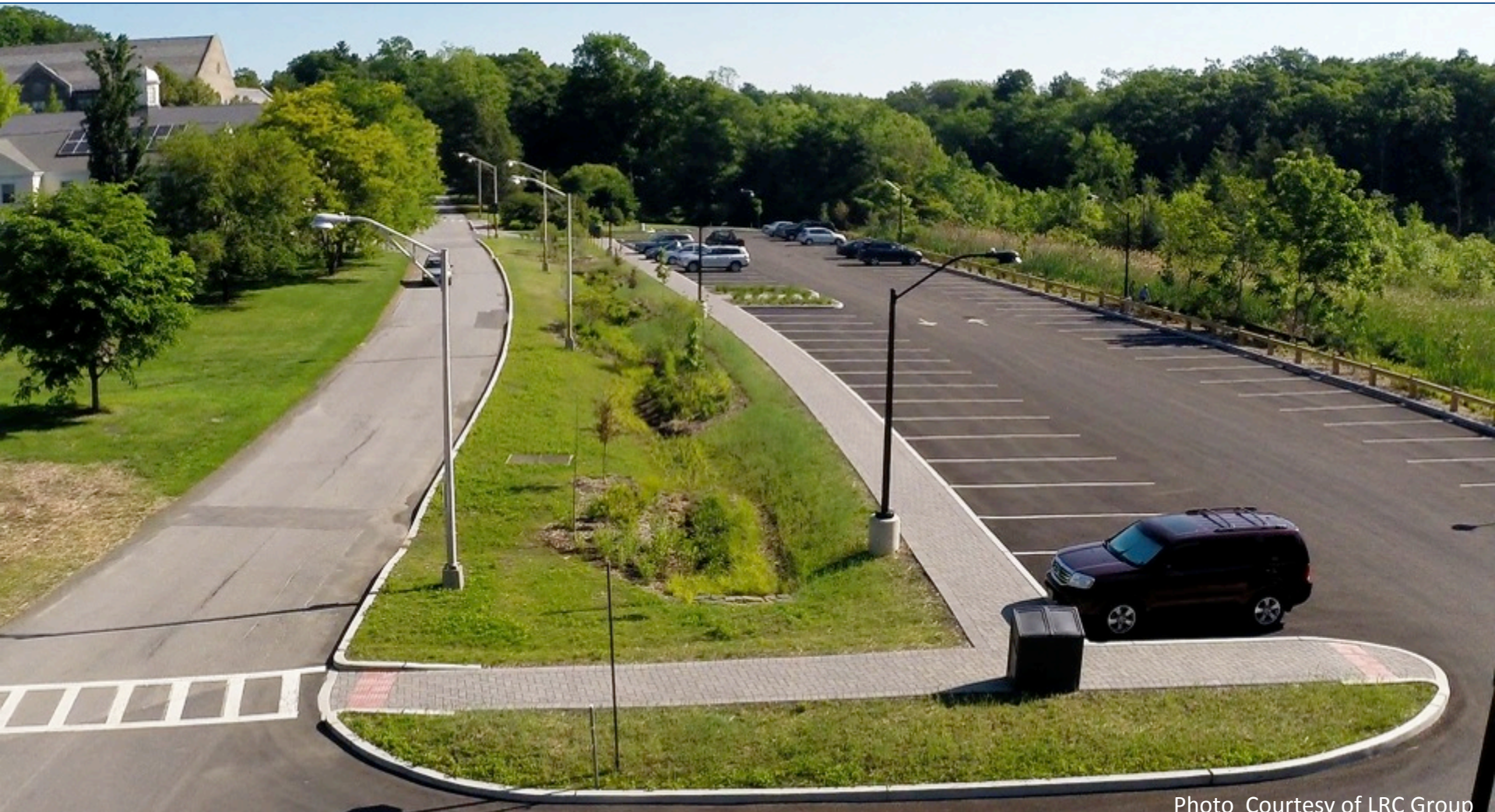


Photo Courtesy of LRC Group

Presenter:

Barbara Z. Restaino, RLA, ASLA

Restaino Design Landscape Architecture, PC

LEARNING OBJECTIVES:

- 1. The value of the feasibility study for green infrastructure project planning.**
- 2. The role of landscape architects in green infrastructure design, construction and implementation.**
- 3. The importance of good design for attractiveness and usefulness of green infrastructure.**
- 4. How the “treatment train” works and some lessons learned regarding design, construction and maintenance of the project.**
- 5. Some ways the Bard GI project is used as an educational tool and resource.**

A BARD GRADUATE STUDENT, CAROL SMILLIE, STUDIED POTENTIAL AREAS ON CAMPUS THAT WOULD BENEFIT FROM GREEN INFRASTRUCTURE



A MAJOR FOCUS OF THE PROJECT WAS TO ADDRESS UNTREATED STORMWATER RUNOFF FLOWING INTO THE ADJACENT WETLAND

THE PROJECT TEAM WAS ASSEMBLED BY LAURIE HUSTED, BARD SUSTAINABILITY MANAGER, FOR SITE SELECTION AND TO DRAW UP A FEASIBILITY STUDY FOR A GIGP GRANT PACKAGE



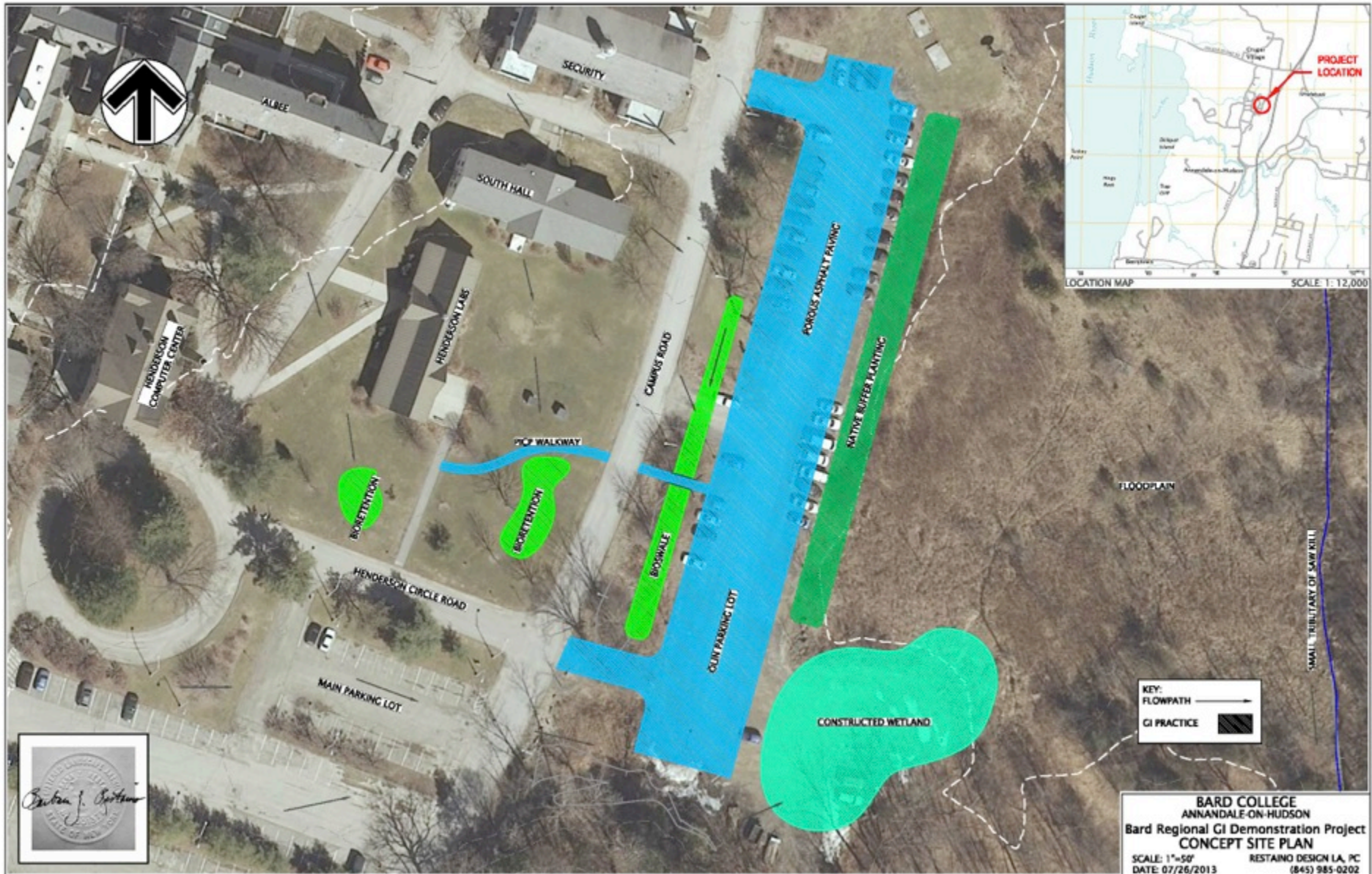
THE OLIN PARKING LOT, NOW POROUS ASPHALT, WAS A FORMERLY COMPACTED GRAVEL PARKING AREA THAT ALSO COVERED THE SITE OF THE NEWLY CONSTRUCTED WETLAND

THE GIGP FEASIBILITY STUDY INCLUDED AN EXAMINATION OF :

- Soils and their suitability for each type of recommended GI
- Depth to water table
- Stormwater flow over the topography of the site
- Existing stormwater system
- GI practice sizing & water quality volume (WQv) calculations
- Site uses, opportunities and challenges



THE PROJECT CONCEPT WAS DEVELOPED TO CREATE A TREATMENT TRAIN OF GREEN INFRASTRUCTURE PRACTICES TO ADDRESS A 10 ACRE WATERSHED



ANALYSIS OF THE FLOW PATH OF STORMWATER RUNOFF HELPS THE DESIGN PROCESS:

- Size of drainage area that can be addressed
- Examination of topography to see potential concentration and collection points
- Areas that can be disconnected from the stormsewer system
- Staging of the treatment train as water runs through system



PROJECT SITE SELECTION TOOK ADVANTAGE OF OPPORTUNITIES TO DISCONNECT STORMWATER RUNOFF FROM THE EXISTING STORMWATER SEWER SYSTEM



THE SITE AT THIS YARD DRAIN BECAME ONE OF THE BIORETENTION AREAS THAT ENCOURAGES STORMWATER INFILTRATION INSTEAD OF TRANSMISSION

THE NEED FOR PEDESTRIAN CONNECTIONS CREATED OPPORTUNITIES FOR UTILIZING PERMEABLE INTERLOCKING CONCRETE PAVER (PICP) SIDEWALKS THROUGHOUT THE PROJECT

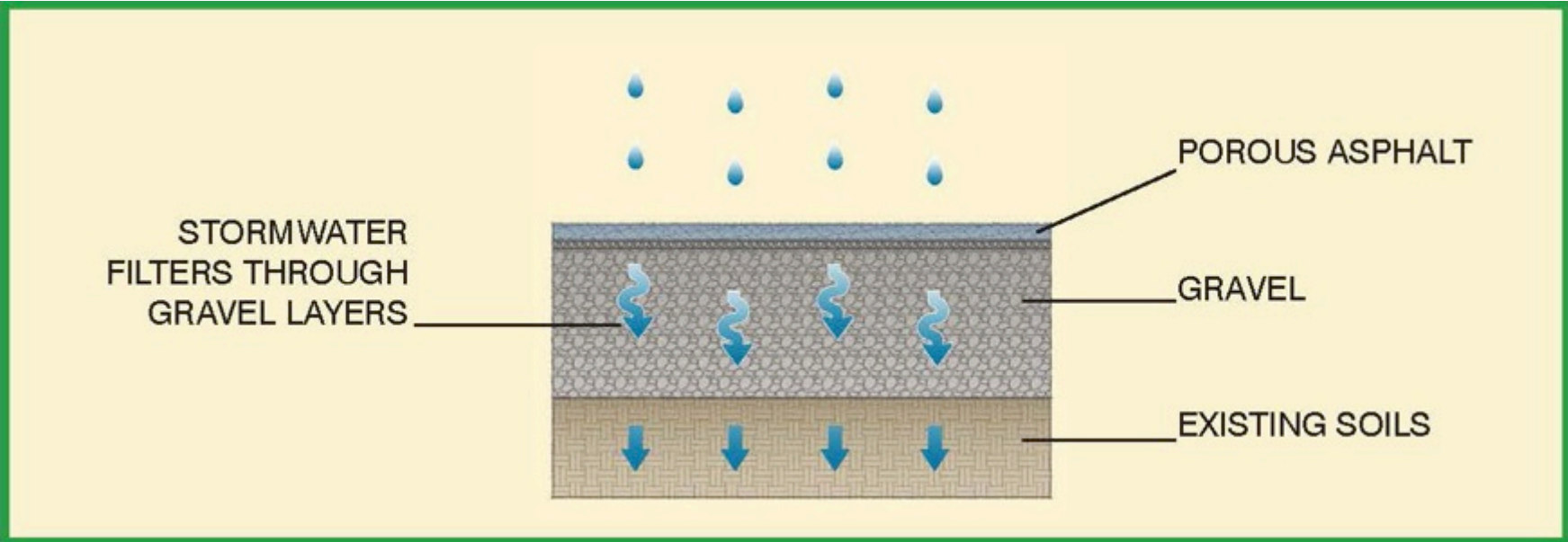


**THE PROJECT DESIGN
DEVELOPED FROM THE
ORIGINAL CONCEPT PLAN
AND FEATURED:**

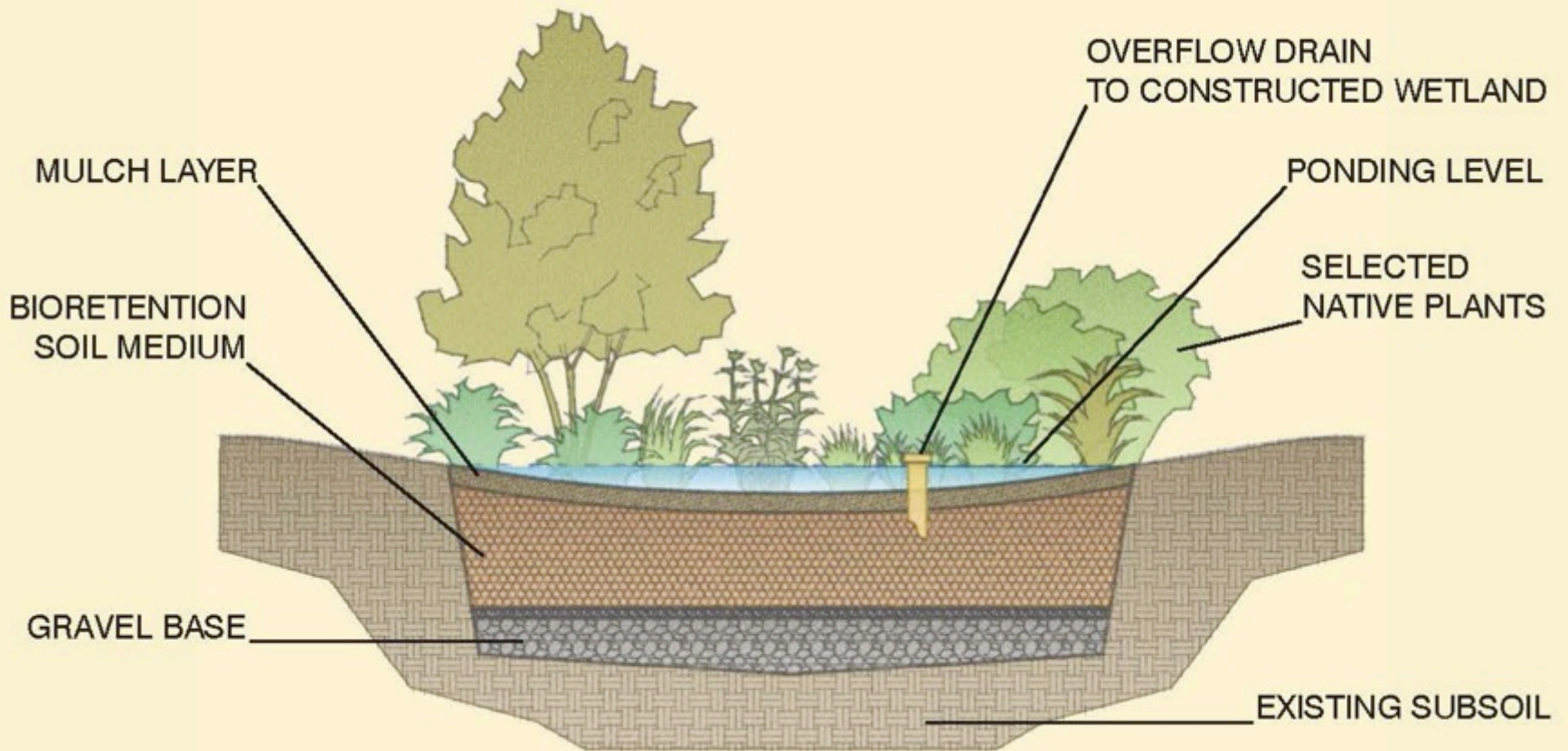
- 800 Linear Feet PICP Walks
- Porous Asphalt Parking Lot
- Two Bioretention Areas
- Bioswale
- Vegetated Swale
- Constructed Wetland & Path
- Riparian Buffer Planting



POROUS ASPHALT PARKING AREA



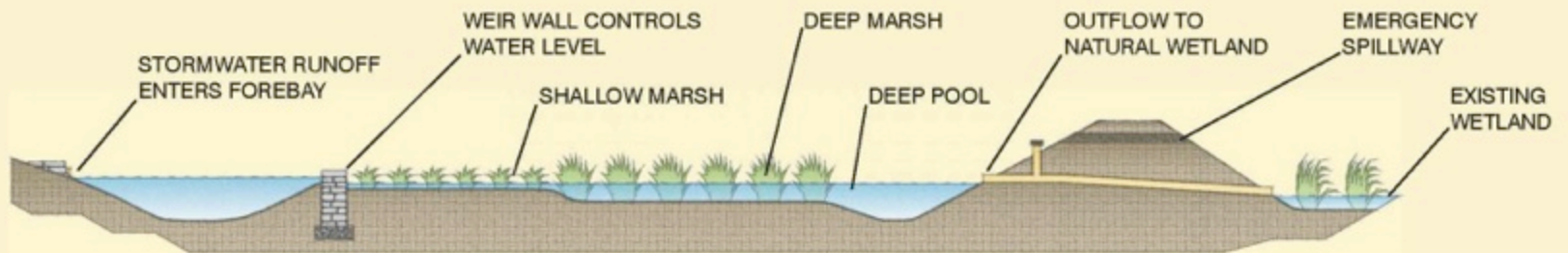
BIORETENTION AREAS



The Constructed Wetland



Cross Section of a Constructed Wetland



**UPON THE AWARD OF
THE GRANT FROM THE
NYS ENVIRONMENTAL
FACILITIES
CORPORTATION,
CONSTRUCTION
COMMENCED IN THE
FALL OF 2014**

**WEEKLY CONSTRUCTION
MEETINGS WERE HELD
WITH ALL TEAM
MEMBERS TO KEEP THE
PROJECT ON TRACK AND
ON SCHEDULE**





DEMOLITION AND REMOVAL OF THE GRAVEL SURFACE AT THE OLIN PARKING LOT AND EXCAVATION DOWN TO RIPARIAN SOILS AT THE CONSTRUCTED WETLAND SITE WERE SOME OF THE FIRST CONSTRUCTION OPERATIONS



THE CONSTRUCTED WETLAND BEING PLANTED WITH THOUSANDS OF WETLAND SEDGES, GRASSES AND HERBACEOUS PLANT PLUGS OCTOBER 2014



**THE CONSTRUCTED WETLAND WITH GOOSE FENCING STILL INTACT
AND MATURING WETLAND PLANTS JUNE 2015**



CONSTRUCTION OF THE WEIR WALL AND WETLAND CROSSING

**THE WEIR WALL
AND PATH
CROSSING WERE
DESIGNED BY THE
LANDSCAPE
ARCHITECT TO BE
AESTHETIC AND
INTERESTING AS
WELL AS
FUNCTIONAL**





NATIVE TREES, SHRUBS AND HERBACEOUS PLANTS WITH SEASONAL INTEREST WERE SPECIFIED FOR THE PROJECT



ONE OF THE BIORETENTION AREAS JUST AFTER INSTALLATION



BIORETENTION AREA AFTER PLANT ESTABLISHMENT



EXCAVATION FOR VEGETATED SWALE THAT RECEIVES ROADWAY DRAINAGE AND CONNECTS TO THE CONSTRUCTED WETLAND



VEGETATED SWALE PLANTED AND MATURING THE FOLLOWING SEASON



FINE GRAVEL SUBBASE FOR THE PICP WALKS

THE PICP WALKS ARE NOT ONLY FUNCTIONAL FOR STORMWATER MANAGEMENT BUT ARE ATTRACTIVE SURFACES





A CHALLENGING ASPECT OF THE PROJECT WAS KEEPING THE PERMEABLE PAVEMENTS CLEAN DURING CONSTRUCTION



INSTALLING THE POROUS ASPHALT PAVING WAS THE LAST TASK OF CONSTRUCTION AND OCCURRED ON ONE OF THE FEW REMAINING DAYS WITH ADEQUATE TEMPERATURES

**A MAINTENANCE PLAN WAS
DRAWN UP AS AN
INTEGRAL PART OF THE
PROJECT AND ADDRESSES
PREVENTIVE MAINTENANCE
AND CARE OF EACH GREEN
INFRASTRUCTURE
PRACTICE**





IDENTIFICATION OF POROUS ASPHALT SURFACE IMPORTANT FOR PROPER MAINTENANCE



PHOTO COURTESY OF NYS EFC

DEMONSTRATION OF THE POROUS PAVEMENT AT EFC SUMMIT 2015



INTERPRETIVE SIGNAGE WAS A PROJECT REQUIREMENT BY EFC AND EMPHASIZES THE EDUCATIONAL ASPECT OF PROJECT

BIOLOGY CLASS AT BARD COLLEGE USING THE STORMWATER PROJECT AS AN OUTDOOR CLASSROOM



PHOTO COURTESY OF BARD
OFFICE OF SUSTAINABILITY

BARD STUDENTS ORGANIZED BY THE BARD OFFICE OF SUSTAINABILITY ENGAGING IN A “PHRAG” PULL

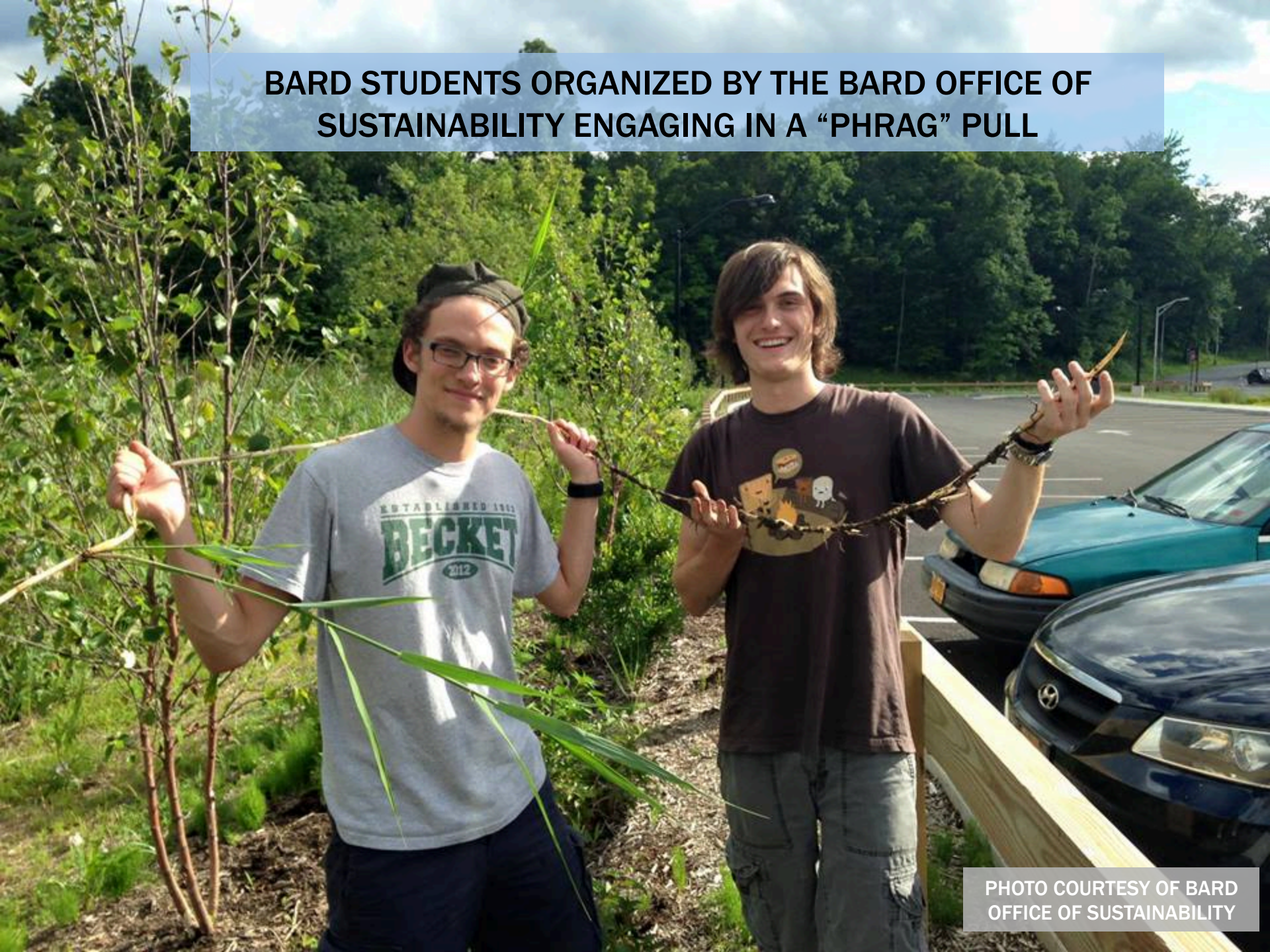


PHOTO COURTESY OF BARD OFFICE OF SUSTAINABILITY



FROGS, DRAGONFLIES AND OTHER BIOTA HAVE MOVED INTO THE CONSTRUCTED WETLAND SOILS, PLANTS AND MICROBES ARE ACTING AS A SYSTEM TO CLEANSE STORMWATER

The Sites

Bioswale #2



Turtle Pond



Marsh Stream



EUS221 Water Projects Transformers Team: Investigating Filtering Functions of Permeable Pavement

Melissa Guevara, Yue Jiao Wan, and Clara Duman

The project to replace the Olin Parking Lot with a permeable paver lot has been years in the making. The new 75-space parking lot was designed to allow for multiple forms of water filtration. The project uses porous asphalt, porous paver walkways, a constructed wetland, bioretention and bioswales to filter 10 acres of run-off from the surrounding areas as well as any rain or snow melt that falls directly on the permeable surfaces.

Our research was based on testing three different areas in this system to investigate the effectiveness of the newly constructed parking lot and bioswales in filtering out different pollutants, including Nitrogen, Phosphorus, Lead, and bacteria. This study's first data collection occurred on March 5th, 2015 and will continue until early May 2015.



Wendi collecting samples from the Marsh Stream on a rainy day



Readings from the YSI



Clara getting the YSI readings from Bioswale #2

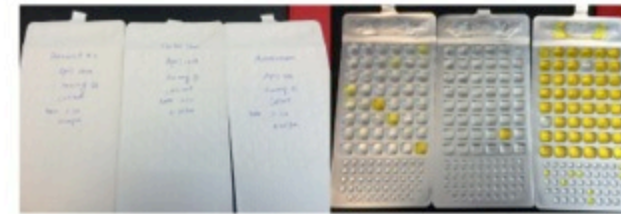


Teamwork!

In the Lab



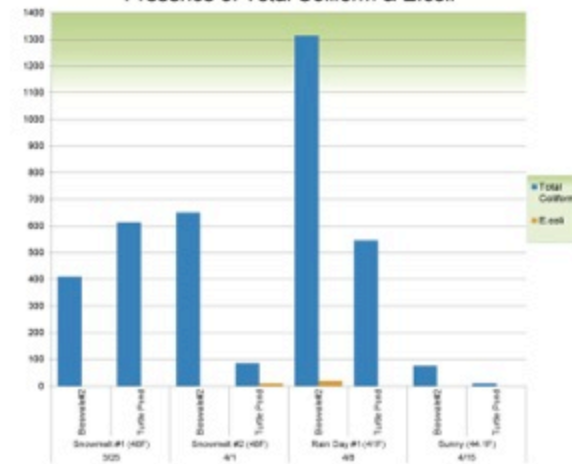
Samples from each site: notice the difference in turbidity (suspended materials in water) as water moves through the system



Coli cult Samples after incubation: yellow indicates the presence of Coliforms

Preliminary Data

Presence of Total Coliform & E.coli



Some initial data on concentration of bacteria (col/100ml) present in the waterways. We are interested in determining whether or not biological processes are occurring within the Bioswales to reduce the amount of Total Coliforms and *E. coli* delivered to the Saw Kill watershed. Sources for these bacteria include animal waste and soil run-off. Coliforms were detected in higher concentrations on days with heightened flow (snowmelt/rain), and it does appear that the movement of water from the Bioswale to the turtle pond reduces coliform concentrations. Future sampling will allow us to look into this further.

LEARNING ASSESSMENT DISCUSSION:

- 1. What are some of the site factors that a feasibility study for a green infrastructure project should address?**
- 2. Why is an attractive as well as functional design important for green infrastructure and what is the role of the landscape architect on the GI team?**
- 3. What is the added value of a “treatment train” and can this type of system be done differently for a similar project?**
- 4. In what other ways could a GI project be used as an educational tool or resource?**
- 5. How critical for a successful GI project is a maintenance plan or follow-up with the client and maintenance personnel?**

ADDITIONAL QUESTIONS?



BARD COLLEGE REGIONAL GI DEMONSTRATION PROJECT FUNDED BY:



**Environmental
Facilities Corporation**

PRESENTATION CREATED BY: *Restaino Design*^{PC}
LANDSCAPE ARCHITECTURE

www.restainodesign.com

Photo Courtesy of LRC Group