Chagrin River Watershed Partners, Inc.

Orange Village and Pepper Pike Bioretention Retrofit Projects

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Ohio EPA Stormwater Training
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Chagrin River Watershed Partners

- **Formed in 1996 by watershed communities. Supported by member dues and grants. Board composed of member representatives.**
- **Work directly with 36 cities, villages, counties, townships, and park districts to minimize flooding and erosion as communities grow.**
- **Focus on improving local development practices and site design to reduce long term infrastructure costs.**

Sponsoring Members

EMH&T
The Holden Arboretum
Hull
Emerald Necklace Chapter of Trout Unlimited
Stantec
CDM
Western Reserve Federation of Conservationists
Biohabitats
TranSystems
Ohio Stream Preservation
ES Enviro Science
Partners
URS

Low Impact Development Demonstration Project

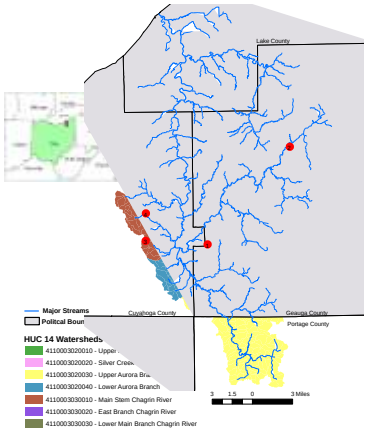
- **CRWP received US EPA grant** to design, install & monitor 4 demonstration projects.
  - *Demonstrating Innovative Approaches to Distributed Storm Water Management in Northeast Ohio*
  - US EPA National Community Decentralized Demonstration Project
- **Request for Demonstration Project** distributed in July 2006 to CRWP Members.

CRWP Demonstration Project

- **Goal:** Address barriers to LID implementation in NE Ohio on **local** projects.
- **Project funds:**
  - Design, construction, operation, and maintenance of structural LID practices.
  - Monitoring of LID practices after installation.
  - Technical assistance to CRWP members.

CRWP Demonstration Project

- CRWP provided up to 60% of total project costs for storm water management.
- Applicants responsible for 40% match.
- Eligible costs included the following related to storm water management.
  - Site design
  - Construction of storm water infrastructure

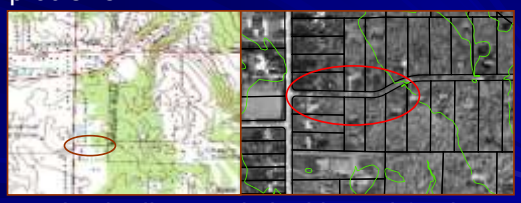


Demonstration Sites in the Chagrin Watershed

1. Cawrse and Associates Storm Water Project, South Russell
2. Munson Township Scenic River Retreat Rain Garden Project
3. **Orange Village Bioswale Project, Sterncrest Road**
4. **Pepper Pike Bioretention Project, Fox Hollow Drive and Chagrin Boulevard**

Orange Village – Sterncrest Retrofit

Replace existing storm system with bioswale system along the north and south sides of Sterncrest Road to fix flooding problems.



Moreland Hills provided additional funding.

Original Roadside Conveyance System

- Built late 1950's
- North side of road drains to a channel through rear yards on private property
  - No access easements
  - Channel not maintained
  - Little to no gradient, results in standing water, no flow, and chronic street and yard flooding

To Update the Current System

- Obtain easements from multiple property owners
- Clear and re-grade hundreds of feet of channel
- Remove existing undersized and rusted pipe and replace
  - Clear heavy brush and trees
  - Remove trees

Before Installation

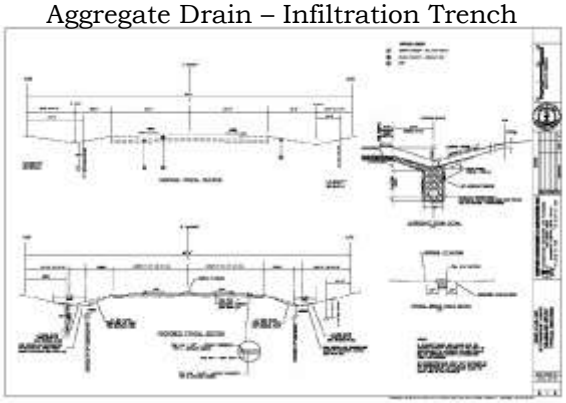
Flooding Problems

Site and Design Constraints

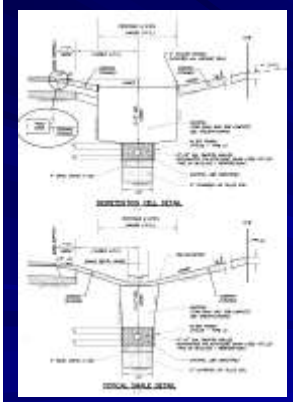
- Lander Road Storm Sewer
  - Storm sewer was not sized to take runoff from Sterncrest
  - Necessary to detain Sterncest runoff
  - Need to reduce overall flow to storm system
  - Elevation of current storm sewer forced a shallow system
- Remain within the existing right-of-way
  - 12′ – 14′ on each side

Original Design

Aggregate Drain – Infiltration Trench



Bioswales and Bioretention



- Under-drain system perforated storm sewer pipe.
- Swale and bioretention areas drain in less than 40 hours.
- Bioretention areas designed to treat WqV of drainage areas.
- Catch basins in each bioretention area.
- Storm sewer pipe connected to Lander Road storm system.

Water Quality Calculations

- Meeting the NOI CGP
- Maximum Drainage Area – 2 Acres
  - Utilize Drives and/or Check Dams to separate Bio-swales into Areas
- Calculate Required WQv
  - Utilize ODNR's Rainwater and Land Development Manual
- Size Length/Area to Pond 6″

Installation Guidelines

- Bottom of swale & bioretention cell scarified to 9″.
- 4″ aggregate layer of sand at bottom of swale over scarified or tilled bottom.
- Filter fabric between soil mix and stone backfill, along sides of trench, and between soil mix and stone backfill.
- Engineered soil mix placed in 6″ lifts with tilling between each lift to limit compaction.
- Edger at transition of bioretention cell and grass.
  - Equal/slightly lower than top of grass to promote water travel to basin.
  - Edger of plastic, steel, or rock to minimum depth of 4″.

Resident Meeting

- Before project began.
- Presented street resurfacing and "rain gardens."
- Residents able to choose the look of their "rain garden."

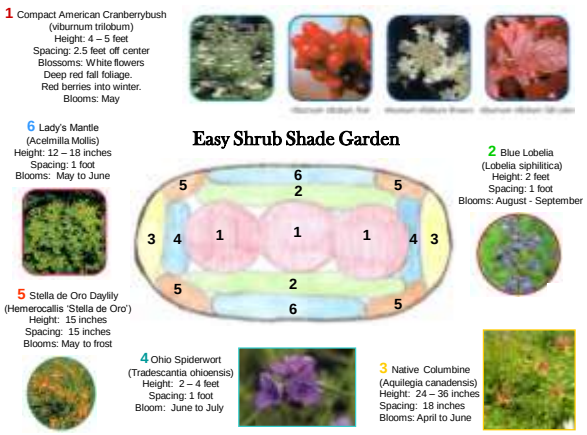
Available Rain Garden Designs

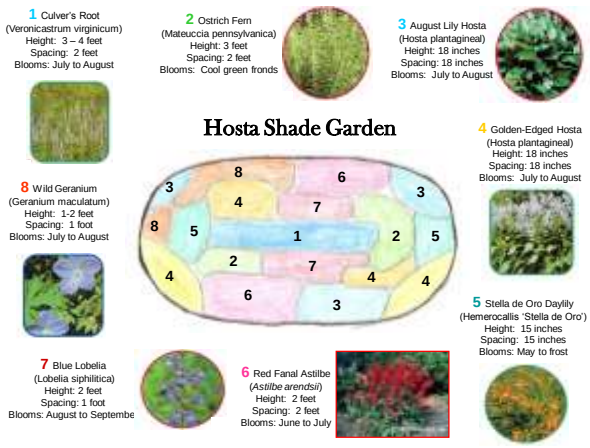
1. Shady Shrub Garden
2. Hosta Shade Garden
3. Shrub and Hosta Shade Garden

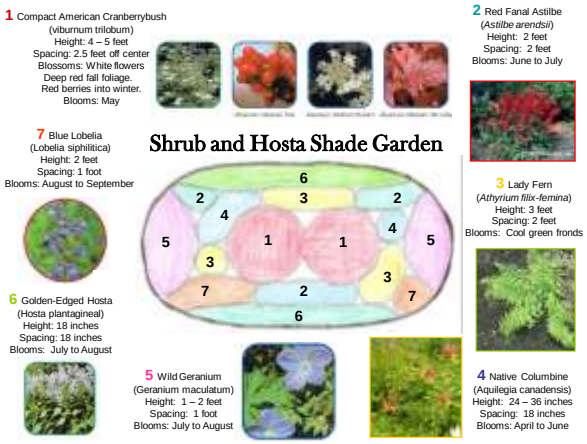
Designs based on:

- Sun requirements
- Water tolerance
- Foliage/flowers
- Maintenance needs
- Salt tolerance

These plants require limited maintenance to keep them looking their best.







Rain Garden Maintenance

- Orange Village Service Department
  - 3 Years of maintenance
  - Ensure plants are well established
- Orange Village and CRWP will work with homeowner to ensure easy transition after 3 year period.

Rain Garden Maintenance

- Woodchip mulch to prevent weeds.
- A quick weeding once or twice at the beginning and end of the summer.
- Supplemental watering to keep plants blooming during prolonged periods without rain.

Before Installation

After Installation - November 14

Project Monitoring

- Monitor 2 bioretention cell and catch basins.
- What is the frequency of overflow into the catch basin?
- What is the quality of runoff:
  - Before infiltration through the bioretention areas?
  - After infiltration through bioretention areas?
- What is the maximum level of runoff in the bioretention areas when they do not overflow?

Pepper Pike Retrofit Project

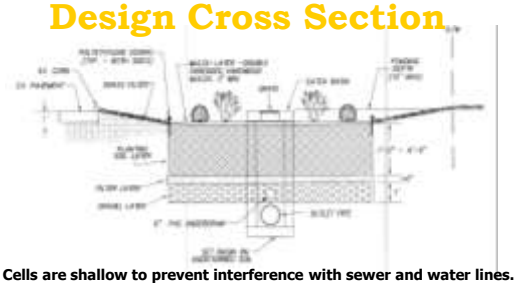
- Modify existing drainage swale and install bioretention in residential & public areas.
  - Fox Hollow Drive – Residential Subdivision
  - Chagrin Boulevard – Orange Campus High School

- Goal is to provide option to ditch culverts.

Site Constraints

- Design around current utilities
  - Sewer and water lines
  - Utilities
- Resident approval
  - Resident and school were approached by Mayor and gave consent
  - Accept maintenance after 2 years

Design Cross Section



- Cells are shallow to prevent interference with sewer and water lines.
- Potential for fines and silt:
  - Filter layer of 4" of aggregate sand according to ASTM C-33 over 2" of #8 - pea gravel.
  - Gravel layer 1 foot of #57 limestone aggregate.
- Designed to meet WqV standards for drainage areas.

Installation Guidelines

- Bottom of bioretention cell scarified to 9".
- 4" aggregate layer of sand at bottom of swale over scarified or tilled bottom.
- Engineered soil mix placed in 6" lifts with tilling between each lift to limit compaction.
- Edger at transition of bioretention cell and grass.
  - Equal/slightly lower than top of grass to promote water travel to basin.
  - Edger of plastic, steel, or rock to minimum depth of 4".

Installation and Monitoring

- Service department will install this spring.
- Monitoring to begin in spring:
  - What is the frequency of overflow into the catch basin?
  - What is the quality of runoff:
    - Before infiltration through the bioretention areas?
    - After infiltration through bioretention areas?
  - What is the maximum level of runoff in the bioretention areas when they do not overflow?

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