Creating a Comprehensive Green Infrastructure Maintenance Program: Costs, Strategy & Design

Miller Ave Rain Garden. Photo Credit: Linda Prieskorn

Catie Wytychak | Washtenaw County Water Resources Commissioner's Office
GREEN INFRASTRUCTURE IN ANN ARBOR

- 50 sites & 124 individual units
- 30 total acres
- Rain gardens, mitigated wetlands, detention basins, bio-swales & bio-retention basins
AESTHETIC LEVEL

High
- no weeds or invasives present
- Retain original planting design
- Dead headed in the late fall and mulched

Medium
- common lawn weeds allowed but no invasives present
- Edges trimmed back to create clean edge

Low
- invasives controlled but left standing after herbicided
Arbor Oaks Rain Gardens

Site Plan

Area: 0.1
SP: 4,560

NATIVE PLANTS TO LOOK FOR:

Perennials:
- Blue Flag Iris (Iris virginica)
- Black-eyed Susan (Rudbeckia hirta)
- Brown Fox Sedge (Carex virgata)
- Canada Anemone (Anemone canadensis)
- Common Cinquefoil (Potentilla simplex)
- Great Blue Lobelia (Lobelia siphilitica)
- Ironweed (Vernonia严tus)
- Joe-Pye Weed (Eupatorium maculatum)
- Mountain Mint (Pycnanthemum incisum)
- Swamp Milkweed (Asclepias incarnata)
- Switch Grass (Panicum virgatum)
- Umbrella Sedge (Carexmuskingensis)
- Wild Senna (Senna hebecarpa)
- Wild Strawberry (Fragaria virginiana)

Shrubs and Trees:
- Red-twig Dogwood (Cornus sericea)
- Pussy Willow (Salix alba)
- Northern Red Oak (Quercus rubra)

1. Arbor Oaks July 2016

1. Arbor Oaks February 2016
CASE STUDIES: Cost & Strategy

Mary Beth Doyle Mitigated Wetland & Detention Basin
7.5 vegetated acres | 2007

Stone School Road Rain Gardens | 1.3 acres | 2015

Kingsley and 1st Rain Garden
0.05 acres | 2014

Photo Credit: Linda Prieskorn
Year Built: 2007
Designer: Conservation Design Forum
Aesthetic Level Required: Medium

DESCRIPTION:

Built as a mitigation for impacts to the original stormwater wetland that was renovated and expanded to create the current regional detention basin. Located directly adjacent to the detention basin, and takes advantage of natural groundwater seepage to create a fen-like habitat. Monitoring showed a Floristic Quality Index in the lower 20s, which is an improvement over pre-construction conditions, but is not floristically significant from a statewide perspective. Stormwater is captured from overland flow. A burn was conducted in 2015 by PlantWise. Few invasives currently are growing in the area. Watch for teasel re-growth.
# MARY BETH DOYLE MITIGATED WETLAND & DETENTION BASIN

**Built in 2007 | 7.5 vegetated acres**

**Level of service: medium**

<table>
<thead>
<tr>
<th>MAINTENANCE NEEDS</th>
<th>COMPLETED BY</th>
<th>TIMELINE</th>
<th>COST/YEAR</th>
<th>TOTAL/ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled burns</td>
<td>Contractor</td>
<td>1 every 3 years</td>
<td>$317</td>
<td><strong>$235/acre</strong></td>
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<tr>
<td>Invasive control with herbicide</td>
<td>Contractor</td>
<td>2 visits per year</td>
<td>$620</td>
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<tr>
<td>General maintenance &amp; monitoring: weed, pick up trash, collect seeds</td>
<td>Staff</td>
<td>16 hours per year</td>
<td>$825</td>
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<tr>
<td>General maintenance &amp; monitoring: weed, pick up trash, collect seeds</td>
<td>Volunteers</td>
<td>45 hours per year</td>
<td>$0</td>
<td><strong>$0.54/100 square feet</strong></td>
</tr>
<tr>
<td><strong>total</strong></td>
<td></td>
<td></td>
<td><strong>$1,762</strong></td>
<td></td>
</tr>
</tbody>
</table>
Stone School Road Rain Gardens

Approximate Address: Stone School Rd north of Ellsworth Rd

Year Built: 2015
Designer: InSite Design Studio
Aesthetic Level Required: High

DESCRIPTION:
Six vegetated swales line Stone School Road to the west and to the east. Each swale receives stormwater from Stone School Road through a curb cut inlet. Inlets have deep sumps for sediment. Terraced step pools help slow stormwater.

MAINTENANCE NOTES:
Northern most basins were so wet that few of the original plantings survived. Invasives were allowed to grow to stabilize soil. Cut back standing dead between late fall and early spring. Invasives include Cat-tails, Chicory, Phragmites, Japanese Knotweed, Yellow Sweet Clover and Teasel.
## STONE SCHOOL ROAD RAIN GARDENS

Built in 2015 | 1.35 acres
level of service: high

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<th>TOTAL/ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled burns</td>
<td>Contractor</td>
<td>1 every 3 years</td>
<td>$150</td>
<td>$6,407/acre or $15/100 square feet</td>
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<tr>
<td>Invasive control with herbicide</td>
<td>Contractor</td>
<td>5 visits per year</td>
<td>$7,000</td>
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<tr>
<td>General maintenance &amp; monitoring: weed, pick up trash, collect seeds</td>
<td>Staff</td>
<td>10 hours per year</td>
<td>$500</td>
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<td></td>
<td>Volunteers</td>
<td>16 hours per year</td>
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<tr>
<td>Sediment Removal</td>
<td>Staff</td>
<td>1 every 3 years</td>
<td>$1,000</td>
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<tr>
<td></td>
<td>total</td>
<td></td>
<td>$8,650</td>
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</table>
Kingsley & 1st Rain Garden

Approximate Address: 219 W. Kingsley

Year Built: 2014
Designer: Conservation Design Forum
Aesthetic Level Required: High

DESCRIPTION:
Built on a site from which an abandoned home was removed, this garden features a sculptures of fish created by the artist, Josh Weiner. The lot is now a pocket park. Stormwater flows over land from the surrounding neighborhood. A controlled burn was conducted in the spring of 2016 by PlantWise.

MAINTENANCE NOTES:
Vegetation should be trimmed away from the path occasionally. Grass along the edges is mowed by the City. Invasives include Sow Thistle and Cottonwood saplings but are sparse.
# KINGSLEY & 1st RAIN GARDEN

Built in 2014 | 0.05 acres
level of service: high

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<tr>
<td>Controlled burns</td>
<td>Contractor</td>
<td>1 every 3 years</td>
<td>$216</td>
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<td></td>
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<td></td>
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<td>$12,320/acre or $28/100 square feet</td>
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<td>General maintenance &amp; monitoring: weed, pick up trash, collect seeds</td>
<td>Volunteers</td>
<td>58 hours per year</td>
<td>$0</td>
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<td>General maintenance &amp; monitoring: weed, pick up trash, collect seeds</td>
<td>Staff</td>
<td>4 visits per year</td>
<td>$400</td>
<td>$616</td>
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<tr>
<td></td>
<td>total</td>
<td></td>
<td>total</td>
<td>$616</td>
</tr>
<tr>
<td>SITE</td>
<td>TOTAL ANNUAL COST</td>
<td>COST/ACRE</td>
<td>COST/100 SQUARE FEET</td>
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<tr>
<td>-----------------------------------------------------------</td>
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<tr>
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<td>$1,762</td>
<td>$235</td>
<td>$0.54</td>
<td></td>
</tr>
<tr>
<td>7.5 acres</td>
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<td></td>
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<tr>
<td>Stone School Road Rain Gardens</td>
<td>$8,650</td>
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<td>$12,320</td>
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Average annual cost of $10,000 per acre or $23 per 100 square feet.
SIZE MATTERS

60% of our budget is spent on 4 acres that are spread across 37 sites.
DESIGN TECHNIQUES

1. aesthetic level & size
DESIGN TECHNIQUES

2. right plant, right place
DESIGN TECHNIQUES

3. simple plant designs
**DESIGN TECHNIQUES**

4. inlet designs

- **PRO:** sediment accumulates in one place
  - **CON:** dangerous to clean out along roadsides. 2x per year maintenance

- **PRO:** slows water as it enters garden
  - **CON:** time consuming to clean out. 1x per year maintenance

- **PRO:** maintain 1x every 5 years
  - **CON:** costly to clean with vactor. Need traffic control
LESSONS LEARNED

1. use a multi-pronged approach

INDIVIDUAL VOLUNTEERS
- general maintenance
- monitoring
  ➢ small sites

GROUP VOLUNTEERS
- general maintenance
- monitoring
  ➢ small or large sites

CONTRACTED WORK
- controlled burns
- herbicide
- general maintenance
  ➢ large sites, typically not on park property

CITY STAFF WORK
- controlled burns
- herbicide
- mowing
- group volunteer coordination for general maintenance
  ➢ sites on park property

COUNTY STAFF WORK
- Planning, coordination & implementation for maintenance
- sediment removal by crew
  ➢ all sites
LESSONS LEARNED

3. develop a volunteer program

- Volunteer Stewards – Master Rain Gardeners
- Group Volunteers
- Educational & Social Events
VOLUNTEER CONTRIBUTION

- 2,000 volunteer hours in 2018
  - 40 volunteer stewards
  - 30 volunteer workdays
- 400 residential rain gardens
- Community ambassadors
SUMMARY

- Design to reduce maintenance
- Plan for ongoing costs: $23 per 100 square feet each year
- Use a multi-pronged approach