Case Study:
Residential Rain Garden Design And Construction
Chapter 118 (*Chesapeake Bay Preservation Ordinance*)

- Safe Approach – No disturbance in a Resource Protection Area (RPA)

Fairfax County Code

- Chapter 104 (*Erosion and Sediment Control*)
  - Rain gardens are exempt if land disturbance is < 2,500 sf, per 104-1-7(m)(1 & 10), and not in RPAs.

Fairfax County Public Facilities Manual

- Section 6-0202.3 (*Storm Drainage*)
  - Requires that discharges from a development site be discharged into a receiving channel that will contain the 2-year storm event within its bed and banks at nonerosive velocities or, if not possible due to existing conditions, demonstrate no adverse impact and a proportional improvement.
  - *It is ridiculous to apply this regulation to rain gardens (should allow level spreaders or provide a small drainage area exemption).*

Fairfax County Zoning Ordinances

- Section 2-601 (Paragraphs 1 & 2) (*Land Regulations*)
  - Only allows the removal and/or addition of sod & soil up to a depth of 18” if disturbance is less than 2,500 sf.
  - Allows for the removal of soil from a floodplain, according to the above restrictions. No addition of soils is allowed, unless applicant provides verification that no increase to 100-yr water surface elevation occurs. (NOTE: Major floodplains are also RPAs, so NO disturbance)
  - Requires approved grading plan if greater than 2,500 sf of disturbance.

- Section 2-602 (Paragraphs 1 - 4)
  - No changes in natural drainage channels, and no filling or change in contours within any floodplain, wetland or RPA (unless approved per Chapter 118 of the Fairfax County Code)

- Section 2-903 (Paragraph 7) (*Floodplain Regulations*)
  - No disturbance in major floodplains ( > 360 acres) without a special exemption.

- Section 17-103, 104 (*Site Plans*)
  - If your property is a type that requires a site plan (in lieu of a single family subdivision plan) such as a townhouse, condominium, office, etc. the 2,500 sf becomes 250 sf!

*Write DPWES Director for permission prior to building rain garden.*
WHERE ARE YOU ALLOWED TO BUILD A RAIN GARDEN WITHOUT A PLAN SUBMISSION?

As long as it:

1. Is not in an RPA
   » Fairfax County Code Chapter 118
2. Does not disturb more than 2,500 sf on a single family detached home lot
   » Fairfax County Code 104-1-7(m)(1&10)
3. Does not disturb more than 250 sf everywhere else
   » Fairfax County Zoning Ordinance Section 17-104
4. Does not have a depth greater than 18” and area of disturbance greater than 2,500 sf
   » Fairfax County Zoning Ordinance Section 2-601 (18” is an interpretation issue)
5. Does not alter natural drainage or contours in any floodplain, wetland or RPA (without special exemption)
   » Fairfax County Zoning Ordinance Section 2-602

And, remember:

• All disturbances must provide adequate outfall for underdrains and overflow.
  » Fairfax County Public Facilities Manual Section 6-0202.3
• To be safe, ALWAYS write DPWES Director for permission prior to building rain garden!
Watershed Conditions

- 0.24 acre (10,448 sf) Drainage Area
  » 0.10 acre (4,470 sf) Impervious Cover
    - 70% house & porch
    - 30% driveway & sidewalks
- Clay Soils
  » $k_{sat} = 5.55 \times 10^{-7} \text{ cm/s}$
Wetland

Rain garden drainage area - 0.24 acres (10,448 sf)
Impervious area (drive, house) - 0.1 acres (4,470 sf)
Rain garden footprint (565 ft²)
Storm chambers

Outdoor patio and portion of house drains to this rain garden
Portion of house drains to 2nd rain garden
Retaining Wall
Rain Garden Cross Section

- 2″ Hardwood Mulch
- BMP Ponding Depth = 4"
- 2-yr Storm Depth = 6"
- Proposed Grade
- Existing Grade
- 3′ Bioreention Soil Mix
- 5 LF 10″ SCH. 40 PVC Pipe with 10″ Agridrain collar & grate (set 4″ above cell floor)
- 3.83’ Rock Fill (dia 1″–2″)
- Stabilization Netting
- Storm Chambers (Typical)
- Nonwoven Filter Fabric
**Design Criteria**

1. **Water Quality Control (BMP)**
   - Footprint captures ½” runoff from impervious areas
     - Maximum 4” ponding depth improves bio-diversity (many use 6-12”)

2. **Water Quantity Control (1” outflow orifice)**
   - Runoff Volume
     - Exceeds “energy balance” requirements
   - Peak Flow Rate
     - Provides 7-hr detention for 1-yr storm
       - 0.4” outflow orifice required for 24-hr detention
     - Reduces pre-development 2-year rate by 82%
   - Assume no infiltration in underlying soil

3. **Adequate Overland Relief (Structure flooding)**
   - 100-year storm confirmed

4. **Confirm planting media infiltration**
   - Bioretention soil mix testing
Bioretention Soil Mix Testing

(With stone & Non-woven Filter Fabric)
Installing Storm Chambers (With Inlets)
1 – 2” Crushed Stone
INSTALLING FILTER FABRIC

Wetland Studies and Solutions, Inc.
Bio-Retention Soil Mix
Outlet Pipe & Erosion Control
Testing … It Works!
PLANT INSTALLATION
(IN THE RAIN...)
LANDSCAPING

Wetland
Studies and Solutions, Inc.
LET IT RAIN!
Rain Garden Storage vs. Rain Barrel Storage

- **Rain Garden Storage**: 968 ft\(^3\)
  - Storm Chamber Volume: 450 ft\(^3\)
  - Rock Void Volume: 518 ft\(^3\)
    - (1” - 2” dia, 40% voids)

- **Rain Barrel Storage**: 14.8 ft\(^3\)
  - 55 gallons (7.4 ft\(^3\))
  - (if empty!)
# Cost Estimate

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**Total**                                                                 $38,845