Urban Watershed Mentors

Bureau of Environmental Services

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Agenda

• Urban Stormwater background
• Stormwater retrofits
• Site assessment
• Design considerations
• Maintenance considerations
• Resources/programs
• Wrap up and questions
A. Urban Stormwater
Background

Then

Now
Portland stormwater drainage systems

- Natural Waterways
- Combined Sewer
- Sumps/dry wells
- Combined sewer with sumps
Improper management of stormwater runoff causes...

- In-stream impacts like erosion, pipe exposure, and habitat destruction
- Pollution movement into streams and groundwater
- Millions of dollars to build and maintain pipes, ditches, sumps, and other stormwater systems and provide treatment
New Construction

Must follow the City of Portland’s 2008 Stormwater Management Manual.

Stormwater Infiltration and Discharge Hierarchy

**Onsite Infiltration**

**Category 1:** Requires total onsite infiltration with vegetated infiltration facilities. Examples include infiltration swales, planters and basins.

**Category 2:** Requires total onsite infiltration with vegetated facilities that overflow to subsurface infiltration facilities. Examples of subsurface infiltration facilities include drywells, soakage trenches and sumps. These facility types are underground injection control structures (UICs) and must be registered with DEQ. Roof runoff is exempt from pollution reduction requirements and may drain directly to a UIC.
New Construction

Offsite Discharge

**Category 3:** Requires onsite detention with vegetated facilities that overflow to a drainageway, river, or storm-only pipe. Vegetated facilities (lined or unlined) must meet pollution reduction and flow control requirements to the maximum extent feasible prior to offsite discharge.

**Category 4:** Requires onsite detention with vegetated facilities that overflow to the combined sewer system. Vegetated facilities (lined or unlined) must meet pollution reduction and flow control requirements to the maximum extent feasible prior to offsite discharge.
B. Stormwater Retrofits as part of the solution

Stormwater retrofits mimic the natural hydrologic cycle in a manner that is safe and effective for the site and neighboring properties.

Basic stormwater management components:
- Collect and convey
- Slow or detain
- Evaporate, transpire & infiltrate
- Safe overflow & escape route
Benefits of Stormwater Retrofits

- Simplest solution
- Community engagement
- Reduced costs
- Watershed benefits
Benefits of Stormwater Retrofits

Rain garden wildlife
Stormwater Retrofit Options

Residential Retrofit

Commercial Retrofit
Reducing Stormwater Runoff

Plant trees:
- Trees help intercept rain and reduce stormwater reaching the ground
- Friends of Trees is a great community resource
  (503) 248-TREE (8733)
  www.friendsoftrees.org

Remove Impervious Area:
- Reduces stormwater runoff
- Provides pervious areas for stormwater management
Downspout disconnection

- Simple disconnection of roof downspouts to landscaped infiltration area
Rain barrels/cisterns

- Not disposal systems! Great for stormwater detention and conveyance
  - On average, one rain barrel will fill up with < 0.2 inches of rain
- Where’s the overflow going?
Rain gardens

- Vegetated depression to contain and infiltrate stormwater
Rain gardens
Rain gardens

Dry creek bed swale
Subsurface facilities

Drywell – stormwater piped to an underground *vertical* storage chamber

Soakage trench – stormwater piped to an underground *horizontal* rock trench
Subsurface facilities

Mini-drywell

- < 500 ft$^2$ of roof area
Subsurface facilities

Residential-scale trench

Infiltrator trench
Commercial-Scale Vegetated Facilities

Basins

Swales
Infiltration Planters

- **Impervious Surface**
- **WALL OPENING**
- **FILTER FABRIC**
- **GROWING MEDIUM**
- **GRAVEL**
- **EXISTING SOIL**
- **STRUCTURAL WALL**

Dimensions:
- 12"
- 18"
- 12"
Infiltration Planters
Flow-through planters
Flow-through planters
Ecoroofs

Considerations:

- Rooftops with less than 25% slope (generally flat roofs)
  Building must meet structural requirements for additional weight
Pervious Pavement

Pavers

Concrete
C. Site Assessment

Site Assessment Steps:
1. Site records research
2. Walk the site
3. Map existing conditions
4. Identify site constraints
5. Identify project opportunities
6. Create a site plan

Site assessment guide:
- http://www.portlandonline.com/shared/cfm/image.cfm?id=144648
1. Utilize available records

- Portland Maps [www.portlandmaps.com](http://www.portlandmaps.com)
  - Historic plumbing records
  - Hazard information (slopes, earthquake)
  - Slope information
  - Soil drainage information
- Know local code standards
  - Parking standards, setbacks, stormwater regulations
- Other online/documentated resources as available
  - Google street view?
2. Walk the site

- Map existing conditions
  - Either create your own map or utilize and aerial photo

- Identify the basics
  - Downspout locations, roof and paved areas (estimate sf of these)
  - Where does runoff go now? (sewer, creek, landscape, drywell)
  - Pervious or landscaped areas

- Identify site constraints
  - Hazards (steep slopes, retaining walls), areas of ponding, property lines
  - Access points and walkways, utilities, areas of heavy use

- Conduct an infiltration test
  - Once a facility type and location is determined
3. Map Existing Conditions

Identify on site plan:

- Existing roof and paved areas
- Existing stormwater collection and convey (gutters, downspouts, flow direction, etc.)
- Existing stormwater destination (public sewer, creek, lawn, drywell, etc.)
4. Identify Site Constraints

Identify site constraints:
- Slopes
- Setbacks/property lines
- Utilities
- Access/Walkways
- Foundation type
- Utilities
- Oil tanks/cesspool
- Soil infiltration rate
Testing Infiltration capacity:

• In the location of your planned stormwater facility, dig a hole at least 24” deep and 24” wide
• Fill the hole to the top with water and allow it to drain. This “primes” the system
• Fill the hole to the top with water a second time and mark the top of the water surface
• Wait 1 hour and measure how far the water level has dropped. A 2” drop in 1 hour indicates good infiltration for stormwater management
Things to look for onsite

- Clogged standpipes
- Curb outlets
- Broken downspouts
- Standpipe material (ABS, cast iron, concrete etc.)
- Erosion/sediment patterns
- Ponding water
- Seeps/springs
- Water/moisture in basement
- Disconnection tags
- Rat holes
- Funky disconnections
- Smiling/frowning gutters
- Roof drainage offsite
To Infiltrate, or not, that is the question

- Safe and effective stormwater management can be difficult in West Portland
  - Poorly draining soils are typical
  - Steep slopes, landslide hazards, and erosion concerns abound
  - Seeps/springs and other existing issues indicate poorly draining soils/high groundwater
  - Utilize public drainage systems when safety is a concern
5. Identify Project Opportunities

Stormwater retrofit locations:
- Pervious areas for stormwater management
- Stormwater management may not be feasible for all sites!
Private Property vs. Right-of-Way

Retrofits must be on private property!

ROW:
- Sidewalks, planter strips, curbs, and street
- Must be maintained by property owner but cannot generally be used to manage runoff from private property

Private property:
- Property on house-side of the sidewalk
- May generally be used to manage runoff from that property only
6. Create Project Site Plan

Clearly identify:
- Property lines and dimensions
- North arrow
- Impervious area dimensions and destinations
- Existing and new conveyance methods
- Stormwater facility location and dimensions
- Pertinent project materials and specifications
D. Design Considerations

Safety

- Facilities must be designed and located so that it doesn’t cause a hazard for safety or to property
- All water must discharge to a safe location where it will not drain back to buildings or off property
Location considerations take away message:

- No infiltration on or uphill of steep slopes
- West hills typically has poor infiltration and weak soils (some exceptions)
- Other slopes in Portland prone to slope creep, raveling, erosion problems
- If in doubt, call an engineering geologist or geotechnical engineer

Just because you can, doesn’t mean you should!
Facility Sizing

- Disconnections and rain gardens: 10% of roof area if infiltration > 2”/hour
- Infiltration basins/swales/planters: sizing varies by specific infiltration rate and design – generally 6-9% of drainage area
- Subsurface facilities: sizing varies by drainage area, specific infiltration rate, and design
- Flow-through facilities: 6% of drainage area
- Ecoroofs and pervious pavement: 1 : 1 ratio, no treatment of additional drainage
Design

Setbacks

- Disconnection: discharge point 2’ from slab foundations, 6’ from basements, 5’ from property lines
- Rain gardens: same above, plus deepest point 10’ from any foundations
- Infiltration Basins/swales/planters: 10’ from buildings, 5’ from property lines
- Flow-through planters: no setbacks
- Ecoroofs/pervious pavement: no setbacks
Permits

• No permit required for residential disconnections, rain gardens, and rain barrels that meet safety and design standards
• Permit likely required for all other retrofits
Conveyance methods:

• Water must be conveyed to facility across setback area
• Conveyance can be aerially, on surface, or underground to accommodate site uses and aesthetics
Design
Design

Identify overflow/escape route

Overflow:
- Approved disposal point for excess flow
- Other facilities or offsite disposal (sewer, ditch, stream)

Escape route:
- Directs excess runoff away from buildings during extreme rains
- Low point in berm
- Dry creekbed
Design

Identify materials and plants:

- Stormwater-facility- appropriate species greatly increase evapotranspiration and infiltration
- Plant sheet handout

Mississippi commons plant choices:

1. Grooved rush  Juncus patens
2. Red twig dogwood  Cornus sericea
3. American cranberry bush  Viburnum trilobum var.
4. Camas lily  Camassia leichtlinii
5. Yellow-eyed grass  Sisyrinchium californicum
6. Sword fern  Polystichum munitum
7. Hardstem bulrush  Scirpus acutus
E. Maintenance Considerations

- Property owners responsible for maintaining stormwater systems
- Proper maintenance is key to facility function
  - Inspect and maintain stormwater facilities just like you do your gutters, downspouts, and internal pipes
    - Remove sediment and trash, repair cracks, check for leaks
  - Inspect and maintain landscaping just like you would existing landscaping
    - Weed, prune, mow, remove invasives, replace dead plants
    - No pesticides or herbicides!
F. Incentives and resources

- Treebate program
- Ecoroof Incentive Program
  [www.portlandonline.com/bes/ecoroof](http://www.portlandonline.com/bes/ecoroof)
- Clean River Rewards
  - Technical assistance page has many more resources
Community Programs

East Multnomah Soil and Water Conservation District
Partners in Conservation
www.emswcd.org/grants-cost-share/for-organizations
Small Projects and Community Events
www.emswcd.org/grants-cost-share/small-projects-and-community-events

West Multnomah Soil and Water Conservation District
Financial Incentives for Sustainable Habitats
www.wmswcd.org/content.cfm/Grant-Opportunities/WMSWCD-Grants

Metro Nature in Neighborhoods Grants
www.oregonmetro.gov/index.cfm/go/by.web/id=18203
Other Resources

Oregon Smart Guide: Rainwater Harvesting

Portland Ecoroof Guide
http://www.portlandonline.com/bes/ecoroofguide

Presumptive Approach Calculator
http://www.portlandonline.com/bes/index.cfm?c=47958
Wrap up

- Questions?