

## **Background and Overview**

Stormwater NPDES Compliance  
For New Developments

# Let's talk about...

- Goals
- Compliance
- Actions

# Research shows...

- Impairment
- Impacts from runoff
- Effectiveness of LID
  - To mimic pre-development hydrology
  - To reduce pollutant loadings
  - To protect against dumps and spills

# Why target new development?

- Think long-term
- Demonstrate LID techniques and technologies
- Improve livability of increasingly urban areas

# Municipalities must...

- Use planning authorities to require LID
- Regulate Projects
- Implement LID on public projects

All projects	Site design measures and source controls
≥2500 SF	Include at least one of six LID measures
≥(5,000 SF) ≥10,000 SF	(For parking lots, auto service, restaurants) Treat flows to numeric standard
≥1 acre	Hydromodification Management

# Threshold Arcana



- What if the project *reduces* the amount of impervious surface?
- What about a 6,000 SF project with two parking spaces?
- Does pervious pavement count?
- Does pavement replacement count?
- Are public improvements included?
- The old 50% rule and the new 50% rule
- Flow-control on already developed sites

# Low Impact Development

- Source Control
- Site Design
- Treatment

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# LID Treatment Criteria

- 80% of Average Annual Runoff
- Volume-based criteria
- Flow-based criteria



# Treatment

Infiltration/  
Evapotranspiration  
•  
Harvesting /Reuse



Biotreatment  
(Bioretention)



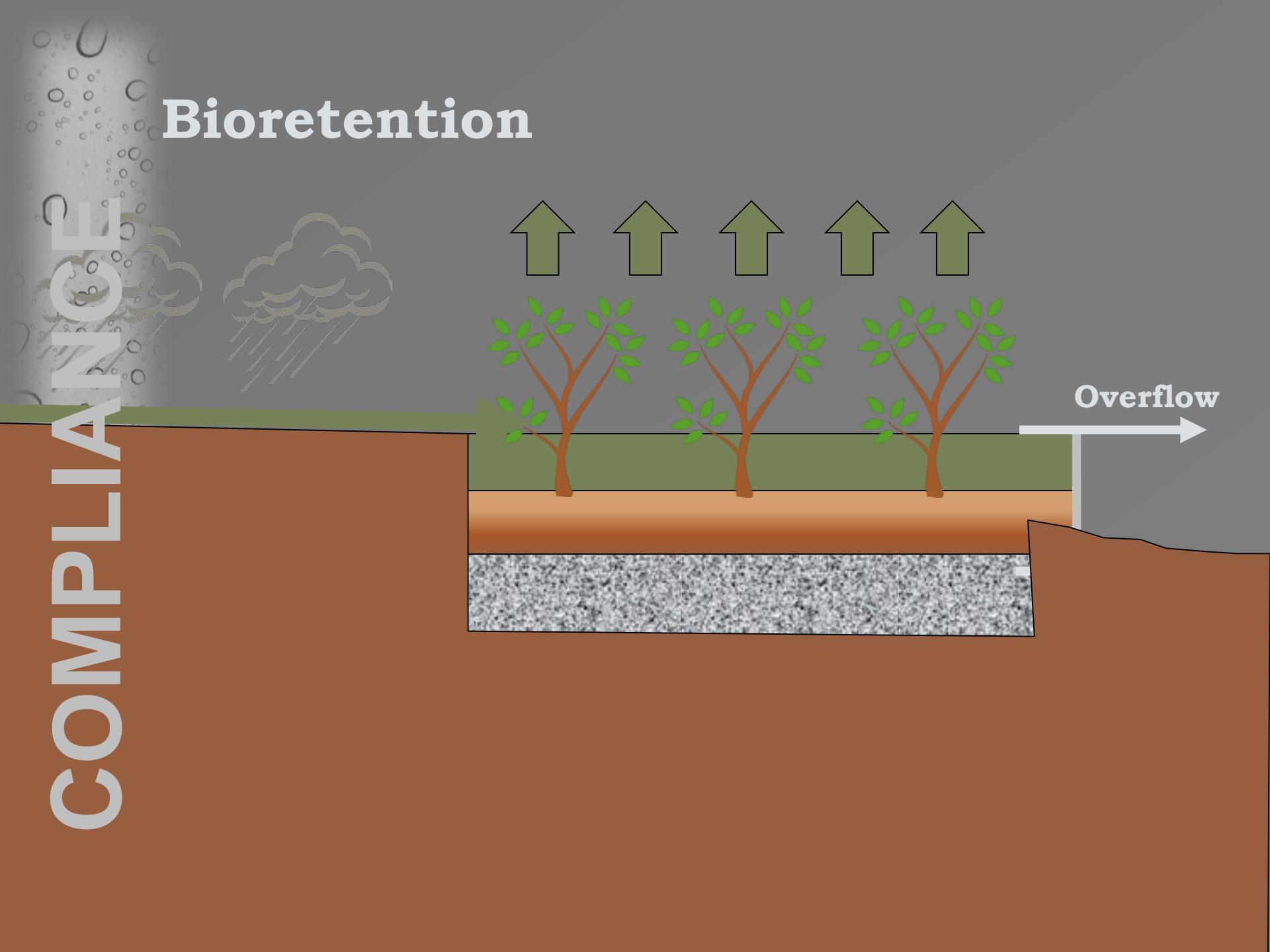
High-Rate Biofilter  
•  
Vault-Based Filter



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# Bioretention

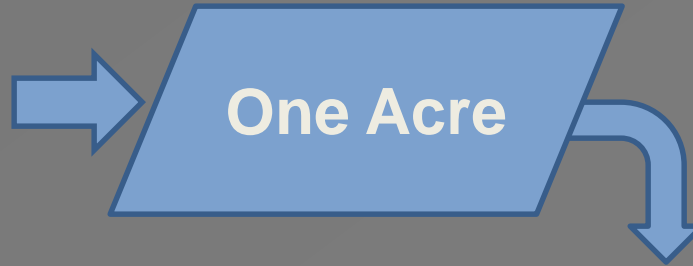
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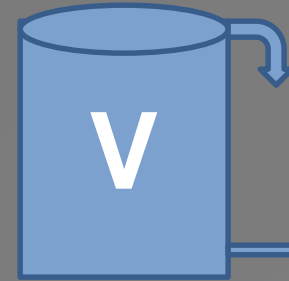
# Volume-based Criteria: Derivation

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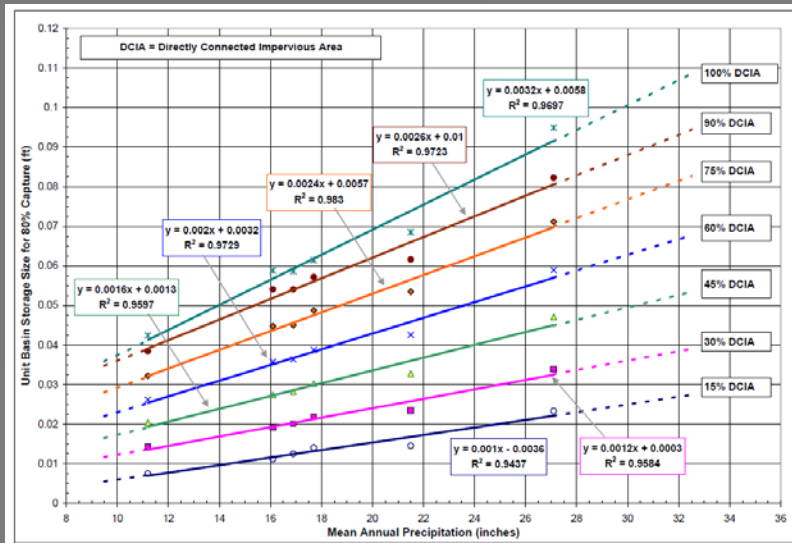
Rainfall Record	
Hour #	Gage
1	0.00
2	0.02
3	0.01
...	...



Vary V until 80% is detained and 20% overflows



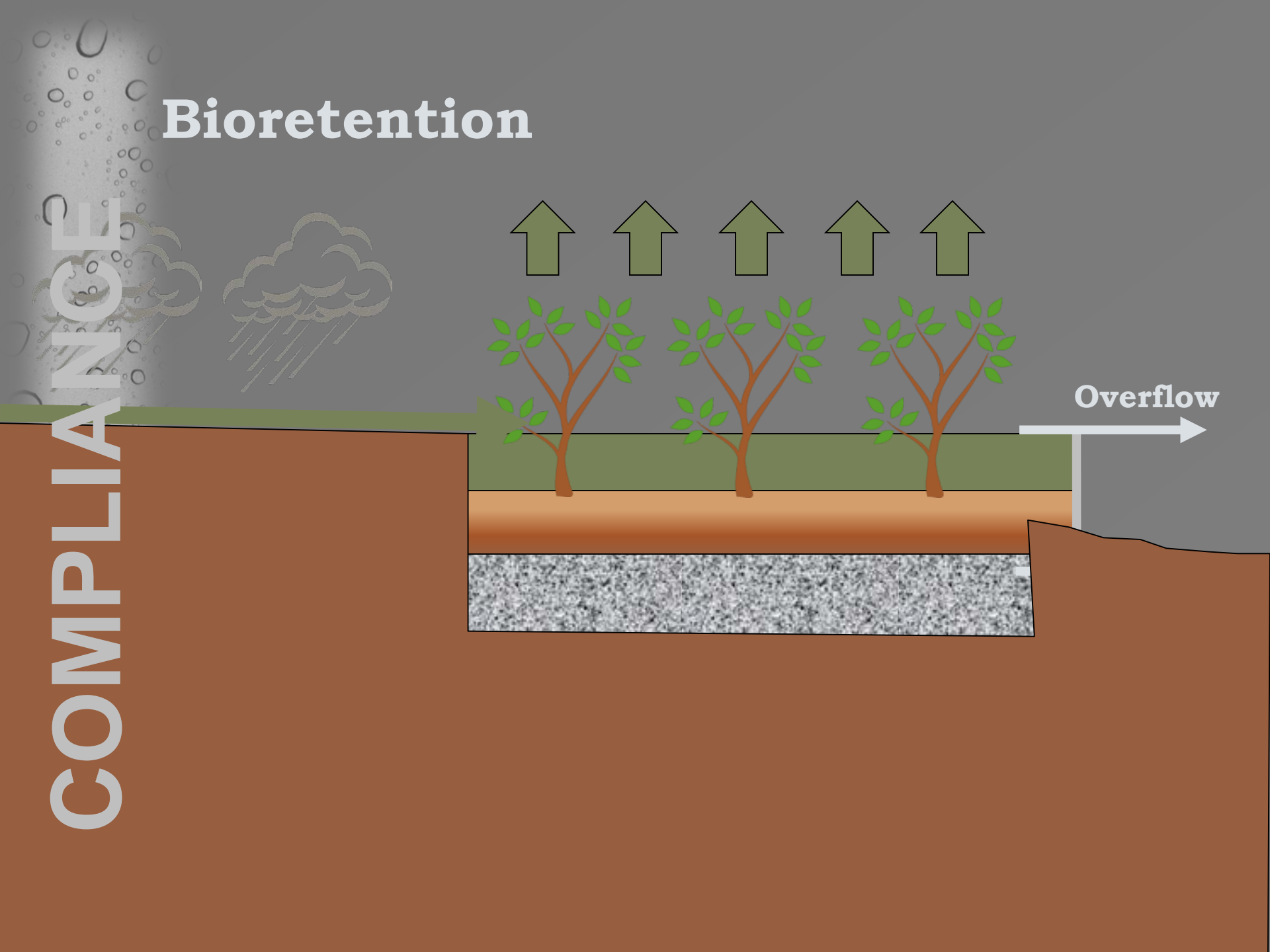
48-hour drawdown



Largest storm retained ≈ 85<sup>th</sup> percentile, 24 hour  
 ≈ 0.5" - 1.0" storm depth

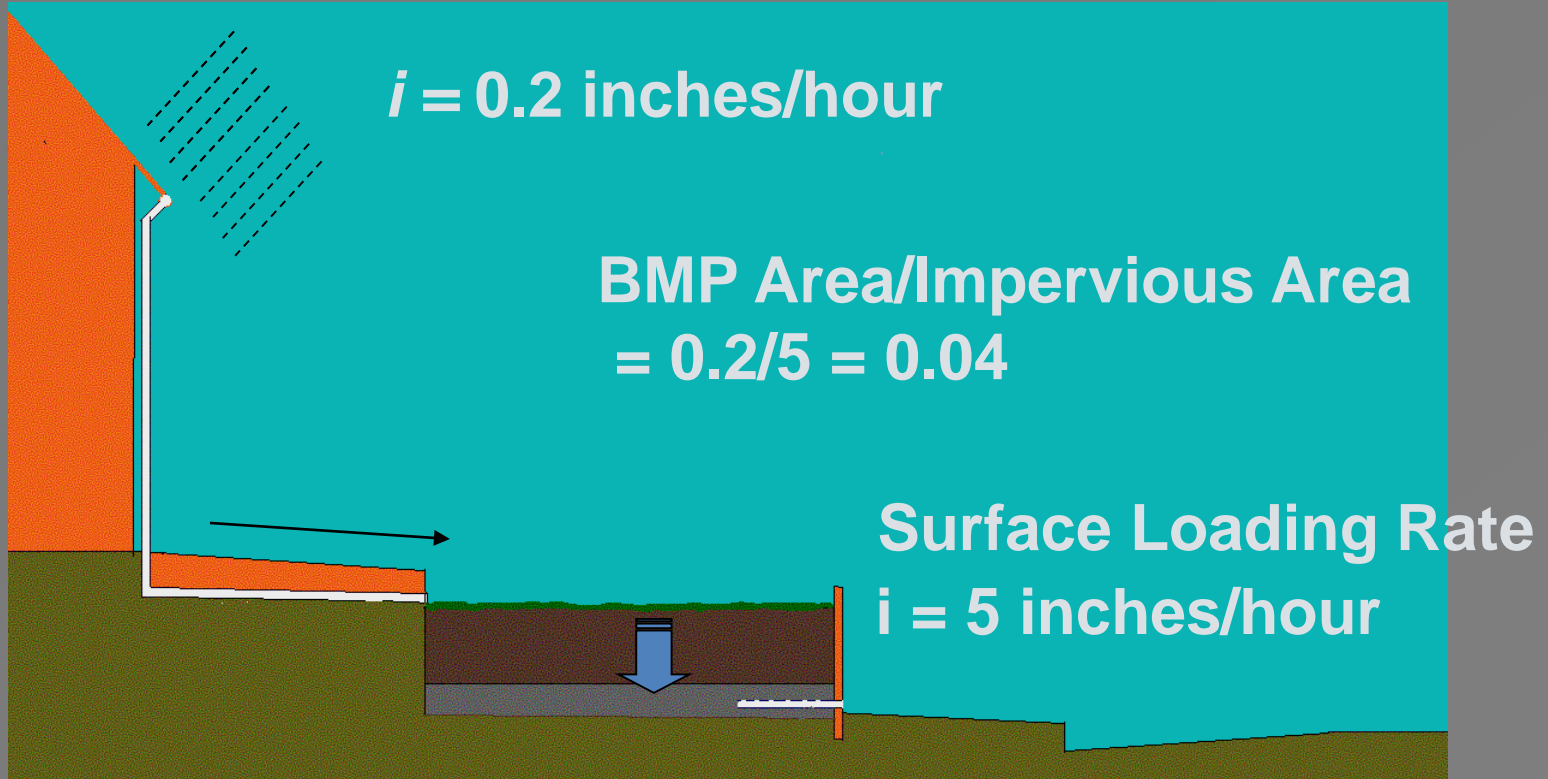
# Bioretention

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# Bioretention flow-based criterion

- MRP Provision C.3.c.i.(2)(b)(vi)
- Maximum surface loading rate





# Treatment Feasibility Tests

Infiltration	Can a bioretention facility (sized to 4% of tributary impervious area) infiltrate 80% of average annual runoff in this site's soils?
Harvesting	Is there enough demand for non-potable water to reliably use 80% of average annual runoff from all or a portion of of the site's impervious area?
Bioretention	Does the project fit Special Project Category A, B, or C?  (Reporting) Do technical or economic factors preclude bioretention?

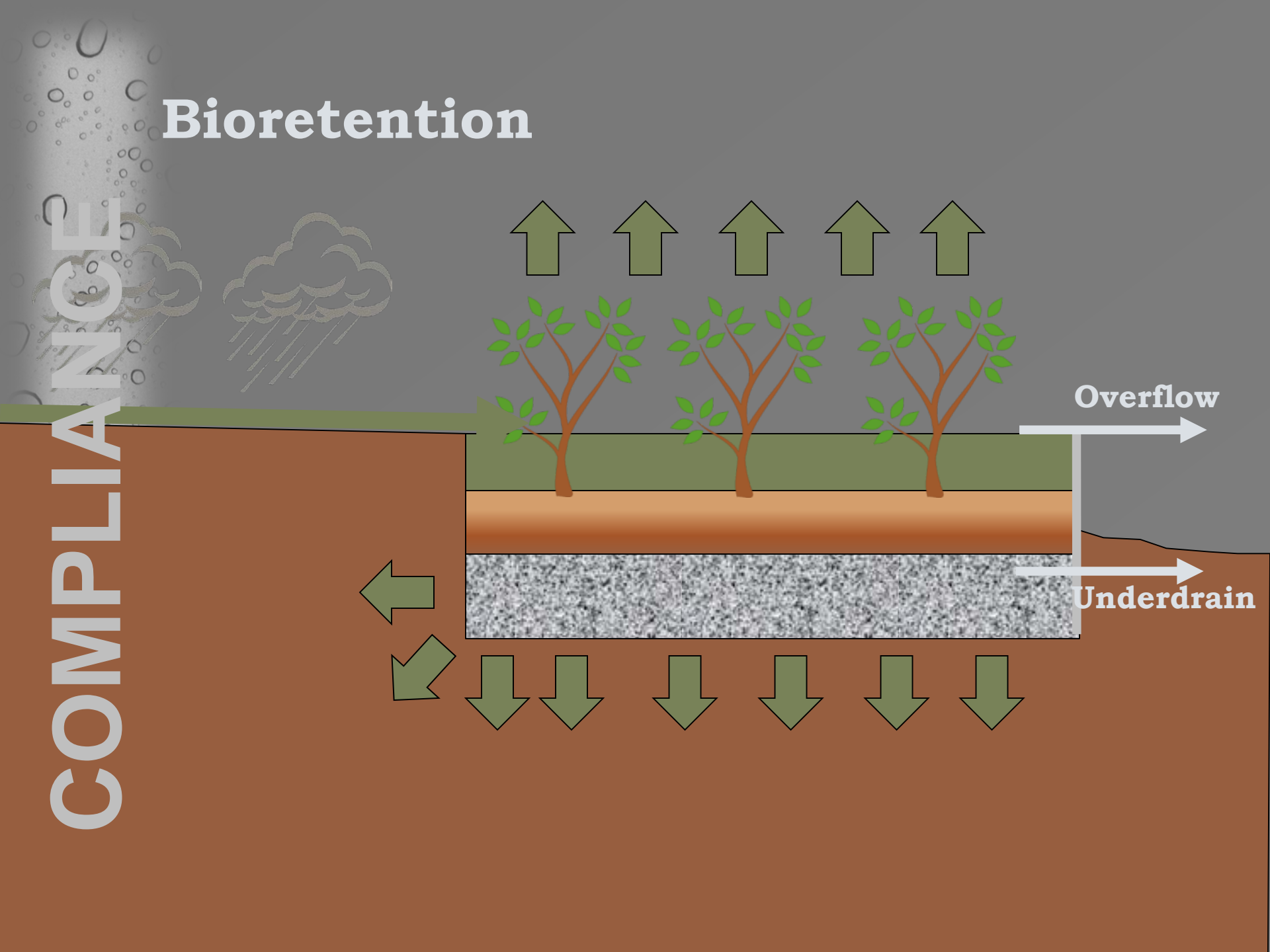
# Alternative Compliance



- Treat runoff from an equivalent impervious area offsite
  - At another site
  - Within a project site
  - On a road project
  - Within a Capital Improvement Program
- Payment of in-lieu fees
  - Net environmental benefit

# Bioretention

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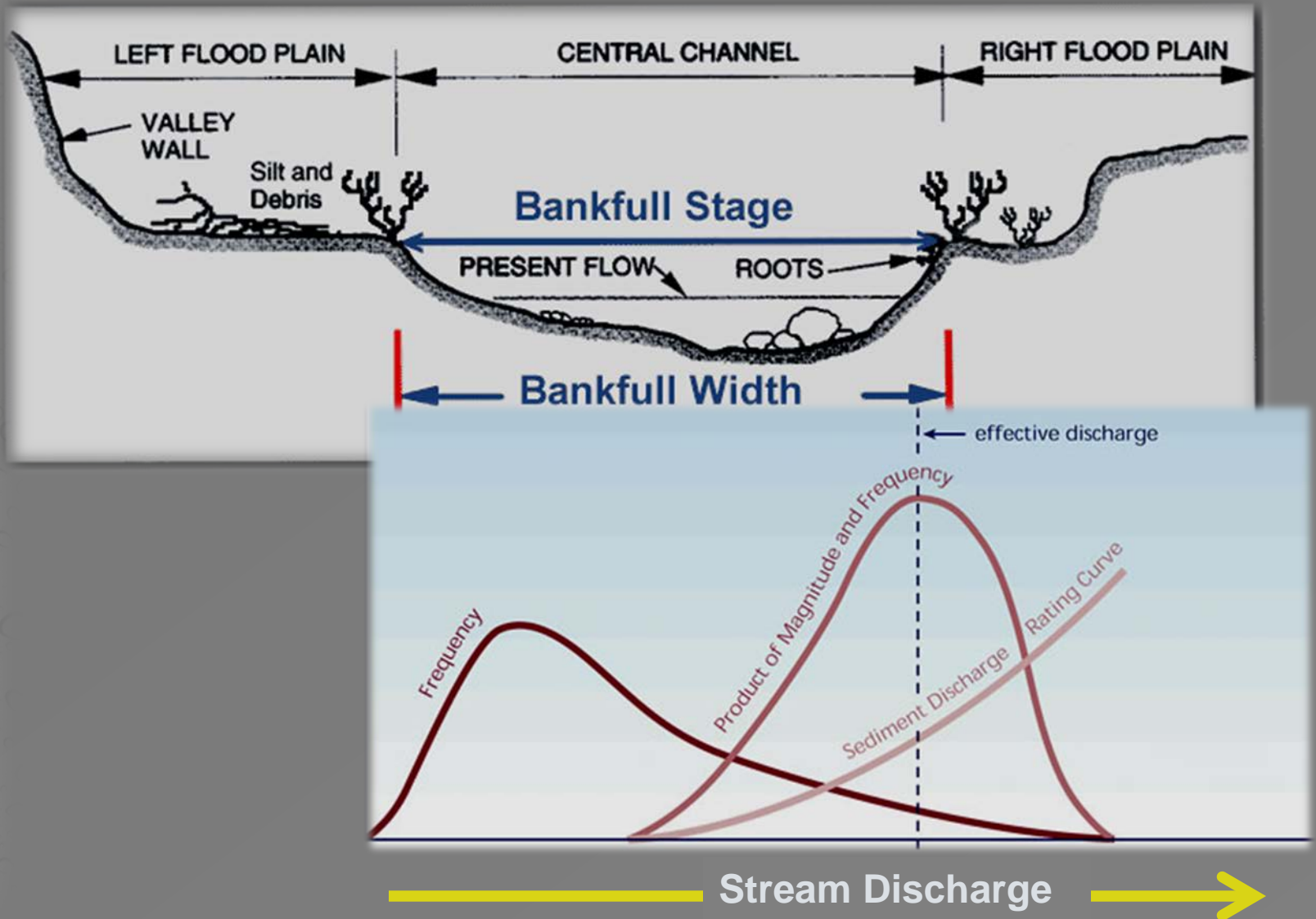


# Bioretention Soil Mix Criteria

- Soil Mix Specification
  - 60%-70% sand
  - 30%-40% compost
- MRP Attachment L
- *Guidebook*  
Appendix B
- Now available from  
local suppliers



# Hydromodification Management



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# Flow Duration Control

Hour #	Flow (cfs)
1	0.0
2	0.0
3	0.1
4	0.1
5	0.0
6	0.2
7	1.5
8	0.6
Etc.	

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# 250,000 hours

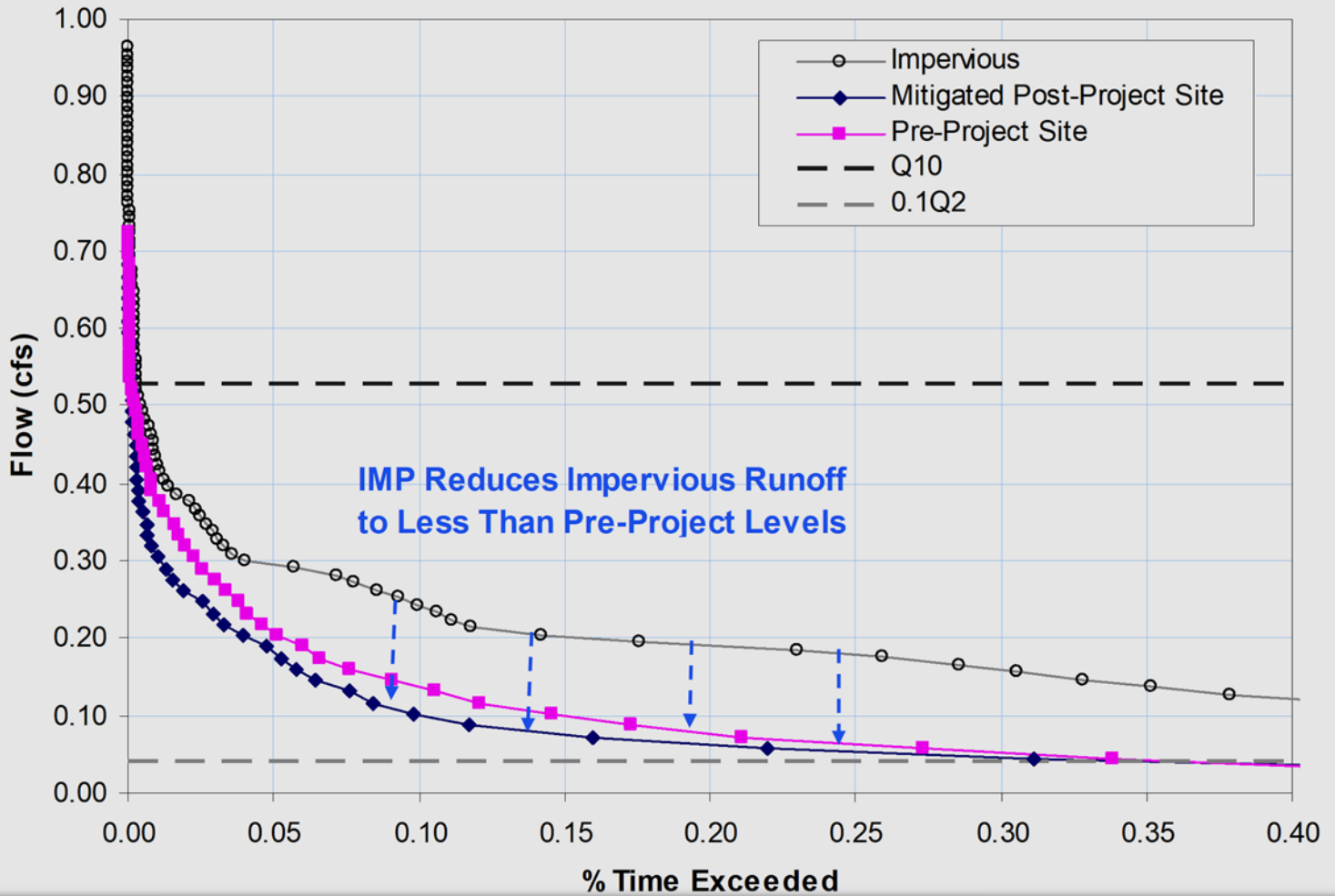
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Hour #	Flow (cfs)	Hours exceeded
115241	10.3	0
4598	10.3	1
3672	10.2	2
115242	10.0	3
243581	10.0	4
66058	9.9	5
75291	9.8	6
186540	9.7	7
Etc.		

This flow exceeded during 2 hours/250,000 hours (0.0008%)

This flow exceeded during 7 hours/250,000 hours (0.0028%)

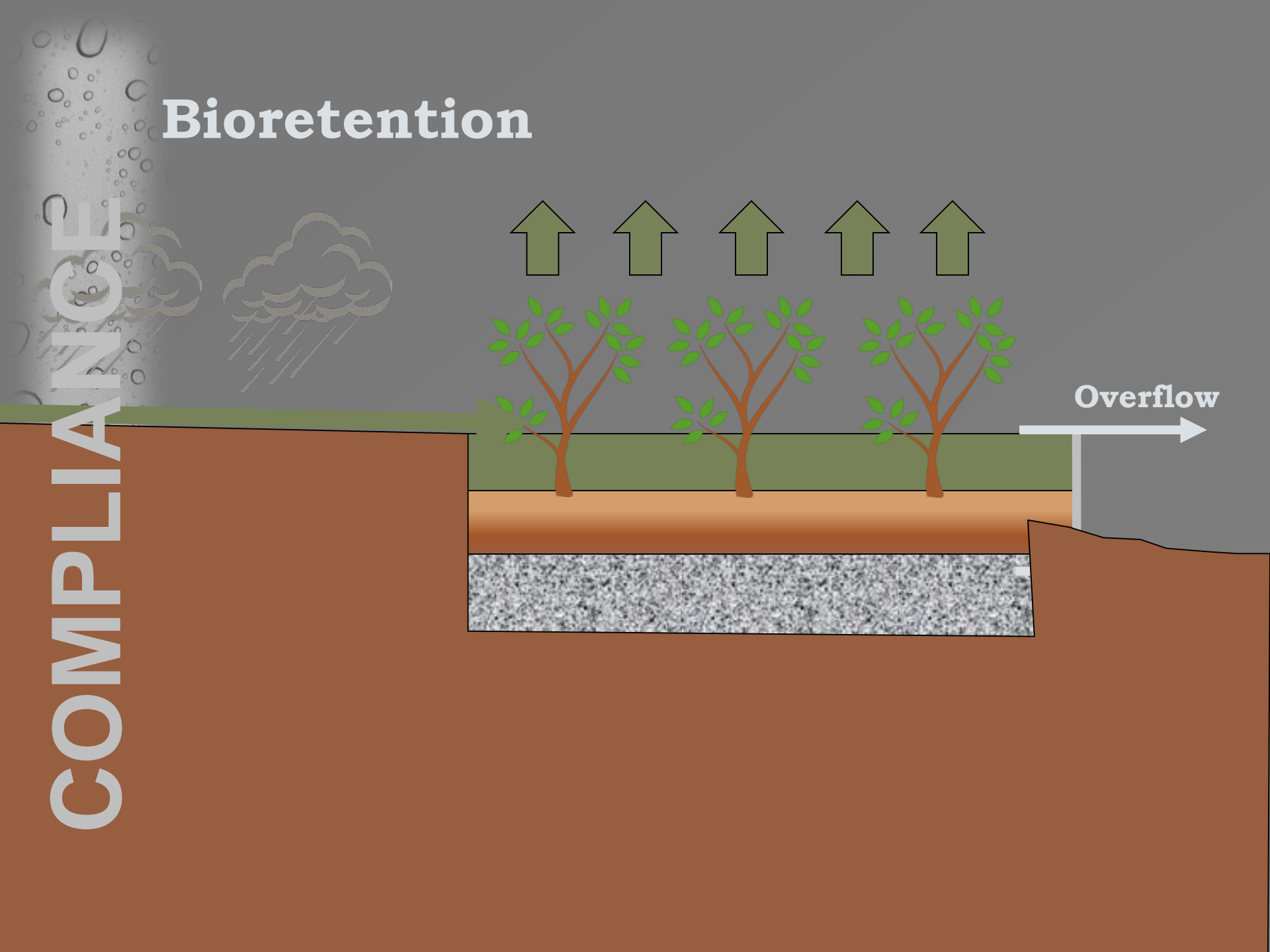
# Flow Duration Control



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# Bioretention

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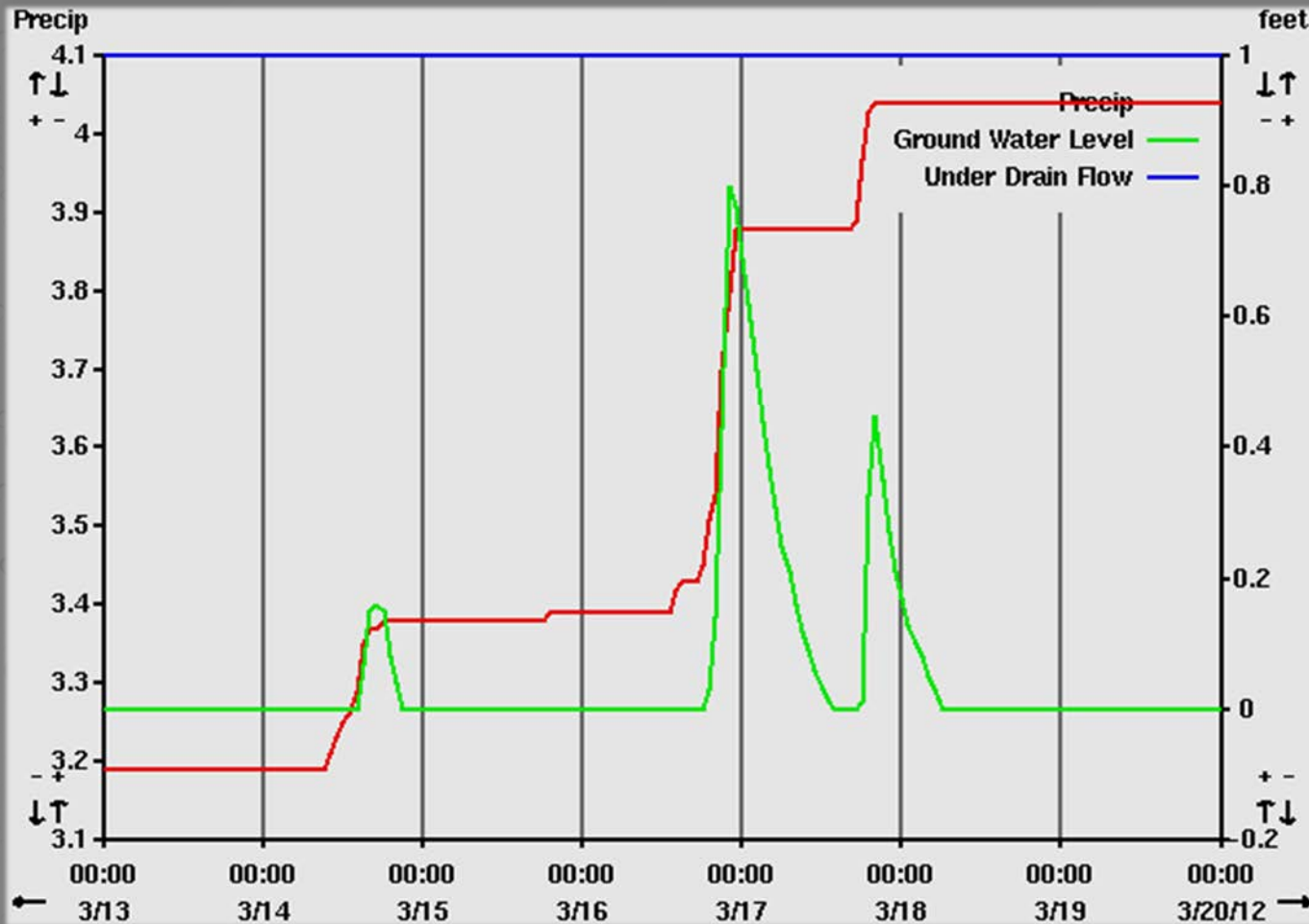


# Bioretention Monitoring

- Three bioretention facilities in Pittsburgh
- Clay soils (Hydrologic Soil Group “D”)
- Underdrain discharge near top of gravel layer
- Tipping buckets below each underdrain discharge
- Pressure sensors at bottom of monitoring wells to measure saturated depth of gravel layer
- Continuous monitoring during WY 2011-2012



# Some Initial Monitoring Results



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# Ensure Operation & Maintenance

- Initial inspection within 45 days
- Inspect 20% of facilities each year
- Inspect every facility once every 5 years



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# Achieving Goals and Compliance

- Consistent implementation
  - LID Design to maximize retention
  - Documentation
  - Construction
- Innovation
  - Harvesting and Reuse
  - Green Roofs
  - Bioretention
    - Multi-use landscapes
    - Retrofits
- Fact-based advocacy