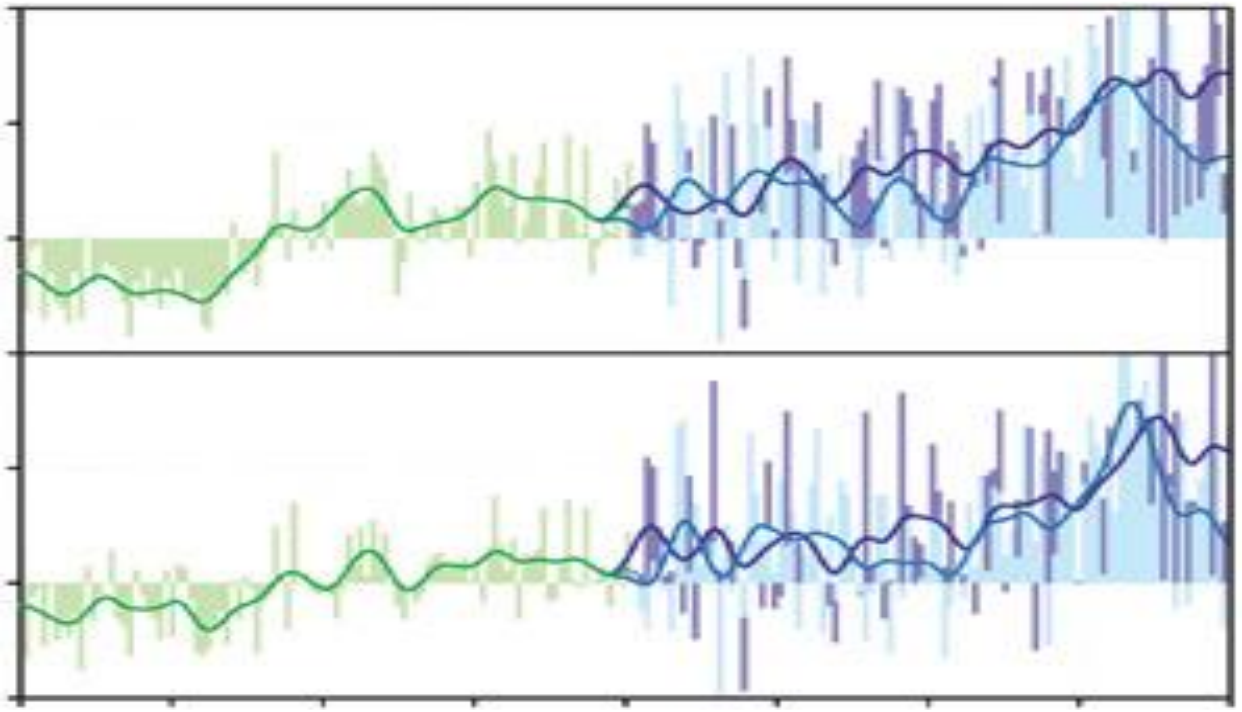
Managing Current and Future Flooding Risk in the Urban Landscape



Key Topics

- What's at risk from extreme storms
- A primer on design storms and managing municipal risk
- Hydrologic design for stormwater BMPs to handle runoff
- Most vulnerable urban BMPs
- BMP Adaptation and Resiliency Strategies

What's at risk in our community?

Public Infrastructure

- Sewer pipe network
- Roads, streets and storm drains
- Bridges, culverts and crossings
- Water pipe distribution system
- Dams, embankments and flood control practices
- Public stream restoration projects
- Public stream corridor or waterfront
- Wastewater treatment plants and public works yards (floodplain)

Private Property

- Expansion of 100 year floodplain insurance boundaries
- Residential flood damage
- Shoreline engineering to prevent erosion
- Bank erosion/tree canopy loss
- Failure of privately- owned stormwater systems

A wide range of municipal stormwater risks to manage through engineering criteria

- Public safety risk – failure puts life at risk (flash flooding)
- Interruption in public utility service (damage to water lines, road closure, etc.)
- Damage to private property, especially in flood zones
- Damage or failure of public or private stormwater infrastructure (BMPs and stormwater conveyance/culverts/crossings etc.)
- Increased long-term cost to maintain stormwater infrastructure
- Loss of BMP function and CBP reduction credit
- Capital cost to relocate, replace or retrofit municipal stormwater infrastructure
- Degradation of public open space and habitat conservation areas
- Increased cost to manage public urban landscaping areas

A primer on stormwater engineering

FIGURE 2.5: FOUR CLASSES OF RAINFALL DISTRIBUTION

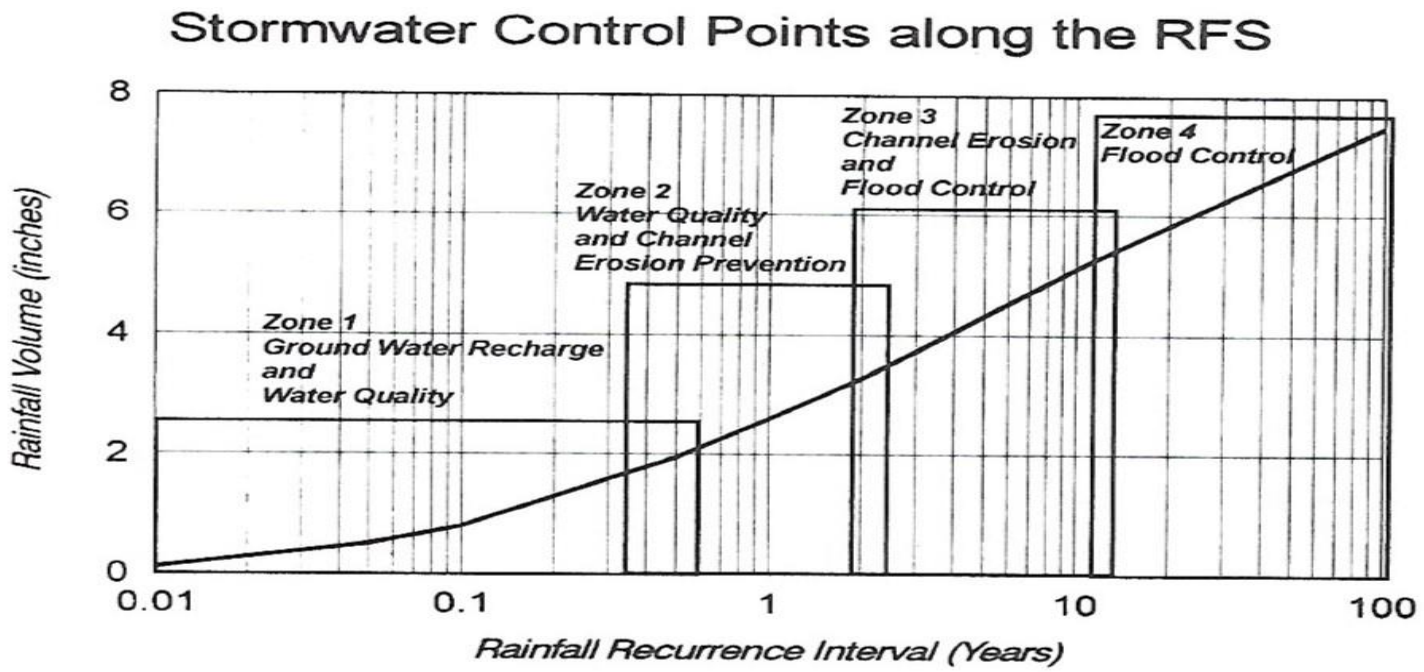


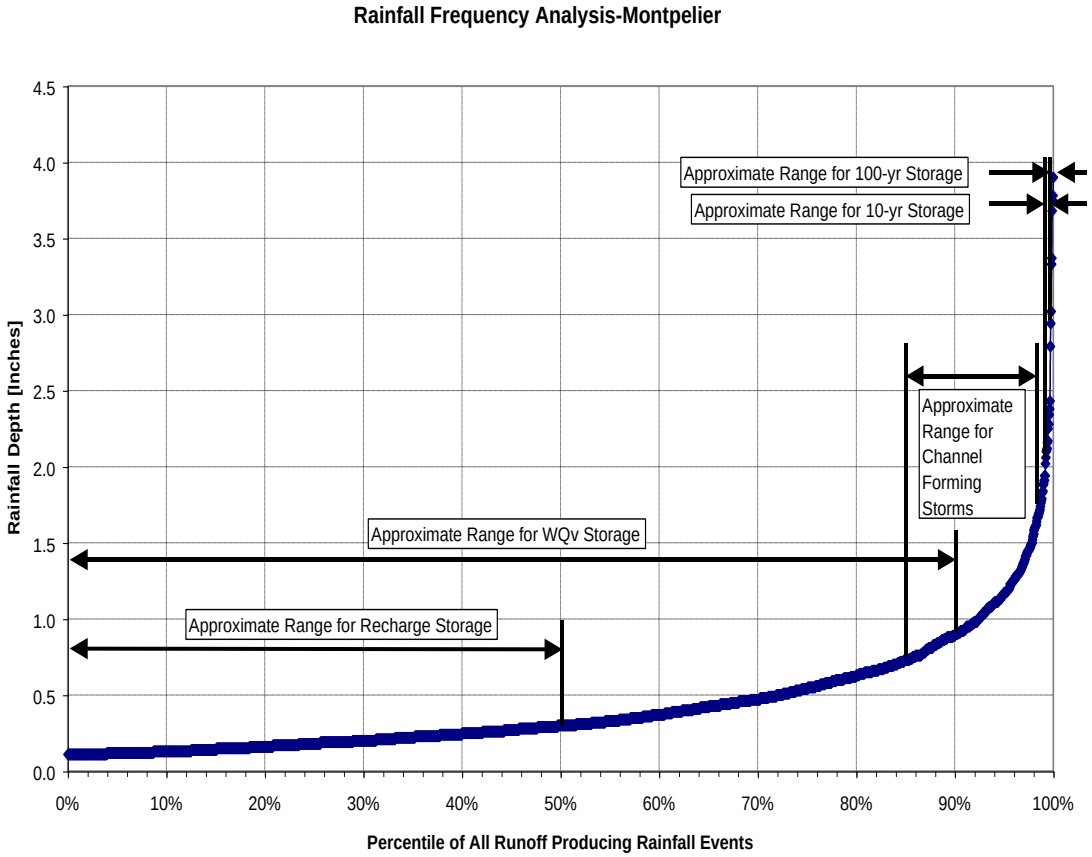
TABLE 2.11: RAINFALL FREQUENCY SPECTRUM WASHINGTON, DC AREA[a]
SOURCE: DESIGN OF STORWATER WETLAND SYSTEMS (SCHUELER, 1992)

Percent of All Storm Events [b]	Return Interval	Rainfall [c] Volume
30	7 days	0.25
50	14 days	0.40
70	Monthly	0.75
85	Bi-monthly	1.05
90	Quarterly	1.25
95	Semi-annually	1.65
98	Annually	2.40
99	Two-year	2.90

a. 50 year analysis of hourly rainfall record at Washington National Airport, excluding all storms less than 0.10 inches that were separated by three consecutive hours from the next storm. These small storms seldom produce measurable stormwater runoff, yet are numerically the most common rainfall event.

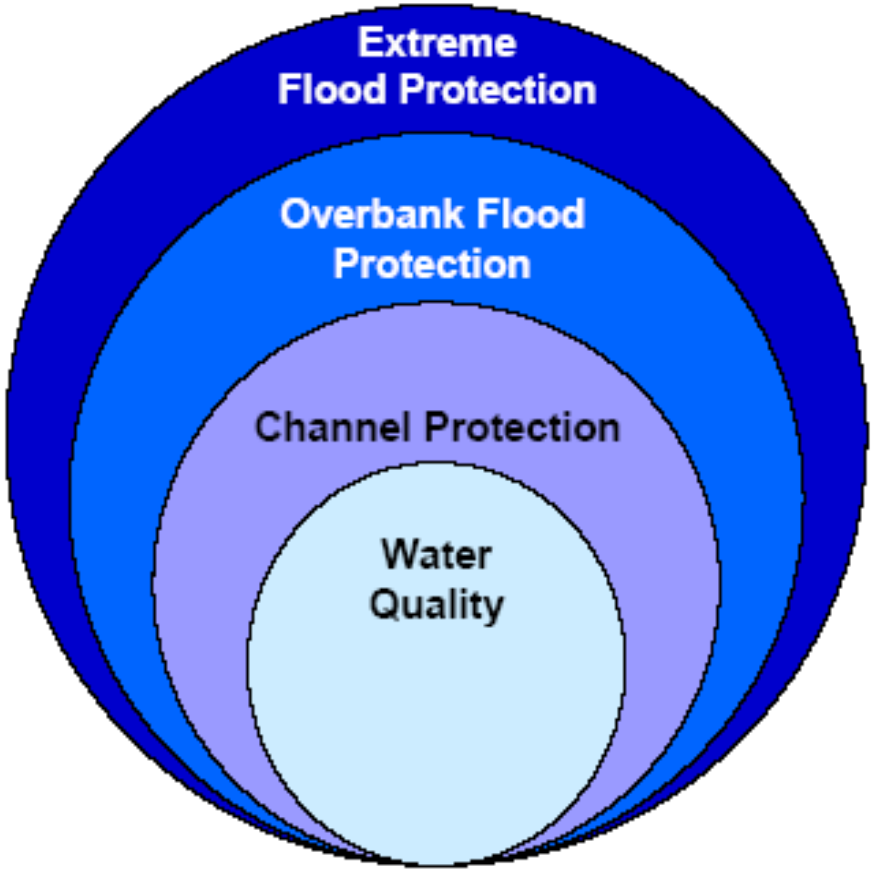
b. Equal to or less than given rainfall volume

c. Watershed inches



Intensity duration frequency (IDF) curves end up as I-F curves , since d = 24 hrs

Stormwater Volume Targets to Manage Municipal Risks

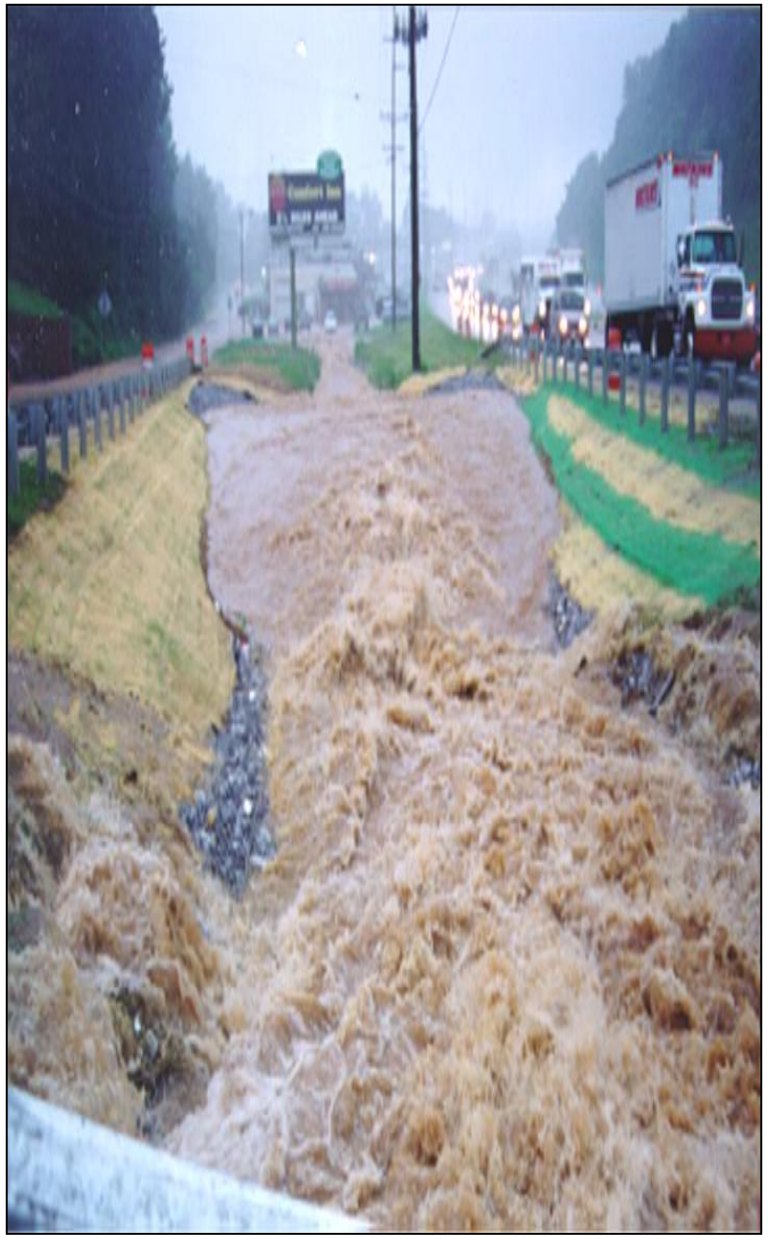


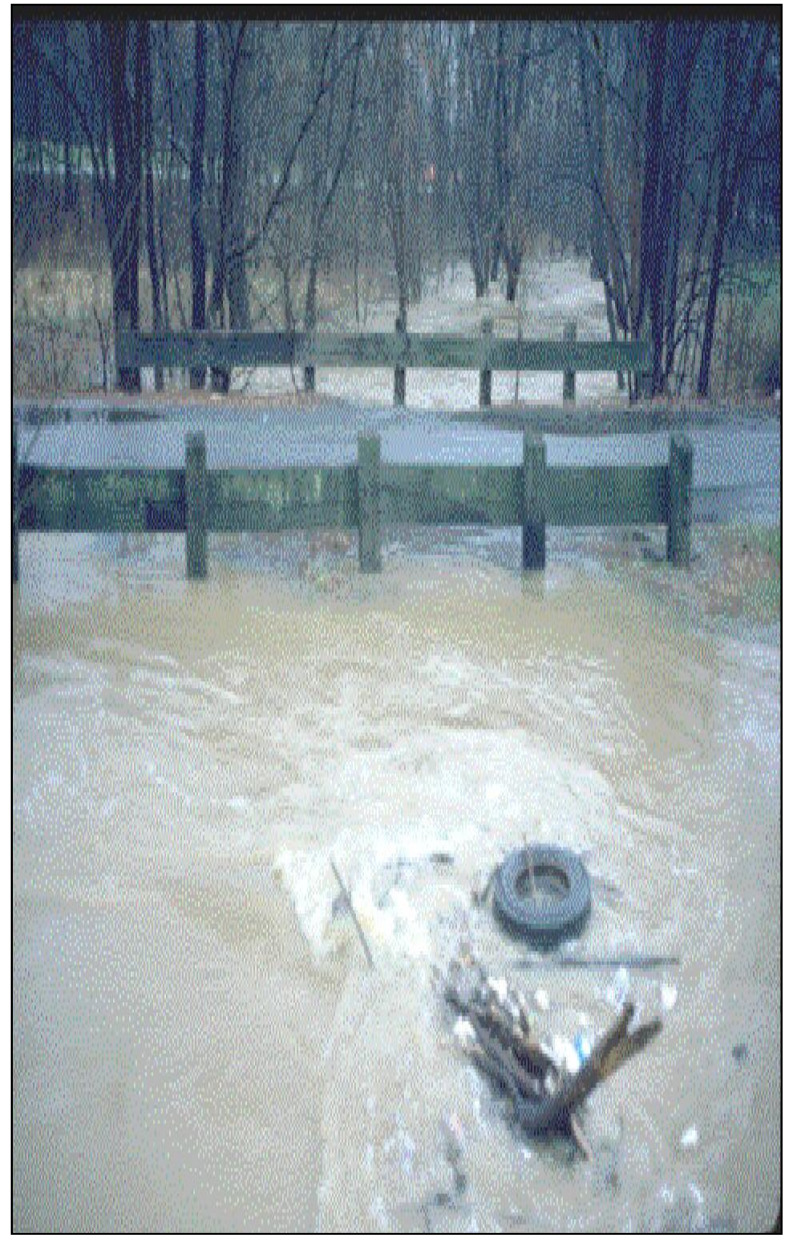
Historically Driven by Increased Subwatershed Impervious Cover Generated From Continued Urban Land Development

(a) DRAINAGE CHANNEL

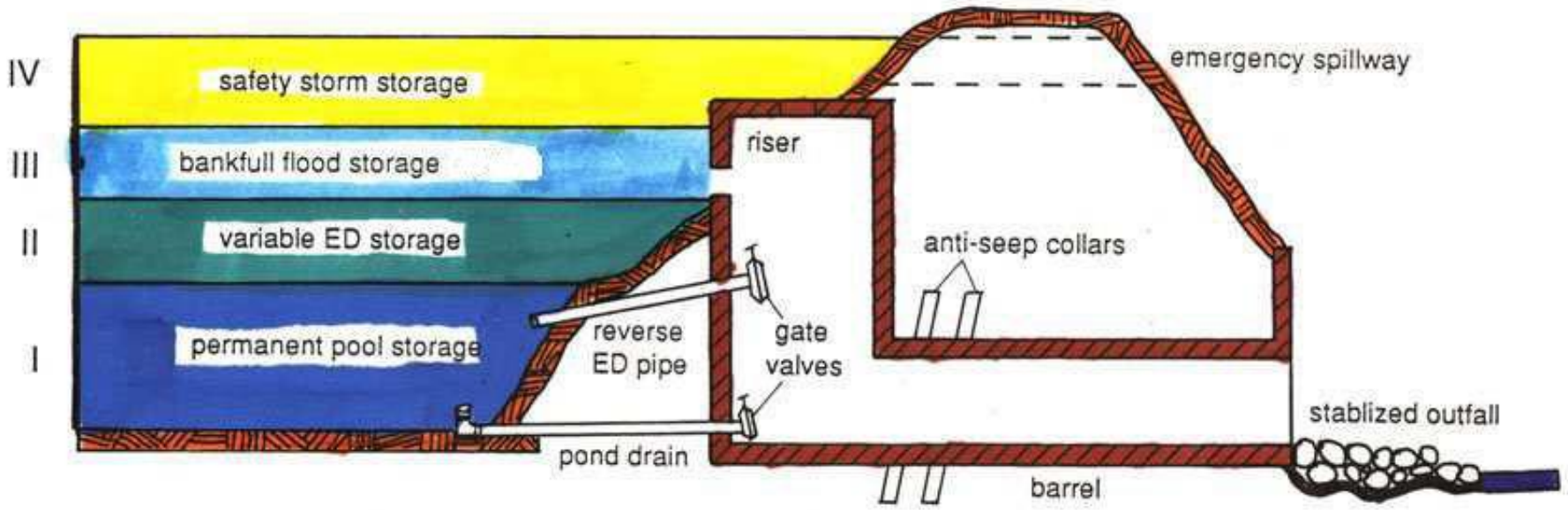
(b) GRASS CHANNEL

(c) DRY SWALE





STANDARD POND SYSTEM DESIGN
CROSS-SECTION VIEW



Source: Schueler, T. R. 1992. Design of Stormwater Wetland Systems. MWCOG

Pond BMPs are used to manage multiple design storms in one facility

Vulnerability of Urban Bay BMPs to Climate Risk

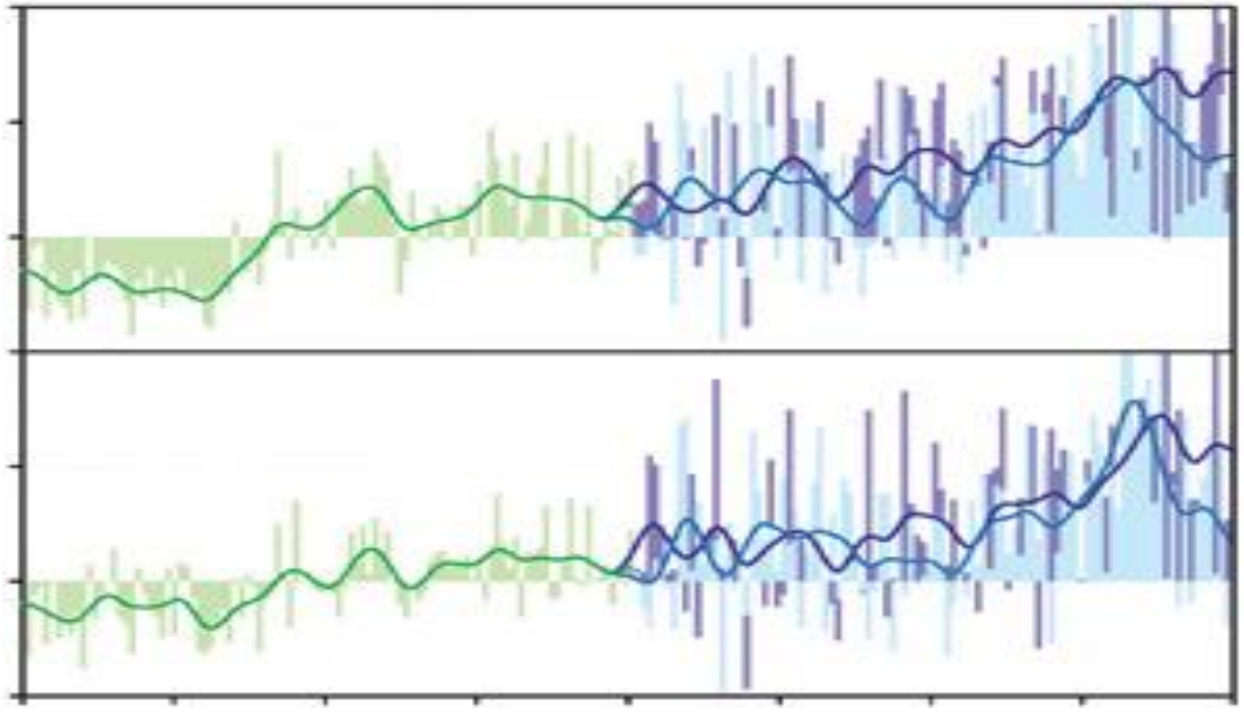
Most Vulnerable Practices

- Legacy stormwater ponds
- Stream restoration
- Pond and swale retrofits
- Stormwater conveyance practices
- Shoreline engineering of any kind
- Riparian buffers

Least Vulnerable Practices

- On-site LID Practices?
- Street cleaning
- Urban nutrient management
- Tree planting/tree canopy/conservation landscaping
- IDDE and NDGI credits
- ESC practices (temporary)
- Septic upgrades

Questions and Answers



TASK 1 OBJECTIVES

- Identify Key Stormwater Stakeholders Interested in the Effort
- Better Understand Current Engineering and Management Responses to Climate Change in the Watershed
- Get Feedback on Priority Issues and Needs

ENGAGEMENT

- Direct Outreach to 90+ key stakeholders – 5 "sectors" and 7 jurisdictions
  - Each state stormwater agency and DOT
  - 25 local stormwater managers – Phase I and Phase II communities
  - 10 researchers from 6 universities
  - 20 NGO and private sector stormwater and climate change professionals
- Broad Outreach to CRWG, USWG, CSN Network

SURVEY

- Section 1: Describing Risks and Concerns
- Section 2: Current Management Approaches
- Section 3: Moving Forward

SAMPLE QUESTIONS: SECTION 1

Q5. Of these climate-change related risks, what would you consider the greatest concern in your community?

Q6. What elements of your public or private infrastructure do you feel are most vulnerable to climate change?

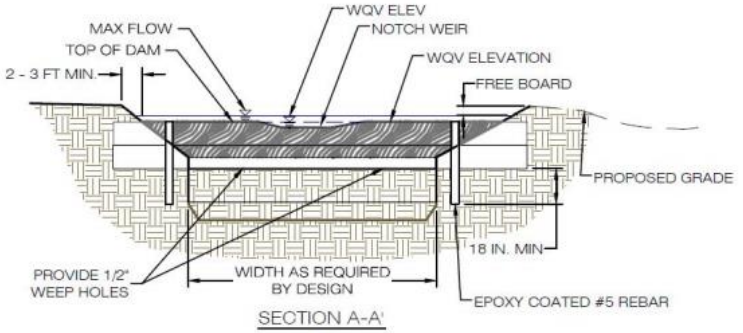
Q7. What are your greatest concerns about the effect of increased rainfall intensity on publicly or privately-owned stormwater practices in your community

SAMPLE QUESTIONS: SECTION 2

Q12. How prepared are you for the future costs/impacts of climate change to your public infrastructure?

Q15. If you do have an asset management system, database, or GIS layers, can this system map, track or otherwise identify the most vulnerable infrastructure assets in the community at risk from climate change?

Q17. What design storm(s) do you use for open channel and storm drain conveyance?



SAMPLE QUESTIONS: SECTION 3

Q24. Of the following information, please indicate what would be most useful to you if you have a need for better stormwater design specs:

Q26. How likely are you to consider the following potential strategies for reducing risk to stormwater infrastructure?

NEXT STEPS

- December 11 Survey Closes
- Analyze Results
- December 17 USWG Presentation

QUESTIONS?

SURVEY LINK: HTTPS://WWW.SURVEYMONKEY.COM/R/CSN_CLIMATE_SW