MAINTAINING THE RESILIENCE OF OUR STORMWATER PRACTICES

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Joint Meeting of the Modeling WG, Urban Stormwater WG and Climate Resiliency Workgroup

David Wood

Chesapeake Stormwater Network

Wood.CSN@outlook.com

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www.chesapeakestormwater.net/the-bubbas

Agenda & Key Questions

Key Questions:

1. Where is our stormwater infrastructure most vulnerable and what do the risks look like?

2. How do we shape the next generation of BMP design and maintenance programs to consider resilience?

Past Work:

Links to CSN Reports:

- Memo 1: Summary of Stakeholder Concerns, Current Management and Future Needs for Addressing Climate Change Impacts on Stormwater Management
  - Link:https://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2020/02/FINAL-Climate-Change-and-Stormwater-Survey-Memo.pdf

- Memo 2:Review of Current Stormwater Engineering Standards and Criteria for Rainfall and Runoff Modeling in the Chesapeake Bay Watershed
  - Link: https://chesapeakestormwater.net/download/10023/

- Memo 3:Review of Recent Research on Climate Projections for the Chesapeake Bay Watershed
  - Link: https://chesapeakestormwater.net/download/10027/

- Memo 4:Vulnerability Analysis and Resilient Design Considerations for Stormwater Best Management Practices
  - Link: Coming Soon

Previous Work

Key Takeaways

Takeaways:

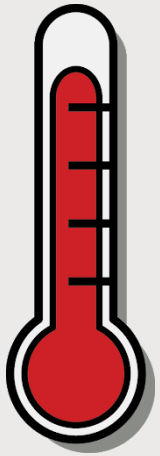
1. Stormwater professionals across the watershed are not comfortable with the current quality and utility of engineering design criteria on future rainfall intensity as currently provided by state and/or federal authorities.

2. Each state and the District of Columbia uses different design criteria. Further, within states, there are often differences in how design storms and precipitation data sources are discussed by departments of transportation, environmental regulatory agencies and the departments overseeing dam safety.

3. Engineering design criteria and stormwater runoff models generally rely on Atlas 14. Multiple studies suggest that stormwater design based on historic precipitation analysis are likely to underestimate future precipitation.

4. Work to develop climate change projections with the temporal and geographic resolution needed for stormwater modeling is ongoing.

Changing Conditions



2-3°F of warming

5-35% increase in precip intensity

1-2 feet of sea level rise

<u>In 30 years, Bioretentions will see:</u>

- Shifting vegetation palettes
- More sediment mobilization in CDA
- Additional rainfall volume in similar # of events
- Rising water tables in coastal areas
- Unknown impacts on pollutant removal efficiency



Key Question #2

Where is our stormwater infrastructure most vulnerable and what do the risks look like?

Urban BMP Risk and Vulnerability

Catastrophic Failure	Complete failure of the practice to perform its design function, resulting in risk to human health and public safety
Structural Failure	Complete failure of the practice to operate as designed, but with no immediate risk to public safety
Water Quality Performance Failure / Water Quantity Performance Failure	Practice still exists and may perform some intended functions, but either no longer provides any pollutant removal or leads to impacts on downstream floodplain boundaries
Diminishing Performance	Practice still exists provides some pollutant removal function, at a diminished rate
Anticipated Failure	Some degree of failure or loss of performance was anticipated due to causes unrelated to climate change

Key Factors:

Location in the Watershed

Age

Maintenance/Design Condition

Upland “LID” Practices

- Maintenance “needy”,
- Primarily designed for water quality

- Vulnerabilities:
  - Erosion (in and out)
  - Bypass/Overflow
  - Clogged Filter Media

Conveyance Practices

- Serves as choke point that can elevate risk elsewhere
- Impacts on transportation infrastructure
- Vulnerabilities:
  - Erosion (in and out)
  - Loss of Capacity

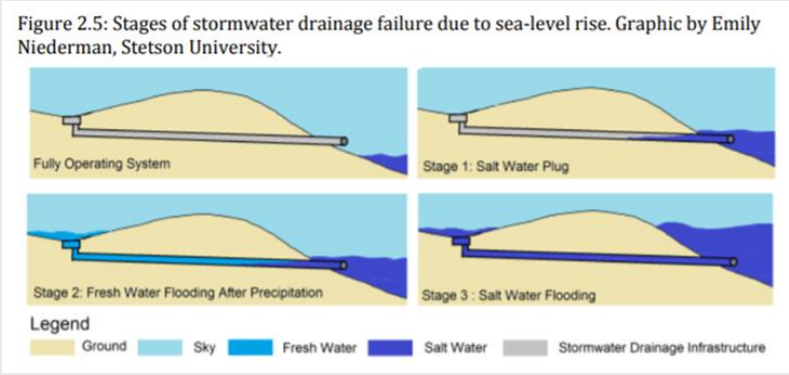


Figure 2.5: Stages of stormwater drainage failure due to sea-level rise. Graphic by Emily Niederman, Stetson University.

Pond Practices

- Potentially high impact on public safety
- Older practices
- Vulnerabilities:
  - Erosion
  - Sedimentation
  - Emergency Spillway
  - Leaching and Resuspension

Stream Corridor and Shoreline Practices

- Most “online”, w/ large CDA
- Designed to withstand floods, not reduce them
- Vulnerabilities:
  - Structural elements of restorations
  - Increased erosion

Other Urban Practices

- Data is lacking for programmatic BMPs (Street sweeping, UNM, NDGI)
- Tree BMPs are somewhat better understood, but again lack data
- Vulnerabilities:
  - Variable by practice

Key Question #3

How do we shape the next generation of BMP design to consider resilience?

More Resilient Design

- "Smart" BMPs
- Treatment Trains
- Inlet/Outlet Plumbing
- "PEDs"
- Better maintenance programs

What's Next

Full Memo to Debut at January USWG

- Will include recommended actions for Bay Program partners for each practice type
- Will introduce a series of resilient stormwater design principles
- Can serve as potential kick-off to larger Bay Program effort to develop climate resilient stormwater workplan

QUESTIONS?