

# Climate Impacts to Restoration Practices

Restoration Research Question B.5 in FY 19 RFP

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# Research Question and Hypothesis

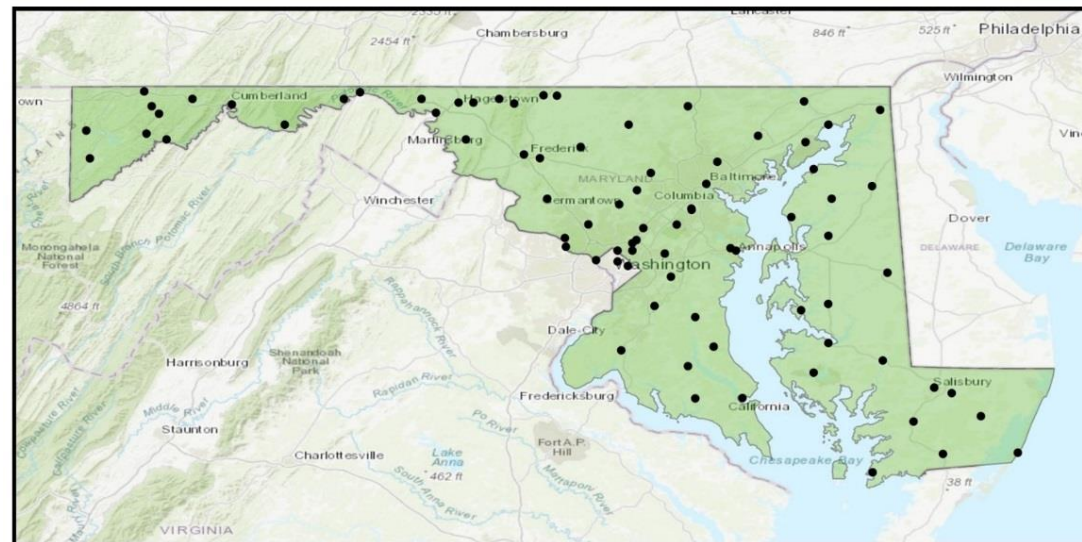
- Climate change models predict that frequency and intensity of rain events will increase. How will that affect BMP performance?
- Hypothesis: BMP and restoration designs based on historic weather may be inadequate to achieve desired levels of service for pollutant removal and habitat protection under future climate



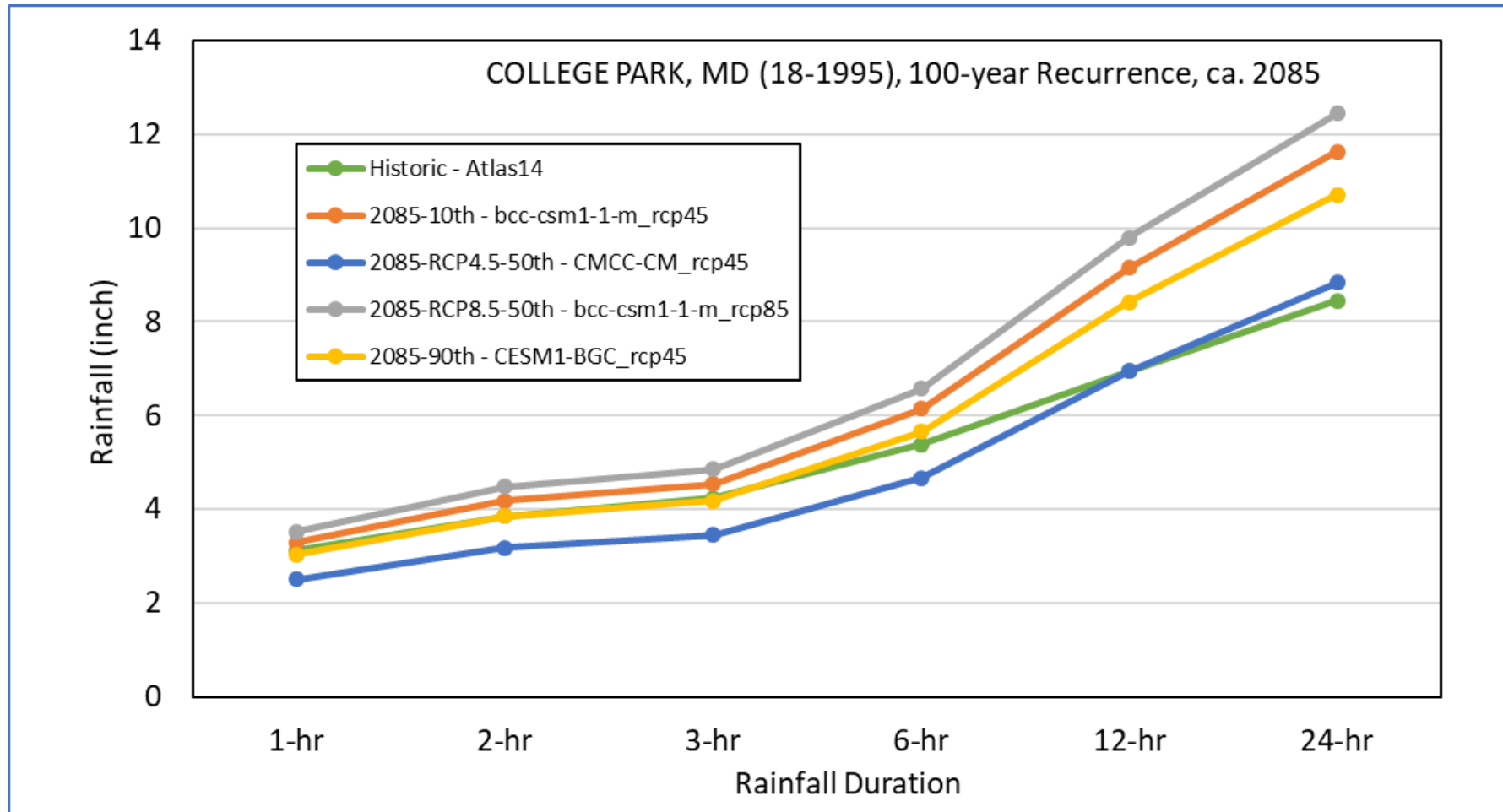
*If you design a BMP to capture a one year storm and the one year storm gets bigger, the BMP overflows and there is less treatment than is expected.*

# Efficient Methods Enable Estimates of Precipitation and Runoff throughout MD

- Statistical approach to update NOAA Atlas 14 IDF (intensity duration frequency) curves based on change in climate models
- Application of SWMM5 to convert rainfall to runoff and simulate best management practice (BMP) performance
- Estimate range of futures to which adaptation may be needed

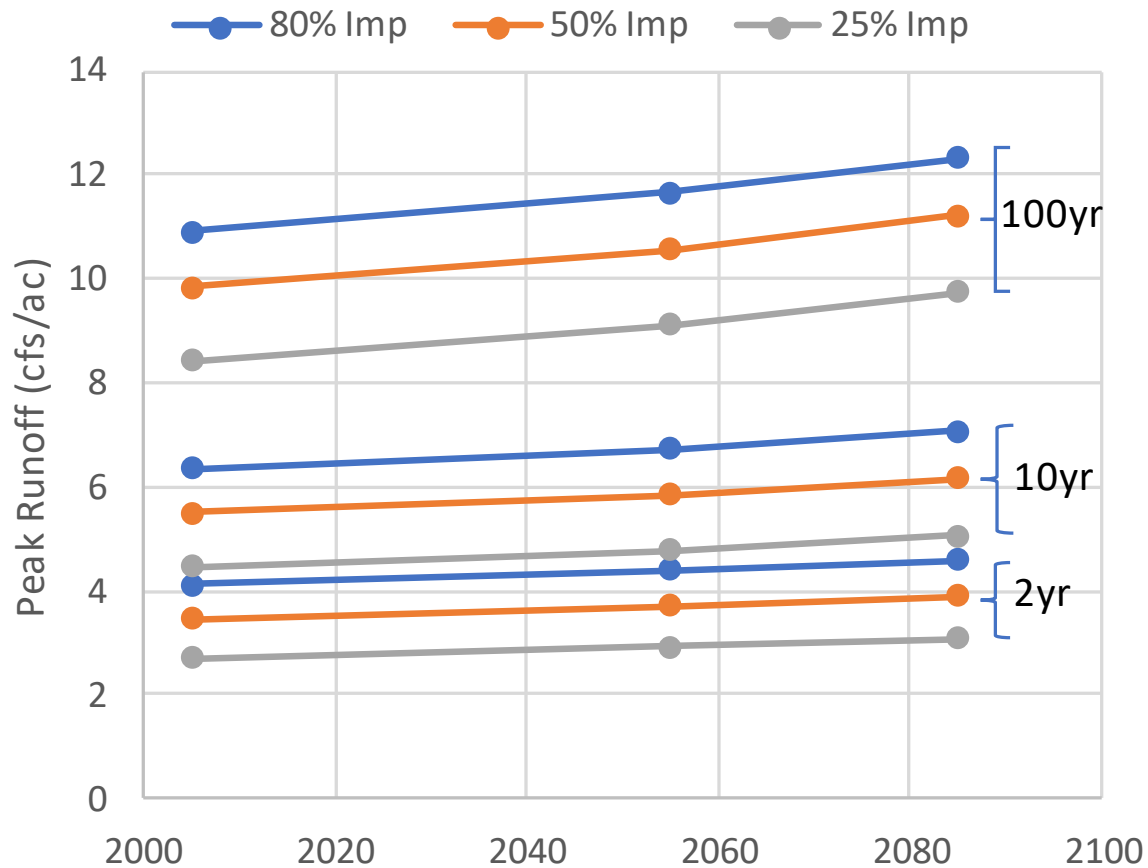


## Future IDF Curves Show a Range of Possible Conditions, with a Tendency toward More Intense Storms

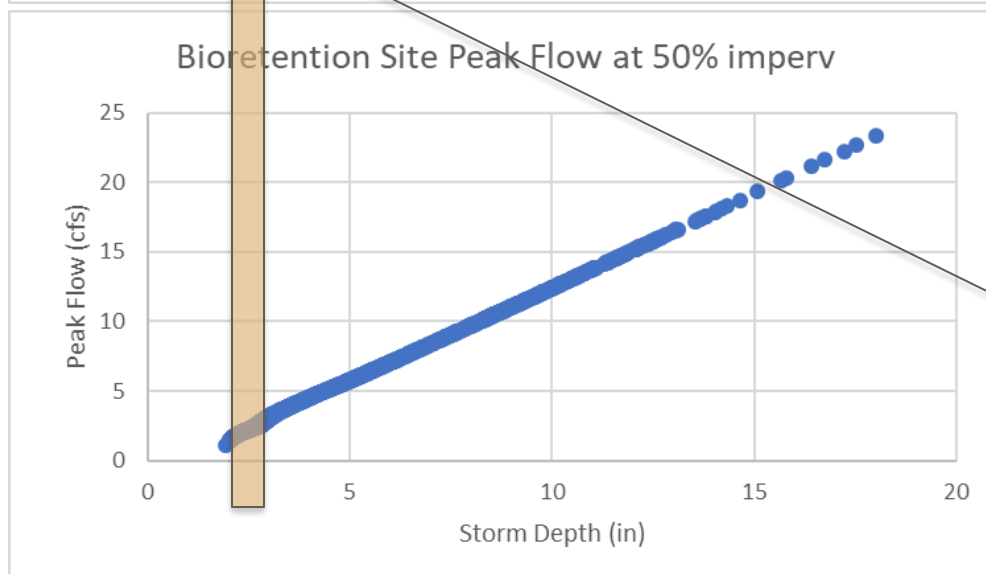
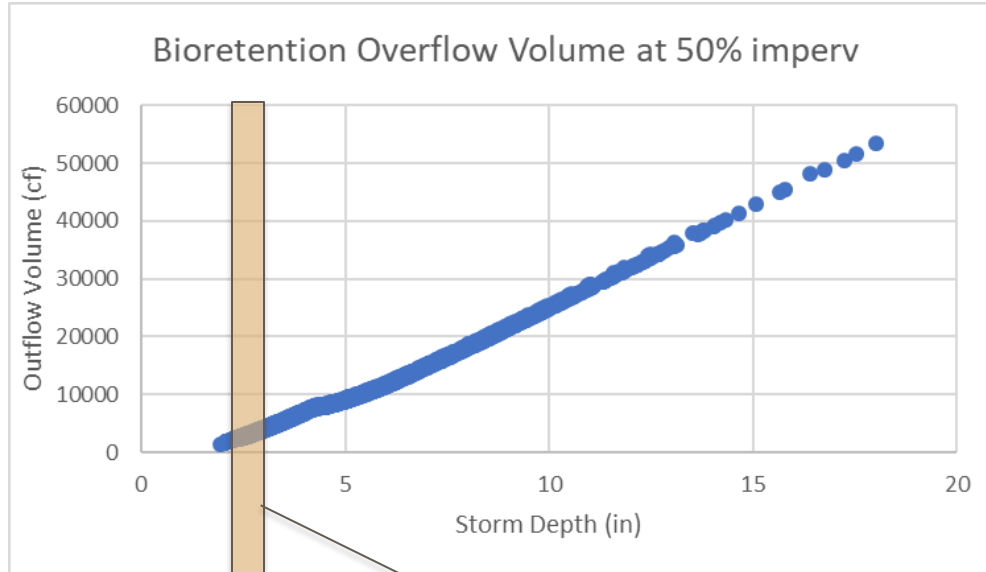


# Runoff Depends on Rainfall and Site Conditions – but the General Trend is Up

- Averages over 20,576 combinations of sites, GCMs, recurrence intervals, imperviousness
- ~14% increase in storm peak runoff rates by late century



# BMPs may not achieve expected performance as rainfall becomes more intense



- Greater fraction of runoff is bypassed and untreated
- Shortened contact time can decrease pollutant removal efficiency
- Higher output flows impact channel

Current 1 yr-24 hr storm  
(Environmental Site Design)

## Next Steps: Practical Implications

- Deliverable #6: Evaluation of how changes in intensity-duration-frequency of storm events and associated runoff may affect channel stability, road flooding frequency, and performance of BMPs designed for the historic climate
- Key questions to address:
  - What is the range of risks to which we may need to adapt?
  - Is there need to refine design specs for gray and green BMPs?
  - How might changes in runoff affect stability of stream restoration projects?
  - What strategies can enhance resilience in the face of an uncertain future?



# Acknowledgment Slide

- We thank the Chesapeake Bay Trust and partners, the Maryland Department of Natural Resources, the Maryland Department of Transportation State Highway Administration, Montgomery County Department of Environmental Protection, and the National Fish and Wildlife Foundation for funding this work
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Translation Slides by Megan Granato, Maryland  
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- Overview and take-home points
- What do I take from this if I am a practitioner
- What do I take from this if I am a regulator