Channel Protection Detention

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What is Channel Protection Detention?

- Slowly drains the storm event over a specified period of time
- Designed to prevent channel erosion
- Typical “1-year” storm is detained and slowly released
  - Released as extended detention”
  - 3.0 inches of rainfall
  - Reduces the “shear stress” (erosive forces) on the channel for large storm events

What is the Purpose of Channel Protection Detention?

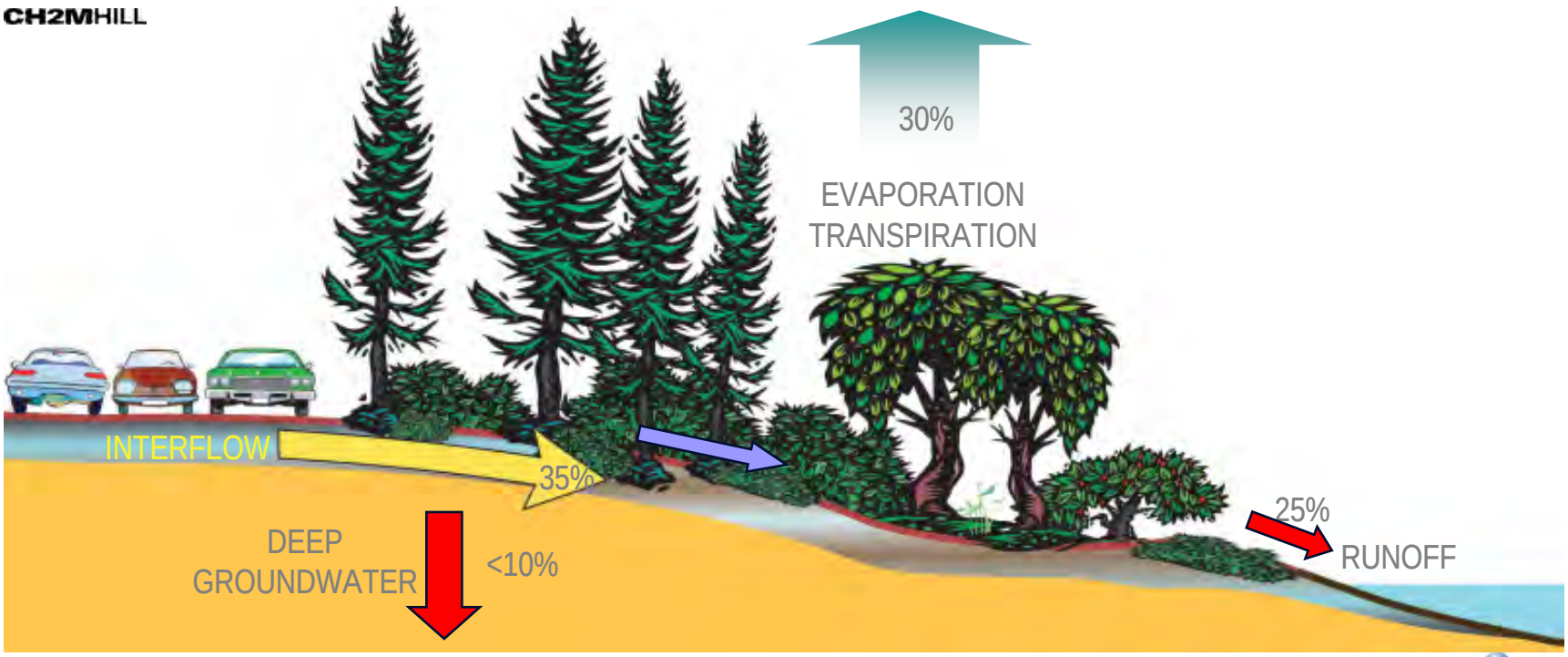
- Protects channels from erosive velocities
- Protects from unstable conditions:
  - Scour and erosion
  - Channel destabilization
- Lowers extreme flows
- Provides a level of flood protection for more frequent storms
- Releases flows over a longer period of time, preventing “super-positioned” hydrographs downstream that can actually increase flooding problems.

What does it do during big storms?

- 40% of the “100-year” storm is contained in the pond for an extended time period
  - A 100-year storm has a 1% statistical chance of occurring in any given year
  - 7.3 inches in 24 hours
- Time to drain the pond:
  - Traditional detention would release the storm event in about 15 hours
  - Ponds designed for channel protection release flow over several days.

What Causes Channel Erosion?

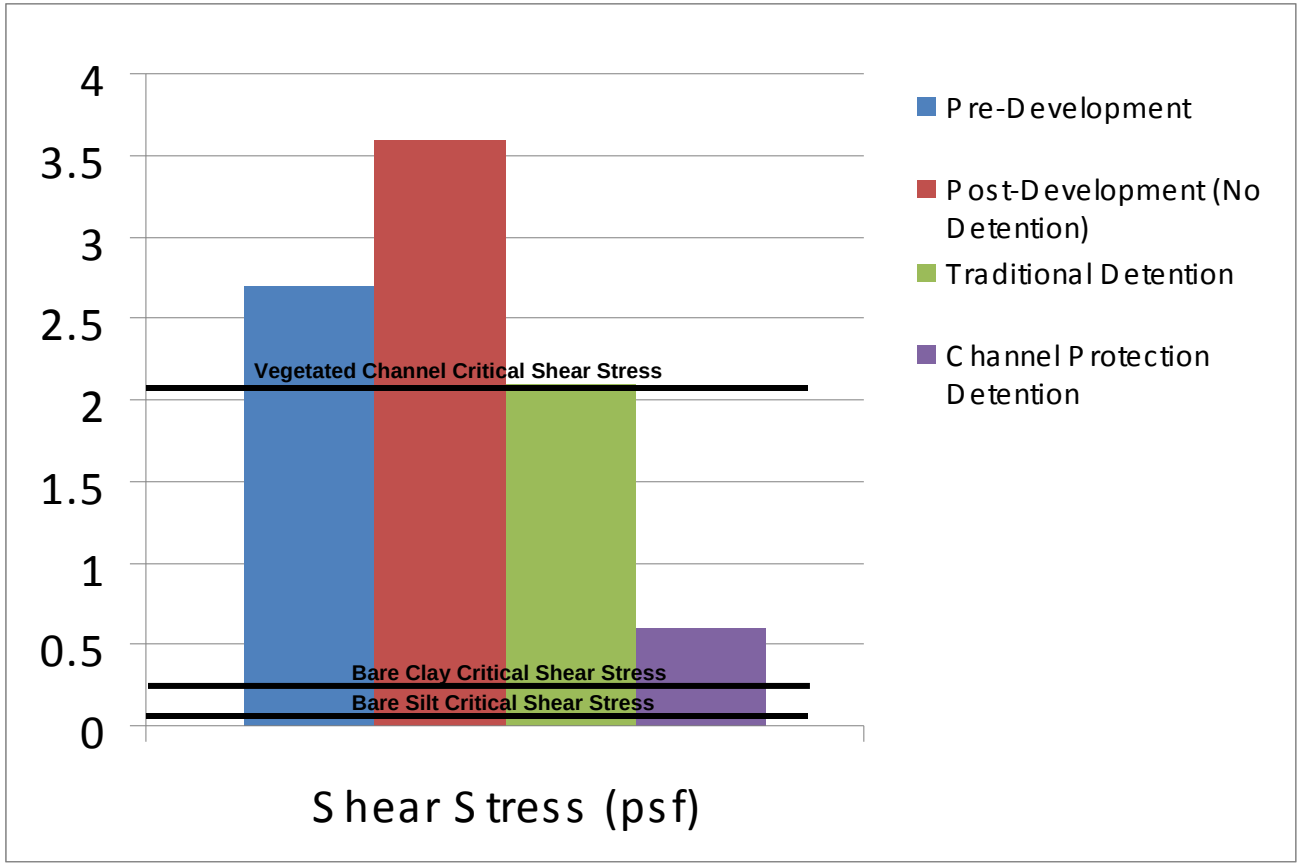
- Development increases hard surfaces that do not infiltrate rainfall
- This increases the volume of flow and increases velocity
- More flow and higher velocity increases “shear stress” (erosive forces)

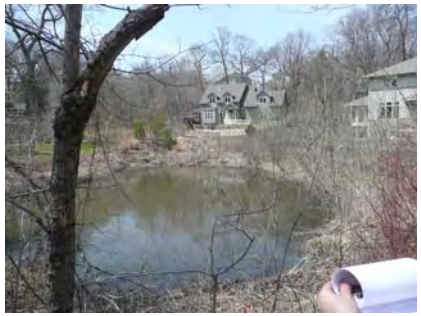


What is Shear Stress?

- Shear Stress is the “rubbing” of water moving against the bed and slopes of a creek or open channel
- The “rubbing” on the channel bed and bank is a measure of how likely a stream is to erode.
- Critical shear stress is the shear stress required to begin moving sediments.
- When the shear stress is greater than the critical shear stress for the bank material, erosion ensues and channel degradation will likely result.

1-year Design Storm Shear Stress (24 hours of rainfall)





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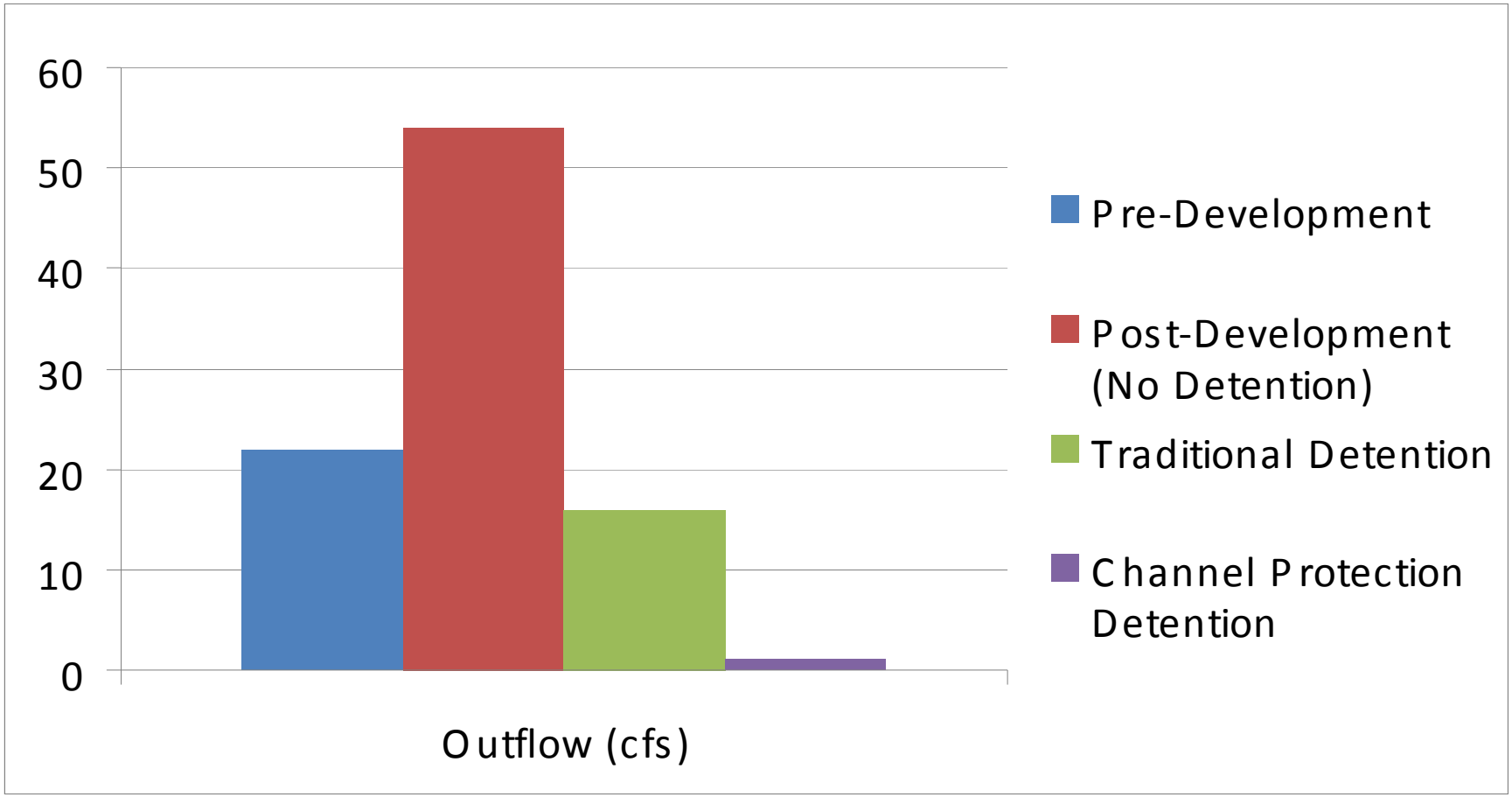
Peak Flow Comparison for 1-year Storm
3.0 Inches of Rain in 24 hours
(Channel Protection Storm Event)



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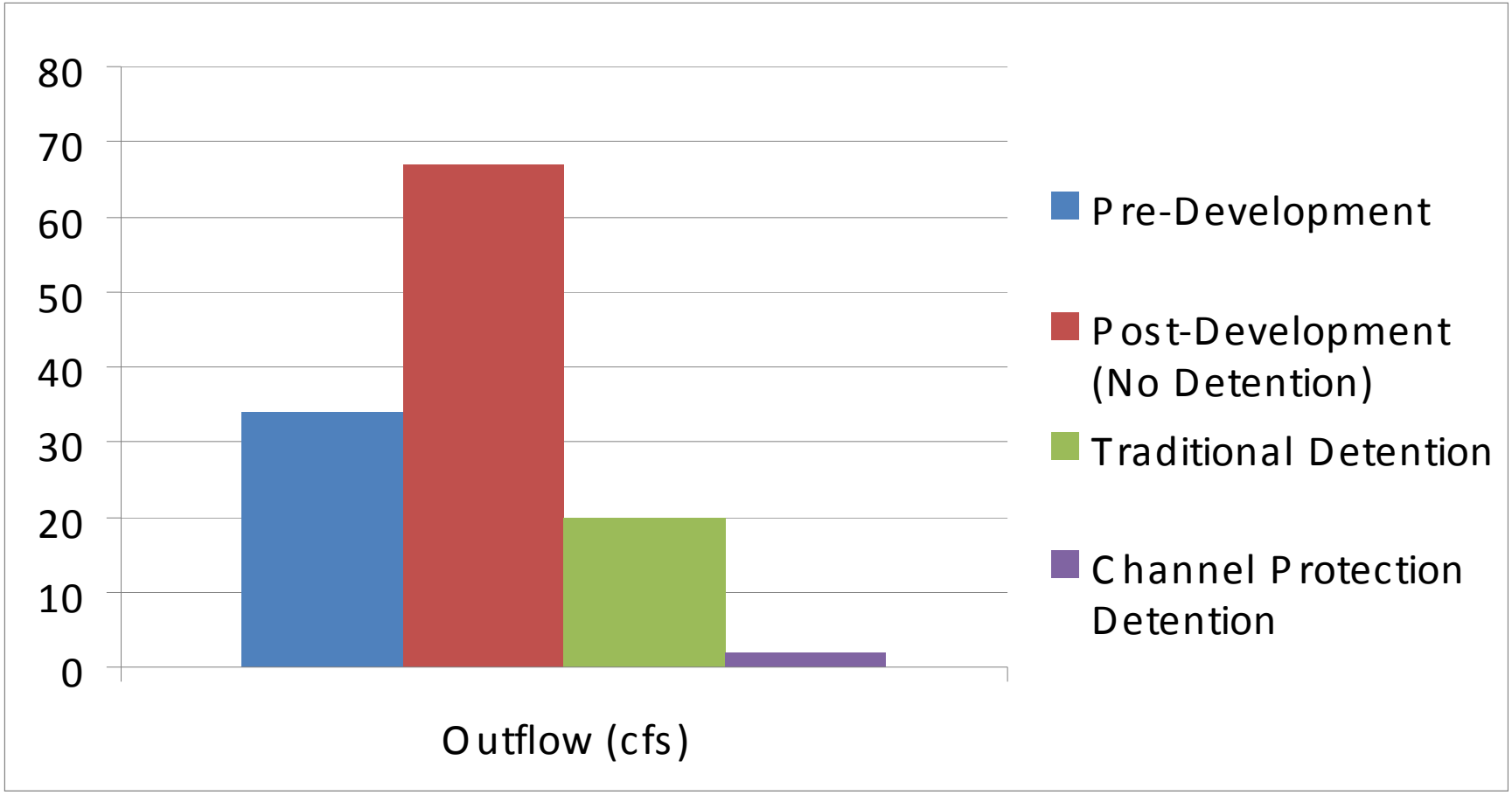
Outflow Comparison for 2-year Storm
3.5 Inches of Rain in 24 hours



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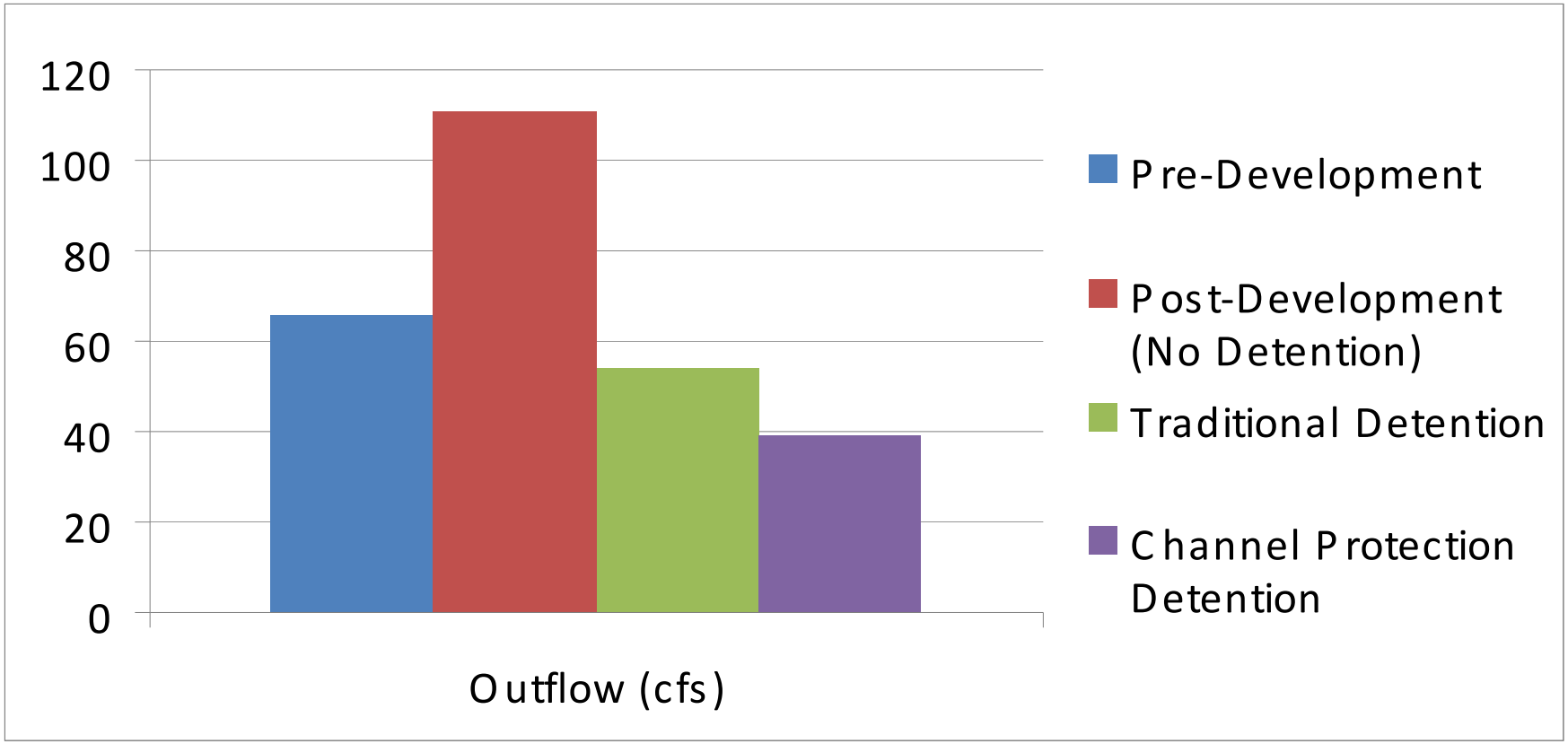
Outflow Comparison for 10-year Storm
5.2 Inches of Rain in 24 hours



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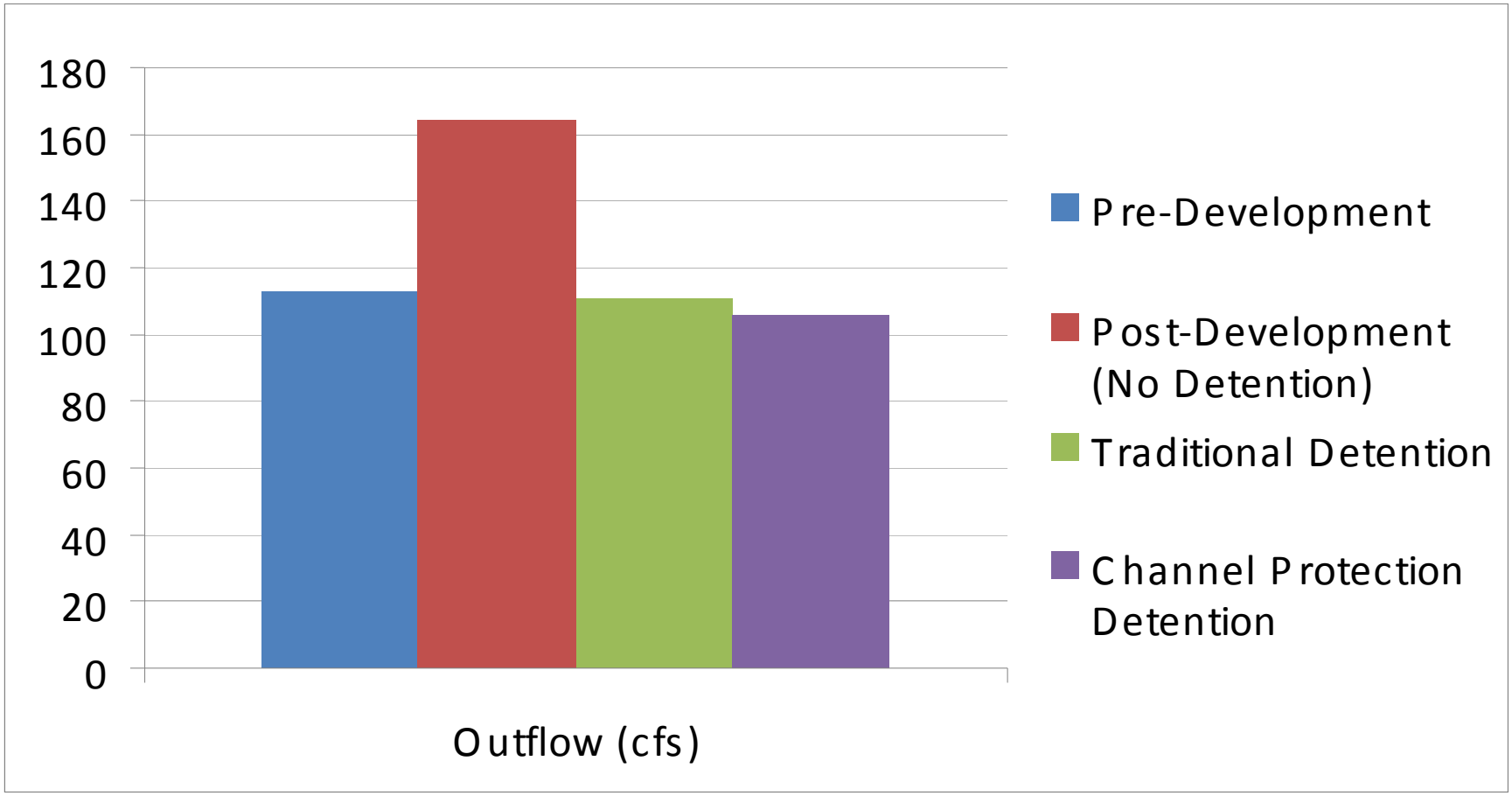
Outflow Comparison for 100-year Storm
7.3 Inches of Rain in 24 hours



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Who else requires Channel Protection Detention?

- Atlanta, GA (16 county metropolitan area)
- State of Maryland
- State of California
- New York State
- Southeast Pennsylvania/Philadelphia
- Wayne County, MI
- Boston, MA
- Portland, OR
- St. Louis City and County, MO
- Milwaukee, WI
- Western Washington State

Other Jurisdictions with Limited "Traditional Detention" Requirements

- Kansas City Metropolitan Area (MARC Manual)
  - Level required depends on decision matrix. Required only if flooding problems occur as defined for existing or future peak flows. Not required if peak runoff is not increased.

- State of Maryland
  - Controlling the peak discharge rate from the 10-year storm event to the pre development rate is optional and subject to local municipalities
  - 100-year detention is noted as not usually necessary if development is excluded from 100-year floodplain and downstream conveyance is adequate. (2-yr requirement for Eastern Shore only.)

Summary

- Detention designed for the larger storm events does not mitigate the smaller, everyday storms.
- Traditional detention matches the highest flow for before and after development-it does not match the rest of the storm
- Many channels in Columbia are already eroding
- Channel Protection Detention lowers flows and reduces the risk of erosion
- Channel Protection Detention releases flow much slower than traditional detention
- **Where there is a flood risk downstream, it makes sense to combine channel protection detention AND flood protection detention**

Discussion