

Effectiveness of stormwater management practices in protecting stream channel stability

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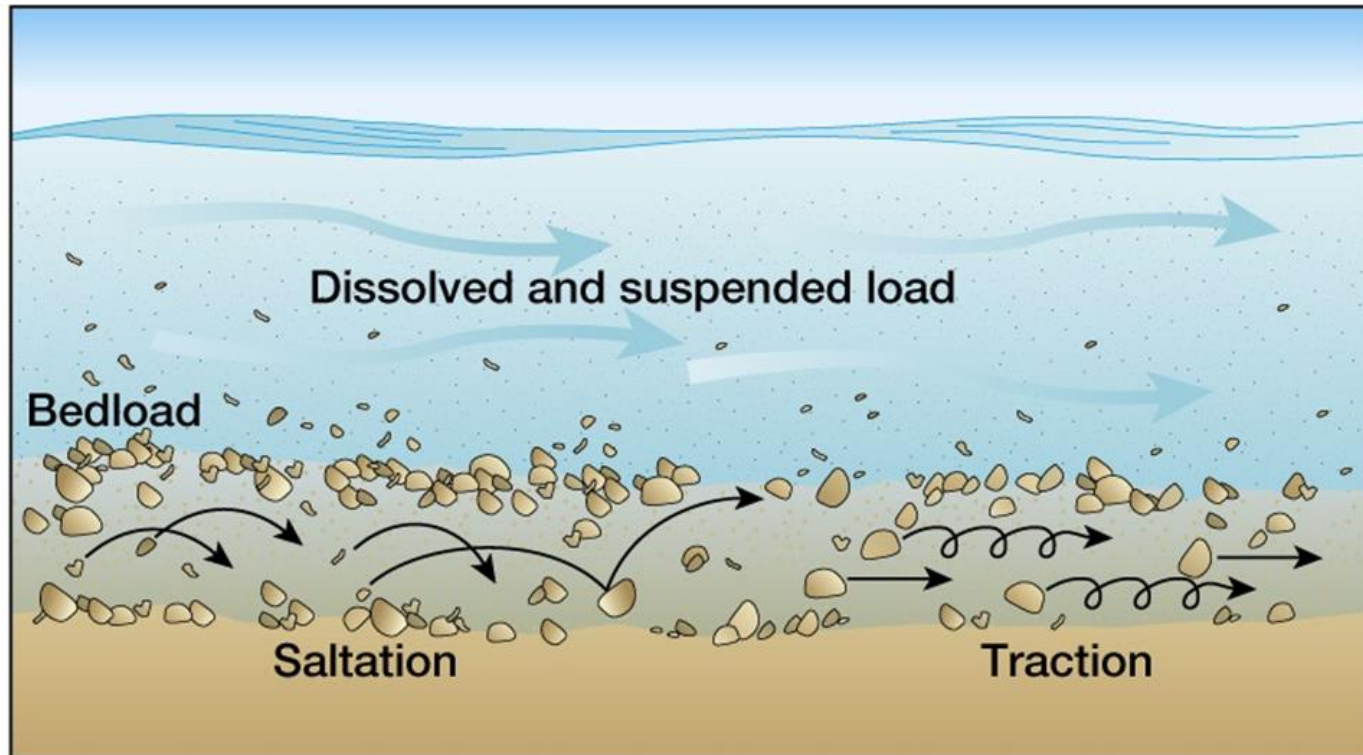
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Before we talk research...

In this talk, “sediment” is not a four-lettered word.



- Coarse sediment is naturally transported in suspension and along the channel bed.
- Fine sediment does not play a major role in channel morphology.

Paying for, good stormwater management is now bearing its cost later.



All models are wrong, but some are useful

- *George Box, British statistician*



Adjust the model to match
observed conditions.

http://www.clipartpanda.com/clipart_images/reality-check-ahead-59860852



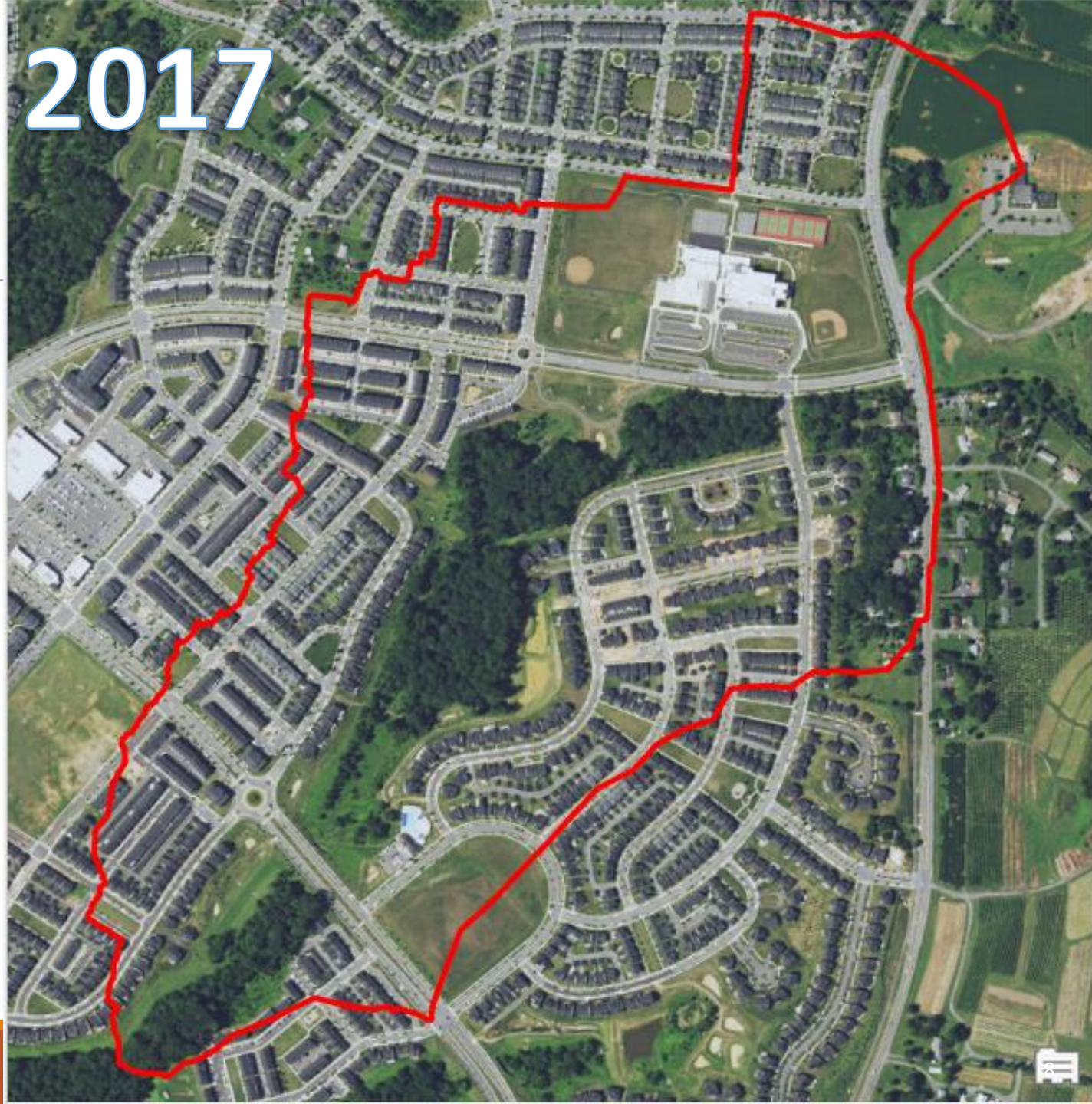
Apply common sense.

http://www.clipartpanda.com/clipart_images/reality-check-ahead-59860852

Ok, let's talk research...

Tributary 109 to Little Seneca Creek served as a case study

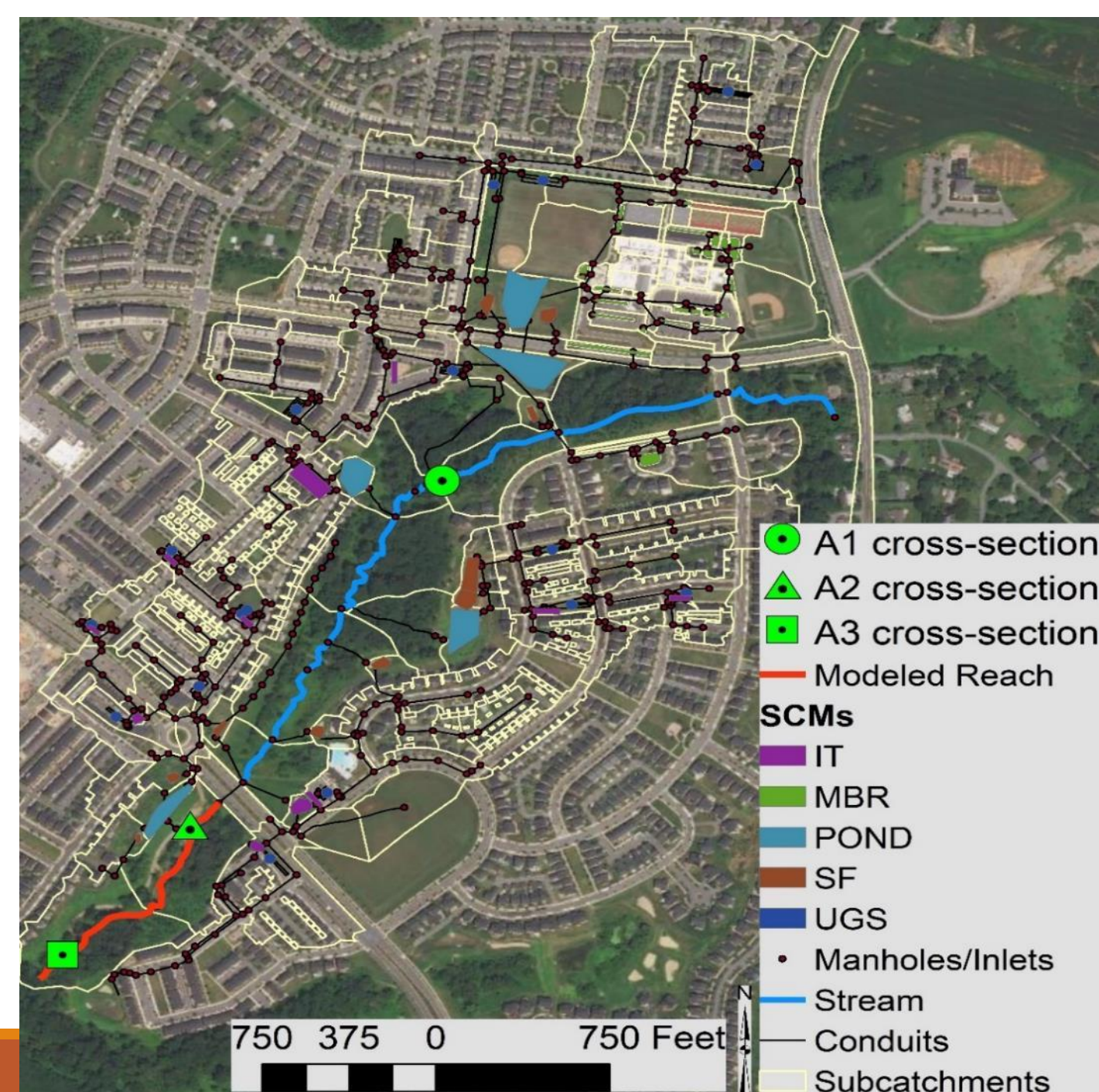
- 0.3 mi² drainage area, 44% TIA
- Developed 2006 - 2016
- USGS stream gage (2004)
- USGS rain gage
- Montgomery County data
 - Cross sections
 - Longitudinal profiles
 - Pebble counts
- Multiple lidar datasets



Stormwater system was designed to meet the 2000 USC requirements:

- 5 ponds
- 26 micro bioretention (MBR)
- 10 infiltration trenches (IT)
- 11 sand filters (SF)
- 18 underground storage facilities (UGS)

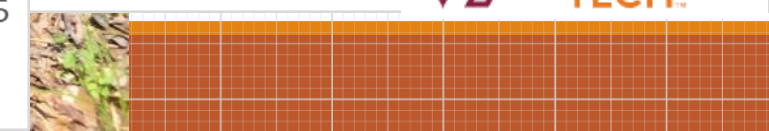
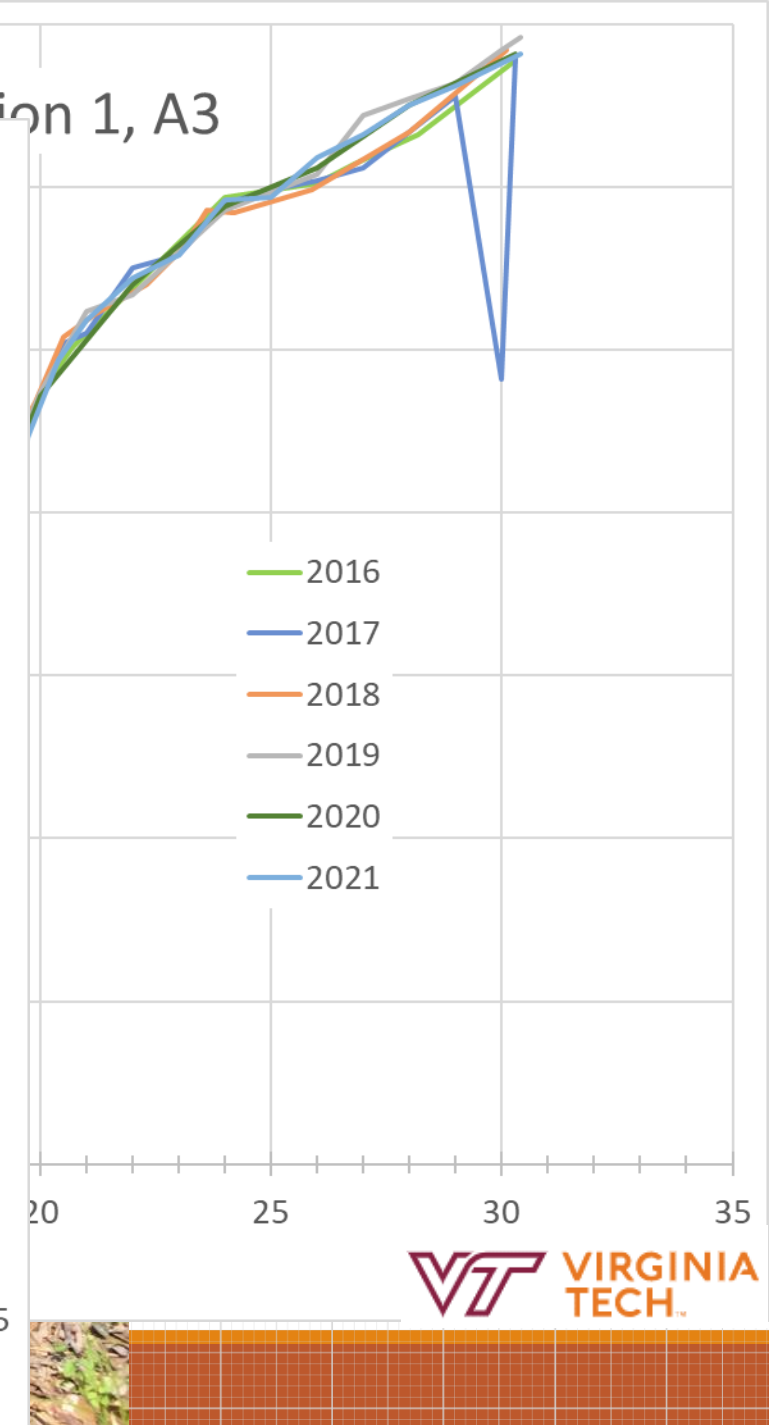
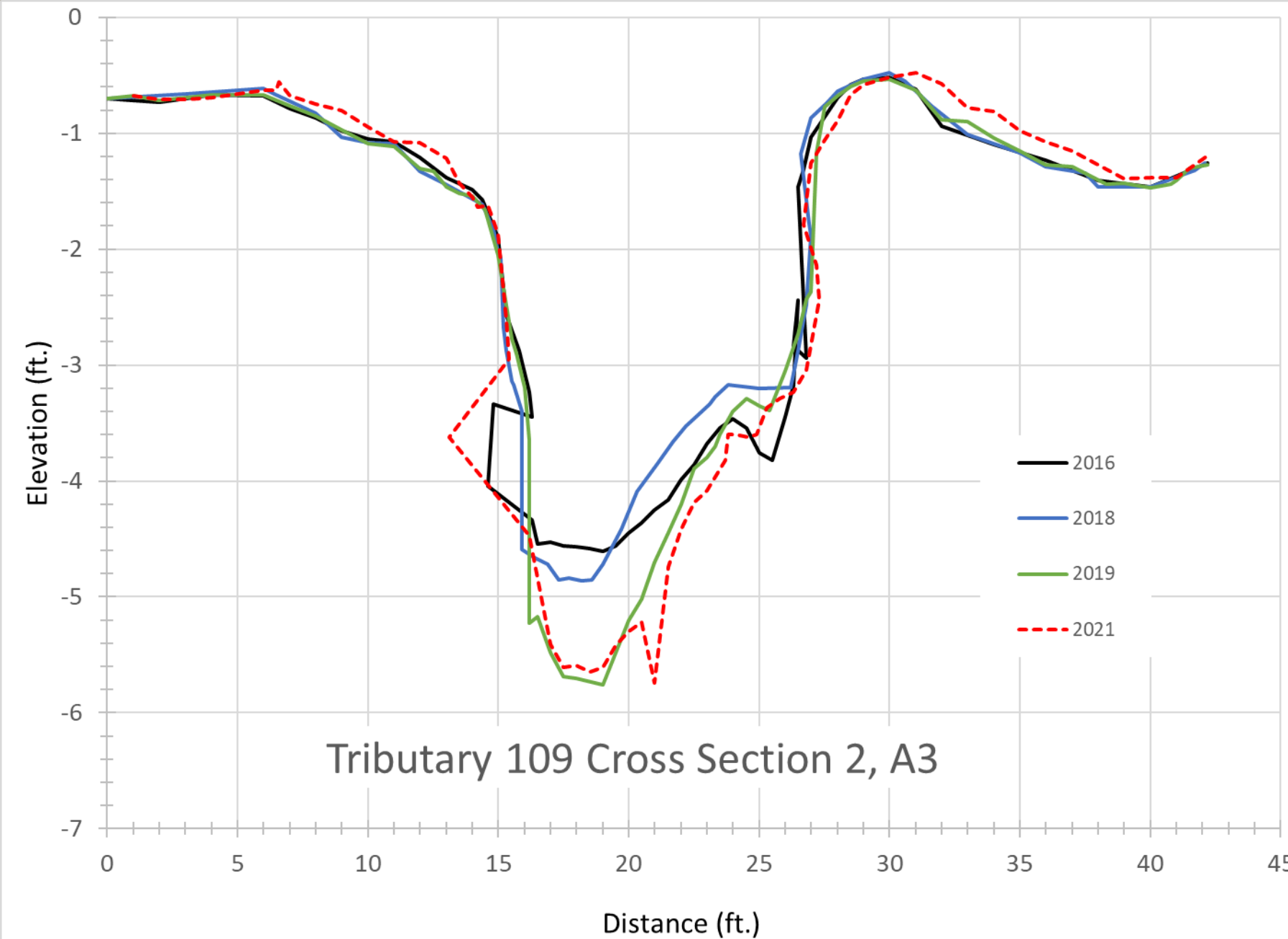
“Distributed” stormwater control practices





0

Tributary 109 Cross Section 1, A3



Channel stability is a two-part problem

Water



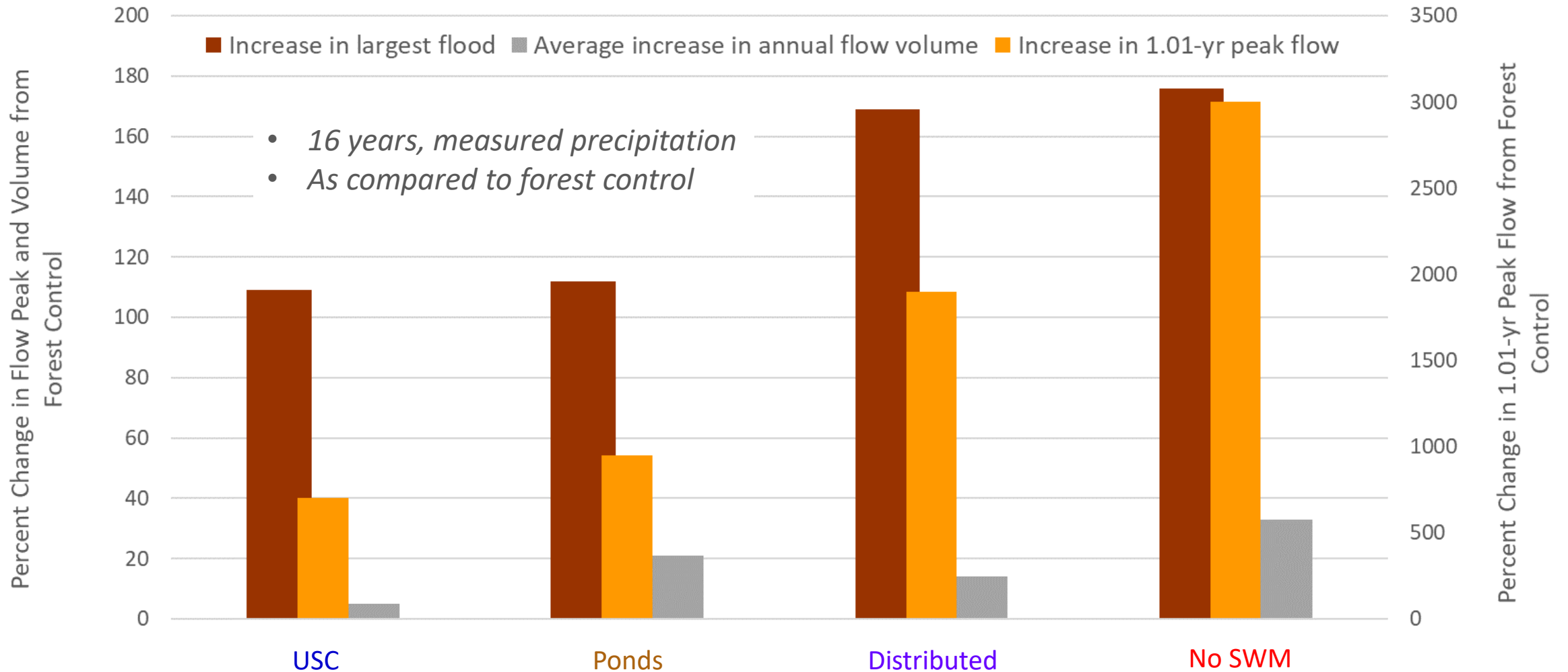
Sediment



HEC-RAS 6.3

Results...

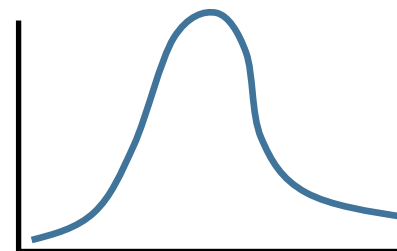
Both ponds (storage) and distributed SCMs are needed to minimize hydrologic impacts of development



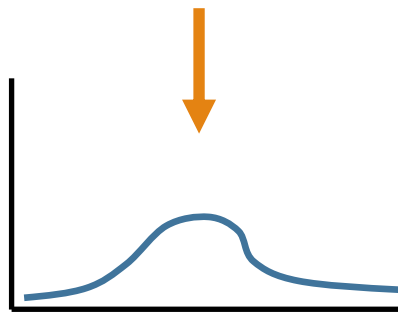
Stormwater
re...tion
asso... 1-yr
sto...
pr...ces 1-yr
flood.



1-yr, 24-hr storm



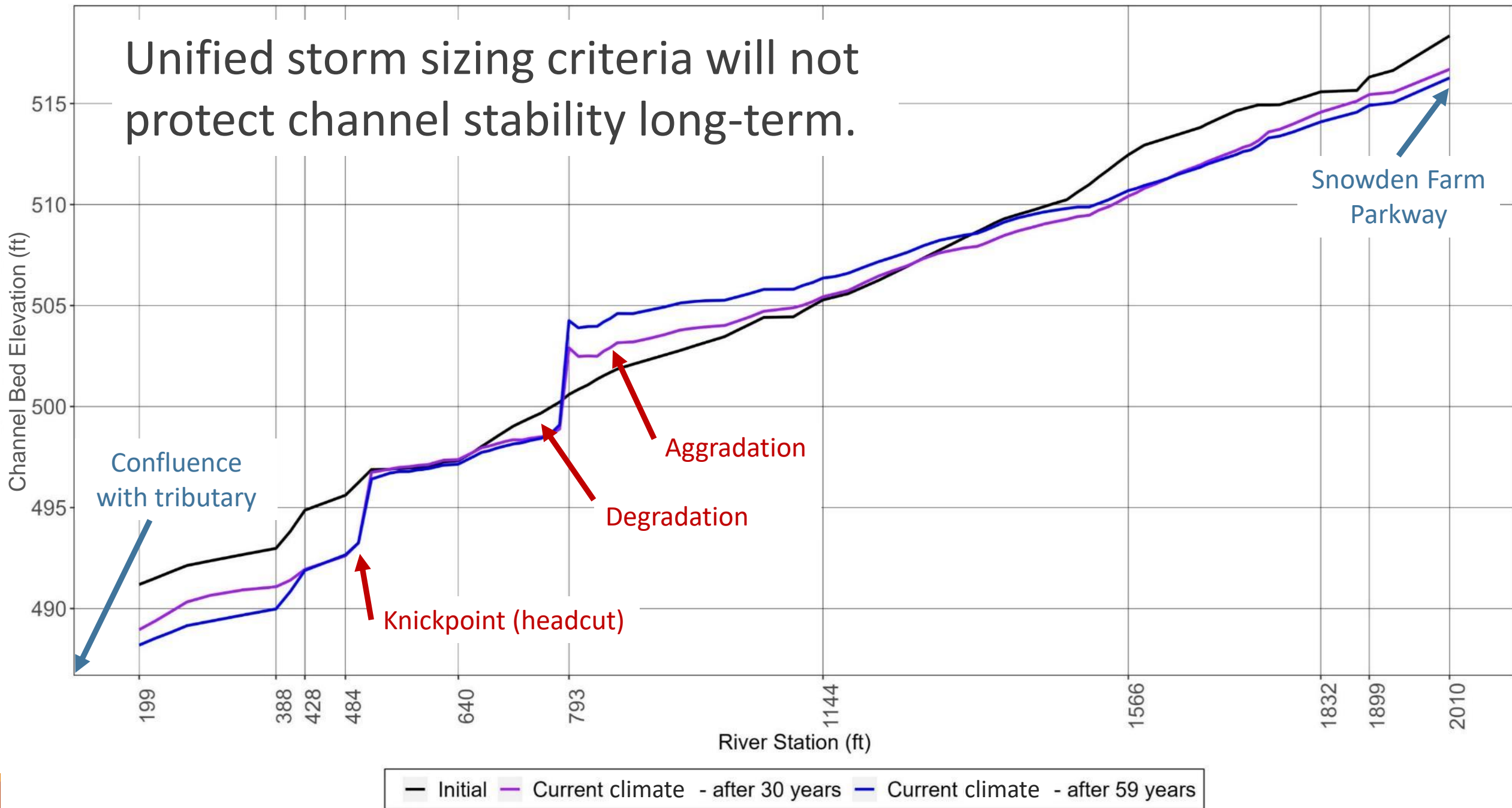
5-yr flood



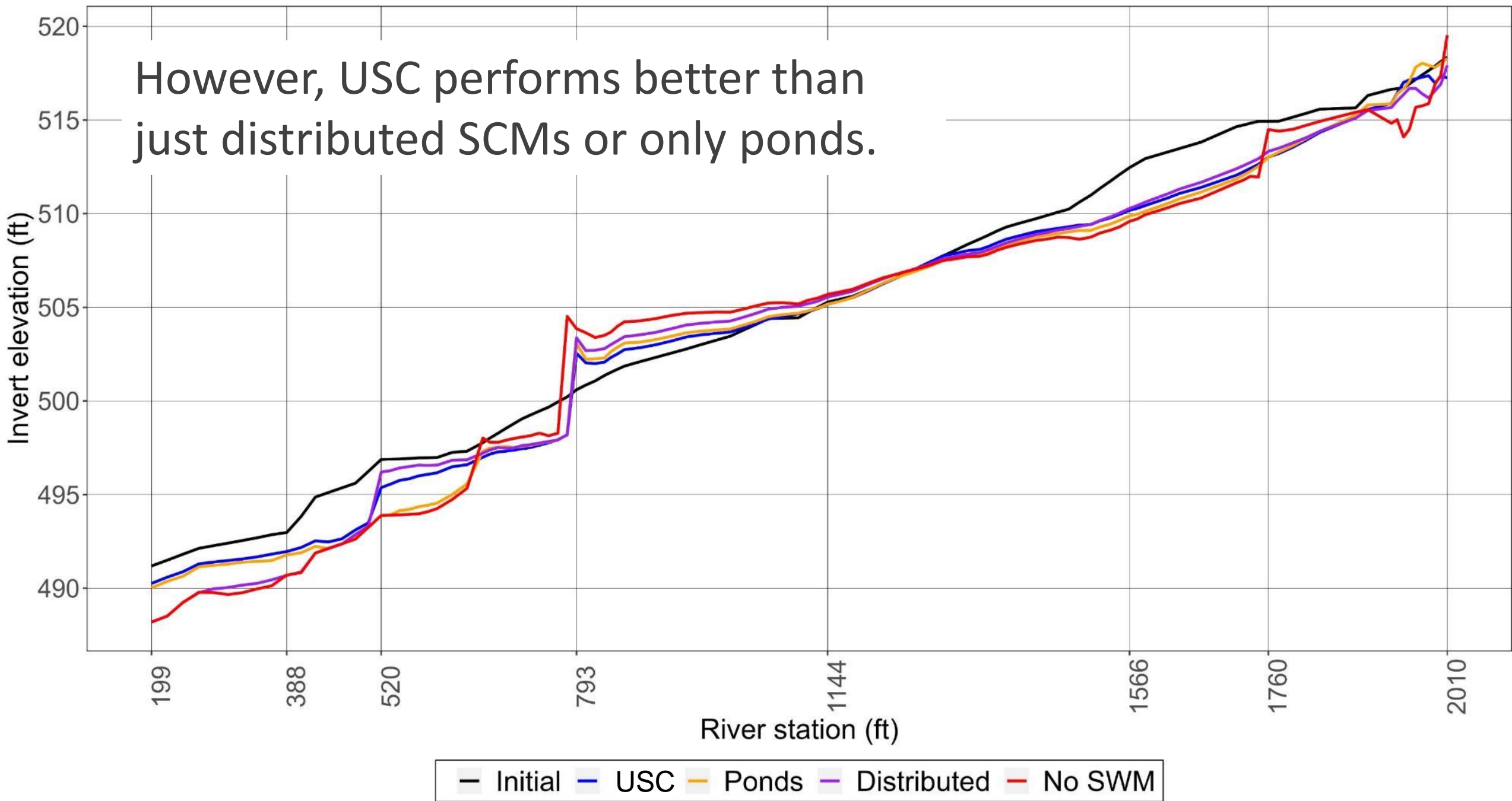
0.5-yr flood

What does the change in hydrology mean for channel stability?

Unified storm sizing criteria will not protect channel stability long-term.



However, USC performs better than just distributed SCMs or only ponds.



Where do we go from here?

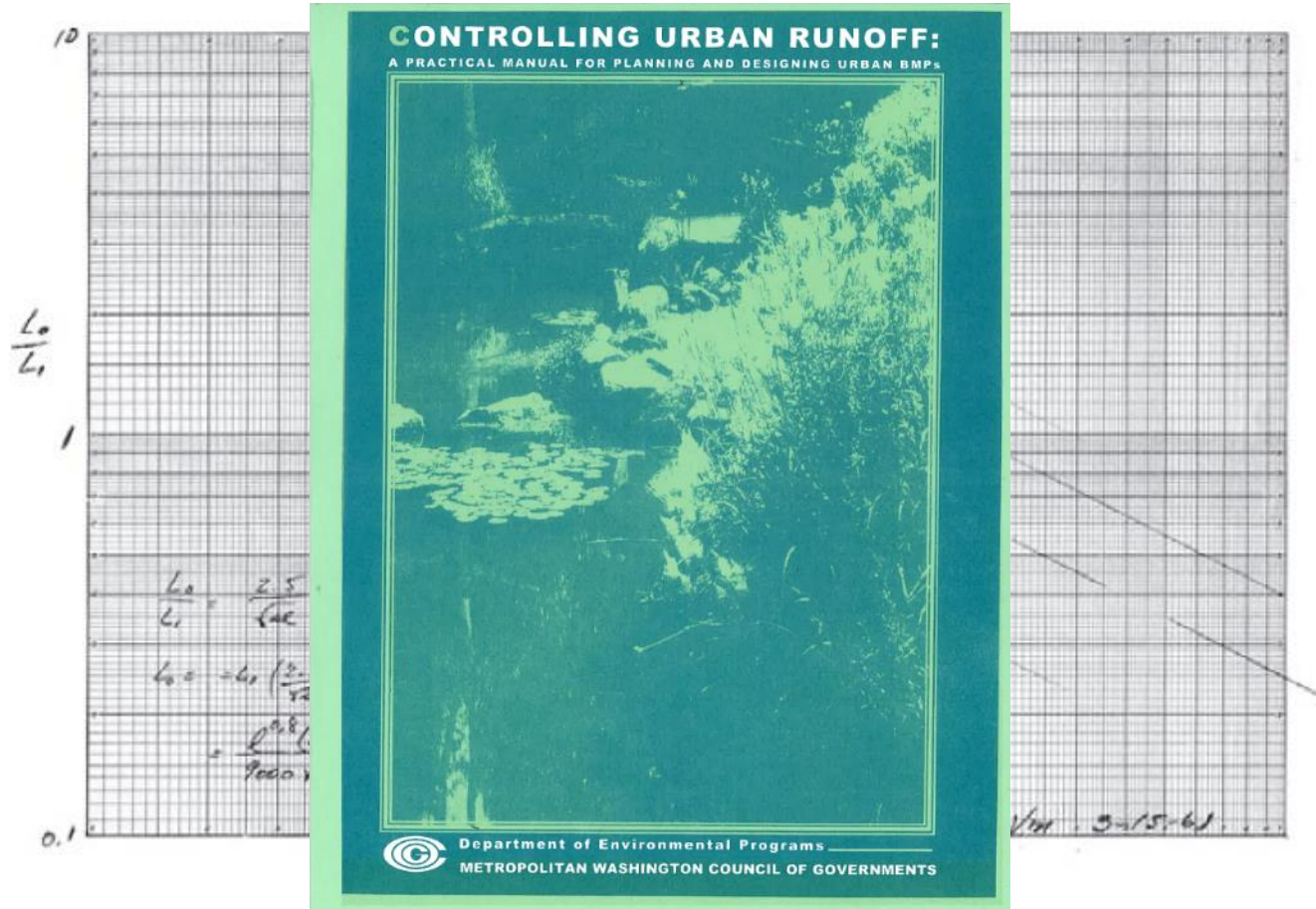


How can we design stormwater management to protect channel stability?



- Design/retrofit stormwater systems to match post-develop and pre-development sediment transport
 1. Erosion potential = 1
 2. Duration of critical flow
- Where the receiving stream is already incised, re-create floodplain connection to reduce sediment transport capacity
- Use design storms with durations <24 hours
- Use a watershed-scale model with continuous rainfall data to design SCMs

Some stormwater history



1984 computing power

Software with state-specific climate data could be developed

Weather Station Data - GSOD (NOAA)

Create New Station

Search Filter
by Code by Location

Drag a column header here to group by that column

Code	WBAN	Location	State
720334-WB	93764	GAITHERSBURG MONTGOMERY	MD
720397-WB	00131	OHIO STATE UNIVERSITY SNYD	OH
722020-WB	12839	MIAMI INTERNATIONAL AIRPOR	FL
722030-WB	12844	WEST PALM BEACH INTL ARPT	FL
722045-WB	12843	VERO BEACH MUNI	FL
722050-WB	12815	ORLANDO INTERNATIONAL AIR	FL
722056-WB	12834	DAYTONA BEACH INTL	FL
722060-WB	13889	JACKSONVILLE INTERNATIONA	FL
722070-WB	03822	SAVANNAH/HILTON HEAD INTL	GA
722080-WB	13880	CHARLESTON AFB/INTERNATIC	SC
722106-WB	12835	PAGE FIELD AIRPORT	FL
722110-WB	12842	TAMPA INTERNATIONAL AIRPOI	FL
722135-WB	13870	ALMA/BACON CO.	GA
722137-WB	13878	MALCOLM MC KINNON AIRPORT	GA
722140-WB	93805	TALLAHASSEE REGIONAL AIRPI	FL
722146-WB	12816	GAINESVILLE RGNL	FL
722148-WB	63824	STANLEY COUNTY AIRPORT	NC
722160-WB	13869	SW GEORGIA REGIONAL ARPT	GA
722166-WB	93845	VALDOSTA REGIONAL AIRPORT	GA
722170-WB	03813	MIDDLE GEORGIA REGIONAL AI	GA
722177-WB	63811	ANDREWS-MURPHY AIRPORT	NC
722180-WB	03820	AUGUSTA REGIONAL AT BUSH I	GA

General Dry/Normal/Wet Years Influence Area Data Management Help

Station Code - Site Code (WMO ID)
720334-WB 30 Show Station on Map

WBAN ID Number 93764 COOP-ID Call Sign

Latitude 39.1700 Longitude -77.1700 Elevation (ft) 539.04

State MD Show Station Data Summary

Polygon Influence Area Defined Version 2 Chart Monthly Precipitation

Pre-loaded Station 30 Chart Annual Precipitation

Station Location GAITHERSBURG MONTGOMERY COUNTY

Data Available From 01/01/1964 Data Available To 08/01/2019 Import New Preloaded Stations

Update Dates Based on Precipitation Data Import New/Updated Polygons and Updated DNM Years

Comment on Station
Station Created on 2019-11-19. Available Data From 20150224 To 20151121

93764
720334

NCDC Station Locator
Import Station Header Information

Wetbud

Projects Parameters Basic Models Advanced Models Reports Utilities Help

Project Wizard

Select Site and/or Weather Station(s) on Google

PR Longitude PR Marker ID Show

ST Longitude ST Marker ID Show

-77.1700 720334-WB--GAITH Show

Current Units 03.00 00.03 Current Project: None

C:\Users\thwynn\Documents\MyWetbud\Wetbud2.FDB

Satellite

Baltimore

Washington

Alexandria

Keyboard shortcuts Map data ©2023 Google Terms of Use



Questions?