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ecological restoration

Using Floodplains to Promote Climate Resiliency and Sustainability

Prepared for the 2023 National Stream Restoration Conference
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Natural Floodplain Functions

- Groundwater recharge
- Sediment/nutrient/contamination filtration
- Slow runoff
- Store flood water (both surface water and groundwater)
- Improve water quality
- Support habitat
- Support wetland development and native vegetation

Resilience

resilience:
"[t]he capacity of a dynamic system to adapt successfully to challenges that threaten the function, survival, or future development of the system."

—**Ann Masten**, Professor, University of Minnesota College of Education and Human Development

resilience:
"a measure of the persistence of systems and their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables."

—**C.S. (Buzz) Holling**, emeritus professor, University of Florida

resilience:
"an ability to recover from or adjust easily to misfortune or change."

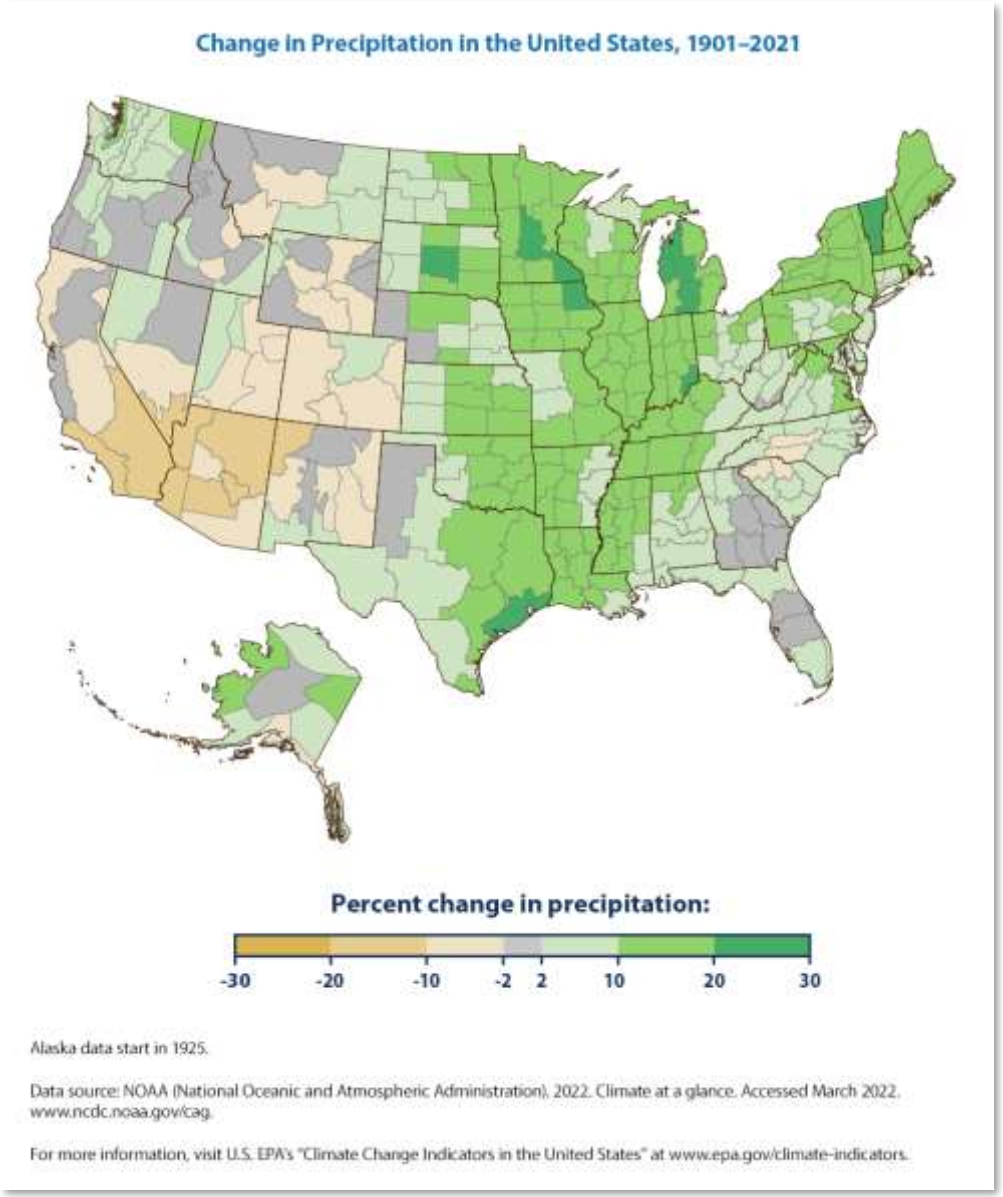
—**Merriam-Webster Dictionary**

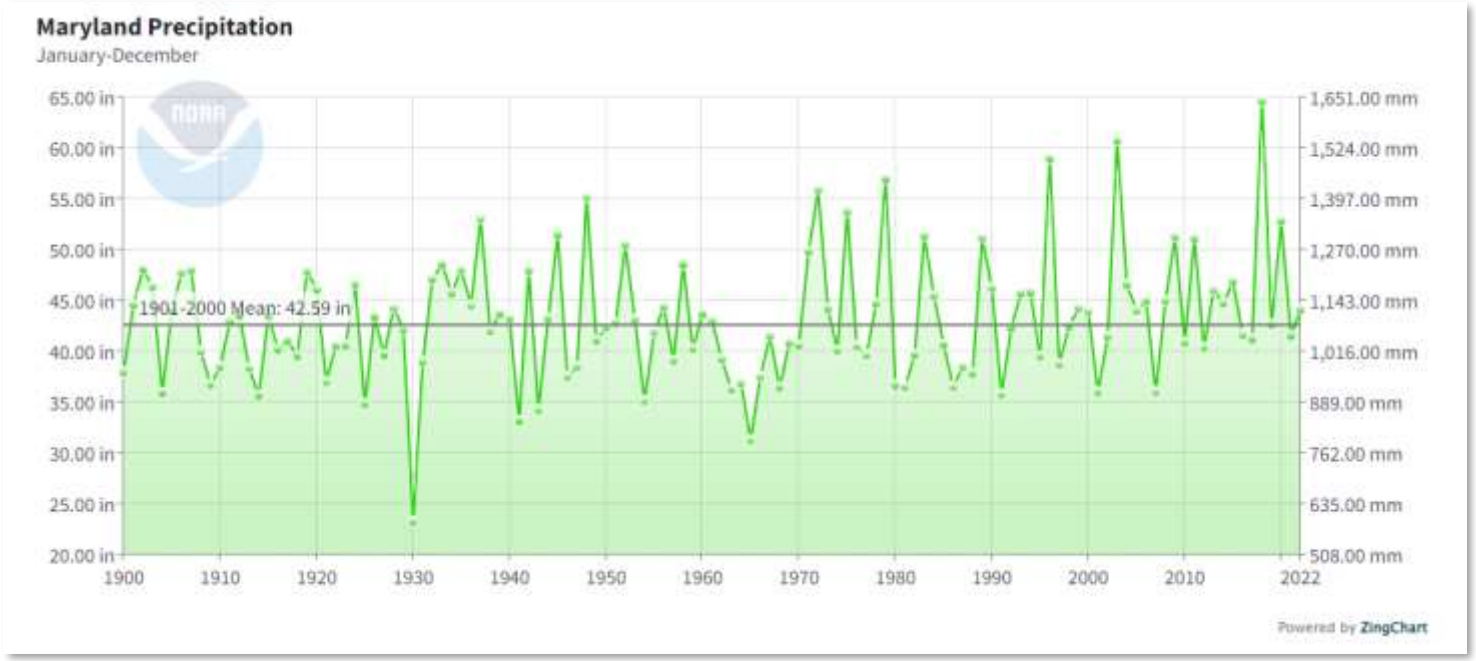
https://ensia.com/articles/what-is-resilience/

Changes Affecting Floodplain Functions

- Legacy sediment infill
- Urbanization (increased discharges and runoff volume)
- Stream encroachments (development in floodplains)
- Stream crossings (bridges and culverts)
- Channel incision
- Ditching/straightening channels for agriculture
- Erosion
- Drought
- Groundwater pumping
- Fire
- **Rainfall changes to frequency, intensity, and/or duration**

Rainfall

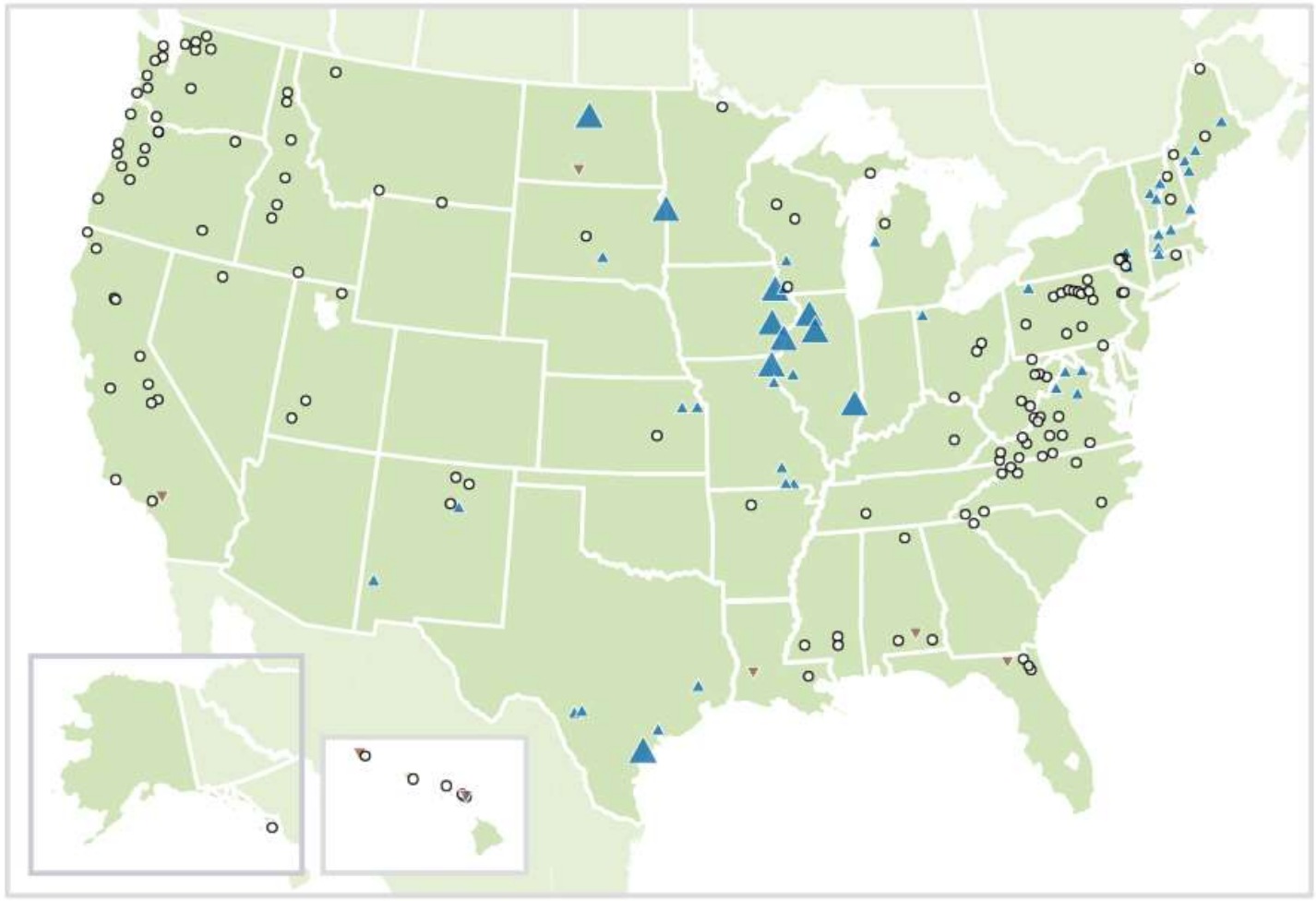




NOAA National Centers for Environmental information, Climate at a Glance: Statewide Time Series, published June 2023, retrieved on June 26, 2023 from https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series

Runoff

Annual Average Streamflow in the United States, 1940–2018



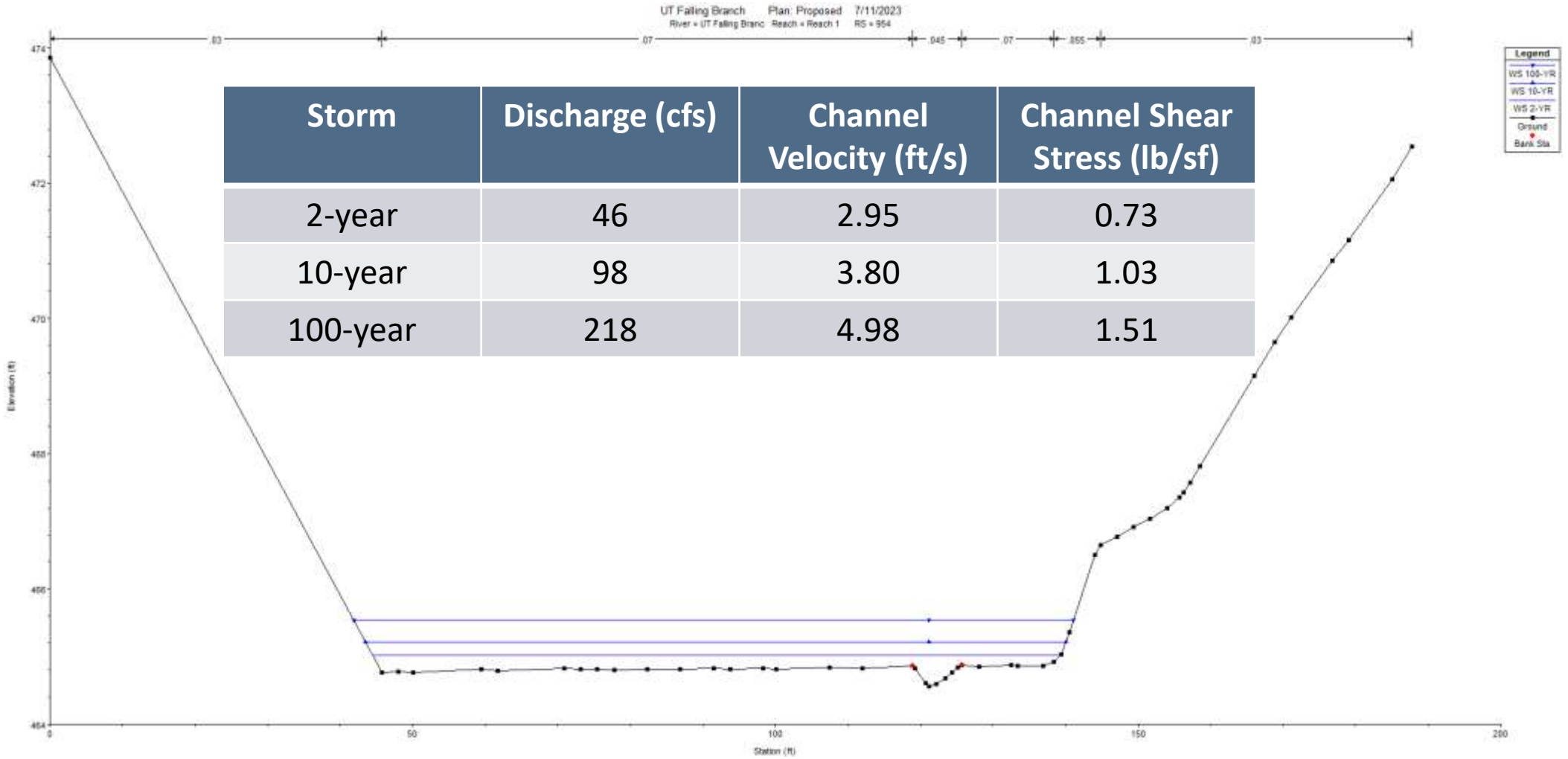
More than 50% decrease | 20% to 50% decrease | 20% decrease to 20% increase | 20% to 50% increase | More than 50% increase

Data source: USGS (U.S. Geological Survey). 2020. Analysis of data from the National Water Information System. Accessed June 2020.

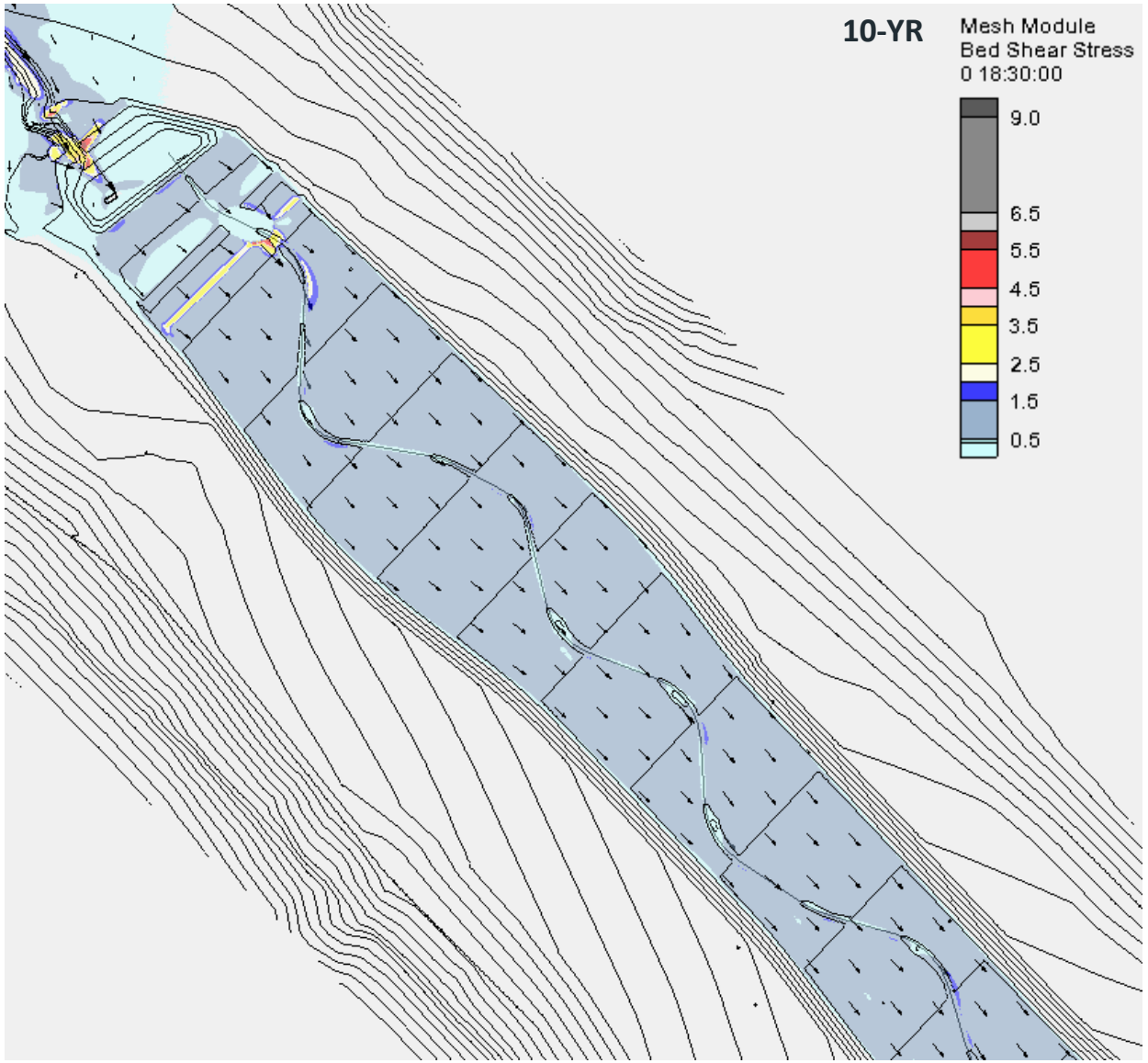
For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

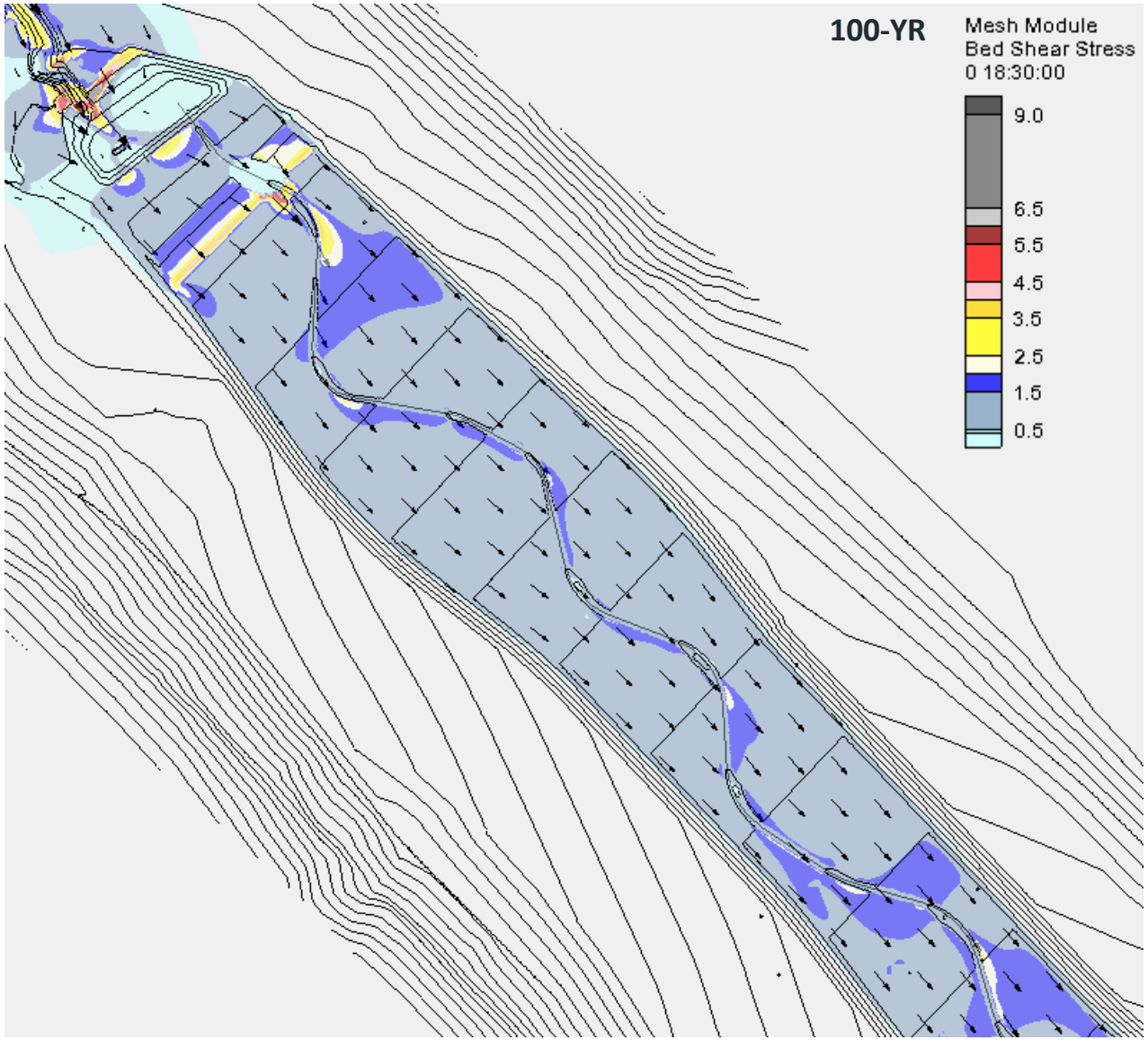
Discharge Estimation and Hydraulic Results

Storm	Discharge (cfs)	Channel Velocity (ft/s)	Channel Shear Stress (lb/sf)
2-year	46	2.95	0.73
10-year	98	3.80	1.03
100-year	218	4.98	1.51



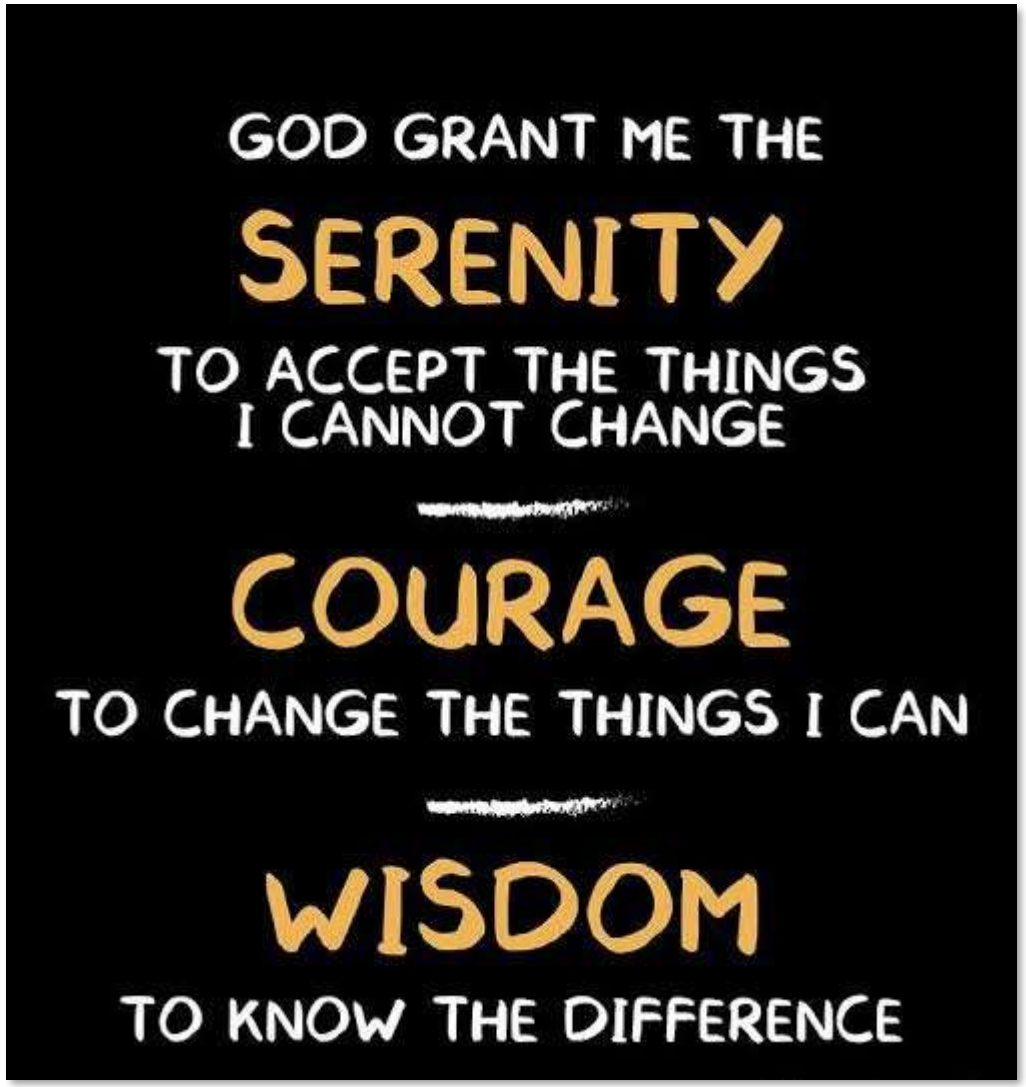
Hydraulic Modeling





Controls

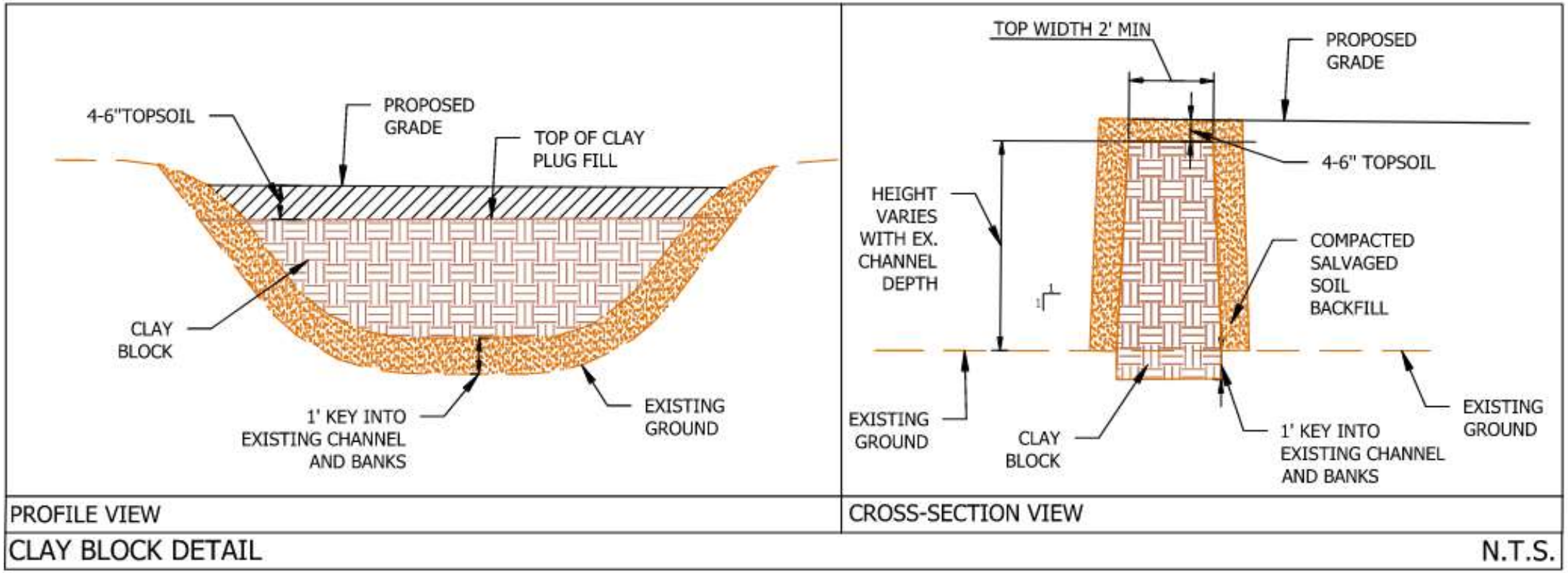
- Grade controls
- Groundwater controls
- Flow controls
- Slope manipulation



Grade Controls

- Culverts
- Bedrock
- In-stream and floodplain structures
- Upstream and downstream tie-in structures

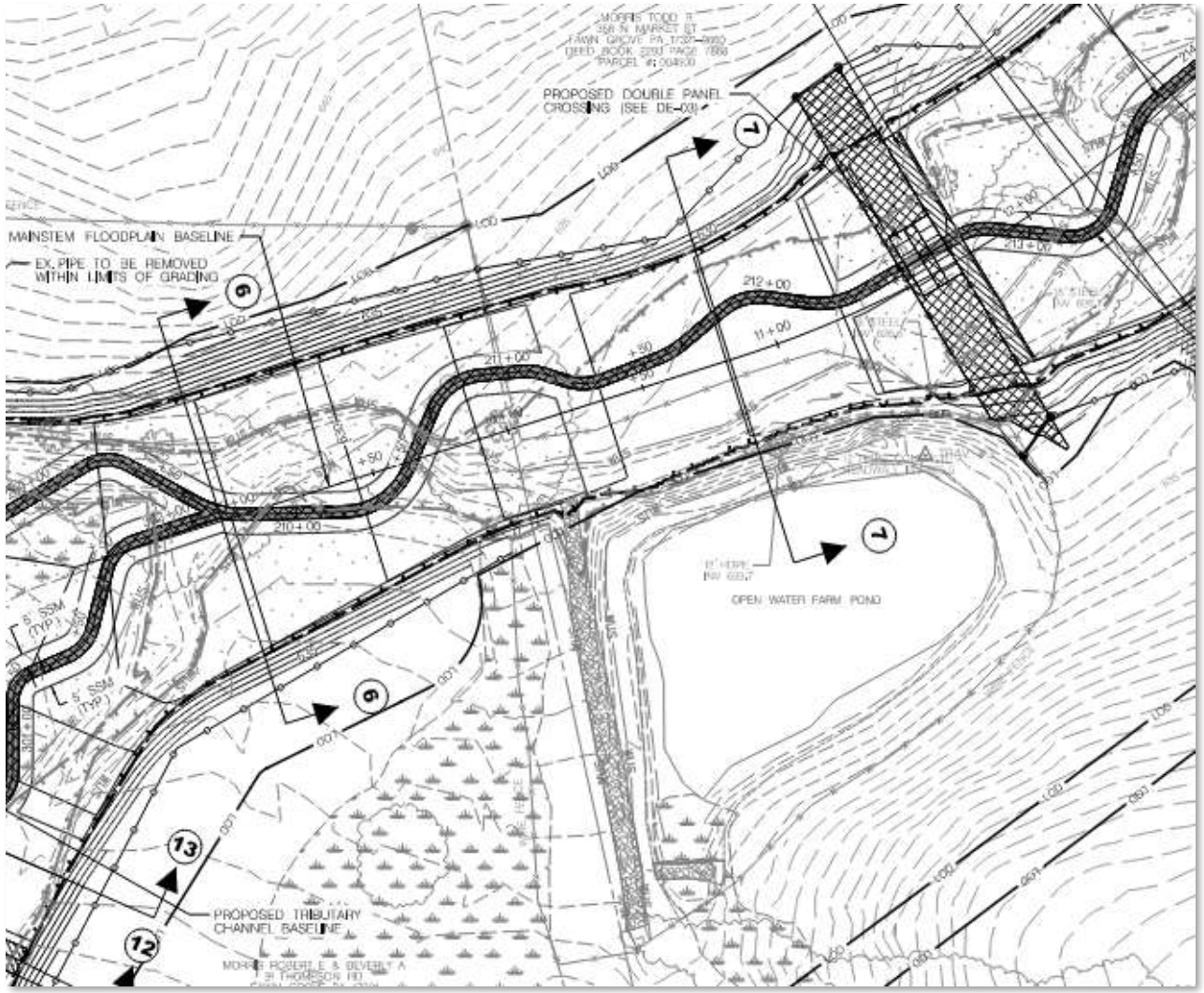
Groundwater Controls



Flow Controls

Photo courtesy of Carroll County Bureau of Resource Management

Slope Manipulation



Summary


The difference between good and
great is just a little extra effort.
Duffy Daugherty

Questions?