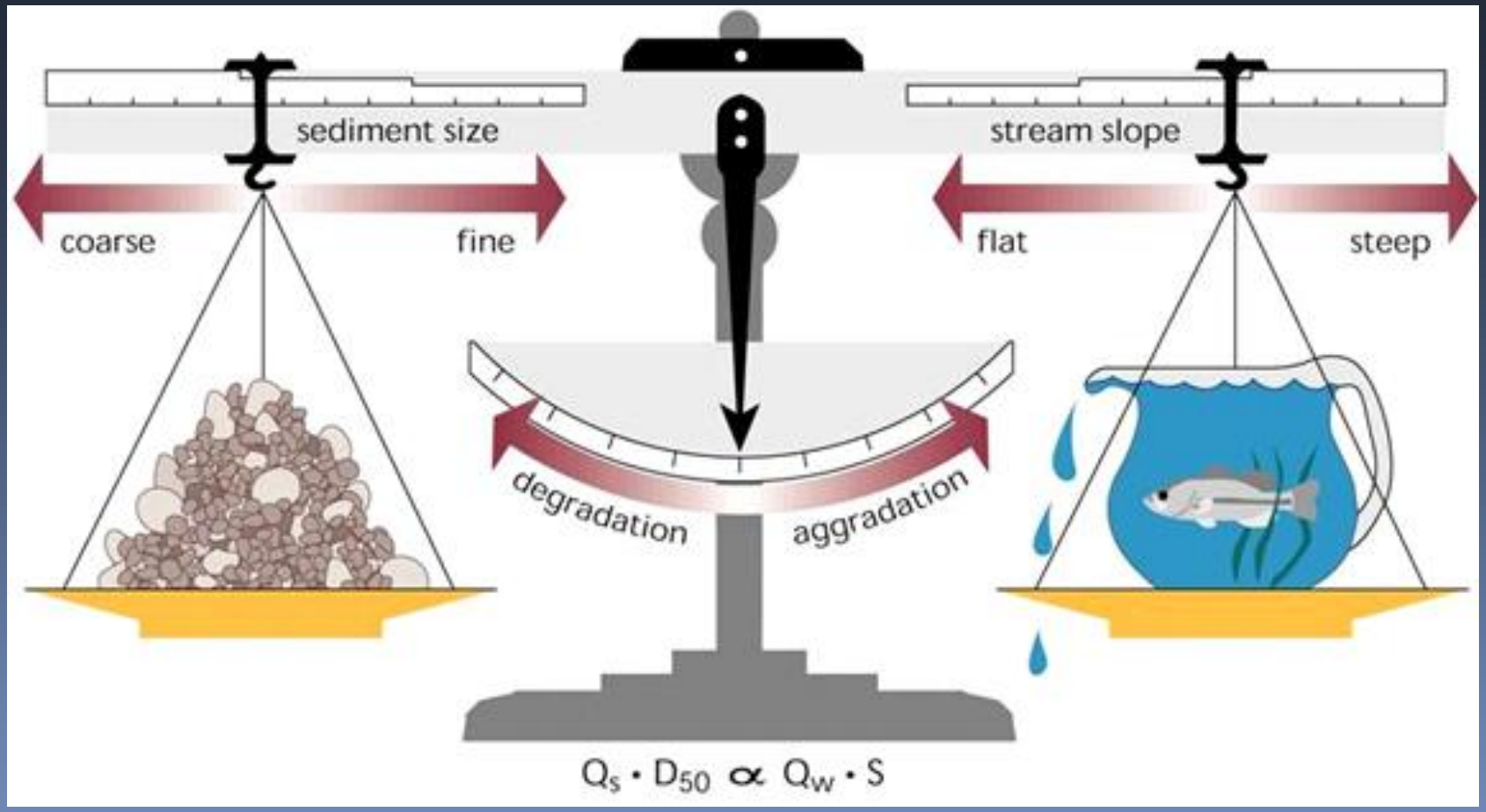
City of St. Peters Project #P-10

Springwood and Crescent Hills Channel Improvements

inter·fluve inc.

HRGreen



River channels develop and adjust to efficiently pass the sediment and water delivered to them

changing the amount of water or channel slope results in changes to the amount or size of sediment carried by the channel and vice versa

Erosion resistance

Tree roots

- Generally good to 4 ft bank height
- Evolved for river life
  - Flood tolerant
  - Plastic root systems
  - Fibrous roots
  - Vegetative reproduction

Urban geomorphology

Urban Stream experience a variety of complex impacts compared to their rural counterparts

Increased Impervious Surface (Paved Watershed)

Increased Channel Density (pipes/ditches)

MORE WATER TO THE CHANNEL FASTER

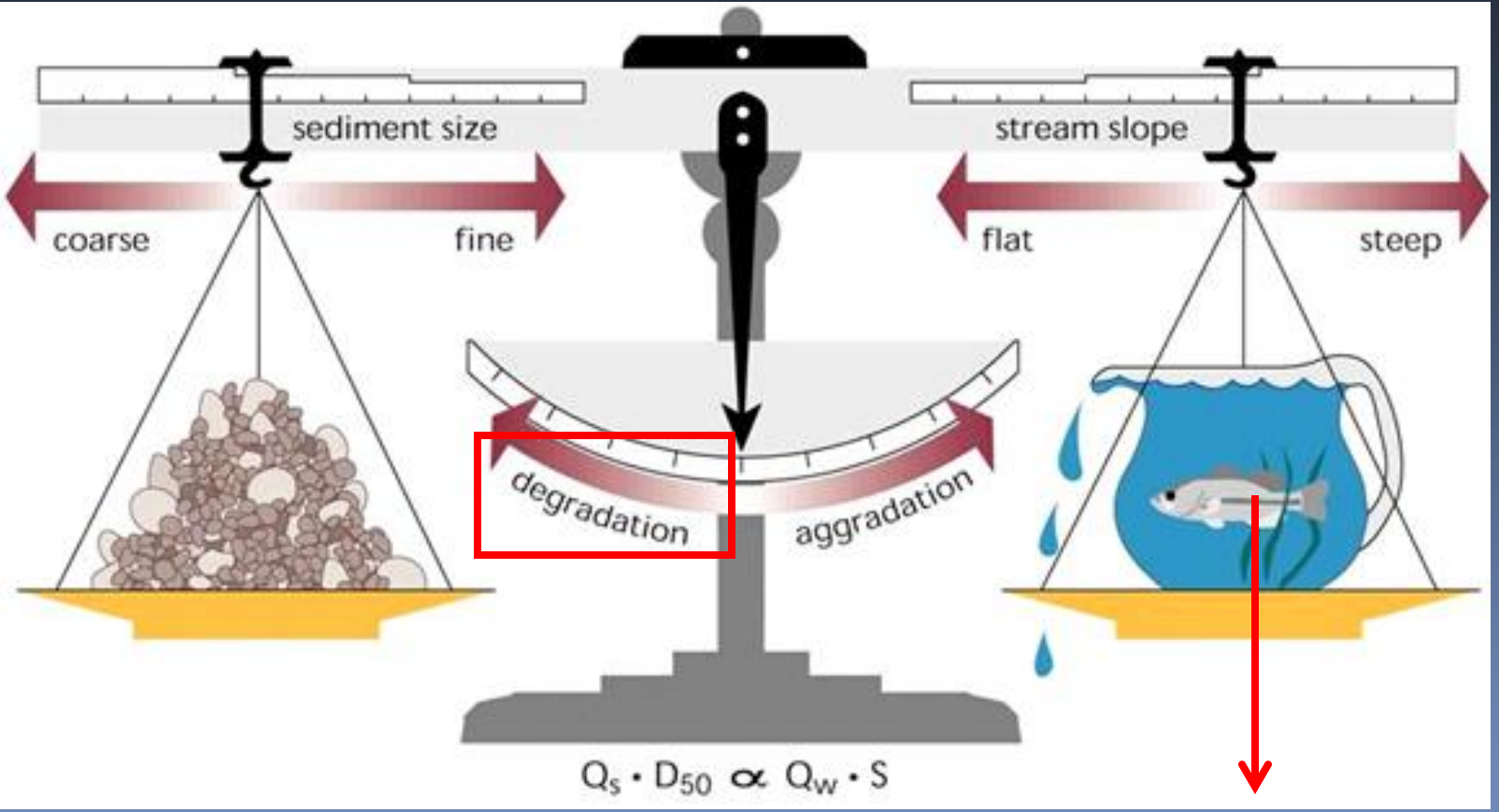
Straightened/Channelized (Bank Protection)

Floodplain Encroachment (retaining walls)

INCREASE DEPTH AND SLOPE OF FLOW ~ ENERGY

Vegetation Removal

DECREASE BANK ROUGHNESS/RESISTANCE

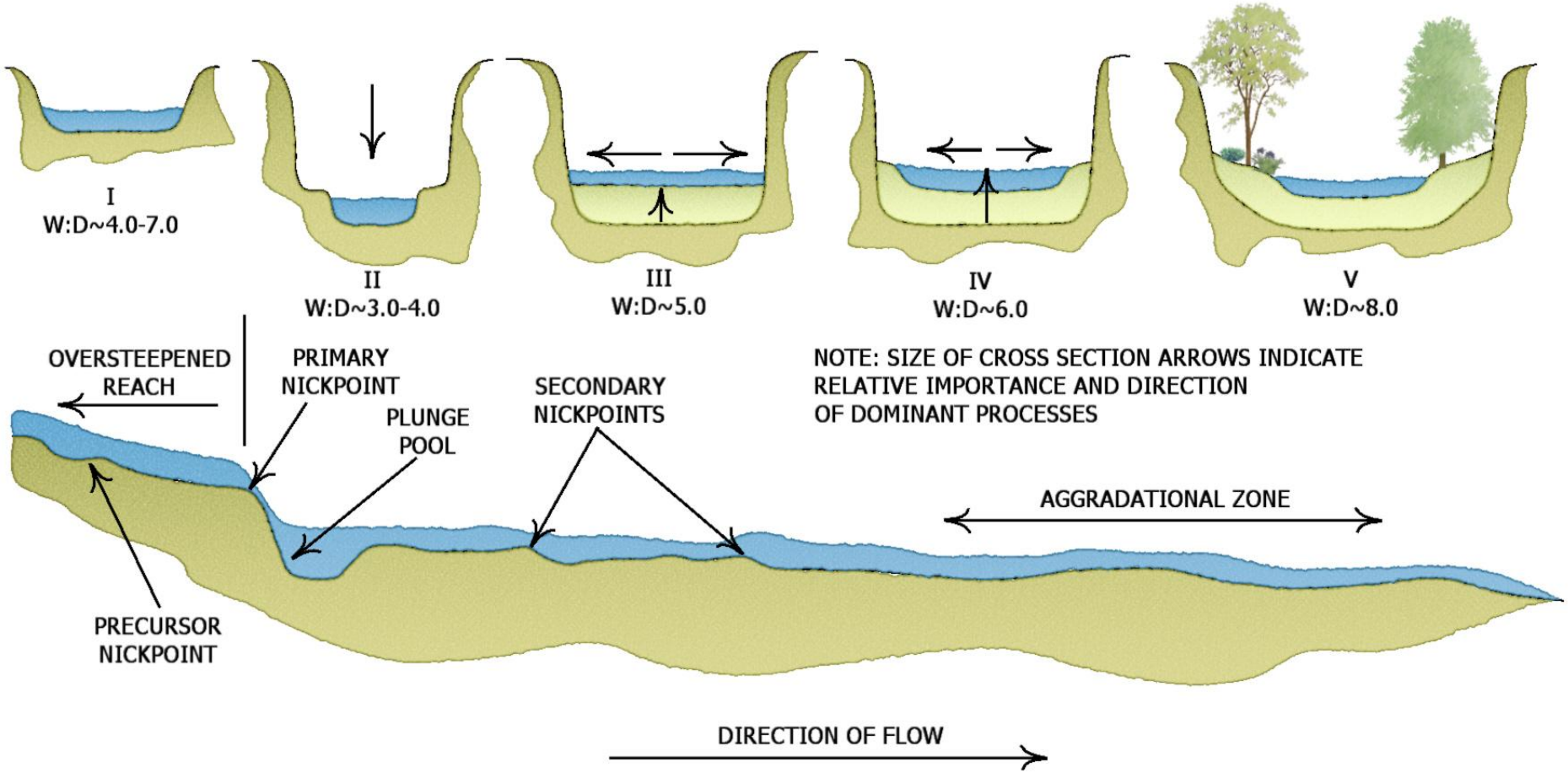


Degradation

Channel will rebalance by eroding sediment from the bed and banks

Channel Evolution

- Schumm (1977)
- Simon (1986)



Common stream problems

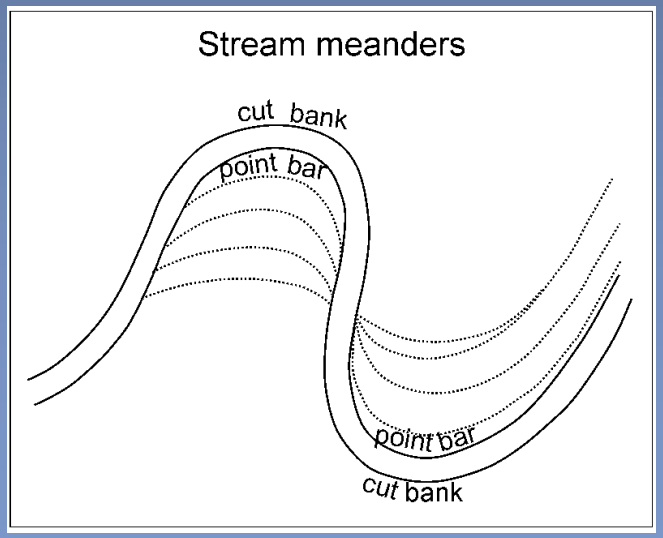
Channel incision (Stage II)

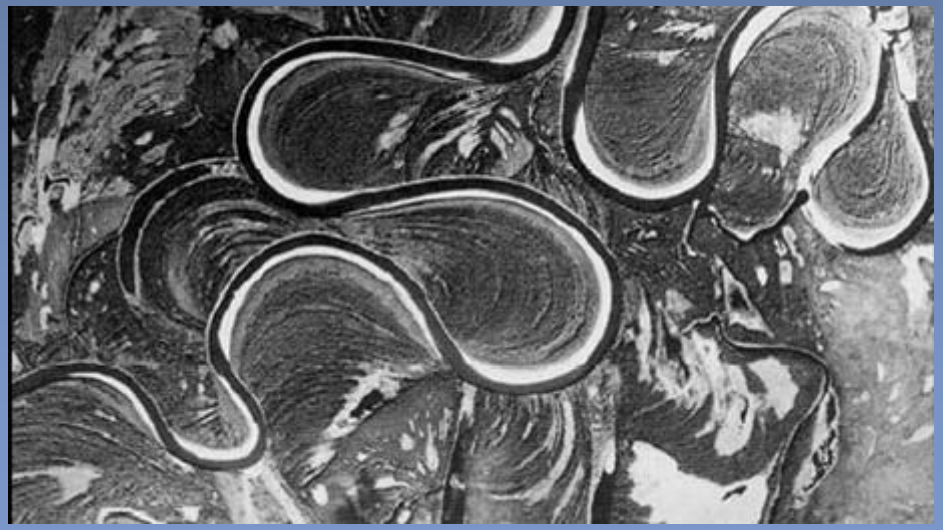
- *Channelization is usually what initiates incision (Δ slope)*
- *Changes in rate and volume result in additional sediment movement and further incision (Lane's balance)*
- *Bank erosion ensues when the stream reaches a control elevation yet still has energy to do work (Stage III)*

Common urban stream problems

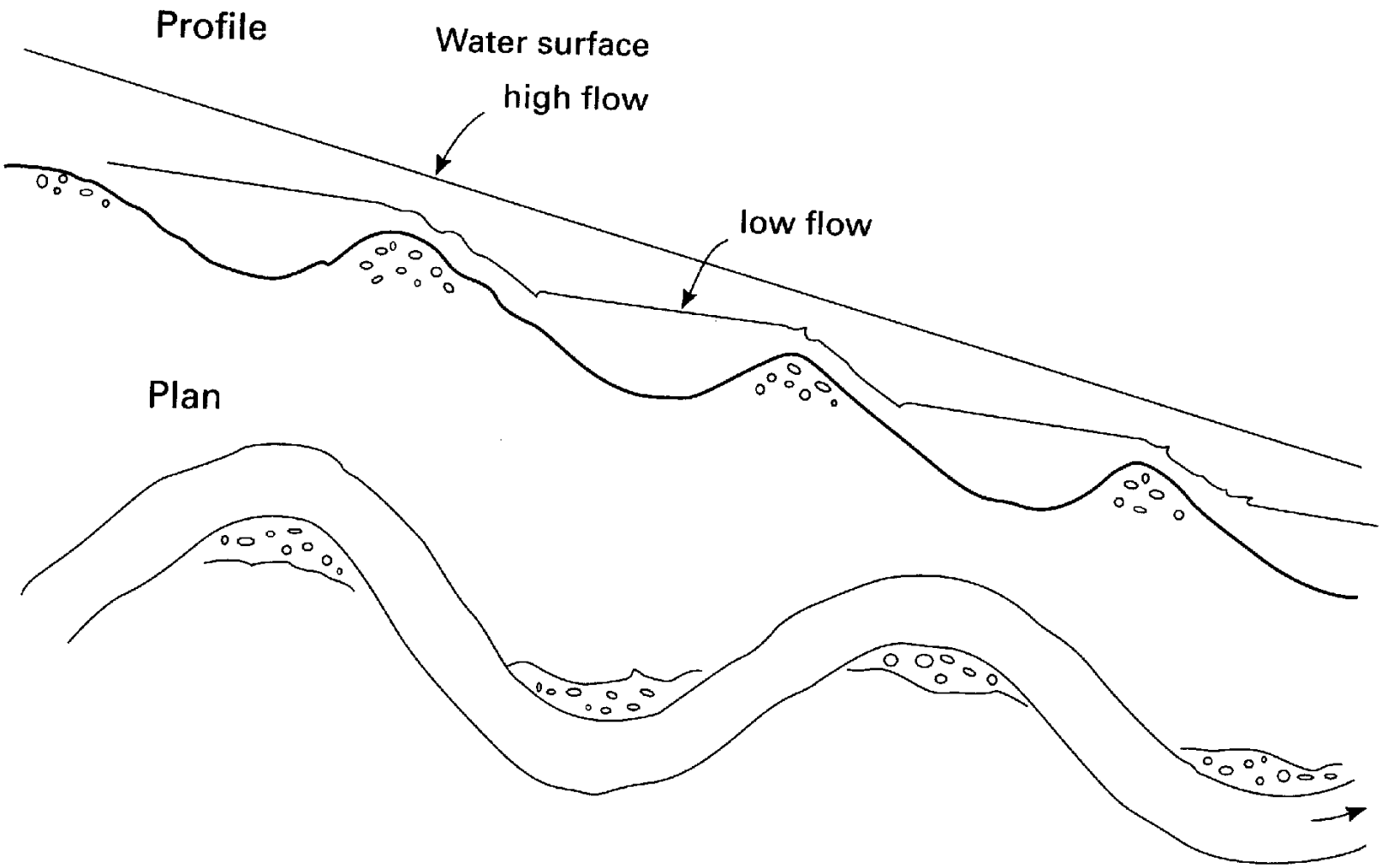
Bank erosion

- *Streams erode their banks on the outside of meanders and deposit on the inside of meanders or on the floodplain*
- *Good erosion*
  - *Equilibrium geomorphic process (helps maintain balance)*
  - *Not all erosion is bad*





Riffles and pools also dissipate energy

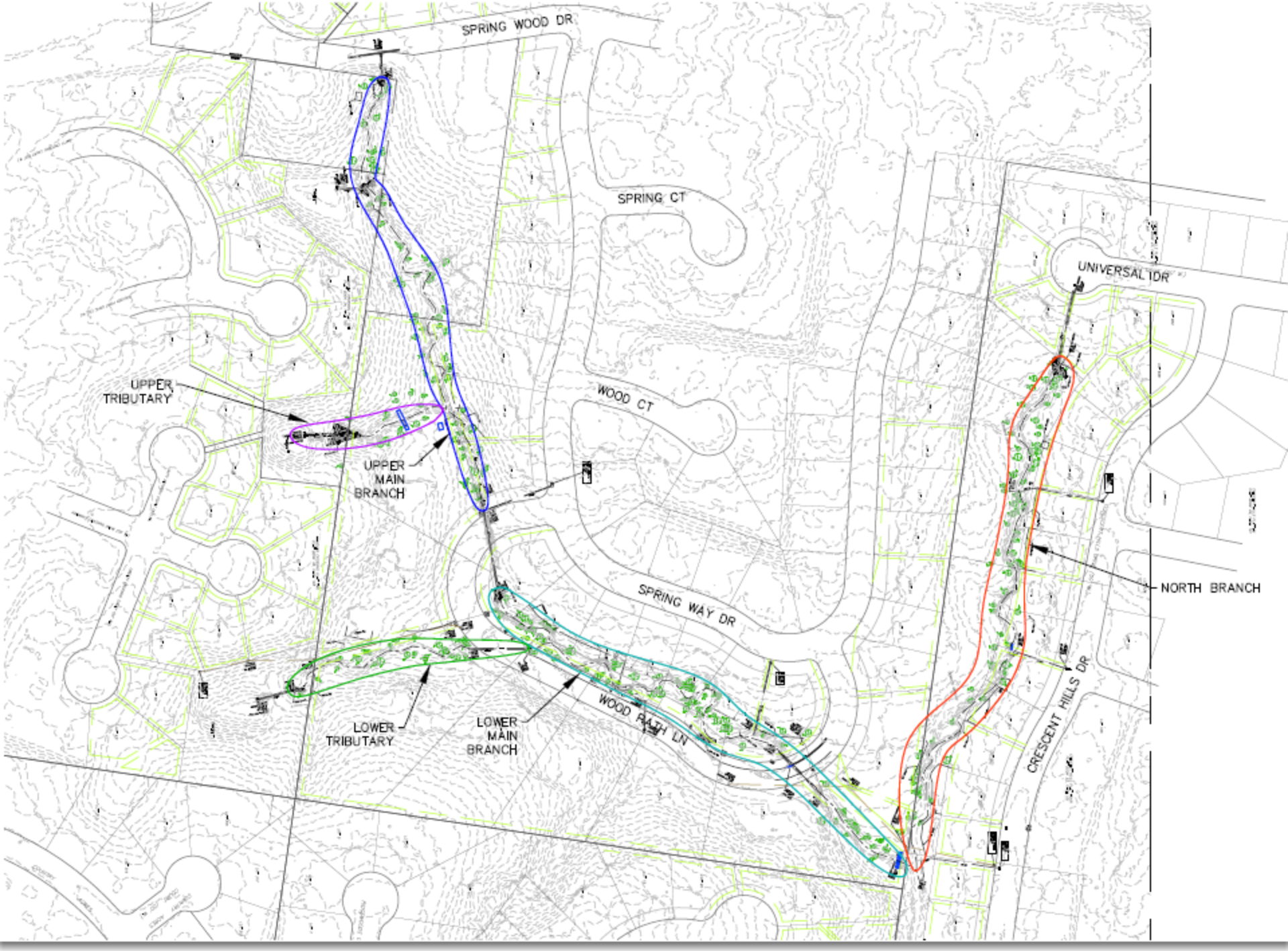


Excessive Erosion

- *Indicative of a hydrology or sediment problem*

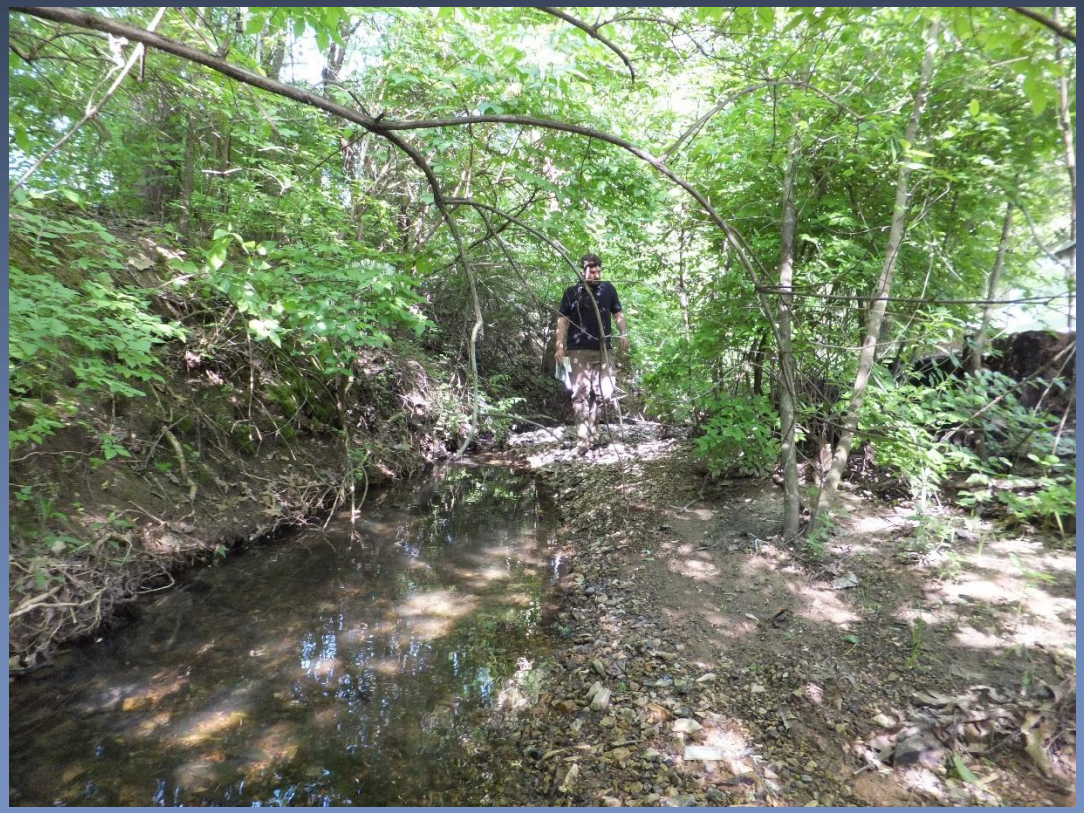
  Channel is adjusting to new conditions
- *Infrastructure impacts*
- *Sediment pollution*

Project Site


SPRING WOOD DR
SPRING CT
UNIVERSAL DR
UPPER TRIBUTARY
WOOD CT
UPPER MAIN BRANCH
NORTH BRANCH
SPRING WAY DR
CRESCENT HILLS DR
WOOD PATH LN
LOWER TRIBUTARY
LOWER MAIN BRANCH

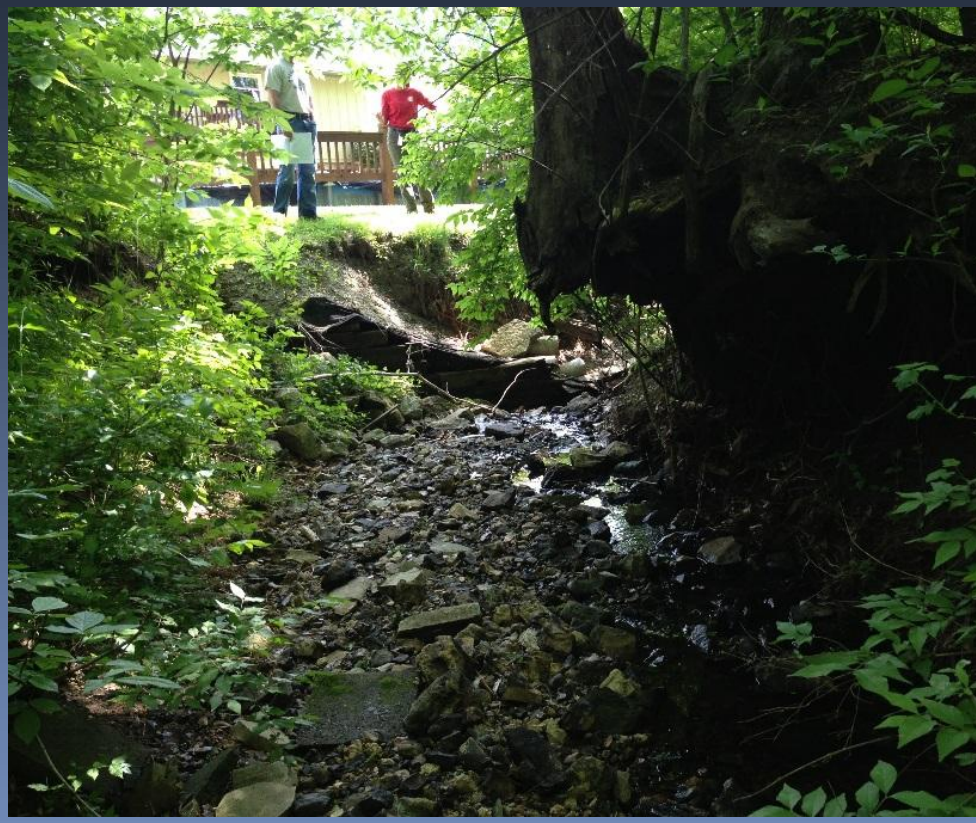
North Branch

- Lower reach relatively stable with some pinch points and localized bank erosion



North Branch

- Upper reach experiencing incision with pinch points and bank erosion

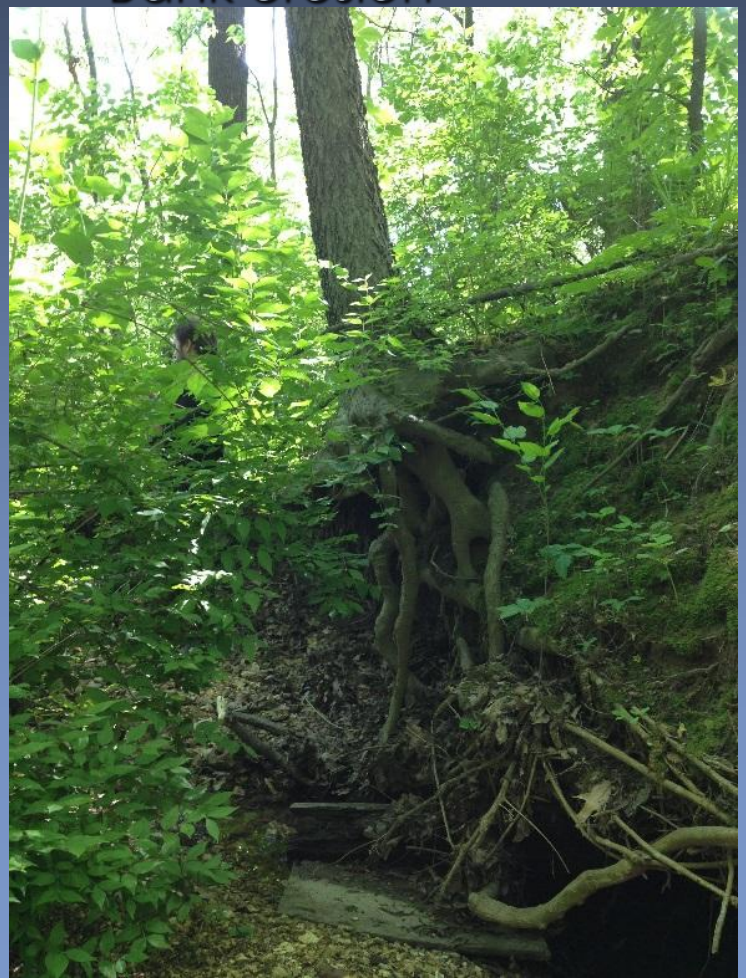


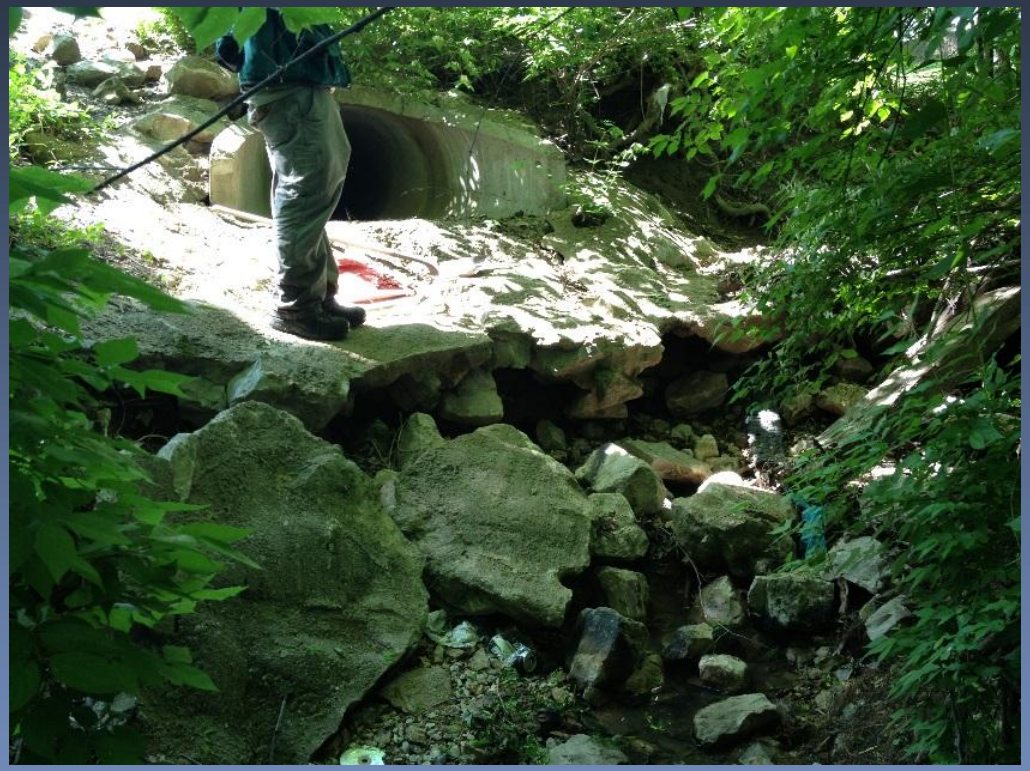
Lower Main Branch

- Upper reach slight incision
- Lower reach slight aggradation
- Relatively stable channel

Upper Main Branch

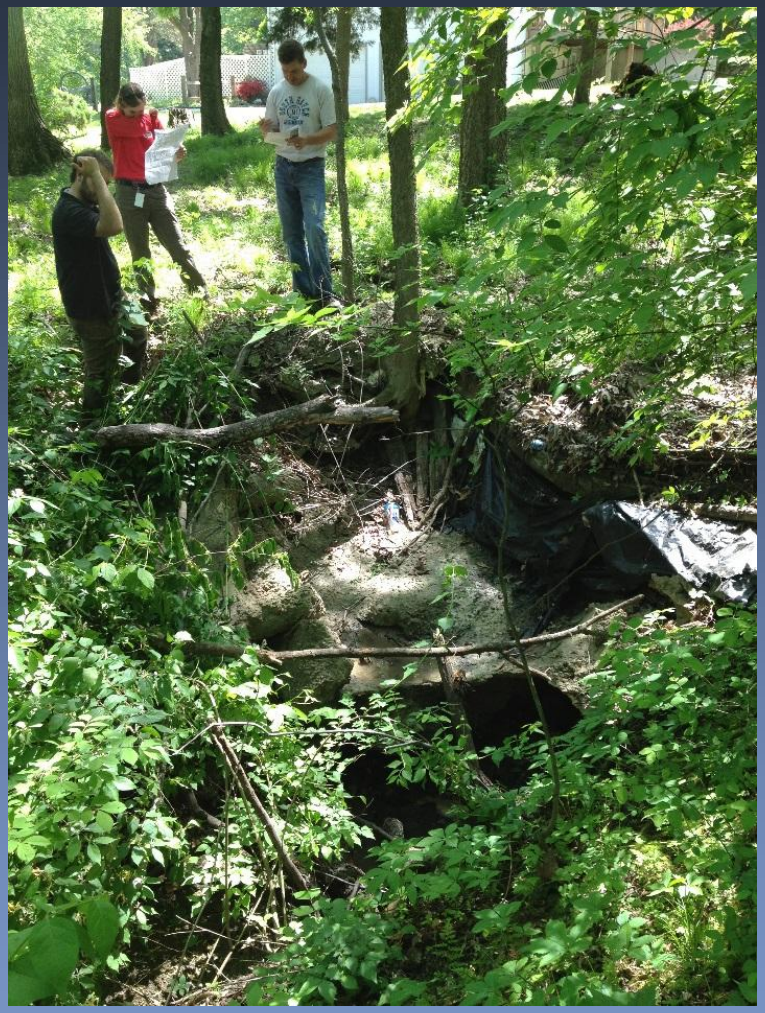
- Incision through middle of reach
- Debris throughout
- Bank erosion





Upper Tributary

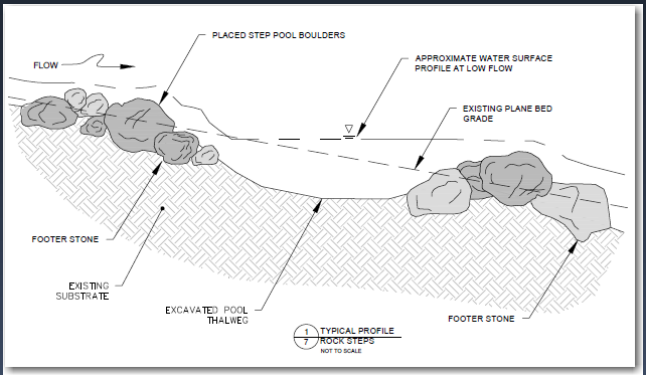
- Artificial knick point near confluence not stable long term solution



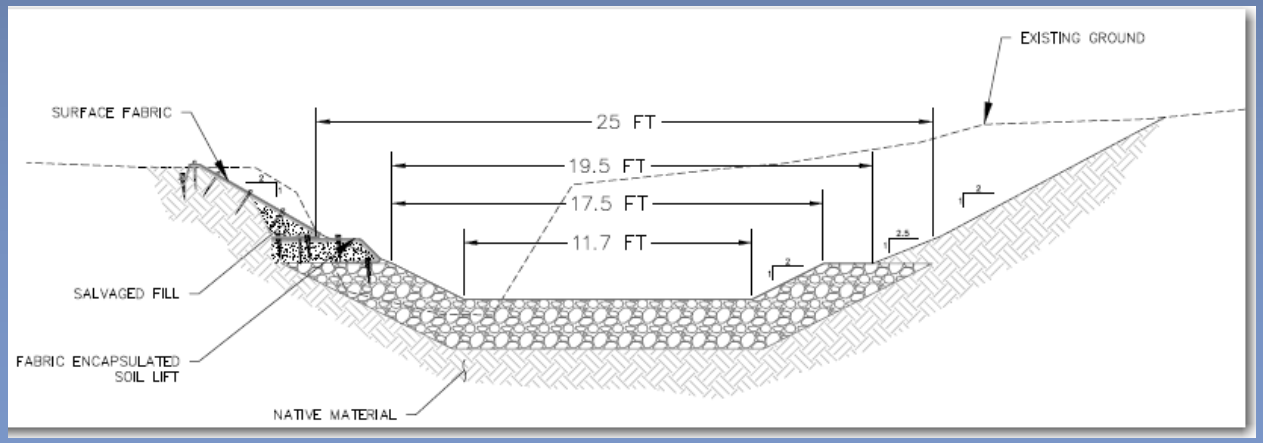
Project Goals

- Create geomorphically stable channel under range of flow conditions
- Improve water quality
- Improve aesthetics
- Not to impact flood conveyance
- Reduce future maintenance costs
- Wildlife (birds)

Solutions



- Create stable channel (step/pool)
- Convey100-yr flood event within channel
- Use vegetated bioengineered banks for channel bank stabilization



Single Pass Construction

Incised channel elevation

Incised channel elevation

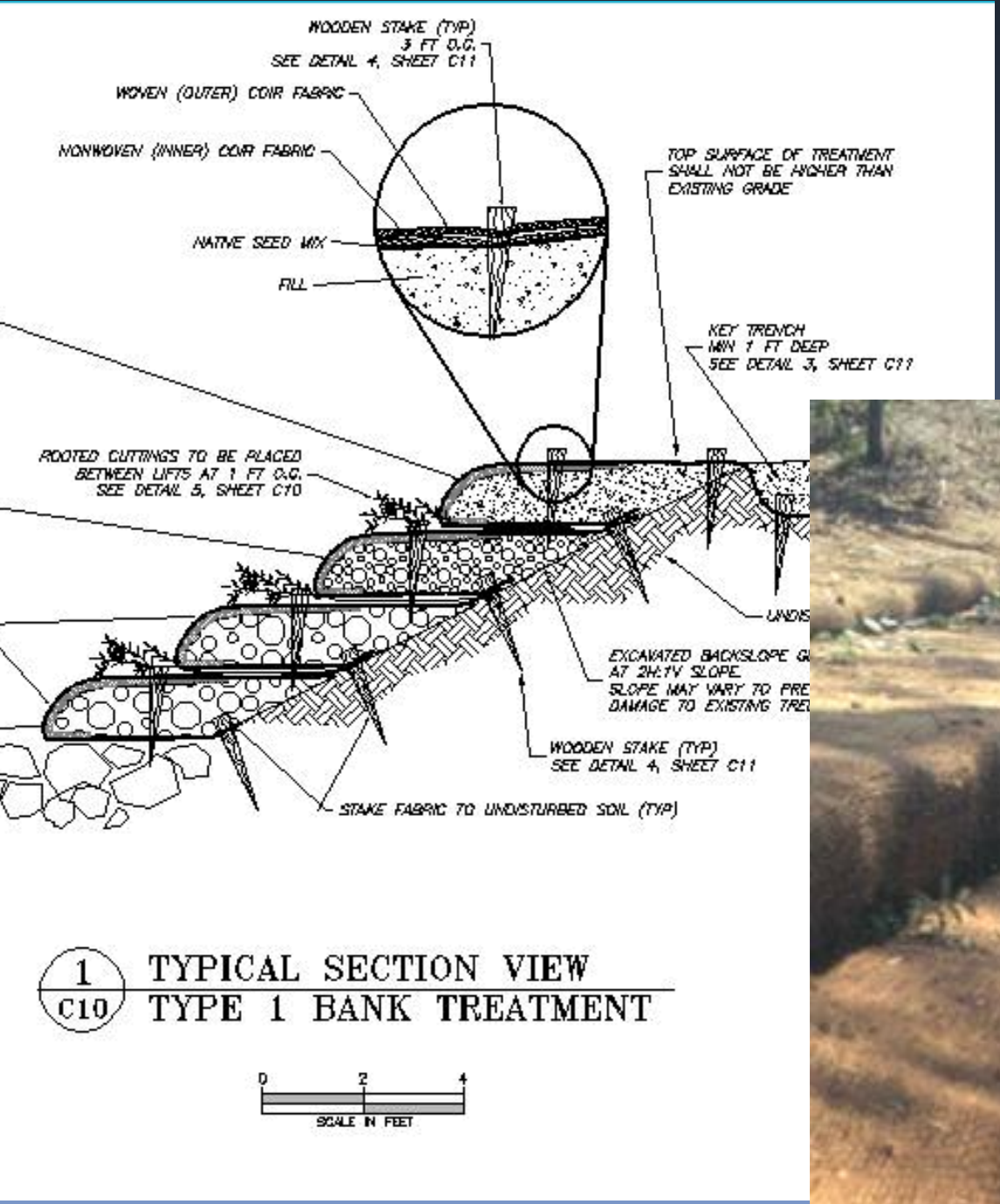
- 1 year post construction

Steep channel elevation/stabilization

- Natural step pool/cascade

Step pool channel stabilization & bluff protection

Soil encapsulation



Steep bluff treatment

- 10 years

Erosion resistance

Grasses

- Generally good to 2 ft bank height
- Reed canary grass vs natives

Shrubs

- Some have high root density
- Shade tolerant vs. full sun

Thank you