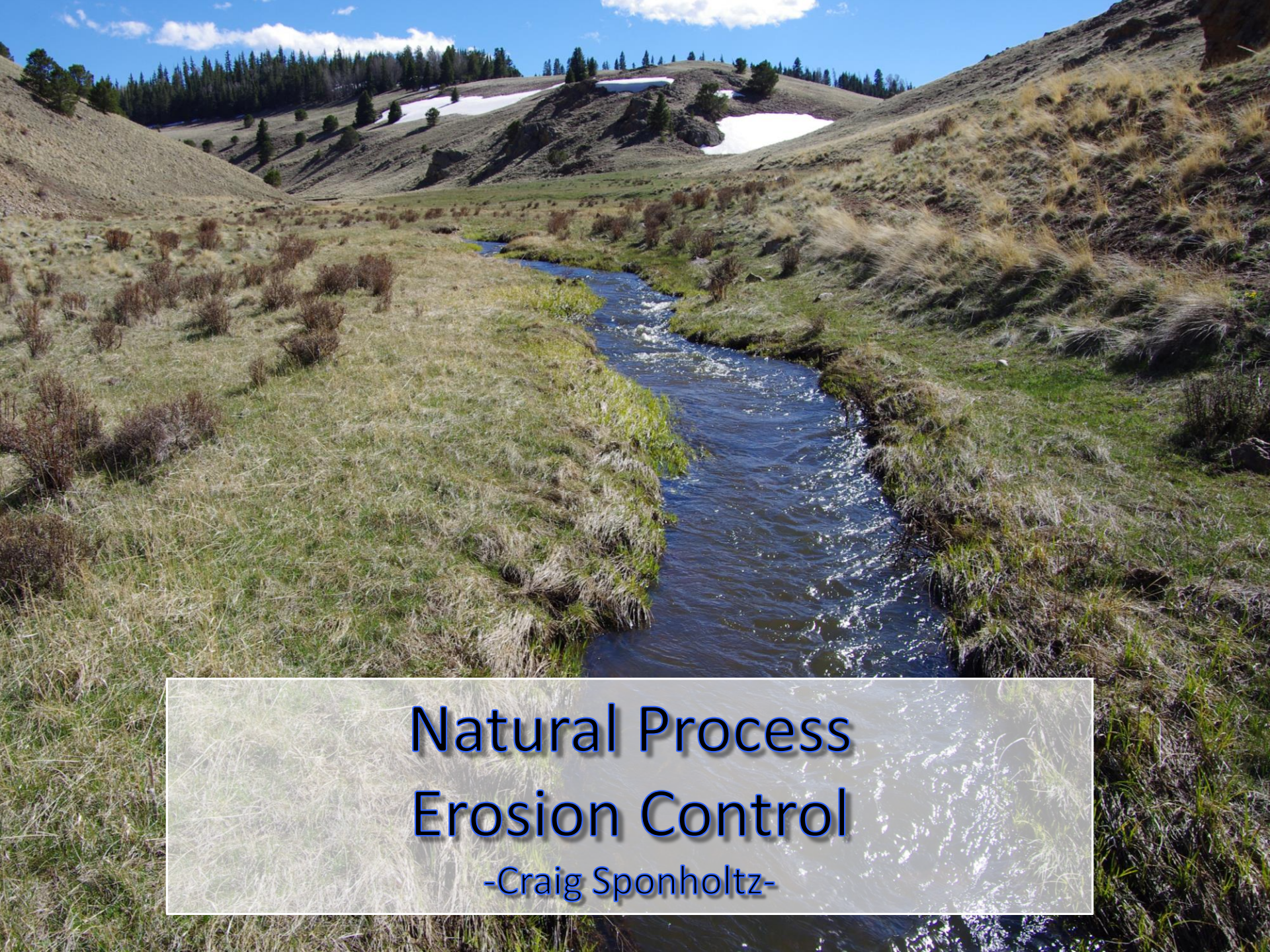


# Natural Process Erosion Control

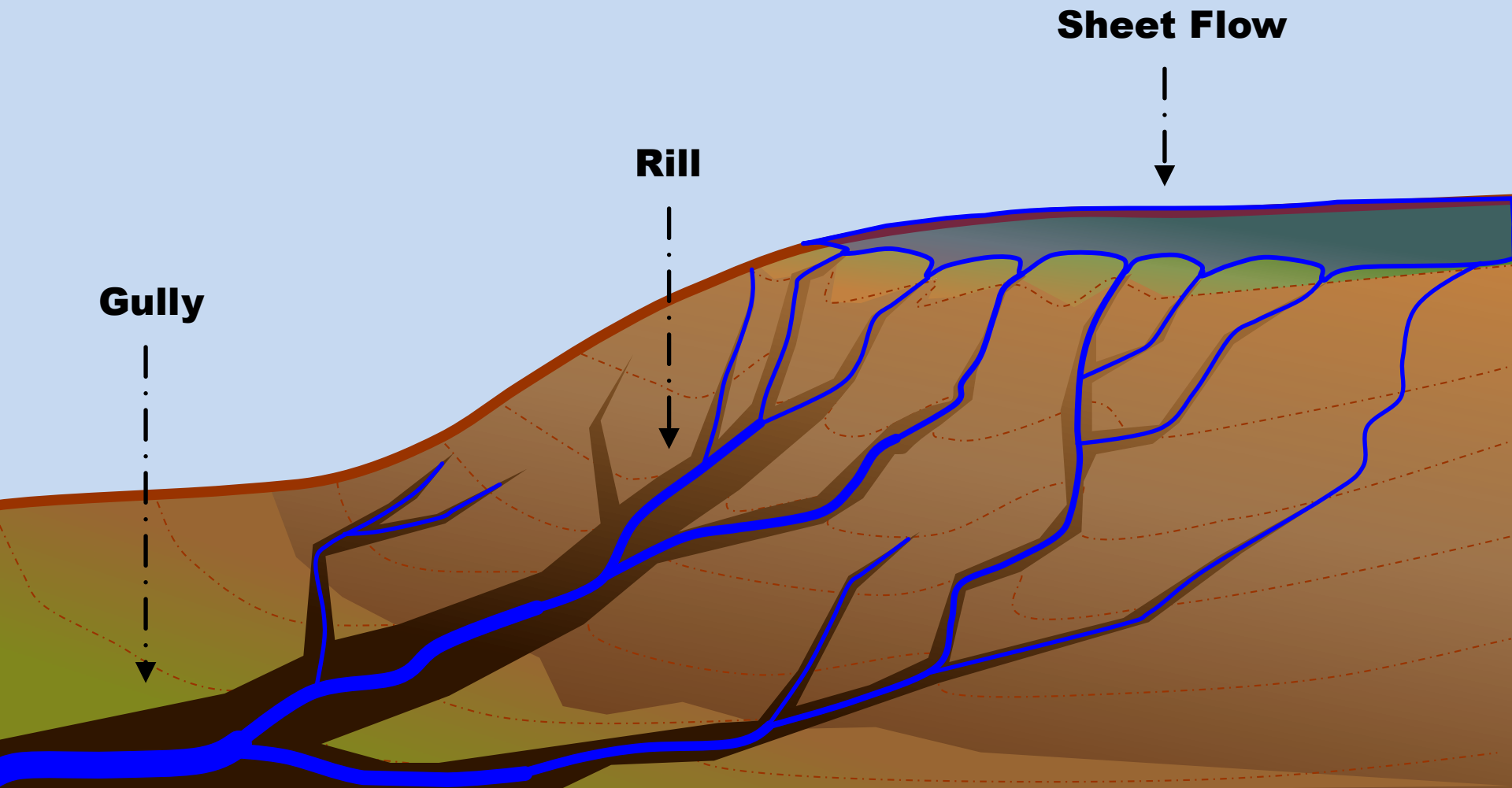
-Craig Sponholtz-


Channel Systems Have 4 Primary Jobs:
•Transport runoff
•Transport sediment
•Store moisture
•Transform energy


Converging flow lines illustrate the
Continuity Principle
When velocity increases, cross sectional area decreases
or
When cross sectional area decreases, velocity must increase.

# Runoff and Erosion Processes

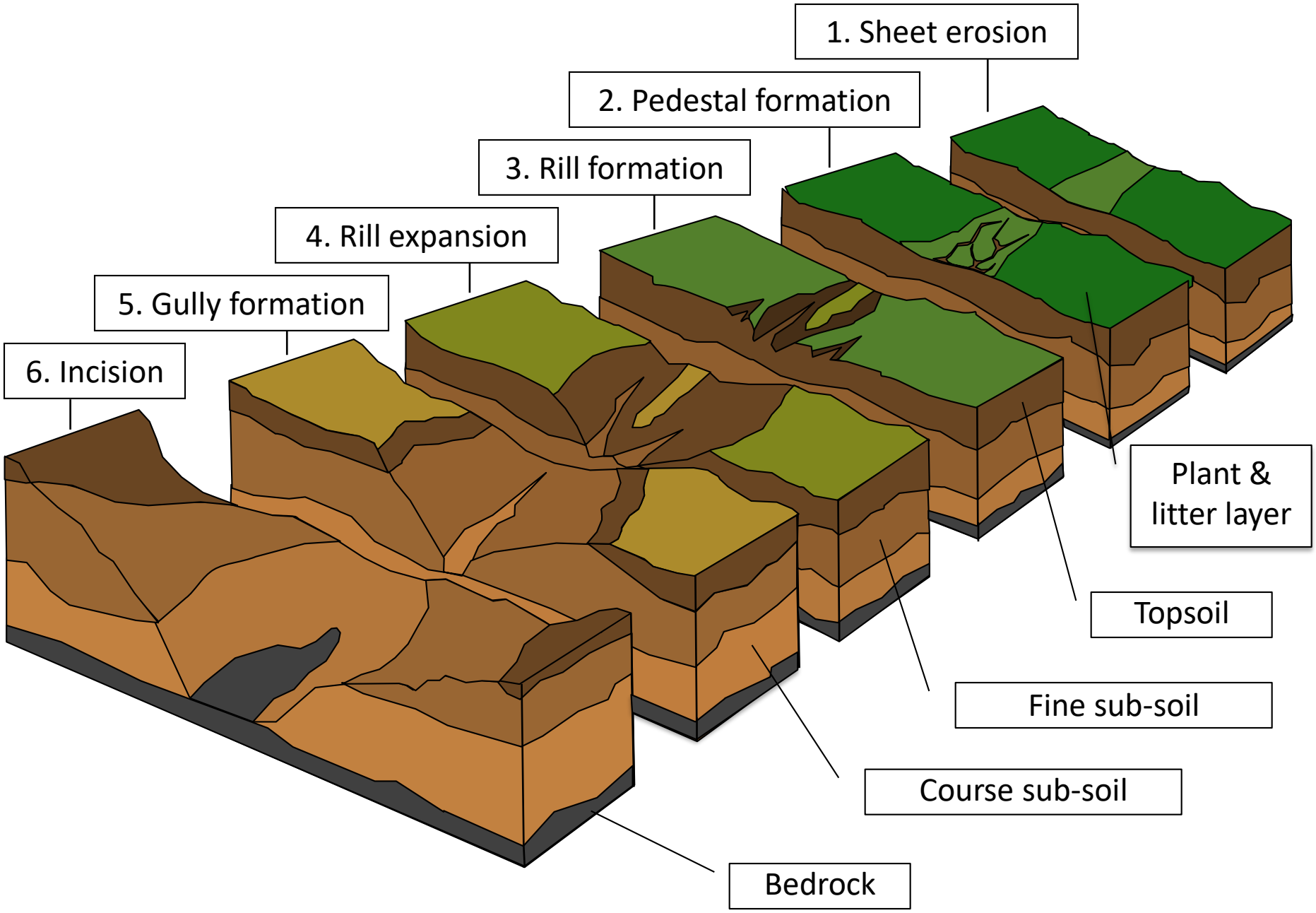
# Forms of Runoff Transmission



# Runoff Erosion Processes

**Erosion is a symptom of land degradation**

# Stages of Gully Development

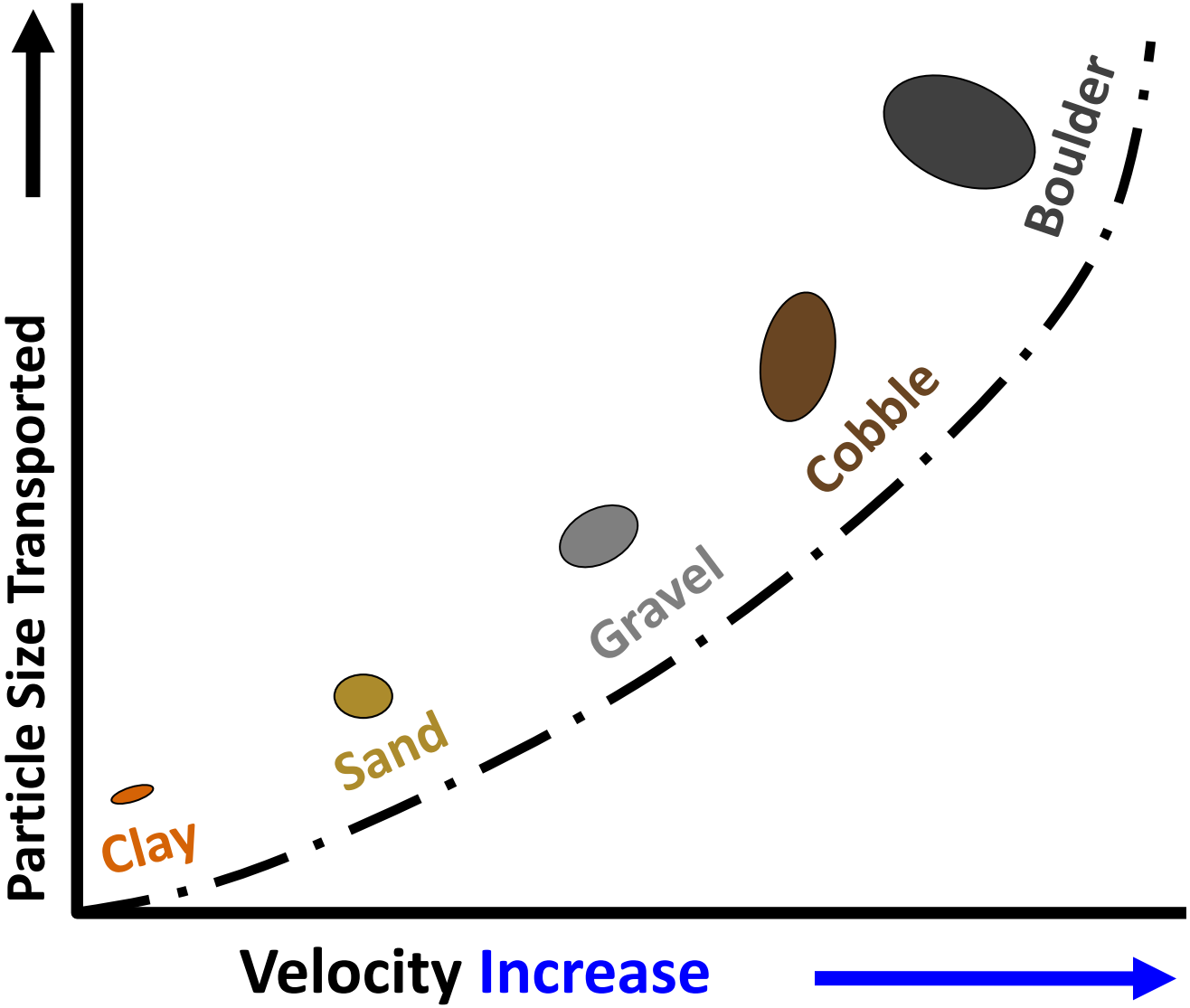



Bank
Erosion

**The rate of erosion on bare soil is 80 times greater than soil covered with vegetation.**

# Sediment Transport

# Soil Erosion and Sediment Transport




**Exponential relationship- Increased velocity 2x = increased particle size by 4x**

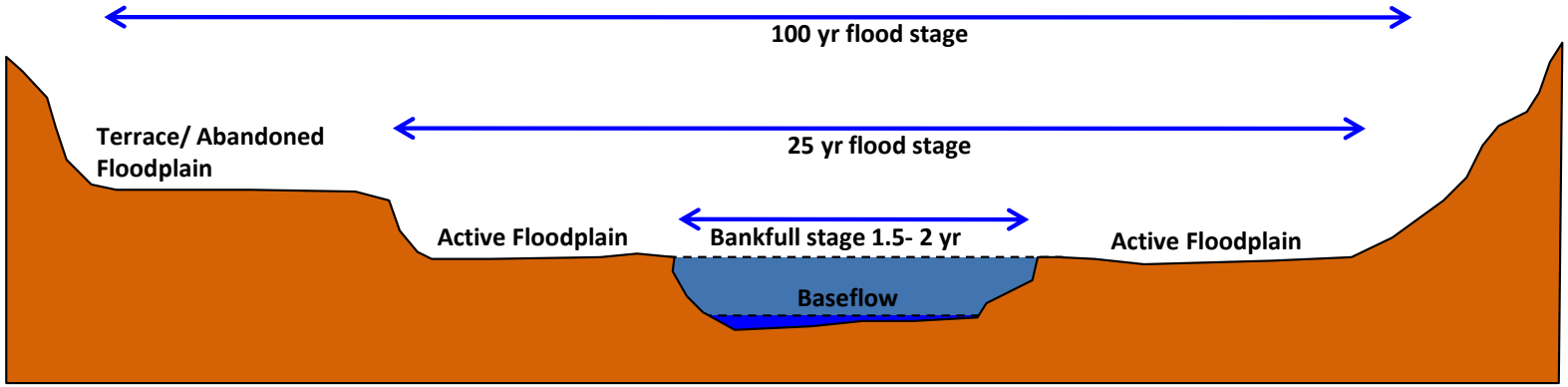

Sediment Sorting in Streams

# Channelization and Incision


Channel Incision
Headcutting

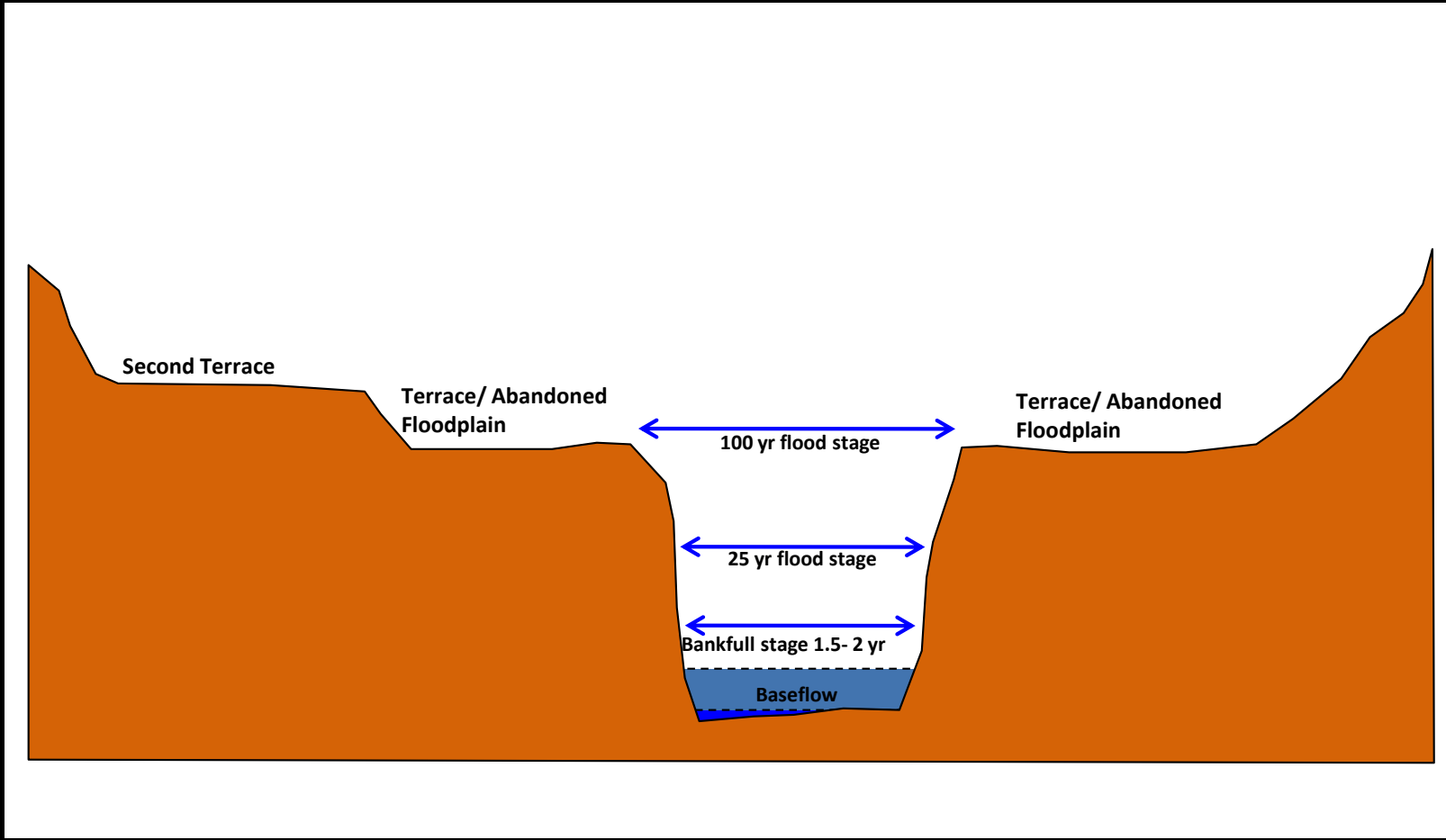
# Headcuts Reduce Floodprone Area

# Floodplain Access




Floodplains reduce velocity and increase infiltration

# Incised Channel




**Remember the continuity equation…**

# Five Principles of Natural Process Erosion Control

1. Protect and expand moisture storing areas of the landscape.

2. Stabilize active erosion and prevent further degradation.

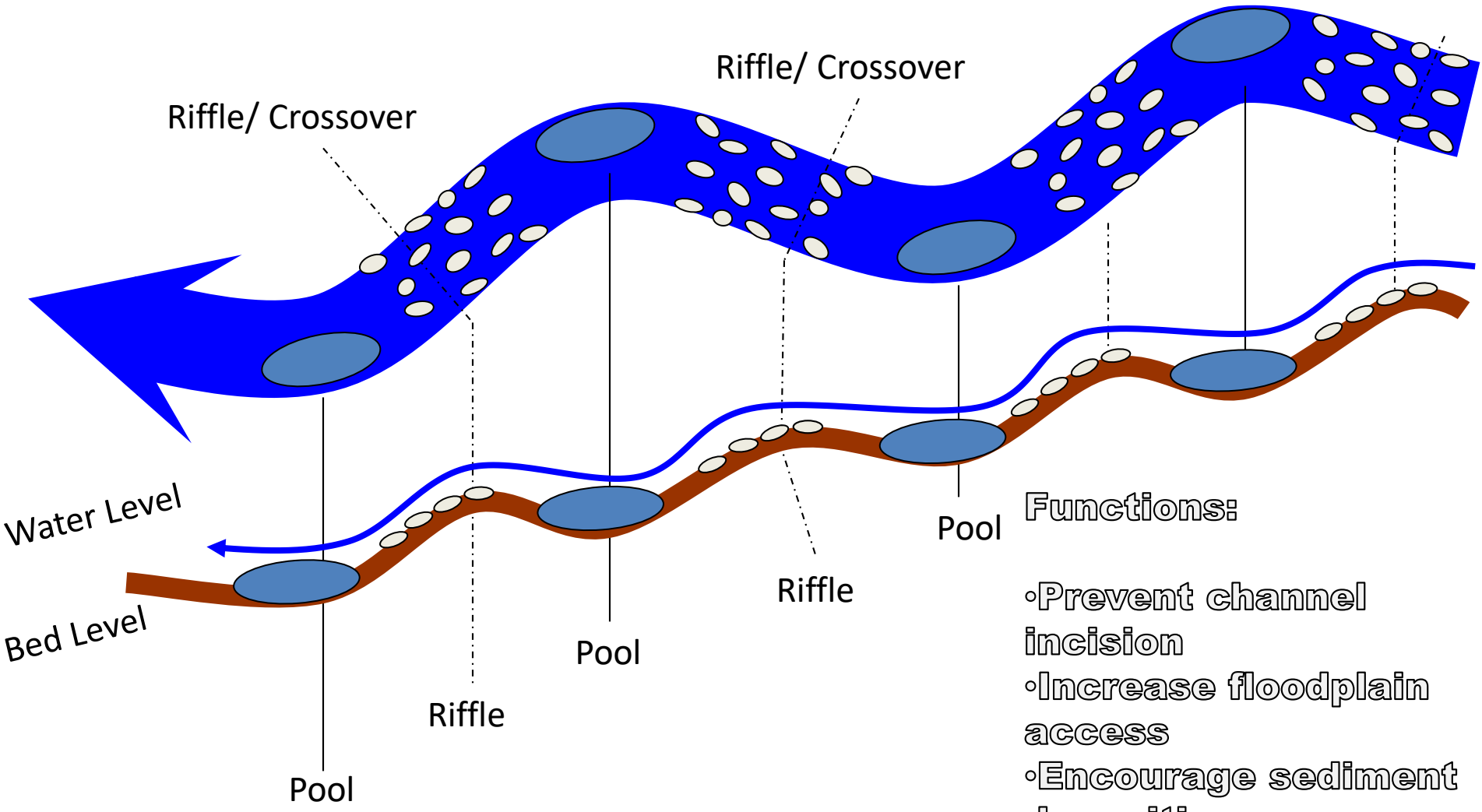
3. Restore dispersed flow and increase infiltration at every opportunity.

4. Cultivate regenerative plant communities to build soil.

5. Create site-specific solutions using natural forms and processes.

# Grade Control Structures

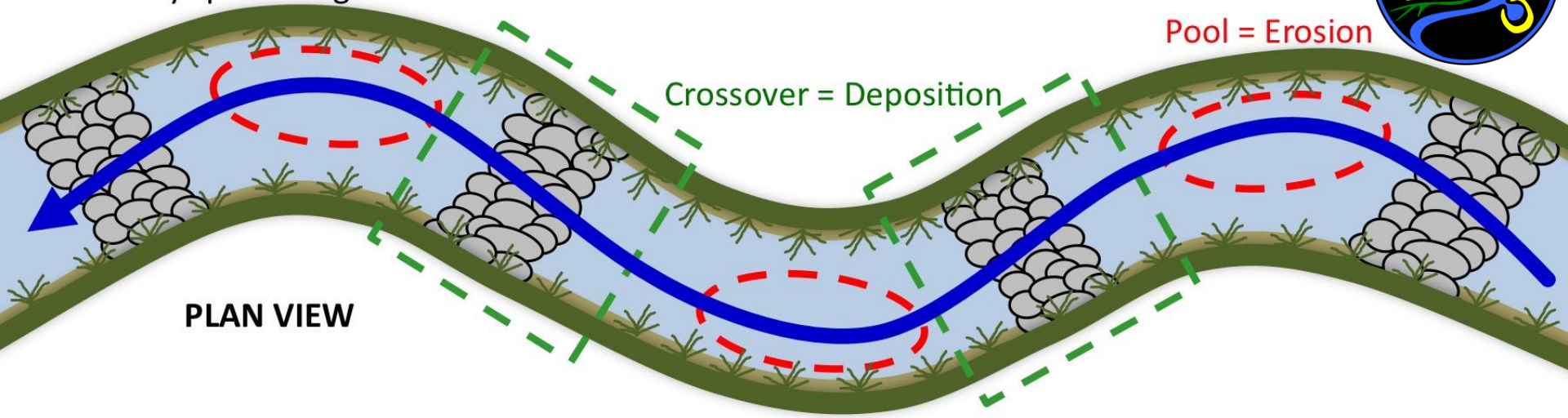
# Riffles Provide Natural Grade Control



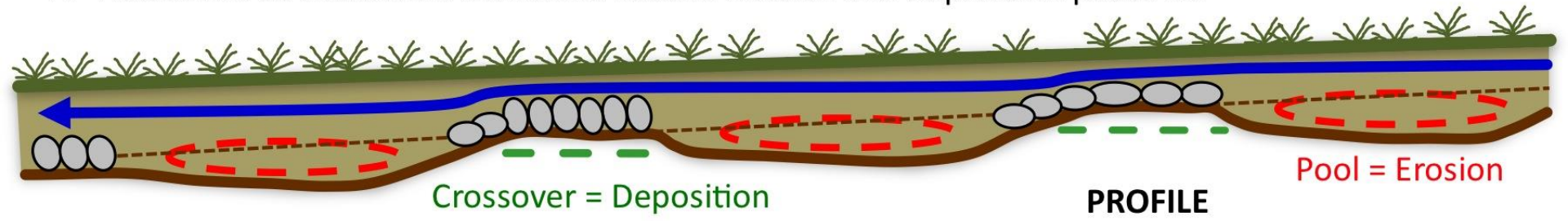

## Riffle/ Pool Sequence

# ONE ROCK DAM

1. Always position grade control structures at meander crossovers.




2. Placement at crossovers maintains natural erosion and deposition patterns.




3. Always maintain channel cross section to protect banks.

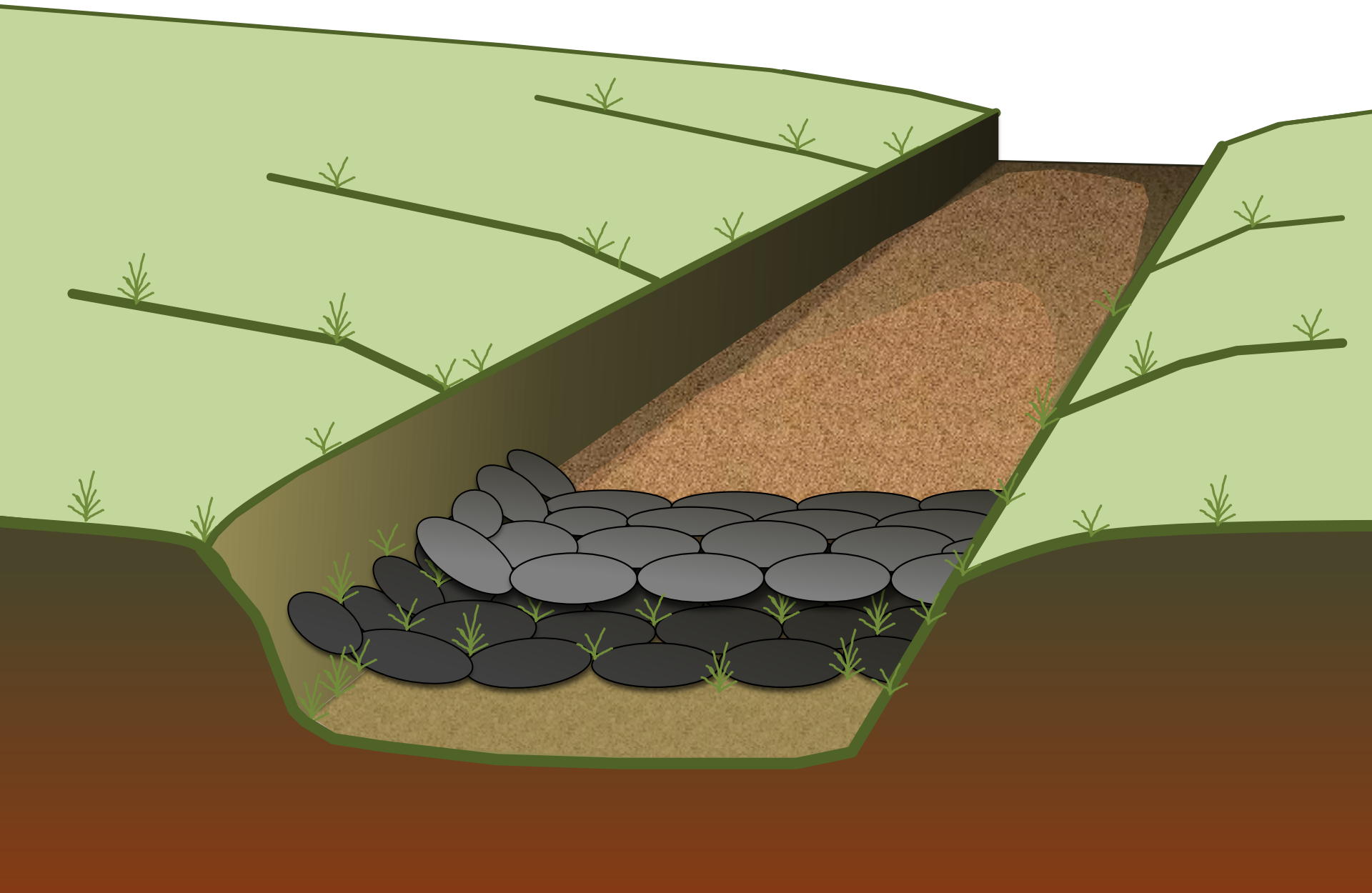

© 2010 CS AA


One Rock Dams can expand bank vegetation


One Rock Dams increase roughness at riffles


One Rock Dams increase floodprone area

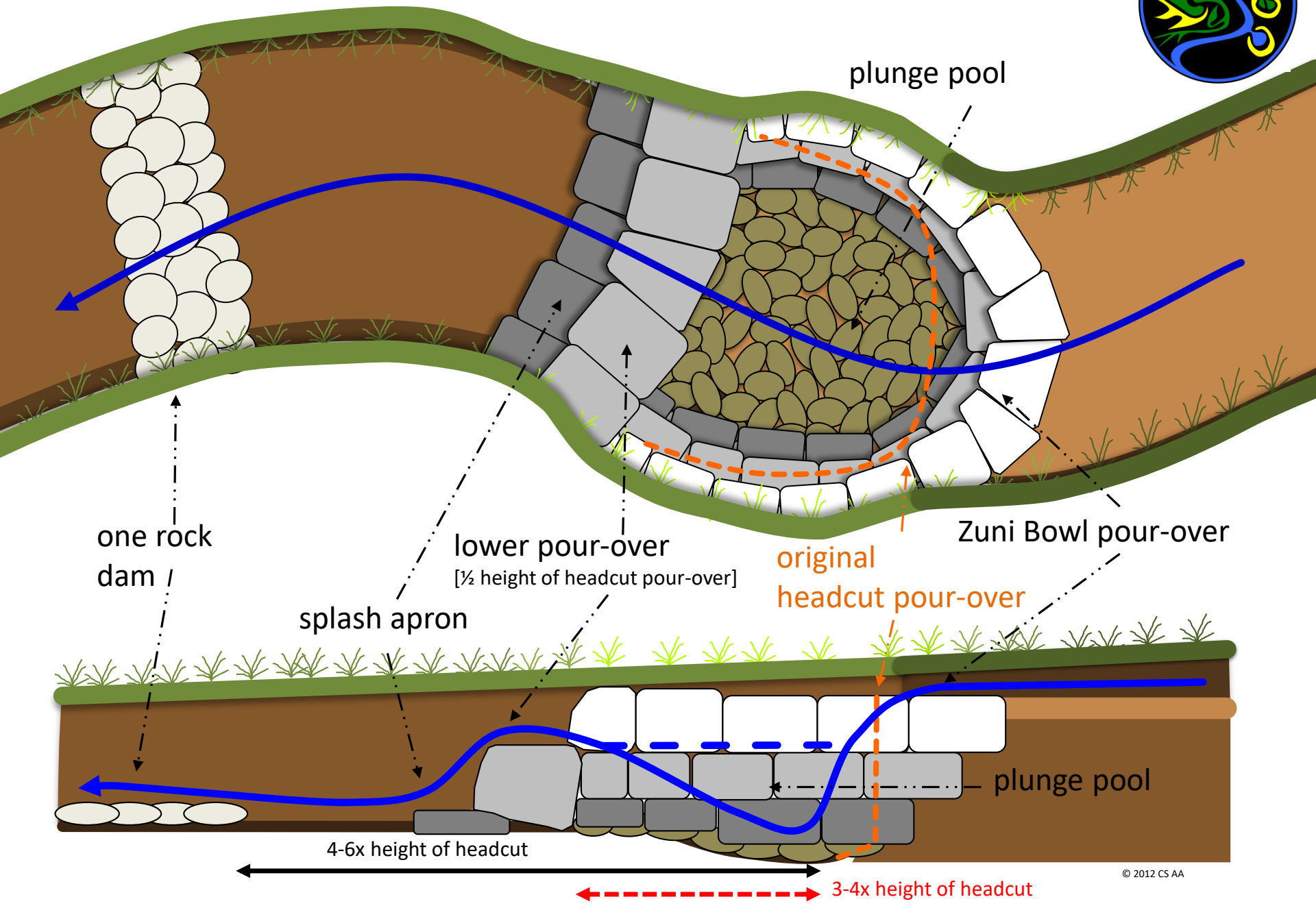
# A second layer of rocks increases deposition



# In-Channel Headcut Treatments


In-Channel Headcut Stabilization
Why: To prevent further channel incision and loss of floodprone area

# ZUNI BOWL

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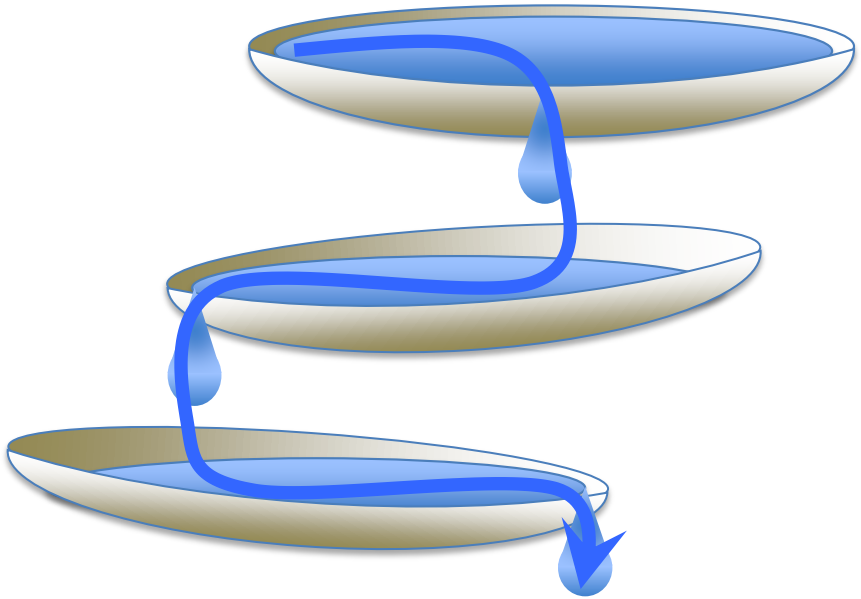


# Multi-Step Zuni Bowl for Larger Headcuts >3’ (1m)

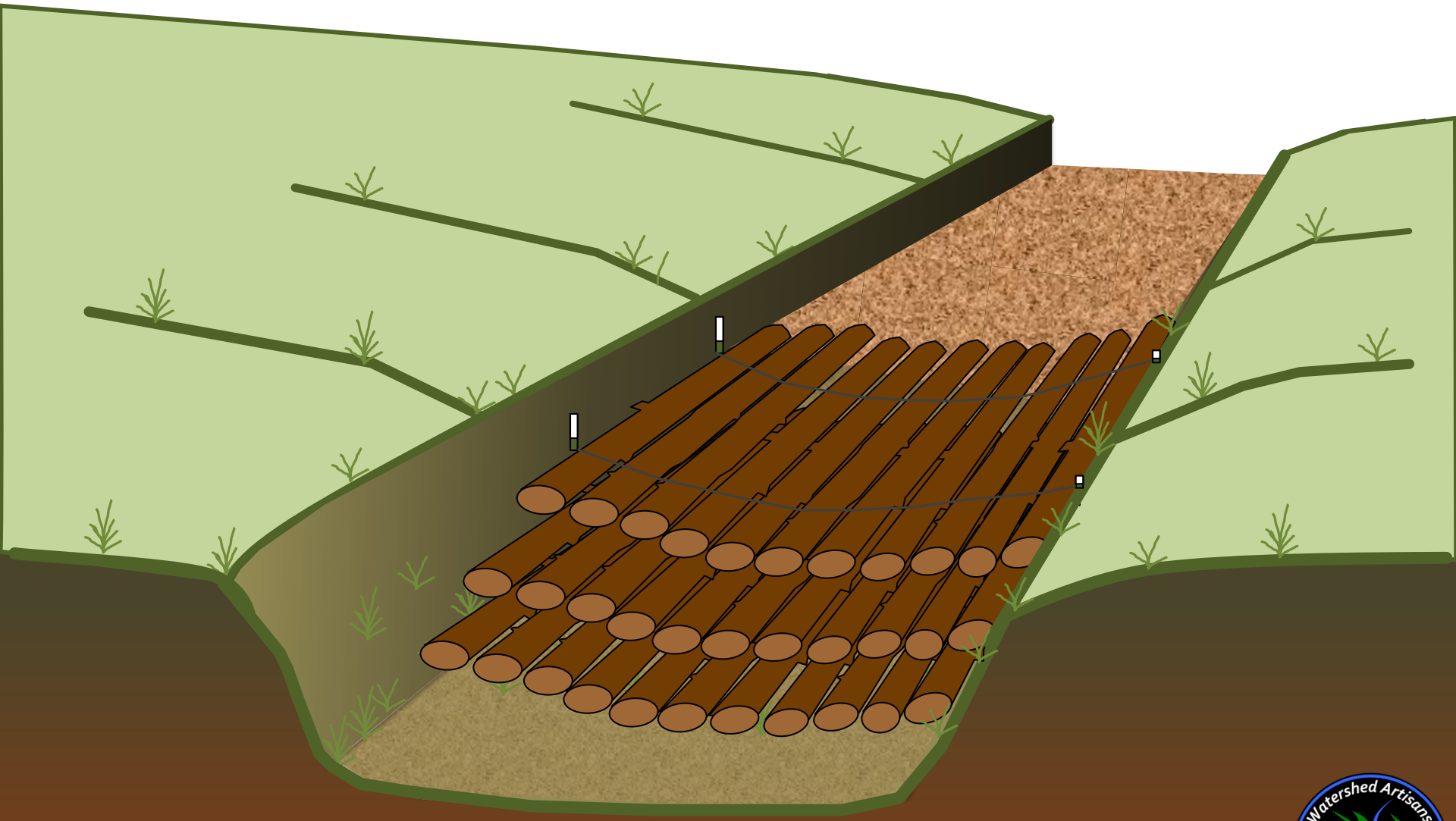
# Zuni Bowl Construction

1. Cut back and shape headcut face to simplify rockwork.

2. Cover face of headcut with geotextile fabric to prevent soil piping.

3. Fill the gap between fabric and rock with gravel as each tier is built up.

# Log Stepdown



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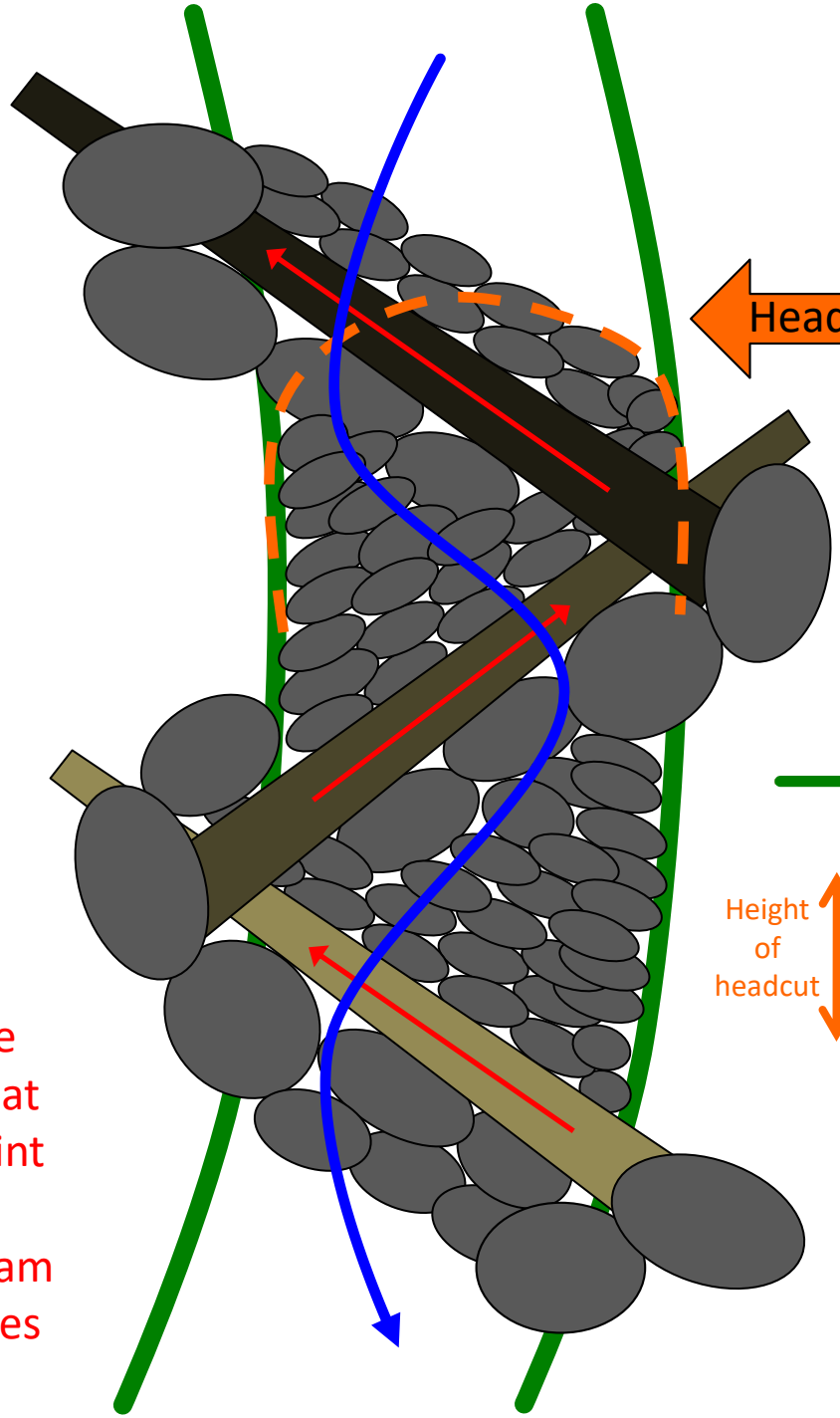
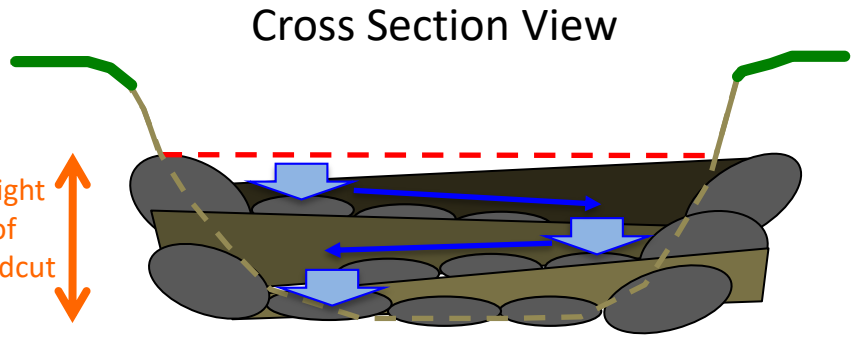
# Log and Rock Step-Down




Logs should be oriented so that the lowest point of the log is always upstream (arrow indicates low side).

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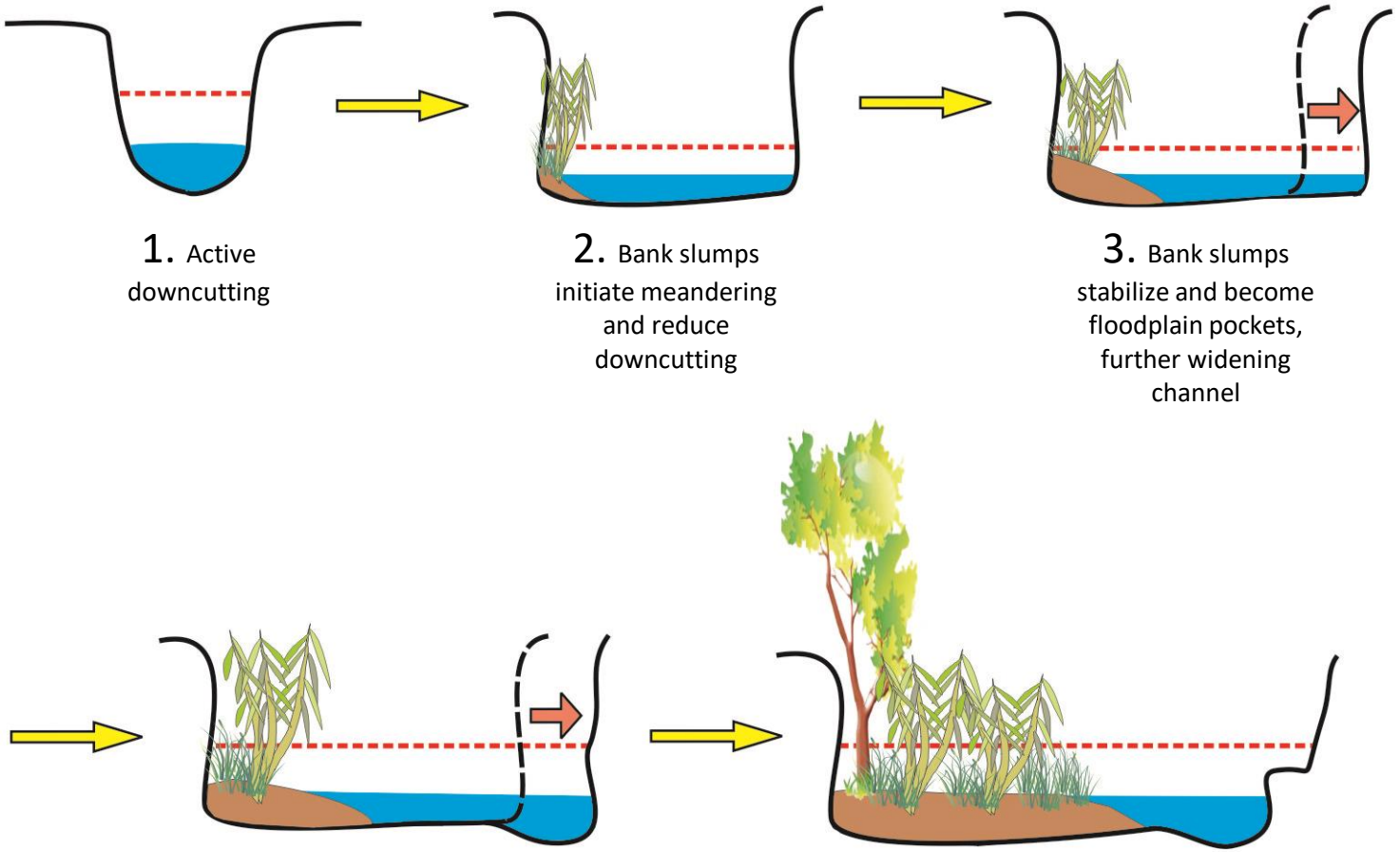
# Induced Meandering Restoration Method

**Induced Meandering accelerates the natural processes that allow an actively incising channel to evolve into a stable channel with and in-set floodplain.**

**Channel Evolution Phase**



1. Active downcutting

2. Bank slumps initiate meandering and reduce downcutting

3. Bank slumps stabilize and become floodplain pockets, further widening channel

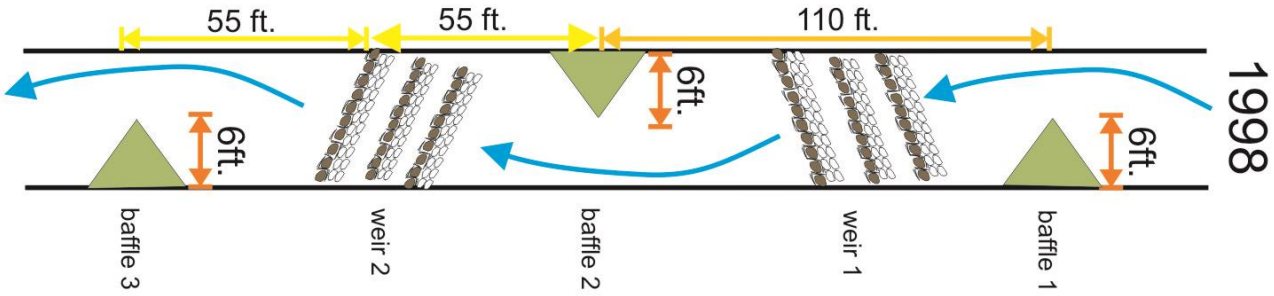
4. Evolving floodplains recruit perennial vegetation, inside bends stabilize and full channel morphology develops

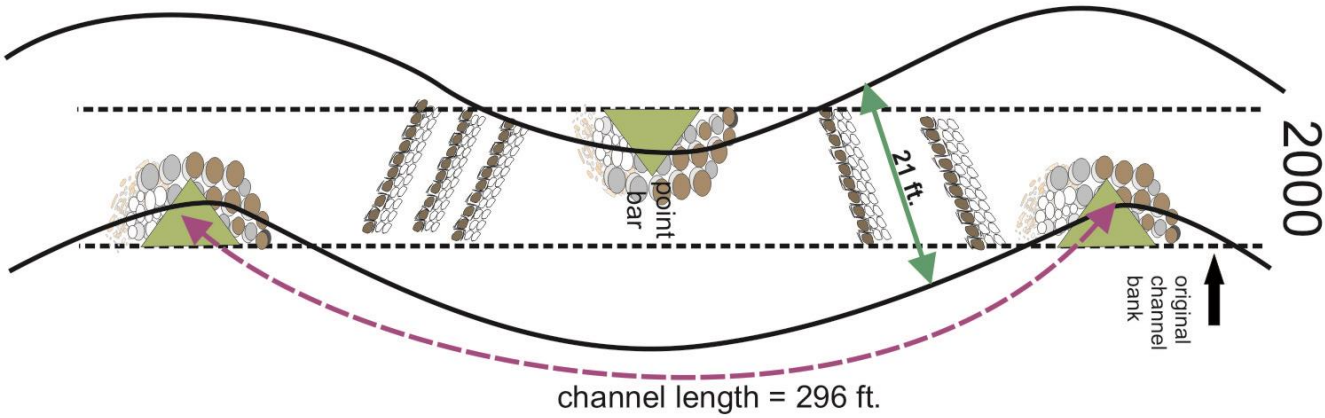
5. Sub-irrigated floodplains recruit and expand riparian plant species, which further stabilize banks and narrow the channel

© BZ & TEG

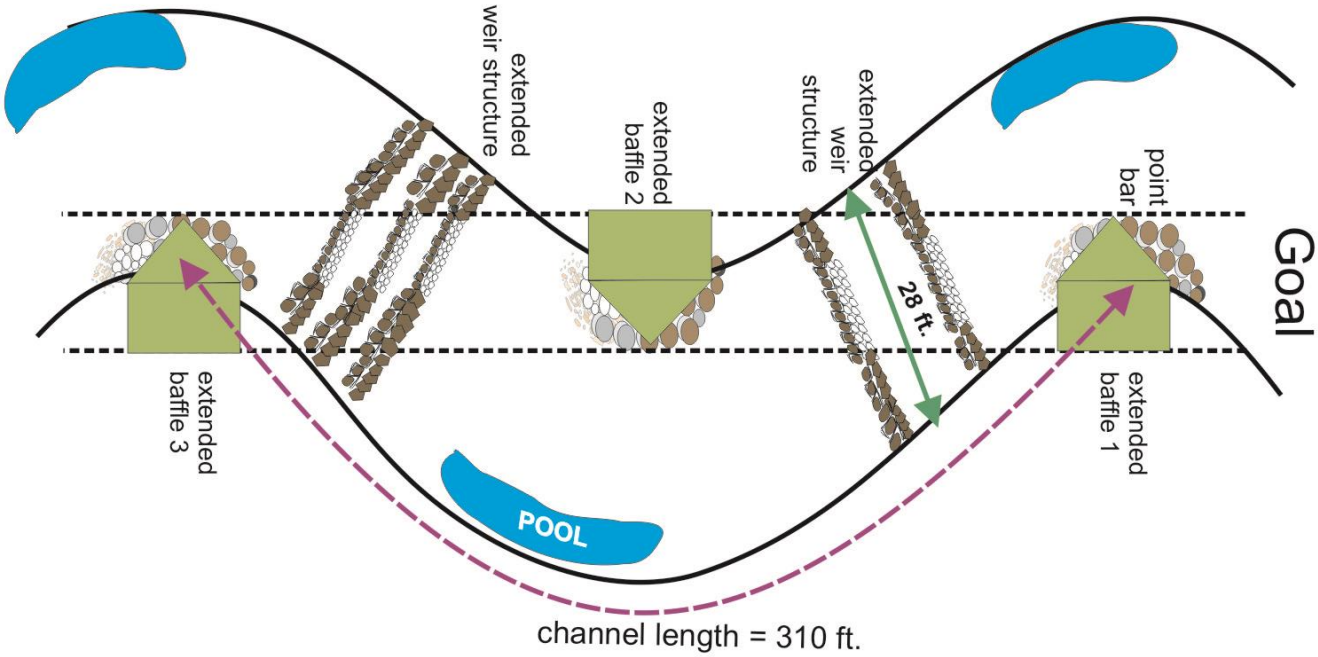
Starting point: Meander Length, 220 ft. Channel Length, 233 ft.,
Sinuosity = 1.06 and Channel Width, 12 ft.


Goal Parameters: Meander Length, 220 ft., Channel Length, 310 ft.
Sinuosity = 1.4 and Channel Width, 28 ft.



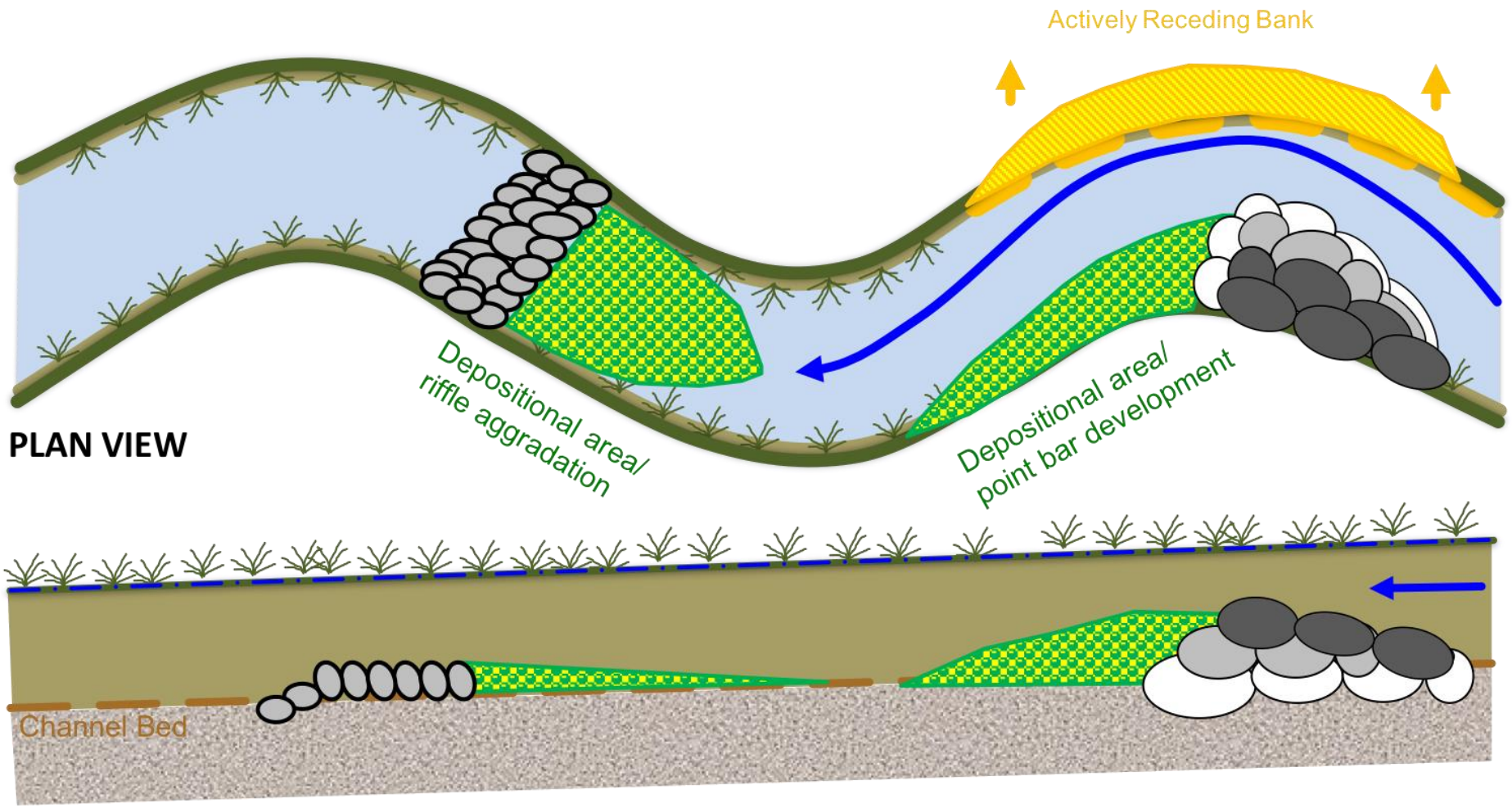

channel length = 296 ft.




channel length = 310 ft.

# Boulder One Rock Dam

# Boulder Baffle



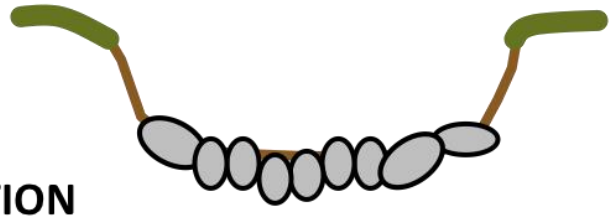

**PLAN VIEW**

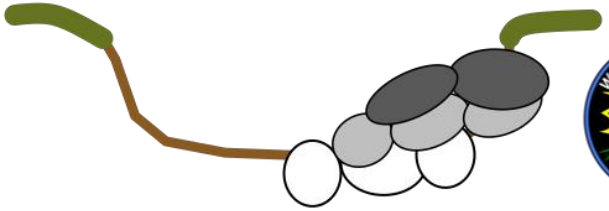
**PROFILE**

Boulder One Rock Dam

Boulder Baffle

**CROSS SECTION**





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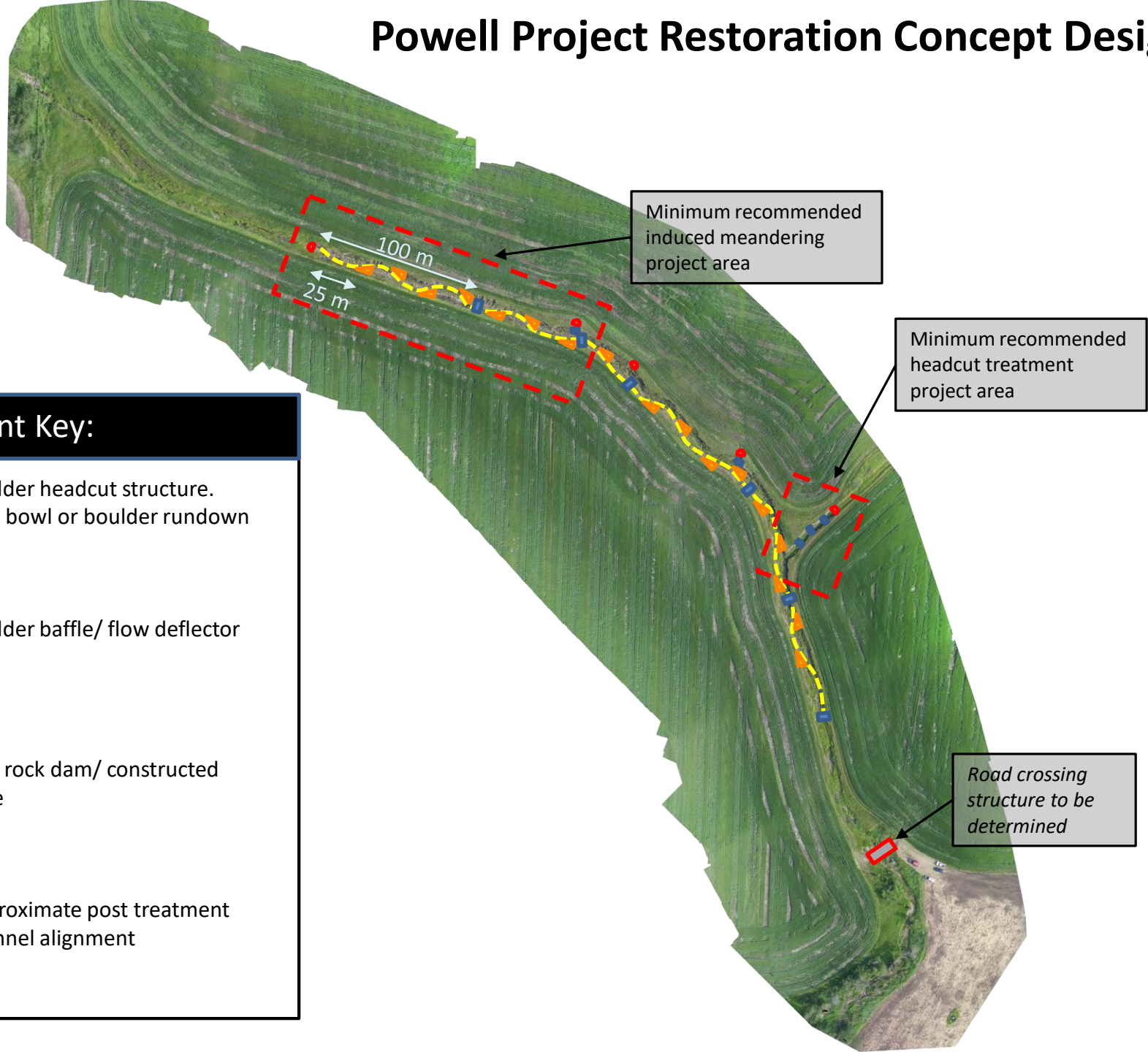
# Powell Project Restoration Concept Design




## Treatment Key:

- Boulder headcut structure. Zuni bowl or boulder rundown
- Boulder baffle/ flow deflector
- One rock dam/ constructed riffle
- Approximate post treatment channel alignment

# Thank You!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