LESSONS LEARNED USING STREAM MORPHOLOGY AND SIMPLE EROSION CONTROL STRUCTURES FROM THE PAST DECADE

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Natural Channel Design Engineering

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- There is a long history of failed channel improvements that did not incorporate basic stream channel morphology

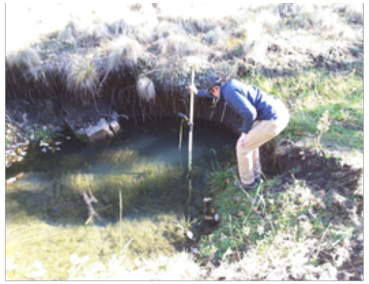
Hand Built, Low Tech Structures

- Ease of installation
- Relatively inexpensive
- Low impacts to site
- Volunteer labor
- Ease of permitting
- Can have huge positive impact

- High Failure Rate
- Frequent Maintenance
- Failures can create harm to site resources
- May not be able to achieve goals that more extensive projects can

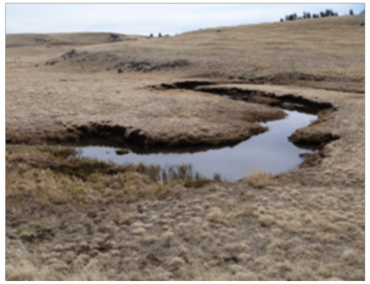
What is the Problem - What can be achieved?

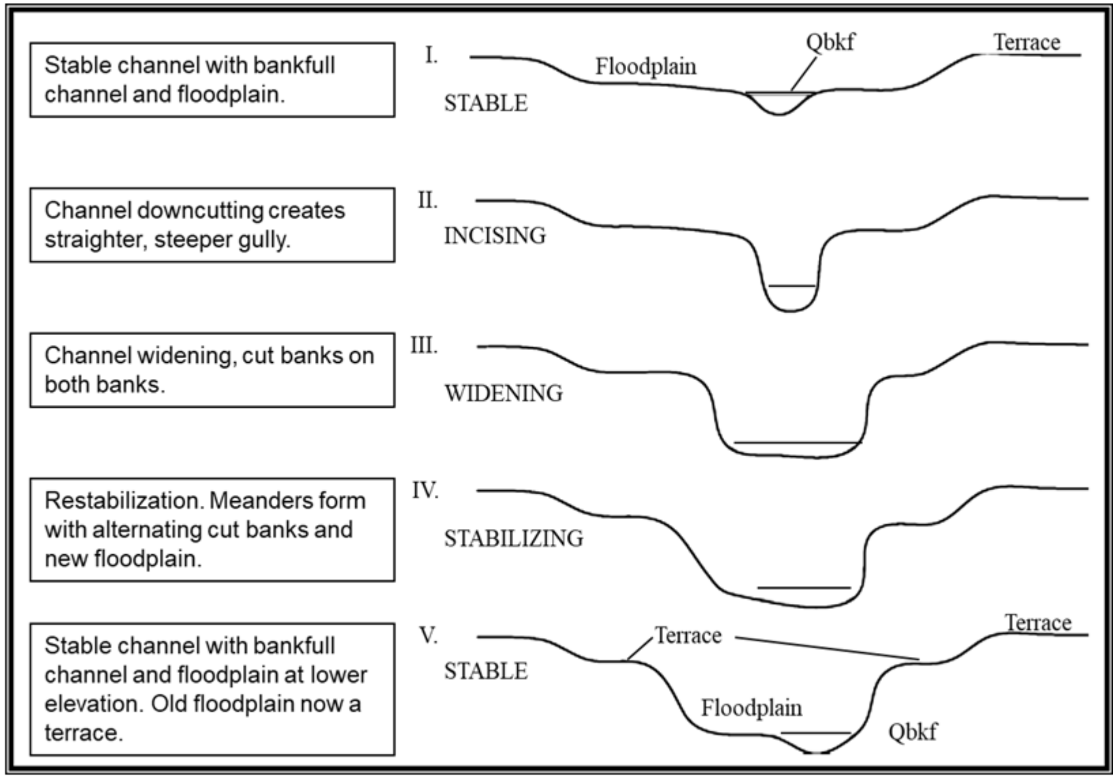
Grade Control- Active head cutting



Incision and loss of floodplain connectivity, wetland function

Lateral instability – Bank erosion, channel and flood plain widening





Choose Appropriate Low Tech Structure

- Rock and Brush
- ORD
- Barbs or Vanes
- Brush Revetment
- Choose appropriate materials
- Don’t forget revegetation and bioengineering principles

Material Type is Important

Wood

- Lighter
- Often available
- Short lived unless permanently wet
- Harder to shape and will not adjust

Rock

- Heavy
- Not always available
- Long life
- Easy to create channel shape

Vegetation

- Easily portable
- Requires appropriate water and disturbance
- Self sustaining with minimal management
- Can be utilized to create shape and flow path
- Can improve habitat quality

Consider The Sediment Load

Too low to fill Incision

Wetland, forested, spring fed

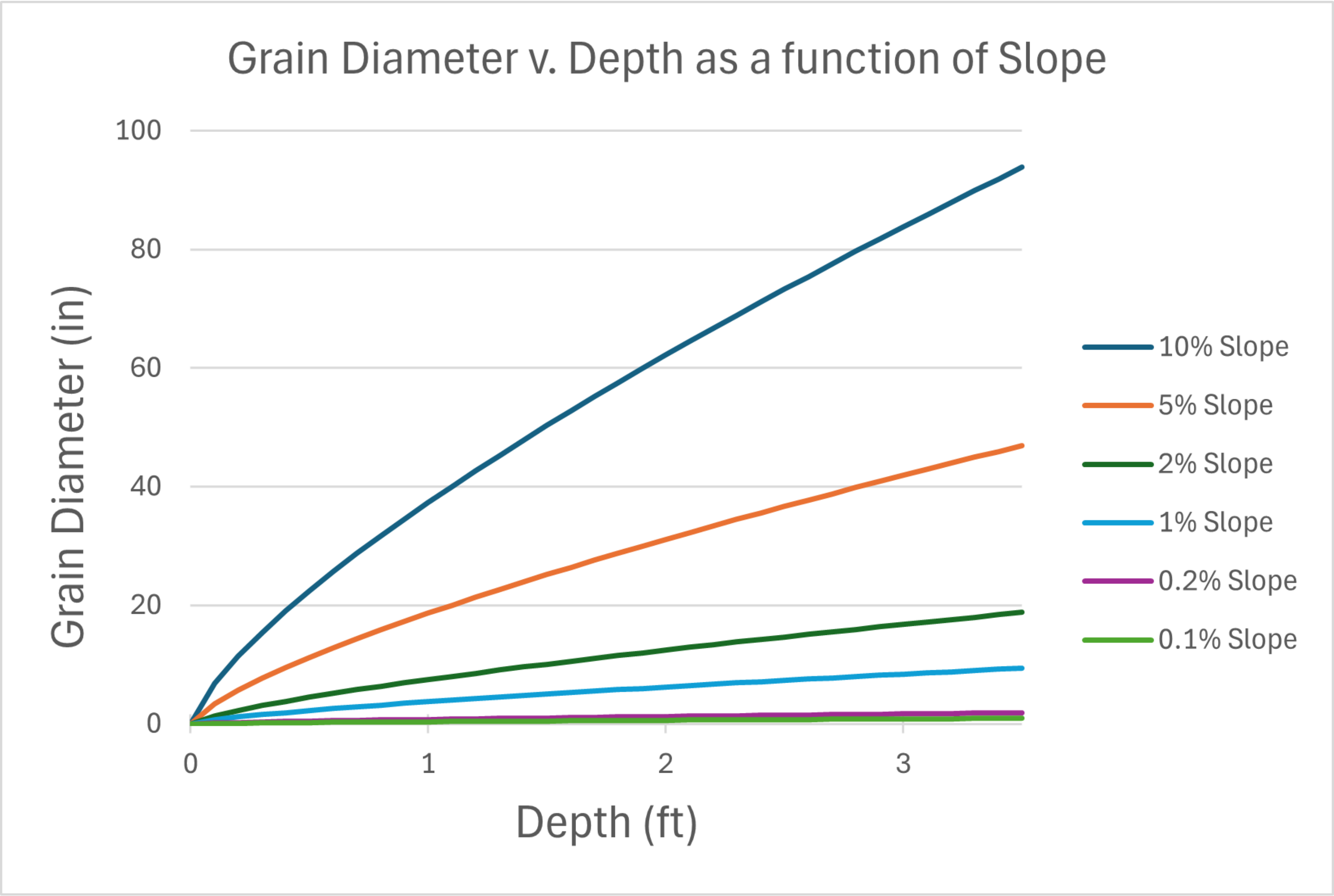
High sediment potential: structures can rebuild the channel

Consider Hydrology and Potential Energy

REGIONAL RATIOS OF VARIOUS HIGH FLOWS TO BANKFULL FLOW

U.S. Sites	Q2.0/Qbkf	Q5/Qbkf	Q10/Qbkf	Q25/Qbkf
Salmon River		1.6	1.9	2.2
Maryland		2.7	4.2	7.5
Eastern U.S.		1.8	2.1	3.3
Eel River, CA		2.4		
Coast Range, CA		4.5		
(Leopold, 1994)				
AZ Sites				
Mogollon Rim (A)	2.0	5.4	9.0	17.0
Upper Gila/Salt (B)	2.0	5.5	10.7	30.0
San Pedro (C)	4.1	8.3	12.0	18.0
Eastern Santa Cruz/Agua Fria (D)	2.6	5.8	9.3	14.0
Western Santa Cruz (E)	1.4	3.8	6.8	13.3
(Moody, Odem, 1998)				

Energy will affect the material size and design



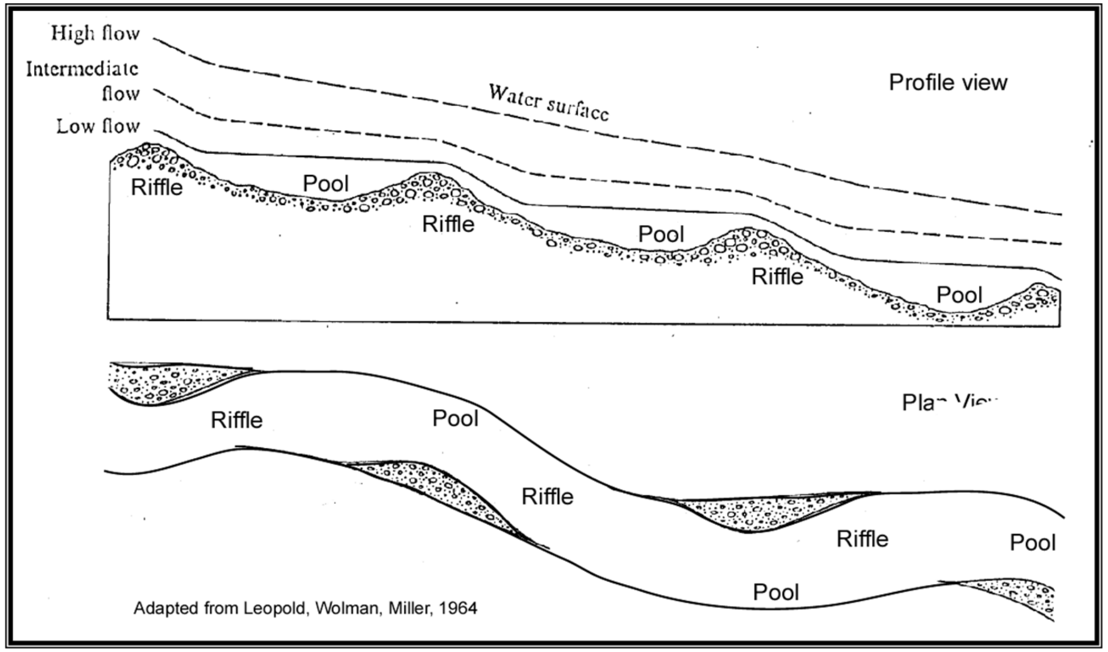
Consider the Shape and Elevation relative to floodplain

- Try to connect the channel back to the geomorphic floodplain (bankfull) to reduce energy at high discharges.

Place Structures in Appropriate Channel Location

Structure placement (riffle spacing) is predicted by stream width and slope

Use riffles for grade control and keep pools deep for energy dissapation



Choose the width of the structure with function in mind

Aggrading reach purposefully kept wide

Flat structure unintentionally widened channel

Consider the energy the structure will create

Additional energy created by the structure should be focused where it can be resisted or utilized.

Take a long-term approach for success

- Consider intermediate stages that lead to ultimate goal
- Utilize channel evolution to your benefit
- Build appropriate structure to aid the channel function you want to utilize
- Plan for high discharges and mitigate potential harm to the site
- Utilize native vegetation to manage channel dimension
- Recognize both the limitations and benefits of the low tech approach