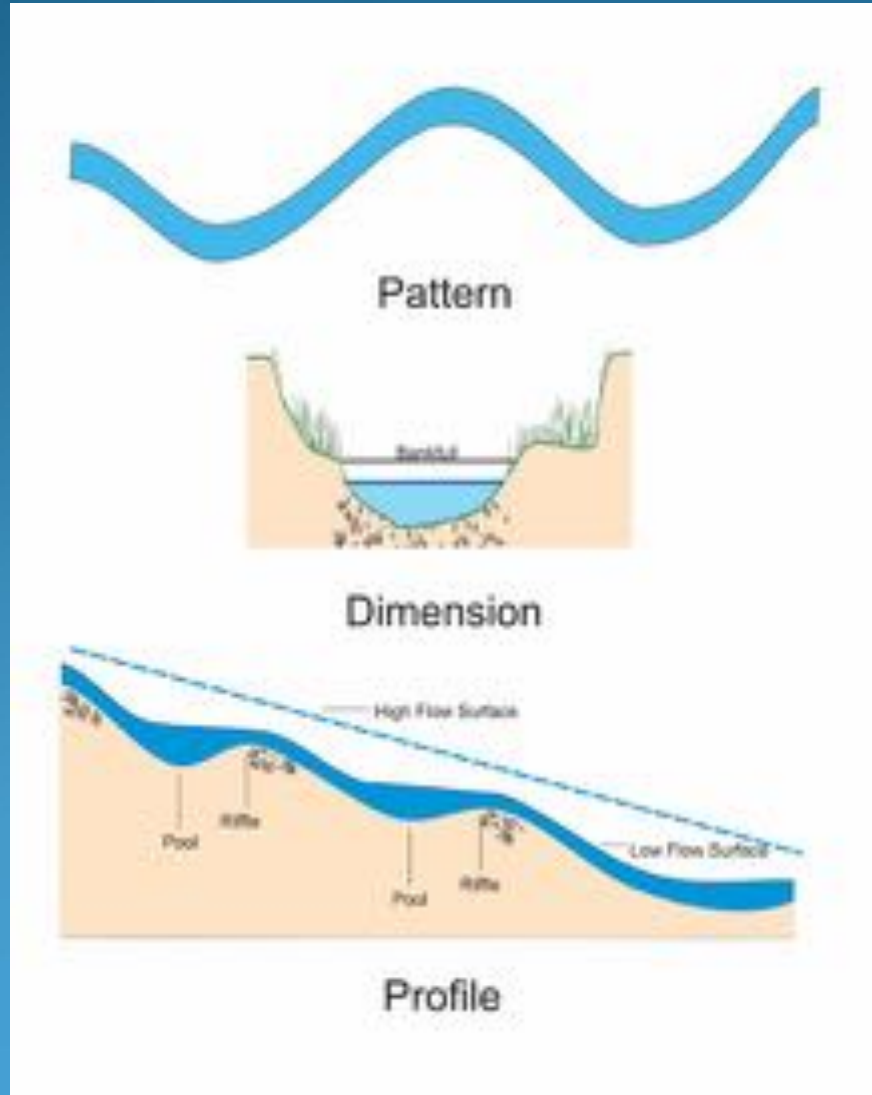
An aerial photograph of a river or stream meandering through a dense, green forest. The water is a light brownish-tan color, contrasting with the surrounding greenery. The stream flows from the upper right towards the lower left, with several sharp turns. The background is a solid blue gradient with white curved lines.

Stream Function and Floodplain Connectivity

Ralph Reznick P.E.
Michigan DEQ

Stream Channel Dimensions



Channel Stability

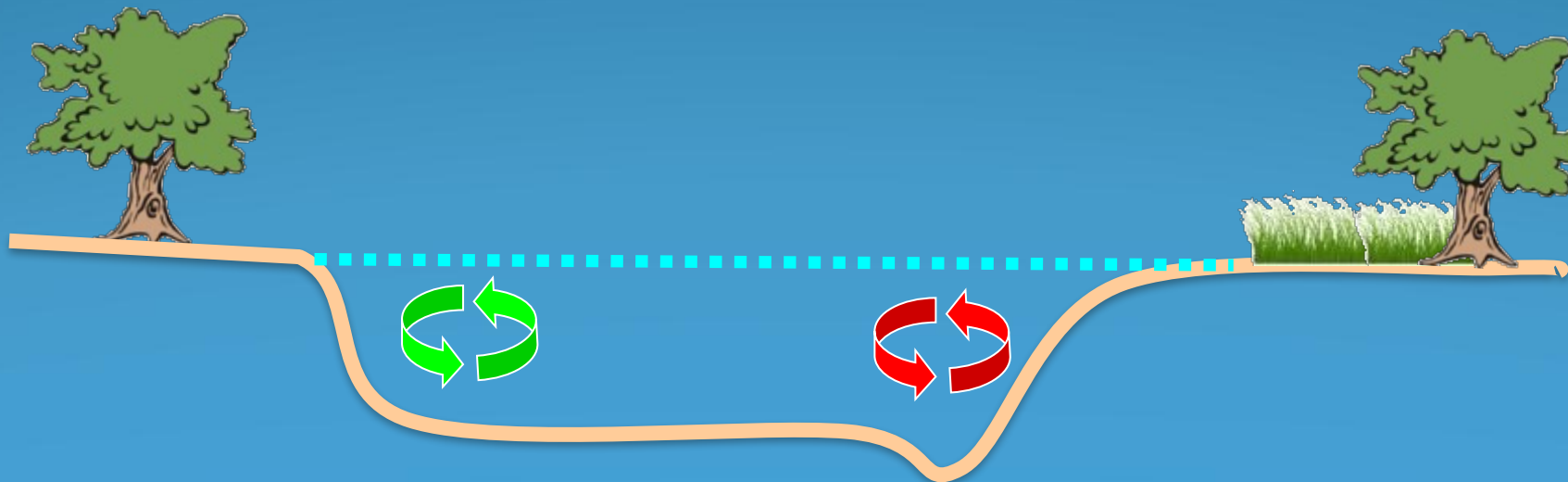
The ability of a stream, over time, to maintain its pattern, dimension and profile such that, the channel neither aggrades or degrades and is able to transport without adverse impact the flow and sediment from it's watershed.

These physical channel features are described as a function of the bankfull elevation.

Bankfull Stage

Bankfull stage is defined as:

- The elevation where **water fills the channel** and just begin to overflow onto the floodplain
- Triggers maximum **deposition** & **erosion** circulation cell development





In high functioning alluvial valleys, all flows greater than the bankfull discharge spread across a wide floodplain.

- Provides stream channel stability
- Maintain sediment transport equilibrium
- Creates stream channel bedforms and habitat
- Establishes a high water table
- Often leads to development of riparian wetlands
- Flood storage

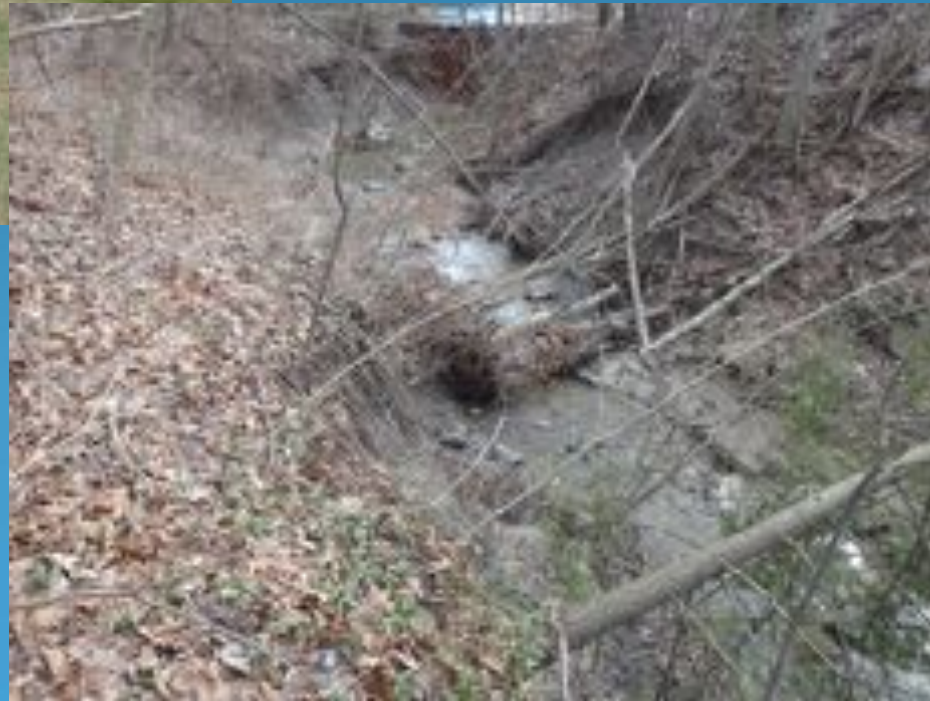


Floodplain connectivity is considered the most important component to the creation of high stream function

Streams are disconnected from their floodplain by

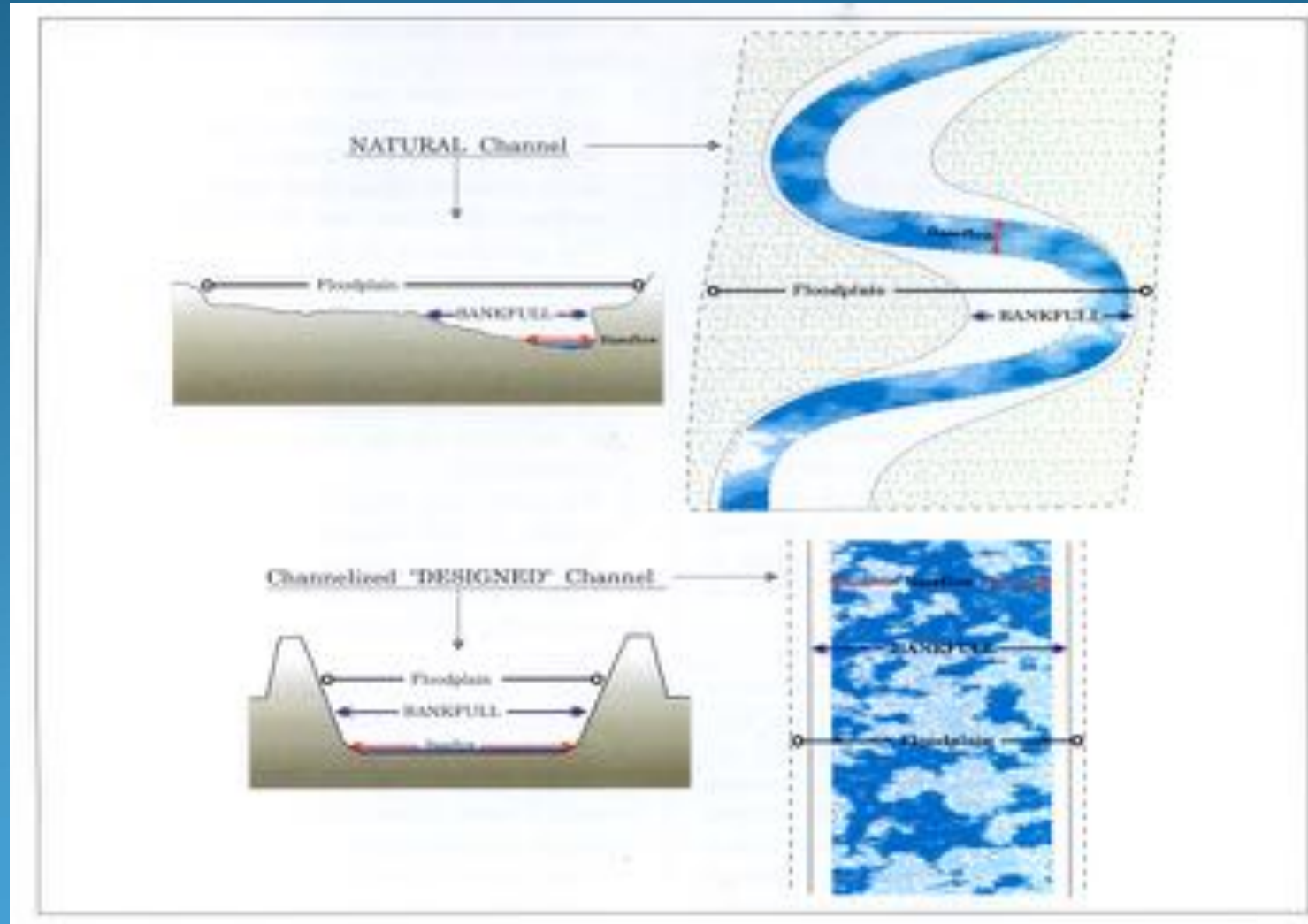


Channelization



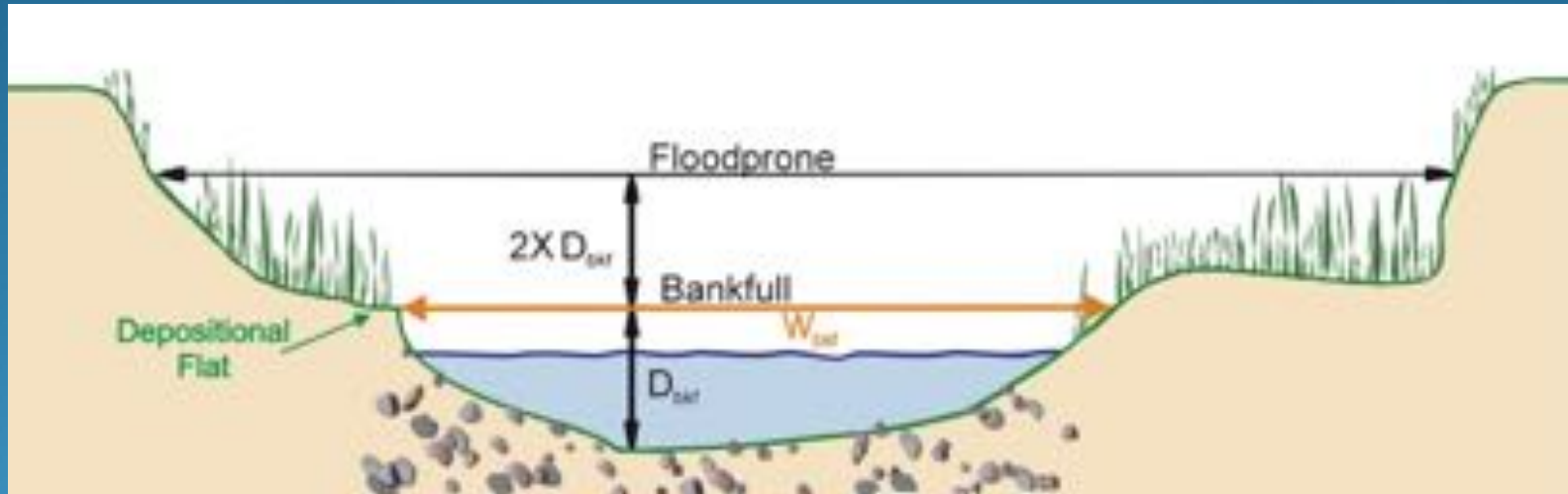
Channel Erosion/Headcuts

Channel Geometry





Measuring Floodplain Connectivity

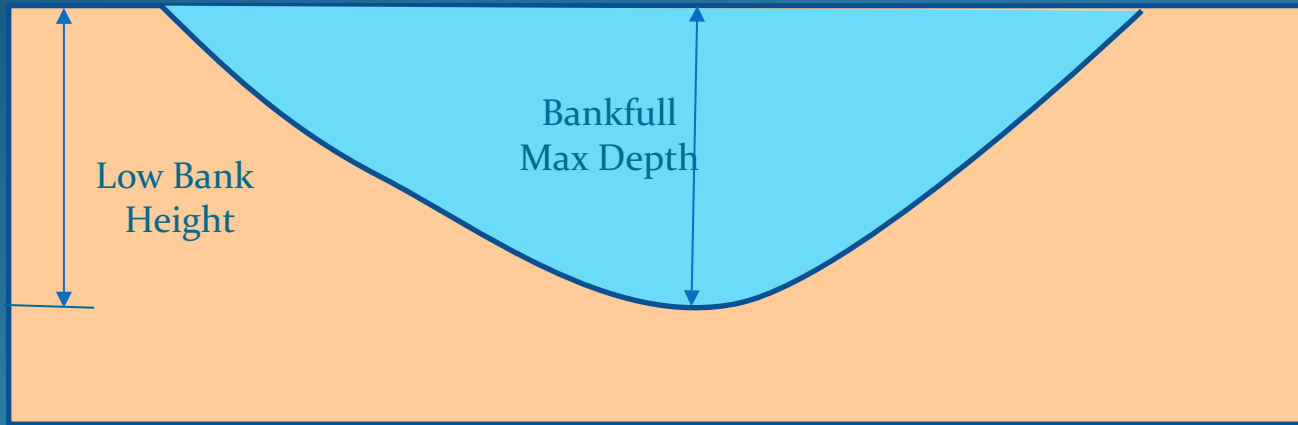


$$\text{Entrenchment Ratio} = \frac{\text{Floodprone Width}}{\text{Bankfull Width}}$$

ER > 2.2 slightly or not entrenched
1.4 < ER < 2.2 Moderately entrenched
ER < 1.4 Entrenched

Functioning
Functioning at Risk
Not Functioning

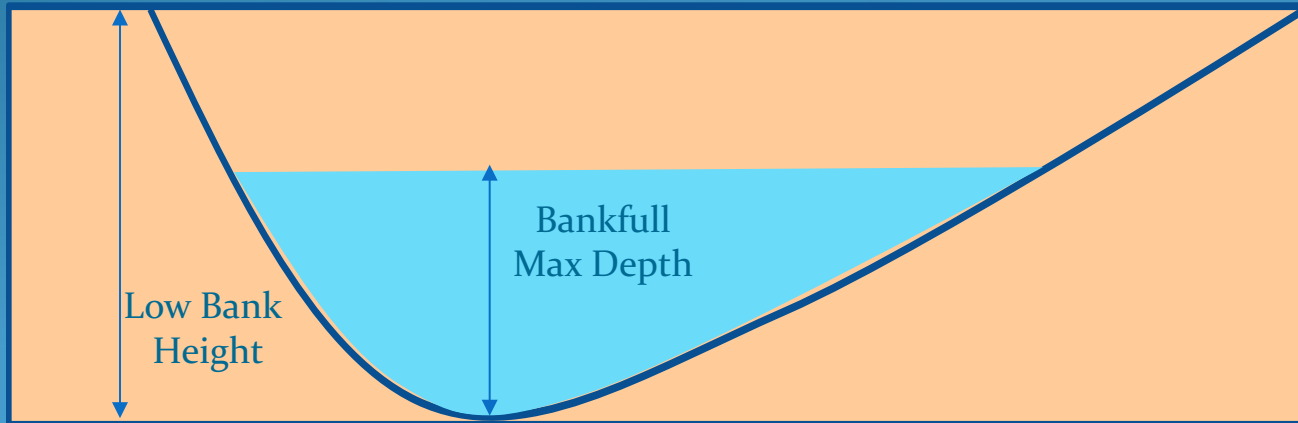
Measuring Floodplain Connectivity



$BHR = 1$ Stable

Functioning

$$BHR = \frac{\text{Lowest Bank Height}}{\text{Bankfull Max Depth}}$$



$BHR = 1.1$ to 1.2 Slightly Incised

Functioning

$BHR = 1.3$ to 1.5 Moderately Incised

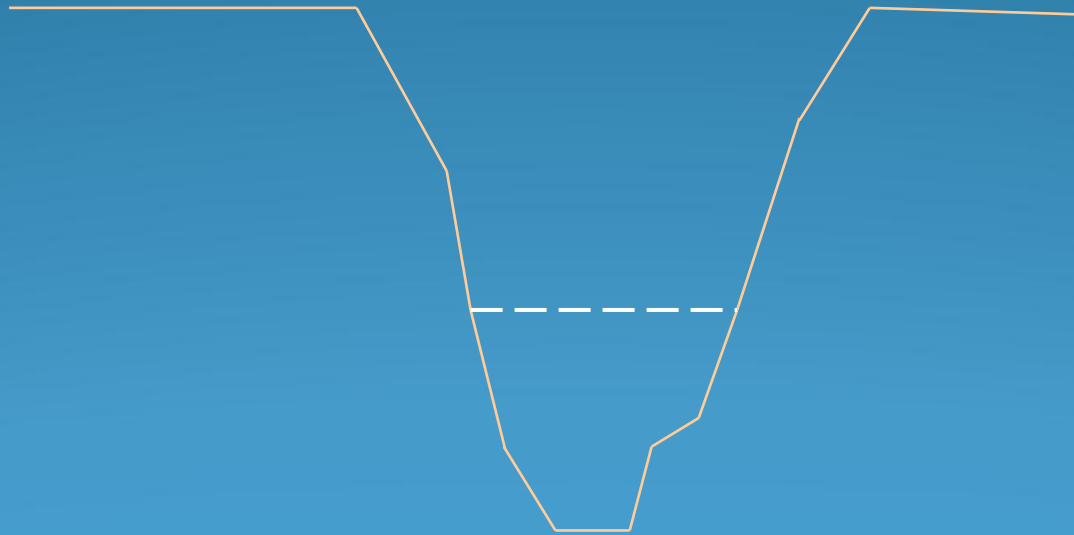
Functioning at Risk

$BHR > 1.5$ Deeply Incised

Not Functioning

Measuring Floodplain Connectivity

Hydraulic Modeling



Restoring Floodplain Connectivity



Restoring Floodplain Connectivity





Restoring Floodplain Connectivity

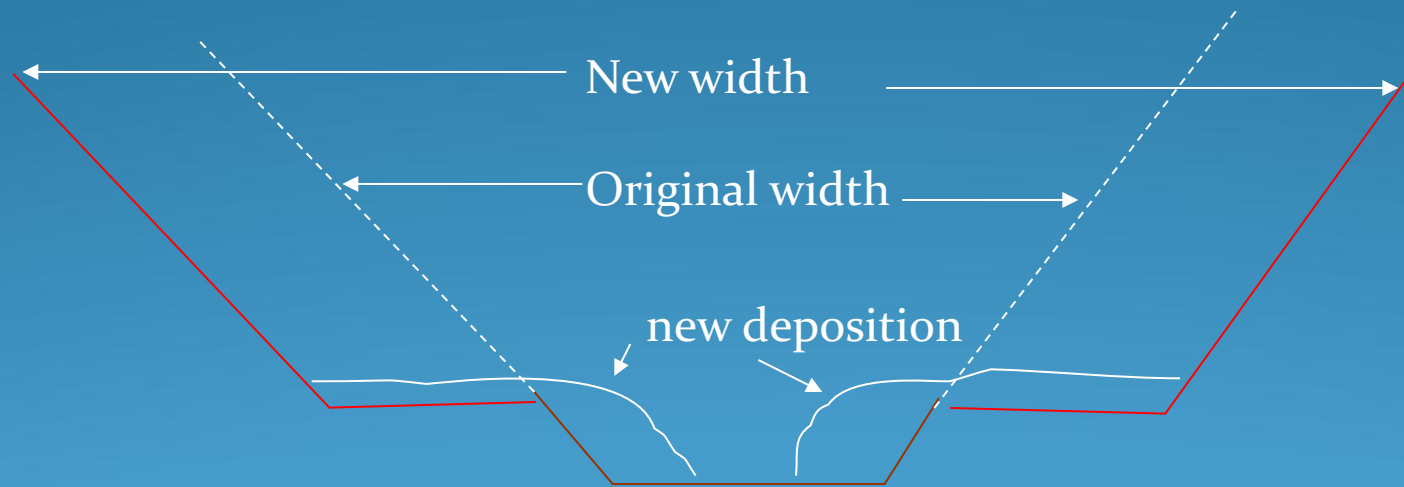


Restoring Floodplain Connectivity



Restoring Floodplain Connectivity

Two Stage Ditch Conceptual Design



Restoring Floodplain Connectivity

