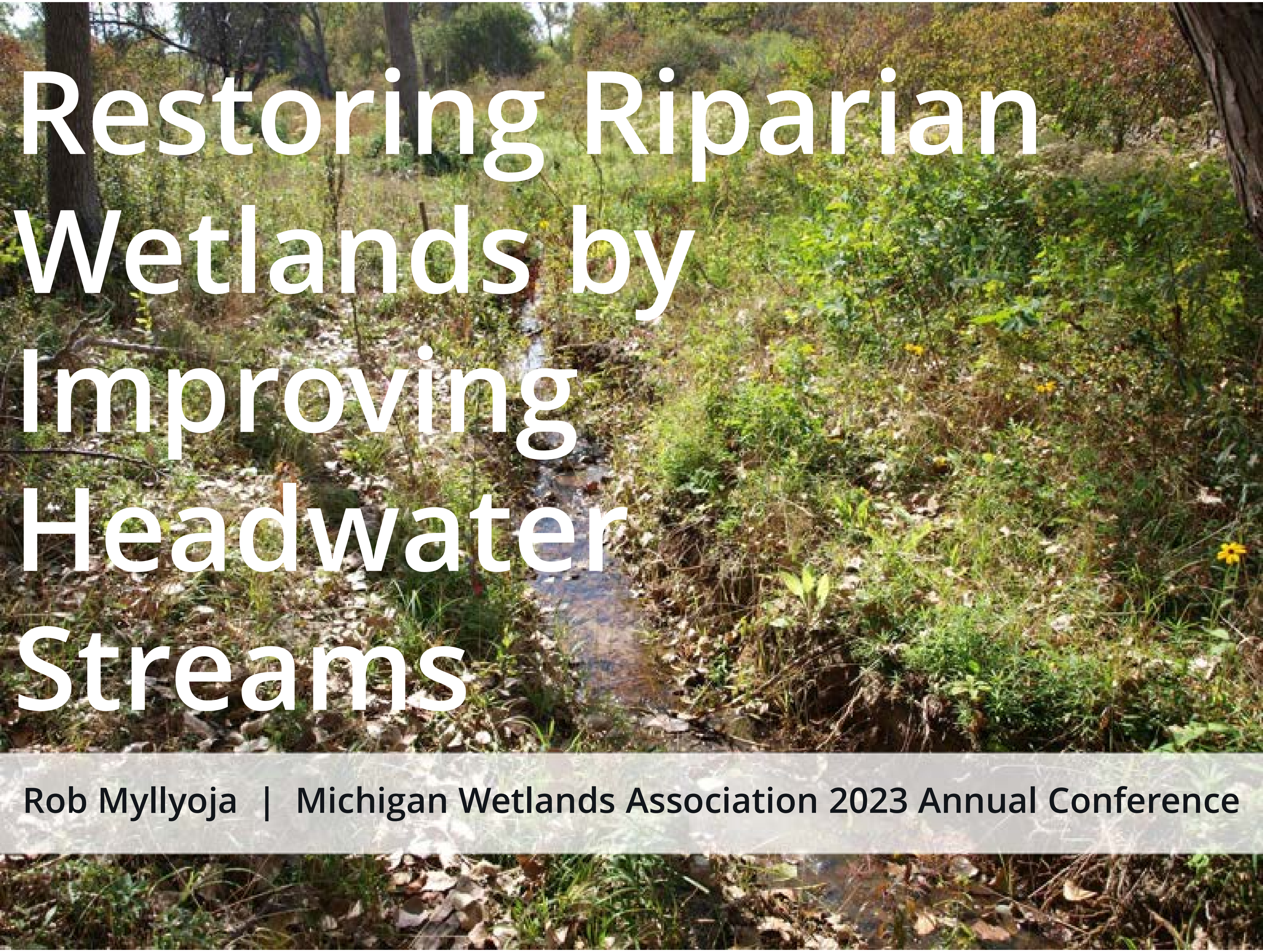


Restoring Riparian Wetlands by Improving Headwater Streams

Rob Myllyoja | Michigan Wetlands Association 2023 Annual Conference

Agenda

- Stream impacts
- Design considerations
- Case studies

Headwater streams provide water to the network (>82% of stream length) and also:

- Buffer water temperature
- Store transform and transport organic matter/energy (metabolism & production)
- Store and transport sediment
- Store, transform, and transport nutrients
- Reduce flood impacts
- Increase climate change resiliency

HISTORIC IMPACTS

- Channelization: dredging, straightening & widening into a flat bed, uniform, trapezoidal F channel
- In-line ponds, weirs, check dams
- Culvert enclosures
- Diversion, relocations
- Landscape drainage: ditches, tile drains, etc.
- Altered riparian vegetation

Larger rivers have similar impacts, so why focus on streams with a drainage area of <2 mi^2?

A benefit of restoring headwater streams:

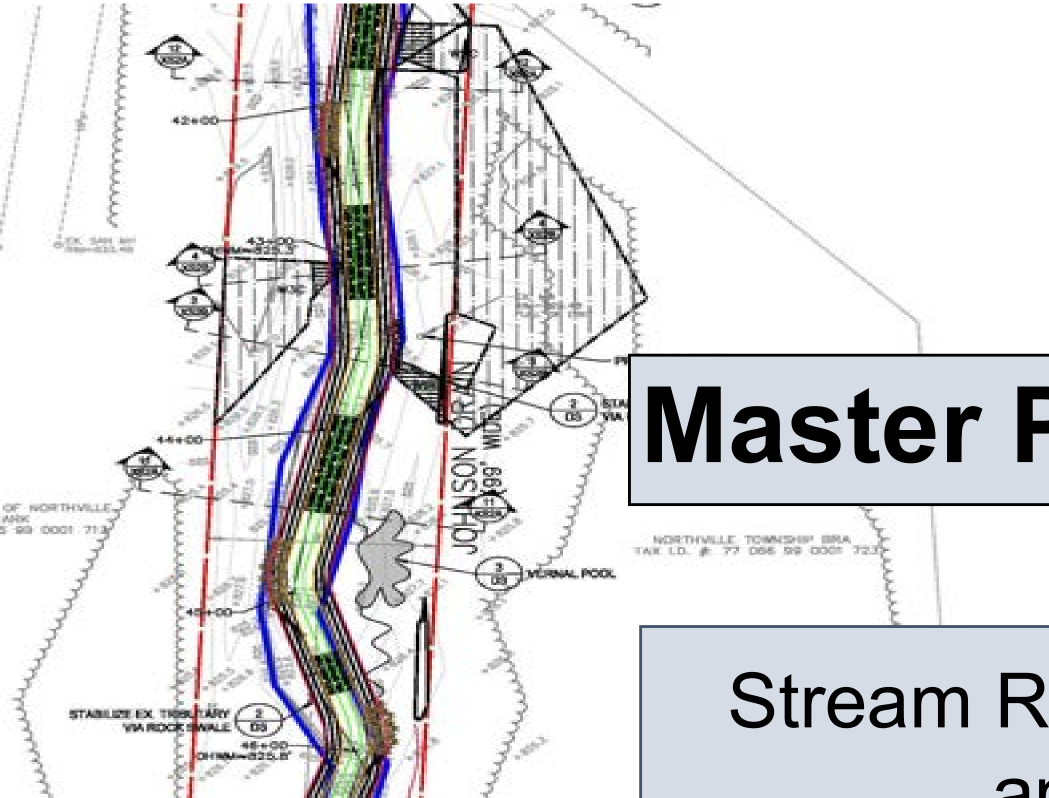
The extensive use of costly habitat structures is not necessary. They may also not be geomorphically-appropriate for certain headwater stream types.

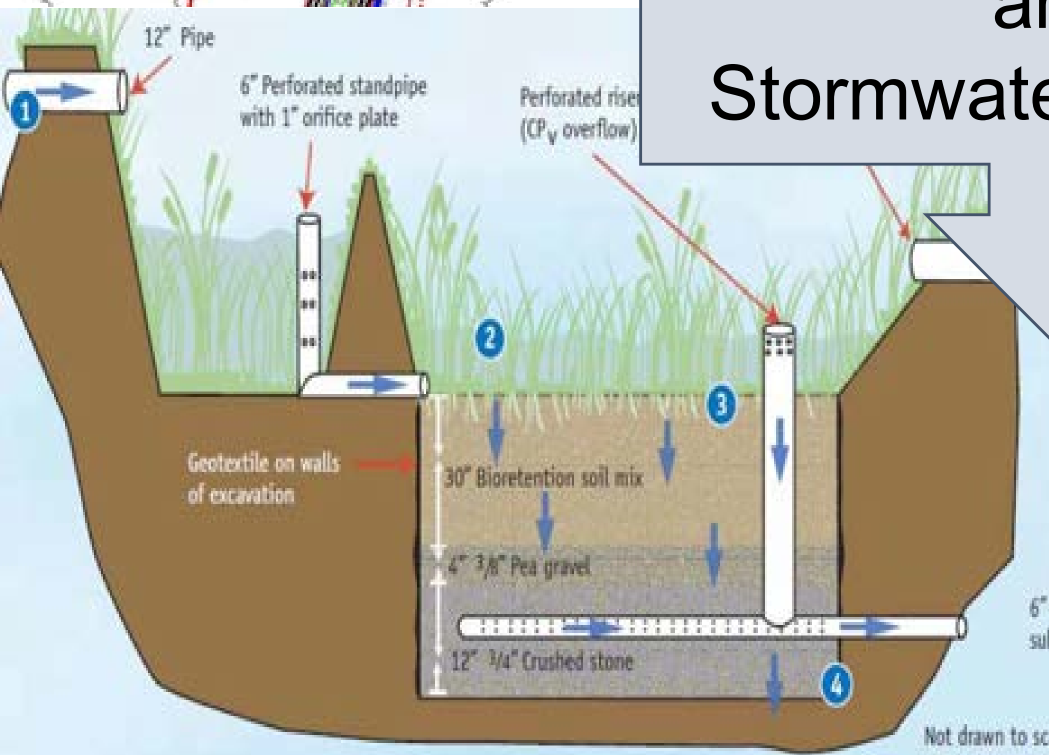
Suitability of various structures by stream type **(Rosgen 2015)**

	Stream Type	Toe Wood	Toe Wood Lunker	Rock J–Hook Vane	Root Wad, Log Vane, J–Hook	Cross–Vane	W–Weir	Conver-ging Rock Clusters	Log Rollers	Log & Rock Step–Pool
Cobble	E3	Good	Excellent	Good	Good	Good	N/A	N/A	N/A	Good
Gravel	E4	Good	Excellent	Good	Good	Good	N/A	N/A	N/A	Good
Sand	E5	Good	Excellent	Poor	Good	Good	N/A	N/A	N/A	Fair
Silt	E6	Good	Excellent	Poor	Good	Good	N/A	N/A	N/A	Fair
	DA4	Excellent	Excellent	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DA5	Excellent	Excellent	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DA6	Excellent	Excellent	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Master Planning

Stream Restoration
and
Stormwater Retrofits





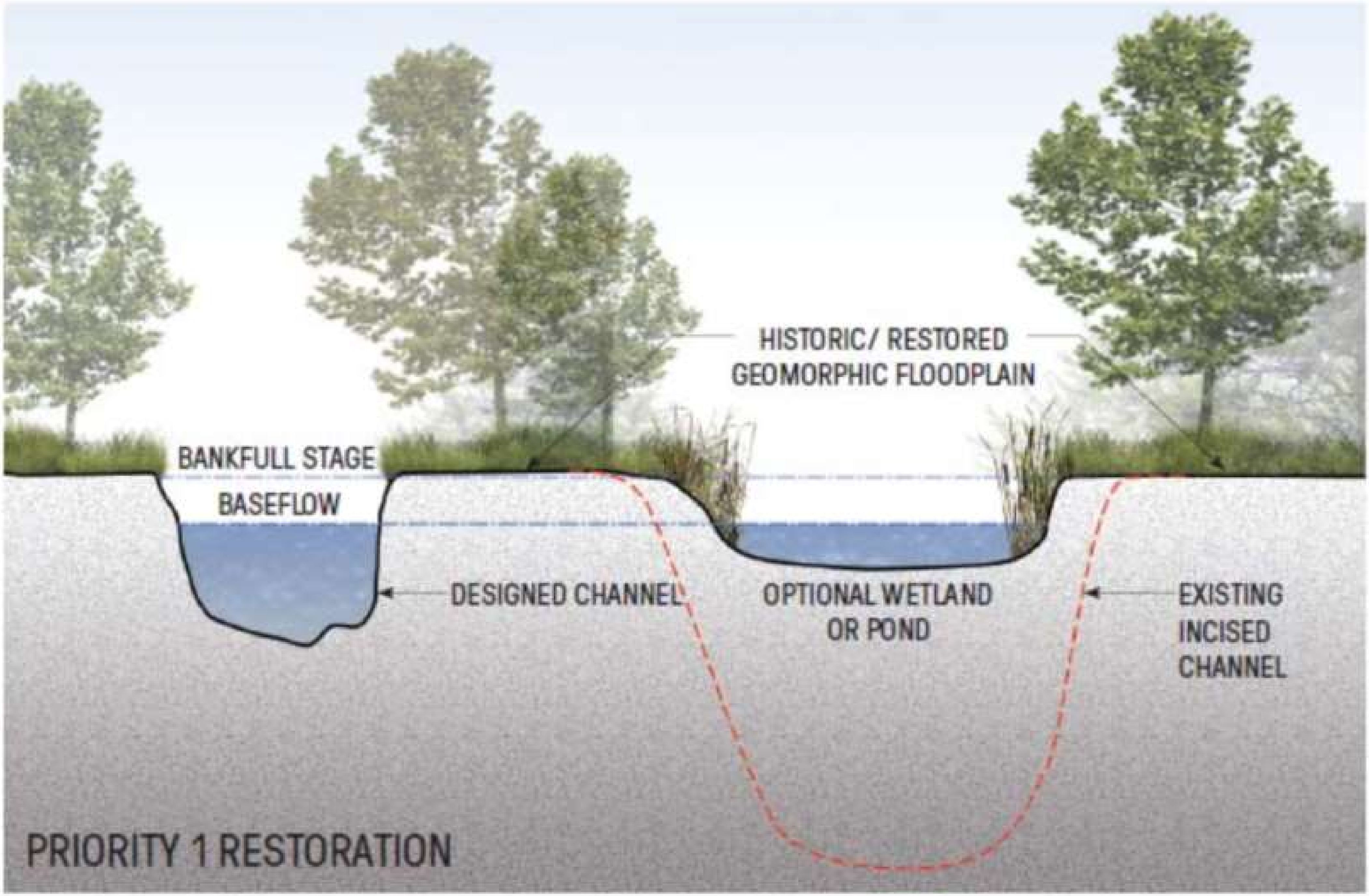
Source: USEPA

Fig. 2: Conceptual bioswale cross section

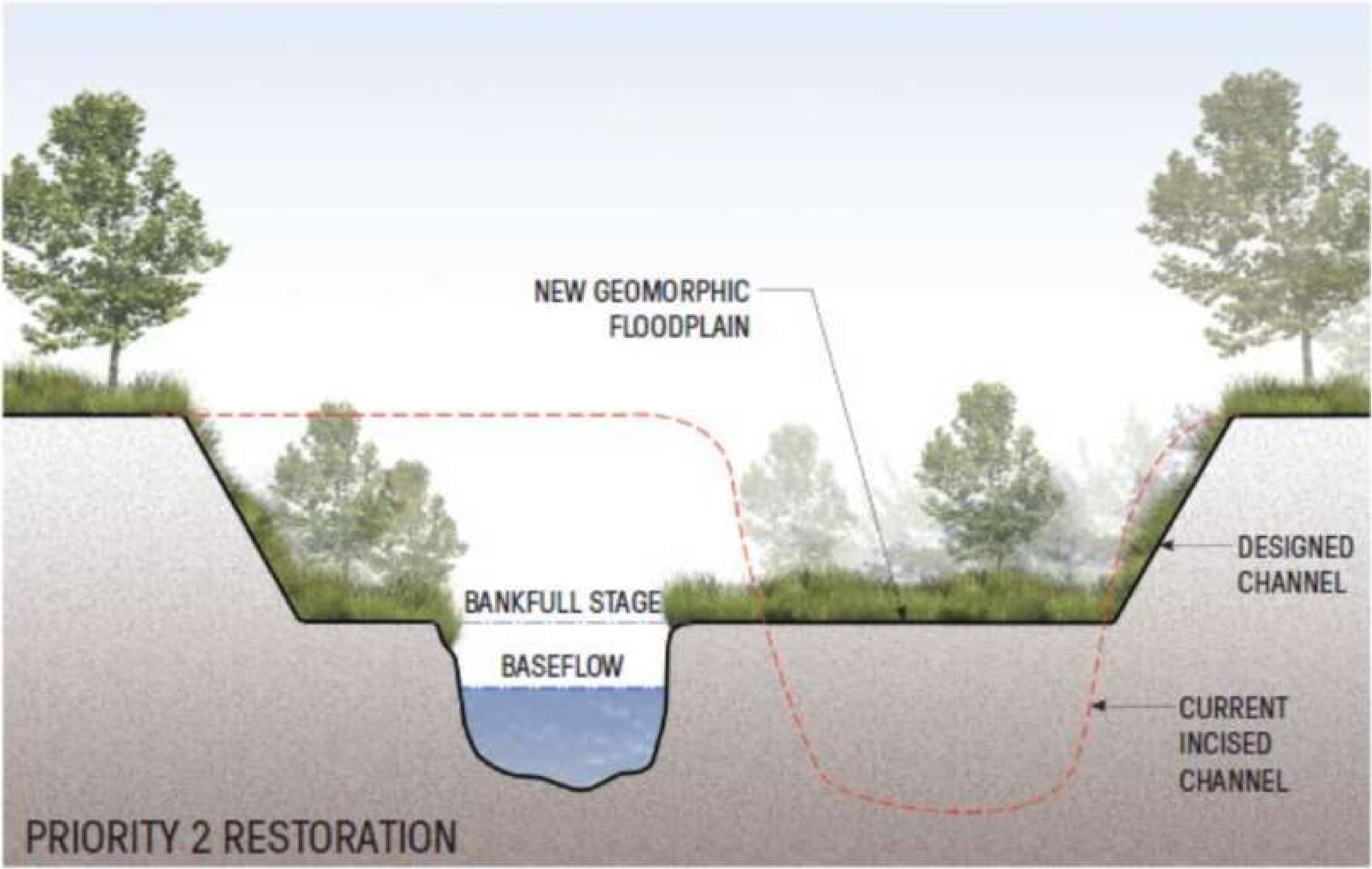
Departure Analysis

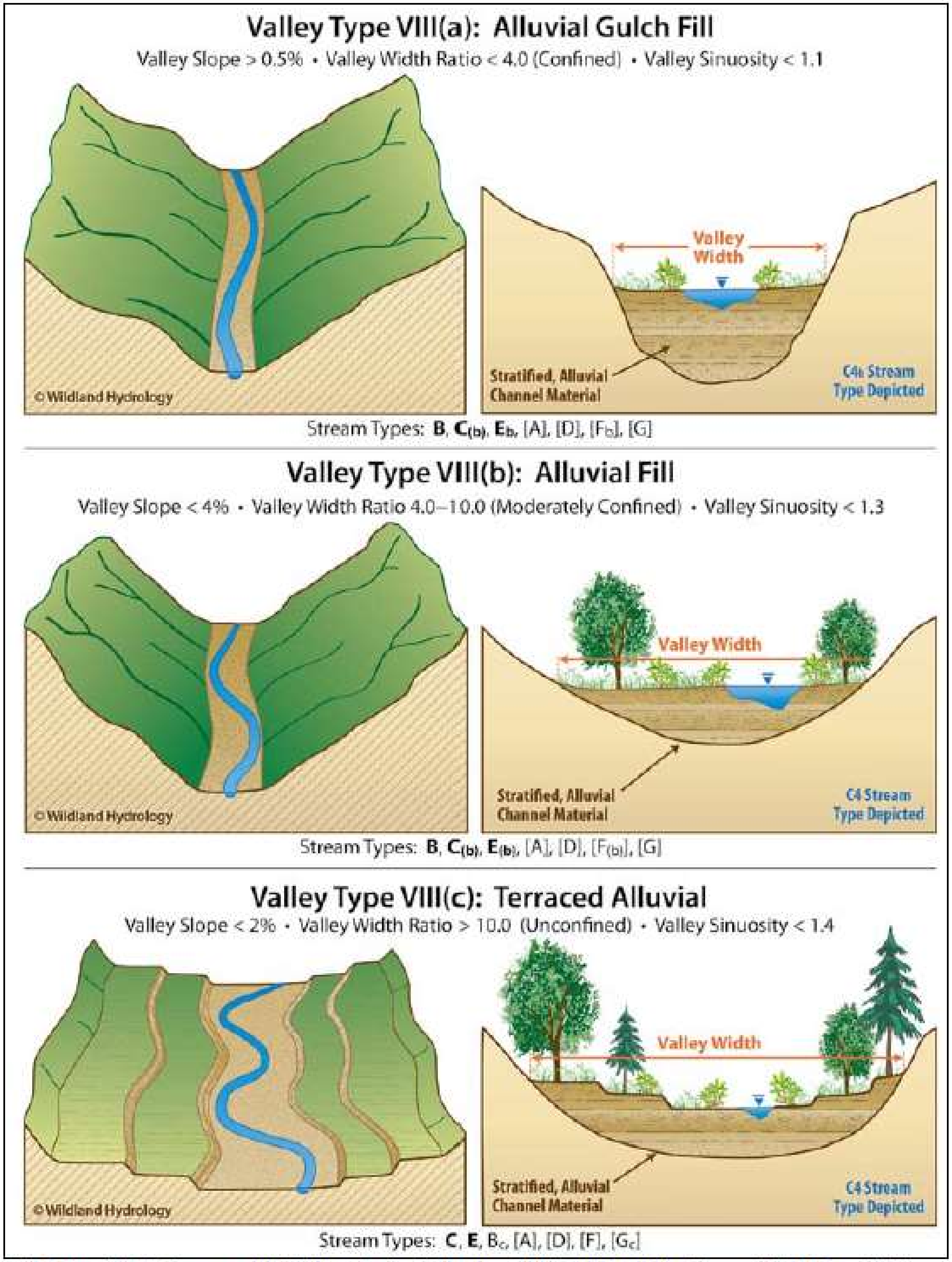
According to Ohio EPA, the loss of floodplain connectivity has had the greatest impact to the health of our streams.

Cross-section of a priority 1 restoration (Harris Co., 2017)



Cross-section of a priority 2 restoration (Harris Co., 2017)





Valley Type VIII(a) – Narrow gulch fill alluvial valley; Valley Type VIII(b) – Alluvial fill valley; and Valley Type VIII(c) – Terraced, alluvial valley

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Geologic Setting:

- Valley Type
- Stream Type
- Landscape Ecology

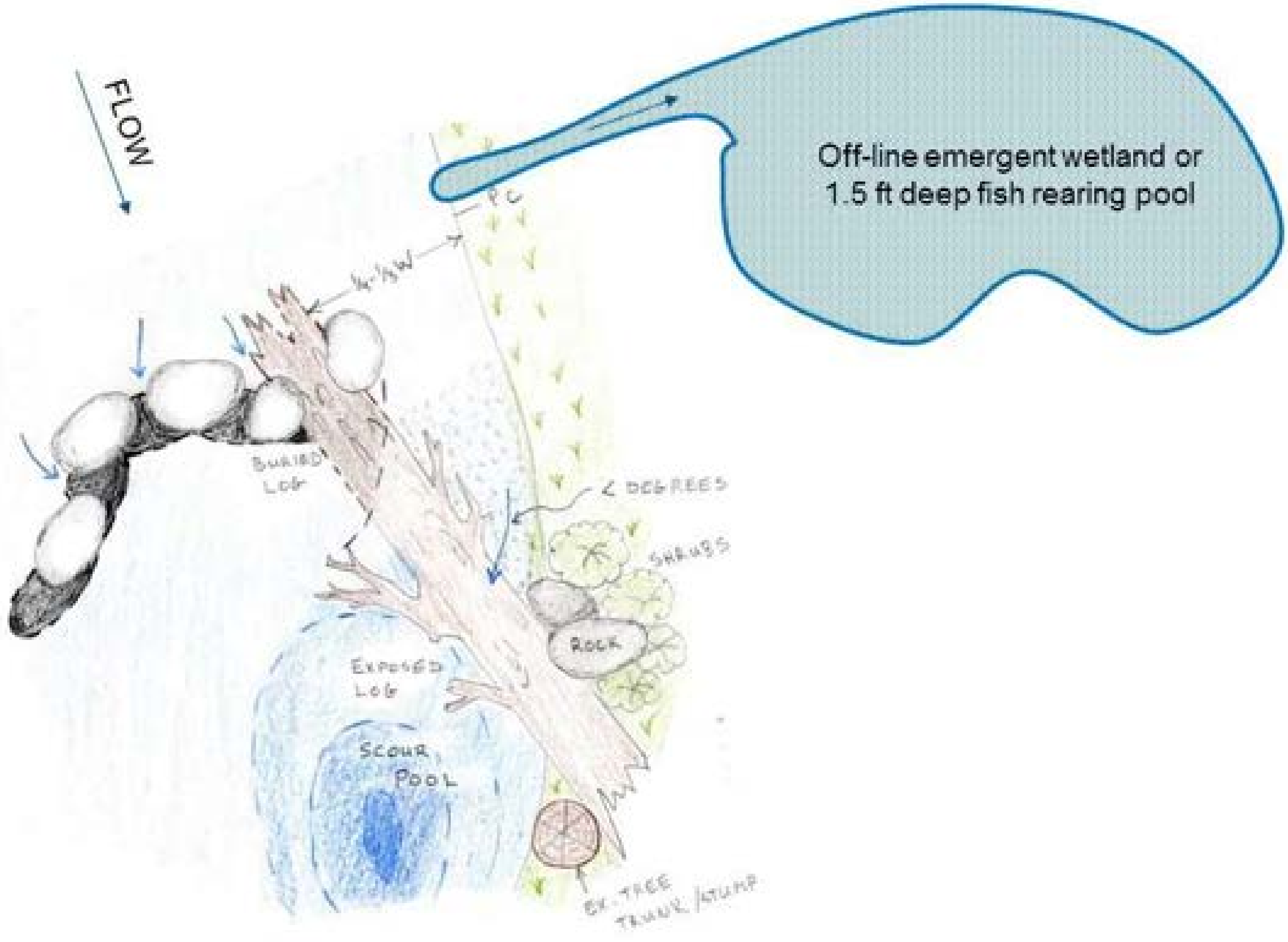
CONSIDERATIONS:

- Valley type, stream type, form and function
- Target aquatic species, life stages, food sources
- Hydrology: store, slow, and infiltrate water
- Sediment regime: changes in size or loadings
- On-site material: wood, gravel, topsoil, transplants
- Riparian plant community potential; succession
- Adaptability to watershed change

Case Studies


Pre-Construction Ditch

Planform Location of Habitat Feature



During Construction:

First order meandering stream in the background with off-channel pools

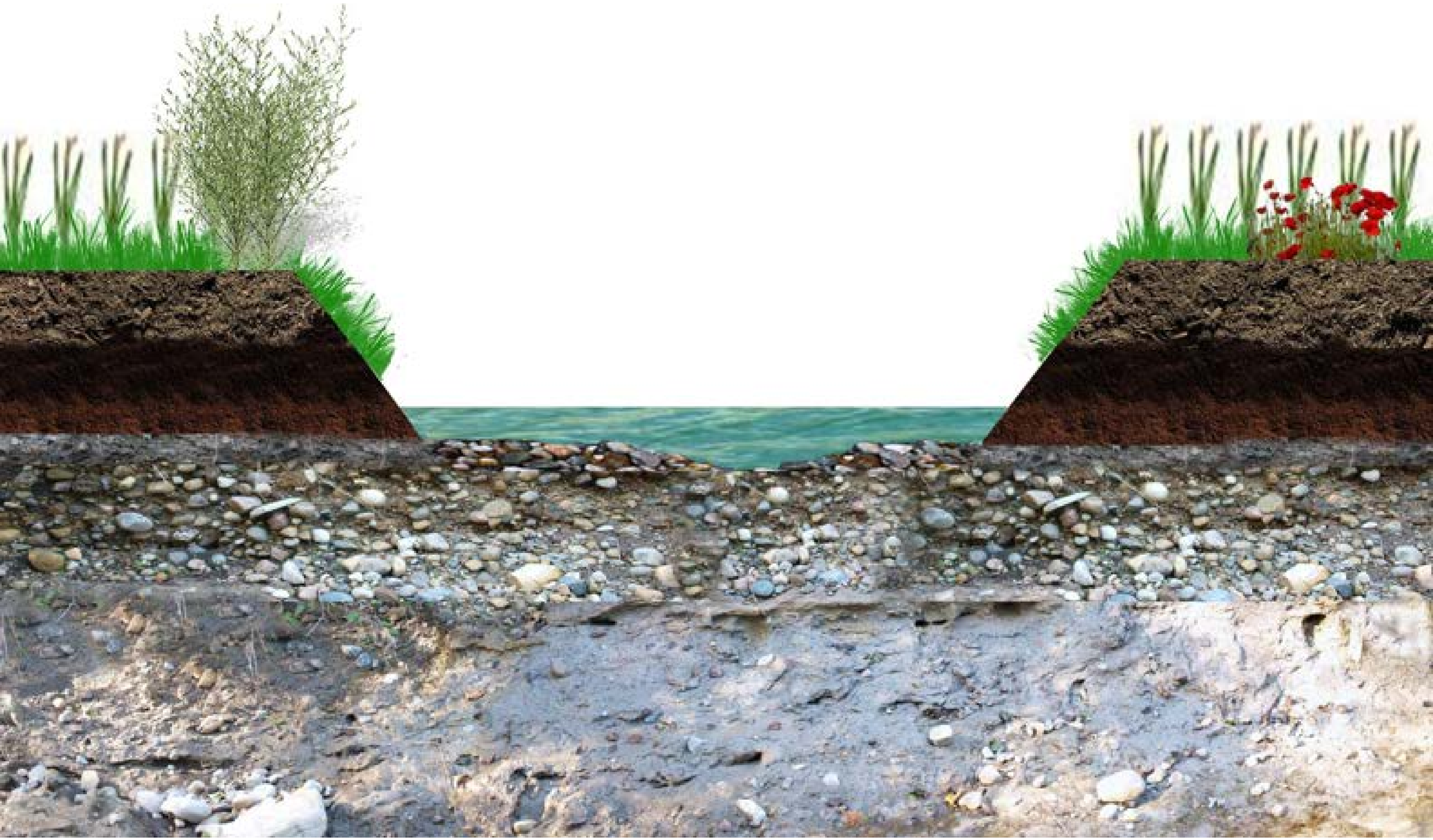
Soil B horizon;
Fill;
Historic deposition

Gravelly sand alluvium
(former streambed)

Clay till bed

Ex. water surface of incised stream

- Raise the bed to restore floodplain connectivity
- Groundwater interflow; recharge during base flow conditions
- Hyporheic zone extends laterally far from the toe of bank



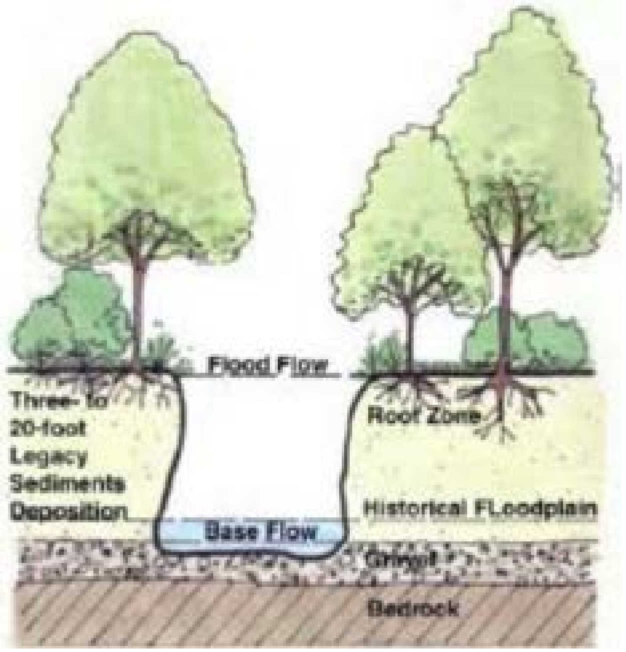
Soil Profile Rebuilding:
Can we repurpose a GSI method?

Photo: Rachel Layman

Induced meandering practices seek to speed up the channel evolution process from incised (F) and gully (G) channels. Erosion and deposition create point bars and floodplain benches of stratified alluvium.

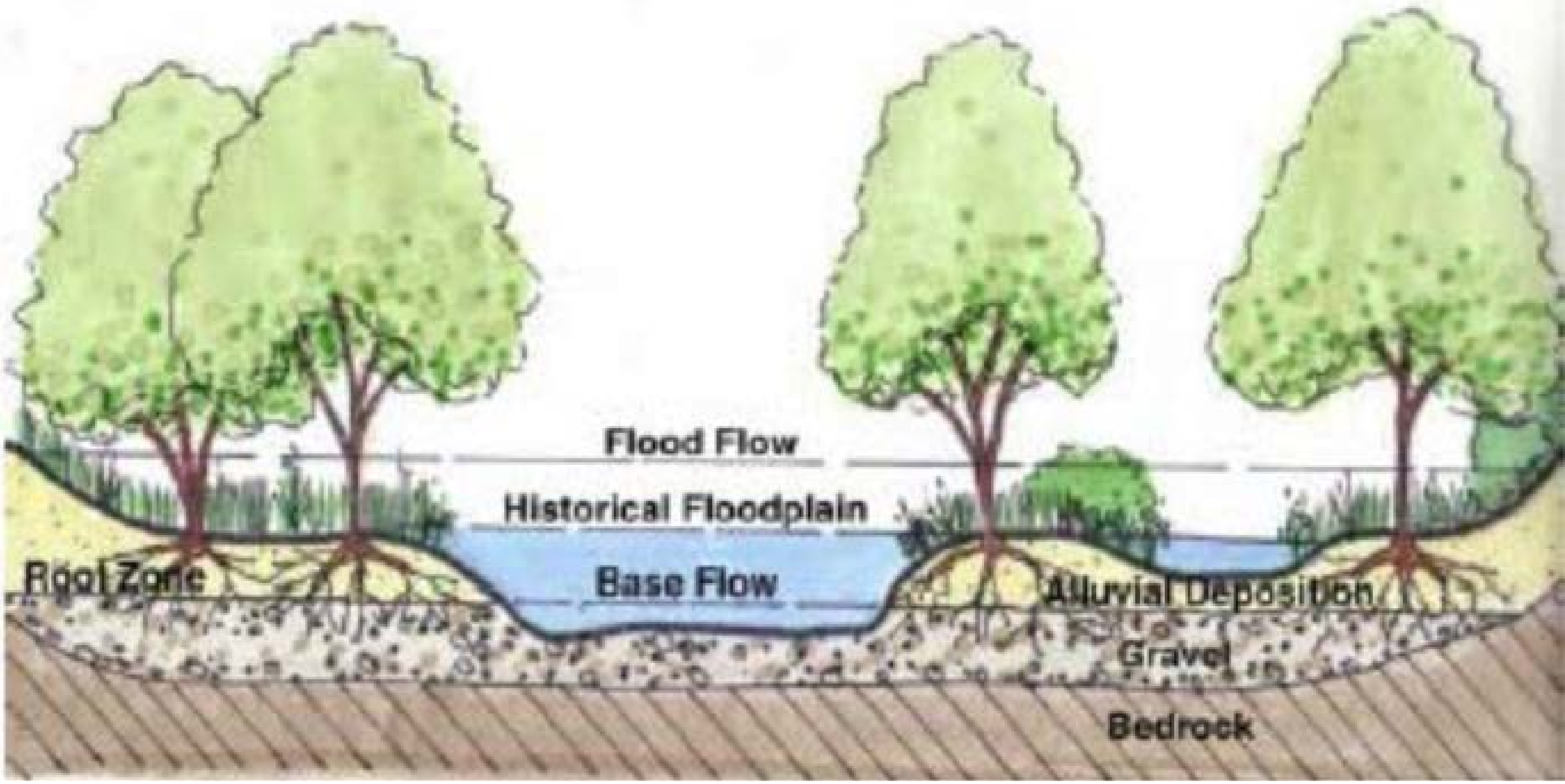
Streambank fill along over-wide channel…

Floodplain terracing without impacting perched pocket wetlands



Legacy sediments from former dams

Stream valley restoration



Source:
PA BMP Manual

Questions

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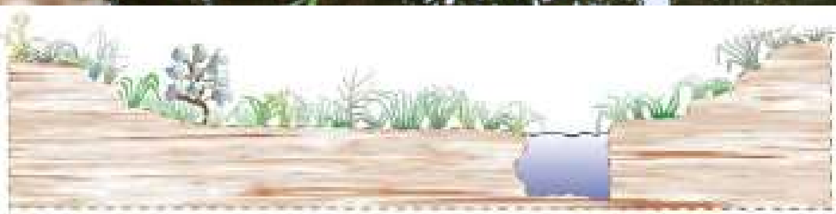

E4

Source: Rosgen 2015