Restoration Outcomes

Wood Features & Beaver Dam Analogs

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ecological restoration

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Restoration Outcomes

Wood Design Features

Beaver Dam Analog Process

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Wood Design Features

- Channel Grade Control
- Floodplain/Bench Grade Control
- Bank Protection
- Roughness
- Adaptive Management

Channel Grade Control

Log
Cross
Vane

Channel Grade Control

Log
Cross
Vane

Channel Grade Control

Embedded Log Cross Vane

Channel Grade Control

Channel Grade Control

Floodplain/Bench Grade Control

- Valley wide – FP Log
  - Depth (Freeze thaw)
  - Size (Dia./Overlap)
  - Cables/Duckbills Anchor
  - Micro berms
  - Frequency
  - Slope/diameter
  - Longevity

Floodplain/Bench Grade Control

- Goal/stress environment
- Right solution – right place
- Purpose of Wood
- Biomimicry, Hydrology
- Grade control

Floodplain/Bench Grade Control

Floodplain/Bench Grade Control

Floodplain/Bench Grade Control

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Bank Protection

- Goal/stress environment
- Right solution – right place
- Purpose of Wood
- Biomimicry
- Hydraulics
- Innovation
- Longevity

Bank Protection

- **Rootwads**
- **Log Vanes**
- **Wood Lining**

Bank Protection

Traditional Rootwads

- Cover – Bank Height
- Bank Stress – Bank Height
- Elevation
- Flanking - Scour

Bank Protection

Biomimicry Rootwads

- Vertical Banks
- Raising Invert
- Limiting Impacts
- Habitat

Bank Protection

Bank Protection

Bank Lining

- Transition
- Last Resort/ Innovation

Bank Lining

Bank Lining

Bank Lining

Roughness

- Cross channel
- Bank
- Floodplain

Roughness

- **Cross channel – Adaptive Management**

Roughness

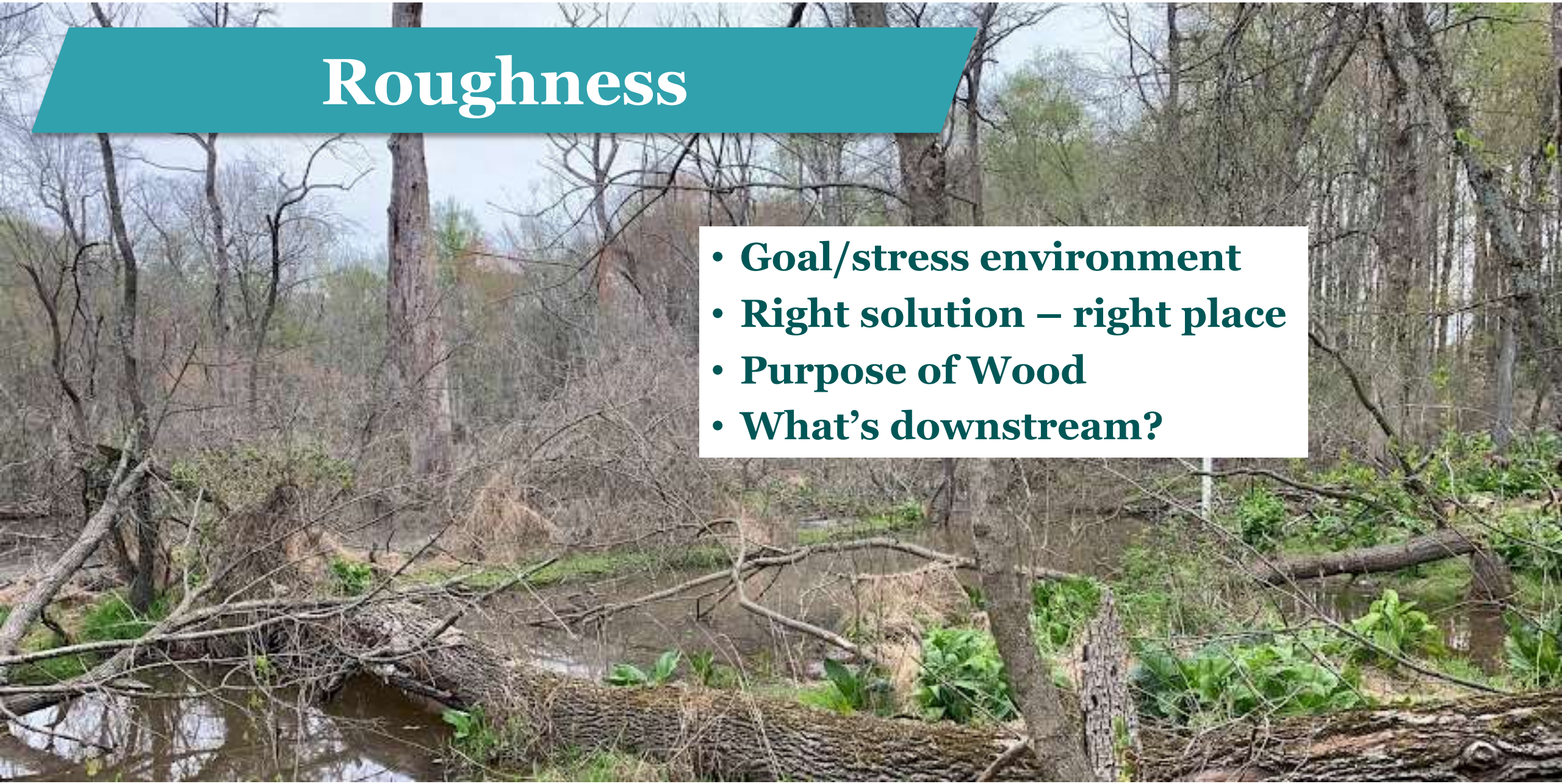
- **Cross channel – Adaptive Management**

Roughness

- **Floodplain**

Roughness

Roughness



- Goal/stress environment
- Right solution – right place
- Purpose of Wood
- What's downstream?

Roughness

Roughness

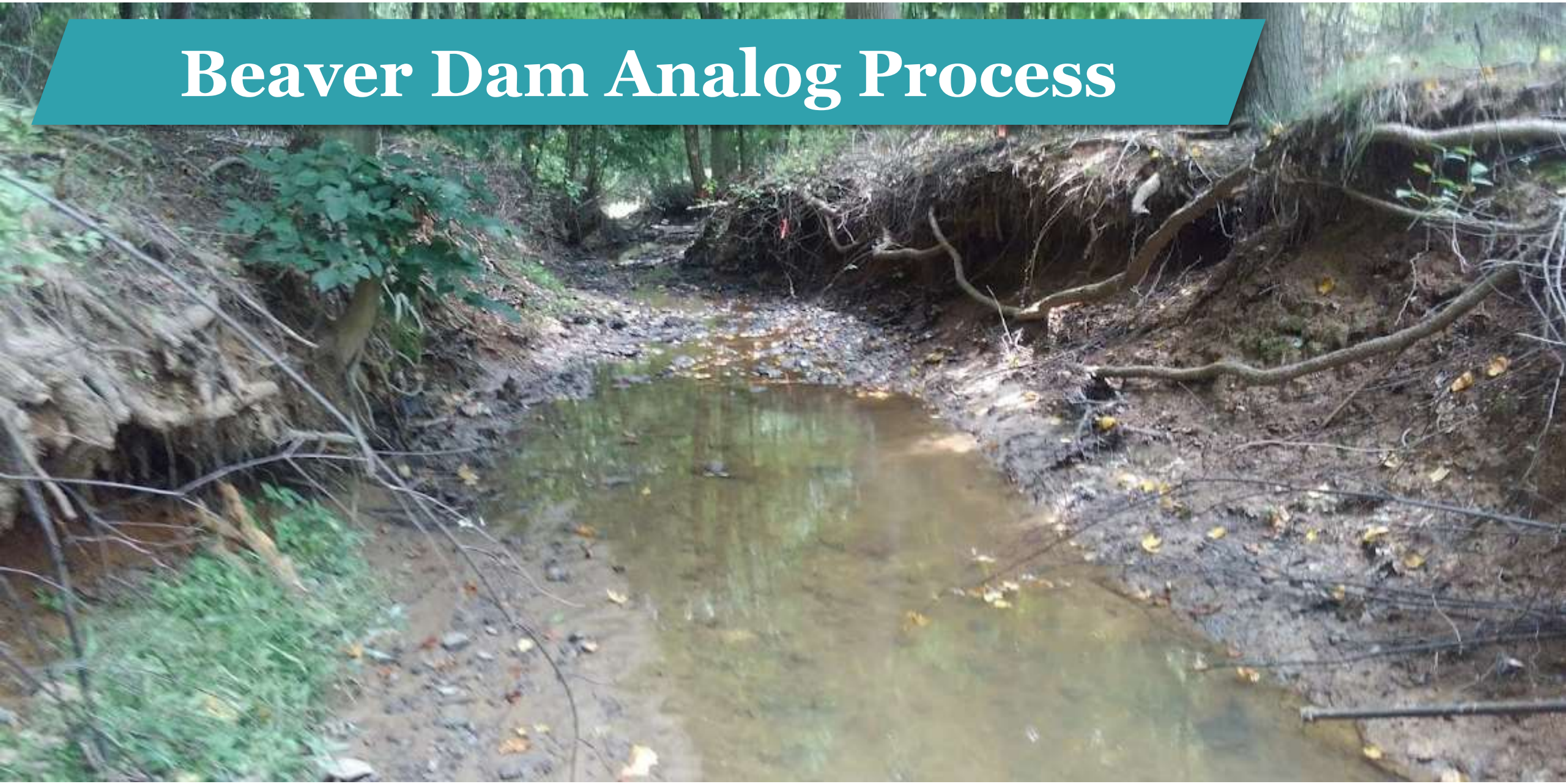
Beaver Dam Analog Process

- Recruitment
- Biomimicry
- Site Selection
- Transitions

Beaver Dam Analog Process

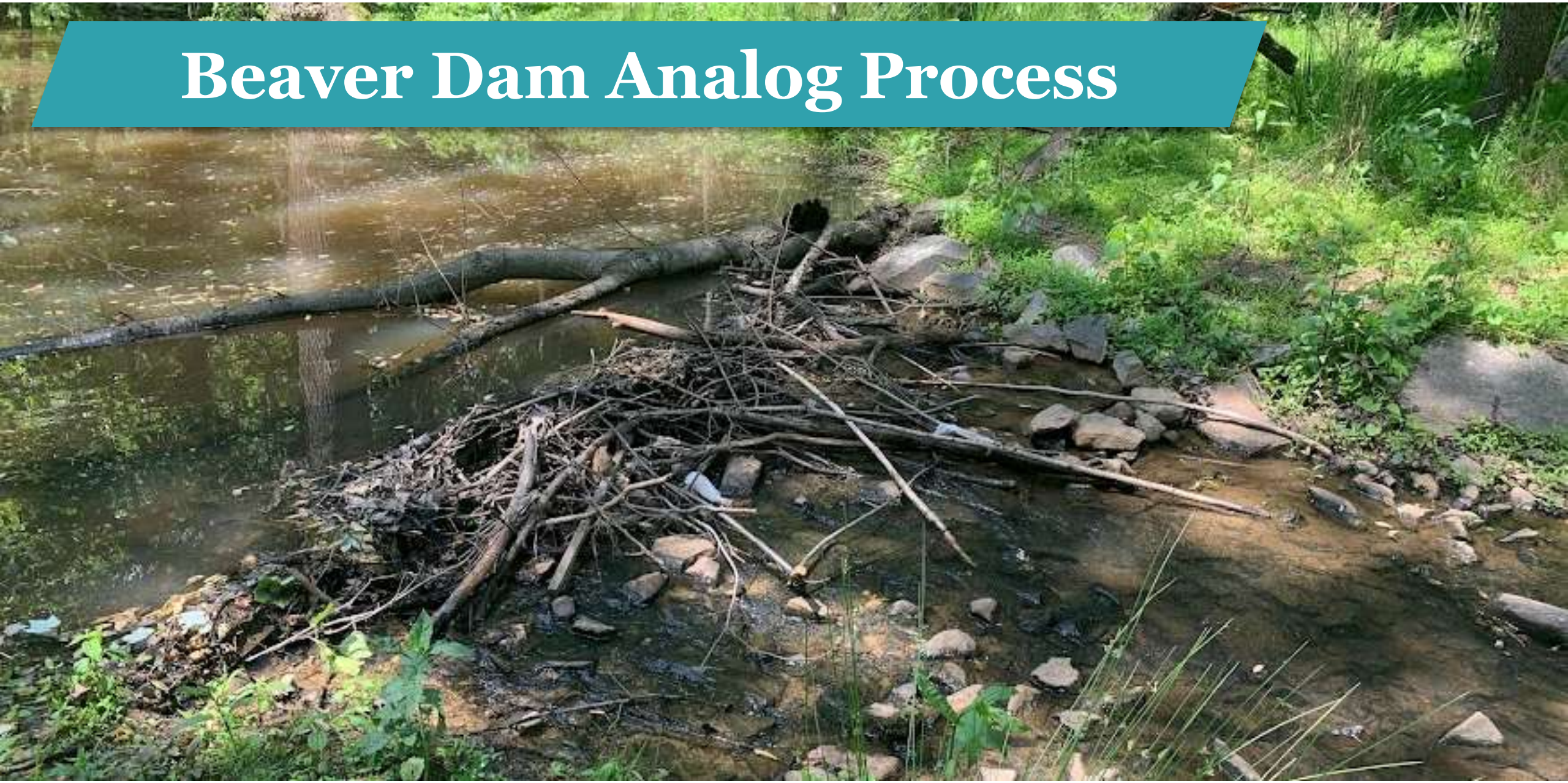
- Recruitment
  - Forage (Willows)
  - Biomimicry (Deep pools, connected floodplain, woody debris, auditory (steep - short riffles, log drops, and cascades) – stress environment
- Biomimicry Design
  - Weeping not overtopping flow (thermal regulation)
  - Fish Passage (Voids yet holds water)
  - Upstream bank protection and tie-ins
- Site Selection
  - Right Solution = Right Place
    - Can my floodplain handle flows, are there low spots (bypass)
    - Modified check dams – know your failure mechanisms/limitations
    - Local Impact (Tree clearing, adaptive management)
    - Infrastructure
    - Transitions at upstream and downstream (Slope Changes)
    - Groundwater Hydrology

Beaver Dam Analog Process



Beaver Dam Analog Process

Beaver Dam Analog Process



Beaver Dam Analog Process

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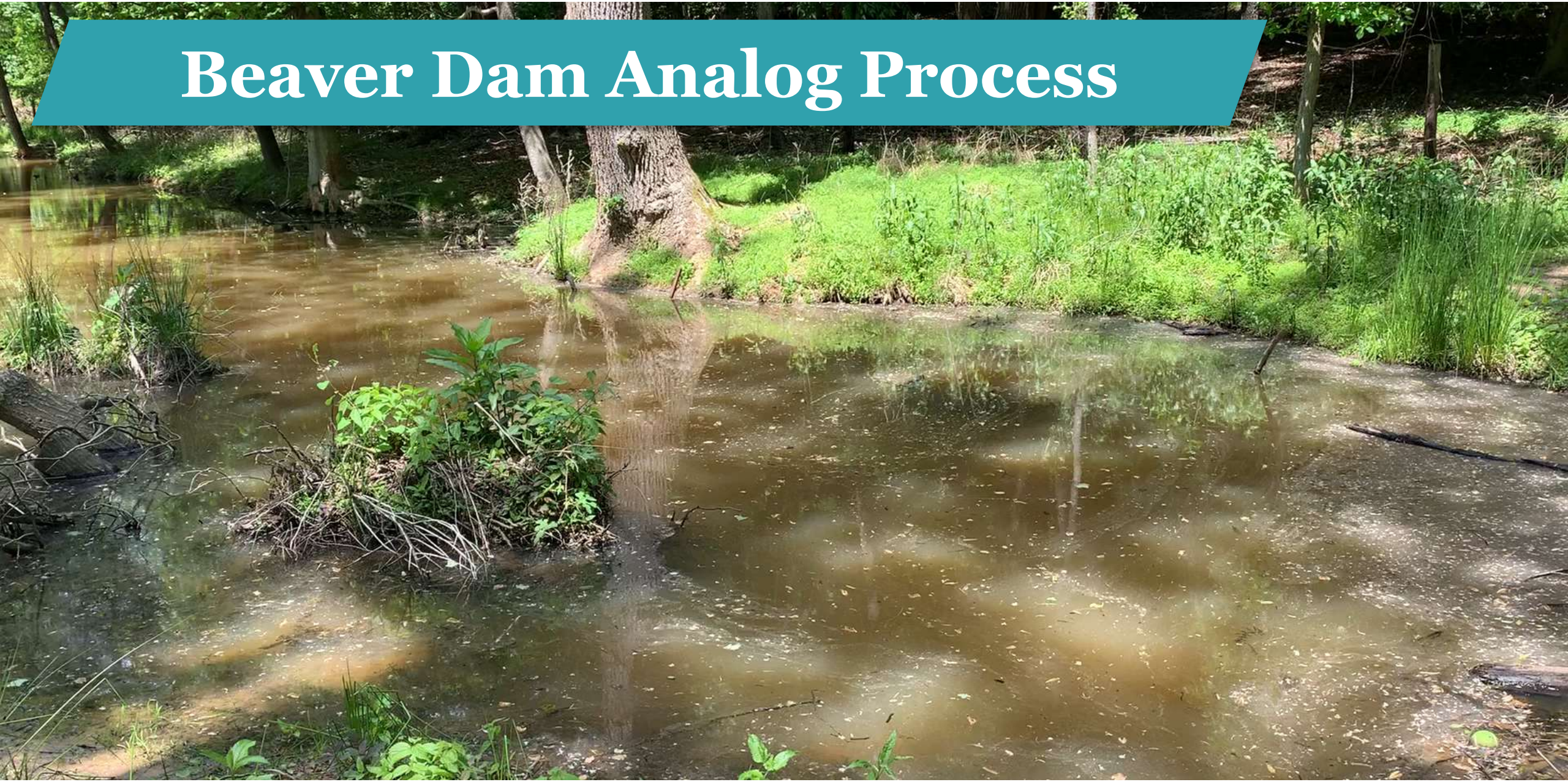

Beaver Dam Analog Process

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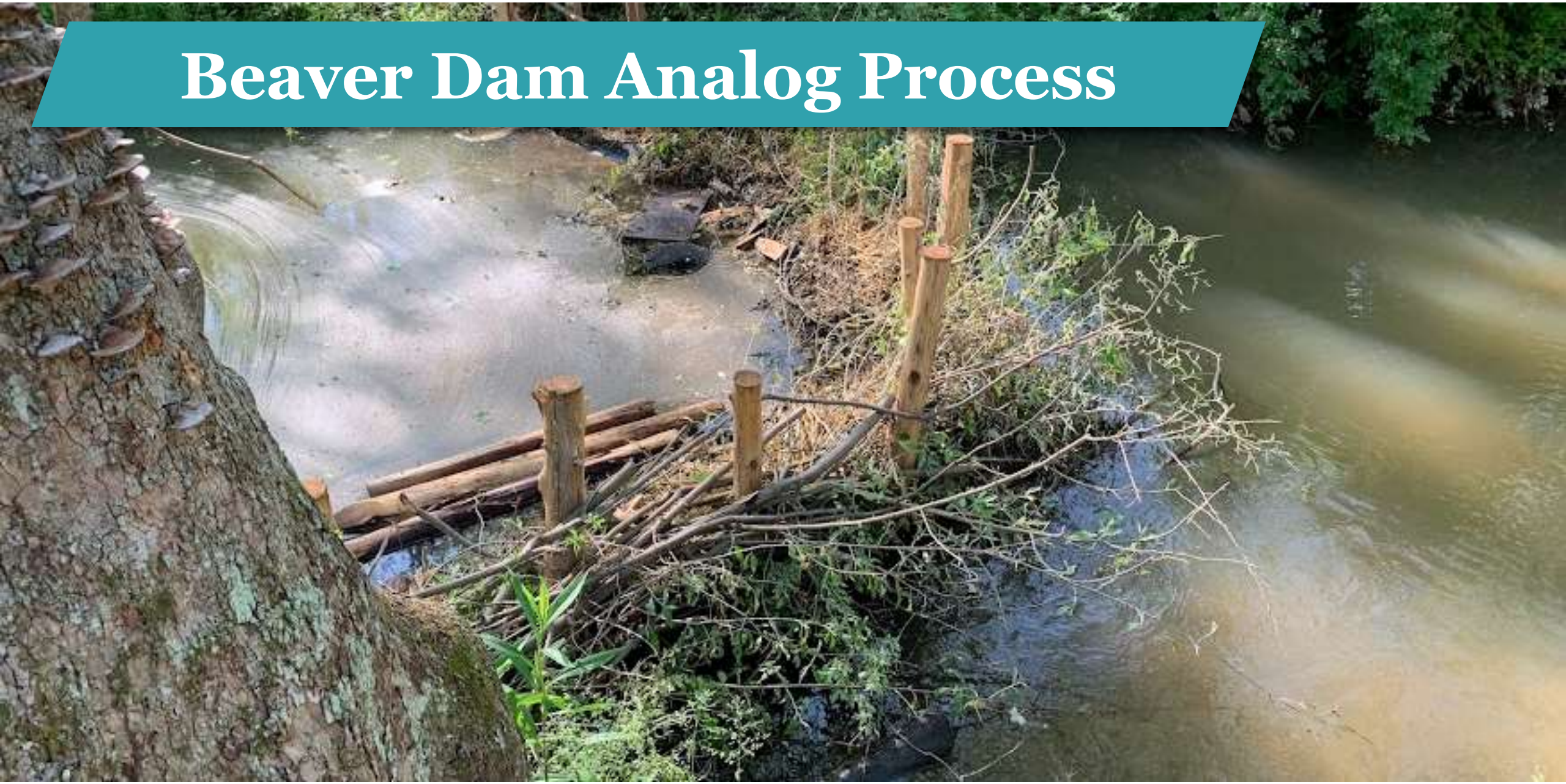
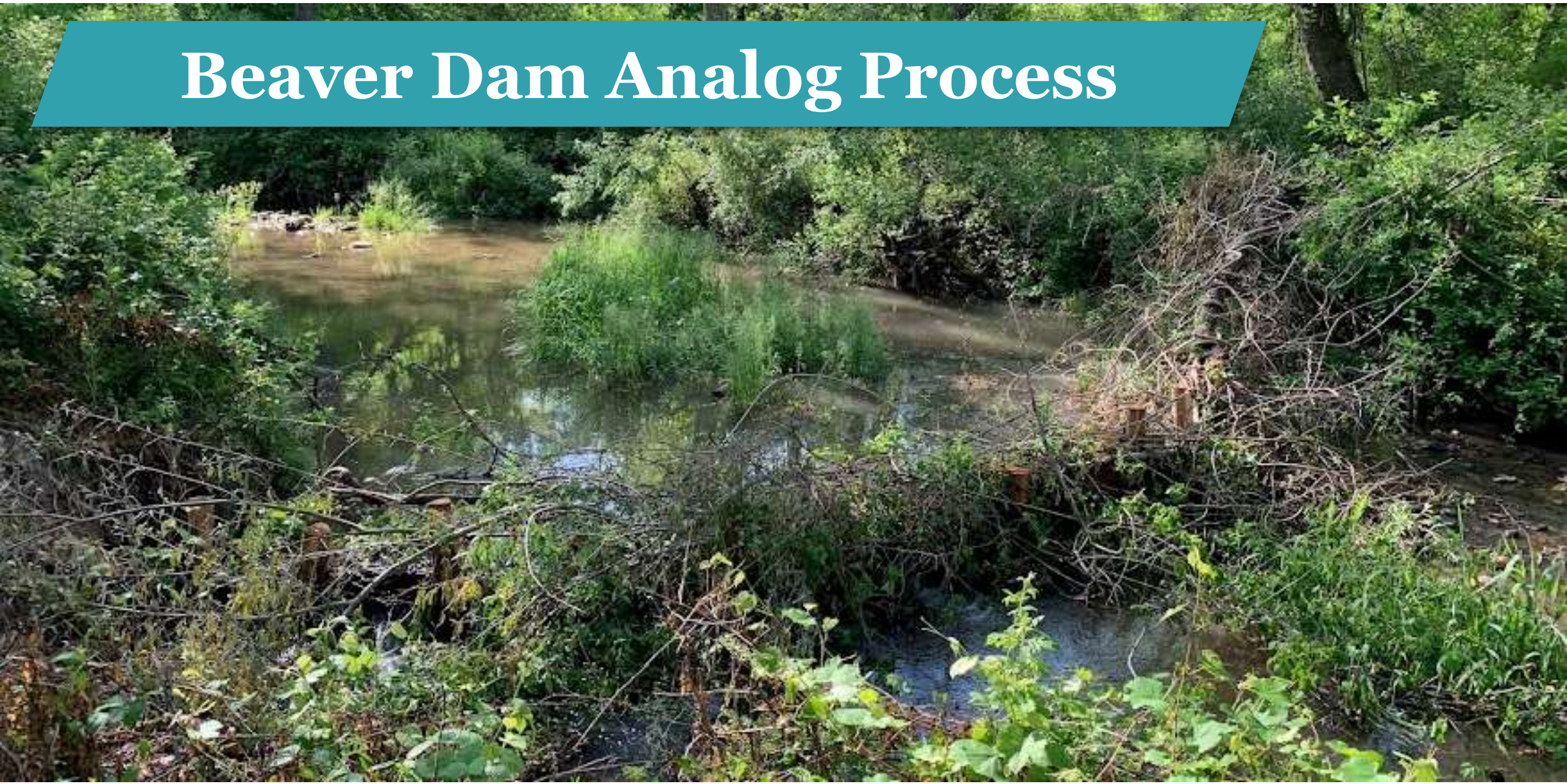


Beaver Dam Analog Process



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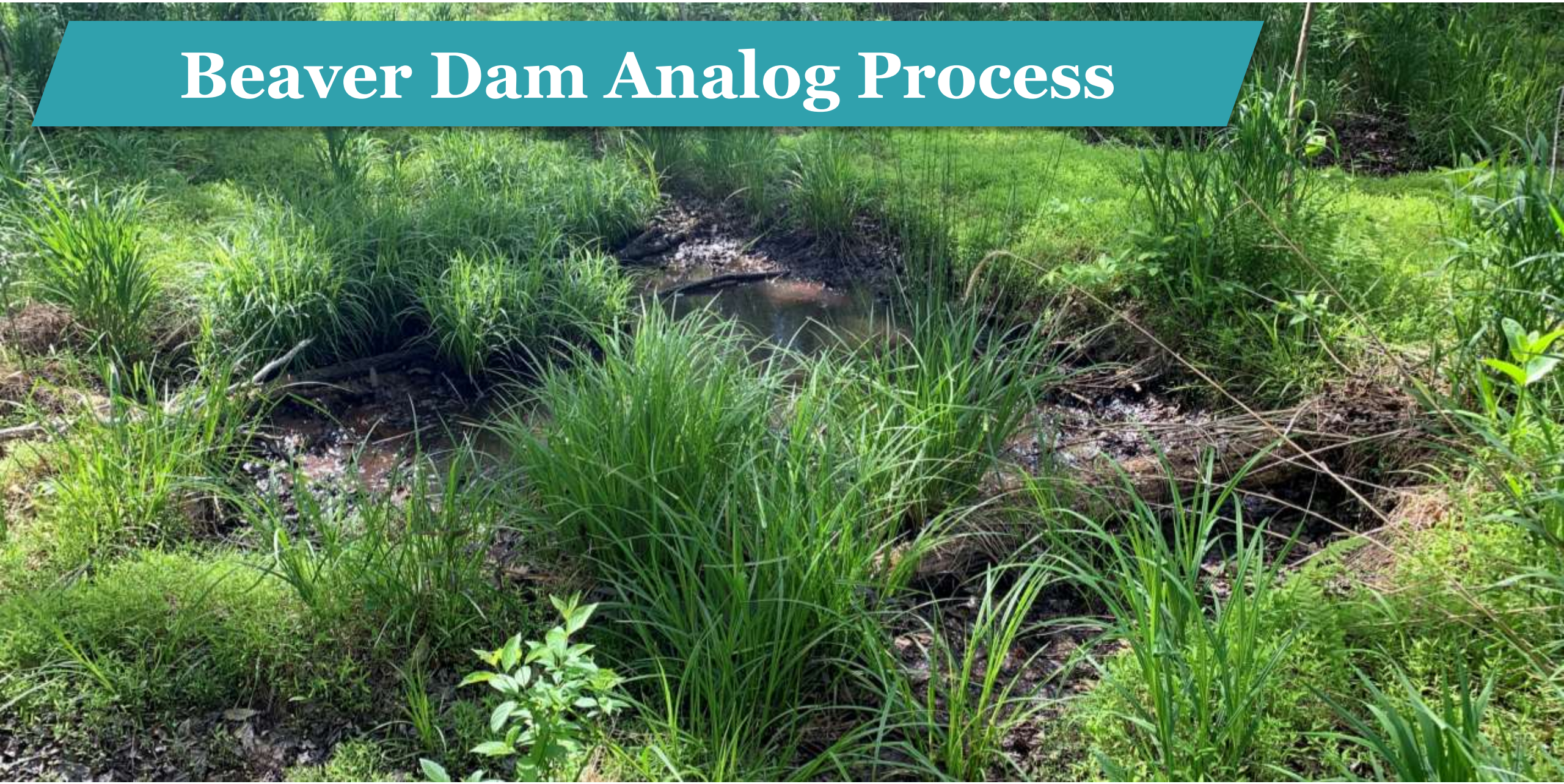

Wood Structures & Beaver Dam Analogs

- Understand source of material before incorporating into design
- Understand implications of rot/site hydrology
- Calculate and evaluate stress environment (channel and floodplain)
- Evaluate negative potential impacts on infrastructure, private property, and resources
- Longevity and Recruitment – Sustaining Beaver
- Biomimicry (Tie-ins)
- Attached root assemblages

Wood Structures & Beaver Dam Analogs

- Huge Potential for positive impact
- Right Solution for the Right Place
- Hybridizing designs for sustainable site-specific solutions that maximize uplift
- Biomimicry Design (Nature Inspired Innovation): understand adaptive management implications
- Design site to beaver dam wetlands (H&H process) – more than mimicking structures.
- Role of wood (ecological lift versus structural control – can be both or just one at same site)
- Recruitment requires planting/ food source presence

QUESTIONS: