



Flood Fencing: Reconnecting Floodplains and Riparian Areas



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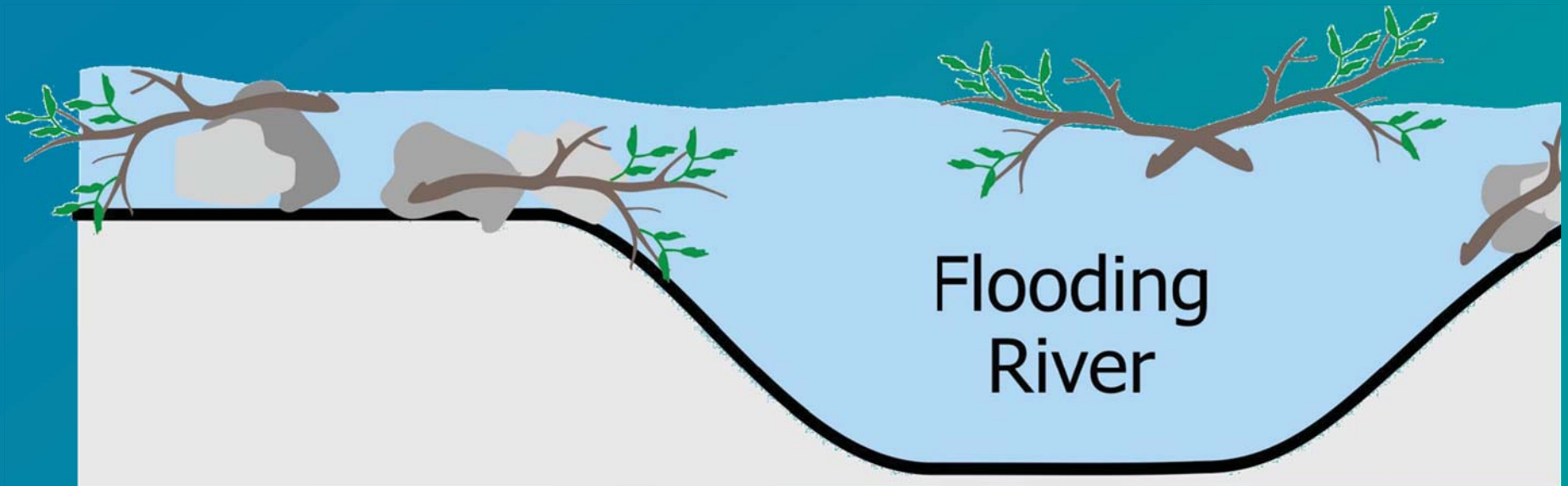


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Speaker Bio

- Bob Aldrich – Project Specialist
Snohomish County Public Works
Surface Water Management
- WRIA's - 4, 5, and 7; Skagit (Sauk),
Stillaguamish, Snohomish
- Discussing Two Types of Flood
Fence Applications, Floodplain and
In-stream

What is Flood Fencing?



Flood Fencing Concept

Large River Bioengineering Technique

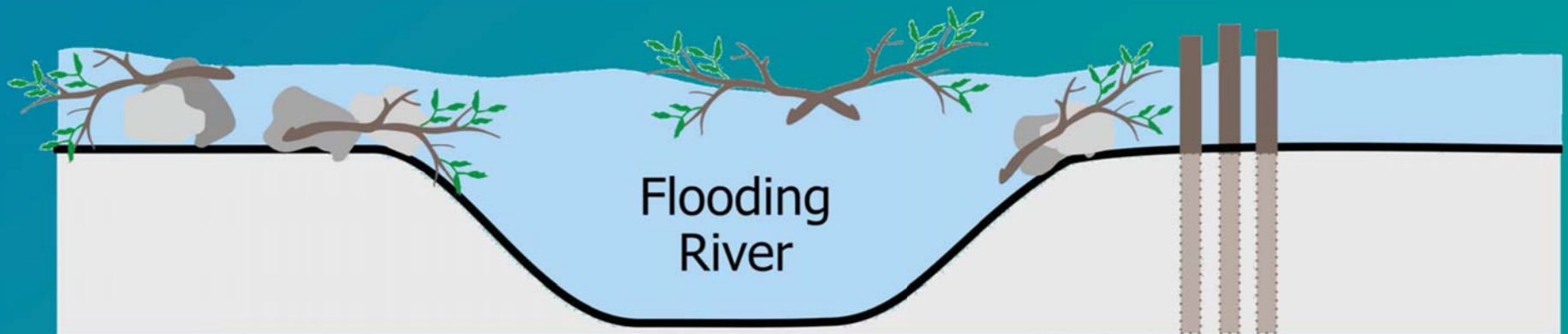
Cleared Riparian Zone:

Water flows over bank & transports woody debris onto floodplain where it deposits

Flood Fence Emulates

Riparian Tree Corridor:

Slows flow of water, promotes sediment deposition, & traps debris transported from channel to floodplain



Flood Fencing: Background

- Snohomish County involved in river engineering & habitat restoration
 - Engineered log jams in 1990's
 - Flood fencing around same time
- Original motivation:
 - Salmon recovery – Benefit to SalmonWork with farming community to reduce flooding impacts
 - County's farmland preservation policy
 - Large river habitat restoration goals

Flood Fencing: Floodplain/Riparian Context

- Historically, riparian forests cleared to create pasture
- In other cases, channel migration has removed riparian buffer
- Without riparian forests, overbank floods deposit debris, coarse sand and gravel on farmed fields
- Flood fencing was developed in response to this problem

Flood Fencing Concept

- Flood Fence arrays emulate riparian zone roughness
- Trap wood debris before it gets to fields
- Promote local sediment deposition
- Provide riparian vegetation colonization site
 - Seeds
 - Propagules
- Not intended to provide direct bank protection

Flood Fence Details

Use Live Cottonwood Boles:

- 6"-18" diameter, 8'-12' long
- Does not require continual contact with groundwater
- Dormant (October-March)

(continued)

Flood Fence Details

Use Live Cottonwood Boles:

- Cost effective construction
 - Ready supply of material
 - Augering, trenching

Flood Fence Details

Why Cottonwood?

- Native riparian species
- Buried bole develops adventitious roots rapidly
- Can also use Douglas fir, other
 - Stronger material
 - No regrowth

Benefits of Flood Fences

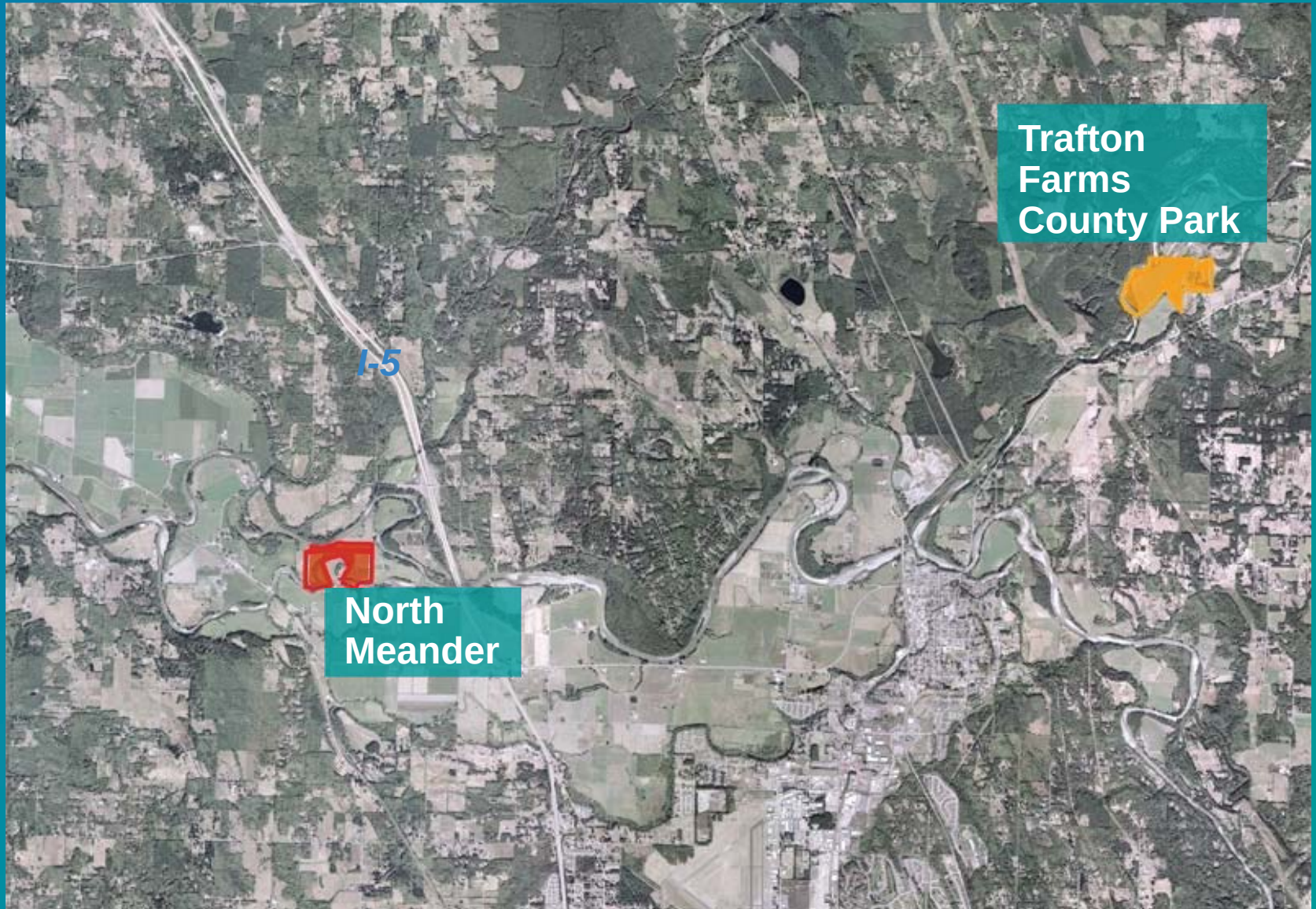
- Benefits Salmon Recovery
- “Instant (simulated) riparian buffers”
- Benefits farming community
 - Scour reduction
 - Debris retention
 - Sediment deposition
 - Prevents flood damage to farm fields
- Team effort between farmer, private sector and County

Flood Fencing Applications

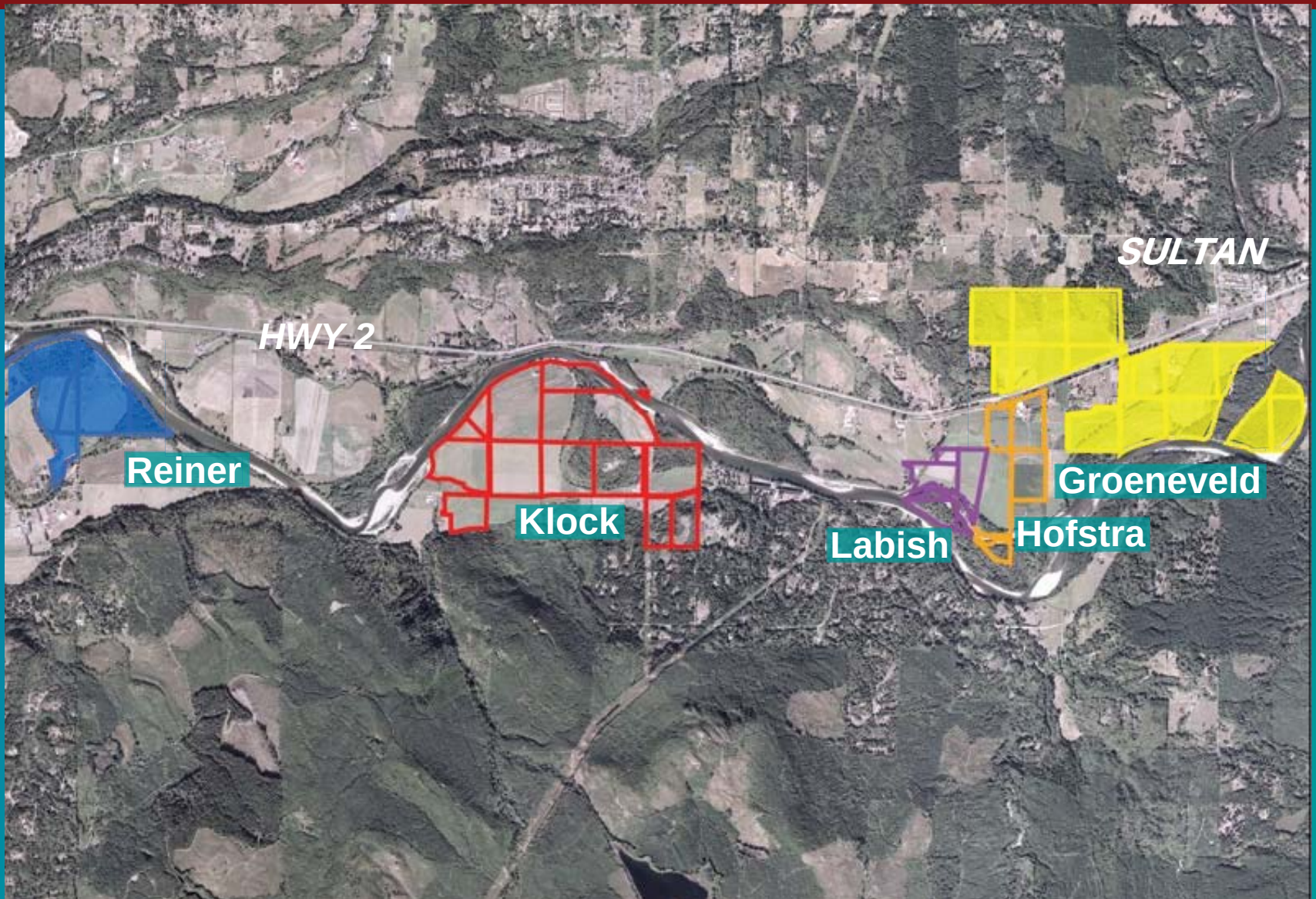
Where Have Flood Fences Been Installed?

- First installation was on the Mainstem Stillaguamish, in 1998, an additional one installed on North Fork Stilli in 2004.
- All remaining County installed flood fences have been on the Mainstem Skykomish River
- Regionally, other entities have used the technique

Stillaguamish River



Skykomish River



Mainstem Stillaguamish River, North Meander

One Week After Installation



Mainstem Stillaguamish River, North Meander

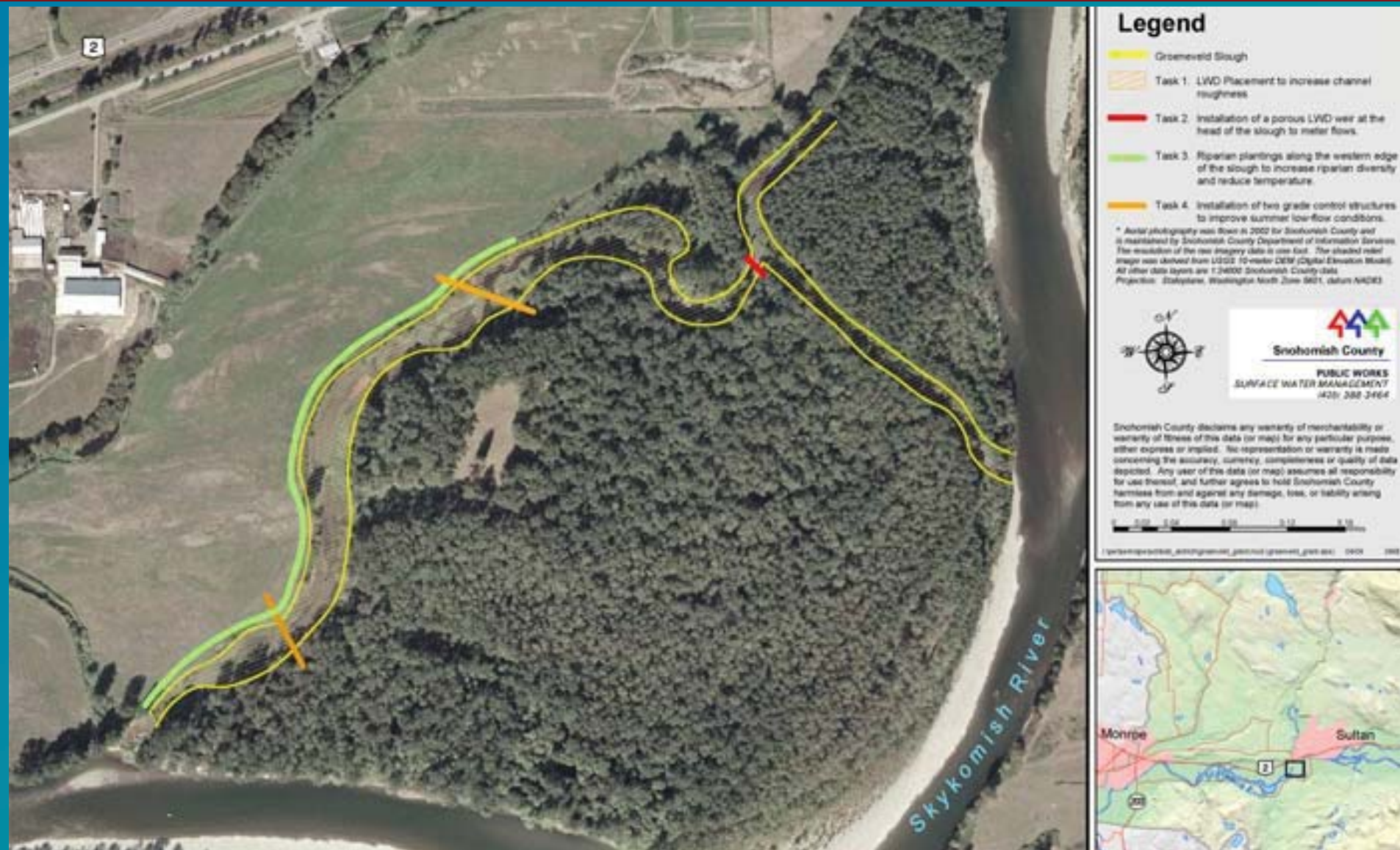
Baby's First Flood



North Meander: 6 Years Later



Groeneveld Slough Restoration



Groeneveld Slough Flood Fencing

Augering



Groeneveld Slough Flood Fencing **Wood Accumulation**



Instream Flood Fencing Engineering Approach

Flood Fencing – An Intersection Between Riparian and Instream Projects

- Evolution from riparian zone to instream habitat restoration tool
- Using engineering design to apply riparian fencing within the channel
 - Identify goal(s) of flood fencing
 - Quantify physical design parameters
 - Develop design criteria

Integrated with Engineered Log Structures



Now, where did I leave that log...



Moving From Concept to Construction

- Identify/Quantify Reach-Scale Processes
 - Crucial in large river settings
- Application matched to location
 - Compatible with natural process – hydraulics, sediment transport
 - Depositional locations
 - Let river do majority of work - don't fight river!!!

Example: Skykomish River Braided Reach Analysis

- Channel migration analysis
 - Bank migration rates
 - Changes in river length
- Changes in active gravel bar area
(continued)

Example: Skykomish River Braided Reach Analysis

- Sediment transport characterization
 - Long profiles
 - Grain size, slope
 - In-reach sediment budget
 - HEC-RAS model
 - Parker's (1990) bedload equation
 - Net erosion/deposition tendency

Skykomish River Braided Reach Restoration Design



Construction Specifics

- 2 miles of river
- Three weeks mobil/construction
- 3-person crew
- 1,100 pieces of large wood
- 28 separate structures
- Spent \$67,000



Constructing Apex Bar Jam and Flow Pathways



Constructing Channel Roughness Features



First Event



First Events (continued)



Other Post Construction



Post Construction – 1st Event



Engineering Design of Instream Flood Fences

- Habitat Function
 - Side channel maintenance/creation
 - Flood Fence Performance
 - Debris trapping
 - Roughness/sediment deposition
 - Design Issues:
 - Location of array
 - Bole spacing/arrangement
 - Roughness
 - Scour depth
 - Buoyancy pull out depth
- (continued)

Engineering Design of Instream Flood Fences

- Critical shear/bending moment
- Ploughing
- Public safety
- Adaptive management
- Safety factor
 - Need monitoring to refine design thresholds

Recap:

Benefits of Flood Fence Installations

- Agricultural benefits
 - Less debris in fields
 - Reduction of coarse sand & gravel deposits
- Habitat benefits –
 - “Instant” riparian
 - Captures wood debris, retains close to channel
 - Site for capturing seed “rain”
 - Indirect river training tool (instream installations)

Questions, Comments?

