Engineered Log Jams for Geomorphic Processes and Habitat Complexity in Low Gradient Alluvial Valleys

*Examples from TNC’s Ten Mile River Projects*

Lauren Hammack (PCI) with Dave Wright (TNC)

*Large Wood Field School*

11.12.2021
Low Gradient Alluvial Valleys

Hydrogeomorphic Features and Processes
• Floodplains – connectivity and complexity
• Sediment storage and transfer
• Riparian vegetation
• Large wood
• Groundwater and spring fed
• Entrenched channels (versus incised)

Salmonid Lifestage Utilization
• Winter and spring rearing and outmigration (high flow refugia, feeding, shelter)
• Summer rearing (in-channel complexity and shelter, flow quantity and quality)
• Migration and spawning (pools with shelter, well-defined riffles with appropriate hydraulics)
Legacy Sediment (Entrenchment) and Channel Simplification

- 5 to 15 feet of homogenous, silty sand - no buried soil layers or stratigraphy.
- Alluvial gravels, buried logs, intact tree roots below floodplain fine sediments. At existing channel elev.
- Flood and alluvial fan deposits from intense logging periods, cleared and smoothed for agriculture.
- Historic large wood removal
- Minimal wood recruitment and delivery to reaches
Goals and Design Objectives – Reach Based

Goals
• Significantly increase winter high flow refugia and rearing habitat for juvenile salmonids (with focus on coho).
• Improve in-channel complexity and cover for summer juvenile salmonid rearing.

Design Objectives
• Increase prevalence of low velocity (< 1 ft/sec) environments at range of winter flows.
• Increase number of deep pools with complex wood cover.
• Engage existing floodplain benches at lower winter flows.
• Drive channel widening and stable vegetated gravel bar formation.
• Accelerate natural recruitment of riparian trees.
• Trap and accumulate woody debris.
• Link accessibility to range of habitats.
• Use a range of large wood designs and techniques
Cross-Channel Racking Jam
Meander Jam
Off-channel flooded wetland and side channel complex
Mainstem Ten Mile – Stop 2 – Constructed 2021
Engineered Log Jam Designs

STEP 1
1. ENGINEERED LOG JAMS ARE INTEGRAL TO THE STRUCTURAL Framework. THEY PROVIDE SUPPLEMENTAL STABILITY TO THE SYSTEM AND ARE PREPARED TO BE USED AS PORTION OF THE PRIMARY STRUCTURE.
2. INSTALLATION PROCEDURE 1 (IMMERSE). SUGGESTED INSTALLATION PROCEDURE 2 (USE LOG JACKPLATES)
3. BEDDING PLATE OR BOLTS (AT 12") TAPPED BELOW RM WITHIN THE RACK.
4. WELD ACCESS HOLE DURING INSTALLATION WHERE OPTIMAL.

STEP 2
1. CONDUIT FOR PLUMBING IN DRAINAGE HOLE TO MAINTAIN DRAINAGE integrity OF DRAINAGE HOLE WITHIN CONDUIT.
2. STRUCTURAL BOUNDARIES SHOWN FOR VISUAL PURPOSES, NOT TO SCALE. STRUCTURAL BOUNDARIES SHOWN FOR VISUAL PURPOSES, NOT TO SCALE.
3. INSTALLATION PROCEDURE 1 (IMMERSE). SUGGESTED INSTALLATION PROCEDURE 2 (USE LOG JACKPLATES)
4. WELD ACCESS HOLE DURING INSTALLATION WHERE OPTIMAL.

LEGEND
- LOG Connector
- MAJOR VERTICAL LOGS
- MINOR VERTICAL LOGS
- SPACER
- SPACER CONNECTION
- HORIZONTAL LOGS
- TYPICAL INSTALLATION

NOTES
1. THIS DRAWING IS SHOWING AN INTENT TO CONFORM THE GENERAL STRUCTURAL Framework OF LOG JAMS. THE LOG JAMS DISABLE BEHAVIOR ALONG THE DIRECTIONAL FRAMEWORK AND ARE PREPARED TO BE USED AS PORTION OF THE PRIMARY STRUCTURE.
2. INSTALLATION PROCEDURE 1 (IMMERSE). SUGGESTED INSTALLATION PROCEDURE 2 (USE LOG JACKPLATES)
3. WELD ACCESS HOLE DURING INSTALLATION WHERE OPTIMAL.
4. THIS DRAWING IS SHOWING AN INTENT TO CONFORM THE GENERAL STRUCTURAL Framework OF LOG JAMS. THE LOG JAMS DISABLE BEHAVIOR ALONG THE DIRECTIONAL FRAMEWORK AND ARE PREPARED TO BE USED AS PORTION OF THE PRIMARY STRUCTURE.
Upstream Deflection and Bar Apex Jams
Deflection jam
Downstream Deflection and Bar Apex Jams
Lessons Learned

Go Big!