

Telling the Restoration Story of *Deer Creek*

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The Deer Creek Story

Collaborative

Innovative

Modified monitoring approach

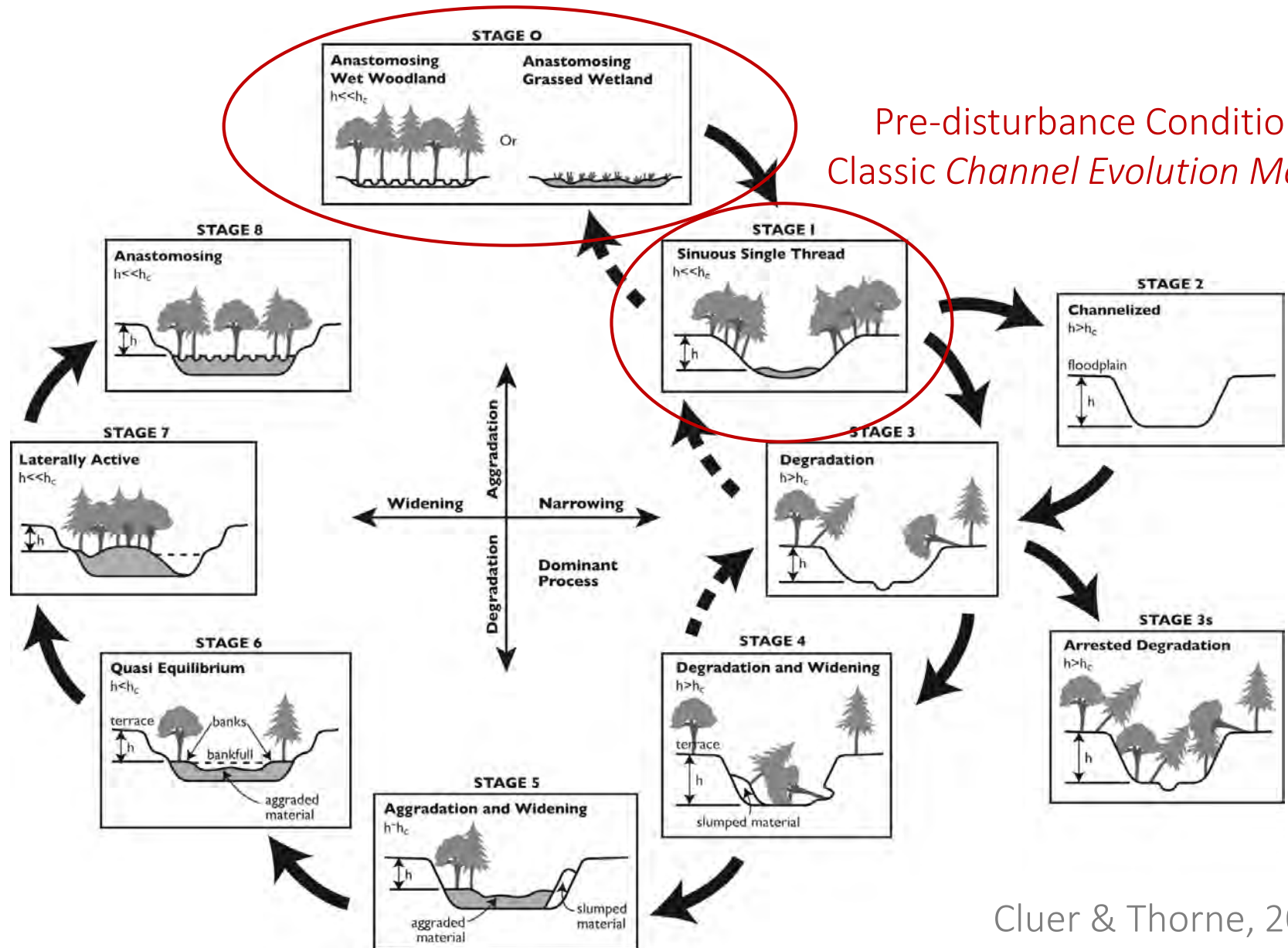
Varied and evolving outreach

Collective learning



Pre-disturbance Condition Updated Stream Evolution Model

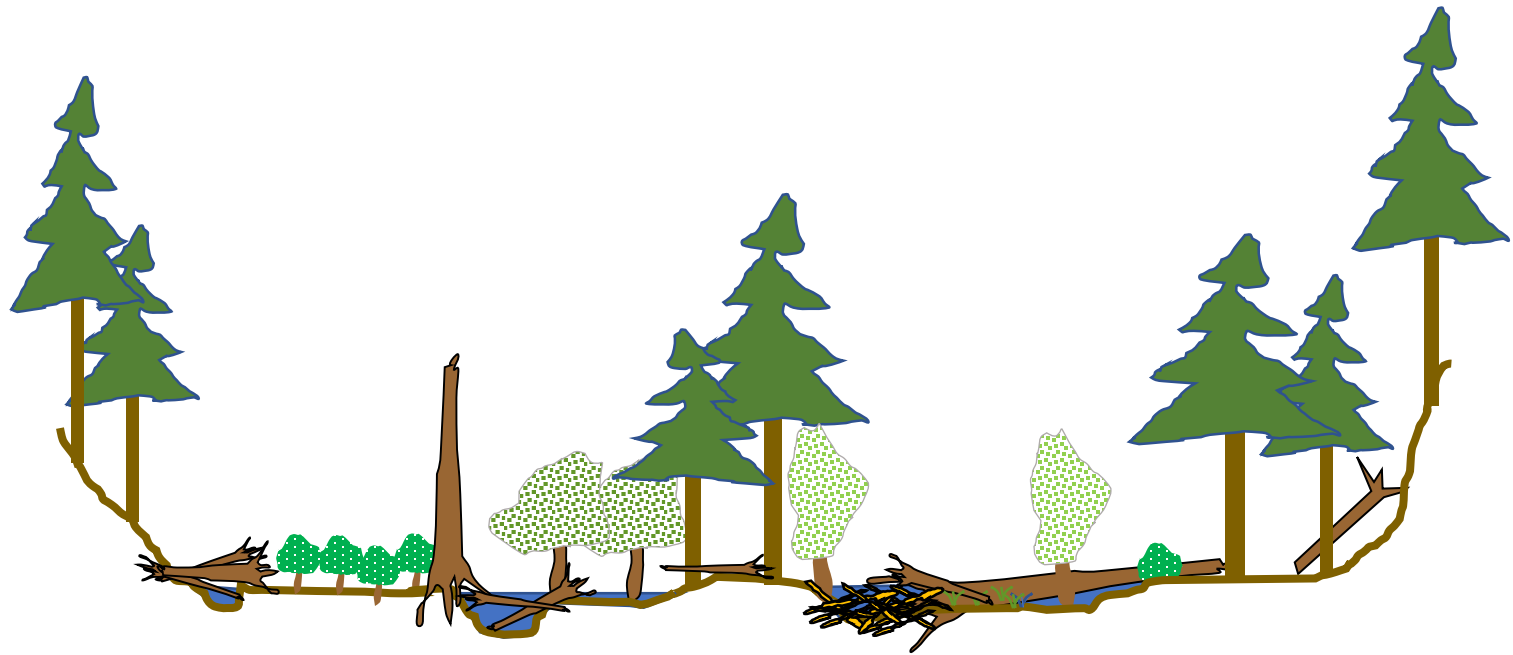
Pre-disturbance Condition Classic Channel Evolution Model



What is "Stage 0" Restoration?

"A valley-scale, process-based approach with the aim to re-establish depositional environments to maximize connectivity resulting in dynamic wetland-stream complexes."

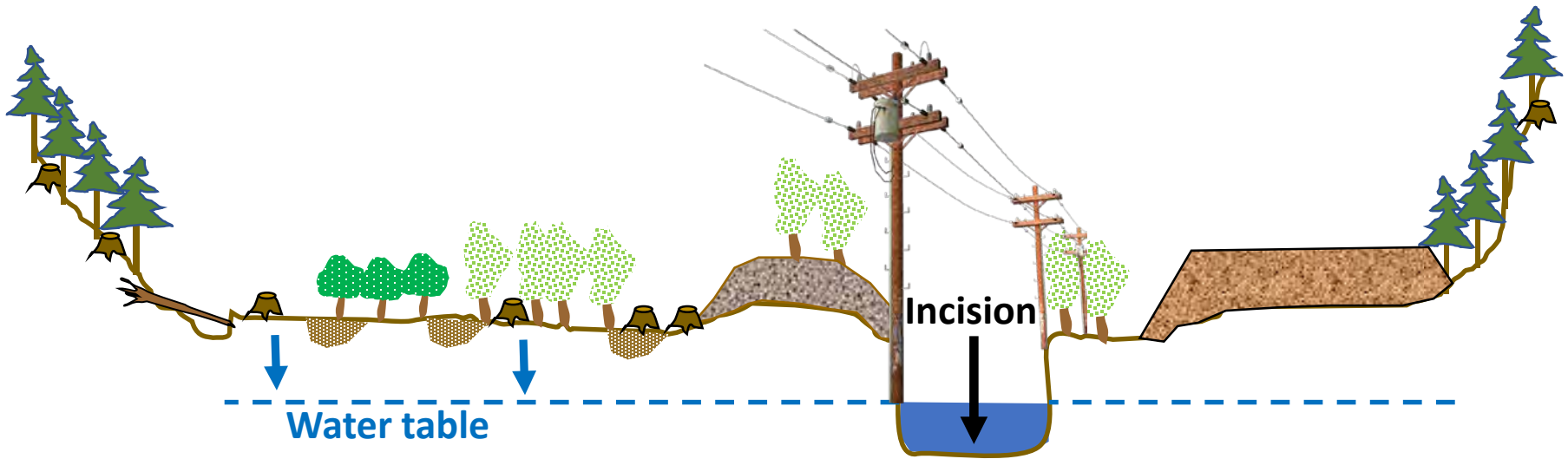
- Oregon Stage 0 Practitioners (OWEB-funded workshop)



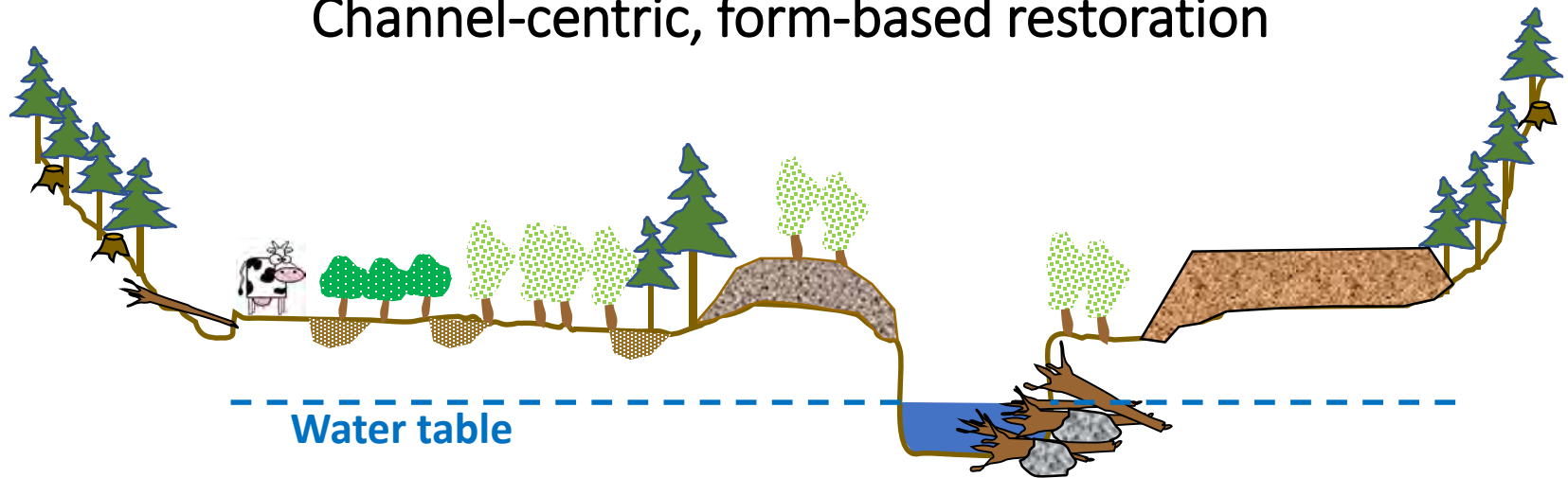
- High water table
- Multiple channels and wetlands
- Frequent floodplain inundation
- Dynamic, complex geomorphology
- Diverse habitats
- Diverse flora and fauna
- Downed wood / future supply
- Resilient to disturbance

Impaired Deer Creek

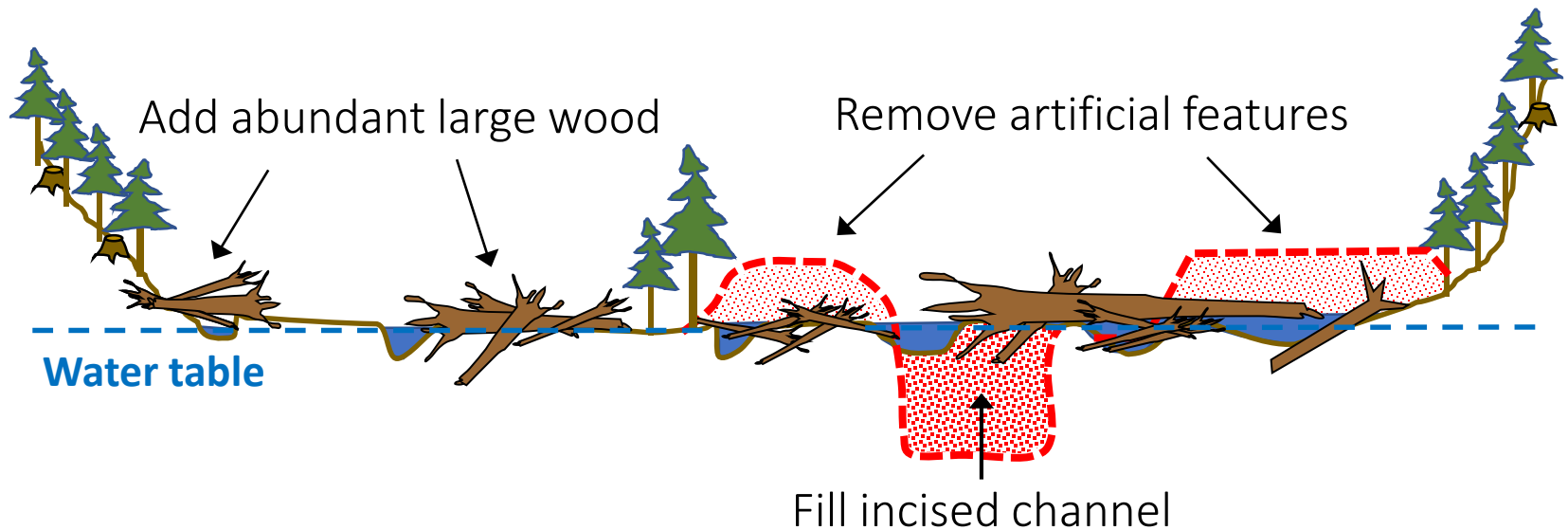
- Single incised channel
- Lowering of water table
- Altered vegetation types
- Reduced hydrologic connectivity
- Changed from depositional to transport reach
- Simplified habitat
- Coarse, armored substrate



Channel-centric, form-based restoration



Stage 0, process-based restoration



Stage 0 Design Tools

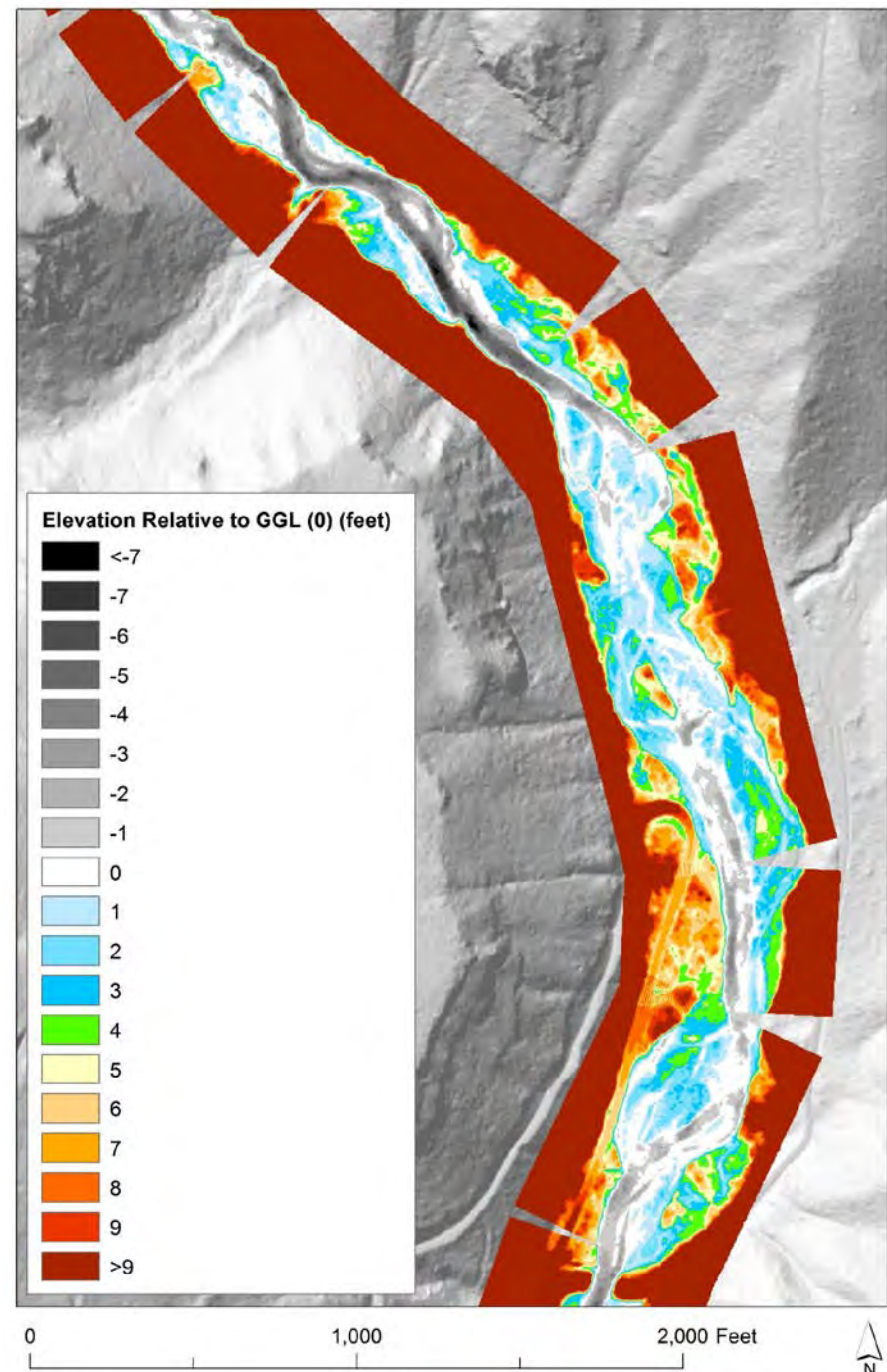
- Relative Elevation Model based on the Geomorphic Grade Line (GGL) methodology*
- Requires LiDAR

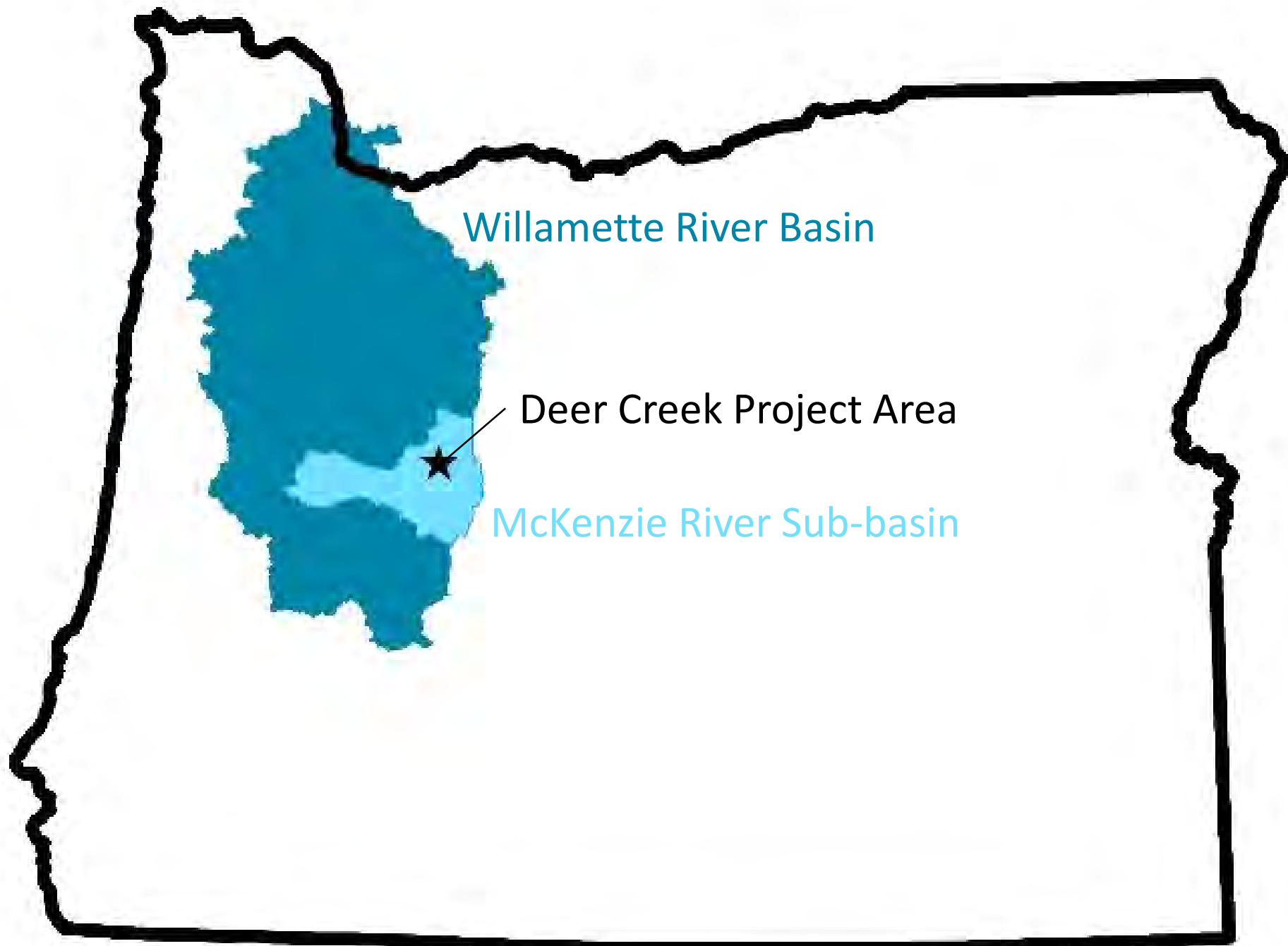
INCISION

WETTED ANNUALLY

FLOODPLAIN / TERRACE

*Powers et. al. 2018. A process-based approach to restoring depositional river valleys to Stage 0, an anastomosing channel network.





Willamette River Basin

Deer Creek Project Area

McKenzie River Sub-basin

Implementation



- Multiple water diversions
- Streamside berms (high spots) were cut to target elevation
- Removed sediment was used to fill the incised stream channel (low spots)



Implementation

- Large wood placement throughout valley
- Small and large log jams
- Tipped 23 live streamside trees



Constraints

- Transmission line
- Dispersed camping sites
- McKenzie River Trail
- USFS Road



Monitoring Approach

- Valley-wide transect surveys
- Remote sensing (LiDAR, aerial imagery)
- Macroinvertebrate sampling
- Redd surveys (Chinook salmon, rainbow and cutthroat trout)

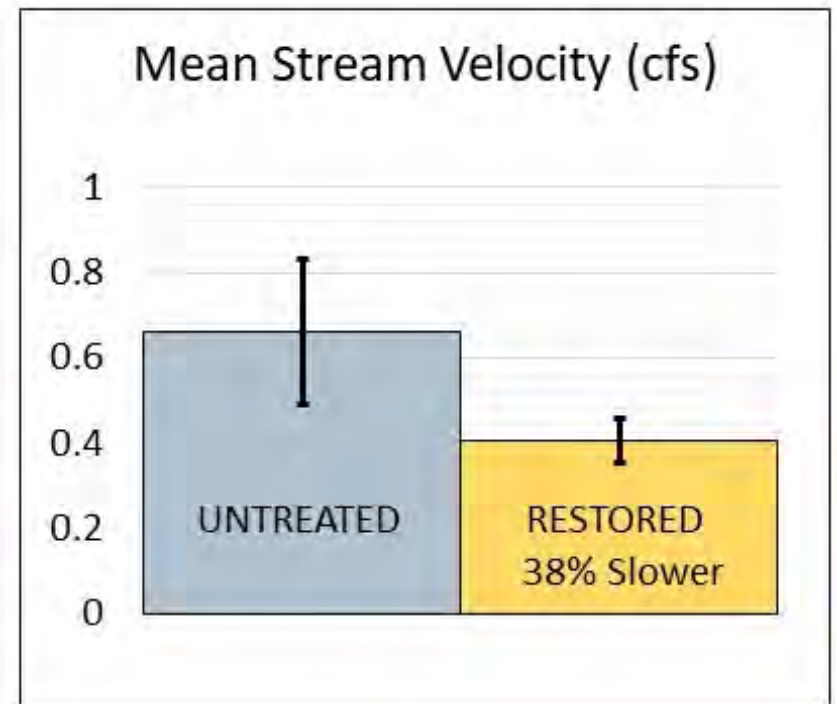
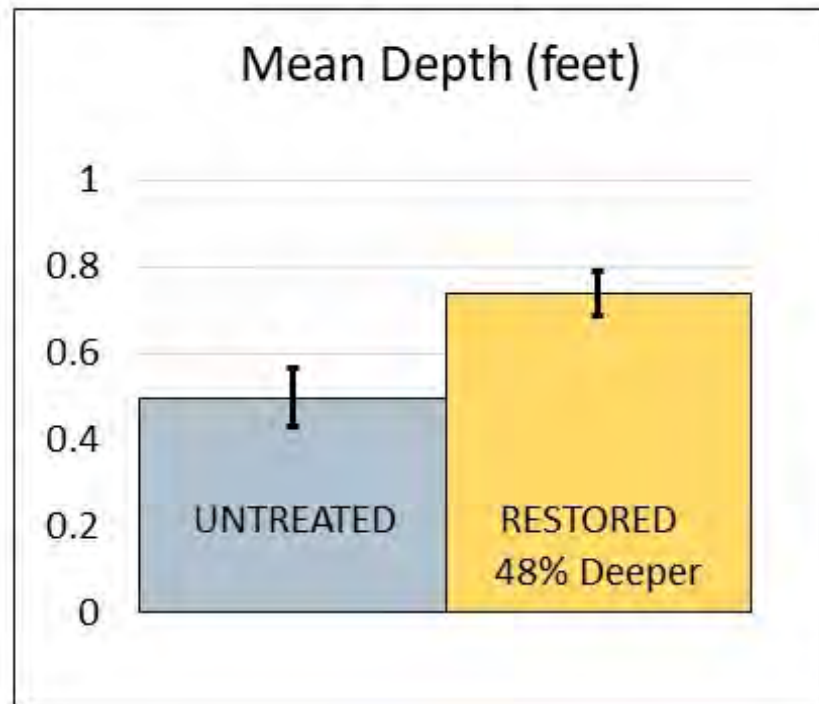


Preliminary Monitoring Results - Transects

Restored Reaches have 2.5 times more wetted area at base flow than the Untreated Reach

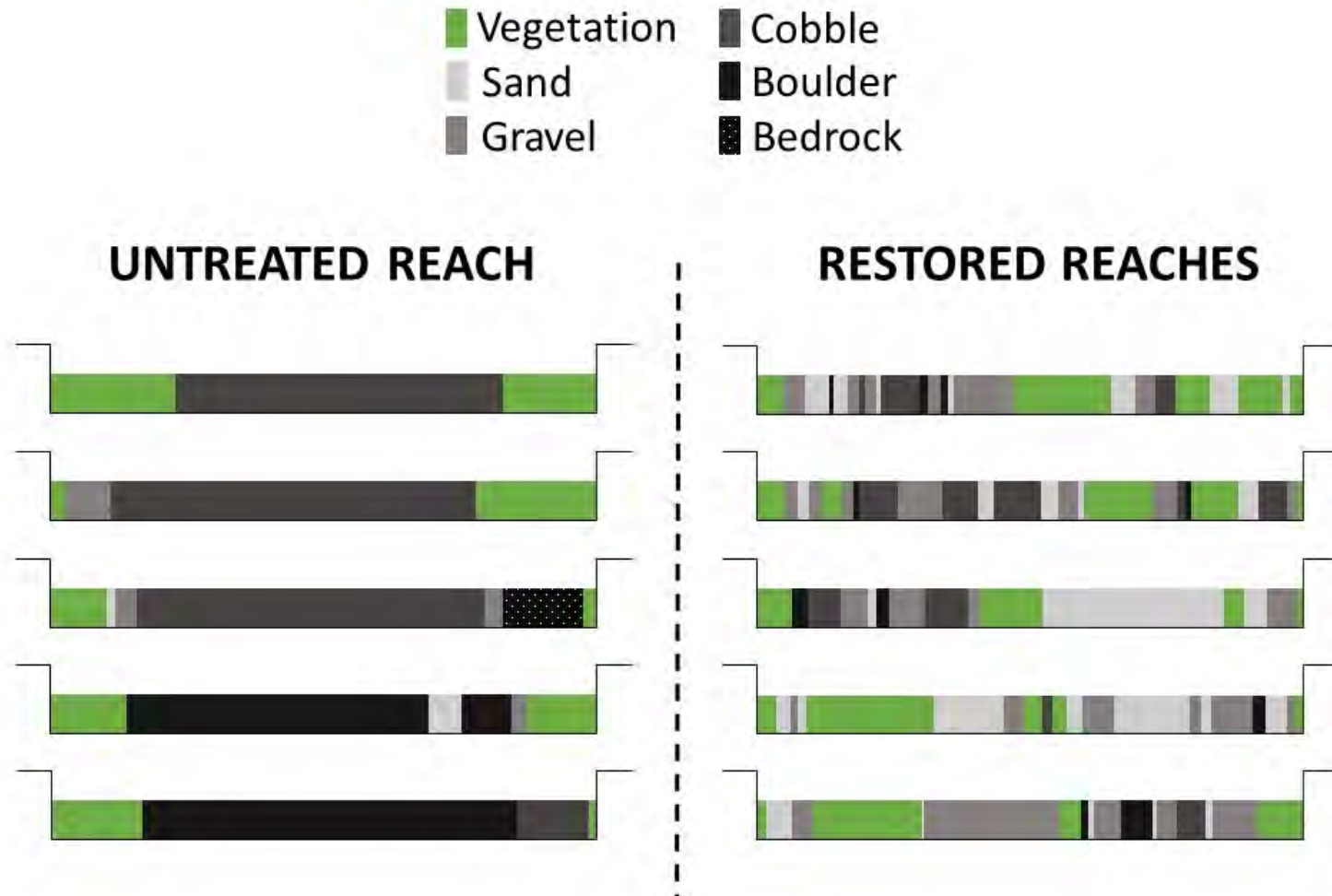


Preliminary Monitoring Results – Transects



Preliminary Monitoring Results – Transects

Sediment size and heterogeneity



Preliminary Monitoring Results – Geomorphic Complexity*



**April 2016
BEFORE**



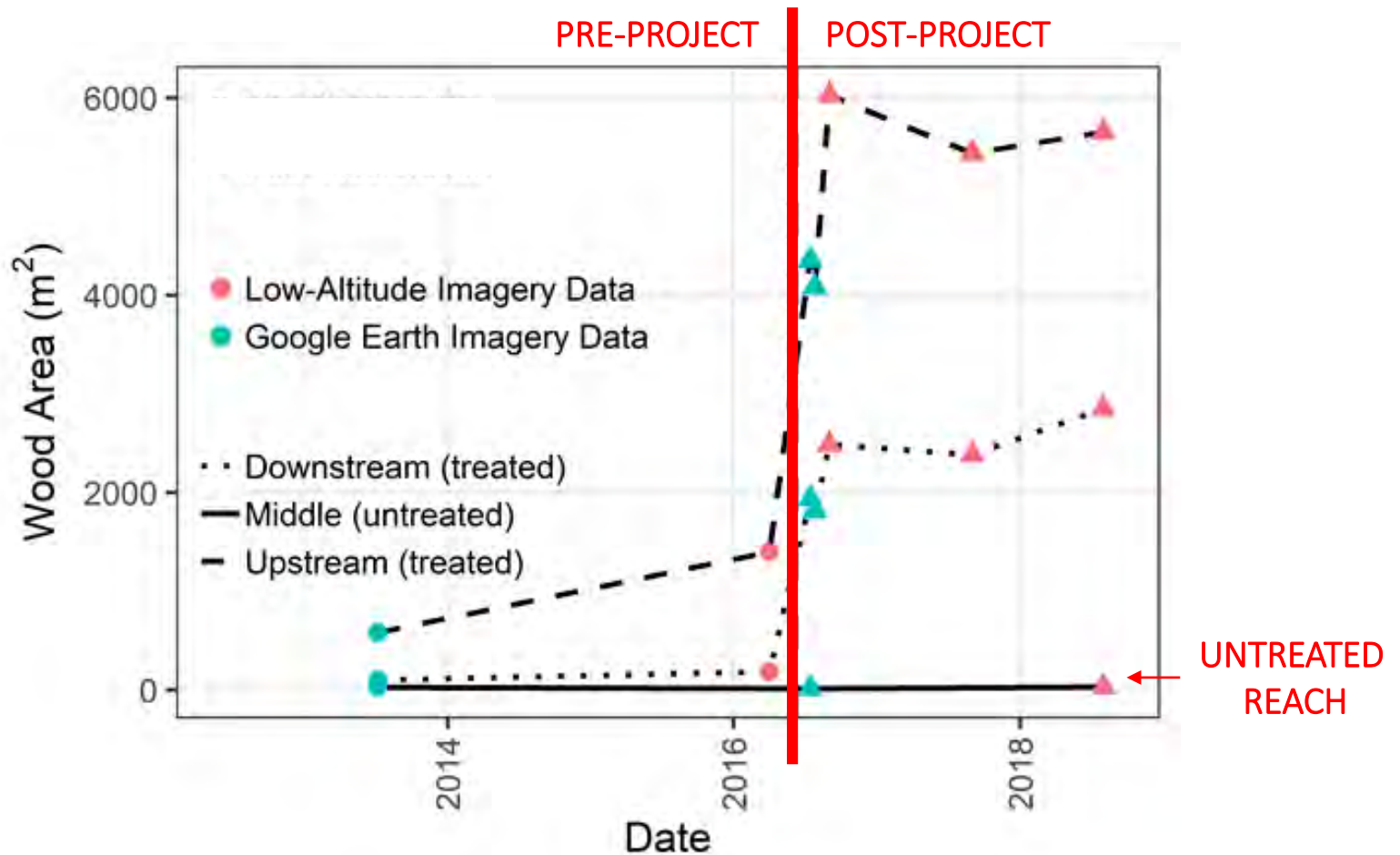
**September 2016
IMMEDIATELY AFTER**



**September 2019
3 YEARS AFTER**

* Funded by OWEB; Scott, 2020. Deer Creek Stage 0 Restoration Geomorphic Complexity Monitoring Report

Preliminary Monitoring Results – Wood Density/Retention*



Preliminary Monitoring Results – Macroinvertebrates*

RESTORED REACHES vs. UNTREATED REACH

- 62% greater taxa richness (diversity)
- >2 times more biomass
- 10 more rare/unusual species that have newly colonized
- substantially greater abundance of more than 20 different taxa



**Funded by OWEB; Wisseman, 2019. Benthic Macroinvertebrate Biomonitoring of the Deer Creek Habitat Restoration Project, McKenzie River Basin, Oregon*

Preliminary Monitoring Results – Chinook Redd Density

Spring Chinook Salmon Return to Deer Creek!

- No Chinook redds documented since 1993
- 2017 – 3 Chinook redds
- 2019 – 2 Chinook redds



Lessons Learned



- Incision where constraints limited connection across entire valley



- Coarsening of sediment size in areas with low wood density

Lessons Learned



Logs jams with fine woody material had greater connectivity, complexity, and deposition of gravels and fines



Lessons Applied to Phase 2 in 2020

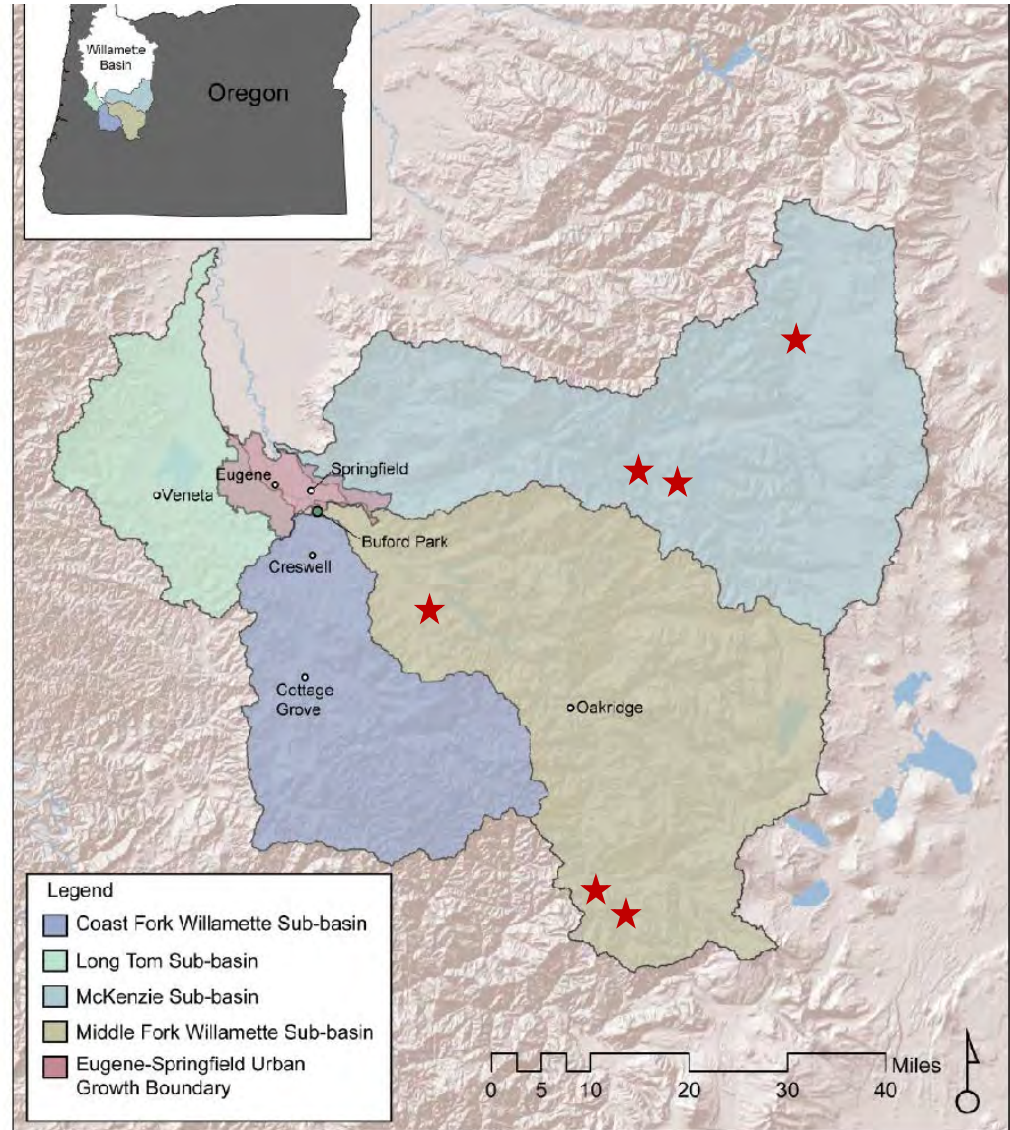


- Preparation for transmission line relocation
- Increased design wood density
- Removed one major dispersed campsite



Regional Learning & Collaboration

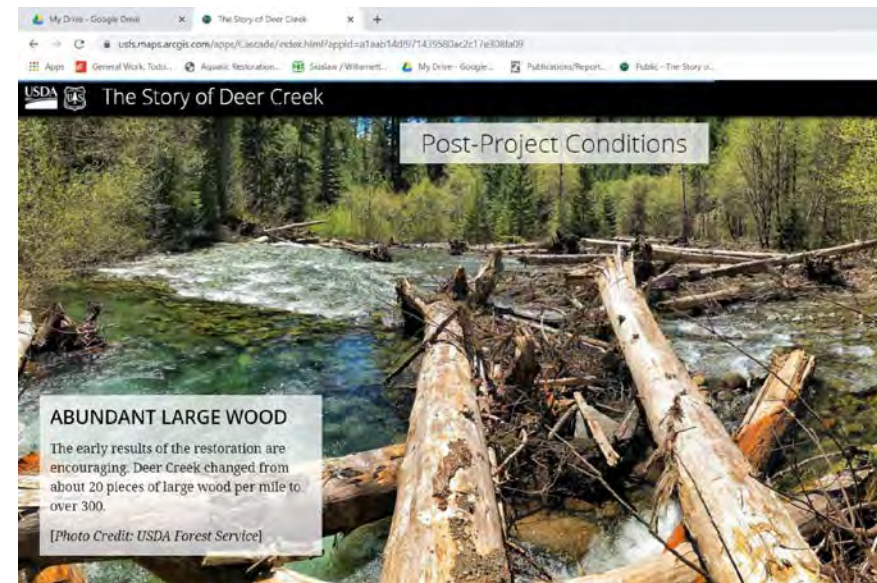
- Five Stage 0 projects on WNF since Deer Creek Phase 1
- Shared learning and evolution
- Collaborative planning of Stage 0 projects off the WNF



The Story of Deer Creek

A modern approach to valley scale restoration

- Deer Creek Story Map (over 5,300 hits)
https://www.mckenziewc.org/?page_id=1540
- Inspiring Story Map development at other sites



Acknowledgements

Key People Involved in Phase 1 Project

- Kate Meyer, Fisheries Biologist, USFS Willamette National Forest
- Jared Weybright, Director, McKenzie Watershed Council
- Johan Hogervorst, Hydrologist, USFS Willamette National Forest
- Paul Powers, Fisheries Biologist, USFS Deschutes National Forest
- Mickey Means-Brous, Fisheries Technician, USFS Willamette National Forest
- Cari Press, Hydrologist, USFS Deschutes National Forest
- Jeff Ziller, District Fish Biologist, ODFW

Project Funders

- Oregon Watershed Enhancement Board
- National Fish and Wildlife Foundation, Bring Back the Natives Program
- Payments to Counties/Title II Funding (US Forest Service)
- Western Native Trout Initiative/US Fish and Wildlife Service

Contractors

- Haley Construction Company, Inc.
- Blue Ridge Timber Cutting