

Habitat Enhancement Effectiveness Monitoring Klickitat River Subbasin



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Yakama Nation Fisheries Program



Monitoring Categories

Status and Trend



Monitoring Activity Continuum

Qualitative

Quantitative



Photo Monitoring

Stream Inventory

Food Web Study

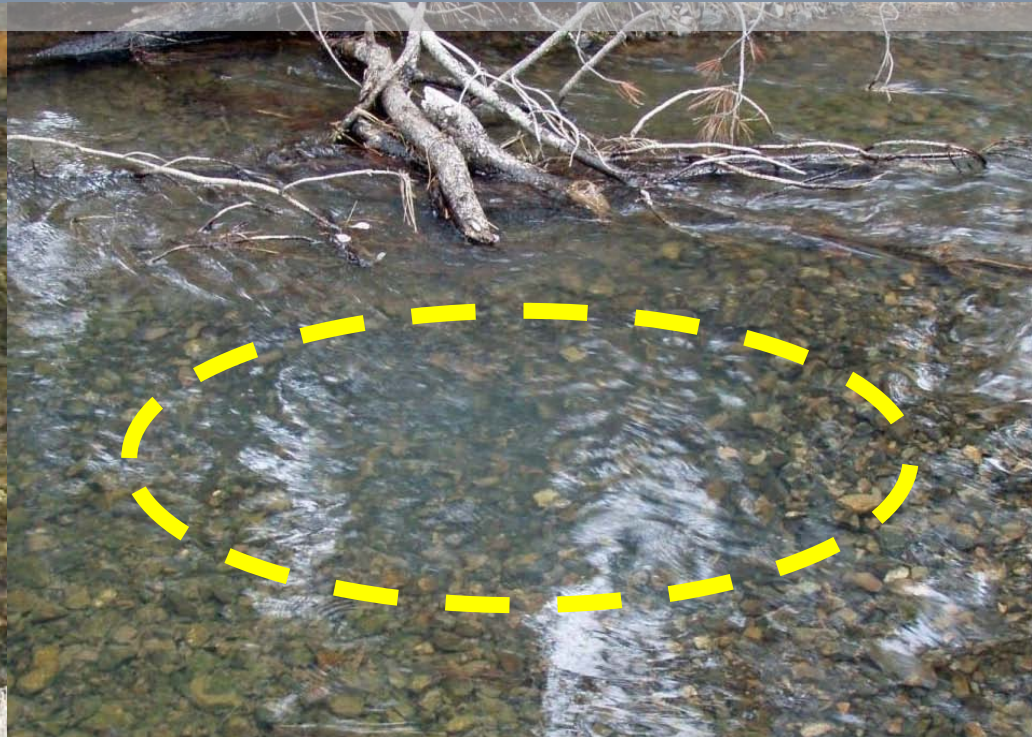
“Classic” Types of Monitoring

- **Status and Trend Monitoring** – provide measures of change in species or habitat status over time and allow for the interpretation of those measured changes.
- **Implementation Monitoring** – documents whether or not management practices were applied as designed. Project and contract administration is a part of implementation monitoring.
- **Effectiveness Monitoring** - designed to determine if the project is effective at meeting its biological and ecological objectives.

Status and Trend Monitoring

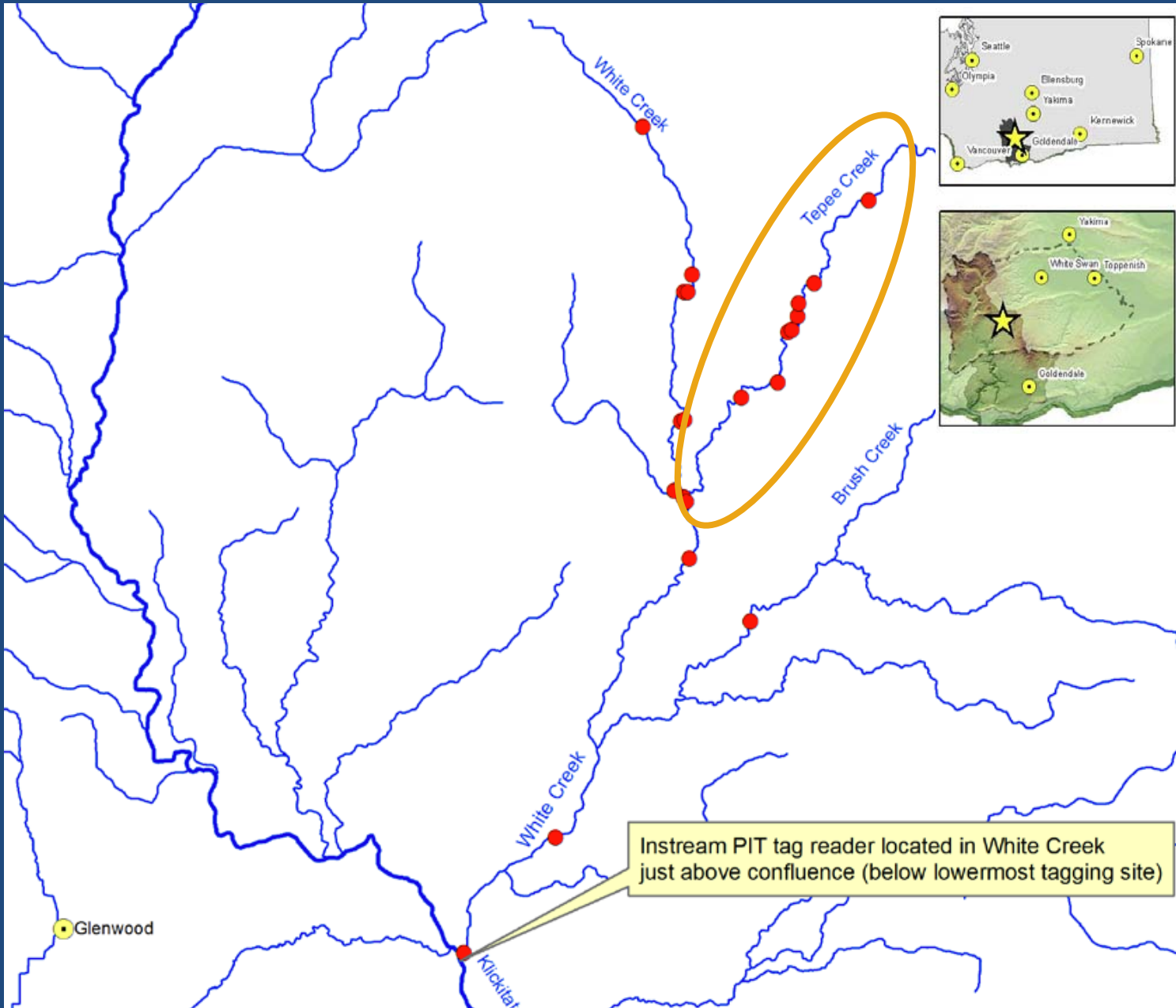
- Stream Hydrology
- Temperature
- Sediment
- Turbidity
- Habitat Surveys (TFW)
- Fish Abundance
- Population Estimates
- Escapement Estimates
- Outmigration Estimates

Steelhead Spawning – Tepee Ck IXL



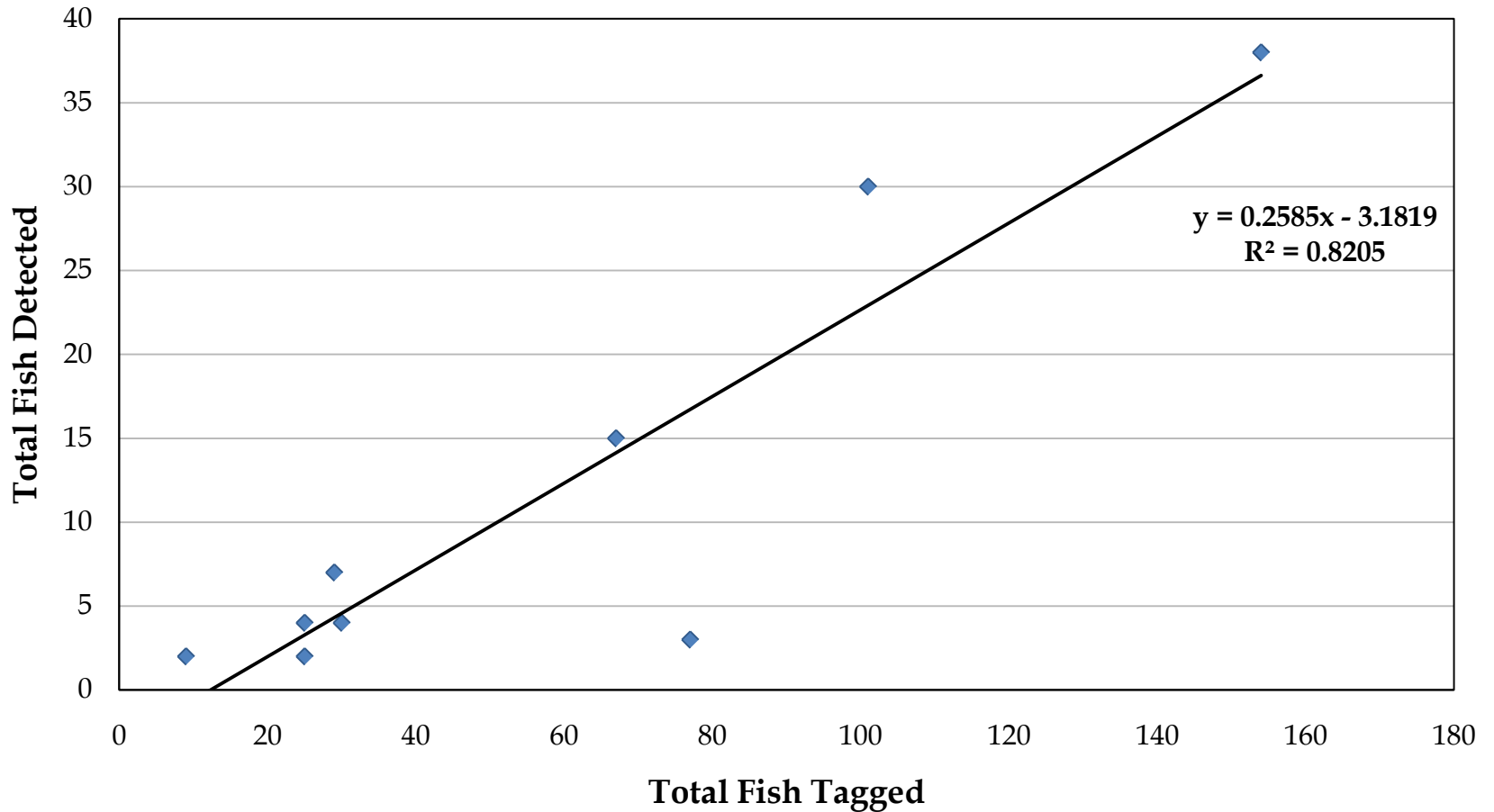
Year	Redds in Tepee IXL Reach (0.4 miles)	Redds in Tepee Cr outside of IXL reach (7.7 miles)
2007	2	1
2008	0	2
2009	4	8
2010	3	8

White Ck PIT Tag Study



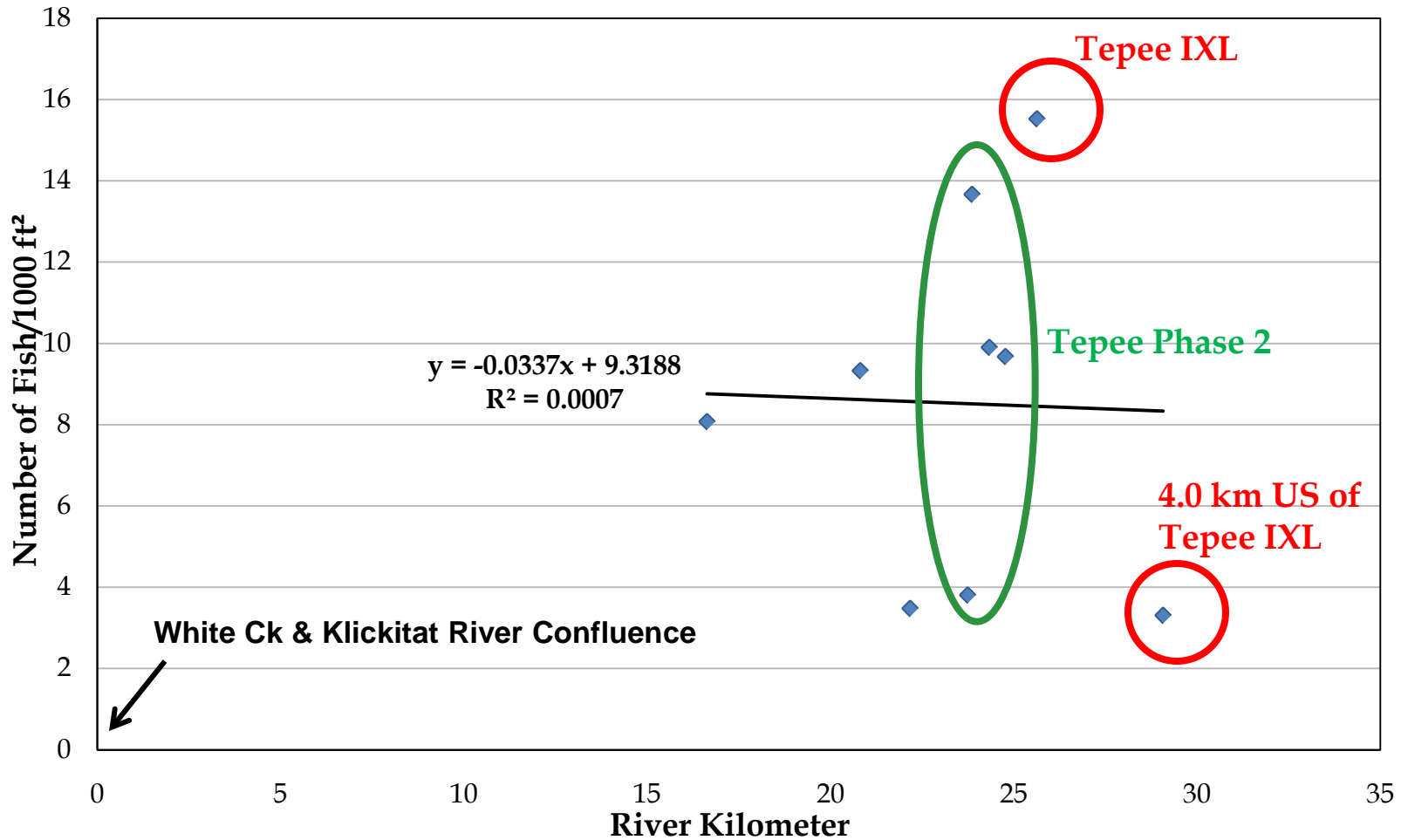
Tepee Ck PIT Tag Study

Relationship Between Total Fish Tagged and Total Fish Detected by Tagging Site in Tepee Creek



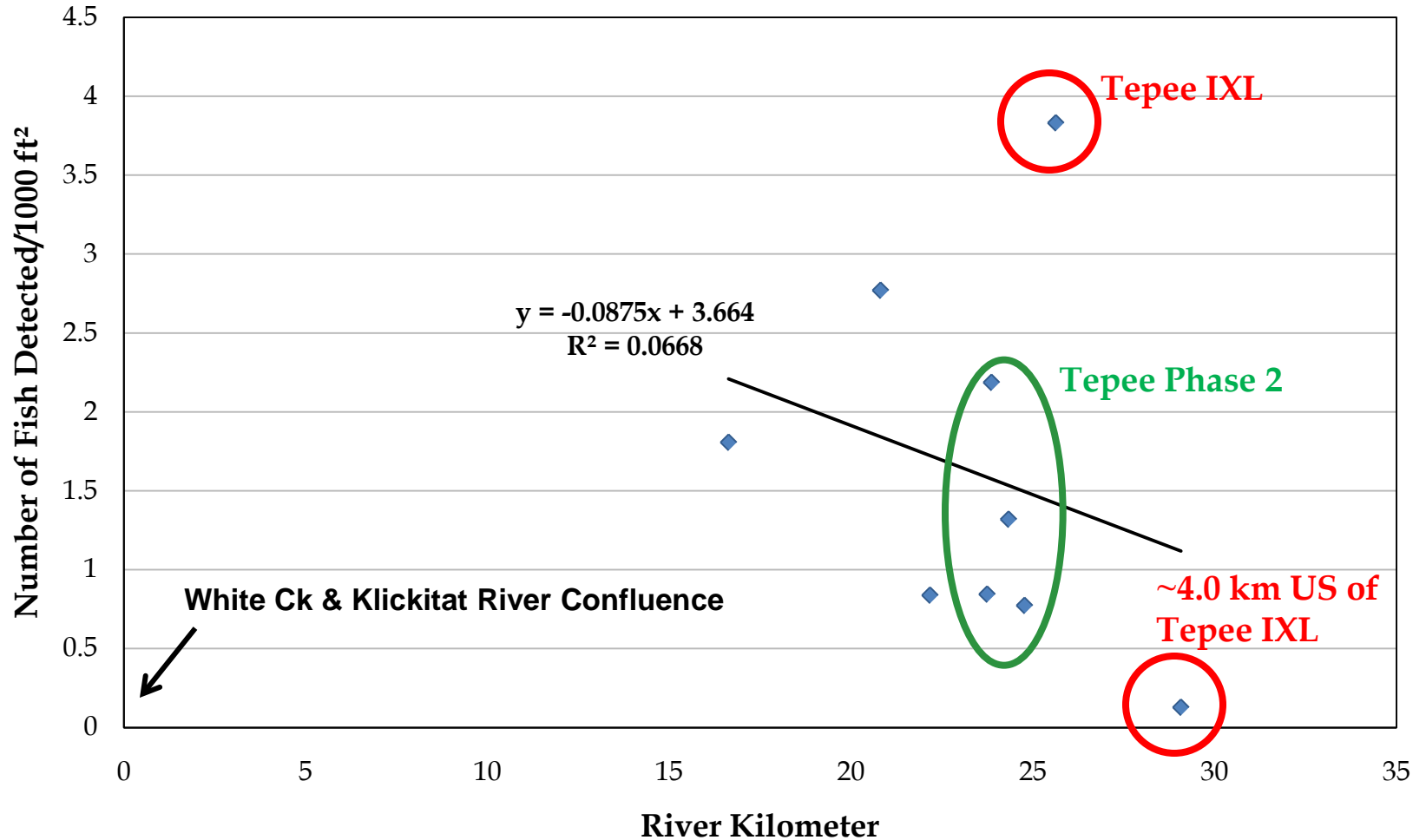
Tepee Ck PIT Tag Study

Relationship Between Fish Abundance by Site and Distance to the Klickitat River



Tepee Ck PIT Tag Study

Relationship Between Fish Detected by Site and Distance to the Klickitat River



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Implementation Monitoring

- Grade-checking
- Compaction testing
- Concrete testing
- Erosion control
- Planting oversight
- Torque-checking
- LWD placement
- Bearing conditions
- Geotextile installation

Implementation Monitoring



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Effectiveness Monitoring

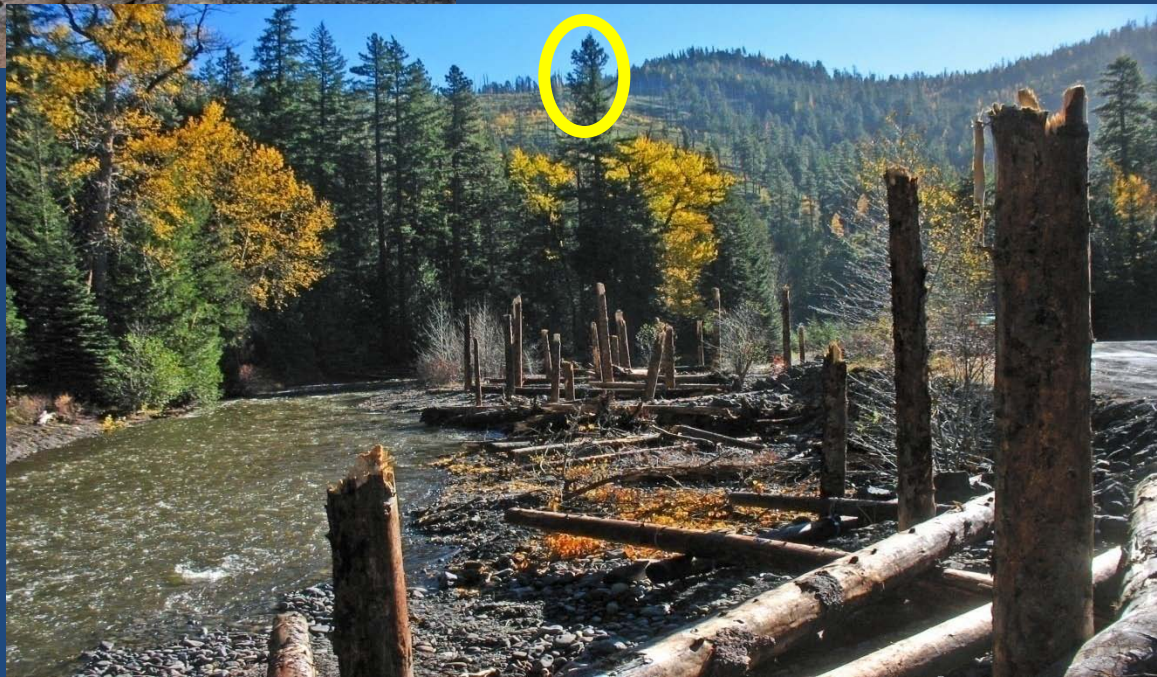
The YKFP is utilizing a measured approach to apply effectiveness monitoring to every project implemented.

A continuum of effectiveness monitoring actions will be presented to demonstrate a spectrum ranging from qualitative descriptive measures to a quantitative experimentally designed research project.

Photo Monitoring – Upper Klickitat Phase 2



Pre-treatment – 4/29/10



Post-treatment – 11/2/10

Photo Monitoring – Tepee Ck IXL Meadows

Pre-treatment – 8/25/04

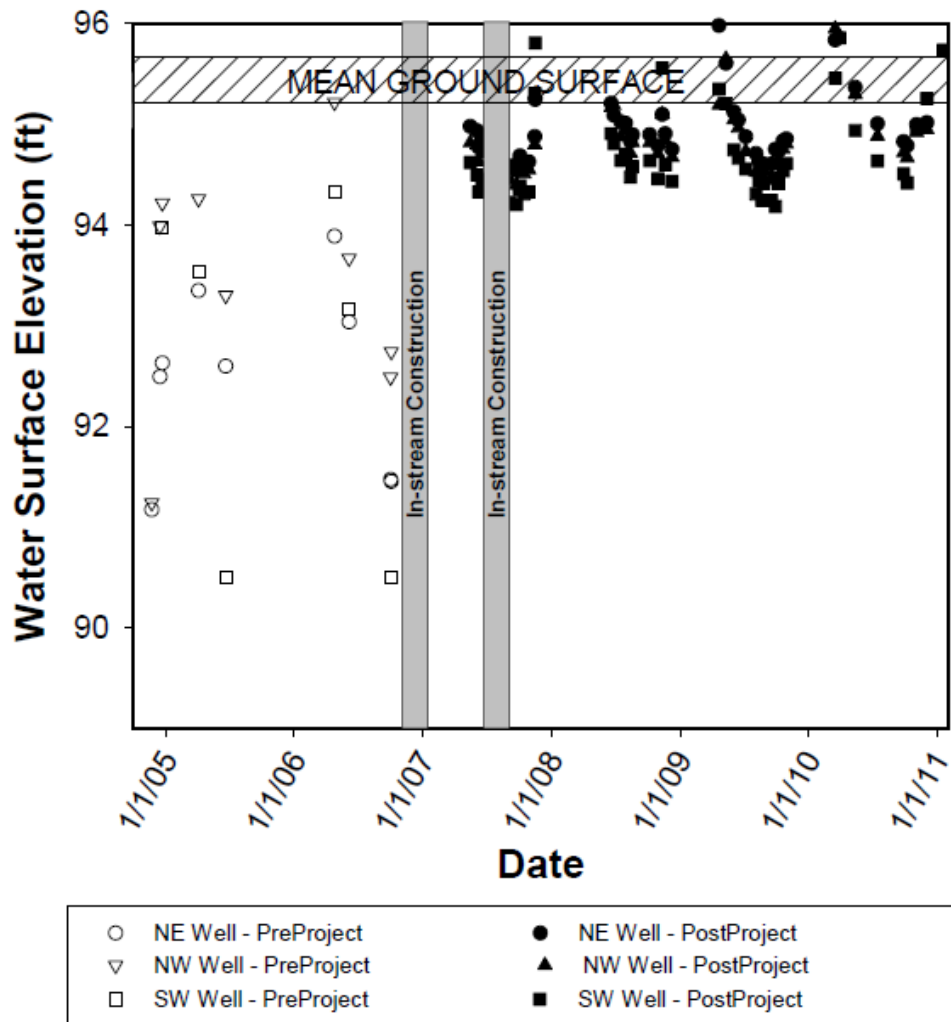


Post-treatment – 5/4/09



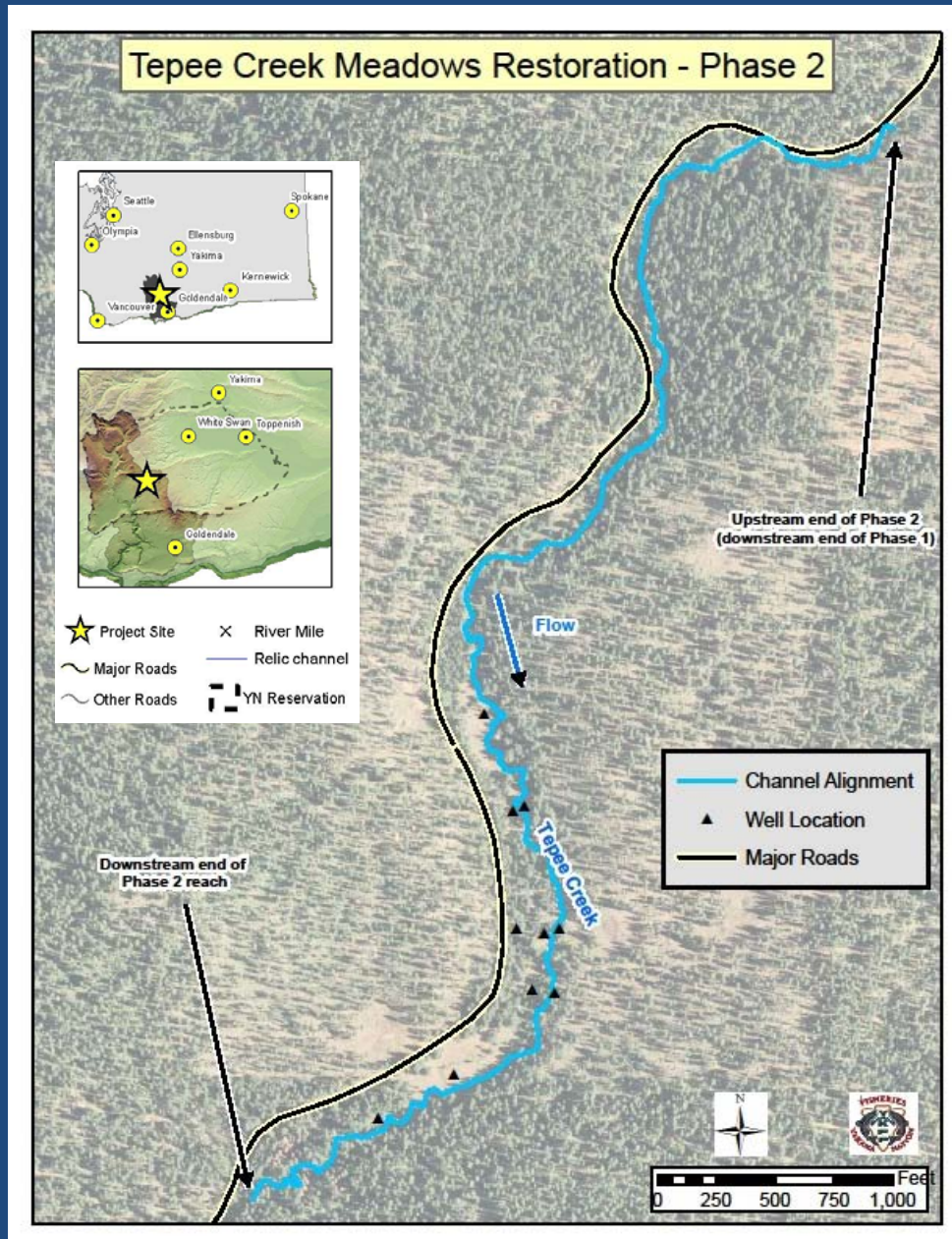
Groundwater Monitoring – Tepee Ck IXL

Tepee Creek / IXL Meadows Restoration Project:
Pre- and Post-Restoration Groundwater Elevations



Higher Water Table – 2' - 4' rise and less variation between and among wells

Groundwater Monitoring – Tepee Ck 2



Tepee Ck (12 Wells)

- 10 treatment
- 2 control

White Ck (4 Wells)

- 4 control

Stream Inventory / Habitat Mapping

Rapid Aquatic Habitat Assessment Protocol

Methods for Stream Inventory Surveys



Klickitat Monitoring and Evaluation Project

Klickitat Watershed Enhancement Project

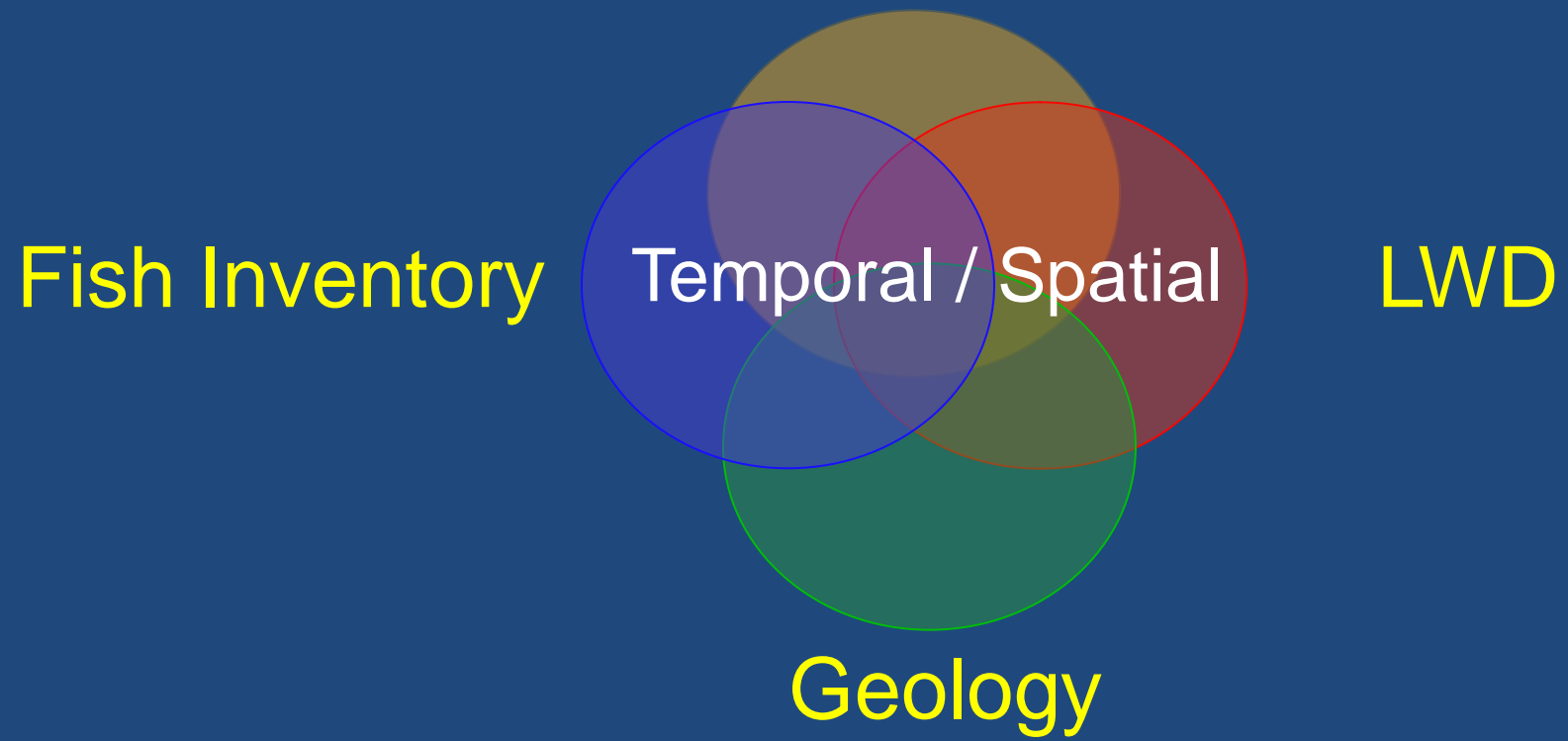
Yakama Nation Fisheries Program

2010



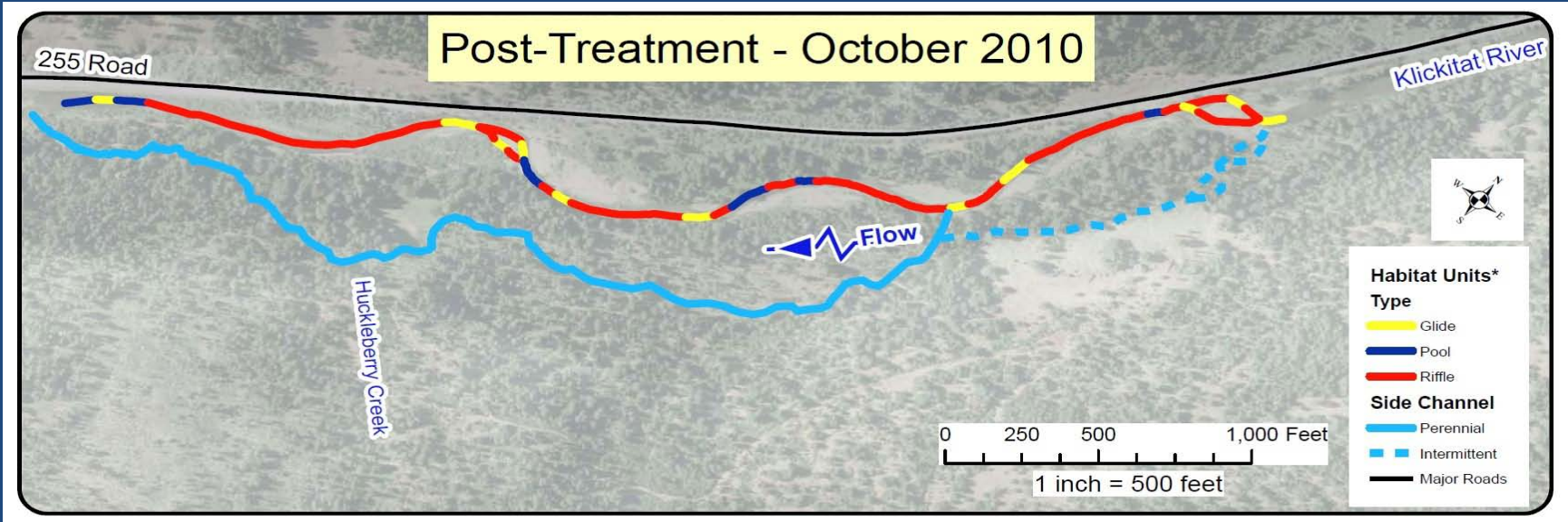
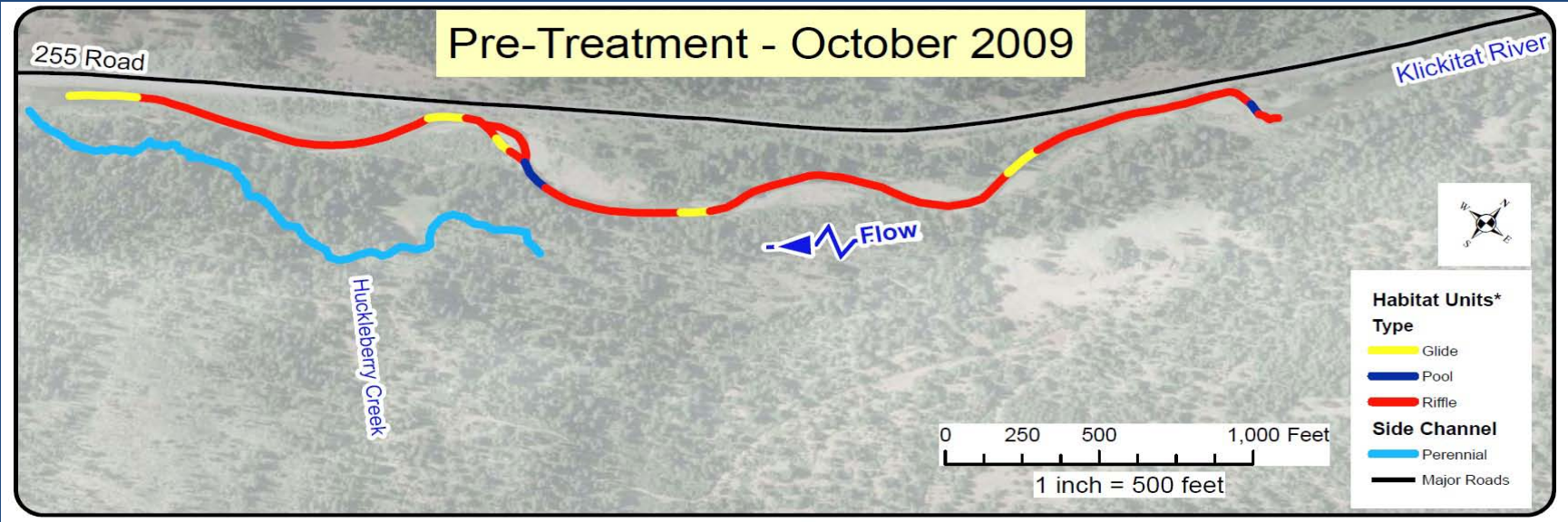
Stream Inventory / Habitat Mapping Conceptual Framework

Instream Habitat Delineation



Stream Inventory / Habitat Mapping

Upper Klickitat Phase 2



Food Web Study – Tepee Ck Phase 2

Literature Review

- “...over 6,000 in-stream habitat enhancement projects implemented in the last decade at a cost exceeding \$1 billion.”
- “Effectiveness monitoring of restoration projects is rare....”
- “Use a rigorous study design that includes pre-and post-project monitoring replicated at both restored and external control sites to account for spatial and temporal variability.”
Miller, et al. 2009

Food Web Study - Tepee Ck Phase 2

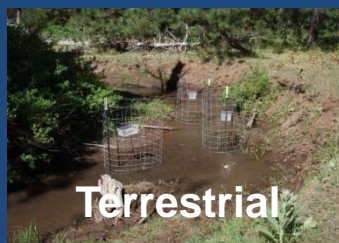
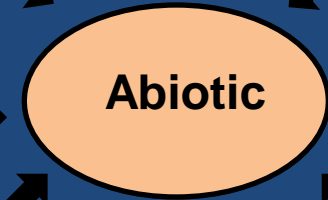
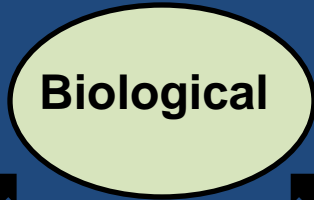
Objectives

- Quantify biotic and abiotic conditions pre and post-treatment
 - Biotic – riparian, secondary production, higher order consumers
 - Abiotic – temperature, surface water, groundwater, habitat

Study Design

- BACI Design (before-after-control-impact)
- Intra-annual sampling (Spring, Summer, and Fall)
- Inter-annual (five year study)
 - 1 year pre-treatment (Fall 2009 - Fall 2010)
 - 1 year treatment – minimal sampling (2011)
 - 3 years post-treatment sampling (2012 - 2014)

Food Web Study - Tepee Ck Phase 2



Conclusion

- Effectiveness monitoring is scaled to the individual project (monitoring activity continuum).
- Habitat enhancement project monitoring in the Klickitat subbasin is designed to encompass multiple spatial and temporal scales.
- “If effectively documented, each project can be considered as an experiment, so that failure can be just as valuable to science as success, provided lessons are learned.”
Brierley, et al. 2005

Acknowledgements

Personnel

- Will Conley – Hydrologist
- Nico Romero – Fisheries Biologist
- Joe Zendt – Fisheries Biologist
- Mike Babcock – Data Manager
- Ralph Kiona – Watershed Technician
- Sandy Pinkham – Fisheries Technician
- Rodger Begay – Fisheries Technician
- Jeremy Takala – Fisheries Technician
- Roger Stahi – Fisheries Technician

YN Collaborators

- Klickitat Monitoring and Evaluation
- Klickitat Data Management
- Klickitat Watershed Enhancement Project

Funding and Materials

- Bonneville Power Administration
- WA Salmon Recovery Funding Board
- Columbia River Inter-Tribal Fish Commission
- Mid-Columbia Regional Fisheries Enhancement Group
- Columbia Land Trust
- Yakama Nation
- Bureau of Indian Affairs – Watershed Program

Questions?

