

Salmonid Life History Strategies in Seasonally Disconnected Streams of the Lower Klickitat River



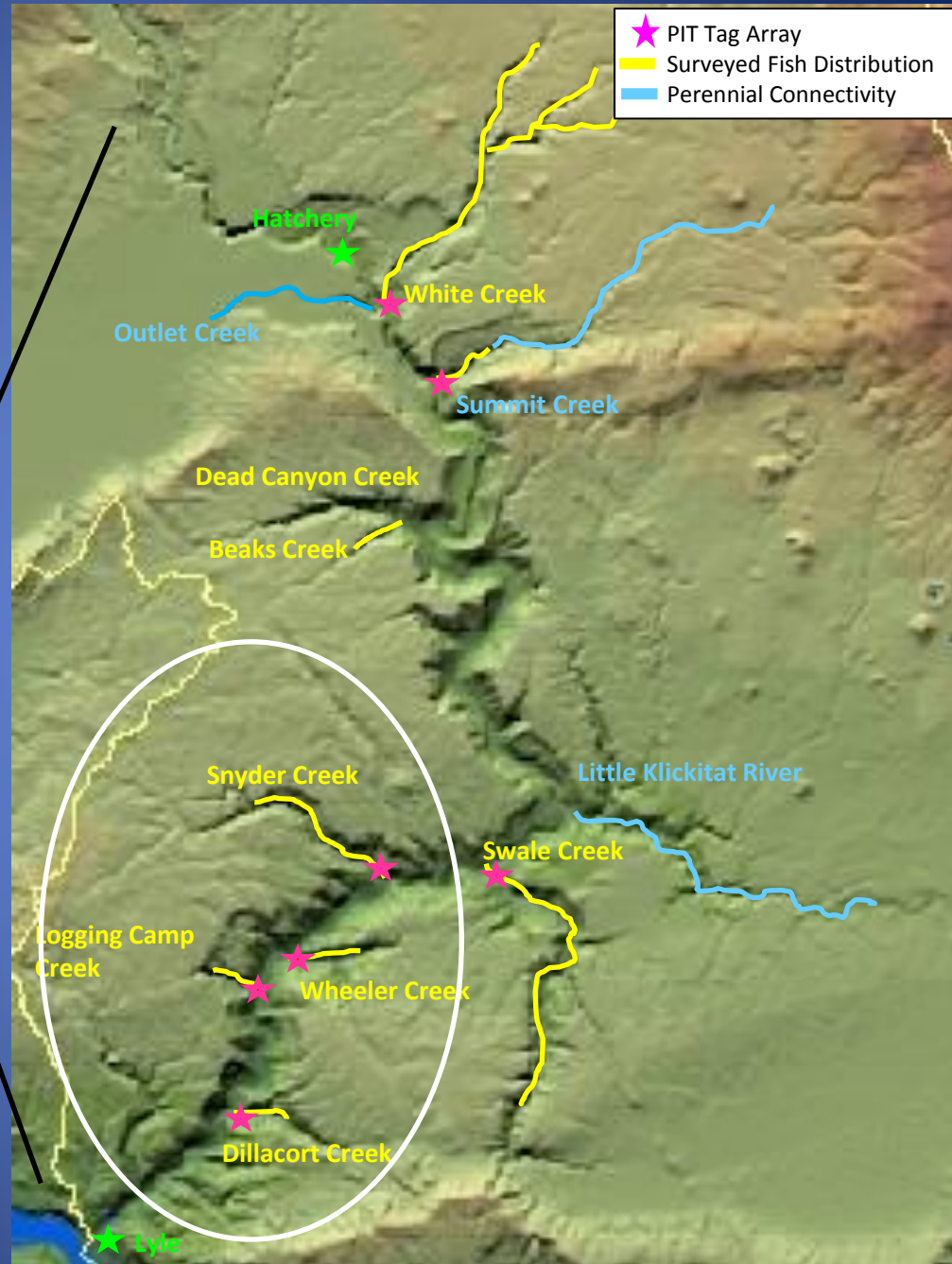
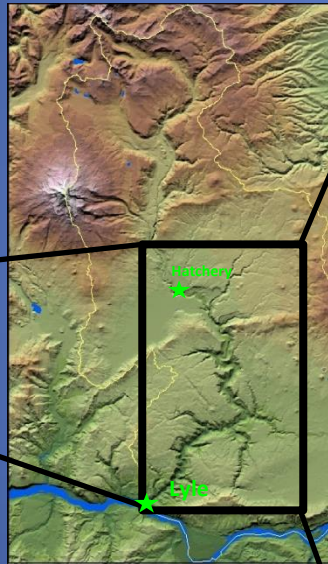
Nicolas Romero
Yakama Nation Fisheries
Klickitat Field Office, Wahkiacus, Washington



Objectives/Outline

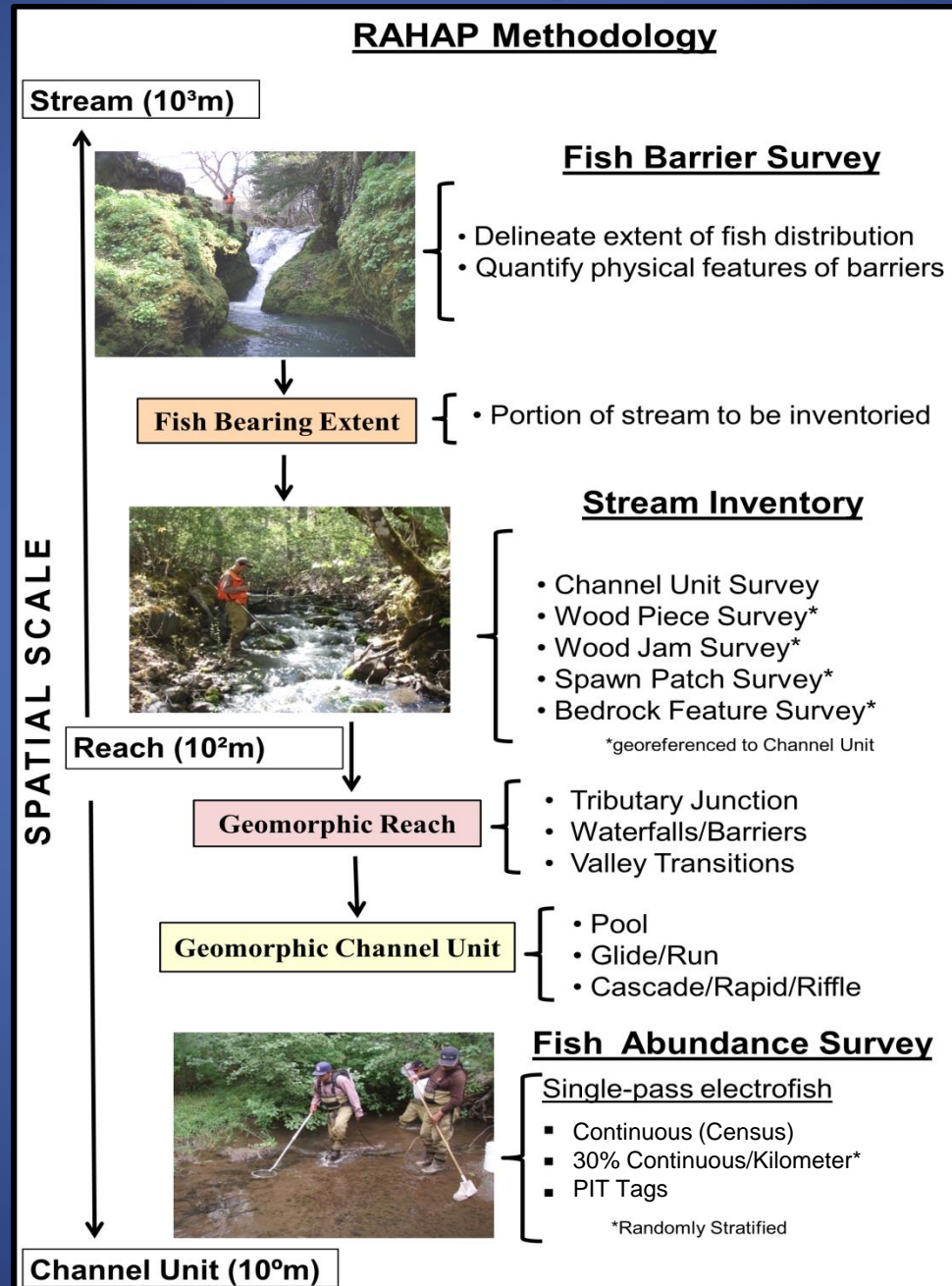
- Study Area Background
- Methodology
- East vs. West Aspect Draining Streams
 - * Habitat
 - * Hydrological
 - * Spatial Movements (Abundance and Distribution)
 - * Temporal Movements (In-and-Out Timing)
 - * Out-migration to Columbia River
- Metapopulation Significance
- Moving Forward

Klickitat River Sub-basin



- South-central Washington State
- Drainage area: 3,501 km
- Enters Columbia River at river km 290.3
- 55.2 km upstream of Bonneville Dam
- Hatchery ~70-km upstream of Columbia River Confluence

RAHAP - Stream Inventory / Habitat Mapping



PIT Tag Arrays/Stream Gages

PIT Tag Array



Stream Gage (Pressure Transducer)



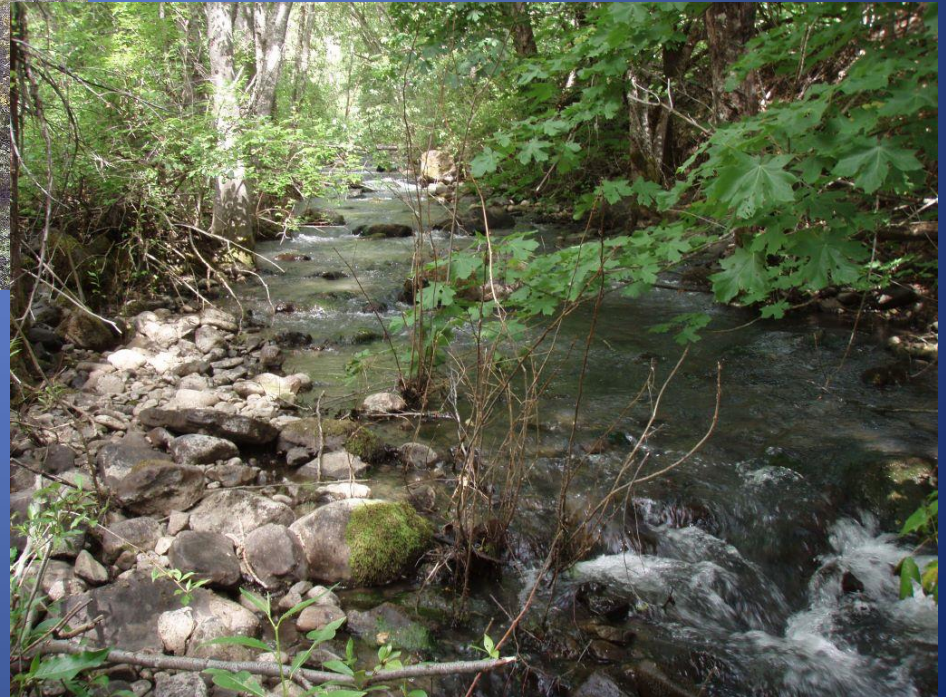
- Detection record includes a date and time stamp
- At least 2 antenna per stream to assess directionality
- Each PIT tagged fish geo-referenced
- Stage and temperature (15 minutes)
- Data-logger

Habitat Differences

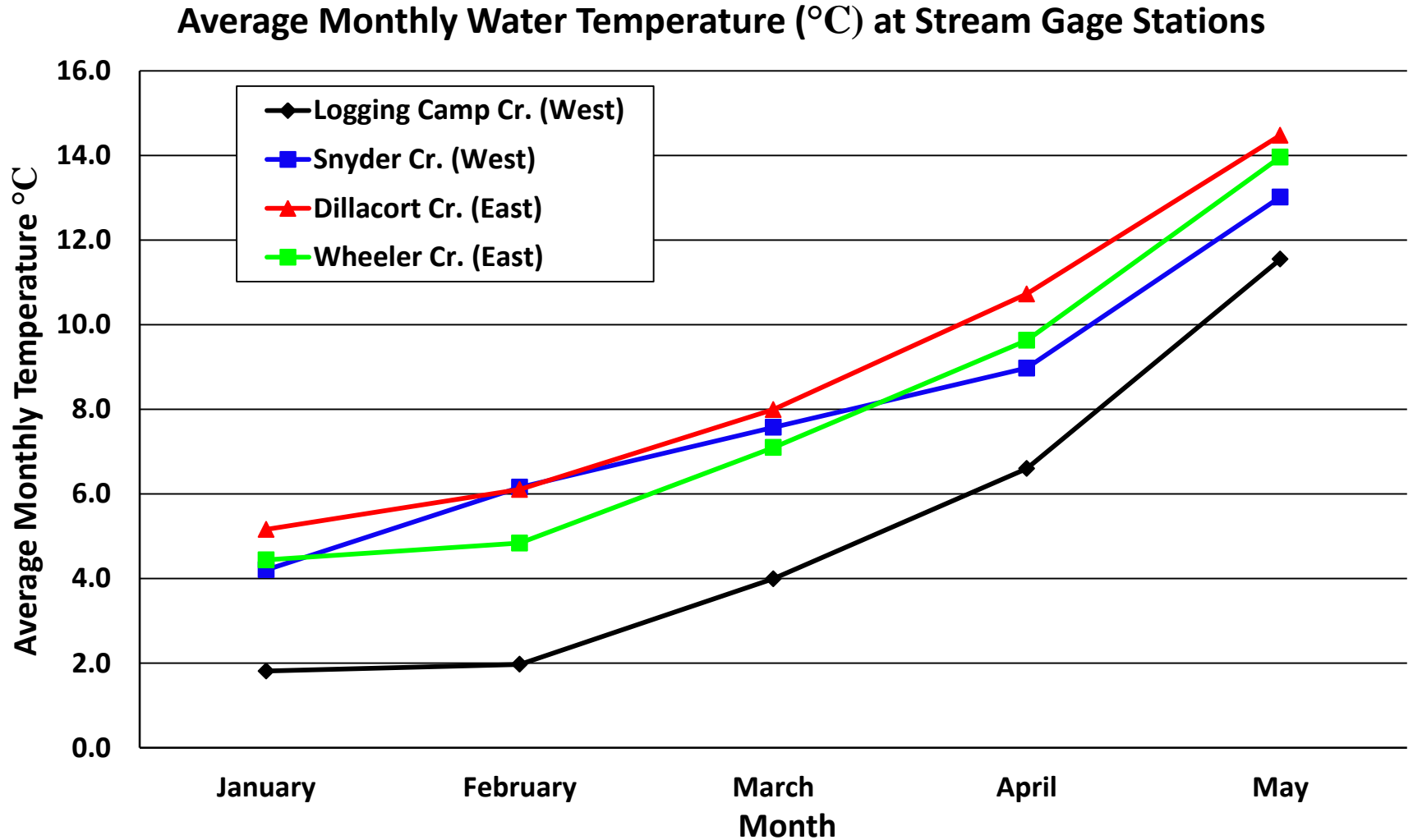
East Aspect Draining Stream



West Aspect Draining Stream

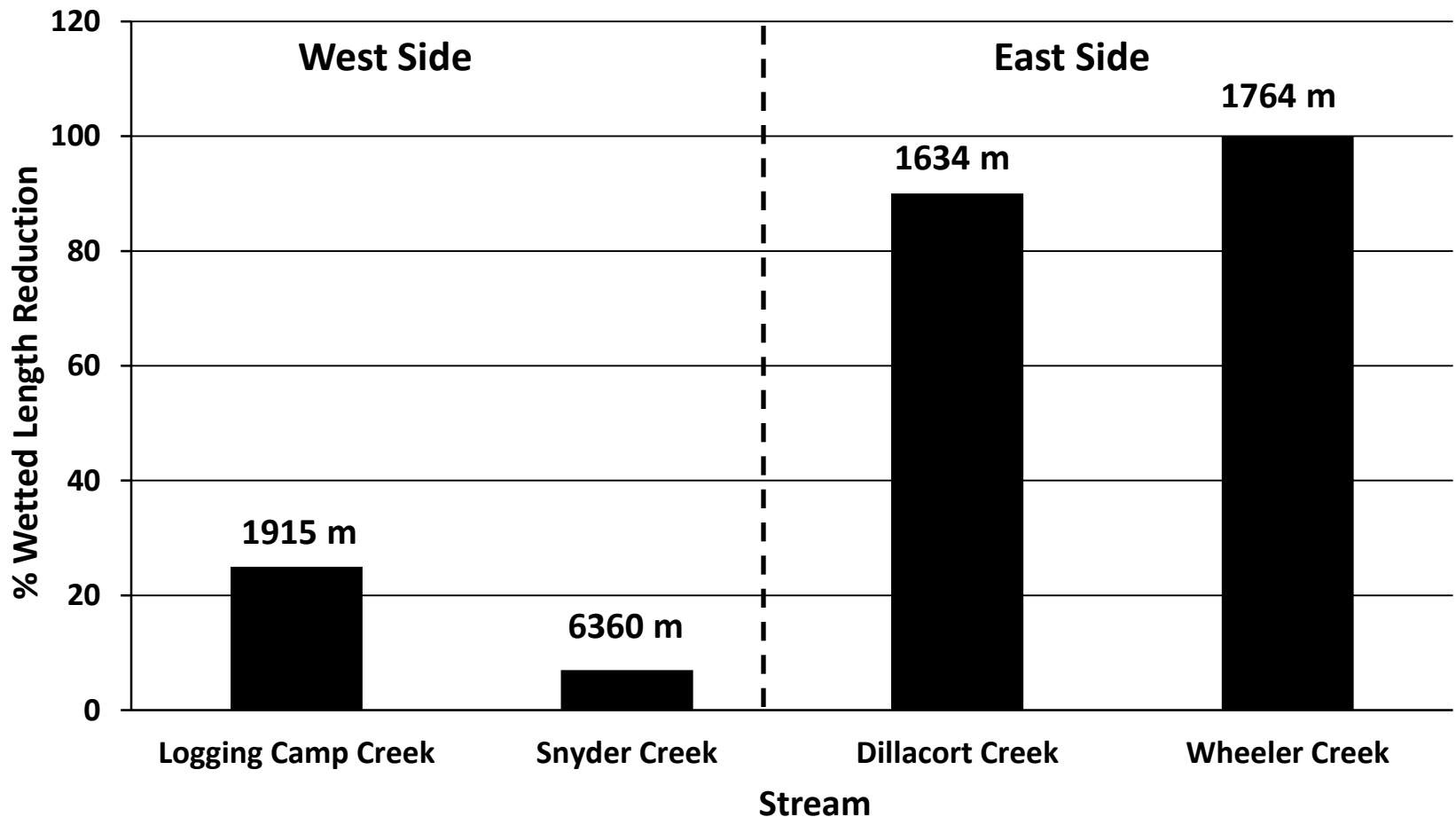


Habitat Differences



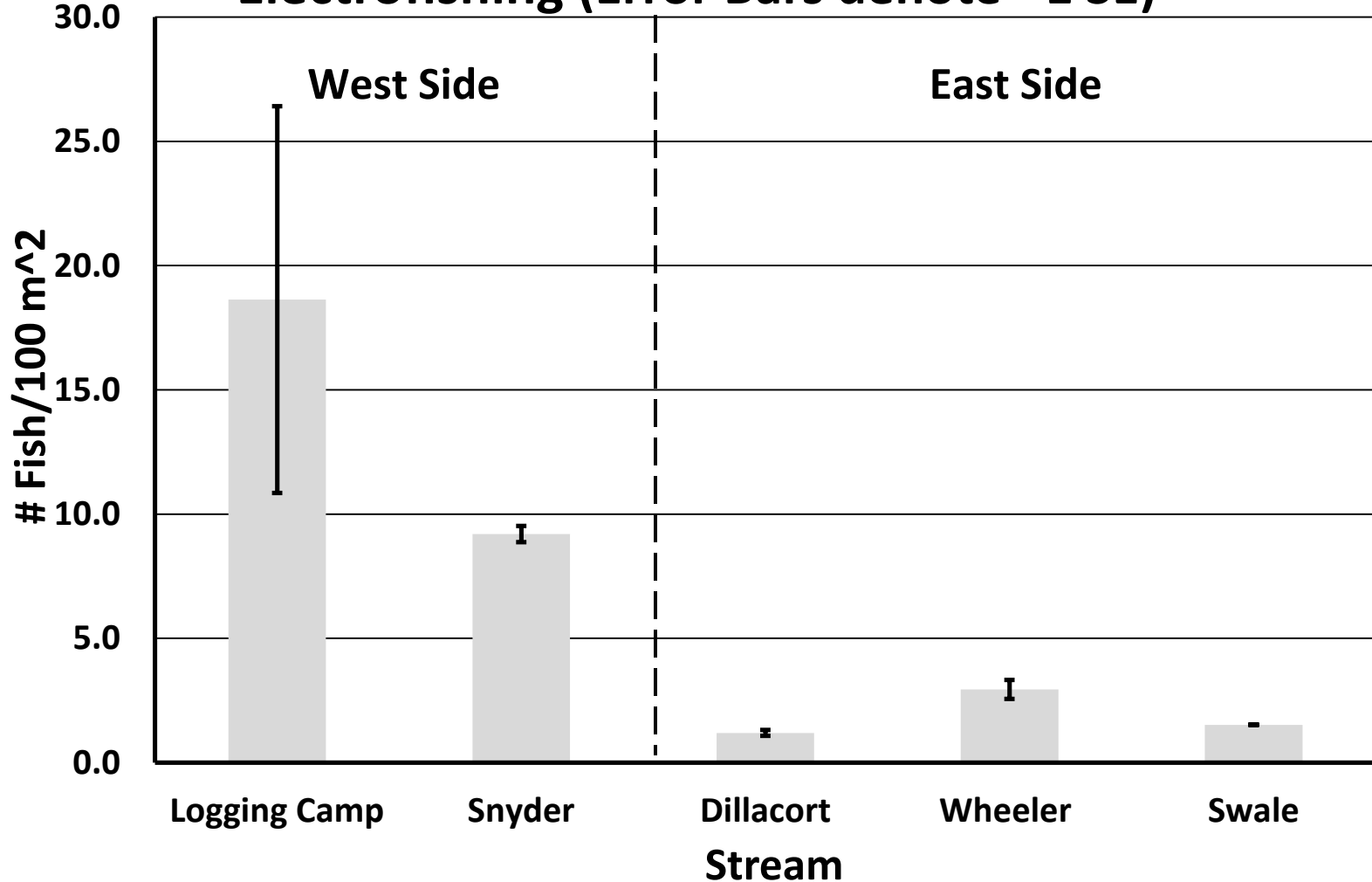
Hydrological Differences

Percent Reduction in Wetted Length During Low Flow Period (September – October 2015)



Biological Differences

Oncorhynchus mykiss Mean Abundance by Single-Pass Electrofishing (Error Bars denote ± 1 SE)



Dillacort Creek



Spatial Distribution of PIT Tagged and Detected Fish in Dillacort Creek in Relation to Surface Water (East Side Stream)

0 meters

1634 meters

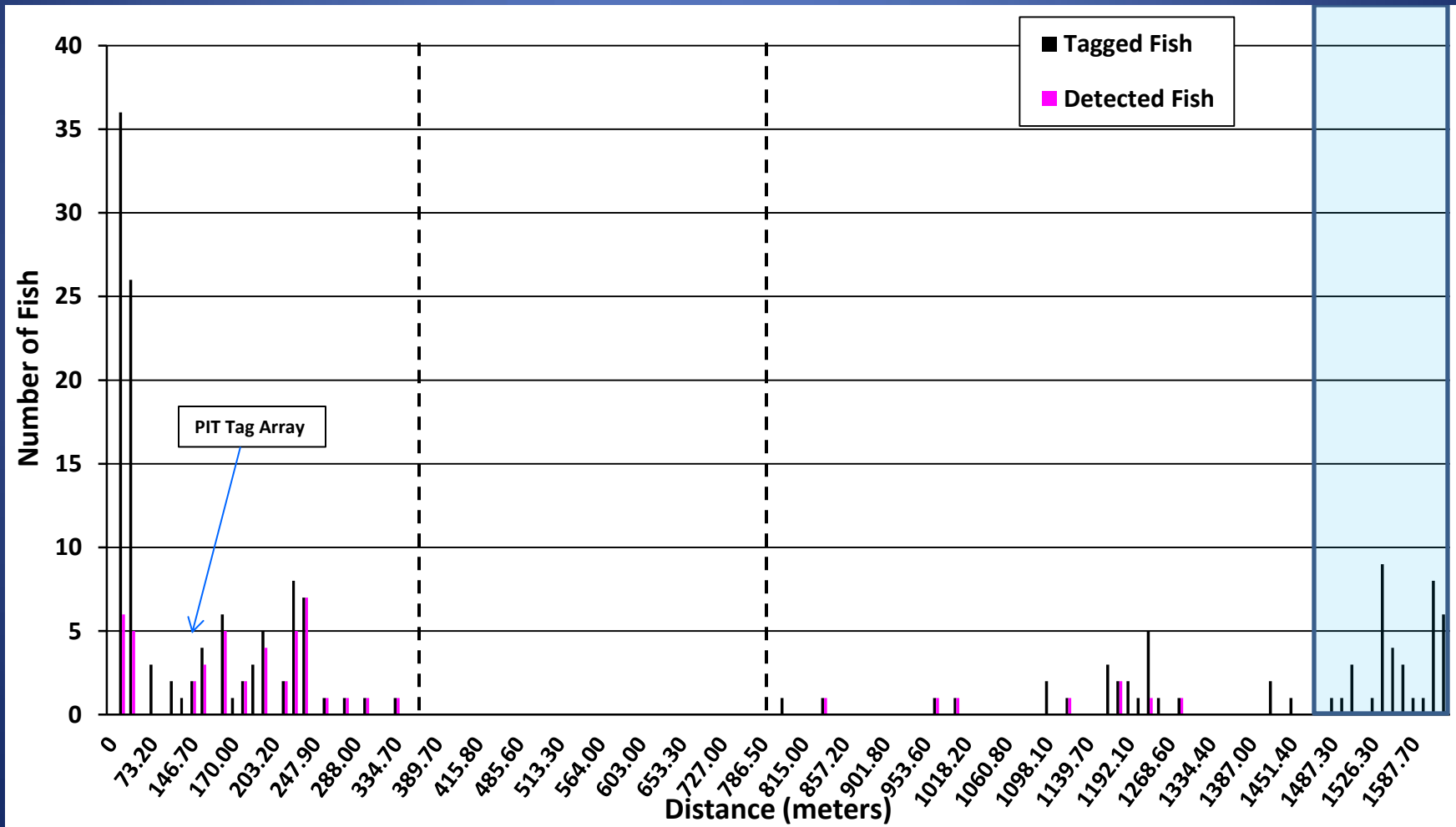


Spring Flow



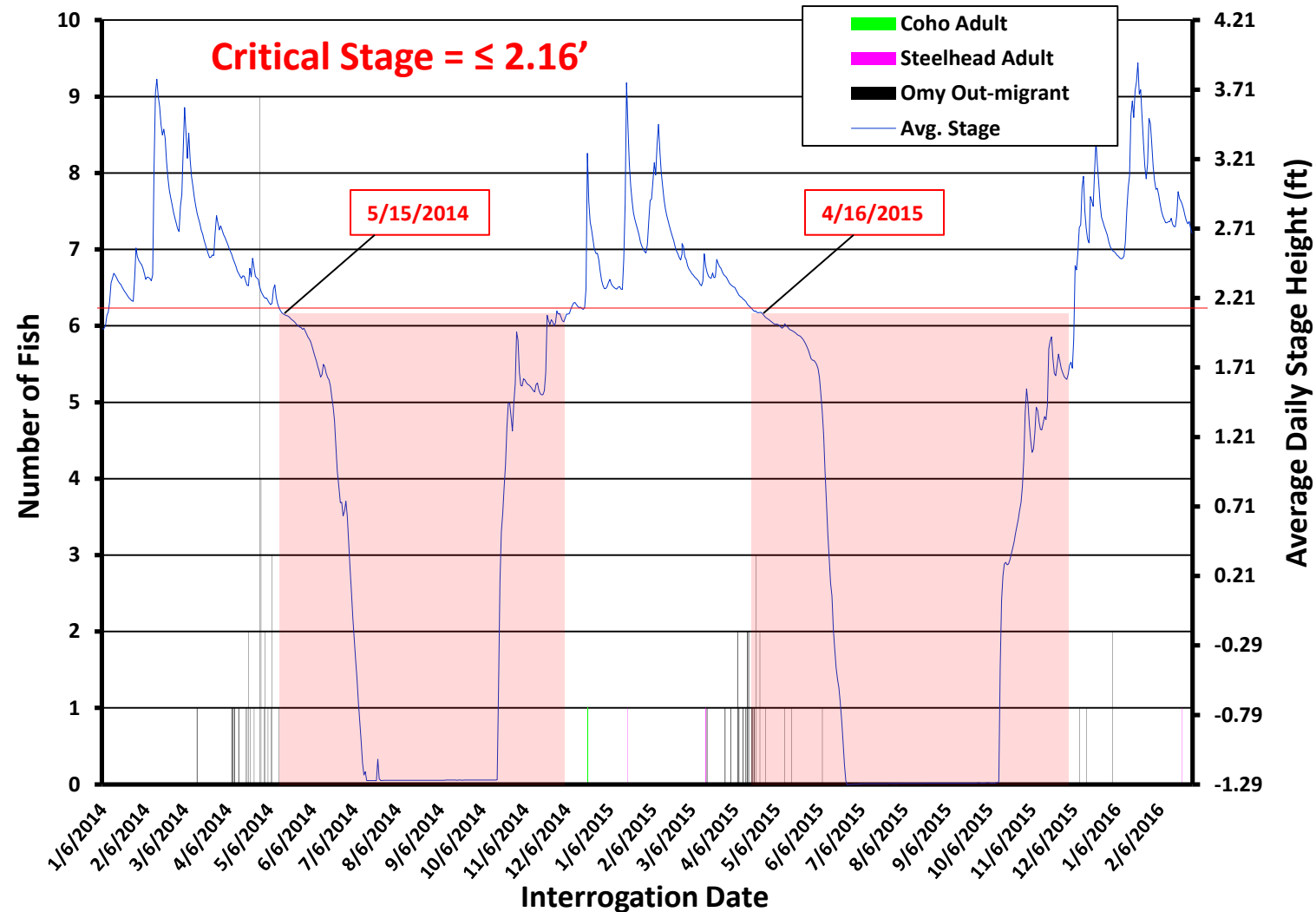
~ 90% reduction in wetted channel habitat length

Low Flow



Dillacort Creek In-and-Out Migration Timing Results

Dillacort Creek PIT Tag Array Interrogation Summary (10/2014 - 3/2016)



- 174 PIT tagged fish (104 above array)
- 65 fish detected (51 above array)
- 13 stranded fish detected
- ~ 100 % Detection Efficiency
- ~ 49% attempted
~ 37% successful
- Excluding Resident Pop (91% attempted
70% success)
- 1 Adult Coho
- 3 Adult Steelhead (2 Wild)

Wheeler Creek



Spatial Distribution of PIT Tagged and Detected Fish in Wheeler Creek in Relation to Surface Water (East Side Stream)

0 meters

1764 meters

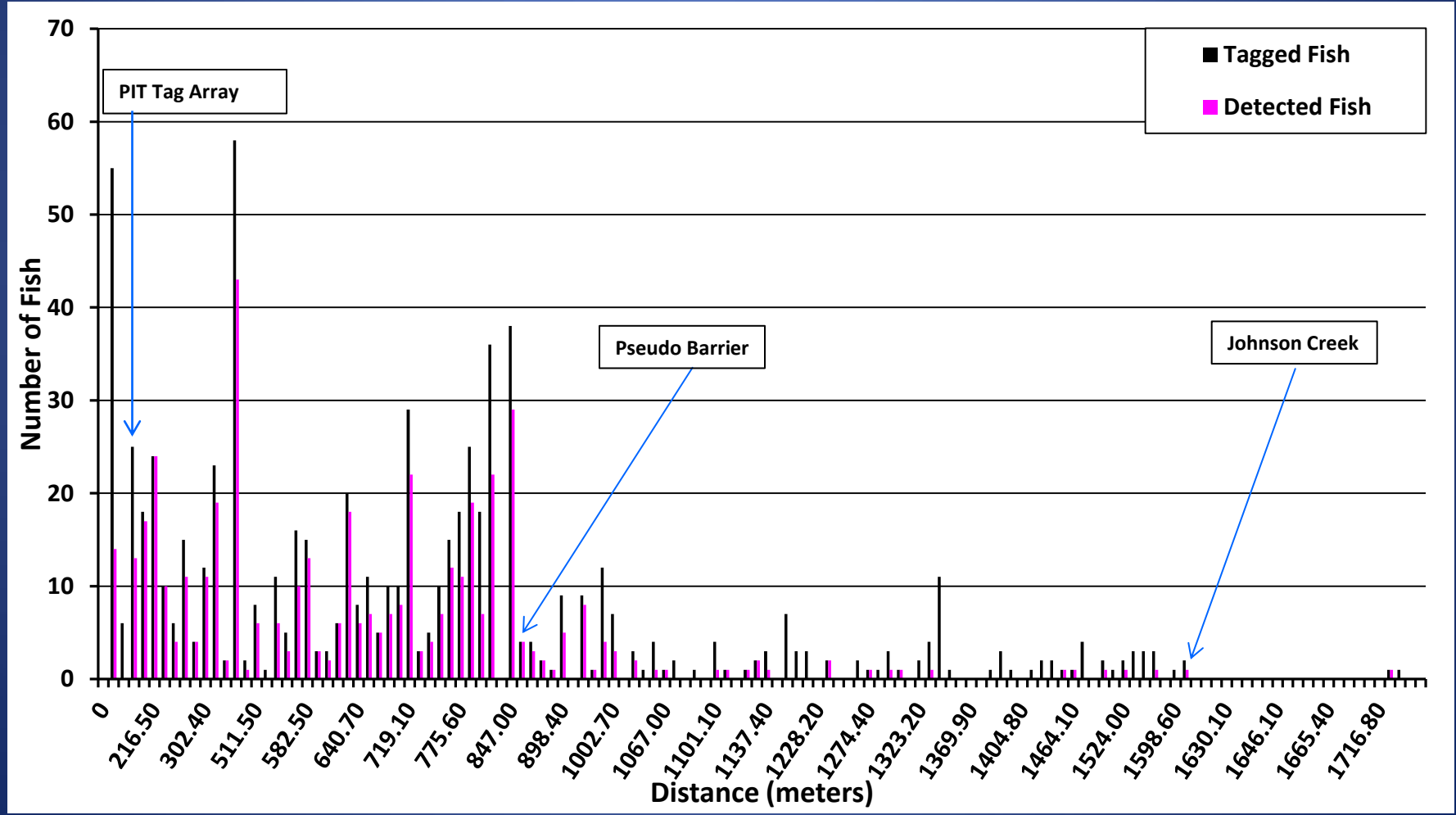


Spring Flow



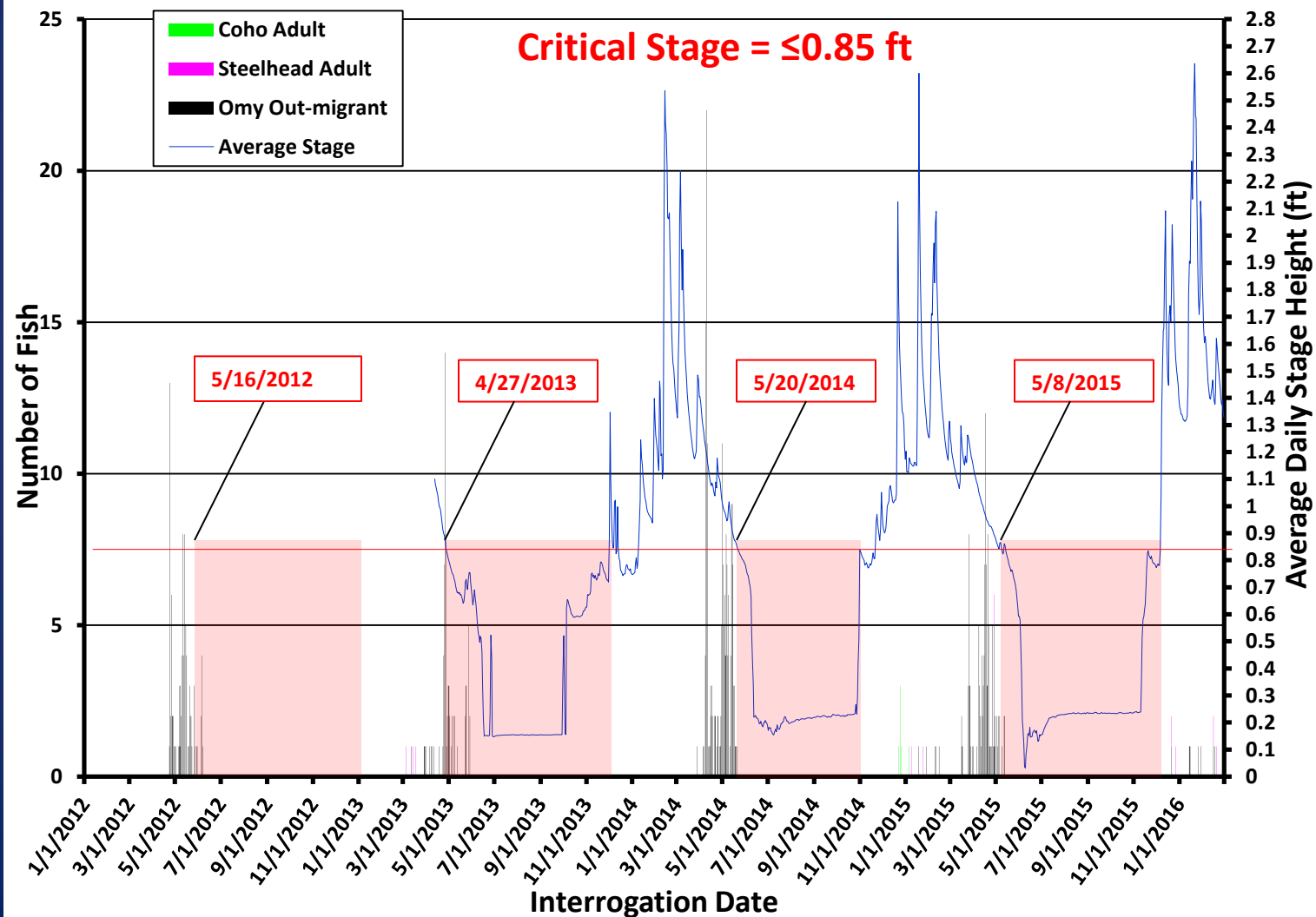
~ 100% reduction in wetted channel habitat length

Low Flow



Wheeler Creek In-and-Out Migration Timing Results

Wheeler Creek PIT Tag Array Interrogation Summary
(4/2012 - 3/2016)



- 734 PIT tagged fish (648 above array)
- 478 fish detected (452 above array)
- 65 stranded fish detected (22 in 2012; 39 in 2013)
- ~ 100% Detection Efficiency
- ~ 60% successfully out-migrated; 70% attempted
- 6 Adult Coho
- 9 Adult Steelhead (2 Wild; 2 Hatchery Kelts)
- 3 Fish Tagged in 2012 Returned as Adults over Bonn

Logging Camp Creek



Spatial Distribution of PIT Tagged and Detected Fish in Logging Camp Creek in Relation to Surface Water (West Side Stream)

0 meters

1915 meters

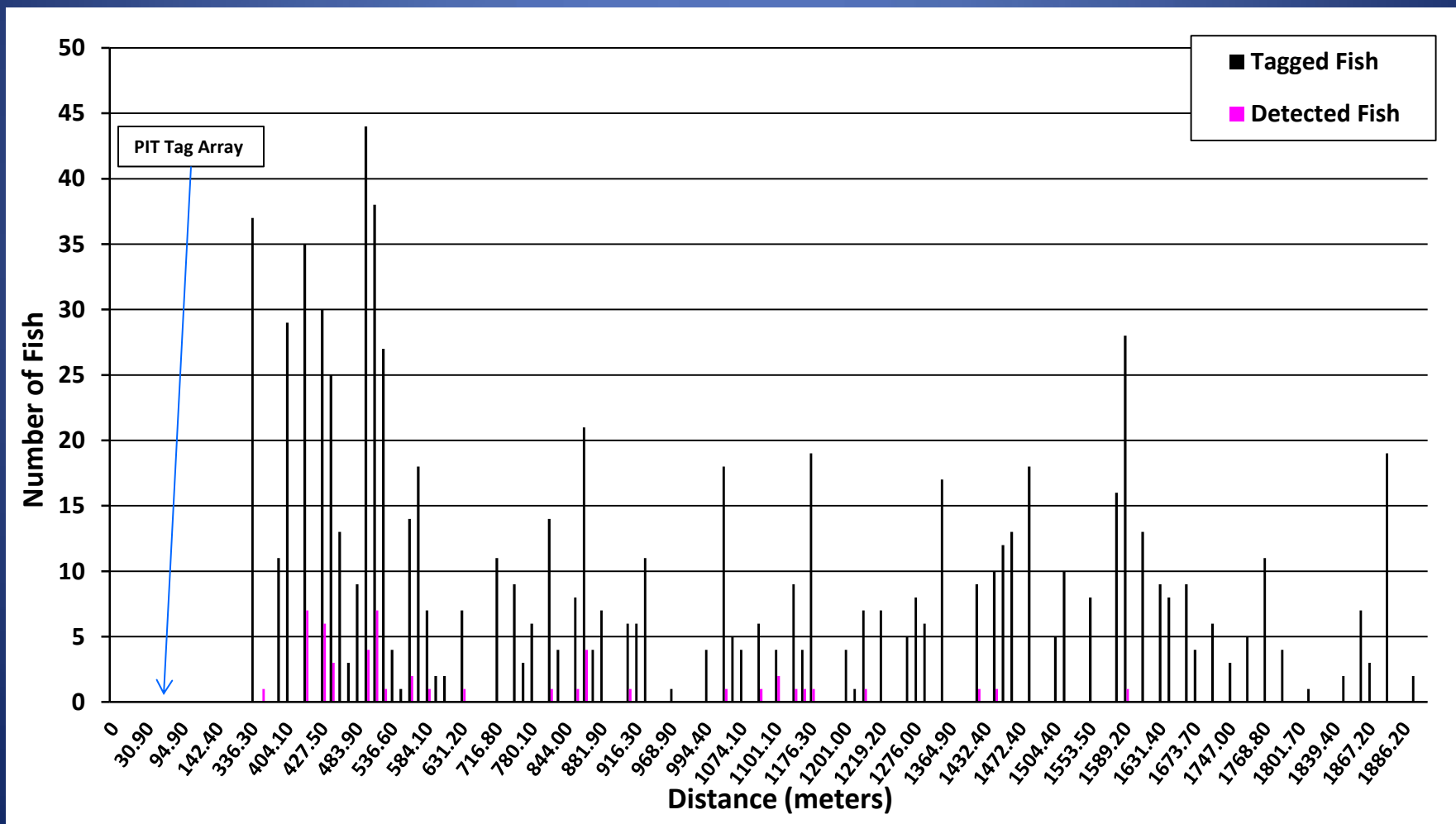


Spring Flow



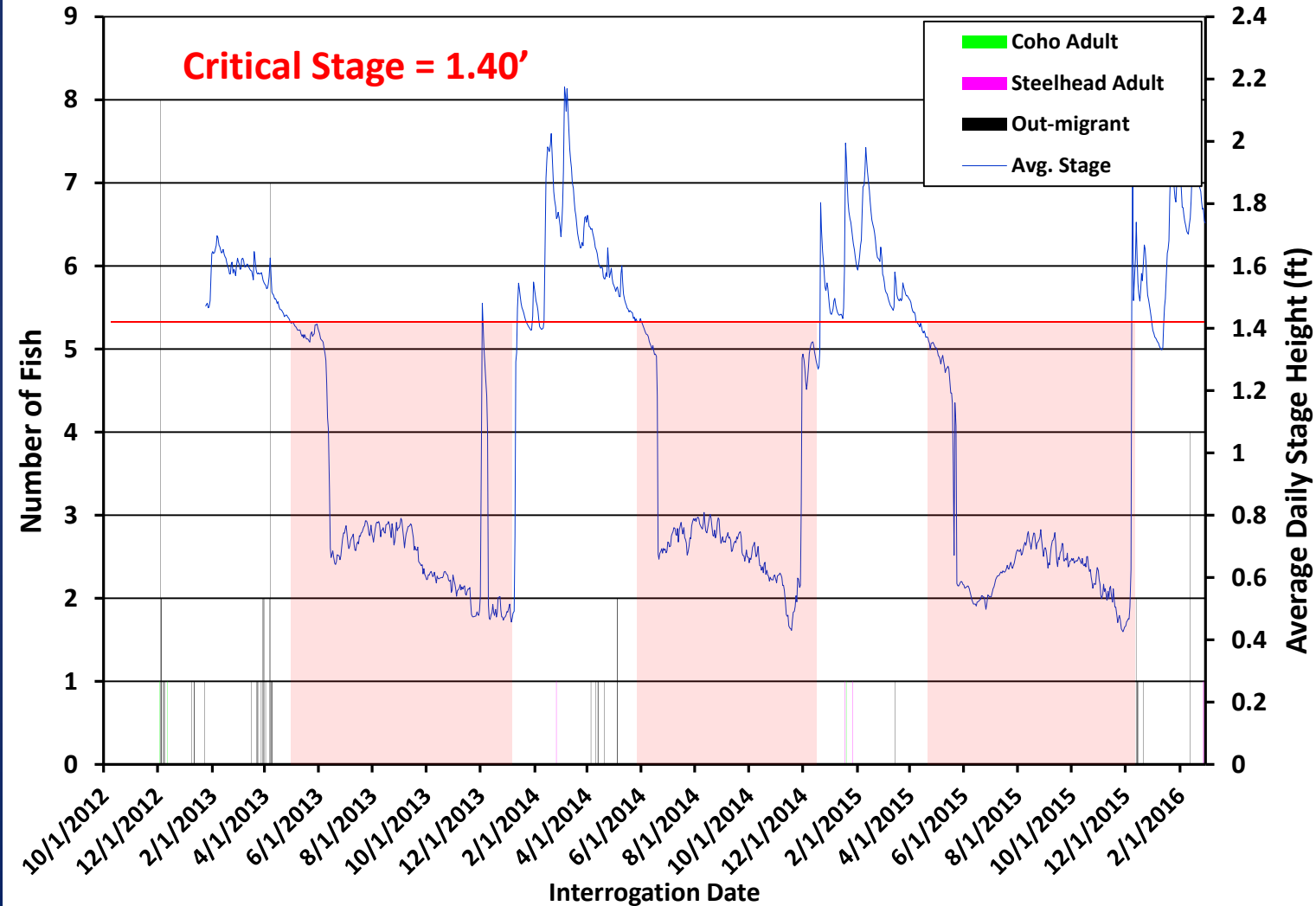
~ 25% reduction in wetted channel habitat length

Low Flow



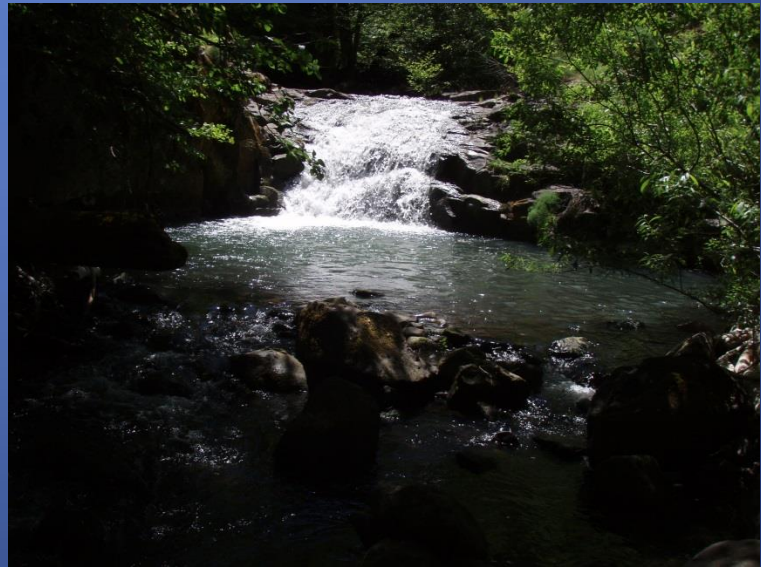
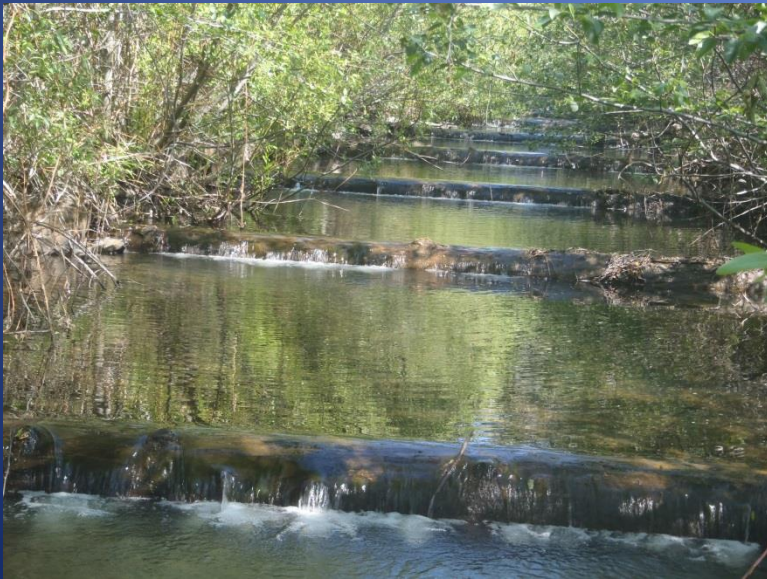
Logging Camp Creek In-and-Out Migration Timing Results

Logging Camp Creek PIT Tag Array Interrogation Summary
(10/2012 - 3/2016)



- 830 PIT tagged fish
- 51 fish detected
- ~ 75% Detection Efficiency
- ~ 64 Expanded fish detection
- ~ 8% out-migration rate for fish tagged above array
- Resident Pop
- 3 Hatchery Adult Coho
- 6 Adult Steelhead (2 Wild)

Snyder Creek



Spatial Distribution of PIT Tagged and Detected Fish in Snyder Creek in Relation to Surface Water (West Side Stream)

0 meters

6360 meters

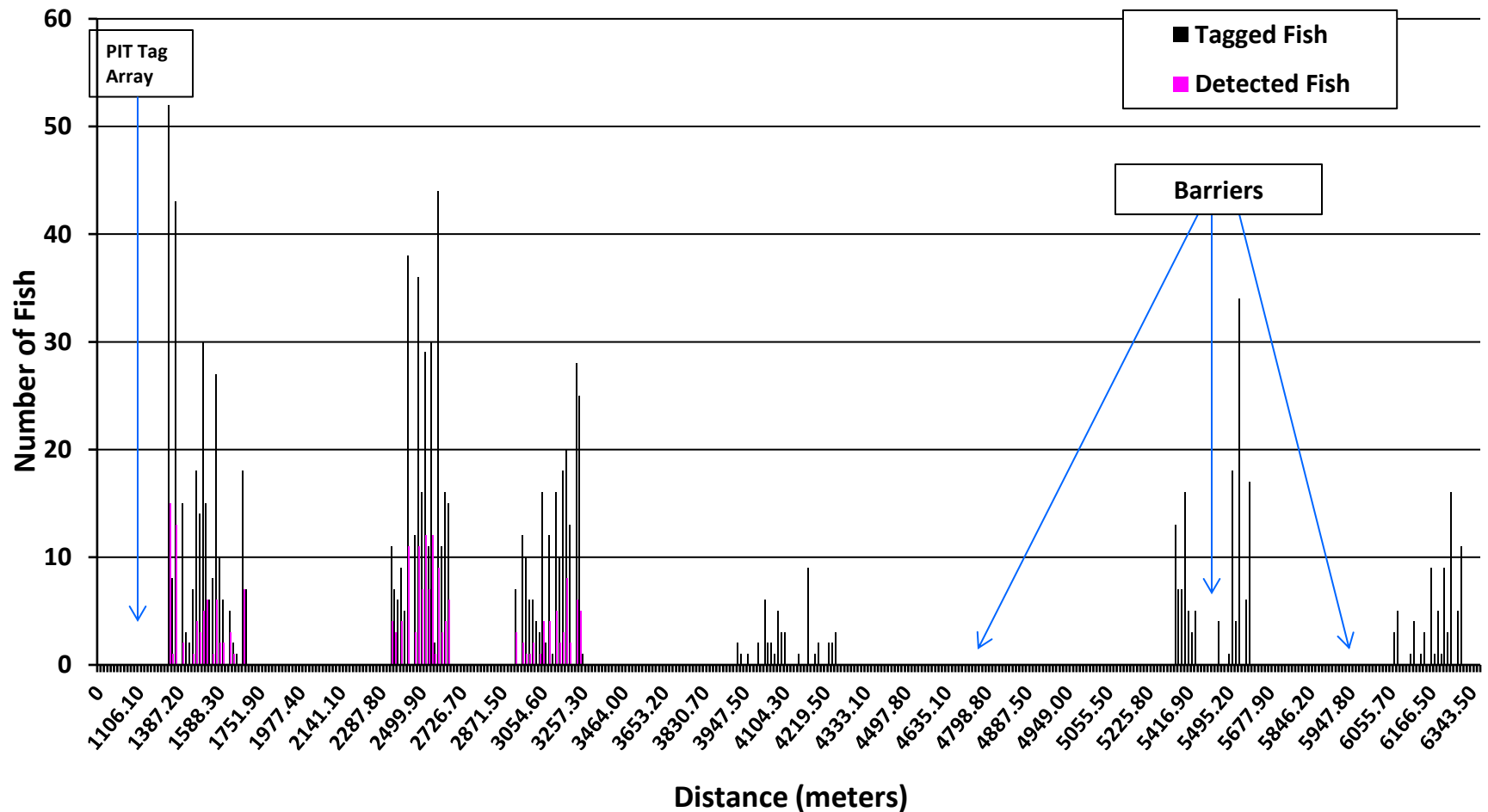


Spring Flow



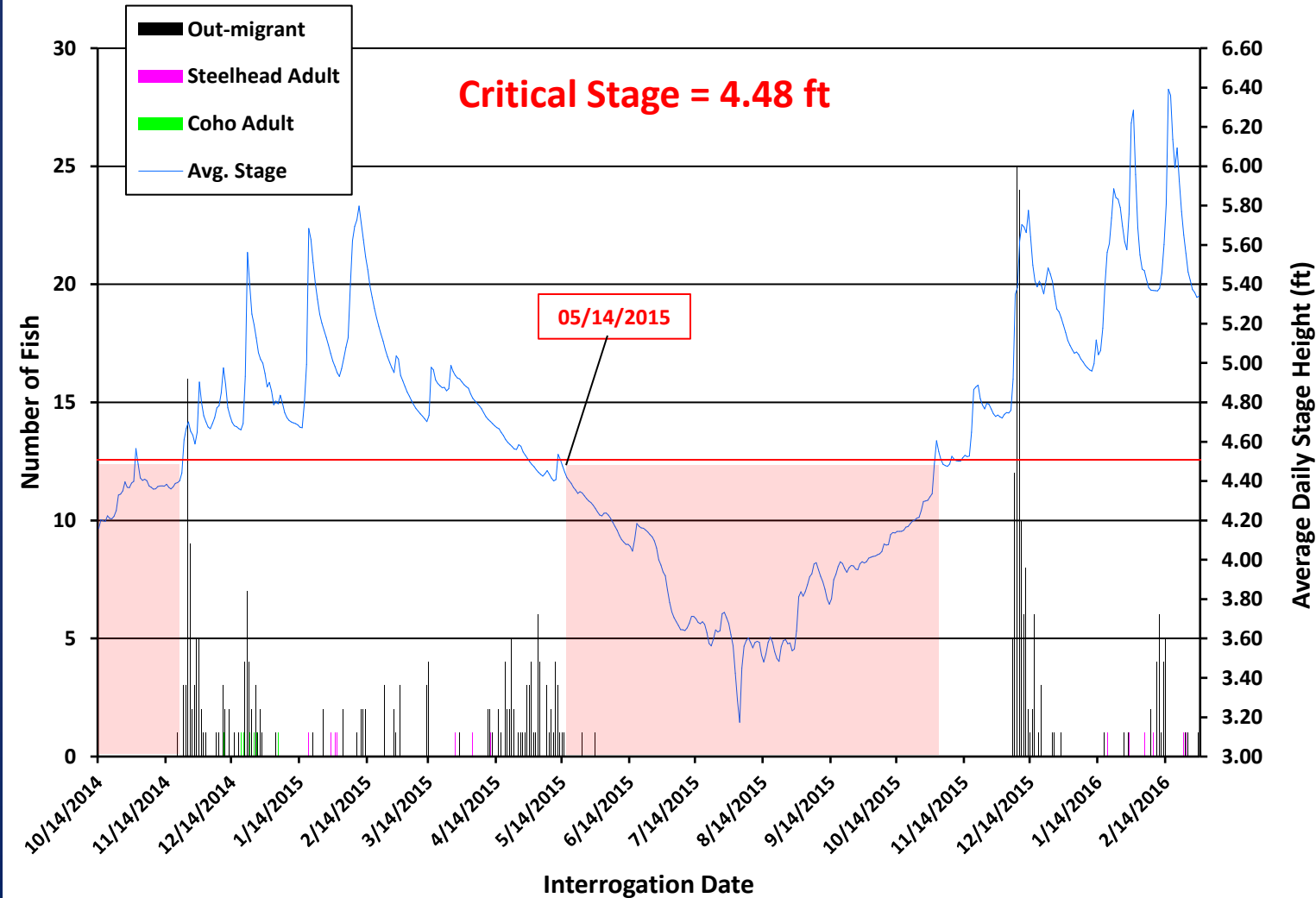
~ 7% reduction in wetted channel habitat length

Low Flow



Snyder Creek In-and-Out Migration Timing Results

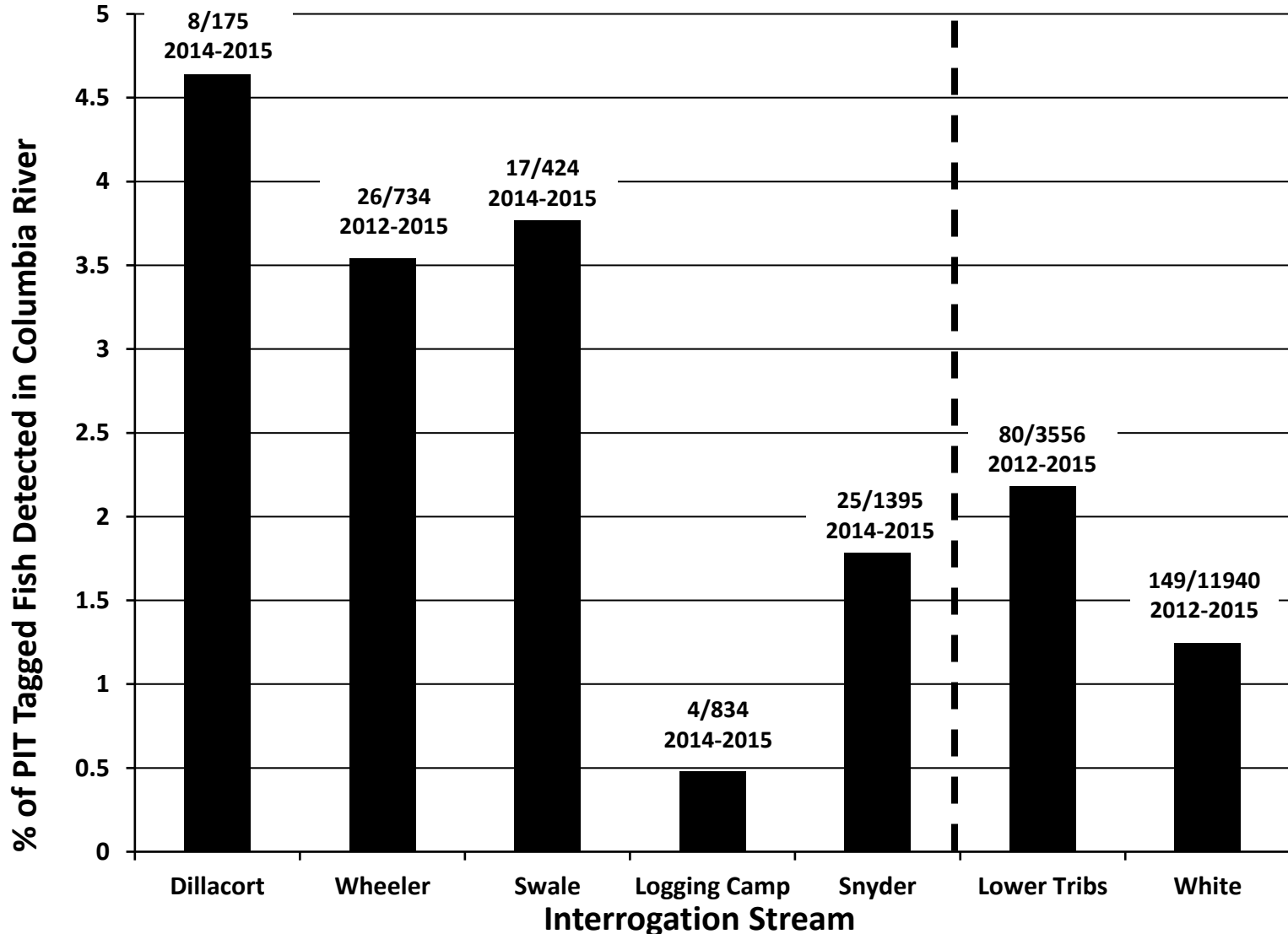
Snyder Creek PIT Tag Array Interrogation Summary (10/2014 - 3/2016)



- 1439 PIT tagged fish
- 324 fish detected
- ~ 100% Detection Efficiency
- ~ 22% out-migrated (~ 40% excluding Resident Pop)
- Bi-modal Out-migration
- 7 Hatchery Adult Coho
- 13 Adult Steelhead (6 Wild)

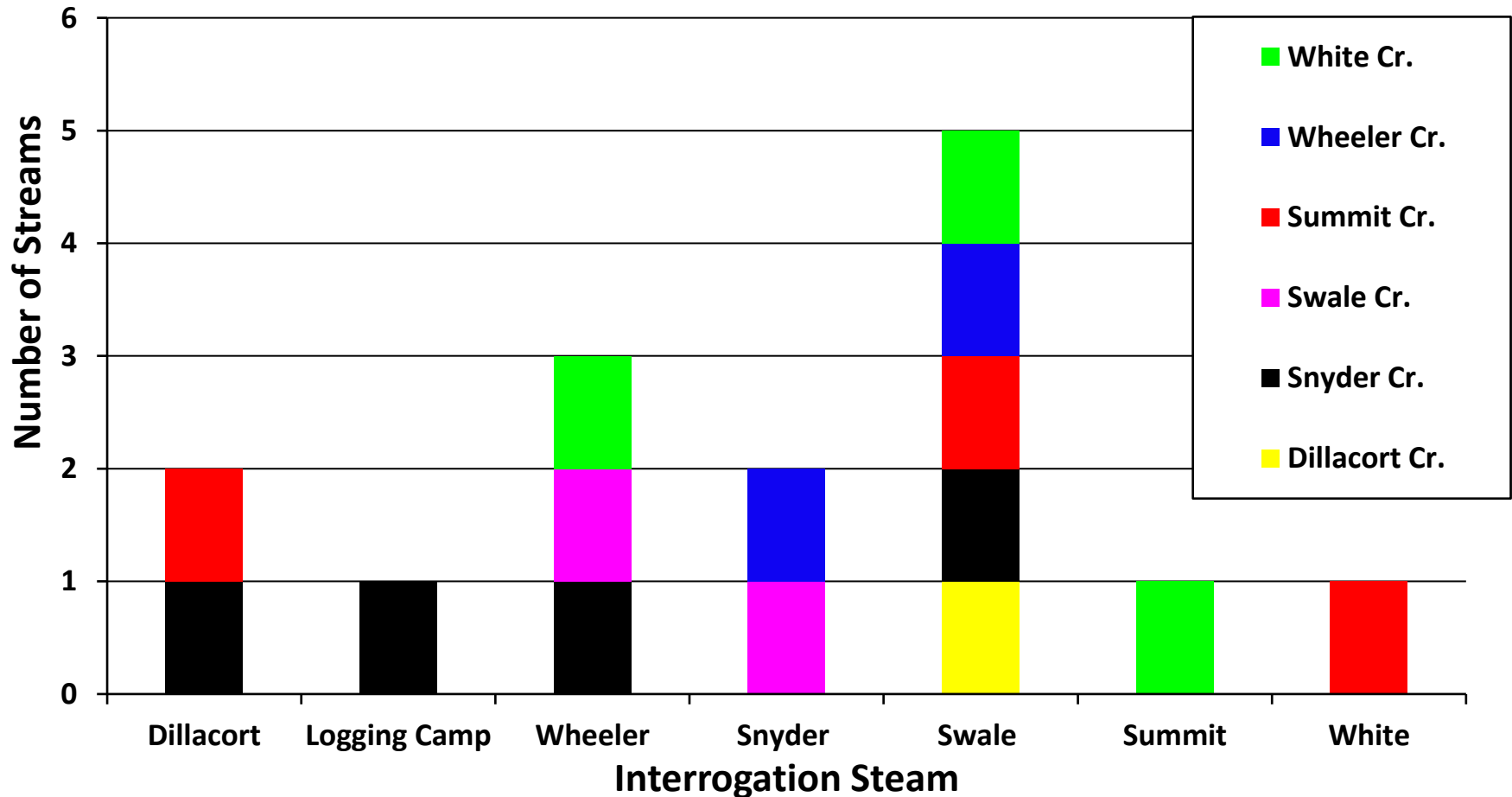
Columbia River Out-Migration Results

Percentage *Oncorhynchus mykiss* PIT Tags Detected in Columbia River

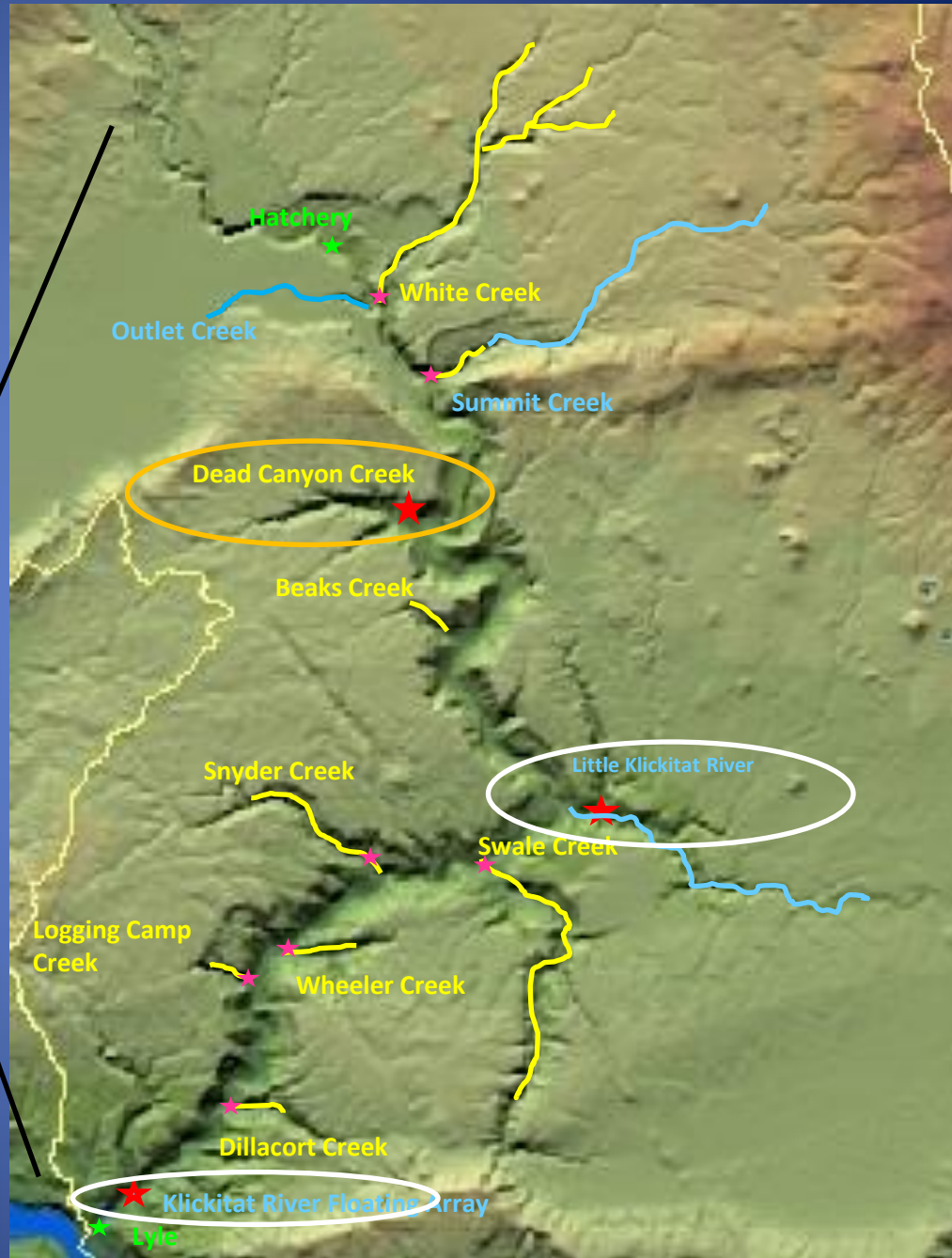
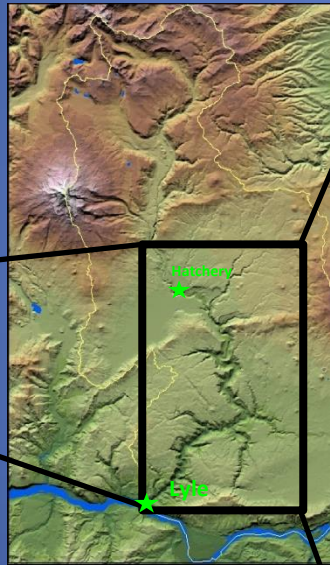


Metapopulation Dynamics

Summary of Inter-stream Mixing in the Lower Klickitat River Subbasin



Klickitat River Sub-basin



- South-central Washington State
- Drainage area: 3,501 km²
- Enters Columbia River at river km 290.3
- 55.2 km upstream of Bonneville Dam
- Hatchery ~70-km upstream of Columbia River Confluence

Acknowledgements

- David Lindley
- John Washines
- Confederated Tribes and Bands of the Yakama Nation
- Bonneville Power Administration
- USGS (United States Geological Survey)
- Field Personnel (Jeremy Takala, Dean Andersen, Sandy Pinkham, and Roger Begay)
- Contributing Personnel (Shane Keep and Will Conley)
- Land Access (Columbia Land Trust, Mike Rolle, Arthur Tooke, and Mary Hanlon)