Fish distribution and aquatic habitat in the Lower Crooked Wild and Scenic River

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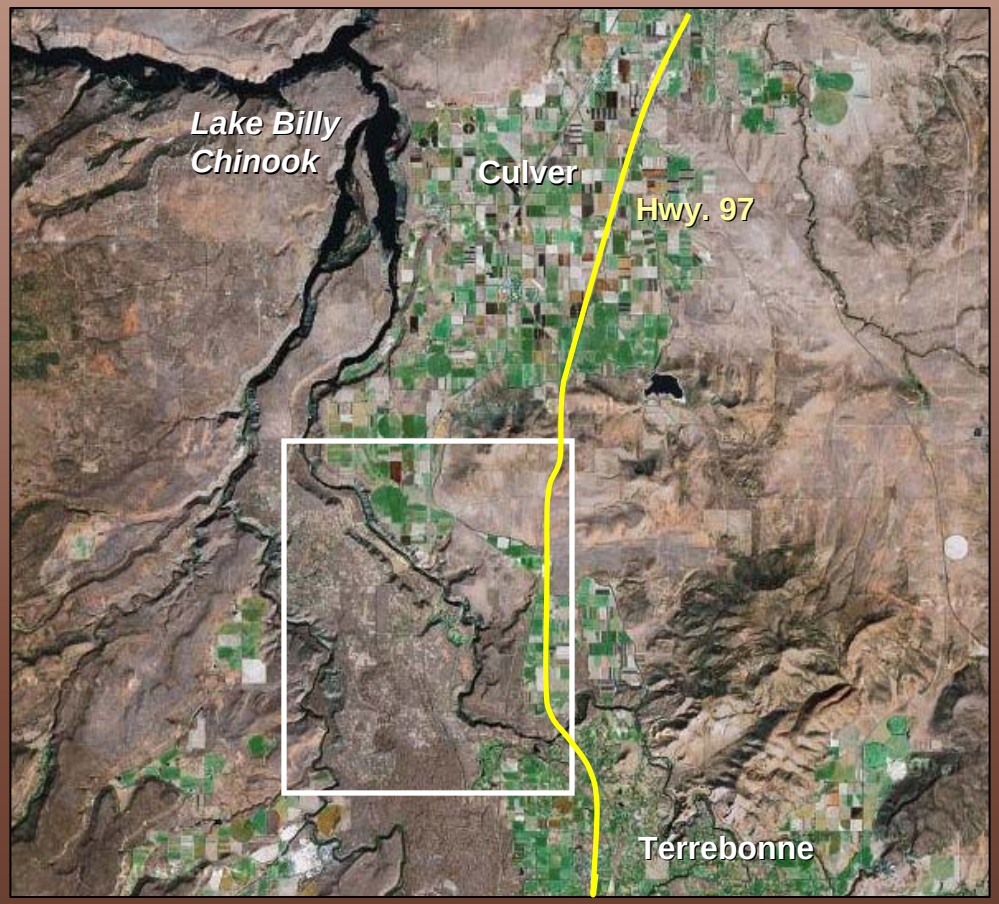
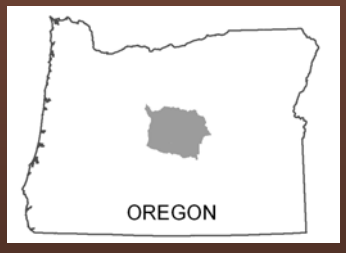
Forest and Rangeland Ecosystem Science Center

U.S. Department of the Interior
U.S. Geological Survey

Landscape context of the LCR





- 9.8 miles in length
- Rugged, steep-walled basalt canyon
- Private (5 mi), BLM, National Grasslands, and ODFW
- Limited access with development on cliff sides

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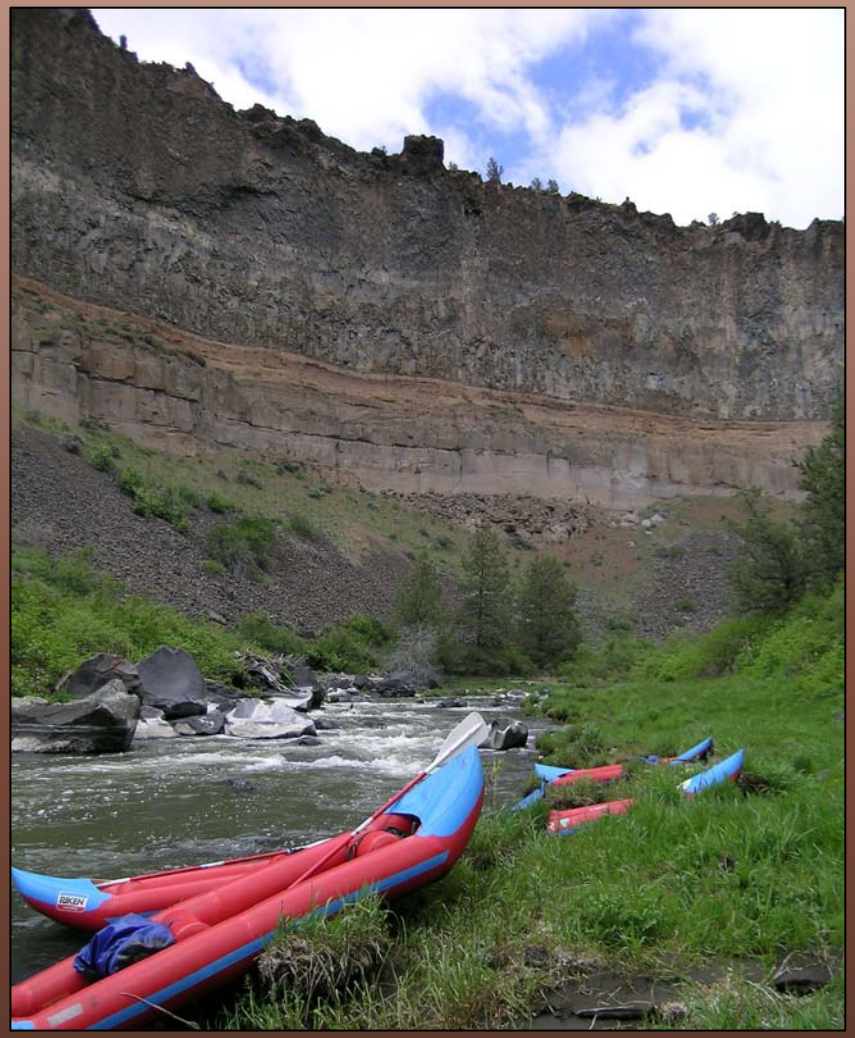
Historical fish surveys



- ODFW (1997); Jones et al.
- Zimmerman and Ratliff (2003)

- Columbia basin redband trout, mountain whitefish, two sculpins (Cottus spp.), two dace (Rhinichthys spp.), two suckers (Catostomus spp.), northern pikeminnow, chiselmouth, redside shiner, and *threespine stickleback*.
- Large- and smallmouth bass, yellow perch, and brown bullhead.
- Anadromous salmonids and bull trout?

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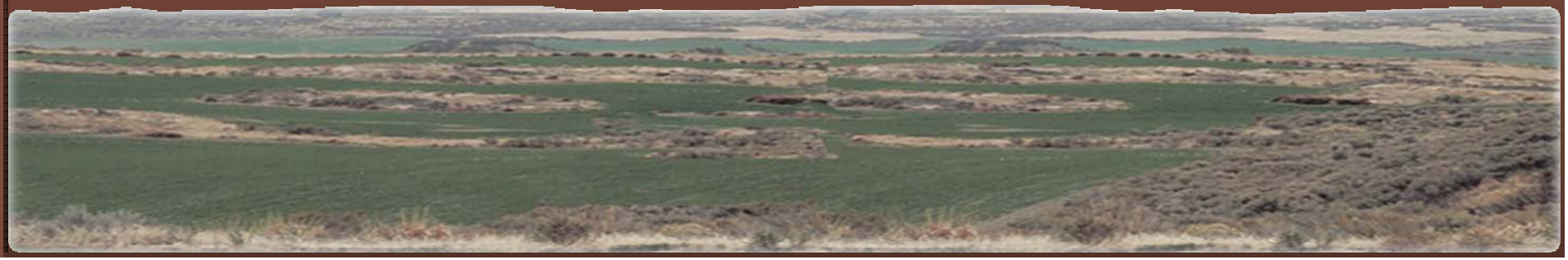
Objectives

- Characterize the spatial distribution of native and non-native fishes.
- Describe variation in channel morphology, substrate composition, and water temperature.
- Evaluate the associations between fishes, aquatic habitat, and water temperature.



Methods

- Airborne thermal IR remote sensing (Watershed Sciences, Inc.)
- Reconnaissance with inflatable kayaks (May 2004)
- Snorkeling (aquatic habitat and fishes)
- Electrofishing
- Angling

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Field reconnaissance

Doug Bateman

- Kayaking: May 2004; 157 cfs @CKKO (near Terrebonne)
- Sampling: July 29-Aug. 3, 2004, 94-147 cfs
- Limited access, steep banks and hillsides, large boulders, deep, swift water

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Field reconnaissance

Aaron Berger

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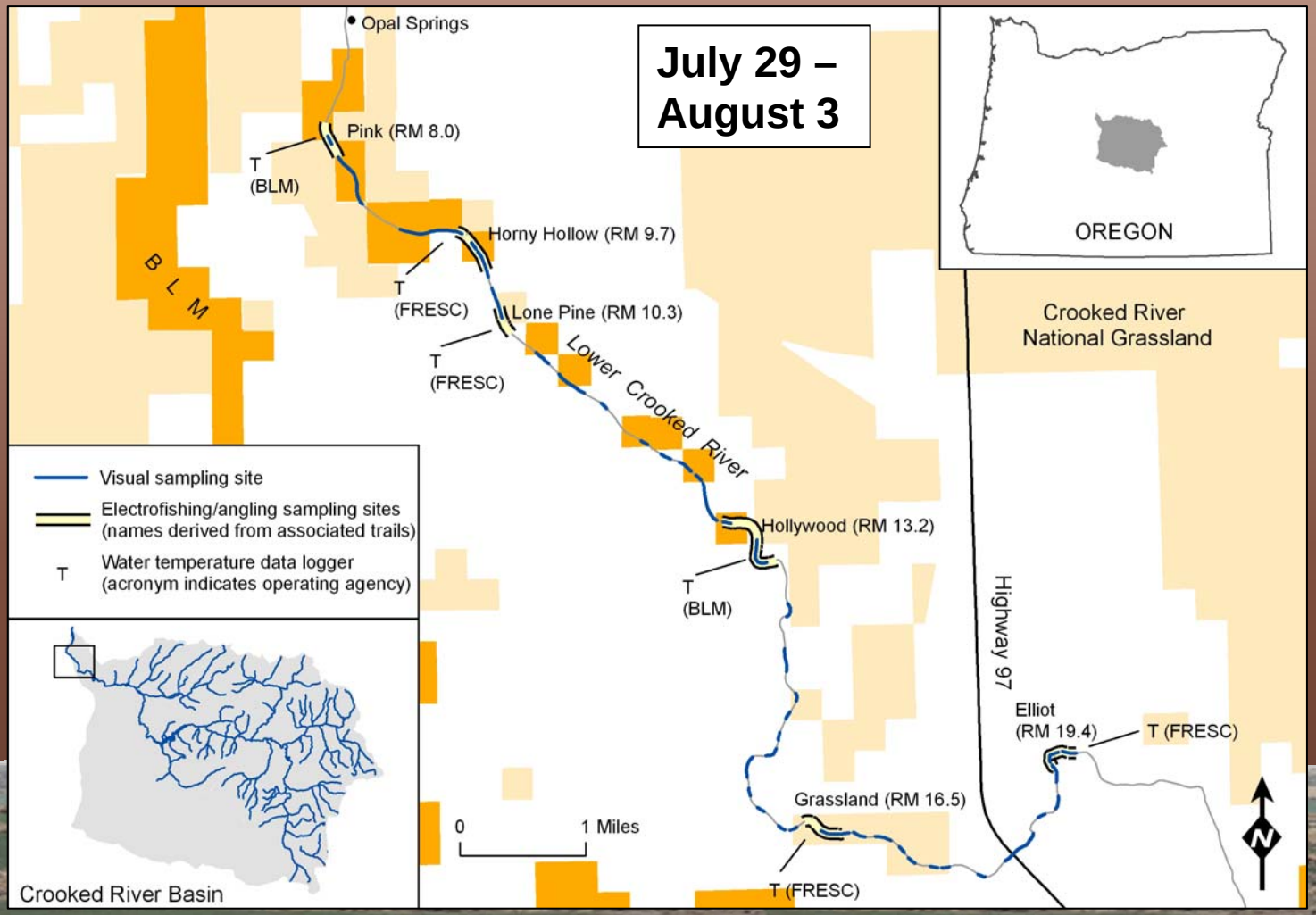
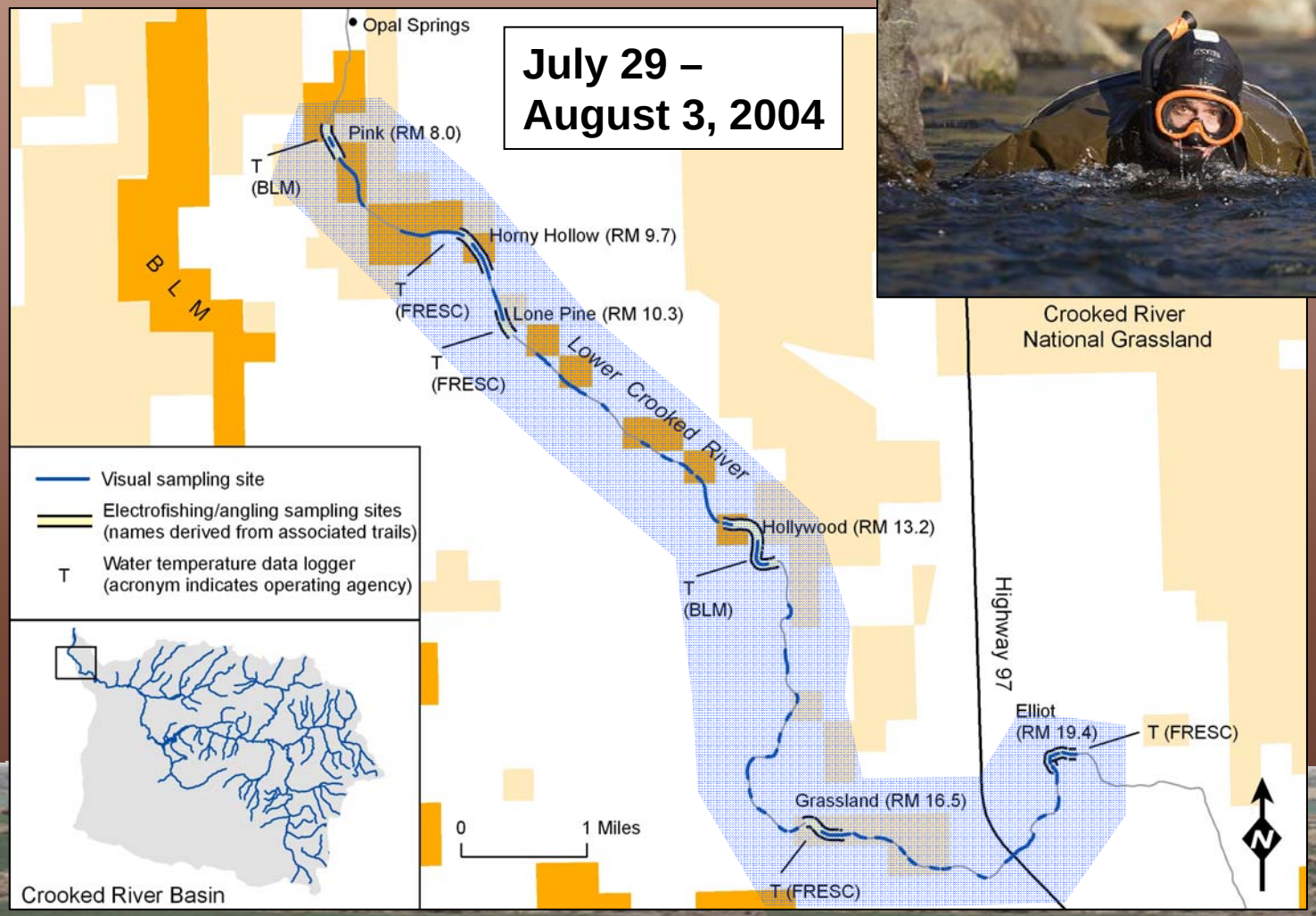
Fish Survey 2004



Snorkeling



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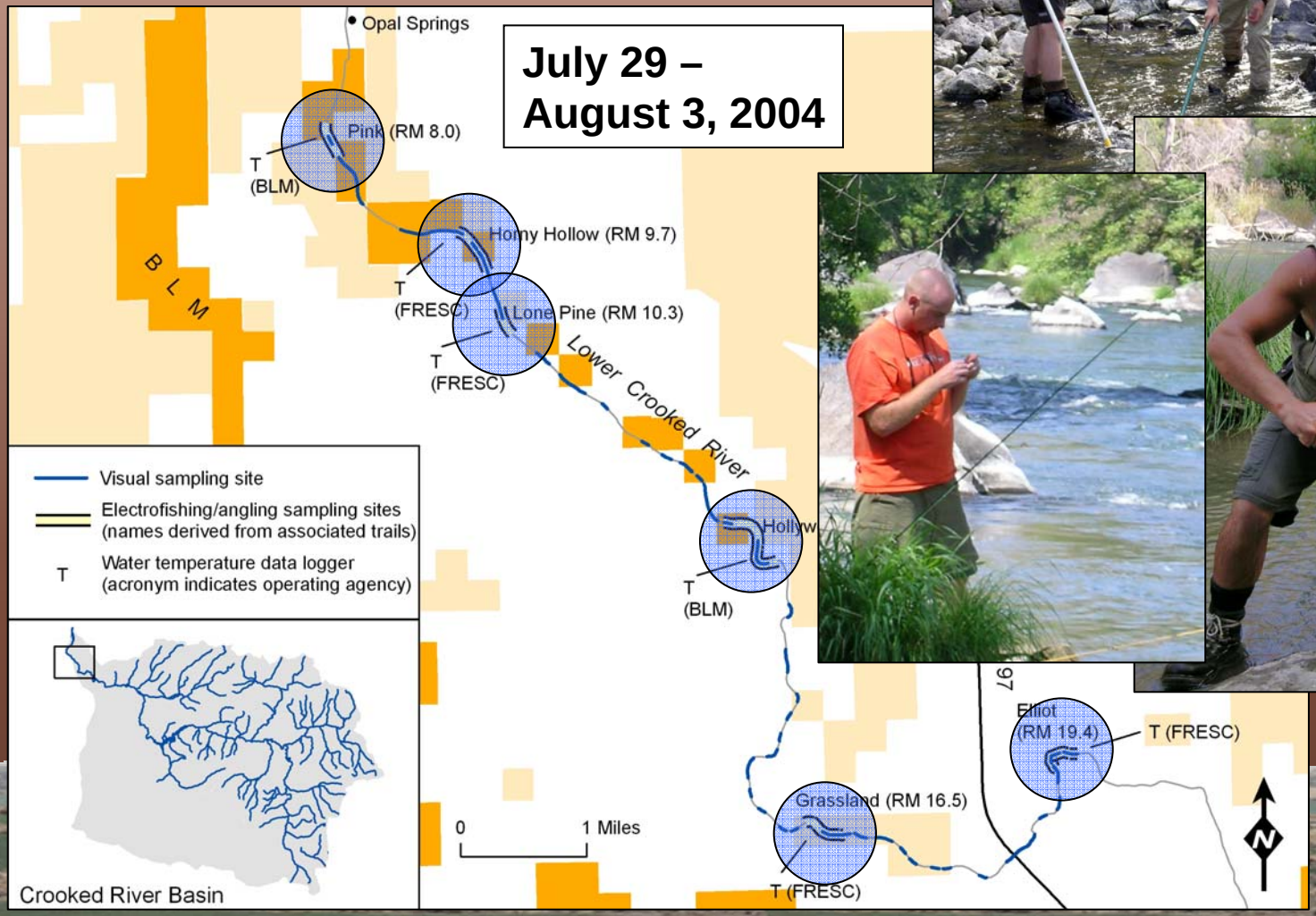
Electrofishing and angling



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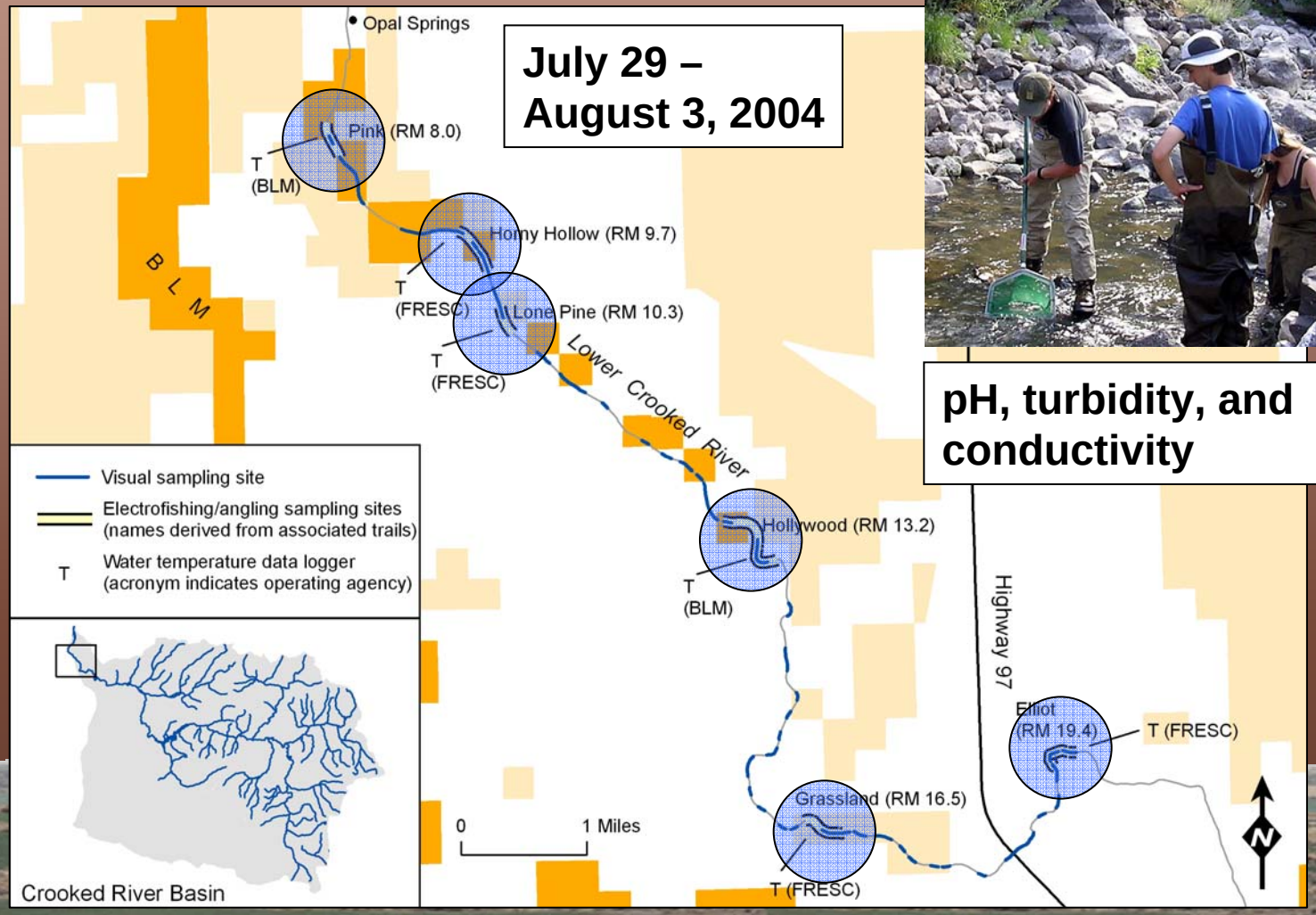
Stream temperature and water quality



July 29 – August 3, 2004

pH, turbidity, and conductivity

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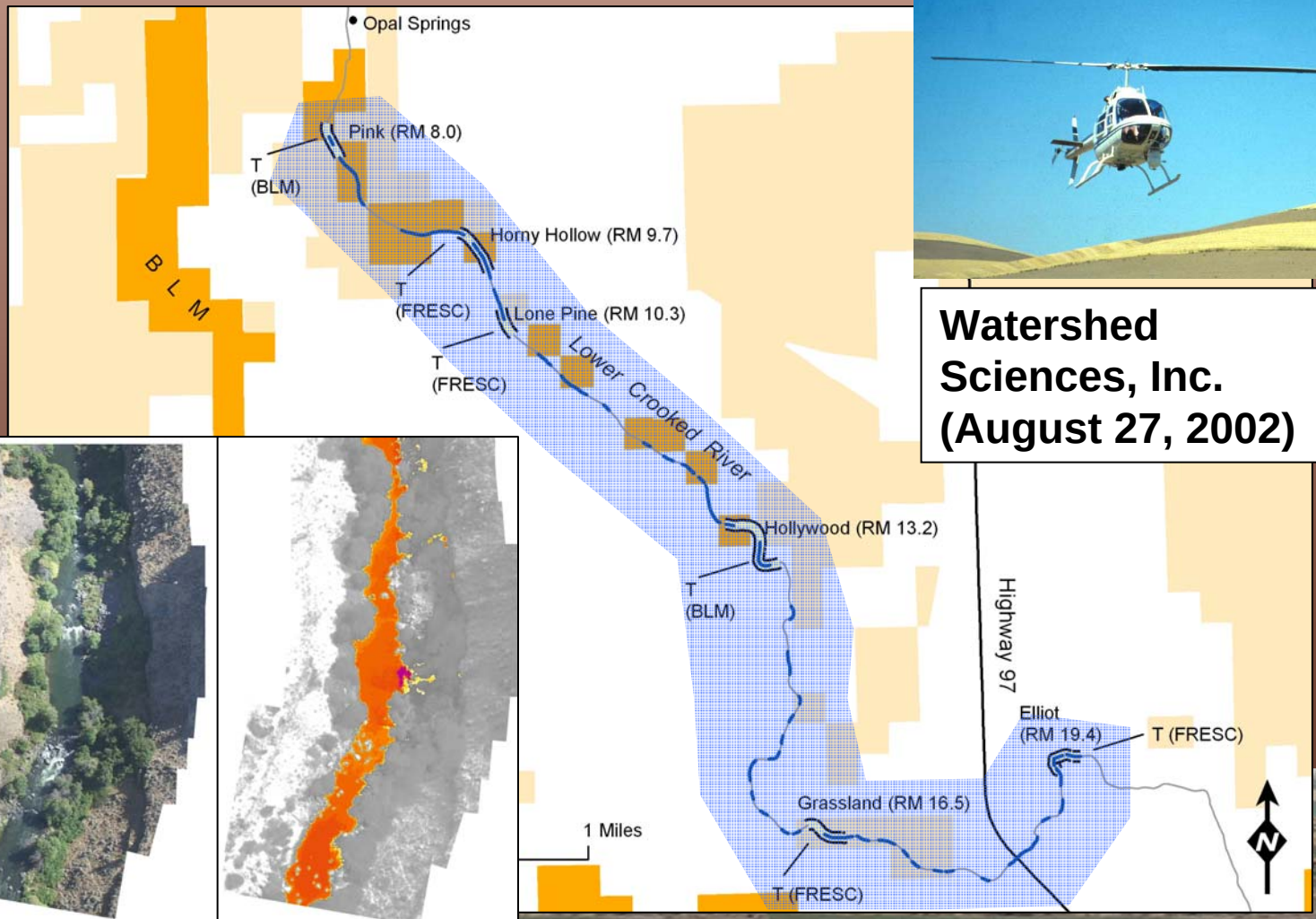
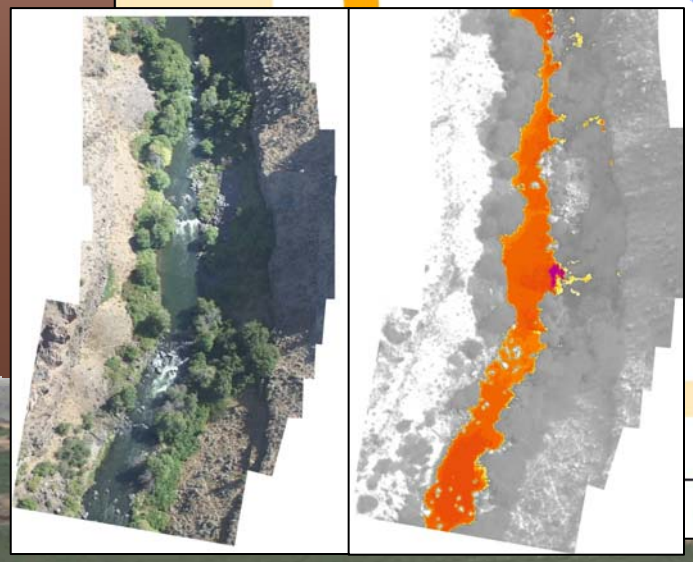
Airborne thermal IR remote sensing



Watershed Sciences, Inc. (August 27, 2002)



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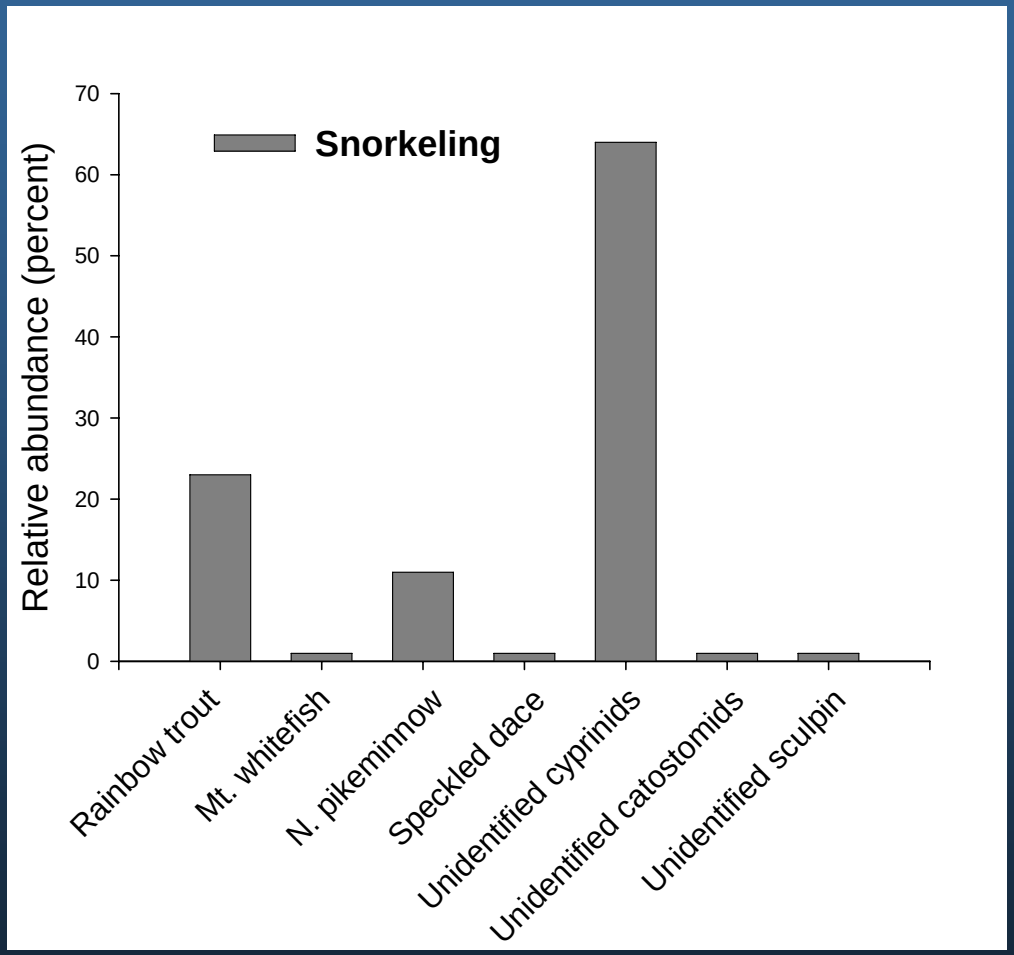
Results: Fishes



12,735 individuals observed

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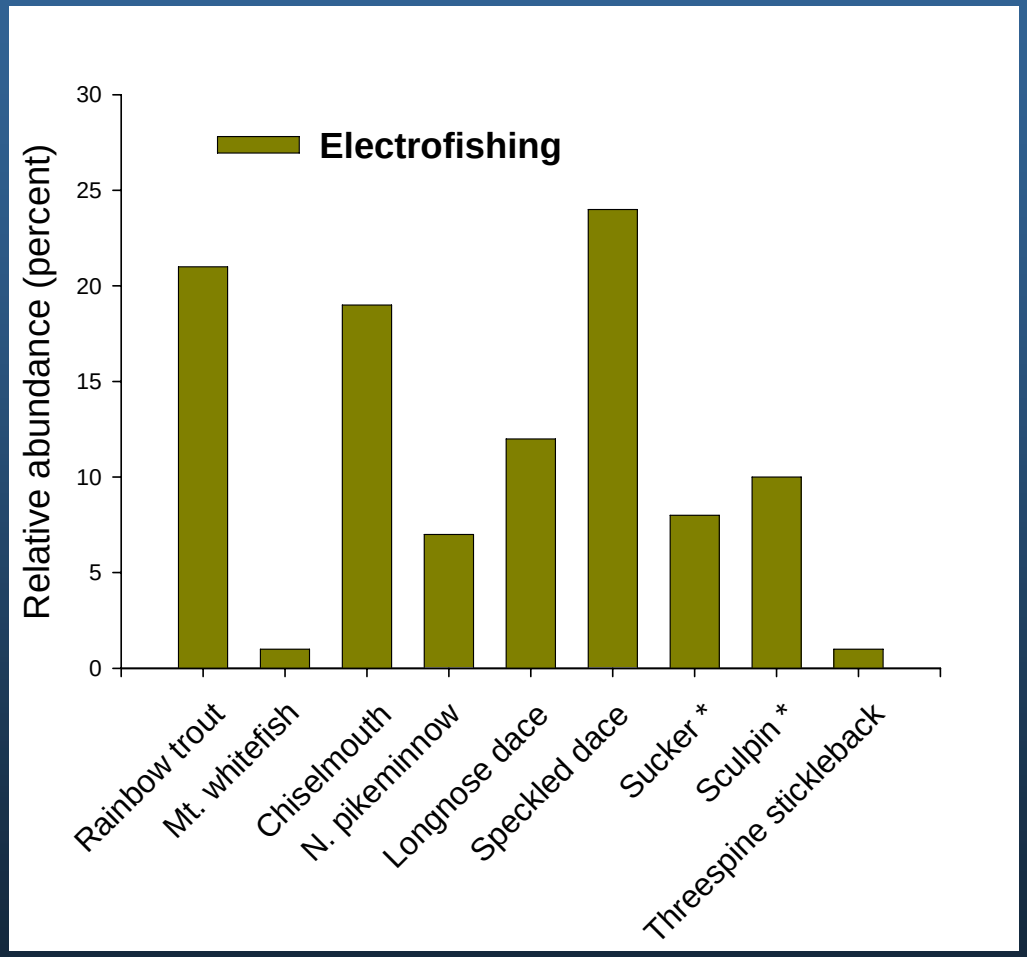
Results: Fishes

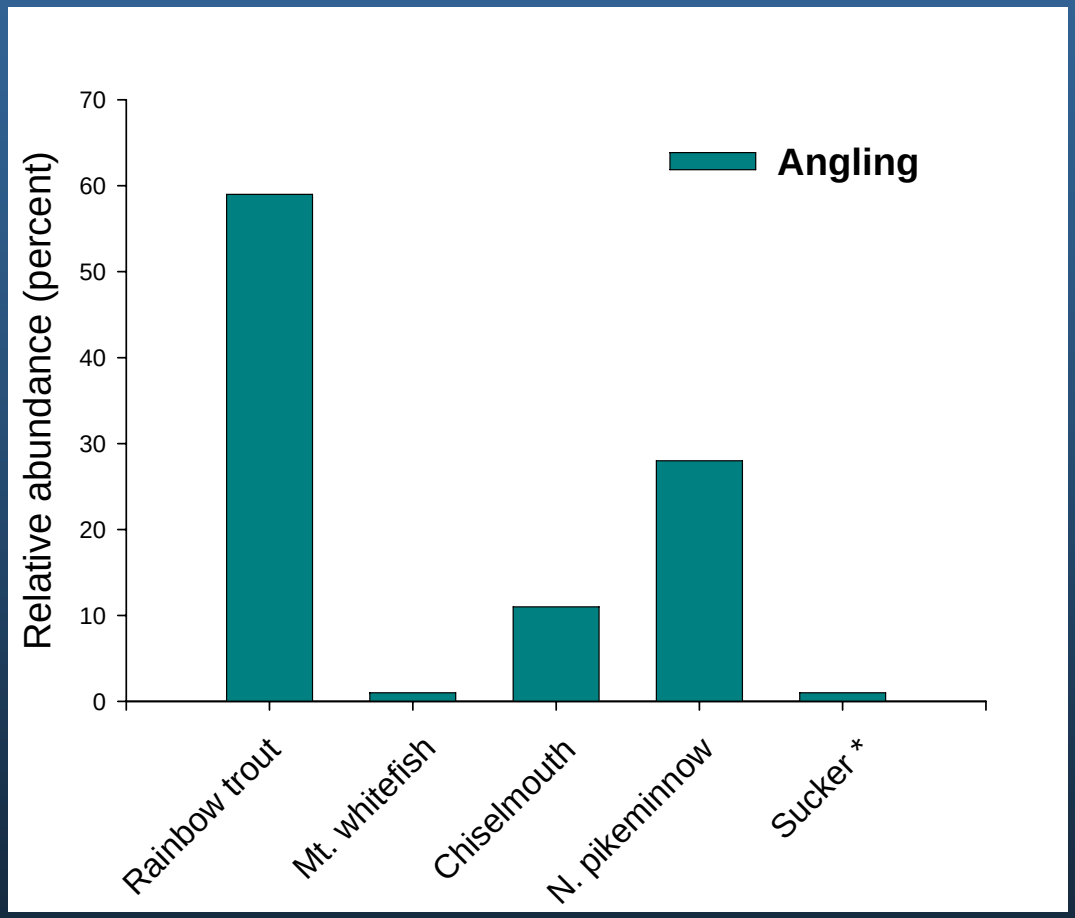


2,035 individuals captured

*** Bridgelip sucker, largescale sucker, Paiute sculpin, torrent sculpin, shorthead sculpin**

USGS

Results: Fishes

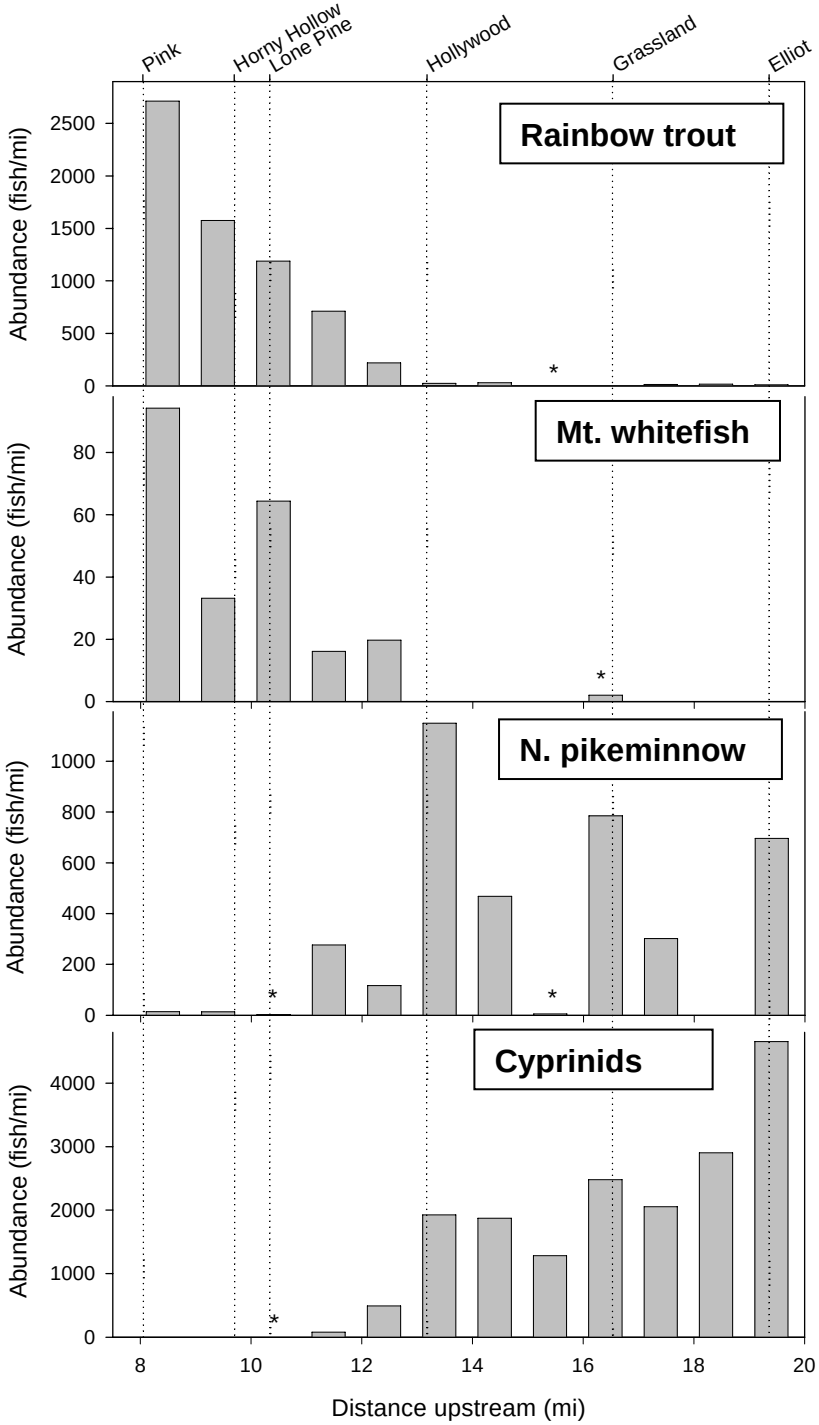


*** Bridgelip sucker, largescale sucker,**

574 individuals captured

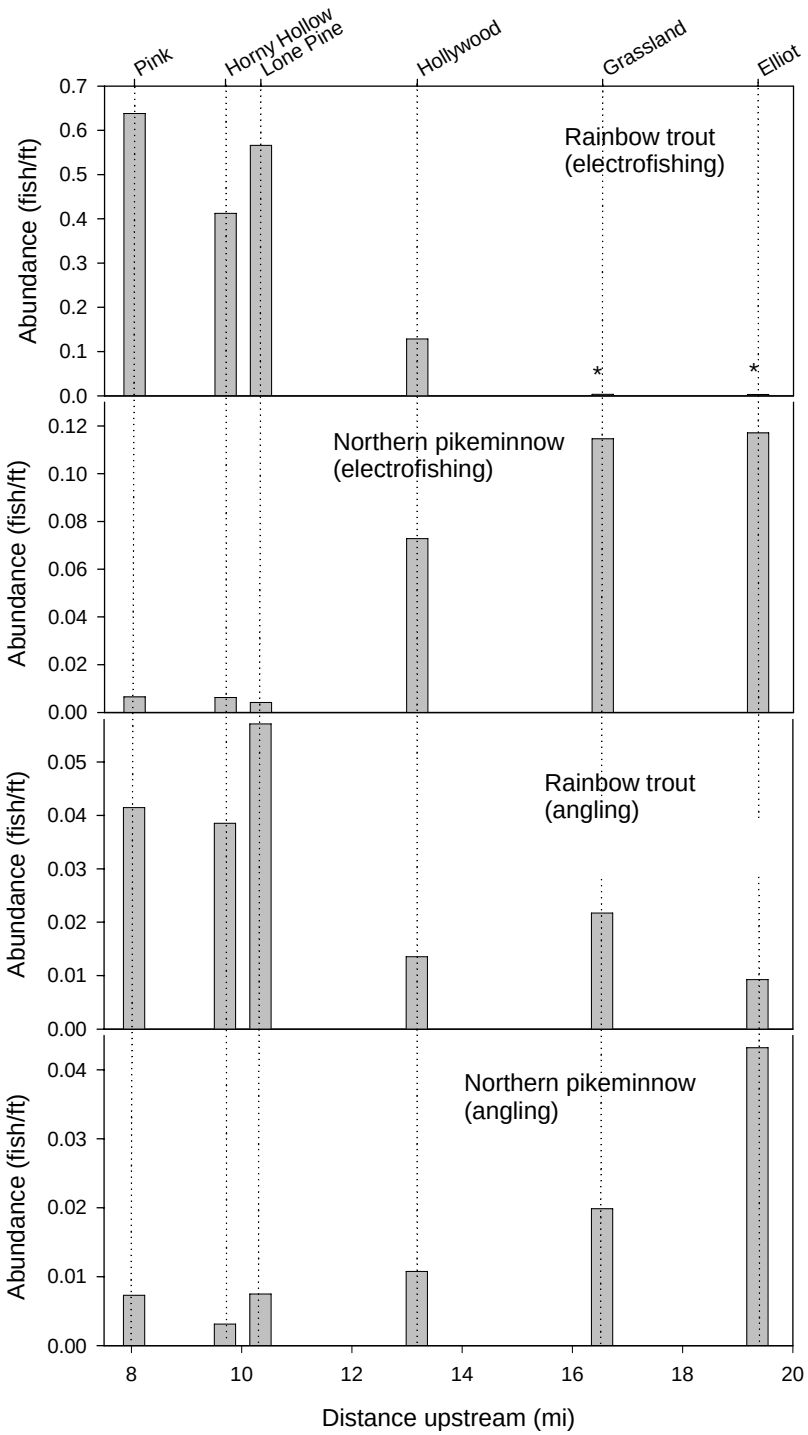
Results: Fishes

Longitudinal patterns: Snorkeling surveys



Results: Fishes

Longitudinal patterns: Electrofishing and angling



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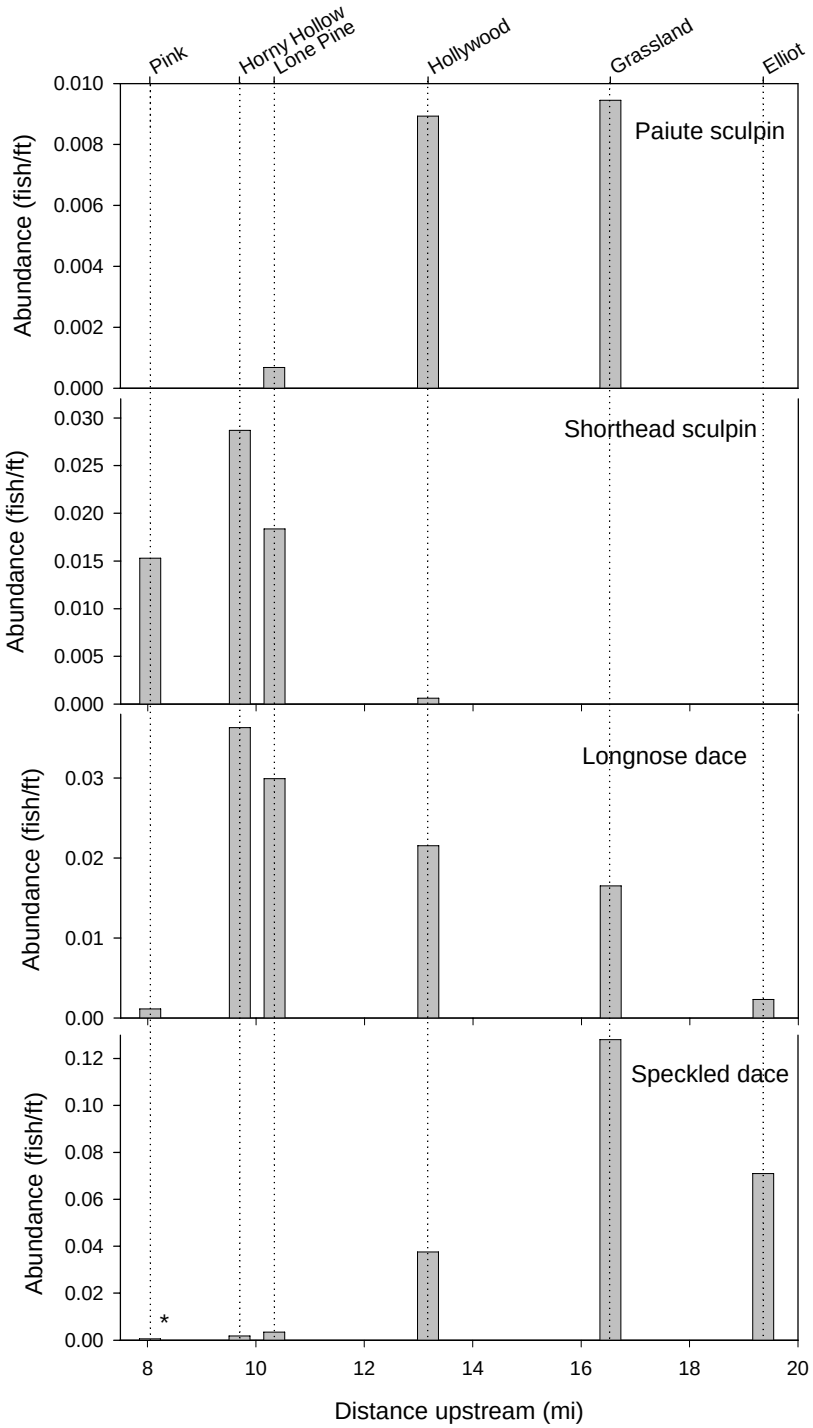
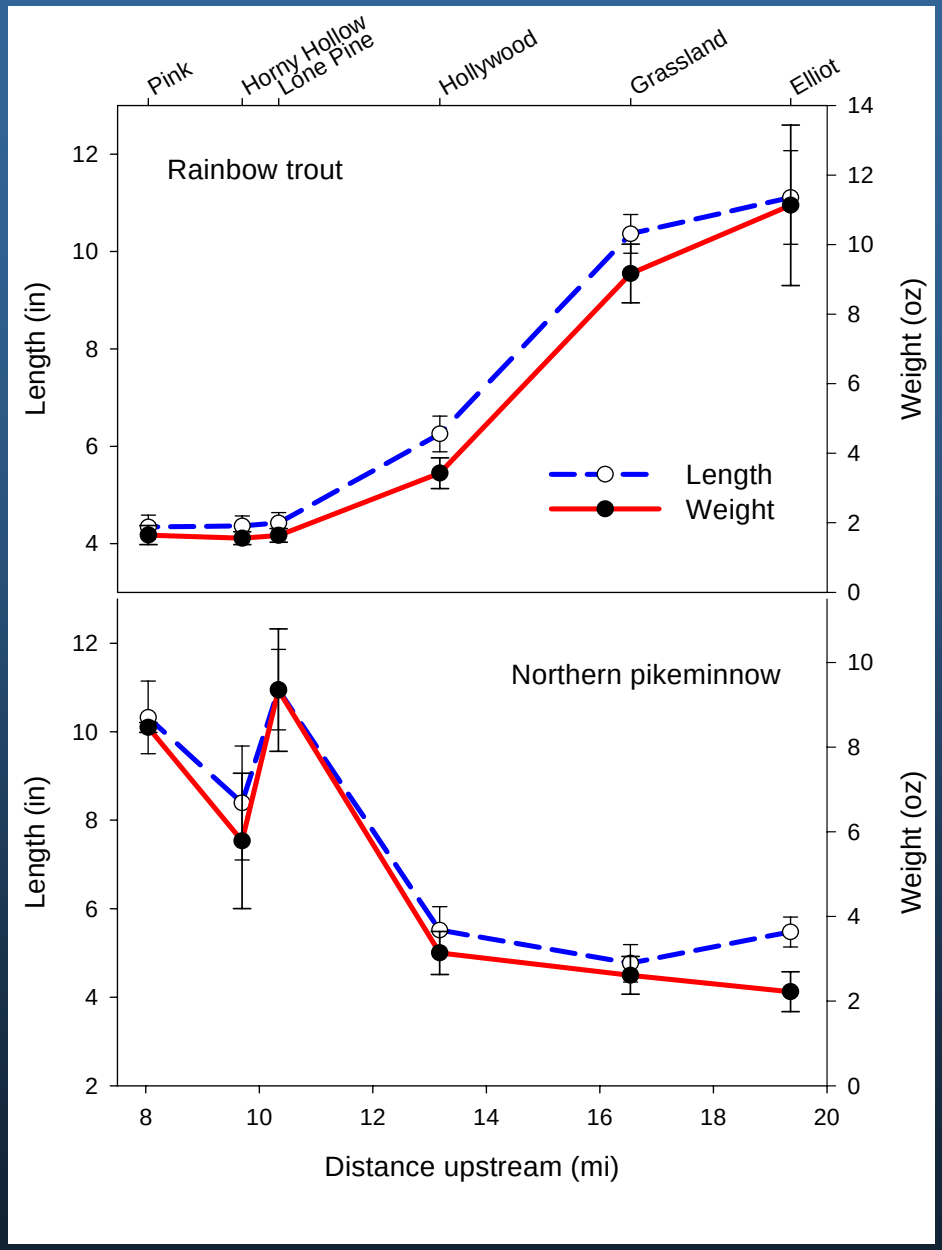
Results: Fishes

Longitudinal patterns: Benthic fishes



Results: Fishes

Longitudinal patterns: Mean length and weight



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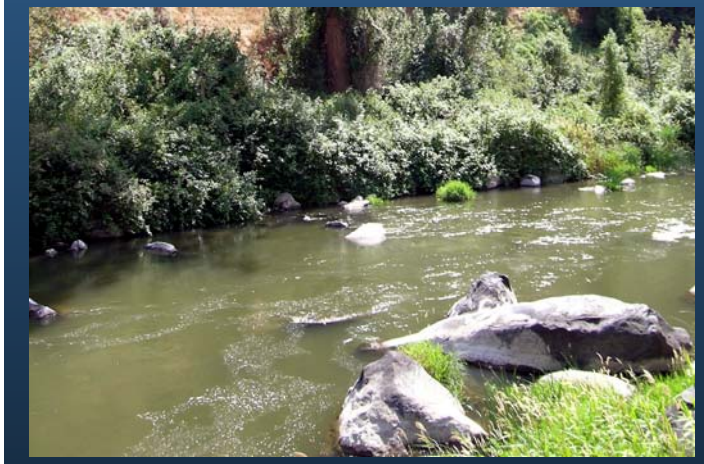
Results: Aquatic habitat



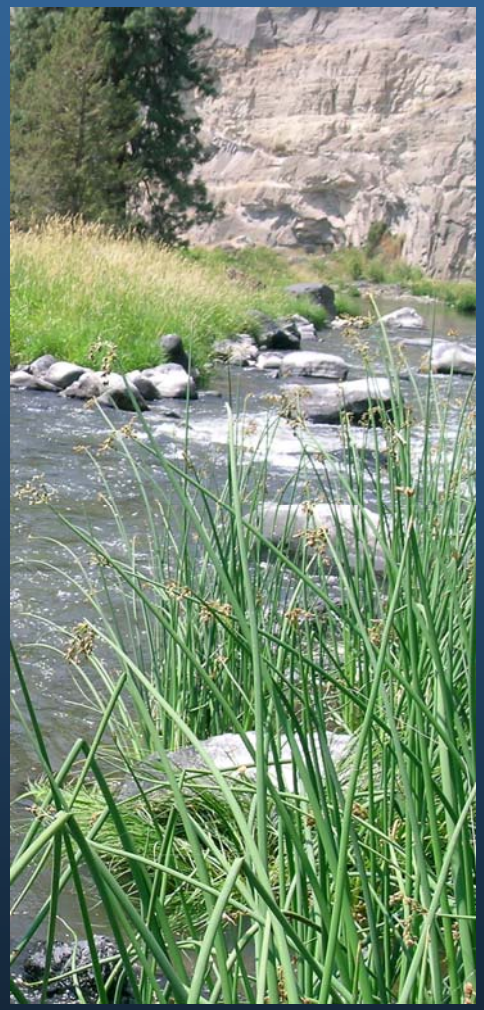
Snorkeling / habitat survey

Channel unit type (percent)	
Pools	30
Riffles	47
Rapids	7
Glides	16

Channel unit dimensions (ft)[1]	
Maximum depth (ft)	8.2 (3.3-16.4)
Depth (ft)	4.9 (1.6-13.1)
Wetted width (ft)	56 (33-82)
Unit length (ft)	328 (16-3281)

USGS

Results: Aquatic habitat



Snorkeling / habitat survey

Substrate type (percent)	
Bedrock	1
Boulder (>10 in)	31
Cobble (2.5-10 in)	32
Gravel (0.1-2.5 in)	19
Sand (gritty - 0.1 in)	15
Silt (fine not gritty)	2

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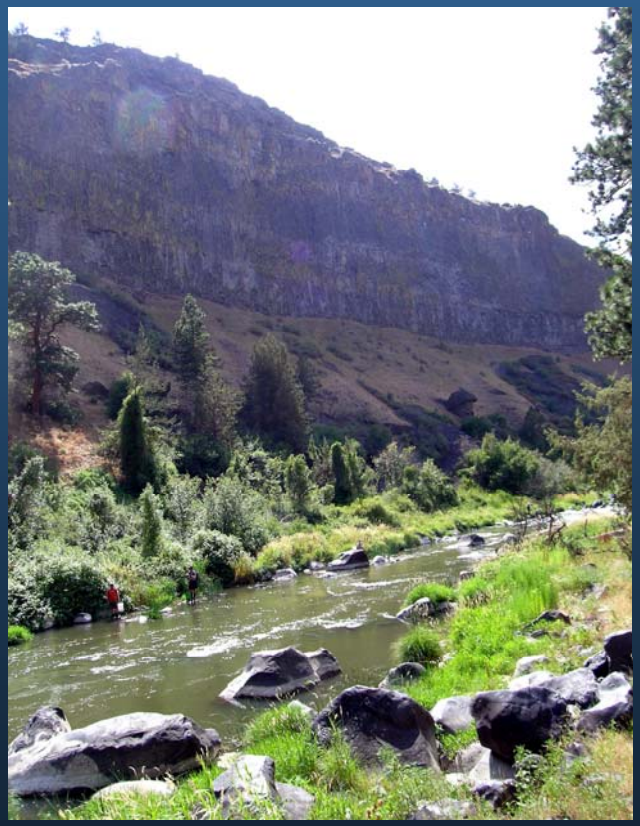
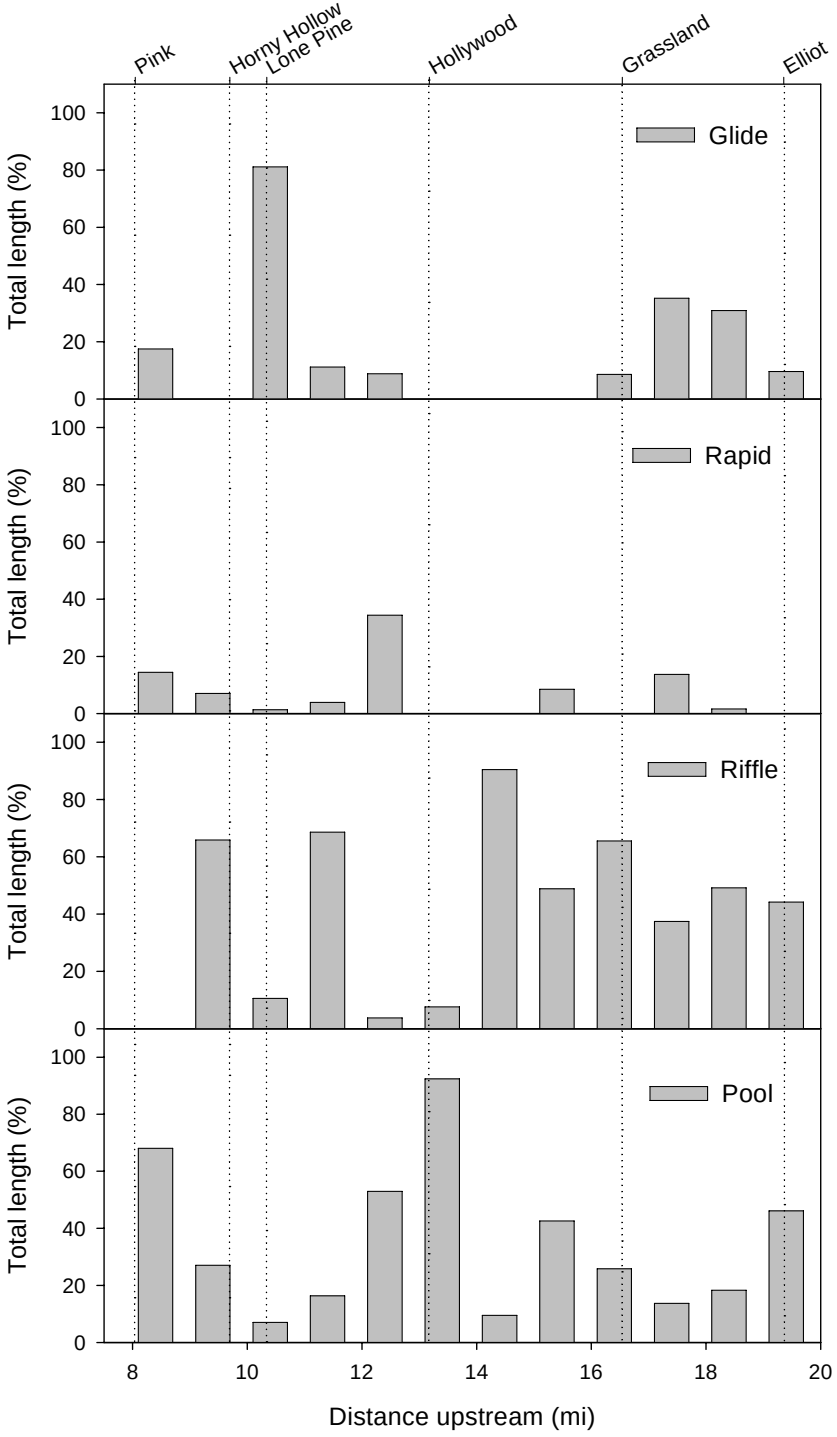
Results: Aquatic Habitat

Longitudinal patterns: Habitat type





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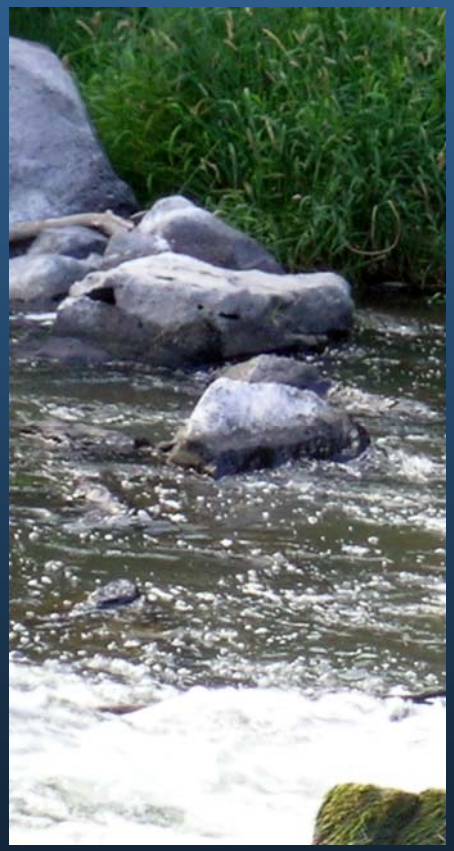
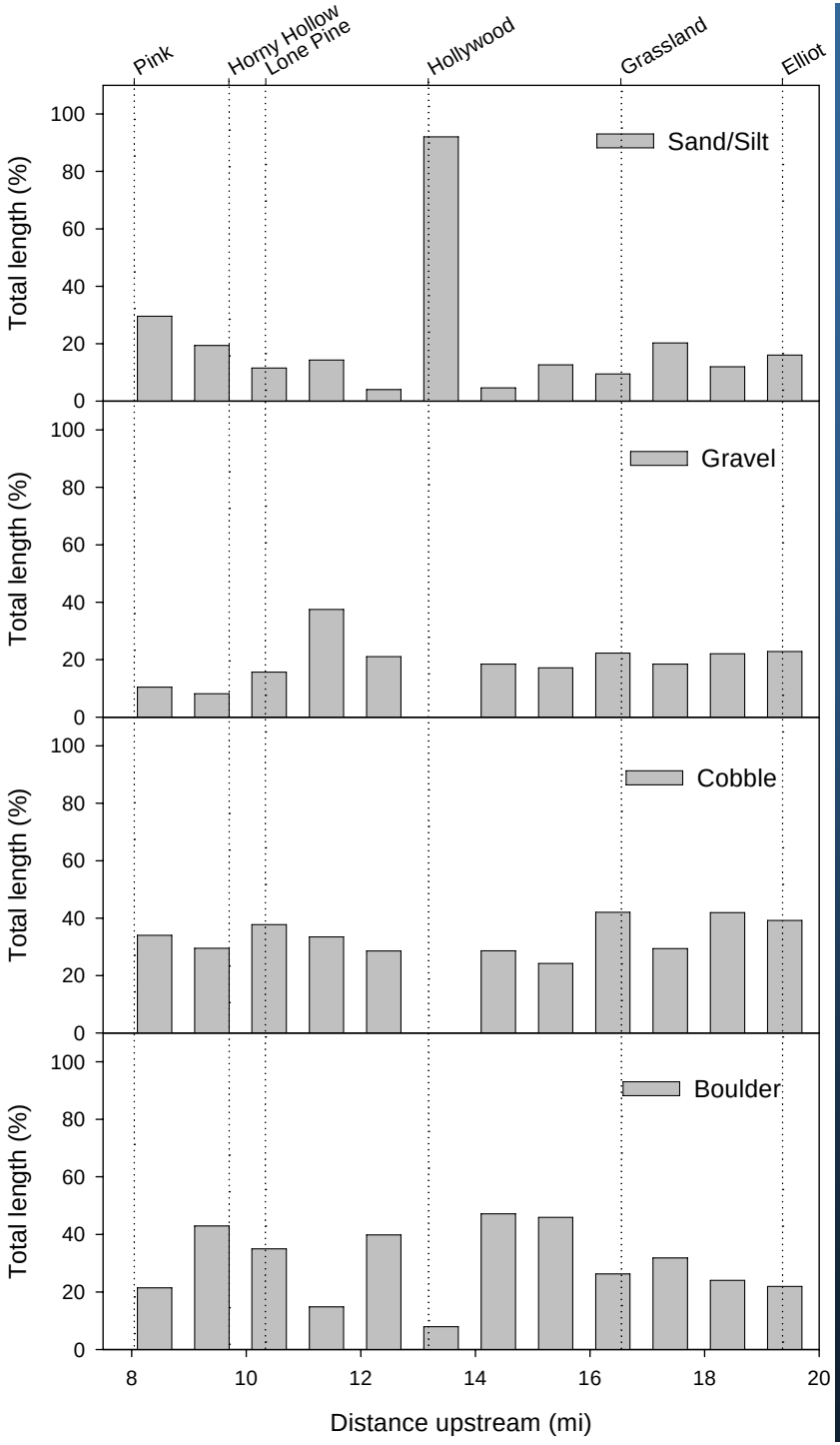
Results: Aquatic Habitat

Longitudinal patterns: Substrate





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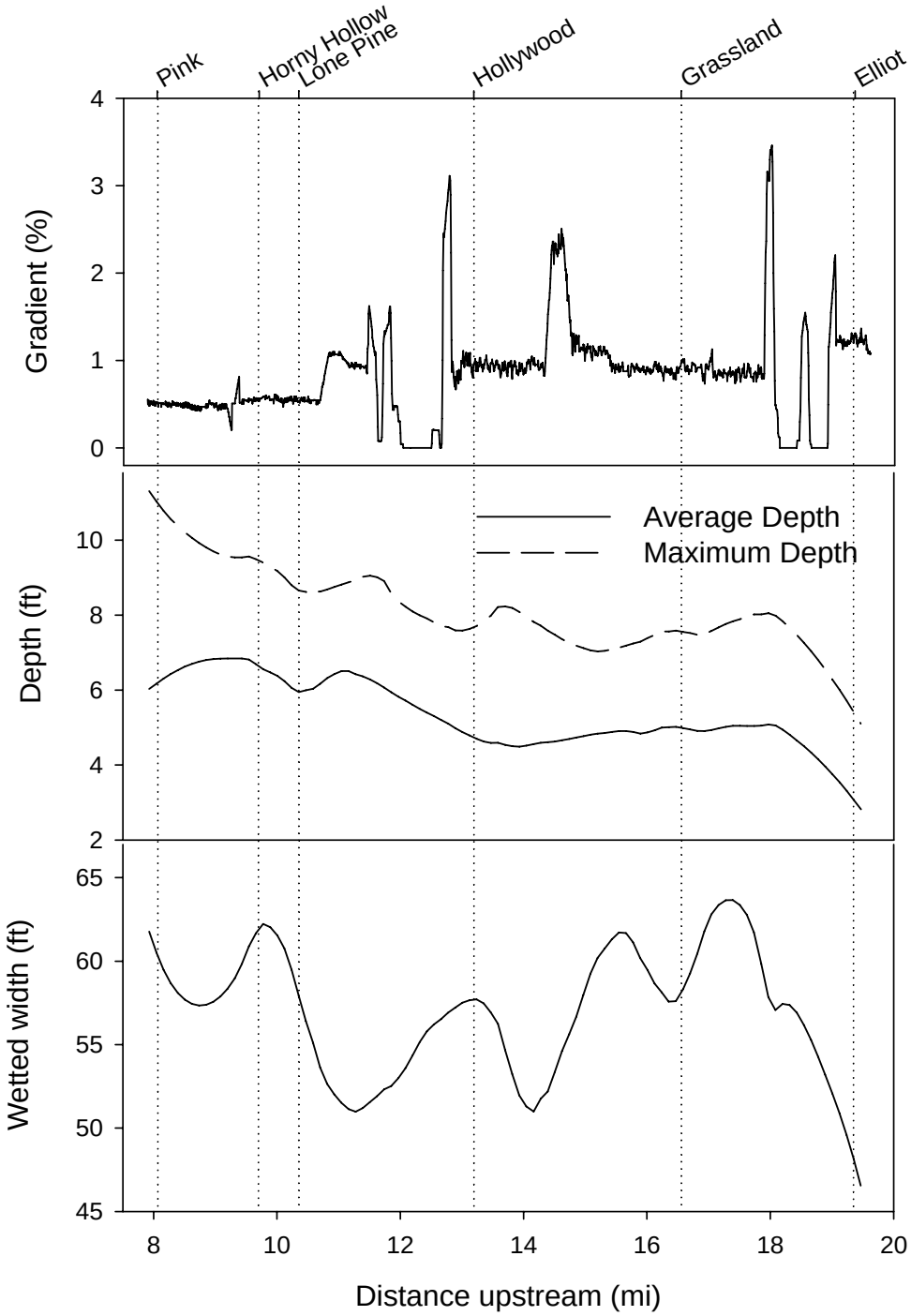
Results: Aquatic Habitat

Longitudinal patterns: Gradient, depth, and width



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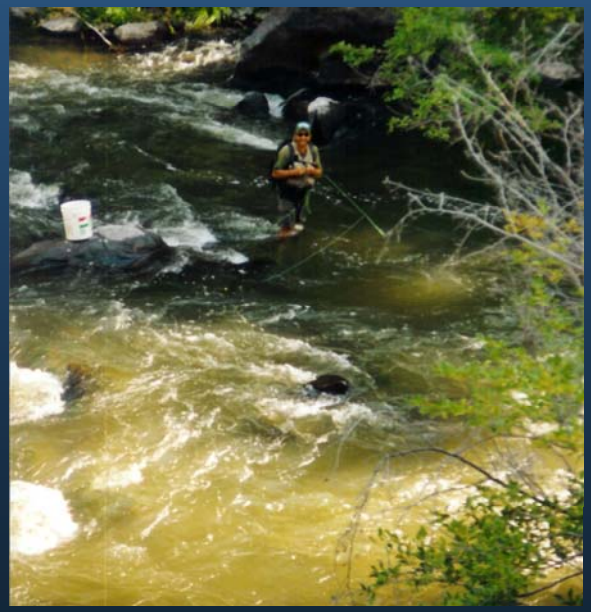
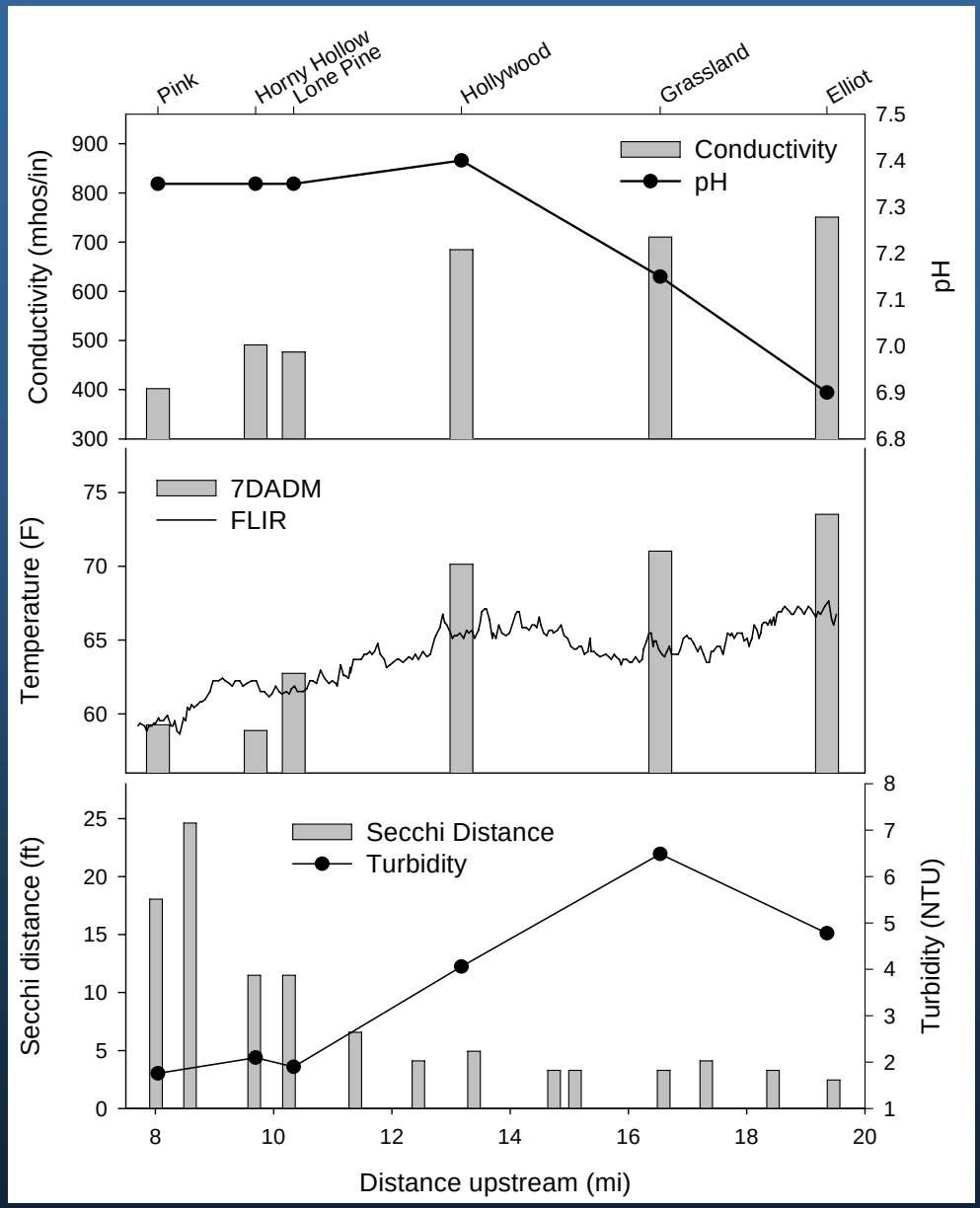
Results: Aquatic Habitat

Longitudinal patterns: Conductivity, pH, temperature, and turbidity





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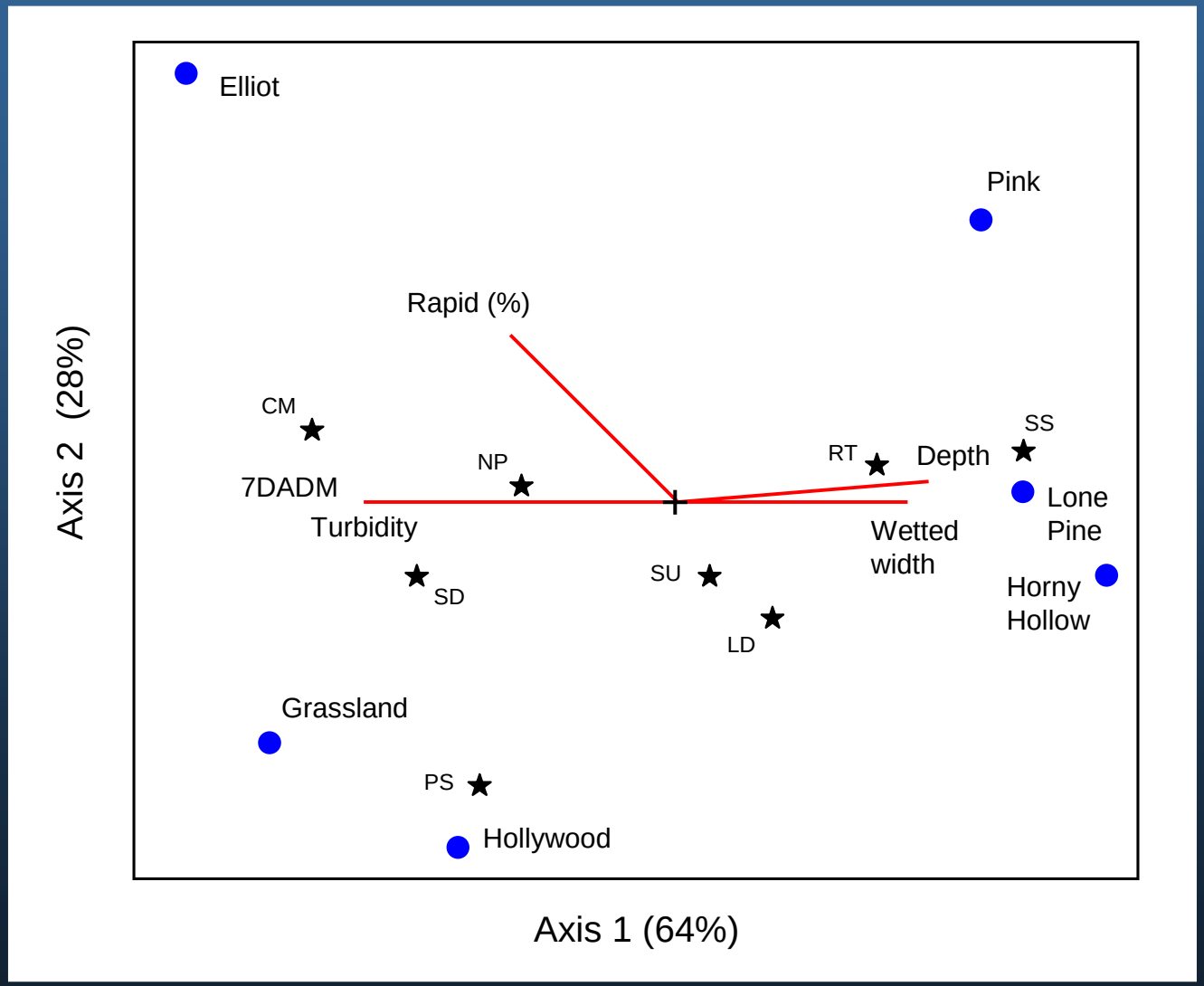
Results: Fish-habitat relationships

Gradients:

Temperature, turbidity, depth, width

All correlated with distance downstream



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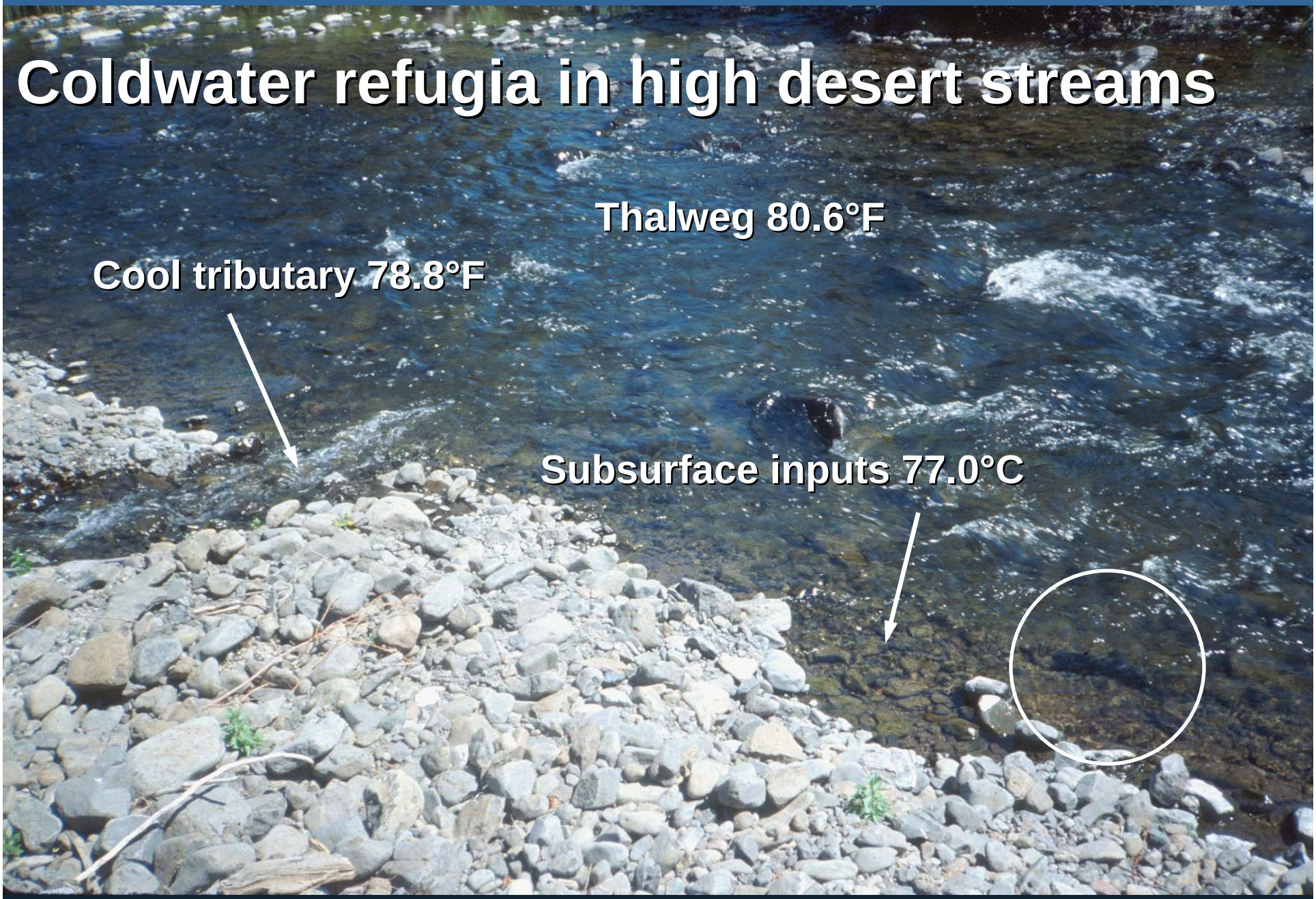
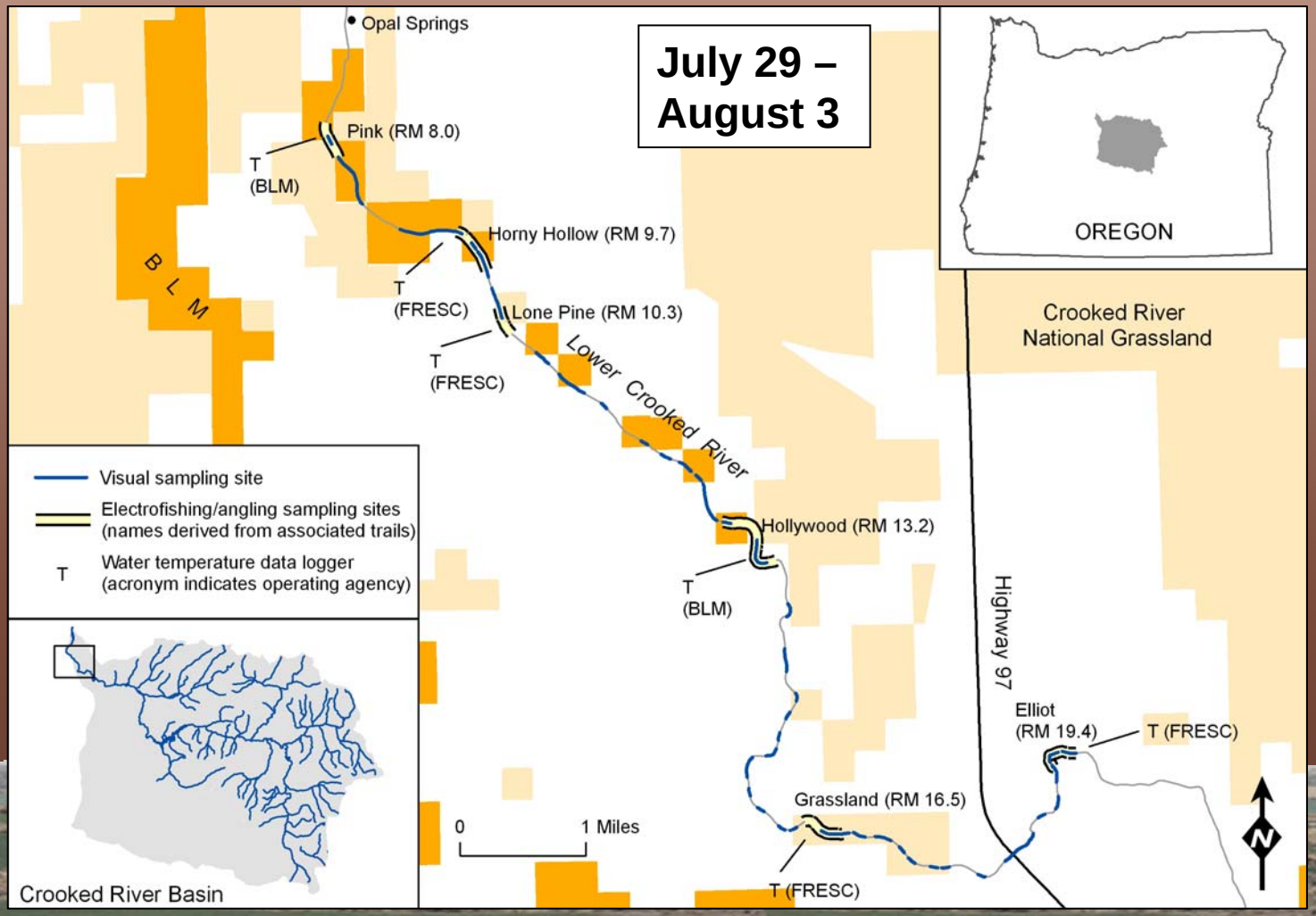
Coldwater refugia in high desert streams



Rainbow trout (*Oncorhynchus mykiss*)
Water temperature 77°F

Thermal patterns and rainbow trout



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Thermal refugia in the LCR

Elliot (warm, upstream)

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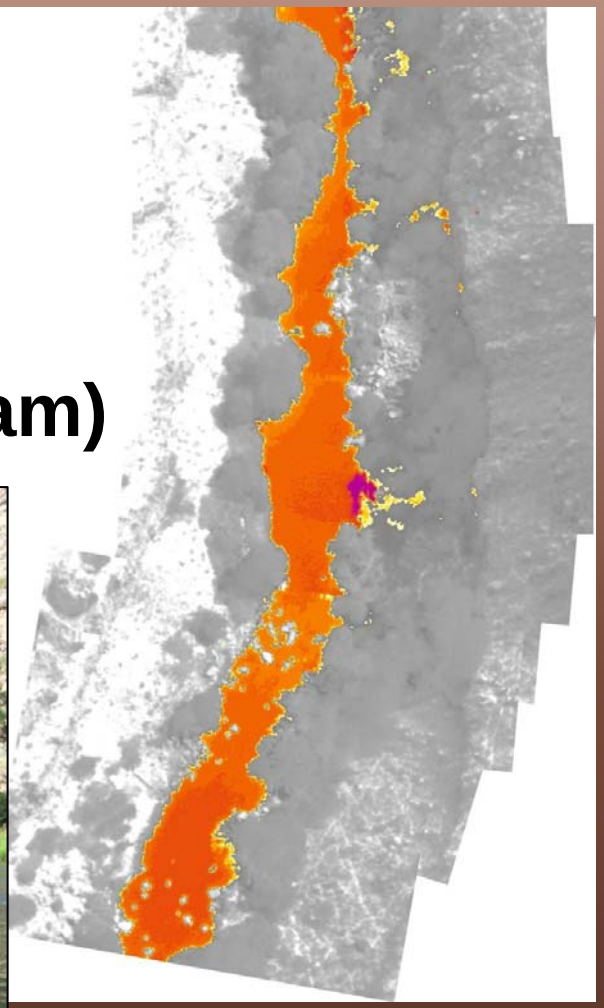
Thermal refugia in the LCR

Lone Pine (cool, downstream)



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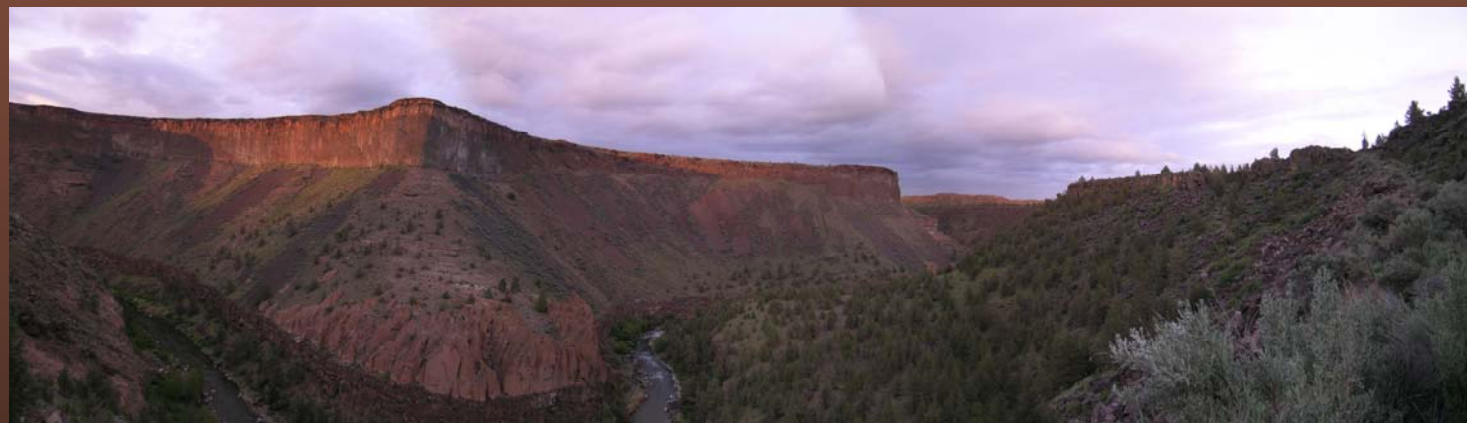
Future research needs

- Movement patterns (refuge use by large and small individuals)
- Physiological consequences: thermal tolerances and growth
- Feeding behavior: effects of turbidity and inter- and intraspecific competition
- Genetic differences between redband and rainbow trout



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