

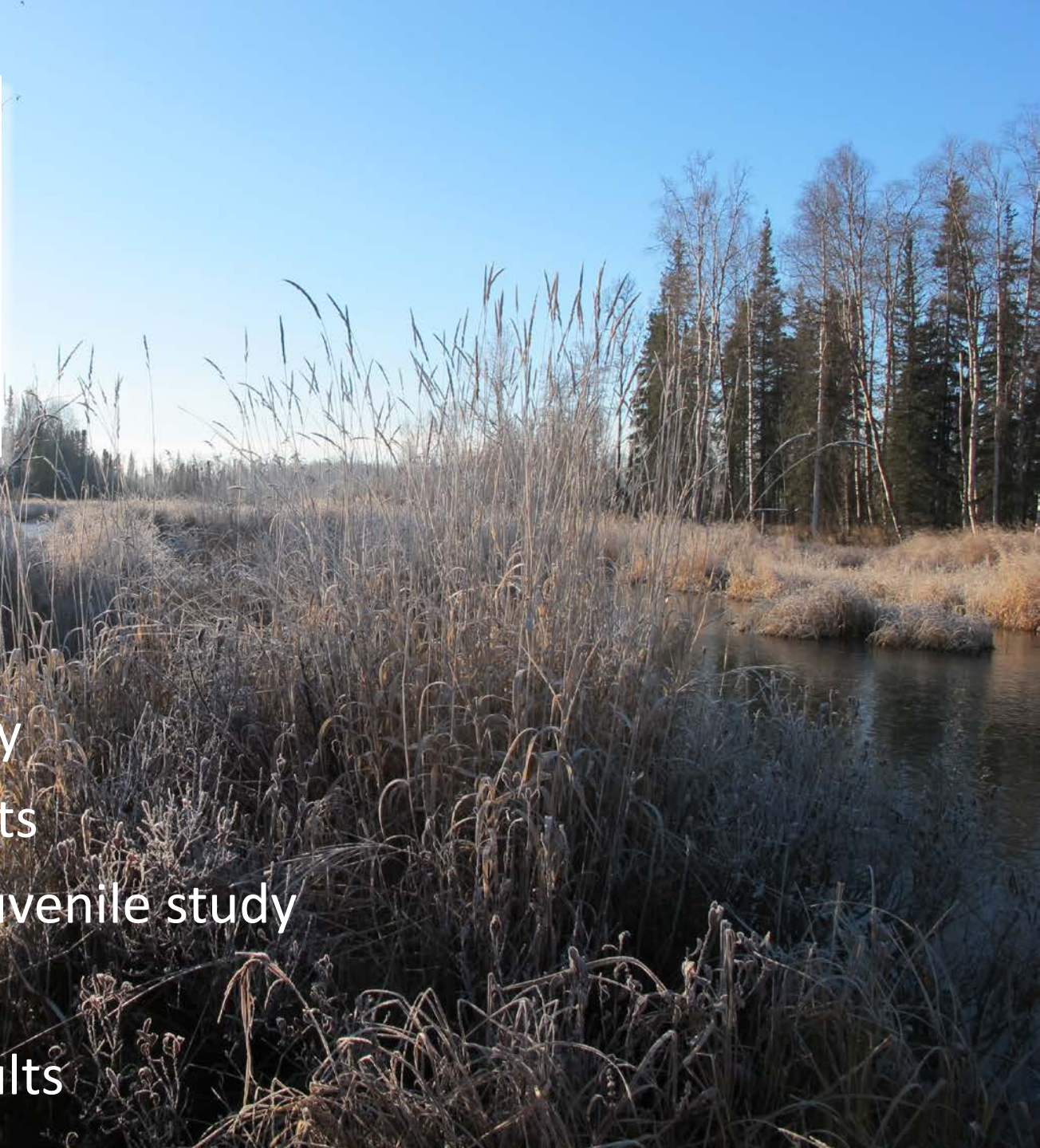
Cold water habitat use by juvenile salmon directing conservation in the Big Lake basin

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Big Lake basin
Thermal imagery
Cold water inputs
Objectives for juvenile study
Sampling plan
Preliminary results



Big Lake Basin

Threats to fish/fish habitat:

- shoreline development
- hydrocarbon pollution
- undersized culverts
- perched culverts
- stormwater runoff
- invasive northern pike

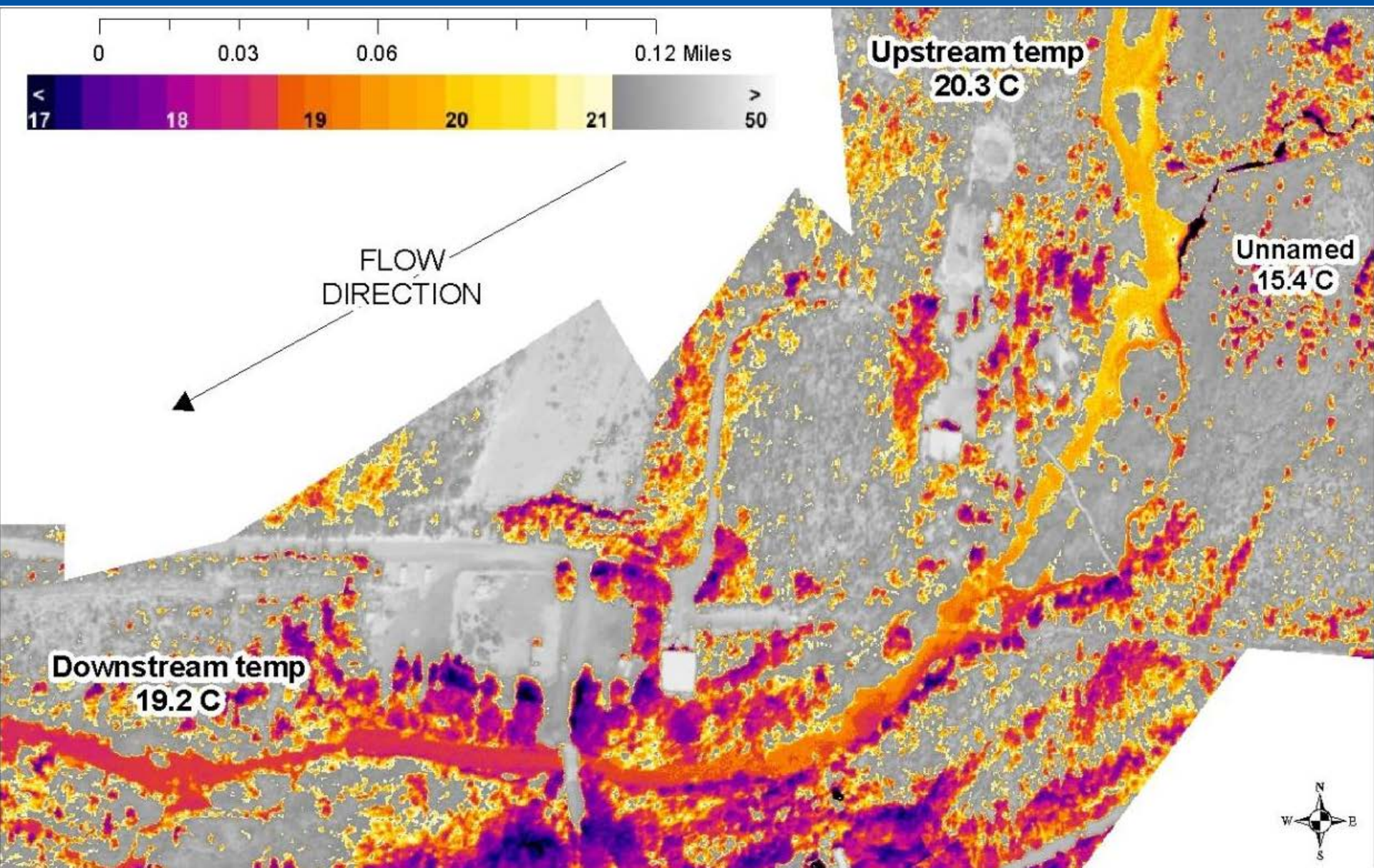
Stream temperatures:

- above thresholds known to be stressful to salmon
- sensitive to climate change impacts

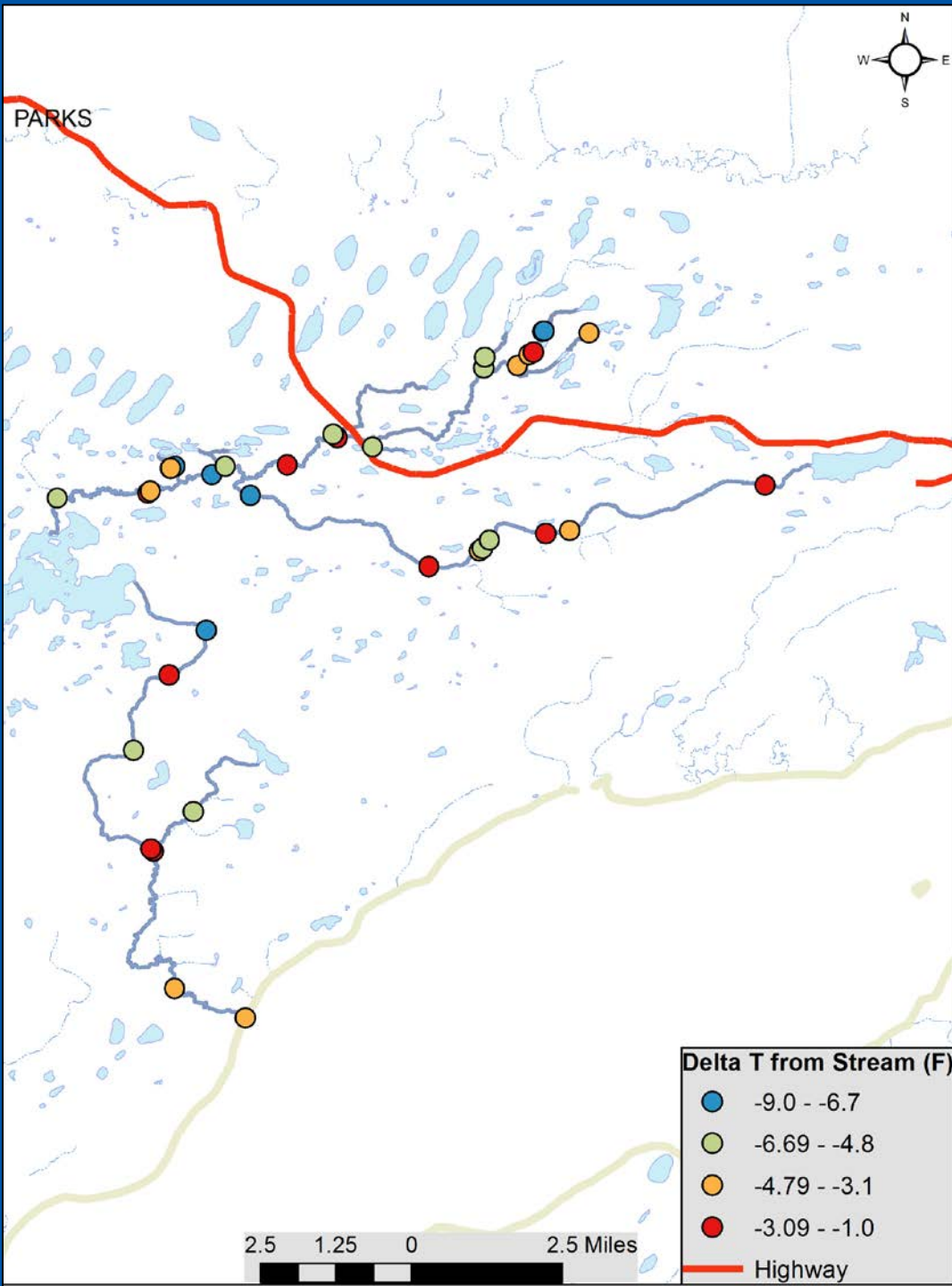
Thermal Infrared Imagery

- July 29, 2011
- 50 river miles
- 1,300 ft elevation
- 1.3 ft pixel resolution





Thermal infrared imagery from Fish Creek



Using thermal imagery - identified 36 significant cold water inputs that may act as “thermal refugia” for migrating adults and rearing juvenile salmon



August 2014

Refuge as a cold water source



Refuge effectiveness as habitat

Accessibility

Predation risk

Water chemistry

Competition

Depth

Frequency

Connectivity between patches

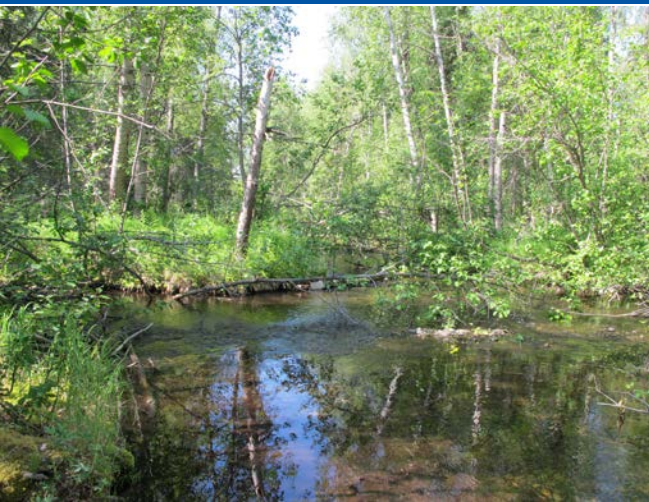


Photo credit: USFWS/Katrina Mueller

Objectives for juvenile study

- 1) Determine the downstream influence of three cold water inputs on the main stem bulk water temperature.
- 2) Determine if juvenile Coho salmon preferentially select main stem habitats influenced by cold water inputs for summer rearing as measured by relative abundance during summer months.

Herkimer Creek

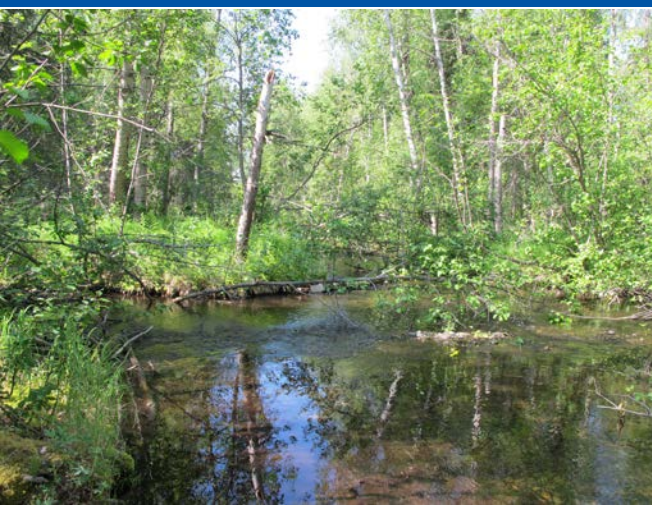
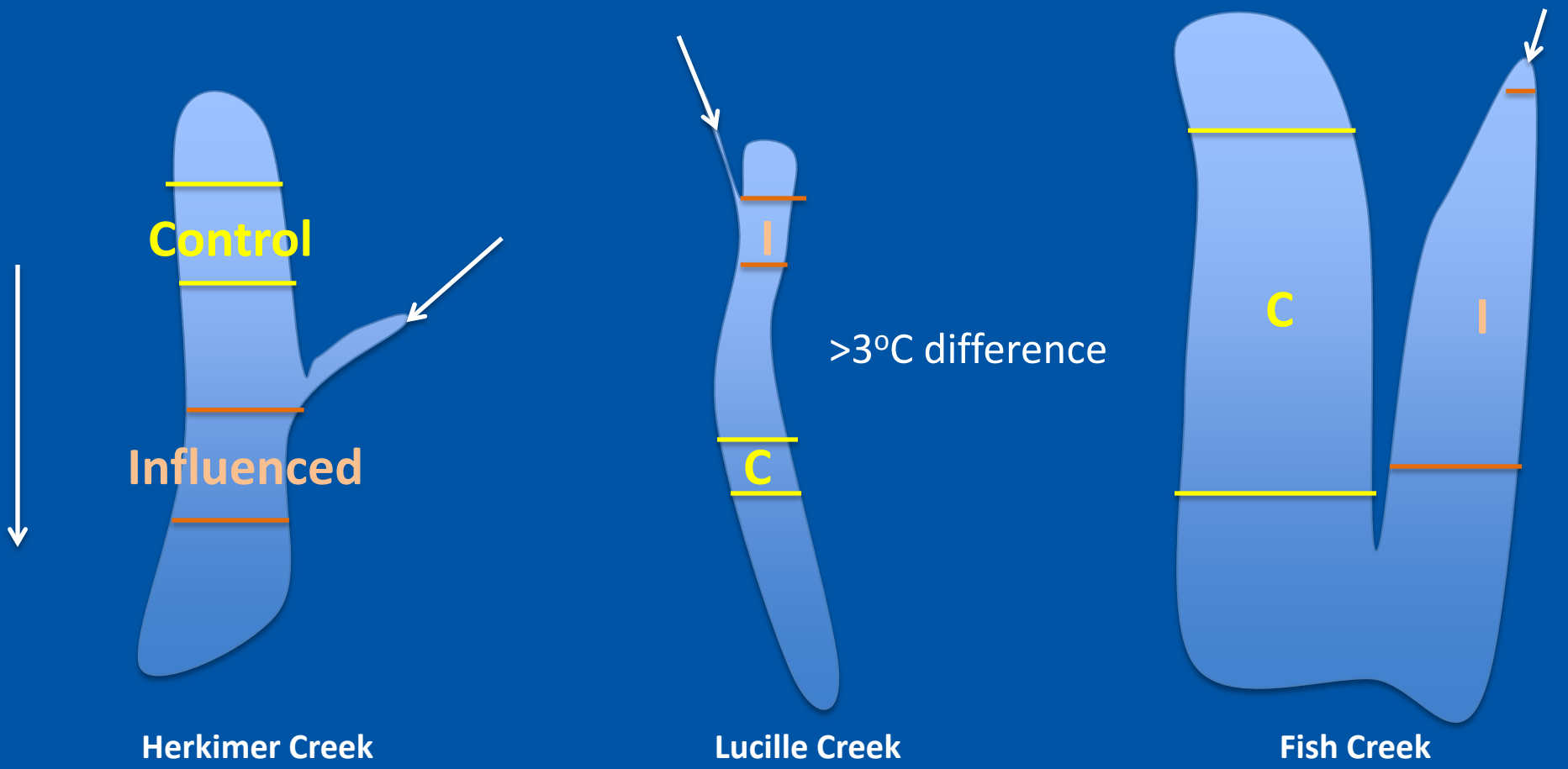


Lucille Creek



Fish Creek



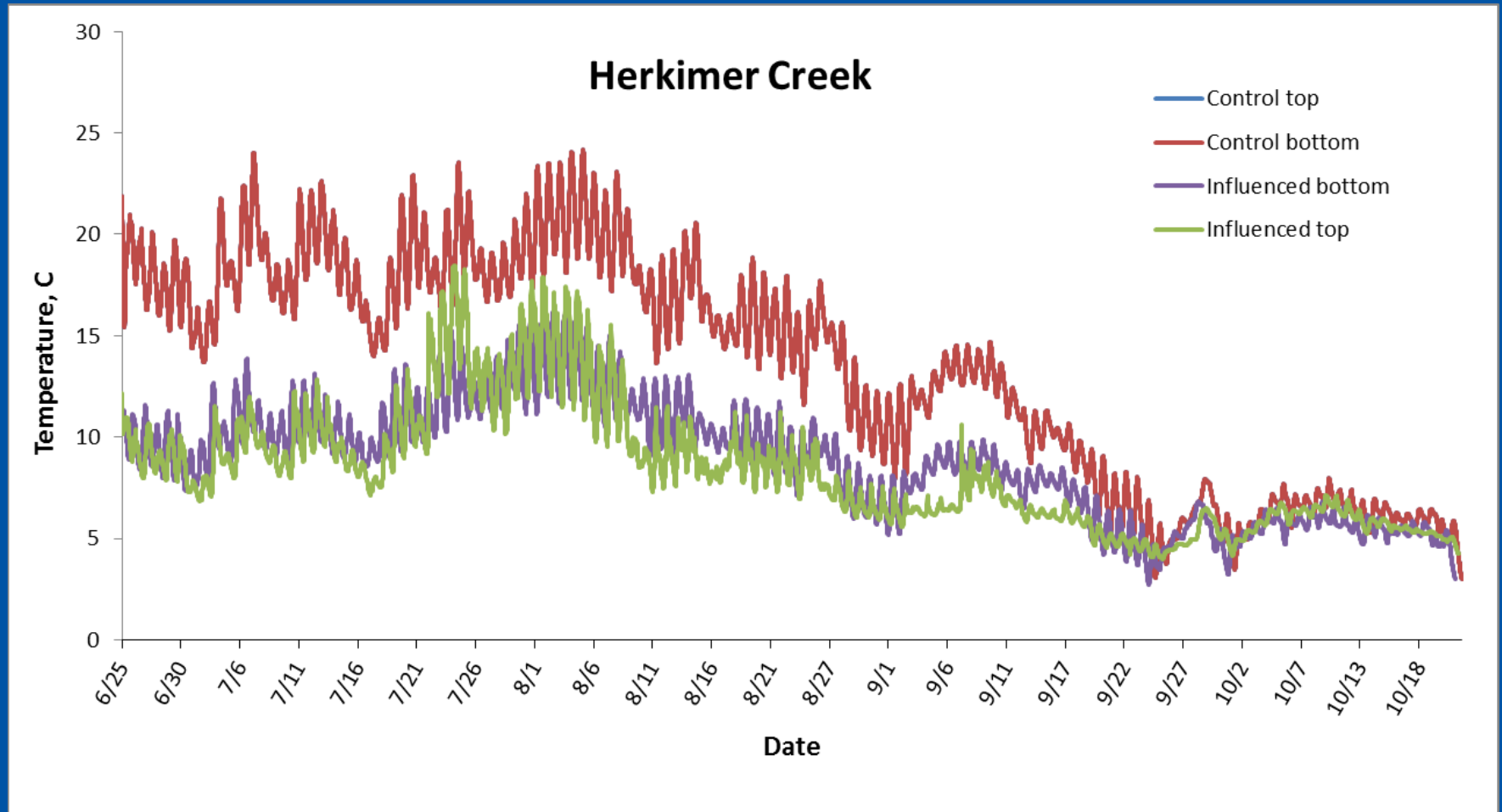


Sampling plan:

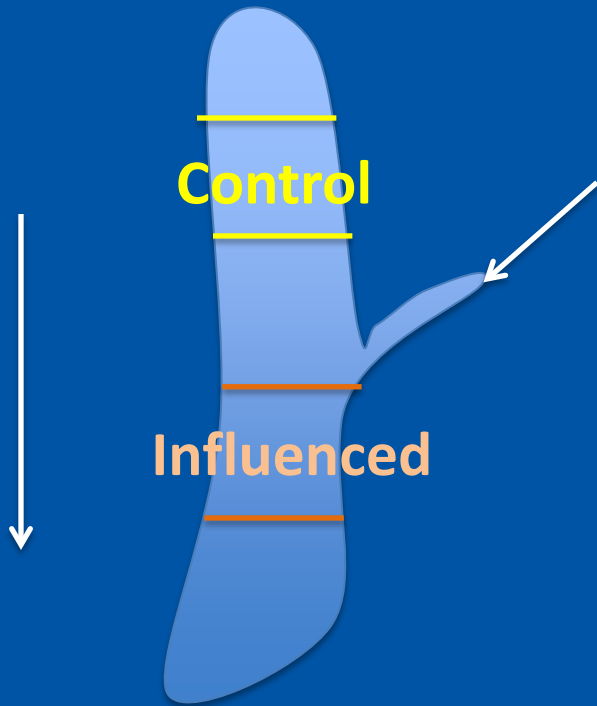
monthly sampling events from July – October, 2015

- fish sampling: electrofishing, minnow traps
- macroinvertebrate sampling
- habitat assessments
- water velocity
- temperature surveys

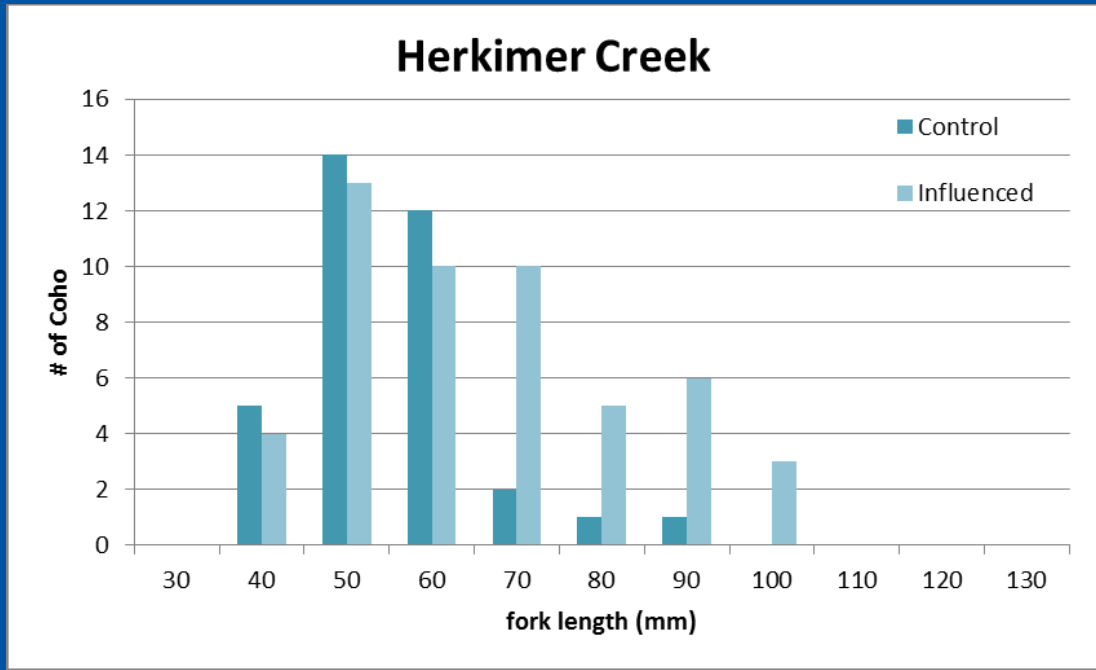
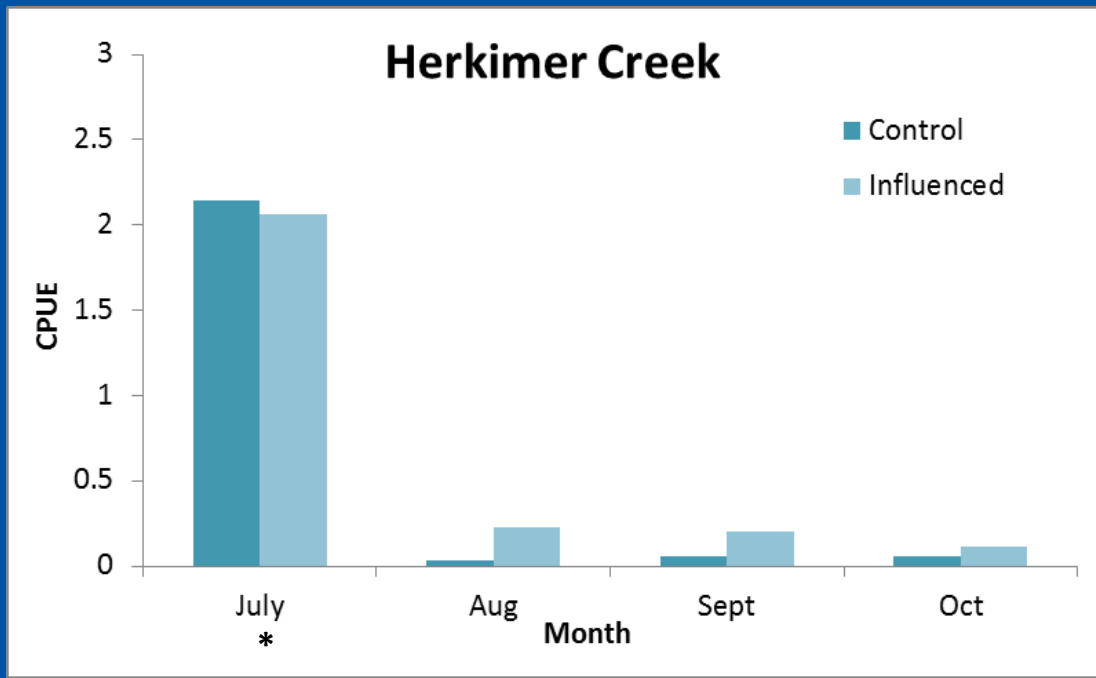
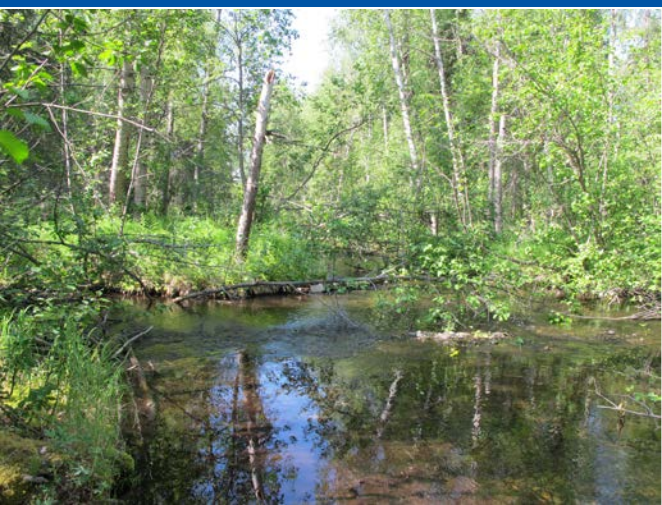


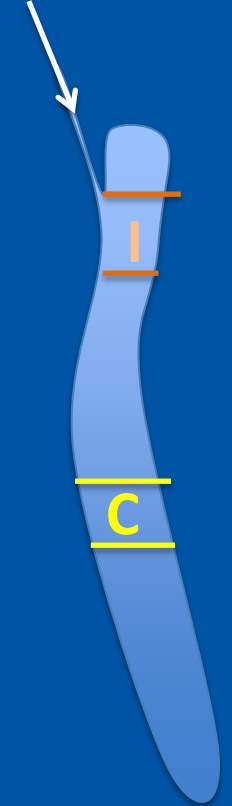
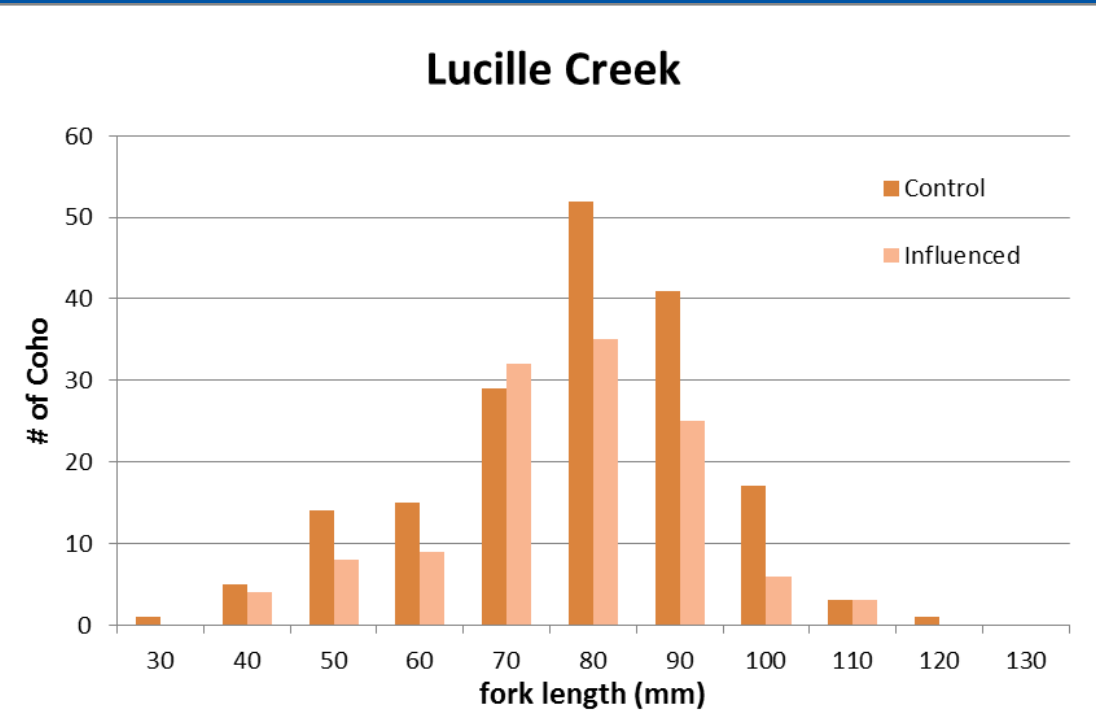
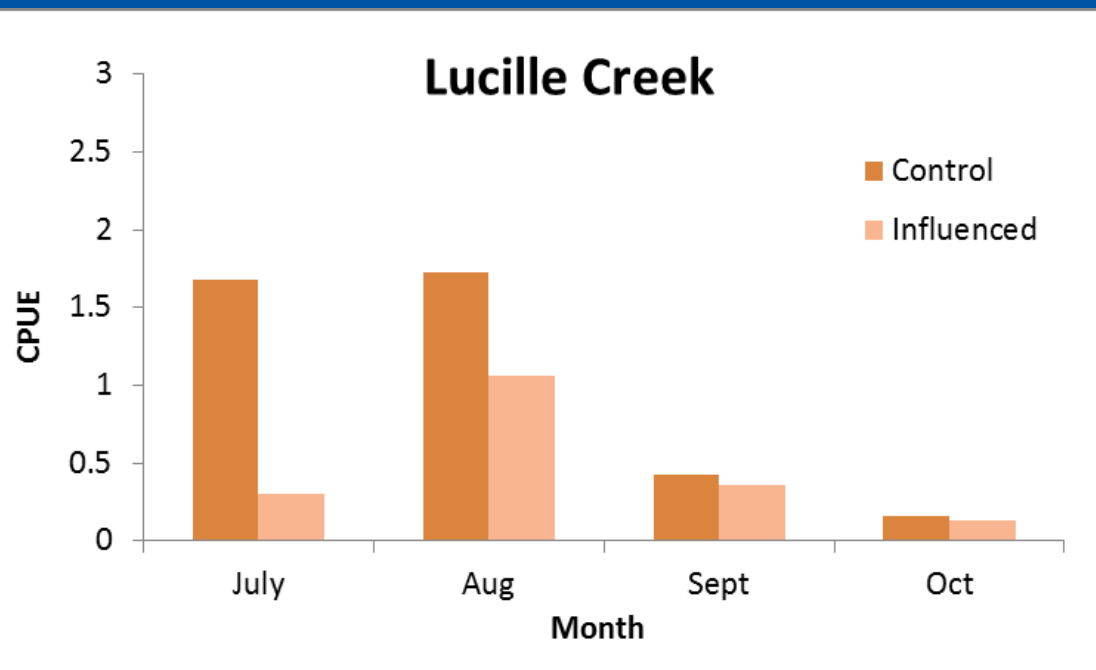


- ✓ Determine the downstream influence of cold water inputs on the main stem bulk water temperature
- ✓ Greater thermal heterogeneity found in influenced reach



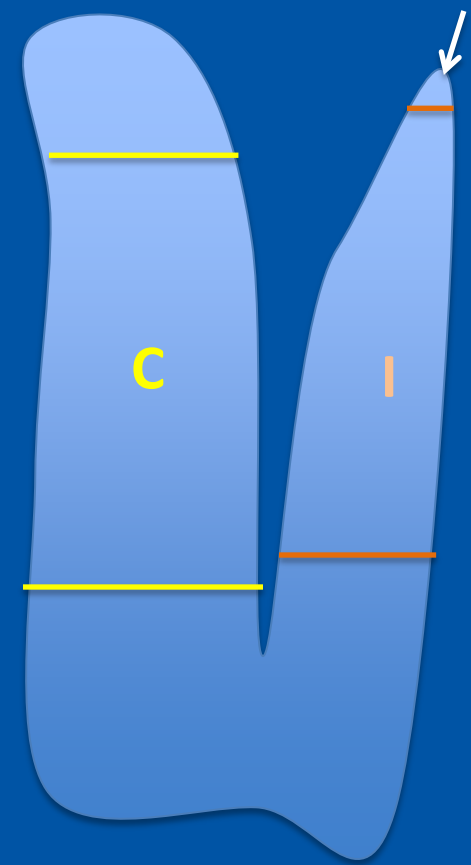
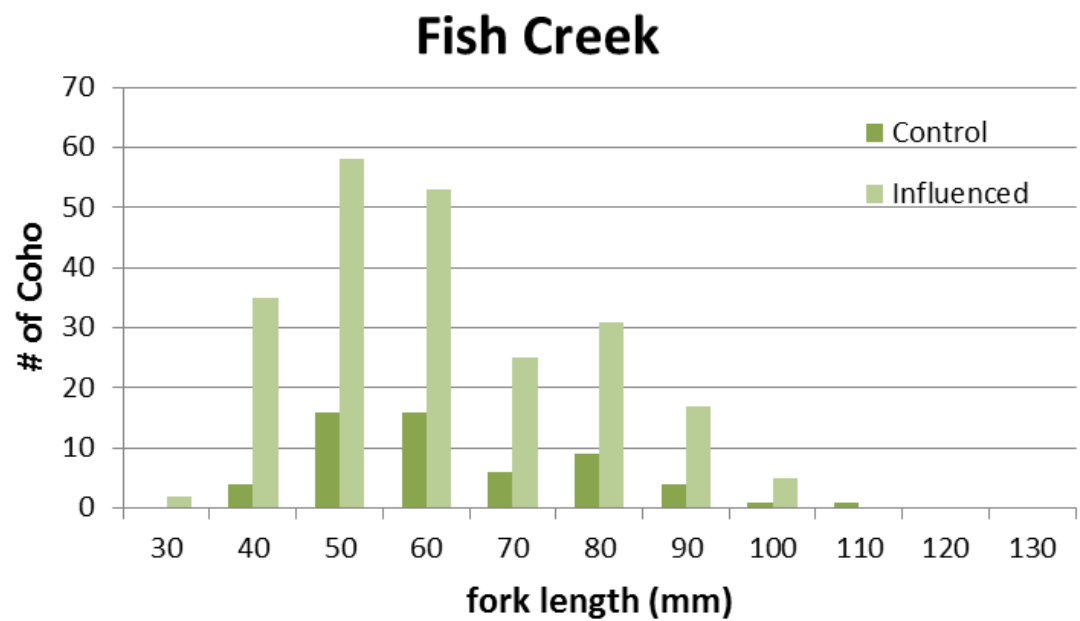
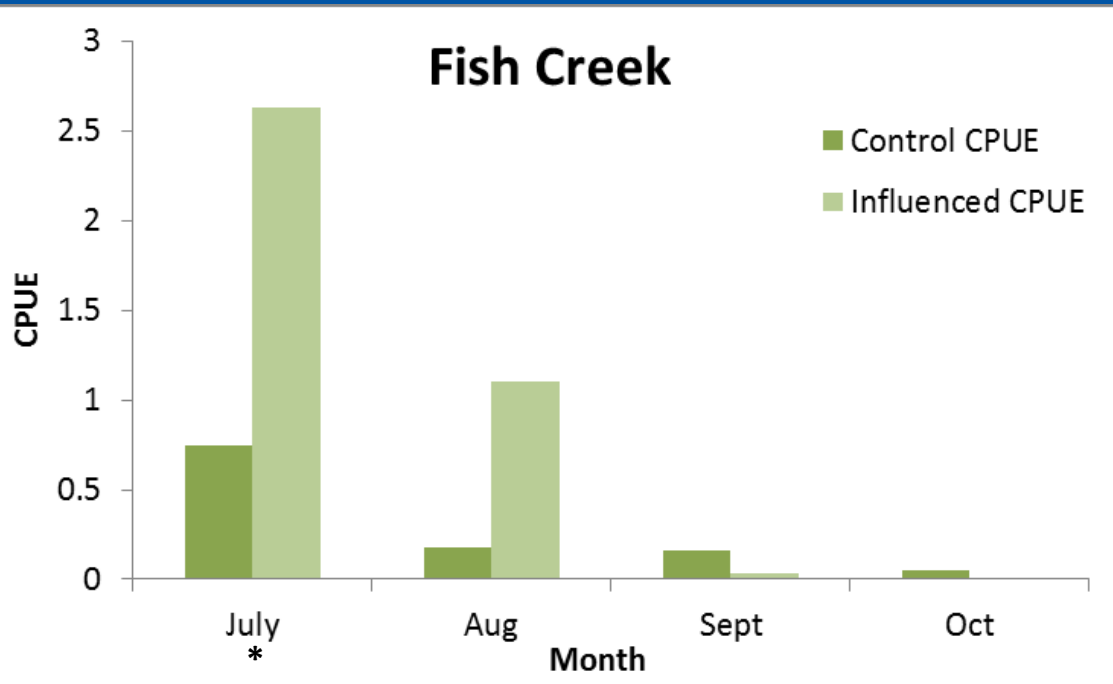
Herkimer Creek





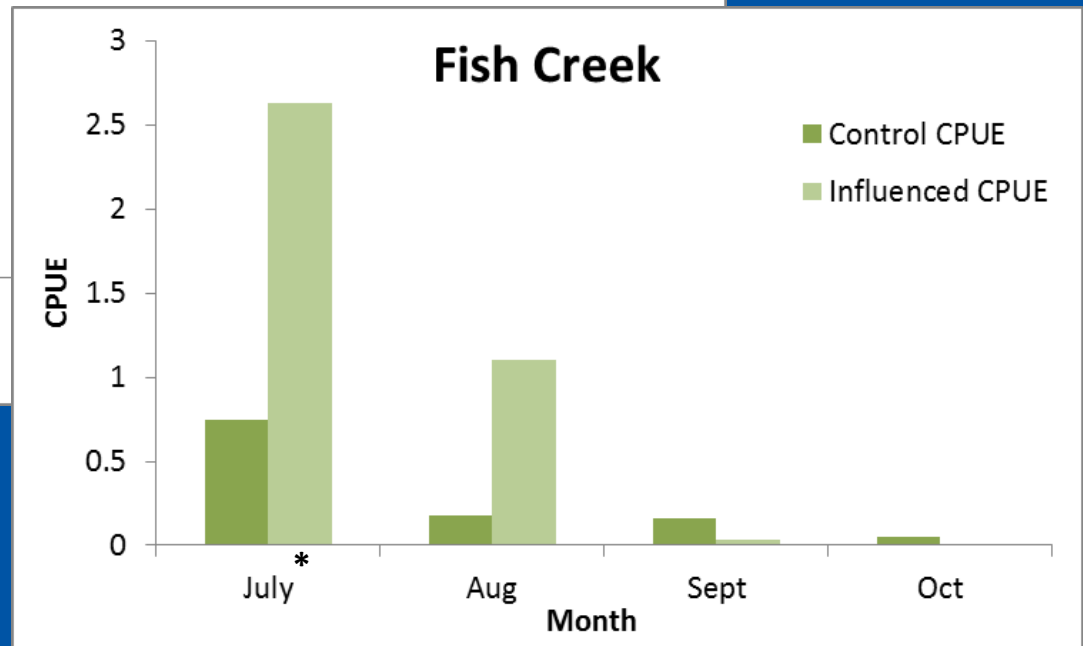
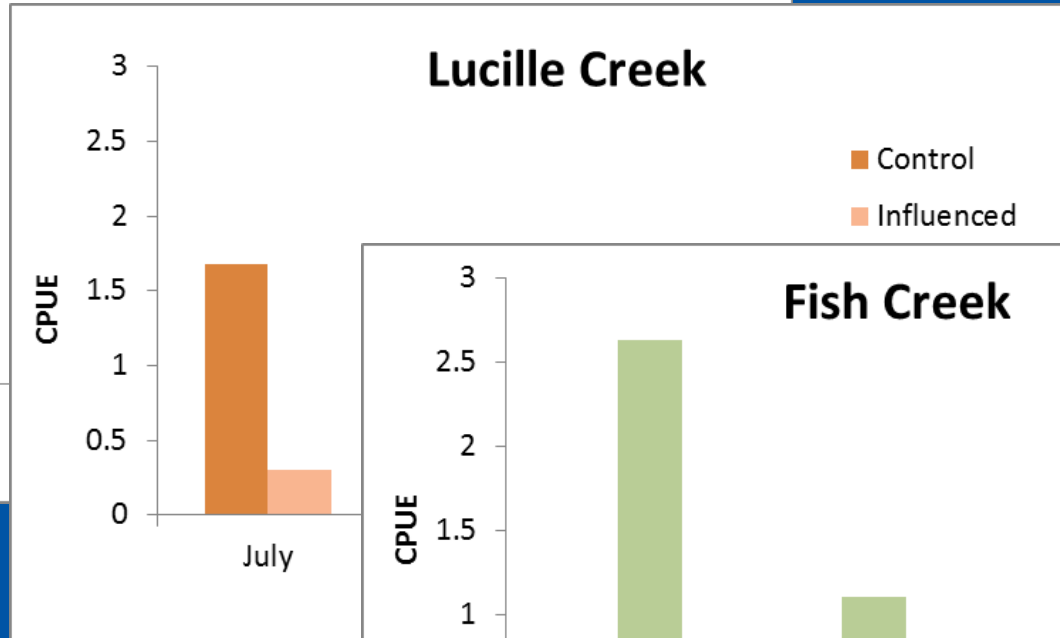
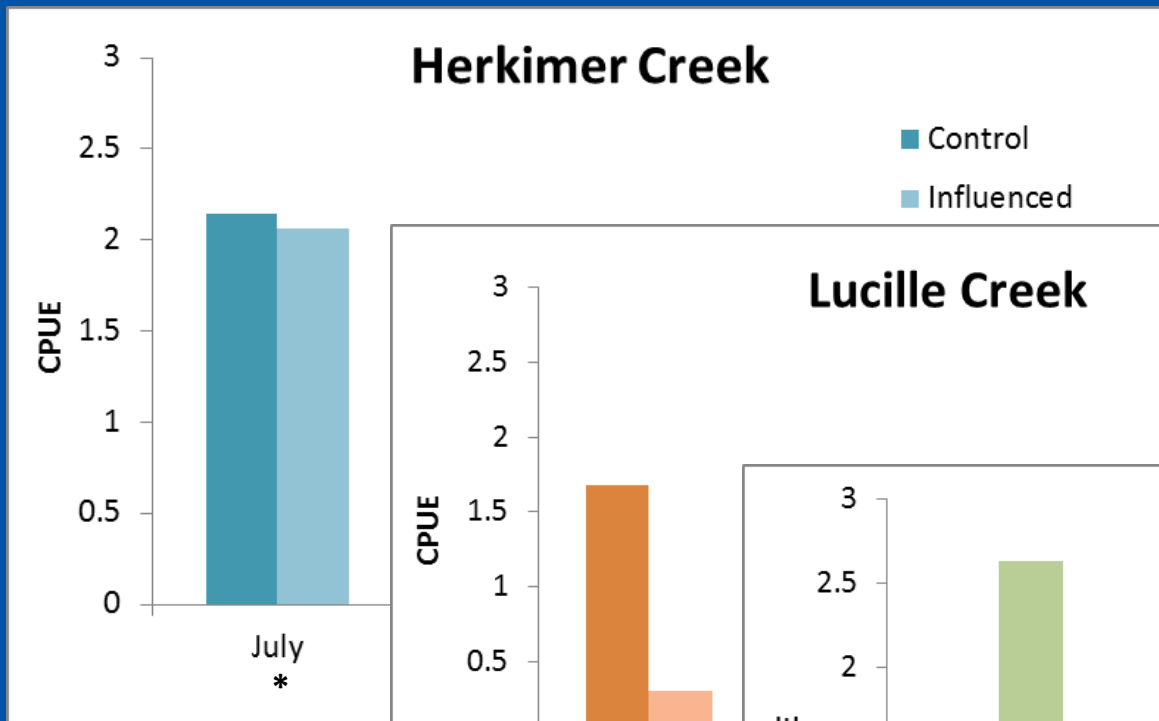
Lucille Creek





Fish Creek





? juvenile Coho salmon preferentially select main stem habitats influenced by cold water inputs



Next Steps



temperature assessment
habitat data analysis
macroinvertebrate sample processing } ongoing

By documenting salmon use of habitats influenced by these cold water inputs, we gain a better understanding of how to ensure protection of key habitat that is essential to ensure healthy, sustainable salmon populations in the Big Lake basin.

Based on our final analysis we will provide Great Land Trust a parcel-level prioritization of key habitats based on the thermal imagery as well as fish abundance data.

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Photo credit: USFWS/Katrina Mueller



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State and federal agencies to map and protect cold water refuges for fish

We need look no further than last summer's tragic salmon deaths in the Columbia River system to know temperature is a serious problem for salmon," said EPA's Dennis McLerran. "We know that Climate Change means higher river temperatures need to be factored into our planning. By locating, documenting and protecting cool water refuges for fish, we can help give endangered salmon and trout a fighting chance.

during the summer, and will likely become increasingly important with climate change.

"Cold water is the lifeblood of these fish we are all working so hard to protect," said Will Stelle, West Coast Regional Administrator of NOAA Fisheries. "But that critical lifeblood is under threat from many factors, including climate change. We applaud the commitment by EPA and Oregon DEQ to work hard on behalf of salmon by mapping and restoring these essential cold water refugia."

The agreement between DEQ, EPA and NOAA Fisheries to identify and protect cold water refugia comes as part of today's release of a NOAA Fisheries biological opinion reviewing Oregon's water temperature standard, including the temperature criterion of 68 degrees Fahrenheit for the lower Willamette and Columbia rivers. The biological opinion examined whether the standards adopted by the state under the Clean Water Act sufficiently protect salmon, steelhead, eulachon, green sturgeon and Southern Resident killer whales – all species listed under the Endangered Species Act.