

Linking physical habitat characteristics to Chinook spawning distribution in the Yakima River

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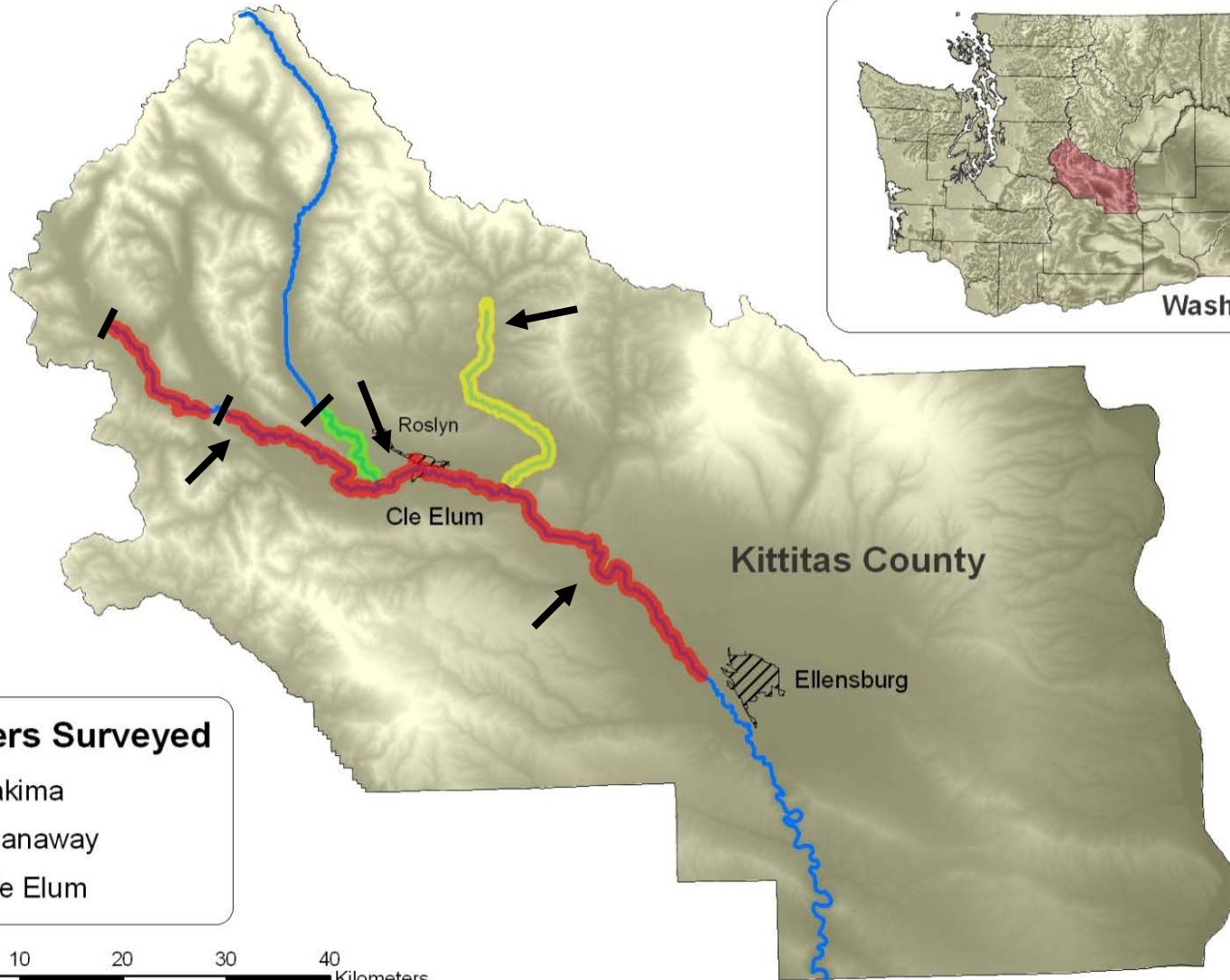
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Yakima River

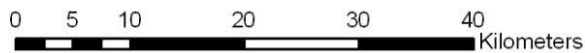
- **Habitat degradation:**
 - Dams and irrigation canals
 - Bank armoring
 - High temperatures in downstream reaches
 - Invasive species
- **Restoration action:**
 - Supplementation in 1997
 - Acclimation facilities to extend spawning distribution

Study Area



Rivers Surveyed

-  Yakima
-  Teanaway
-  Cle Elum



Objectives

- **Develop and evaluate extensive survey methods for lotic habitat and fishes**
- **Relate physical habitat to spawning site selection and homing by wild- and hatchery-origin salmon**
- **Link community structure of resident fishes to habitats associated with salmon spawning distribution**

Methods

- **Extensive habitat and snorkel survey (2007)**
- **Intensive survey (2008)**
- **Carcass and redd surveys (2002 – 2008)**
- **Depth and temperature profiling (2009)**

Extensive survey September 2007

- Channel type (1,2,3)
- Unit type (PO,GP,GR, RI)
- Channel width
- Depth
- Substrate
- Cover
- Wood
- Fish abundance



Survey summary

140 km mainstem

20 km side channel

Intensive survey September – October 2008

- Gradient
- Temperature
- Conductivity
- Velocity



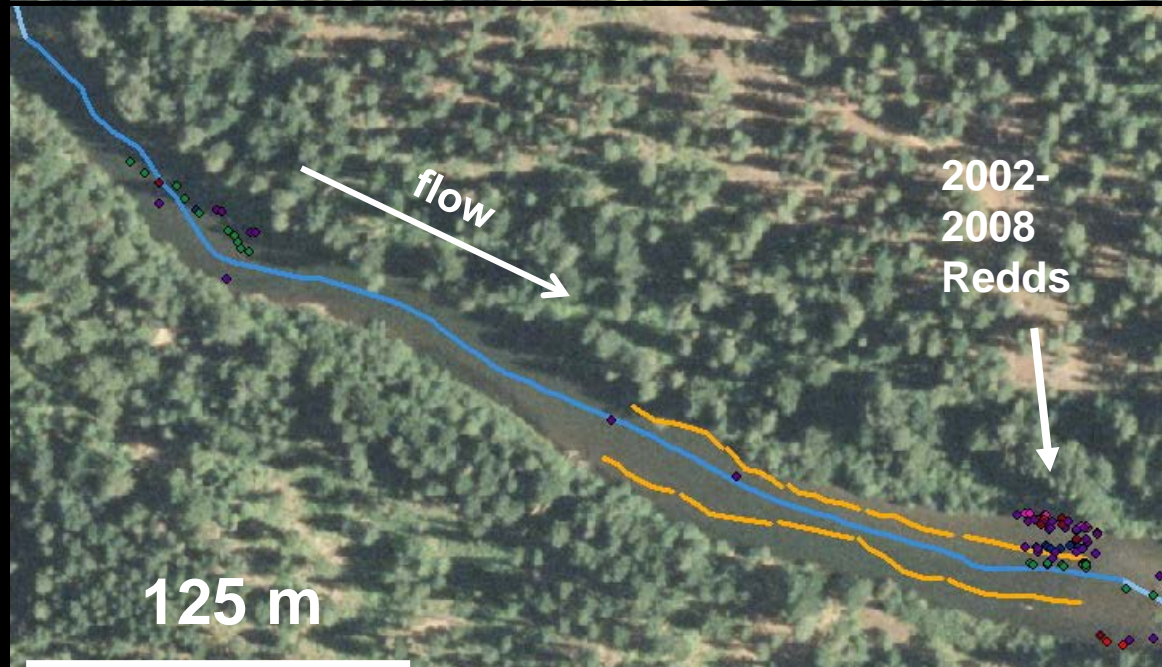
Survey summary

82 sites

.35 km²

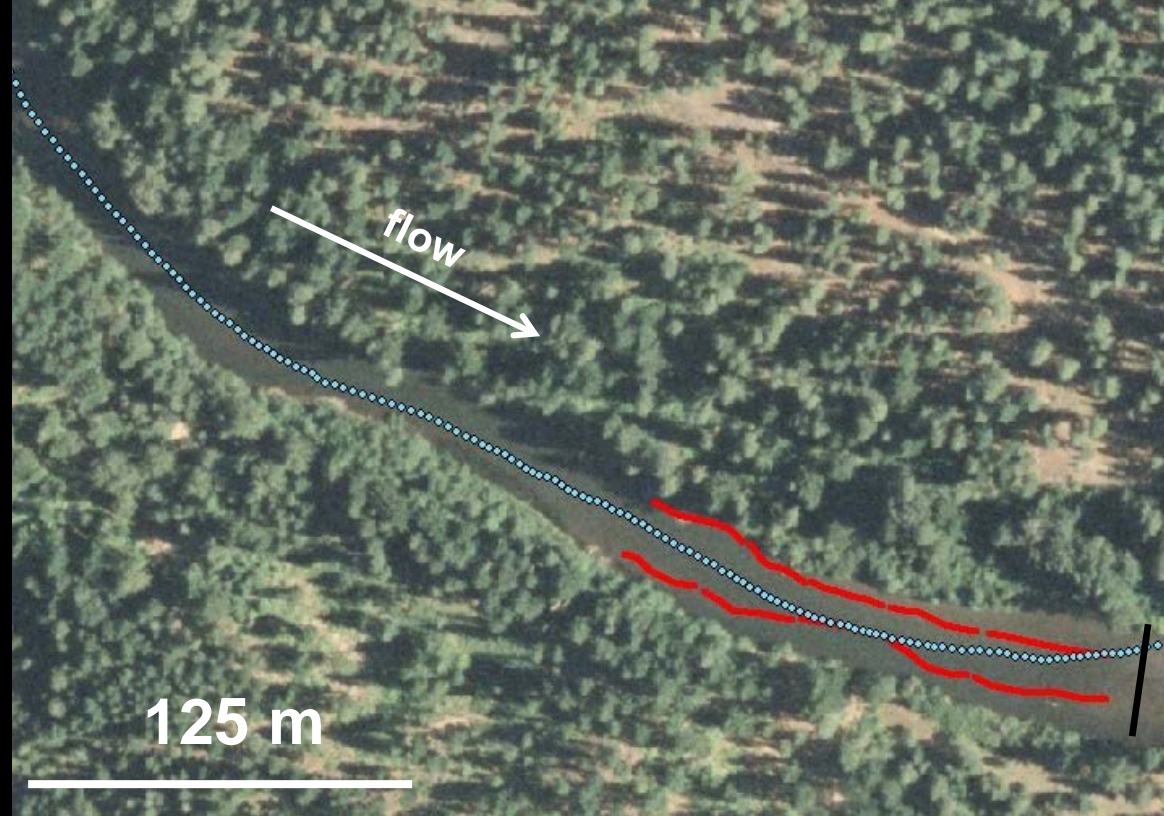
Carcass and redd surveys (2002 – 2008)

- Surveys conducted by Yakama Nation and NOAA Fisheries
 - GPS location
 - Origin (CWT)
 - Gender
 - Age class
 - Length



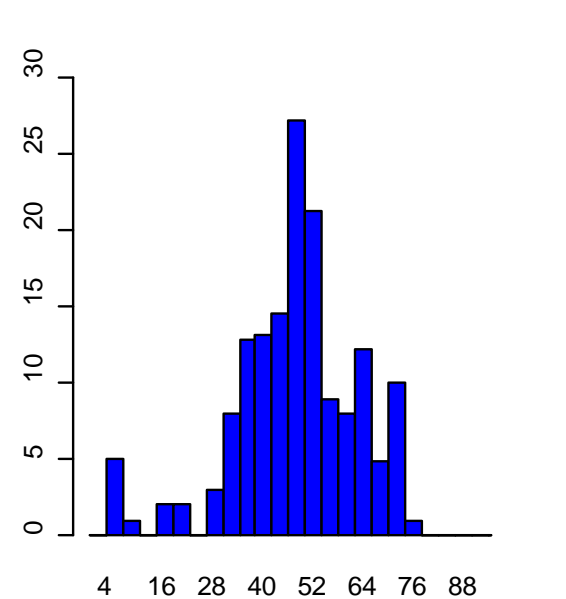
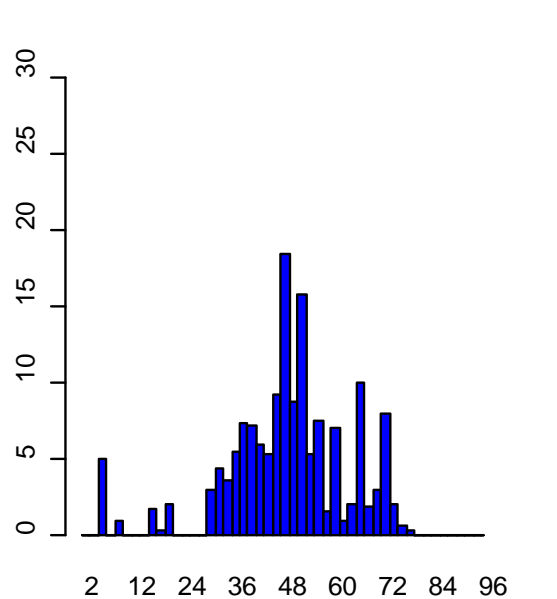
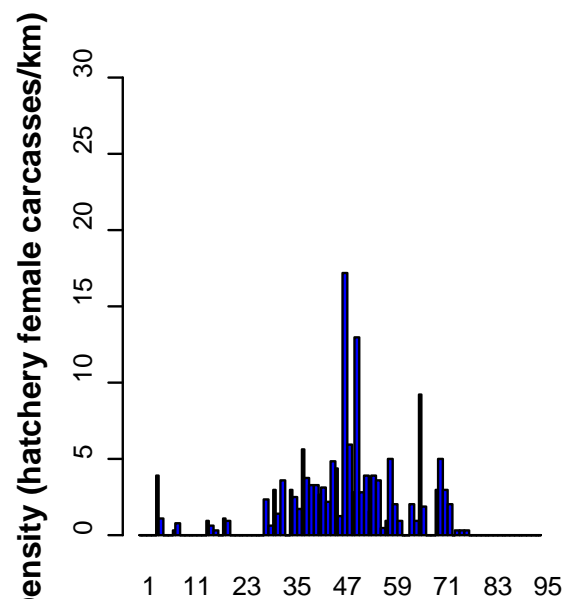
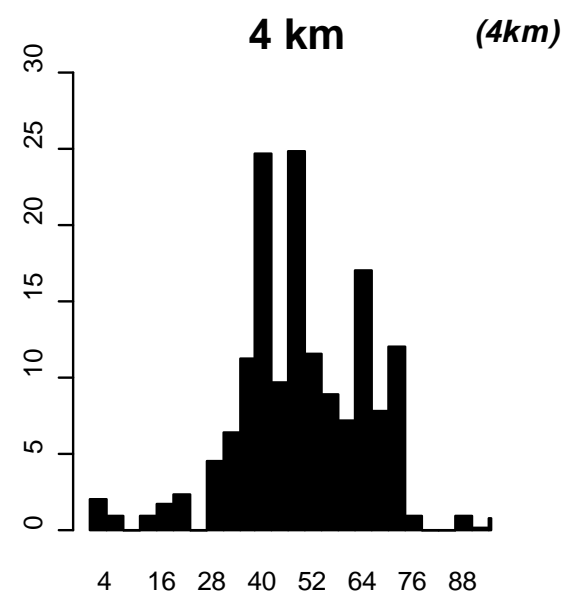
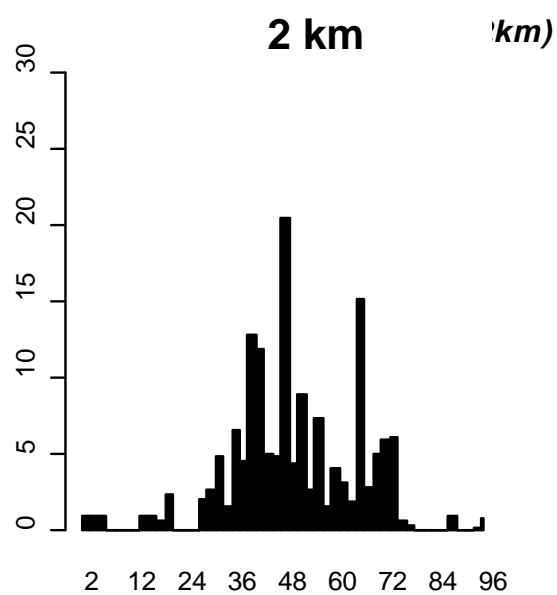
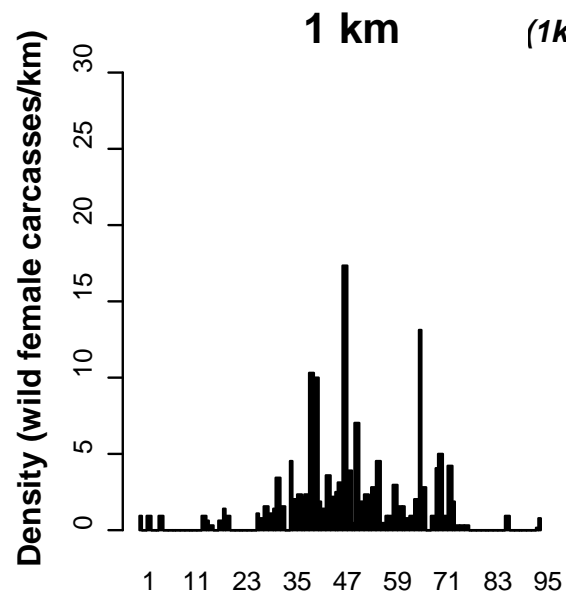
2009 (winter) – temperature and depth profiling

- Near-bottom depth and temperature logged every 2 seconds
- Merged with GPS tracklog based on time stamp



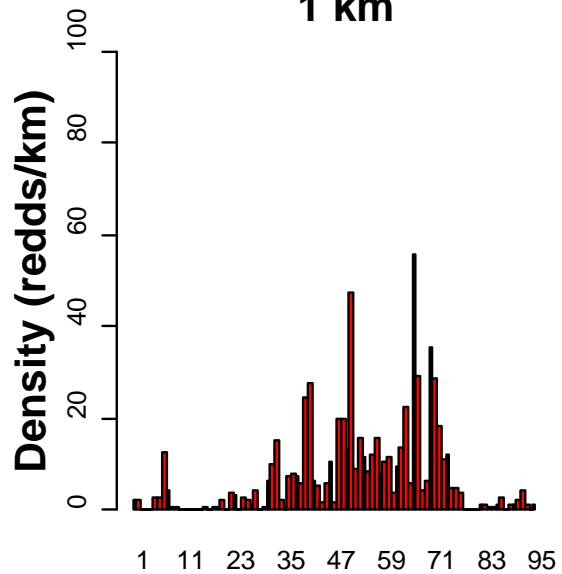
Preliminary results

- Extensive habitat and snorkel survey (2007)
- Intensive survey (2008)
- Carcass and redd surveys (2002 – 2008)
- Depth and temperature profiling (2009)

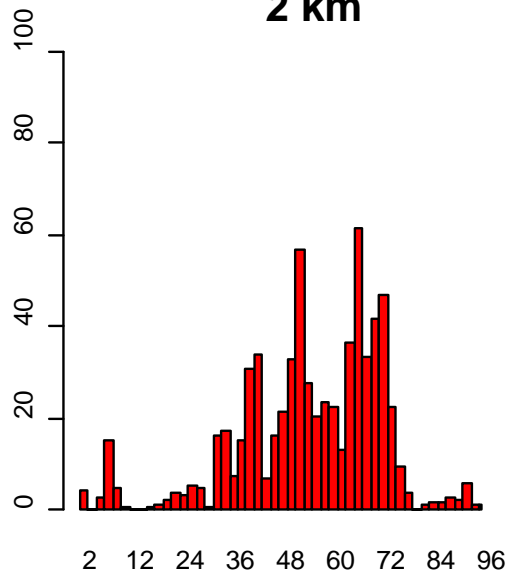


Distance upstream (km)

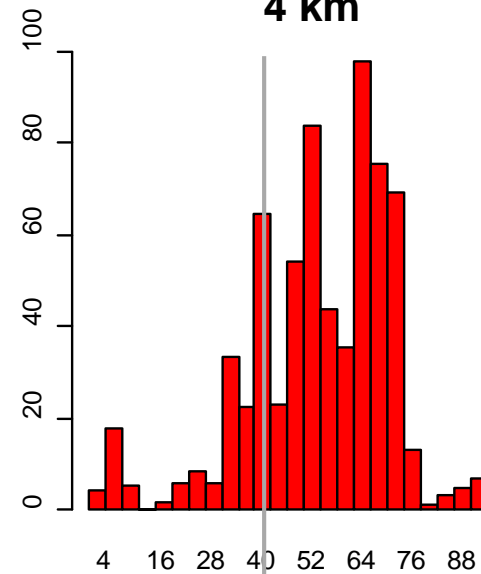
1 km



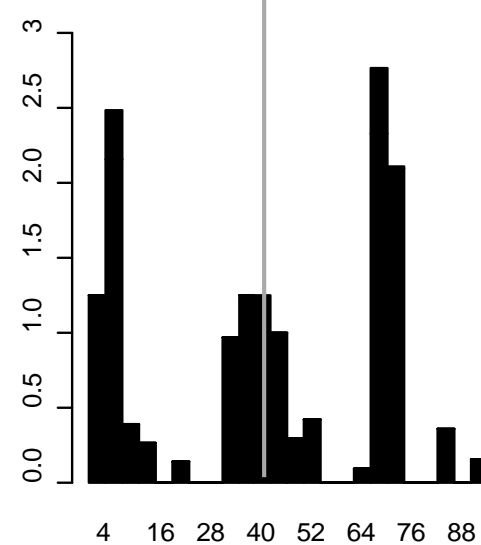
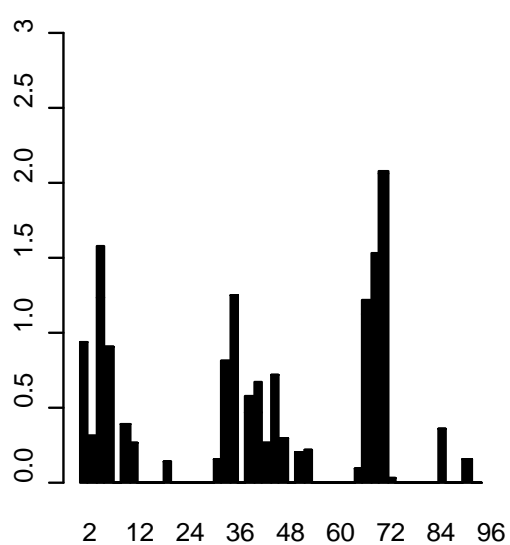
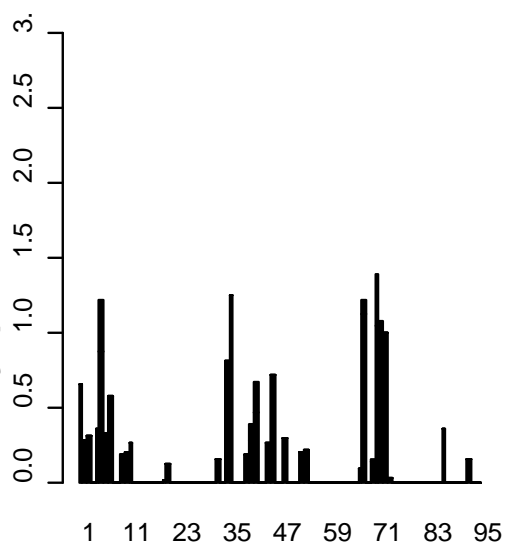
2 km



4 km



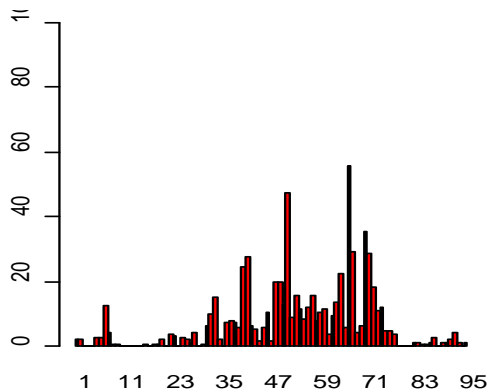
Density (side channels/km)



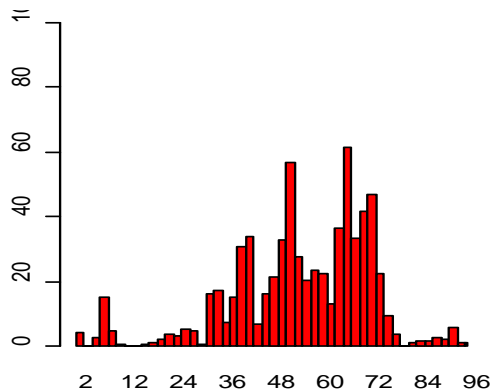
Distance upstream (km)

Density (redds/km)

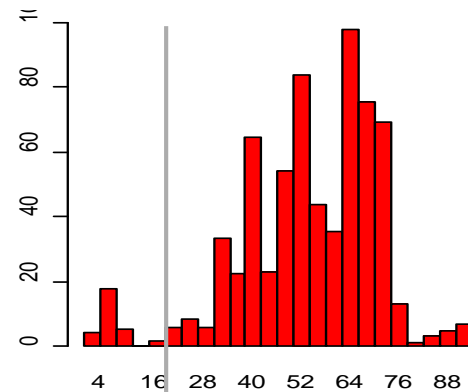
1 km



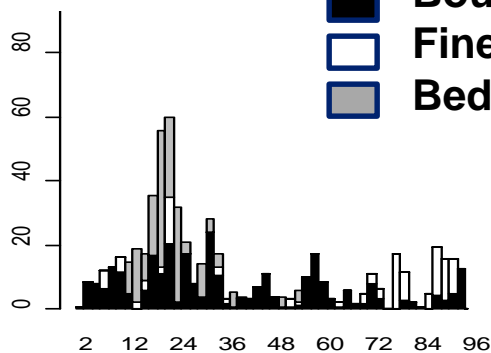
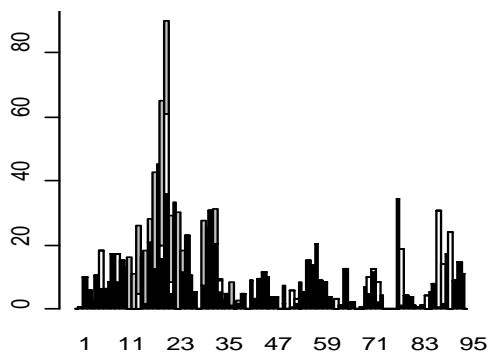
2 km



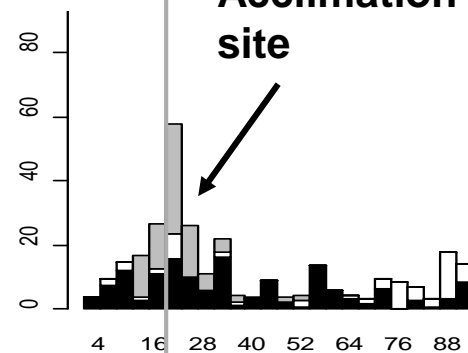
4 km



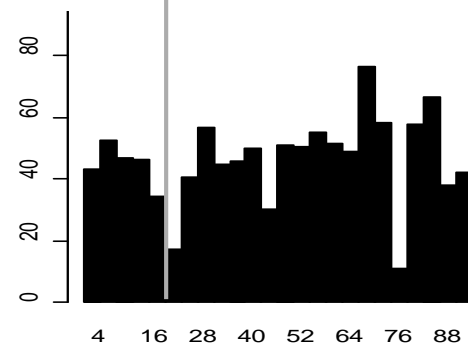
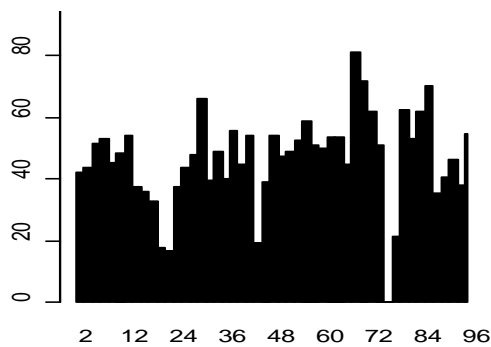
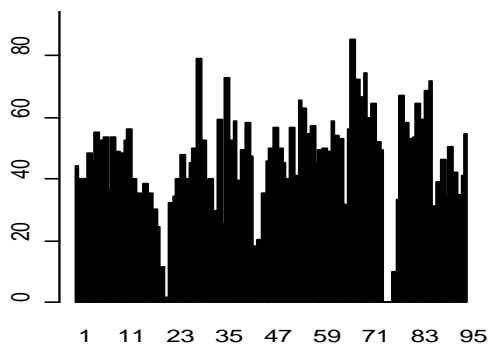
% Poor substrates



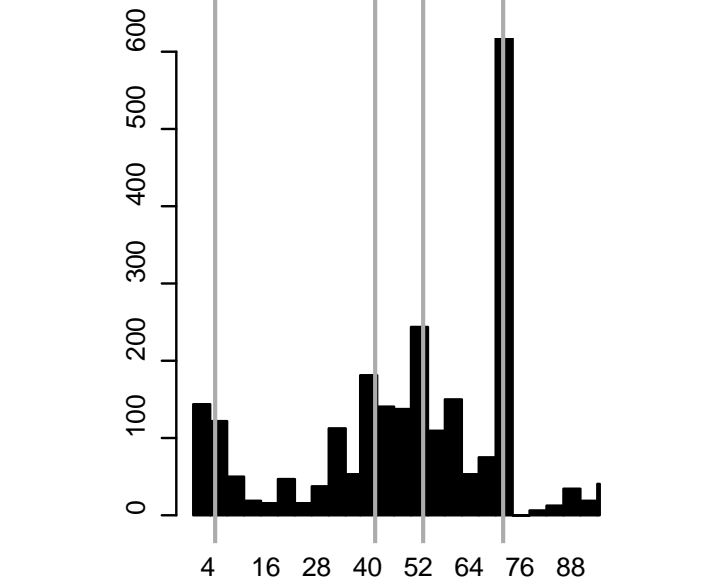
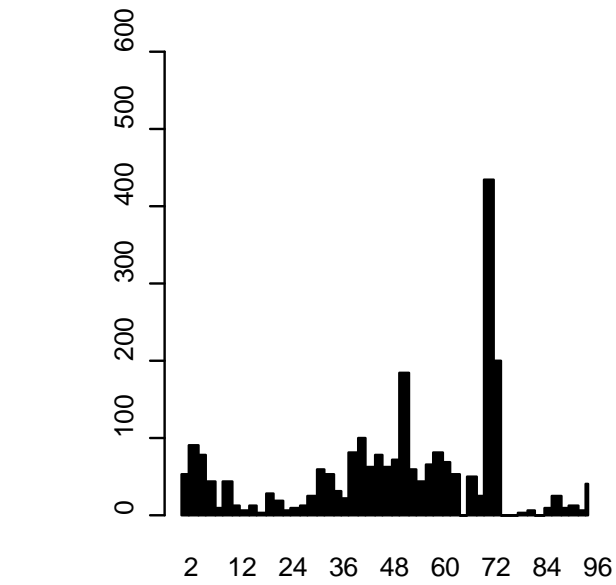
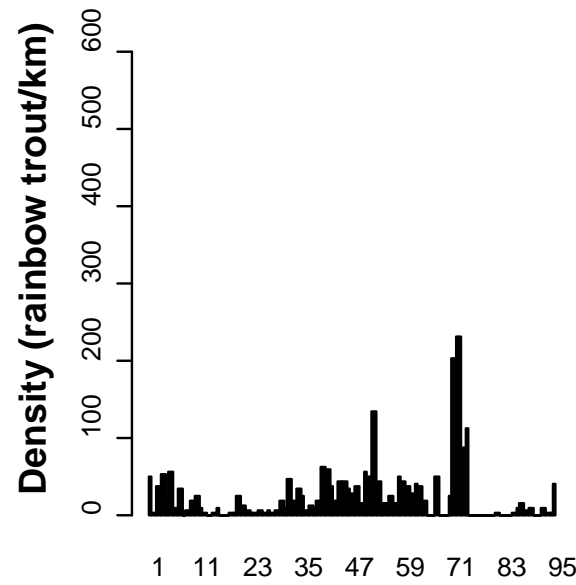
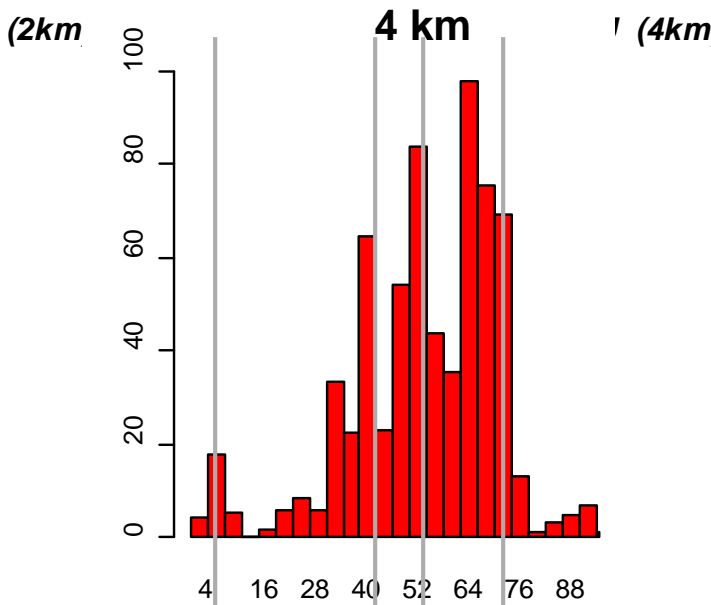
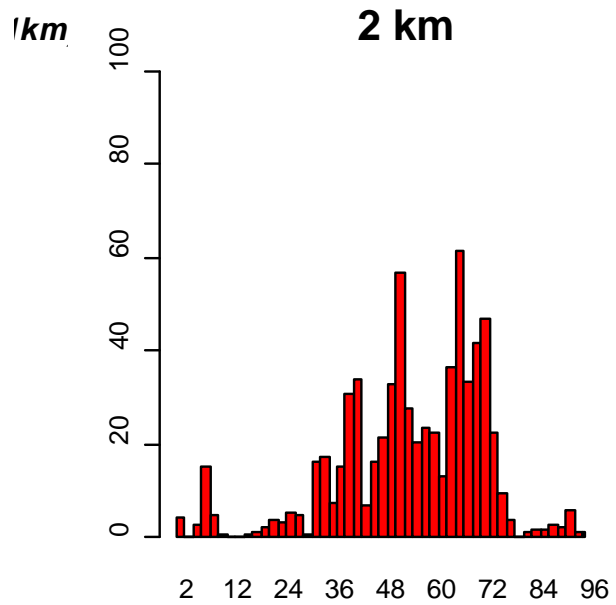
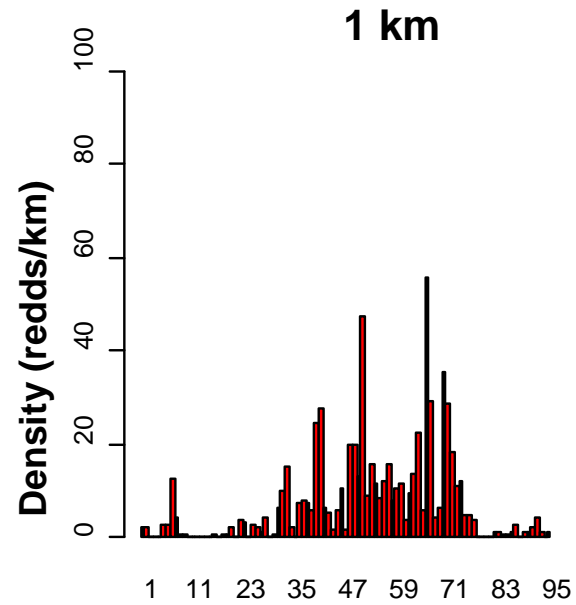
■ Boulder
□ Fines
■ Bedrock



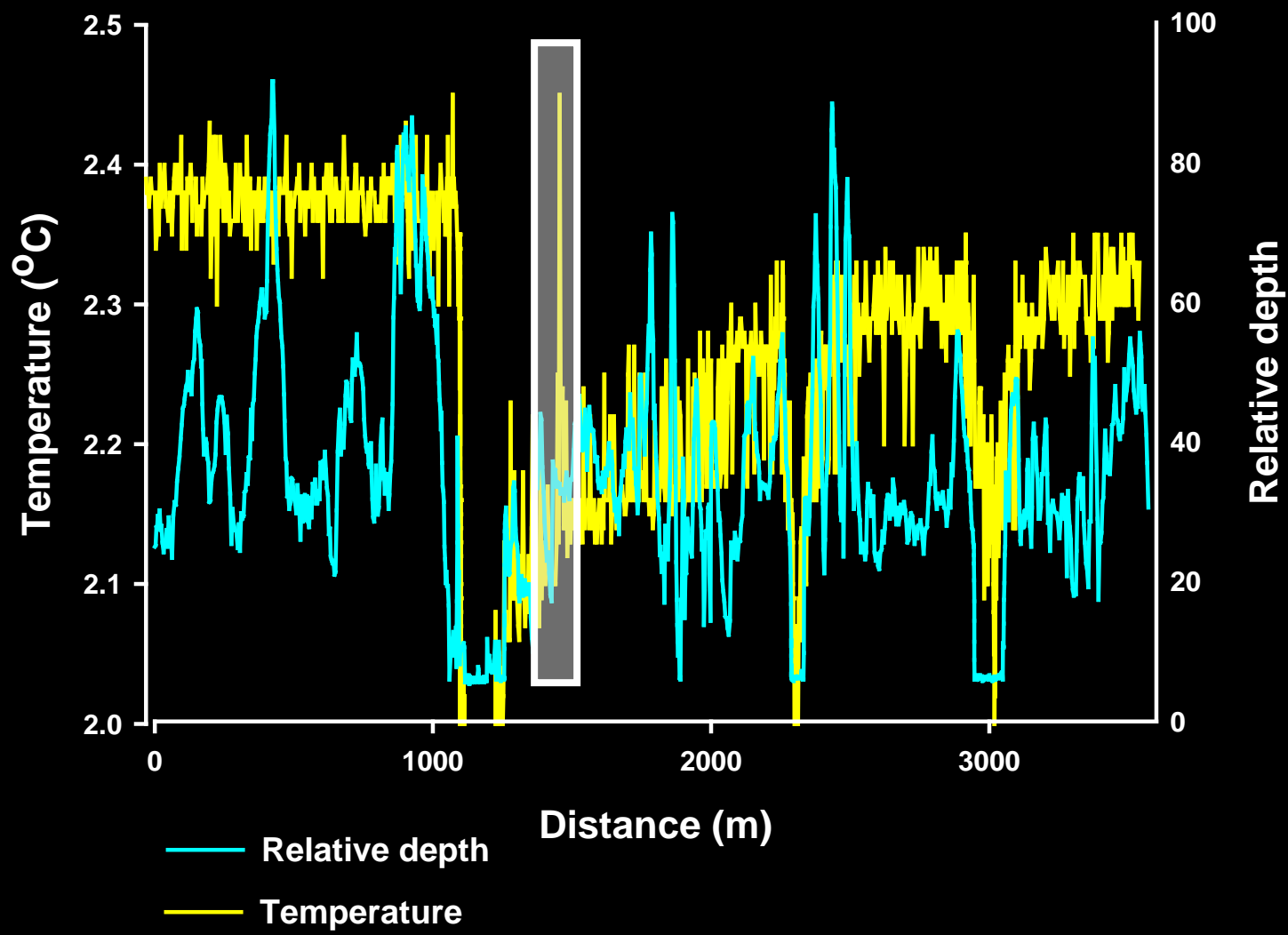
% Gravel

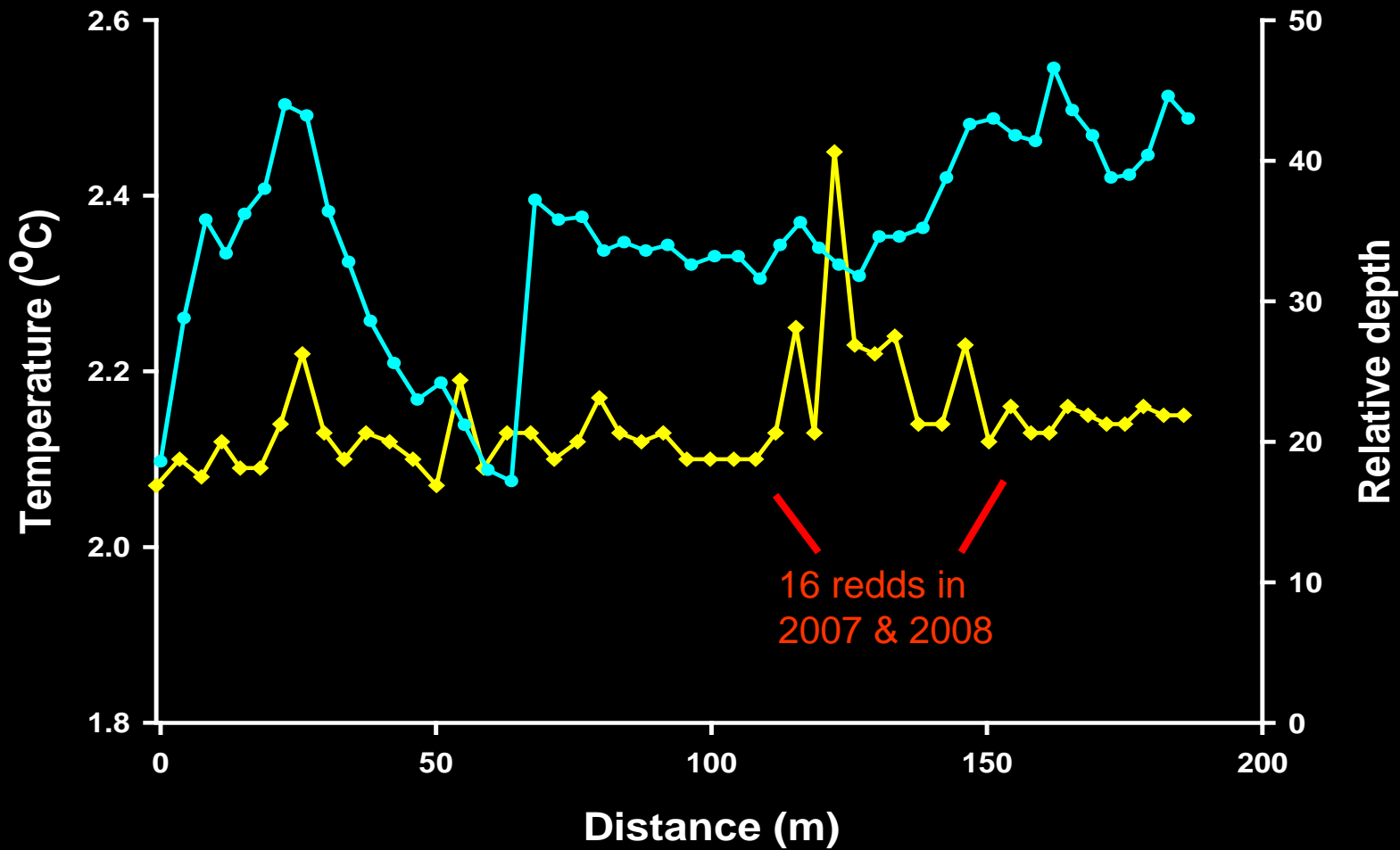


Distance upstream (km)



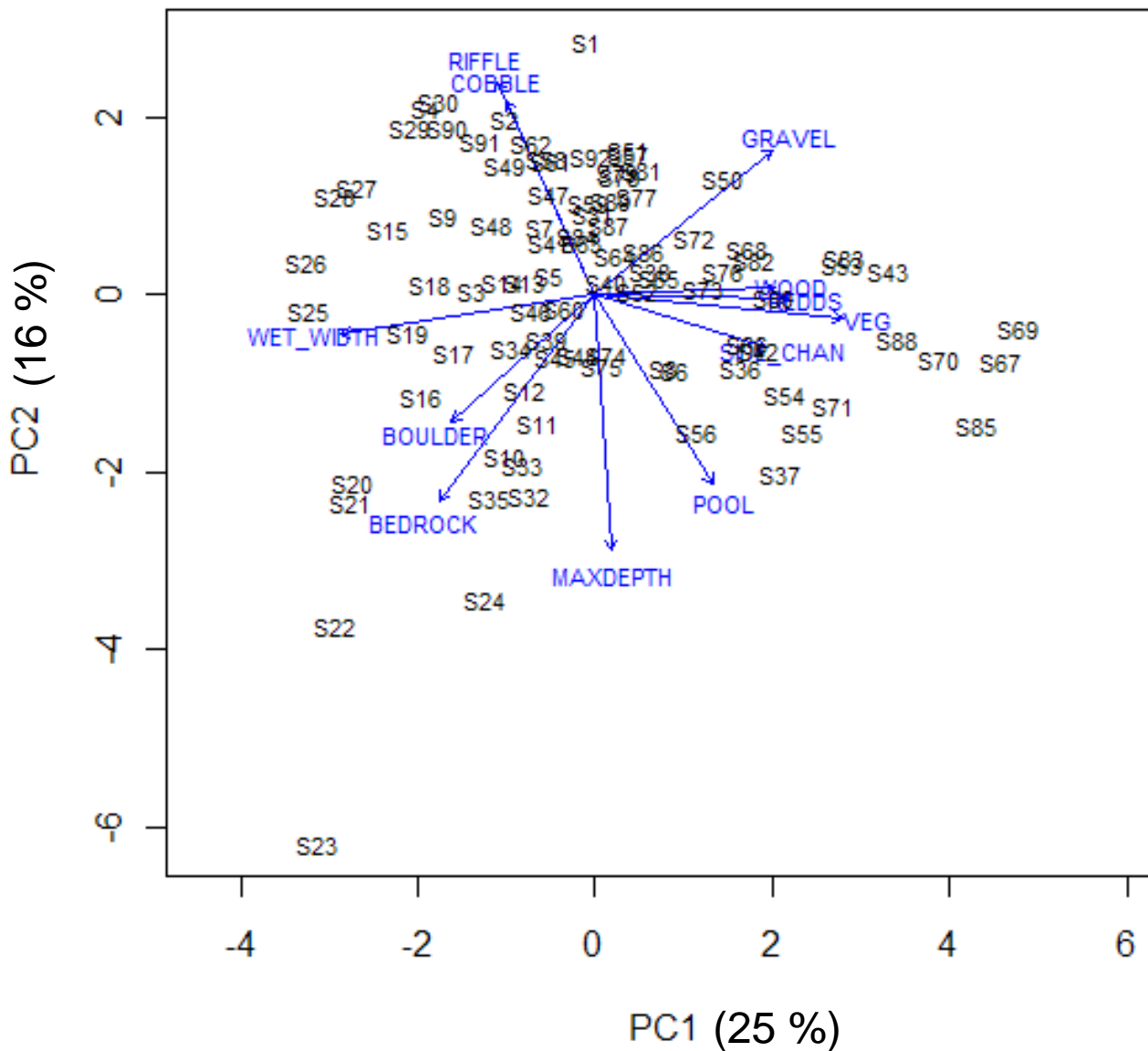
Distance upstream (km)





—●— Relative depth

—◆— Temperature



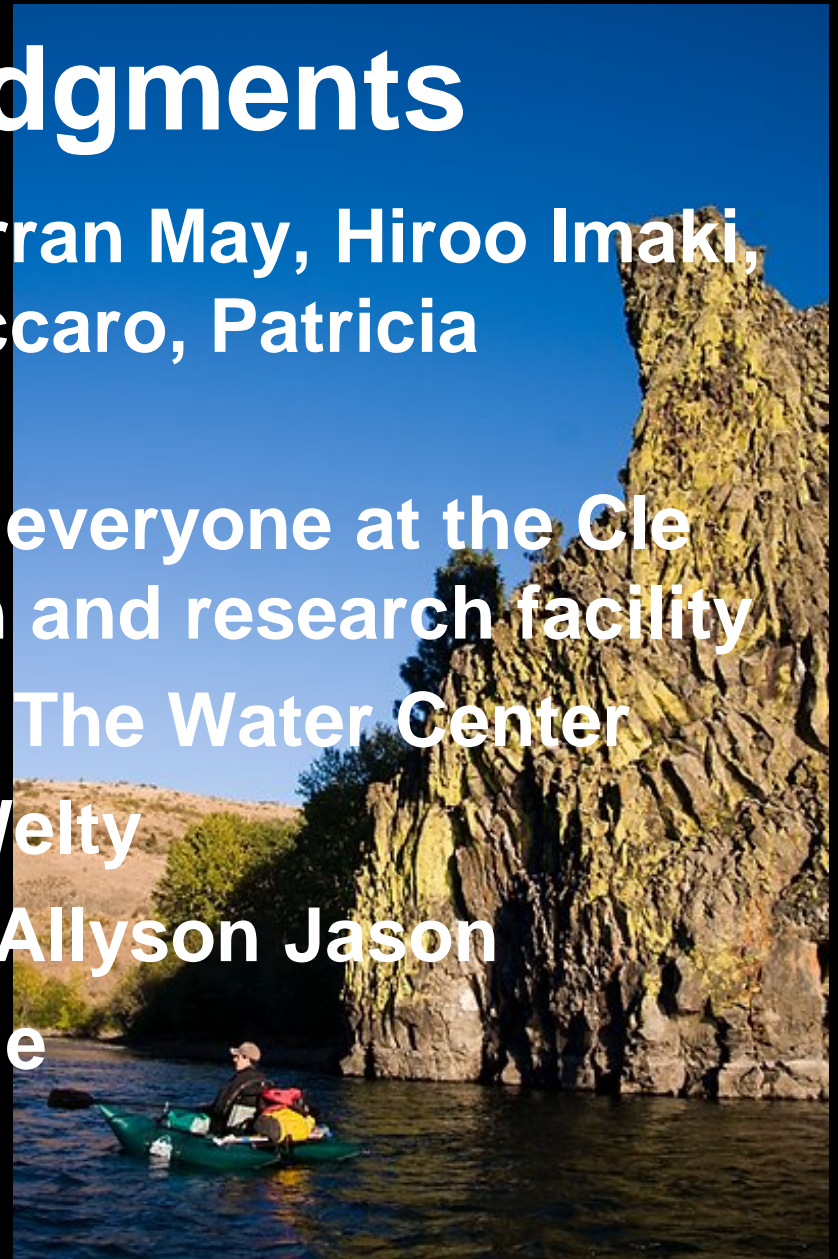
Preliminary conclusions

- Hatchery- and wild-origin Chinook have similar spawning distributions at scales ≥ 1 km
- The influence of habitat factors on spawning site selection depends on spatial scale
- Redd density is correlated with rainbow trout distribution at broad scales (4 km)



Acknowledgments

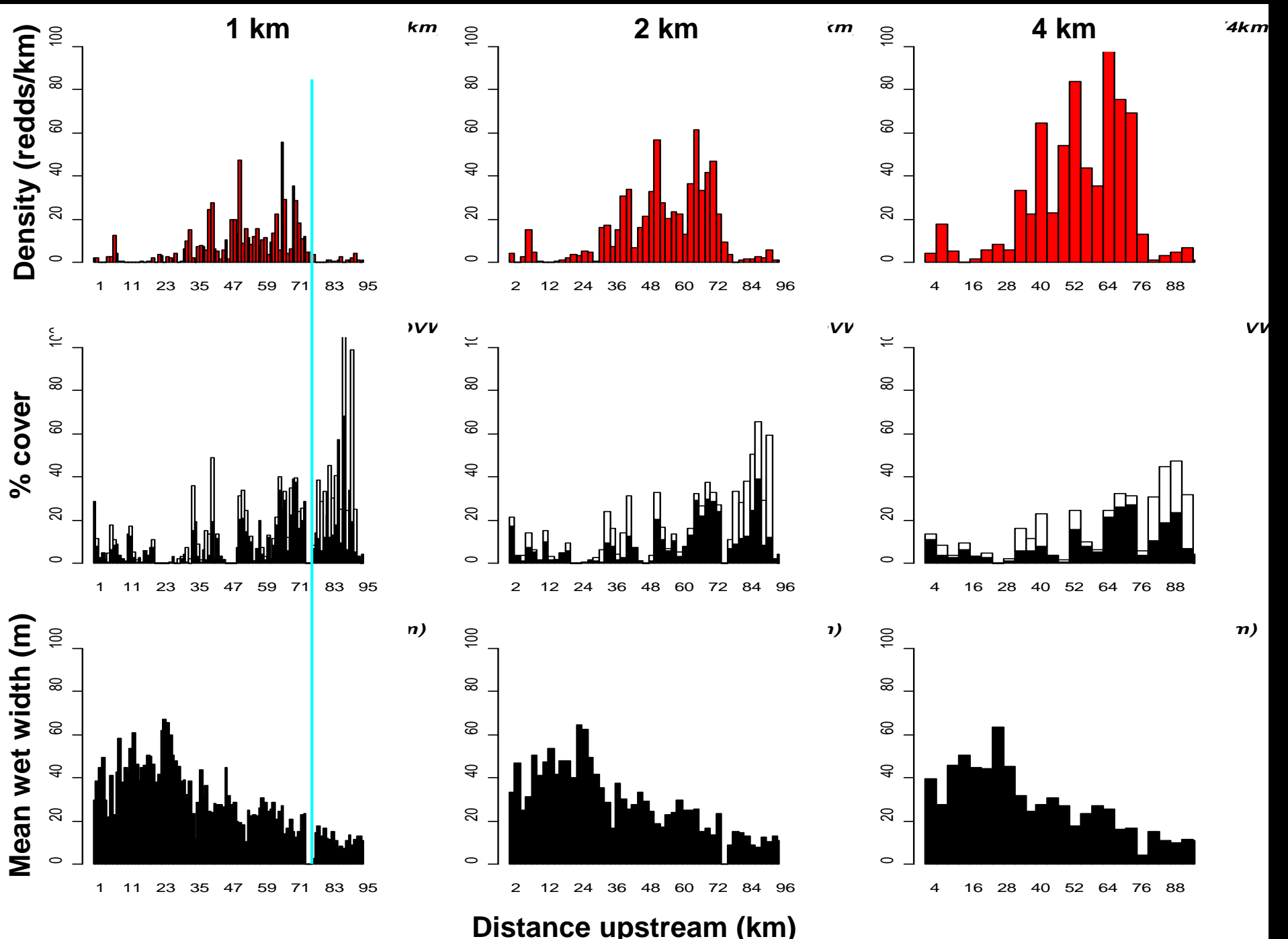
- **Logistics and GIS:** Darran May, Hiroo Imaki, Ethan Welty, John Vaccaro, Patricia Haggerty
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What's next?

- **Data analysis**
 - Extensive
 - Intensive
 - Temperature/depth profile
 - Redd/carcass distribution
 - Lidar





Redds 2007

