

Salmon spawning site selection relative to habitat conditions near acclimation facilities

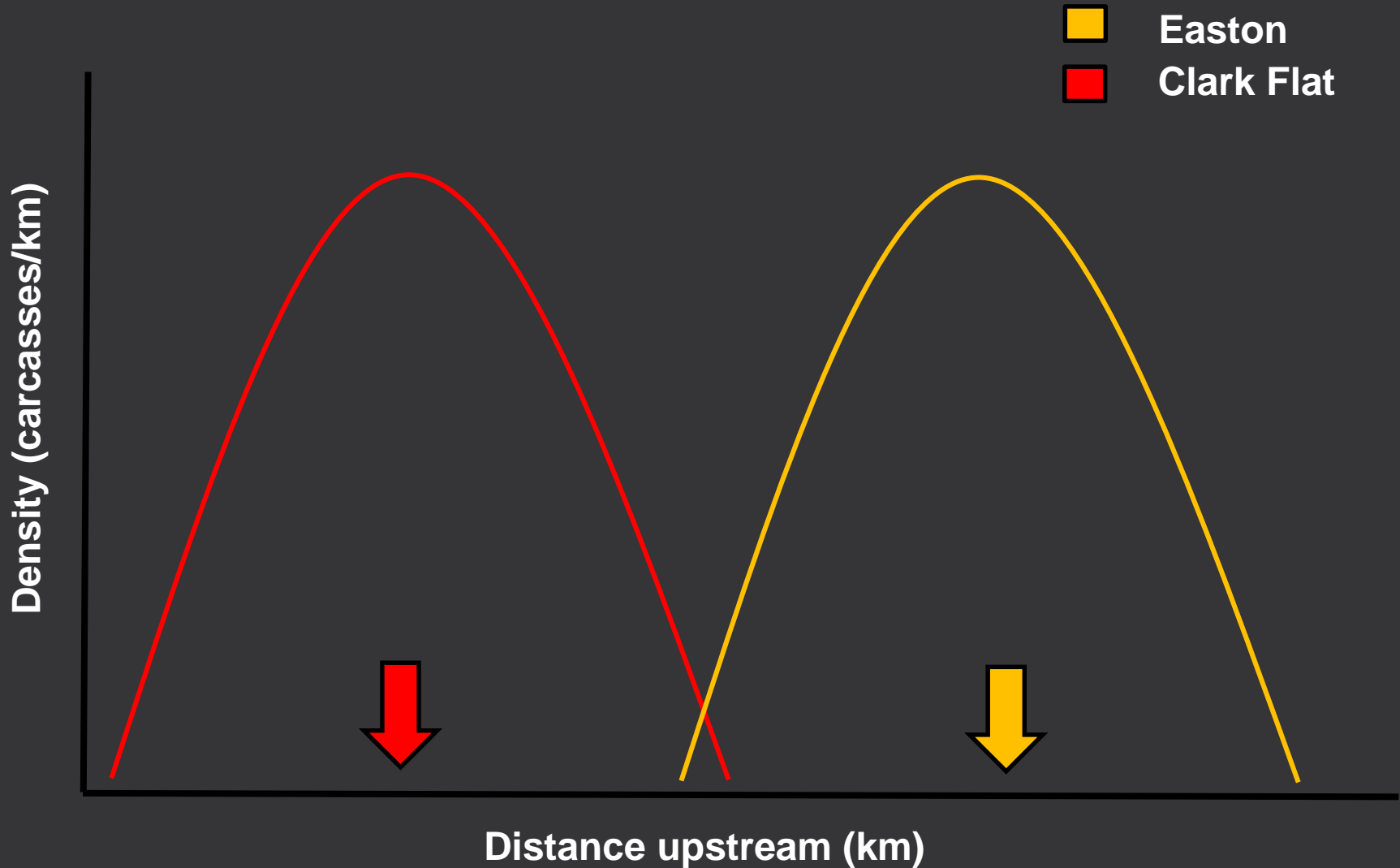
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Hypothetical spawning distribution

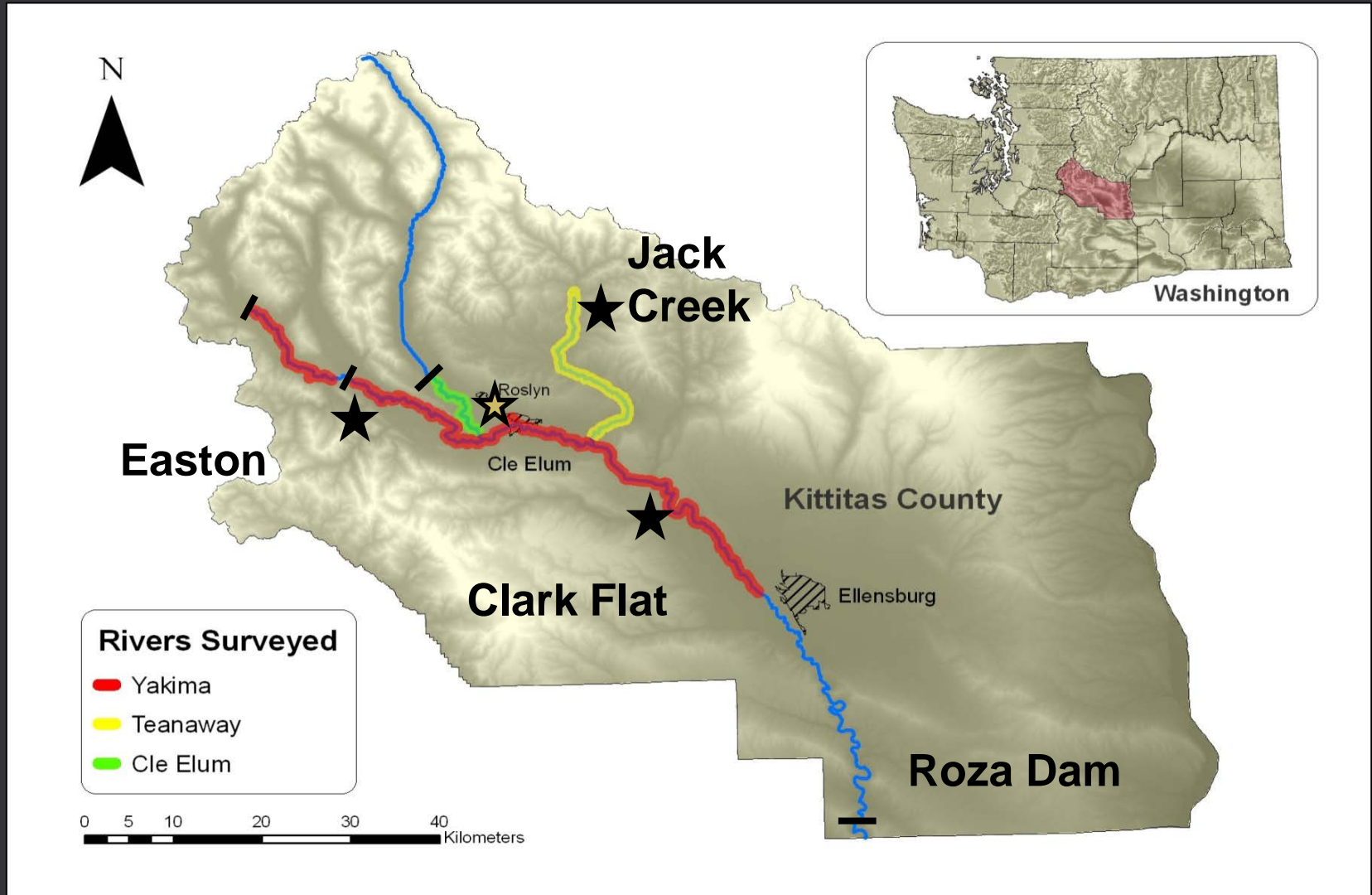


Research Questions

- ▣ How do habitat conditions compare among acclimation areas?
- ▣ If a fish spawns away from its acclimation area, is it due to habitat differences?

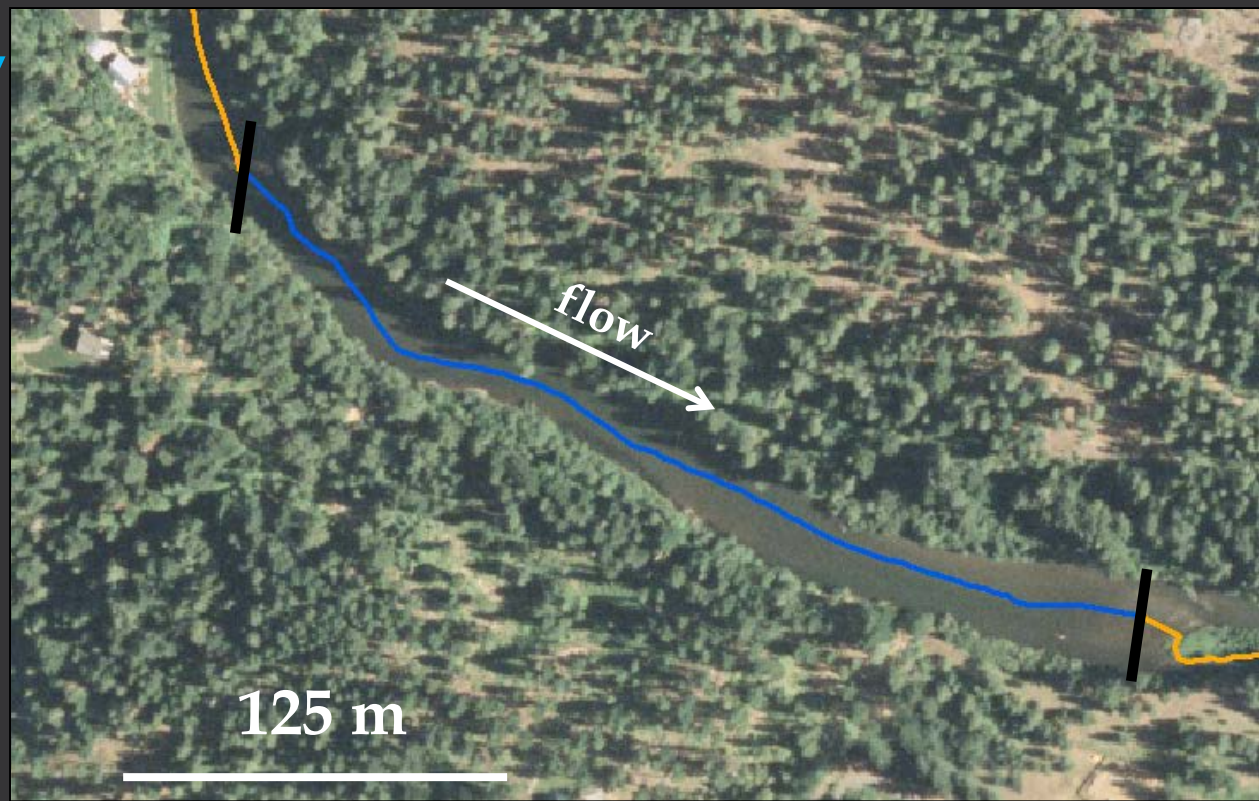


Hatchery supplementation



Extensive survey September 2007

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



Summary

97 km Yakima

31 km Teanaway

11 km Cle Elum

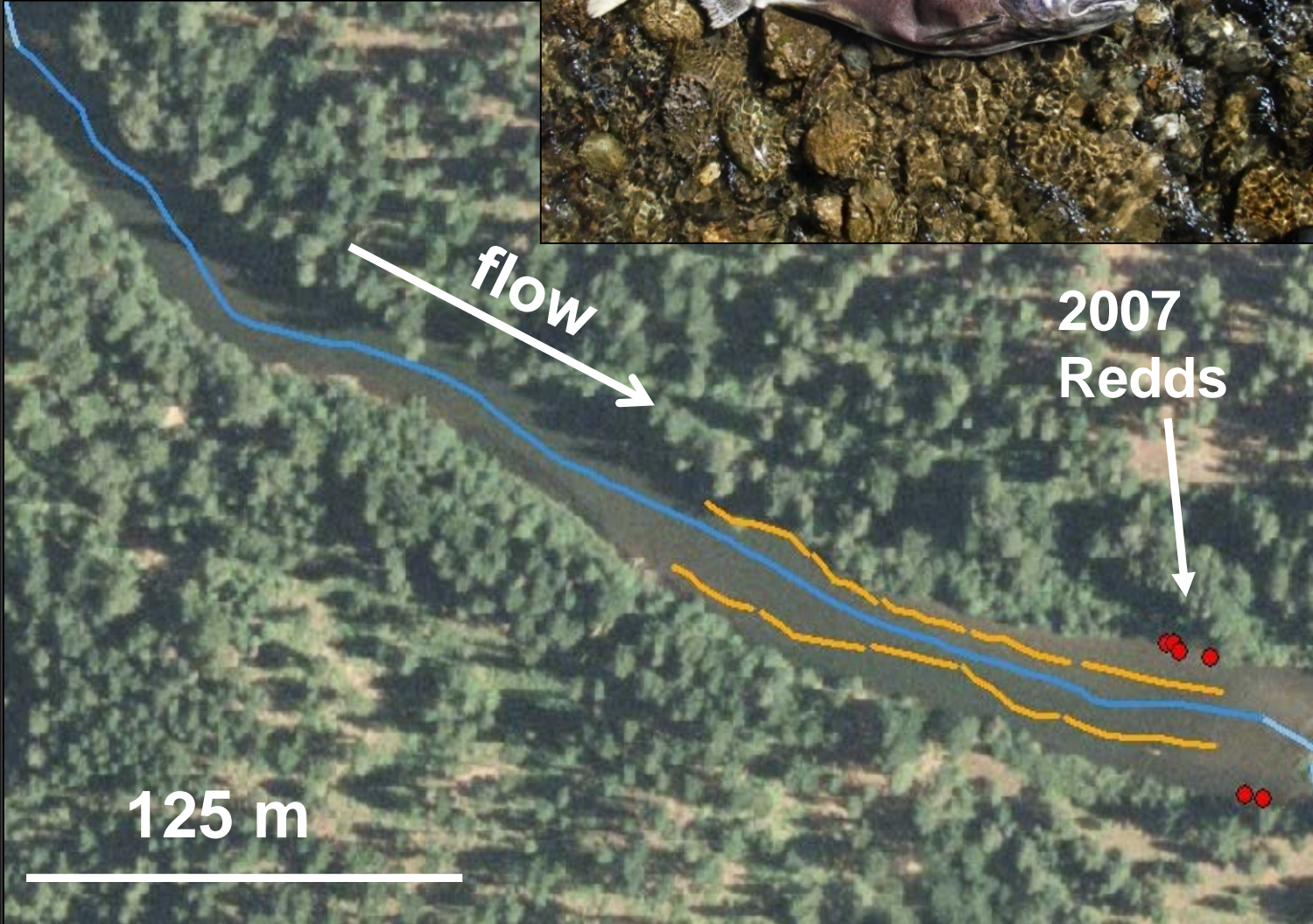
20 km side channel



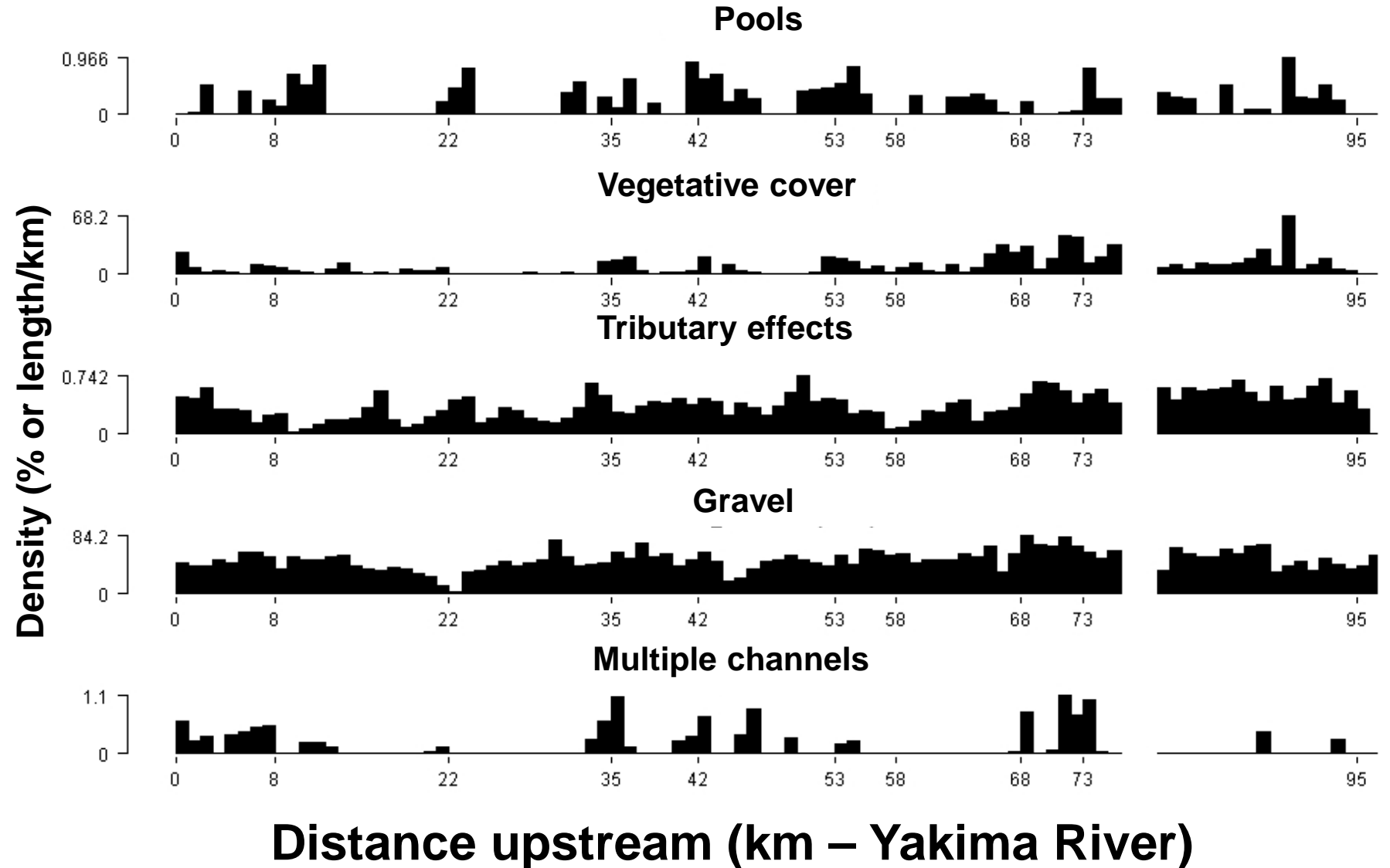
Carcass and redd surveys (2004 - 2008)

Surveys conducted by Yakama Nation and NOAA Fisheries

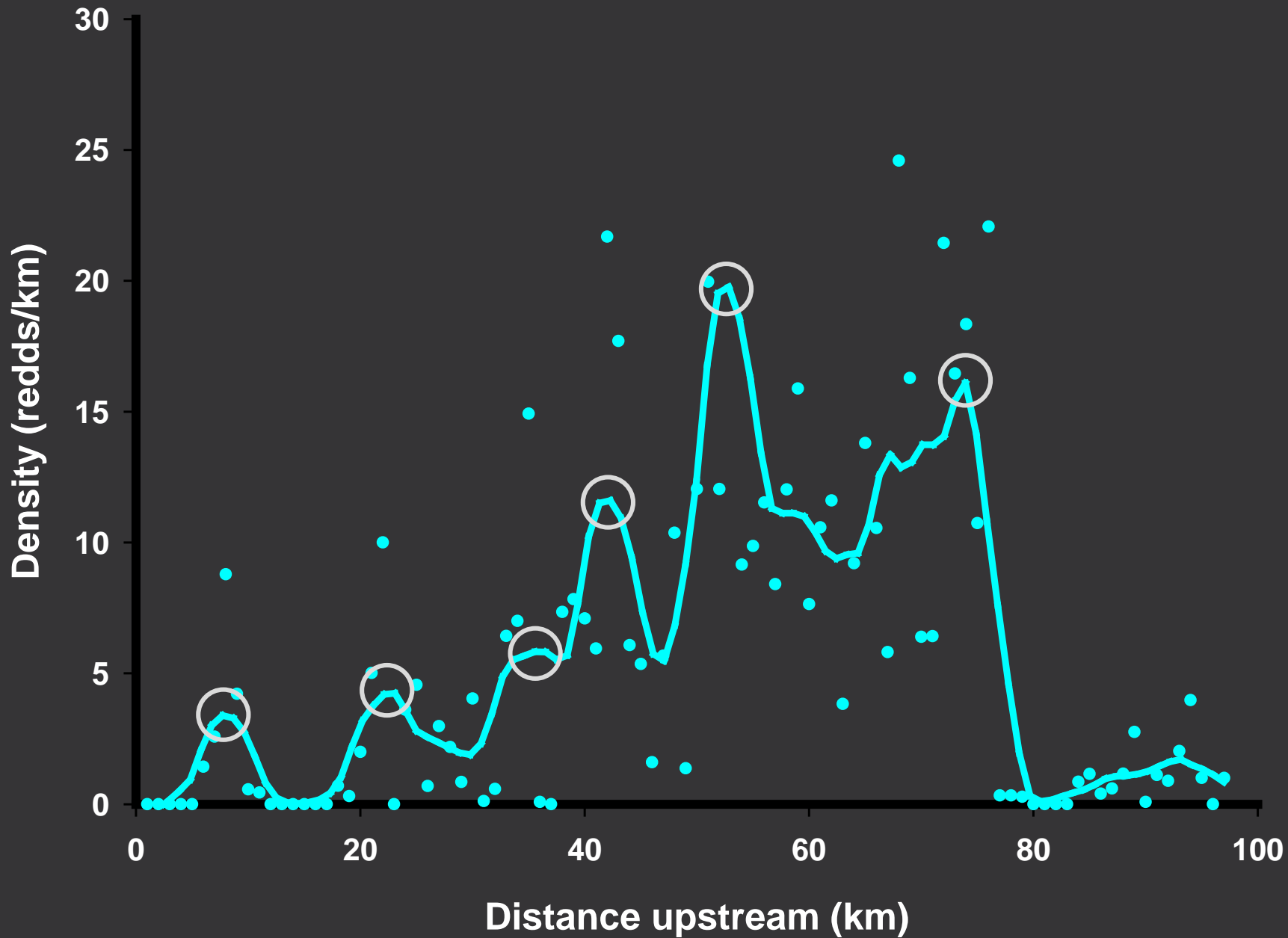
- GPS location
- Origin (CWT)
- Gender
- Age class
- Length

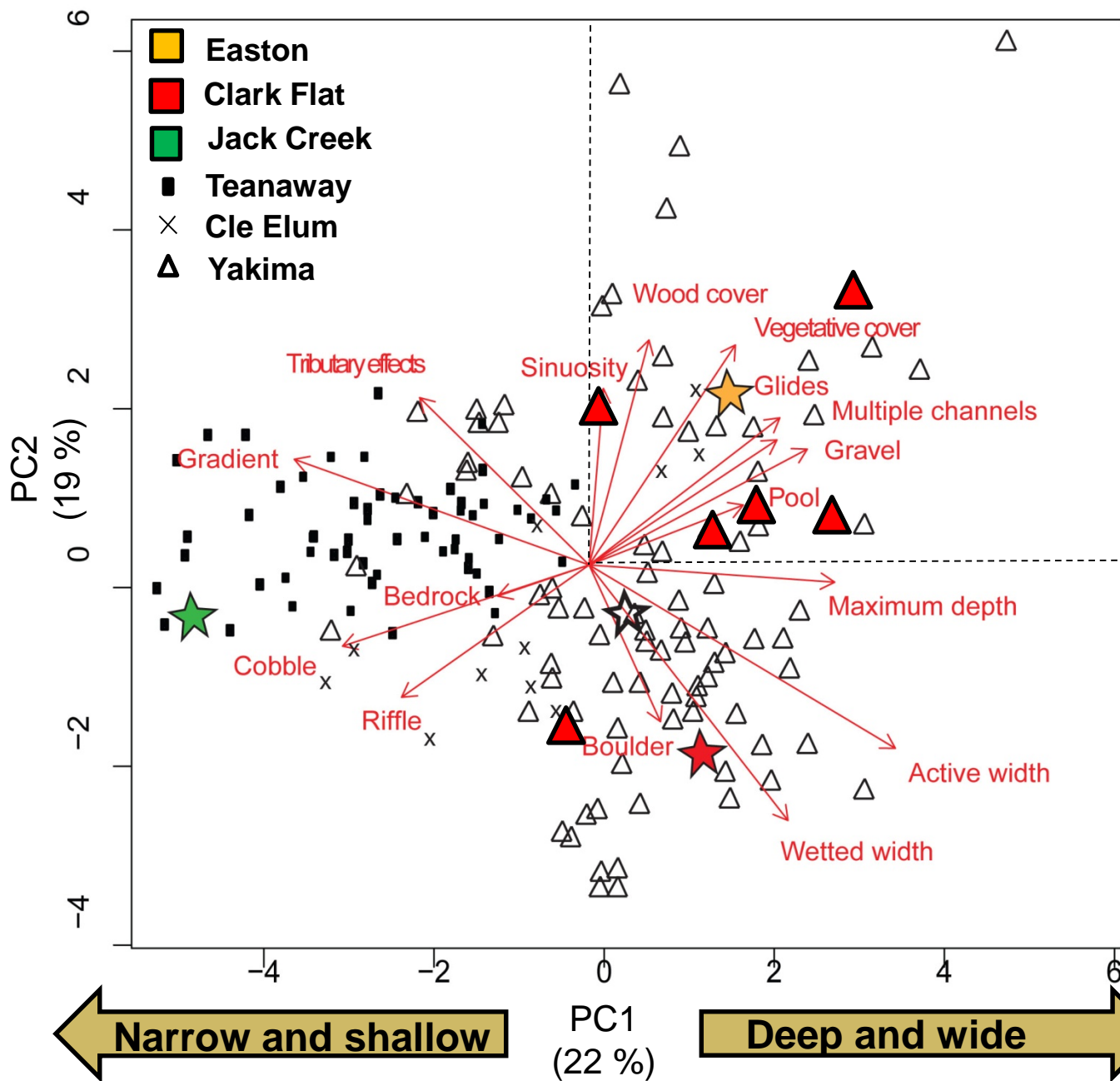


Habitat gradients



2007 Redds

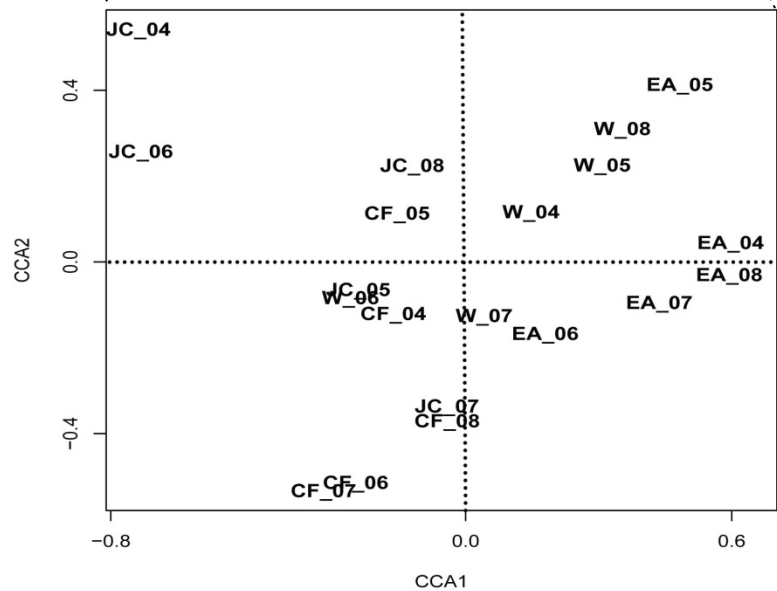
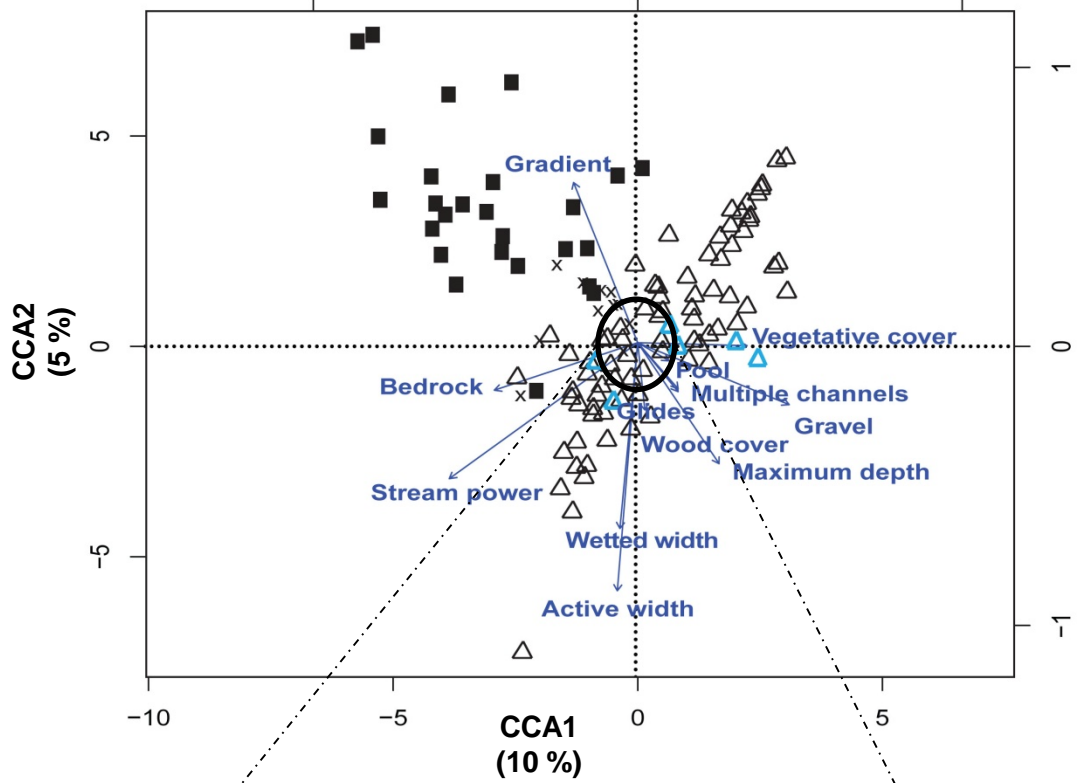


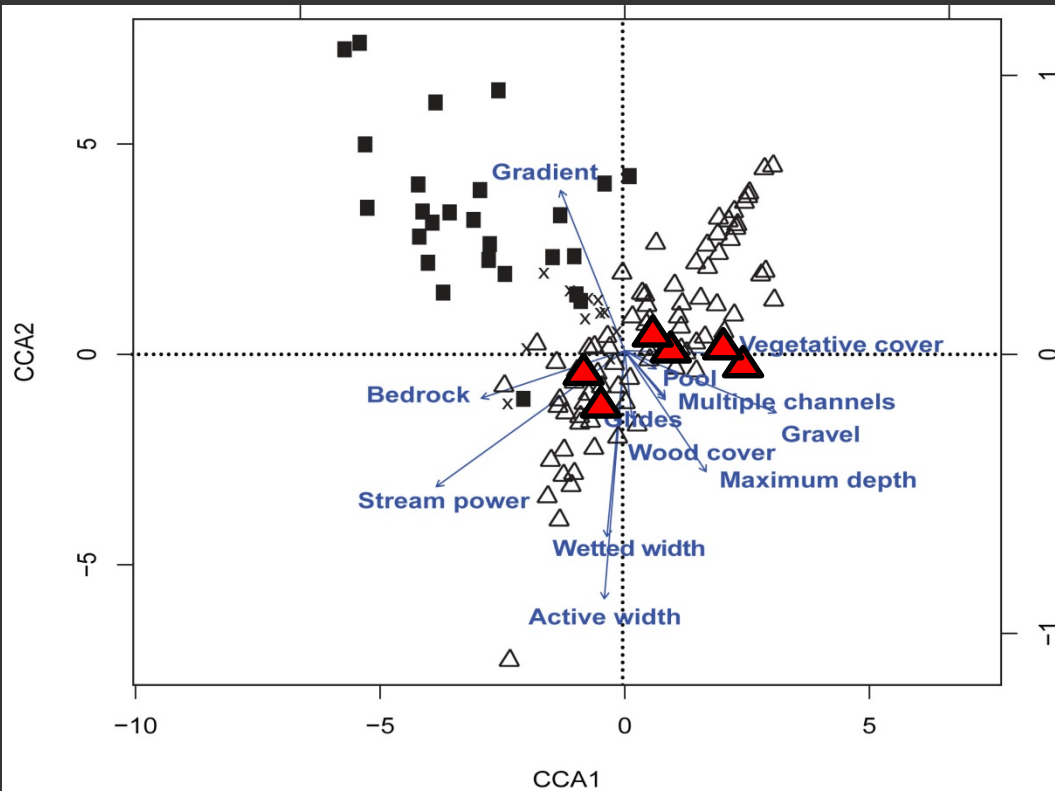


How does habitat affect spawning site selection?

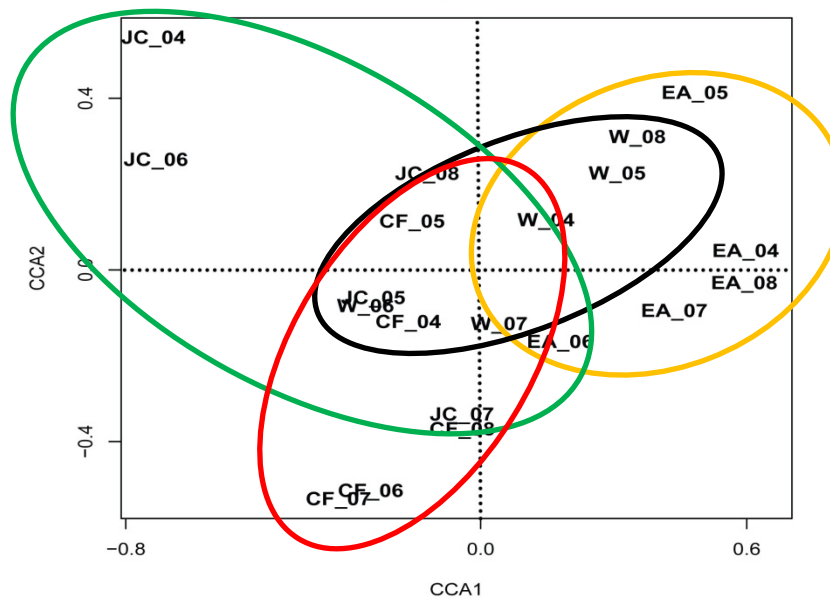
- ▣ Environmental conditions vary throughout the system
- ▣ Keefer et al. (2008) showed that spring Chinook “wander” before spawning





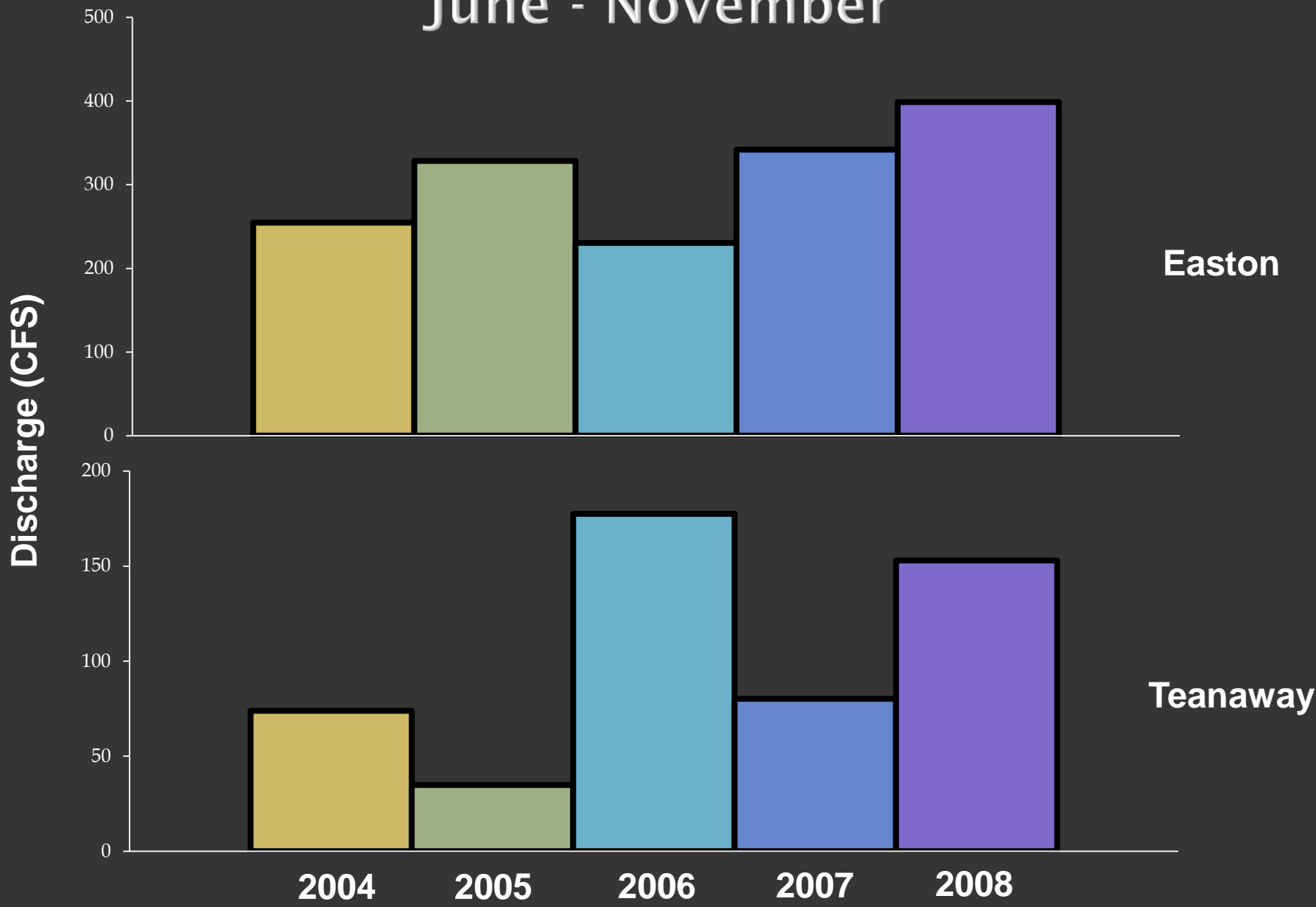


- Easton
- Clark Flat
- Jack Creek
- Wild

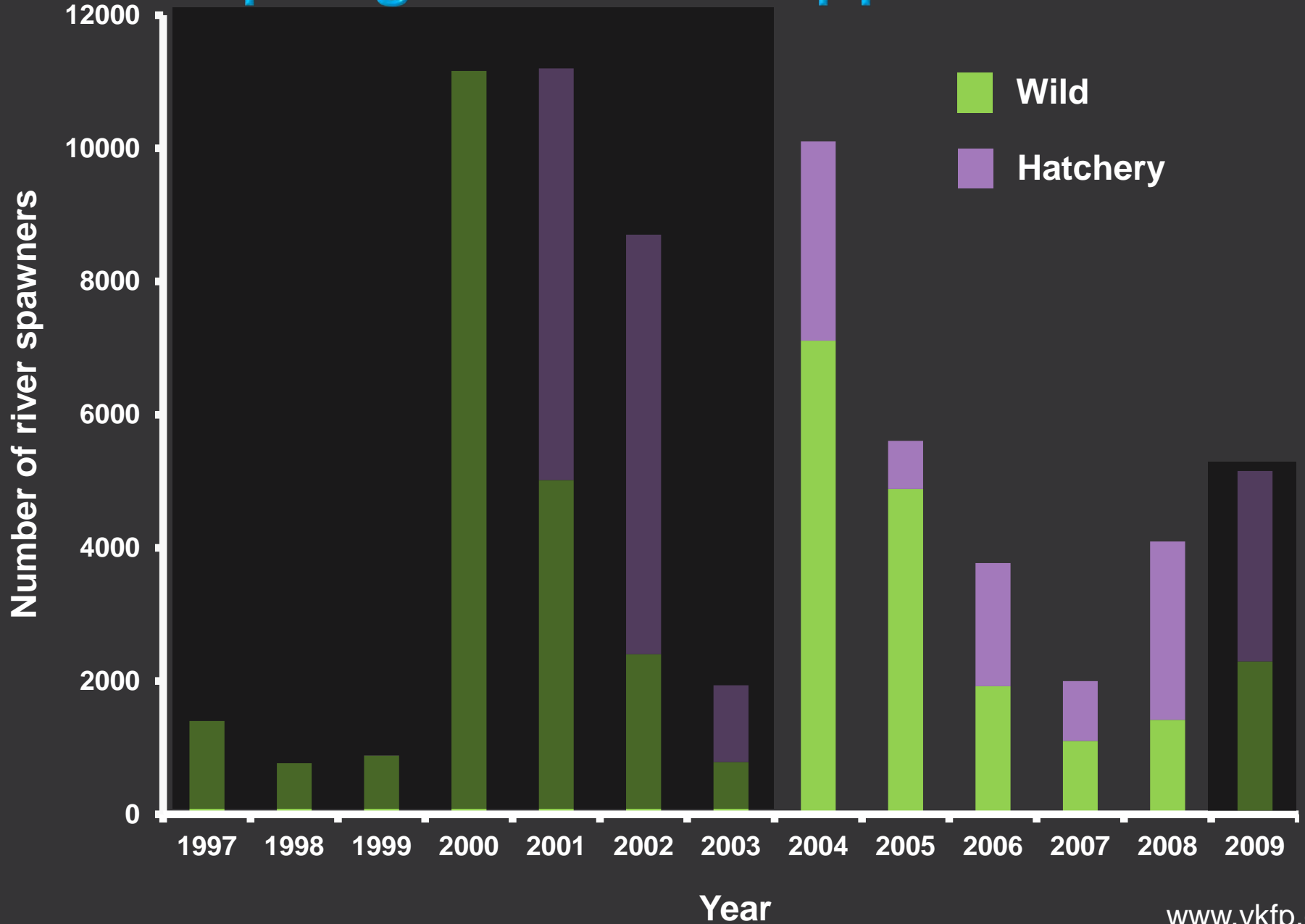


Discharge

June - November



Spring Chinook supplementation



Conclusions

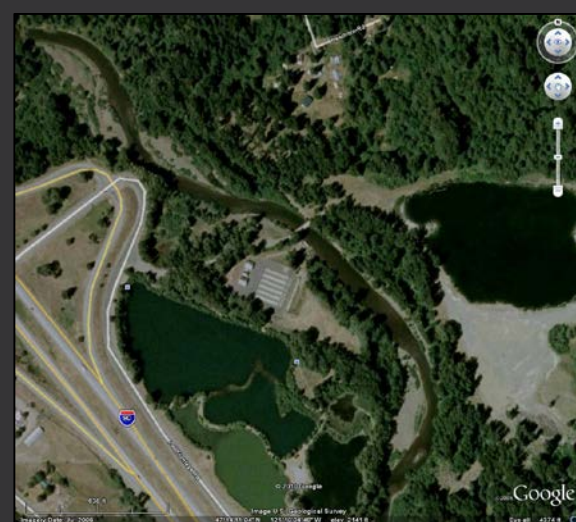
- ▣ **Habitat conditions differ near hatchery acclimation facilities**
- ▣ **Gravel, multiple channels, cover, and depth are positively associated with spawning site selection**
- ▣ **Existing and future acclimation sites may be more effective if habitat conditions receive more attention**

Acknowledgments

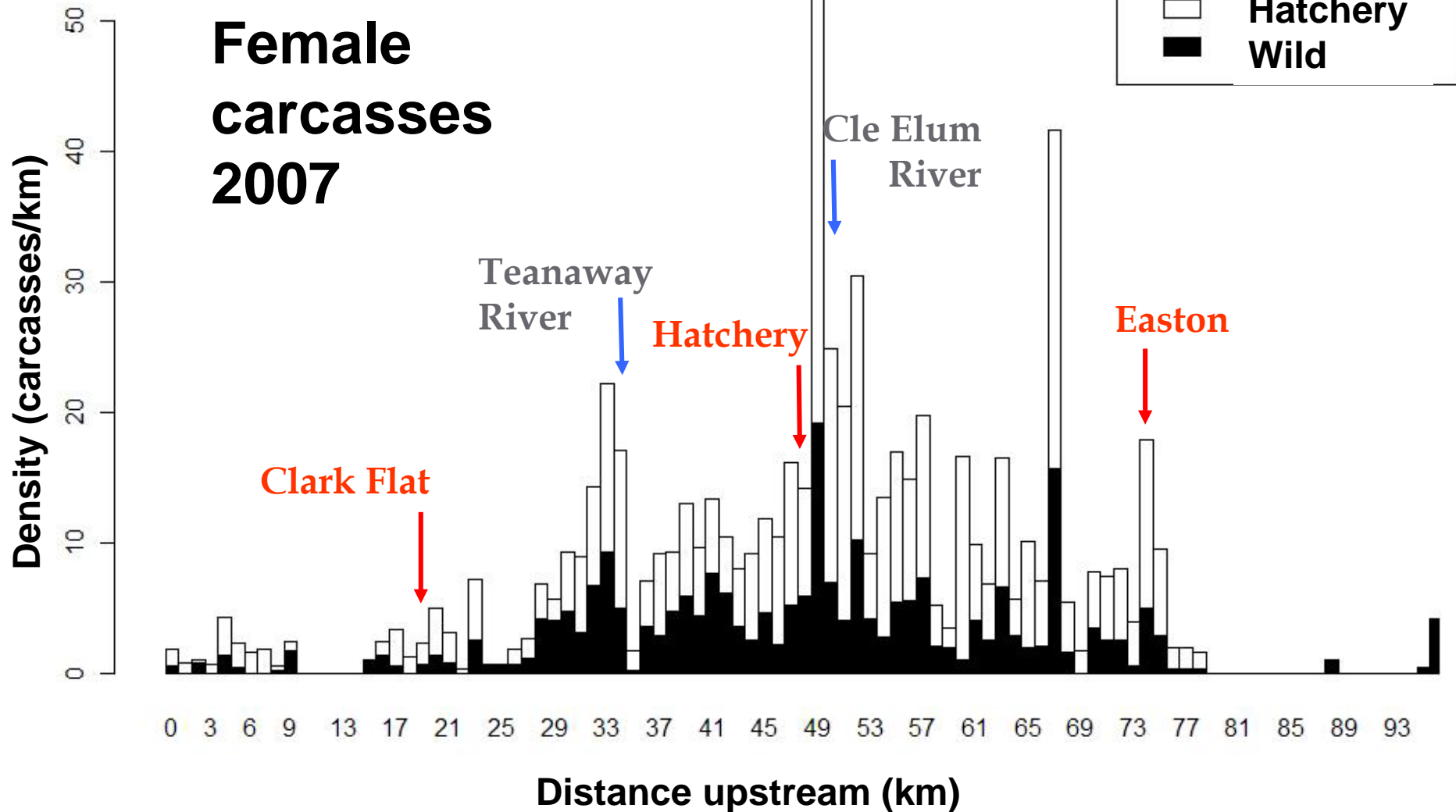
- ▣ **Logistics and GIS: Darran May, Hiroo Imaki, Ethan Welty, John Vaccaro, Patricia Haggerty, NetMap**
- ▣ **Fieldwork: Tanya Cram, James Chu, Ethan Welty**
- ▣ **Housing and support: Everyone at the Cle Elum supplementation and research facility**
- ▣ **Funding: NOAA BiOP, The Water Center**
- ▣ **Photography: Ethan Welty**
- ▣ **Aerial photos: NAIP – Allyson Jason**

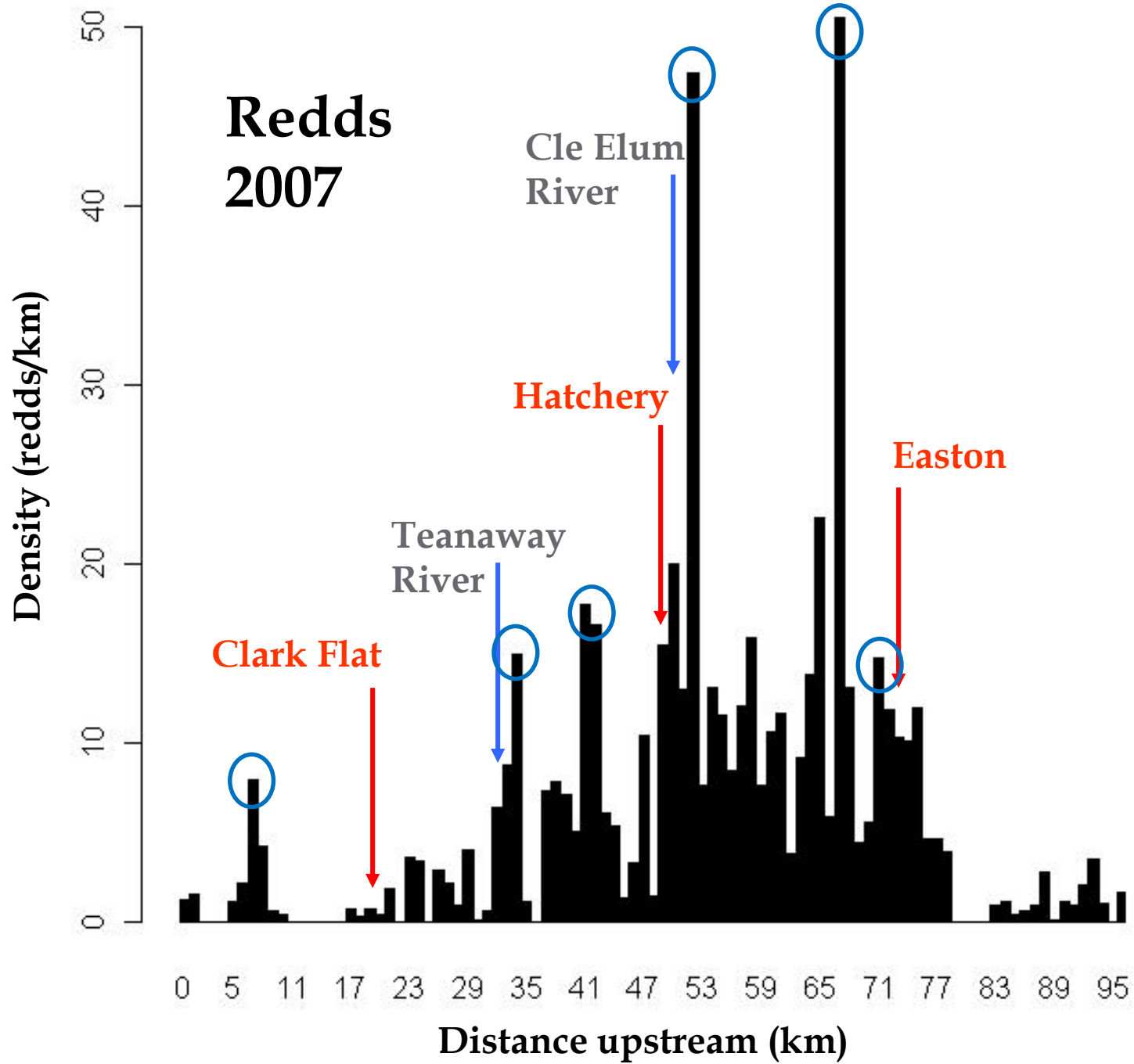
Why does this matter?

- ▣ **Hatcheries are controversial and expensive**
 - Each adult fish costs \$14 - \$530 (WA Ecology 2002)
 - Create jobs and fishing opportunity
 - Genetic and ecological risks to wild fish
 - Integrated practices rely on habitat, which may be fully utilized by wild fish



Female carcasses 2007





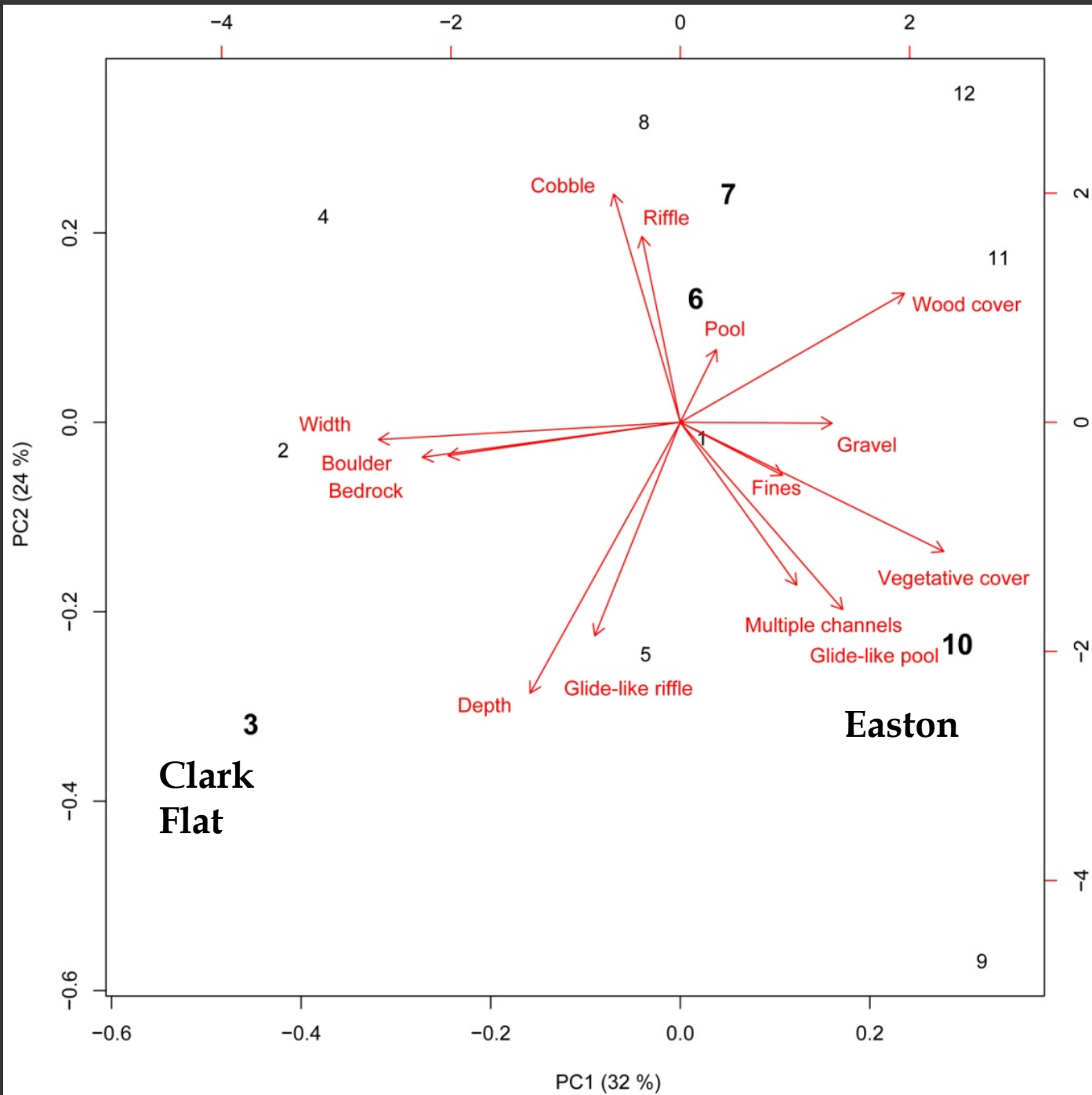
What we know about homing

- ▣ Capable of precise navigation at multiple spatial scales
 - Open ocean to freshwater
 - Within freshwater system
 - Site of incubation
- ▣ Homing confers an evolutionary advantage, just as migration does
 - Allows for local adaptation
 - Improves likelihood of successful reproduction
 - Evident in many species – mountain whitefish, northern pikeminnow, largescale suckers

Why do salmon stray?

- ▣ Evolutionary mechanism to avoid disturbance
 - Mt. St. Helens
 - Flooding
- ▣ Colonize newly accessible habitats
 - Glacier Bay, AK
 - Upper Cedar River, WA
- ▣ Find better spawning habitat?





3
Clark
Flat

Easton

7

6

12

8

4

11

2

5

10

9

PC1 (32 %)

PC2 (24 %)