

# Totally RAD Impassable Barriers: How Geologic Features Separate Summer and Winter-run Steelhead in the Eel River and Beyond

Samantha Kannry  
TRIB Research and Native Fish Society





Summer-run have experienced a more precipitous decline



Summer steelhead in the Middle Fork Eel



Barriers in the Eel River are known as  
“roughs”



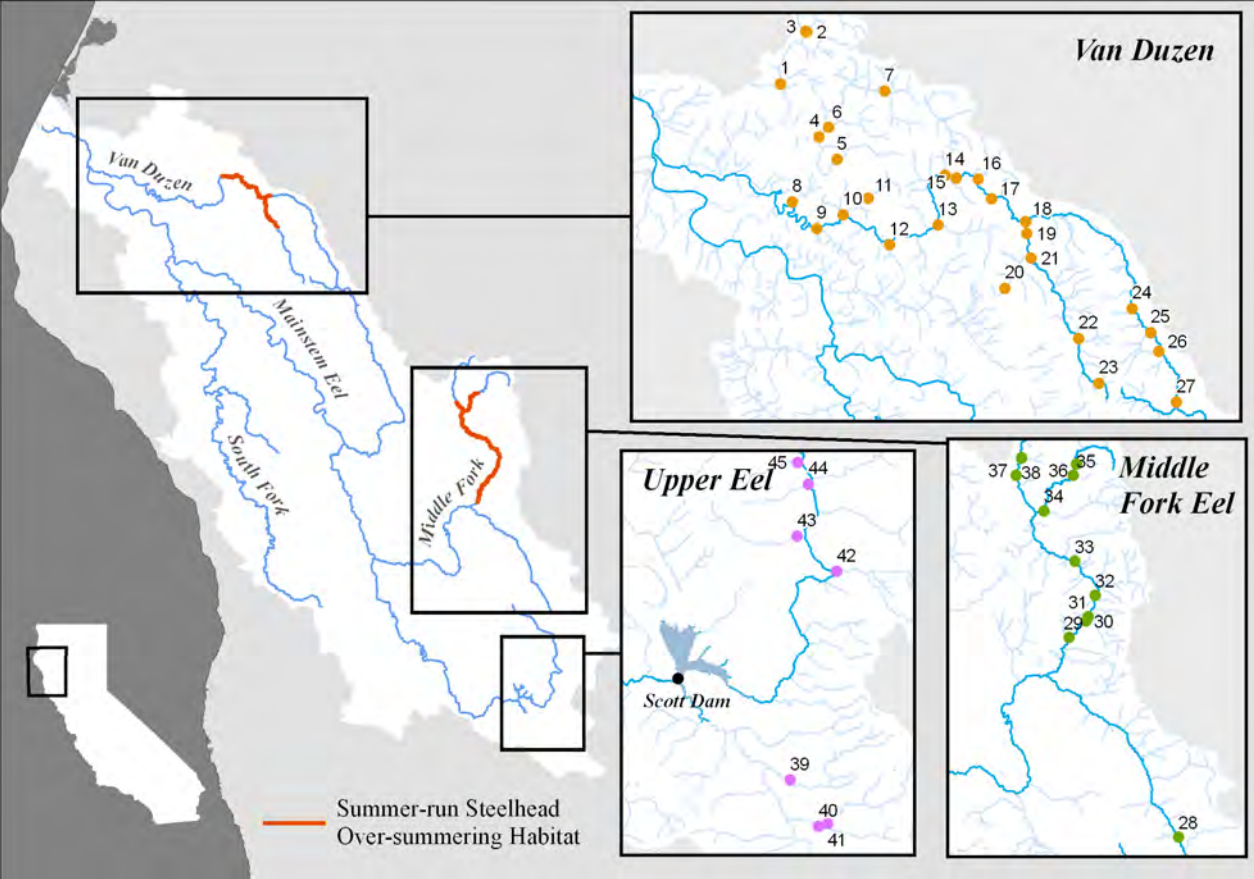


# A number of questions existed regarding present and historical distribution of summer steelhead in the Eel

- Do summer and winter-run fish spawn and rear in different locations in the Eel?
- Are summer-run alleles present above Scott Dam?
- Are summer-run alleles being maintained as standing variation in the South Fork Eel River?
- Additional questions not covered in this talk







River backpacking (minking) combined with night sampling is the most efficient method for obtaining samples

- Spatial Distribution
- Young of the year sampling
- Lab work and analysis

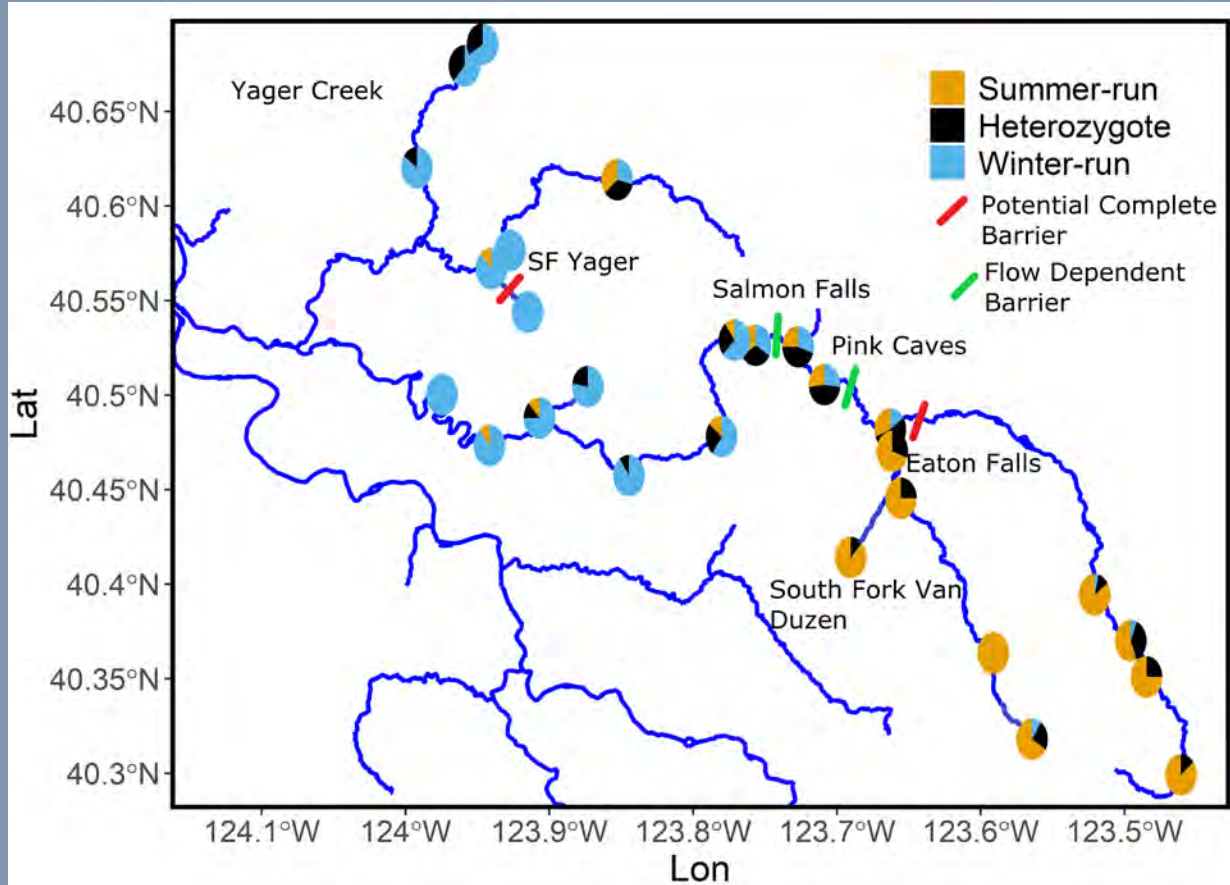


# A number of questions existed regarding present and historical distribution of summer steelhead in the Eel

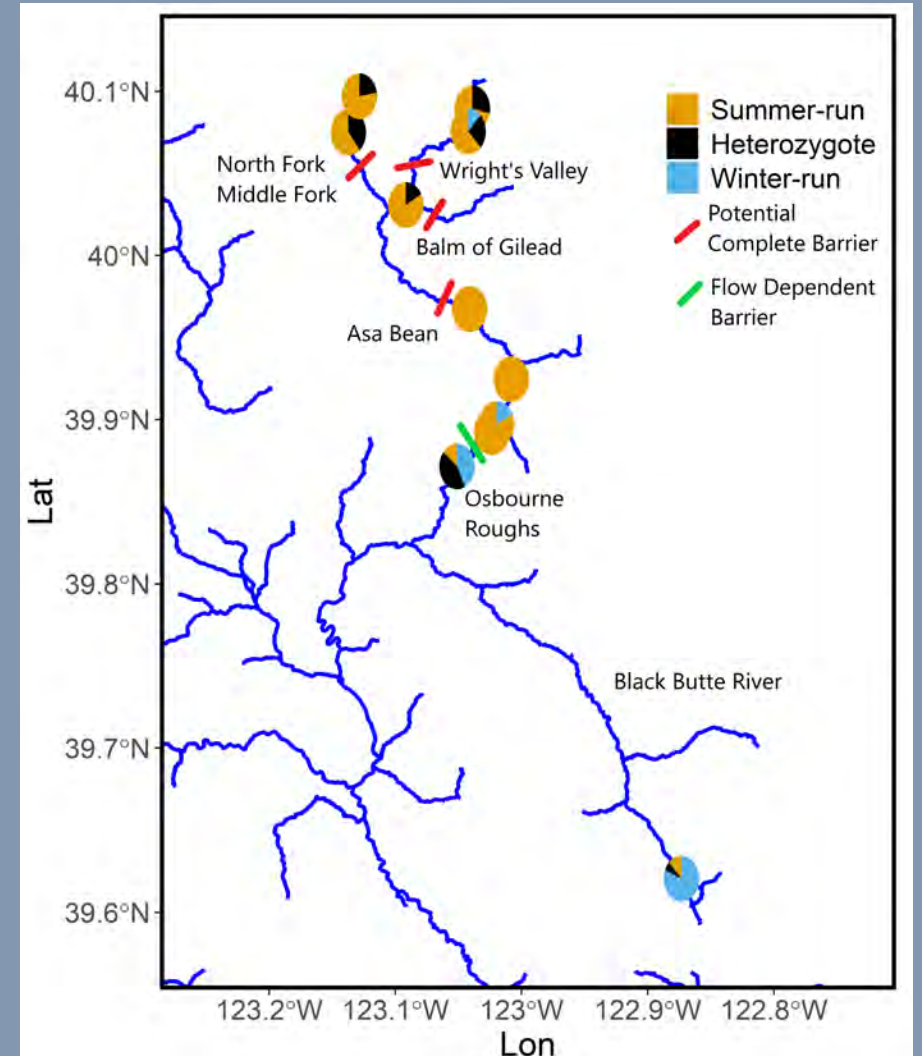
- Do summer and winter-run fish spawn and rear in different locations in the Eel?
- Are summer-run alleles present above Scott Dam?
- Are summer-run alleles being maintained as standing variation in the South Fork Eel River?



We observe distinct spatial segregation around the major Lost Duzen and Middle Fork Eel barriers at the GREB1L region.



Van Duzen River



Middle Fork Eel River



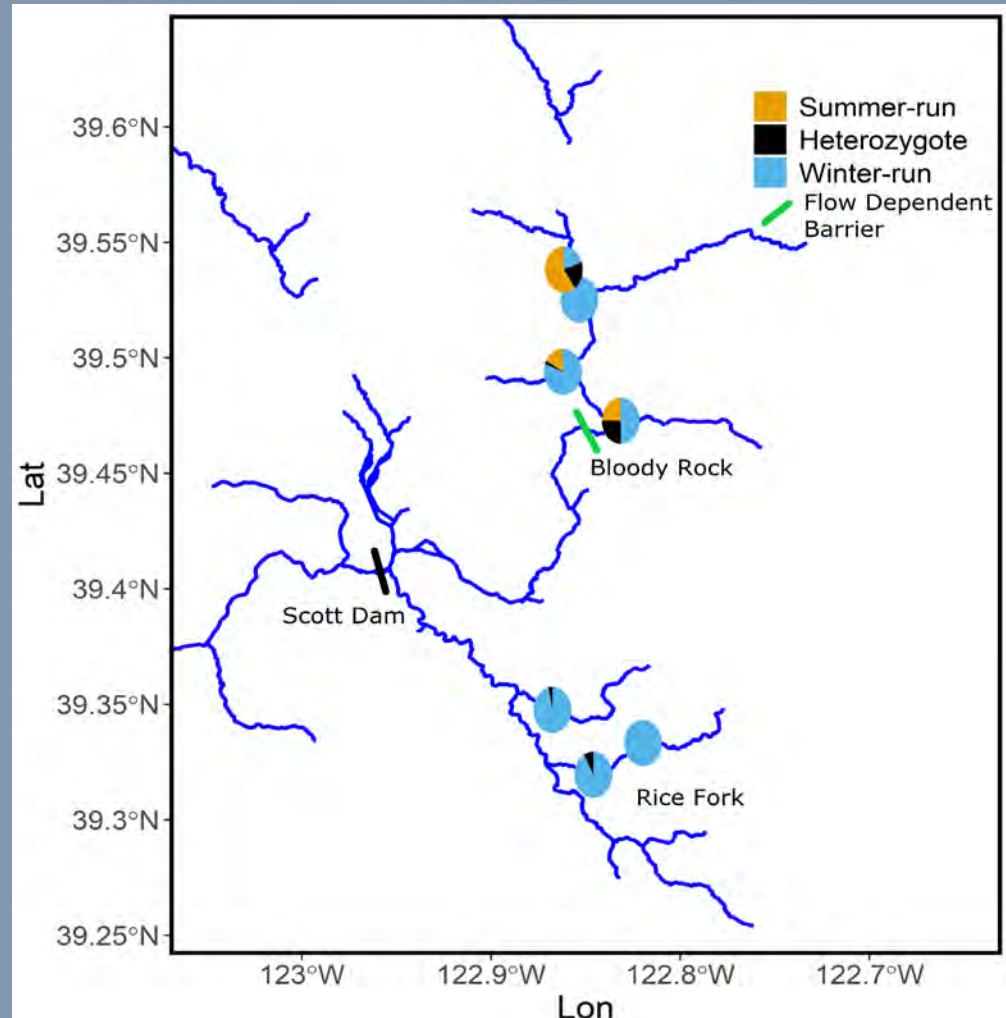
# A number of questions existed regarding present and historical distribution of summer steelhead in the Eel

- Do summer and winter-run fish spawn and rear in different locations in the Eel?
- Are summer-run alleles present above Scott Dam?
- Are summer-run alleles being maintained as standing variation in the South Fork Eel River?





The summer-run allele is present in the resident trout population above Scott Dam





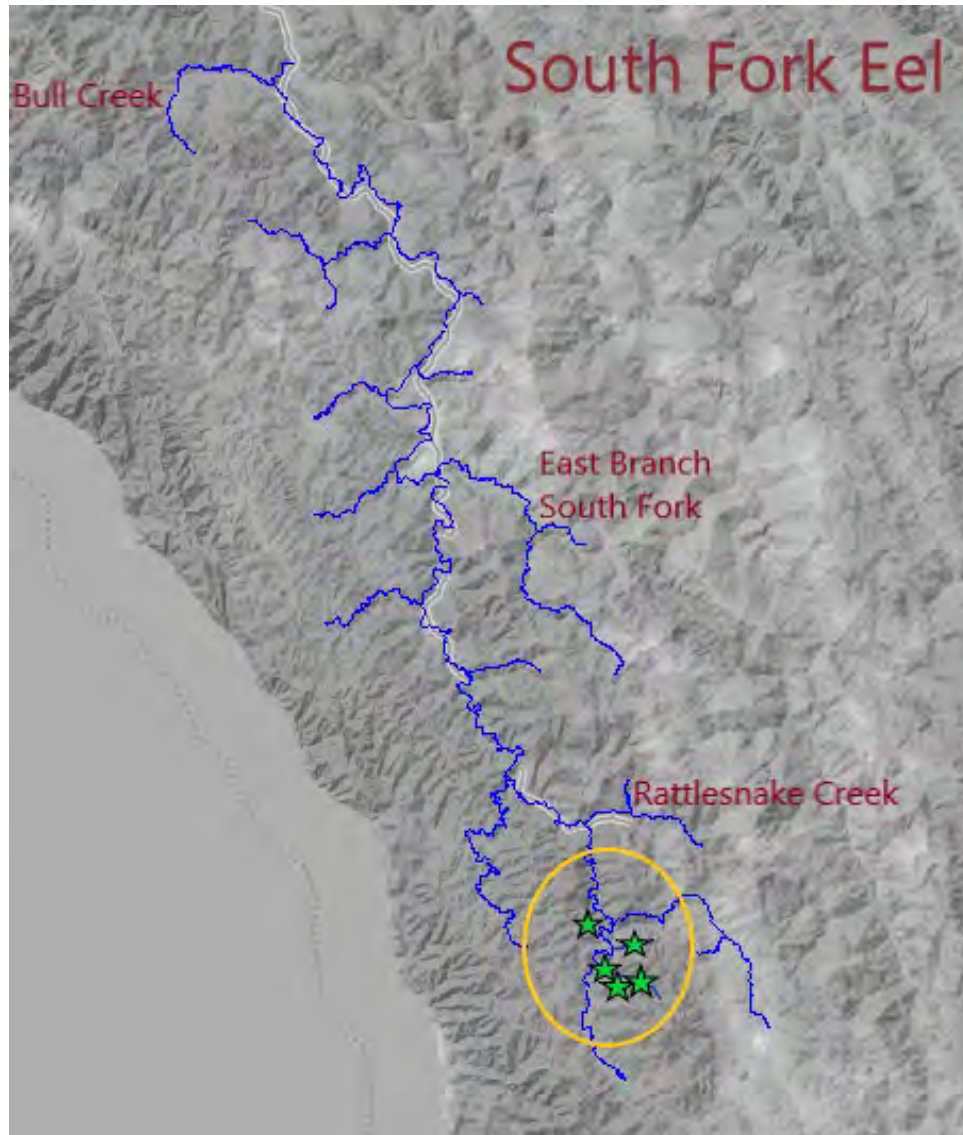
# A number of questions existed regarding present and historical distribution of summer steelhead in the Eel

- Do summer and winter-run fish spawn and rear in different locations in the Eel?
- Are summer-run alleles present above Scott Dam?
- Are summer-run alleles being maintained as standing variation in the South Fork Eel River?





We do not detect the presence of summer-run alleles in nearly 1600 individuals sampled



Year	Homozygous winter	Heterozygous	Homozygous summer
2014	26	0	0
2015	550	0	0
2016	595	0	0
2017	422	0	0
Total	1593	0	0



# Summer-run alleles are not being maintained as standing variation in the South Fork Eel winter-run population

“Thus, the premature migration (summer-run) allele does not appear to be masked in the heterozygous state and cannot be expected to be maintained as standing variation in populations that lack the premature migration phenotype”

-Prince et al., 2017

“As in the Hood River samples, heterozygotes in the BONAFF dataset exhibited Bonneville passage days that were often intermediate to either homozygote.”

-Willis et al., 2020



# Conclusions from the Eel

- Summer and winter-run steelhead are reproductively isolated by distinct geographic barriers
- Summer-run steelhead inhabited the Upper Eel above Scott Dam prior to dam construction
- Loss of summer-run genotype = loss of summer-run phenotype
- Summer-run listed as Endangered under CESA





## Additional questions about summer-run steelhead in the Eel River and beyond

---

- Is there genetic evidence of summer-run steelhead in the North Fork Eel and Mattole Rivers?
- What is the distribution of summer and winter-run alleles around barriers in Redwood Creek, the Mad, Smith, Trinity, Klamath and Rogue Rivers?
- Fall-run steelhead in the Eel, Klamath and Rogue Rivers.





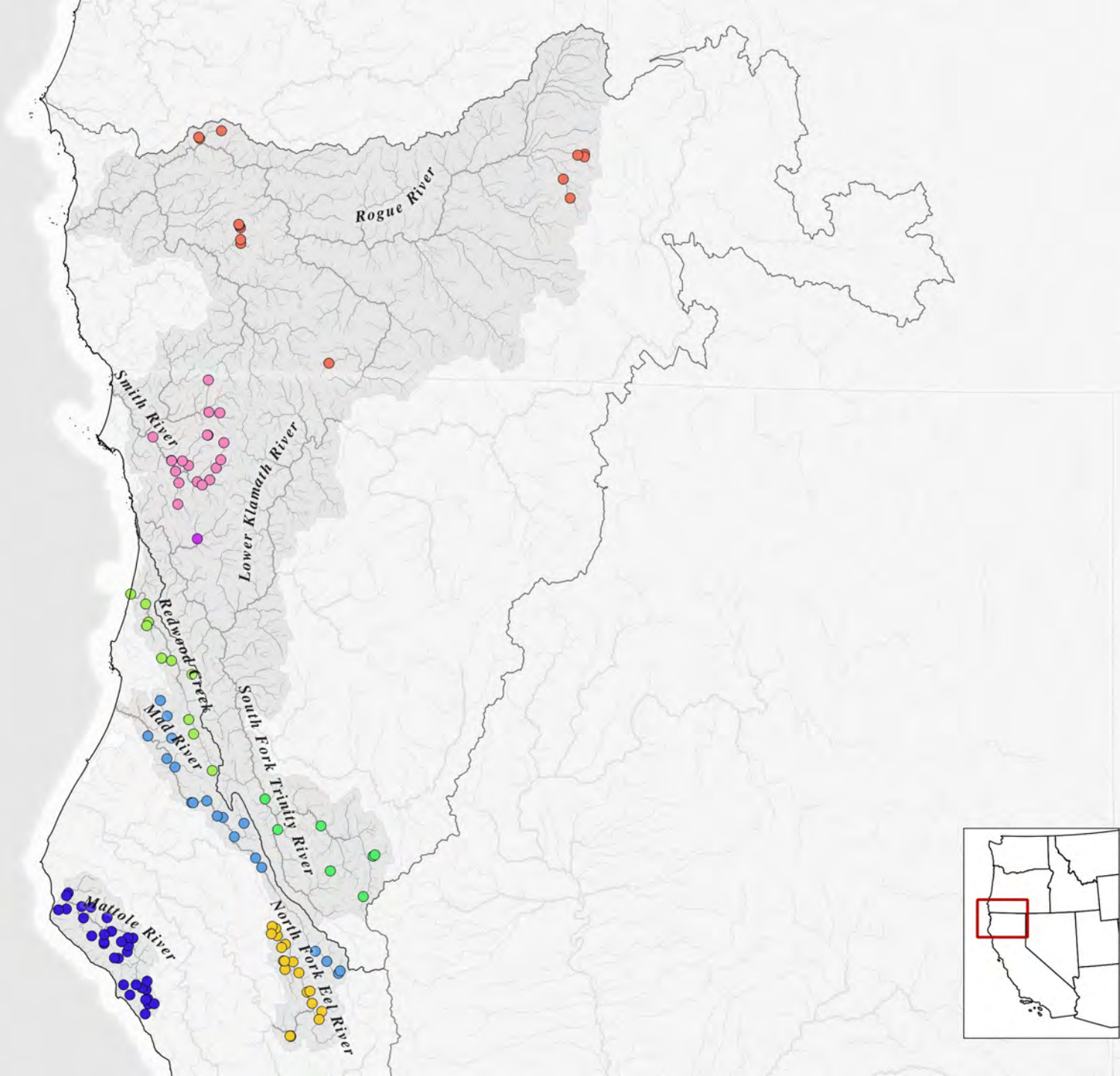
# Minking crosses state lines

- River backpacking and nighttime dip netting are effective outside of the Eel
- Barriers come in many forms





Summer-run  
steelhead  
inhabit river  
systems with  
cooler upper  
reaches and  
seasonal  
barriers





# Fall-run questions

- Refinement of the markers that explain run-timing in steelhead.
- Is the half-pounder life-history in the Eel, Klamath and Rogue associated with the fall-run marker?
- What is the distribution of fall and summer-run fish in the Klamath and Rogue?
- Are all the summer-run fish in the Rogue genetically fall-run?





## Conclusions from beyond the Eel

- Roughs are not the only geologic features separating winter and summer-run and minking is still great
- Look for more results from our extensive sampling in the next year



# Suggestions to consider to improve heart, home and the world

- To heal our rivers, we must heal ourselves
- Treat your smartphone like a landline
- Find comfort in inconvenience
- Use muscle-energy
- Reconsider purchases and investments
- Cultivate mystery





# Acknowledgments

**Eel River Biologists:** Shaun Thompson, Scott Harris

**Amazing volunteers:** Cori Flannery, Avi Kertesz, Emily Cooper, Erin Phillips, Max Ramos, Zoe Ziegler, Lindsey Holm, Jeff Abrams, Natalie Okun, Seth Ricker, Cat Fong, Ryan Thompson, Mary Clapp, Alisha Saley, Rose Dana, Ensieh Habibi, Nick Blixt, Brett Lovelace

**Additional samples:** Bob Pagliuco, Keith Lackey, Suzanne Kelson, Emma Held, Nathan Queener

**Landowners:** Mark and Dina Moore, Humboldt Redwood Company, Eric Larsen, Griff and Portia Bramble, Green Diamond Redwood Company

**Funders/Collaborators:** BLM, Sequoia Park Zoo, Ecology Graduate Group, Department of Animal Science UC Davis, Native Fish Society, Patagonia Inc., Friends of the Eel River, Mattole Salmon Group

**Foundational concepts and essential assistance:** Mike Miller, Sean O'Rourke, Zane Ruddy, Tasha Thompson

**TRIB co-founder and night sampling's biggest fan:** Sam Rizza

