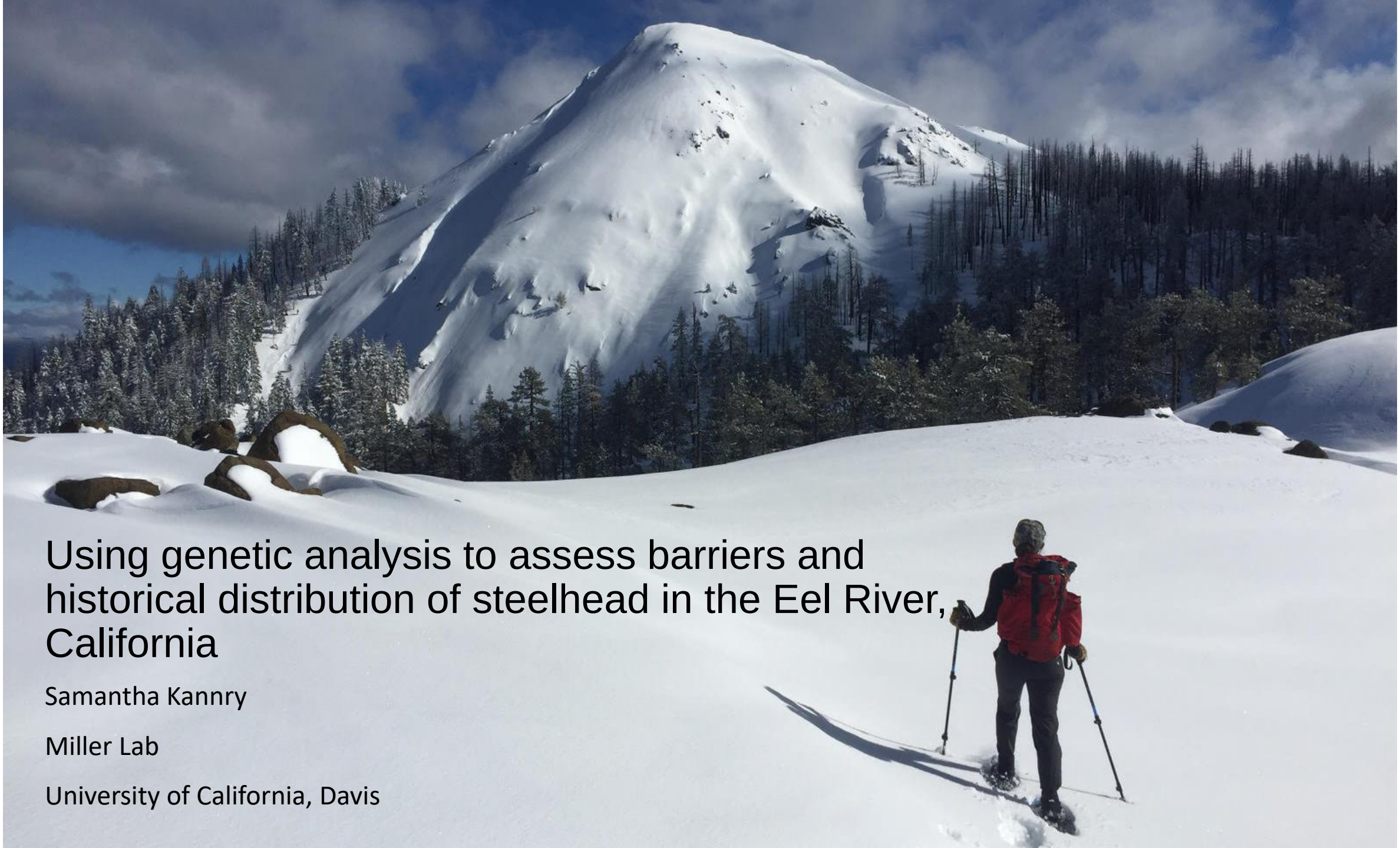

Using genetic analysis to assess barriers and historical distribution of steelhead in the Eel River, California

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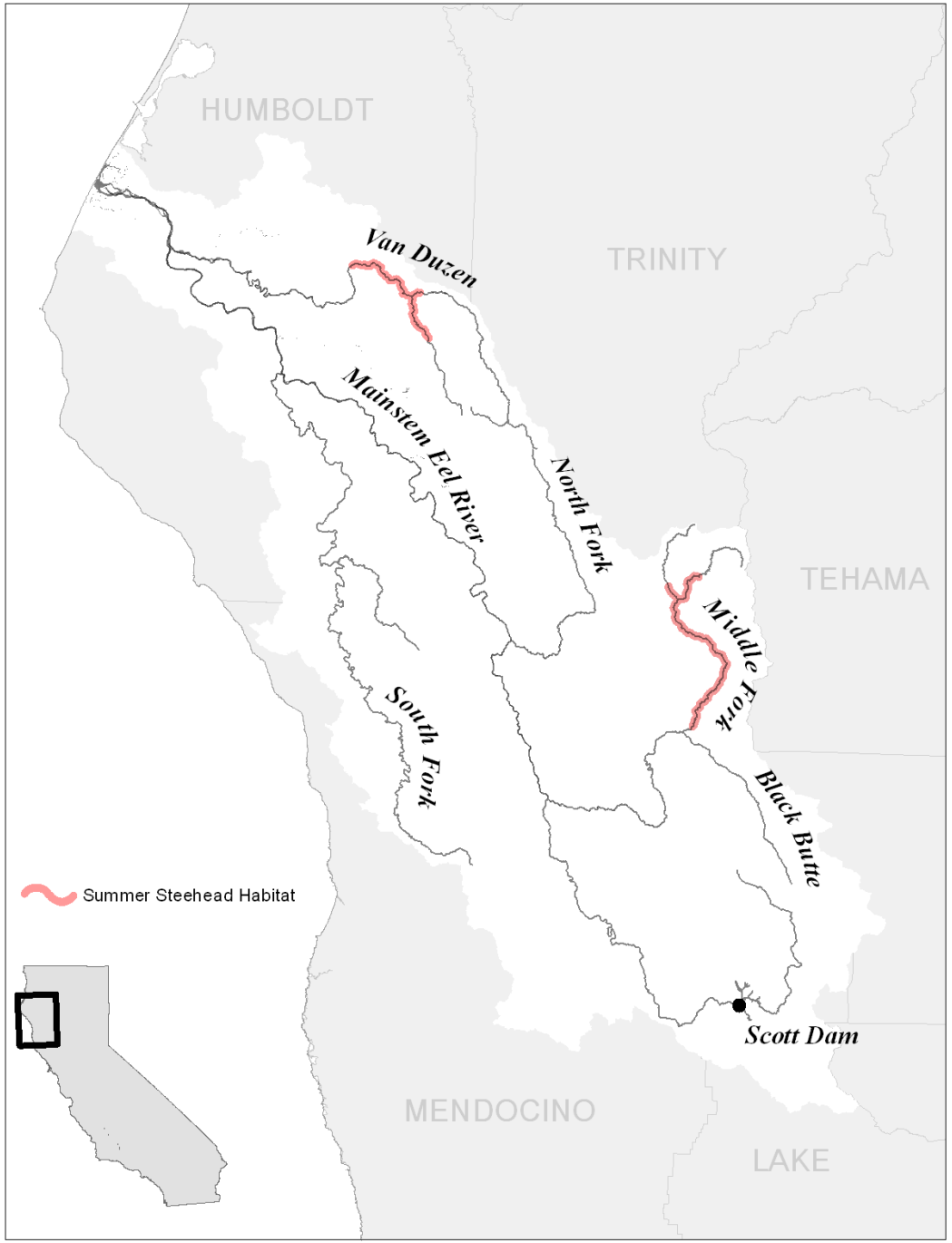
Miller Lab

University of California, Davis

The Eel River is currently the southernmost extent of summer steelhead in California.



The Eel River is extremely erosive and characterized by many large, complex stretches of “roughs”.

Salmon Hole, Van Duzen

Many questions have remained unanswered regarding current and historic distribution of steelhead in the Eel River.

- Is Eaton Falls a complete barrier to anadromy?
- Do summer and winter-run fish spawn and rear in different locations?
- Would the resident trout population above Scott Dam be a good restoration source if the dam were to be removed?
- Are summer-run alleles present in the South Fork Eel River?

Dip-netting proved to be the most effective method to obtain sufficient samples.

Basin	Number of Sites	Total number of samples
Van Duzen	27	478
Middle Fork	11	183
Upper Eel	7	173
		Total = 834

- High spatial distribution
- Young of the year sampling
- 2 years of sampling

Genetic analyses provide useful tools for addressing ecological questions.

- Laboratory preparation
- Rapture
- Overall differentiation, OMY5 and GREB1L

Eaton Falls

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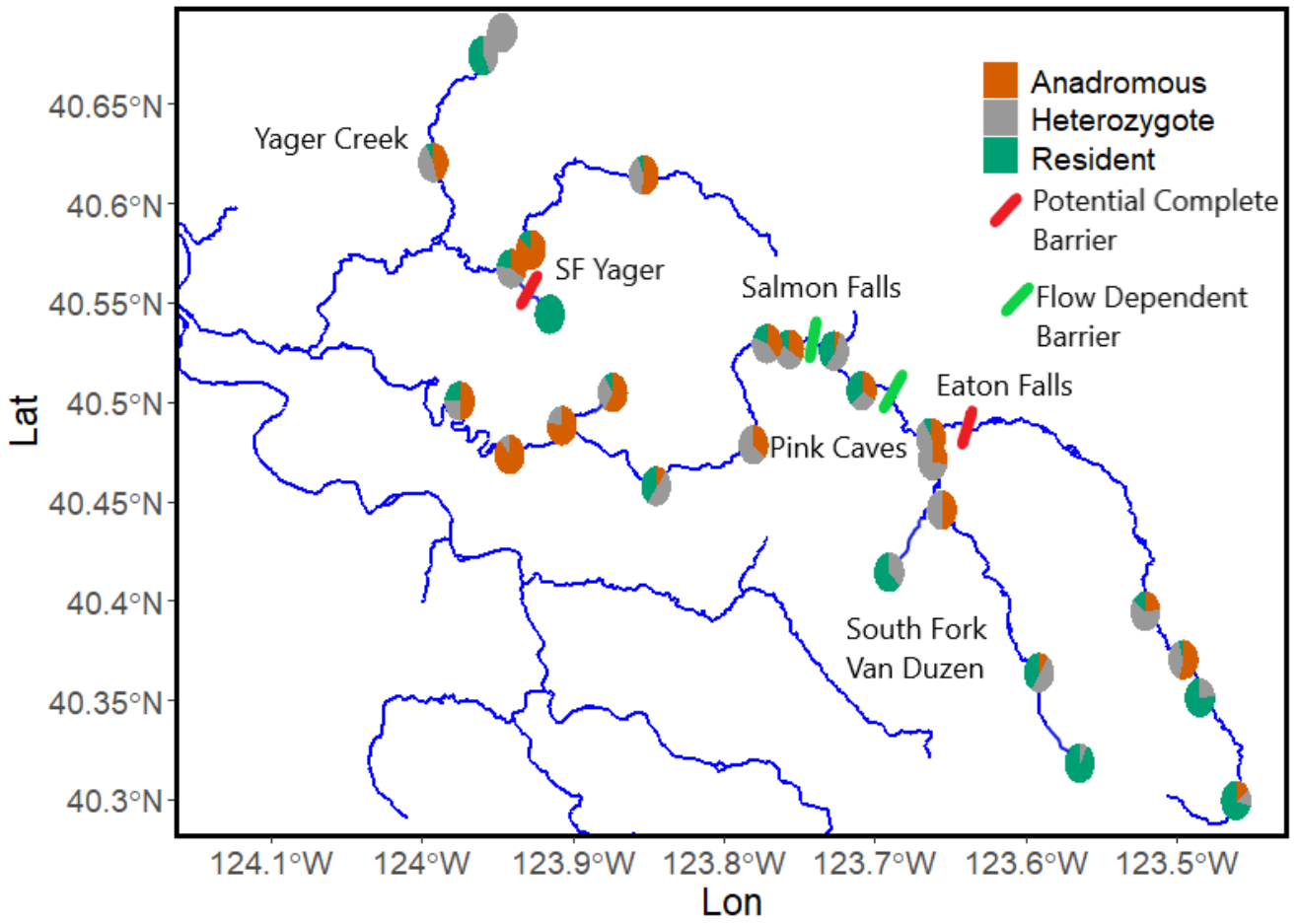
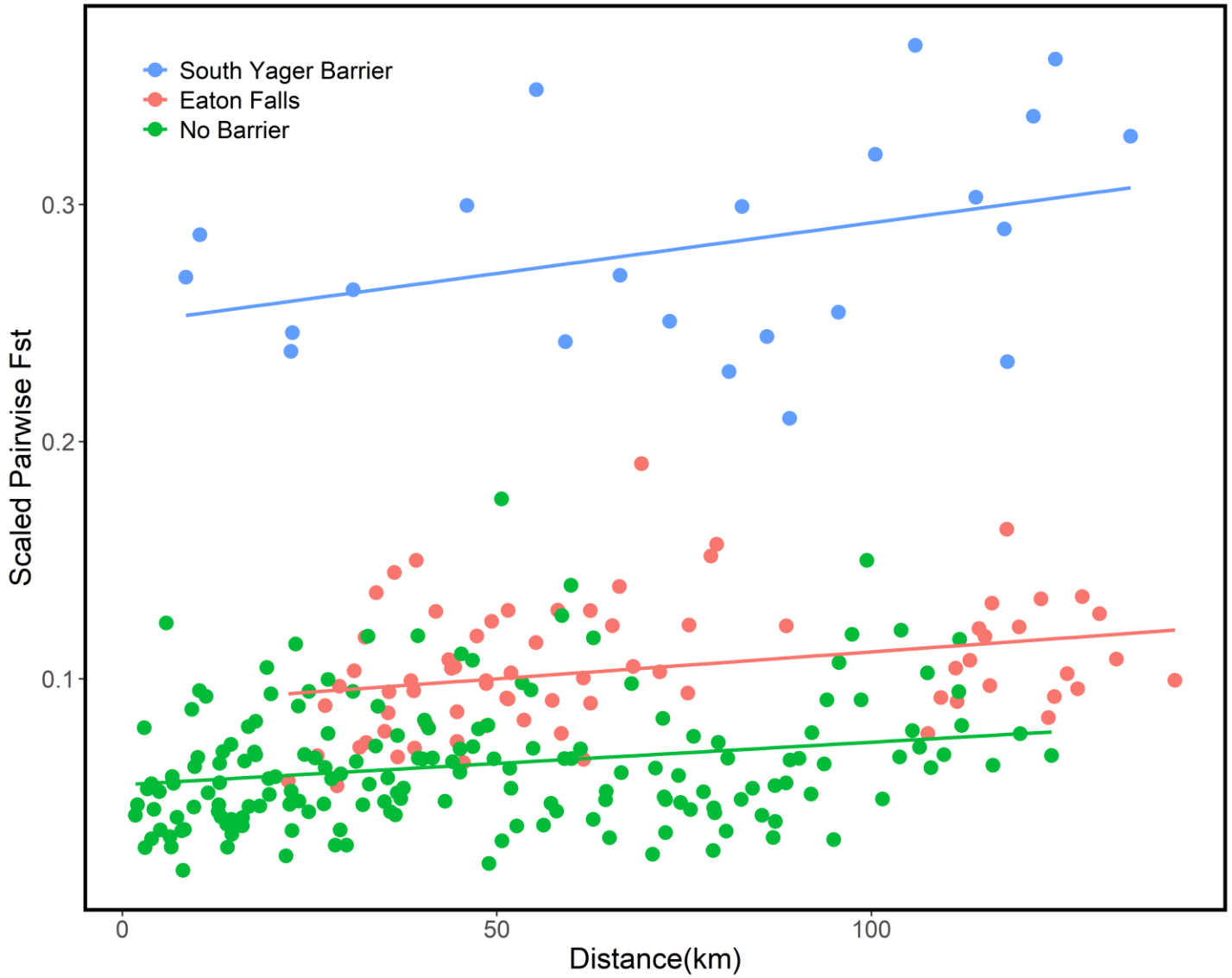
There is a high frequency of the anadromous genotype above Eaton Falls.



Eaton Falls is not a complete barrier to anadromy.



Van Duzen River Isolation by Distance


Pink Caves

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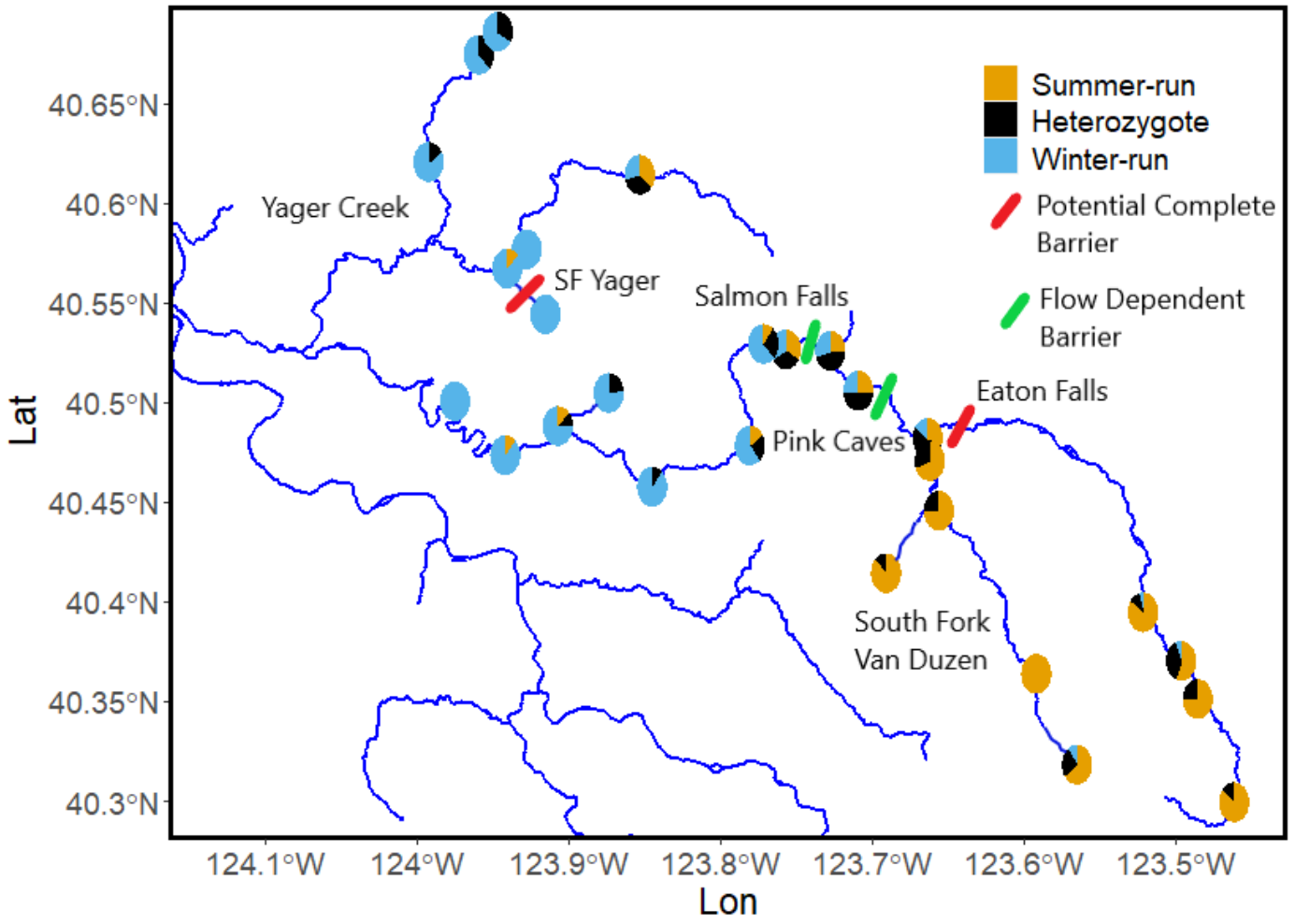
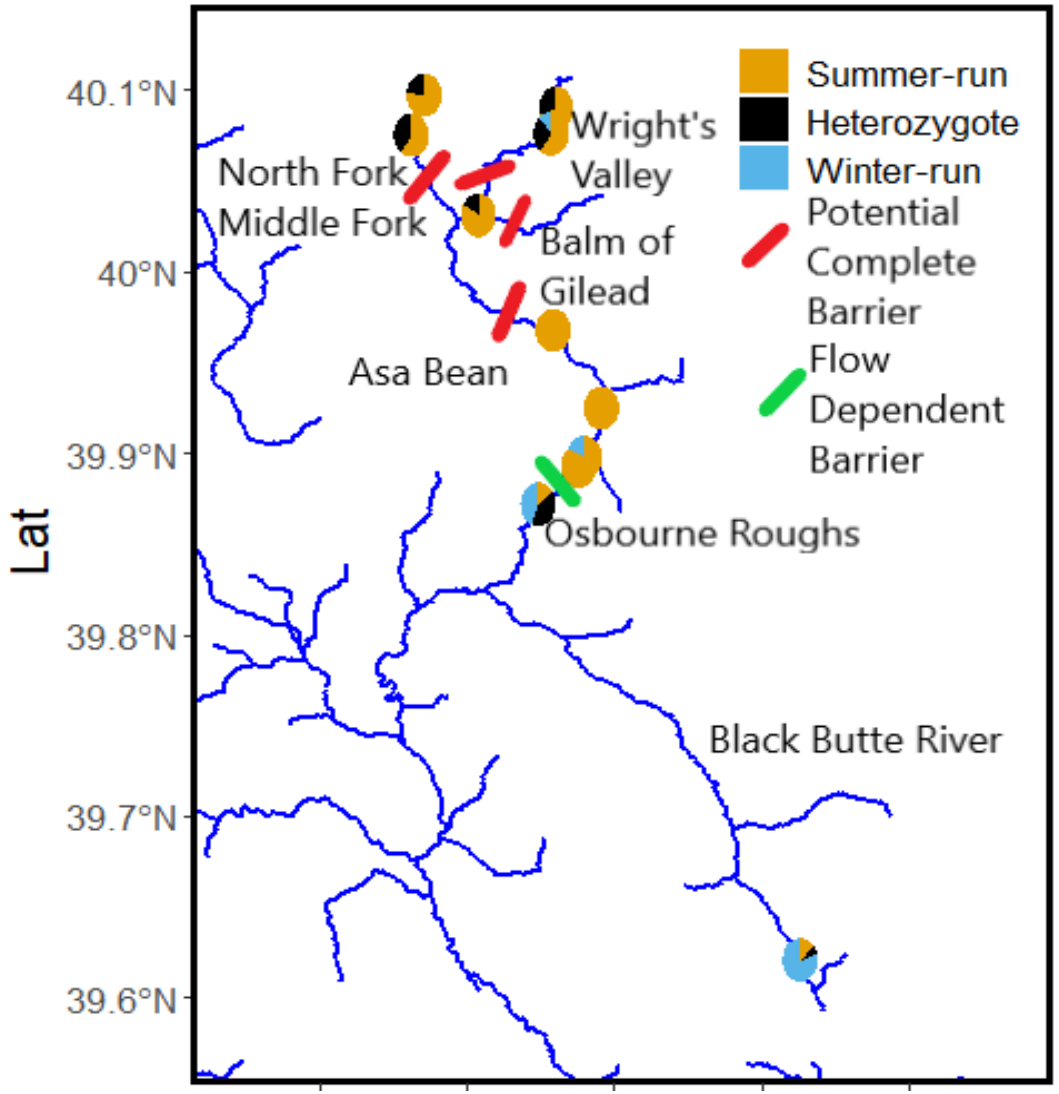
- Are summer-run alleles present in the South Fork Eel River?

We observe distinct spatial segregation around the three major Lost Duzen barriers at the GREB1L locus.



We observe similar spatial segregation of summer and winter-run steelhead around barriers in the Middle Fork.



Upper Eel above Scott Dam

Many questions have remained unanswered regarding current and historic distribution of steelhead in the Eel River.

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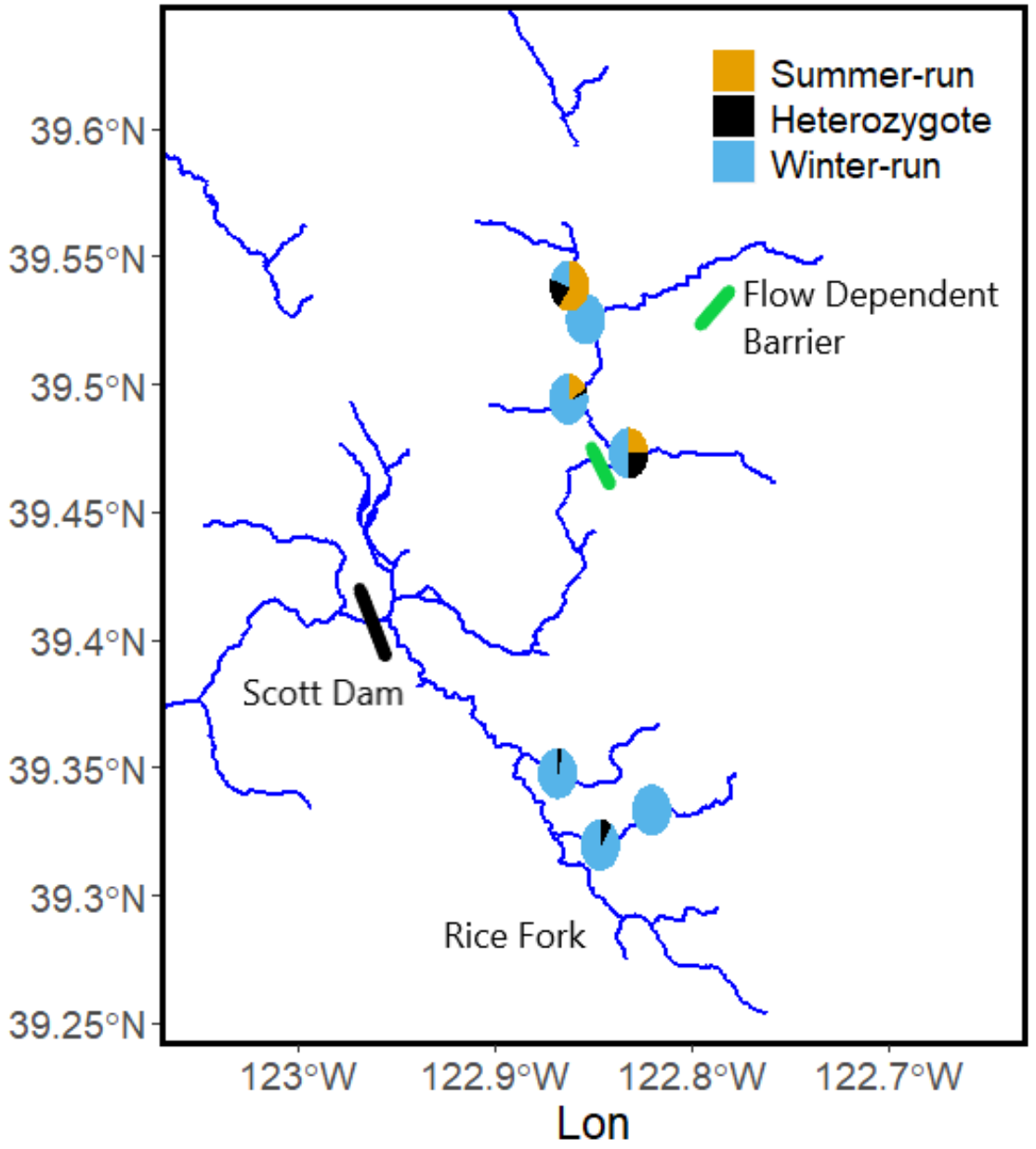
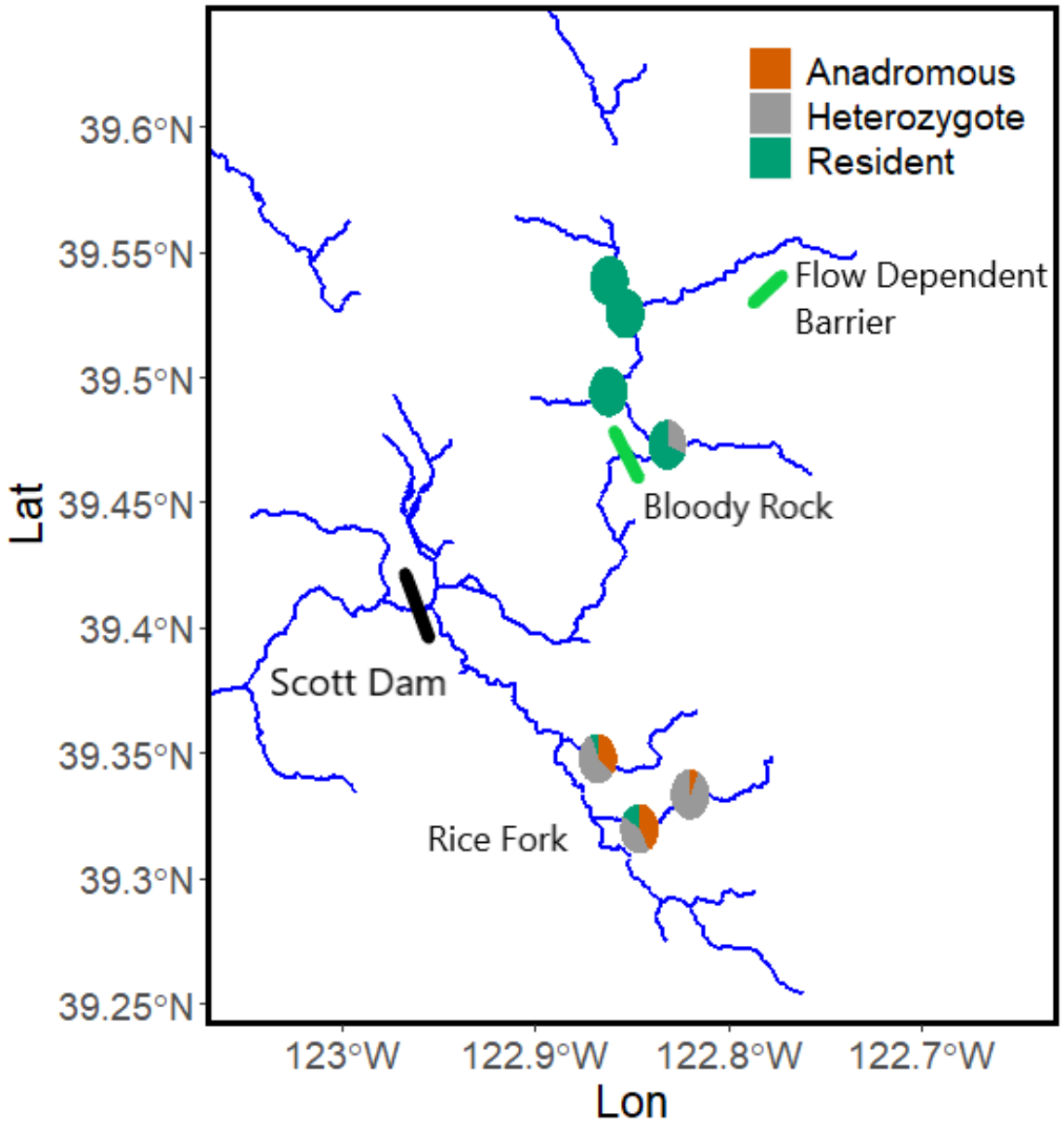
- Are summer-run alleles present in the South Fork Eel River?

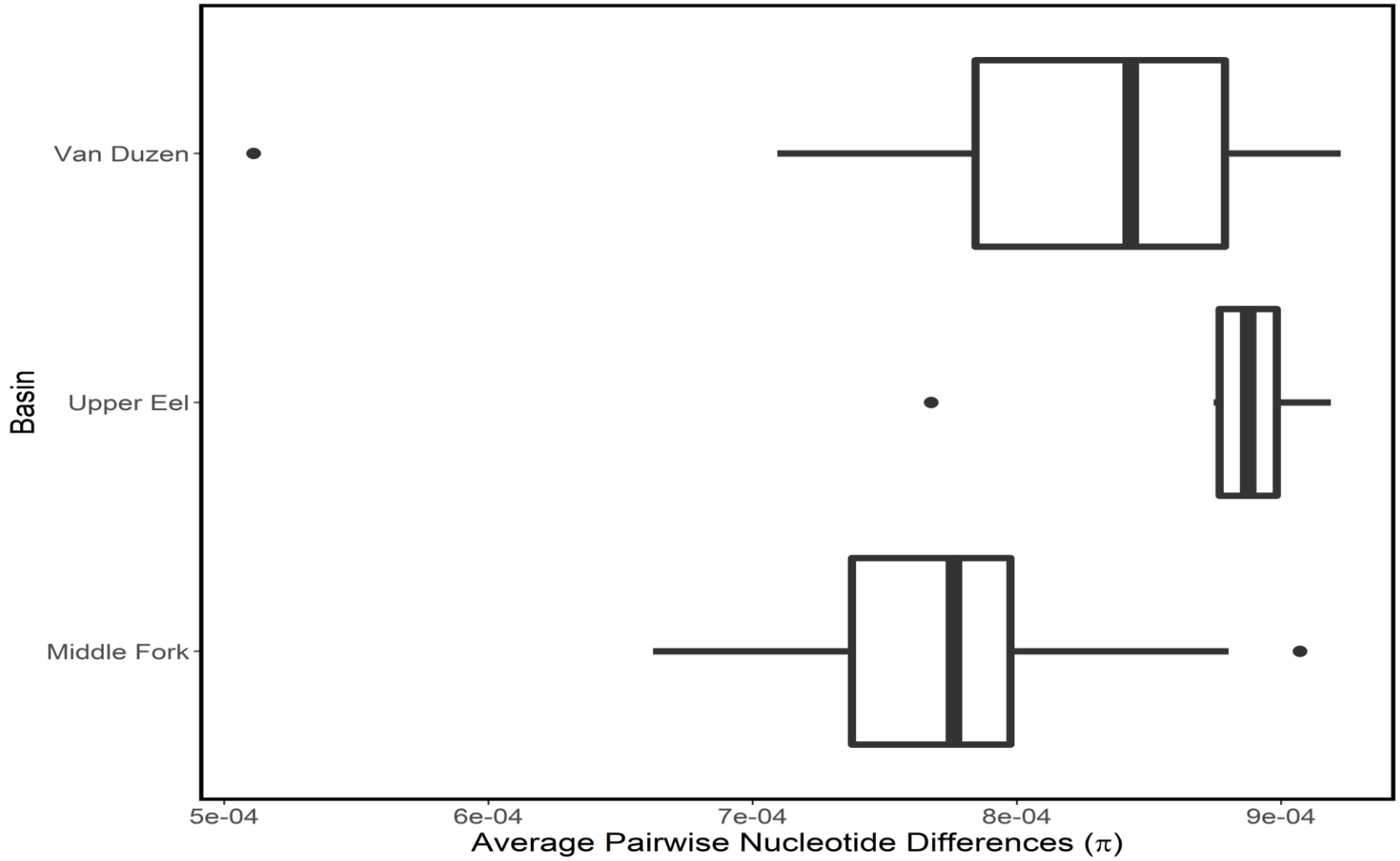
The summer-run allele is present in the resident trout population above Scott Dam.



Life history diversity is being maintained in the resident population above the dam.



Overall genetic diversity is being maintained in the resident population above the dam.

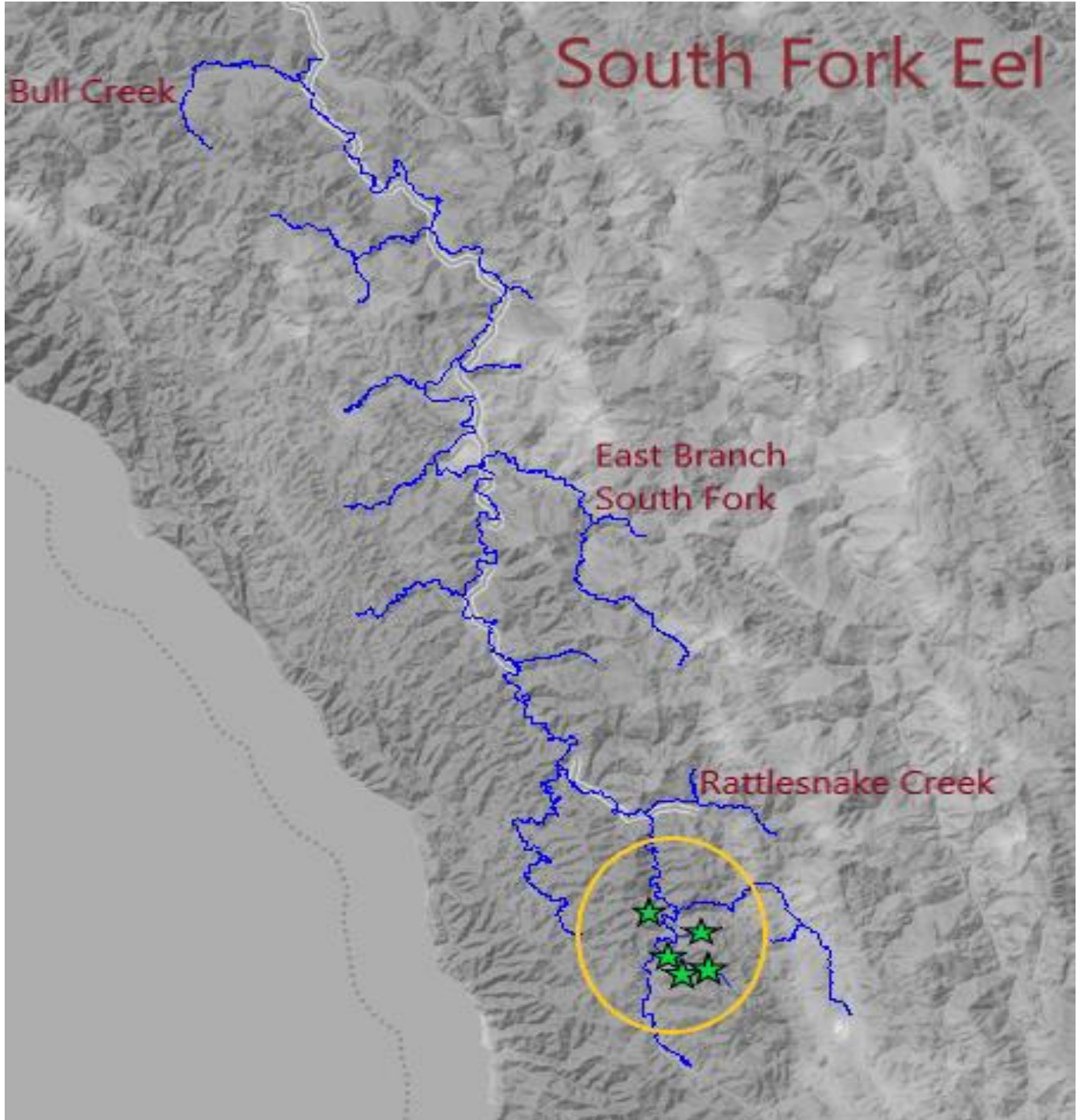


Summer steelhead in the Middle Fork Eel

Many questions have remained unanswered regarding current and historic distribution of steelhead in the Eel River.

- Is Eaton Falls a complete barrier to anadromy?
- Do summer and winter-run fish spawn and rear in different locations?
- Would the resident trout population above Scott Dam be a good restoration source if the dam were to be removed?
- Are summer-run alleles present in the South Fork Eel River?

No evidence of summer-run alleles in contemporary South Fork Eel population.



No evidence of summer-run alleles in contemporary South Fork Eel population.

“Thus, the premature migration 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”

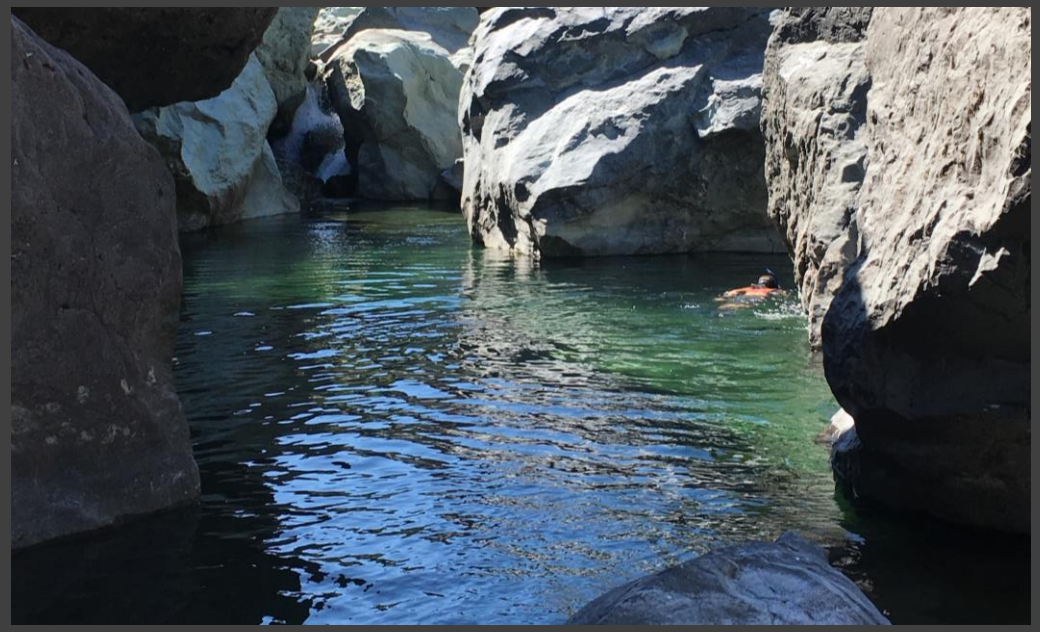
-Prince et al., 2017

“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

- Anadromous fish are passing Eaton Falls with some regularity
- 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
- Genetic diversity is being maintained in the resident population above the dam
- Summer-run steelhead were either never present in the South Fork Eel or alleles are not being maintained



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- Mike Miller, Sean O'Rourke
- And many more