Genetic Comparisons Between Spawning Adult Steelhead, Juvenile Migrants, and Mature Resident *O. mykiss* From Teanaway River and Taneum Creek

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Outline

- Introduction
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  - Previous genetic studies
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  - Collections
  - Genetic analysis methods
- Comparisons among collections with same life history
  - Known spawners
  - Migrants
  - Residents
- Comparison between anadromous vs. resident *O. mykiss*

Project overview

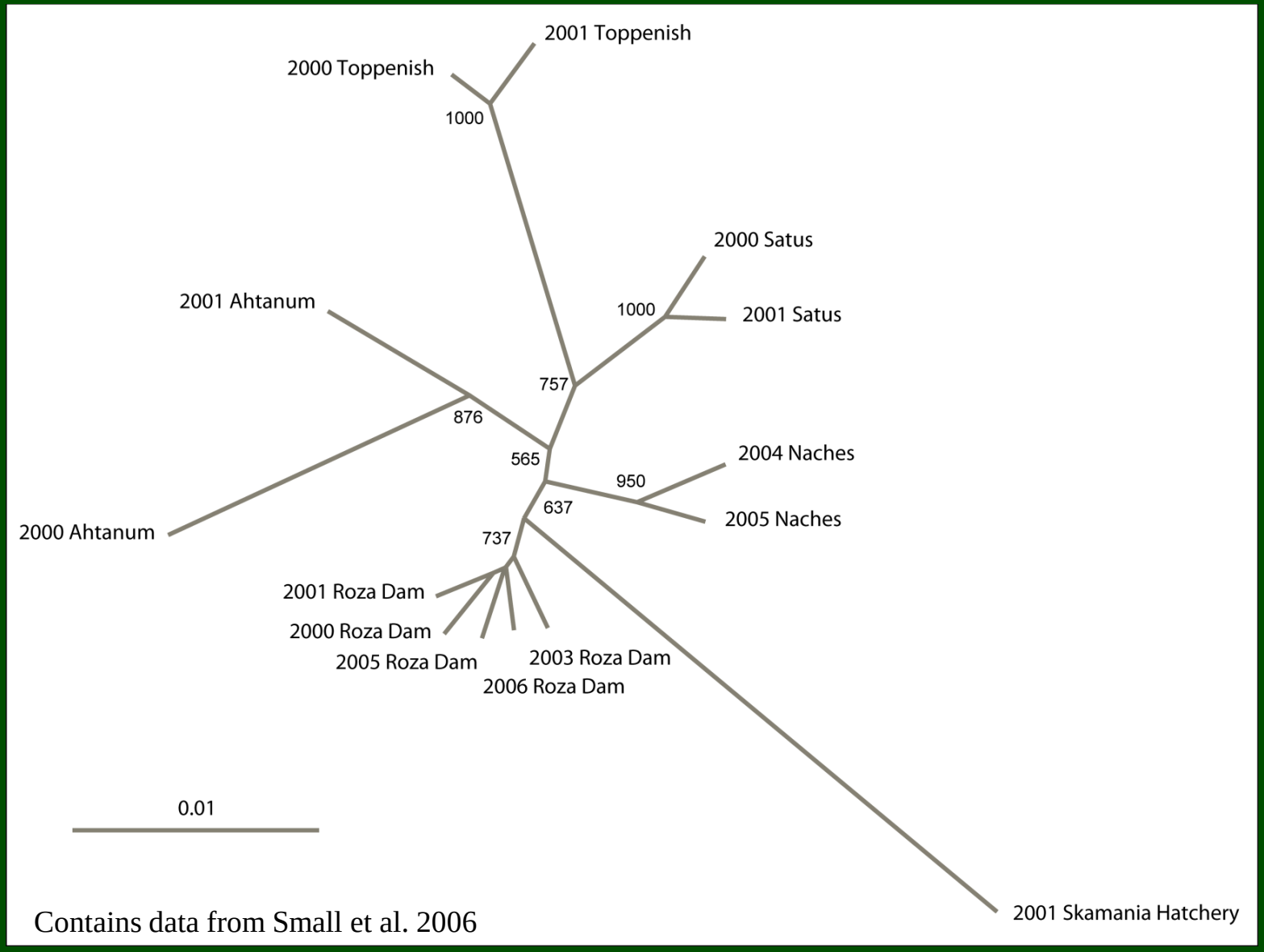
- Characterize the genetic diversity within upper Yakima River *O. mykiss*
  - Anadromous adult steelhead spawners
  - Juvenile migrant
  - Mature residents
- Investigate the genetic affinities between the different life history types
  - Anadromous vs. non-anadromous forms

Previous genetic studies

- Genetic data defines five steelhead populations in Yakima Basin
  - Satus Creek
  - Toppenish Creek
  - Ahtanum Creek
  - Naches River
  - Upper Yakima River

Limited interaction between hatchery and natural steelhead

Interaction unlikely between hatchery *O. mykiss* and natural steelhead

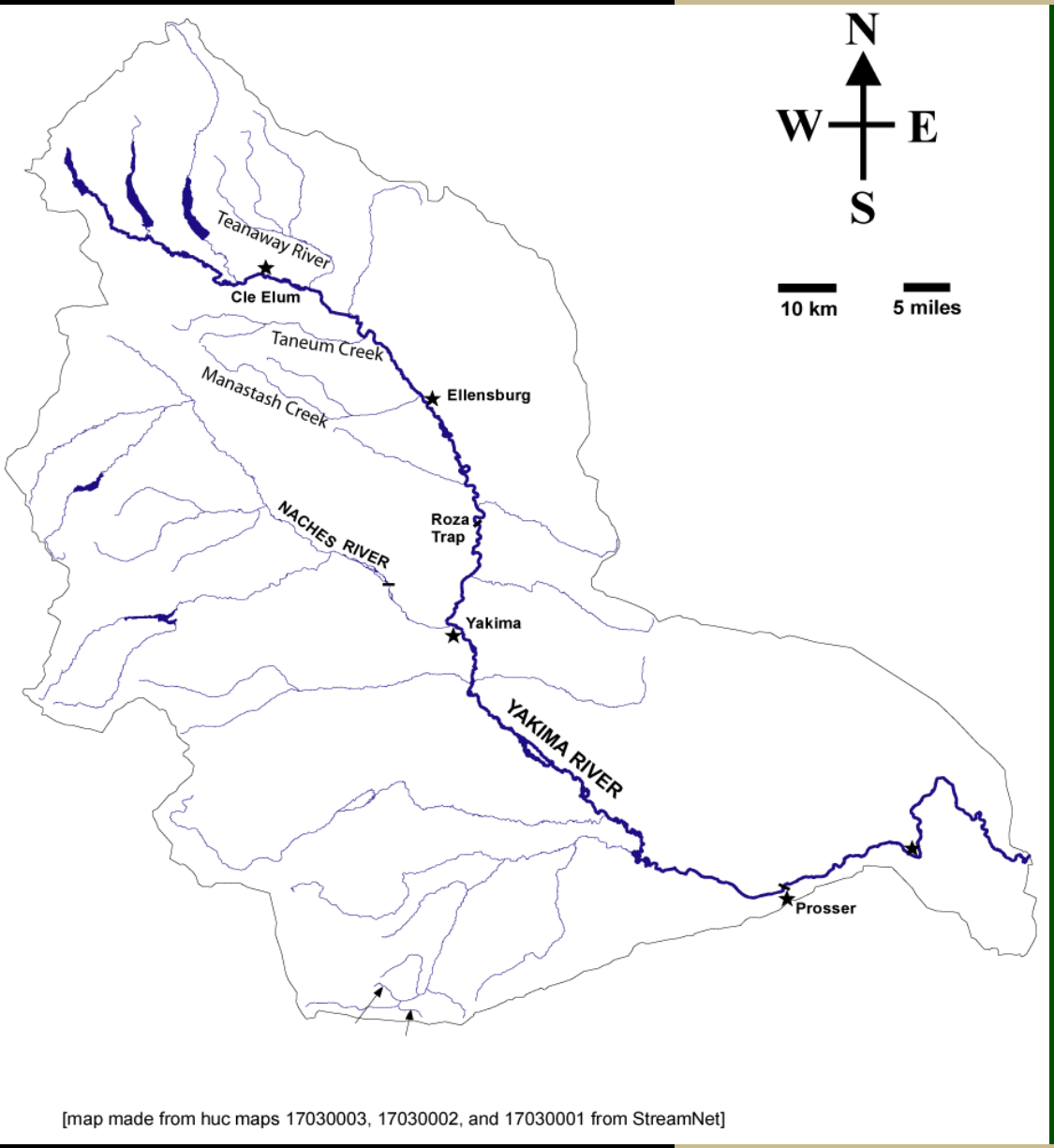


Contains data from Small et al. 2006

Previous genetic studies

- Steelhead Populations in Yakima Basin
  - Satus Creek
  - Toppenish Creek
  - Ahtanum Creek
  - Naches River
  - Upper Yakima River
- Limited interaction between hatchery and natural steelhead
- Unlikely interaction between hatchery *O. mykiss* and natural steelhead

Collections
Genetic analysis methods



[map made from huc maps 17030003, 17030002, and 17030001 from StreamNet]

- Adult steelhead spawners (2002, 2003, 2005, 2006)

  Teanaway = 130
  Taneum = 16

- Juveniles migrants (2006)

  Teanaway = 23

- Mature residents (2006, 2007)

  Teanaway = 121
  Taneum = 39
  Manastash = 8

- Genetic markers
  - SPAN standardized microsatellite suite (15 loci)
  - Microsatellites are short amplified fragments that vary for the number of DNA nucleotides they contain.
- Genetic analyses
  - Basic statistics – Allelic diversity, Hardy-Weinberg, LD
  - Factorial Correspondence Analysis (FCA)
  - Genic Differentiation
  - F_{ST}

Anadromous steelhead adults

- Collection combining all steelhead samples:
  - Hardy-Weinberg equilibrium observed
  - Minimal LD observed
- Conclusion: Collections of adult steelhead adult spawners represent samples from the same underlying population

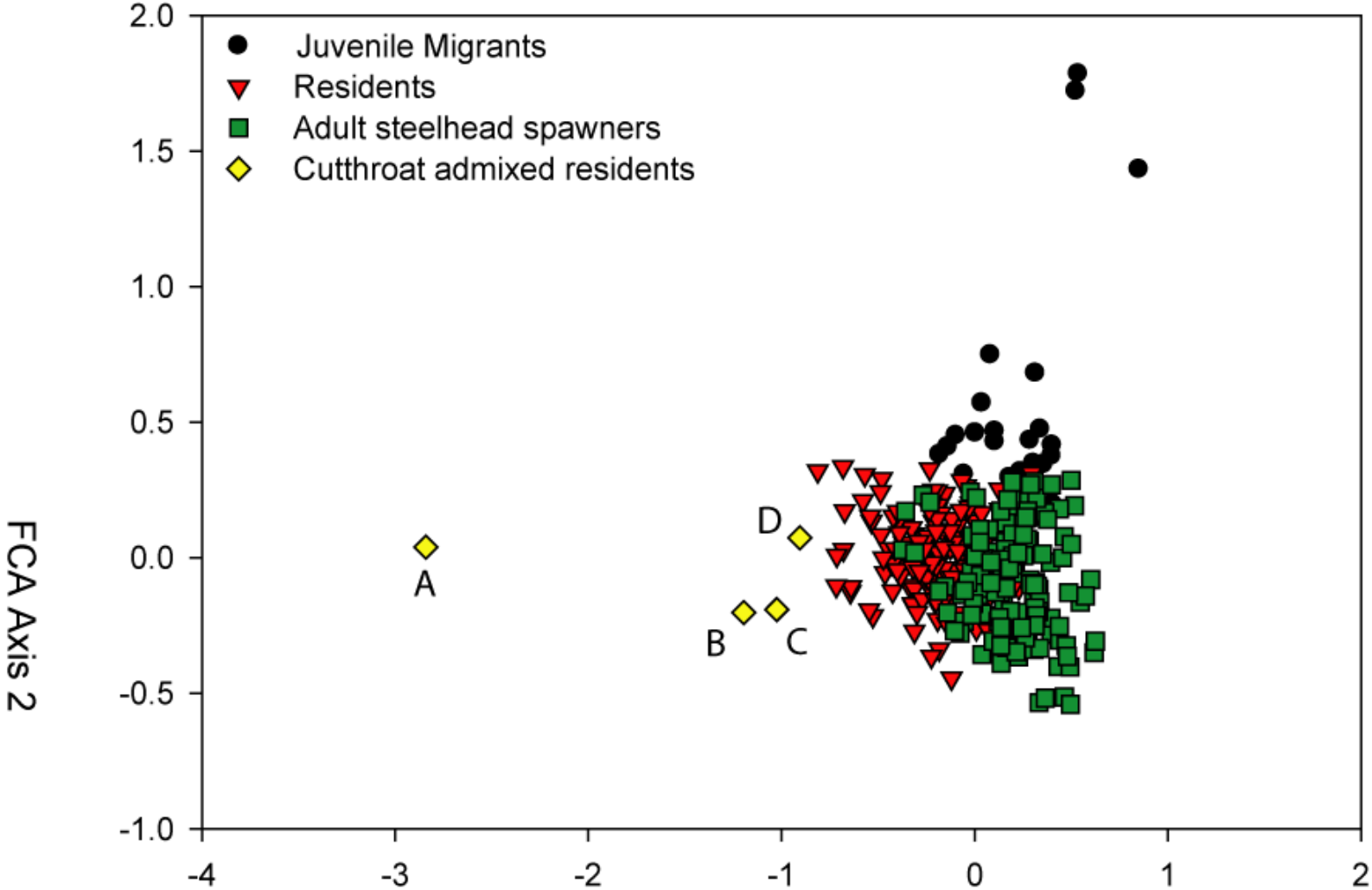
Juvenile migrants

- Collection of juvenile migrants:
  - Hardy-Weinberg equilibrium observed
  - Minimal LD observed
- Conclusion: Collection of juvenile migrants represents a sample from a single population

Mature residents

- Combined collection of mature residents:
  - Substantial LD
- Separated residents from Teanaway, Taneum, and Manastash
  - Linkage remained in Teanaway collection
- FCA of Teanaway collection revealed cutthroat admixture

Known adult spawners
Juvenile migrants
Mature residents



Mature residents

- Comparing residents from Teanaway, Taneum, and Manastash
  - All genetically differentiated based on allele frequency comparisons
  - F_{ST} statistically different from zero
  - Perhaps genetic relationships are inconsistent with geography
  - Limited sampling precludes robust comparisons among residents

- Known Anadromous Spawners vs. Juvenile Migrants
  - Not differentiated based on allele frequency comparisons
  - F_{ST} = 0.003 and not significantly different from zero.
- <u>Conclusion:</u> Spawner and migrant collections represent a single population.

Steelhead vs. Mature Resident *O. mykiss*

- Allele frequencies statistically different
- F_{ST} estimates statistically different than zero

Pairwise estimates of F_{ST}

Residents	Spawners
Teanaway	0.005
Taneum	0.013
Manastash	0.026

Steelhead vs. Mature Resident *O. mykiss*

- Allele frequencies statistically different
- F_{ST} estimates statistically different than zero
- Conclusions:
  - Steelhead and resident collections are genetically differentiated.
  - Residents and steelhead from the Teanaway River interact substantially.

Conclusions

- Collections of adult steelhead spawners represent samples from the same underlying population.
- Collection of juvenile migrants represents a sample from a single population (No evidence of mixture)
- Residents from Teanaway, Taneum, and Manastash are all genetically differentiated. (Cutthroat admixture observed)
- Spawner and migrant collections represent a single population.
- Anadromous and resident *O. mykiss* are genetically differentiated.
- Residents and steelhead from the Teanaway River interact substantially.

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