Seasonal Movements and Habitat Use of Rainbow Trout (*Oncorhynchus mykiss*) in the Susitna River Basin, Southcentral Alaska

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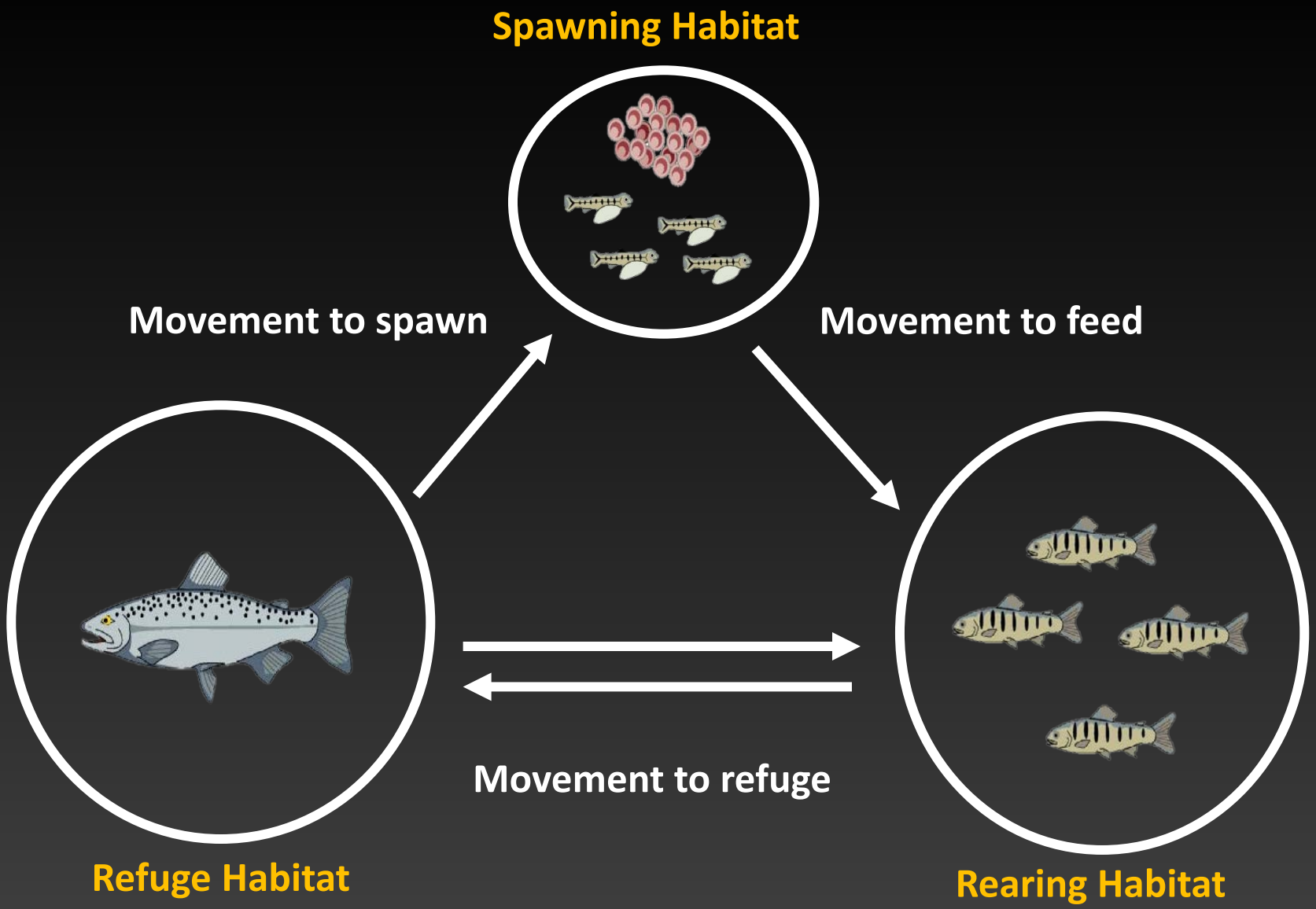
Background: Habitat Use and Movement



Northcote (1978); Schlosser and Angermeier (1995)

Background: Sex Bias

- **Energy budgets may differ between sexes**
  - Egg production more costly
  - Fierce competition among male
- **Behavioral differences may r ty**
  - Risky strategies
  - Skipped spawning

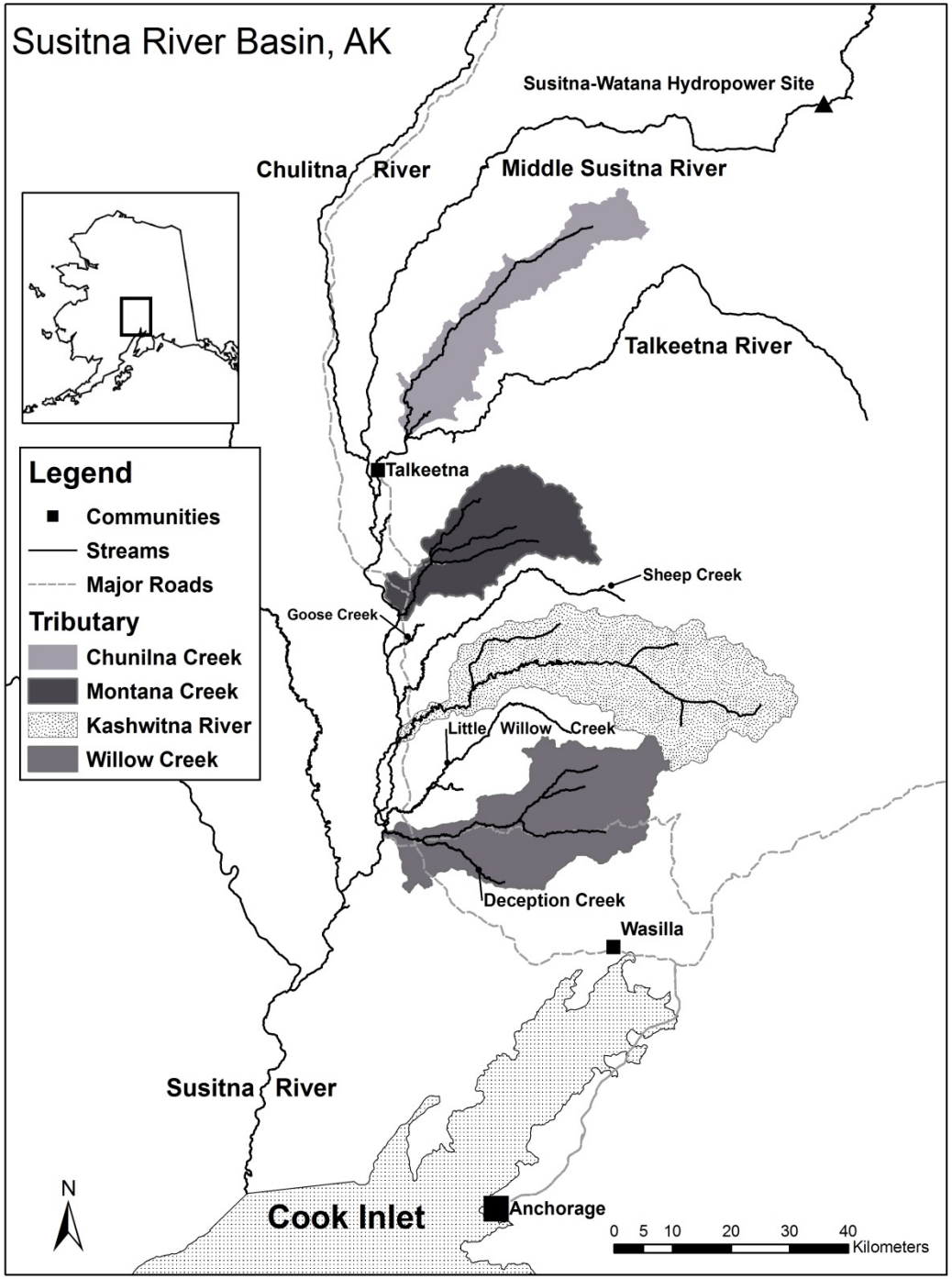
Objectives

1. **Characterize rainbow trout movements**
   - Across seasons
   - Between sexes
   - Among tributaries
2. **Identify important habit**
   - Across seasons

Study Area – Lower Susitna River Basin

- **Rainbow trout**
  - Native
  - Freshwater migratory
- **Sportfishery**
  - 122,235 angler days, 2,260 harvested
  - Catch-and-release
- **Ecologically important**
  - Dependent on salmon run
  - Indicator species
- **Potential threats**
  - Susitna Dam
  - Urbanization

Susitna Dam artist illustration, AEA



Methods: Capture, Tagging, and Tracking

Capture

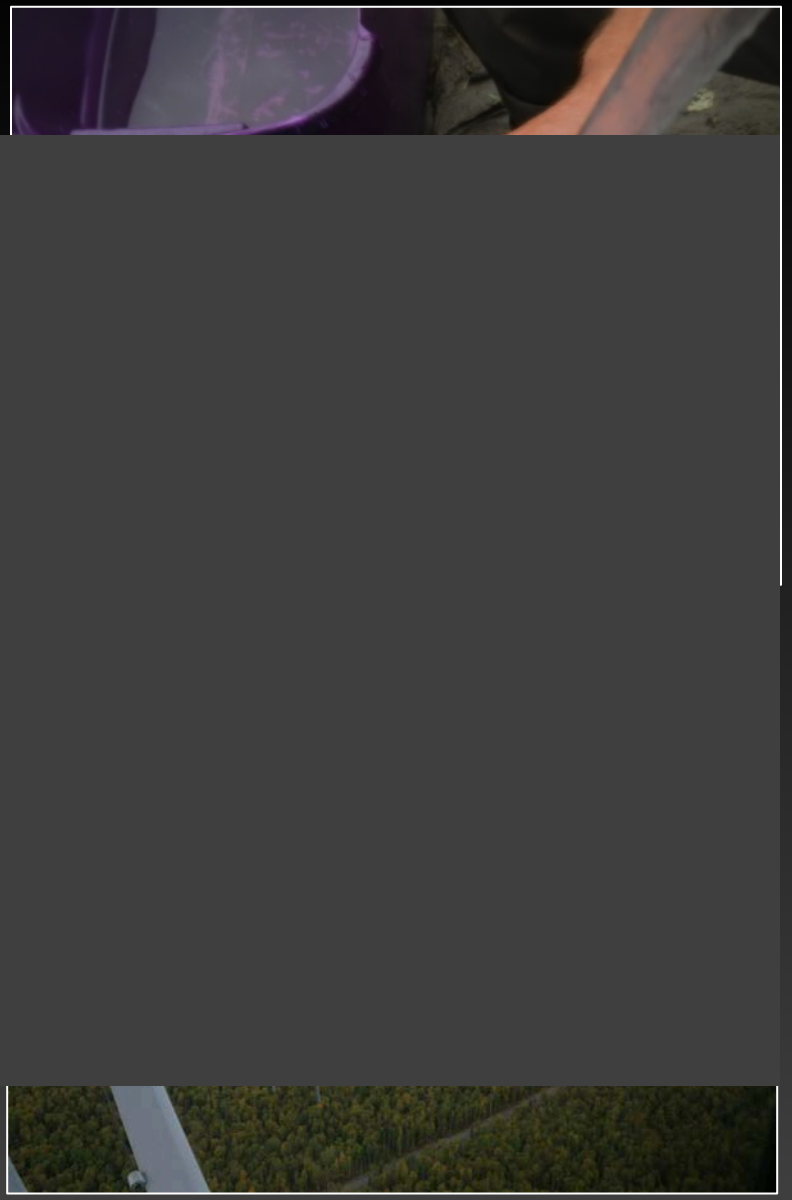
- Angling (adult fish > 400 mm)

Radiotagging

- Anesthetized, implanted, released

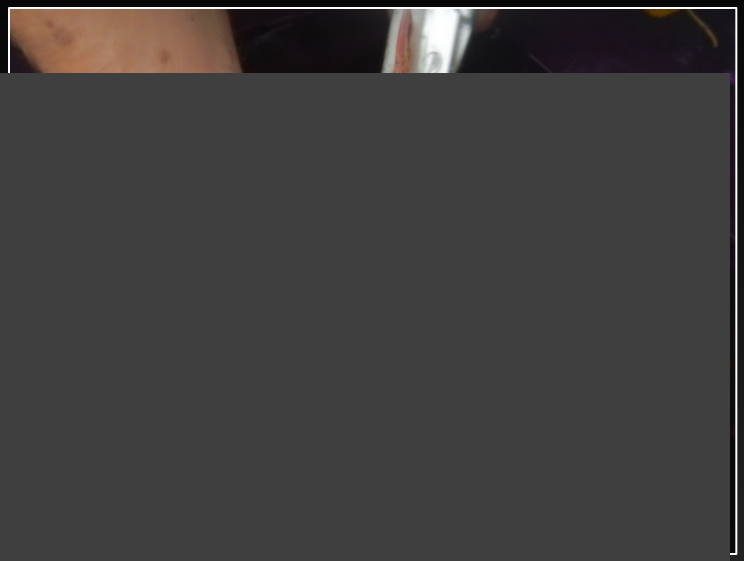
Tracking

- Two time periods (2003-2004, 2013-2014)
- Monthly aerial surveys
- Covered Lower Susitna Basin
- Accuracy (0.5 km)

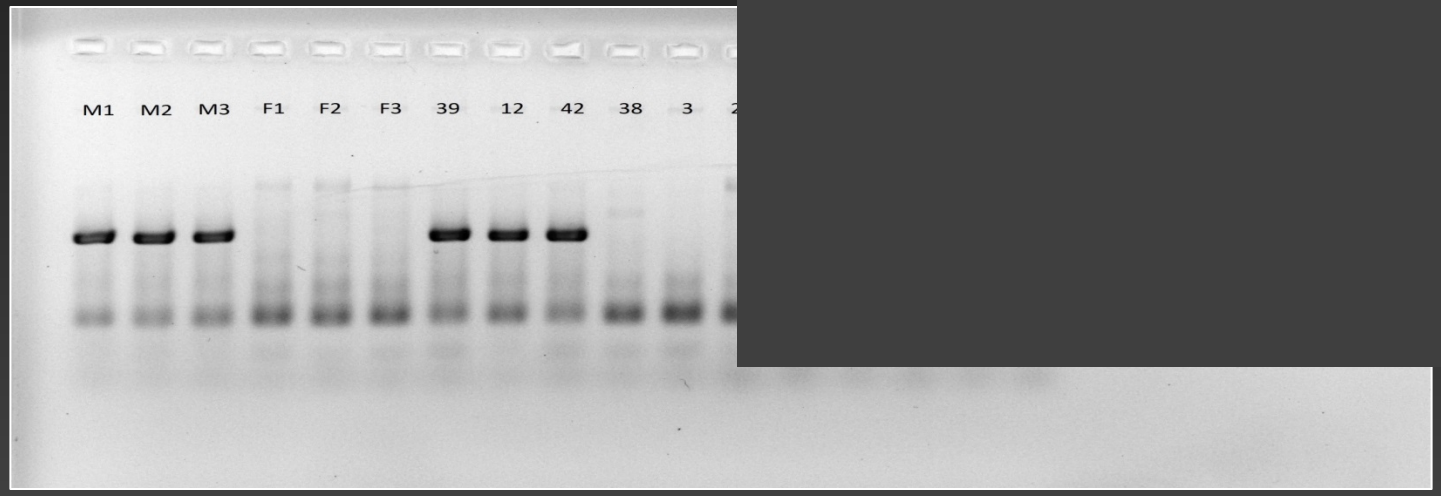


Methods: Sex Identification

- Fin clip taken from Willow Creek 2013-2014 fish, preserved



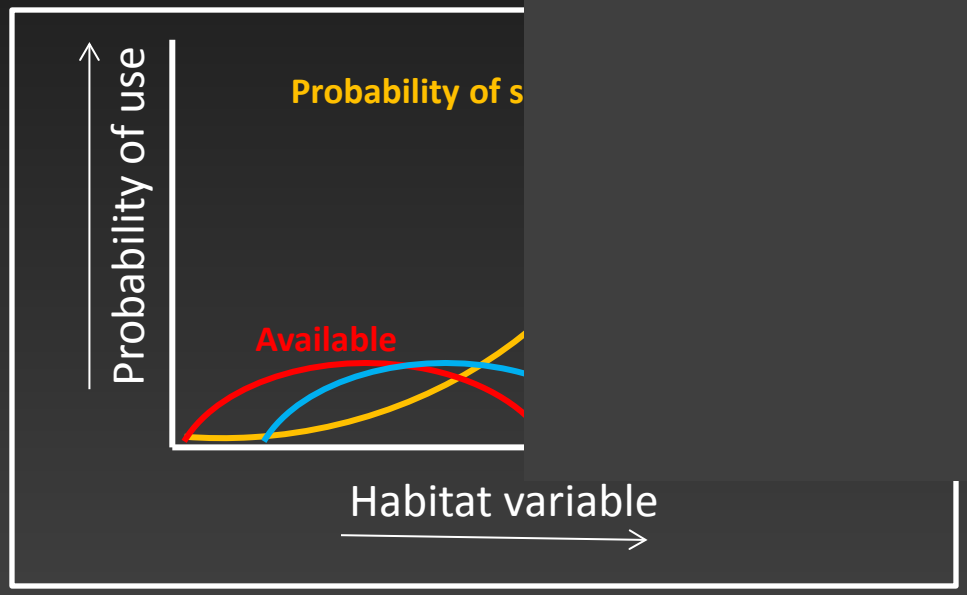
- DNA extracted, multiplied, sex markers examined following methods of Brunelli et al. (2008



Methods: Data Analysis

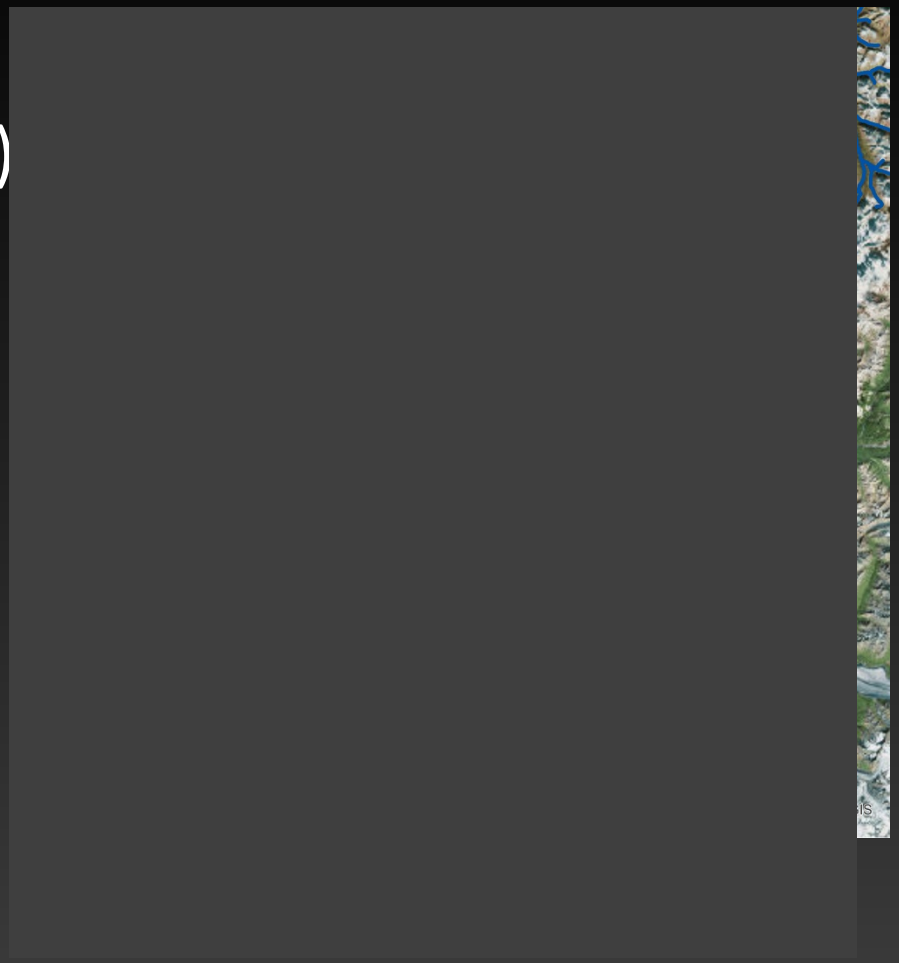
- Movements
  - Inter-seasonal, total annual, distance from confluence (km)
  - ANOVA (sex, season, tributary)
- Seasonal habitat use

9)



Methods: Data Analysis

- NetMap digital stream network (Benda et al. 2007)
  - Stream reach-scale (~100 m)
    - Averaged to 0.5 km
  - Seasonal habitat attributes
    - Stream size/flow (cms)
    - Gradient (%)
    - Sinuosity (unitless)
    - Substrate size (D50;mm)
    - Chinook spawning habitat potential index (0-1)



Results: Tagging and Sex Determination

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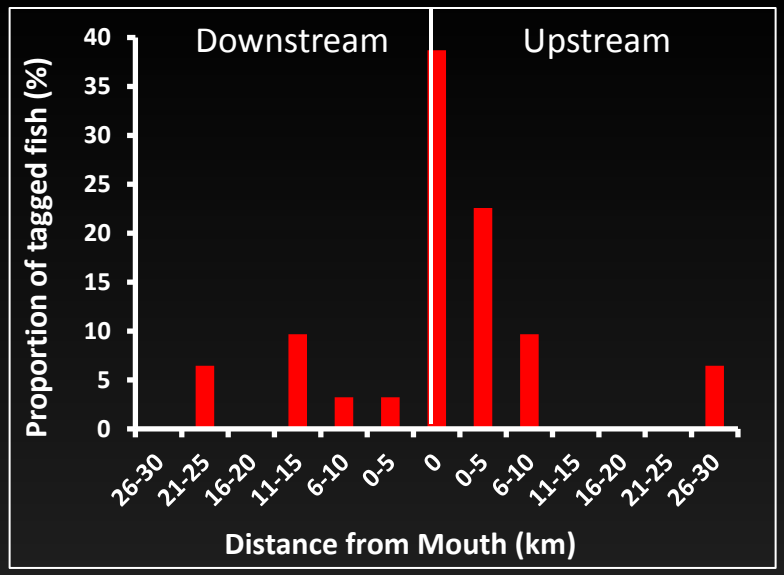
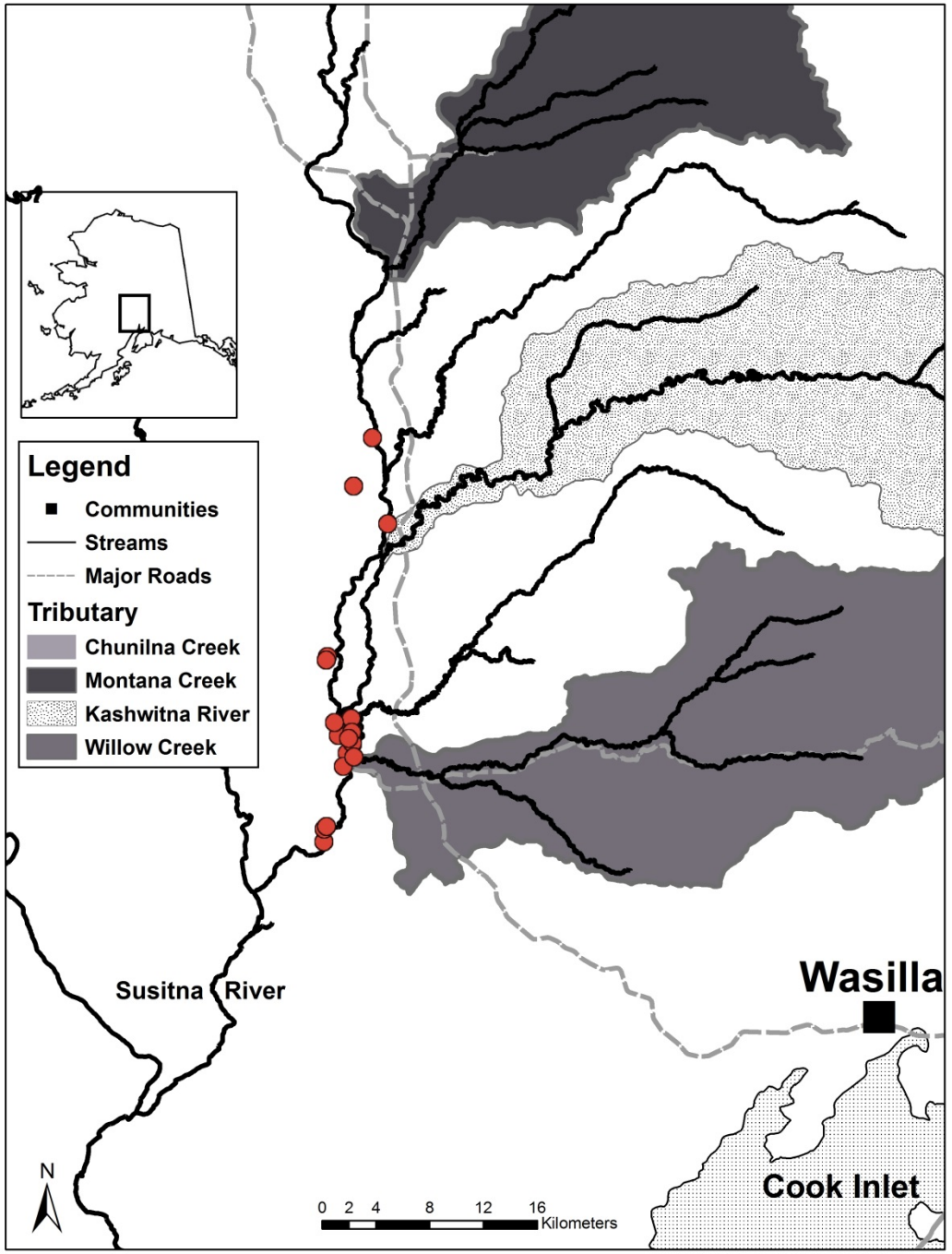
- 2(
  ar
- N
- M
- 65

2014 Willow Creek Overwintering: Oct-May



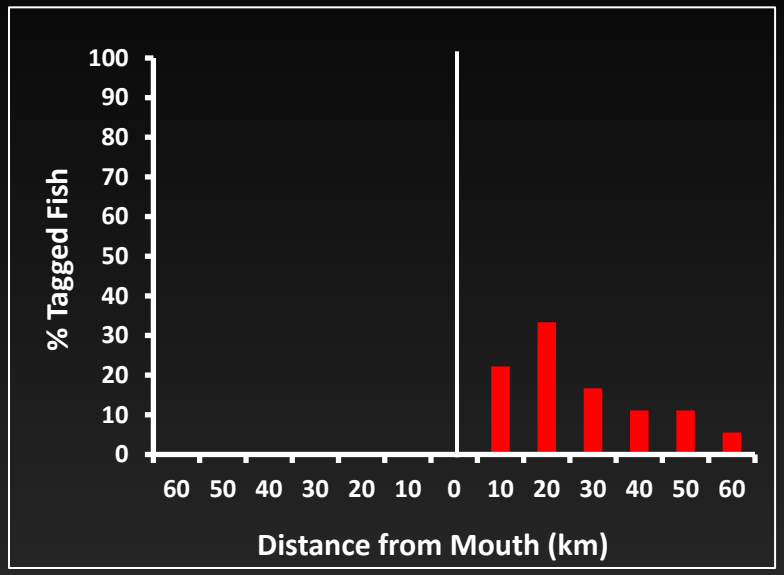
Overwinter habitat use

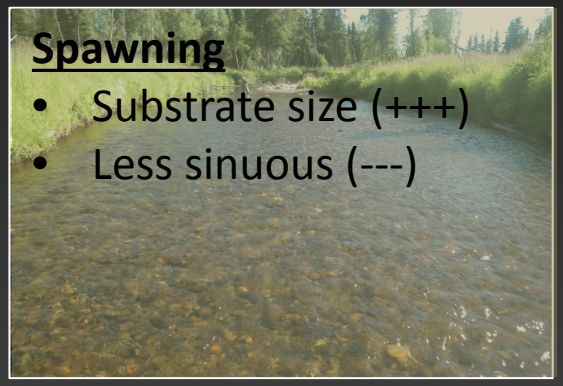
- Lower gradient (---)
- More sinuous (+++)
- Higher flows (++)

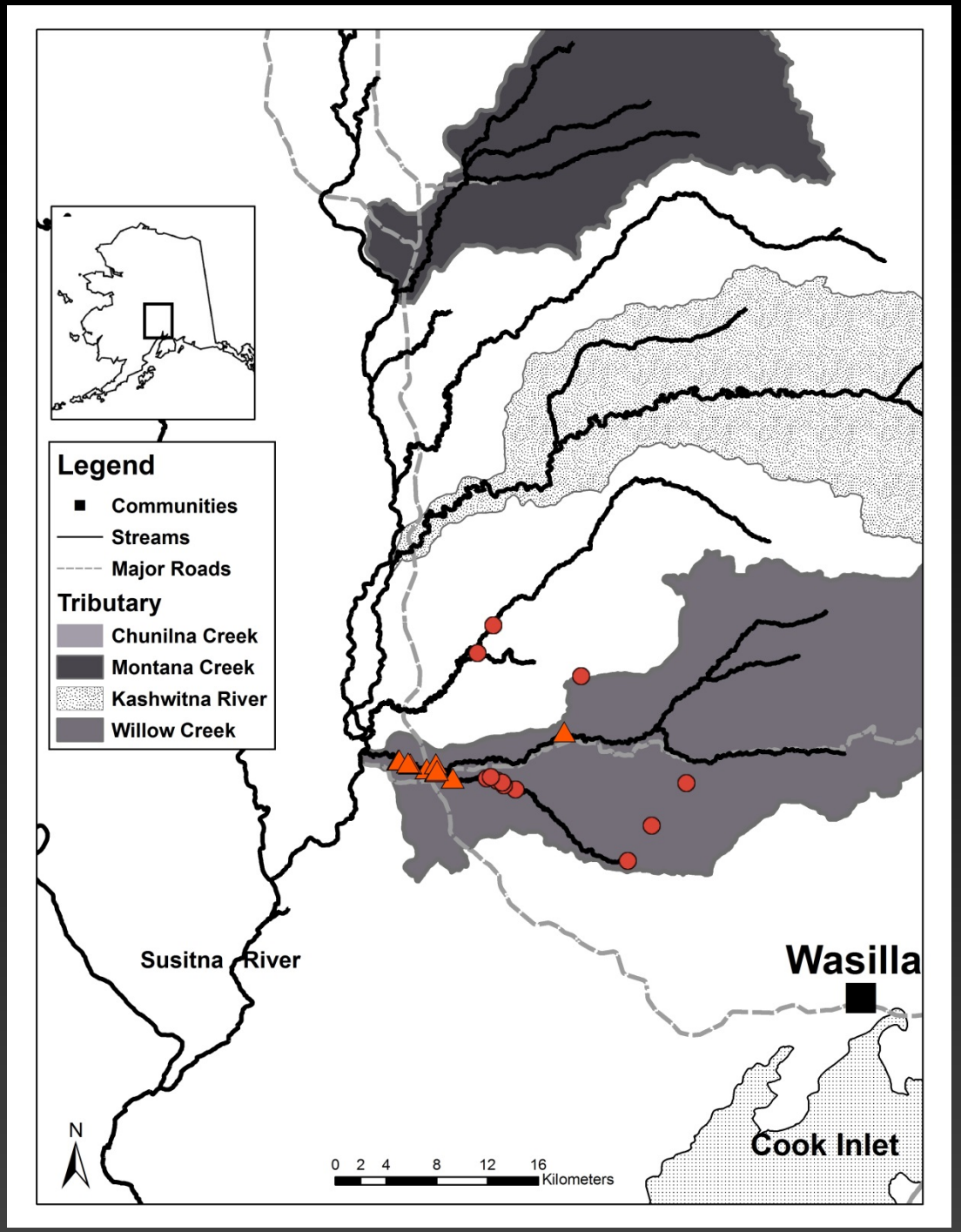


2014 Willow Creek
Spawning: May-June

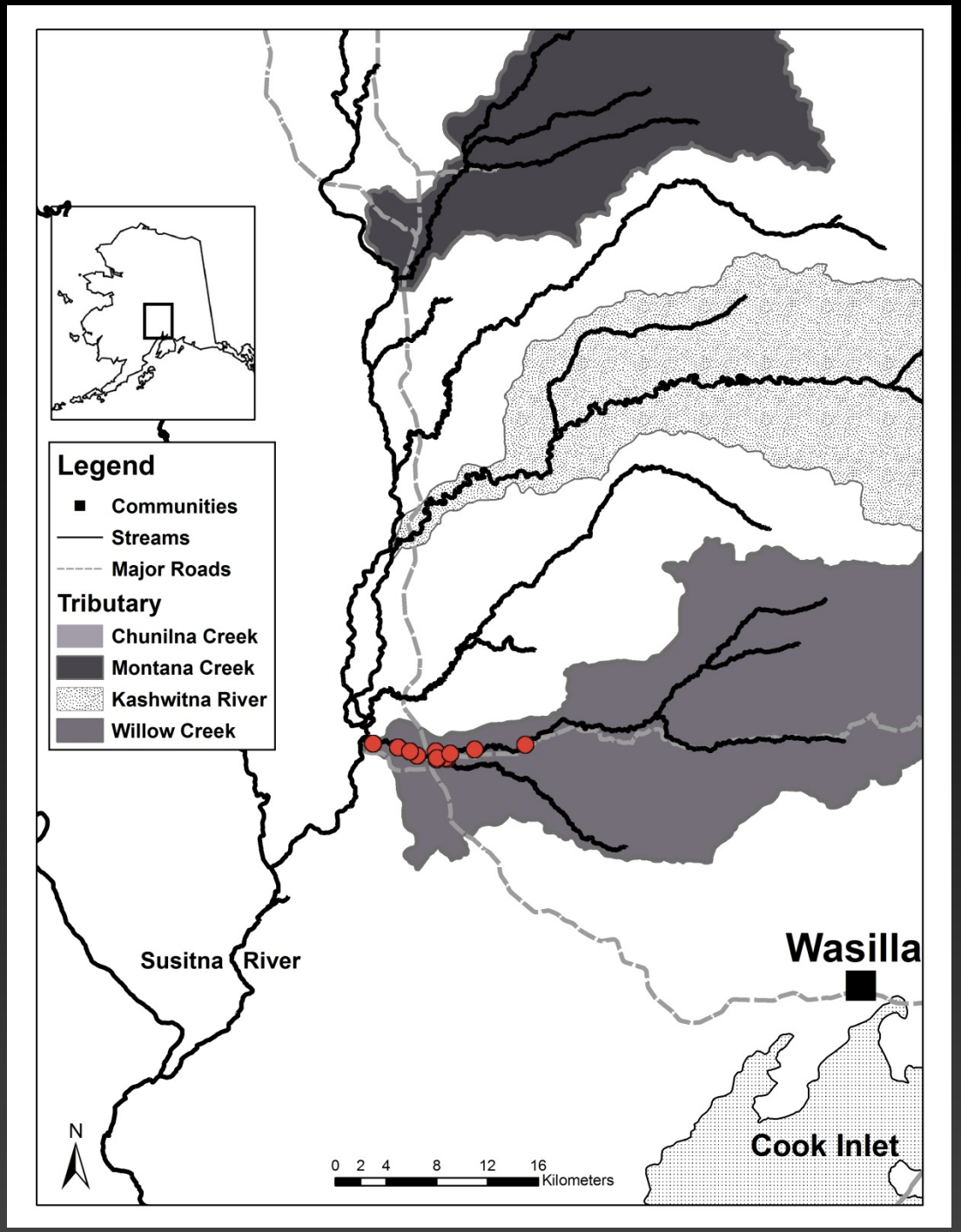
Spawned
Did not spawn







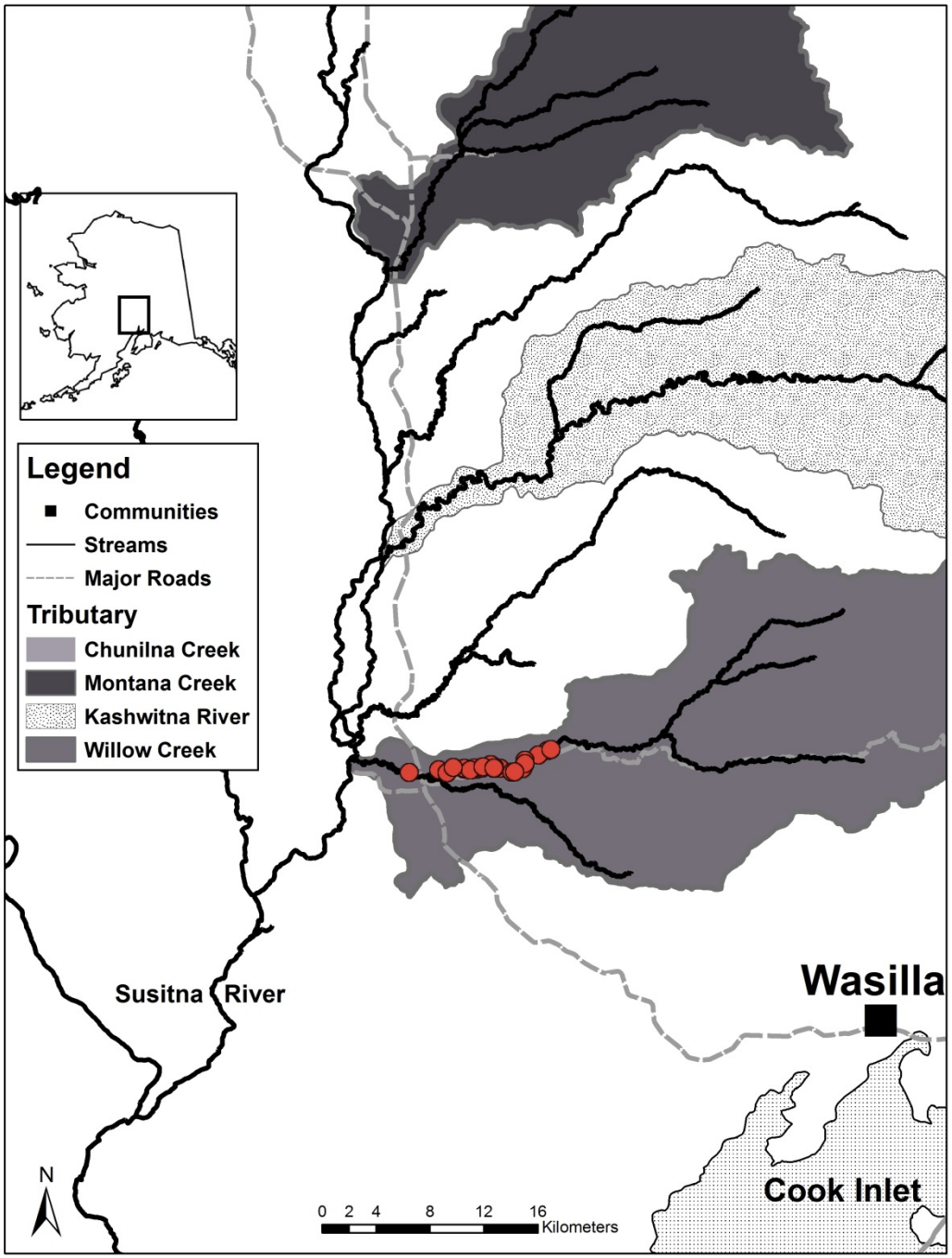
2014 Willow Creek
Early Feeding: June-July



2014 Willow Creek
Late Feeding: Aug.-Sept.

Late Feeding

- Chinook spawning habitat potential (+++)
- Higher gradient (++)
- More sinuous (+)



Results: Movement and Fidelity

Inter-seasonal movement

- No differences between sexes

Total annual movement

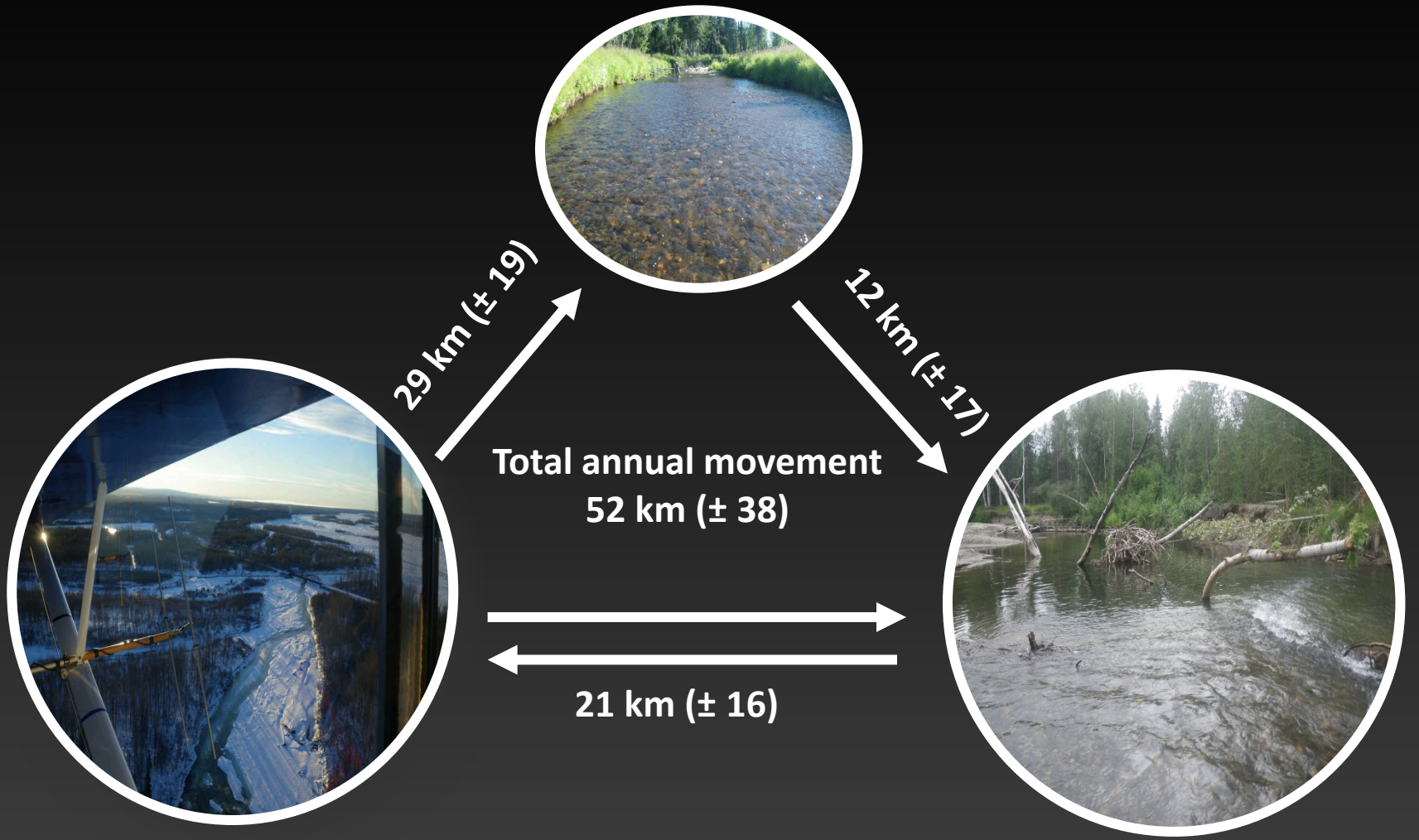
- Mean = 42 km (range 5 – 219 km)
- Kashwitna River fish moved farther (mean = 105 km)

Kashwitna River

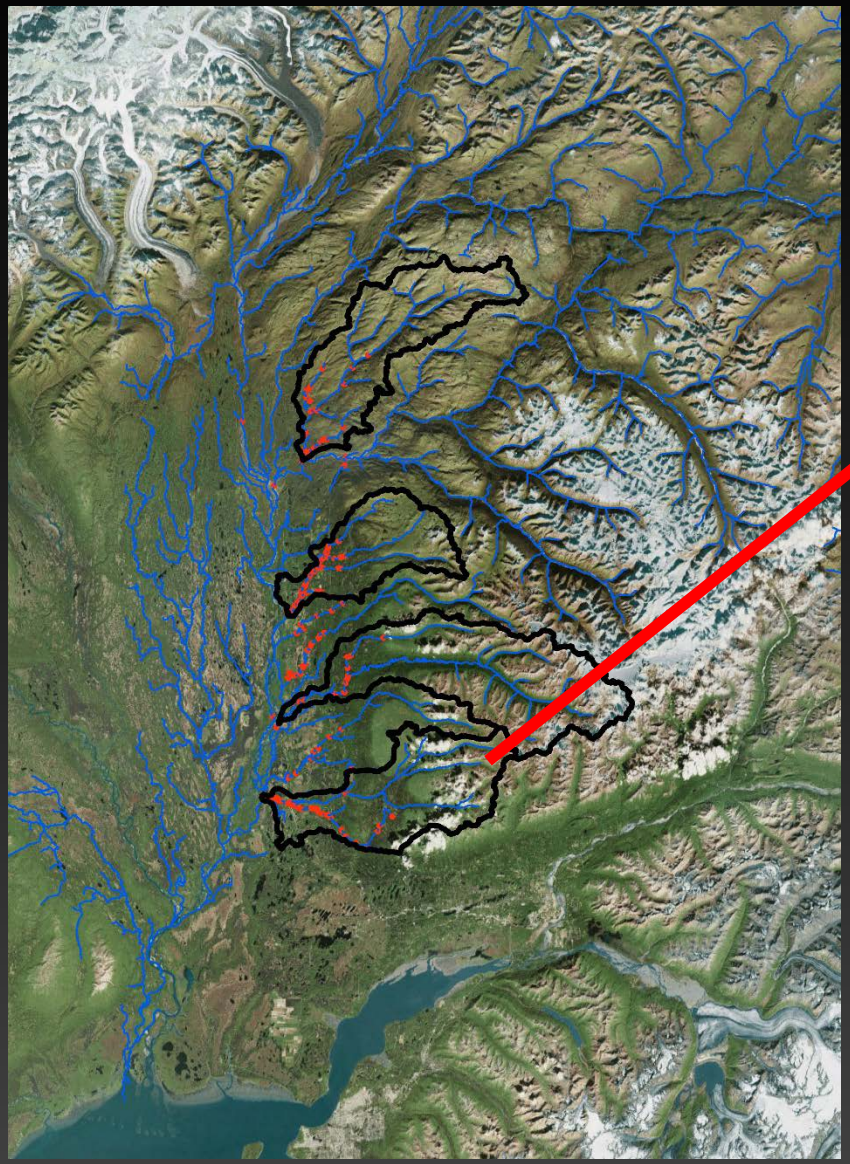
Tributary fidelity

- High fidelity across years, seasons, and tributaries (mean = 88%)
  - Exception: Kashwitna River (only 33.3% during spawning season)
  - Complex movements ~ 10%

Seasonal Habitat Use and Movement of Rainbow Trout – Lower Susitna River Basin



Rainbow Trout – RSF Model Spawning Habitat Predictions



Willow/Deception Creeks ~ 40 stream-km “high quality” spawning habitat

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A

THESIS

Presented to the Faculty

Of the University of Alaska Fairbanks

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Kevin Marshall Fraley, B. S.

Fairbanks, Alaska

December 2015

CH 1: Seasonal movements and habitat use – Lower Susitna

CH 2: Weekly movements, fine-scale habitat use, relationship with spawning salmon

Acknowledgements

- Committee members: Dr. Megan McPhee, UAF SFOS; Dr. Anupma Prakash, UAF Geophysical Institute
- Genetic techniques training and me
- Field assistance: Mike Lunde, John F Huntsman, Lauren Bailey, and Ben C


09.29.2013 12:00