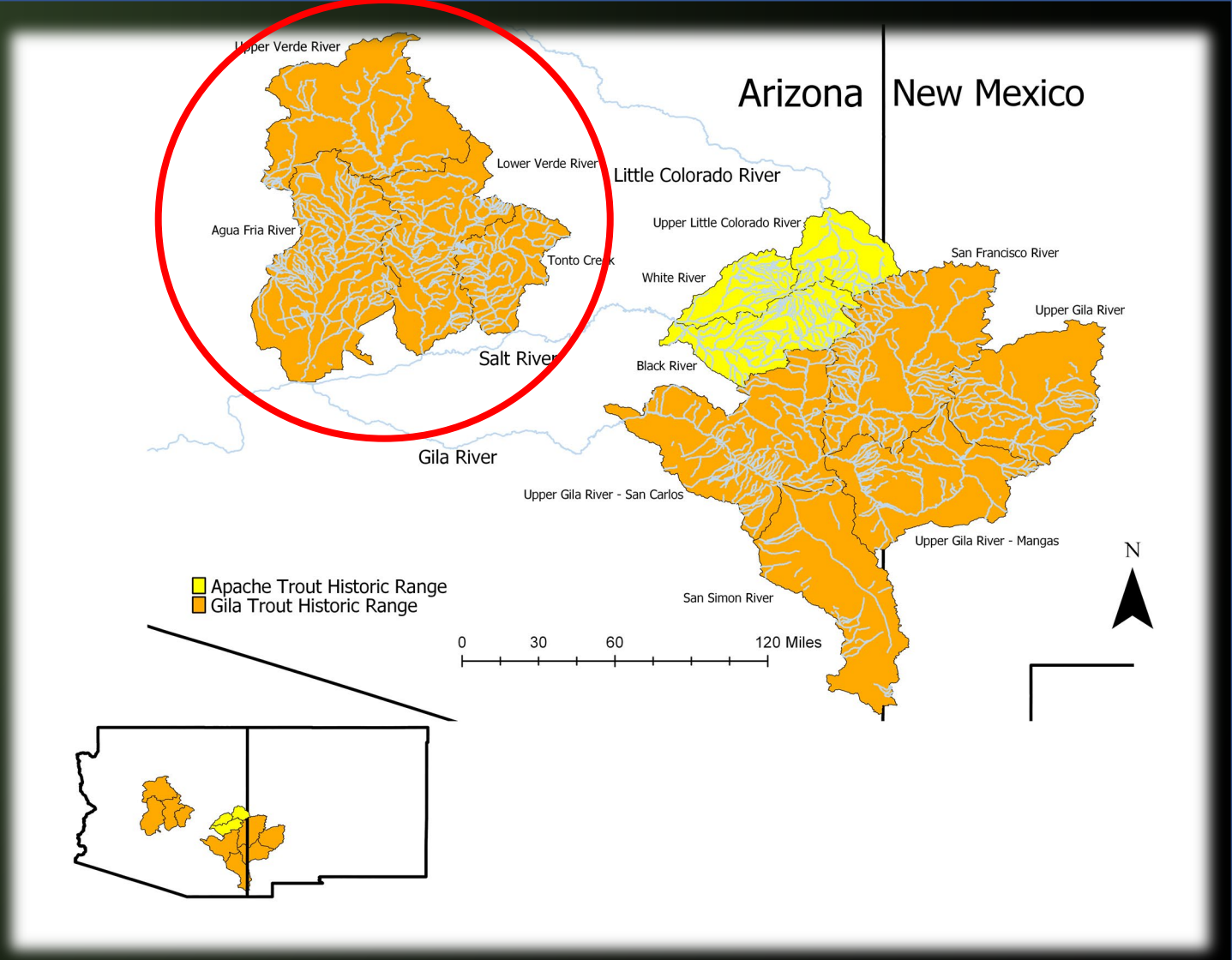
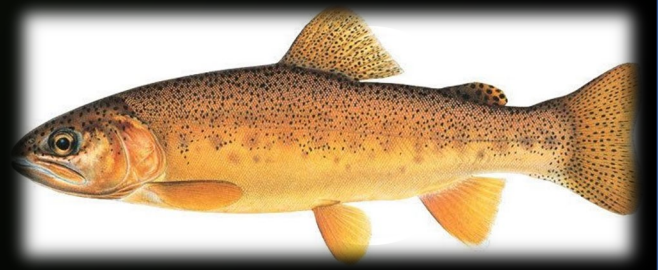
Estimating Survival and Movement Probability of Hatchery Gila Trout in an Arizona Stream

Alex Loubere, Devon Oliver, and Ryan Mann

Introduction

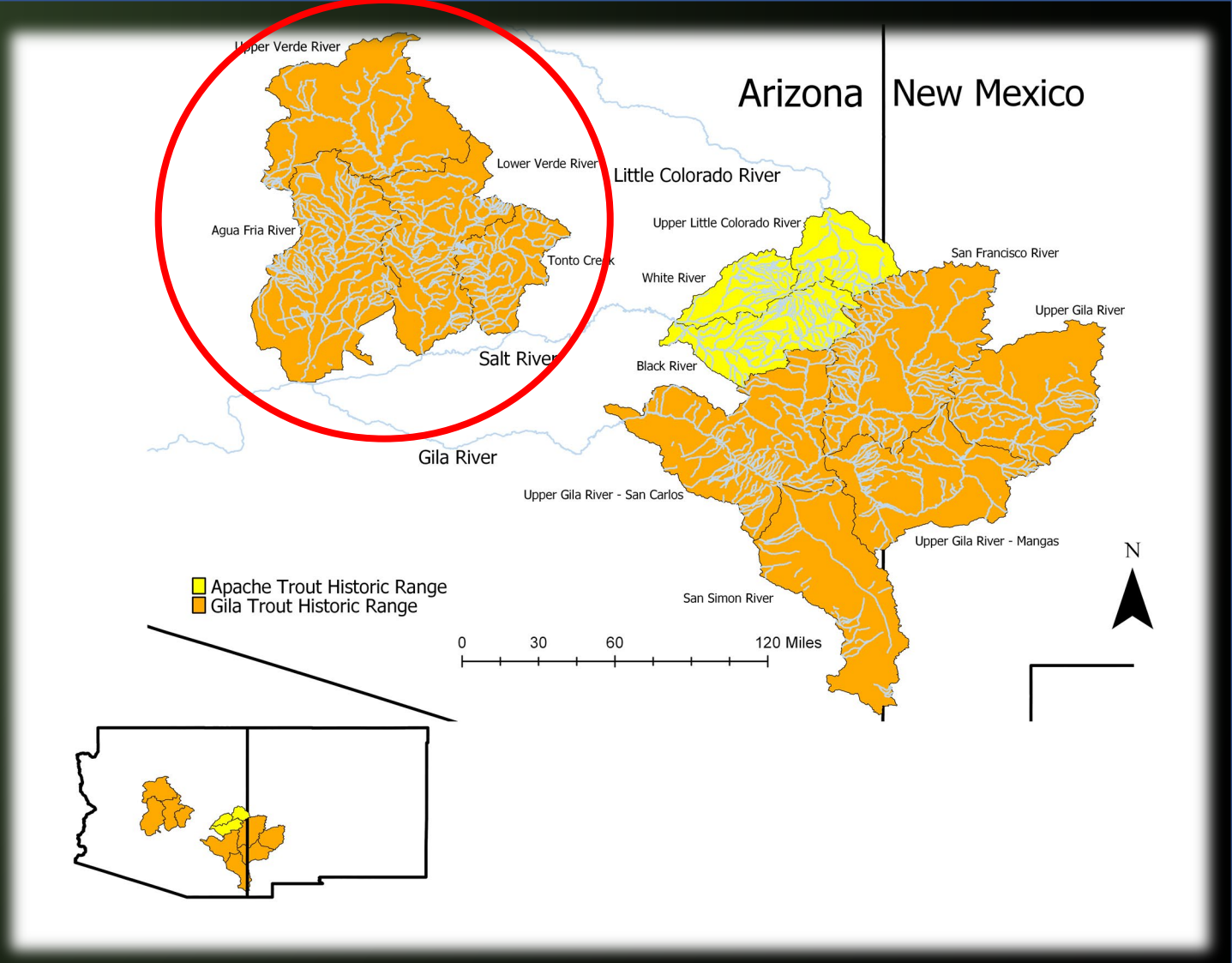
- Put-and-take trout fisheries are popular with anglers
- Replacement of stocked trout with native species
- AZGFD exploring switch to Gila Trout in some fisheries
- Survival and movement of hatchery Gila Trout unknown

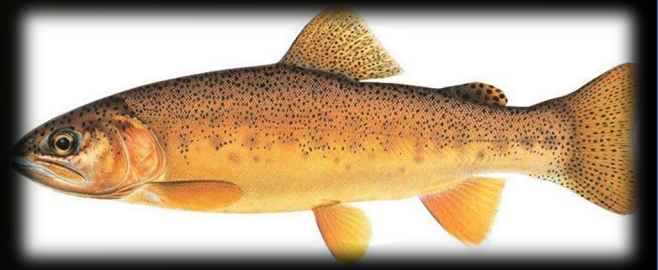




Objectives

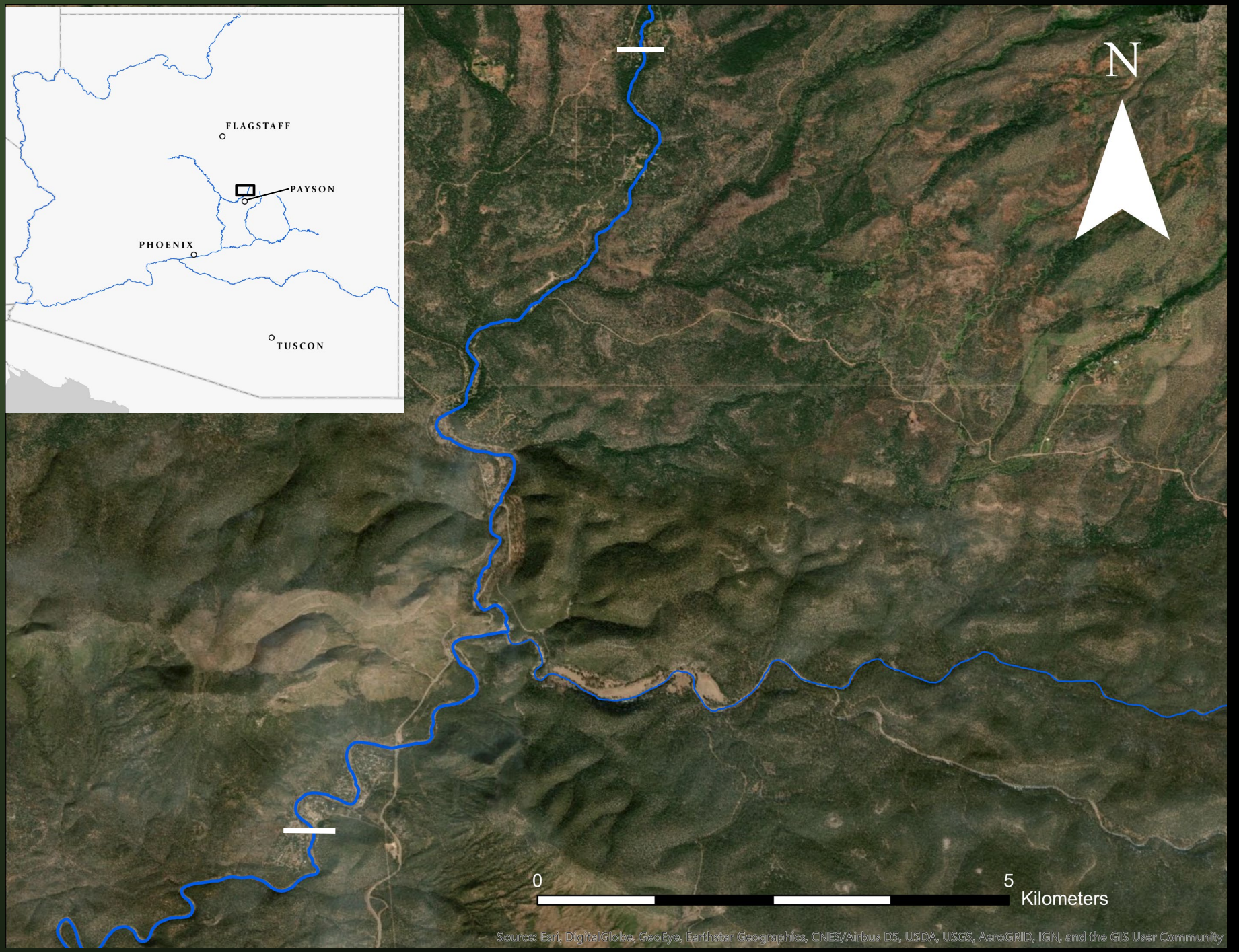
1. Evaluate the return to creel of catchable-size Gila Trout, angler satisfaction, and angler catch rates.
2. Evaluate the movement of catchable-size Gila Trout.
3. Evaluate the suitability of Gila Trout as an alternative to Rainbow Trout in Arizona's stream trout fisheries in its native range.





Study Area

East Verde River (EVR)



Methods: Collection and Tagging

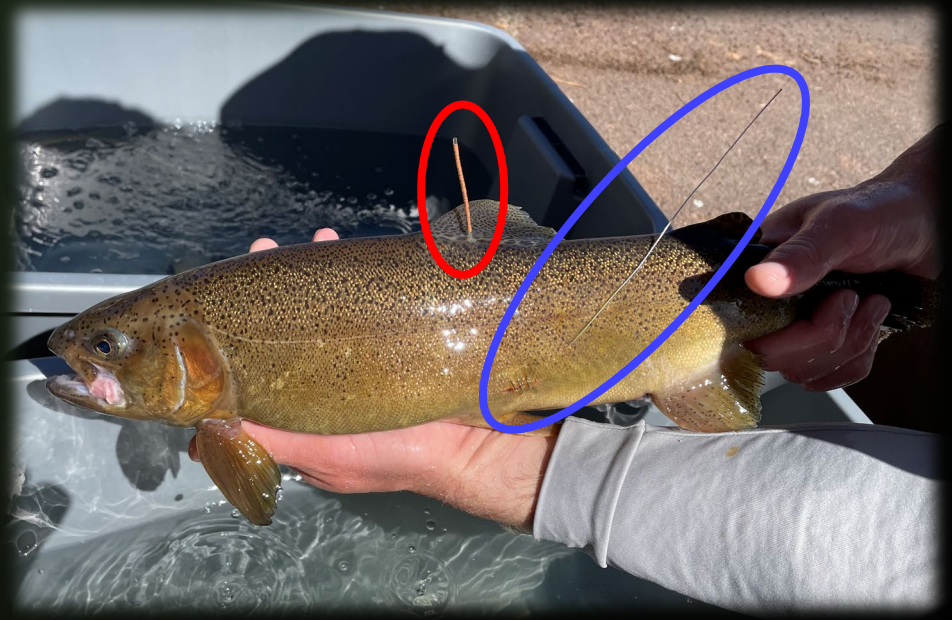
- 585 Gila Trout total

2020: 118 live tags, 119 controls

2021: 78 live tags, 60 controls

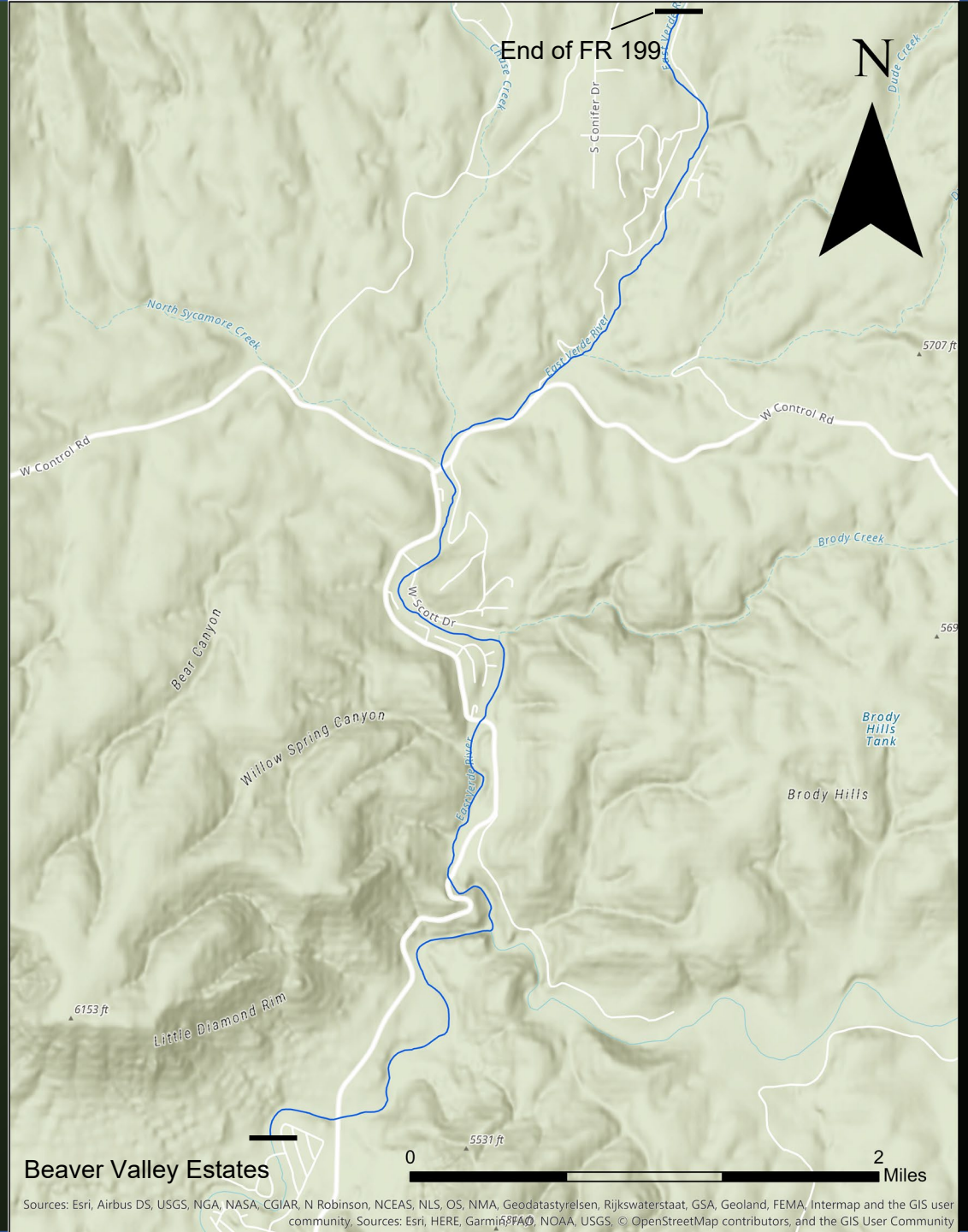
2023: 105 live tags, 105 controls

- Sedated using AQUI-S® aquatic anesthetic
- Radio tags surgically implanted with shielded needle technique
- Held for 10 days prior to stocking



Study Area

East Verde River (EVR)



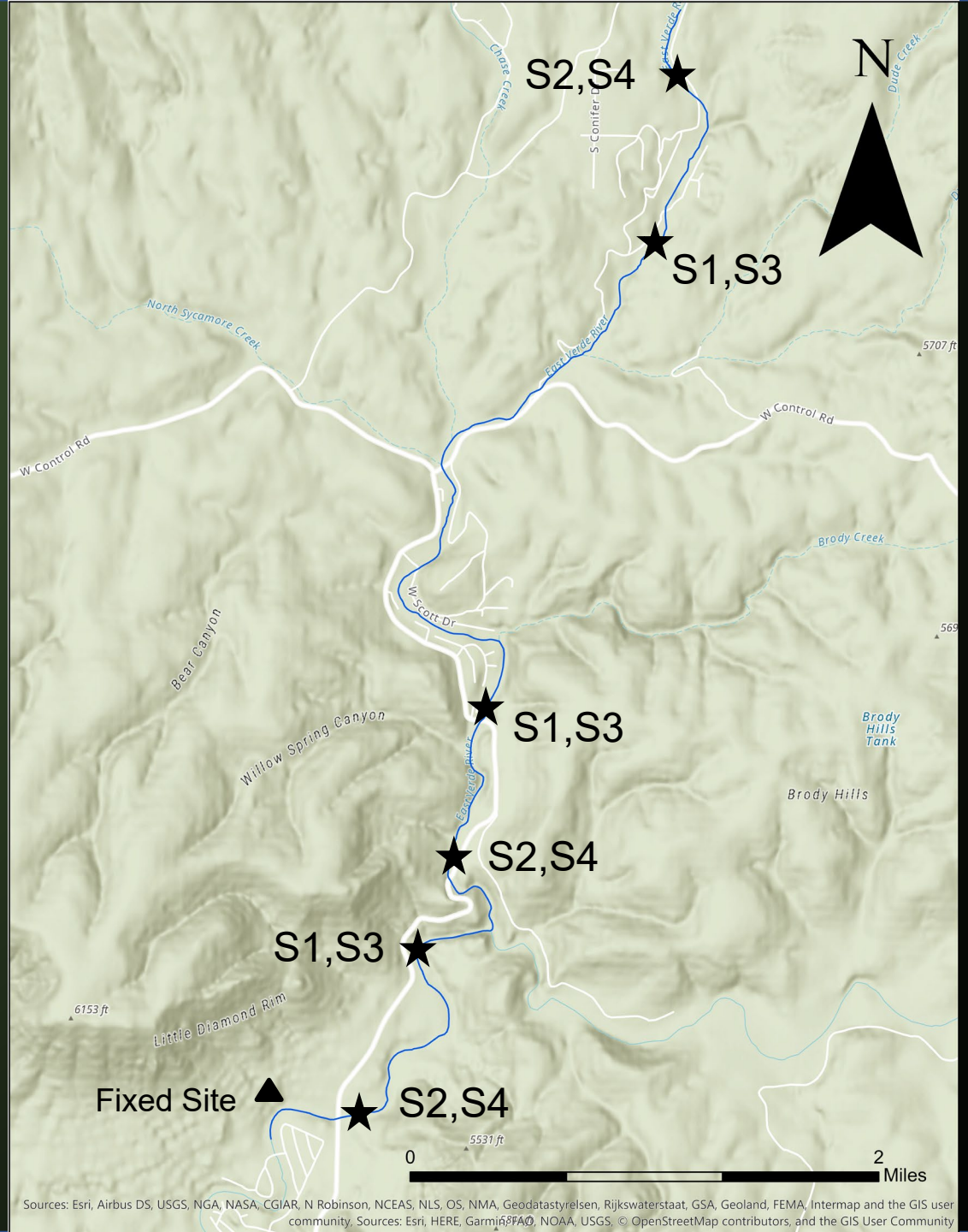
Stocking

2020 Stocking Locations

Numbers split evenly between 3 locations/stocking

Alternated locations for each stocking

n = 74
S1: 19
S2: 18
S3: 17
S4: 20

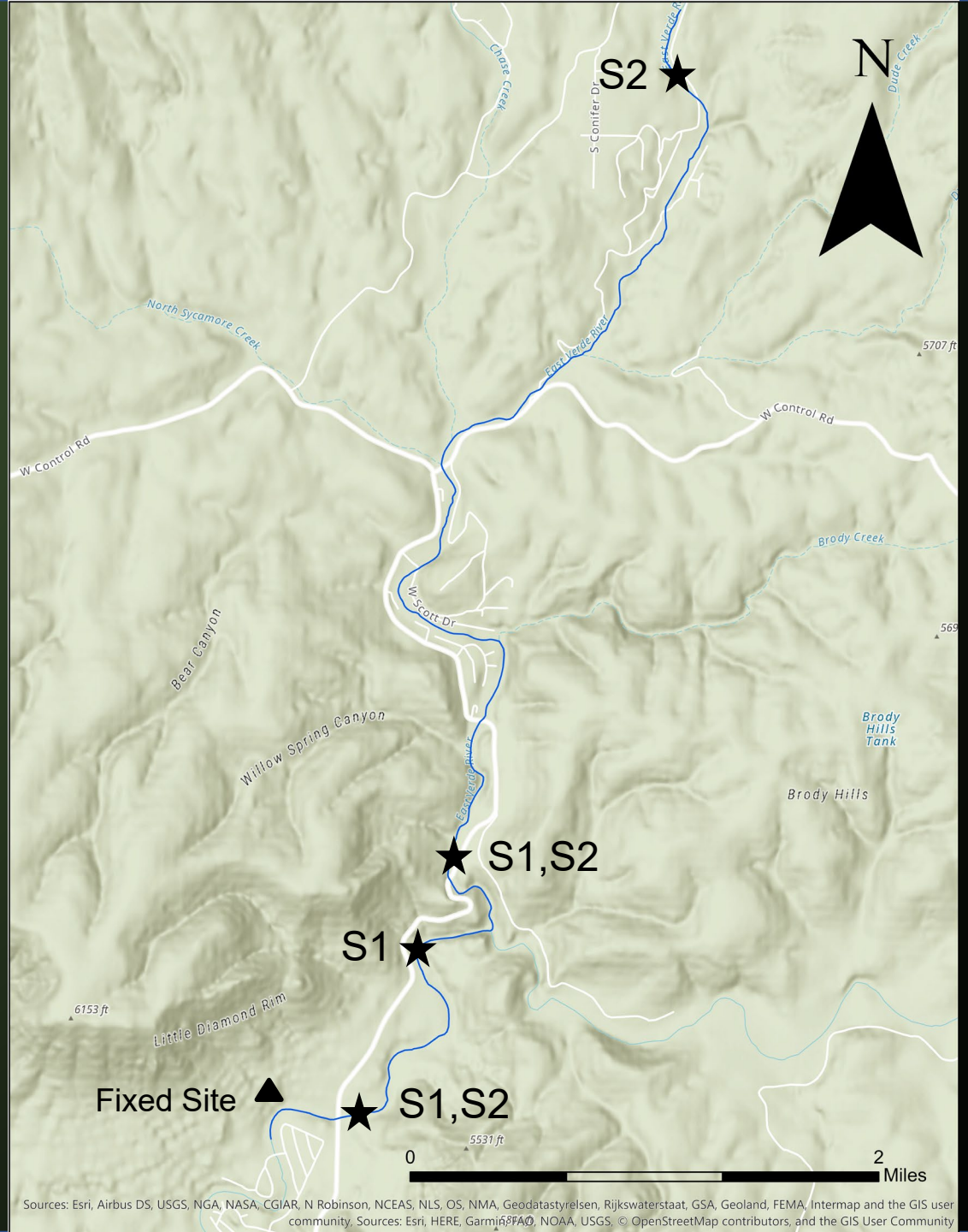


Stocking

2021 Stocking Locations

Reduced flow limited location availability

n = 50
S1: 13
S2: 37



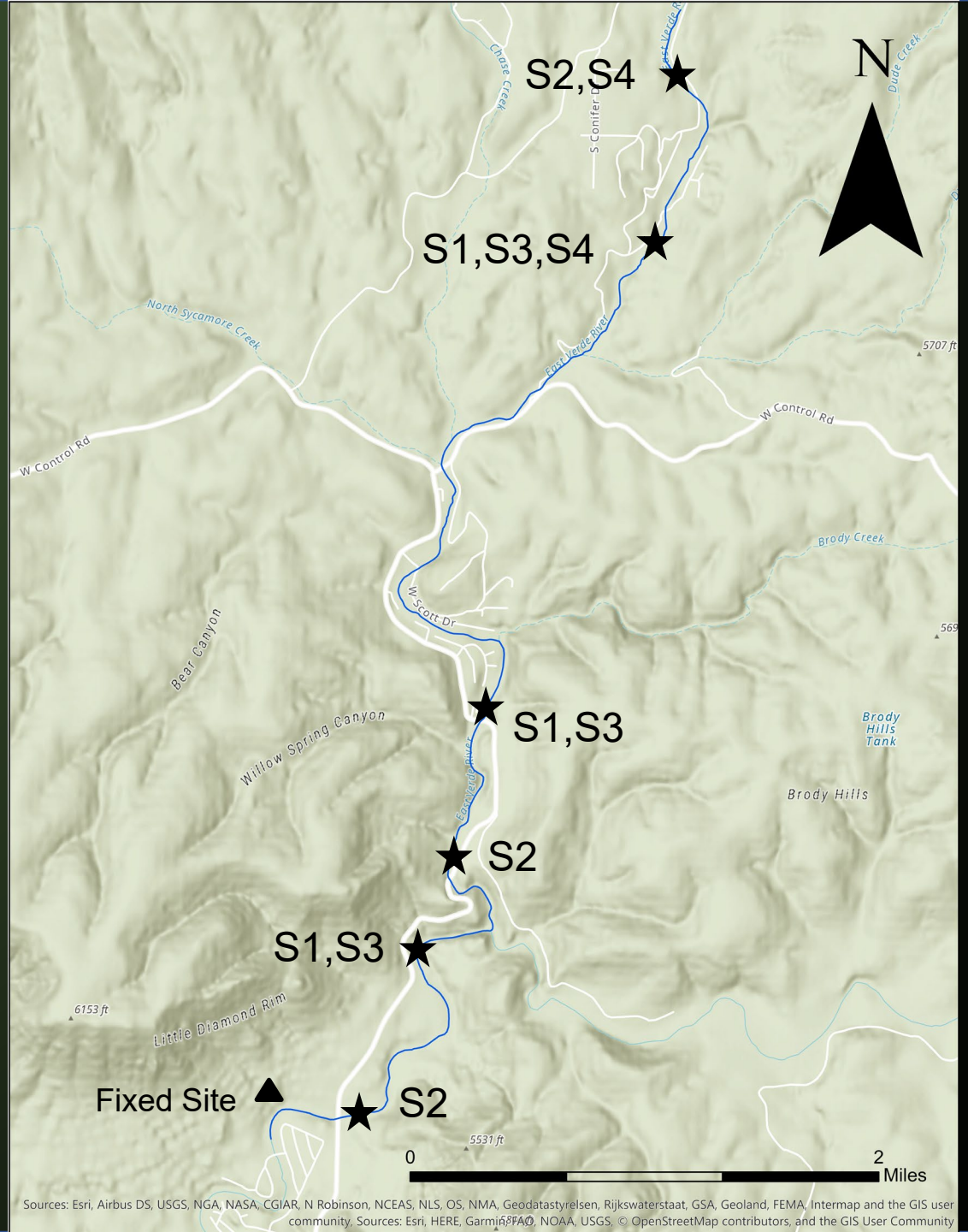
Stocking

2023 Stocking Locations

Numbers split evenly between 3 locations/stocking

Alternated locations for each stocking

n = 99
S1: 29
S2: 27
S3: 28
S4: 15



Methods: Tracking

- Tracking performed on a weekly basis
- Hand held ATS units with yagi antenna
- Tracked to location and GPS waypoint taken

Methods: Tracking

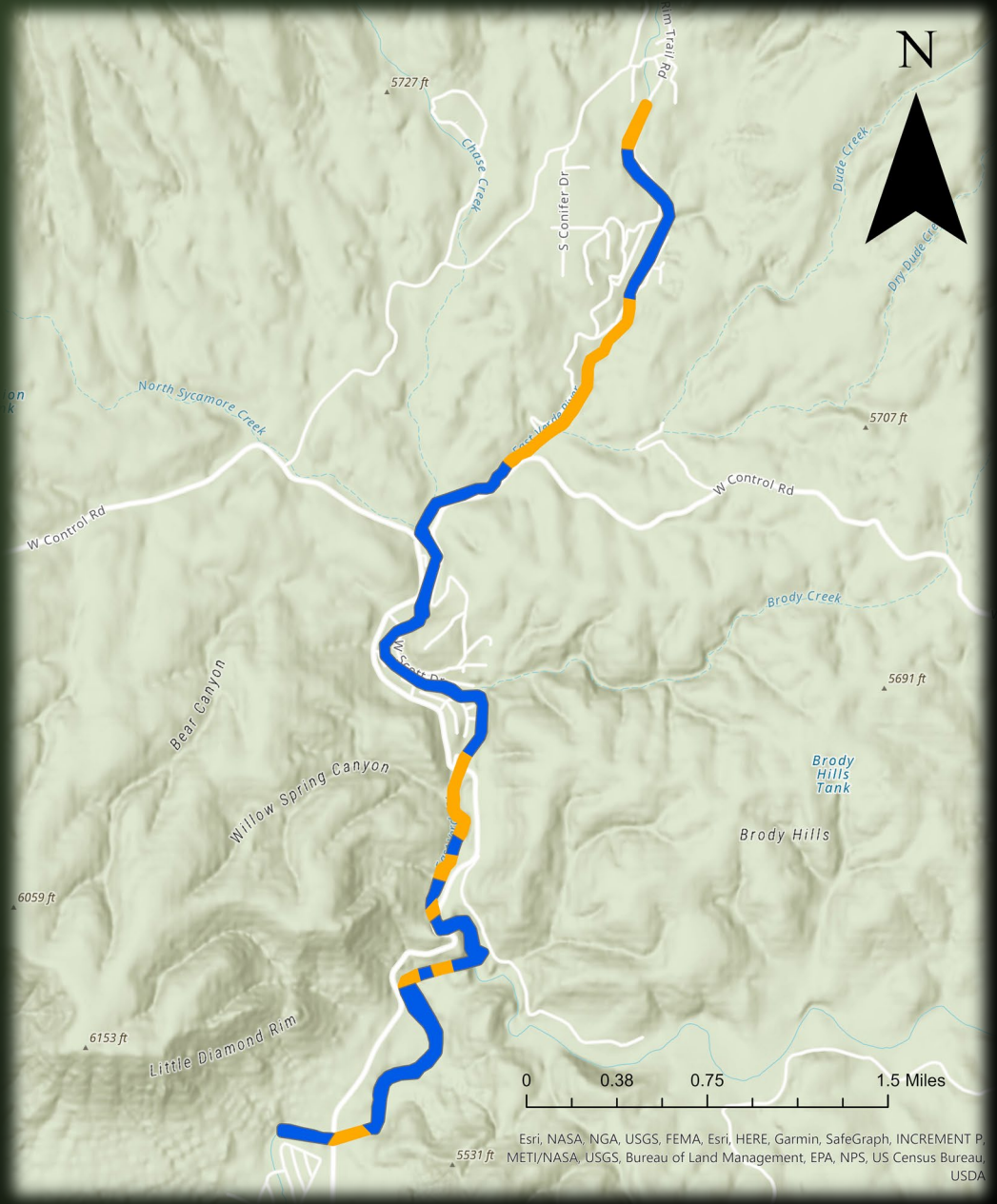
- Cover and habitat noted, fish visually located if possible
- If no movement recorded for 2 weeks, induced movement attempted
- Tag and carcass recovery was recorded

Methods: Creel

- Roving-roving design
- Four weekdays and one weekend day a month randomly selected
- AM/PM shift randomized
- Four Creek reaches, direction and start reach randomized

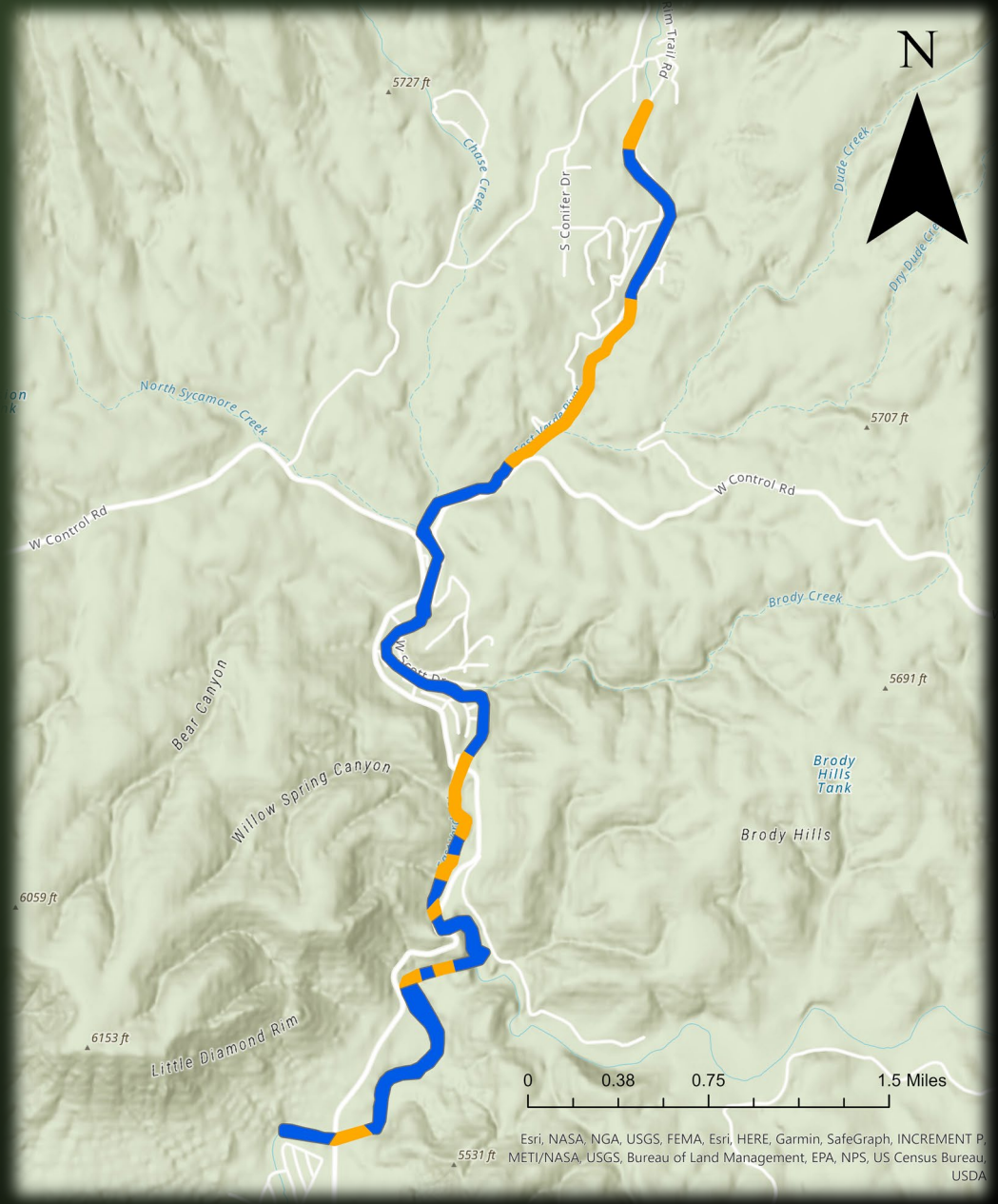
Methods: Analysis

- Stream divided in to high and low traffic zones based on creel waypoints



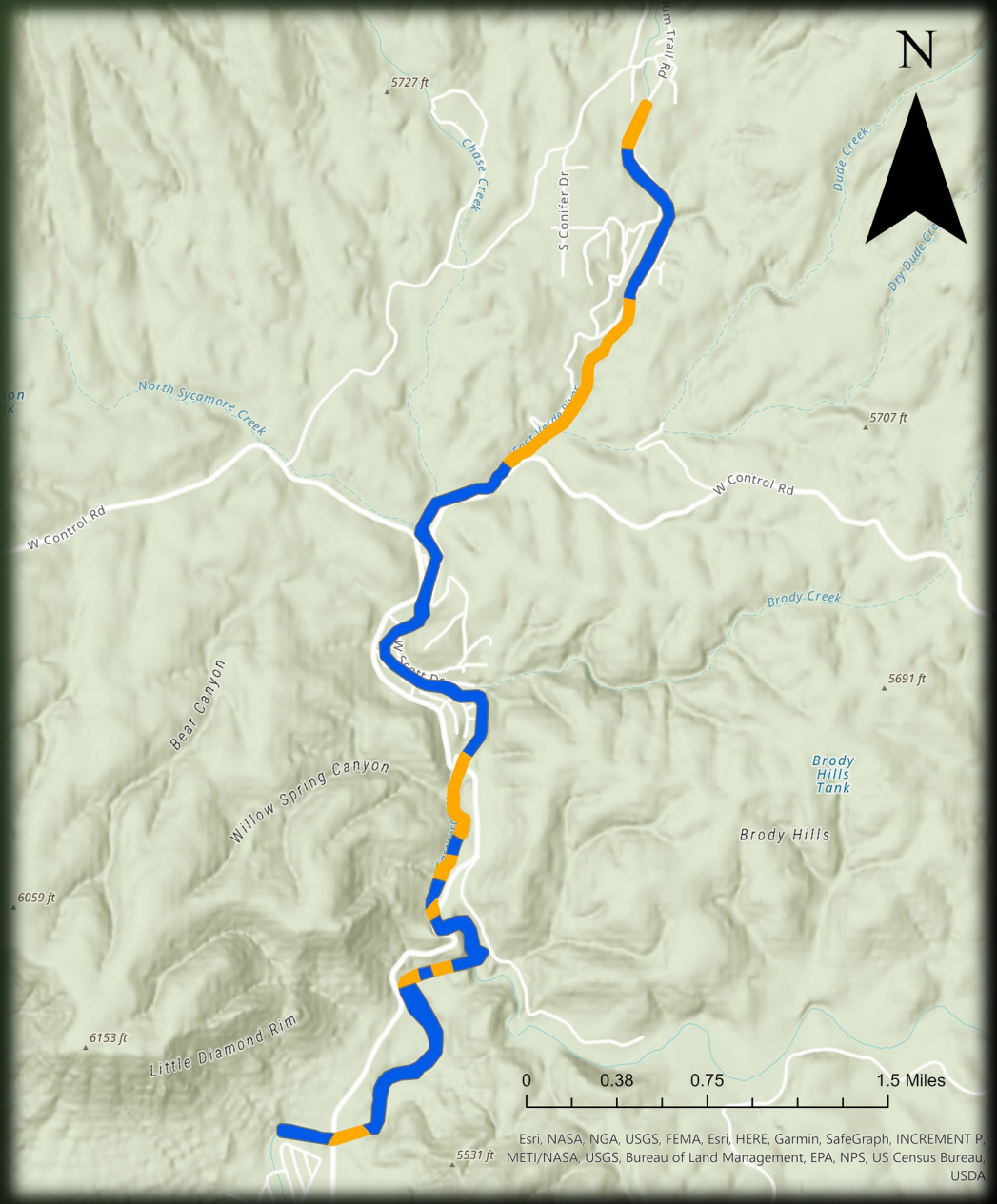
Methods: Analysis

- Stream divided in to high and low traffic zones based on creel waypoints
- Zone and live/dead assessed for every tracking period



Methods: Analysis

- Stream divided in to high and low traffic zones based on creel waypoints
- Zone and live/dead assessed for every tracking period
- Capture history built based on spatial state and survival



Methods: Analysis

- Multi - state Barker model

Evaluation and selection:

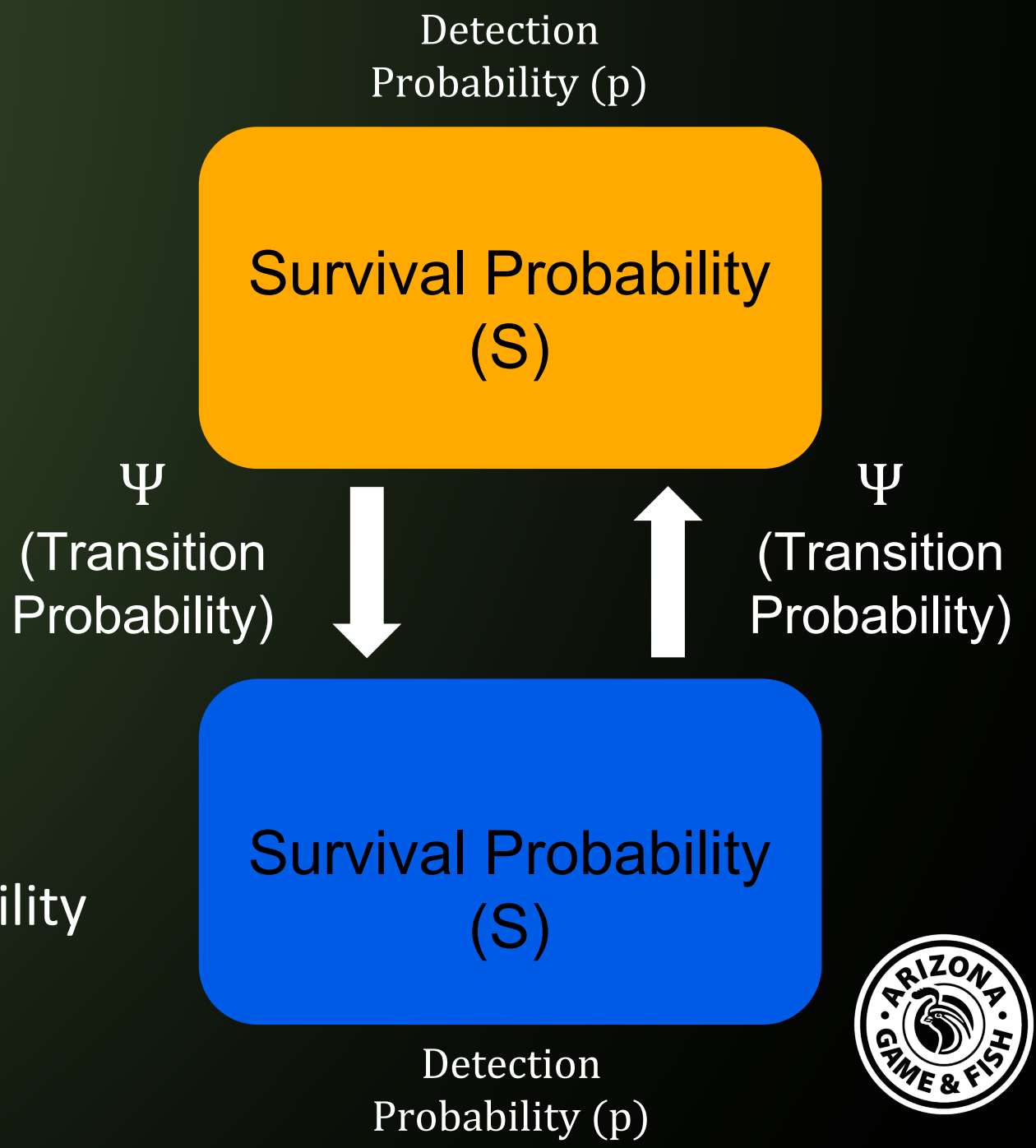
- ΔAICc < 2
- $\hat{c}$ < 2 or 3
- Least complex

Model parameters evaluated:

S = Survival probability

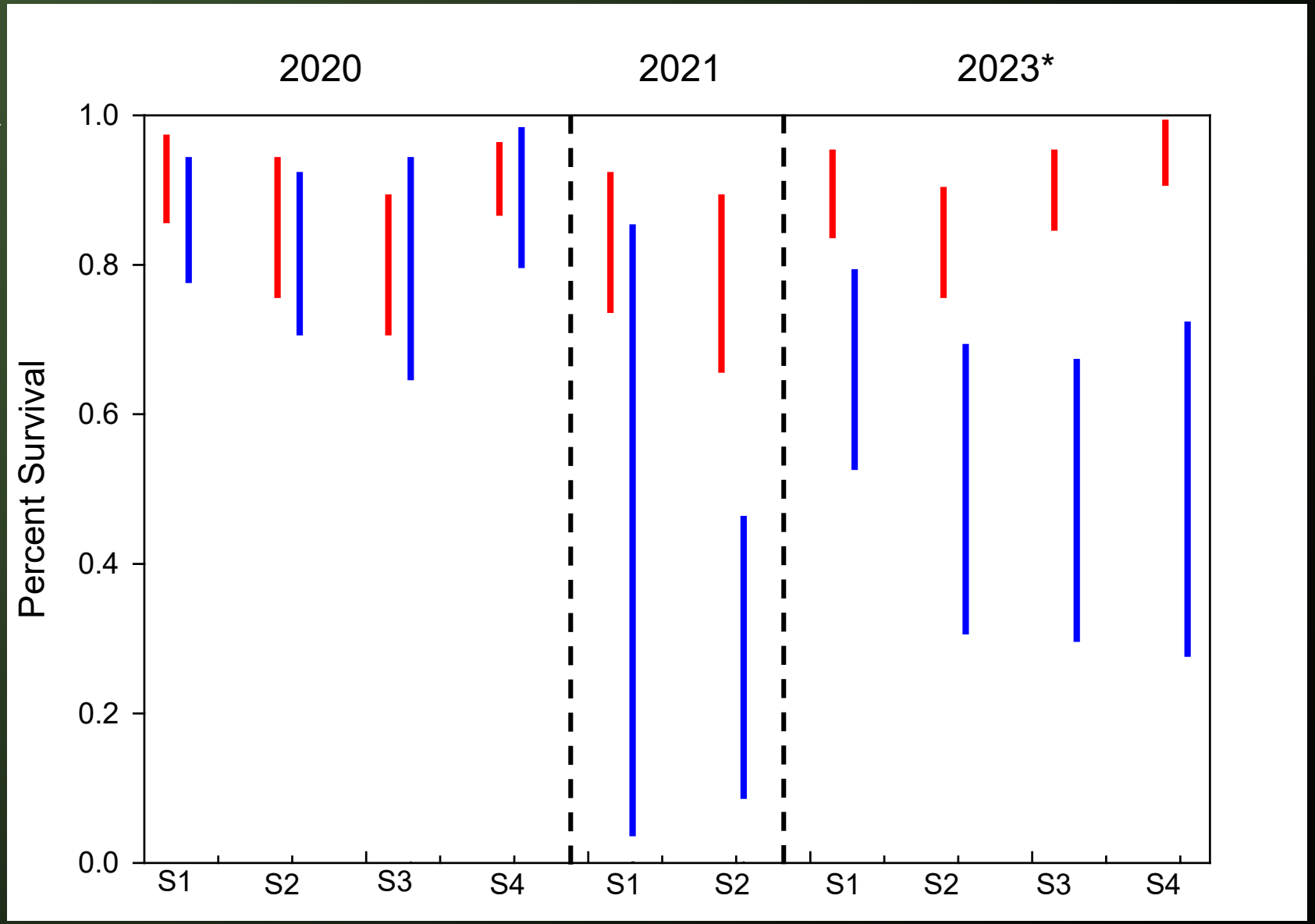
Ψ = Transition (movement) probability

p = Detection probability



Results

Survival: Per week by year/stocking



High Traffic

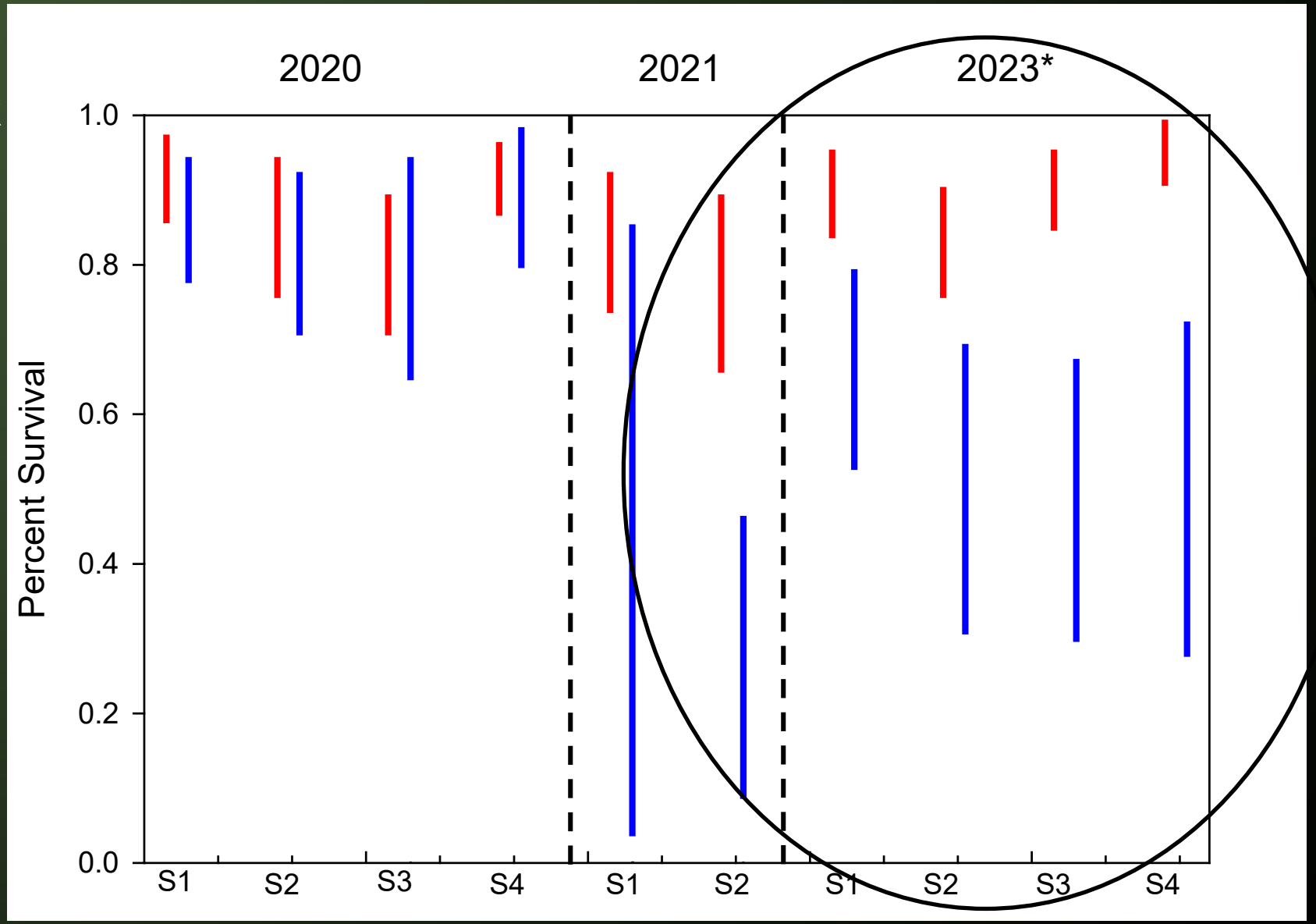
Low Traffic

*No Fixed site state due to lack of occurrence

p = 0.89 - 1

Results

Survival: Per week by year/stocking



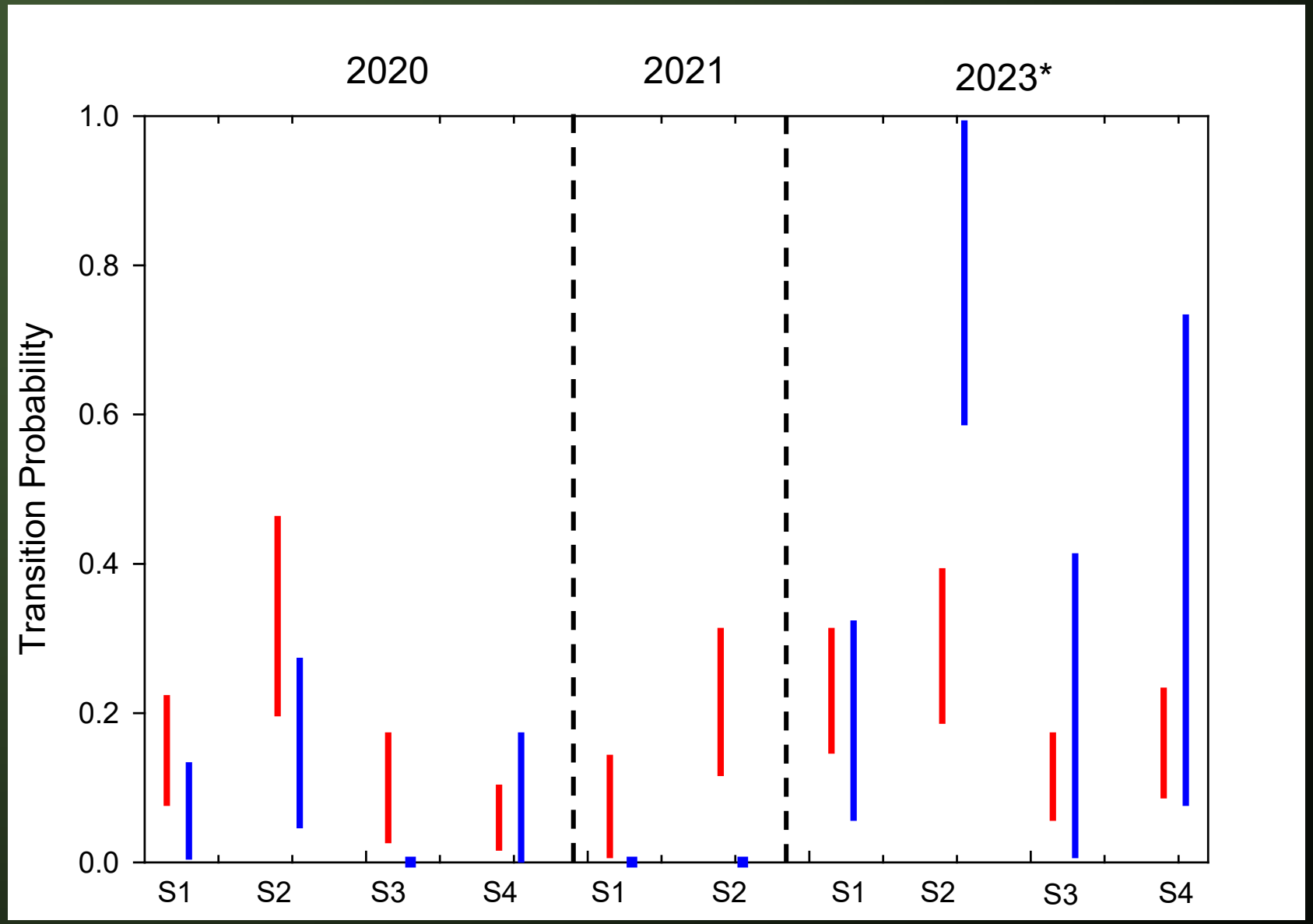
High Traffic

Low Traffic

*No Fixed site state due to lack of occurrence

p = 0.89 - 1

Results

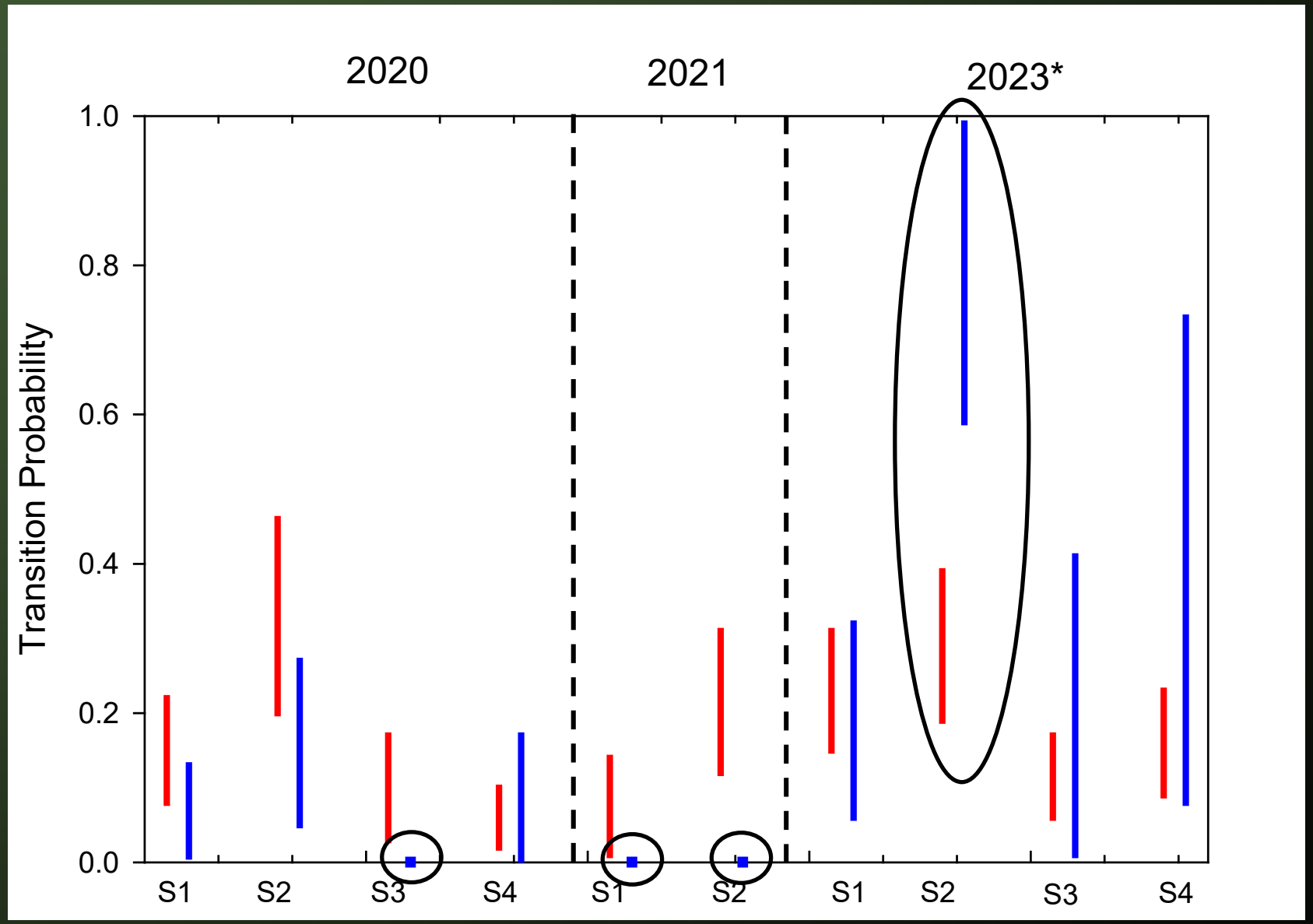


High Traffic → Low traffic

Low Traffic → High Traffic

Ψ
(Transition Probability)
Per week by
year/stocking

Results



High Traffic → Low traffic

Low Traffic → High Traffic

Ψ
(Transition Probability)
Per week by
year/stocking

Discussion: Telemetry

- High variability in survival and movement within stocking and year


N

Discussion: Telemetry

- High variability in survival and movement within stocking and year

- Survival estimates similar in 2020, divergence between HT and LT apparent in 2021 and 2023
  - Low water in those years, stocking pools were best habitat

Discussion: Telemetry

- High variability in survival and movement within stocking and year

- Survival estimates similar in 2020, divergence between HT and LT apparent in 2021 and 2023
  - Low water in those years, stocking pools were best habitat

- Transition probability similar across years and stockings
  - Most fish stayed in stocking pools
  - 2023 outlier (S2) possibly driven by proximity of LT boundaries to stocking pools

Discussion: Telemetry

- High variability in survival and movement within stocking and year
- Survival estimates similar in 2020, divergence between HT and LT apparent in 2021 and 2023
  - Low water in those years, stocking pools were best habitat
- Transition probability similar across years and stockings
  - Most fish stayed in stocking pools
  - 2023 outlier (S2) possibly driven by proximity of LT boundaries to stocking pools
- Inability to standardize stocking numbers and locations between years makes comparison difficult

Acknowledgements:

- Technicians (present and past)
- Interns
- Department personnel from other work units
- Trevor Nelson and Canyon Creek Hatchery Staff

Questions?

Office line: 623-236-7607
Email: aloubere@azgfd.gov