A METHOD TO COMPUTE ADULT ANADROMOUS SALMONID ABUNDANCE BY PIT TAGGING JUVENILE OUTMIGRANTS

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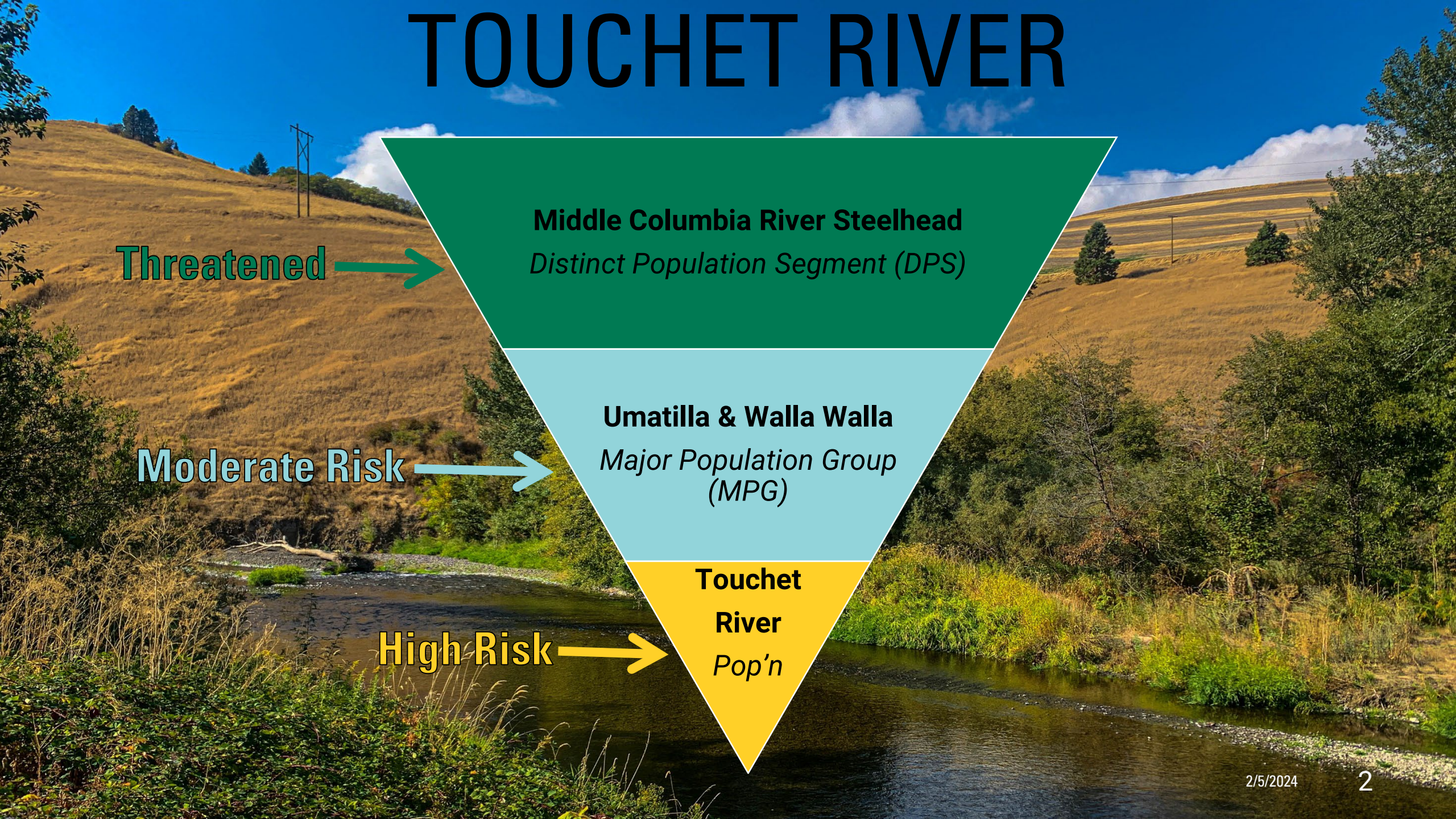
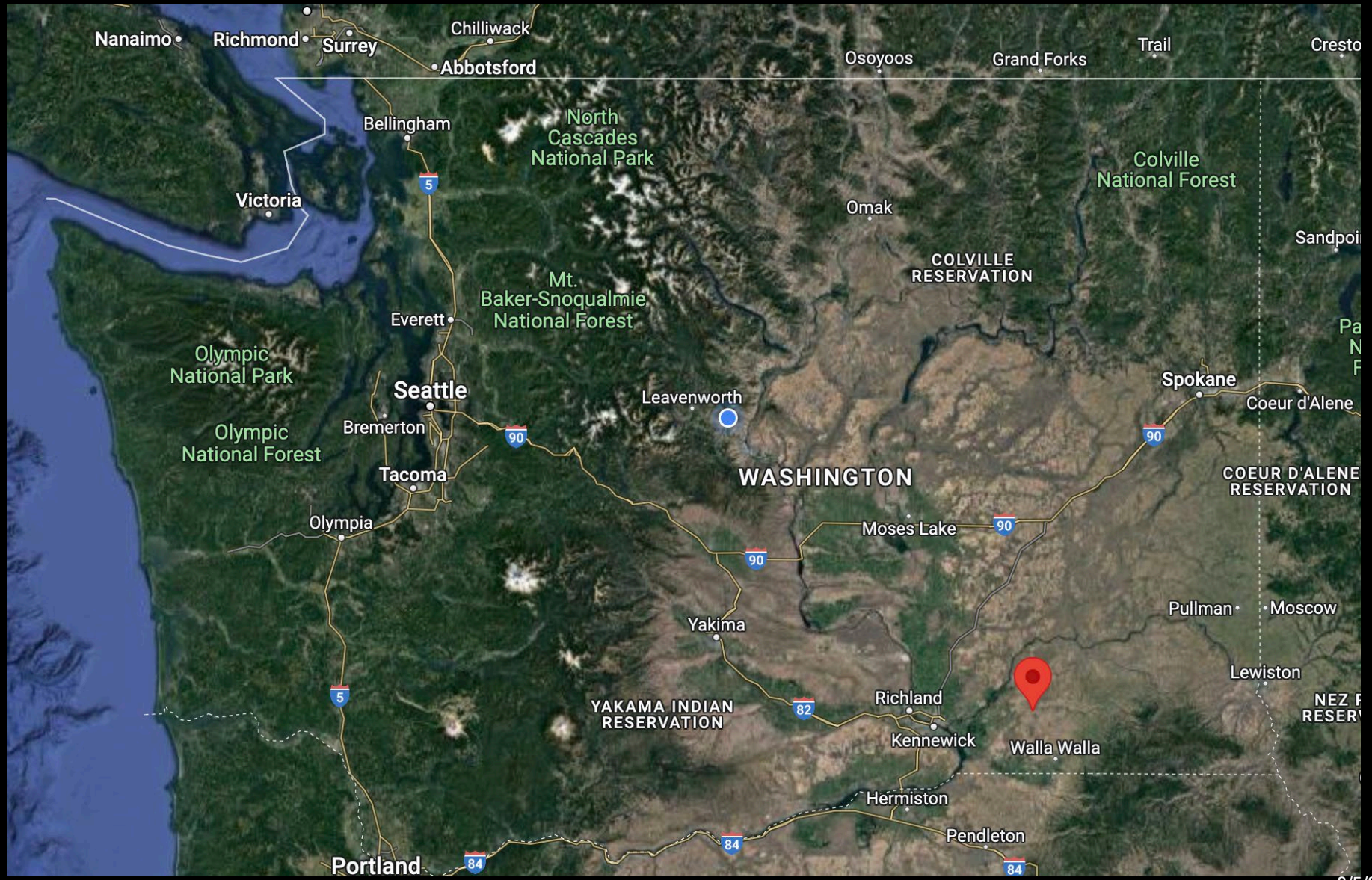
TOUCHET RIVER



WHERE IS THE TOUCHET?




Touchet River Basin
Monitoring sites associated with Touchet Steelhead VSP (2000-039-10)
Legend
HarveyShawRST
Instream PIT Detection Sites
Weirs/Adult Traps
Trap
Mouth
Prescott
Waitsburg
Dayton
Columbia
Walla Walla
Dixie
Walla Walla
Umapine
125
12
332
11
N
10 mi
Google Earth
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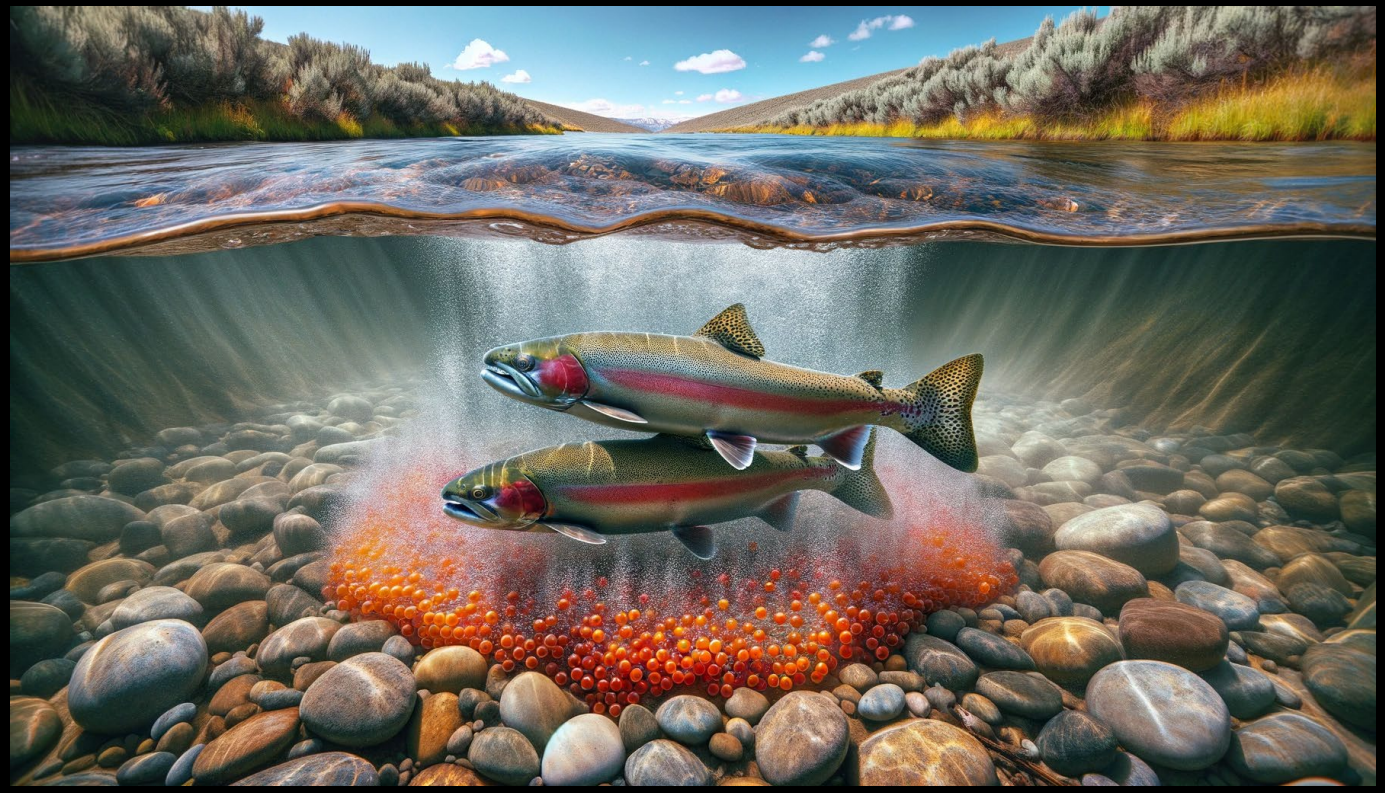
THREE STOCK GROUPS

- Natural-origin spawners
- Hatchery endemic (Touchet) (~50,000/yr)
- Hatchery Wallowa (~100,000/yr)



VIABLE SALMONID POPULATION PARAMETERS

- Abundance
- Productivity
- Spatial structure
- Diversity

This project: Touchet Steelhead VSP Monitoring, BPA Project #2000-039-01

TOUCHET TROUBLES

- Flashy, dynamic river
- Couldn’t estimate mainstem spawning in spring flows
- Limited funding to maintain robust weirs and intense spawning ground surveys simultaneously

ADVERSE ENVIRONMENTAL FACTORS

- Spawning ground surveys & weirs:
  - Highly sensitive to flow, turbidity, large debris, etc.
  - Expensive to staff/maintain (daily checks, all-day surveys)

- PIT arrays:
  - *Relatively* easy and robust
  - Can handle turbidity
  - Less checking

BTSPAs

Bayesian **T**ime-**S**tratified **P**opulation **A**nalysi**s**

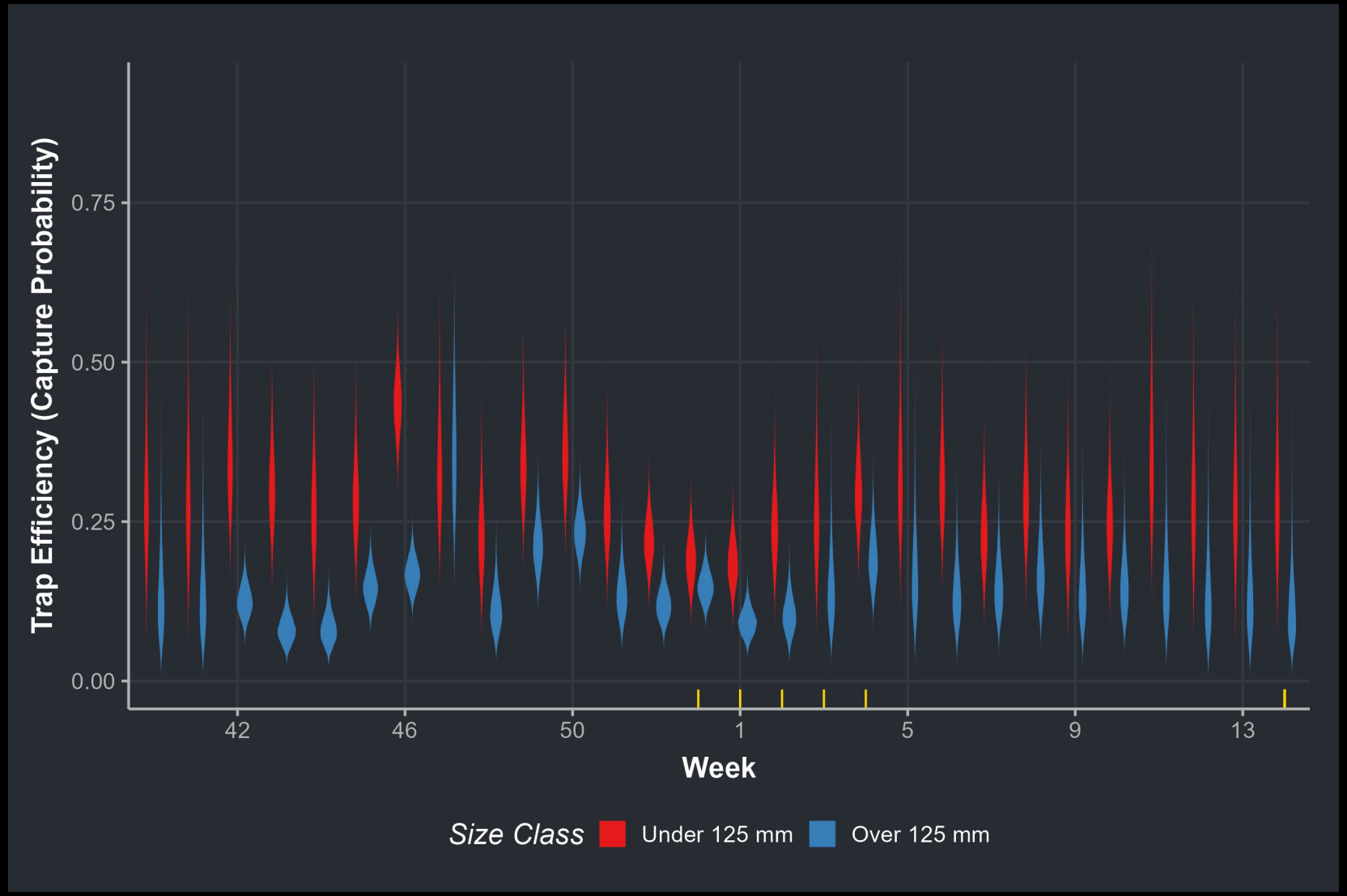
- Bayesian estimates for mark-recapture time series
- Useful for time-varying capture probability
- Fits P-splines to log(count) from smolt traps
- Smoothly interpolates missing data
- Quantifies uncertainty
- Fitted in JAGS via R

Bonner & Schwarz (2011). *Smoothing Population Size Estimates for Time-Stratified Mark–Recapture Experiments Using Bayesian P-Splines*. Biometrics 67(4).

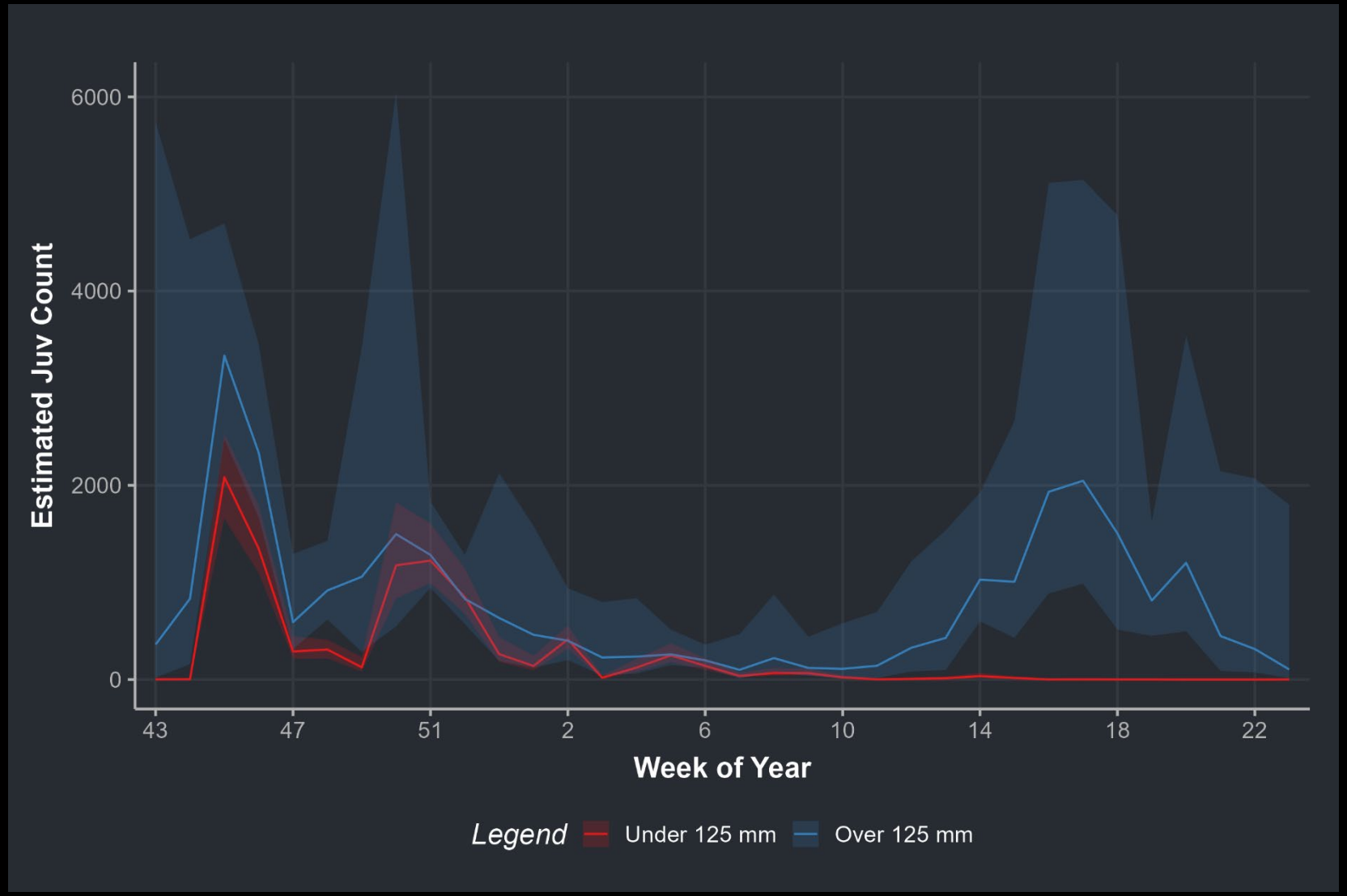
JUVENILE DATA COLLECTION

- Harvey Shaw Road smolt trap (river km 50)
    - Capture smolts, presmolts
    - Mark a subset, release 700 m upstream
    - Recapture some of those

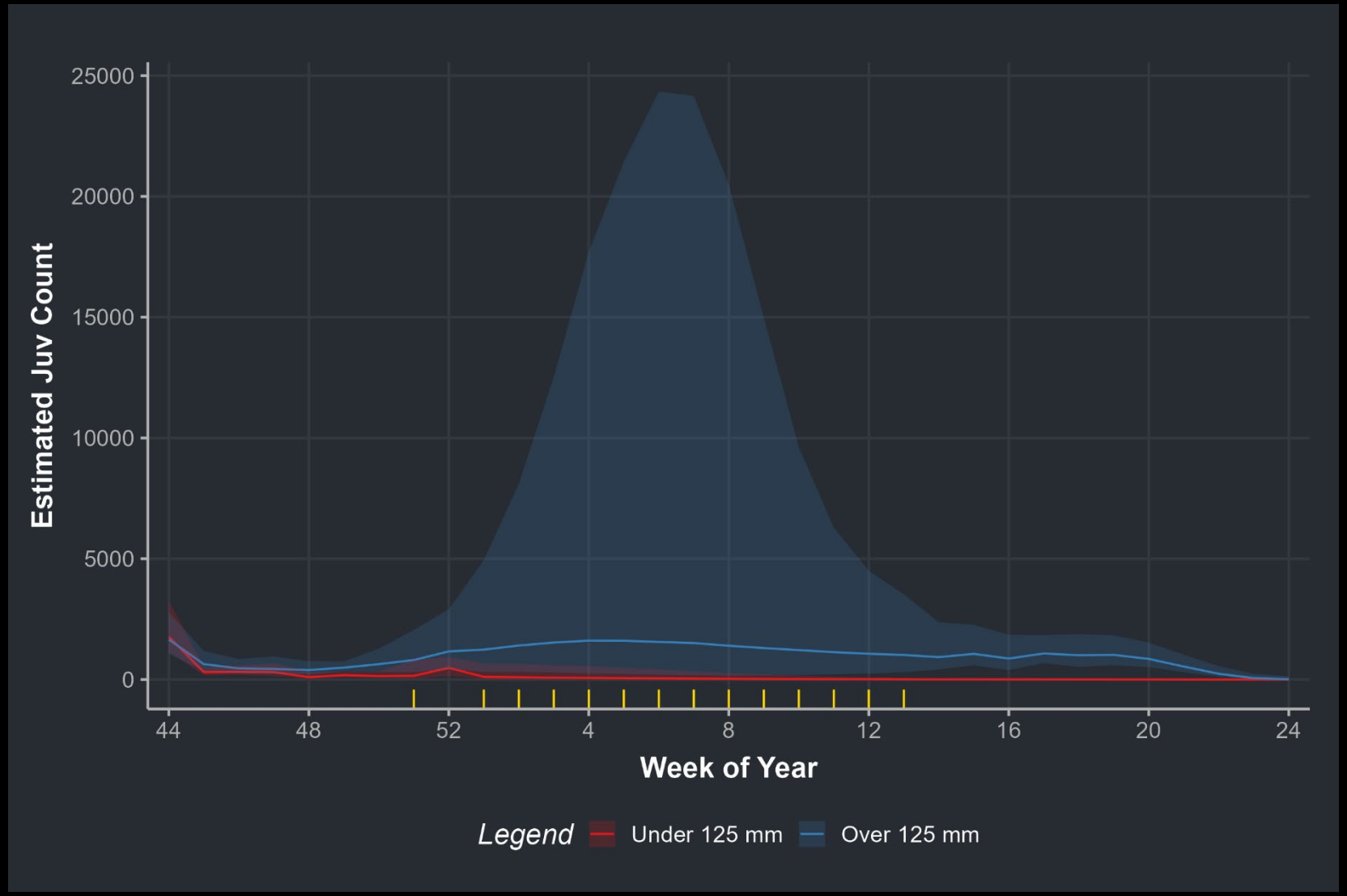
2016 MIGRATORY YEAR JUV TRAP EFFICIENCY



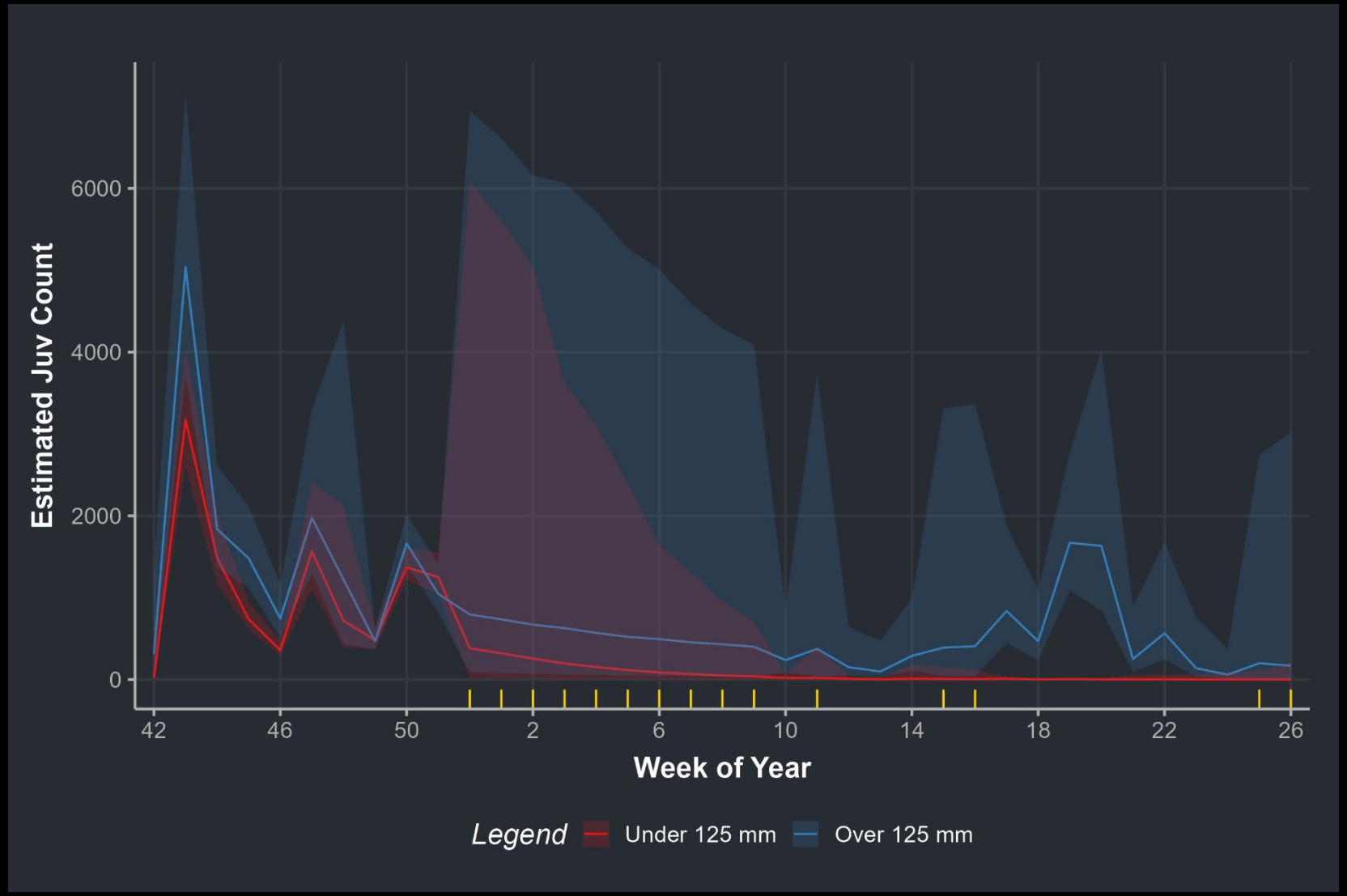
2016 MIGRATORY YEAR JUV ABUNDANCE



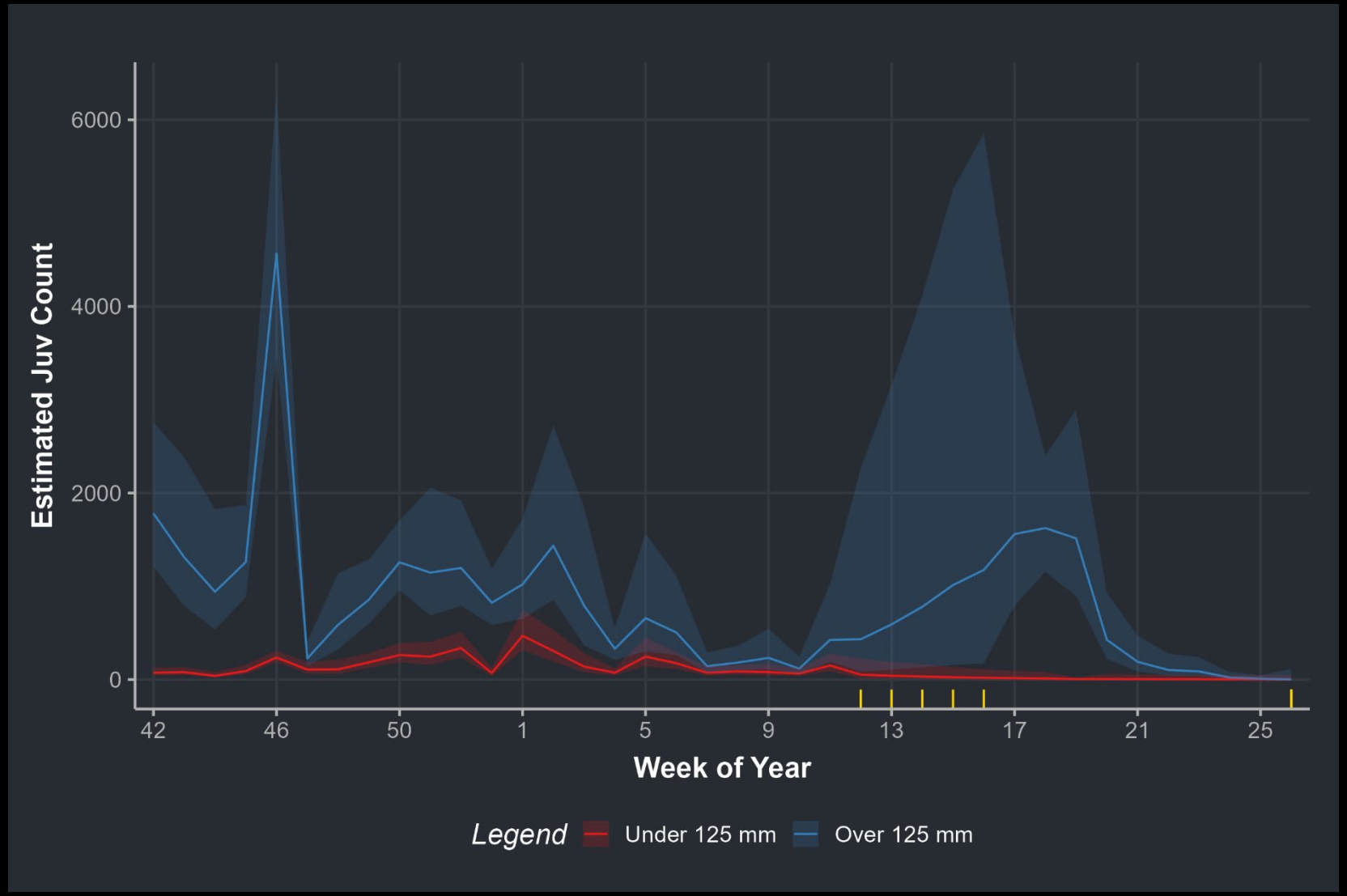
2017 MIGRATORY YEAR JUV ABUNDANCE



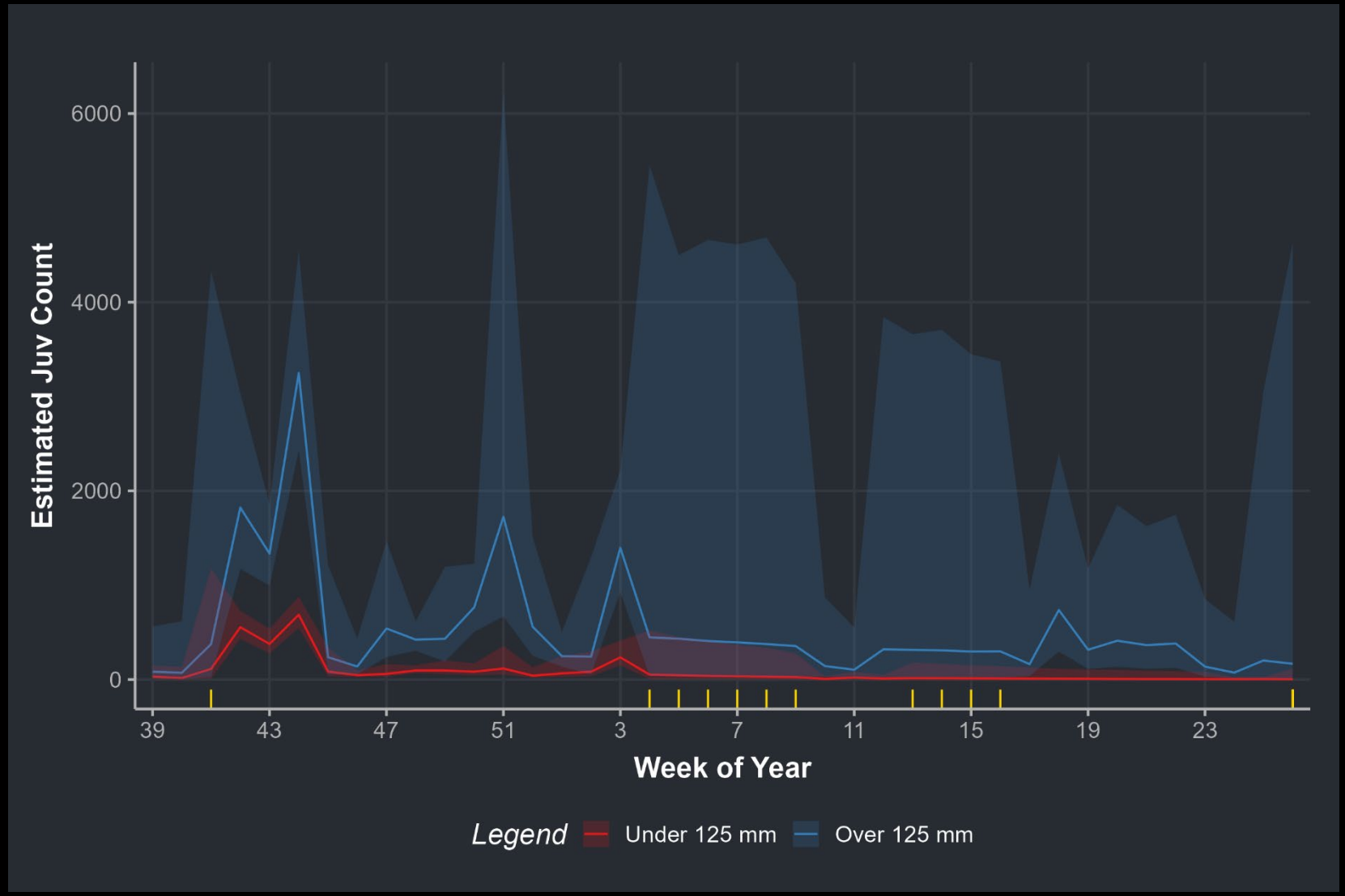
2018 MIGRATORY YEAR JUV ABUNDANCE



2019 MIGRATORY YEAR JUV ABUNDANCE



2020 MIGRATORY YEAR JUV ABUNDANCE

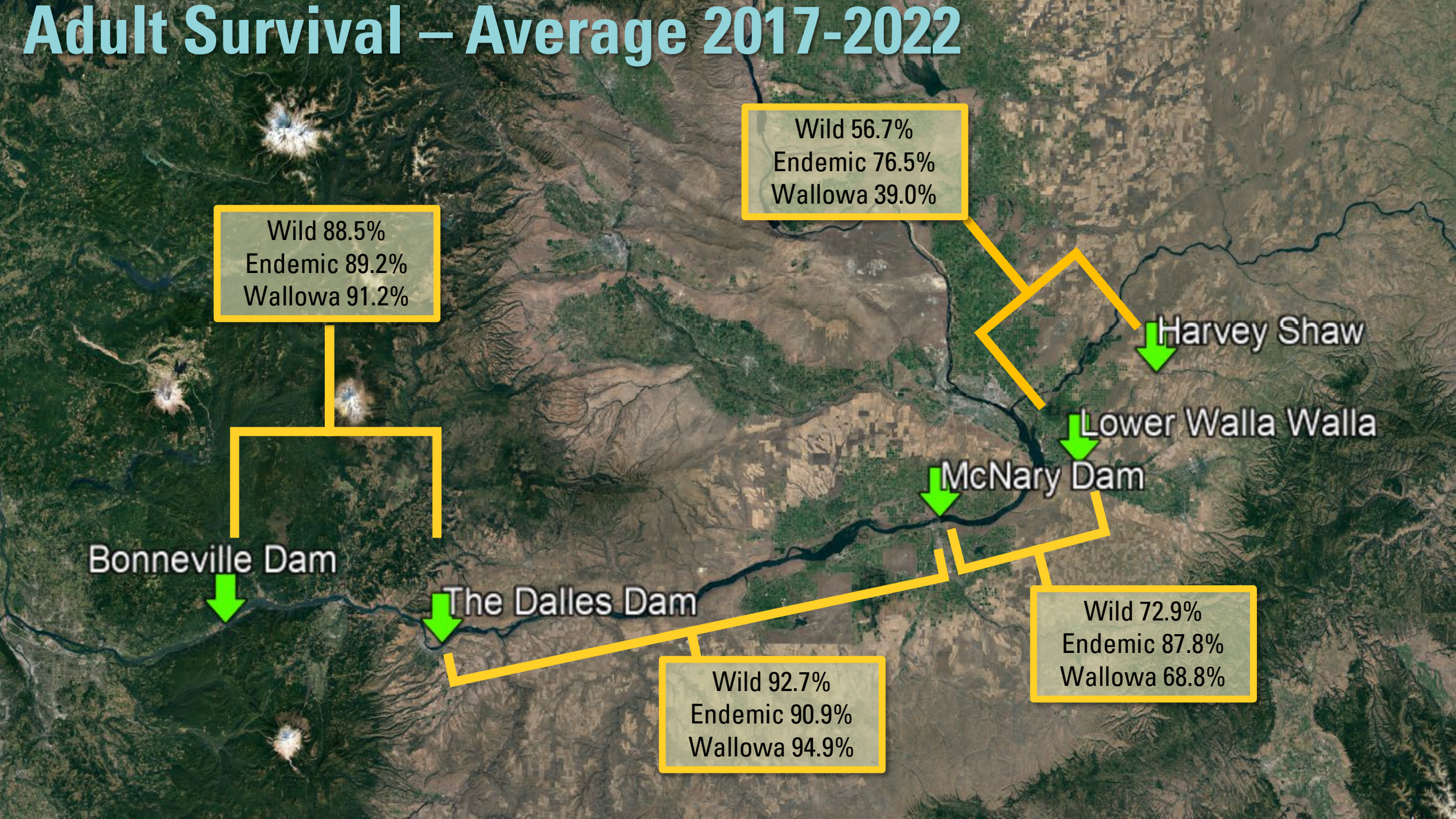


CJS

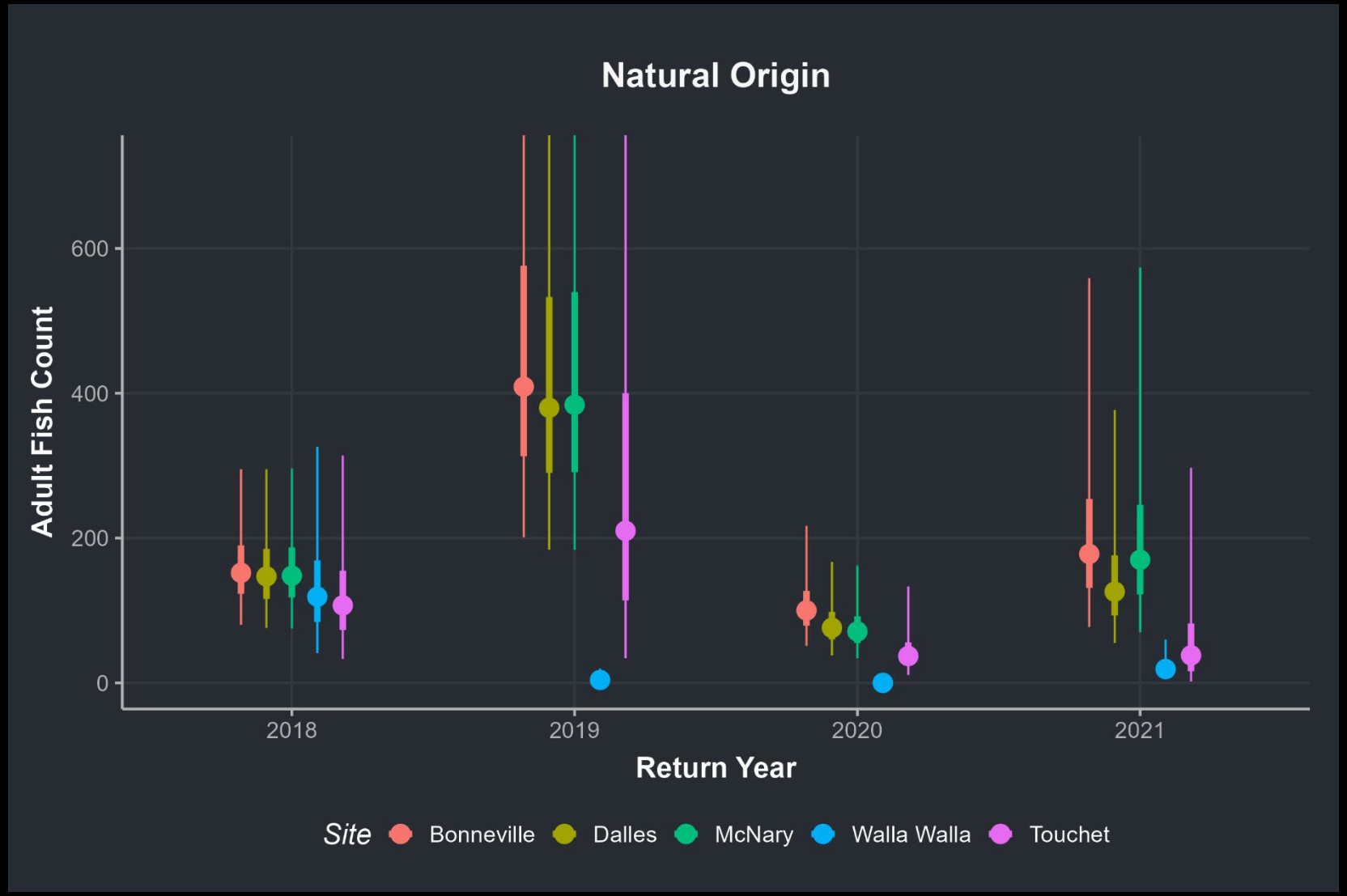
Cormack-**J**olly-**S**eber Model

- Abundance based on adult detections at dams, other PIT arrays
- Multinomial likelihood (m-array) formulation
- Also fitted in JAGS via R

Adult Survival – Average 2017-2022



ANNUAL ADULT RETURNS



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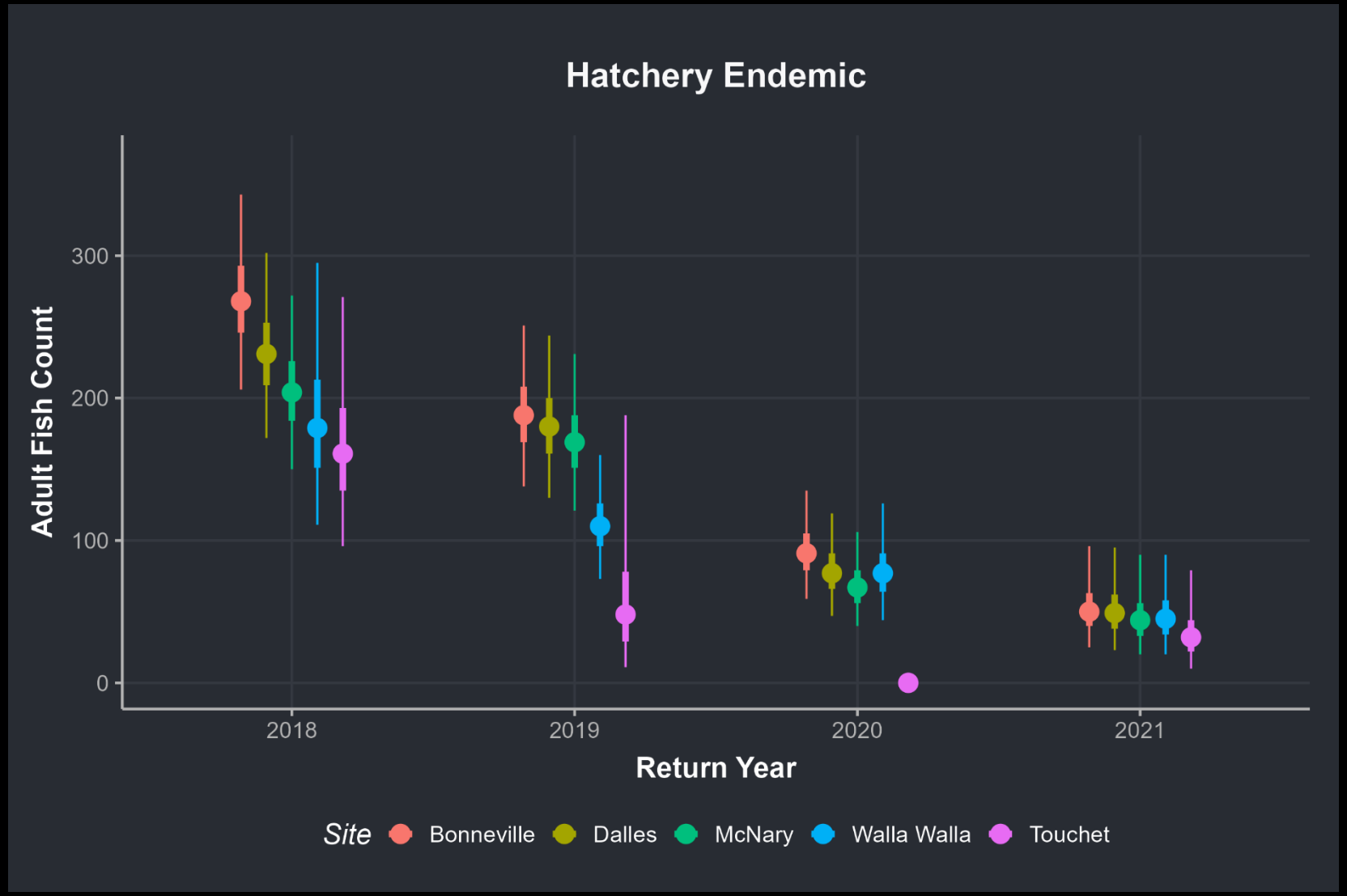

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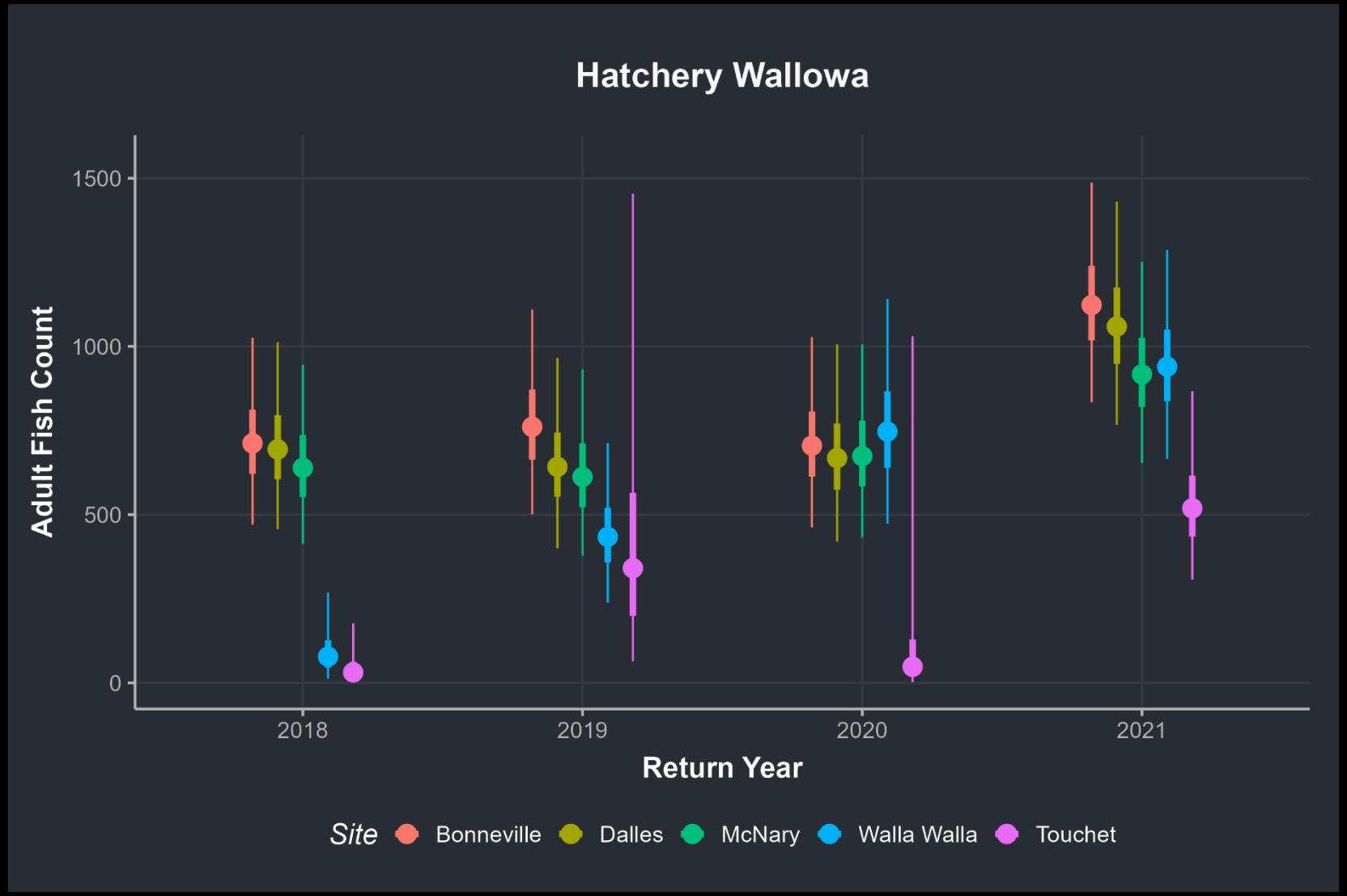

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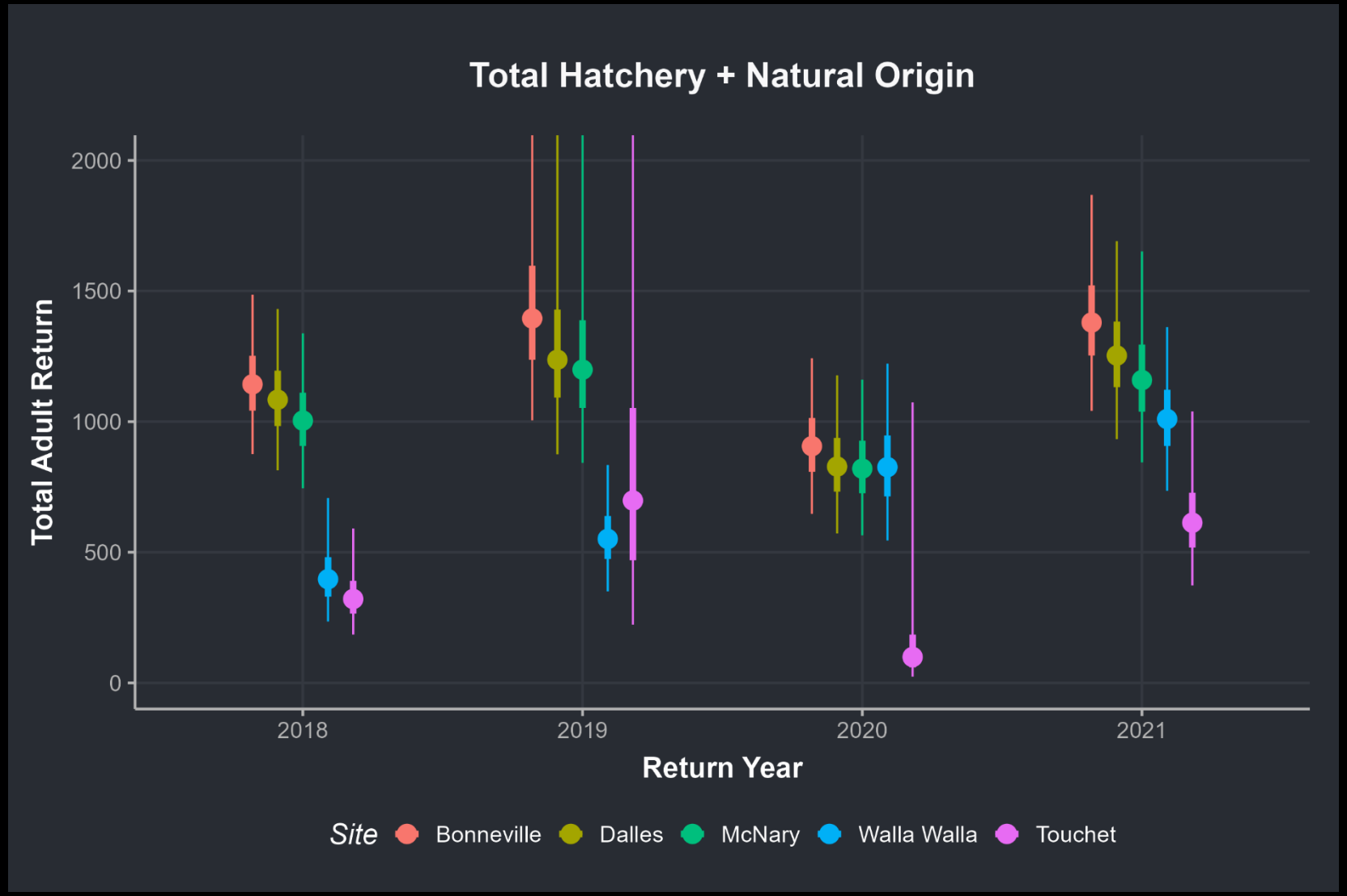
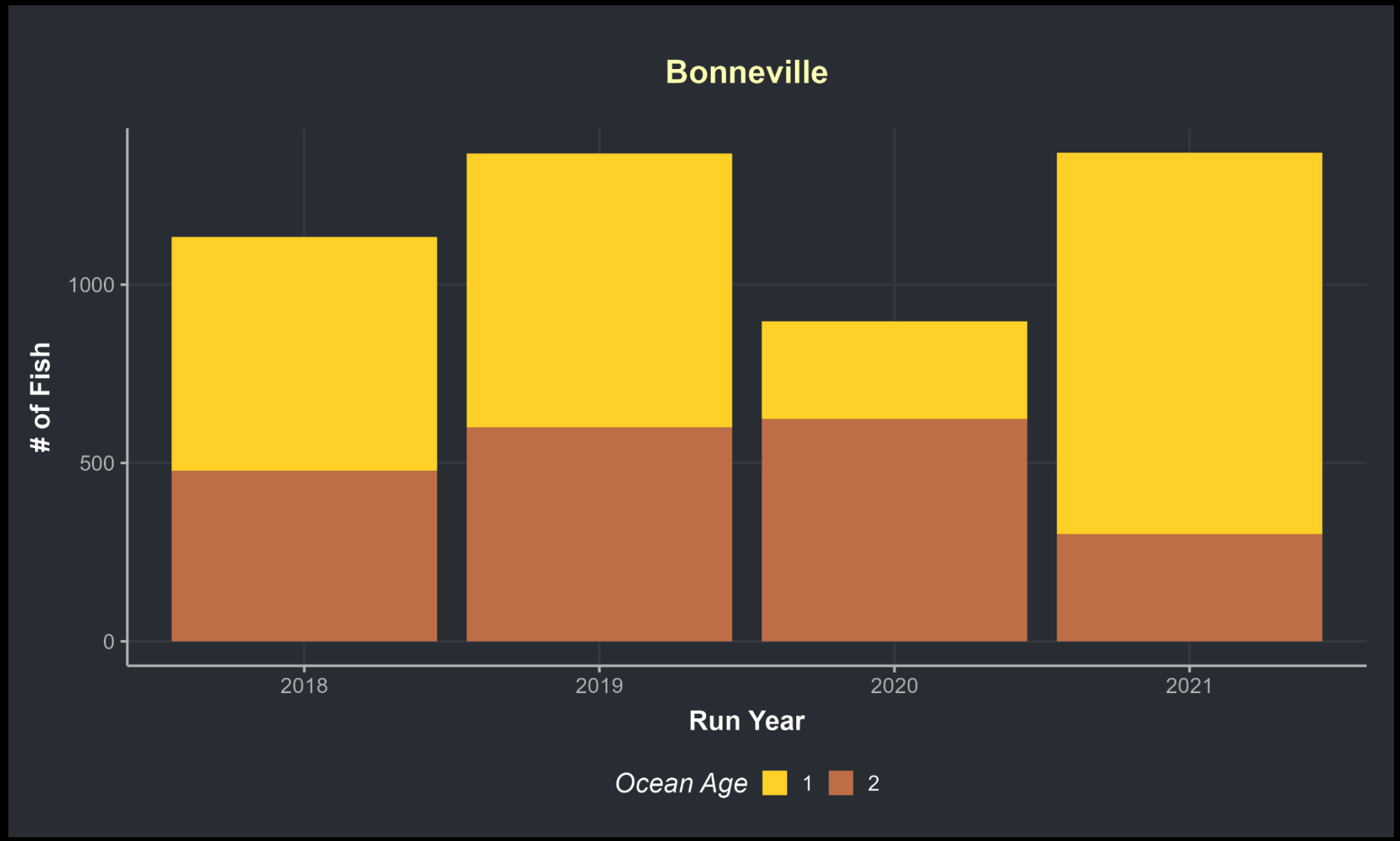
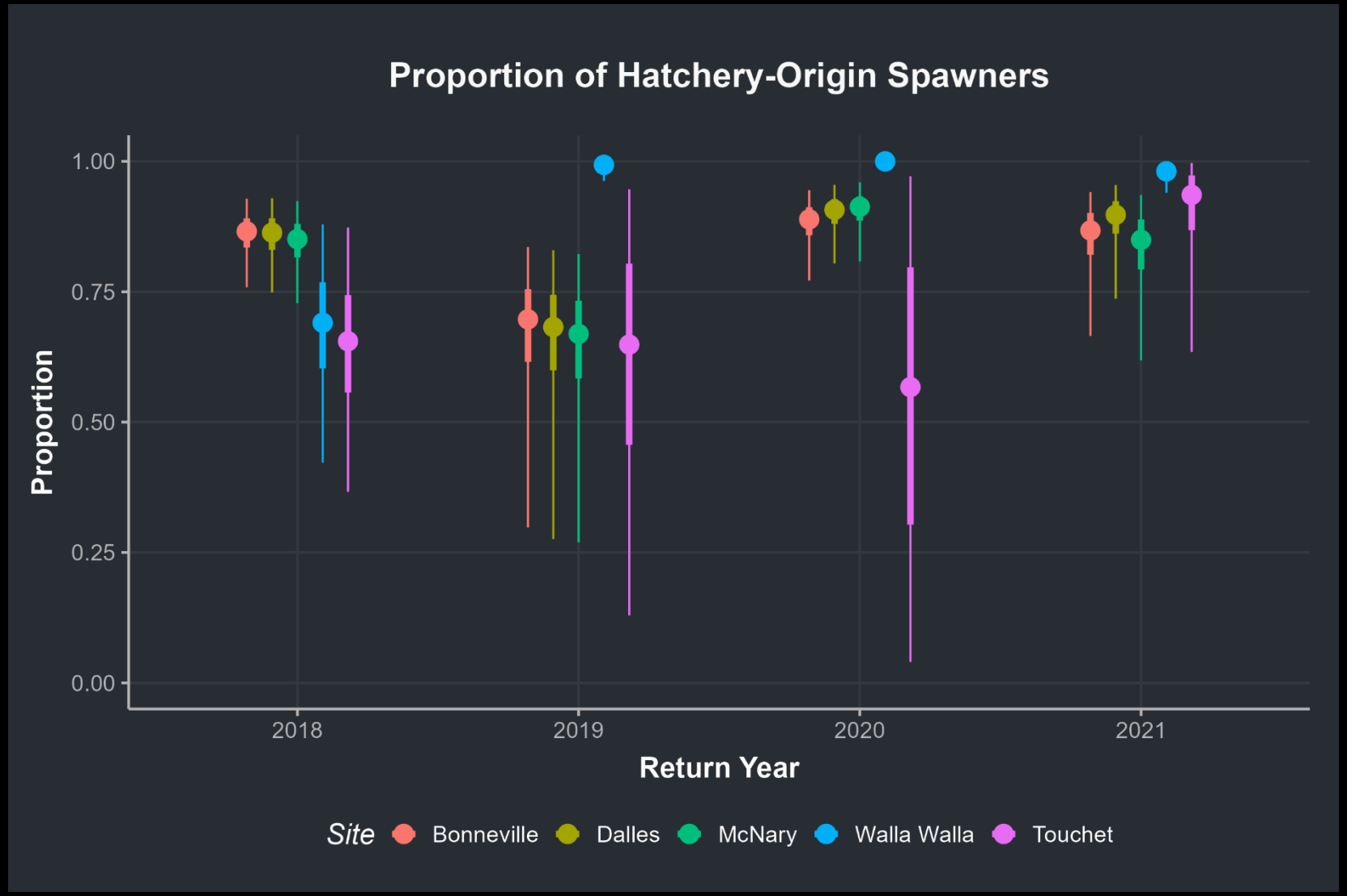


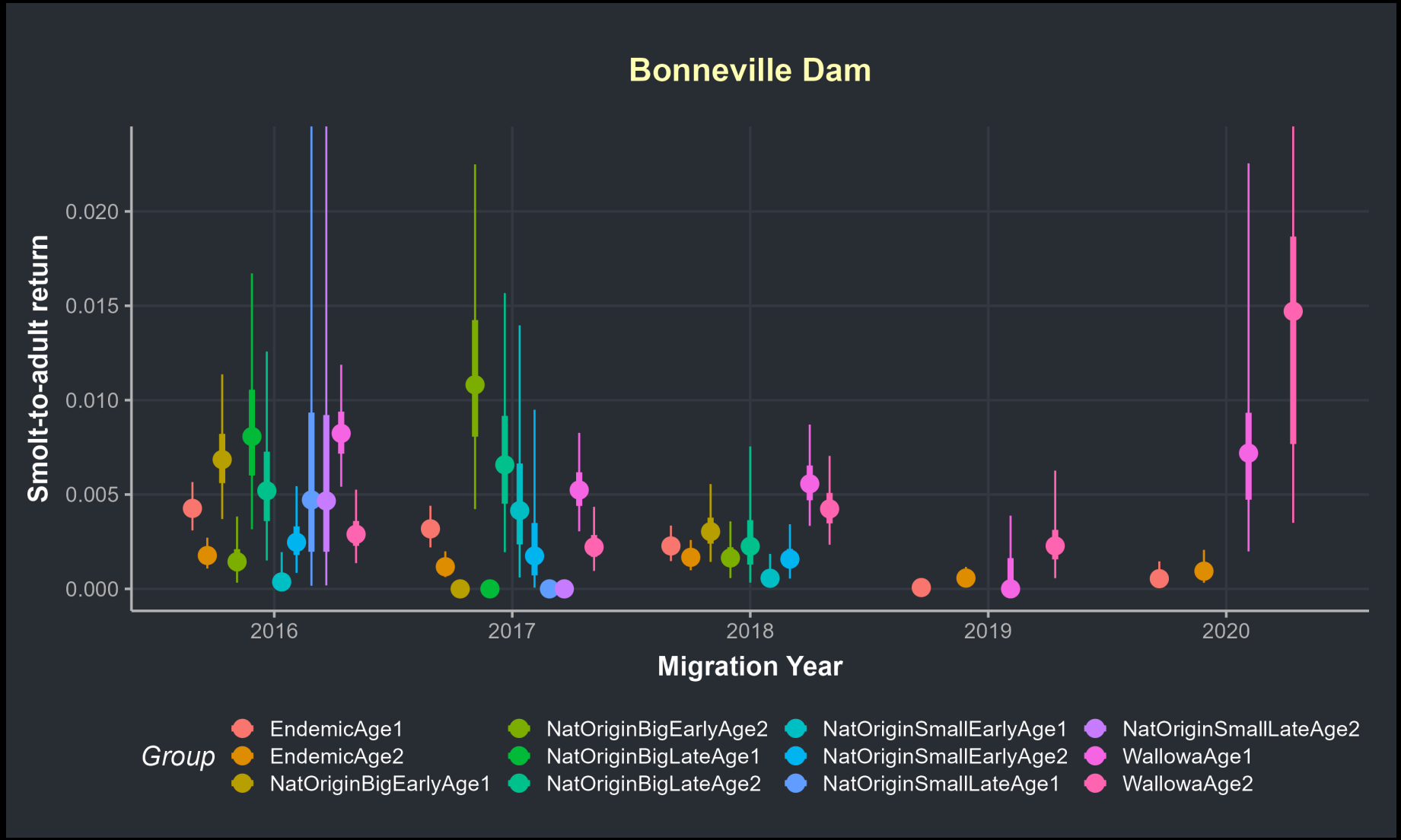
AGE STRUCTURE AT BONNEVILLE



PHOS


Proportion of Hatchery-Origin Spawners
Proportion
1.00
0.75
0.50
0.25
0.00
2018
2019
2020
2021
Return Year
Site
Bonneville
Dalles
McNary
Walla Walla
Touchet

SMOLT-TO-ADULT RETURNS AT BONNEVILLE



WHAT'S NEXT?

- More on the Touchet
    - Analyze tributary detections
    - Run reconstruction
    - Population (stock-recruit) modeling
- Other detections:
    - Overshoots
    - Bird colonies
    - Fisheries
- Application / validation of model on other rivers

VIABLE SALMONID POPULATION PARAMETERS

- Abundance
  - Smolts, spawners, hatchery vs wild
- Productivity
  - Enables run reconstruction, modeling recruits/spawner
- Spatial structure
  - PIT arrays anywhere we want
- Diversity
  - Juvenile life histories, hatchery vs wild

THANK YOU

Mike Gallinat, Lance Ross, Michael Herr, Joe Bumgarner, Dane Kiefel, & many technicians

Bonneville Power Administration (Project #2000-039-01, Touchet Steelhead VSP Monitoring)

Thousands of fish

Washington Department of
FISH & WILDLIFE


QUESTIONS?