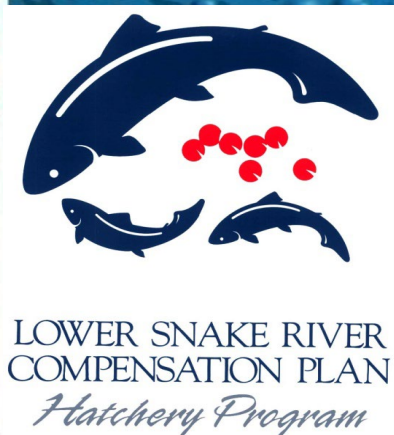


Spring Chinook Mitigation in S.E. Washington

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Washington
Department of
**FISH and
WILDLIFE**

Acknowledgments:

- **Past and present staff of the WDFW Snake River Lab, Lyons Ferry Hatchery Complex, WDFW Fish Management, and the Tribal Co-Managers.**
- **Including but not limited to:**

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Chris Donley

Rianna Earl

Derek Gloyn

Becky Johnson

Dane Kiefel

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Doug Maxey

Dan Pounds

Ace Trump

Jeremy Trump

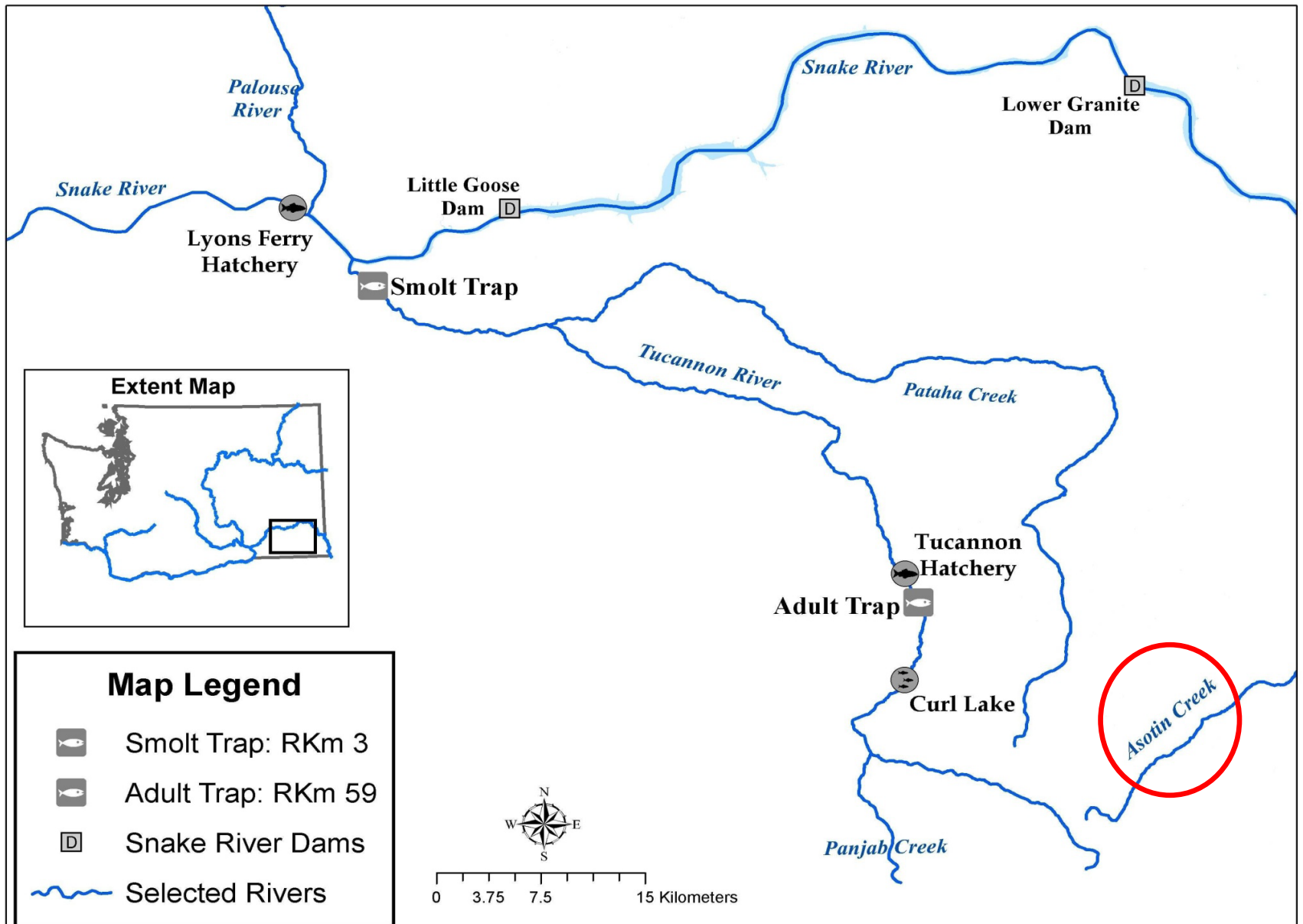
Lower Snake River MPG

- Tucannon River
- Asotin Creek (Extirpated)

ICTRT Criteria – Both populations are restored to viable status, with one reaching highly viable status.



Map of Tucannon River Subbasin



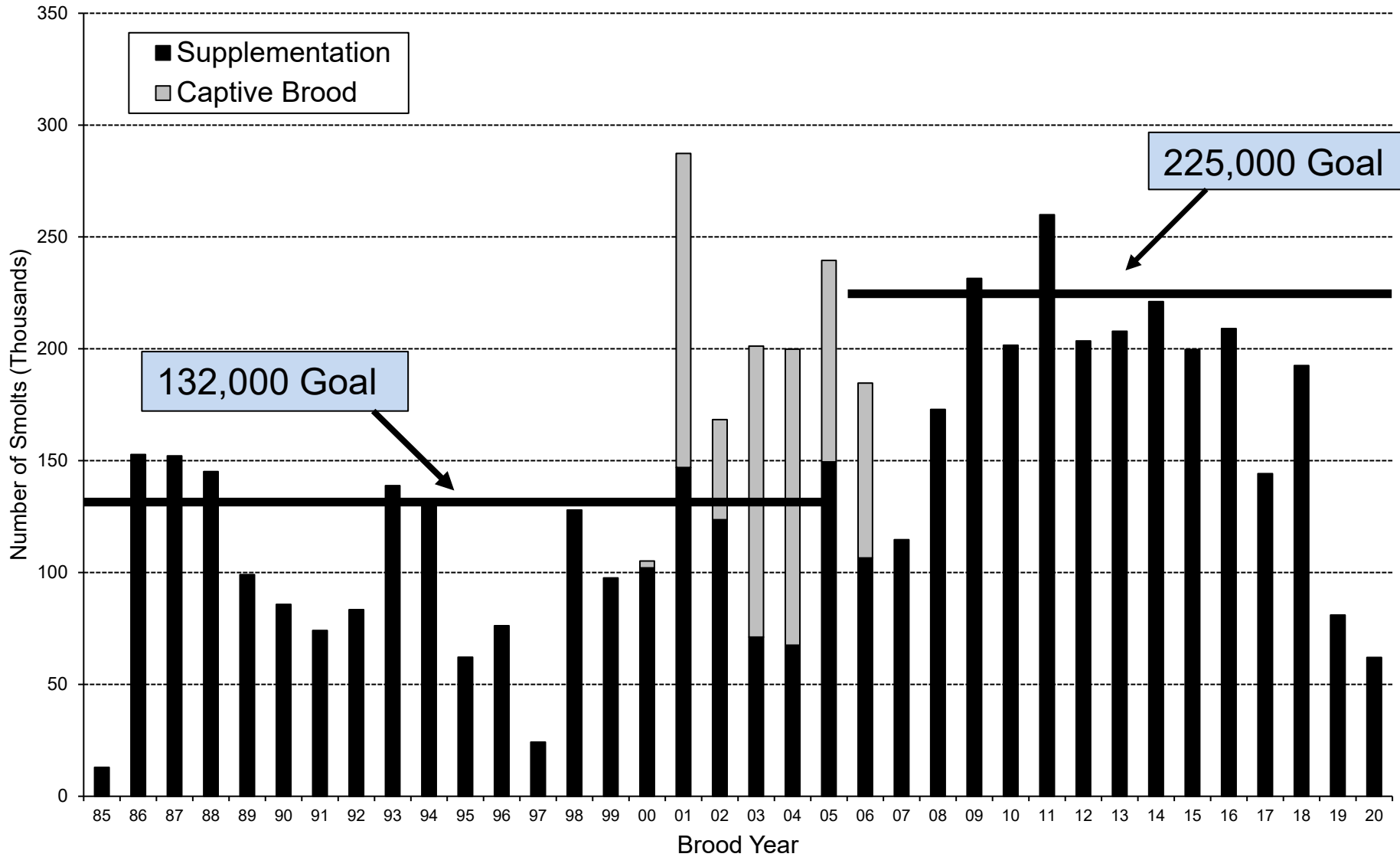
Mitigation Goal:

- Hatchery mitigation was for 48% loss (1,152) through the dams with the remaining 52% (1,248) expected to be self-sustaining.
- It was also assumed that 4,608 fish would be harvested below the project area.
- Mitigation was to be accomplished by the annual release of 132,000 smolts @ 15 fpp (30 g) with an assumed SAR of 0.87%.

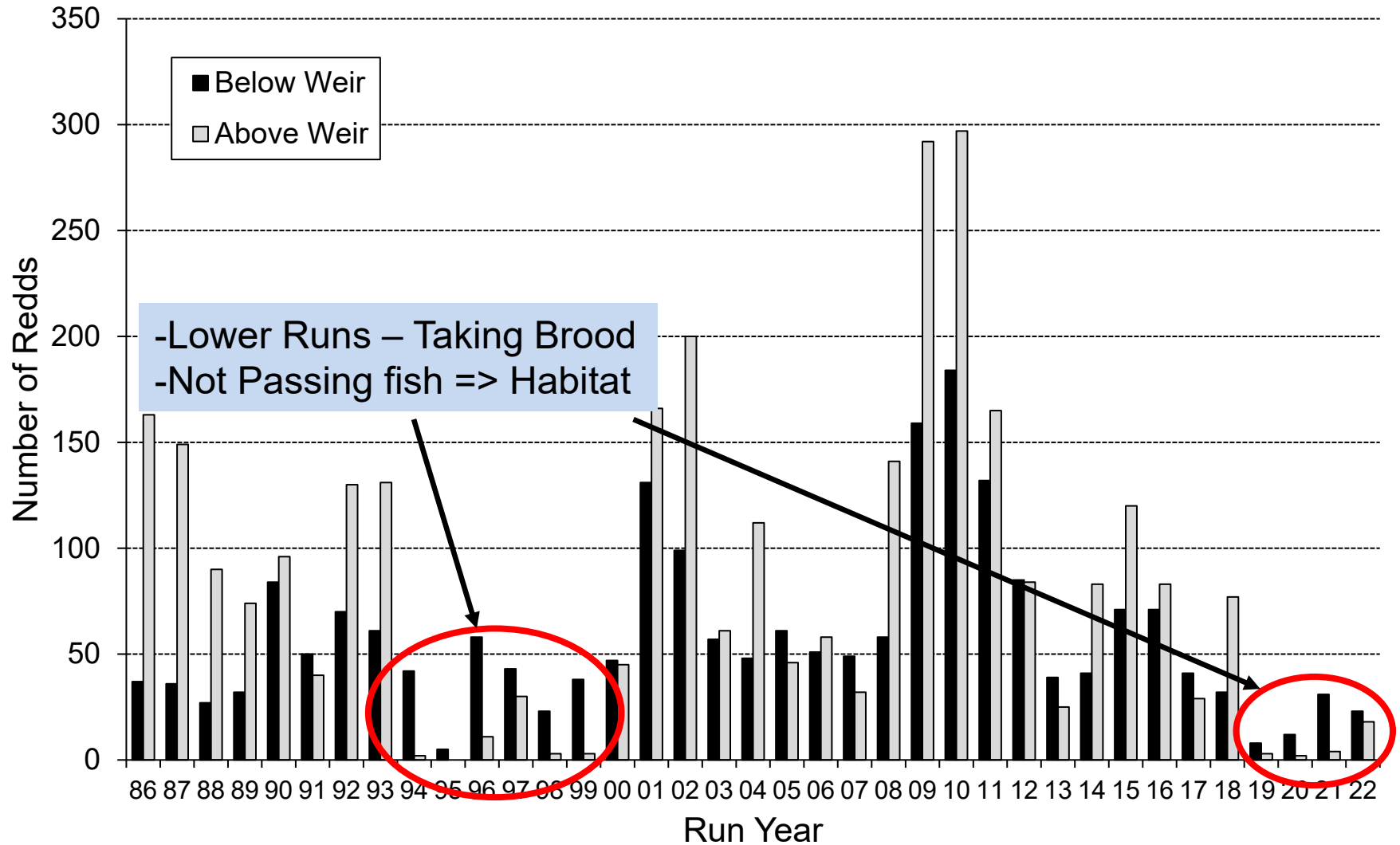
Management Objectives

- Meet the LSRCMP mitigation goal.
- Restore and maintain fisheries (long-term goal – 2,400-3,400 hatchery and natural fish).
- Restore and maintain the natural population (Pop. Viable Threshold – at least 750 natural origin fish over a 10 yr. geometric mean).
- Minimize impacts of the hatchery fish on the natural population.

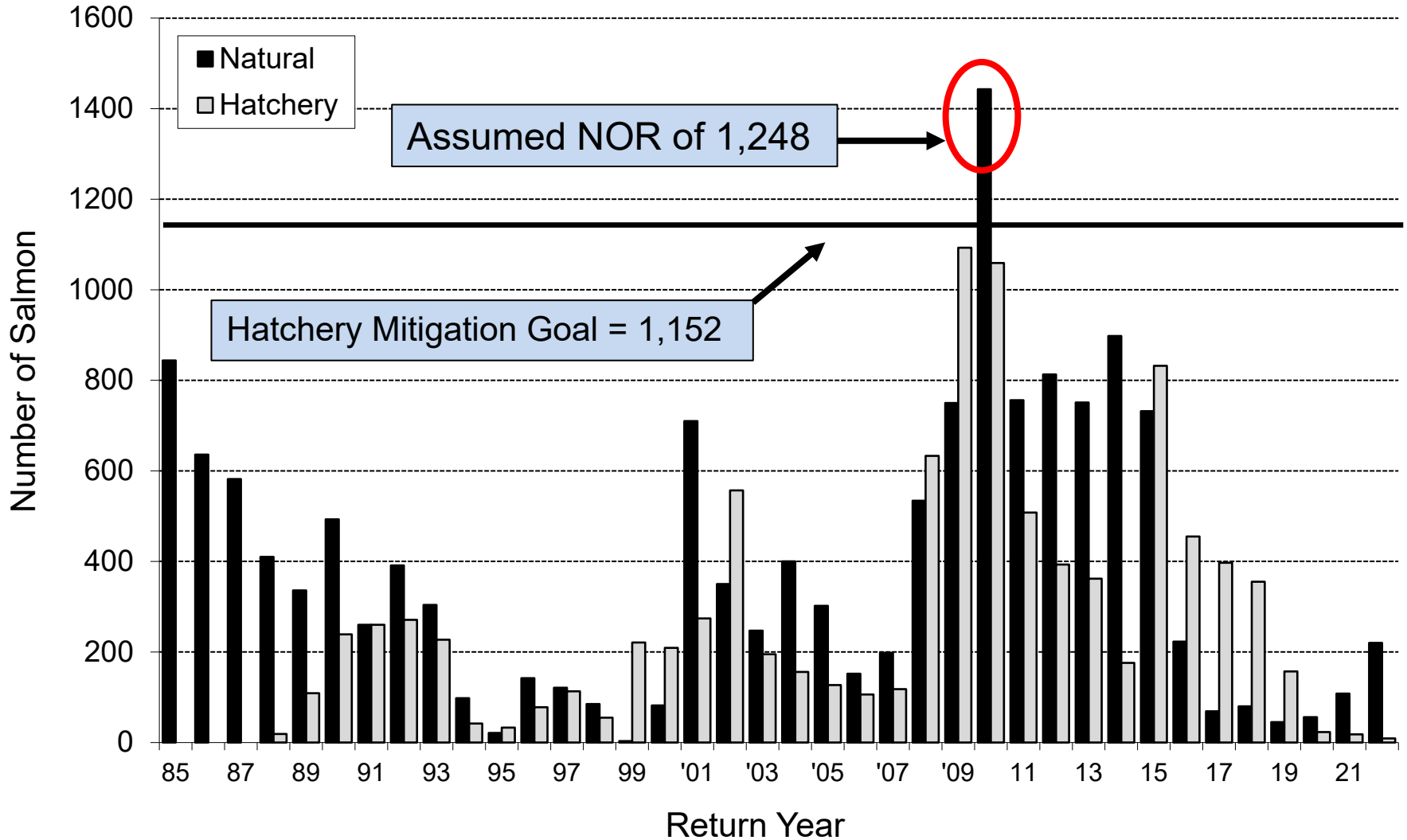
Number of Smolts Produced



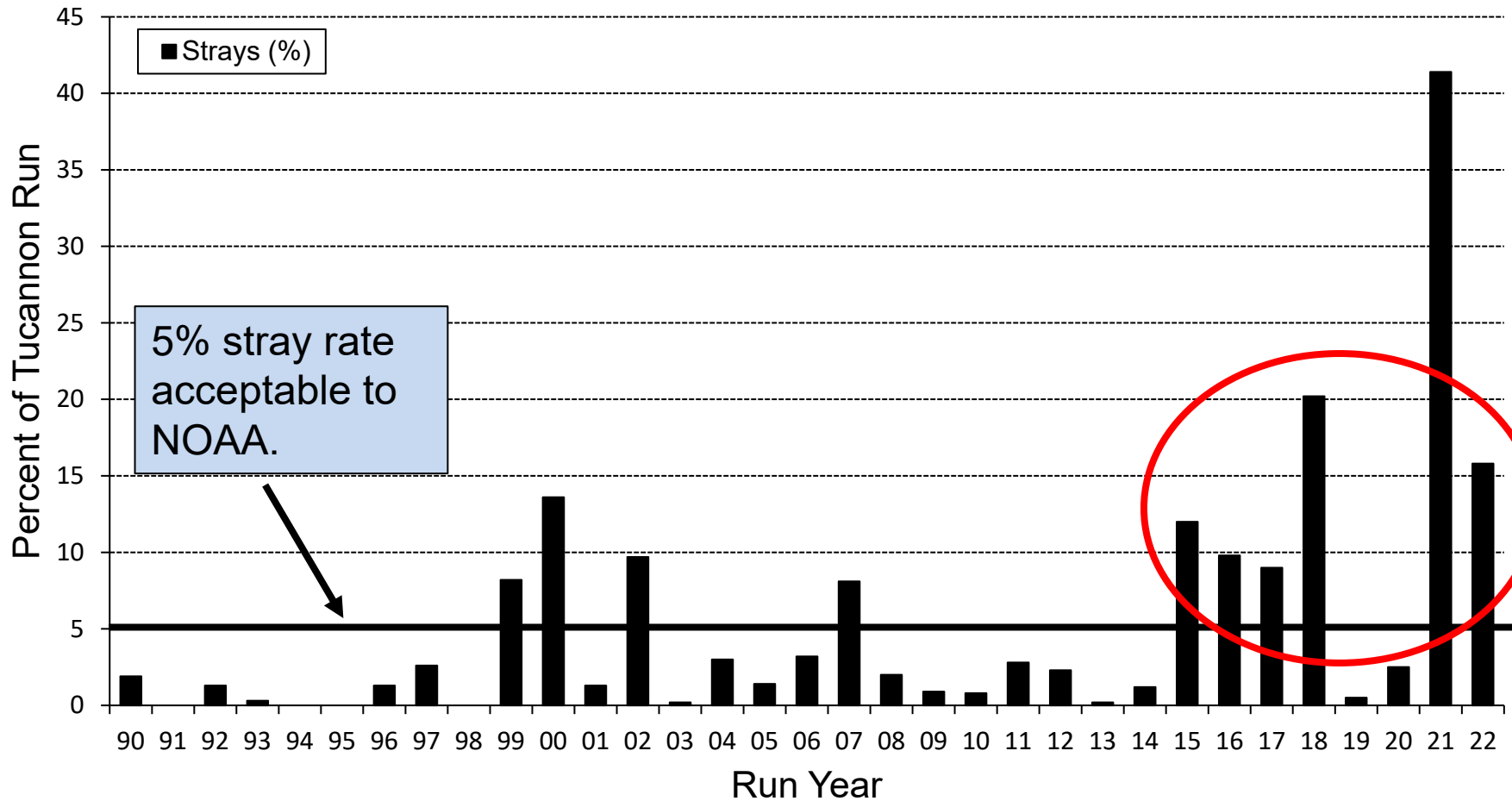
Total Redd Counts and Distribution



Escapement to the Tucannon



Strays from Other Systems

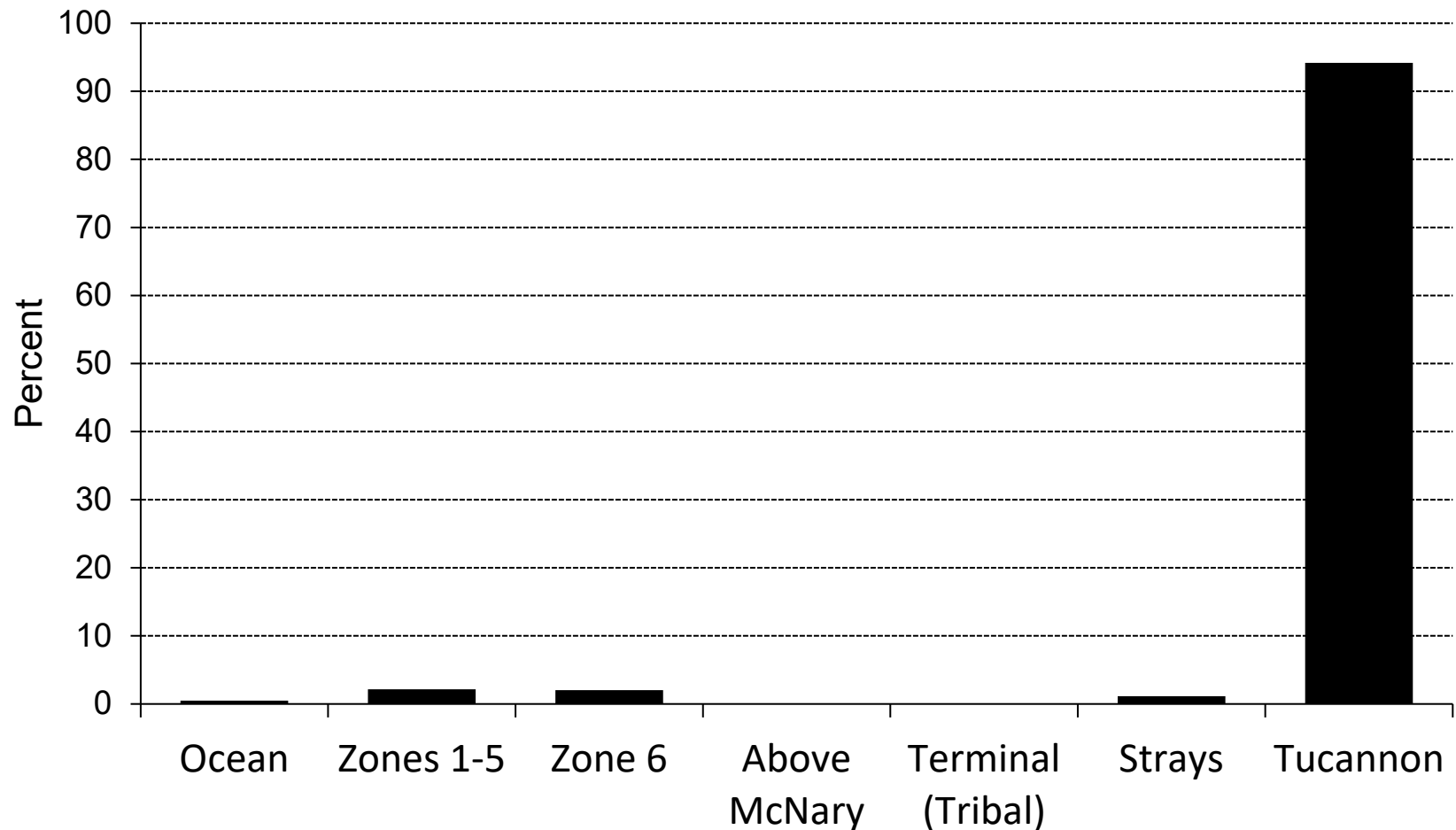


Primarily Umatilla River strays.

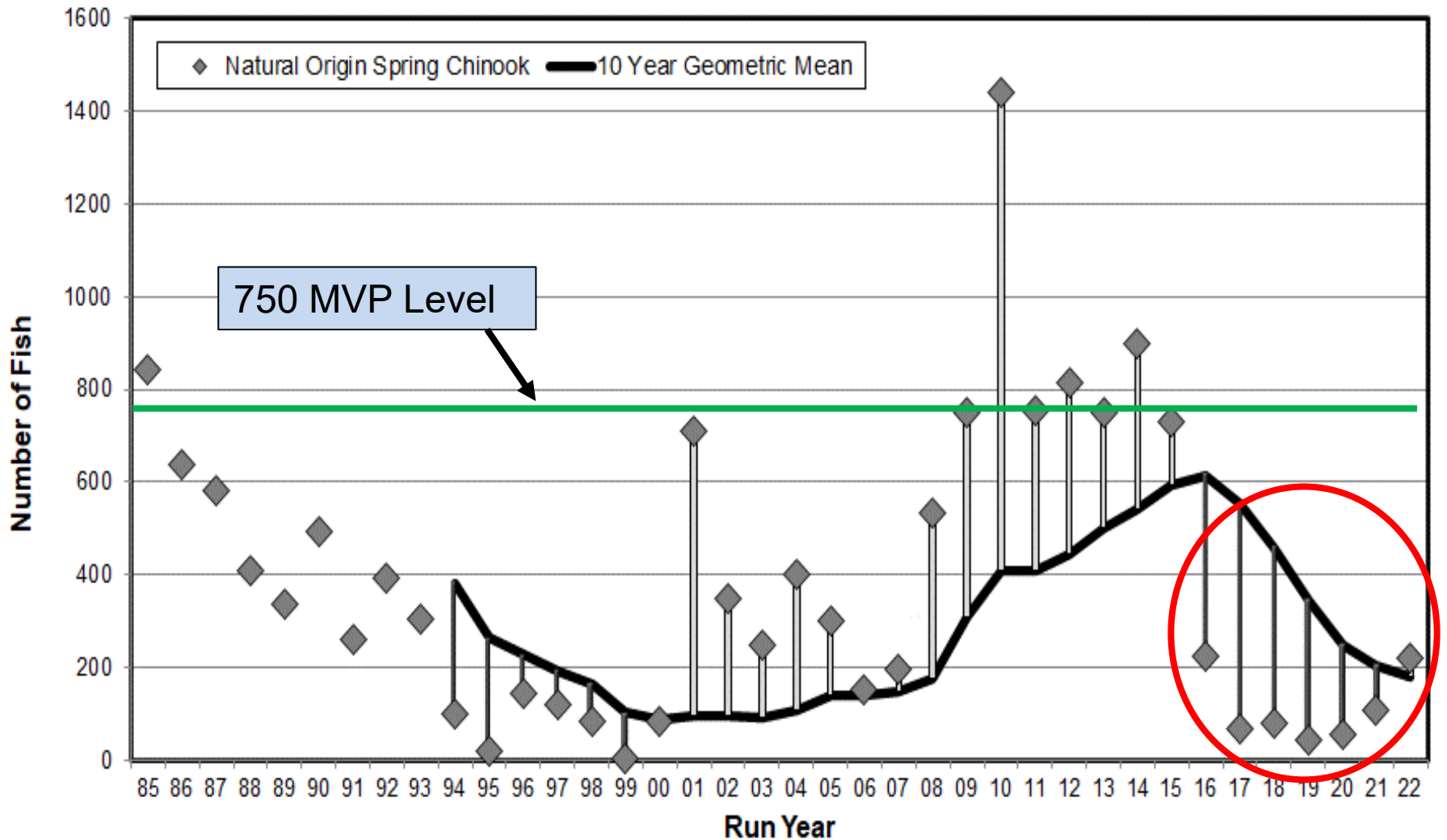
Concerns about outbreeding depression.

Tucannon CWT Recoveries

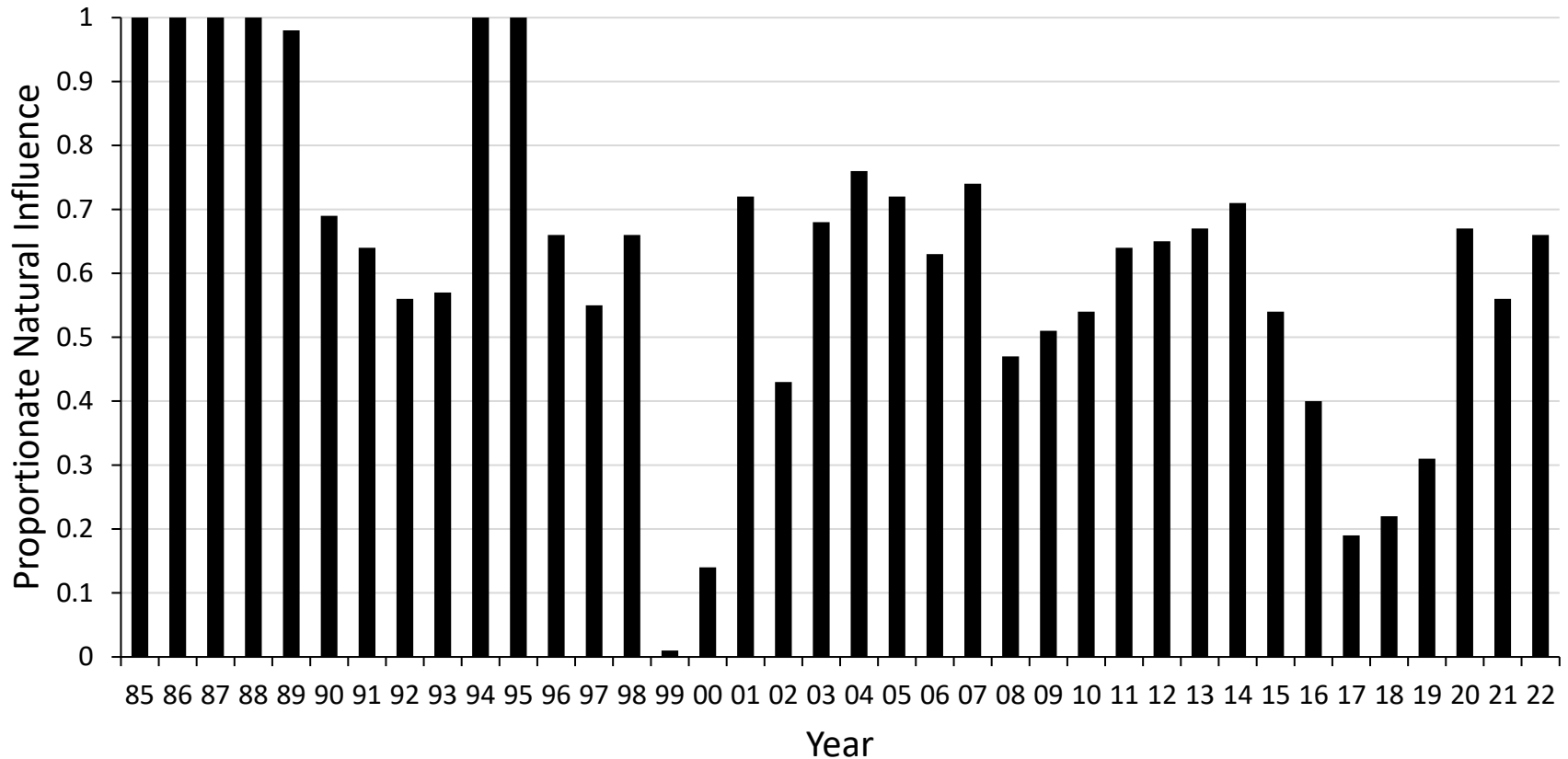
No AD clip from the 2000 BY to Present



750 Minimum Viable Pop. Level

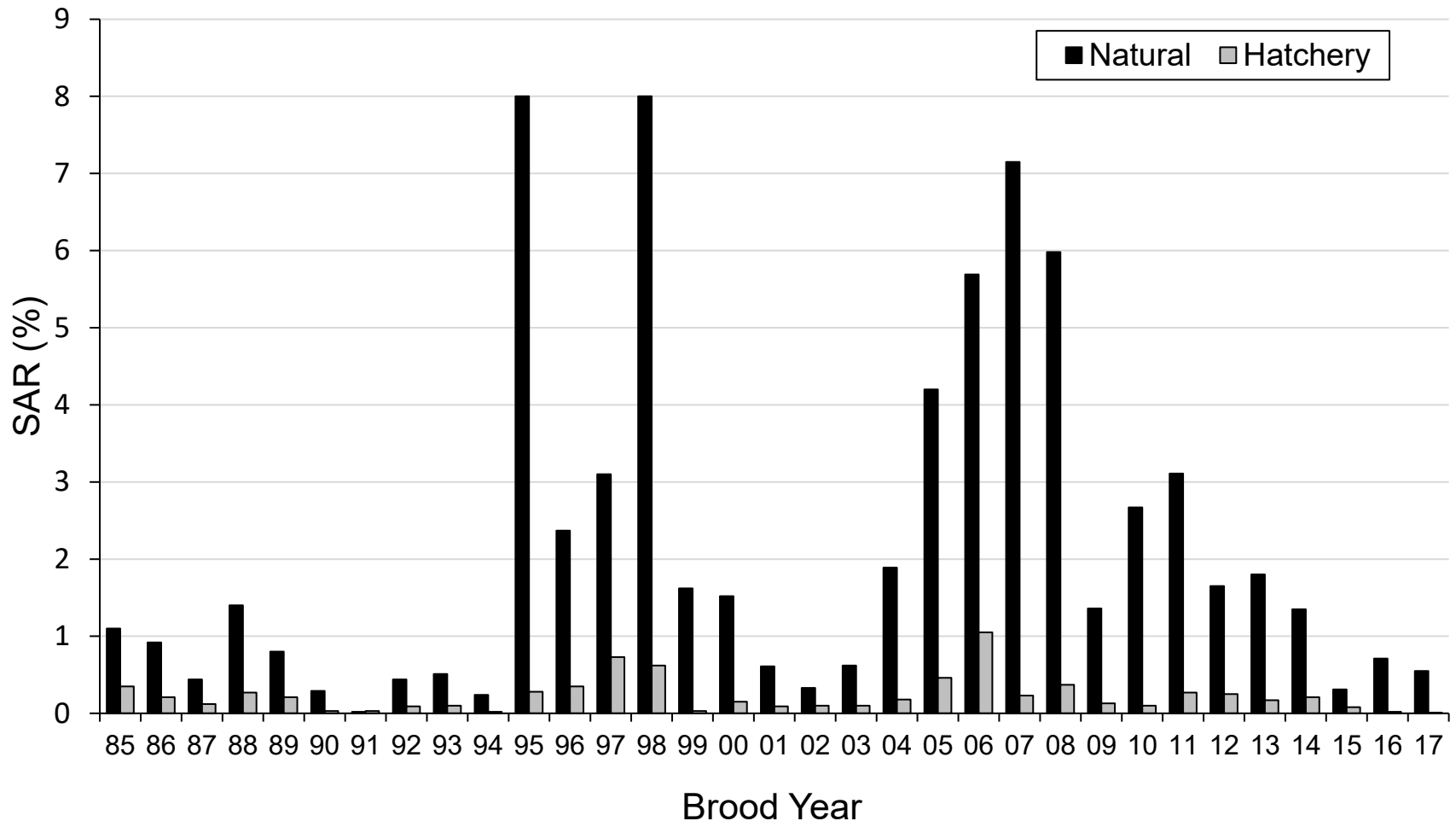


Proportionate Natural Influence (PNI)



PNI is typically above 0.50 and averaged 0.63 from 1985 to 2022.

Smolt-to-Adult Return



Average HOR SAR w/ jacks = 0.23% (0.18% excluding jacks)

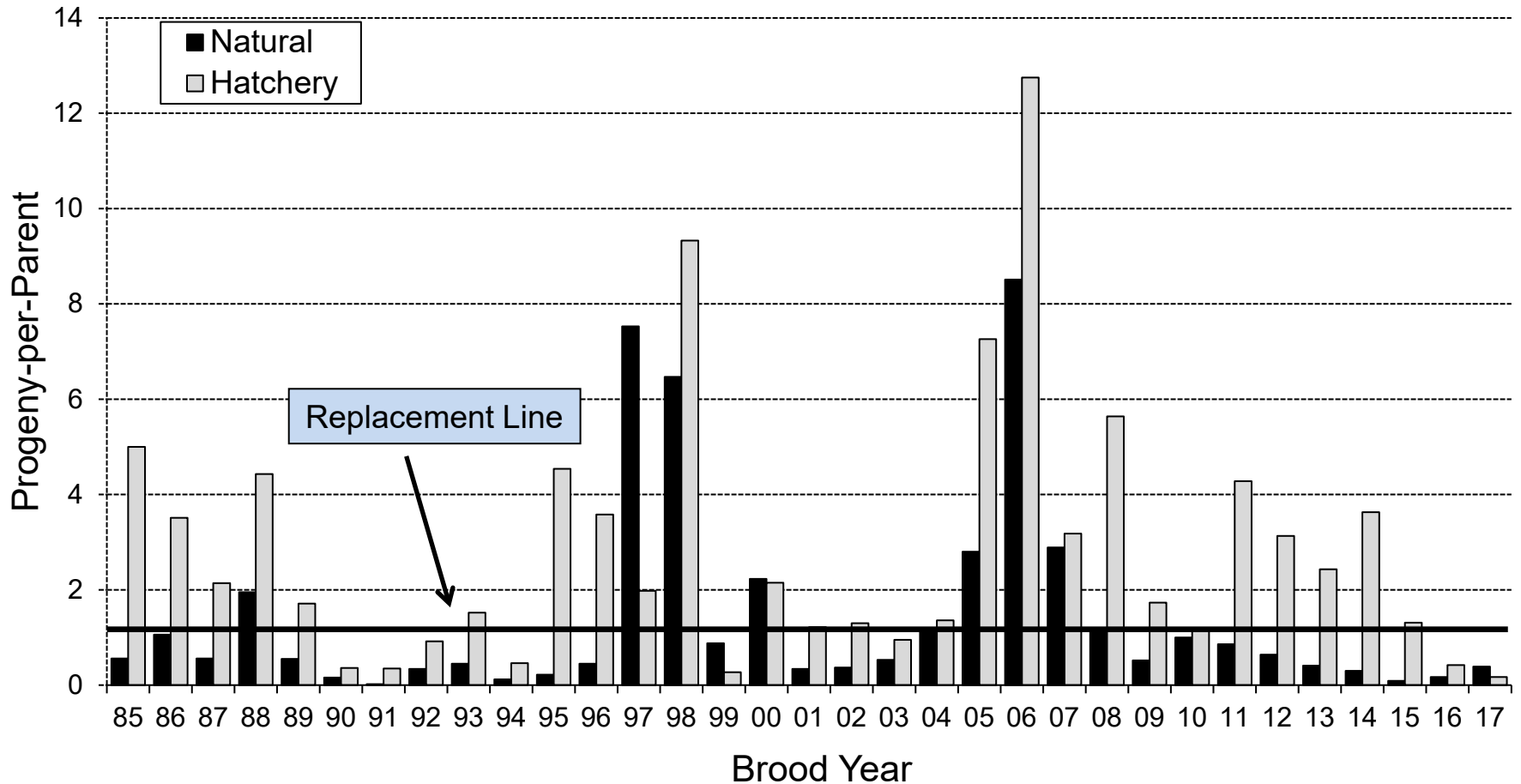
Average NOR SAR w/ jacks = 2.19% (2.07% excluding jacks)

- Based on the Total HOR SAR of 0.23%, it would take a hatchery program of over 500,000 smolts to meet the mitigation goal of 1,152.
- It would take a hatchery program of 640,000 smolts for the 1,152 goal to be comprised of adult fish (Adult SAR = 0.18%).
- Original 132,000 ==> 225,000 goal (2006 BY)

Touchet River Mitigation Program

- Since 2020 (2018 BY), Carson stock spring Chinook (250,000 smolt release goal) are being released into the Touchet River.
- Adult returns from the Tucannon and Touchet programs combined will be used to measure contribution towards the LSRCP spring Chinook mitigation goal for Washington in the future.
- Returns to date: BY18 = 173 fish (SAR = 0.067%)

Progeny-per-Parent Ratios



HOR above replacement for 25 out of 33 years (76%).

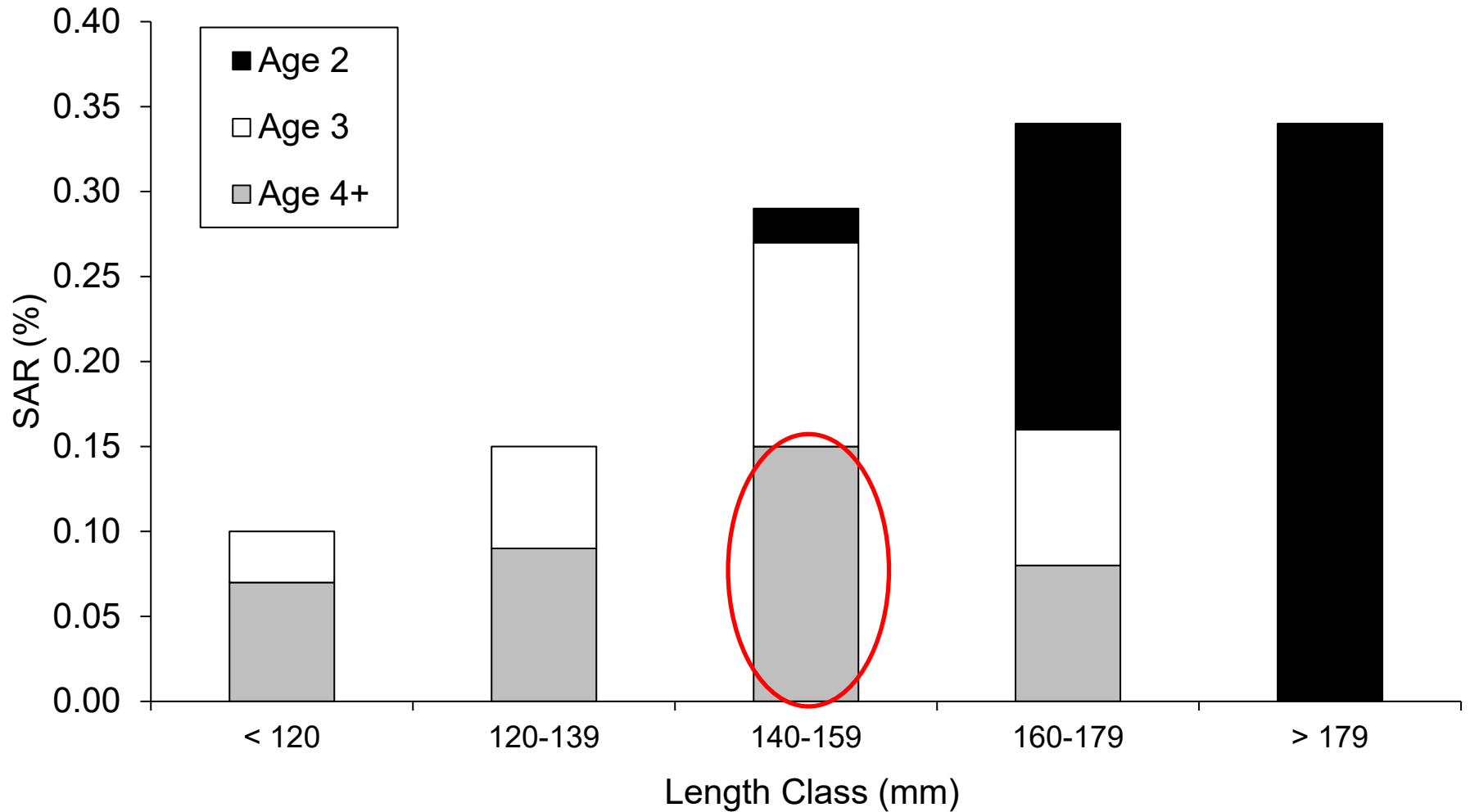
NOR above replacement for only 11 of 33 years (33%).

Is there an Optimum Size at Release? Adults (ages 4+) & SAR = 0.87%?

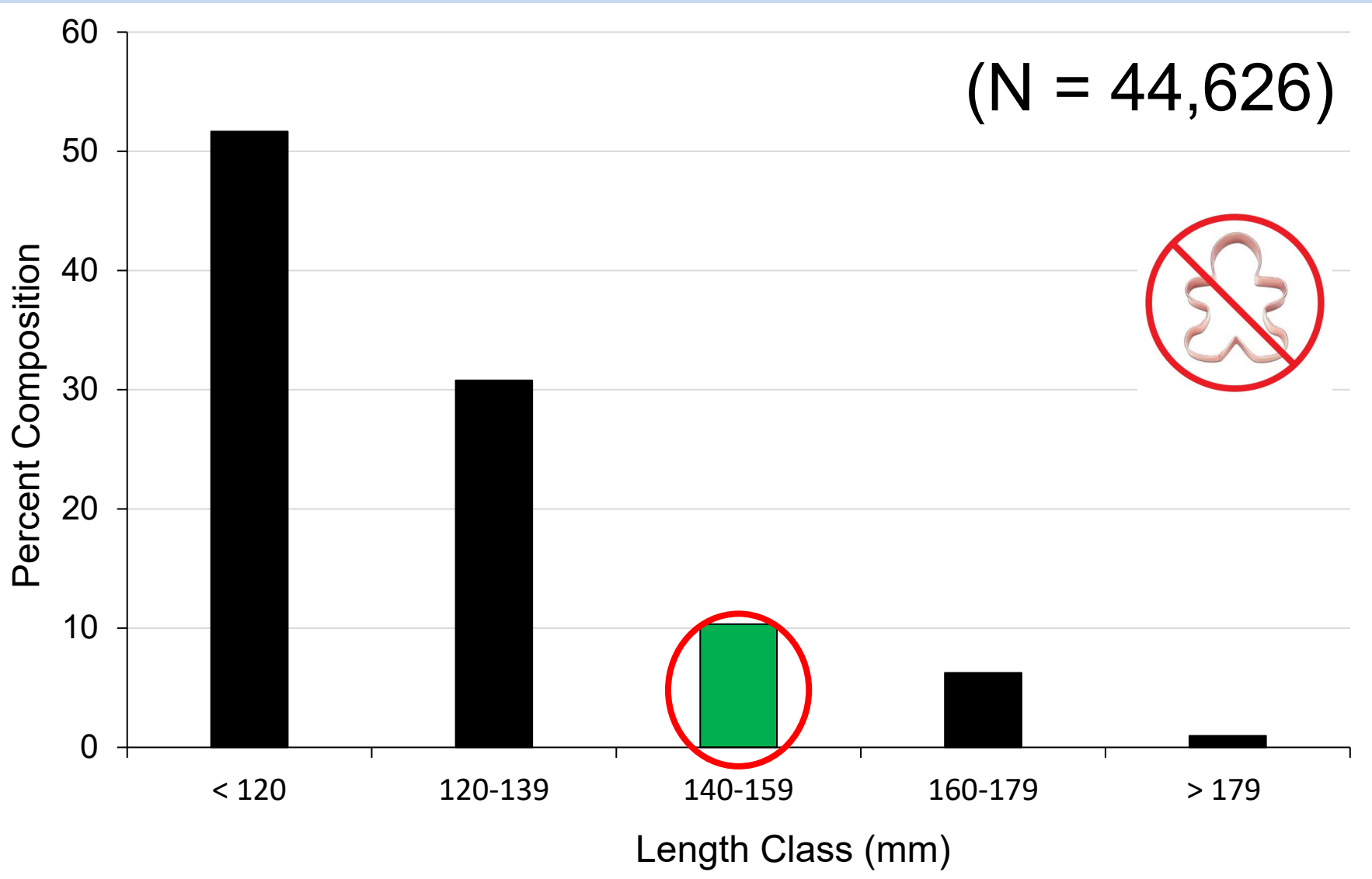
- Released 95,256 PIT tagged hatchery fish w/ known fork lengths (range 73-212 mm).
- Examined for eight BYs (2006-2013).
- Categorized into five length classes (< 120, 120-139, 140-159, 160-179, and \geq 180 mm).
- Used detections at PIT tag antenna arrays to avoid spawning ground survey carcass recovery bias.

Tucannon River SARs

(Based on PIT tag array detections.)



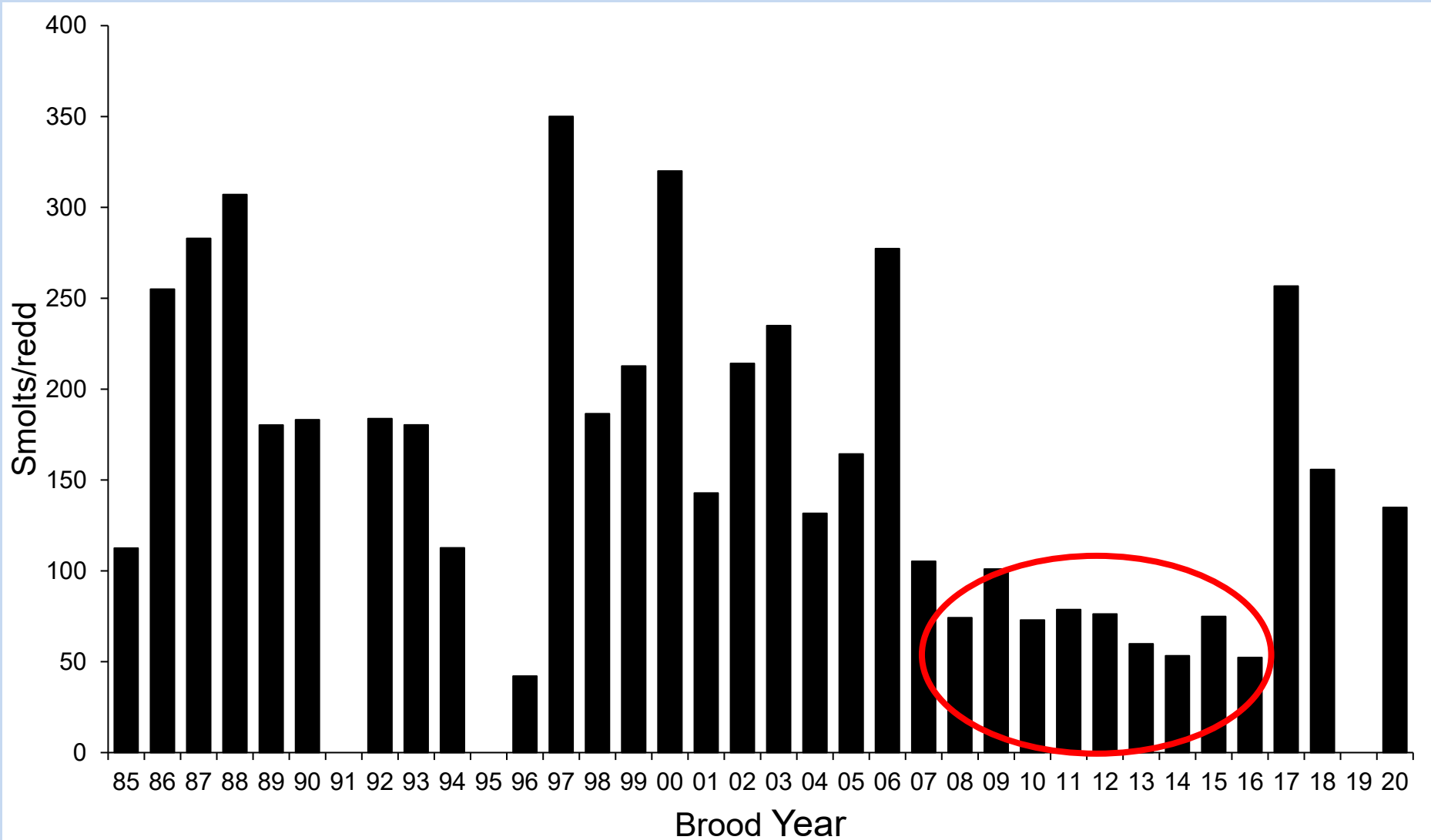
38 g Target Release Goal (12 fpp)



Conclusions...

- To maximize adult returns (ages 4+), HOR smolts should be released in the 140-159 mm range (33 to 49 g).
- None of the length classes came close to reaching the adult SAR target of 0.87%. (Even by growing fish to a size that doesn't normally occur in nature.)

Is the Hatchery Program Lowering Natural Productivity?



- Hatchery origin fish are less fecund with fewer older, larger fish. Could this be the reason for the lower smolts/redd?
- Hatchery stray composition has increased in recent years. (Poor adaptation?) Could this be the reason?
- During low run years we collect everything for broodstock, resulting in most of the natural spawning below the adult trap. (Best habitat is upstream.) Could this be the reason?

Multiple Stepwise Regression (Backward Selection)

- Proportion of hatchery strays in the run.
- Proportion of hatchery fish on spawning grounds (pHOS).
- Proportion of redds above the adult trap.
- Proportion of redds below the adult trap.
- Proportion of redds in Marengo habitat strata and downstream (poor habitat).
- Proportion of redds in the Wilderness and HMA (best habitat).
- Escapement (abundance) back to the river.

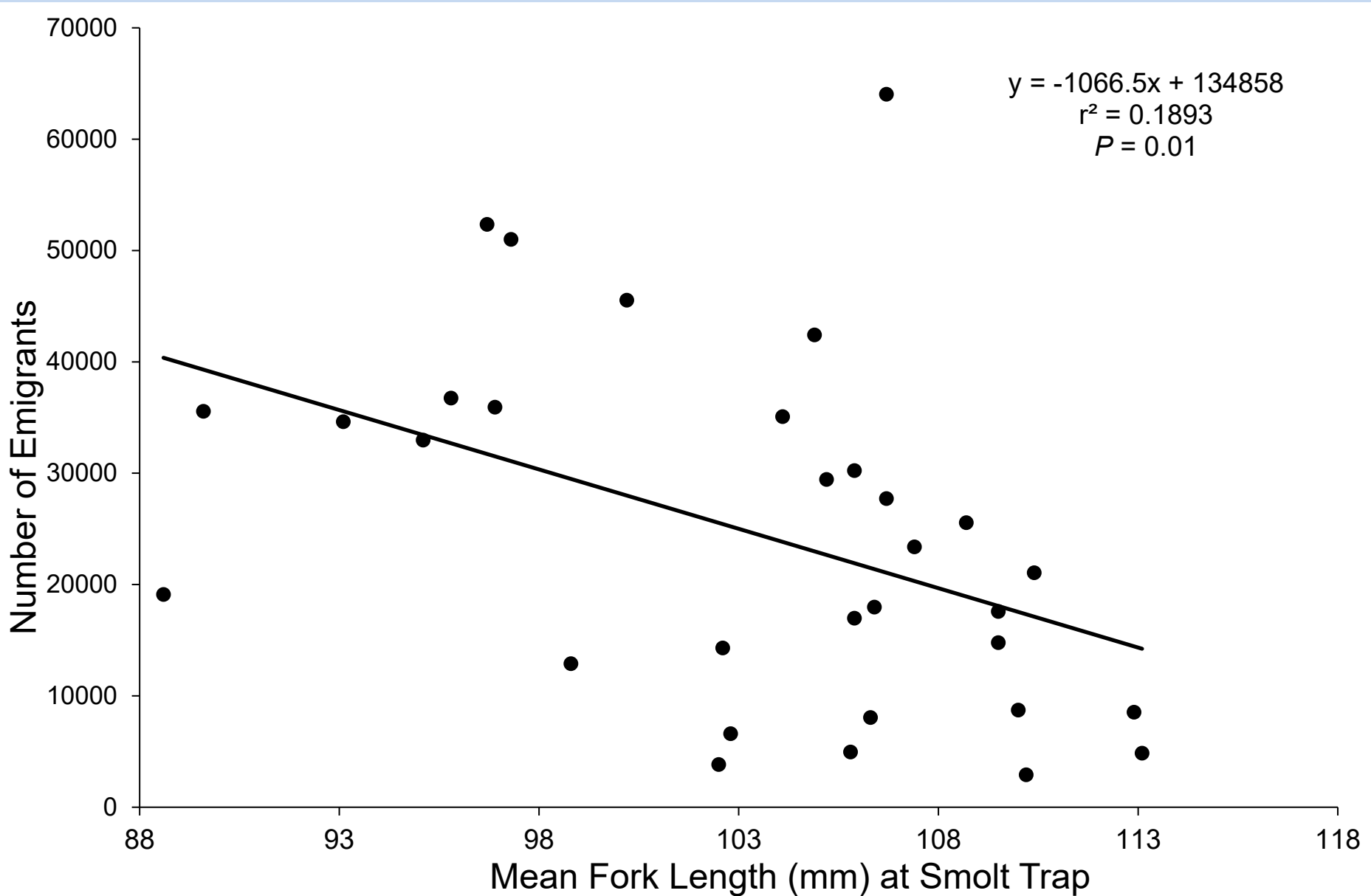
Results:

None of the variables were significant except for annual escapement, suggesting a density-dependent effect.

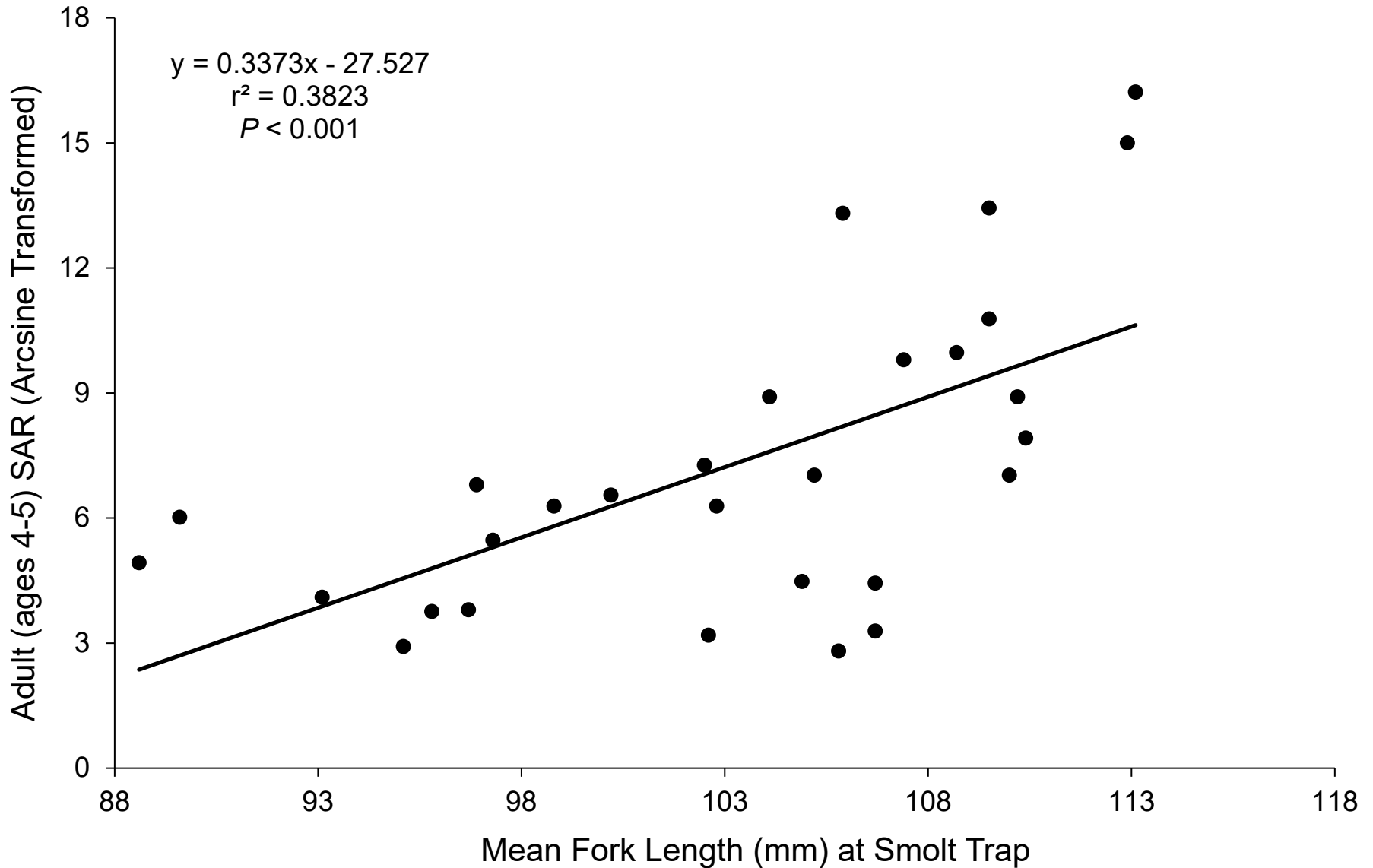
$$\text{Smolts/redd} = 211.51 - 0.076^* \text{Escapement}$$

$$R^2 = 27.4; P < 0.01$$

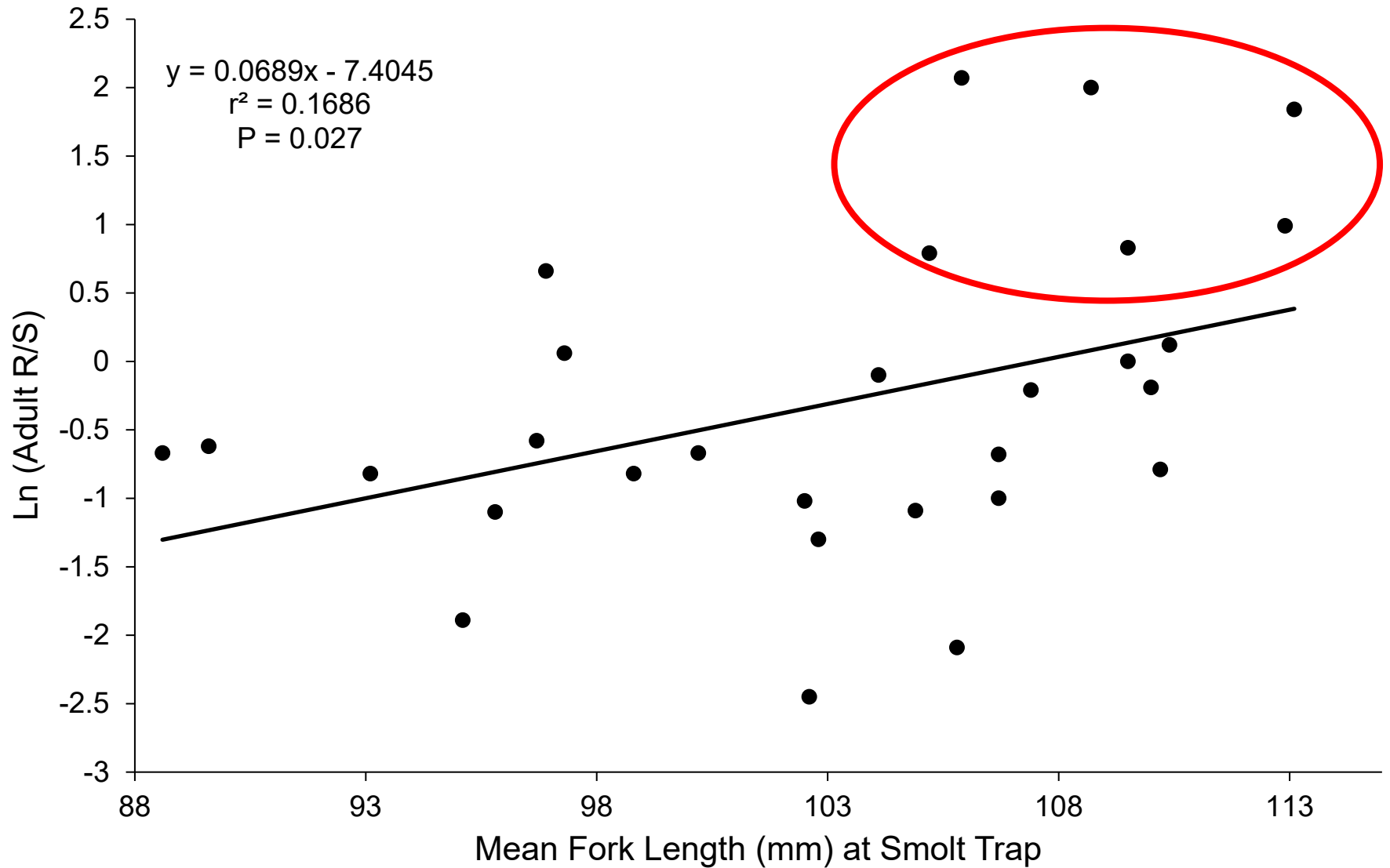
Smaller Escapements = Larger Fish



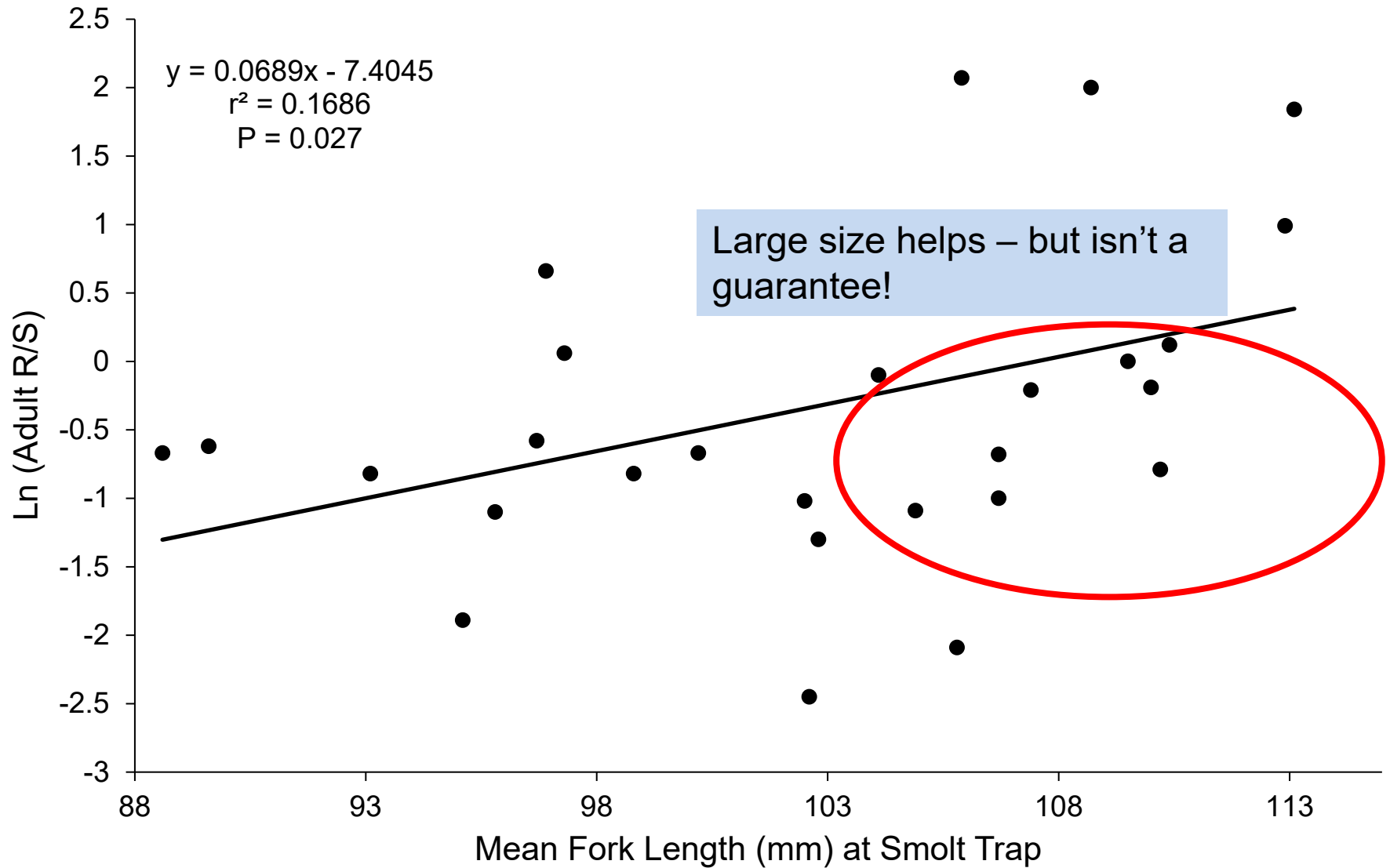
Larger Fish = Higher SARs



Larger Fish Tend to be Above Replacement



Larger Fish Tend to be Above Replacement



- Reaching a larger size is important for **both** hatchery and natural origin fish survival.
- “Catch-22” – Large escapements typically result in smaller fish & lower overall NOR survival and return.
- Even though current escapement numbers are well below historical levels - It appears the natural population is hitting a “productivity ceiling” in environmental capacity that is limiting spring Chinook Salmon in the Tucannon River and halting progress towards reaching restoration goals.

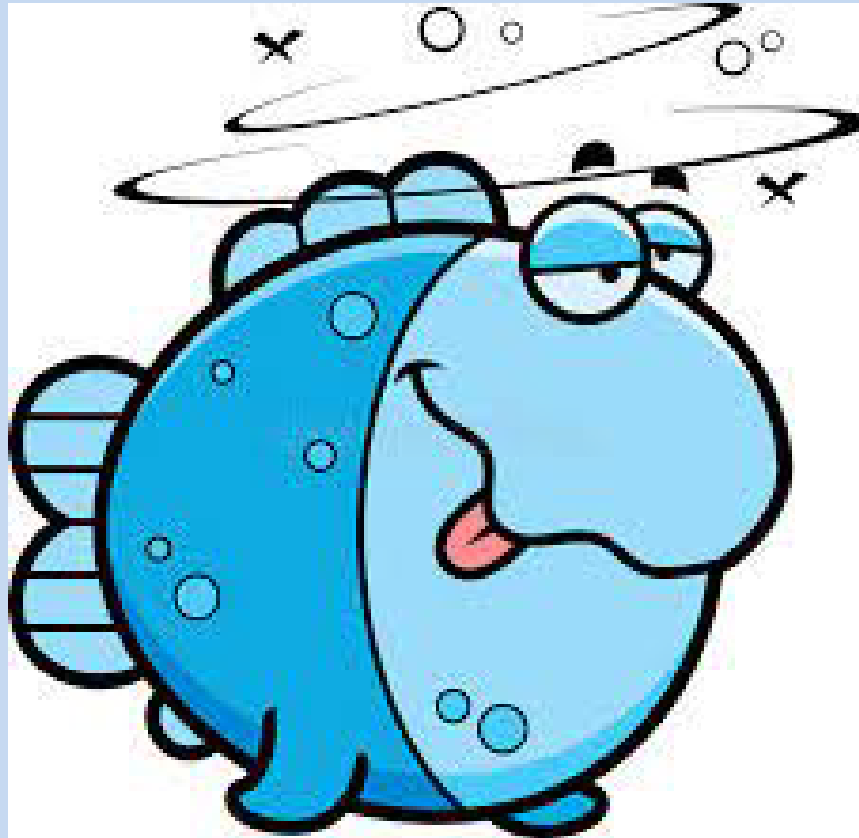


Good Luck!!

You'll Need It!!



Is there anything we can do to help
NOR survival?



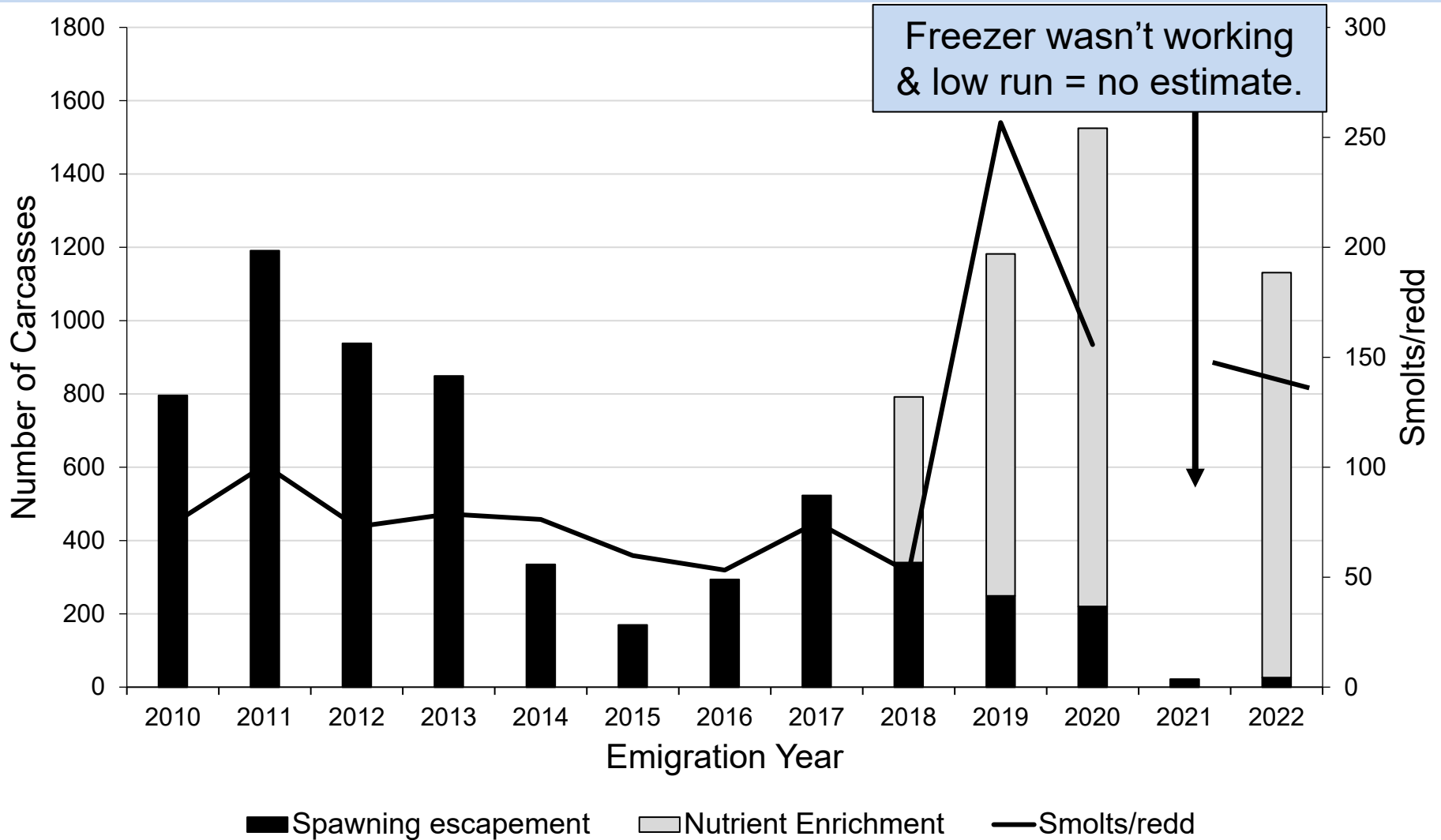
Stream Nutrient Enrichment Program (Fall Chinook Carcasses – “Surrogates”)



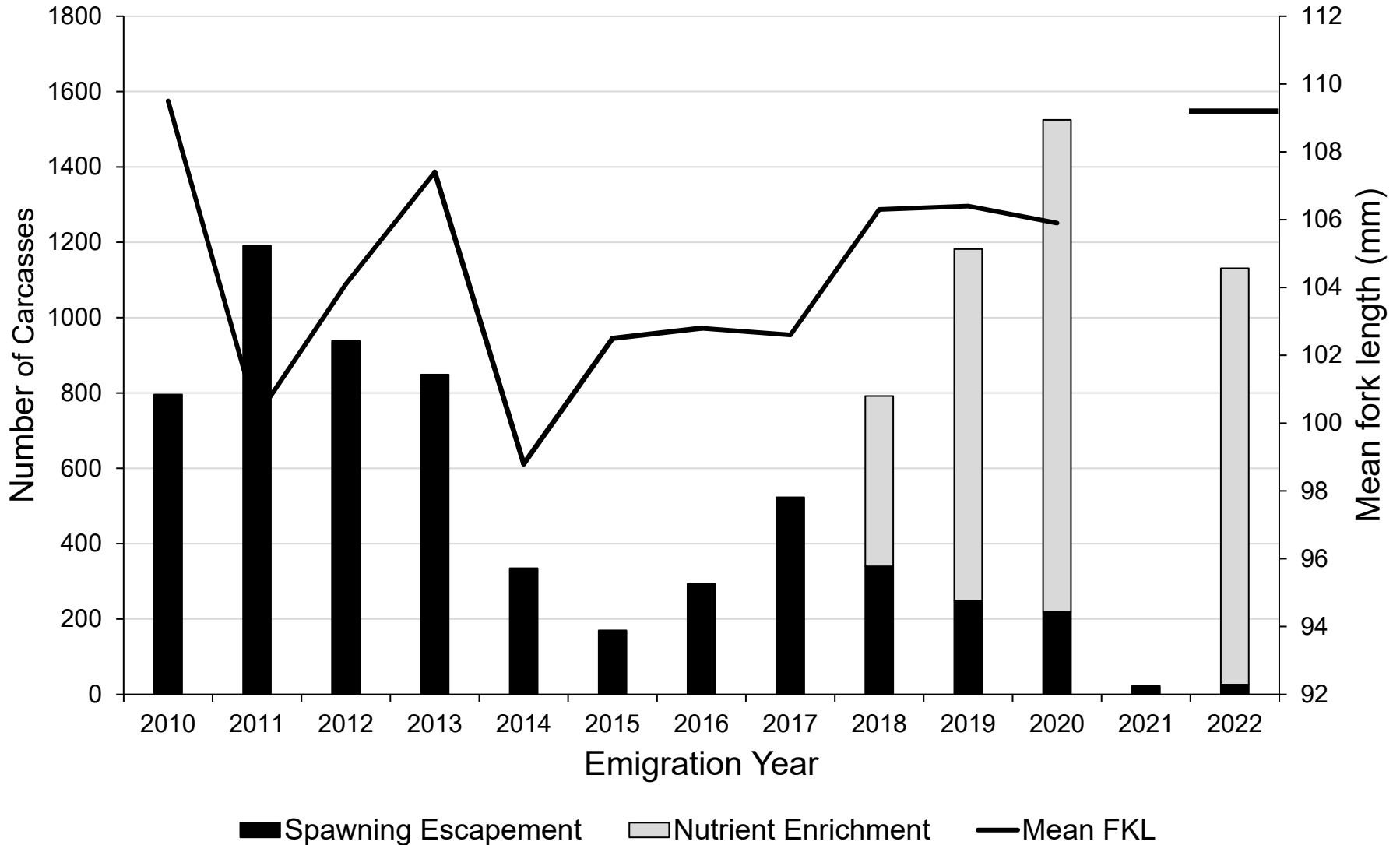
Tri-State Steelheaders – Regional
Fisheries Enhancement Group

Special Kudo's to Hatchery Staff!!!

Smolts/Redd



Mean Fork Length



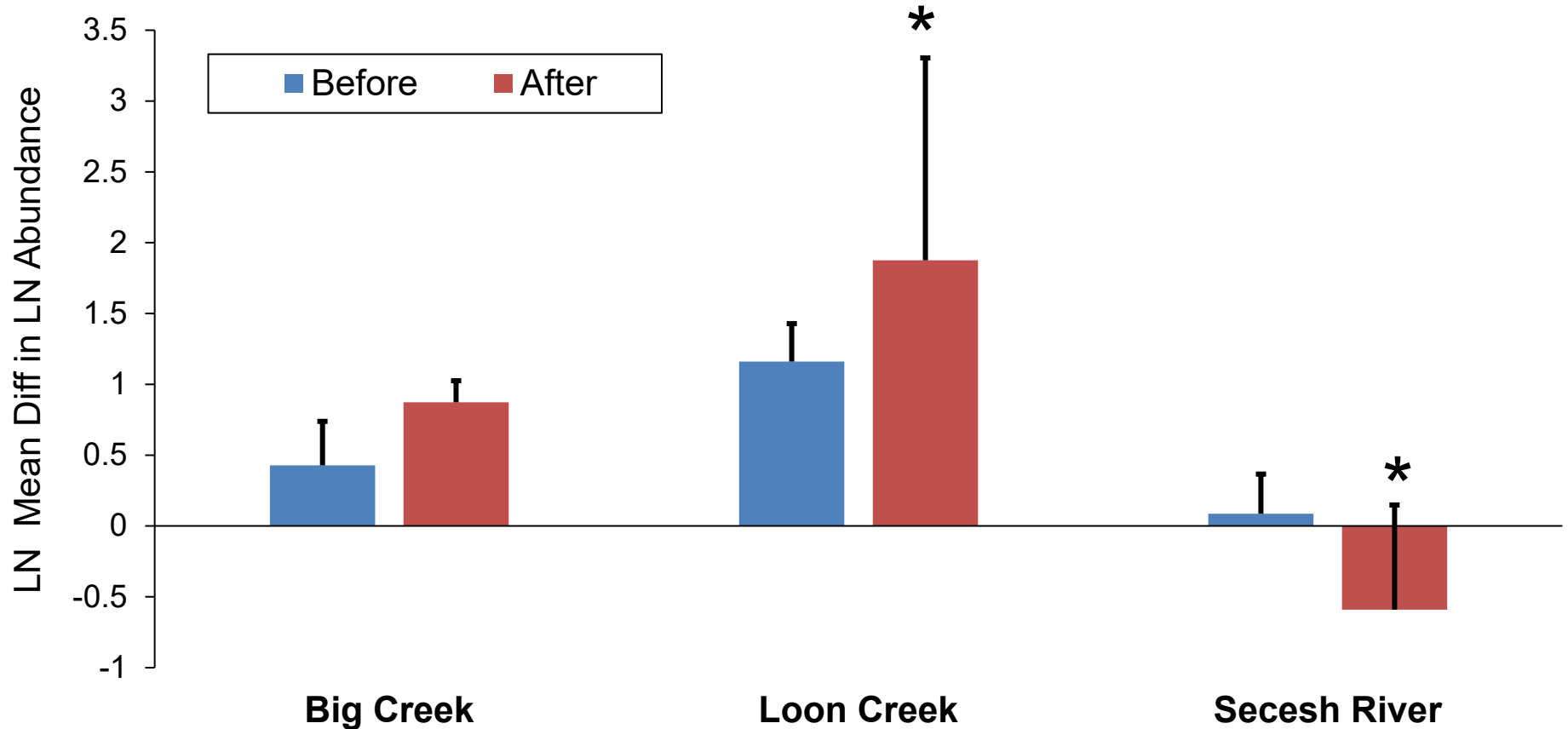
- We are cautiously optimistic that the stream nutrient enrichment program is having a positive impact on the NOR component of the population.
- It will likely take many years to determine for sure. (Will need to account for environmental and density-dependent variables.)

Reference Stream Comparisons

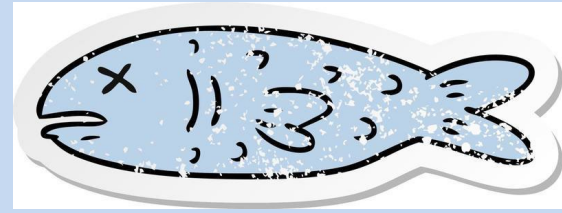
BACI Analysis – Alf Haukenes

- Examined 26 populations w/ little to no supplementation.
- Only three populations shared similarities during the “before supplementation” period to support further analysis. (Big Creek, Loon Creek, and the Secesh River in Idaho.)

Tucannon spring Chinook outperformed Loon Creek but underperformed compared to the Secesh River.



Summary



- The assumptions made at the beginning of the mitigation program have not been realized and the program has failed to meet expected returns to the Lower Snake area.
- - Not meeting hatchery adult return goal.
- - Not providing a fishery.
- - Not meeting the natural return goal.
- - Average progeny-to-parent ratio of NOR fish is below replacement. (Hence – ESA listing).

The End