

Applying the results of an evaluation of  
different hatchery rearing environments to  
improve the smolt-to-adult survival of spring  
Chinook salmon in the Hood River

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Confederated Tribes of Warm Springs

**YKFP Gorge Science Conference**

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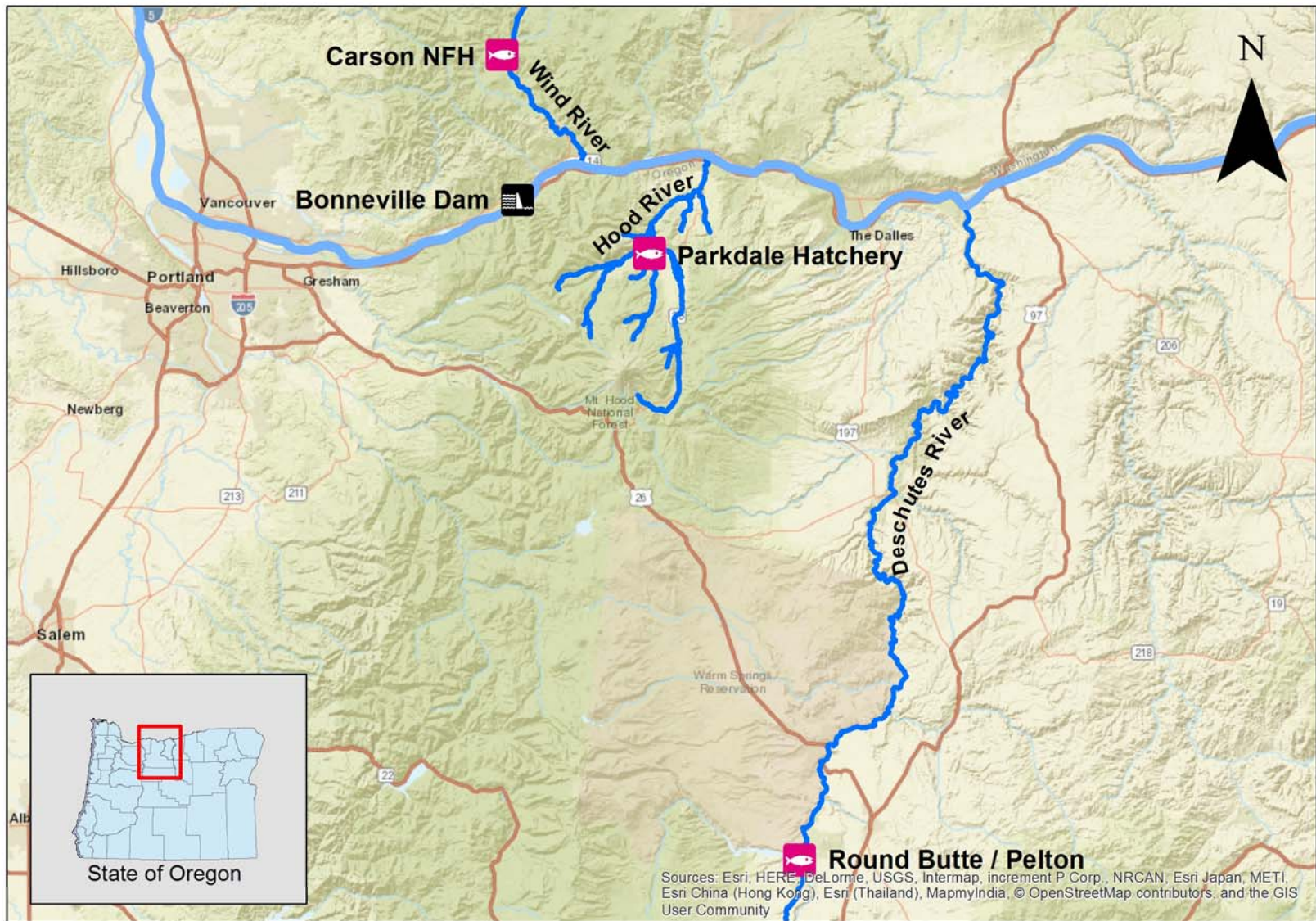


# Project Timeline

- **1960's** Hood River spring Chinook went extinct
- **1991** Hood River Production Program founded (funded by BPA) to reintroduce Spring Chinook
- **2003** Independent review of the program reported poor Smolt to Adult survival Rates (SAR), high stray rates, disease, potentially high production of minijacks contributing to program not meeting Chinook goals.
- **2008** Fish Accords signed with BPA
- **2008** Comparative hatchery evaluation study launched in cooperation with NOAA fisheries researchers
- **2010** Powerdale Dam removed
- **2012** Moving Falls fish facility became operational

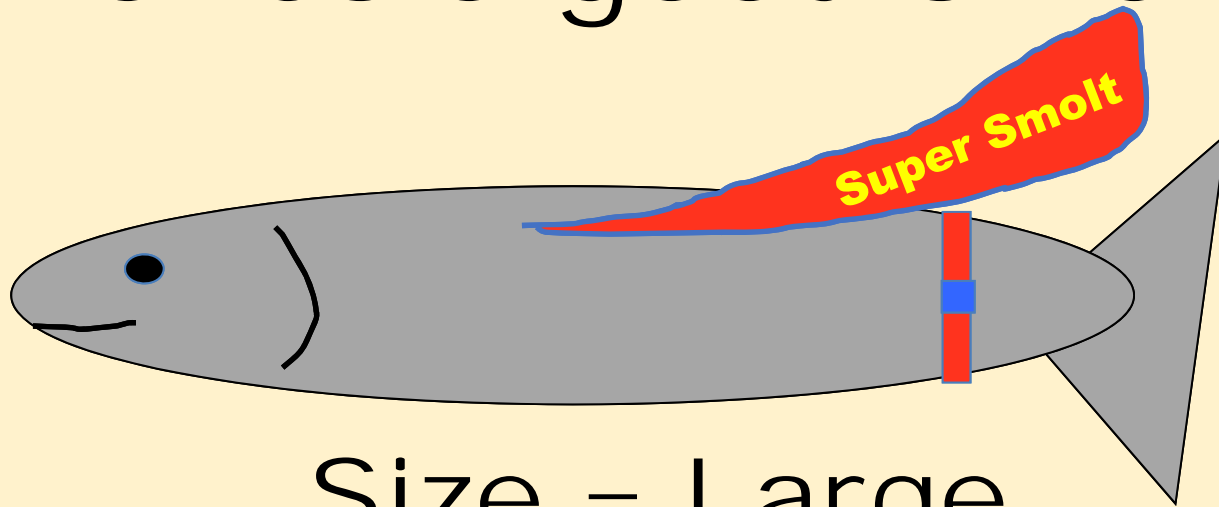
# Study Design

- **Raise Hood River stock fish at:**
  - Round Butte Hatchery/Pelton (~75k) – Pelton
  - Parkdale Hatchery (~40k) – Parkdale
  - Carson NFH (~45k)– Carson
- **Assess & compare smolt quality**
  - Size
  - Lipid
  - Growth
  - Smolt development (Na/K ATPase)
  - Rates of early male maturation (11-KT)
- **Monitor performance post-release via PIT tags**



0 5 10 20 30 40 Miles

# Smolt quality ranking - What makes a good smolt?

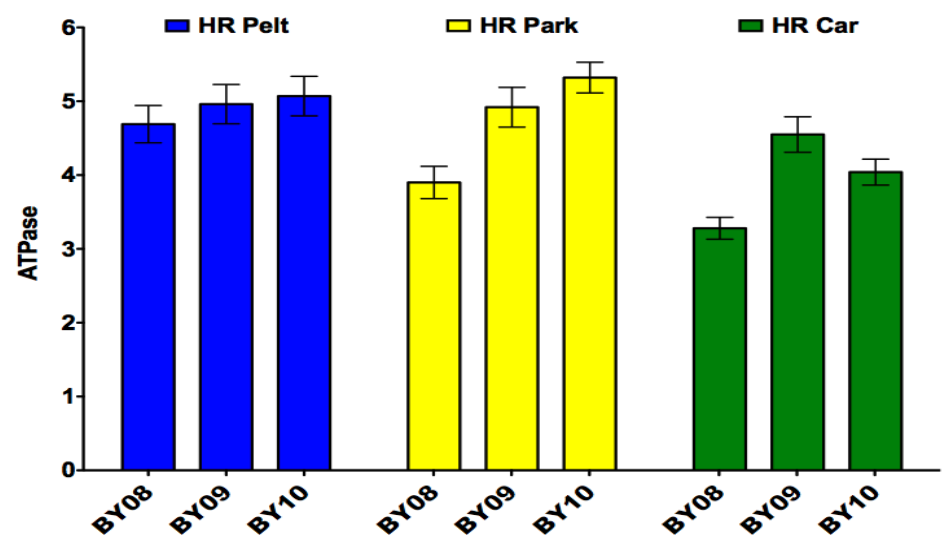
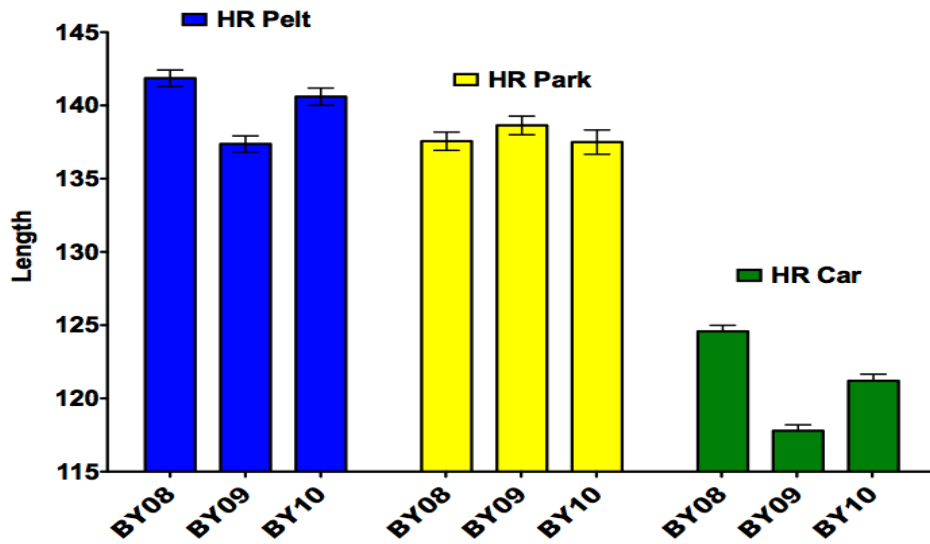


Size = Large

ATPase = High

Lipid = High w/ some Seasonal  
Variation

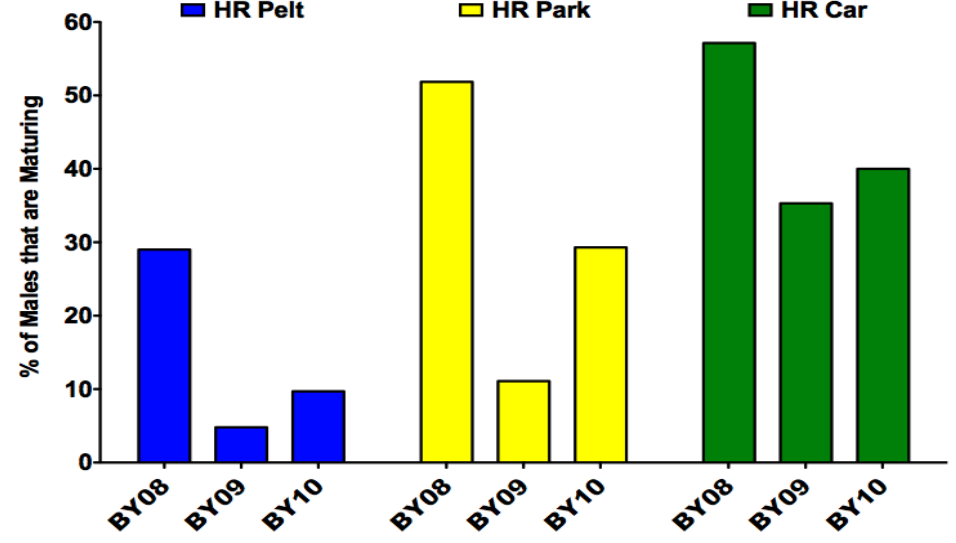
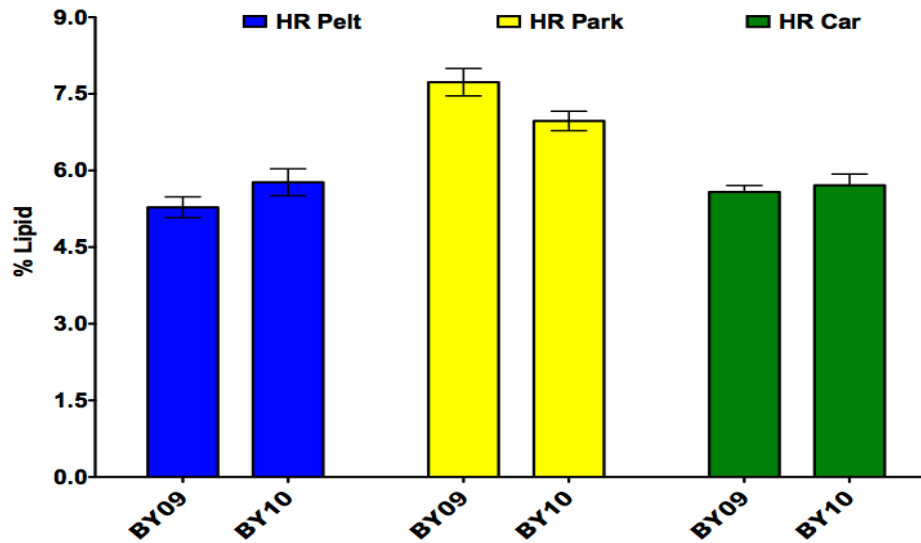
Minijack = Rate Low



Size

ATPase

**Pelton > Parkdale > Carson**

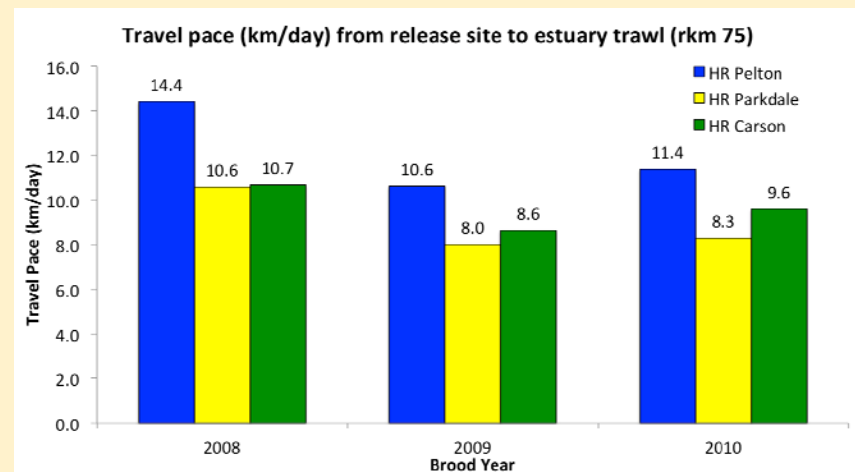
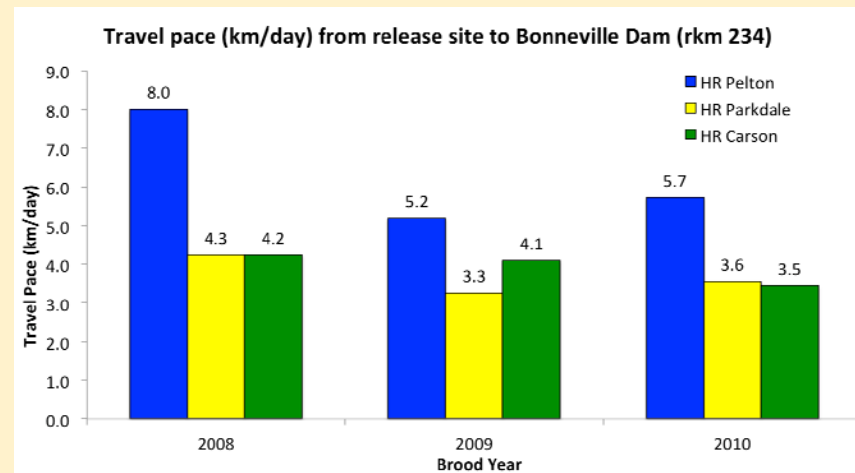


Lipid

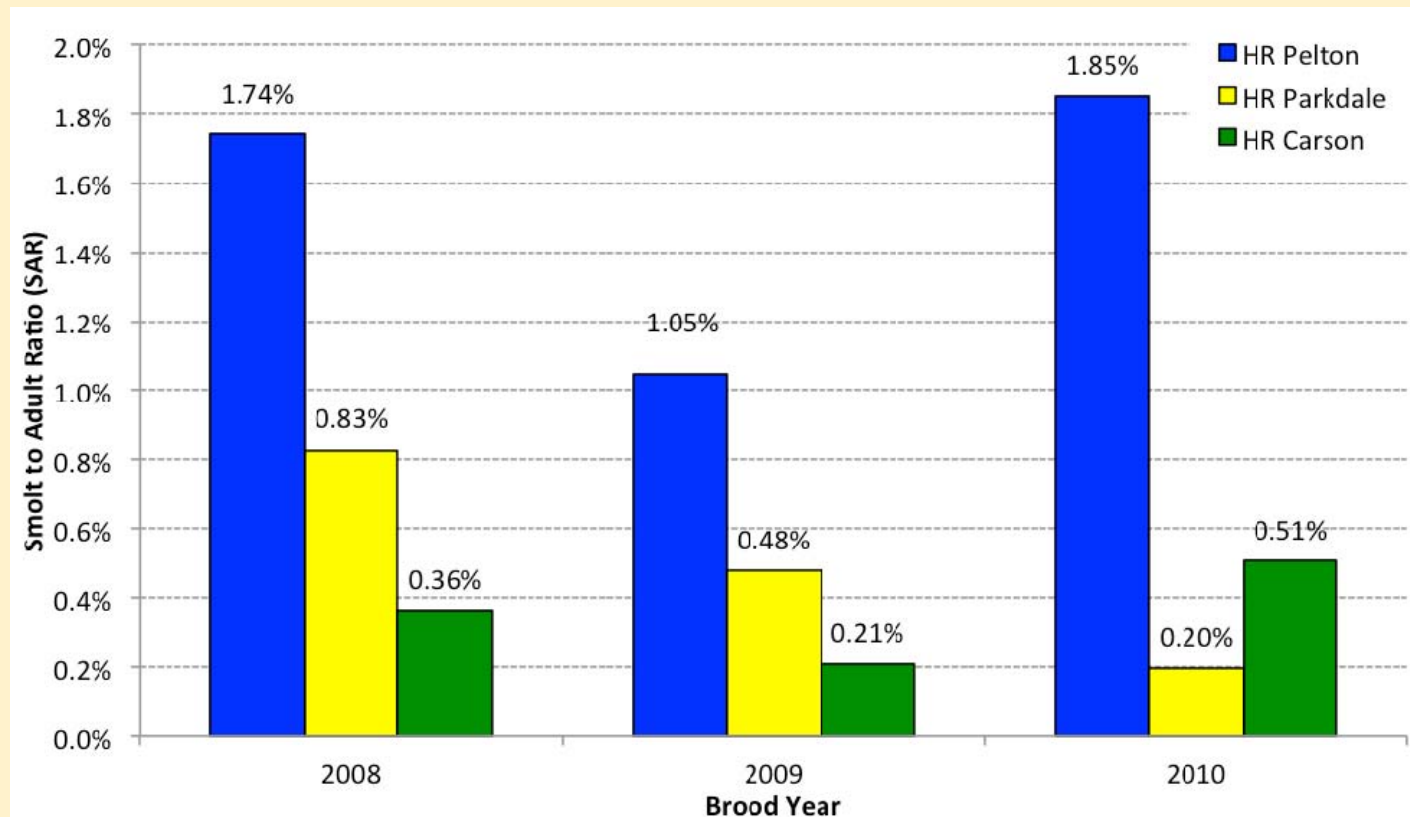
Early Male Maturation

# Results – Migration Pace

- Pelton fish consistently and substantially had a faster migration pace than the other 2 rearing groups
- Parkdale and Carson fish did not appear to differentiate from each other much in migration pace
- Faster pace should lead to higher survival (lower exposure to predators, earlier access to productive ocean feeding grounds)
- Pelton fish spent between 3.7 to 5.6 fewer days in fresh water than Parkdale and Carson fish.



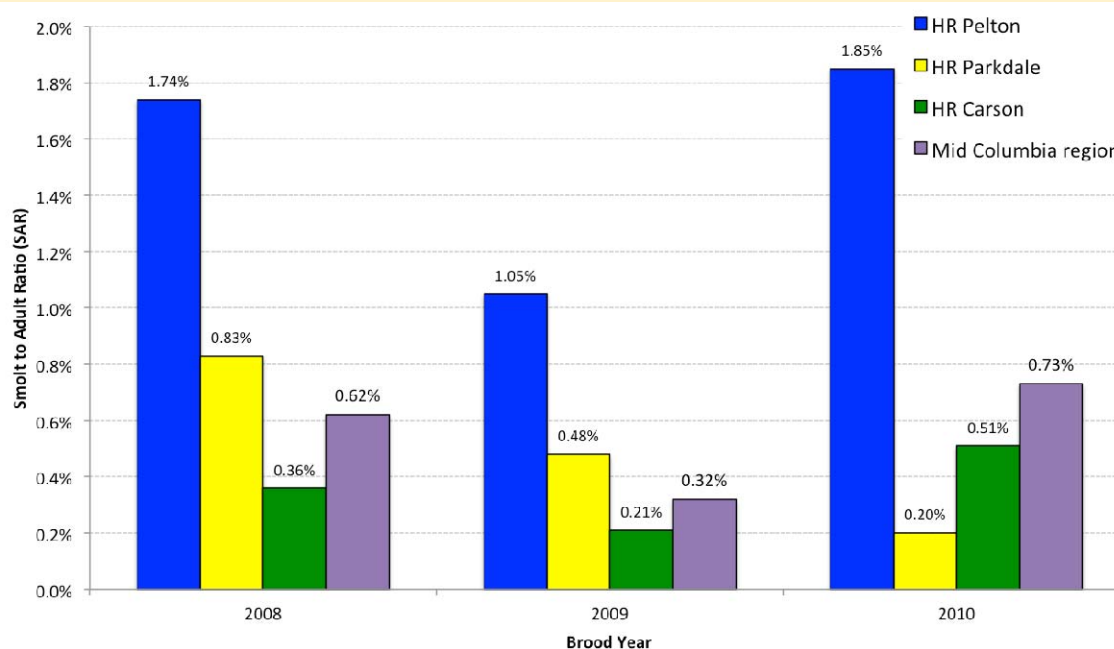
# Results – SARs by Rearing Group



The SARs did in fact rank out similar to what the “smolt quality” ranking suggested. Pelton>Parkdale>Carson



# Results – Relative to other Mid Columbia spring Chinook hatcheries



Hood River SARs compared to regional average

Pelton = 287%

Parkdale = 104%

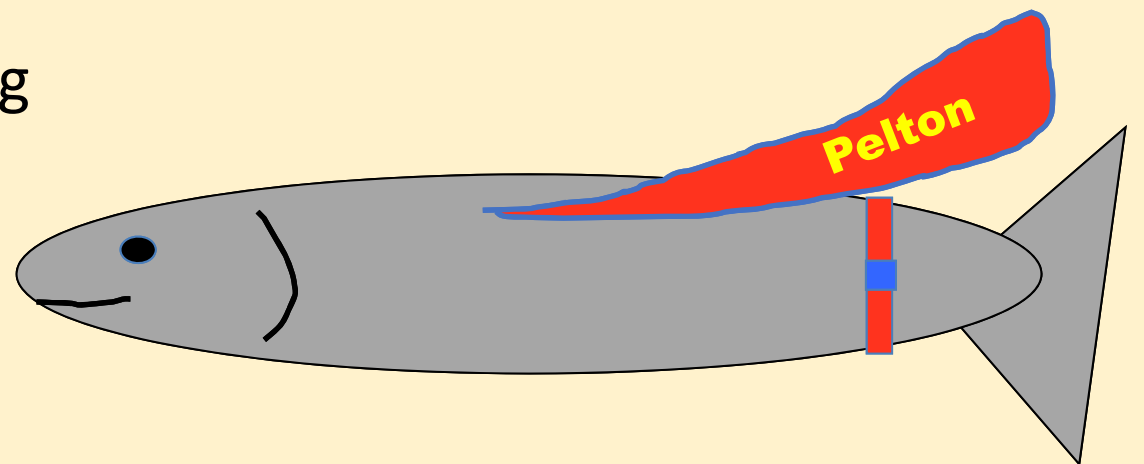
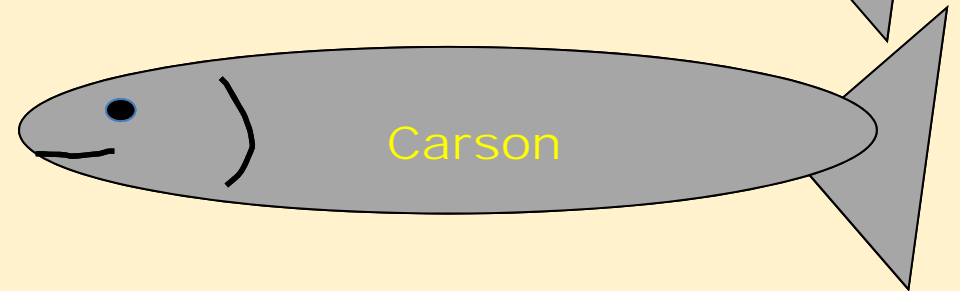
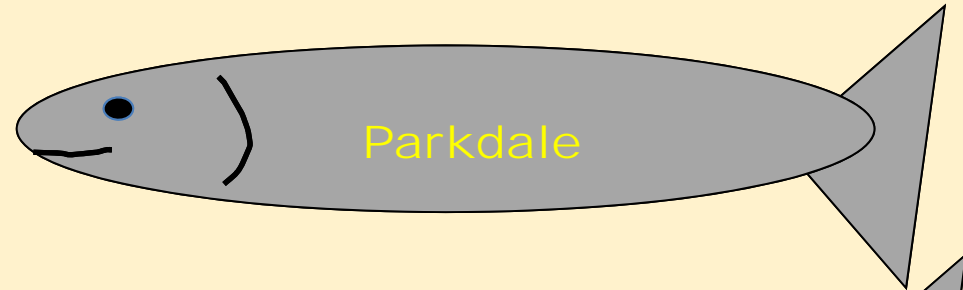
Carson = 65%

## Hatchery (Agency)

- Carson (USFWS)
- Umatilla (ODFW)
- Klickitat (YN)
- Little White Salmon (USFWS)
- Willard (USFWS)
- Round Butte (ODFW)
- Warm Springs (USFWS)

# So what makes Pelton fish so dang special?

- They were big, but not too fat
- They experienced seasonal variations in temperature and growth
- Spent some time in a “semi natural” rearing facility



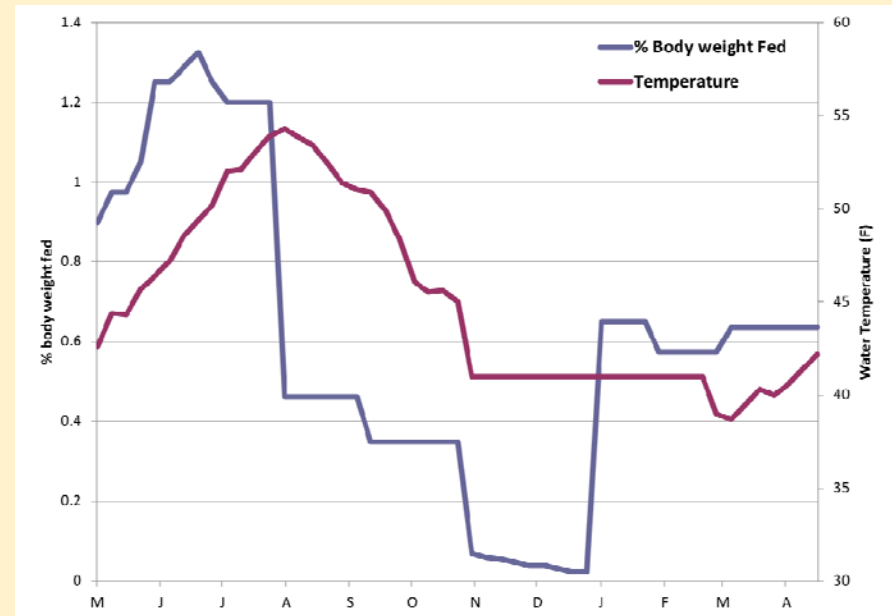
# Applying our Findings – Facility Upgrades

- Built a new acclimation site at Moving Falls on the West Fork Hood River.
- Allows us to start acclimation earlier in the year. Easier to feed and clean than previous temporary ponds
- Provides a location for rearing on a natural water source and temperatures that wild fish experience



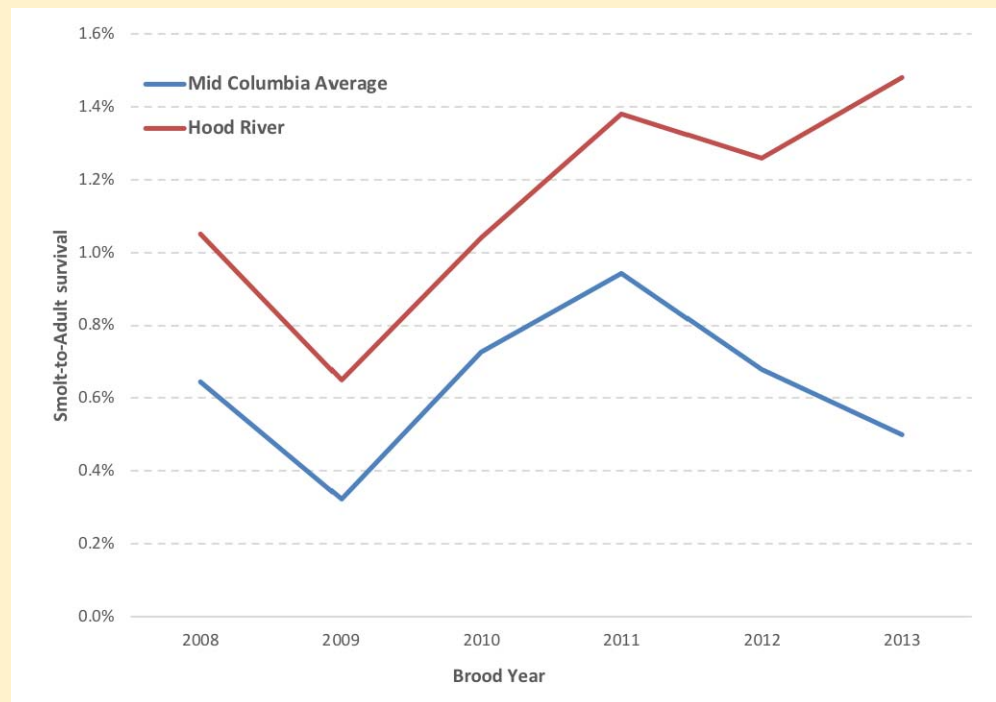
# Applying our Findings- Wild Type Rearing Template

- Produced a feed model for the Parkdale Hatchery with seasonal growth and size targets and temperature manipulation
- Not every facility can control their water temperatures, but anyone can control how and when they feed fish.



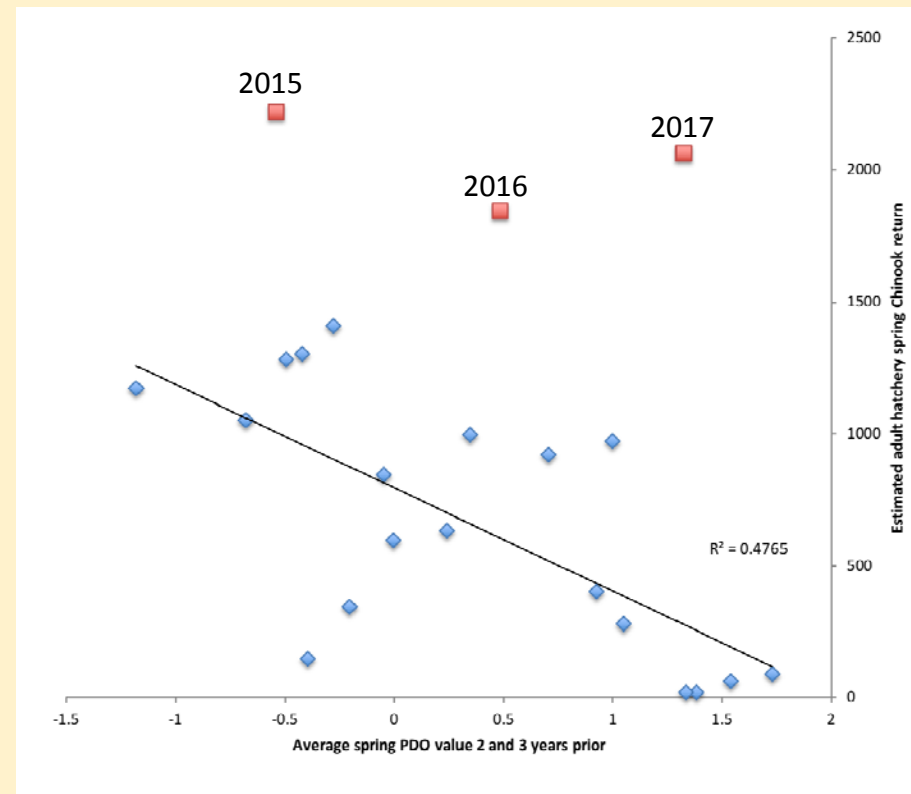
# Post Study Trends

- Is it working?
- During the hatchery evaluation study our SAR's paralleled the other spring Chinook programs in the region
- After we began to apply the results our return rates began to positively diverge



# Post Study Trends

- Its working!
- We are not just diverging from neighboring program's survival rates, but from previous forecasting trends in our own program
- Our survival is increasing in spite of a substantial decline in ocean conditions



# Conclusions

- Size isn't everything, at least relating to smolt quality
- A "wild type" rearing experience, with seasonally appropriate signals of temperature and growth, appears to benefit survival
- This strategy can be applied at full production scale



# Acknowledgements

- Thanks to all the ODFW, USFWS, and CTWS hatchery staff for accommodating our sampling and tagging
- Thanks to all the sampling assistance from a host of people from NOAA, CTWS, UW, Hood River Watershed Group, and others
- A special thanks to coffee and chocolate





# Questions?



# Publications

The Effects of Variation in Rearing Conditions on Growth, Smolt Development, and Minijack Rate in Yearling Chinook Salmon: A Hatchery Scale Experiment

Transactions of the American Fisheries Society

(2014) 143: 1220-1230

D.K. Spangenberg, D.A. Larsen, R.S. Gerstenberger,

C.V. Brun, B. R. Beckman

The Influence of Stock and Environment on Growth, Smolt Development and Minijack Rate in Yearling Chinook Salmon, *Oncorhynchus tshawytscha*: A Hatchery Scale Experiment

North American Journal of Fisheries Management

(2015) 35: 1090-1100

D.K. Spangenberg, D.A. Larsen, R.S. Gerstenberger, C.V. Brun,

D.L. Harstad, S. Nance, L. Rohrbach, B.R. Beckman

The Impact of Different Hatchery Rearing Environments on the Smolt-to-Adult Survival of Spring Chinook Salmon

Transactions of the American Fisheries Society

(2017) 146: 539-555

B. R. Beckman, D.L. Harstad, D.K. Spangenberg, R.S. Gerstenberger,

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