JUVENILE CHINOOK SALMON USE OF RESERVOIRS BEHIND HIGH-HEAD DAMS IN THE WILLAMETTE RIVER BASIN

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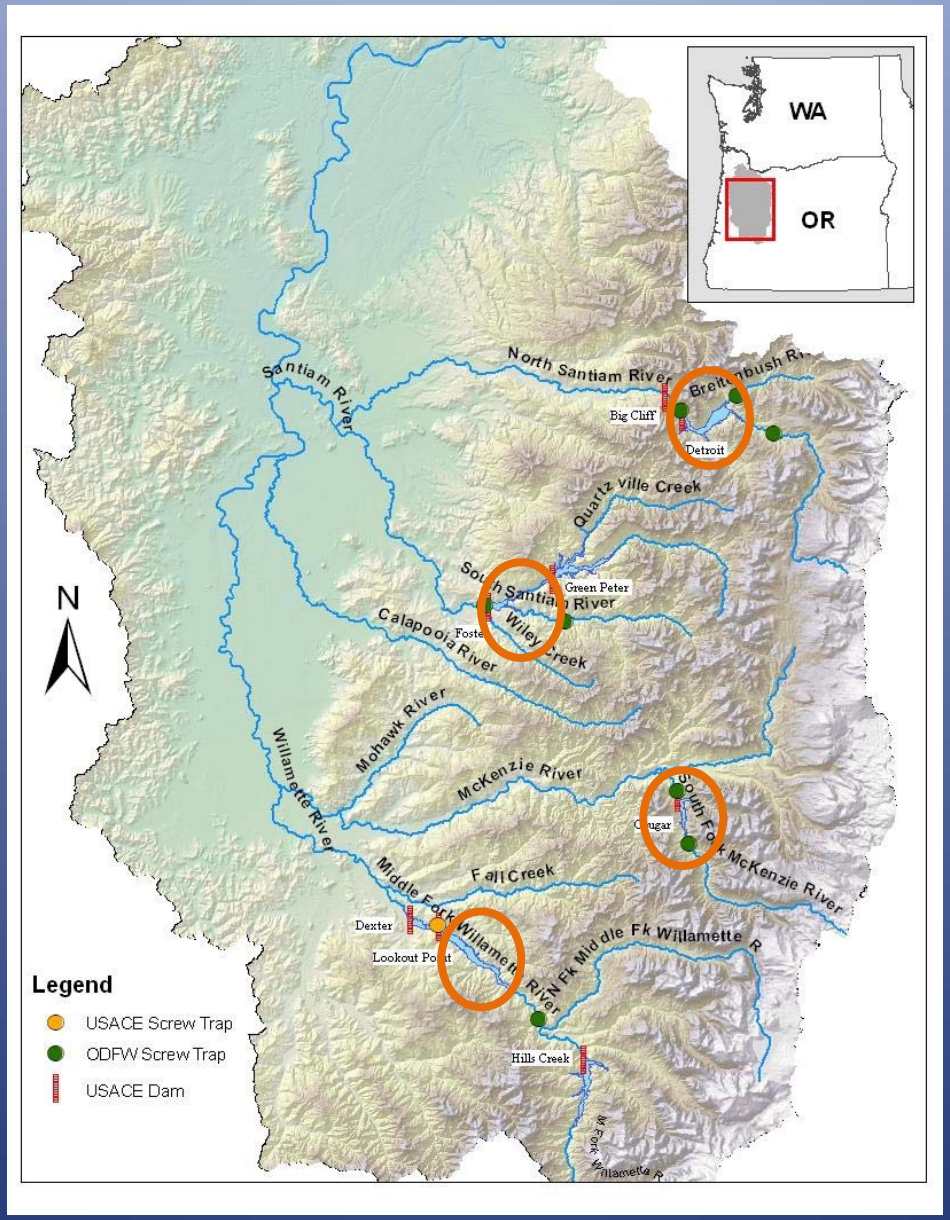
Background

- 13 Dams in Willamette Valley Project -USACE
  - High-head dams (flood control)
  - Blocked 20-95% of historic spawning habitat
- 2008 WVP Biological Opinion (BiOp) –NOAA
  -Actions to avoid jeopardy
  - Reintroductions above dams
  - Provide improved downstream passage
- Lacking Baseline Information on Reservoir Use
  - Aid in design of downstream passage

Objectives

- Provide information on timing and size of juveniles entering reservoirs
- Seasonal distribution within reservoirs
  - Longitudinal and Vertical
- Timing of juveniles exiting reservoirs

Study Sites



Detroit

Foster

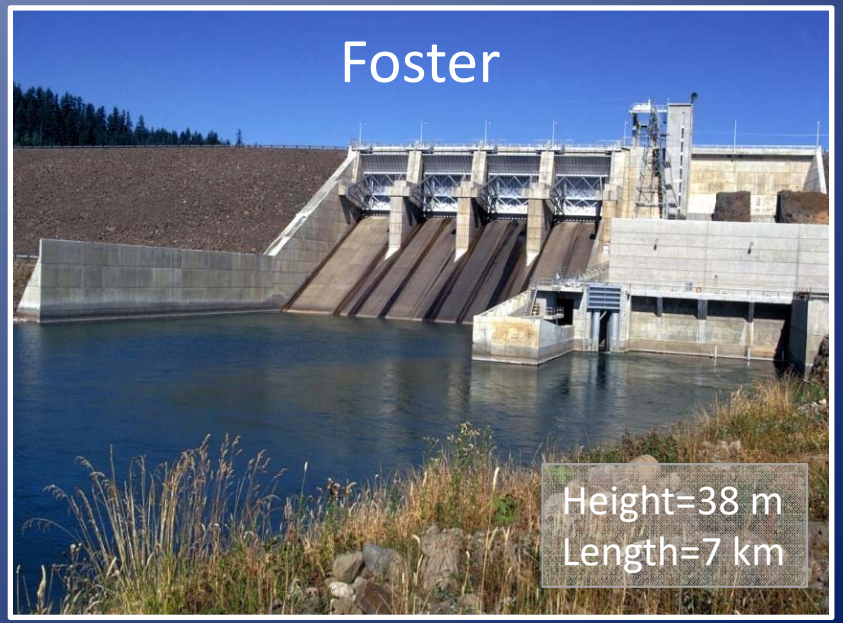
Cougar

Lookout Point


Detroit
Height=141 m
Length=14 km


Cougar
Height=158 m
Length=10 km


Lookout Point
Height=84 m
Length=21 km


Foster
Height=38 m
Length=7 km

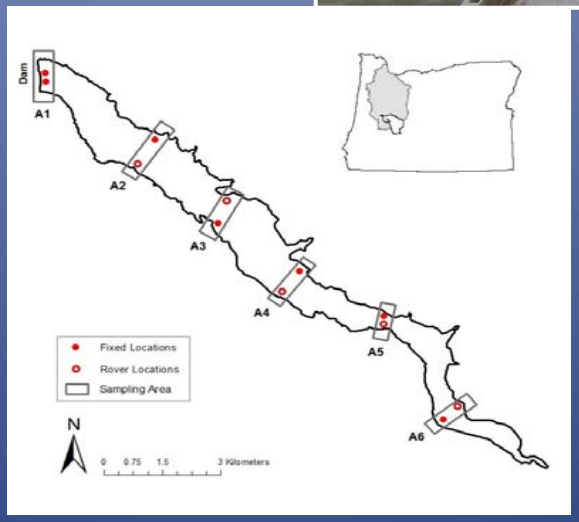
Methods

Migration Timing and Size

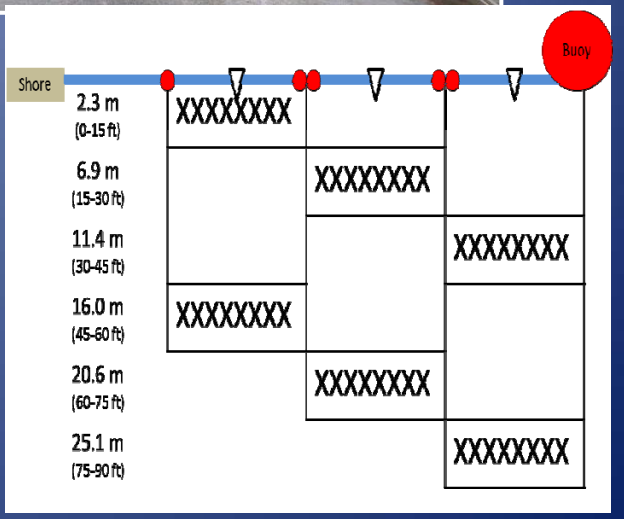
Methods

Reservoir Distribution

Longitudinal Distribution
Mar-Jun



Longitudinal Distribution
Jul-Nov

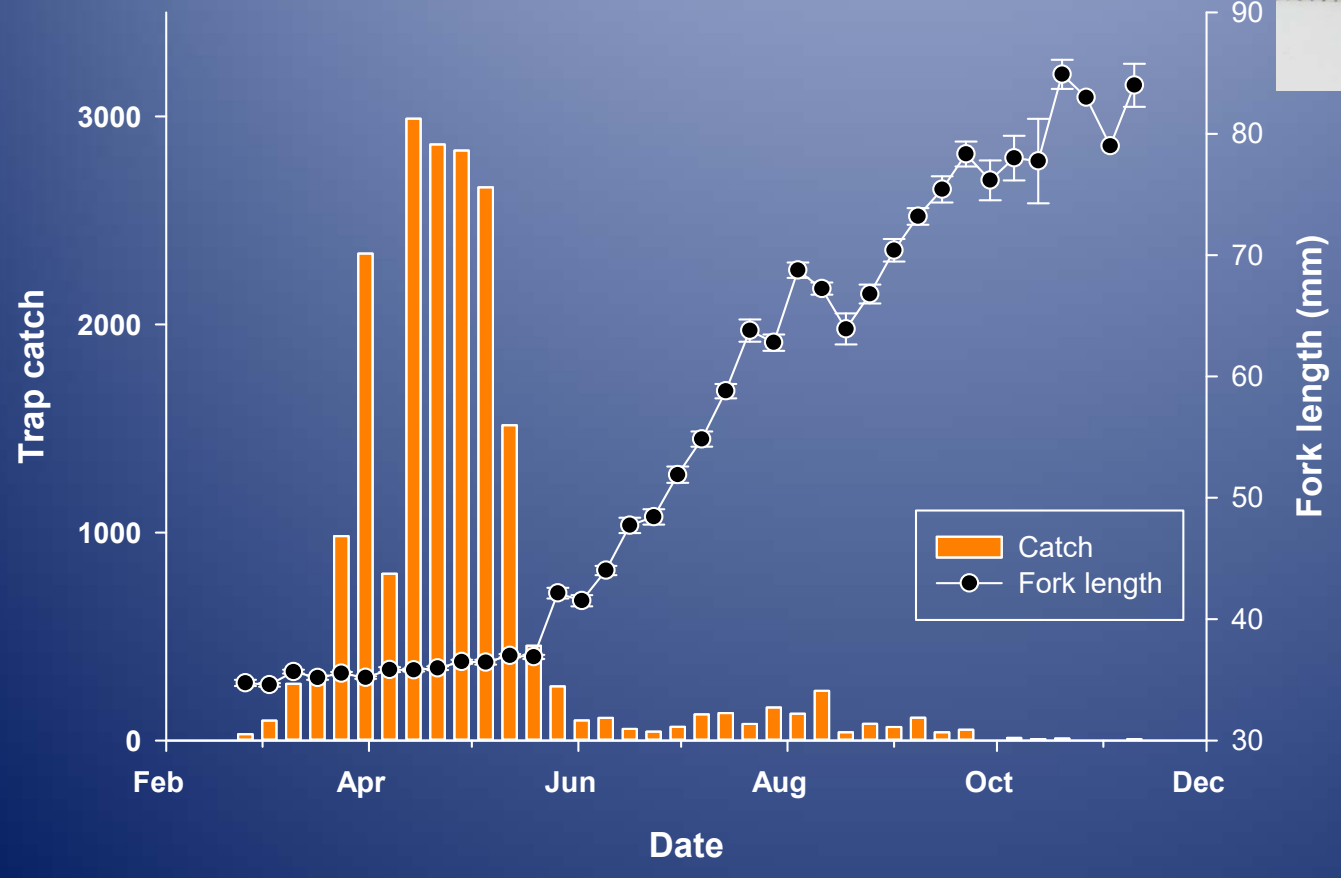


Vertical Distribution
Jul-Nov

Results

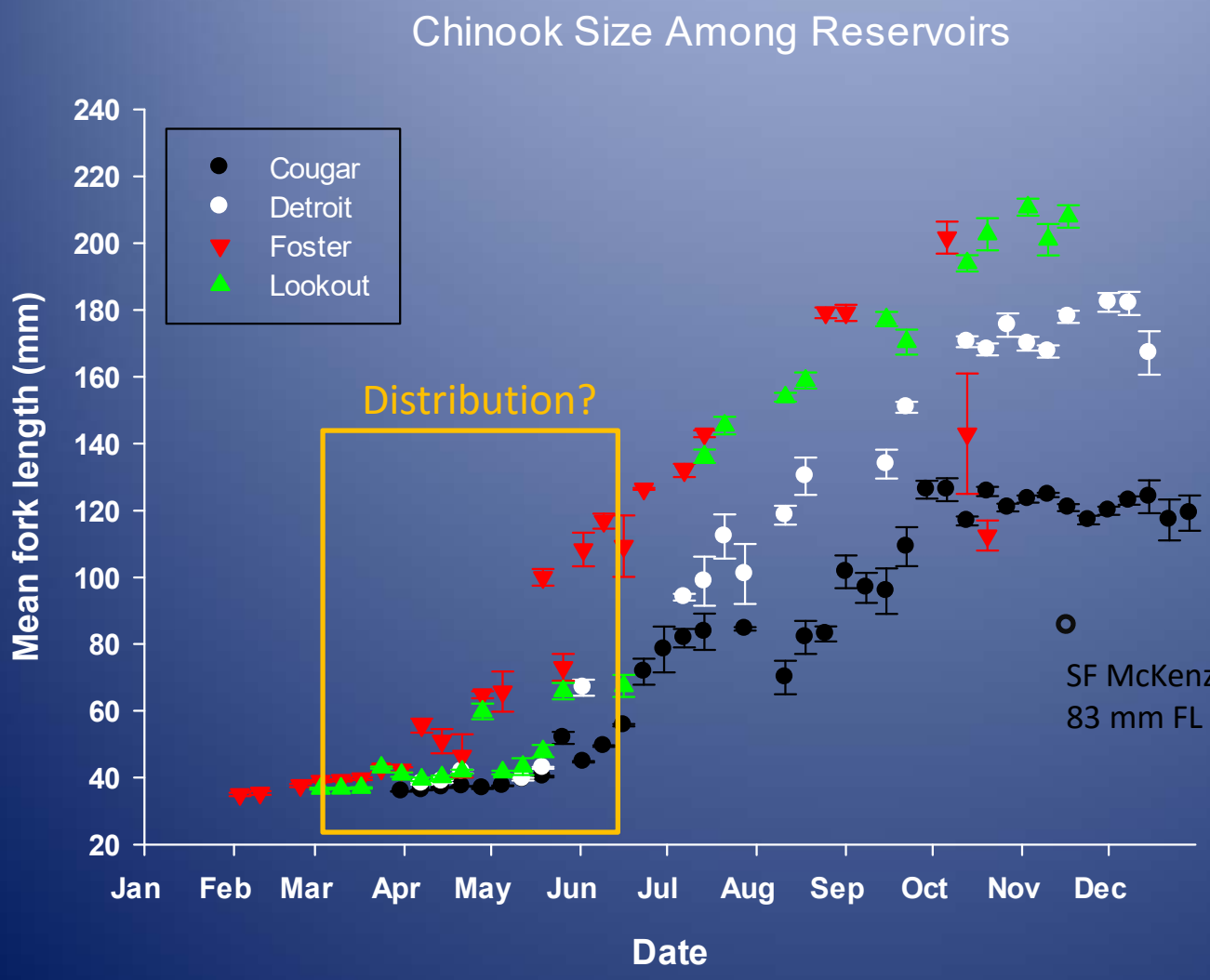
Reservoir Entrance Timing and Size

South Fork McKenzie above Cougar



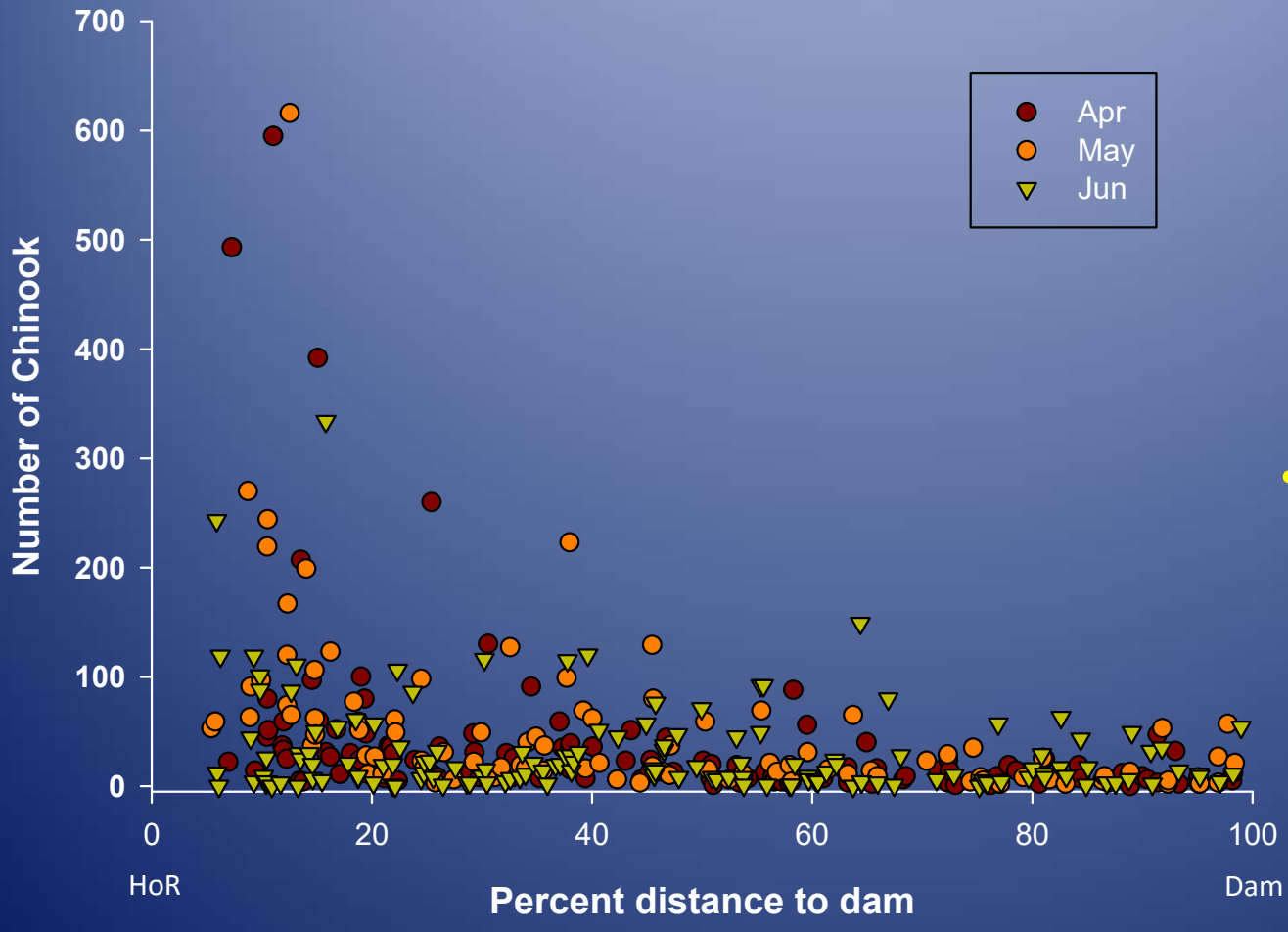
- >90% enter as ‘fry’

Subyearling Growth in Reservoirs



- Growth rate ~1 mm/d in some reservoirs
- Daphnia part of diet

Chinook Distribution in Reservoir During Spring



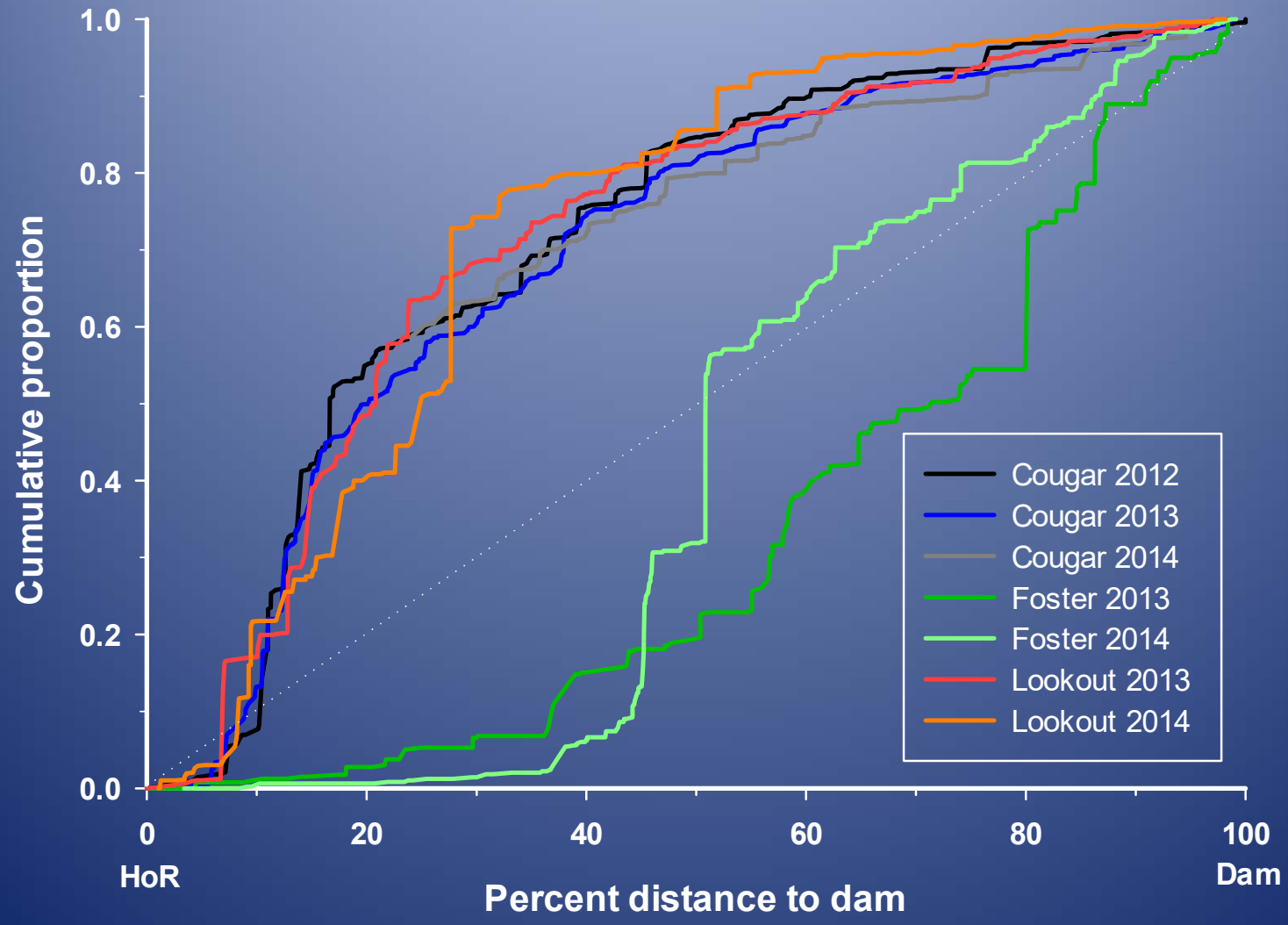
Cougar

- Head-of-reservoir distribution in Spring

Results

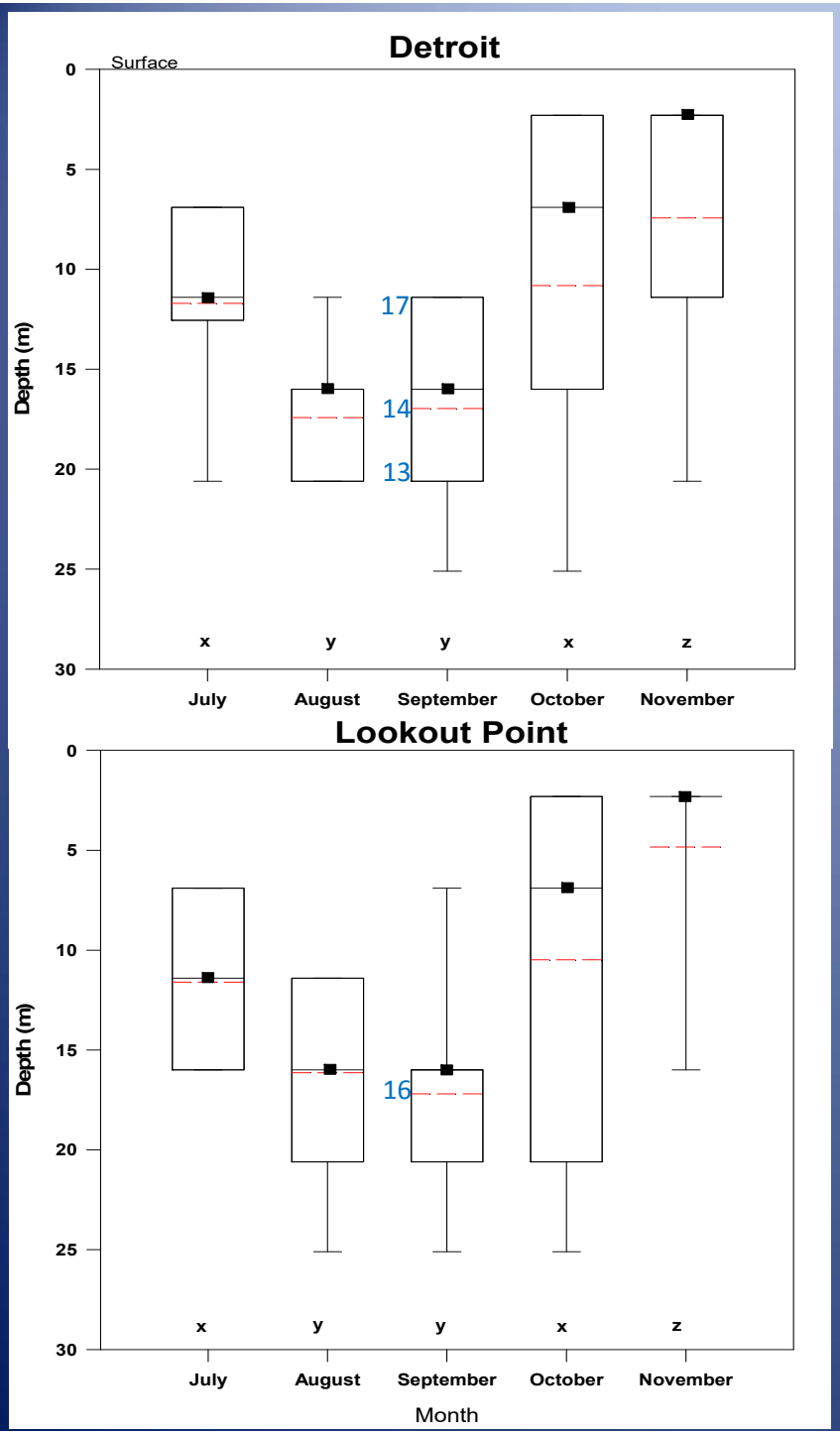
Spring

- Subyearlings more abundant near HoR, except at Foster



Where Are They Distributed from July – November?

- Surface water temperatures >20˚ C by July
- Subyearlings move out of shallow nearshore habitat
  - go deeper

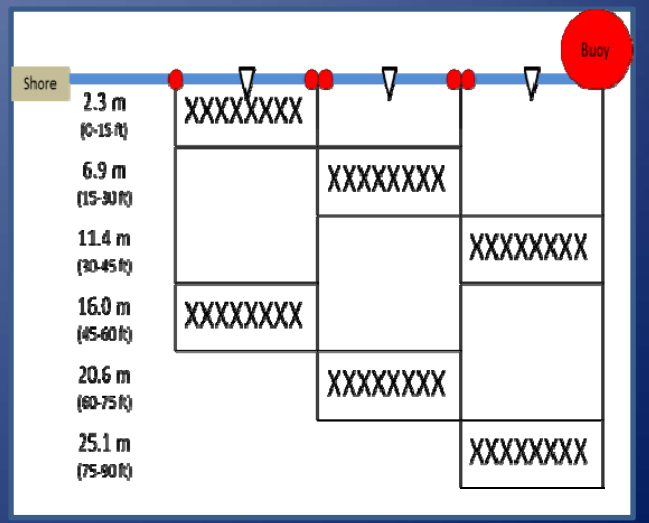


Vertical Distribution

(2013)

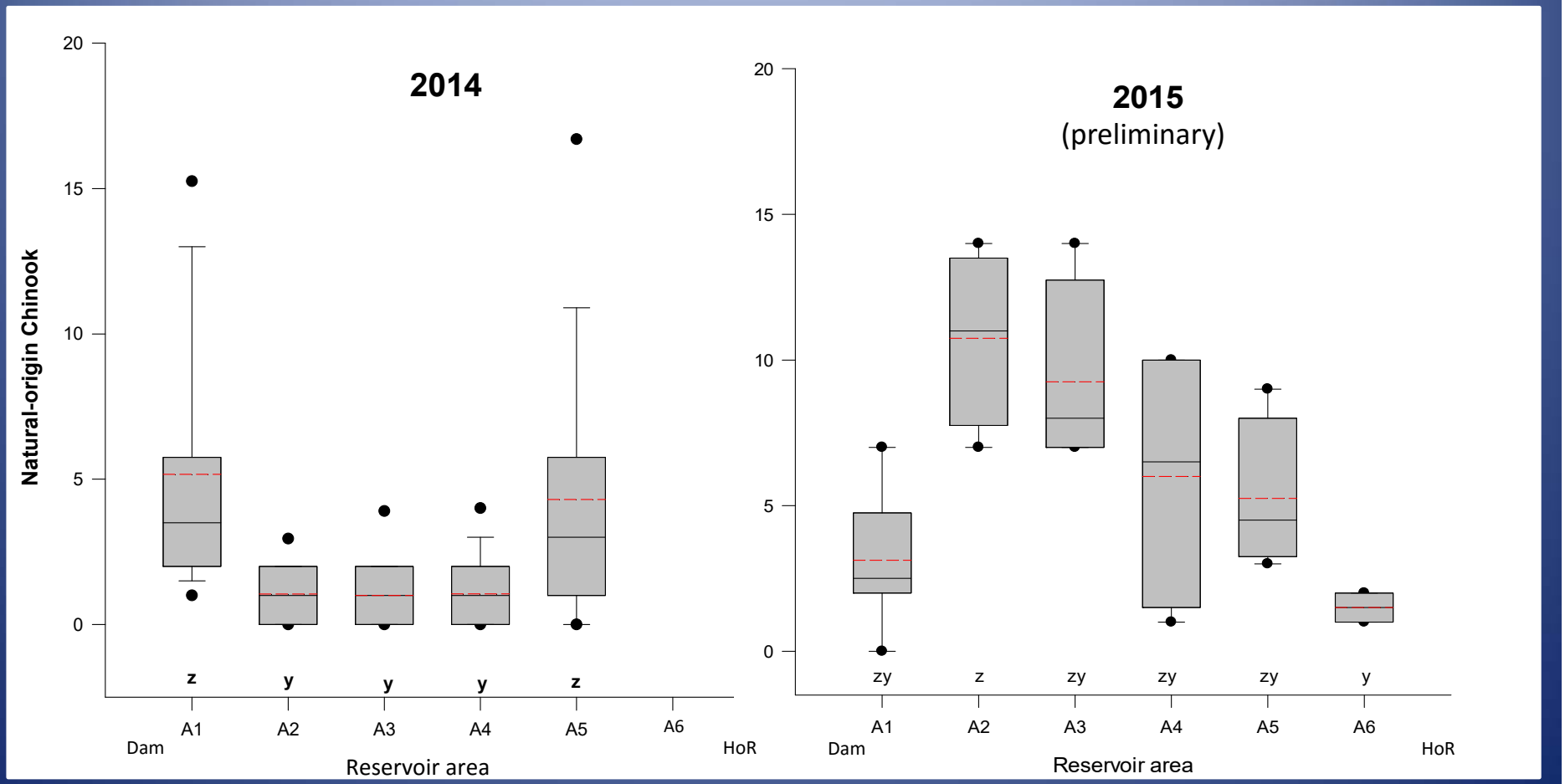
- Tend to be deeper from Jul-Sep
  -near thermocline (<16˚C)
  -surface temps >22˚C

- Return to surface in the fall



Longitudinal Distribution

Summer



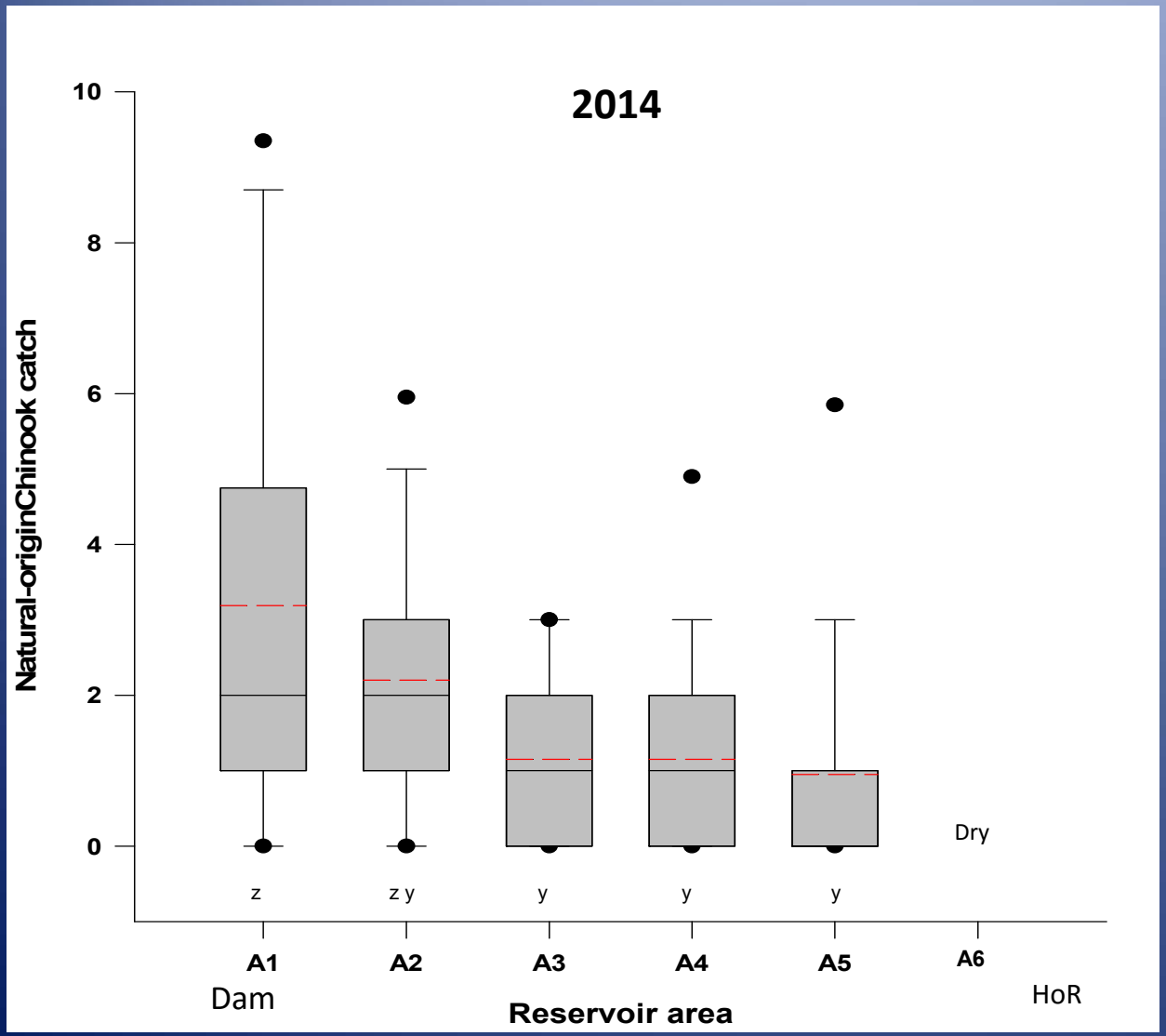
2014 -Bimodal distribution (subyearlings at dam and near HoR)

- Same as hatchery-released fish

2015 – No hatchery fish, reservoir smaller

Longitudinal Distribution

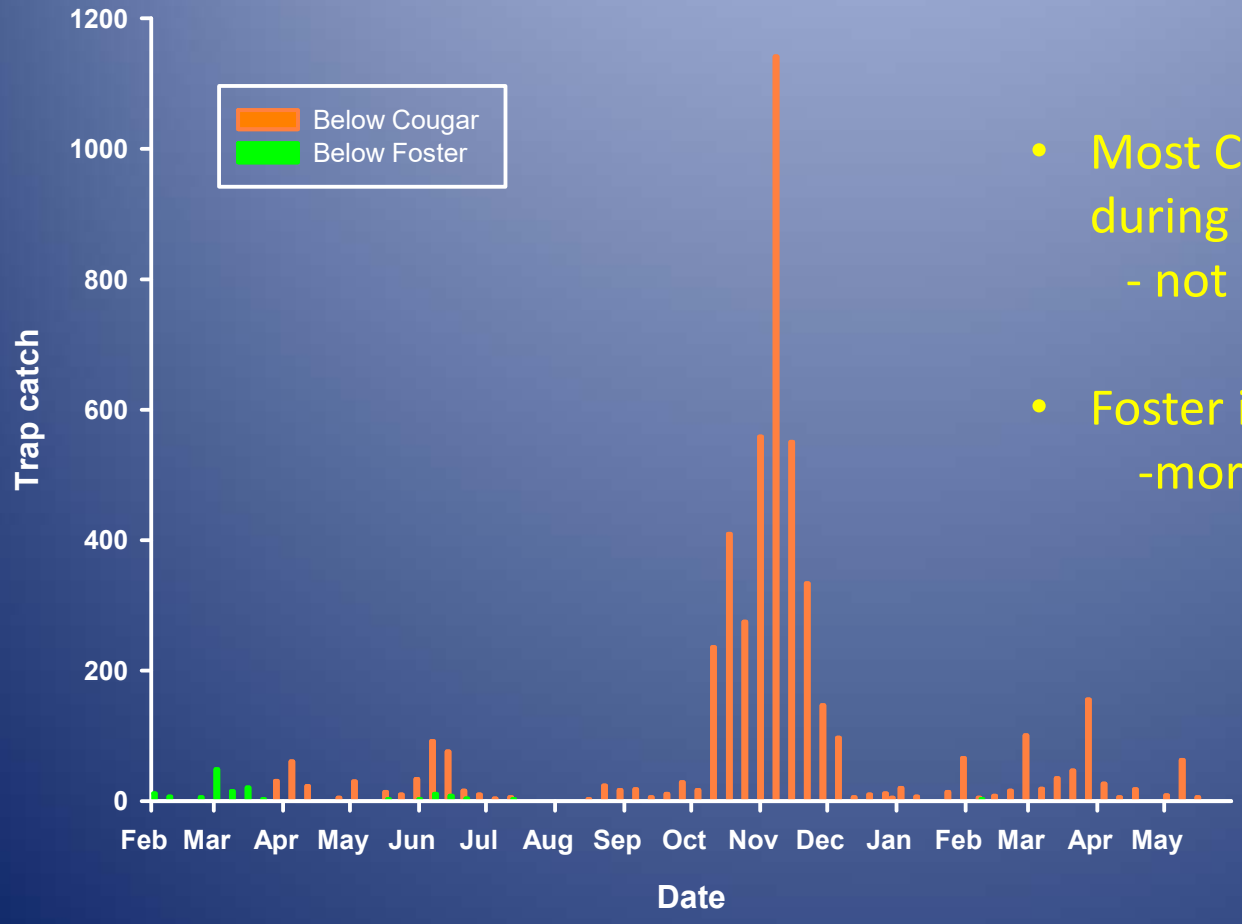
Fall (November)



~45% of subyearlings near the dam in fall

Same result in 2013 (47% near dam)

Reservoir Exit Timing



- Most Chinook exit dam in late fall during reservoir drawdown
  - not many yearling smolts
- Foster is the exception
  -more spring “fry”

Conclusions

- Most Chinook enter reservoirs as ‘Fry’ (<50 mm)
- Distributed in upper end of reservoirs in the spring
- Descend to deeper water in summer, return to surface in fall (thermoregulate)
- Chinook move to forebay by the fall
- Most Chinook exit dam in the fall (drawdown)

Acknowledgements

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