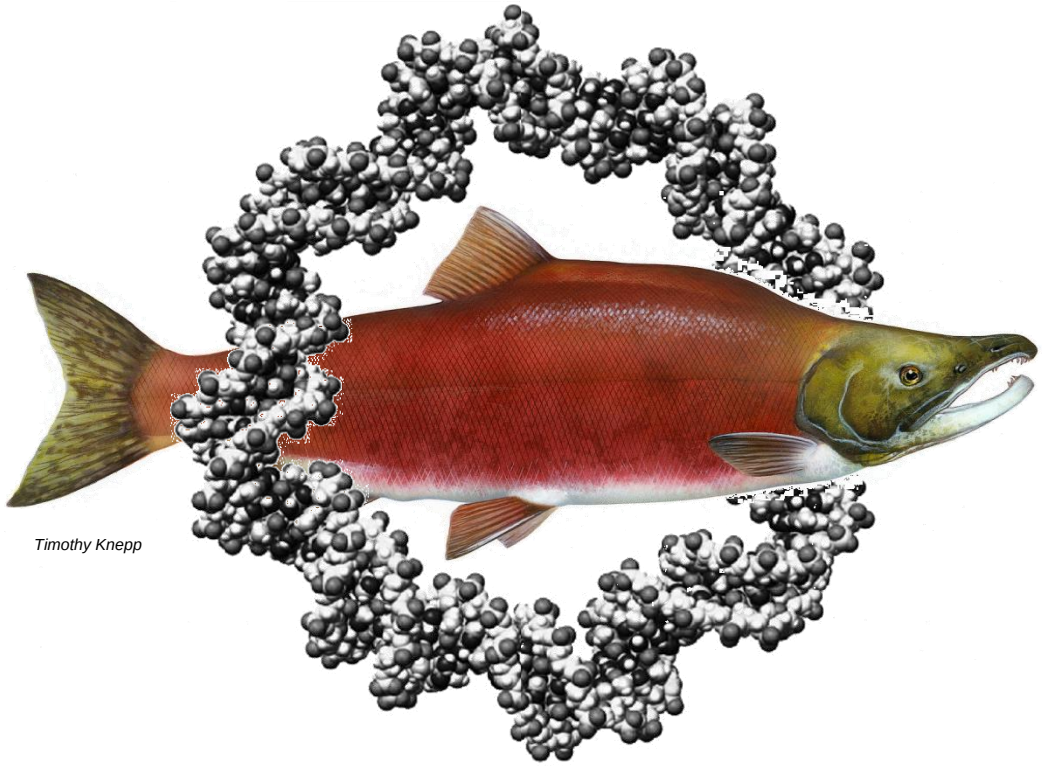
Genetic monitoring of sockeye salmon reintroduction into Cle Elum Lake

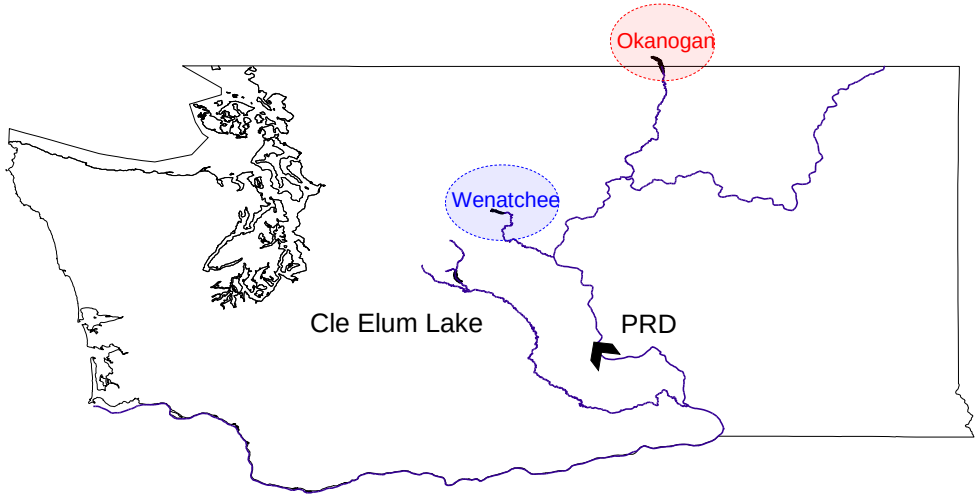


Timothy Knepp

Andrew P. Matala, Peter F. Galbreath
Columbia River Inter-Tribal Fish Commission

Brian Saluskin, Mark Johnston
The Confederated Tribes and Bands of the Yakama Nation

Outplanted stocks: Life history



Wenatchee: cold, typical		Okanogan: warmer, eutrophic
➢ age-4 & age-5	Adult age	➢ age-3 & age-4
➢ Sept. & Oct.	Spawn time	➢ Oct. & Nov.
➢ above lake (↓shore)	Habitat	➢ index river reaches
➢ 1 year	Juvenile rearing	➢ 1 to 2 years
➢ earlier (?)	Juvenile migration	➢ later (?)
➢ yearling ~83mm	smolt size	➢ yearling >100mm

M&E: questions & objectives

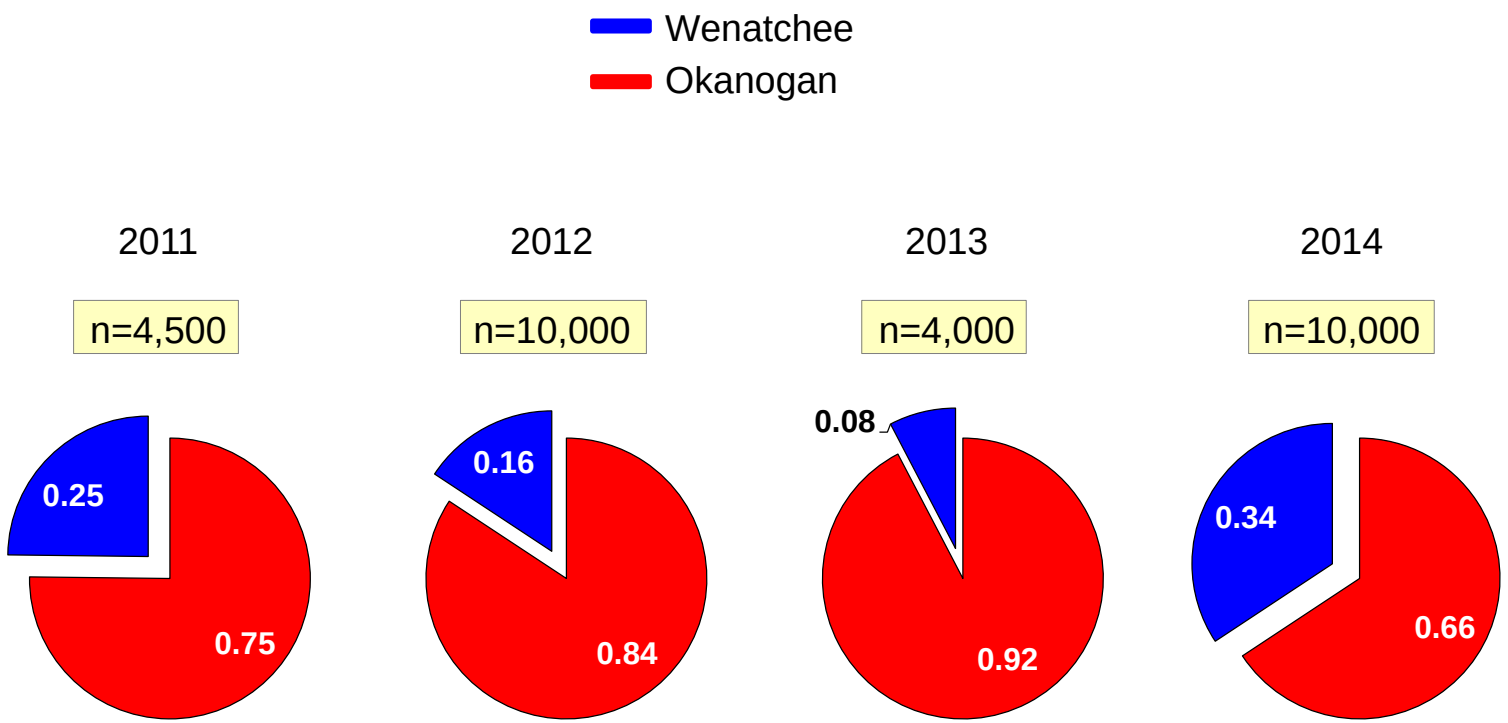
- Stocks well differentiated (genetically distinct)
- Will one “outperform” the other?...reproductive success
- Will stocks interbred...hybrids more productive?
- factors disproportionately favoring one stock?

Estimate stock proportions

(outplants, juveniles, adult returns)

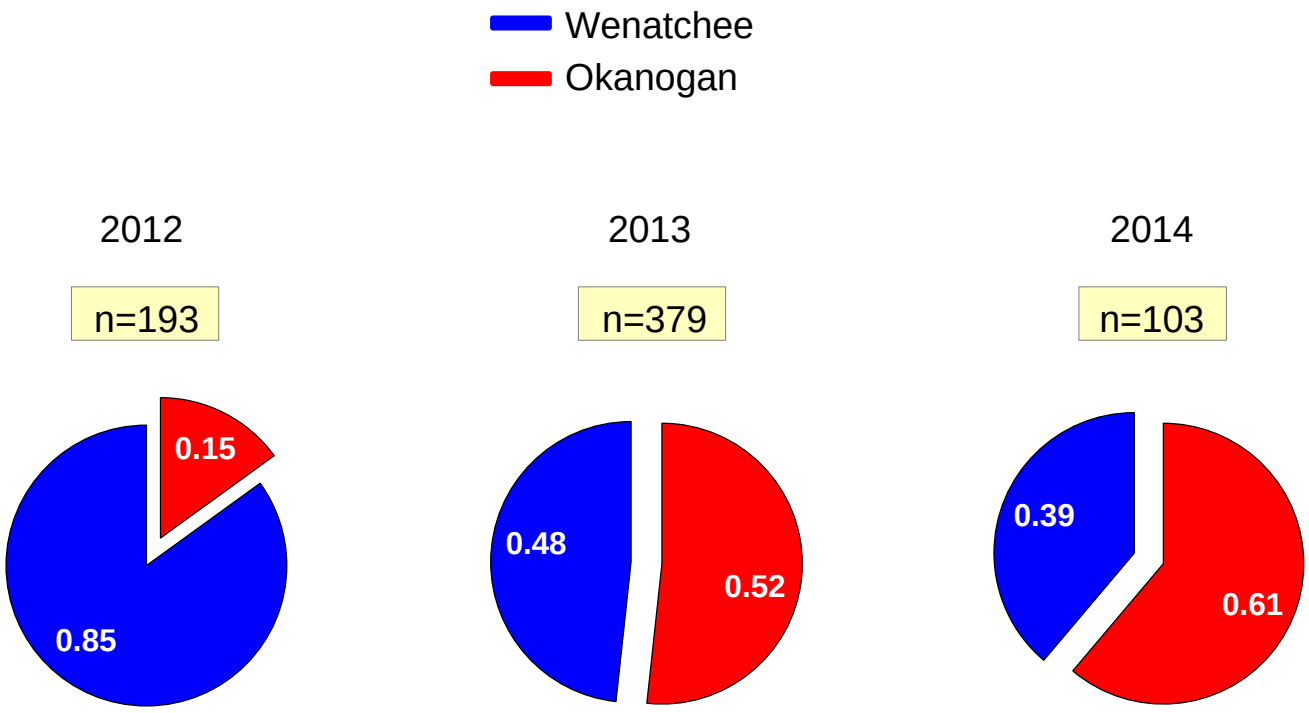
Adult PRD outplants

Variable, dominated by **OK**

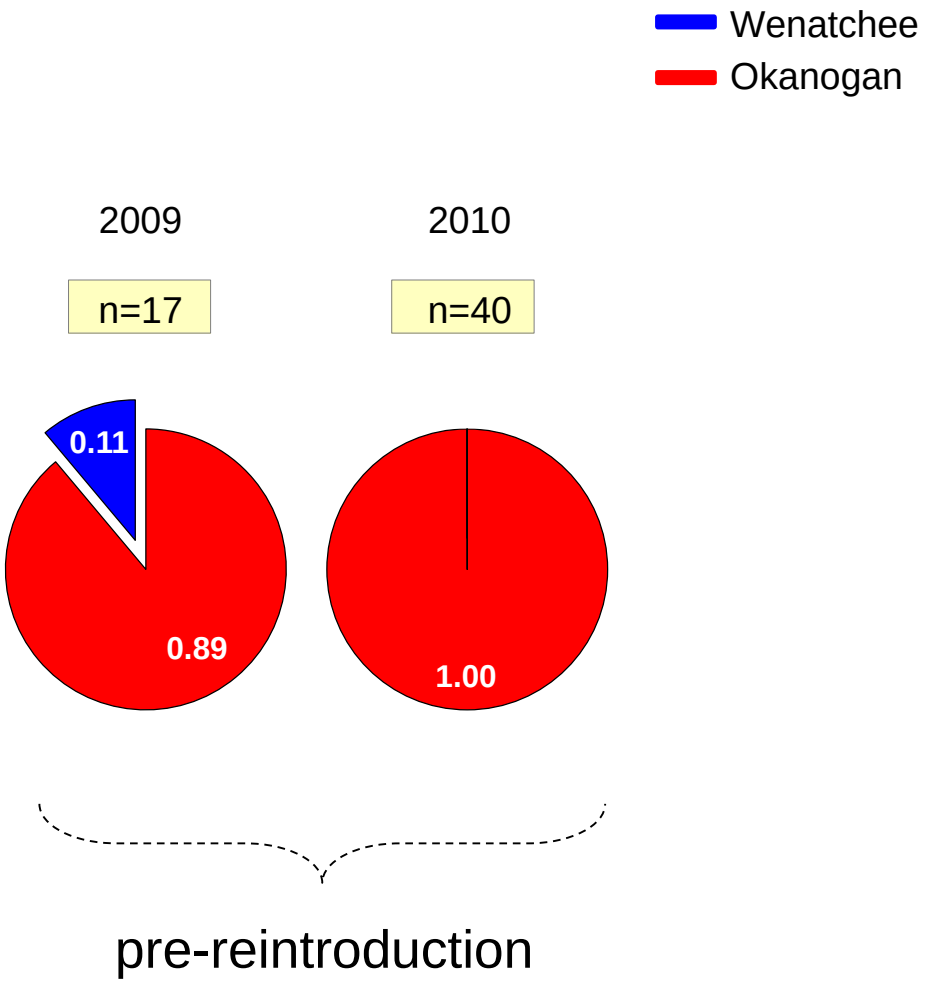


Juvenile outmigrants

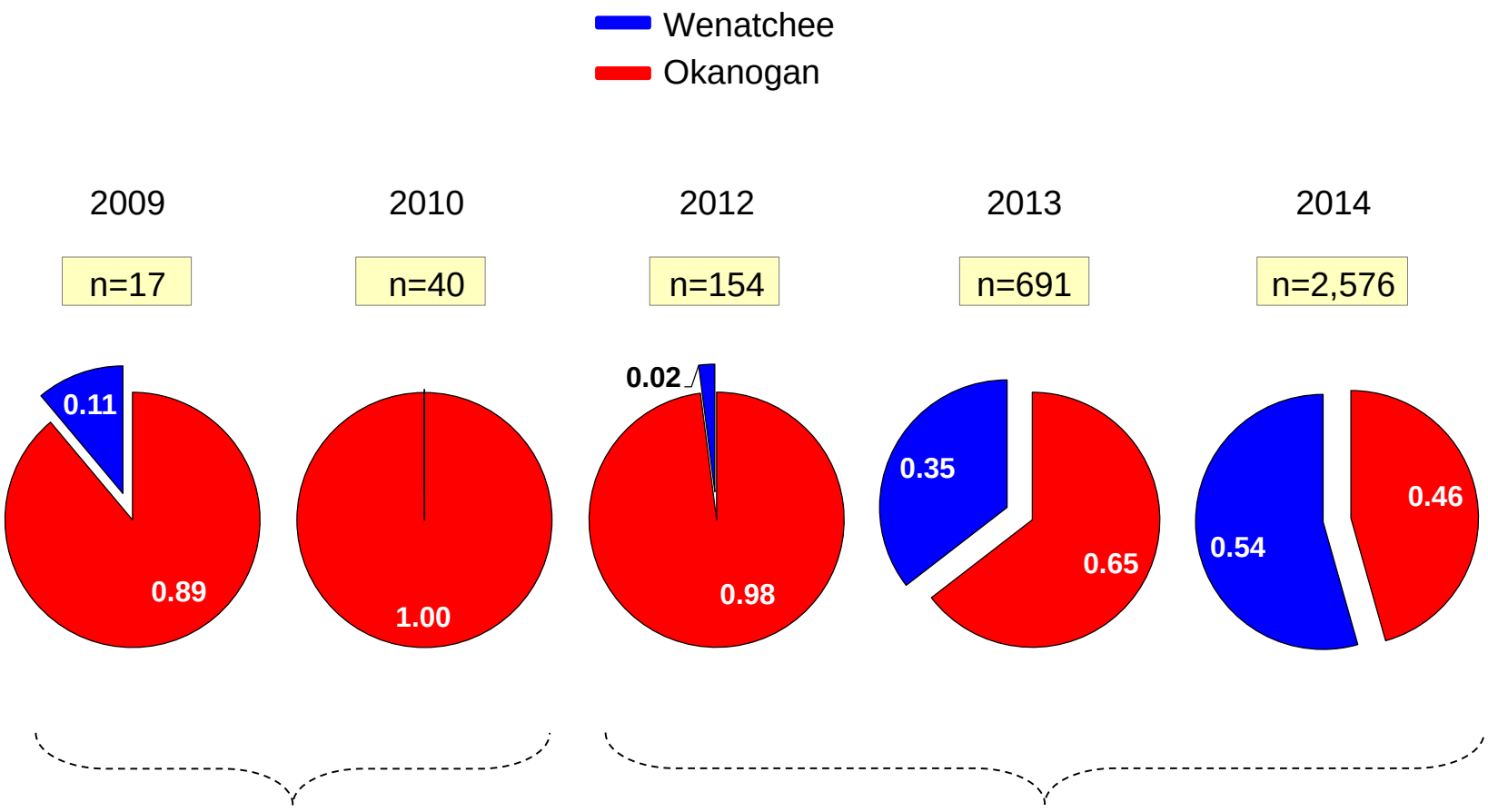
Variable, possible age structure, possible non-random samples



Roza Dam: Adult returns



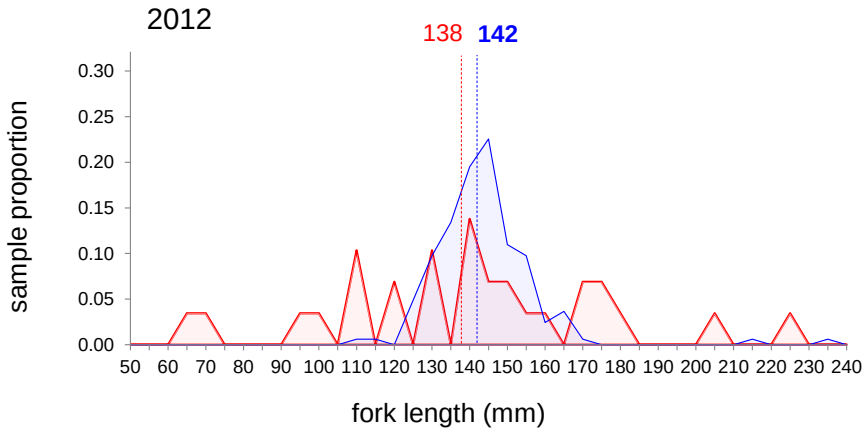
Roza Dam: Adult returns



Acclimation / behavior:

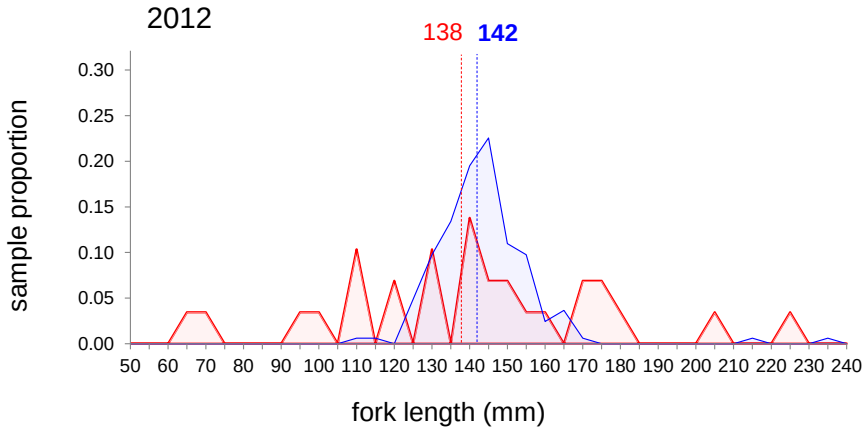
(juvenile growth & migration)

Annual variation in size

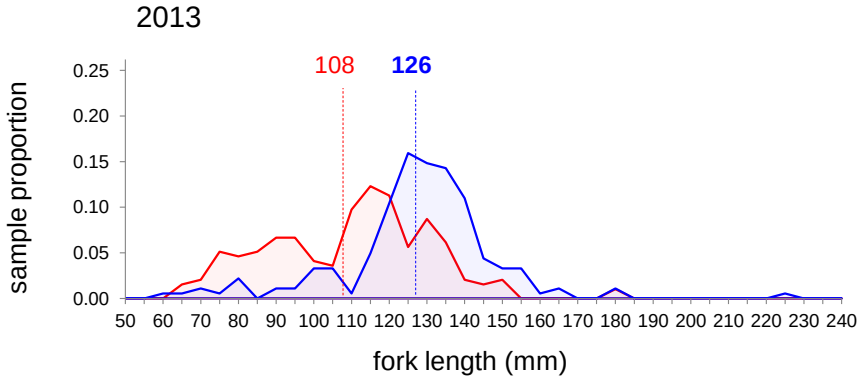


Cle Elum Lake outmigrants

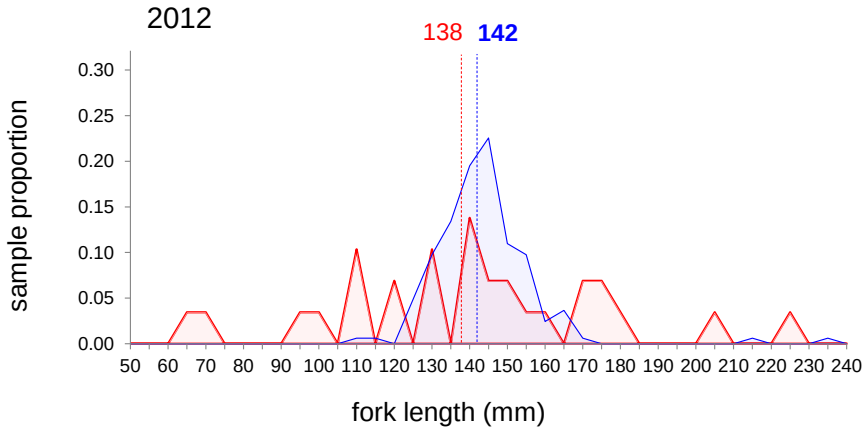
Annual variation in size



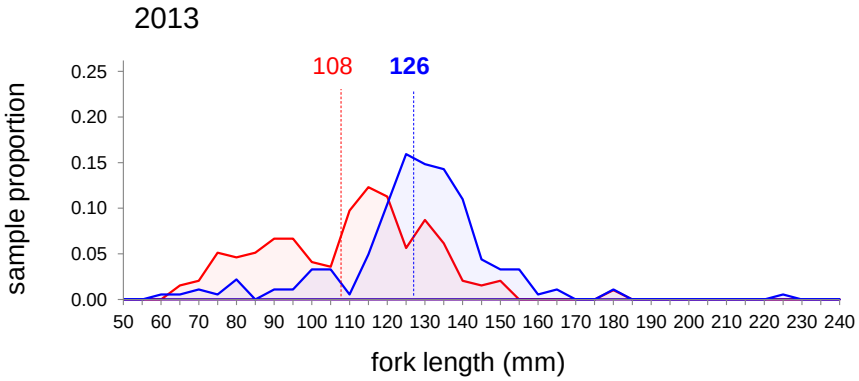
Cle Elum Lake outmigrants

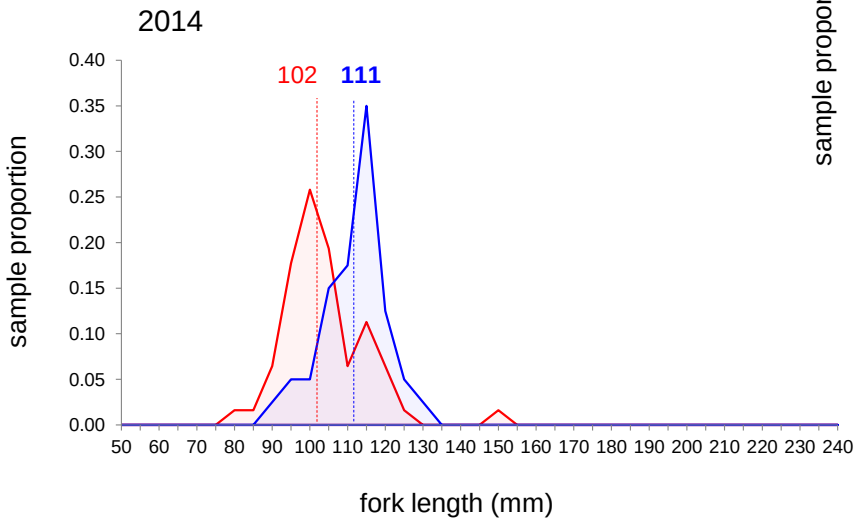


Annual variation in size



Cle Elum Lake outmigrants



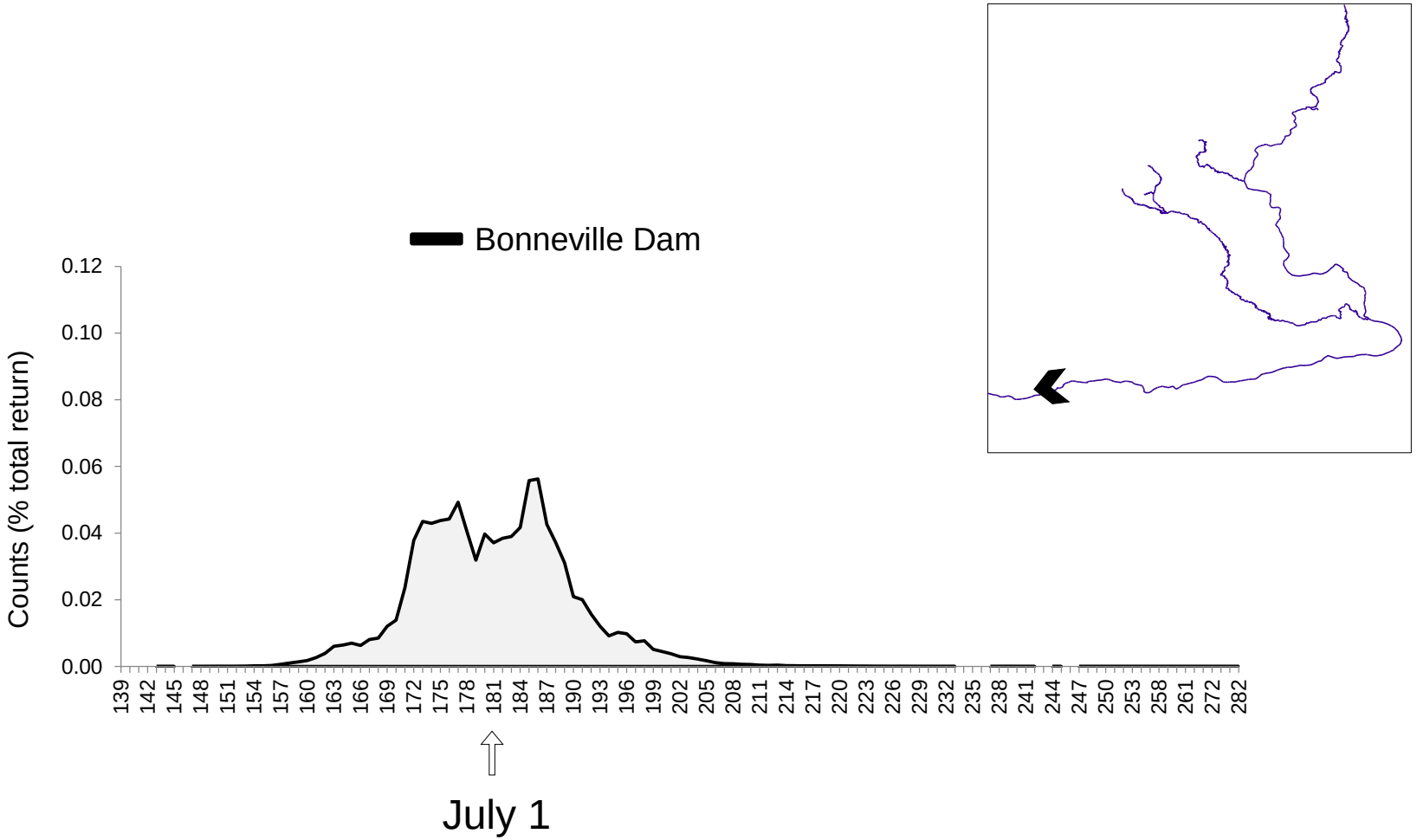


Wenatchee tend to be larger

Acclimation / behavior:

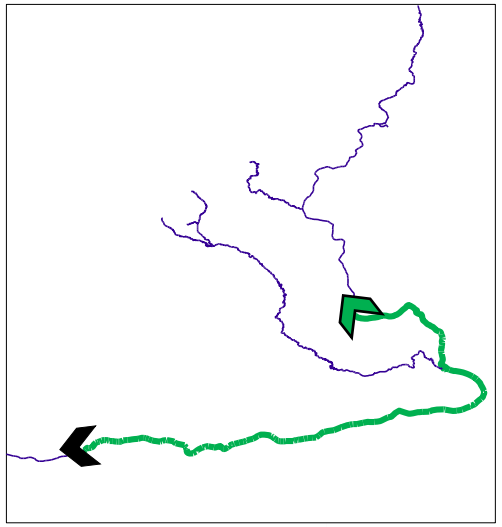
(adult return time & size-at-age)

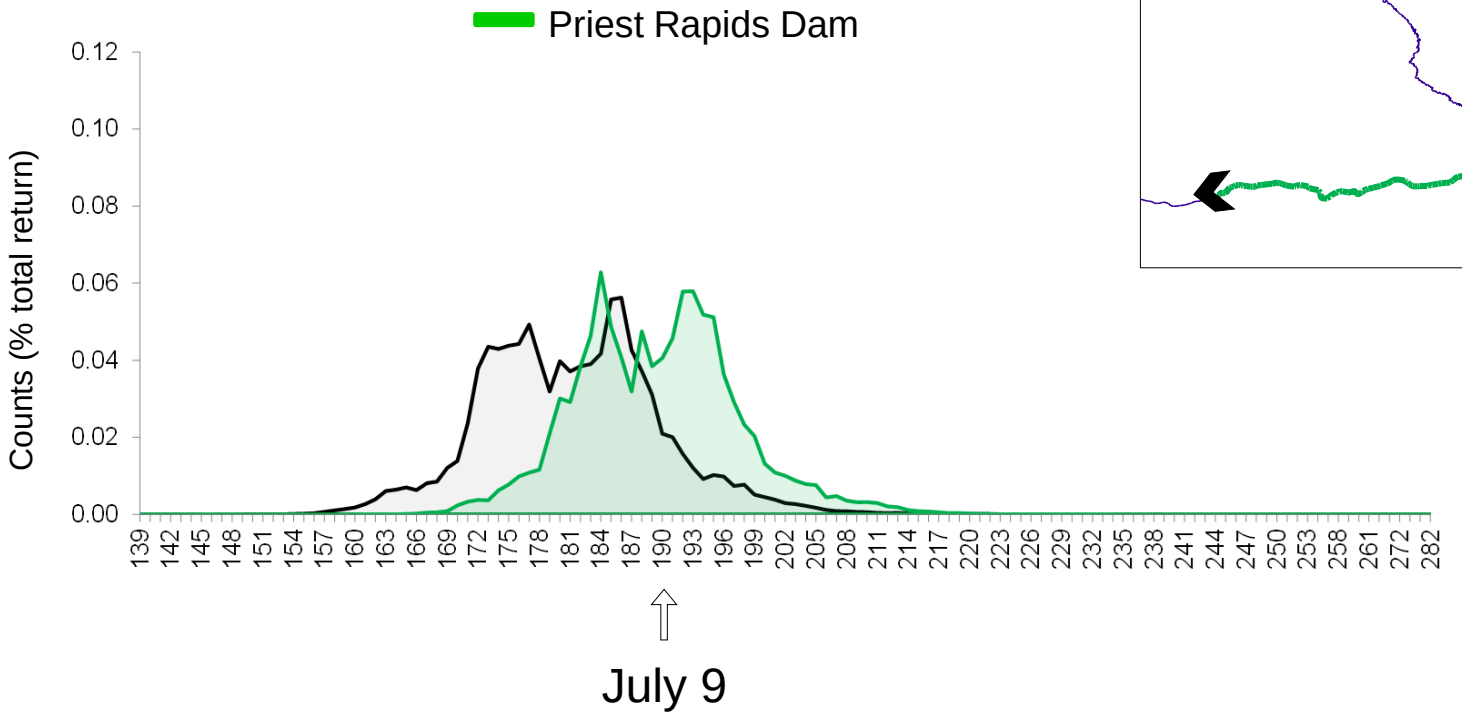
2014 Return: daily counts



2014 Return: daily counts

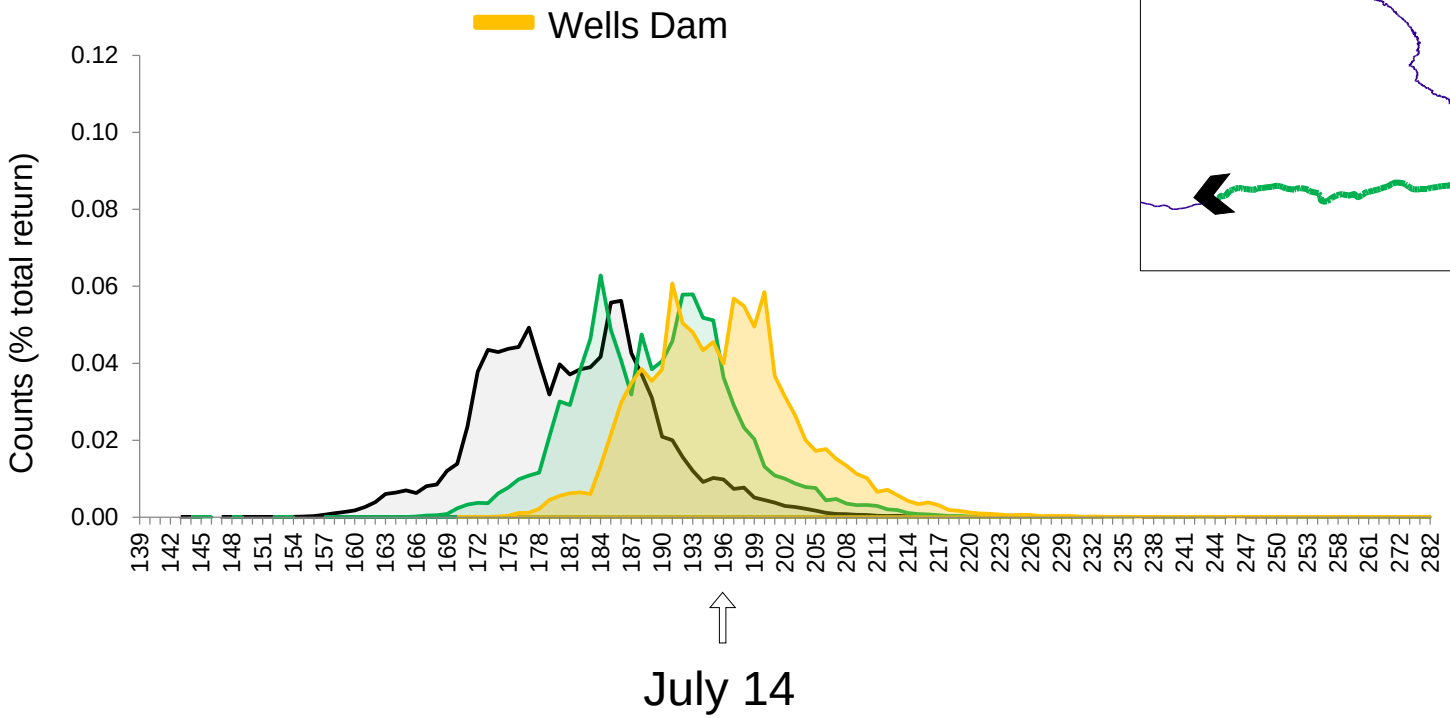
~ 1 week: Bonn to PRD

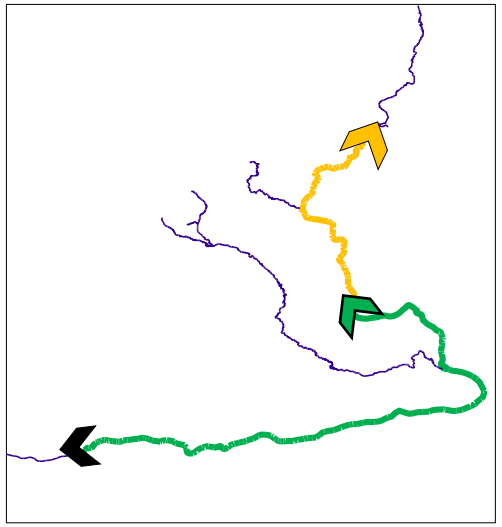




2014 Return: daily counts

~ 2 weeks: PRD to Wells

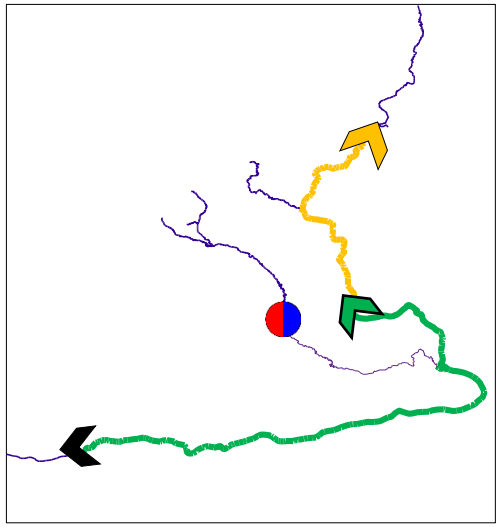


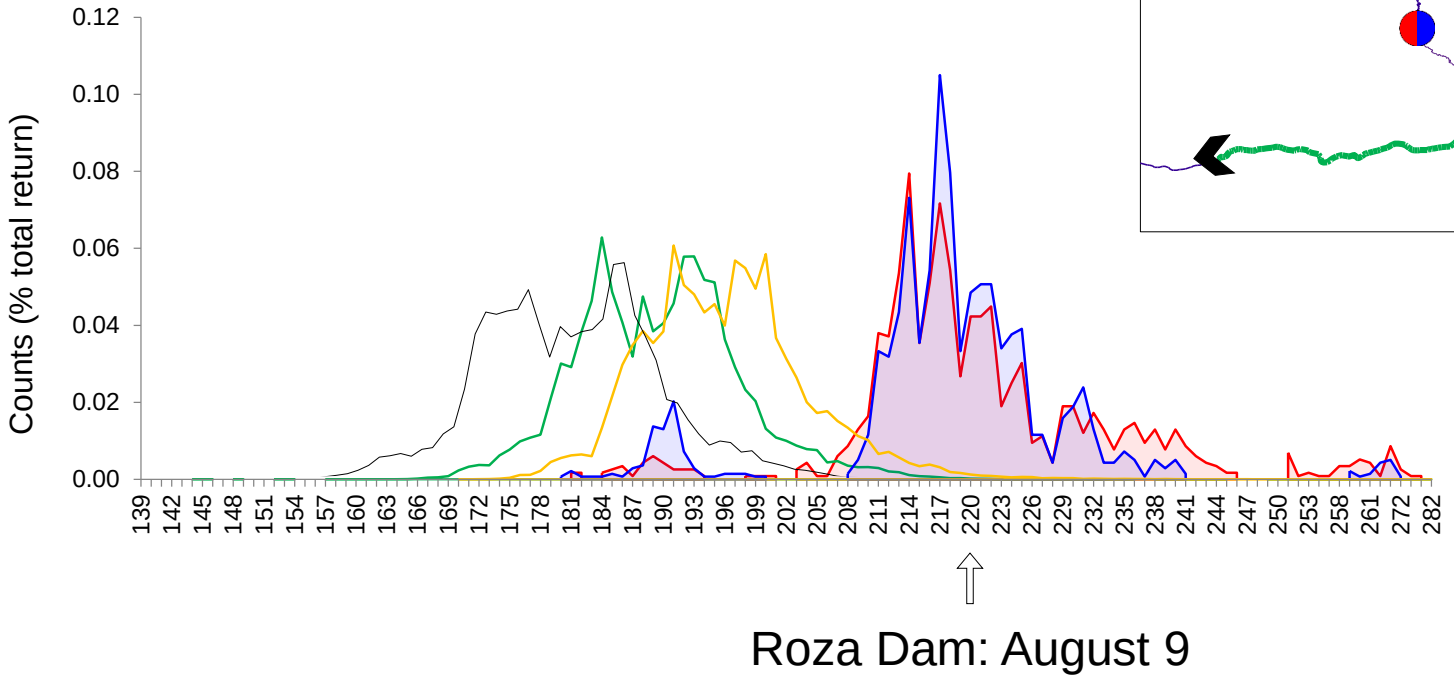


2014 Return: daily counts

~ 4 week lag

no stock difference





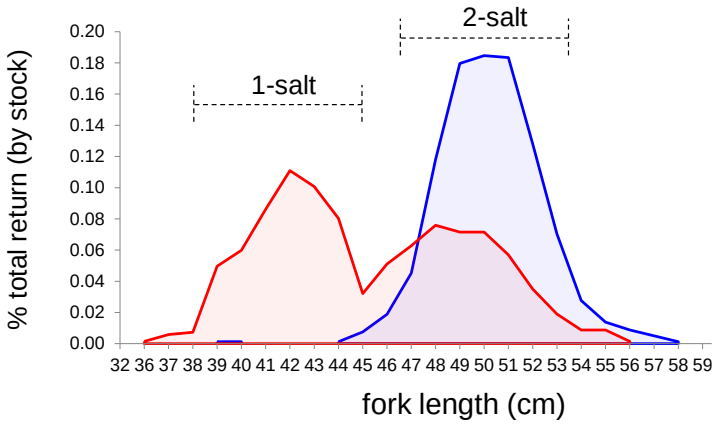
Roza Dam: August 9

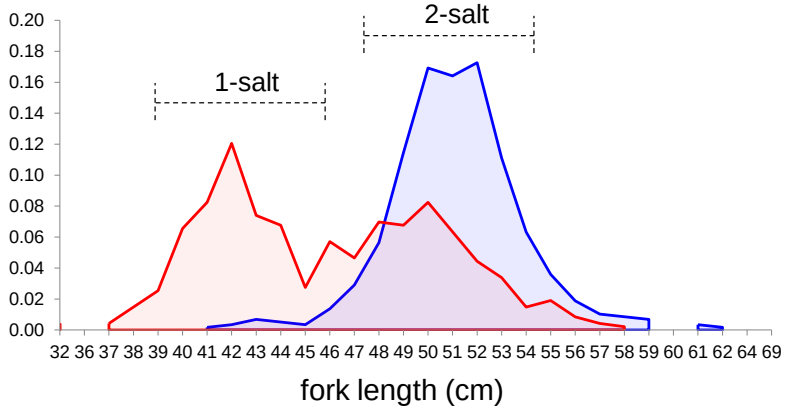
returning adult size distribution

Age structure appears typical of donor populations

female 50.3 45.4

male 51.1 45.9

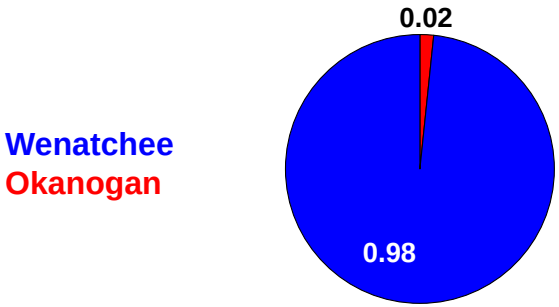


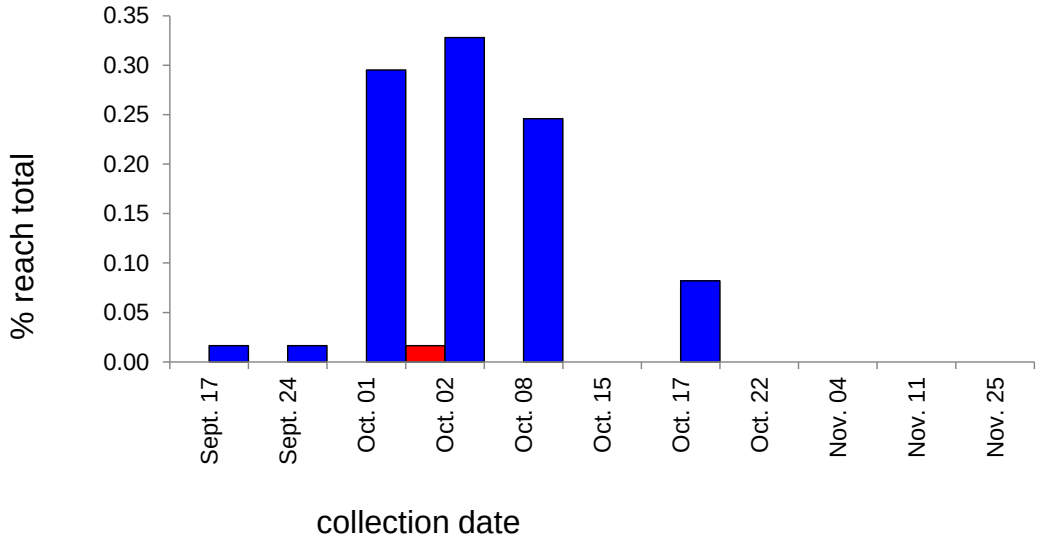


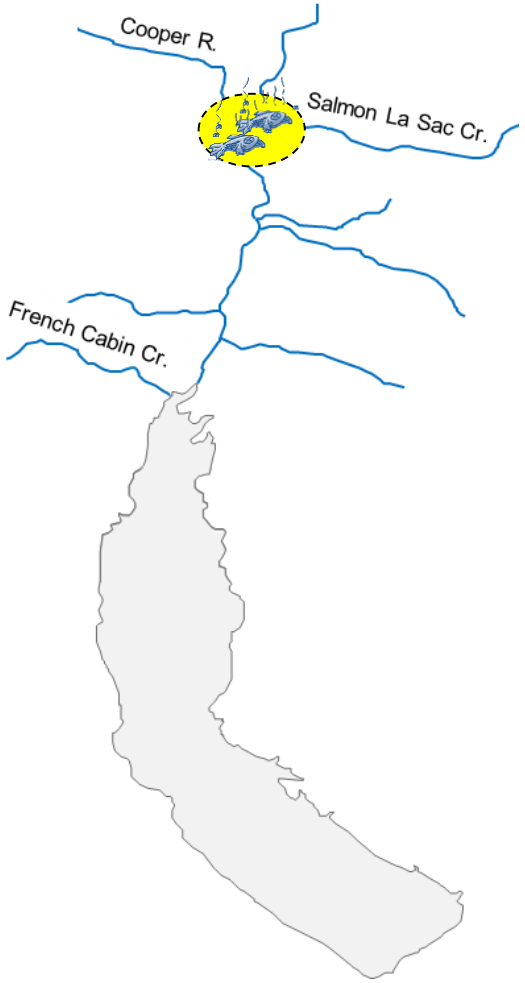
Acclimation / behavior:

(spawn time & distribution)

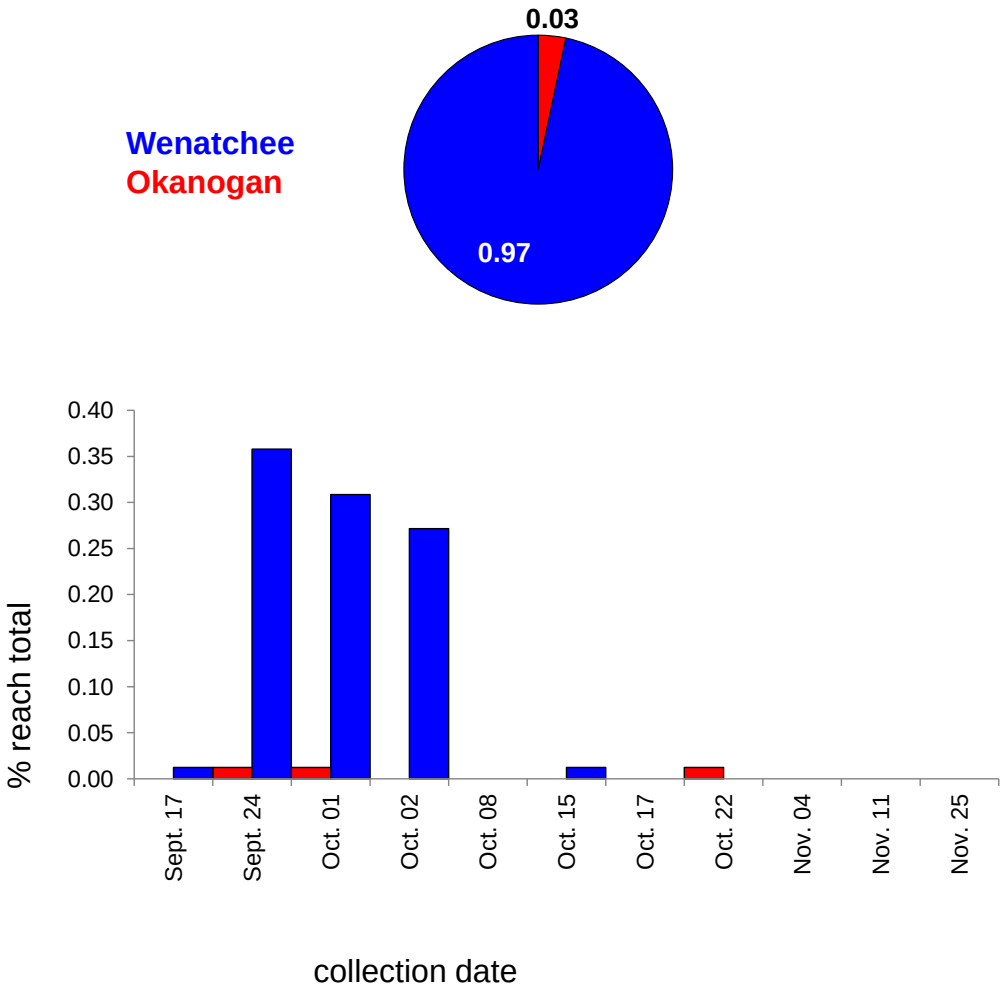
Carcass Surveys: Reach #1

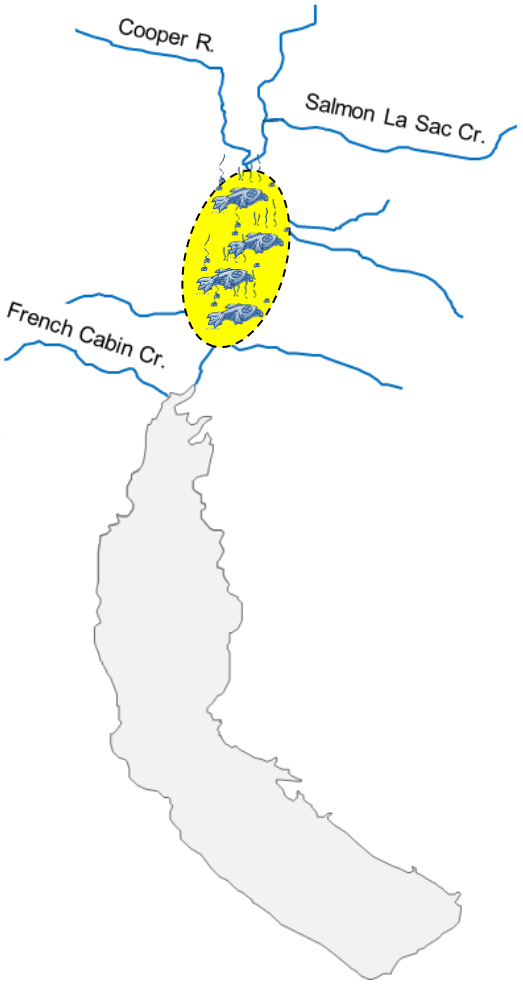




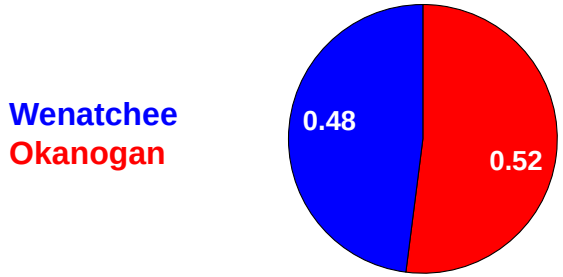


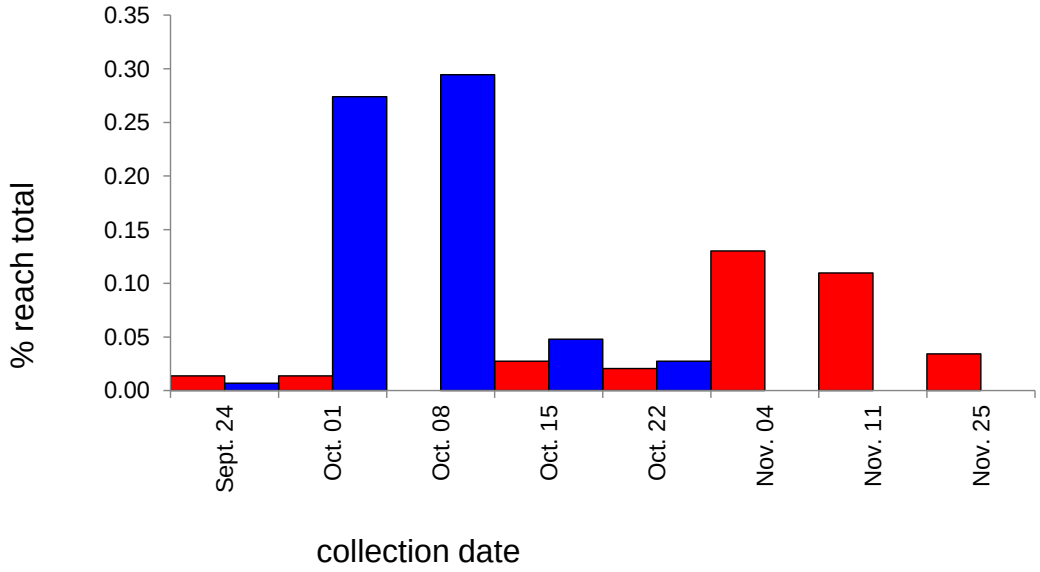
Carcass Surveys: Reach #2

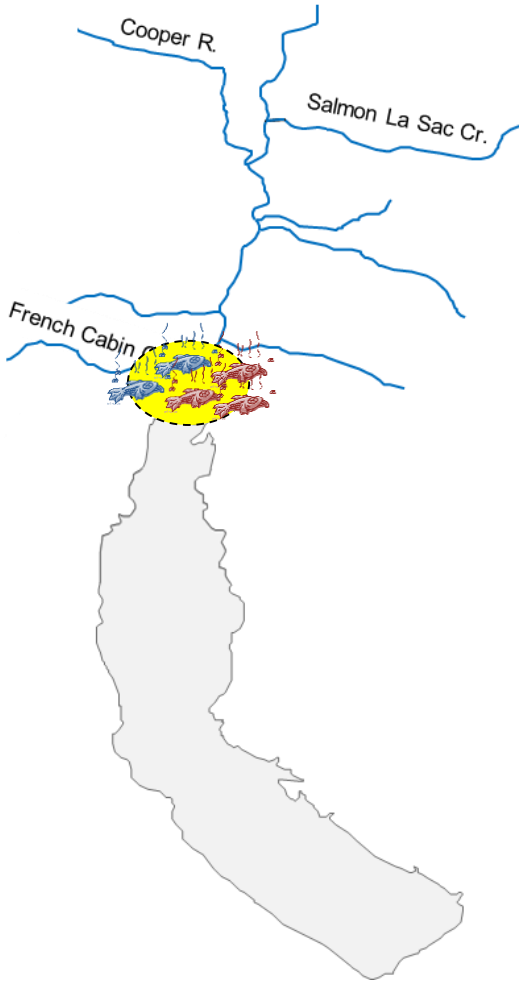




Carcass Surveys: Reach #3



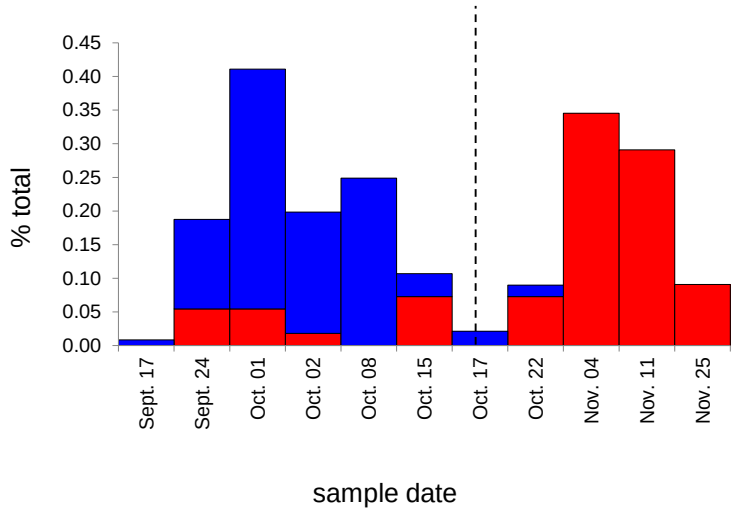




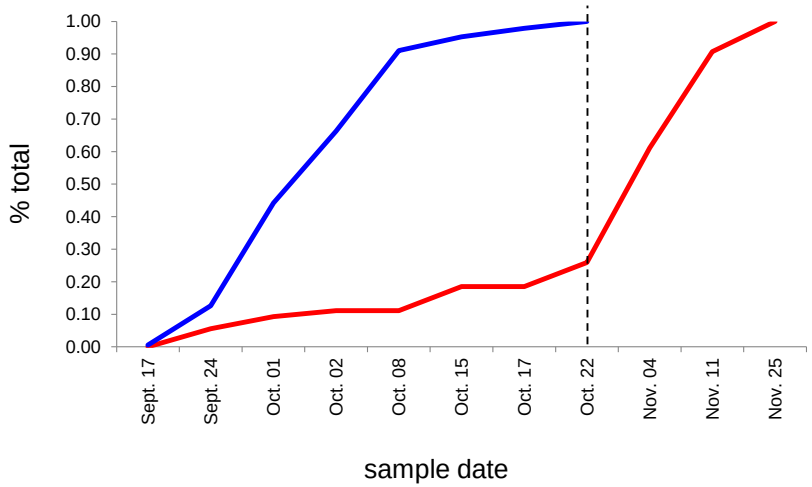
Carcass Surveys: 2011-2014

Summary among all three river reaches

overall temporal distribution



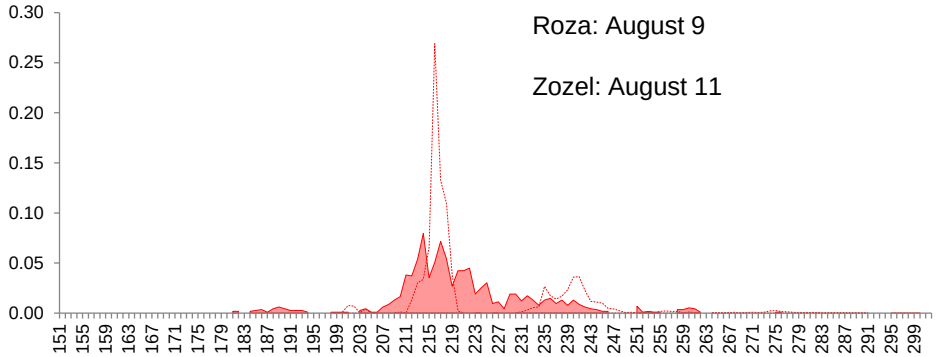
cumulative (by stock)



M&E Summary:

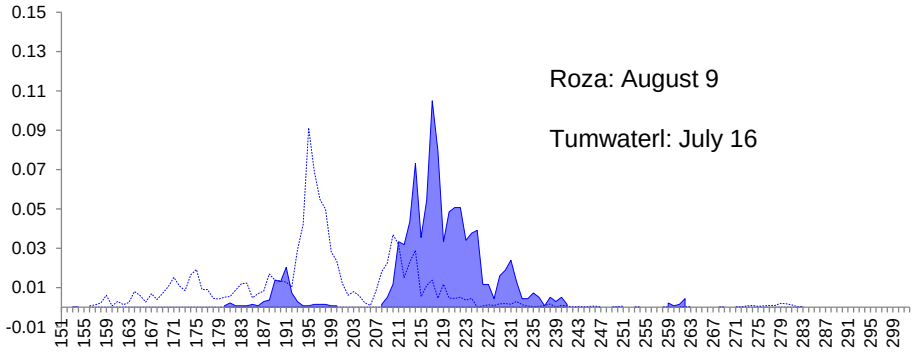
(what I think is occurring)

Influence on migration - temperature



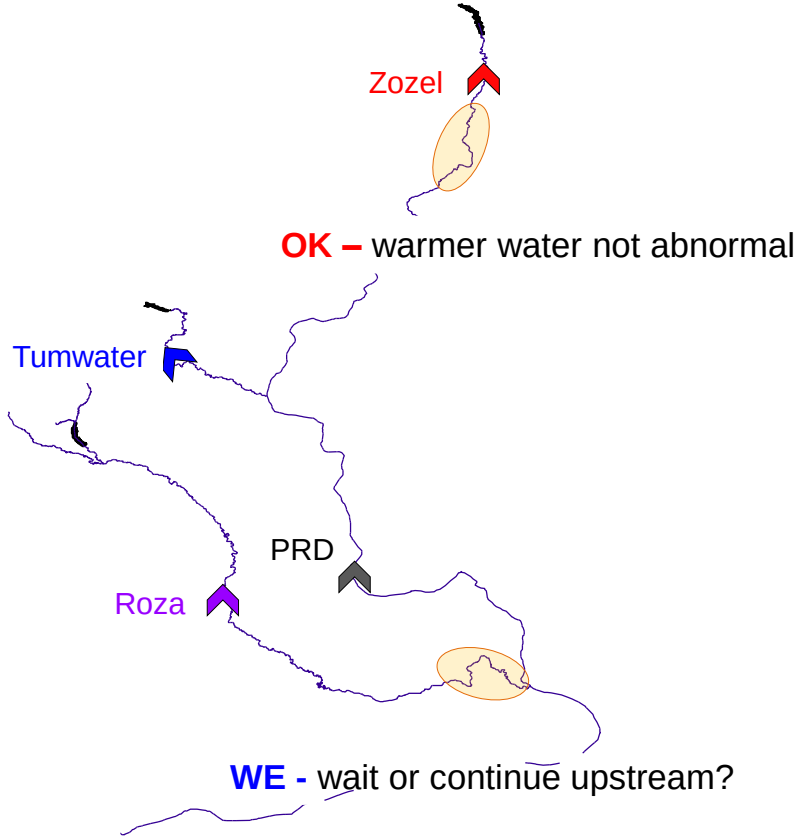
Roza: August 9

Zozel: August 11



Roza: August 9

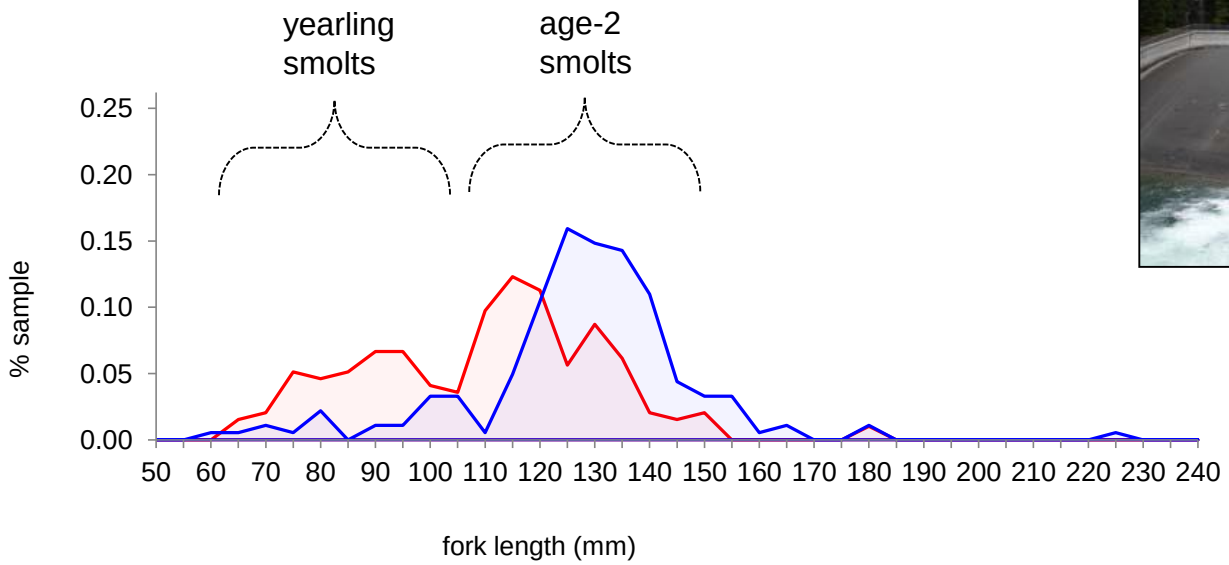
Tumwaterl: July 16



OK – warmer water not abnormal

WE - wait or continue upstream?

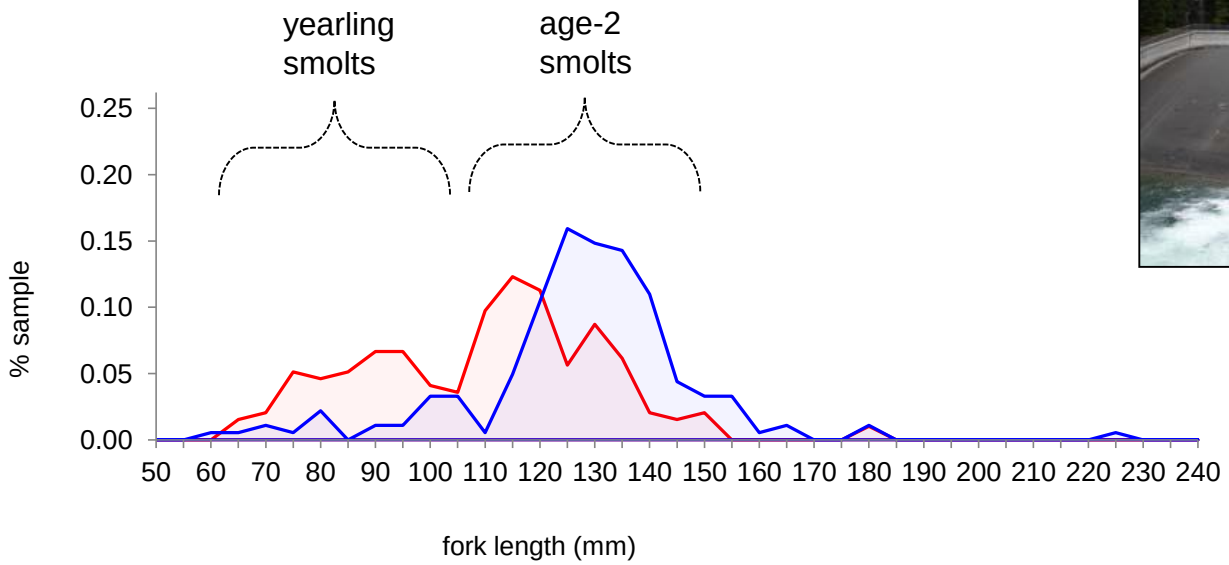
Multiple juvenile age groups



Cle Elum Lake outmigrants

WE ~ dominated by age-2; (typical is 1 year lake rearing)

Multiple juvenile age groups



Cle Elum Lake outmigrants

WE ~ dominated by age-2; (typical is 1 year lake rearing)

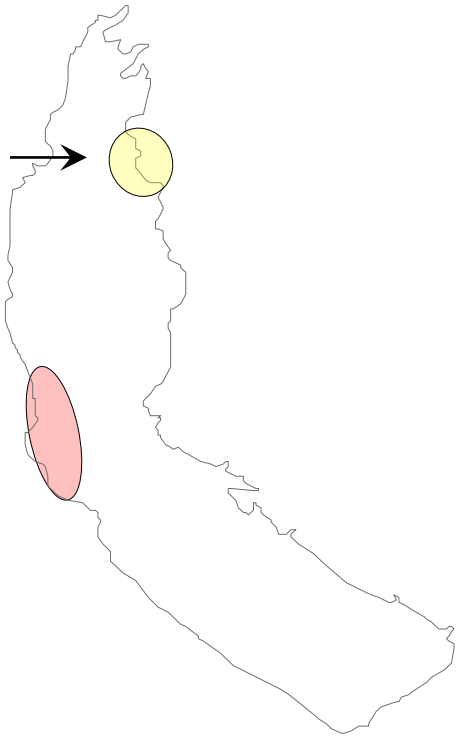
OK – adapted to eutrophic conditions
OK – smaller; slower growth in Cle Elum?

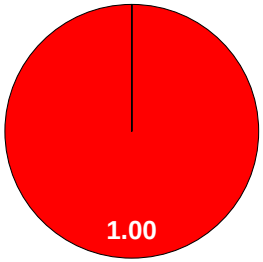
Different spawning habitat

Wenatchee – primarily inlet streams
Okanogan – primarily shore/beach

outplant release ~ July

gillnet by-catch
Oct. 29th – Nov. 5th

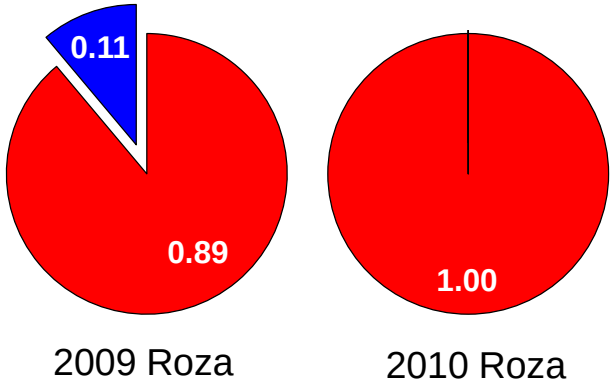


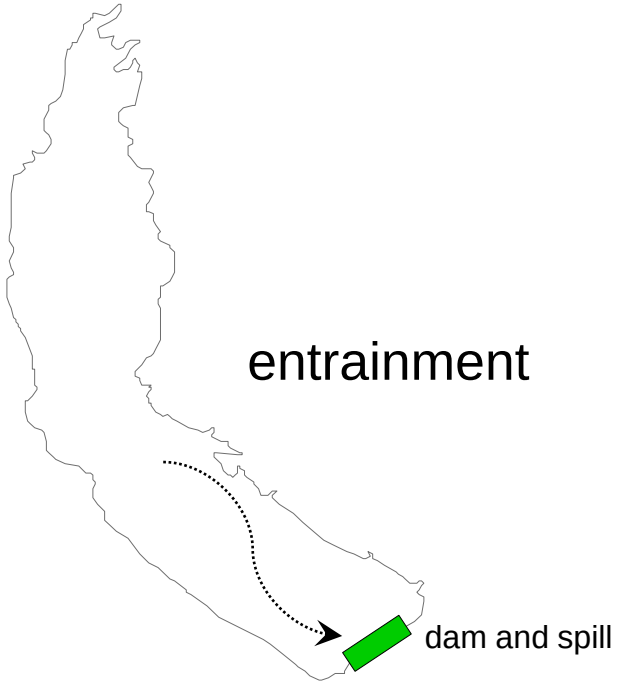


Support: 100% of near shore captures are **OK**

Different spawning habitat

Wenatchee – primarily inlet streams
Okanogan – primarily shore/beach

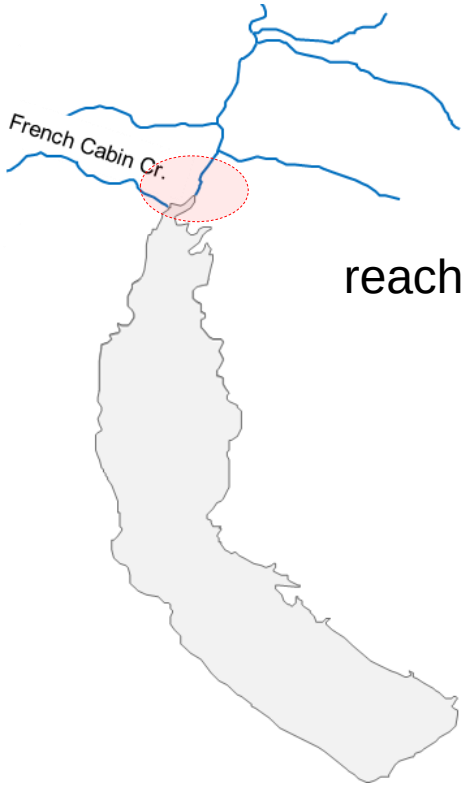




<u>Support:</u> 23 outplants recaptured at Roza (all **OK**)

Different spawning habitat

Wenatchee – primarily inlet streams
Okanogan – primarily shore/beach



reach #3: nearest lake

Support: majority of recovered **OK** carcasses (93%)

Concluding points

- Important future M&E: what will the F2's do?

- Reproductive isolation: stocks >**99%** pure
  - no hybrids among emigration juveniles
  - no hybrids among returning adult progeny

- age-structure differs by donor stock-of-origin
  - partially characteristic of natal regions
  - new environment imparts some unique differences

Concluding points

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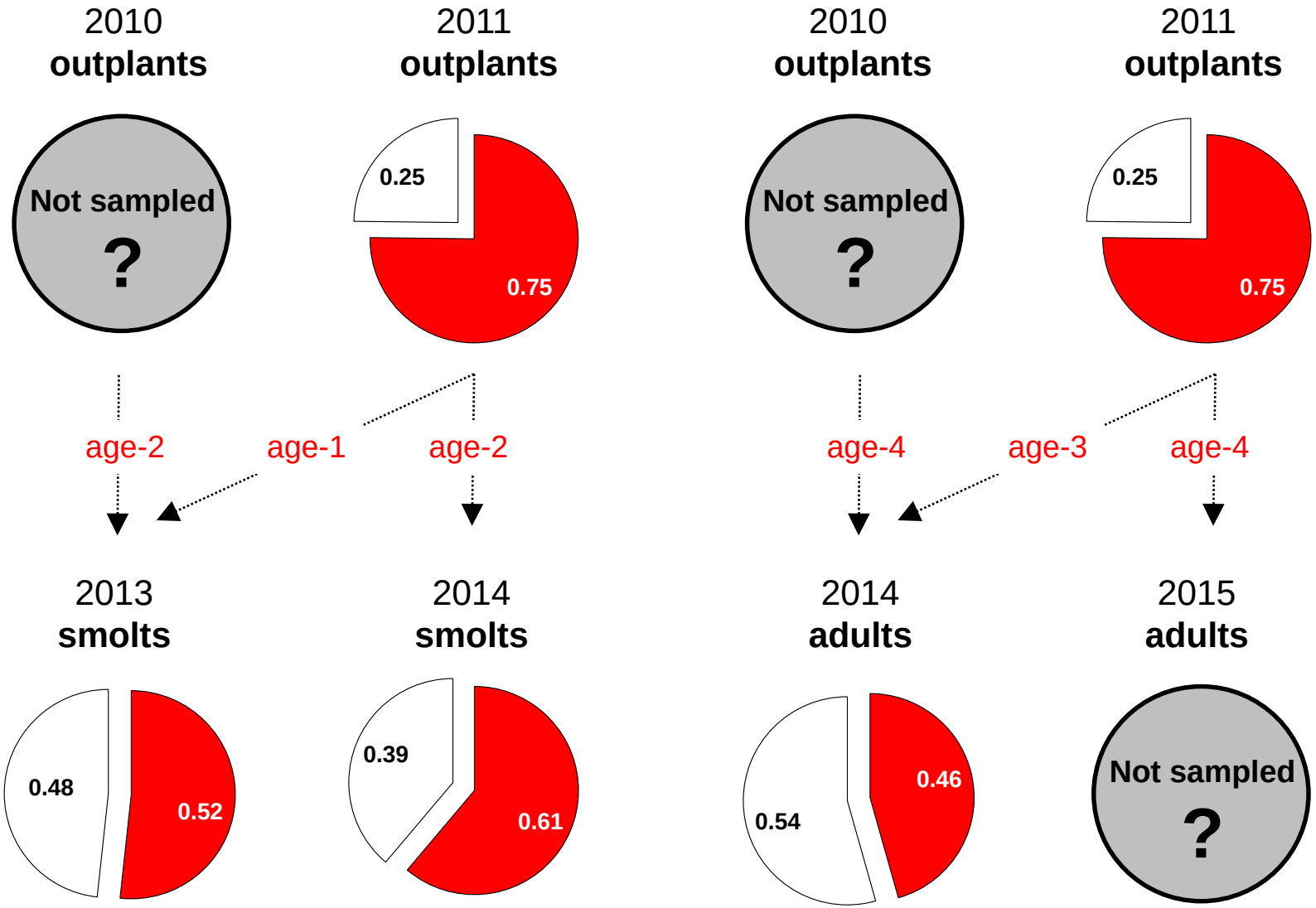
- Reproductive isolation: stocks >**99%** pure
  - no hybrids among emigration juveniles
  - no hybrids among returning adult progeny

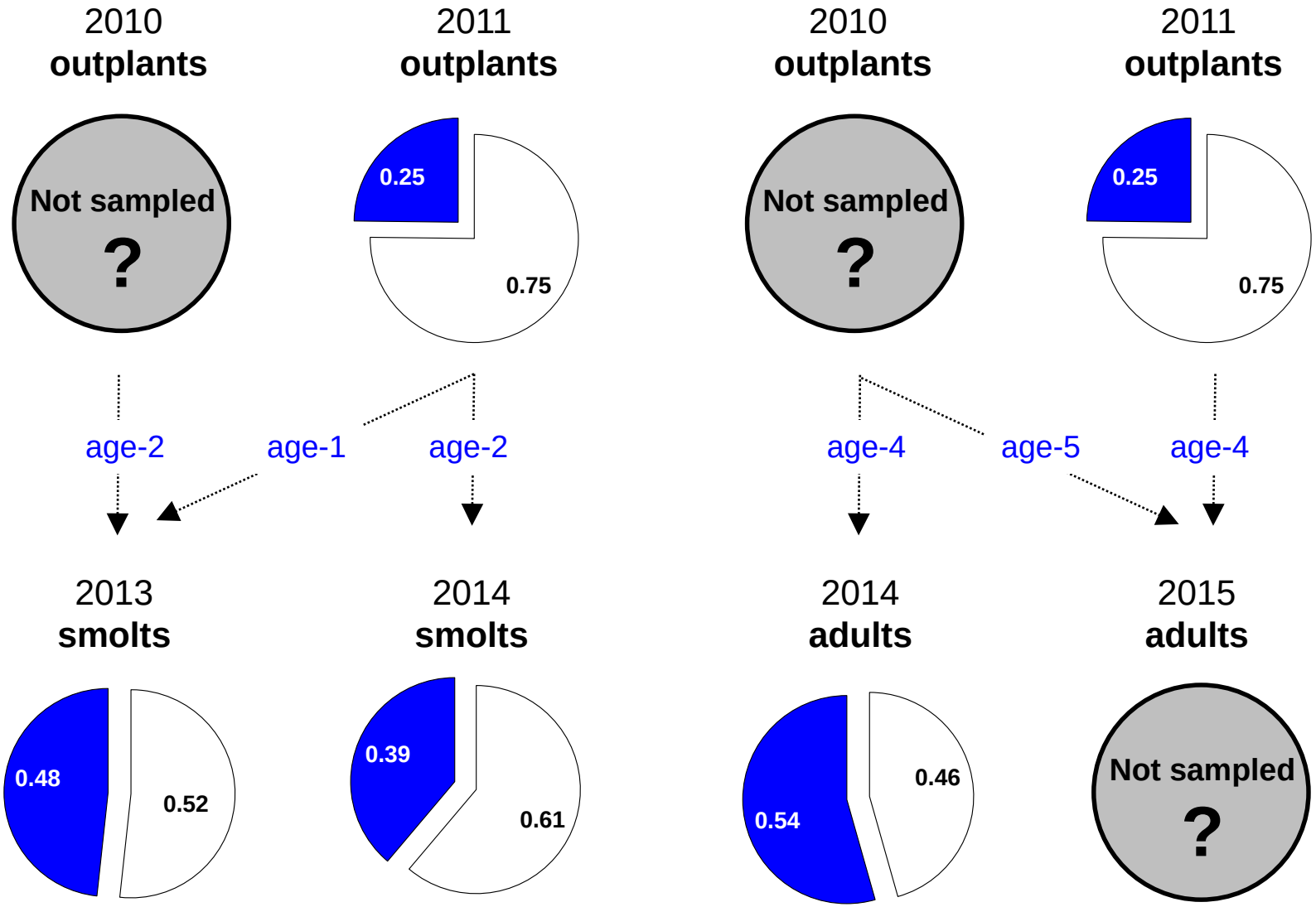
- age-structure differs by donor stock-of-origin
  - partially characteristic of natal regions
  - new environment imparts some unique differences

- Both stocks reproductively successful
  - utilizing all available habitat
  - high genetic variability

Okanogan


2010
outplants
Not sampled
?
2011
outplants
0.25
0.75
2010
outplants
Not sampled
?
2011
outplants
0.25
0.75
age-2
age-1
age-2
age-4
age-3
age-4
2013
smolts
0.48
0.52
2014
smolts
0.39
0.61
2014
adults
0.54
0.46
2015
adults
Not sampled
?

Wenatchee


2010
outplants
Not sampled
?
2011
outplants
0.25
0.75
2010
outplants
Not sampled
?
2011
outplants
0.25
0.75
age-2
age-1
age-2
age-4
age-5
age-4
2013
smolts
0.48
0.52
2014
smolts
0.39
0.61
2014
adults
0.54
0.46
2015
adults
Not sampled
?

That's all!

Mark Johnston, YN field technical staff,
Roza and Chandler technical staff

Supplementation ACCORDS project
- (Peter Galbreath)

Nick Hoffman, Travis Jacobson, Shawn Narum