

# Snake River Sockeye Salmon 2018 juvenile and adult update

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Idaho Department of Fish and Game

TMT year end review  
December 5<sup>th</sup>, 2018



# Acknowledgments

## Cooperating Agencies

Idaho Department of Fish and Game  
National Marine Fisheries Service  
Shoshone-Bannock Tribe

## Funding Agencies

Bonneville Power Administration



# Program History



# Initial Goals Following 1991 ESA Listing

Utilize Captive Broodstock Technology to avoid extinction and maintain genetic diversity

## Broodstock Collection (1991 – 1998)

Returning adult Sockeye (n = 16)

Out-migrating smolts (several hundred from 1991 – 1993)

Residual Sockeye (26 from 1993 – 1995)

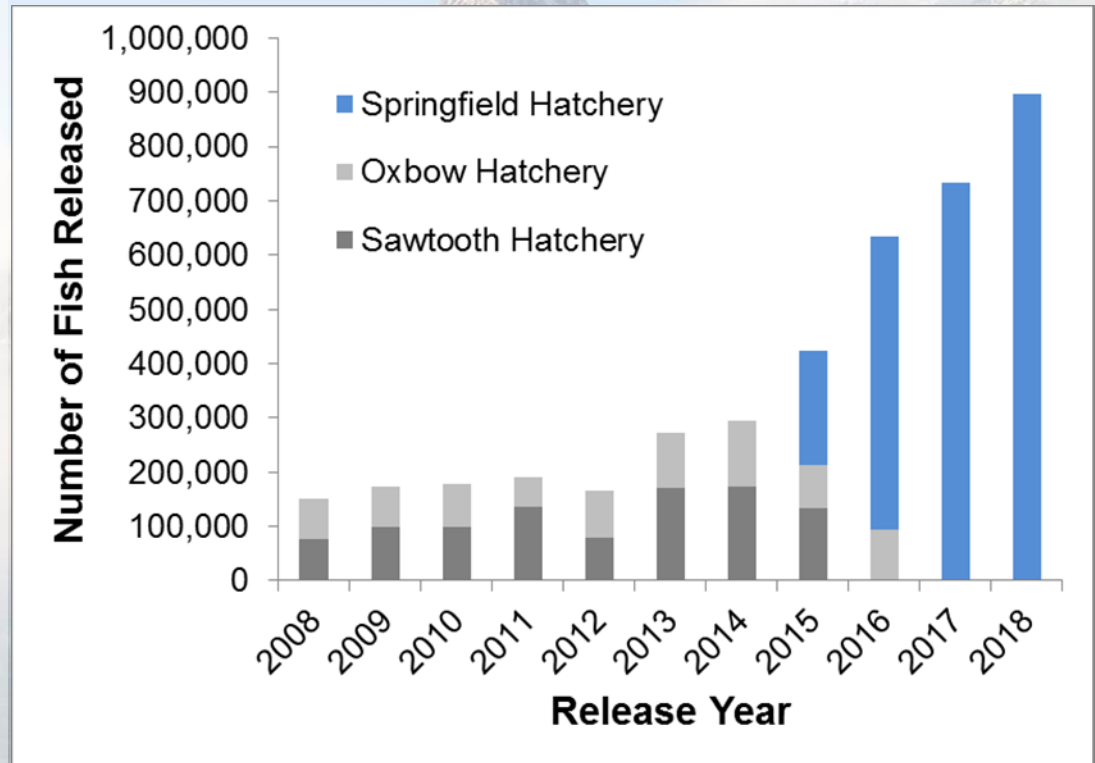
Increase the size of the population

Determine appropriate release strategies for recolonization

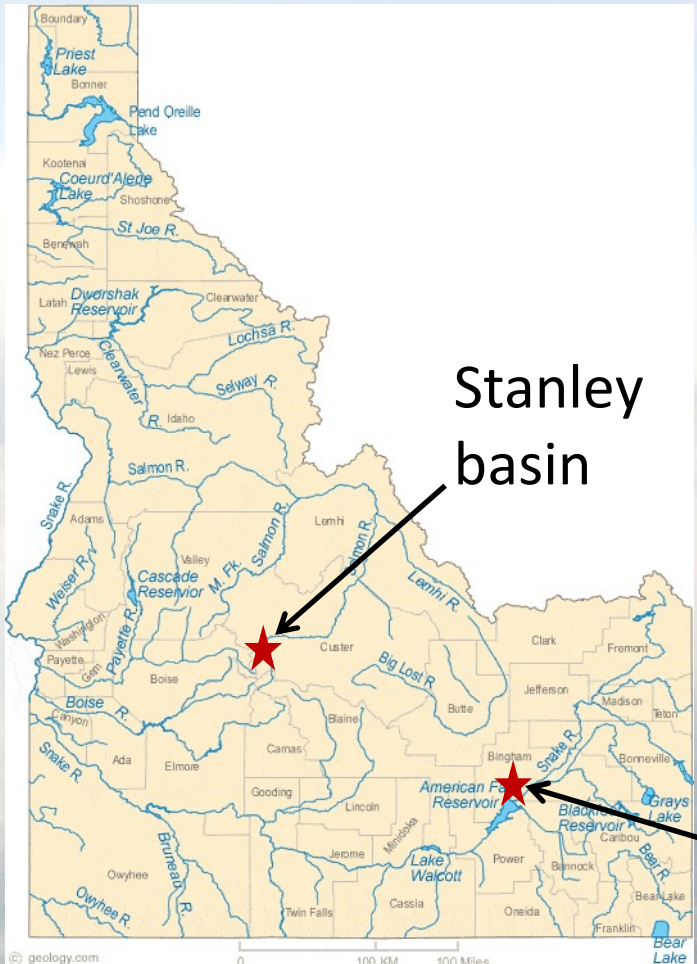


# Recolonization Phase

- Smolt production to increase ~ 5-fold to 1M
- Recolonize habitat
- Replace captive adults in hatchery spawning designs



# Program Expansion



Springfield Hatchery



# 2018 Juvenile Update



# Challenges – Low Survival

## 2015 Springfield Release

214K+ smolts released

Fish in poor condition, gaping mouths, frayed fins, embolisms

31.3% survival from release to Lower Granite Dam

## 2015 Sawtooth and Oxbow Releases

135K Sawtooth smolts released  
77K Oxbow smolts released

48.5% survival of Sawtooth smolts from release to Lower Granite Dam

42.5% survival of Oxbow smolts from release to Lower Granite Dam



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## 2016 Springfield Release Changes

Degassing addressed at Springfield

Water-up night before hauling to reduce TDG levels

New Transport route – lower elevation

**MORTALITY RELATED TO GAS SUPERSATURATION?**



# Challenges – Low Survival

## 2016 Springfield Release

540K+ smolts released

Fish in poor condition, signs of physical trauma

Substantial descaling observed

31.2% survival from release to Lower Granite Dam

## 2016 Oxbow Release

94K smolts released

51.8% survival from release to Lower Granite Dam



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(DE)SMOLTIFICATION?  
WATER CHEMISTRY?**



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**MORTALITY RELATED TO PUMPING TRAUMA?  
(DE)SMOLTIFICATION?  
WATER CHEMISTRY?**

## 2017 Springfield Release Changes

New 6" fish pump purchased

Stock fish earlier, add salt

Look at water chemistry differences

Develop study design to evaluate smoltification/transport stress



# Challenges – Low Survival

## 2017 Springfield Release

730K+ smolts released

Smolts looked good but  
mortality increased

16.4% survival from release  
to Lower Granite Dam



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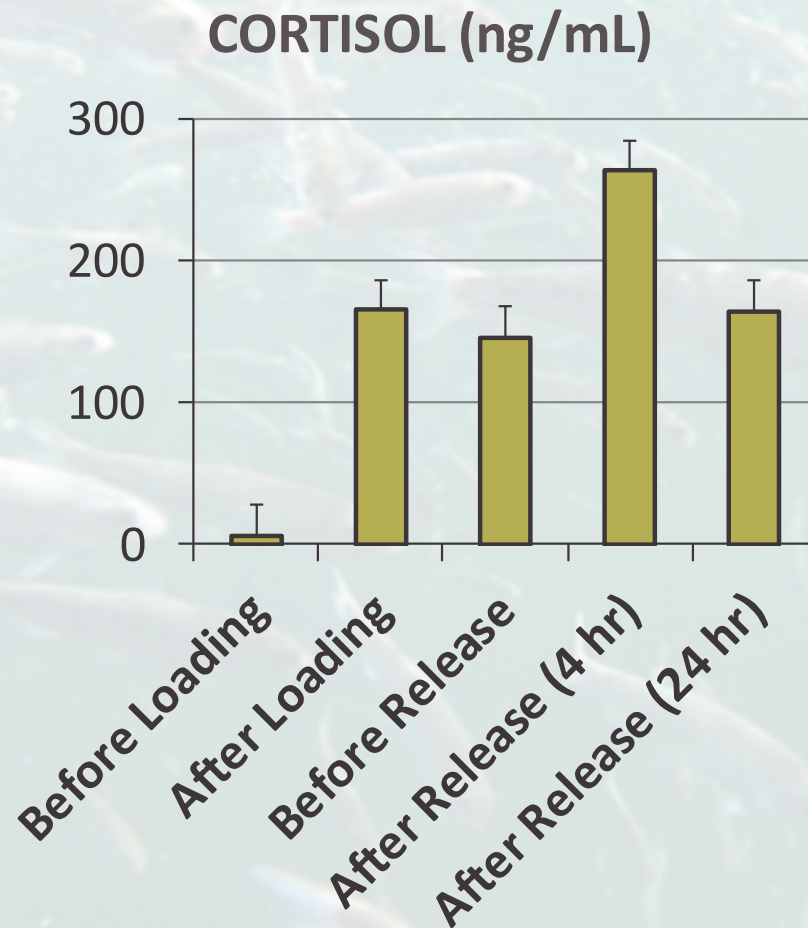
## Physiological & water chemistry parameters measured

Gill ATPase  
Plasma Glucose  
Plasma Cortisol  
Hematocrit

Hardness  
Alkalinity  
pH



# 2017 Springfield Release Results



**RESULTS SUGGEST STRESS FACTOR(S) REMAINS POST-RELEASE**



# 2017 Springfield Release Results



	Springfield Hatchery	Redfish Lake Creek (Oxbow Hatchery)	Salmon River (Sawtooth Hatchery)
Alkalinity	194-202 mg/L	1-8 mg/L	66 mg/L
Hardness	234-248 mg/L	11-12 mg/L	68 mg/L
pH	7.70-7.75	7.41-7.72	7.94

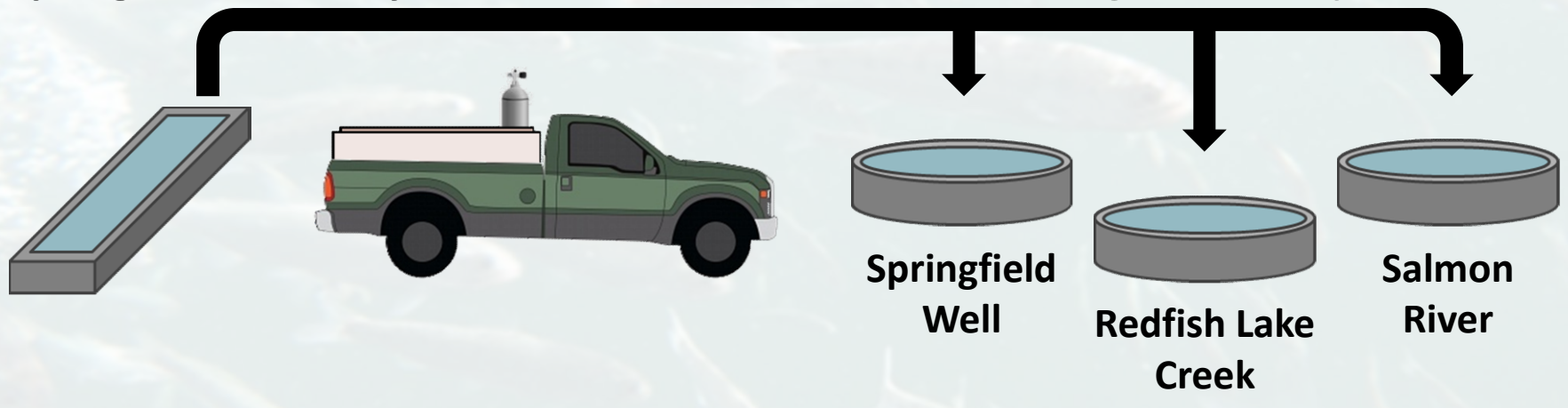


# Researching Effects of Water Chemistry Differences

Springfield Hatchery

~5 hr

Eagle Hatchery



**EXPERIMENT CONDUCTED W/PRE-SMOLTS OCTOBER 2017**

**SAMPLED BLOOD CHEMISTRY BEFORE AND AFTER  
TRANSPORT AND RELEASE TO DIFFERENT WATER SOURCES**



# Researching Effects of Water Chemistry Differences

## SPRINGFIELD WELL

- Alkalinity = 188 mg/L
- Hardness = 232 mg/L
- pH = 8.18

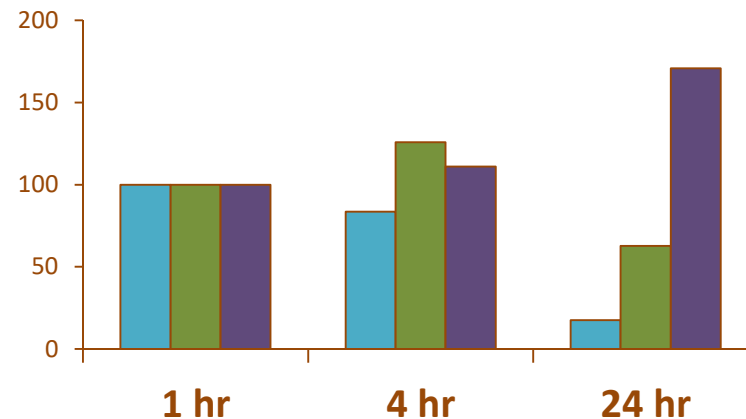
## SALMON RIVER

- Alkalinity = 66 mg/L
- Hardness = 68 mg/L
- pH = 7.94

## REDFISH LAKE CREEK

- Alkalinity = 17 mg/L
- Hardness = 11 mg/L
- pH = 7.33

### CORTISOL (% 1 hr values)



**RESULTS SUPPORT WORKING HYPOTHESIS RELATED TO WATER CHEMISTRY**



# 2018 Springfield Release

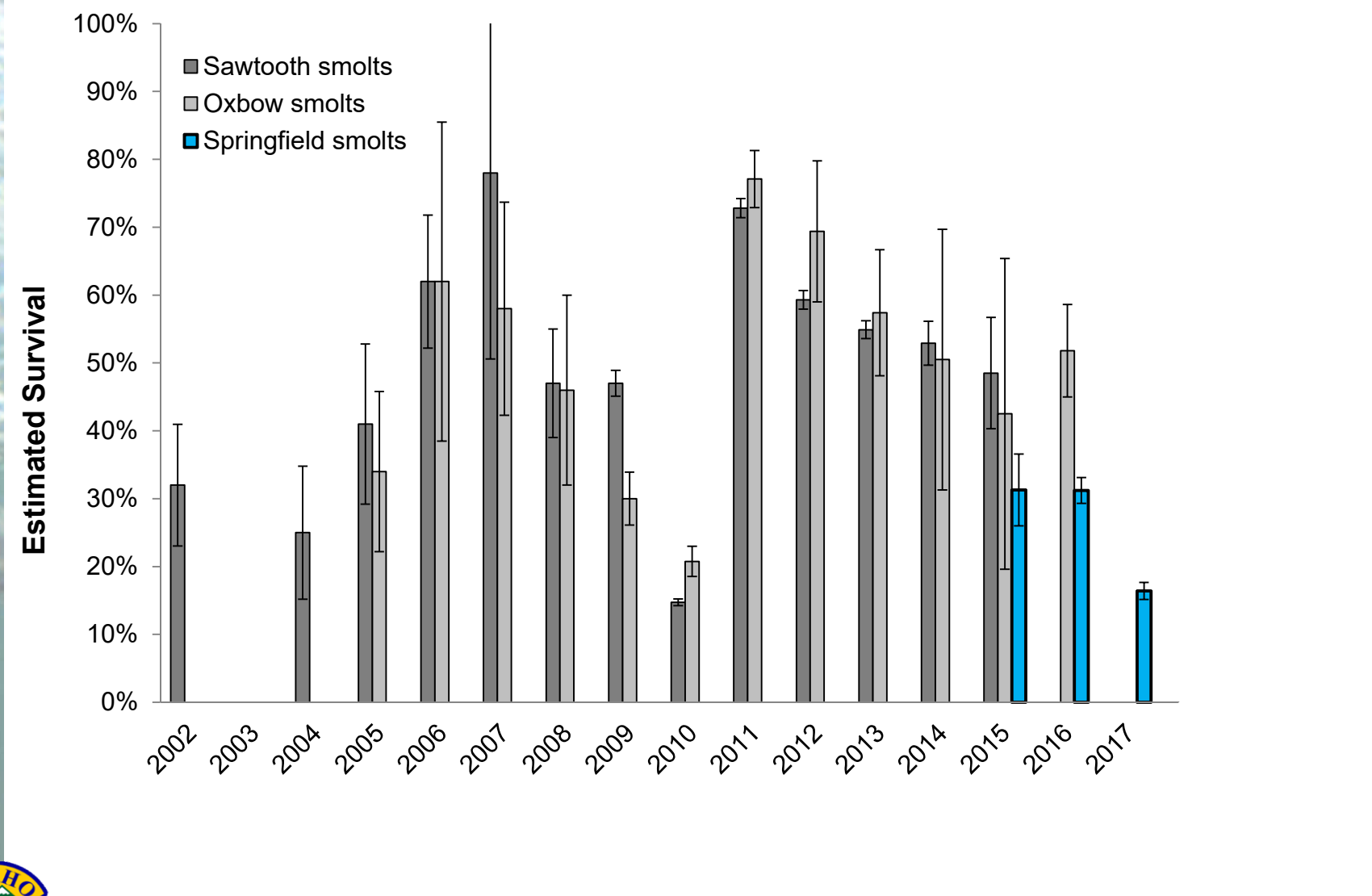
250K pre-smolts released to Redfish Lake in October, 2017  
≈100K smolts migrated in spring 2018

~600K smolts to acclimate at Sawtooth Hatchery  
½ released in Redfish Lake Creek  
½ released in the Salmon River

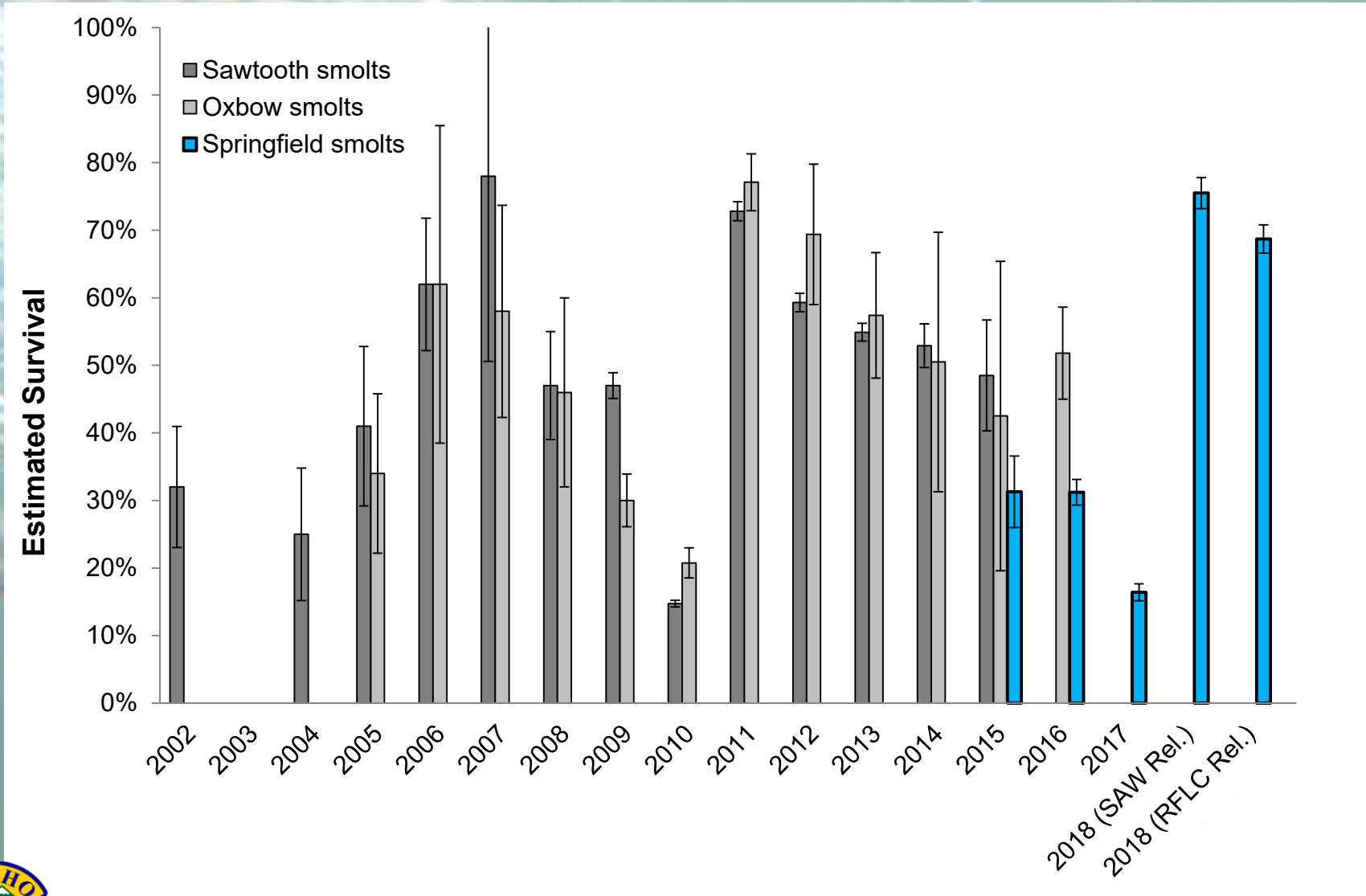
~40K smolts released directly from Springfield Hatchery to  
Redfish Lake Creek as a control



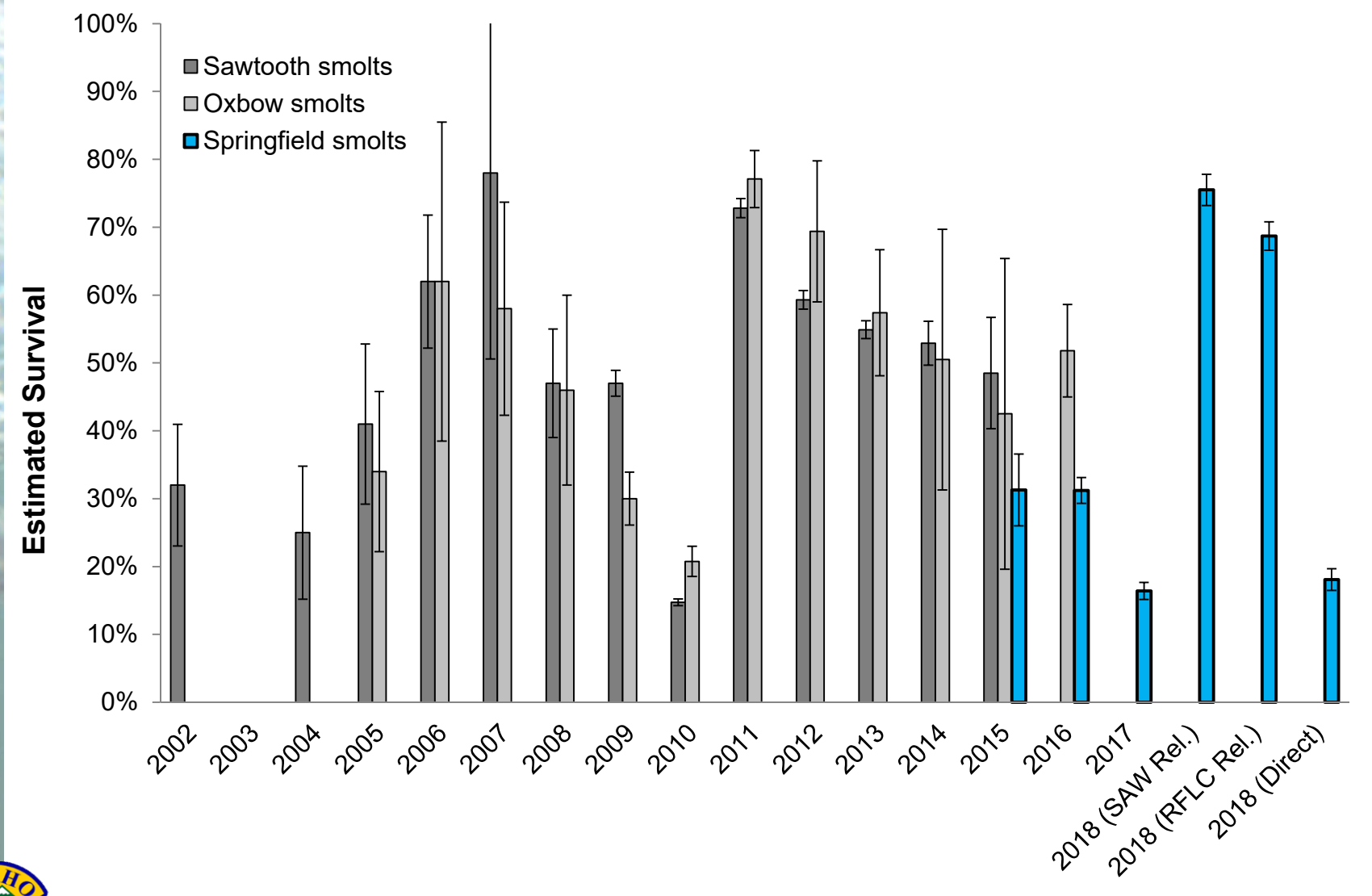
# 2018 Smolt Release Survival - LGR



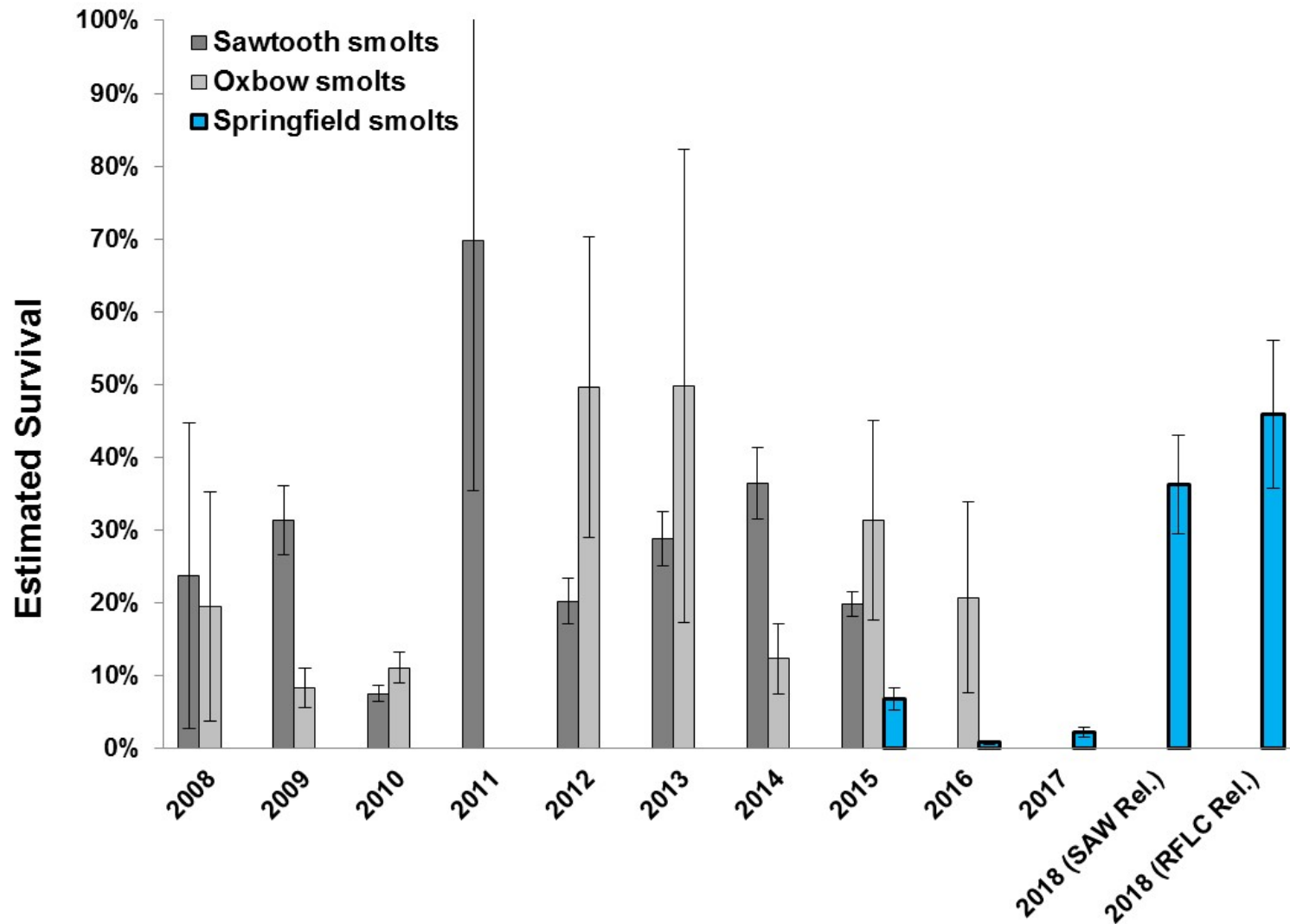
# 2018 Smolt Release Survival - LGR



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# 2018 Smolt Release Survival - BON



# 2019 Release Plan

560K Springfield reared/Sawtooth acclimated smolts released into Redfish Lake Creek

330K Sawtooth reared smolts released into Redfish Lake Creek

3K Springfield reared smolts released directly into Redfish Lake Creek as a control

Continuation of cortisol and blood glucose sampling during acclimation and release transports

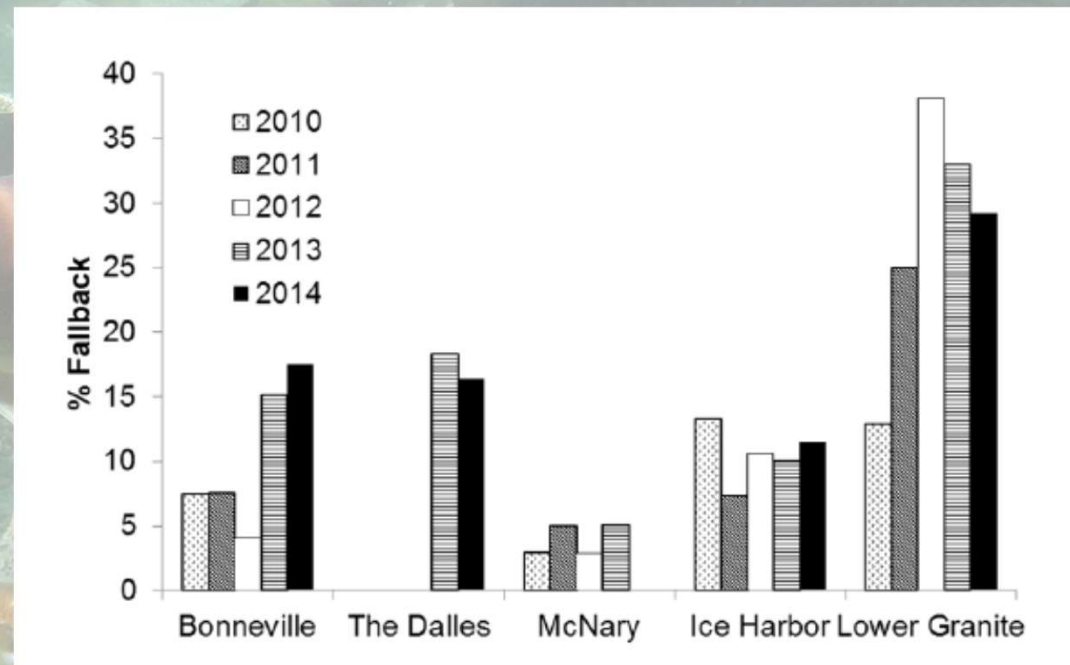


# 2018 Adult Update



# 2018 Fallback and Re-ascension

- 0% Fallback for Redfish Lake Sockeye Salmon
- Low number of tags available to estimate fallback (5 PIT, 39 Genetic)
- 20% resample rate for genetic tags



Crozier et al. 2015



# Sockeye Genetic Stock Identification

- Individuals genotyped at 382 SNPs
- High assignment accuracy among remnant Columbia basin Sockeye Salmon populations

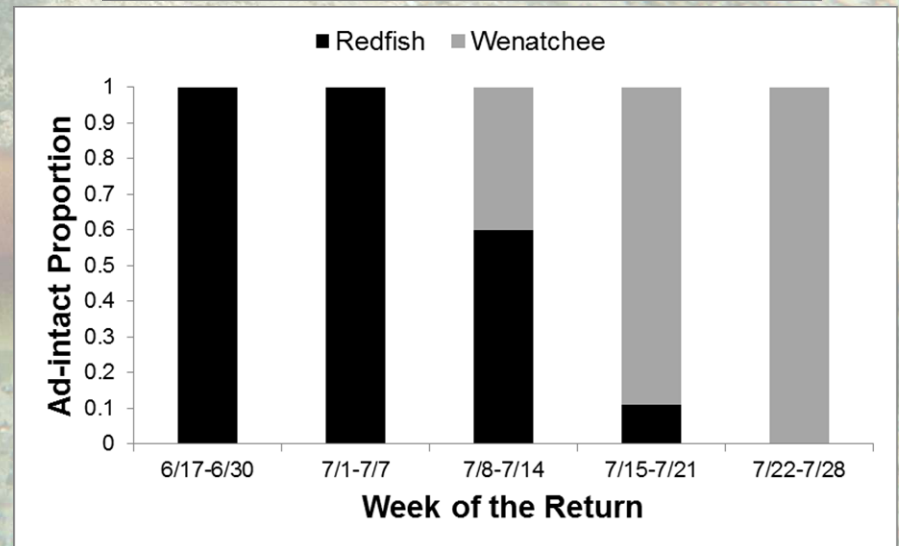
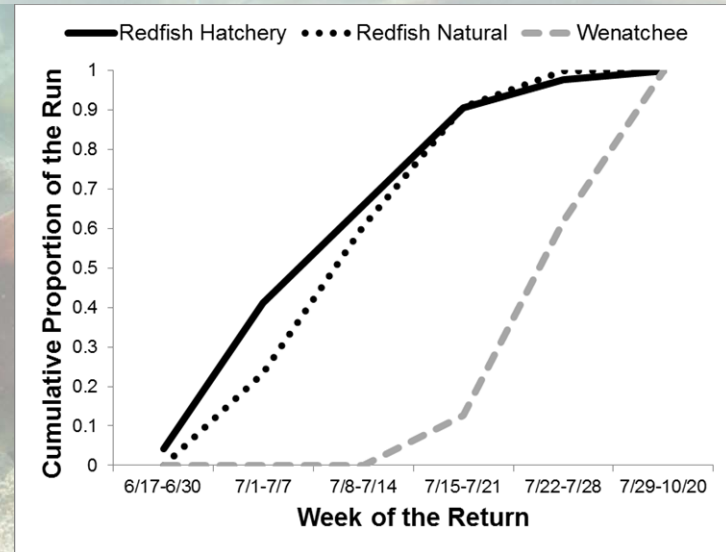
GSI population	Region/Subbasin	n	Self-assignment rate
Redfish Lake	Salmon R.	81	100%
Osoyoos Lake	Okanogan R.	185	100%
Lake Wenatchee	Wenatchee R.	185	100%

Adapted from Matala et al. *In Press*



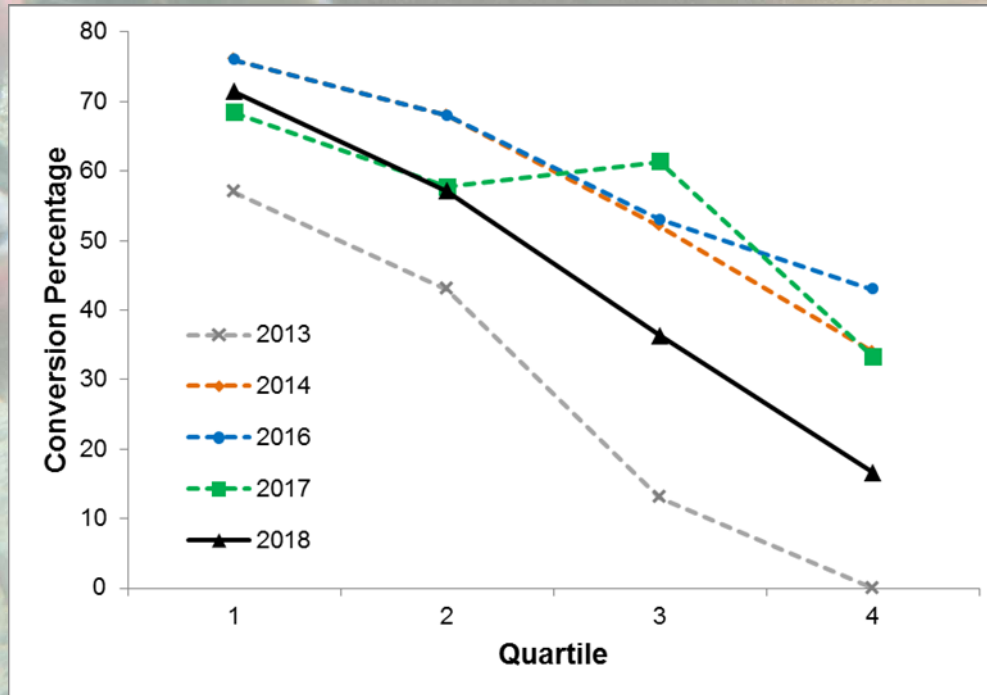
# 2018 Run Composition at Lower Granite Dam

- 56.5% of the ad-intact run sampled at LGR were of Lake Wenatchee origin
- Lake Wenatchee Sockeye arrived later at the trap than Redfish Lake Sockeye
- Lake Wenatchee Sockeye had high fallback rates (115%)



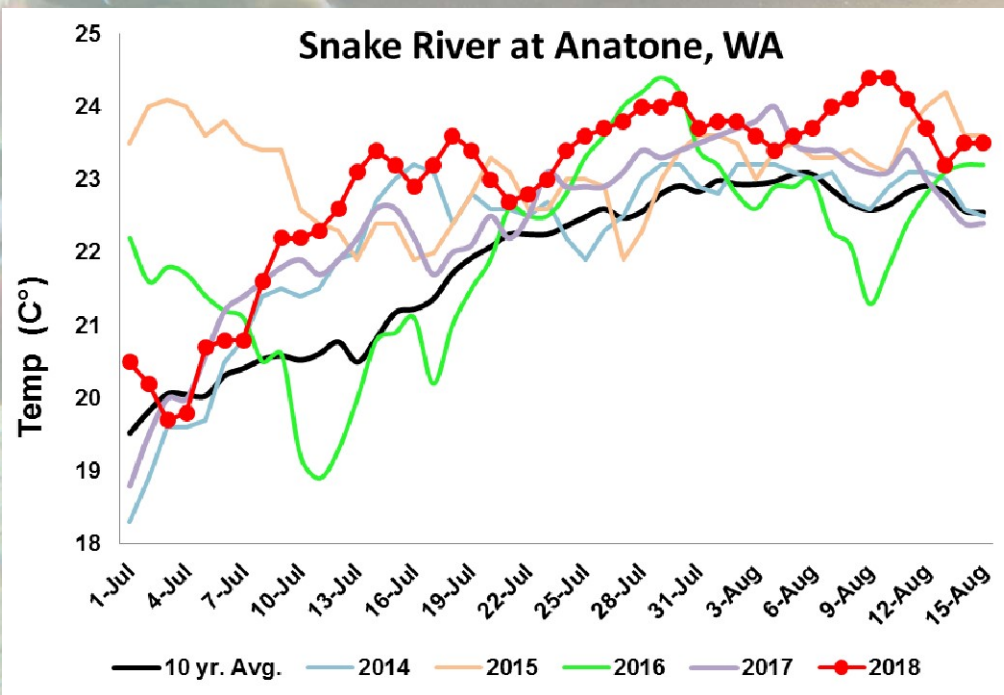
# 2018 Conversion from Lower Granite Dam to Stanley basin

Quartile	Date Range	Marked	Recaptured	Survival
1	6/20 - 7/03	7	5	0.714 [0.290, 0.963]
2	7/4 - 7/5	14	8	0.571 [0.288, 0.823]
3	7/6 - 7/11	11	4	0.363 [0.109, 0.692]
4	7/12 - 10/18	12	2	0.166 [0.020, 0.484]
<b>Total</b>	<b>6/20-10/18</b>	<b>44</b>	<b>19</b>	<b>0.431 [0.283, 0.589]</b>

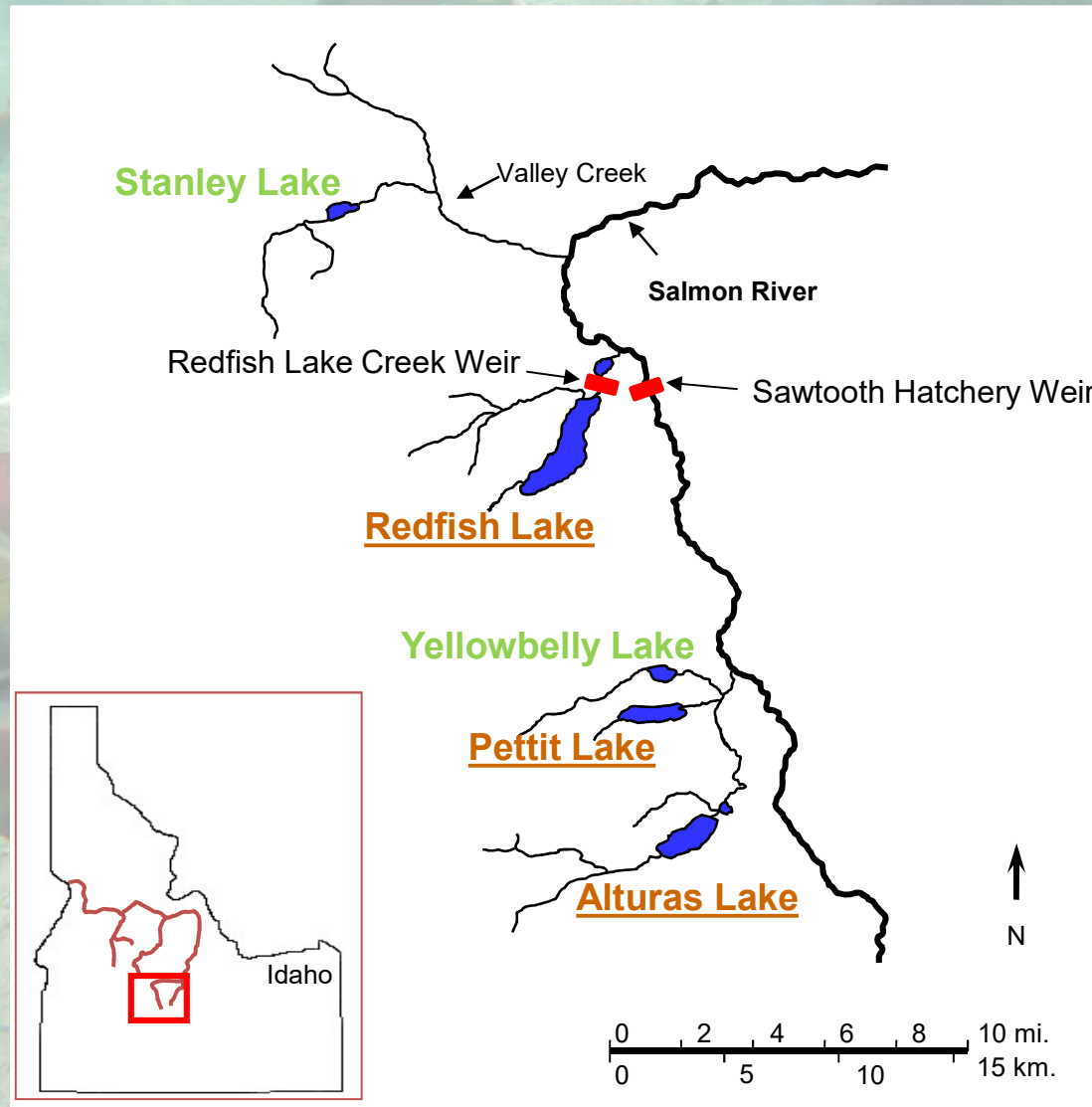


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# Typical Adult Sockeye Management



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Burley Creek ★  
Hatchery

Eagle Hatchery ★

Stanley basin



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Burley Creek ★  
Hatchery

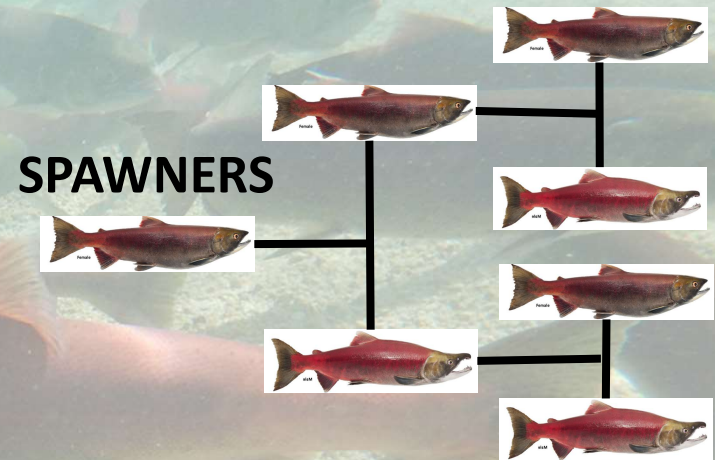
Eagle Hatchery ★

Stanley basin



# PBT and Pedigrees: Selecting Broodstock

- All captive adults and anadromous returns genotyped at 382 SNPs
- Parentage based tagging (PBT) used to assign individuals to parents (place on pedigree)
- PMx used to estimate lineage contribution from pedigrees
- Underrepresented lineages retained for Broodstock

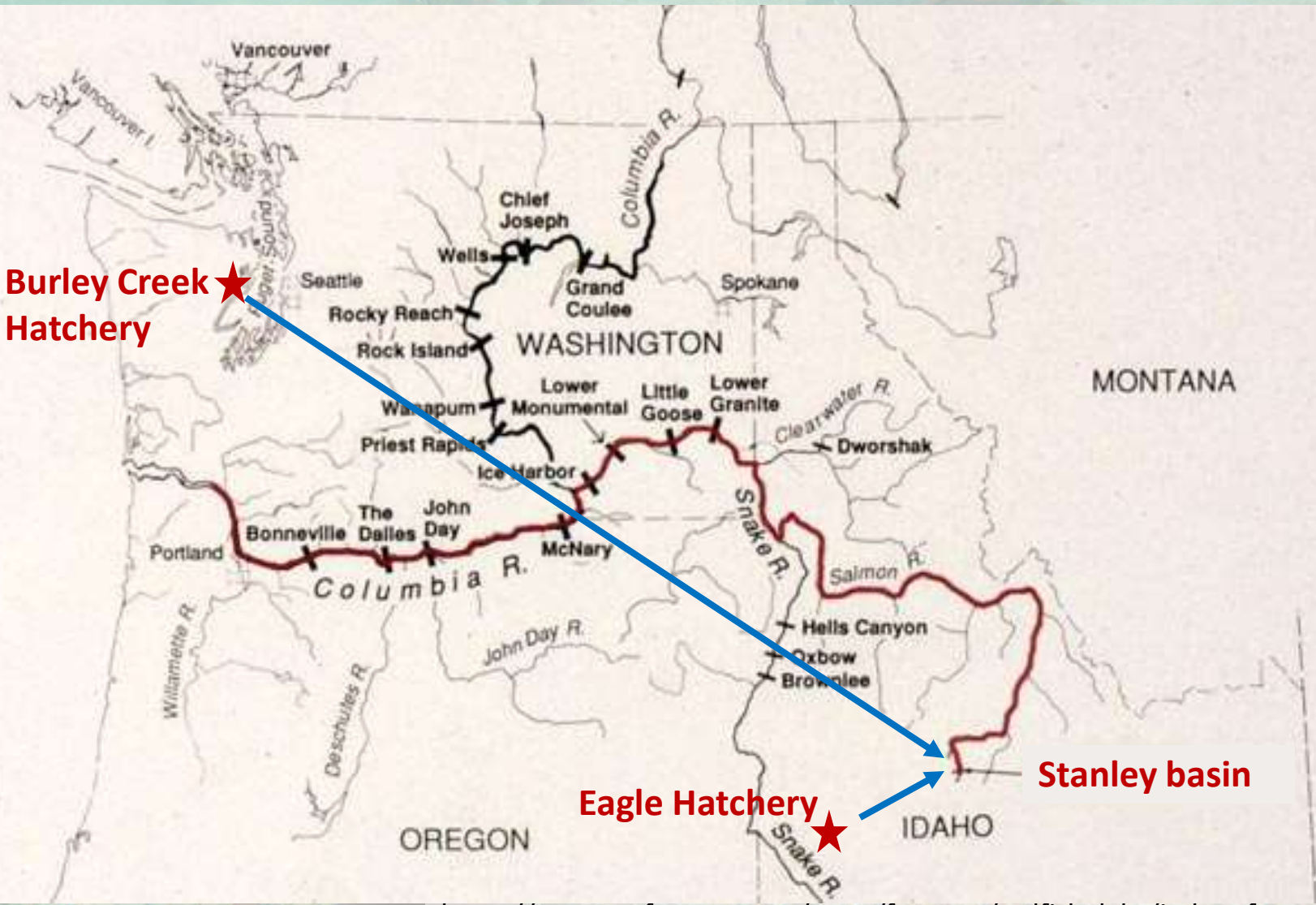


# Typical Adult Sockeye Management

**Burley Creek ★  
Hatchery**

**Eagle Hatchery ★**

**Stanley basin**



# Trap and Haul Adult Sockeye Management



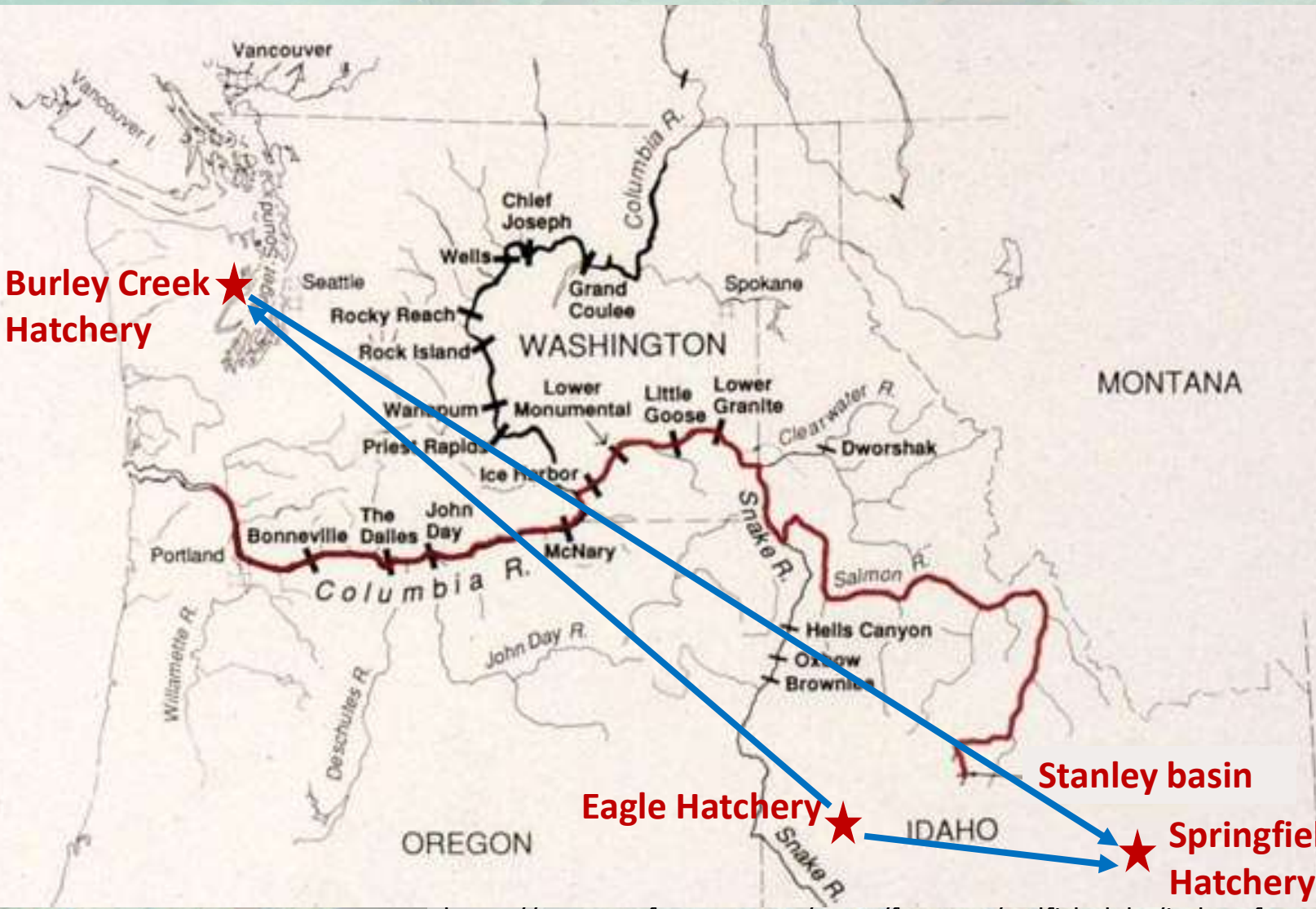
# Sockeye Egg Transportation

**Burley Creek Hatchery** ★

**Eagle Hatchery** ★

**Stanley basin**

**Springfield Hatchery** ★



# Questions?

