Grande Ronde and Imnaha Basin Spring Chinook Salmon: 2022 LSRCP Program Review

LOWER SNAKE RIVER COMPENSATION PLAN
Hatchery Program

BONNEVILLE POWER ADMINISTRATION

Shane Vatland
Brian Simmons
A crew of surveyors
BPA # 199800702

Joseph W Feldhaus
Ethan Brandt
Ian Tattam
Polly Gibson, Kasey Bliesner, Nadine Craft

Les Naylor
Carrie Crump
A crew of surveyors
BPA # 200708300
BPA # 199800703

Department of Fisheries Resources Management
Nez Perce Tribe
Joseph, OR 97846

Oregon Department of Fish and Wildlife
203 Badgley Hall
Eastern Oregon University
La Grande, OR 97850

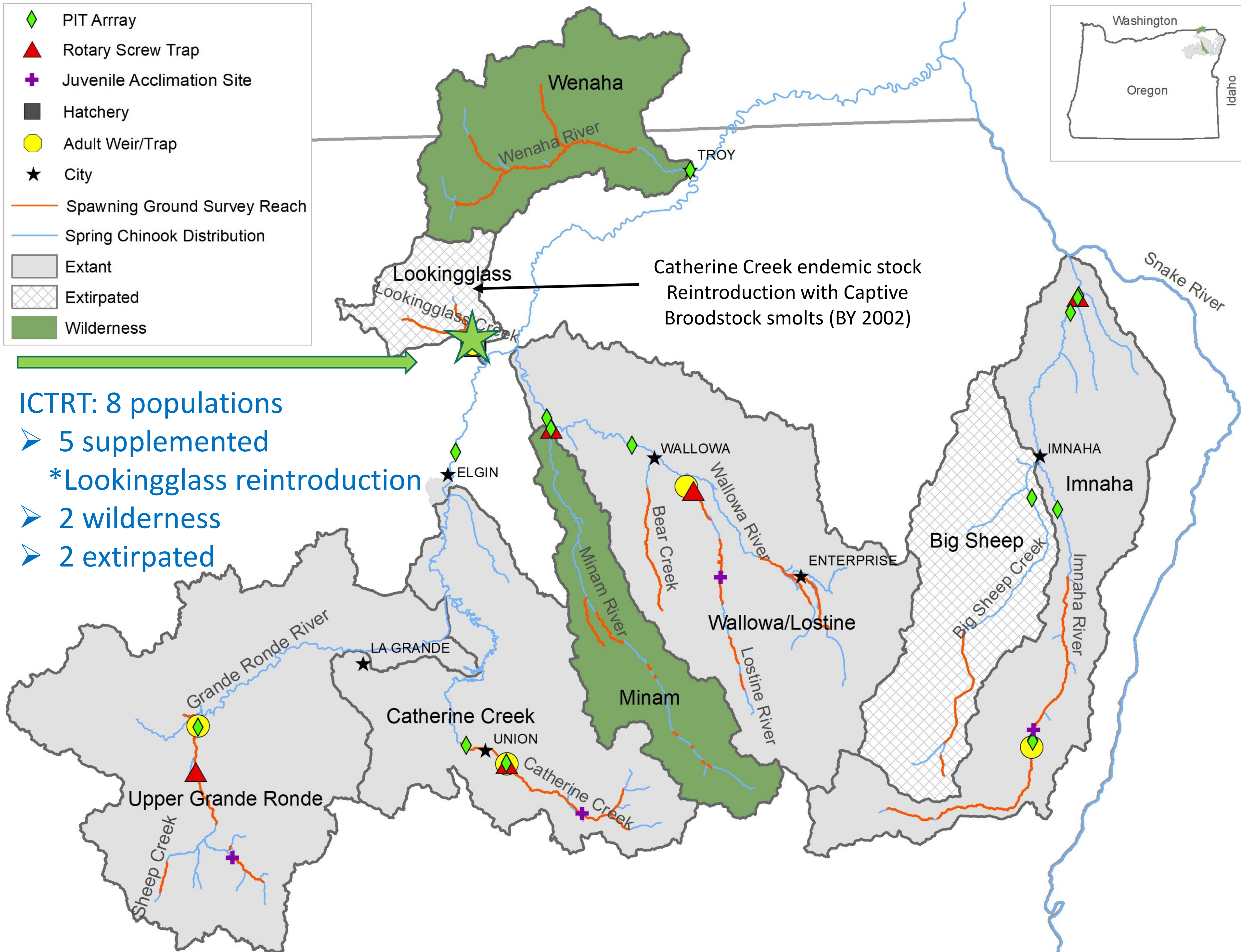
Grande Ronde Basin RM&E
CTUIR Dept. Natural Resources
10507 North McAlister Rd
Island City, OR 97850

NEZ PERCE TRIBE
TREATY OF 1855
© NPT 1995

State of OREGON
Fish & Wildlife

CAYUSE - WALLA WALLA - UMATILLA
CONFEDERATED TRIBES OF THE
UMATILLA INDIAN RESERVATION
Treaty of 1855

This project was funded by the United States Fish and Wildlife Service under the Lower Snake River Compensation Plan



ICTRT: 8 populations

- 5 supplemented
  *Lookingglass reintroduction
- 2 wilderness
- 2 extirpated

LSRCP Spring/Summer Chinook Salmon Annual Mitigation Goals

	Grande Ronde Basin	Imnaha Basin
Compensation Area (Above Lower Granite Dam)		
Annual smolt goal	900,000	490,000*
Annual production (Lbs.)	45,000	24,500
Annual adult goal	5,820	3,210
Brood Year Smolt-to-adult return rate (SAR)	0.65%	0.65%
Total Catch and Escapement below Lower Granite Dam (4:1 harvest objective)		
Annual adult goal	29,100	16,050
Brood Year smolt-to-adult survival rate (SAS)	3.25%	3.25%

* Imnaha interim smolt goals:
  - 360,000 (BYs 2000-2010)
  - 420,000 (BYs 2011-2013)
  - 490,000 (BYs 1985-1999; 2014 to present)

Specific LSRCP Population Compensation Area & Coastwide Mitigation Goals

	Smolts	Smolt release size (fish/lb.)	Compensation Area Adult returns	SAR (%)	Coastwide harvest objective (4:1)	Total Adults Produced	SAS (%)
Grande Ronde Basin							
Catherine Creek[a]	150,000	20-25	970	0.65	3,880	4,850	3.25
Upper Grande Ronde[b]	250,000	20-25	1,617	0.65	6,468	8,085	3.25
Lookingglass Creek	250,000	20-25	1,617	0.65	6,468	8,085	3.25
Lostine River[c]	250,000	20-25	1,617	0.65	6,468	8,085	3.25
Imnaha Basin							
Imnaha River	490,000[d]	20-25	3,210	0.65	12,840	16,050	3.25

[a]Captive Broodstock: BYs 1998 – 2005, 2008 – 2009 (BPA project #s: 1998-010-01 & 1998-001-06)

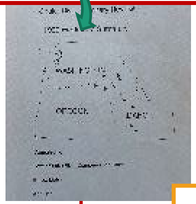
[b]Captive Broodstock: BYs 1998 – 2005, 2007 – 2009, 2011 (BPA project #s: 1998-010-01 & 1998-001-06)

[c]Captive Broodstock: BYs 1998 – 2009 (BPA project #s: 1998-010-01 & 2007-404-00)

[d]Interim smolt goals: 360,000 (BYs 2000-2010); 420,000 (BYs 2011-2013); 490,000 (BYs 1982-1999; 2014 to present)

History Review
Grande Ronde Basin: Adaptive Management

1990
- Oregon's Wild-Fish Management Policy- guidelines specifying limits on the proportion of natural spawners that were hatchery origin.
- First LSRCP hatchery review.



1988
Imnaha satellite facility was constructed

1982
Lookingglass Fish Hatchery was constructed. Wild adult collected from Imnaha river.

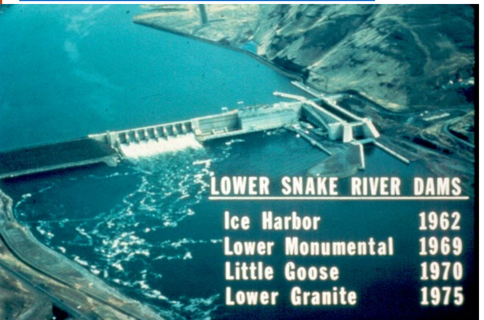
1994-1995
Captive Broodstock Stock (CBS) initiated in the Grande Ronde Basin

1980 1985 1990 1995

1984
First Imnaha River smolt releases

1992
Spring/Summer Chinook listing as threatened under ESA

1968
United States v. Oregon



1997
Conventional hatchery programs start in the Upper Grande Ronde, Catherine Creek, and Lostine River with natural broodstock collection at weirs

1998:
Second ISRP review

Carson and Rapid River stocks allowed us to quickly achieve **smolt production** and **broodstock goals.** However,

- **Smolt-to-adult survival (SAS)** rates were consistently poor.
- Failure to re-establish fisheries
- A high percentage of **hatchery origin spawners (pHOS)** were found in the Lostine, Minam, and Wenaha rivers.
- **Natural population** status was severely depressed:
    i. *High extinction risk*: population growth rates (i.e., **R:S <1**),

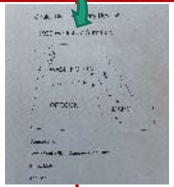
Recommendations:

✓ Use **endemic broodstock** for Grande Ronde Basins programs, construct juvenile acclimation and adult collection facilities, manage pHOS in conventional programs with sliding scales.

✓ Develop **captive broodstock** programs: Lostine River, Catherine Creek, Upper Grande Ronde

History Review
Imnaha Basin: Adaptive Management

1990
- Oregon's Wild-Fish Management Policy- guidelines specifying limits on the proportion of natural spawners that were hatchery origin.
- First LSRCP hatchery review.



1988
Imnaha satellite facility was constructed

1982
Lookingglass Fish Hatchery was constructed. Wild adult collected from Imnaha river.

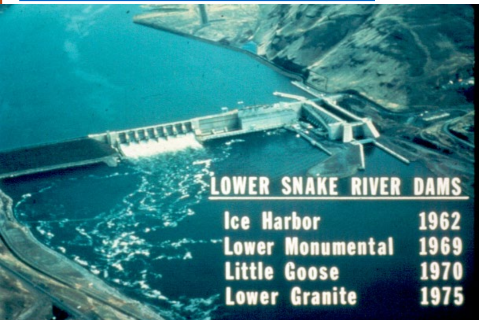
1994-1995
Captive Broodstock Stock (CBS) initiated in the Grande Ronde Basin

1980 1985 1990 1995

1984
First Imnaha River smolt releases

1992
Spring/Summer Chinook listing as threatened under ESA

1968
[United States v. Oregon]



1997
Conventional hatchery programs start in the Upper Grande Ronde, Catherine Creek, and Lostine River with natural broodstock collection at weirs

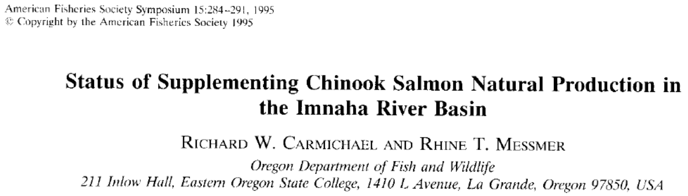
1998:
Second ISRP review

✓ **Already using endemic broodstock**

Management objectives

- Maintain genetic and life history characteristics of the *endemic population* while achieving mitigation goals.
- Operate hatchery program to ensure that genetic and life history characteristics of the *hatchery fish mimic the wild fish*.

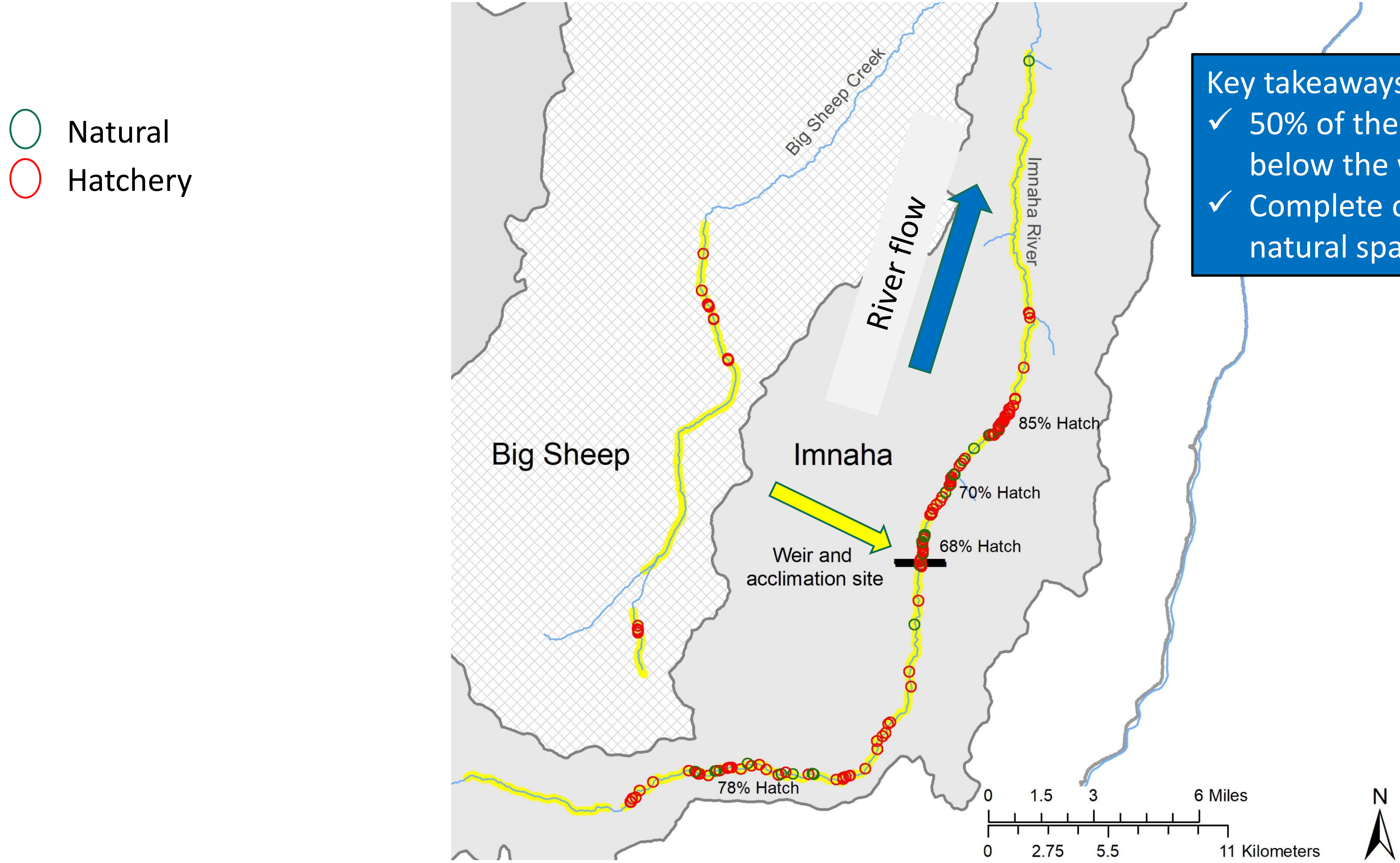
- **Not meeting smolt production goals**
- Consistently **poor smolt-to-adult survival rates**
- Lookingglass Hatchery & Imnaha weir
  - a) Limited pond space + disease (EIBS and BKD)
  - **b) Late Imnaha River weir installation**
    - a) 50% of natural fish released to spawn in nature
    - b) Differential **adult run timing** (natural arrive before hatchery)
    - c) Divergent hatchery adult **age composition**: higher proportion of age 3 and lower proportion of age 5 compared to natural adults


American Fisheries Society Symposium 15:284–291, 1995
© Copyright by the American Fisheries Society 1995

Status of Supplementing Chinook Salmon Natural Production in the Imnaha River Basin

RICHARD W. CARMICHAEL AND RHINE T. MESSMER
Oregon Department of Fish and Wildlife
211 Inlow Hall, Eastern Oregon State College, 1410 L Avenue, La Grande, Oregon 97850, USA

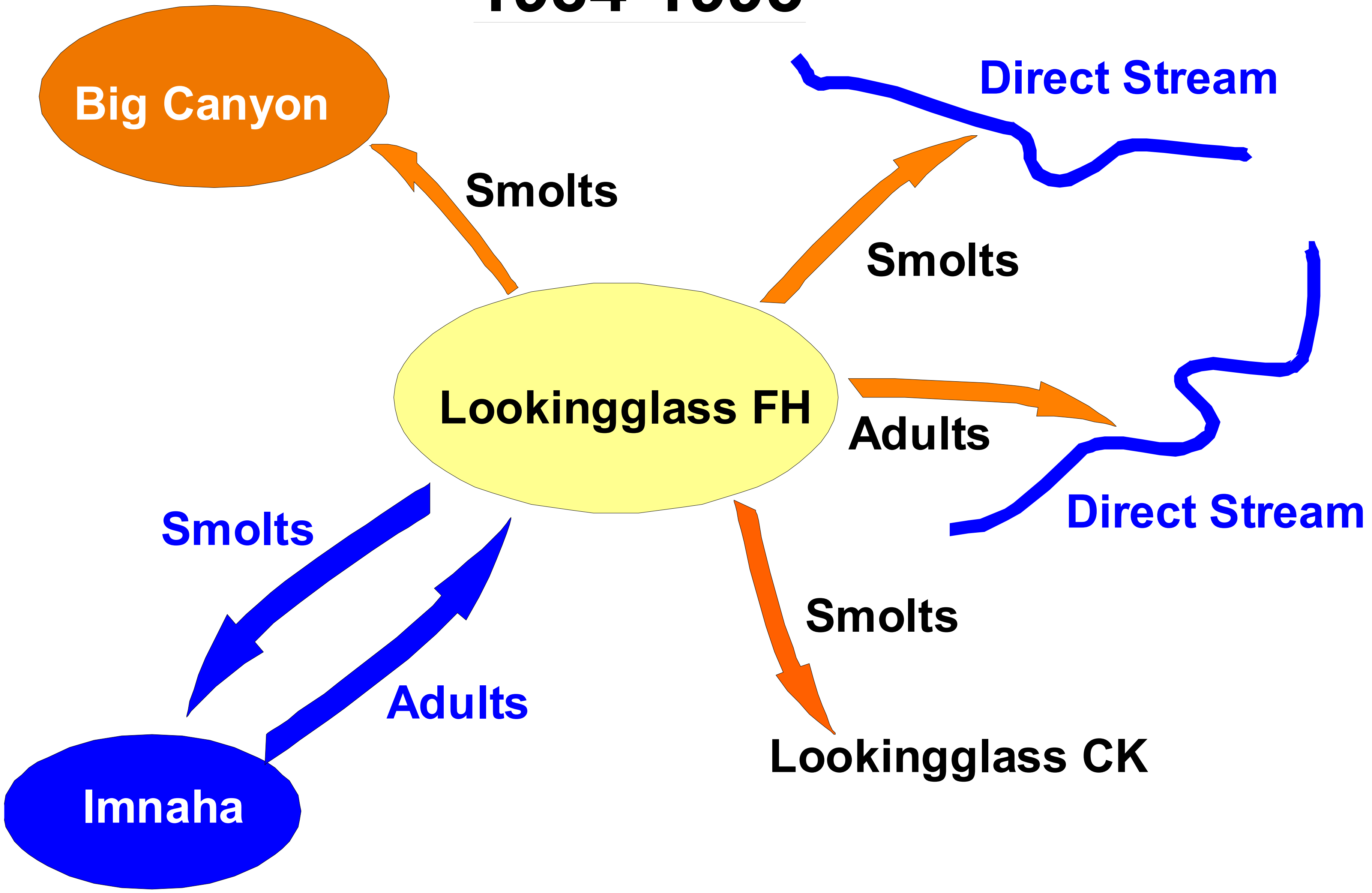
ArcGIS Survey 123: Carcass waypoints Imnaha River (2021 & 2022)



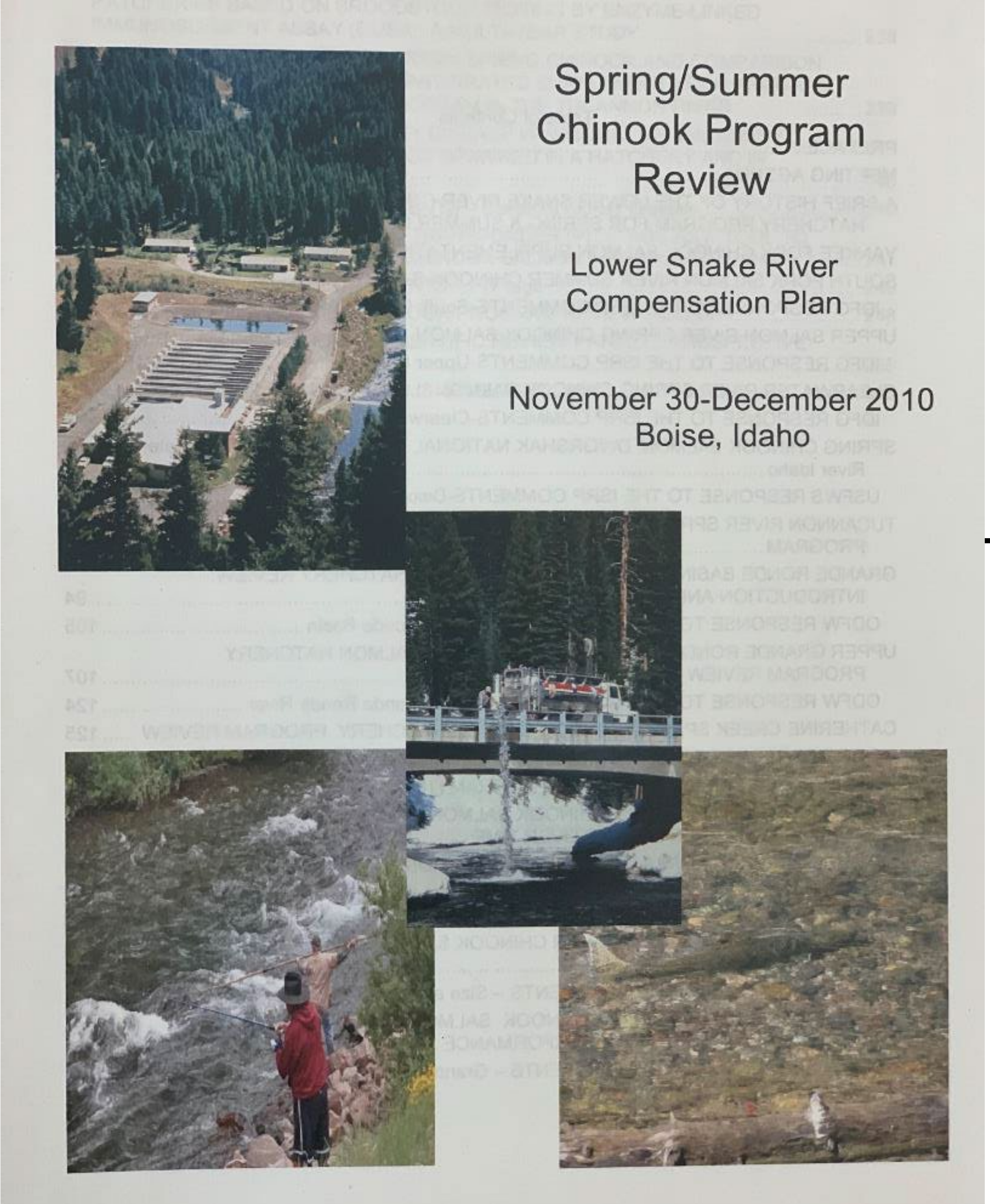
Key takeaways:
- ✓ 50% of the spawning population is below the weir
- ✓ Complete overlap in hatchery & natural spawning

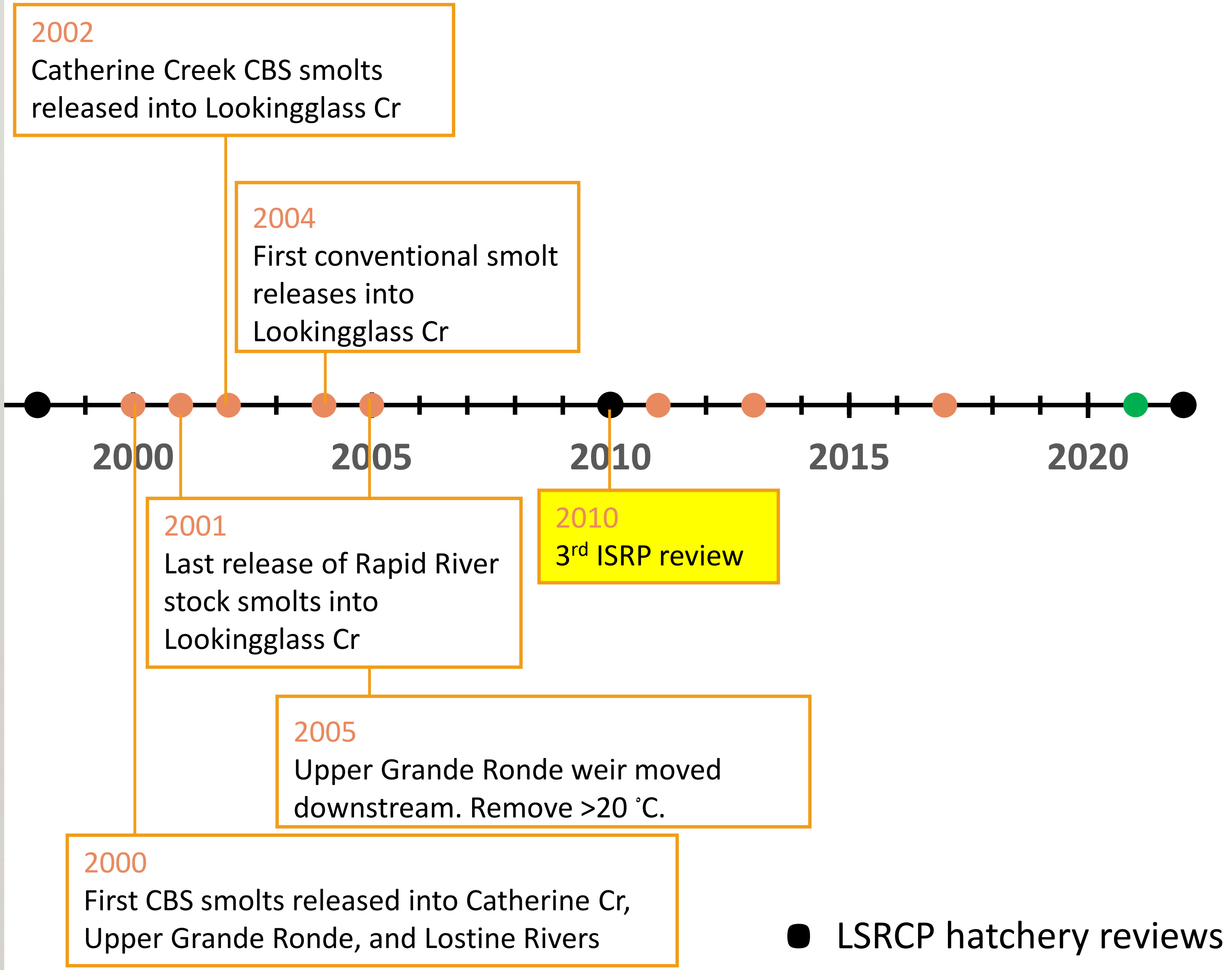
Characterizing the “early” program

1984-1993

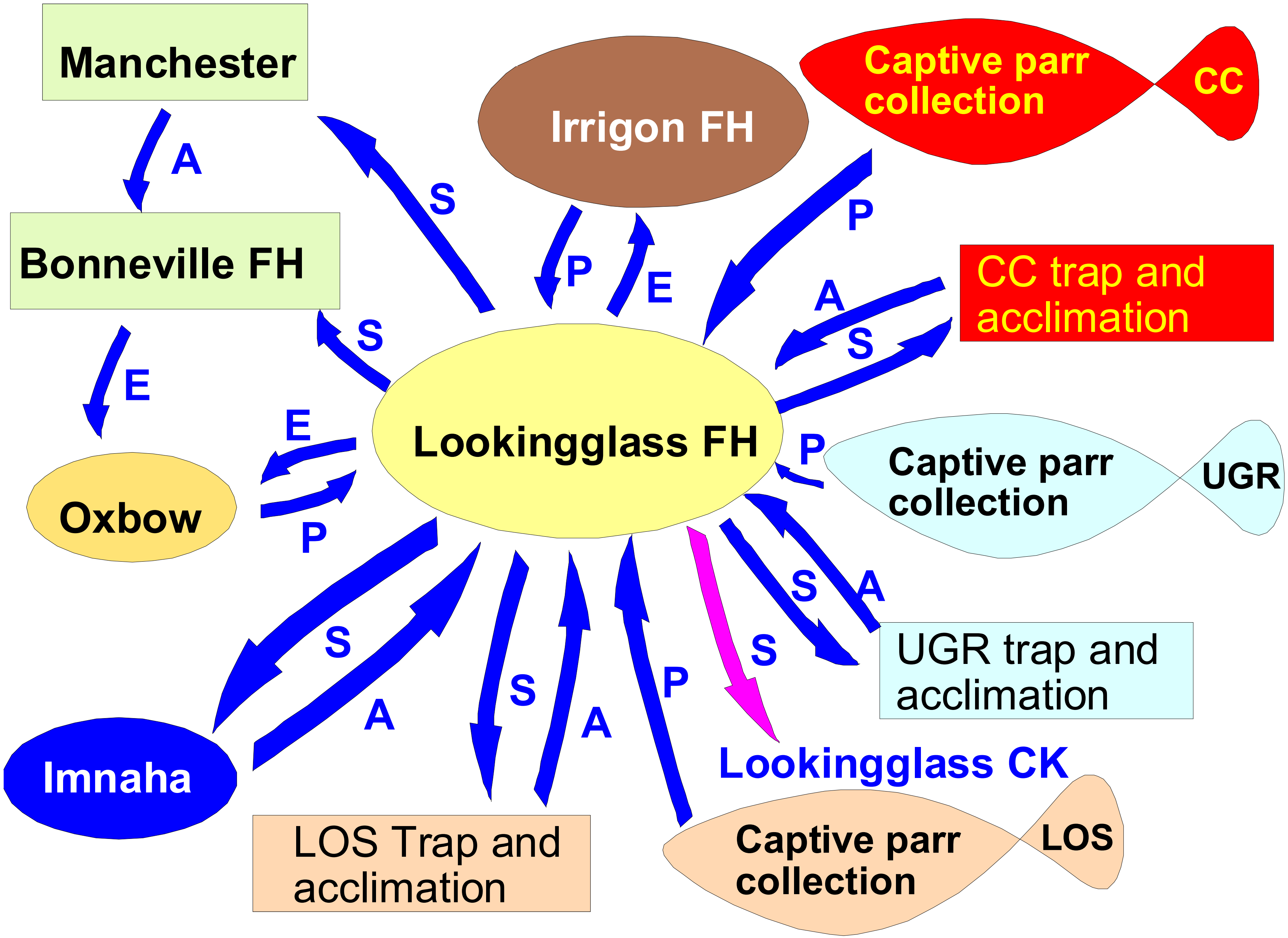


1998-2010: the 3rd program review

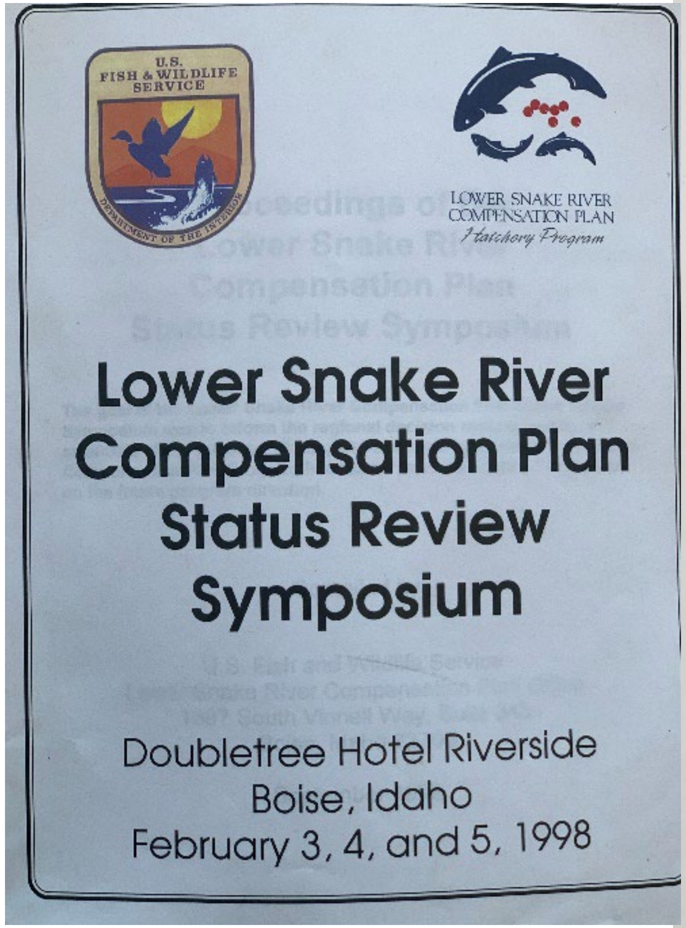




Program changes: late 1990's to about 2010

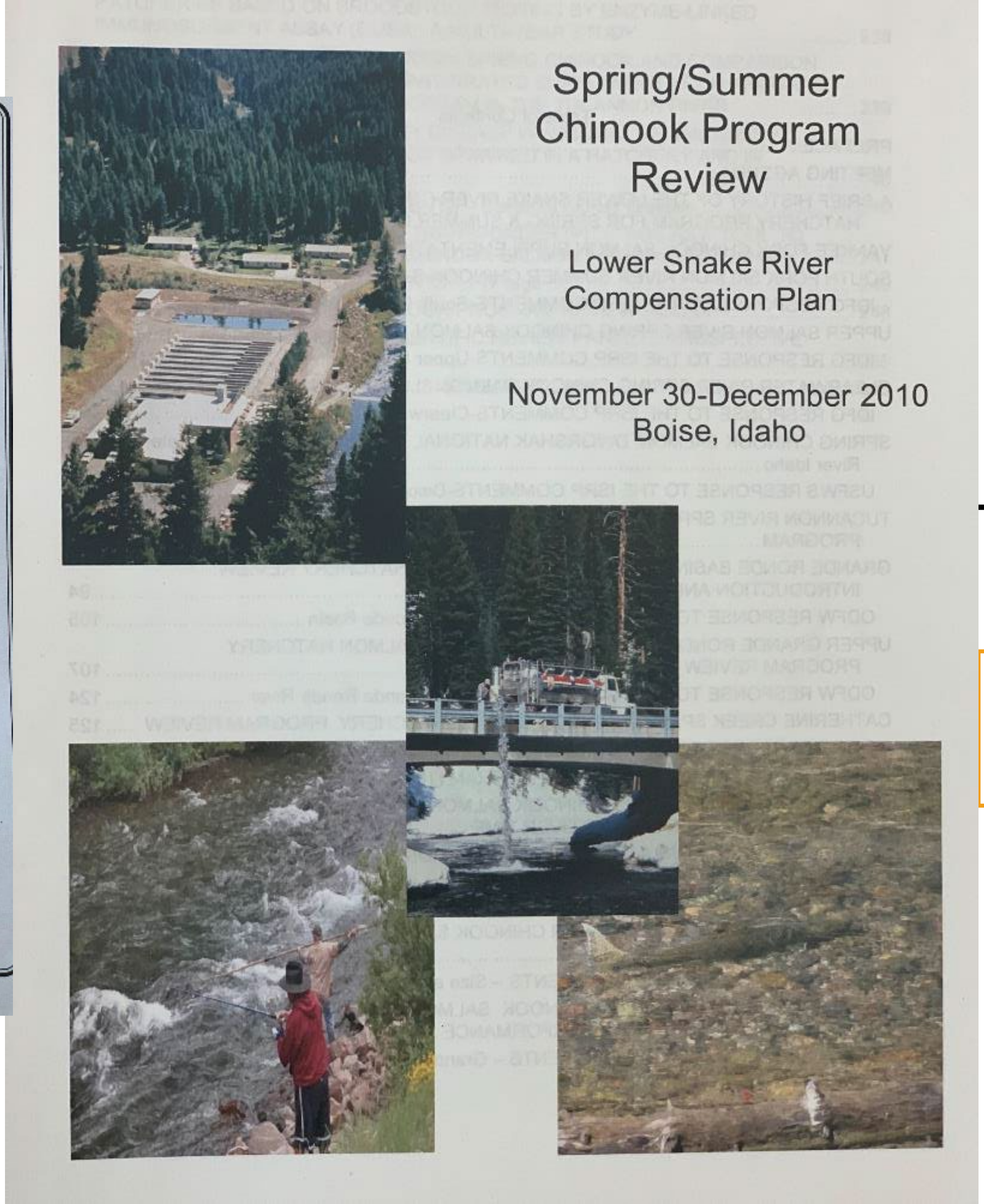


2010 to 2022: the 4th LSRCP program review + 2021 Habitat and Hatchery Review


U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
LOWER SNAKE RIVER COMPENSATION PLAN
Hatchery Program

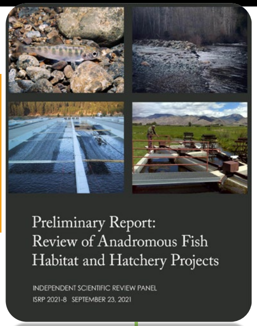
Lower Snake River Compensation Plan Status Review Symposium

Doubletree Hotel Riverside
Boise, Idaho
February 3, 4, and 5, 1998


Spring/Summer Chinook Program Review

Lower Snake River Compensation Plan

November 30-December 2010
Boise, Idaho



2011
Last CBS smolts released into Catherine Creek and Lostine River

2013
Last CBS smolts released into the Upper Grande Ronde

2010 2015 2020

2017
New bridge style weir installed on the Imnaha River

2018
Upper and Lower trap at Lookingglass

2022
Dec 13-15:
5th ISRP Review

● LSRCP hatchery reviews

Lookingglass Fish Hatchery: About 2013 to present

Figure 4 in written document

Key takeaways:

- All adult spawning and juvenile rearing at Lookingglass for **5 conventional** hatchery programs
  - All the eggs are in one hatchery

AD clips and CWTs

- 4 of 5 stocks **100% Ad clipped**
  - ✓ % CWT for these stocks ranges from **50-67%**
- **100% CWT (50% Ad clipped)**
  - ✓ Upper Grande Ronde

All stocks = PIT Tags for juvenile survival

- ✓ Imnaha and Catherine Creek = CSS (21,000 PIT tags)

Lookingglass Cr (ODFW, CTUIR, NPT)

- ✓ Adult trapping (2 traps):
- ✓ 250,000 smolts released directly LFH (rkm 3.7)
- 100% AD clipped ~48% CWT
- 5,000 PIT tags from LSRCP

Catherine Creek (ODFW, CTUIR)

- ✓ Adult trapping (rkm 32)
- ✓ One acclimated release
- 100% AD clipped ~67% CWT
- 21,000 PIT tags from CSS

Lookingglass Fish Hatchery (LFH)

- LSRCP mitigation hatchery
- Adult spawning & juvenile rearing
- ODFW, NPT, CTUIR, USFWS/BPA

Imnaha River (ODFW, NPT)

- ✓ Adult trapping (rkm 85)
- ✓ Acclimated & direct releases
- 100% AD clipped ~ 50% CWT
- 21,000 tags from CSS

Upper Grande Ronde (ODFW, CTUIR)

- ✓ Adult trapping (rkm 307)
- ✓ Two smolt acclimation periods
- ✓ 100% CWT; 50% AD clipped
- 2,000 PIT tags from LSRCP

Captive Broodstock/Safety Net (discontinued)

Last smolt releases occurred

- BY 2011 into Catherine Creek
- BY 2011 into the Lostine River
- BY 2013 into the Upper Grande Ronde River

Lostine River (ODFW, NPT)

- Adult trapping (rkm 1)
- Two smolt acclimation periods
- 100% AD clipped & ~ 50% CWT
- 6,000 PIT tags from LSRCP

Grande Ronde River Basin Chinook Hatchery Program Organization:

Figure 5 in written document

Chinook Spawning Ground Surveys
- ✓ Collaborative effort with ODFW, CTUIR, NPT, LSRCP and other agencies (e.g., USFS, Local watershed councils)

BPA/LSRCP

Genetic Monitoring
<u>Relative Reproductive Success</u>
- ✓ Catherine Creek
- ✓ Lostine River
- ✓ Lookingglass Creek

<u>Parentage-based tagging</u>
- ✓ Starting in 2008- All 5 hatchery stocks spawned at Lookingglass Fish Hatchery

BPA/LSRCP/NOAA/CRITFC

Juvenile Survival
- ✓ Estimates of natural origin juvenile production
- ✓ PIT tagging juveniles at rotary screw traps on the Lower Imnaha River, Upper Grande Ronde, Minam River, Catherine Creek, Lostine River, and Lookingglass Creek
- ✓ Snorkel and habitat surveys

BPA/LSRCP PSMFC CSS ODFW NPT CTUIR

LSRCP
- ✓ Operations and Maintenance
- ✓ Monitoring & Evaluation

ODW, NPT, CTUIR
USFWS/BPA

PIT tag technology
- ✓ Install and maintain instream interrogation sites
- ✓ Full life cycle: detections at adult and juvenile facilities, spawning grounds, in-stream
- ✓ Data submitted to PTAGIS

BPA/LSRCP ODFW NPT CTUIR

Captive Broodstock/ Safety Net
- ✓ Catherine Cr,,
- ✓ Upper Grande Ronde,
- ✓ Lostine R.

ODFW, NPT, CTUIR,NOAA, BPA

Adult – Juvenile Telemetry
- ✓ Adults: Upper Grande Ronde, Lostine River
- ✓ Juveniles: Catherine Creek, Upper Grande Ronde

NPT, CTUIR, ODFW, OWEB, BOR, Freshwater Trust, Trout Unlimited

Grande Ronde Endemic Supplementation Program
- ✓ CTUIR: Catherine Creek and Upper Grande Ronde adult traps and juvenile acclimation facilities
- ✓ NPT: Lostine River weir and juvenile acclimation facility
- ✓ ODFW/CTUIR: Lookingglass Creek adult trap

BPA/LSRCP

Imnaha Basin Supplementation
- ✓ Imnaha River adult trap and juvenile acclimation facility

BPA/LSRCP

Discontinued

Evaluation

Hatchery Production

Sliding Scale Management Framework

<u>Goal</u>

Save the salmon

High Demographic Risk

- Use captive broodstock
- No constraints on pHOS in nature
- No minimum pNOB

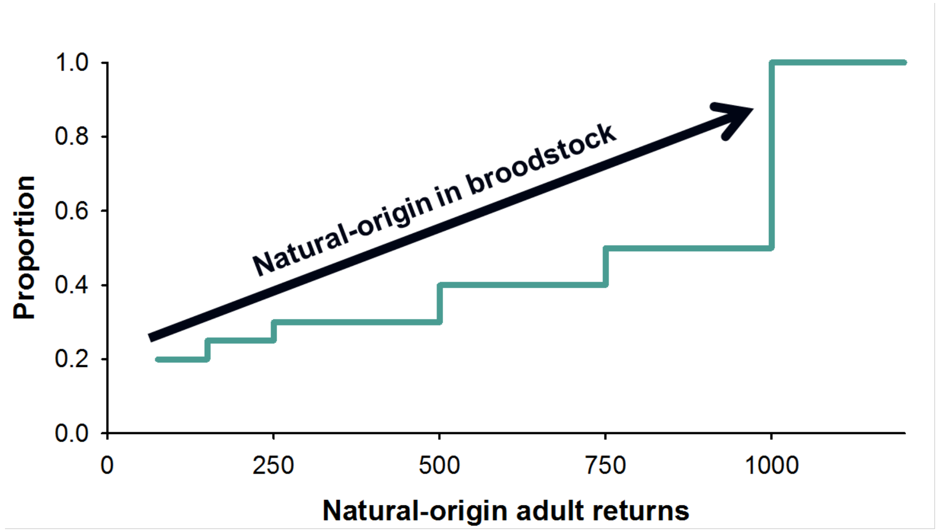
0 Threshold Escapement

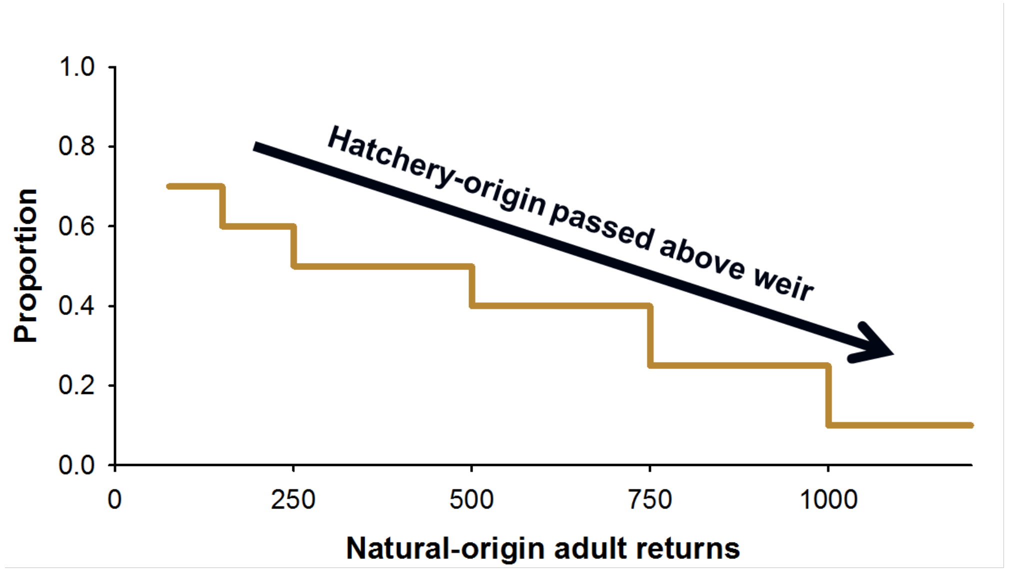
Manage Genetic Risk

- Phase out captive broodstock
- Use conventional broodstock
- Constrain % hatchery in nature
- Meet minimum % natural in broodstock

<u>Goal</u>

No hatchery support needed to maintain natural populations





Grande Ronde and Imnaha Basin Management: Objectives

Conservation

Minimize impacts of hatchery program on resident stocks of game fish

Maintain endemic wild populations in the Minam and Wenaha rivers

Restore and maintain natural populations in Grande Ronde and Imnaha basins

Mitigation

Reestablish tribal and recreation fishing

Establish adequate broodstock

Adult returns to Compensation area:
Grande Ronde Basin: 5,820 adullts
Imnaha Basin: 3,210 adults

Evaluation Objectives

Fish Culture

- Document and assess fish culture and hatchery operation practices.

Rearing & Release

- Determine optimum rearing and release strategies that will produce maximum survival to adult.

Escapement

- Determine total catch and escapement and assess if adult production meets mitigation goals.

Genetic integrity

- Determine the success of maintaining genetic integrity of endemic wild spring Chinook Salmon in the Minam and Wenaha rivers.

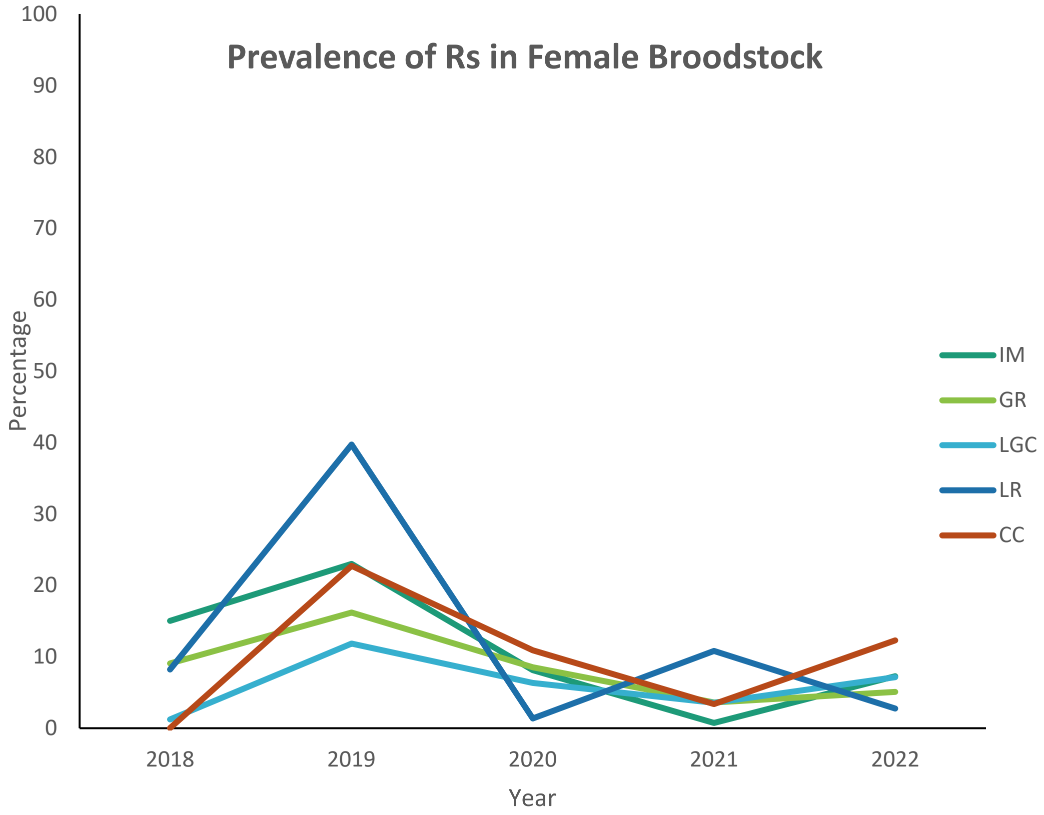
Objective 1: Document and assess fish culture and hatchery operation practices and performance

- Fish health monitoring
- Fecundity & females spawned
- Age structure (moved here from objective 6)
- Green egg-to-smolt
- Proportionate Natural Influence (PNI)
  - ✓ Proportion of Natural Origin Broodstock (pNOB)
  - ✓ Proportion Hatchery Origin Spawners (pHOS) in nature

Fish Health: Monthly adult and juvenile monitoring

- Bacteriology
  - ✓ Bacterial cultures
  - ❖ Largest and **most consistent challenge** involves the management of *Renibacterium salmoninarum,* the causative agent of **bacterial kidney disease***.*
- Virology
  - Cell culture for culturable viruses.
- Parasitology
  - ❖ Ectoparasites increasing regionwide
    - ➢ Increase of outbreaks in NE Oregon.
    - ➢ Increased staff time and resources are being devoted to this problem.

Bacterial Kidney Disease Management



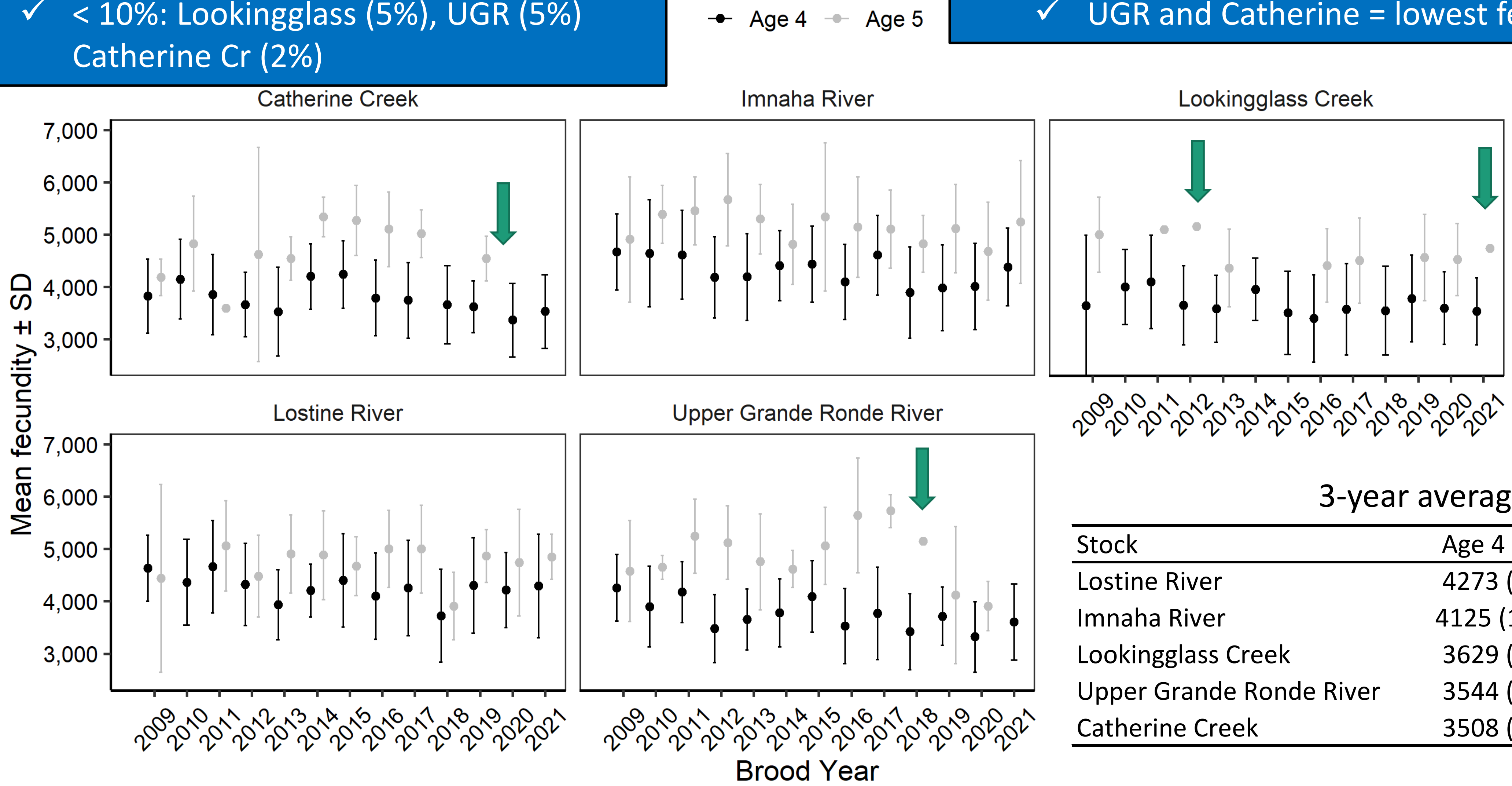
- Broodstock culling program
  - ✓ Female ELISA OD value >0.2 = culled.
- Monthly juvenile exams
  - ✓ a visual and microbiological survey for bacterial presence & disease signs.
- Regular communication
  - ✓ appropriate response to pathogen and disease presence
  - ➢ Culling & medication

Broodstock fecundity by Age

Key takeaways for last 3 years:

1) Low % of age 5 females in the broodstock
- ✓ Lostine (20%), Imnaha (12%),
- ✓ < 10%: Lookingglass (5%), UGR (5%) Catherine Cr (2%)

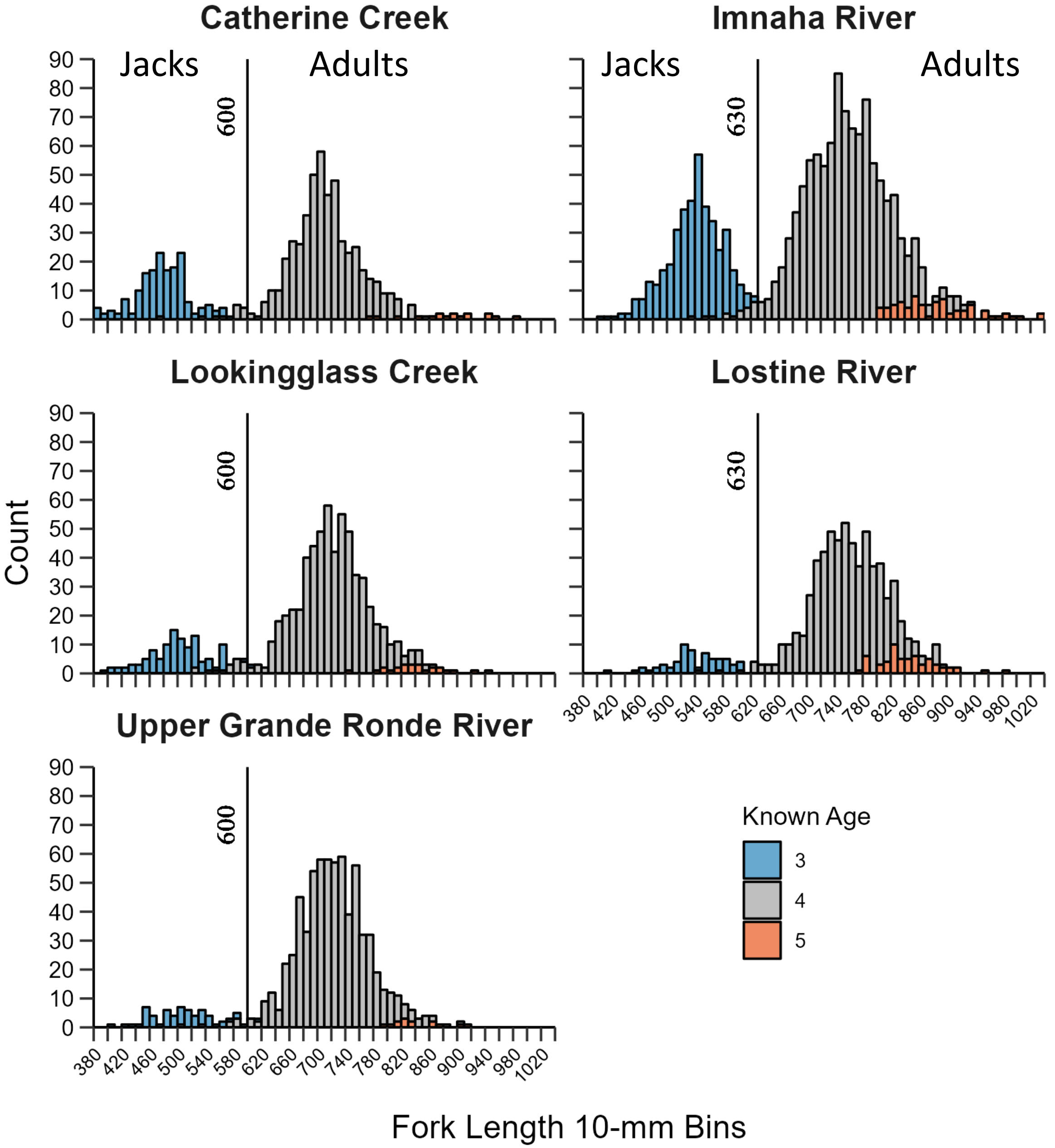
2) Age 5 > Age 4
- ✓ Lostine & Imnaha = highest fecundity (>4,100)
- ✓ UGR and Catherine = lowest fecundity



3-year average

Stock	Age 4 (*N*)	Age 5 (*N*)	Total
Lostine River	4273 (59)	4822 (15)	74
Imnaha River	4125 (121)	5037 (16)	137
Lookingglass Creek	3629 (74)	4565 (6)	80
Upper Grande Ronde River	3544 (76)	4024 (4)	80
Catherine Creek	3508 (52)	4545 (1)	53

Known Ages: An example with hatchery returns (2017-2021)

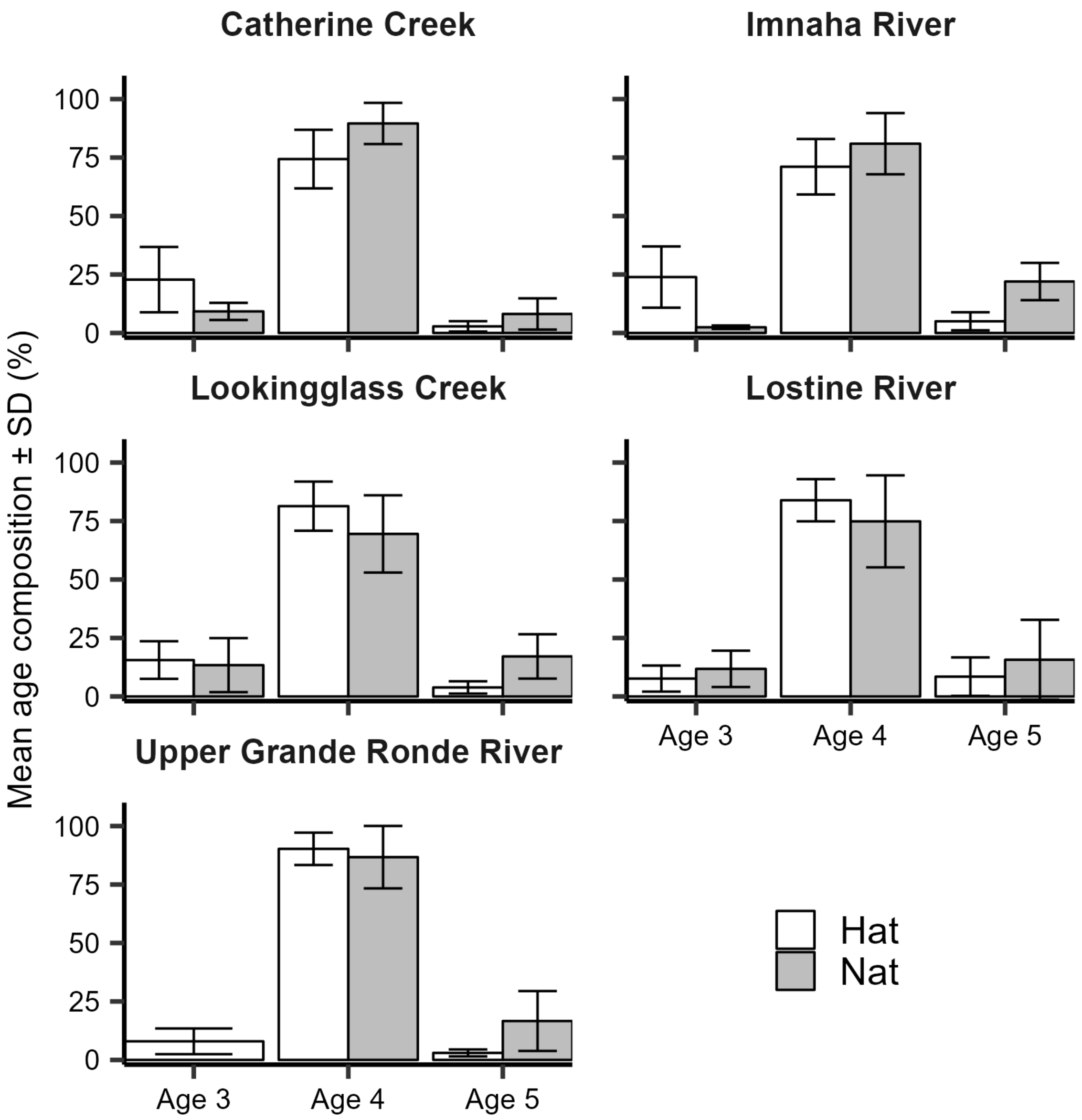


Key takeaways

Known Ages are used in Age-Length Keys
- ✓ Coded-wire-tag
- ✓ Genetic (PBT)
- ✓ PIT tags
- ✓ Scales
- ✓ Fin Rays (new for 2021)

- ➢ Complete overlap in Age 4 and Age 5
- ➢ Low numbers of Age 5
- ➢ Age 3 "jack" break is not perfect
  - How to define a "jack"
  - Fork length or age?

Mean Age Composition (2017-2021)

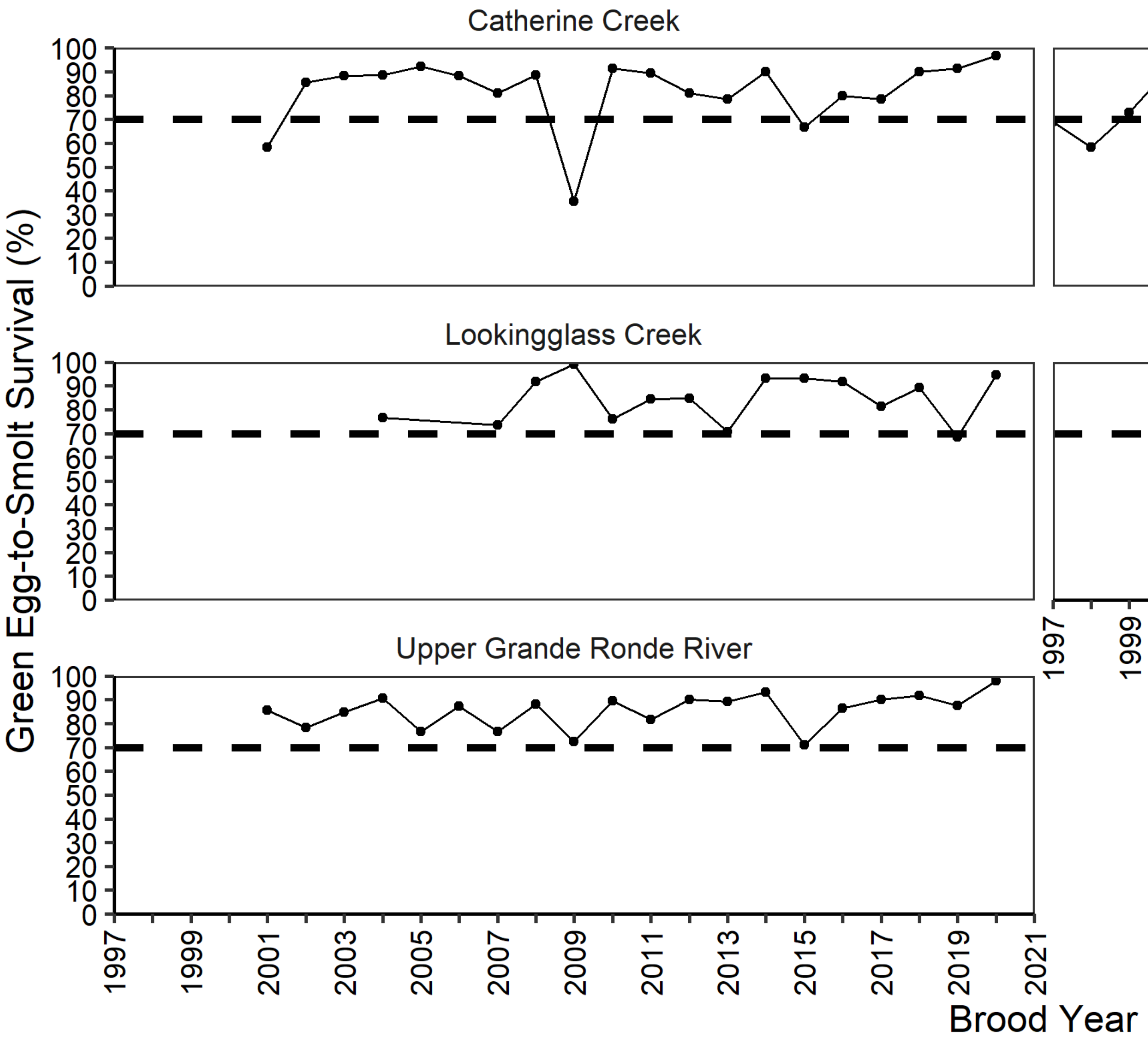


Key takeaways
- % Age 5 Natural > % Age 5 Hatchery

- Hatchery
  - % Age 4 > % Age 3 > % Age 5

- Natural
  - % Age 4> % Age 5 > % Age 3

Conventional green egg-to-smolt (BY 1997-2021)



Key takeaways for last 10 years:

1) Usually > 70%
2) BY2009: well water failure at Lookingglass + leaves clogging water intake = facility health is important

PNI: Primary, Contributing, & Stabilizing Populations

Proportionate Natural Influence = pNOB/(pNOB + pHOS)

- **pNI** of **<0.5** hatchery selective forces dominate
- **pNI** of >**0.5** natural selective forces dominate

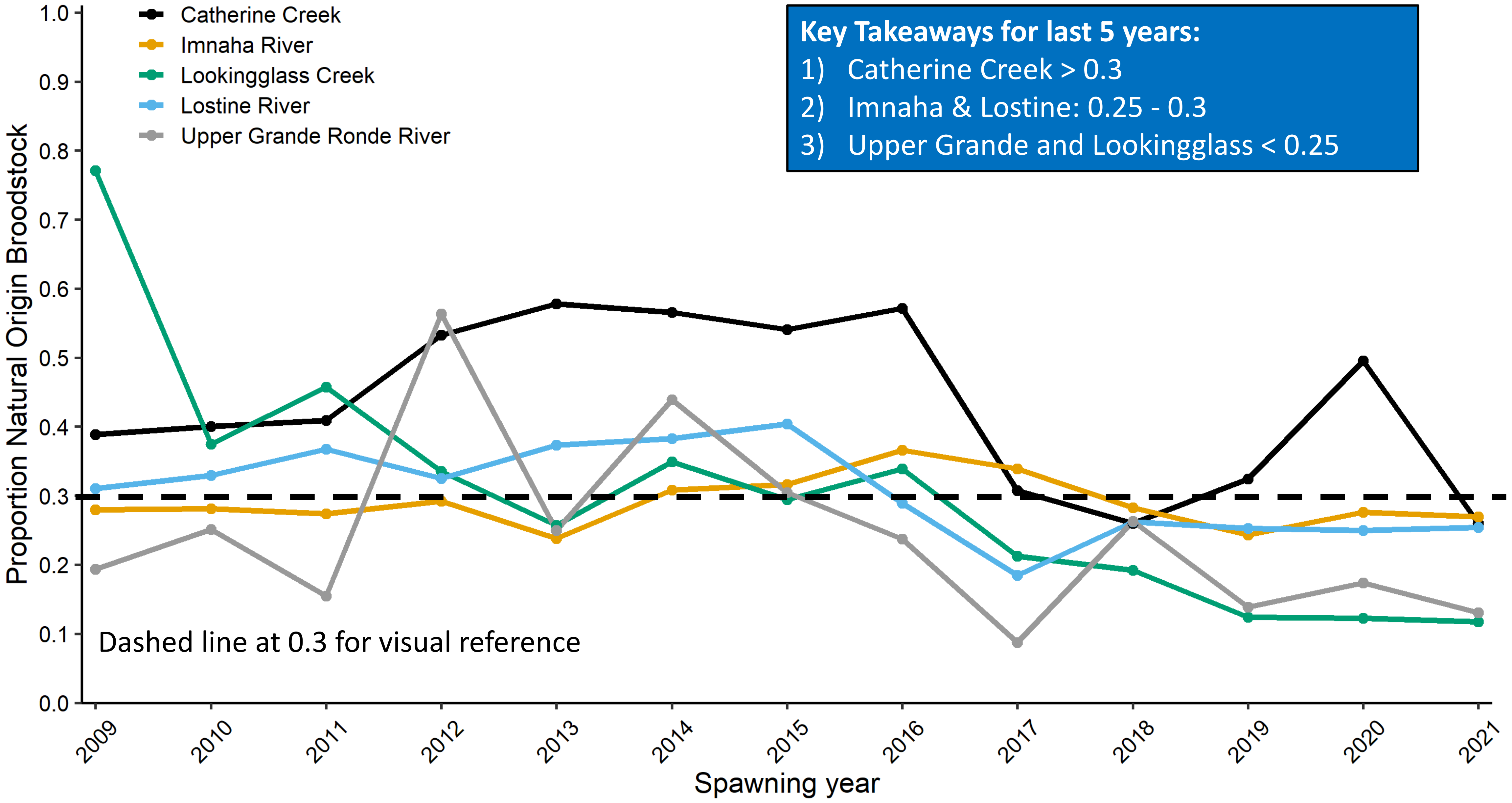
Table 1. Population designations for the Grande Ronde/Imnaha Spring Chinook MPG and HSRG broodstock criteria achieved for each population under current conditions and the HSRG recommended hatchery management solution.

Population	Designation[1]	HSRG Criteria Met[2]	
		Current	HSRG Solution
3-Grande Ronde_Wenaha Spring Chinook	**Primary**	**Primary**	**Primary**
6-Grande Ronde_Minam Spring Chinook	**Primary**	**Contributing**	**Primary**
7-Grande Ronde_Lostine Spring Chinook	**Primary**	**Contributing**	**Primary**
9-Imnaha Spring-Summer Chinook	**Primary**	Stabilizing	**Primary**
Grande Ronde_Catherine Creek Spring Chinook	**Primary**	Stabilizing	**Primary**
Grande Ronde_Lookingglass Creek Spring Chinook	Stabilizing	Stabilizing	Stabilizing
Grande Ronde_Upper Grande Ronde Spring Chinook	Stabilizing	Stabilizing	Stabilizing

[1] Using the naming protocol of the Lower Columbia River Salmon Recovery Plan (LCFRB 2004), populations were classified based on information provided to the HSRG as Primary, Contributing, or Stabilizing. These designations are meant to reflect the conservation importance of a population within the MPG from most important (Primary- bold, red), to moderately important (Contributing-bold, blue), to least important (Stabilizing).

[2] The HSRG developed criteria for hatchery influence for the three population designations from low influence (Primary), moderate influence (Contributing) to high influence (Stabilizing).

Proportion Natural Origin Broodstock (pNOB) Ages 3-5

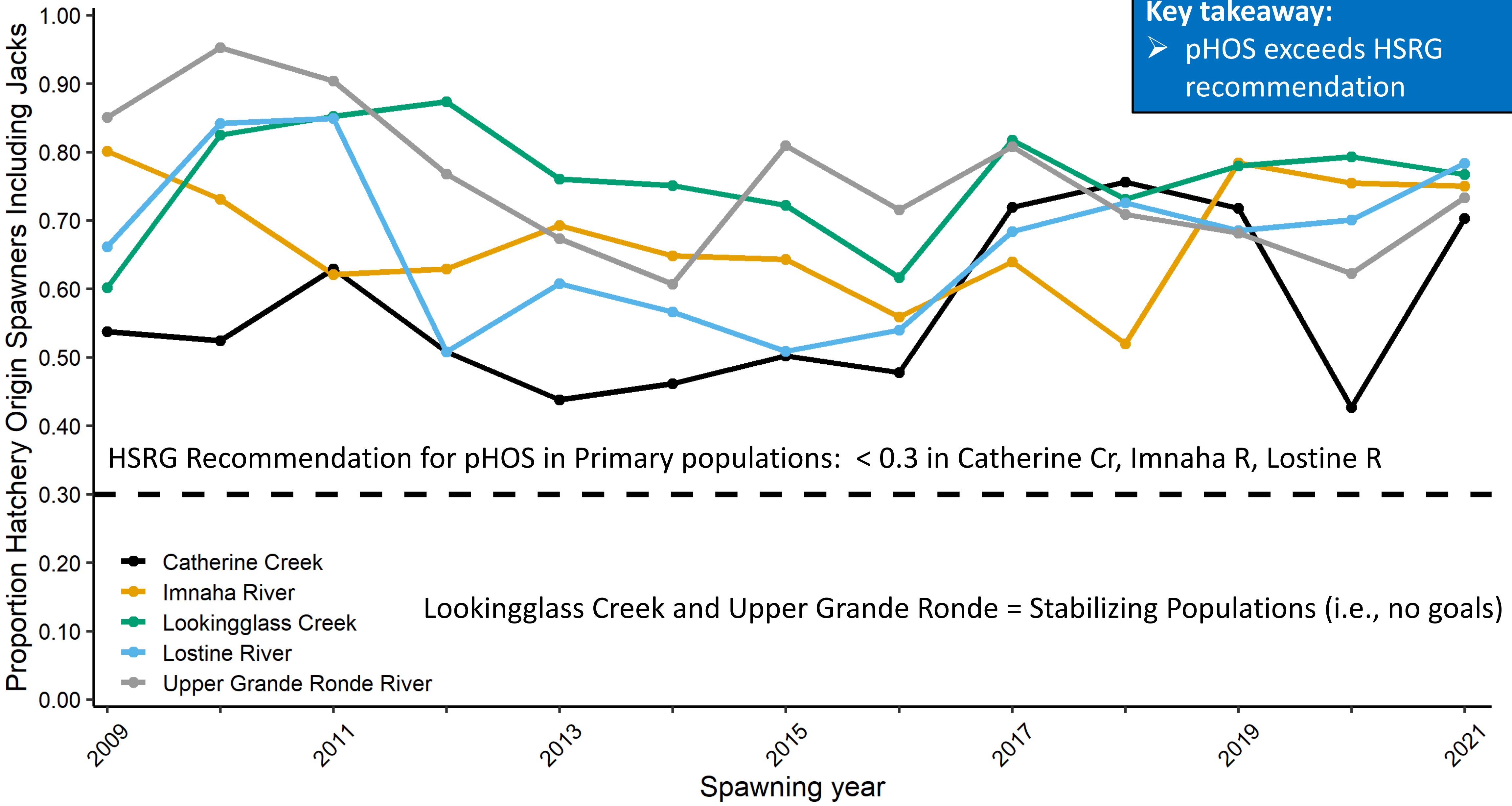


Key Takeaways for last 5 years:

1) Catherine Creek > 0.3
2) Imnaha & Lostine: 0.25 - 0.3
3) Upper Grande and Lookingglass < 0.25

Proportion Hatchery Origin Spawners (pHOS) Ages 3-5 in Nature

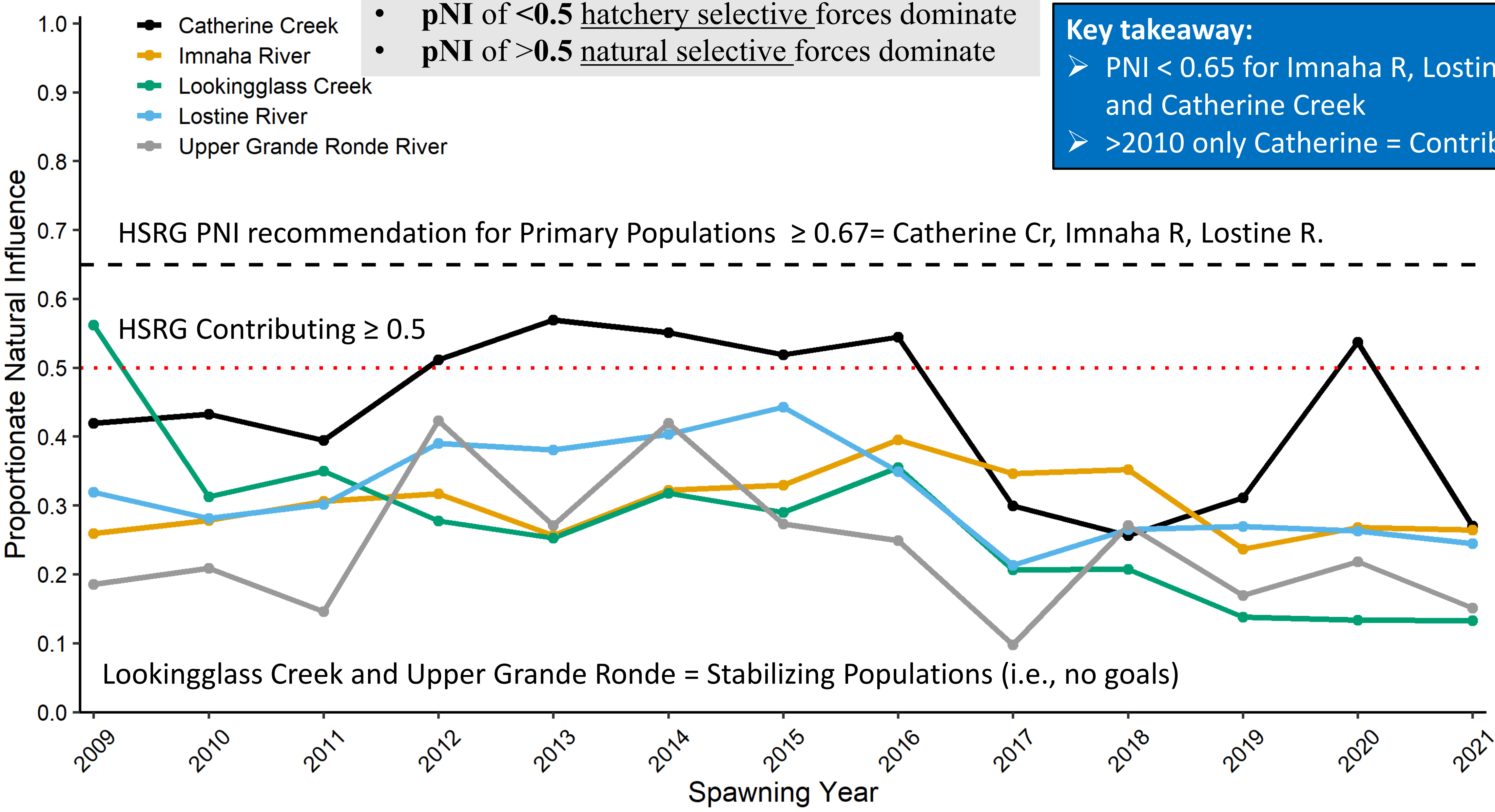
Key takeaway:
- pHOS exceeds HSRG recommendation



Proportionate Natural Influence: (PNI = pNOB/(pNOB+pHOS)

- **pNI** of **<0.5** hatchery selective forces dominate
- **pNI** of >**0.5** natural selective forces dominate

Key takeaway:
- PNI < 0.65 for Imnaha R, Lostine R., and Catherine Creek
- >2010 only Catherine = Contributing

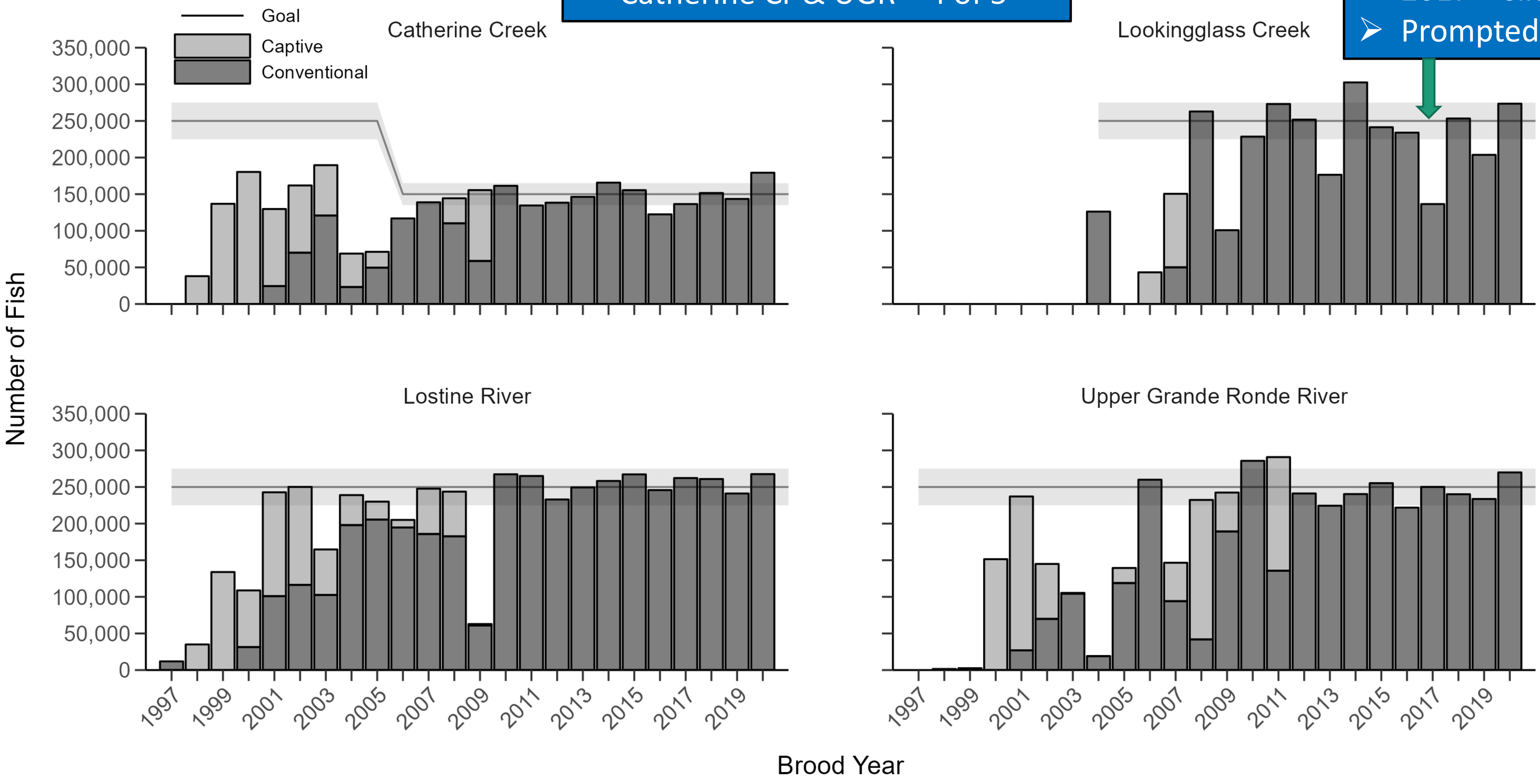


Objective 2: Determine optimum rearing and release strategies

- Smolt release goals
  - ✓ ± 10%
- Smolt release strategies
- Juvenile survival to Lower Granite Dam
  - ✓ Based on PIT tag detections

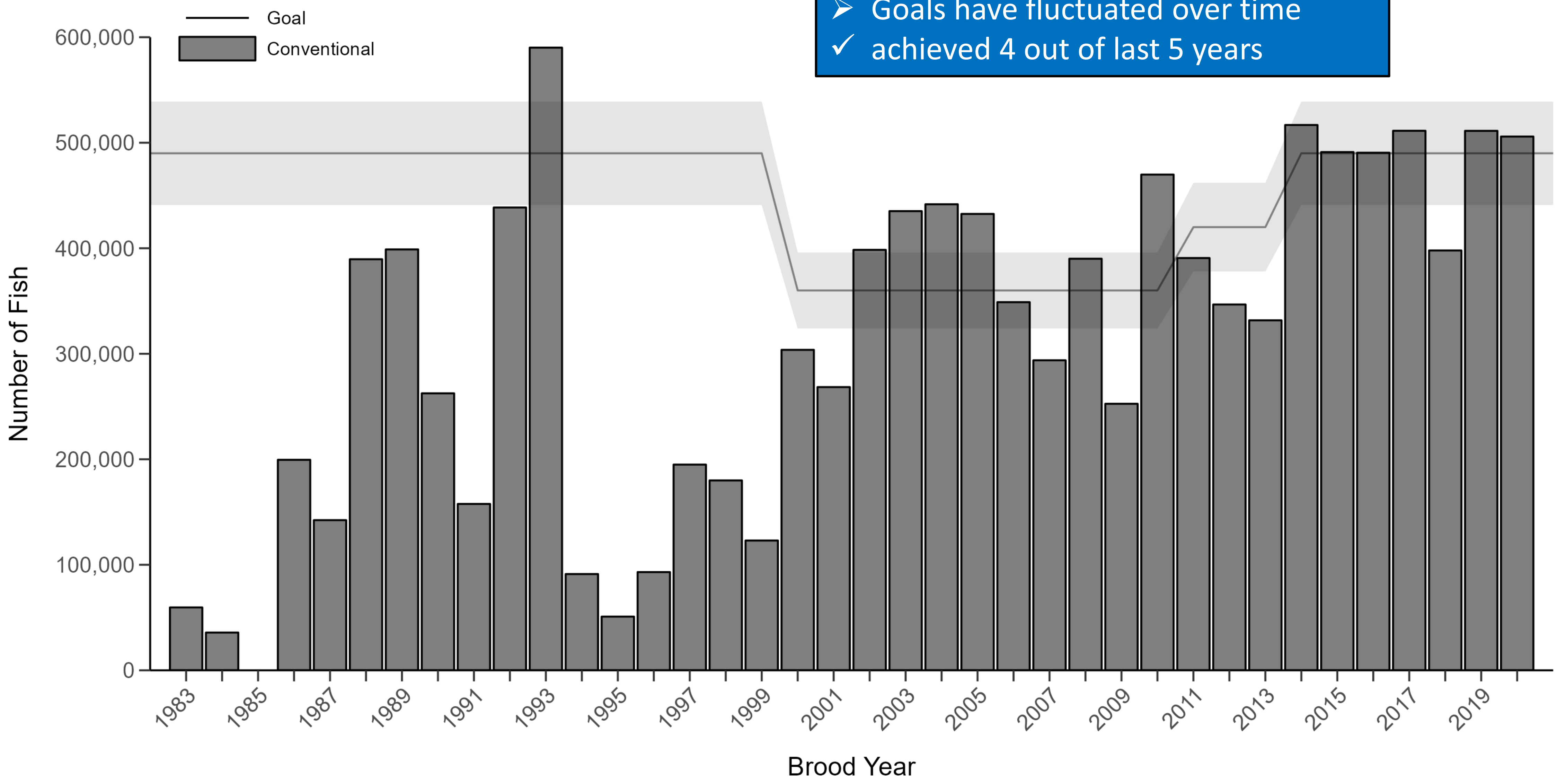
Grande Ronde Basin Programs: Smolt Release Goals ± 10%

Key takeaways for last 5 years:
- ✓ Lostine 5 of 5
- ✓ Catherine Cr & UGR = 4 of 5



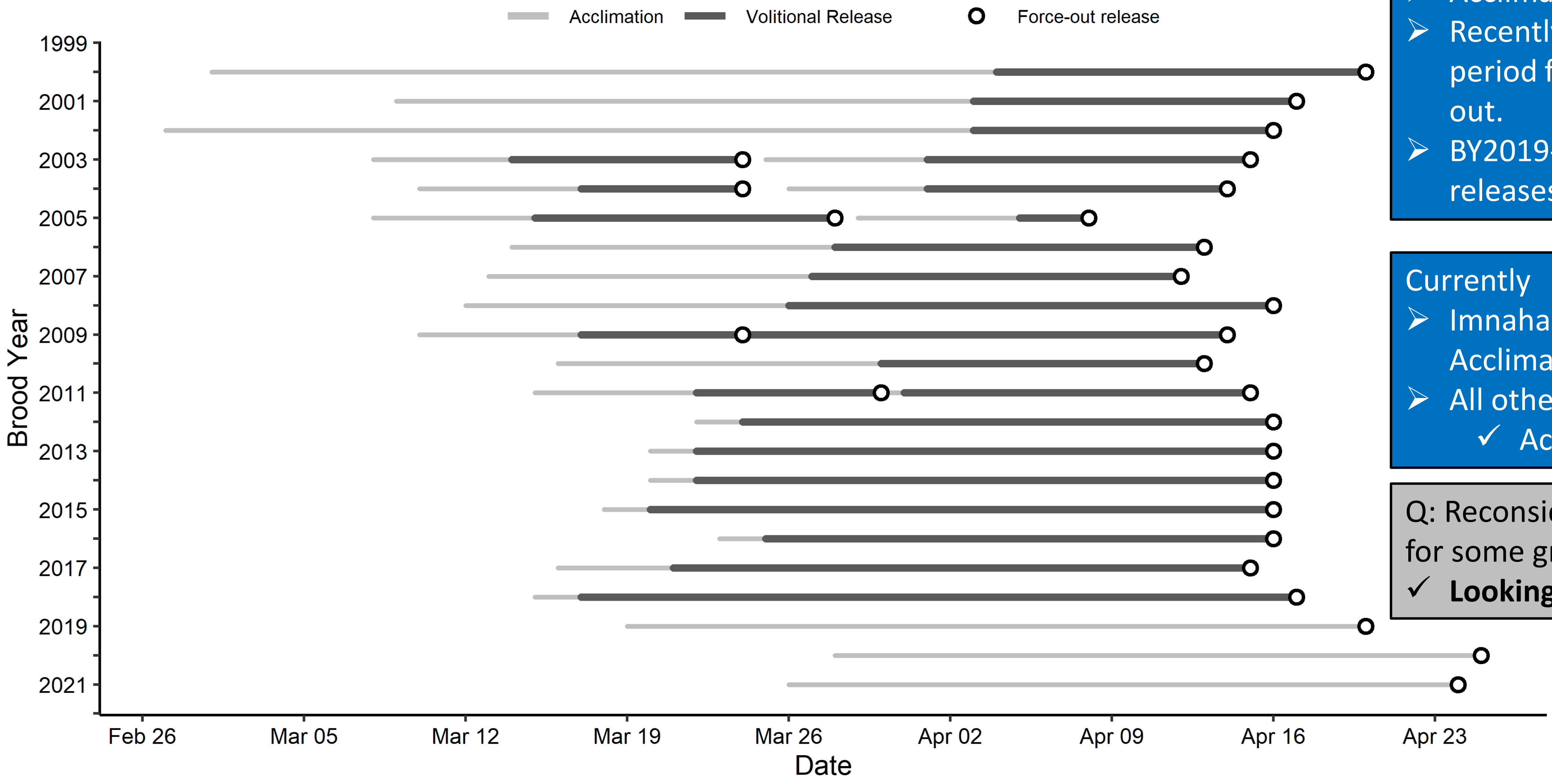
Imnaha Basin Programs: Smolt Release Goals

Key takeaways:
- ➢ Goals have fluctuated over time
- ✓ achieved 4 out of last 5 years



Catherine Creek: a case study to understand changes in smolt releases

- 2 acclimation ponds + volitional & forced releases + 1 acclimation period



Key takeaways:

- Acclimated & Volitional
- Recently, a single acclimation period followed by a force out.
- BY2019-2021 = forced releases at later date

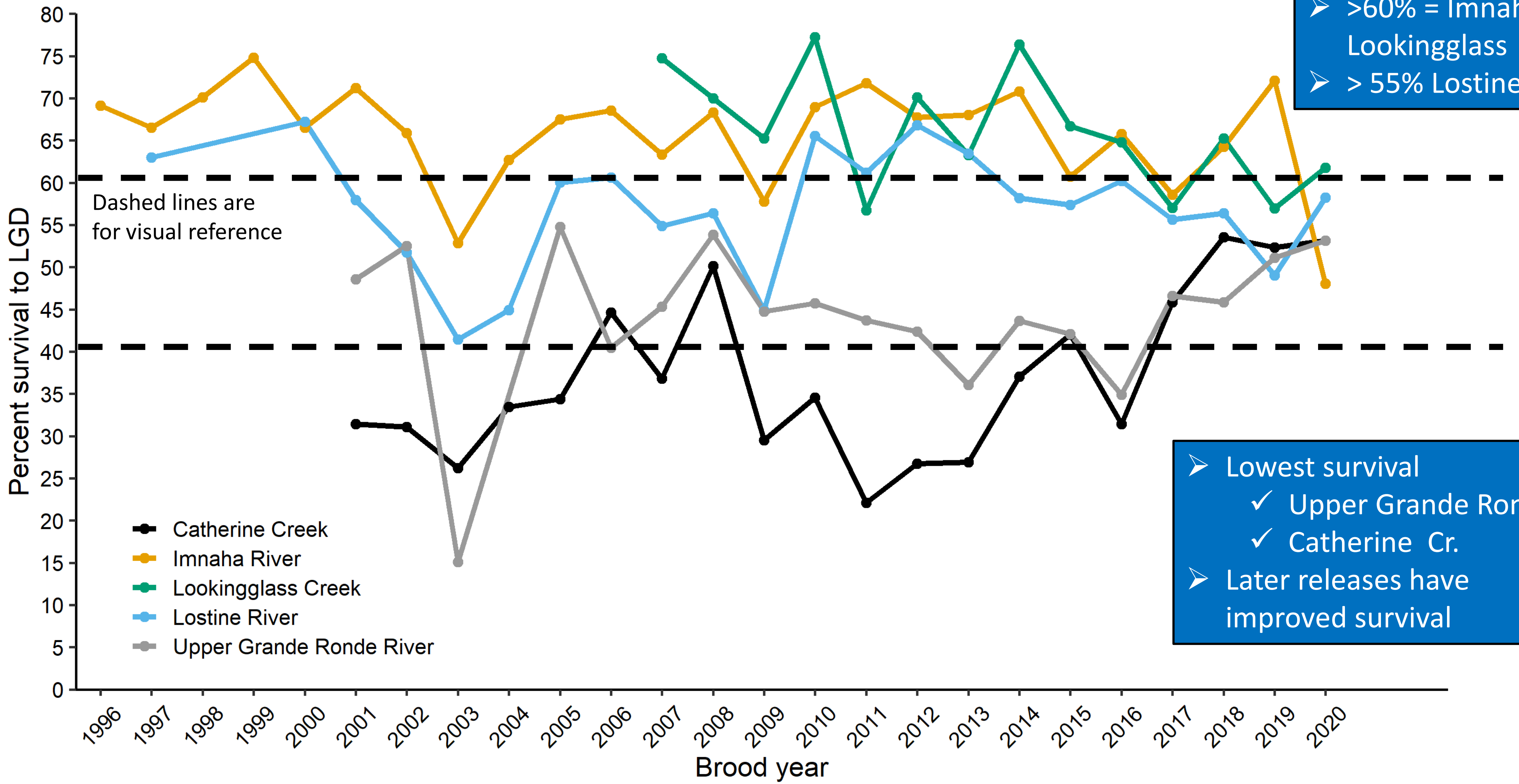
Currently

- Imnaha: Direct stream & Acclimate then Force-out
- All others:
  - ✓ Acclimate & Force-out

Q: Reconsider volitional releases for some groups?

✓ **Lookingglass Cr**

Conventional Hatchery Program: Survival to Lower Granite Dam

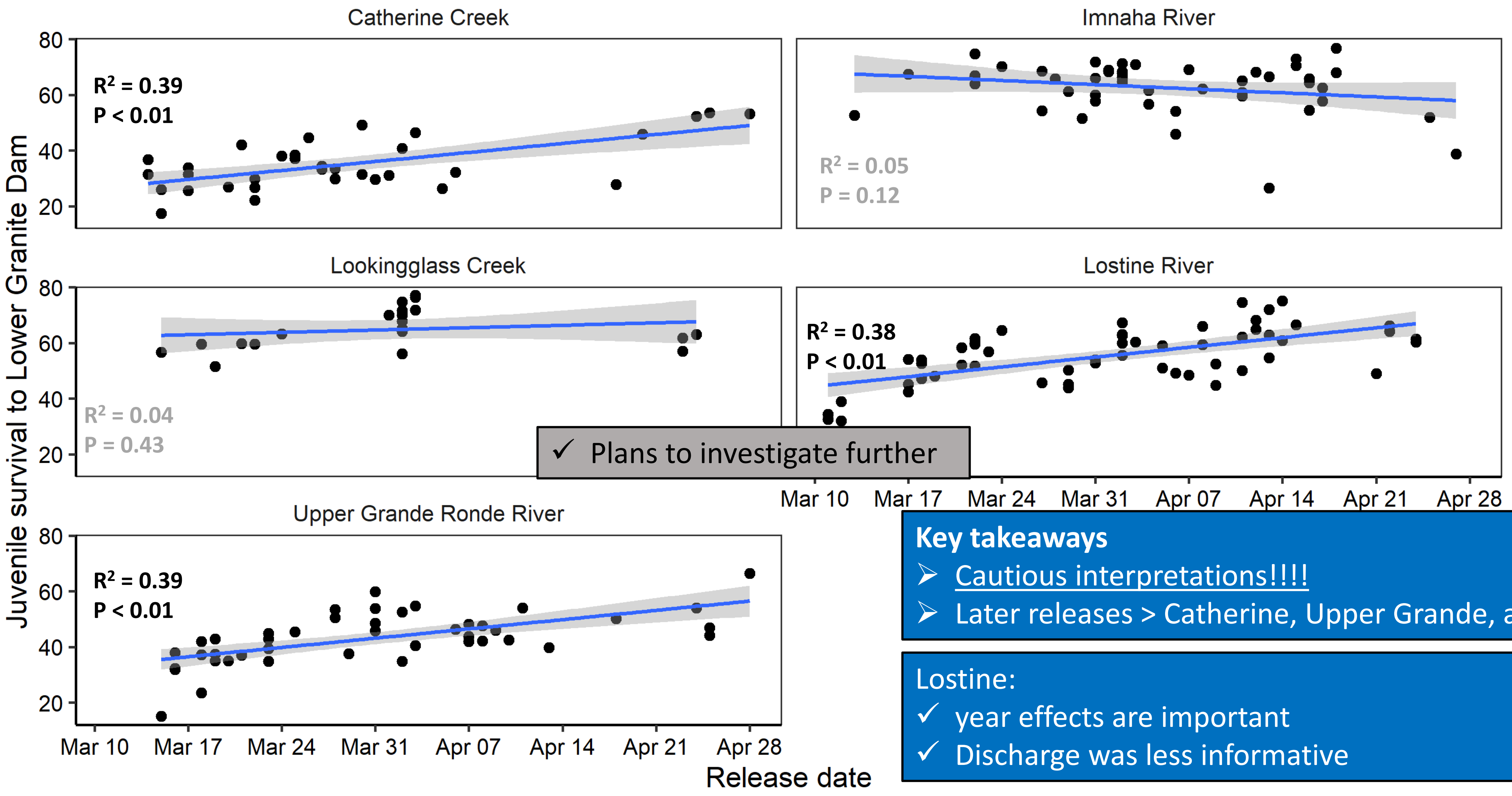


Key takeaways

- >60% = Imnaha R., Lookingglass
- > 55% Lostine

- Lowest survival
  - ✓ Upper Grande Ronde
  - ✓ Catherine Cr.
- Later releases have improved survival

Release date vs juvenile survival to Lower Granite Dam: a simplified story



✓ Plans to investigate further

Key takeaways

- ➢ Cautious interpretations!!!!
- ➢ Later releases > Catherine, Upper Grande, and Lostine

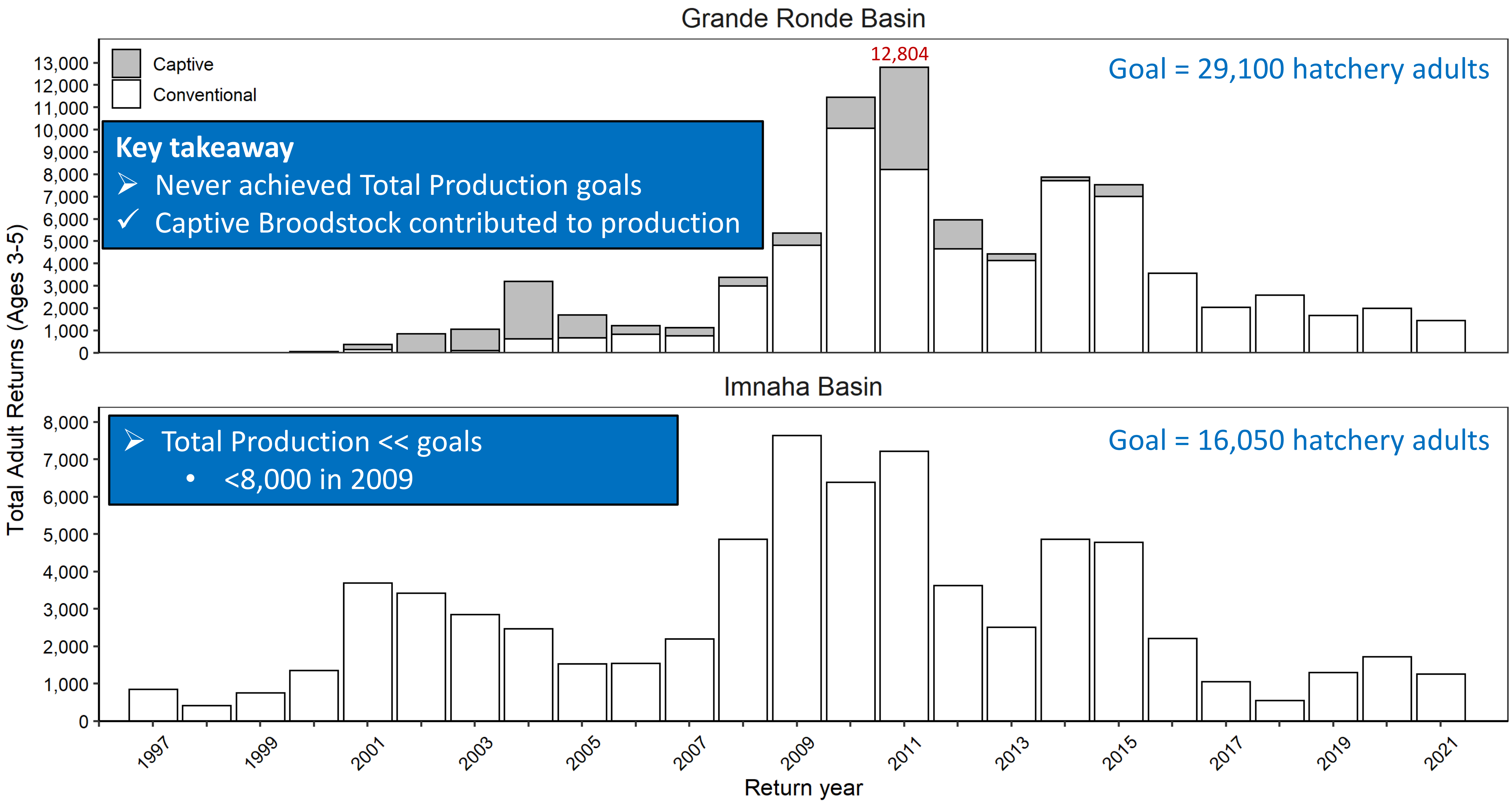
Lostine:

- ✓ year effects are important
- ✓ Discharge was less informative

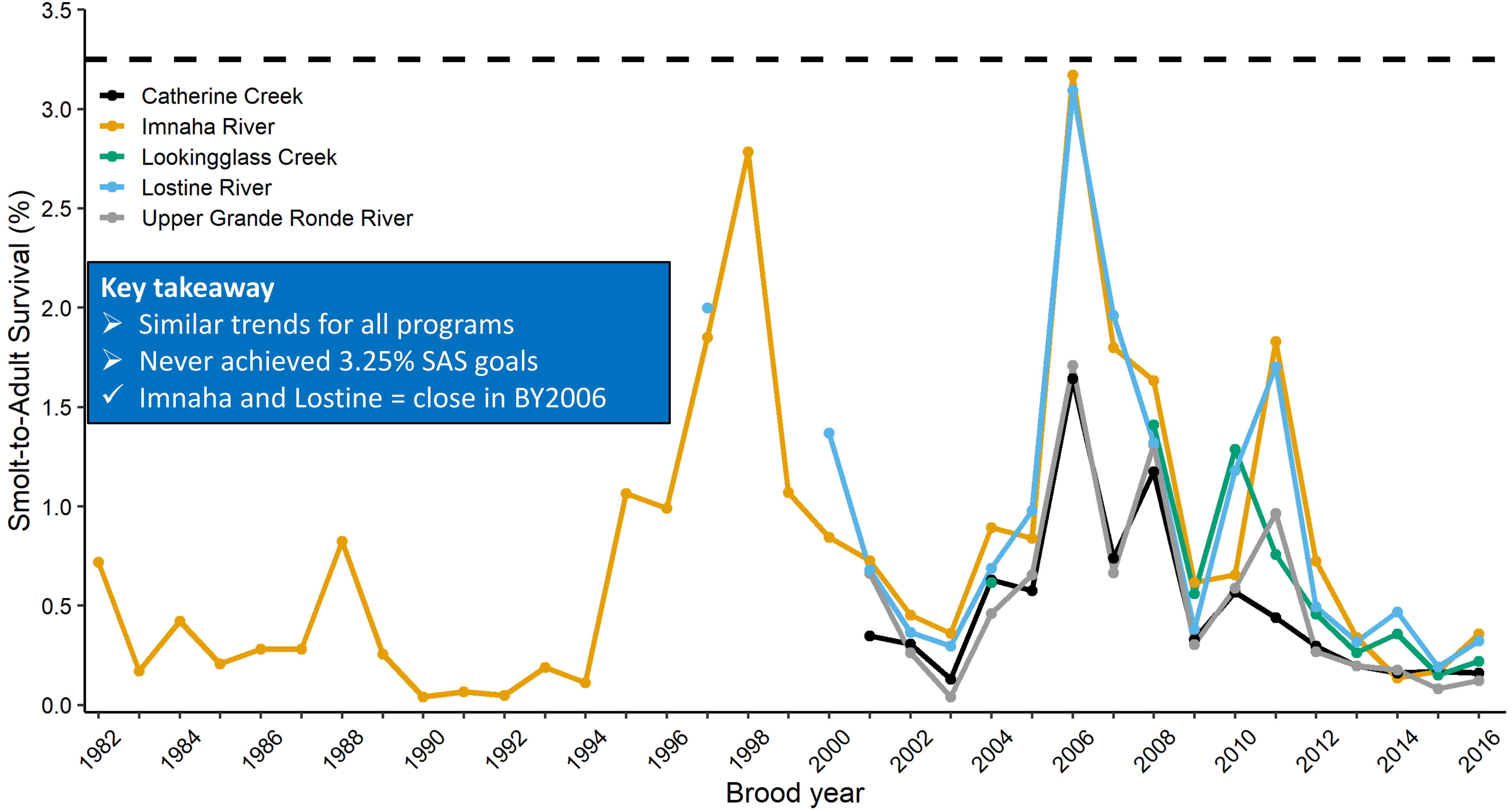
Objective 3: Determine total catch and escapement, smolt survival, smolt-to-adult survival, and assess if adult production meets mitigation goals

- Catch and Escapement
  - ✓ relies on coded-wire tag data
- Total adult production
  - ✓ smolt-to-adult survival (SAS) rates
- Compensation area returns
  - ✓ smolt-to-adult return (SAR) rates
  - ✓ Juvenile survival vs SAR

Total Hatchery Adult (ages 3-5) Production (4:1 catch to escapement goal)



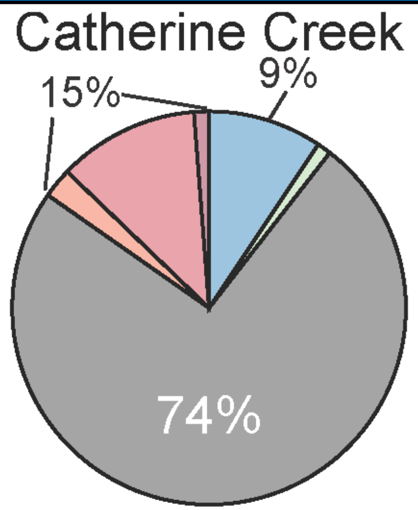
Smolt-to-Adult-Survival (3.25%)

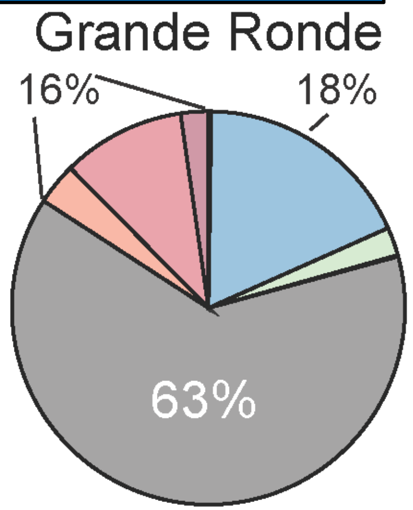


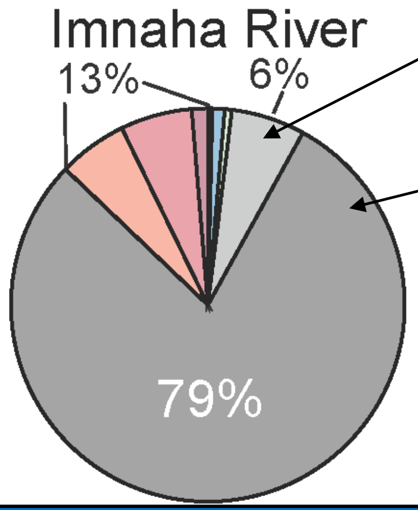
Catch and Escapement: 5-year average (BY 2012-2015)

Grande Ronde Basin
- Most in-basin strays go into Lookingglass Cr.
- Lookingglass goes everywhere

Based on CWT data in Pacific States RMIS database, not PBT based

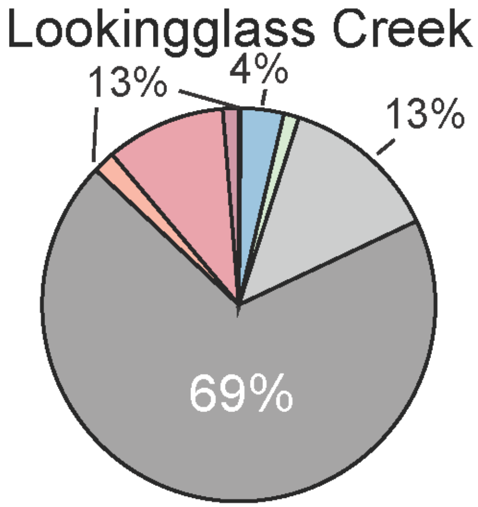


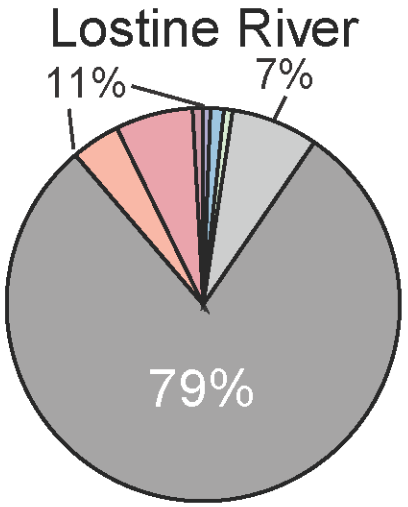




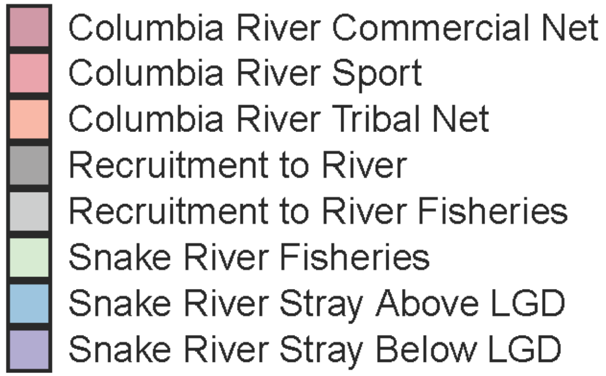
$$\frac{\text{Tributary fisheries} + \text{Total Returns to the river (minus fisheries)}}{\text{Total Escapement}}$$

Key takeaway
- Tributary returns comprise > 80%
- Tributary fisheries ≤ 13% ; only 3 of 5 stock



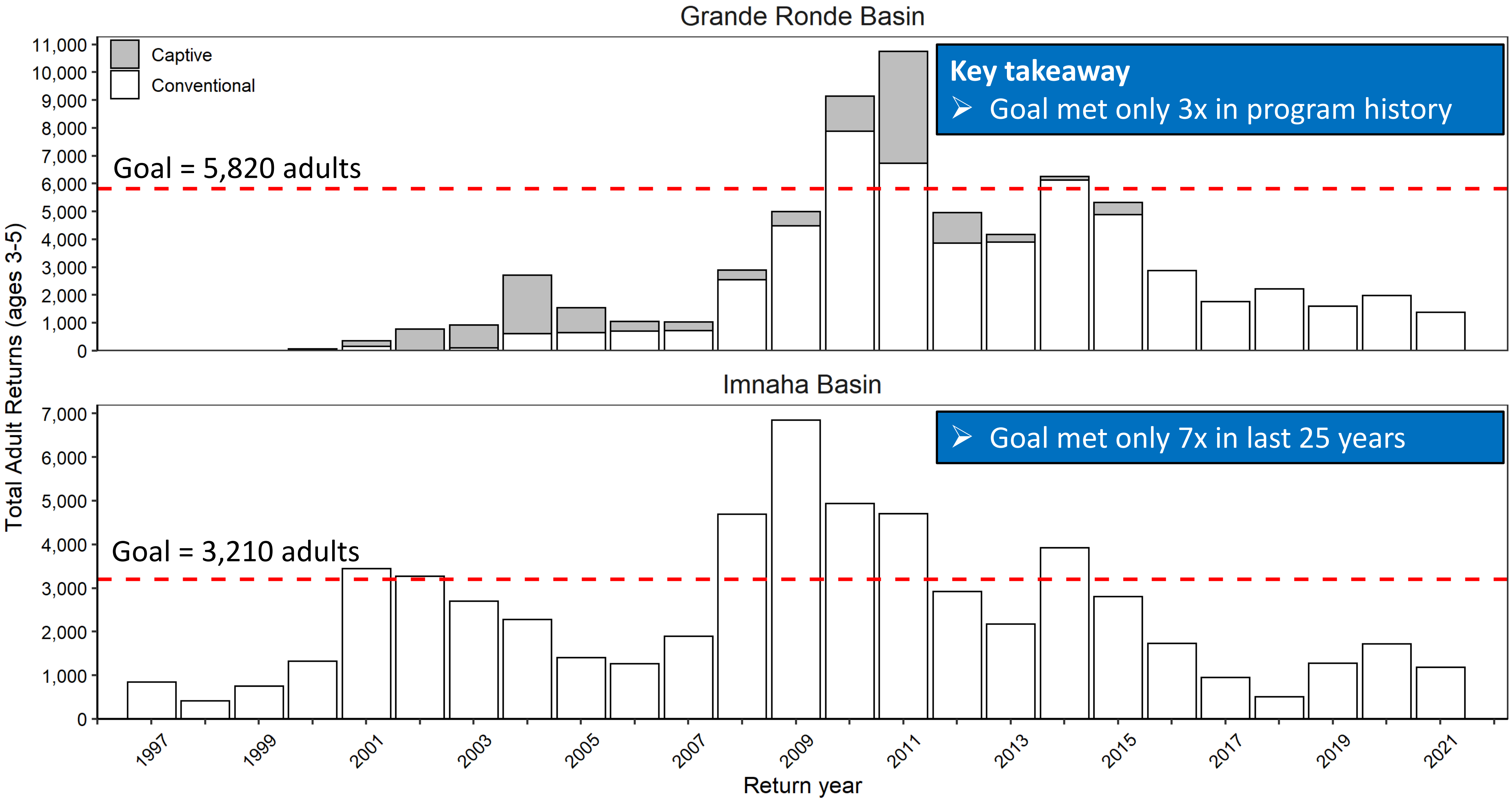


Imnaha Basin
- Strays above Lower Granite <1%



- All stock contribute to Columbia fisheries (≤ 16%)

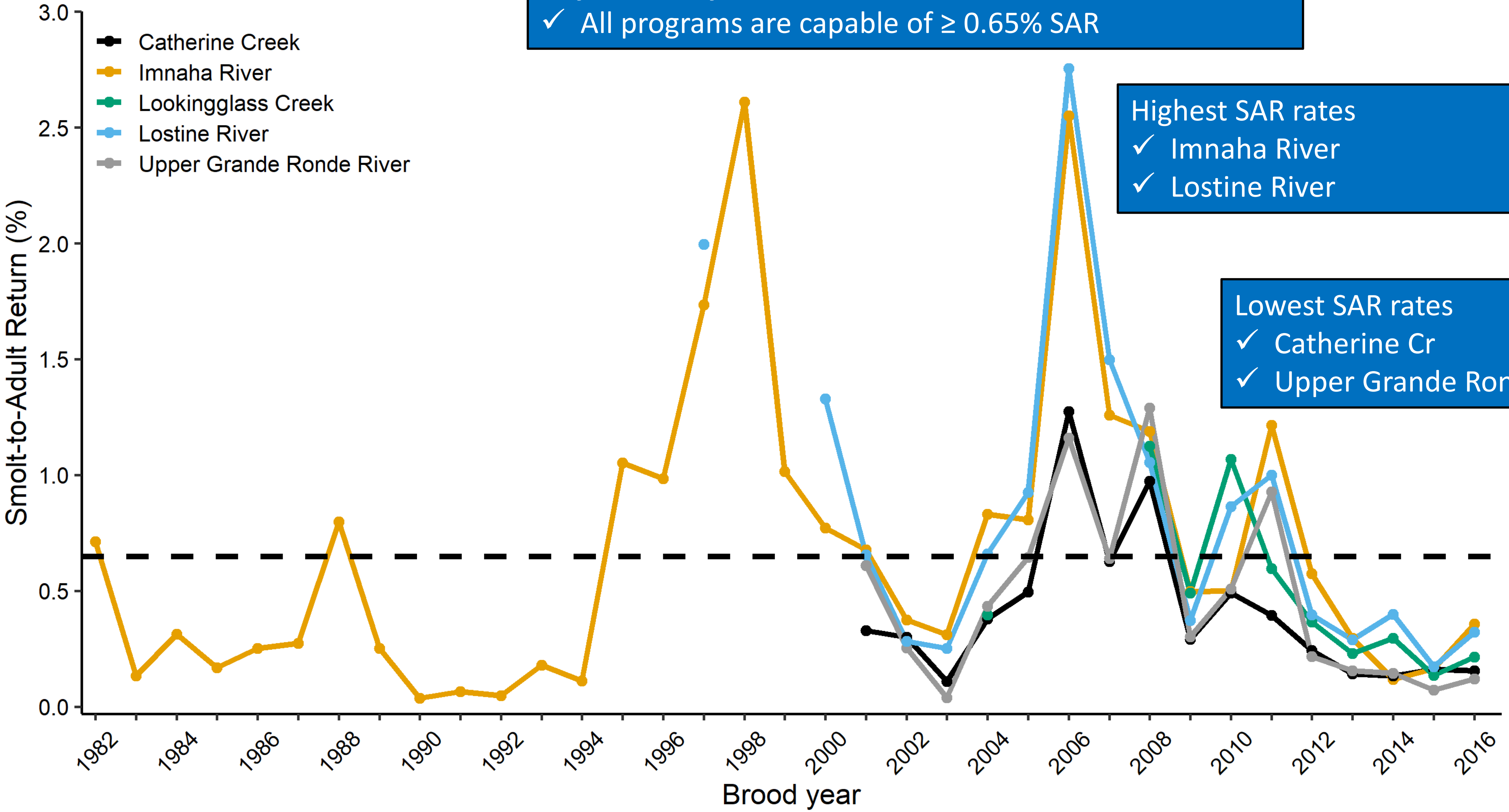
Total Hatchery Adults to the Compensation Area



Hatchery Smolt-to-Adult-Return (SAR) to the Compensation Area (0.65%)

Key takeaway

✓ All programs are capable of ≥ 0.65% SAR



Highest SAR rates

✓ Imnaha River

✓ Lostine River

Lowest SAR rates

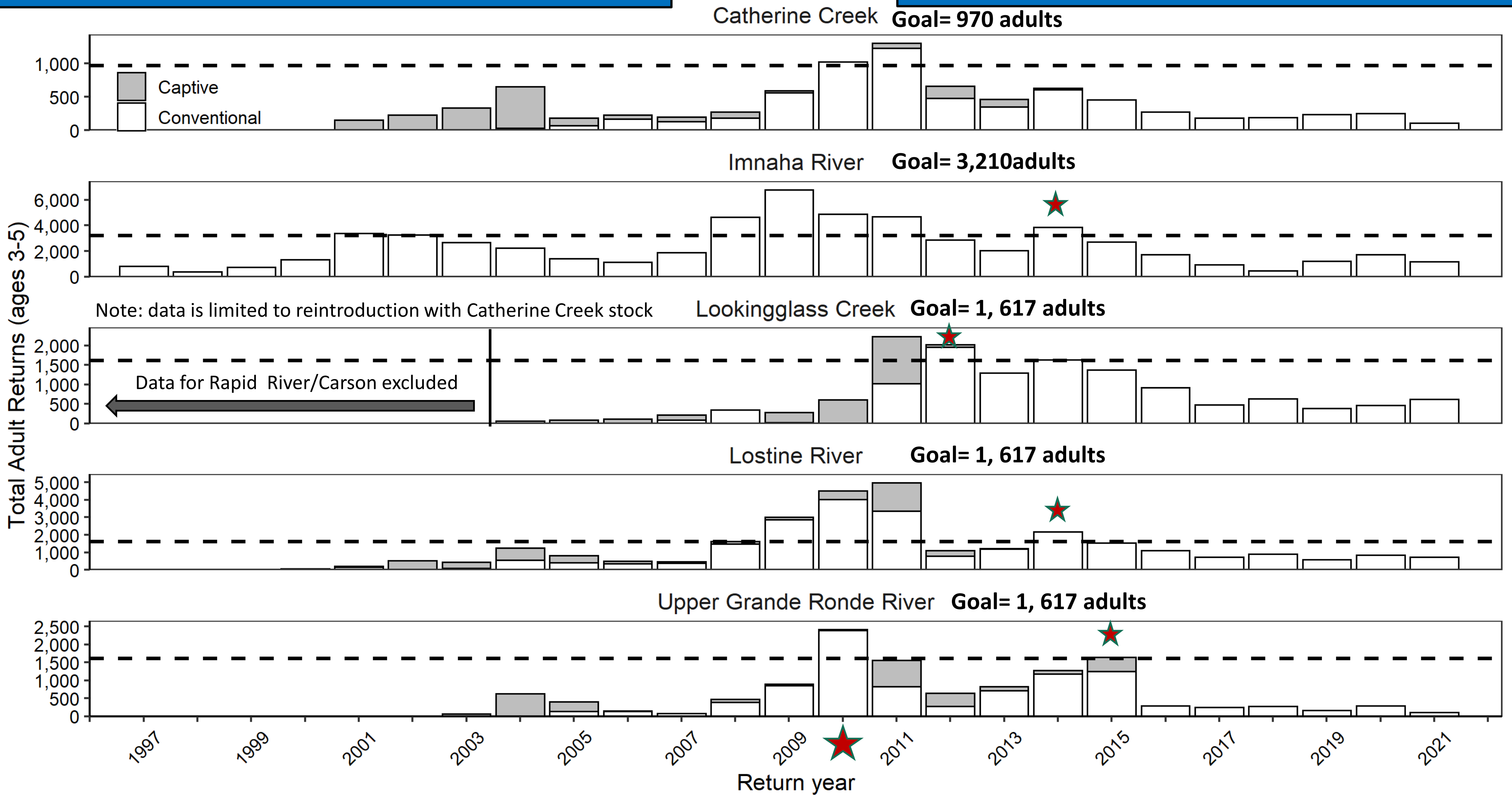
✓ Catherine Cr

✓ Upper Grande Ronde

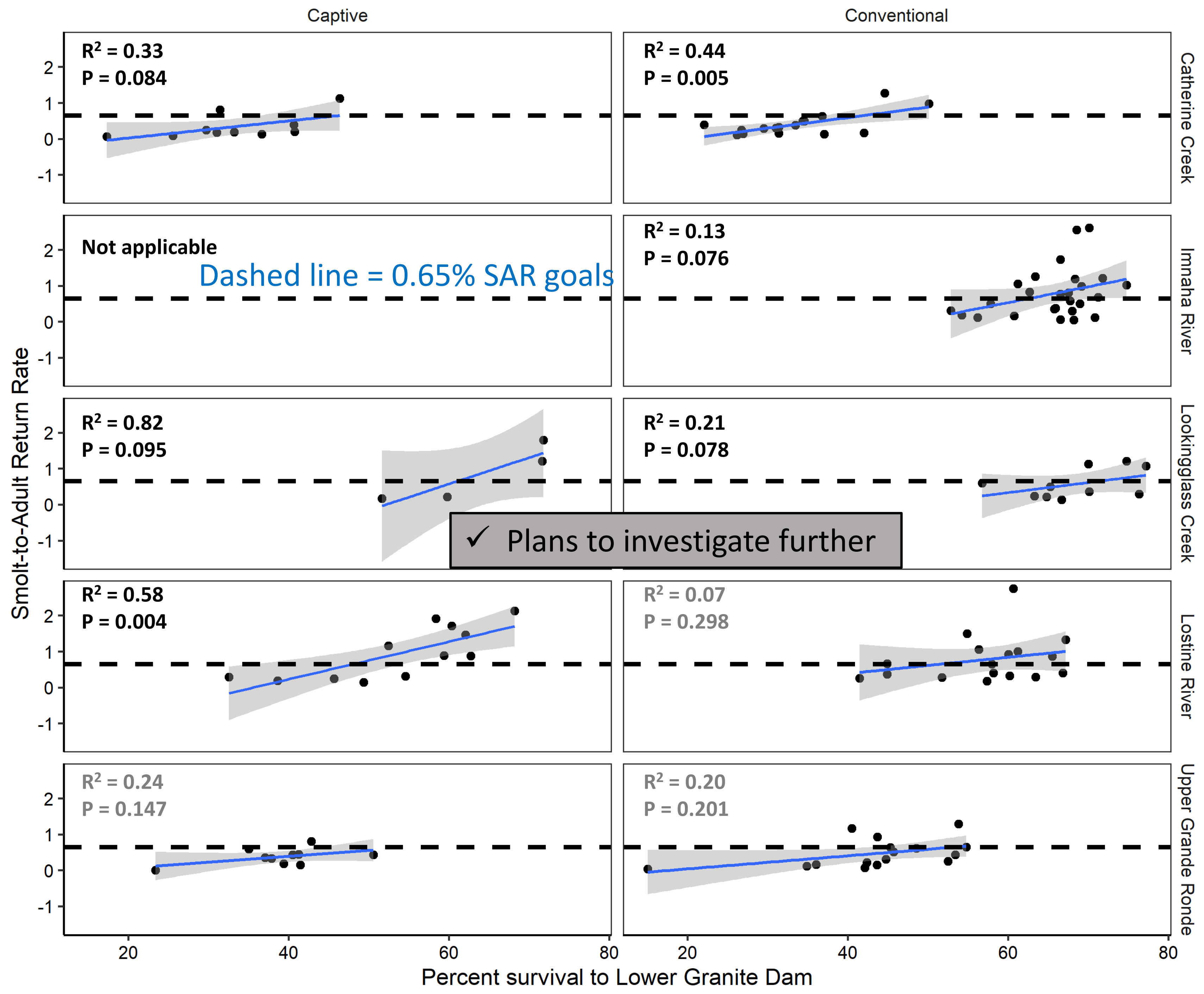
Total Return to Compensation (supplemented populations)

✓ 2010 and 2011 = optimistic

➢ After 2011 = consistently failing to meet goals



Juvenile survival to Lower Granite Dam



Cautious interpretations
- ↑ juvenile survival ≈ ↑ SARs
- Similar trends with both captive and conventional production

Biological co-variates
- Fish size (length/weight)
- Fish health (BKD, IHN)

Environmental co-variates
- Freshwater (temperature, flow)
- Ocean (NOAA stoplight chart)
- Columbia river hydrosystem
  - Barging, flex spill, harvest

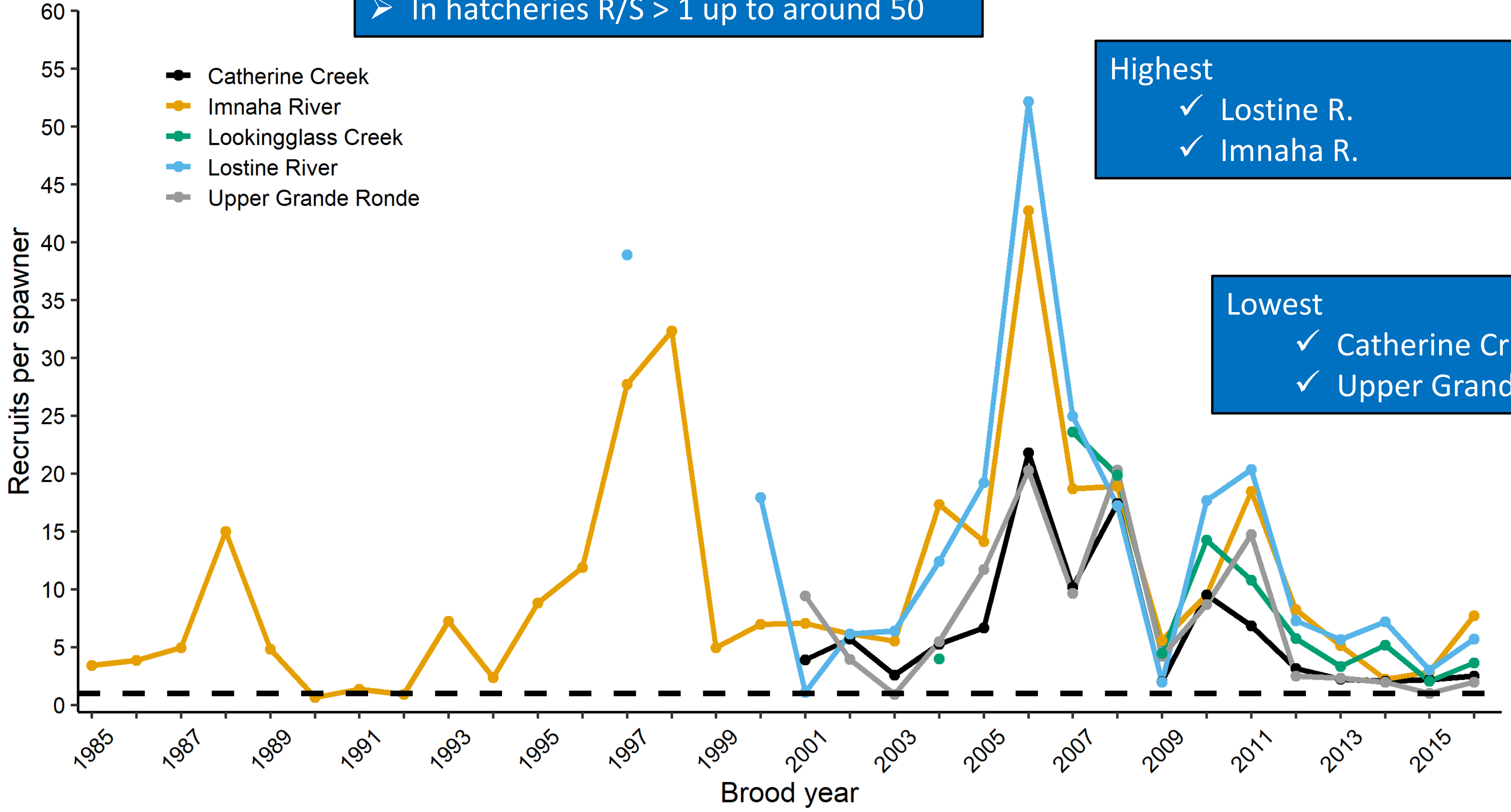
Objective 4: Compare recruits-per-spawner (R/S) between hatchery rearing and natural rearing

Recruits-per-spawner

- hatcheries > nature

Recruits per Spawner (R/S): Hatchery Broodstock

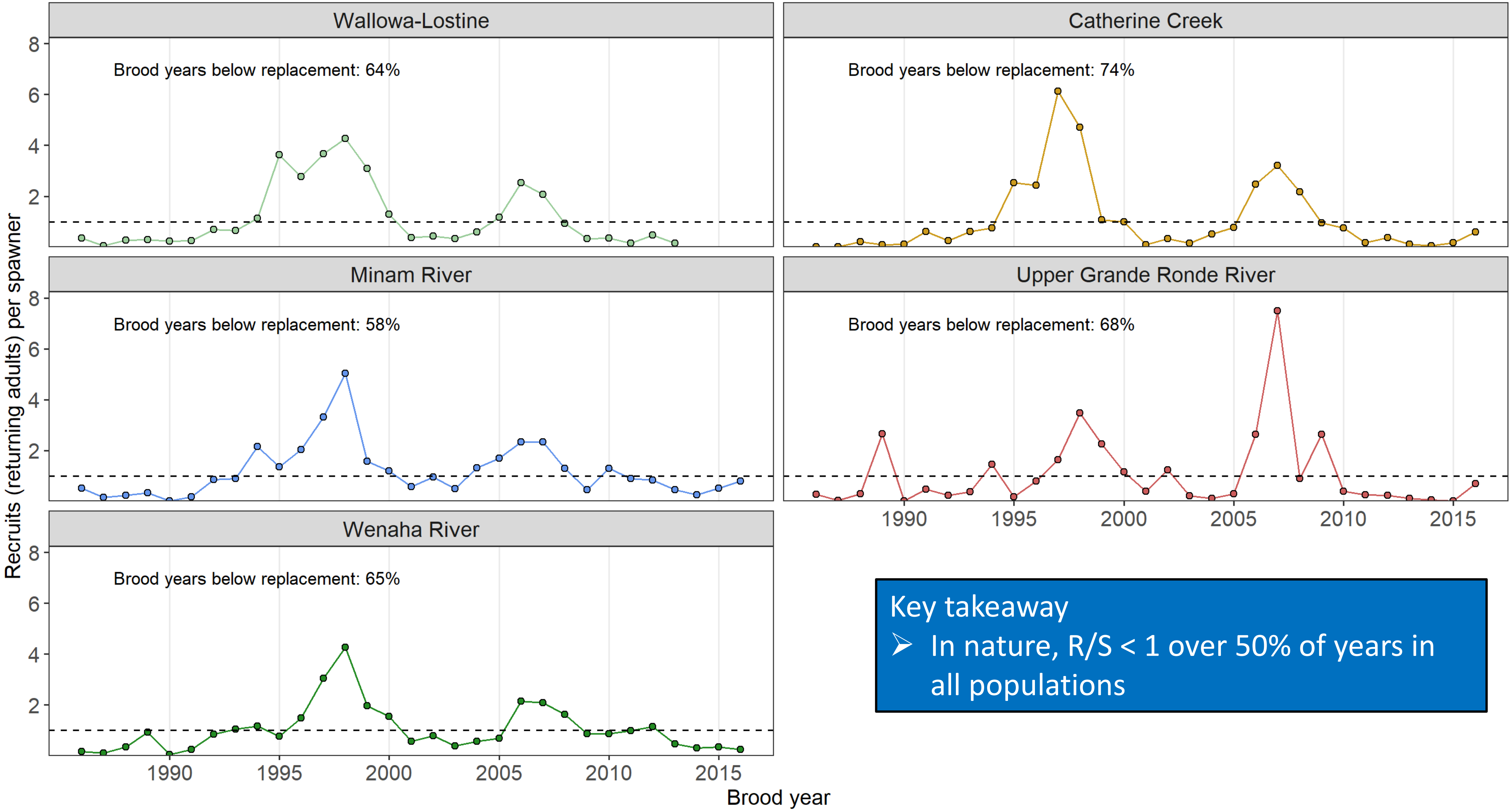
Key takeaways
- Similar trends across populations
- In hatcheries R/S > 1 up to around 50



Highest
- ✓ Lostine R.
- ✓ Imnaha R.

Lowest
- ✓ Catherine Cr
- ✓ Upper Grande Ronde

Recruits per Spawner: Spawning in nature



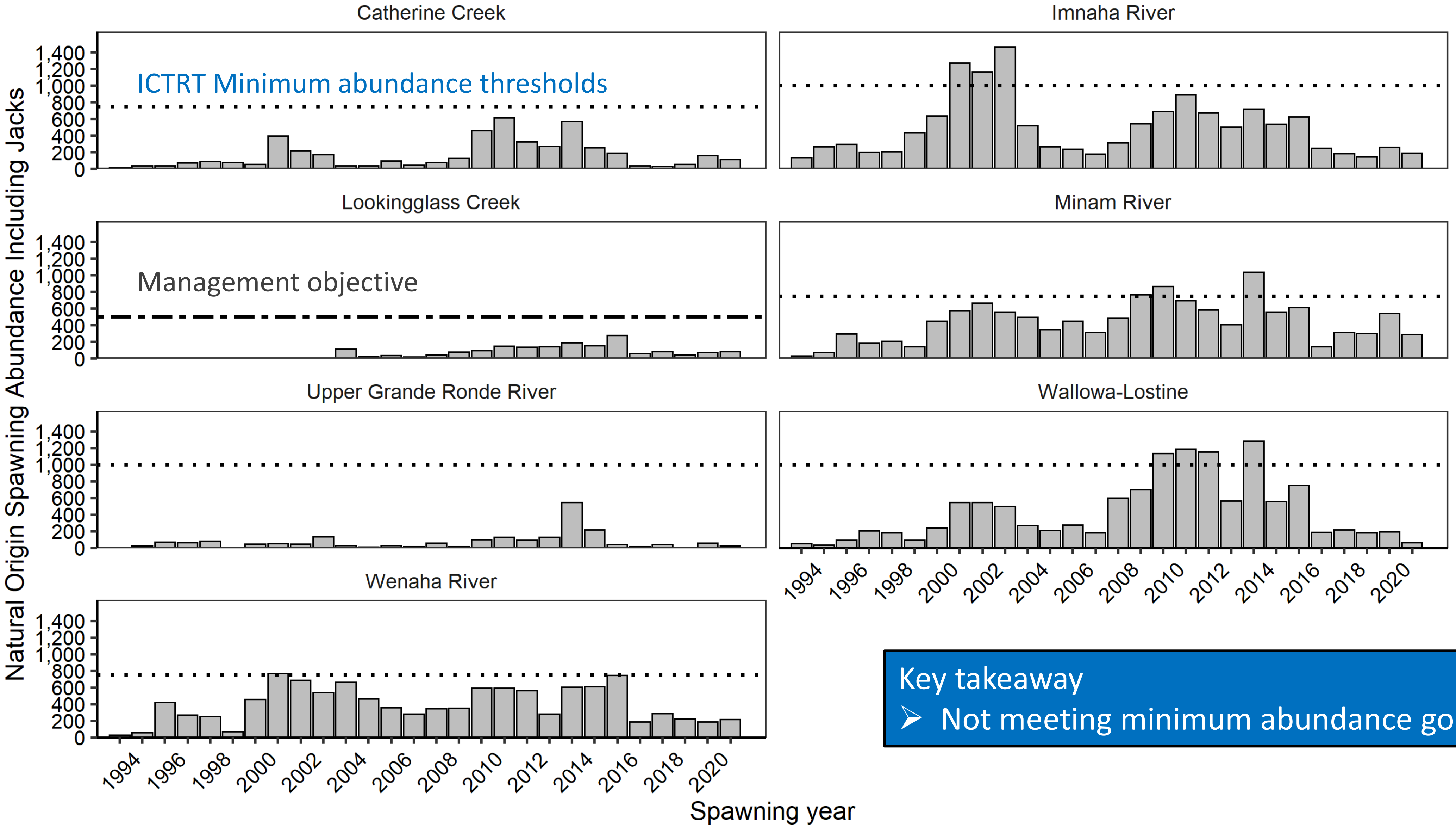
Key takeaway

- In nature, R/S < 1 over 50% of years in all populations

Objective 5: Assess response in natural population abundance and productivity to supplementation

- Natural adult returns
- Genetic monitoring
- Smolts per-spawner

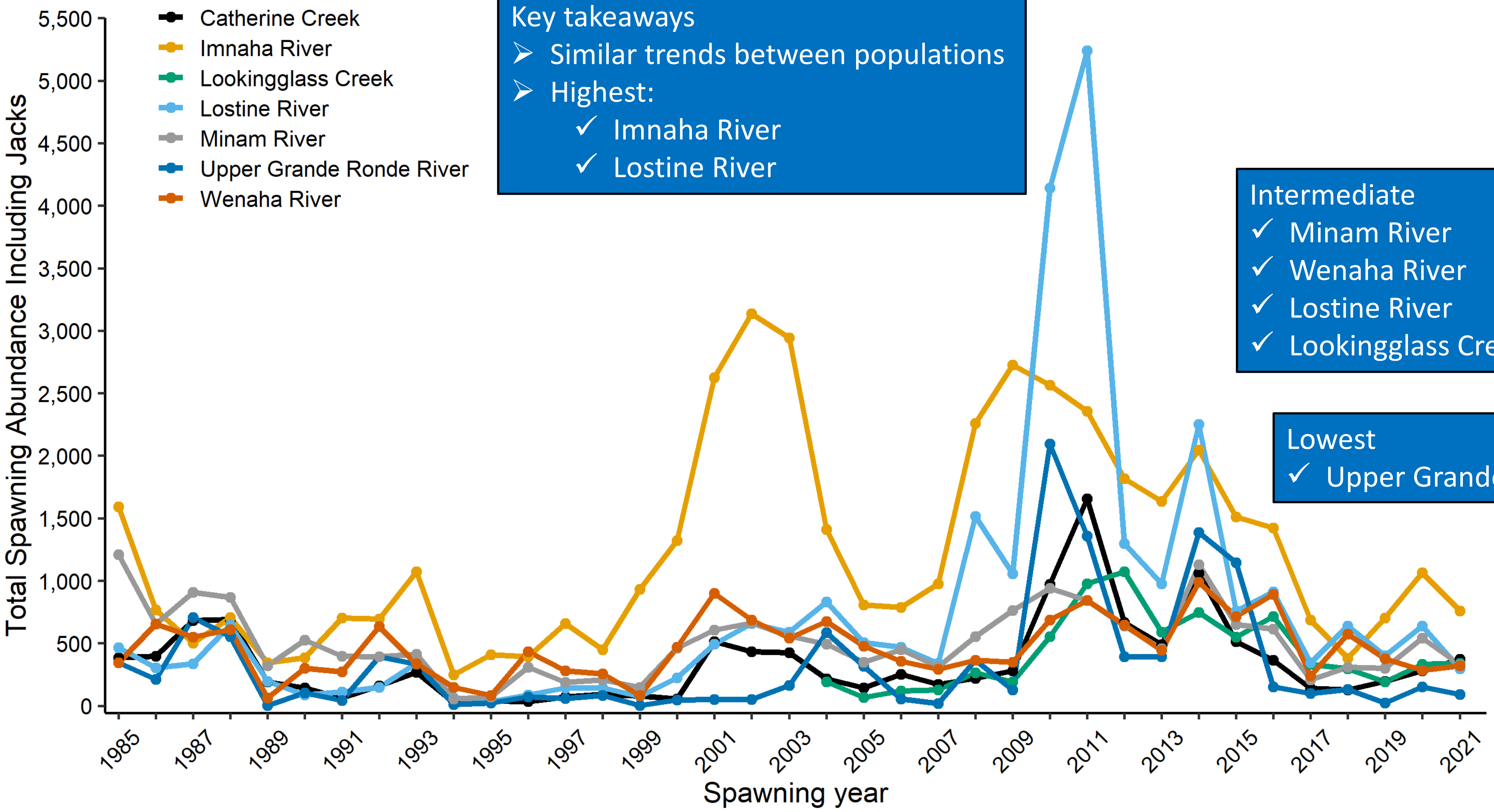
Natural Origin Spawning Adults including jacks: Are natural populations meeting viability criteria?



Key takeaway

- Not meeting minimum abundance goals

Total spawning adults including jacks (TSAij)



Key takeaways

- ➢ Similar trends between populations
- ➢ Highest:
  - ✓ Imnaha River
  - ✓ Lostine River

Intermediate

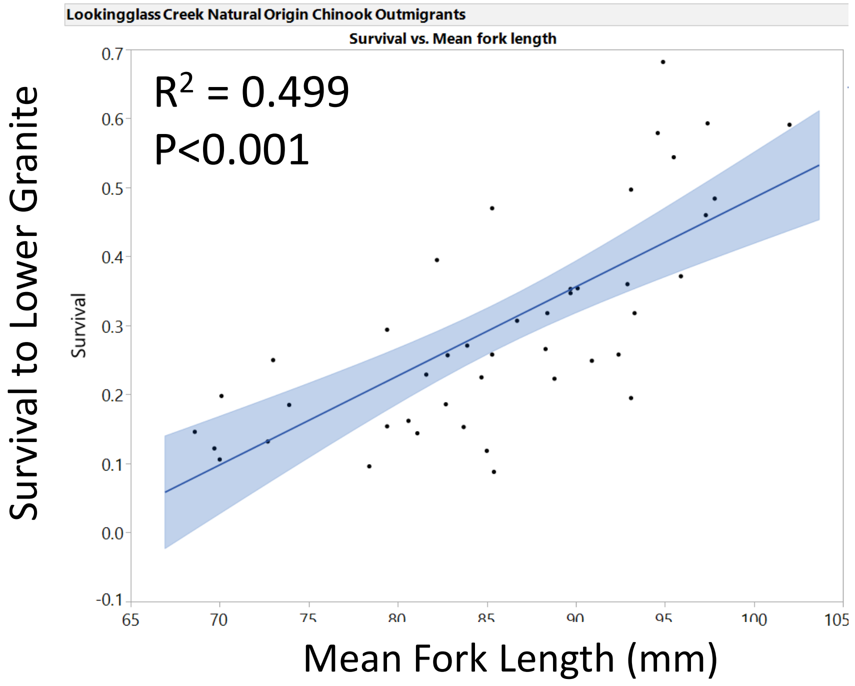
- ✓ Minam River
- ✓ Wenaha River
- ✓ Lostine River
- ✓ Lookingglass Creek

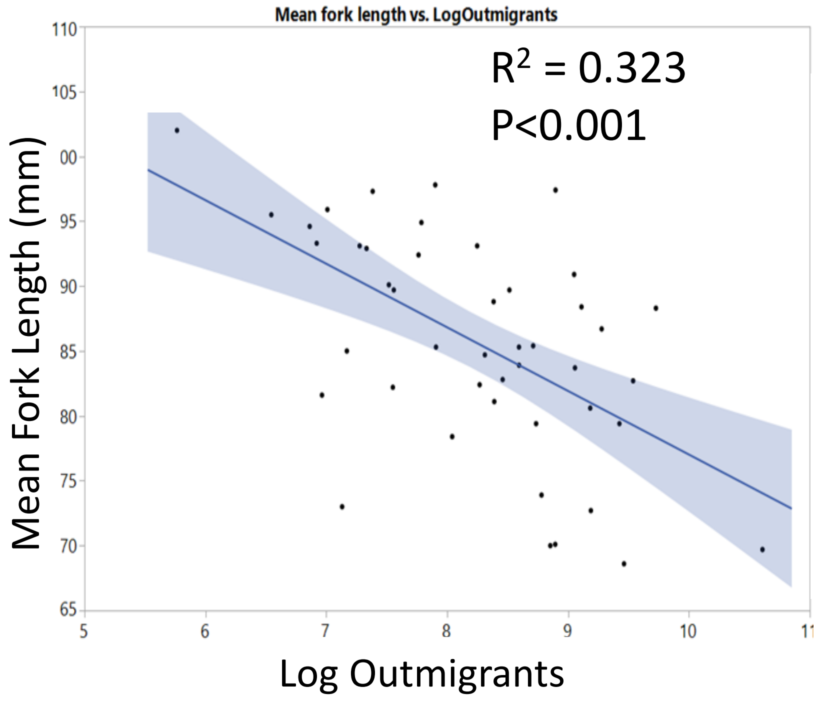
Lowest

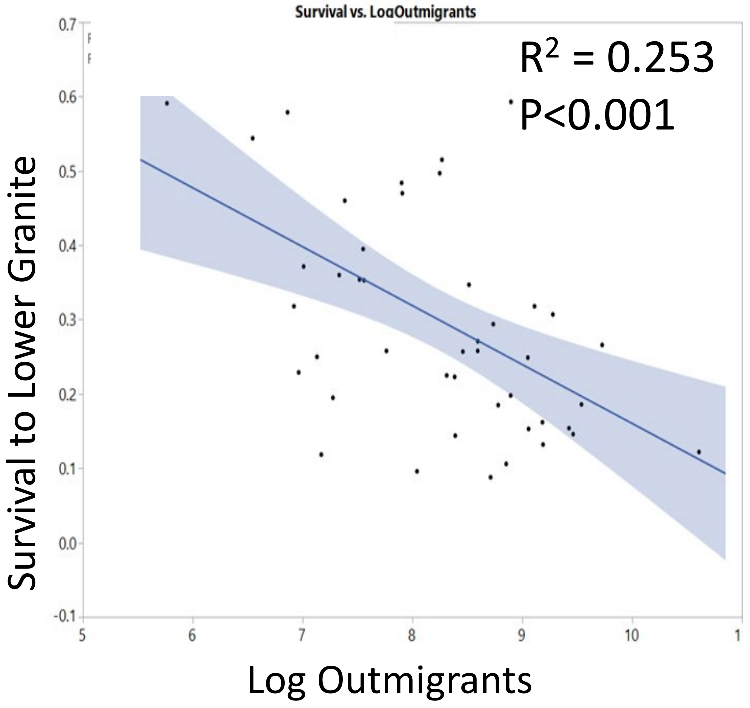
- ✓ Upper Grande Ronde

Lookingglass Creek: Natural smolt emigrants – a Case Study

Key takeaway
- Same trend observed in all populations
- Size is an important component of surival
- Complex interactions: Spawning abundance X Smolt Size





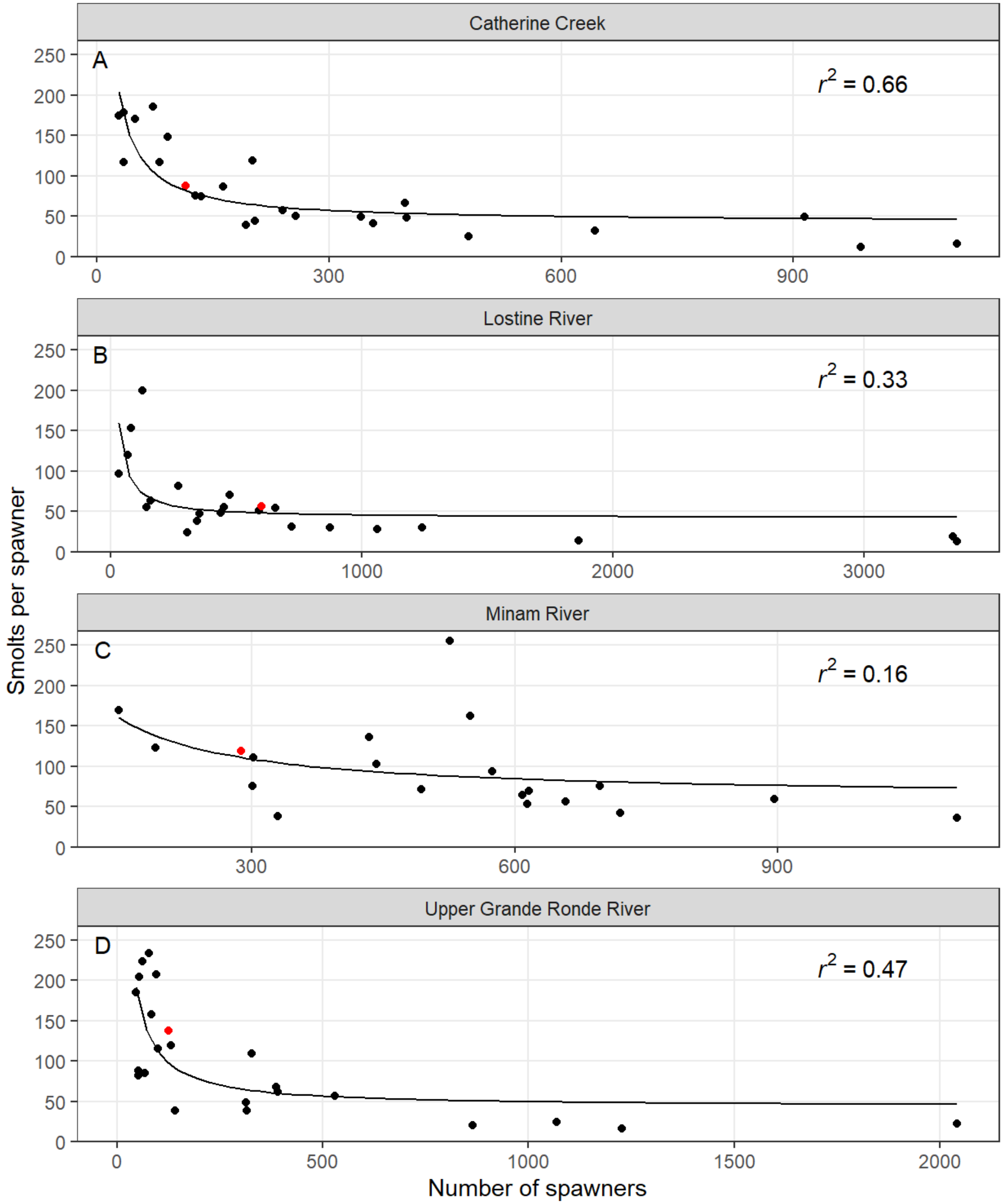


Larger migrants = better survival to Lower Granite Dam

Increasing the number of outmigrants = smaller fish

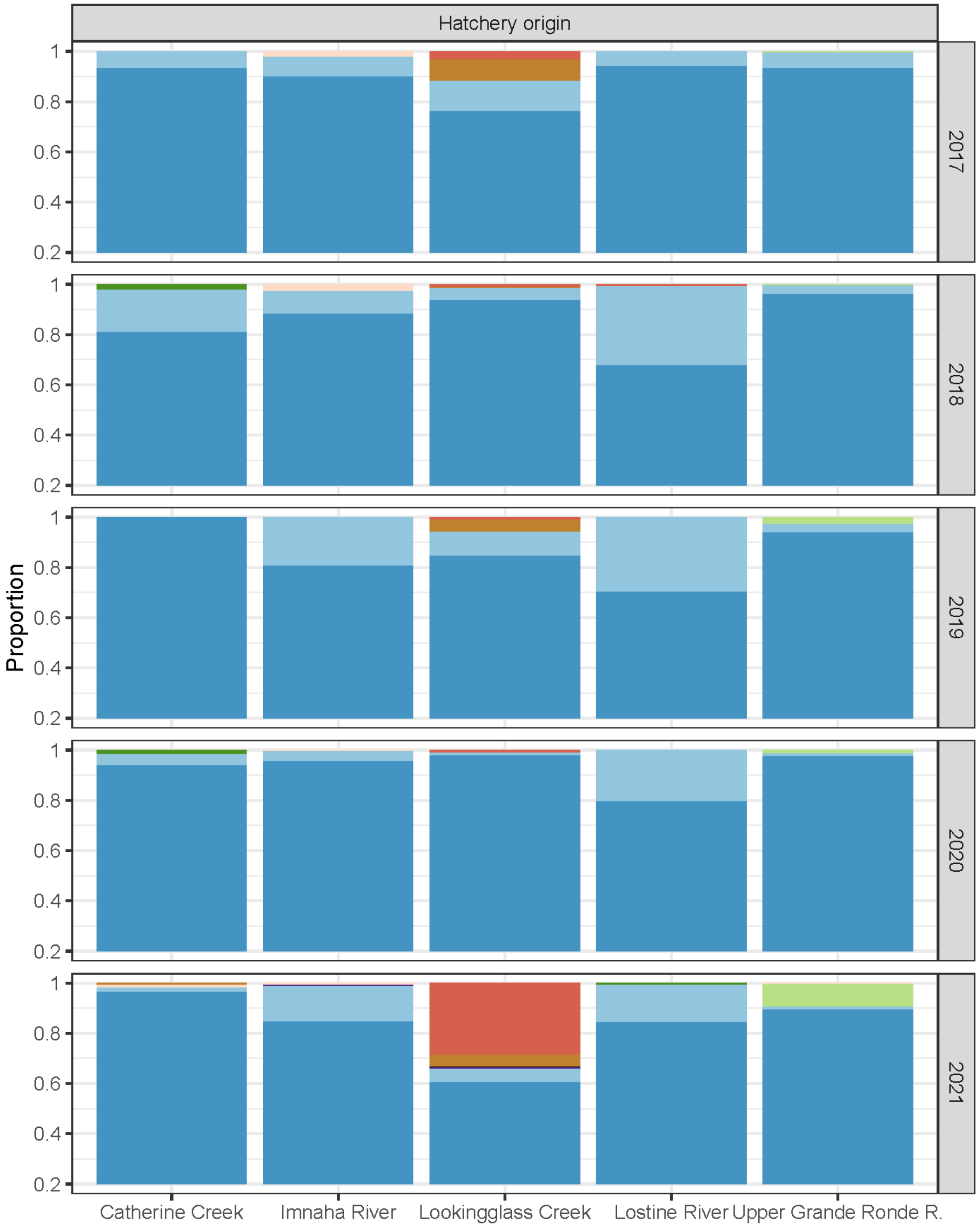
Increasing outmigrants = decreases survival to Lower Granite Dam

Spawning in nature compared to smolts per spawner



Key takeaways

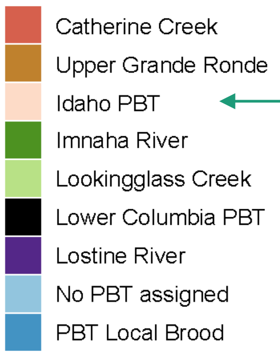
- productivity, measured as smolts per spawner, decreases as spawner density increases
- Minam population shows the weakest density-dependence



Parentage-based tagging (PBT) data

Key takeaways

- Within a program
  - ✓ Most hatchery fish are identifiable to their program
  - ✓ Lowest assignment rate = Imnaha and Lostine



Rapid River and Kooskia

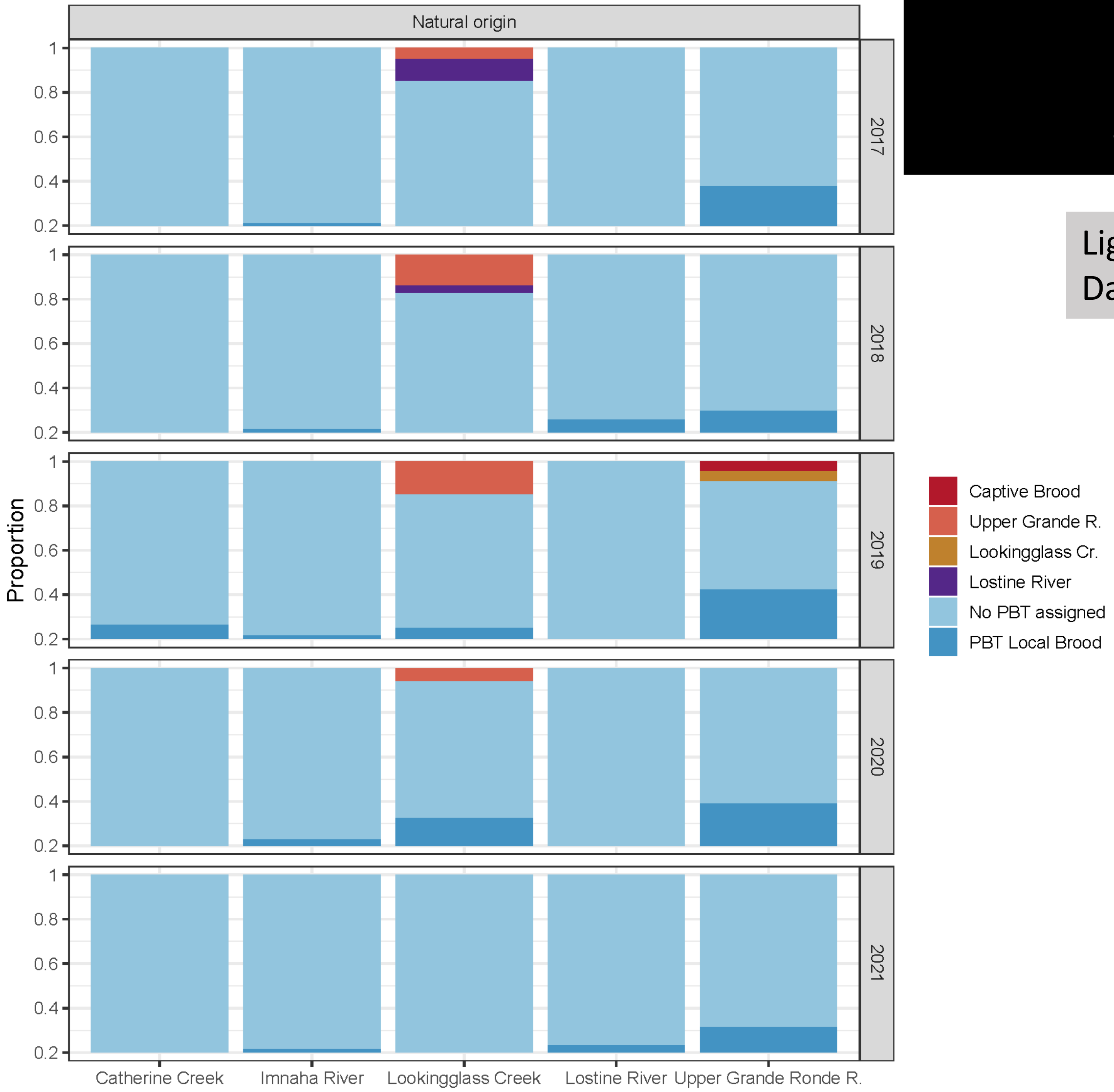
Klickitat Fish Hatchery

Hatchery strays

- ✓ CWT and PBT data agree
- ✓ Identifying hatchery fish that lack a CWT

PBT data lacks a centralized database that is publicly accessible like the Pacific States RMIS database.

- ✓ Potential for duplication in Columbia & Snake River



Parentage-based tagging data

Some hatchery fish masquerade as natural origin

Light blue = no PBT = "natural origin"
Dark blue = hatchery fish from same stock

Key takeaways

- Under-estimating hatchery fish
  - ✓ In the Hatchery Broodstock
  - ✓ In-Nature?

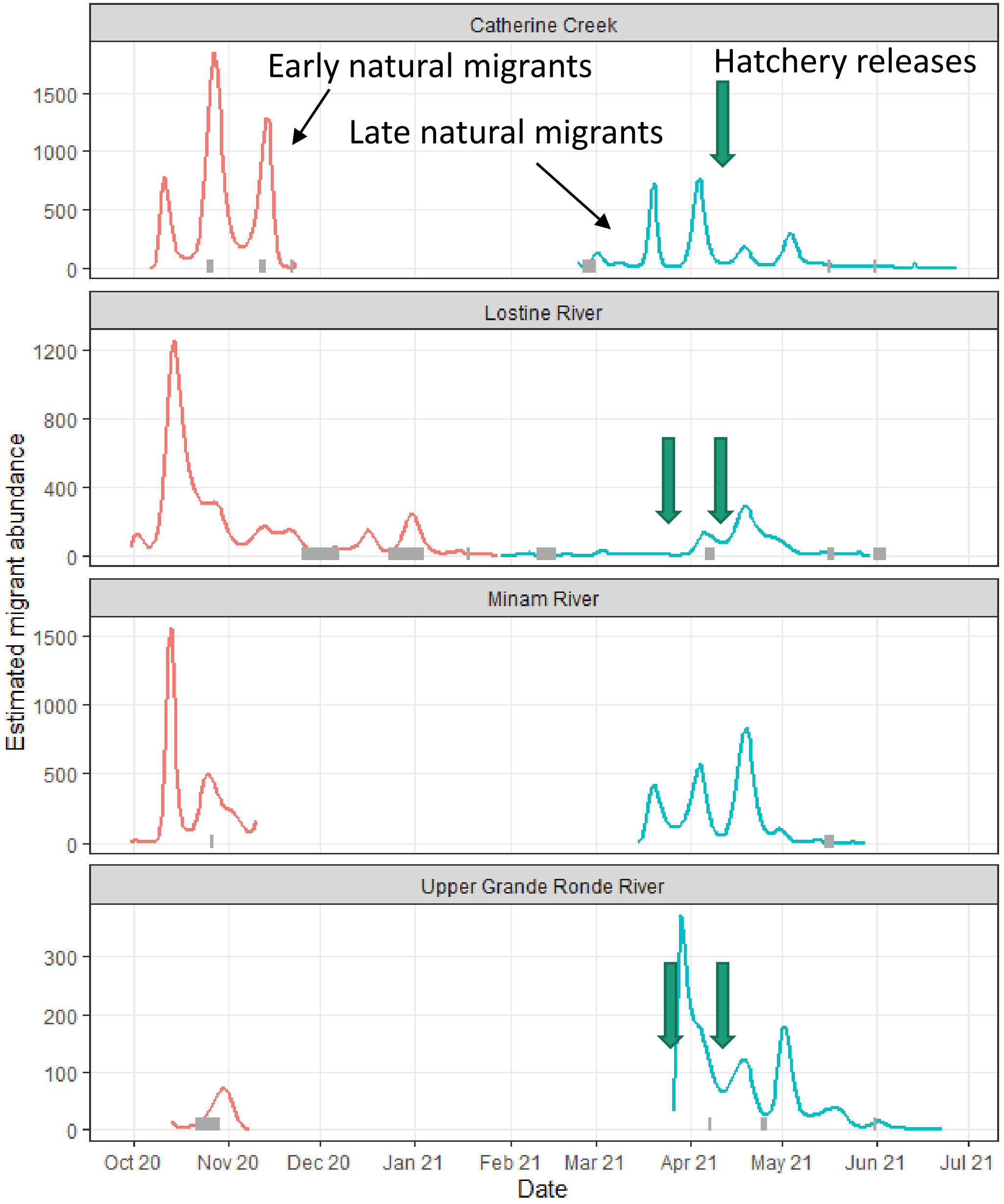
Upper Grande Ronde

- 100% CWT
  - ✓ 50% Ad + 50% unclipped

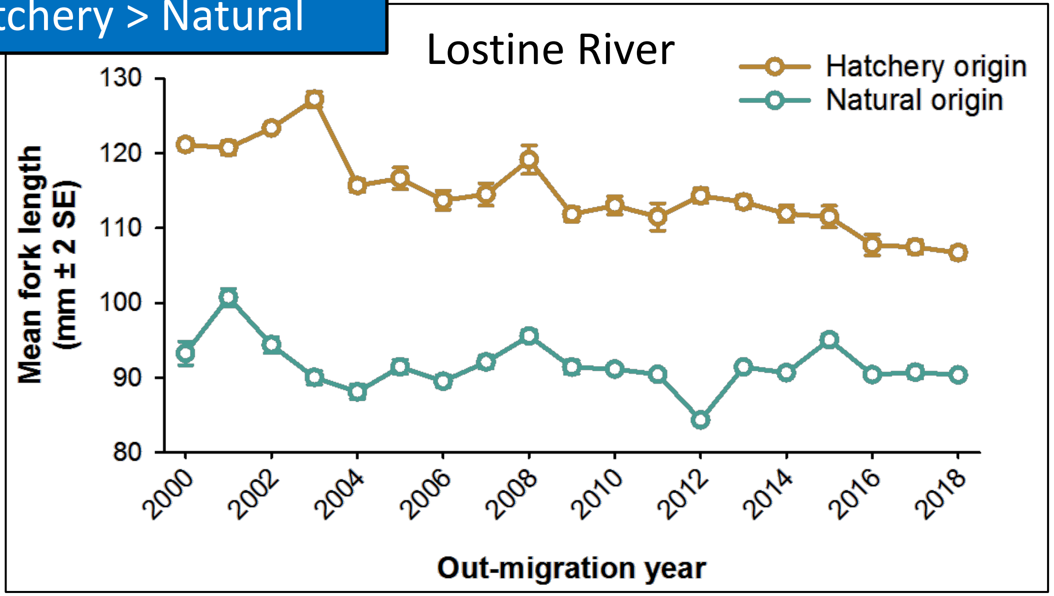
Objective 6: Assess and compare life history characteristics of hatchery and natural fish

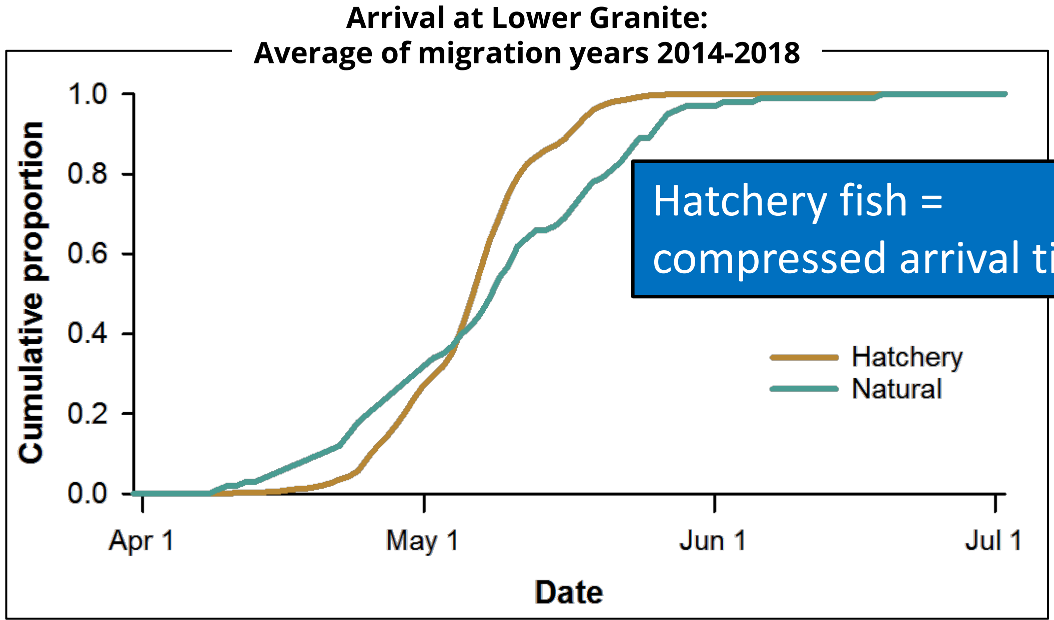
- Hatchery smolt releases vs natural smolt out-migrants
- Weir operations and trap efficiency
- Spawning distribution
- Pre-spawn mortality
- Age structure (discussed in Objective 1)

Hatchery smolt releases compared to natural smolt emigration



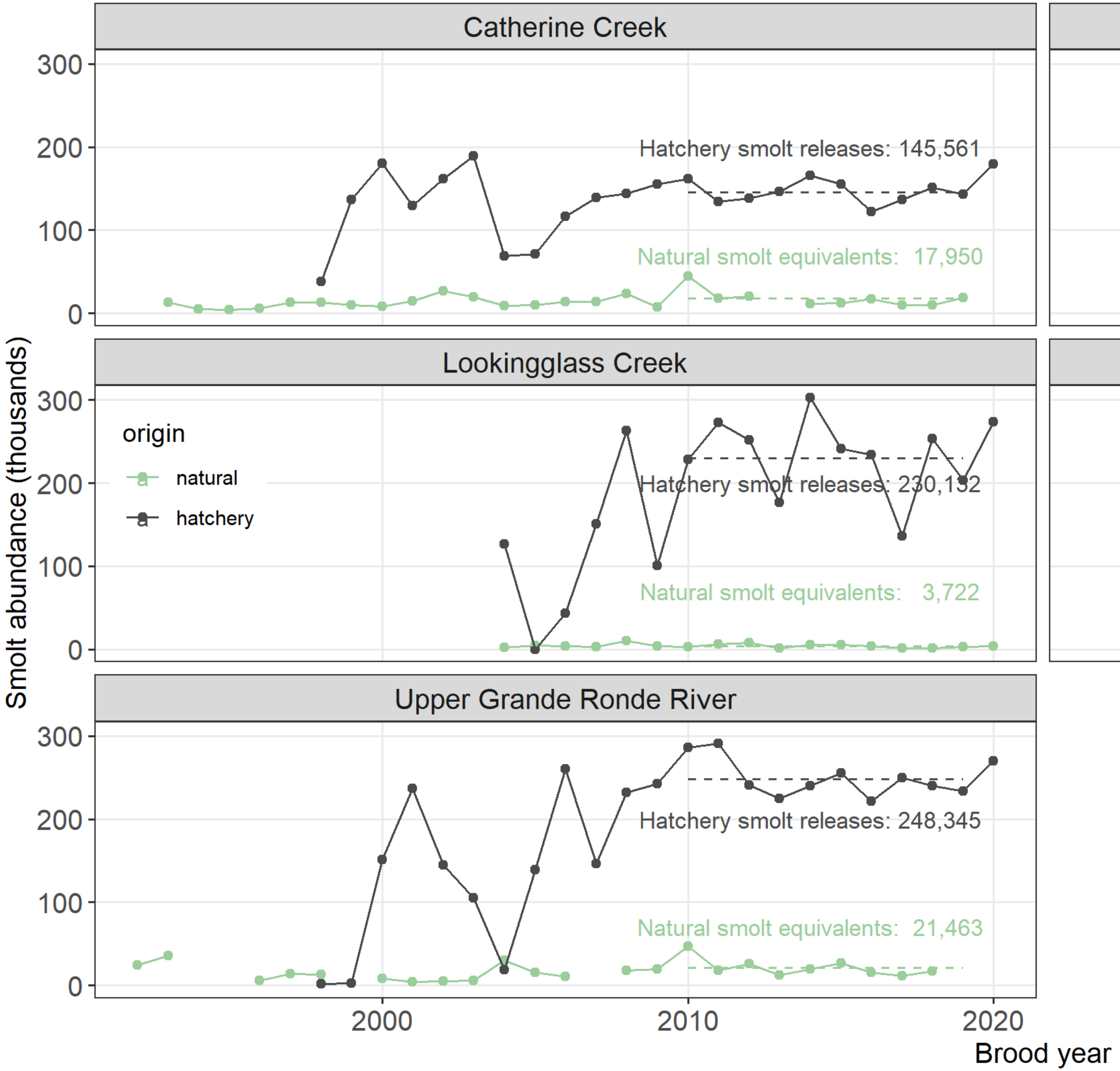
Hatchery > Natural





Hatchery fish = compressed arrival time

Smolt abundance: hatchery vs natural smolt equivalents

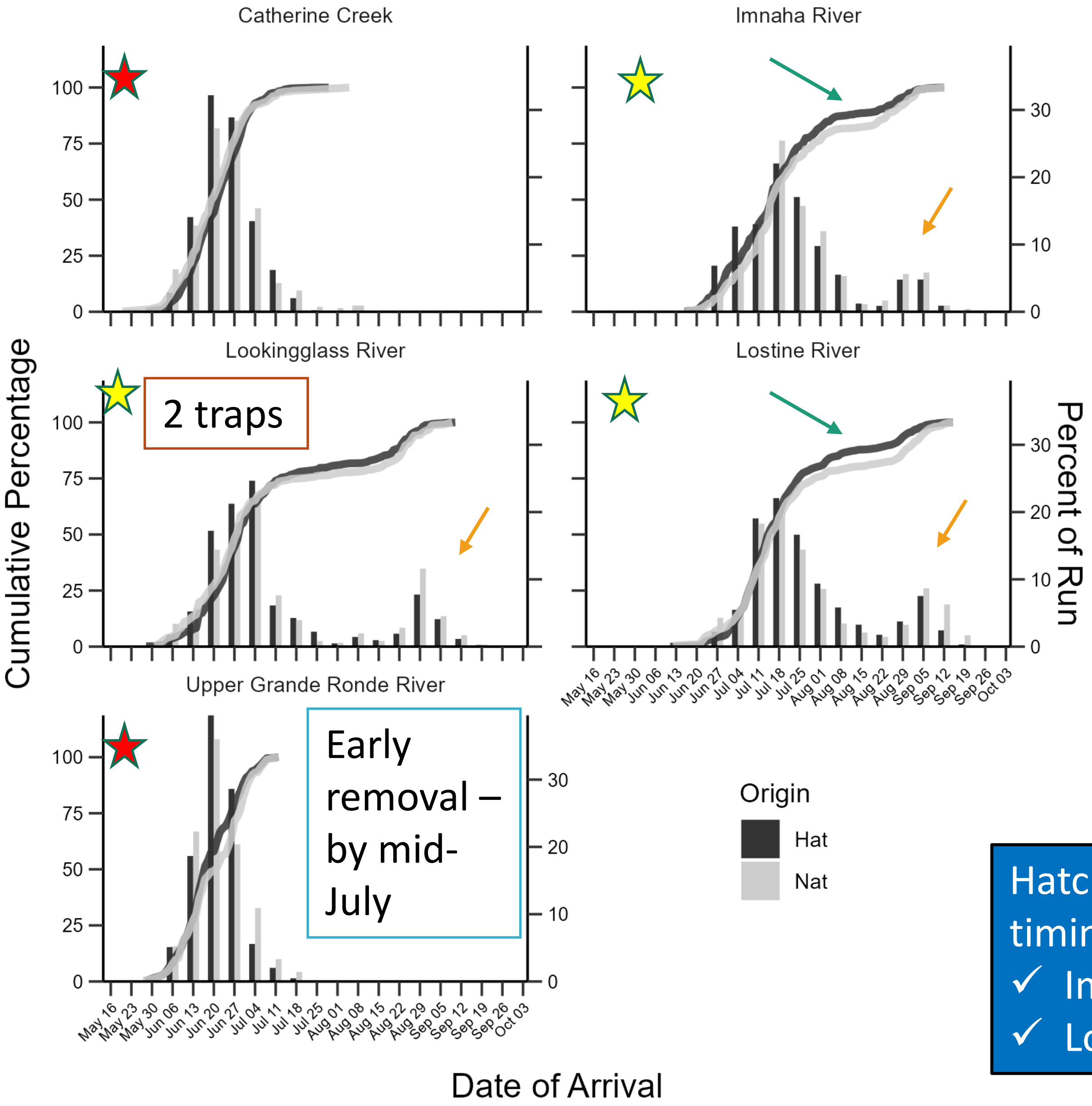


Key takeaways-

- Hatchery smolt > > natural smolts

- Natural smolts (large disparity)
  - ~32,000 in Minam River
  - <4,000 in Lookingglass Creek

Average for return years 2018-2022: Mimicking starts at the weir



Key changes since 2010

- ✓ 2010: Upper Grande Ronde weir is pulled when temps >20 °C
- ✓ 2010: new hydraulic weir on the Lostine River
- ✓ 2015: installation begins for Imnaha bridge weir. Operational in 2016.
- ✓ 2018: Lookingglass Creek- 2018 started operating a "lower trap

Key takeaways

Bi-modal return patterns & longest trapping seasons (mid-September):

- ✓ Imnaha R.
- ✓ Lookingglass Cr.
- ✓ Lostine R.

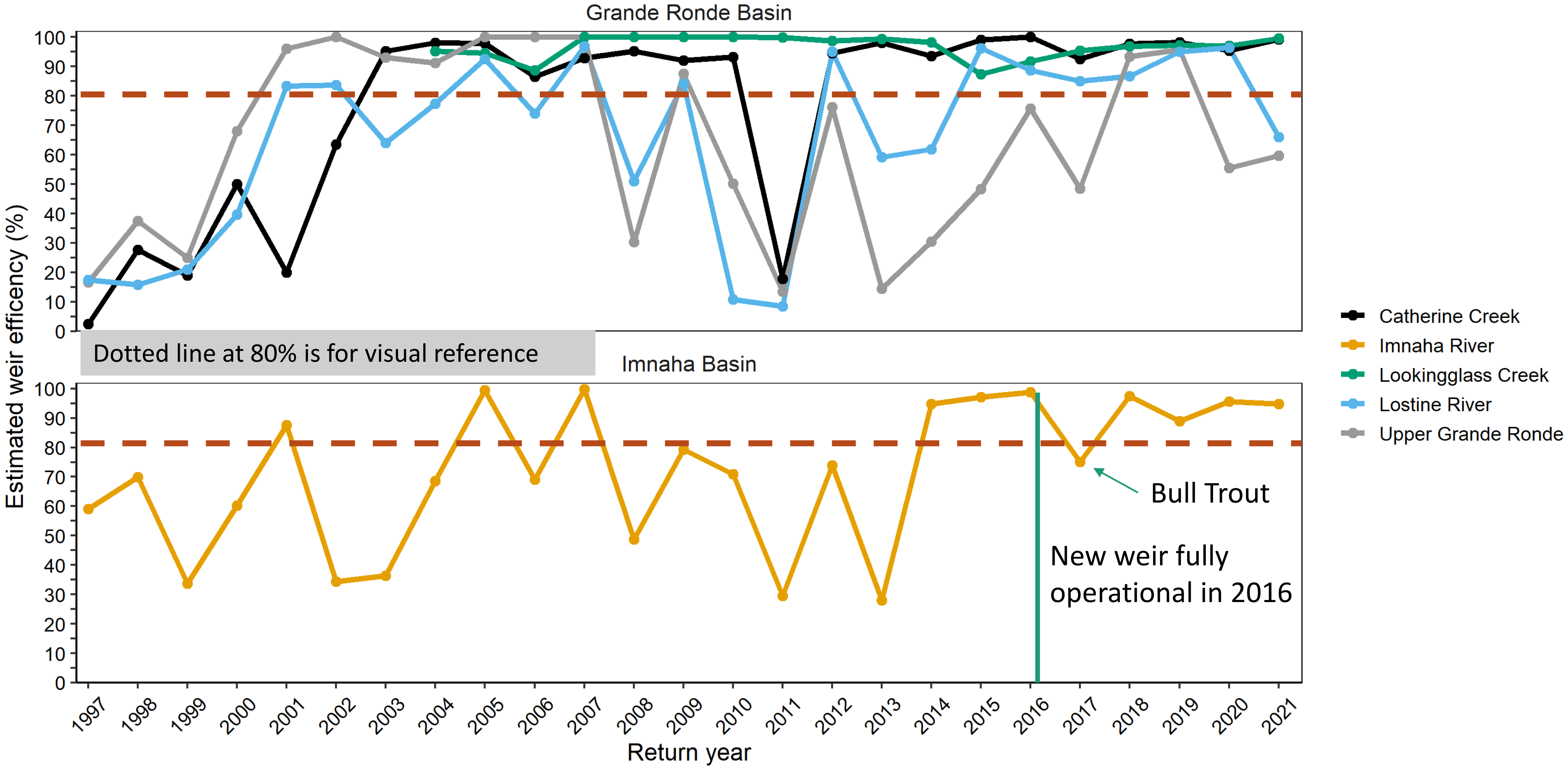
Hatchery vs Natural return timing differences?

- ✓ Imnaha R.
- ✓ Lostine R.

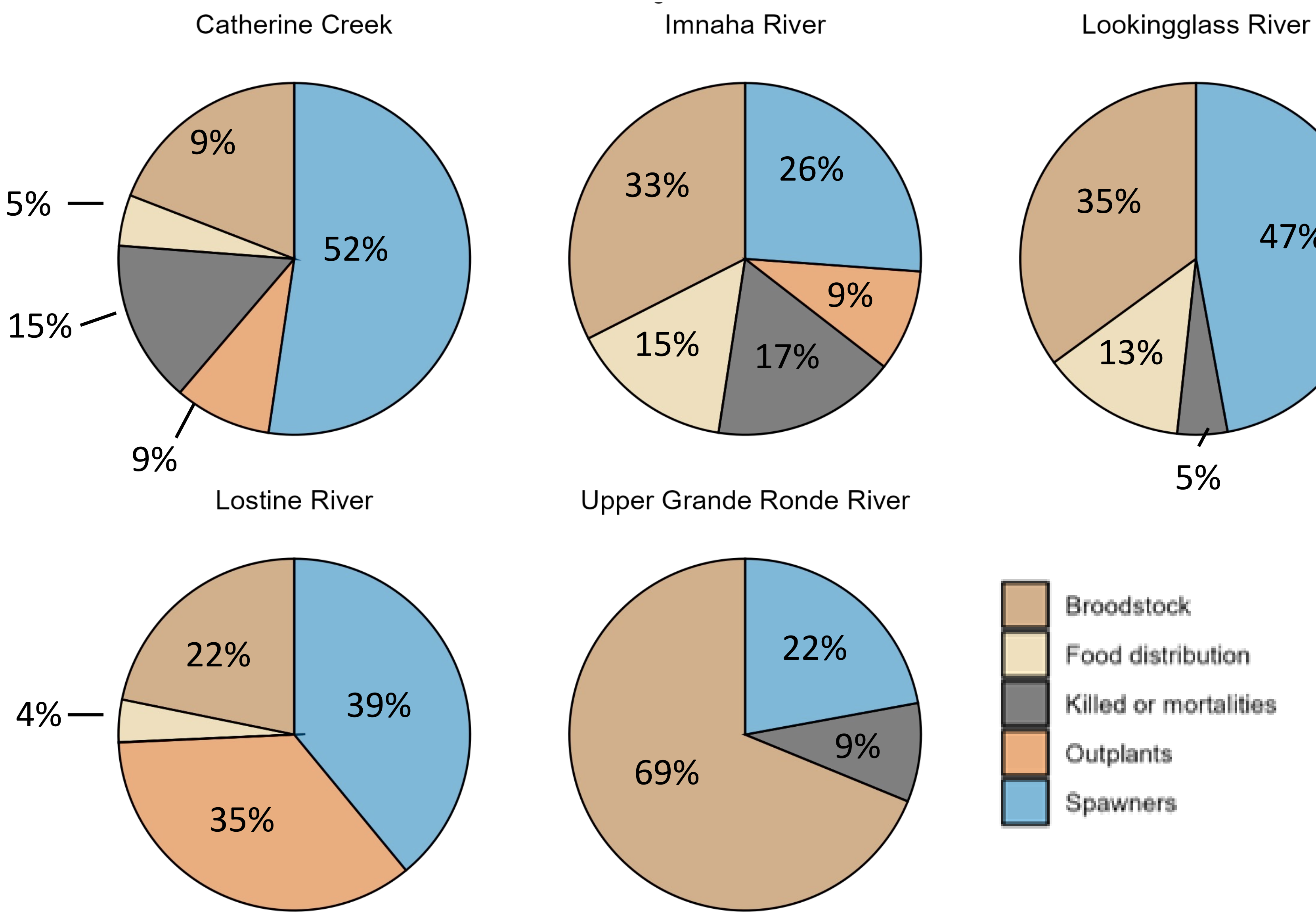
Shortest trapping seasons:

- ✓ Catherine Creek
- ✓ Upper Grande Ronde (temperature limits)

Weir efficiency: important for managing spawners above the weir



How fish are handled at the weir: 5-year average (2017-2022)



>50%
- ✓ broodstock + released to spawn in nature

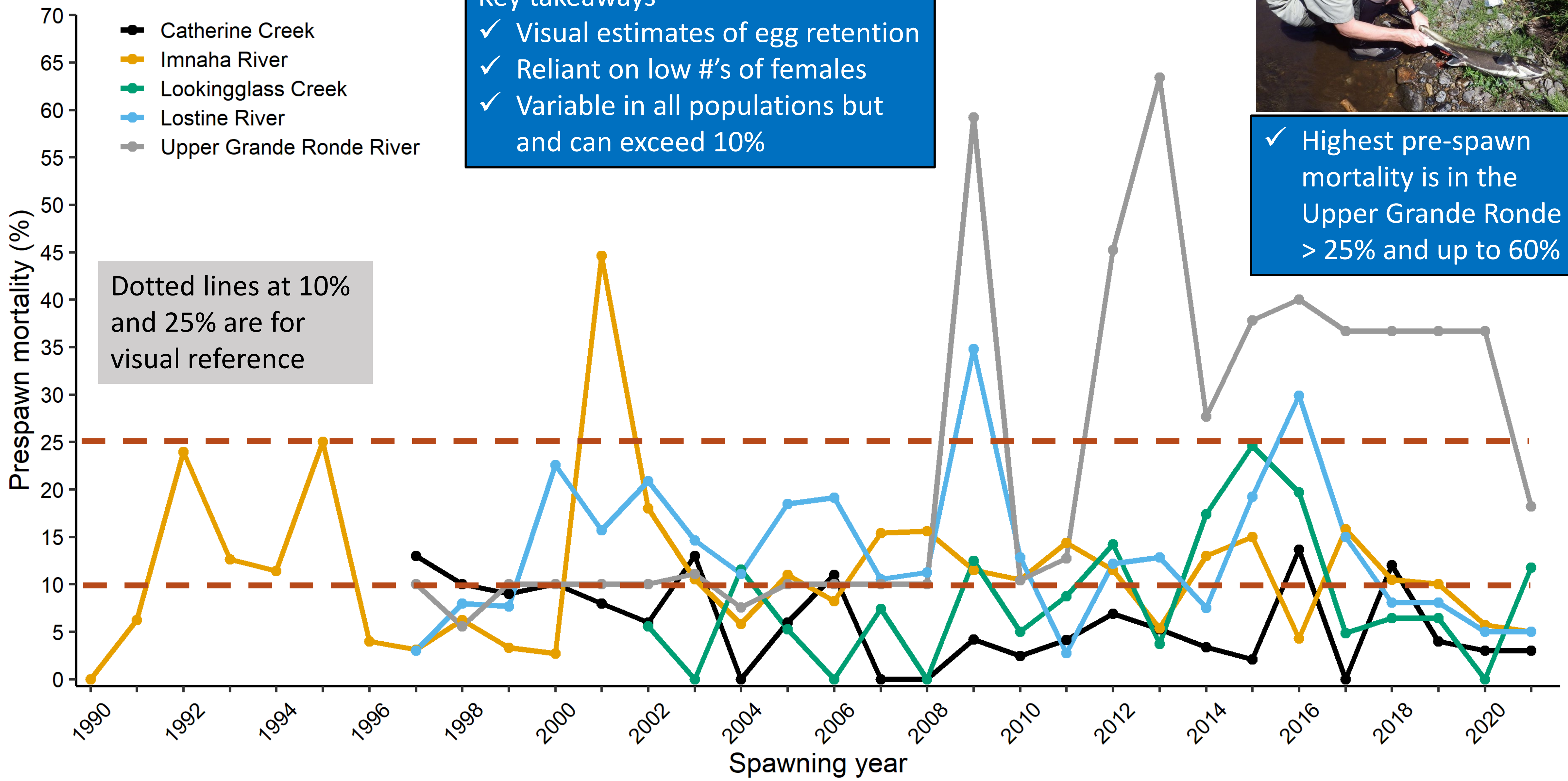
Food distribution
- ✓ Catherine Cr.
- ✓ Imnaha R.
- ✓ Lostine R.
- ✓ Lookingglass Cr.

Outplants
- ✓ Catherine Cr.
- ✓ Imnaha R.
- ✓ Lostine R.

Minimum prespawn mortality in nature: Female egg retention

Key takeaways

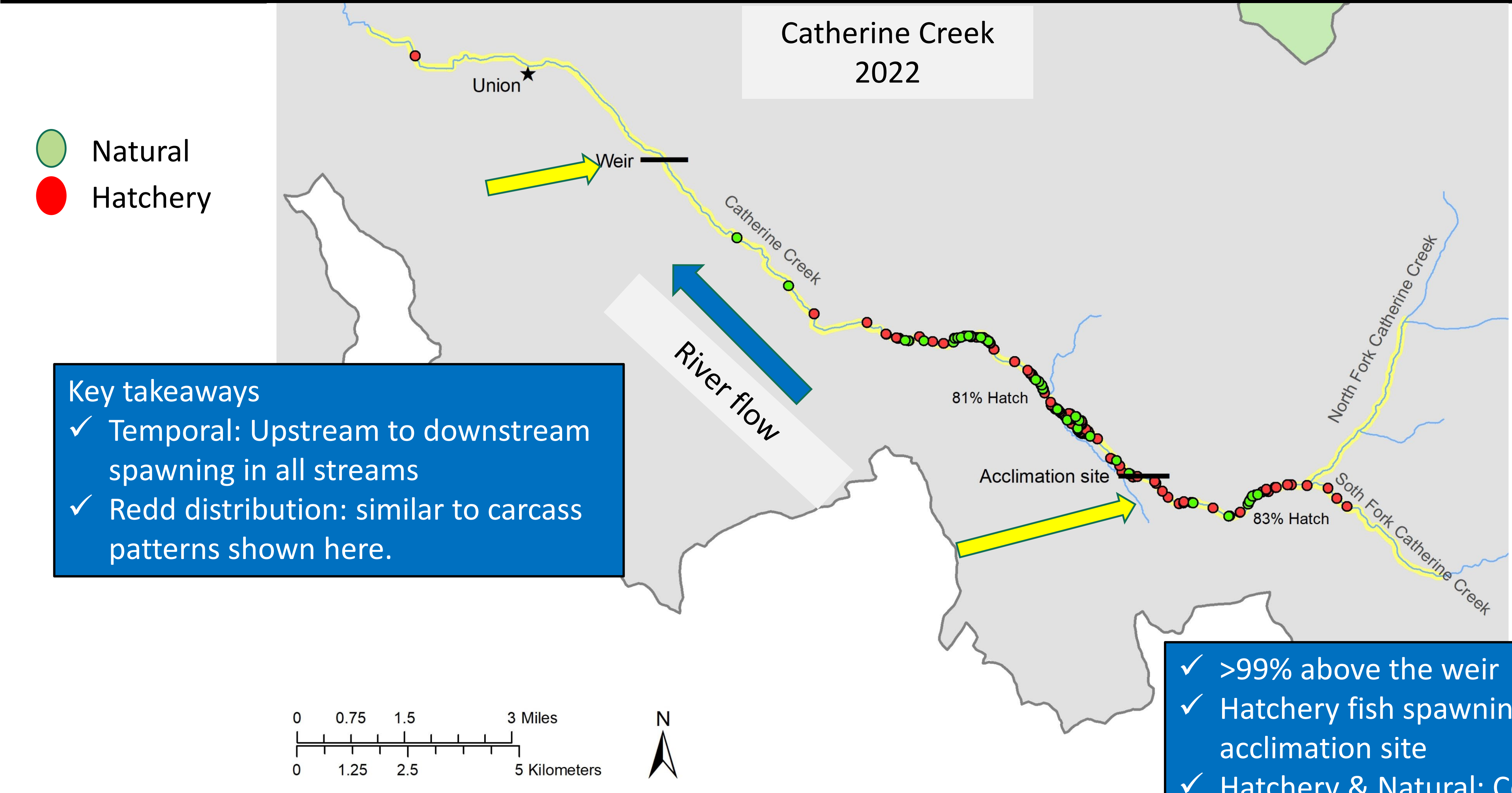
- ✓ Visual estimates of egg retention
- ✓ Reliant on low #'s of females
- ✓ Variable in all populations but and can exceed 10%



Dotted lines at 10% and 25% are for visual reference

✓ Highest pre-spawn mortality is in the Upper Grande Ronde > 25% and up to 60%

ArcGIS Survey 123: Carcass waypoints: Spawning Distribution



Key takeaways

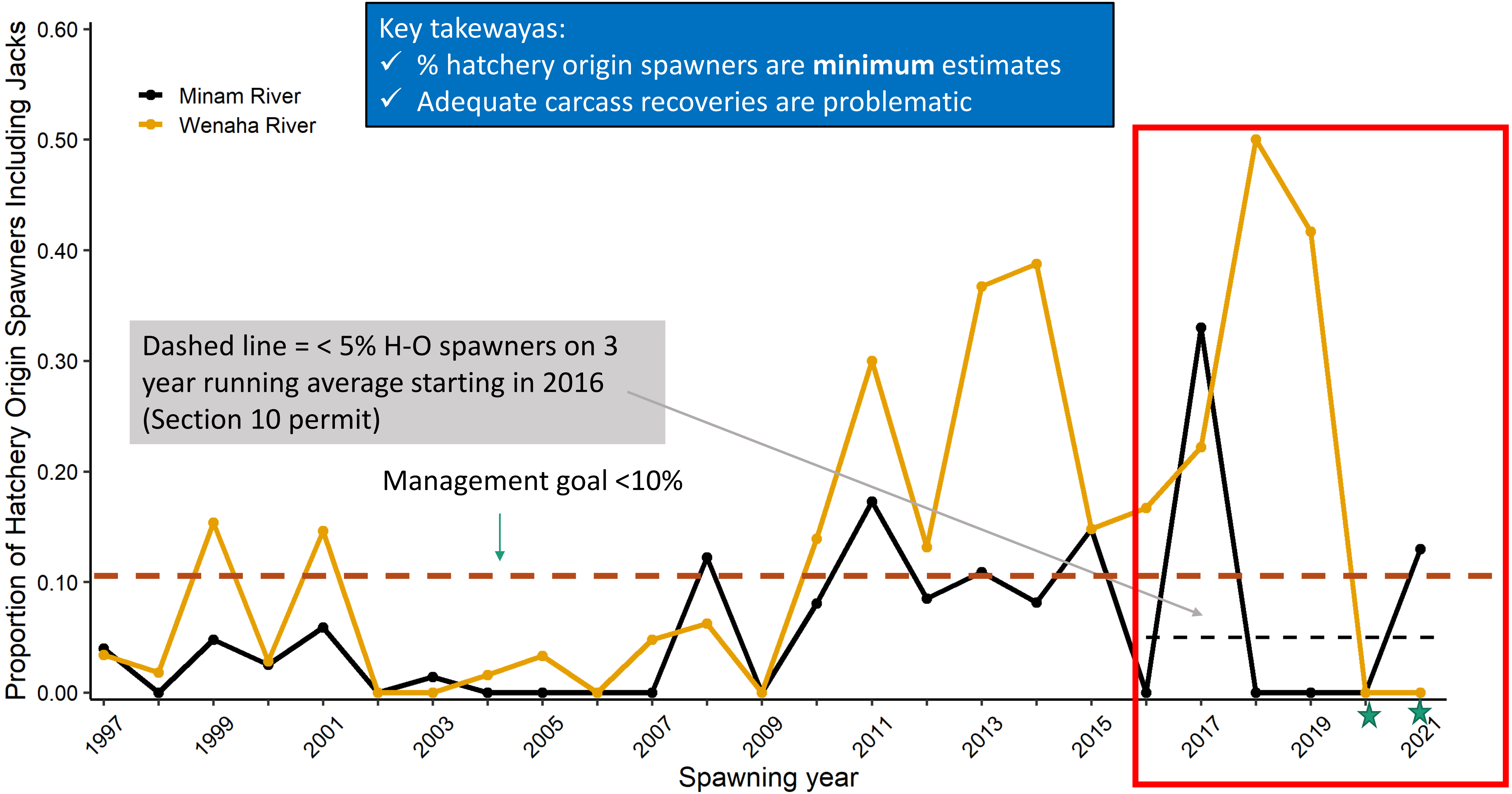
- ✓ Temporal: Upstream to downstream spawning in all streams
- ✓ Redd distribution: similar to carcass patterns shown here.

- ✓ >99% above the weir
- ✓ Hatchery fish spawning above the acclimation site
- ✓ Hatchery & Natural: Complete overlap

Objective 7: Determine success of maintaining genetic integrity of endemic wild spring Chinook salmon in the Minam and Wenaha Rivers.

- Proportion Hatchery Origin Spawners (pHOS) in the Minam and Wenaha River

Hatchery spawners in the Minam River and Wenaha River



Carcass recoveries are challenging

	Minam River				Wenaha River						
	Natural Origin	Hatchery Origin			Natural Origin	Hatchery Origin					
Year	N-O	UNK	Total	% H-O	N-O	LKG	UNK	Other	Total	% Hatchery	%H-O LKG
2016	23	0	23	0%	45	1	7	1	54	17%	1.9%
2017	2	1	3	33%	5	1	1	0	7	29%	14.3%
2018	9	0	9	0%	11	5	6	0	22	50%	22.7%
2019	6	0	6	0%	7	0	5	0	12	42%	0.0%
2020	12	0	12	0%	2	0	0	0	2	0%	0.0%
2021	6	1	7	14%	2	0	0	0	2	0%	0.0%
2022*	5	0	5	0%	11	0	3	0	14	21%	0.0%
Total	63	2	65		83	7	22	1	113		
		3-year average		4.7%						4.7%	0%

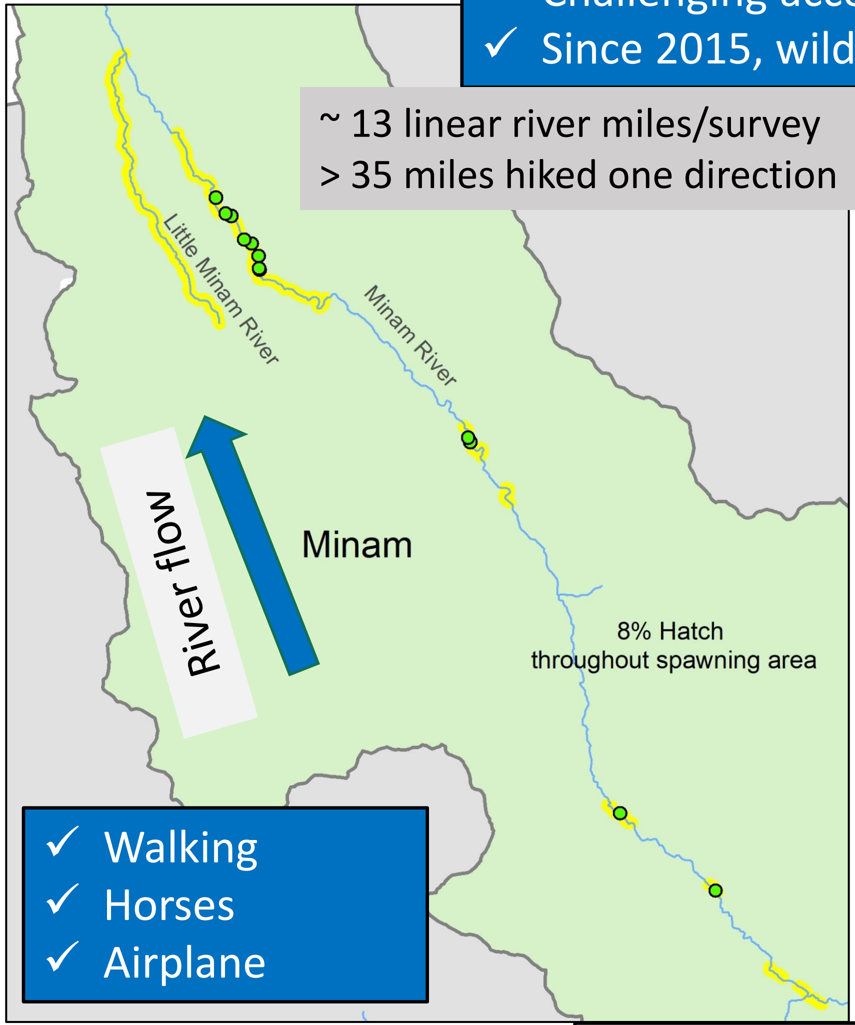
* PBT and CWT data not available for 2022

Section 10 requirements: <5% LKG H-O spawners on 3 year running average

- not being met except on years where carcass recoveries are inadequate for reasonable summaries

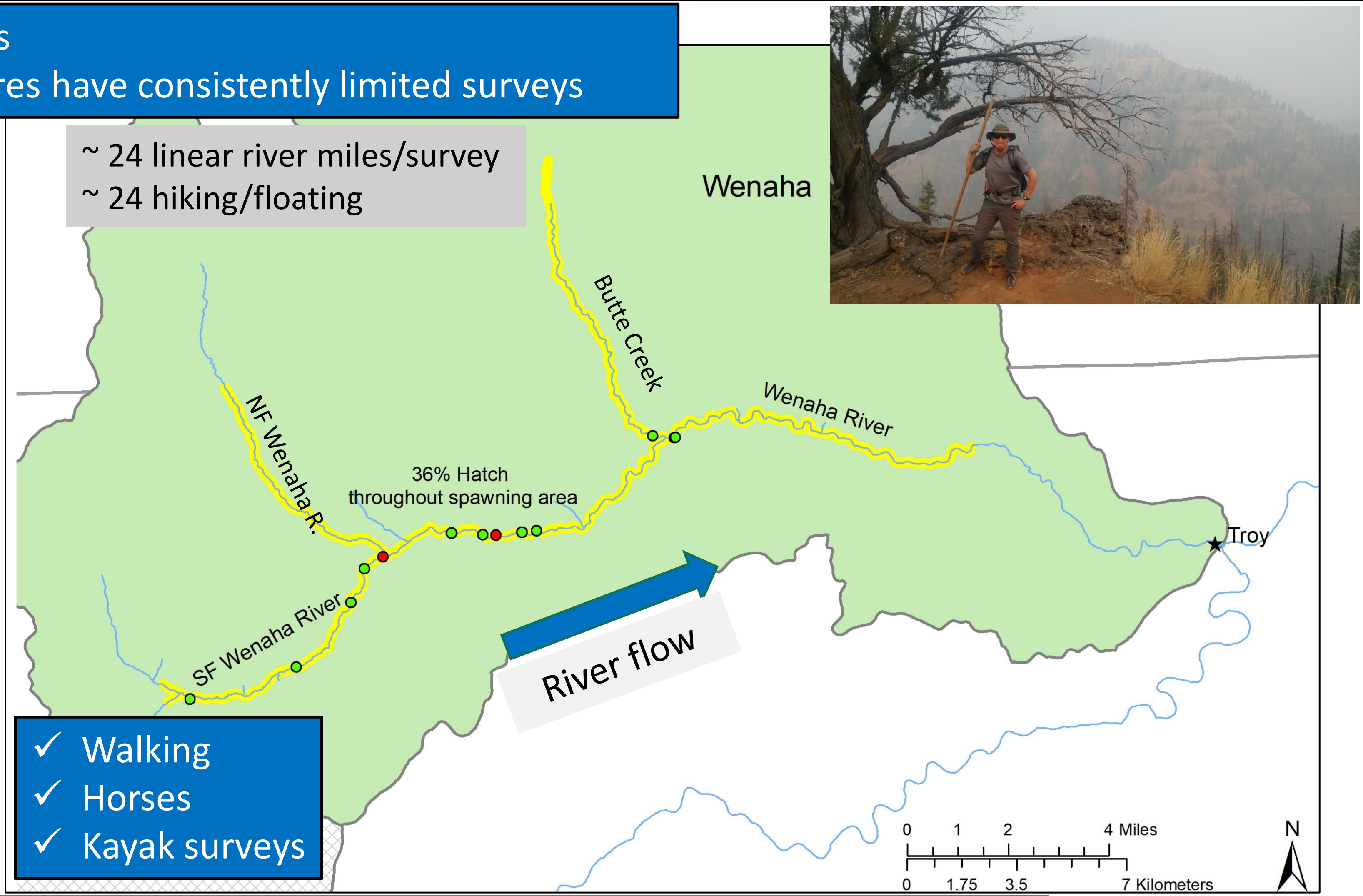
Minam River (2021 & 2022)   Wenaha River (2021 & 2022)

- ✓ Challenging access
- ✓ Since 2015, wildfires have consistently limited surveys



~ 13 linear river miles/survey
> 35 miles hiked one direction

- ✓ Walking
- ✓ Horses
- ✓ Airplane



~ 24 linear river miles/survey
~ 24 hiking/floating

- ✓ Walking
- ✓ Horses
- ✓ Kayak surveys

Natural
Hatchery

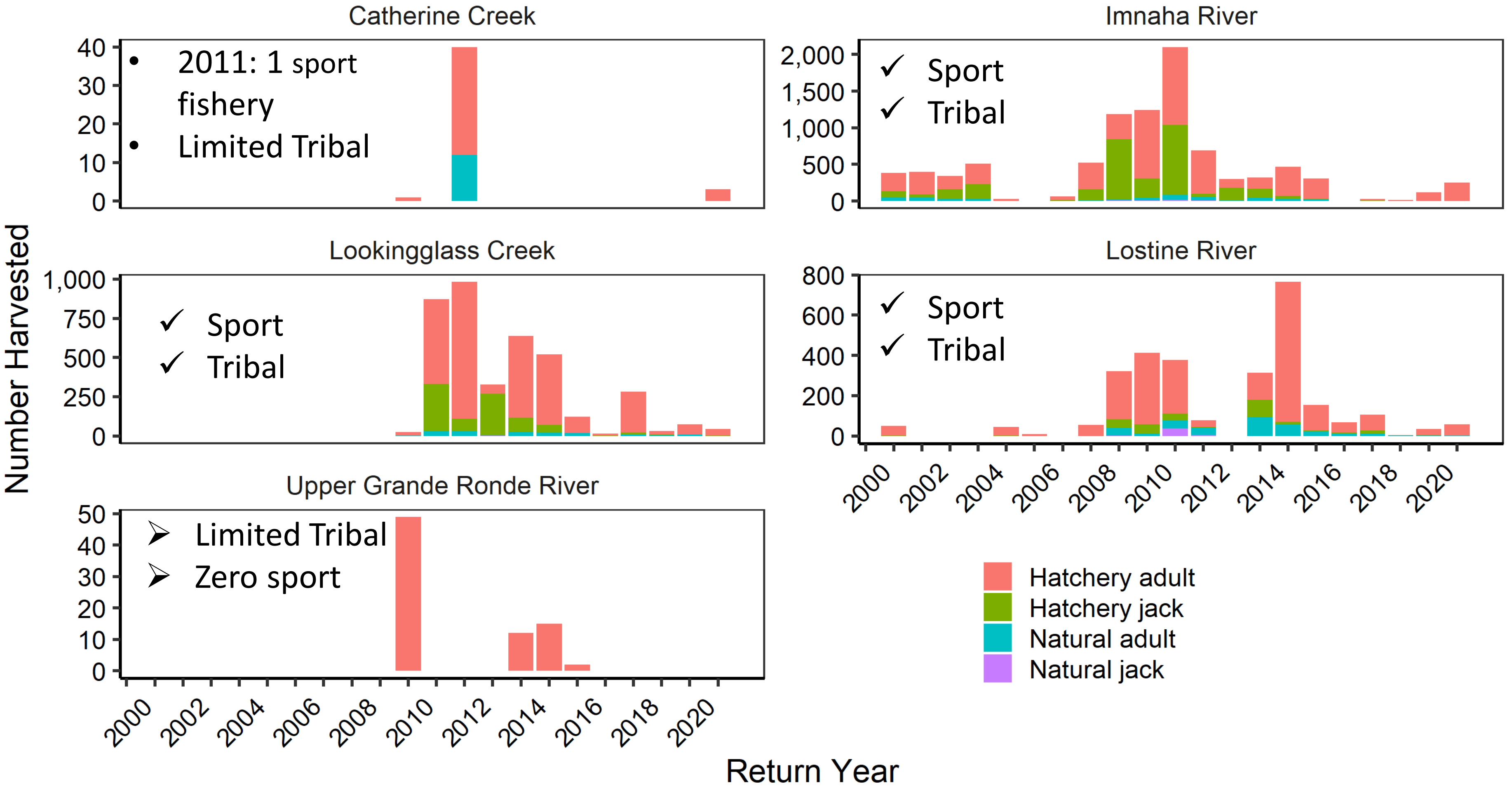
Need new approach to monitoring hatchery strays!

- ✓ PIT tag arrays on Minam River & Wenaha River (dip-ins?)
- ✓ Elk River: Olfactory research to reduce strays?

Objective 8: Assess success in restoring fisheries

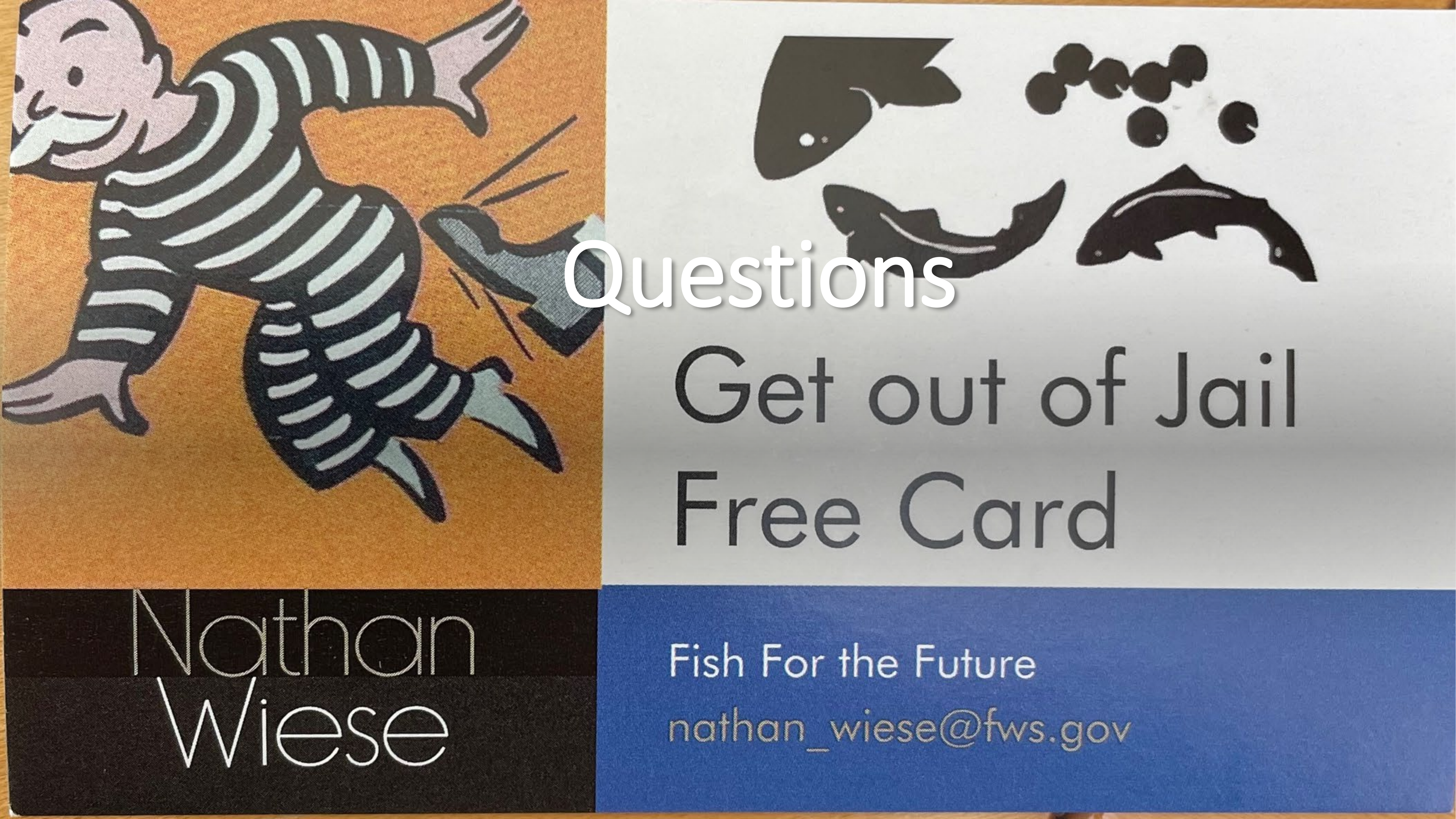
Sport and Tribal Fishing: Capitalizing on sparse opportunities

- Fishing opportunities have remained elusive
- Limited by natural returns
- PIT tags: difficult to predict in-season natural numbers at low abundance



- ✓ 2010 to present: Weekly meetings by co-managers have allowed for harvest opportunities previously missed.
- ✓ Hatchery fish are available to harvest that fishermen can not access

Questions


Get out of Jail
Free Card
Nathan
Wiese
Fish For the Future
nathan_wiese@fws.gov