

Salmon R. Basin Hatchery Steelhead Program Review

ISRP Review Symposium

Boise, Idaho

Jan 21-23, 2025

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Idaho Dept. of Fish and Game

Acknowledgements

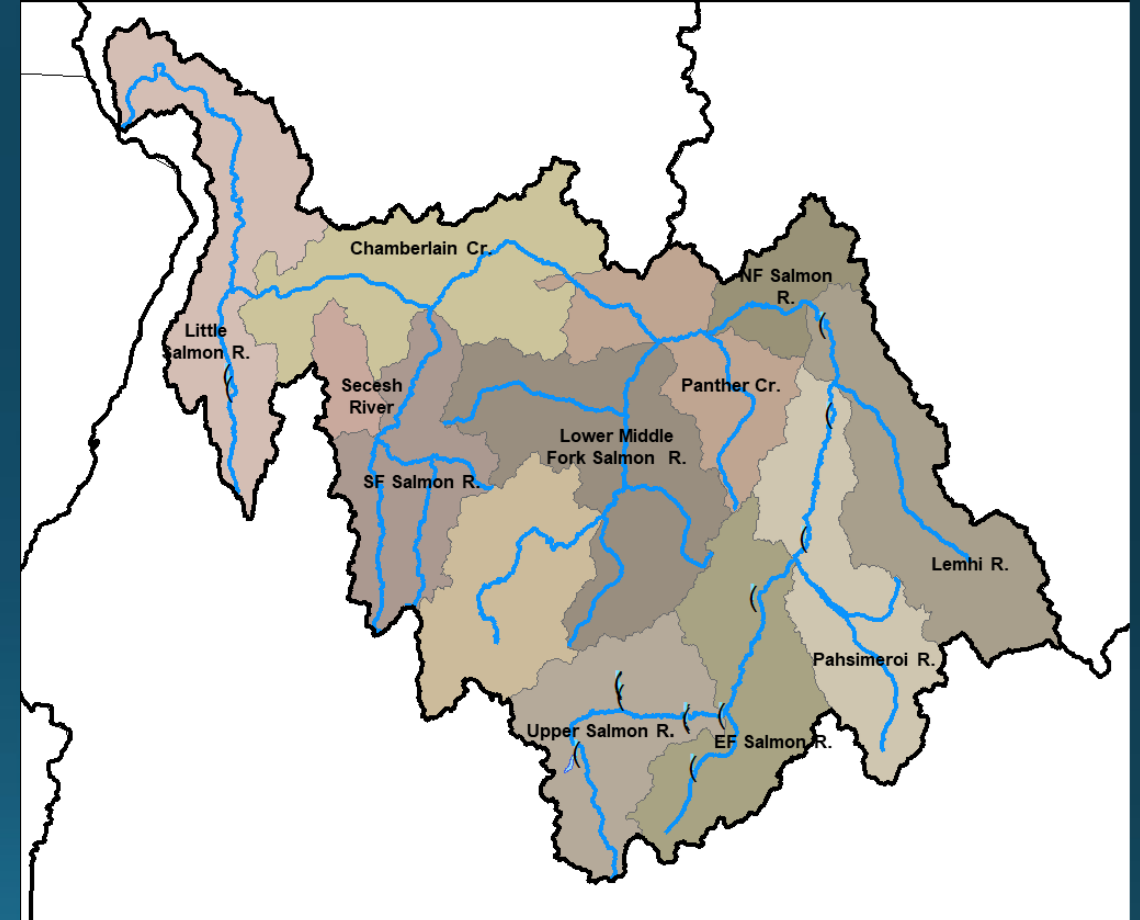
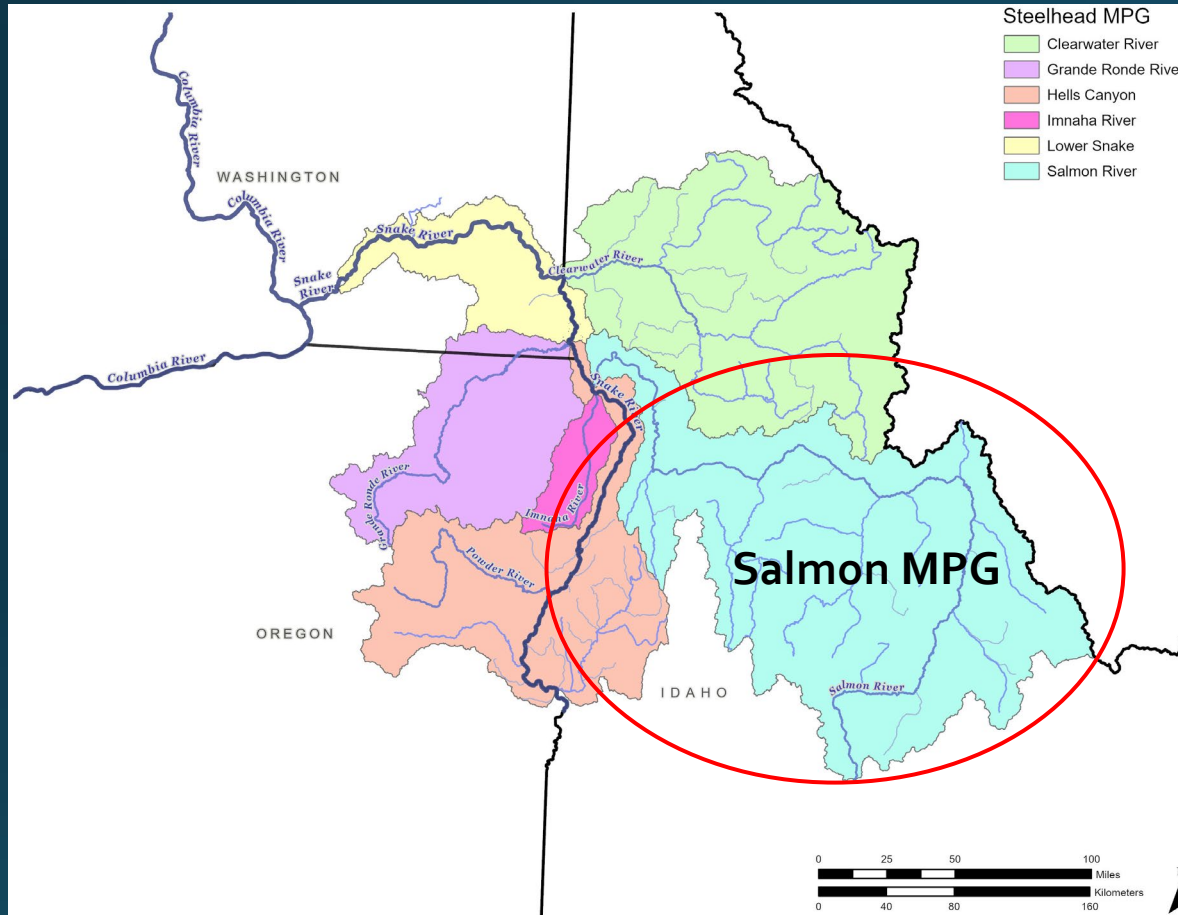
- Hatchery Staffs- Hagerman National, Magic Valley, Niagara Springs, Sawtooth, Pahsimeroi, Clearwater, and Dworshak
- Harvest Monitoring Crews- Don Whitney and Brent Beller
- Fish Marking- Braden Buttars, Ken Bennett
- Lower Granite Dam- IDFG, NOAA
- Genetics Labs- IDFG: Matt Campbell, CRITFC: Sean Narum
- Data Coordinators- Forrest Bohlen and Corey Dondero
- Nez Perce and Shoshone Bannock tribes
- Idaho Power Company
- LSRCP and Bonneville Power

Outline

- Management Framework
- Natural Populations
- Mitigation Goals
- Hatchery Program Description
- Hatchery Performance
 - In-hatchery
 - Post release
- Harvest Mitigation
- East Fork Natural Program
- USAL Program
- Summary



On the Map- Salmon R. Basin



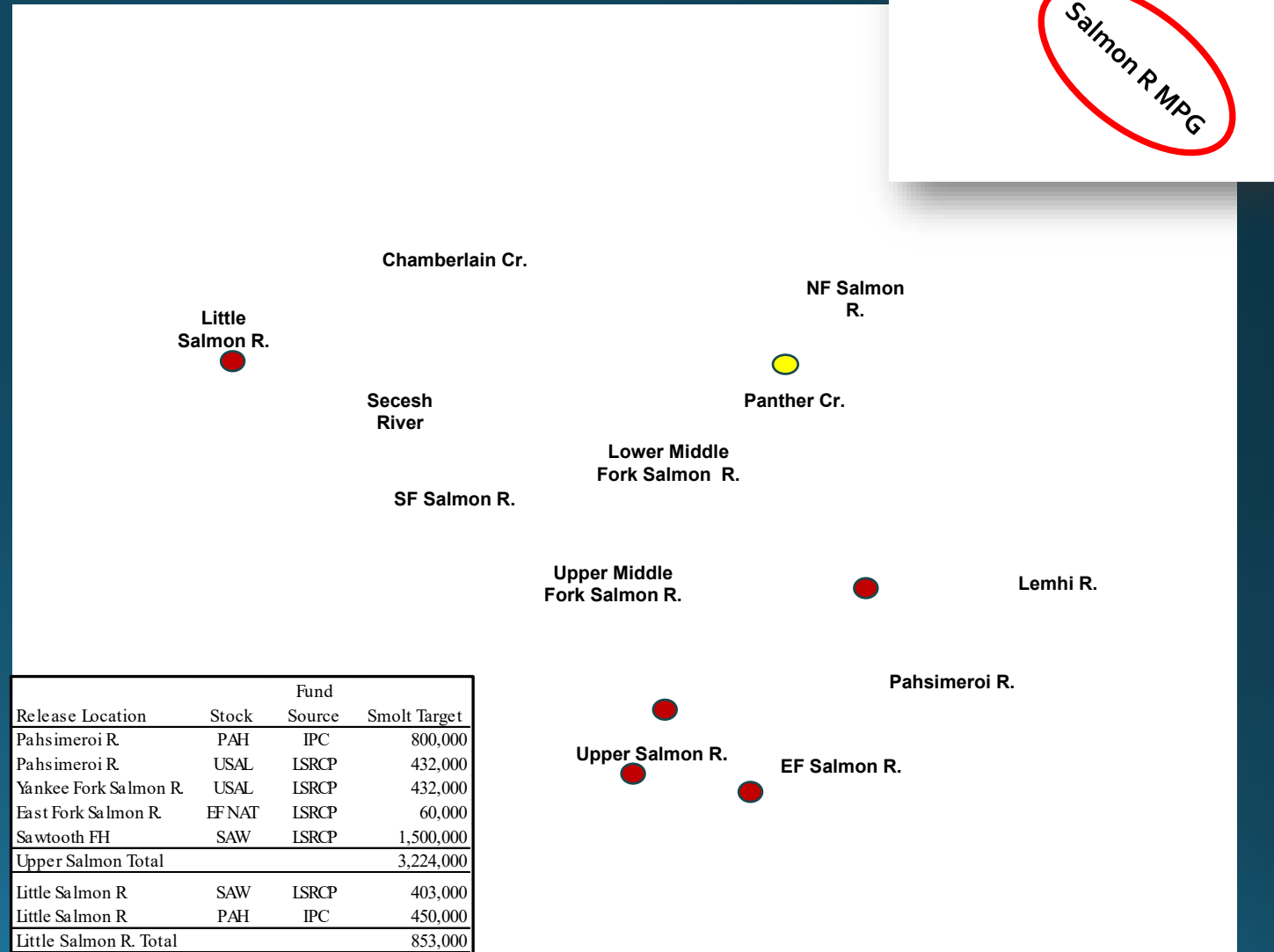
Management Framework for Hatchery Program

- Restore and maintain recreational and tribal fisheries
- Meet LSRCF adult mitigation objectives
- Reduce impacts of hatchery program on natural populations



Management Framework for Natural Populations

- Restore and maintain natural populations
- Monitor and reduce impacts of hatchery program
- Upper Salmon R. and Little Salmon R. populations managed with significant hatchery footprint
- All other areas managed for natural population emphasis



Management Framework for Natural Populations

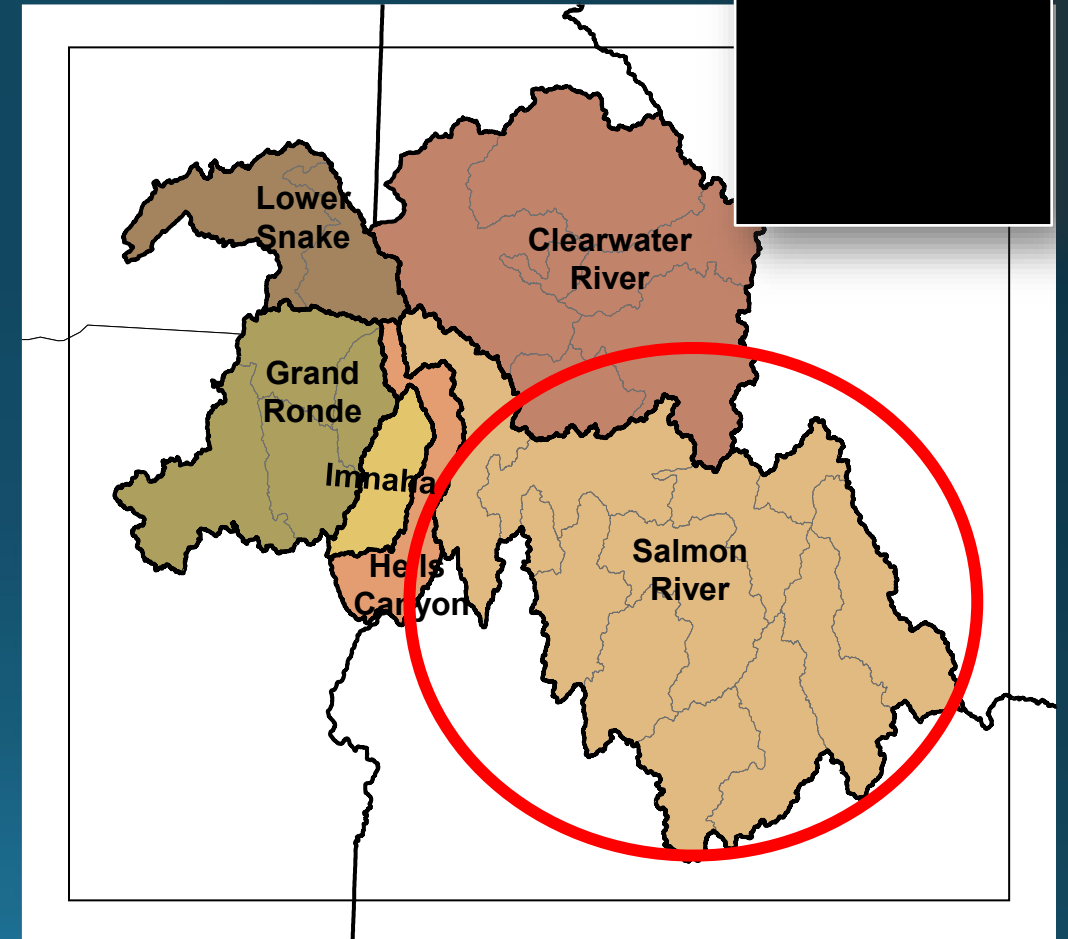
- Restore and maintain natural populations
- Monitor and reduce impacts of hatchery program
- Upper Salmon R. and Little Salmon R. populations managed with significant hatchery footprint
- All other areas managed for natural population emphasis
- Consolidation of release sites



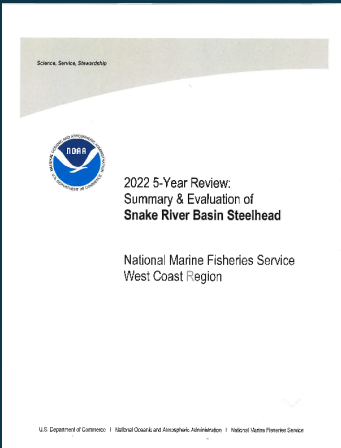
Status of Natural Populations

Snake River Distinct Population Segment (DPS)- Listed as Threatened in 1997

- Six Major Population Groups (MPGs) in the DPS
 - None are currently viable
- Salmon River Major Population Group (MPG)
 - 12 extant populations



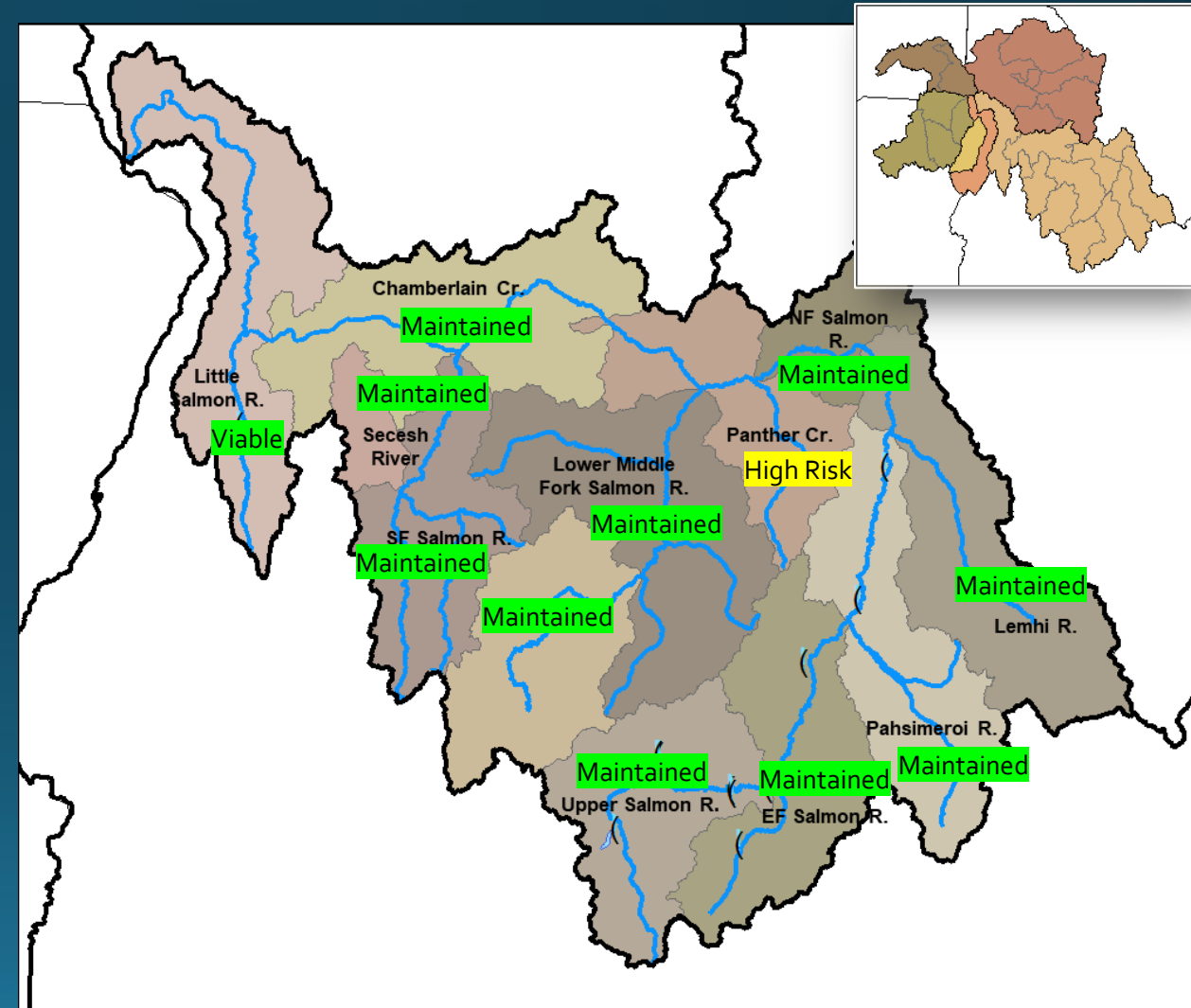
Natural Populations- 2022 ESA Status Review- Salmon R MPG



Population	Overall Risk Rating	Hatchery Program within Population
Little Salmon River	Viable	Yes
South Fork Salmon River	Maintained	No
Secesh River	Maintained	No
Chamberlain Creek	Maintained	No
Lower Middle Fork Salmon River	Maintained	No
Upper Middle Fork Salmon River	Maintained	No
Panther Creek	High Risk	Yes - egg box
North Fork Salmon River	Maintained	No
Lemhi River	Maintained	No
Pahsimeroi River	Maintained	Yes
East Fork Salmon	Maintained	Yes - Integrated
Salmon River Upper Mainstem	Maintained	Yes

MPG Recovery Scenario

Six of the twelve populations must be viable (one highly viable). The remaining six must be at least maintained



Hatchery Mitigation Goals

- HNFH accounts for 24% of LSRCP goal
- MVFH accounts for 21% of LSRCP goal

	Magic Valley	Hagerman Nat.
Adult Goal- Upstream of Project Area	11,600	13,600
Adult Goal- Downstream of Project Area	23,200	27,200
Adult Goal- TOTAL	34,800	40,800
SAR Needed to Reach Adult Goal	0.75%	0.87%
SAS Needed to Reach Adult Goal	2.25%	2.61%
Current Smolt Release Target	1,560,000	1,550,000
Total LSRCP Project Area Goal	55,100	
LSRCP Total Adult Goal	165,300	
Salmon River Program Accounts for 45% of the LSRCP Return Goal		

Hatchery Program: Inter-Agency Coordination

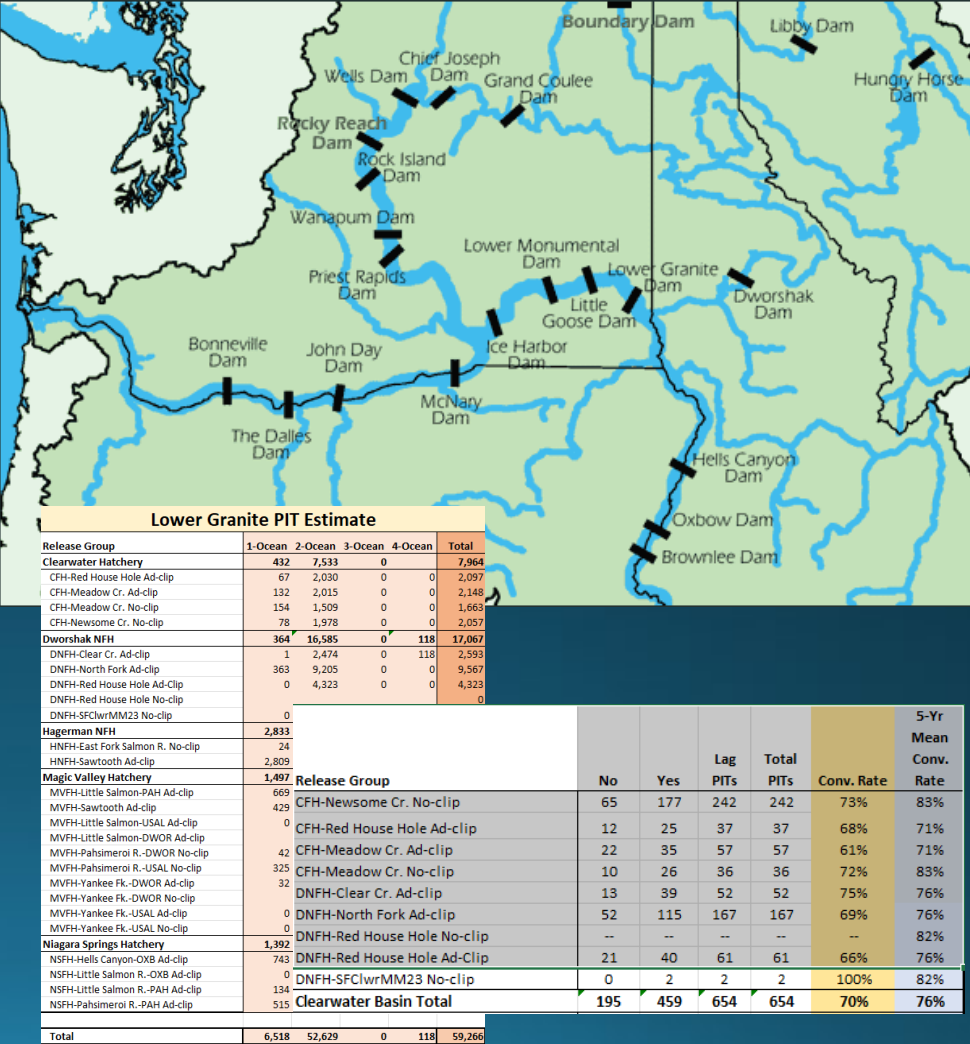
Annual Operating Plans (AOP and SOP)

Fishery Planning

In-Season Weekly Coordination Calls

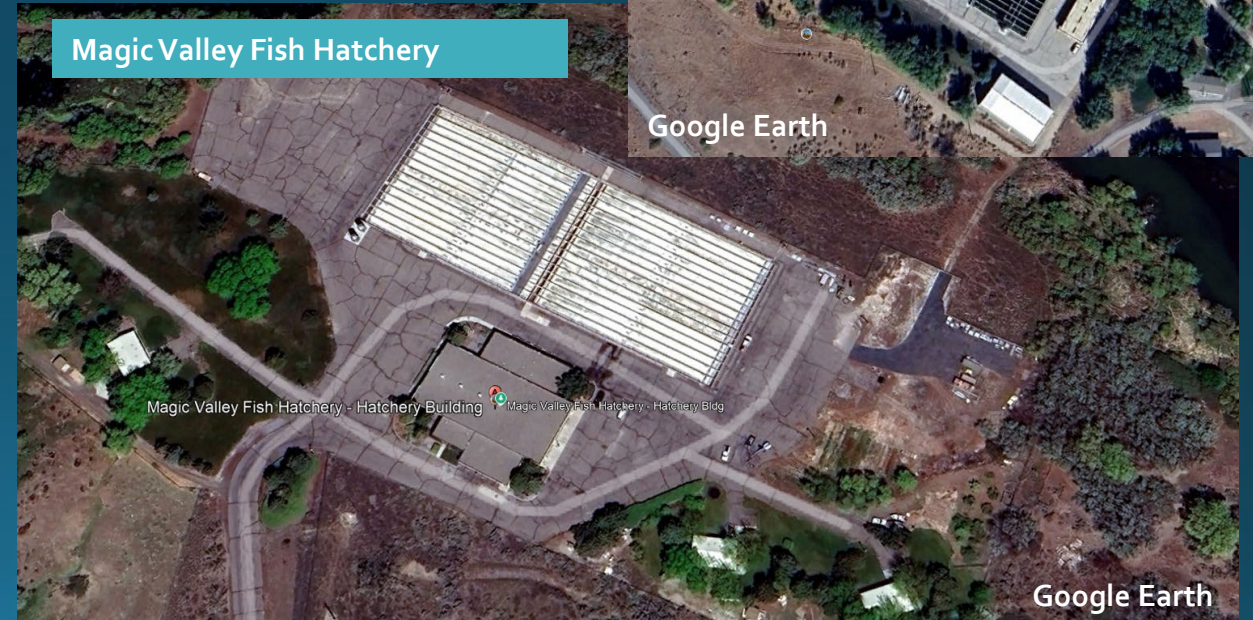
Calendar Year 2024
Annual Operation Plan
for
Salmon and Steelhead
Production Programs
in the
Salmon and Snake River Basins
Prepared by
Idaho Department of Fish and Game
Nez Perce Tribe
Shoshone-Bannock Tribes
U.S. Fish and Wildlife Service
Idaho Power Company

Standard Operating Procedures
for
Salmon and Steelhead
Production Programs
in the
Salmon and Snake River Basins
Prepared by
Idaho Department of Fish and Game
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Hatchery Program

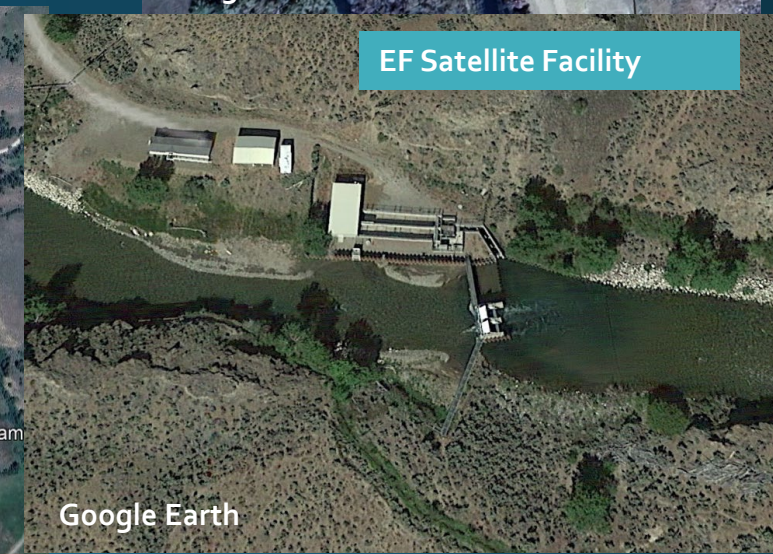
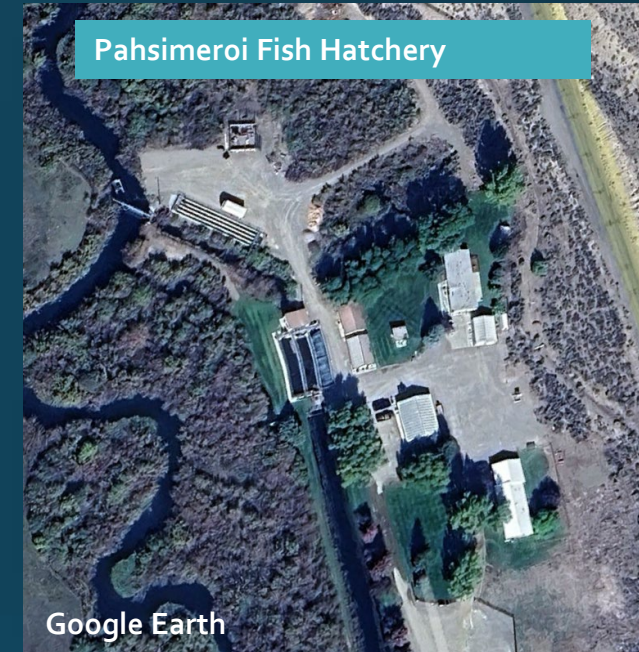
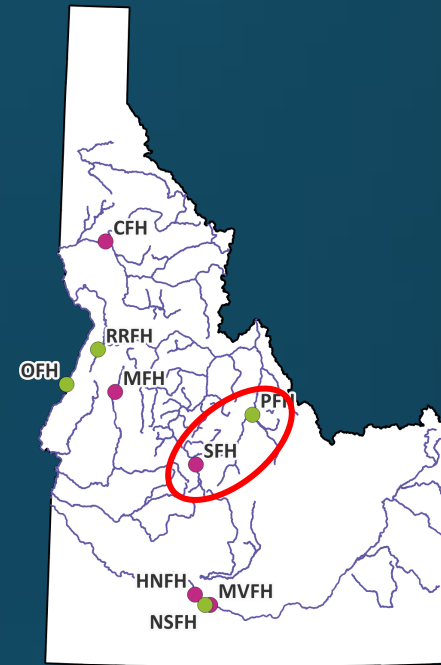
- Hagerman National Fish Hatchery
 - 1.56M smolts
 - Sawtooth stock (1.5M)
 - EF Salmon R stock (60K)
- Magic Valley Fish Hatchery
 - 1.55M smolts
 - Sawtooth stock (682K)
 - Upper Salmon stock (868K)
- Niagara Springs (IPC)
 - 1.8M smolts
 - Pahsimeroi Stock- (1M)
 - Oxbow Stock – (800K)
 - 1.25M in Salmon R.



Hatchery Program

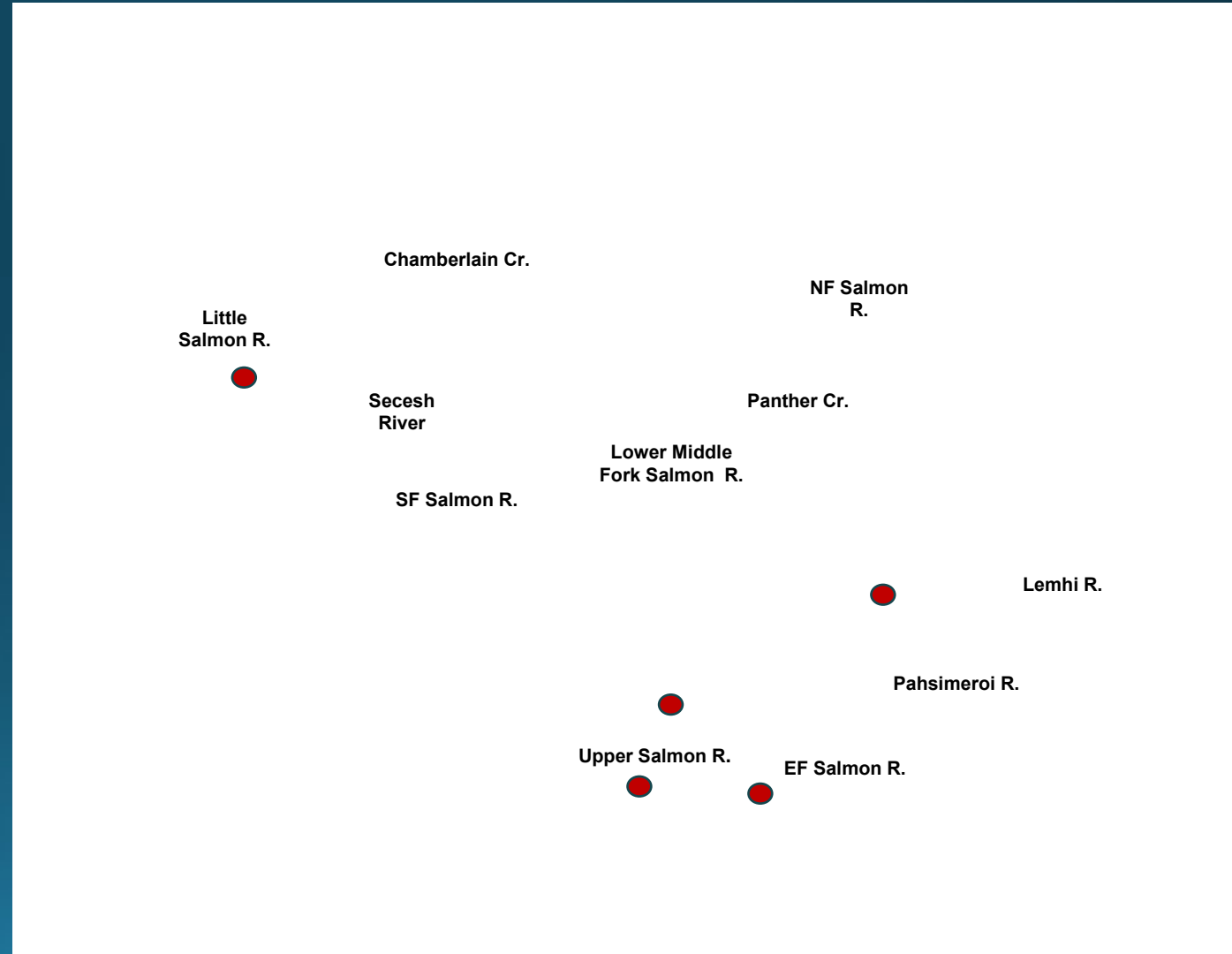
Broodstock Collection

- Sawtooth FH
 - SAW stock
- Pahsimeroi FH
 - PAH stock
 - USAL stock
- E.F. Salmon R. Satellite
 - EF Salmon R. stock



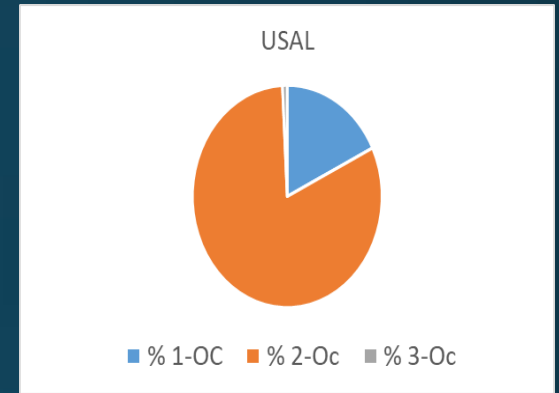
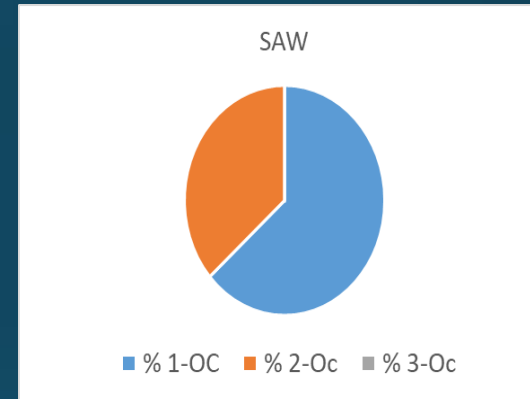
Hatchery Programs- Smolt Releases

- Hagerman National
 - 1,500,000 SAW Stock released at SFH
 - 60,000 EF Nat stock released in the EF Salmon R.
 - Integrated
- Magic Valley
 - 868,000 USAL stock released at Pahsimeroi FH and Yankee Fork
 - 682,000 SAW stock released at SFH and Little Salmon R

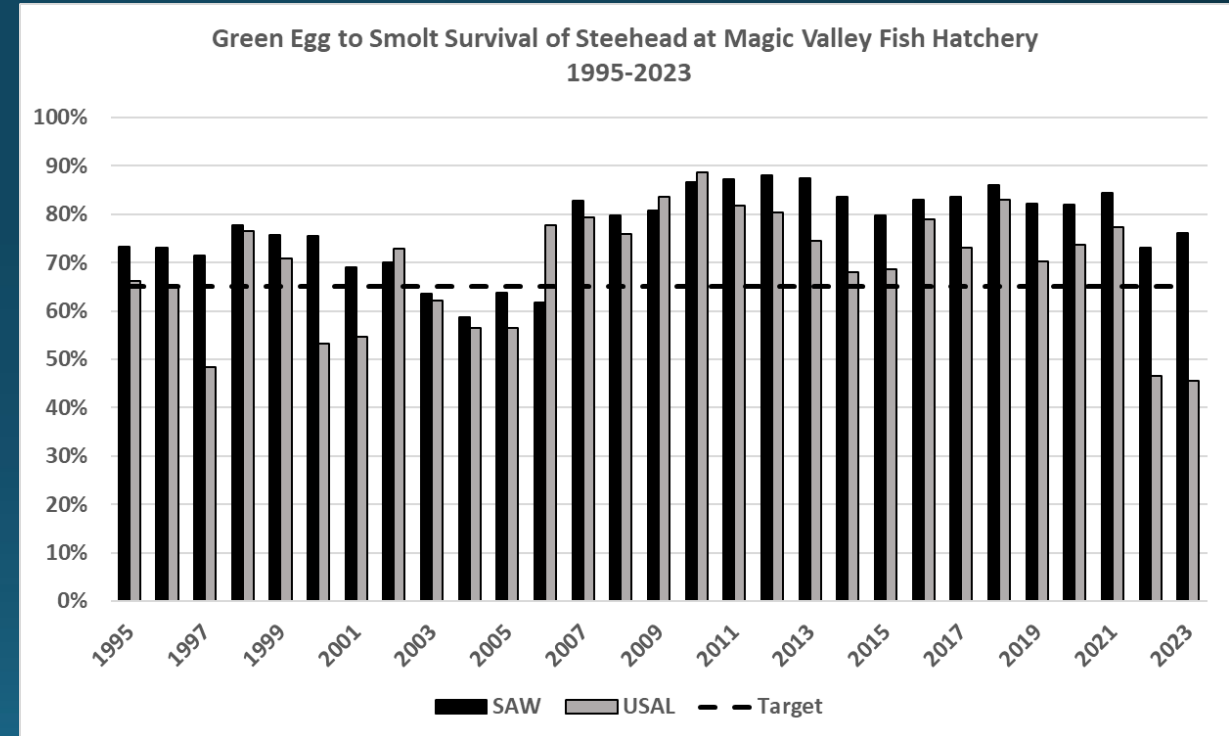
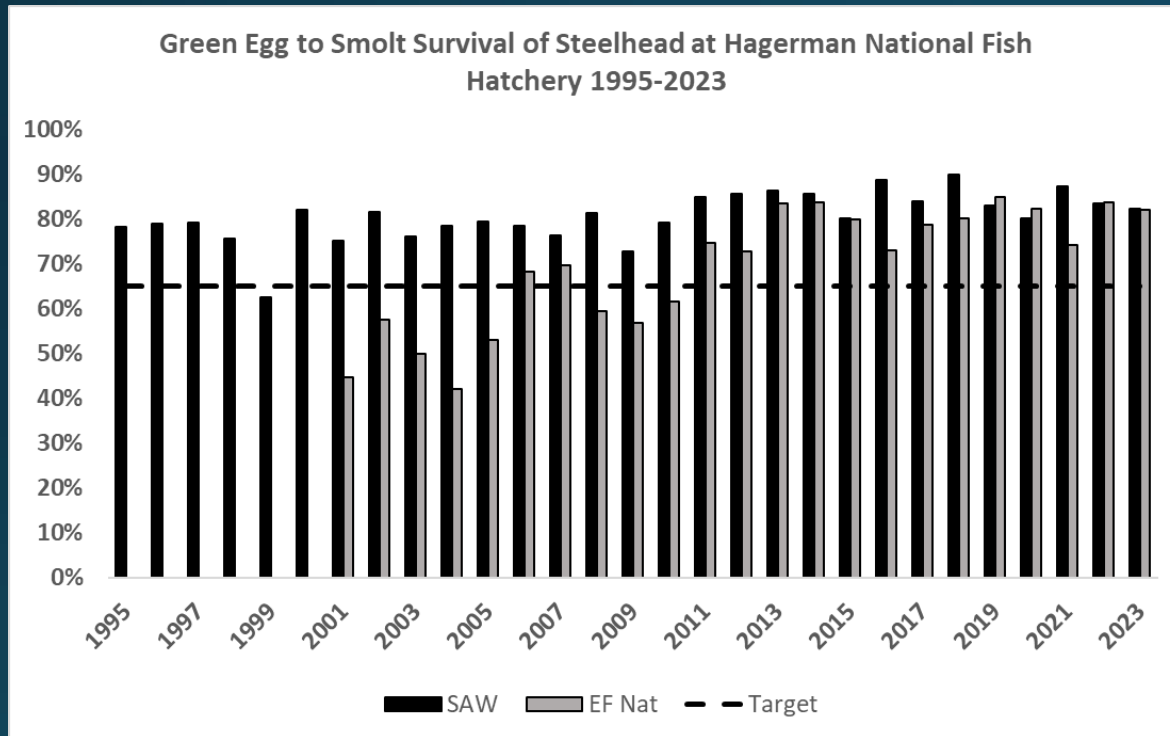


Hatchery Program- Broodstock History

- **Pahsimeroi Stock (PAH)**
 - Sourced from wild steelhead at Hells Canyon Dam beginning in 1965. Locally adapted at PFH starting in 1969
- **Sawtooth Stock (SAW)**
 - Sourced from PFH beginning in 1982. Locally adapted beginning in 1985.
- **Upper Salmon Stock (USAL)**
 - Sourced from DNFH in the late 1970s
 - Locally adapted with continual infusion of DNFH eggs through 2023
 - Older and larger than SAW and PAH stock
- **East Fork Natural (EF Nat)**
 - Integrated broodstock
 - Naturally produced steelhead in EF Salmon R.

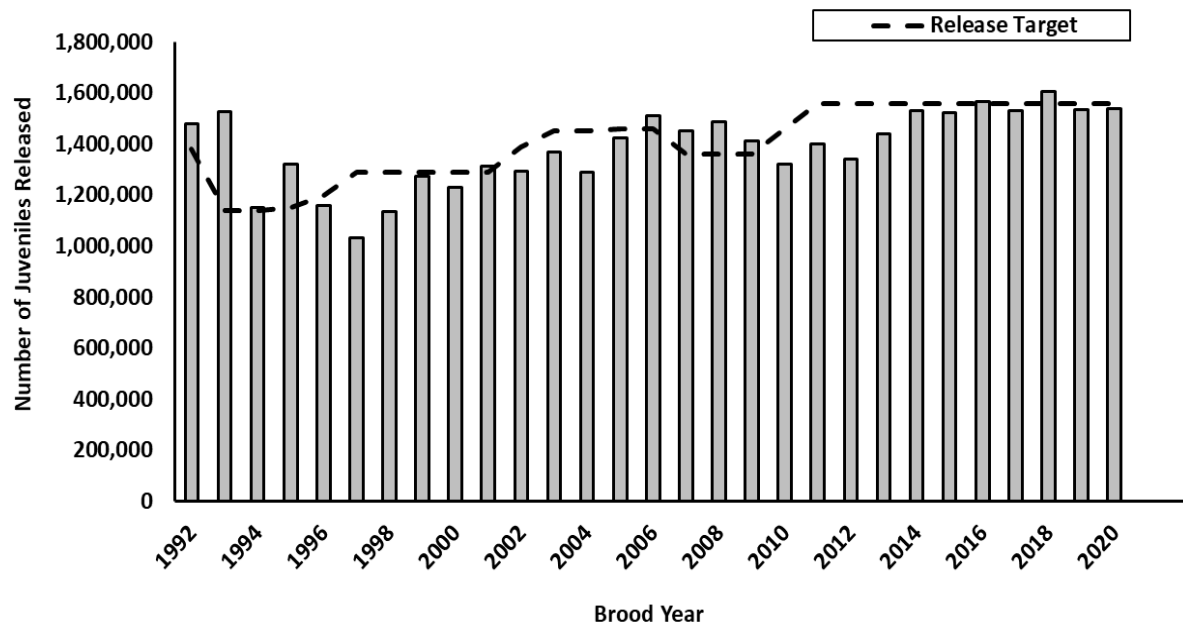


Hatchery Performance: In-Hatchery Survival

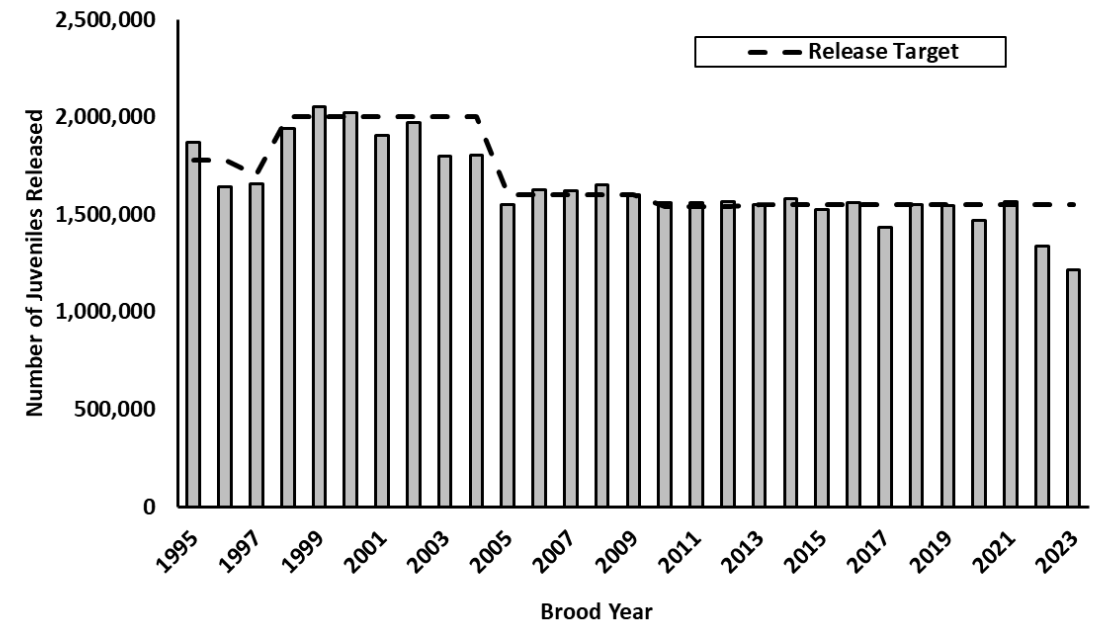


Hatchery Performance: Smolt Release Target

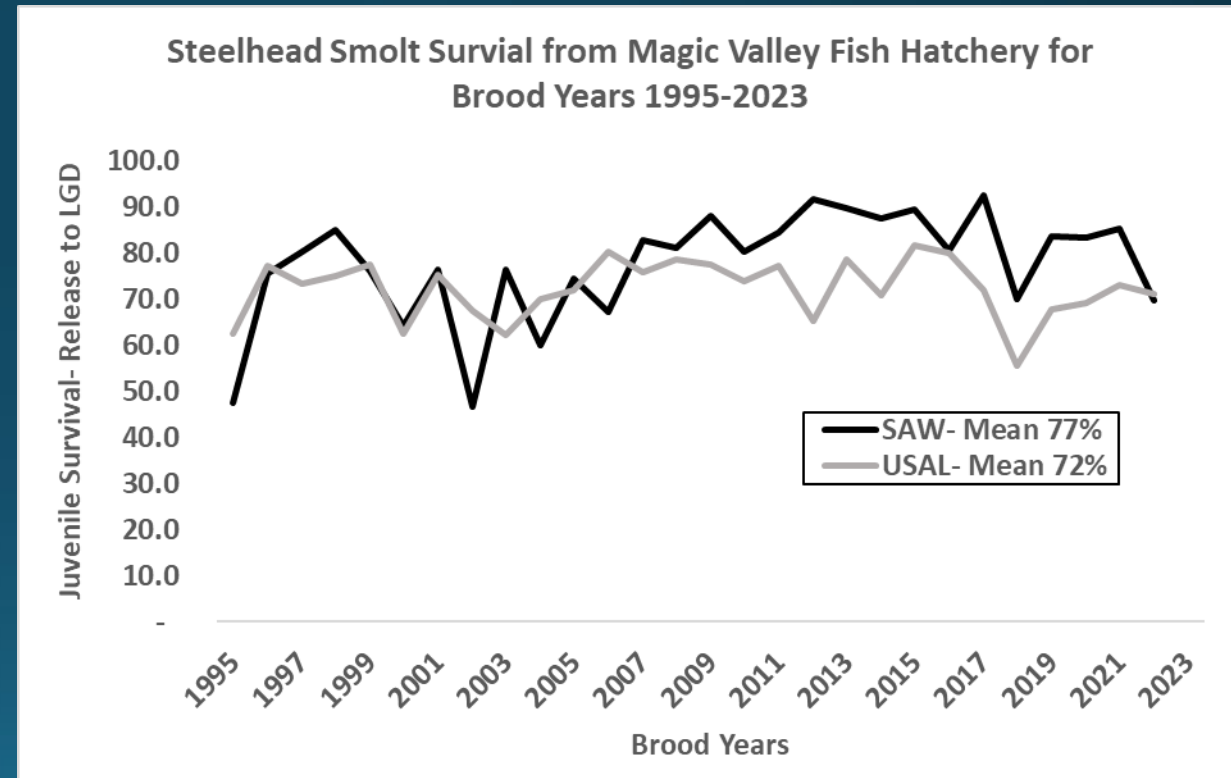
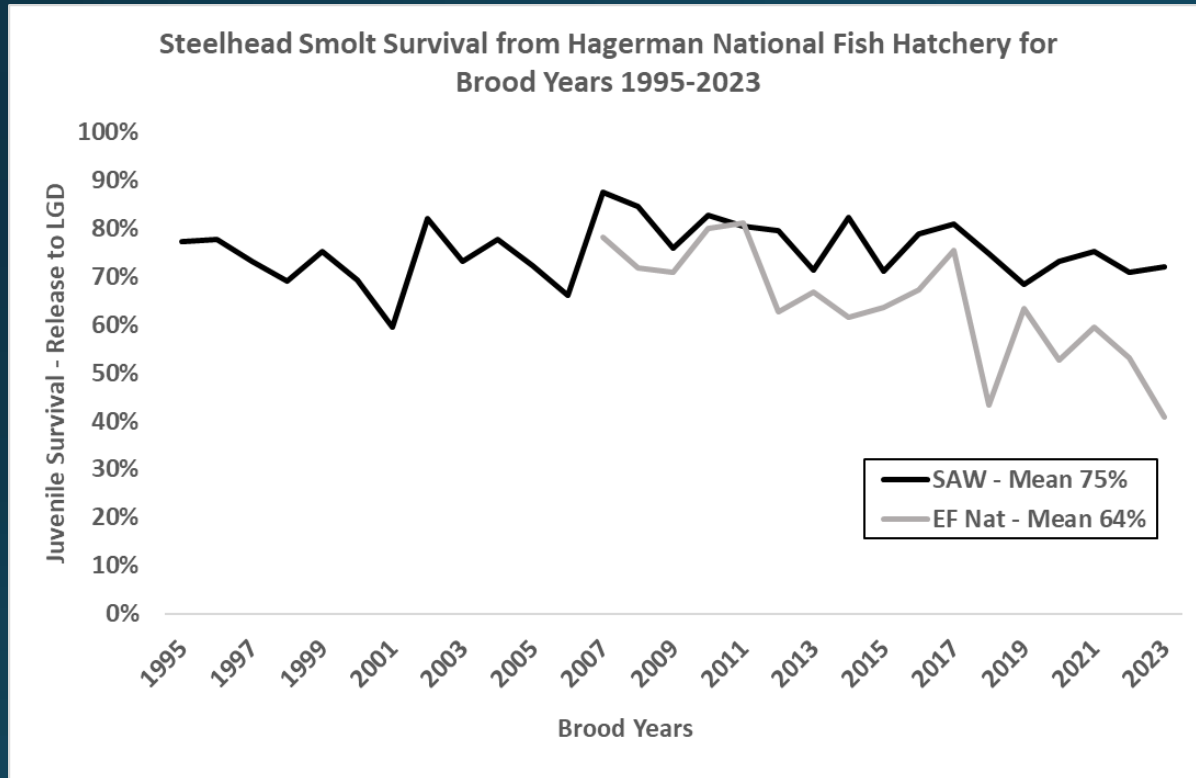
Number of Steelhaed Smolts Released from Hagerman National Fish Hatchery
1995-2023Chart Title



Number of Smolts Released from Magic Valley Fish Hatchery for Brood Years
1995-2023



Hatchery Performance- Smolt Outmigration Survival



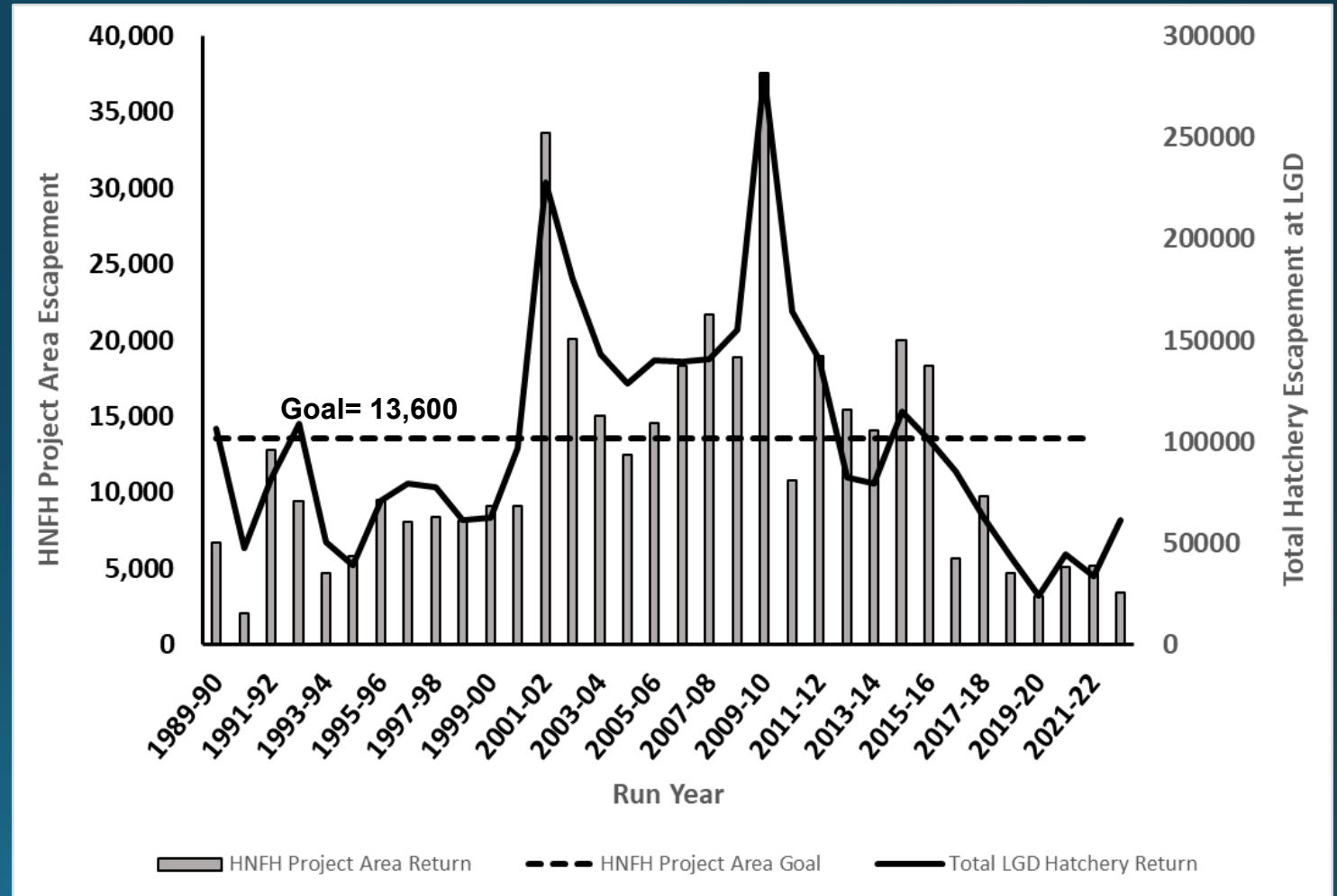
Survival from release location to Lower Granite Dam

Hatchery Performance- Adult Returns and Survival

- Methods
 - Same as those described in the Clearwater presentation by Katie

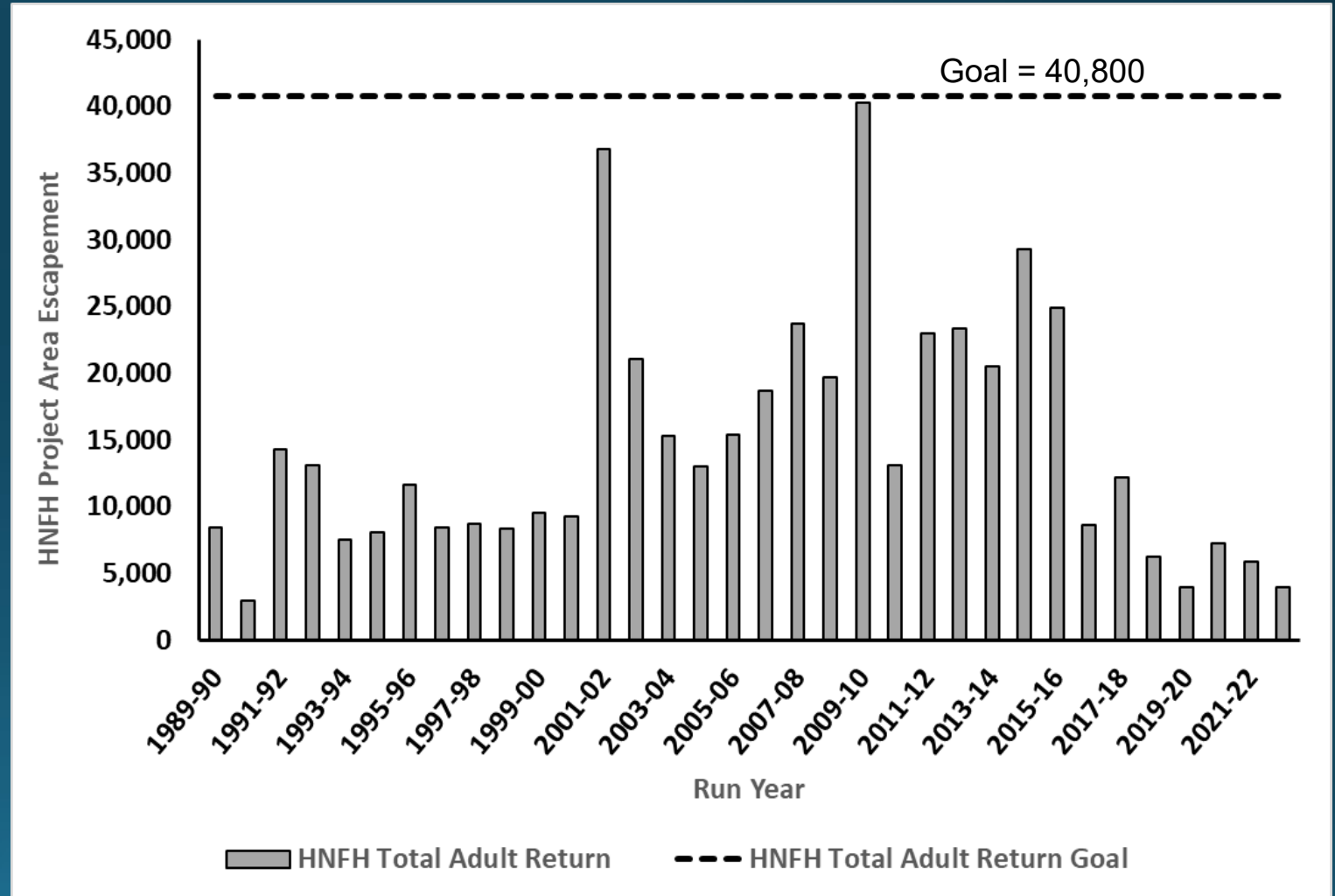
Hatchery Performance- HNFH Project Area Returns

- Met project area goal 13 of 34 years.
 - Six since last review
 - Avg. return = 12,389
- Recent decrease from HNFH is reflective of basin-wide decline in returns
- Average percent of total LGD hatchery return from HNFH since 2000 is 13% (6-19%)
- HNFH produces 17% of total smolts released upstream of LGD



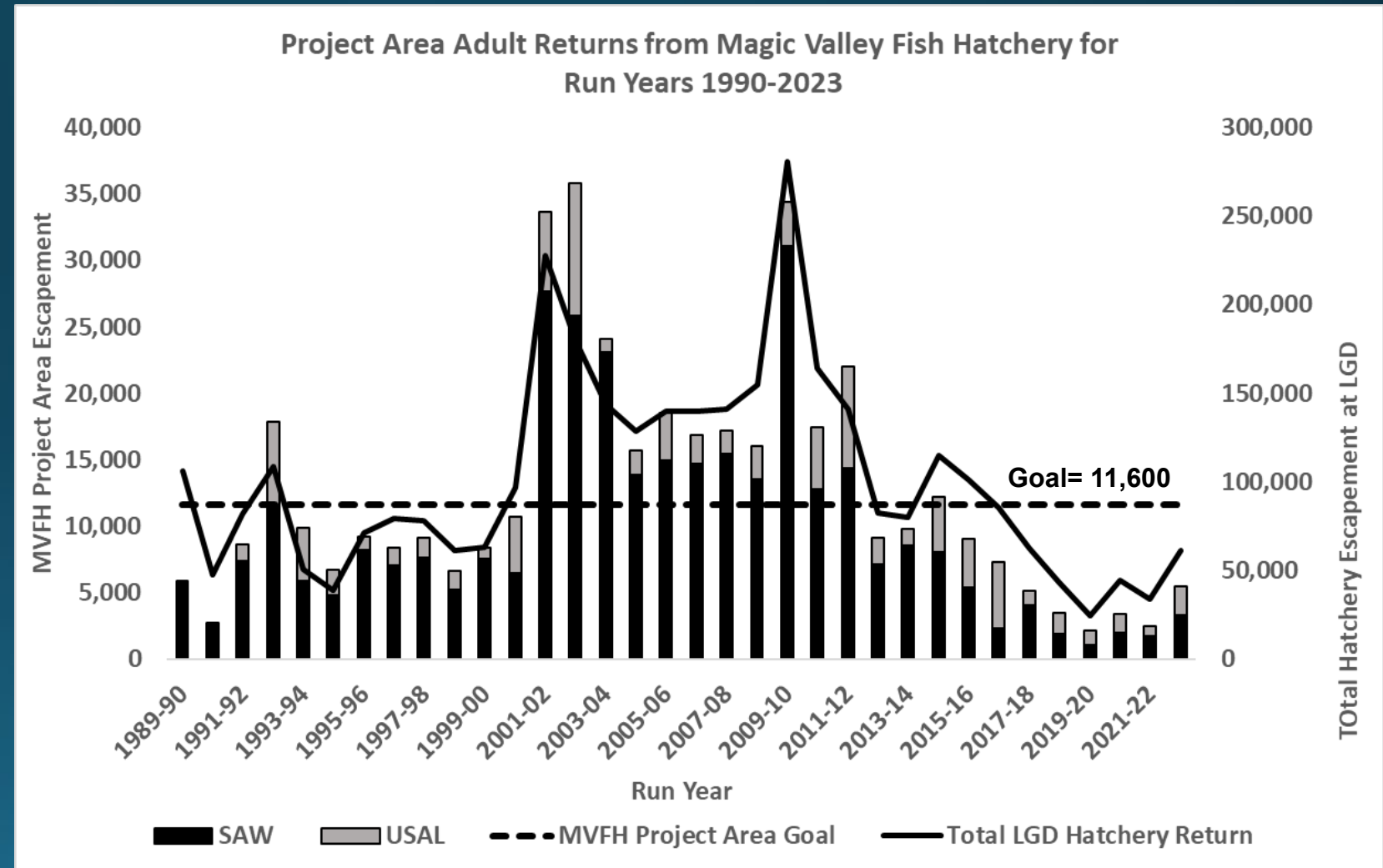
Hatchery Performance- HNFH Total Adult Returns

- Total goal has not been achieved.
- Average return is 14,600 (36% of goal)



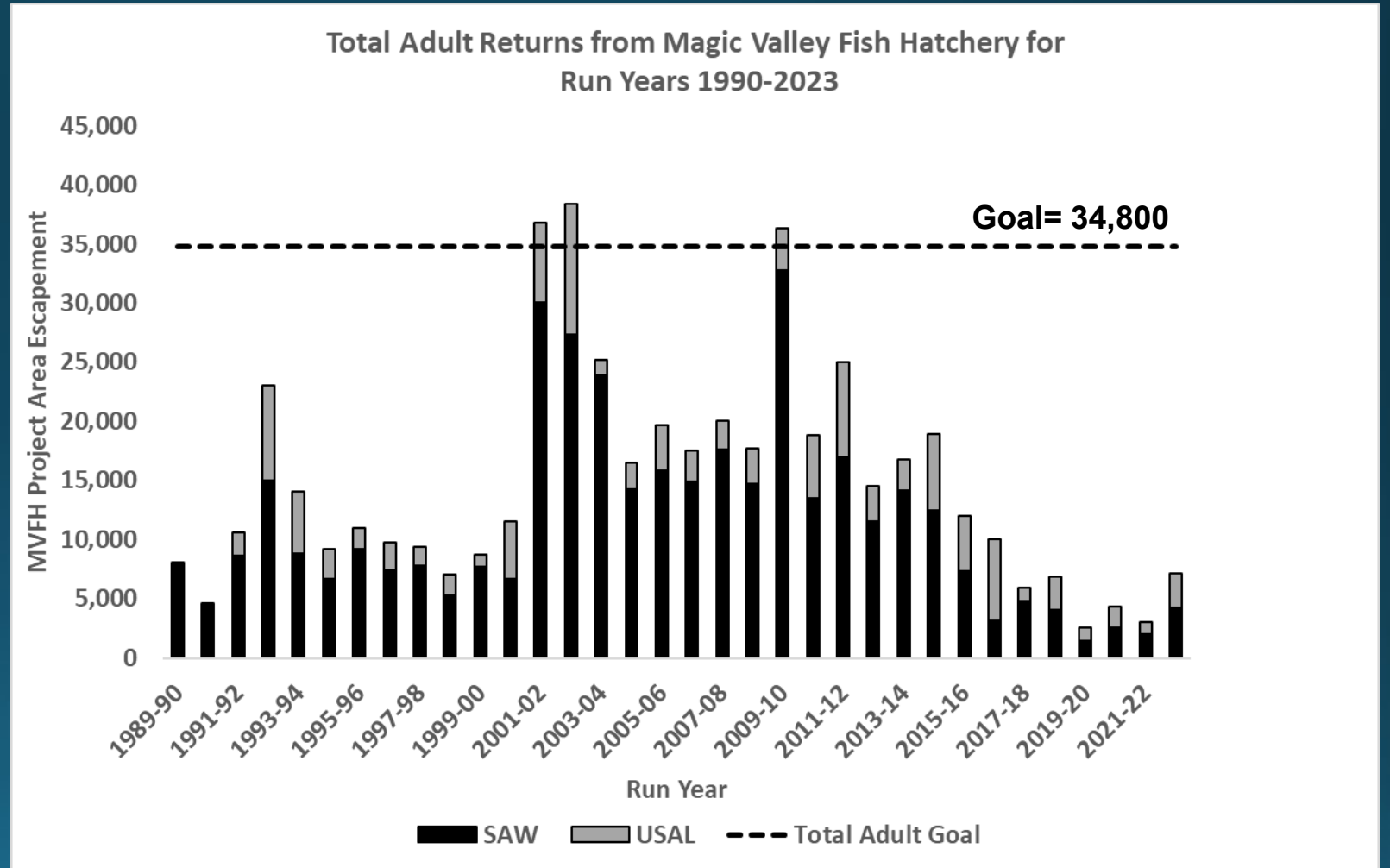
Hatchery Performance- MVFH Project Area Returns

- Met project area goal 13 of 34 years.
 - Four since last review
 - Avg. return = 12,518
- Recent decrease from MVFH is reflective of basin-wide decline in returns
- USAL stock accounts for 50-70% of smolt releases
- Average percent of total LGD hatchery return from MVFH since 2000 is 11% (7-20%)
- MVFH produces 17% of total smolts released upstream of LGD



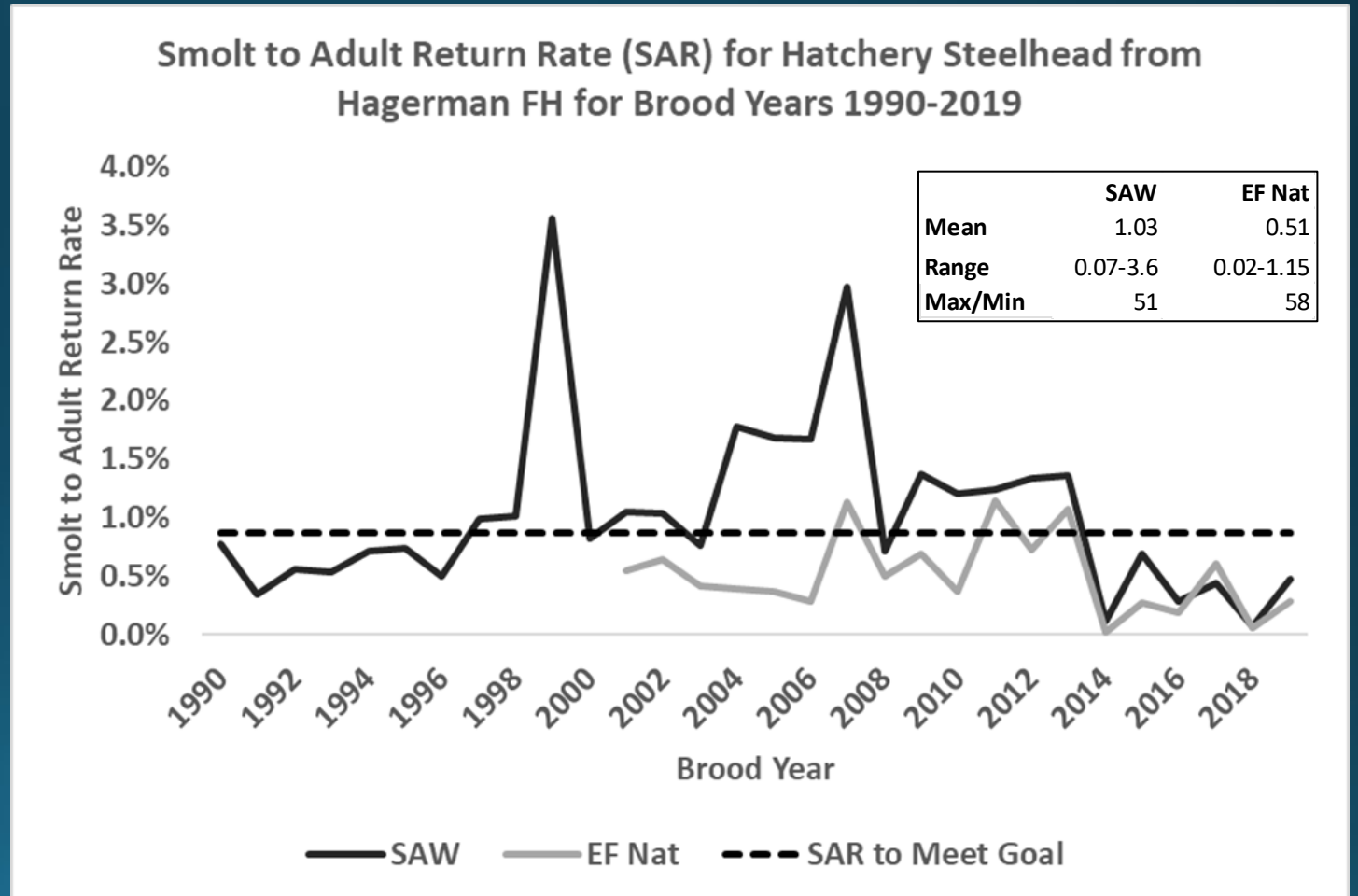
Hatchery Performance- MVFH Total Adult Returns

- Total adult goal has been achieved three times
- Average return is 14,800 (43% of goal)



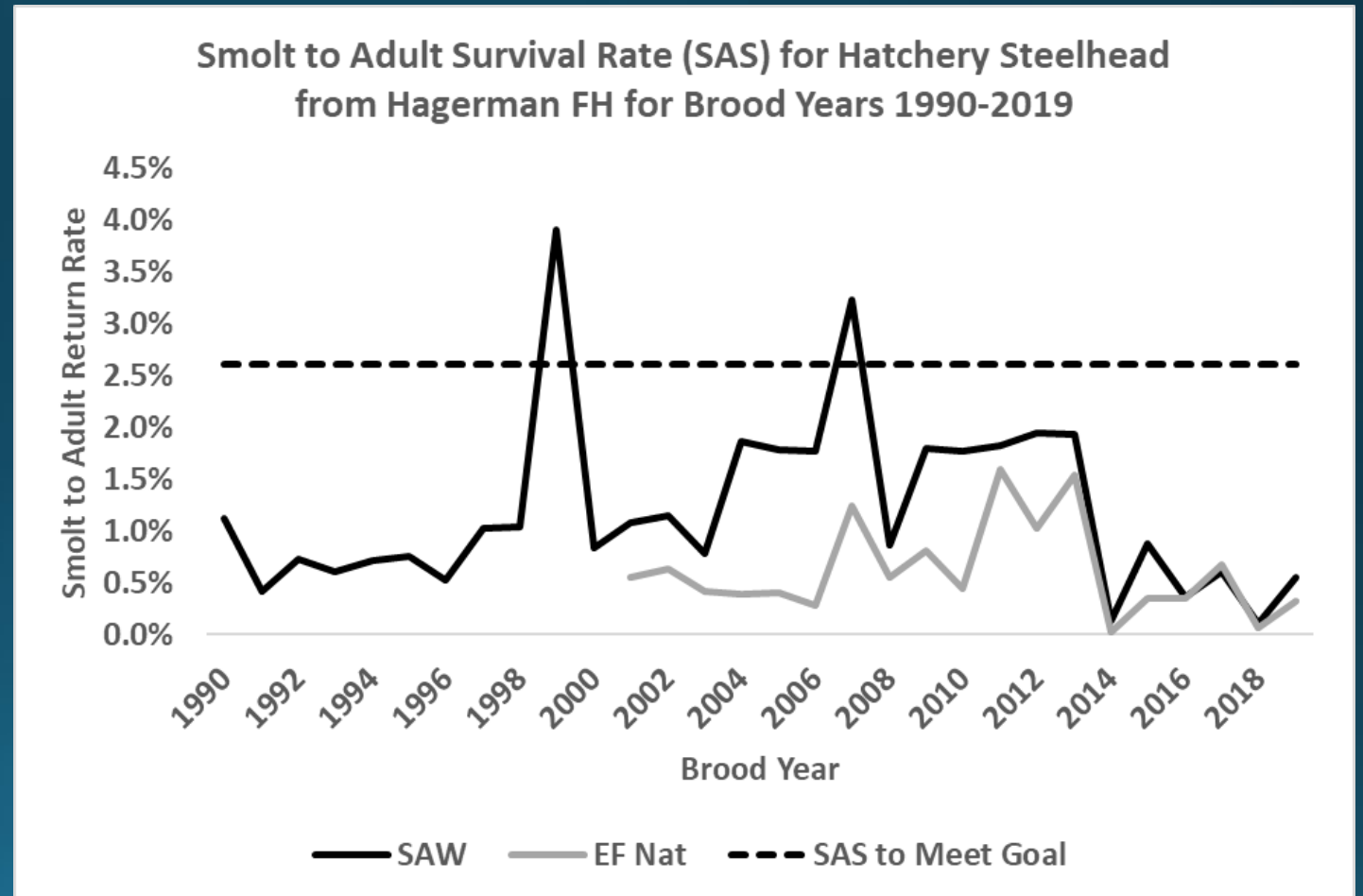
Hatchery Performance- Smolt to Adult Return Rate at Hagerman National Fish Hatchery

- 0.87% SAR needed to achieve project area goal.
- Fifty-fold swing in SARs
- 2x difference between stocks
- EF Nat program is only 4% of HNFH smolt production



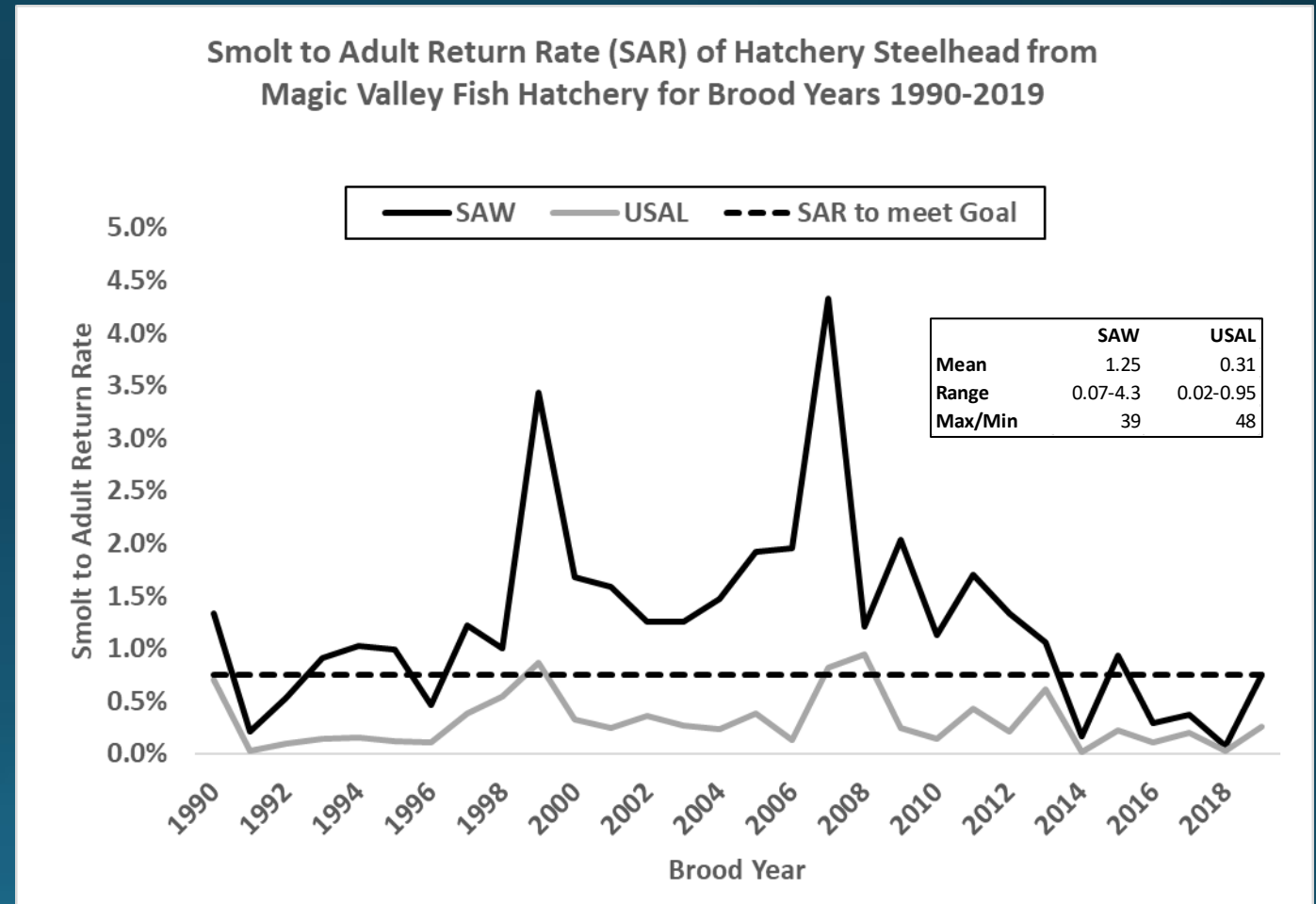
Hatchery Performance- Smolt to Adult Survival Rate at Hagerman Fish Hatchery

- 2.61% SAS needed to achieve total adult goal
 - Exceeded twice for SAW stock



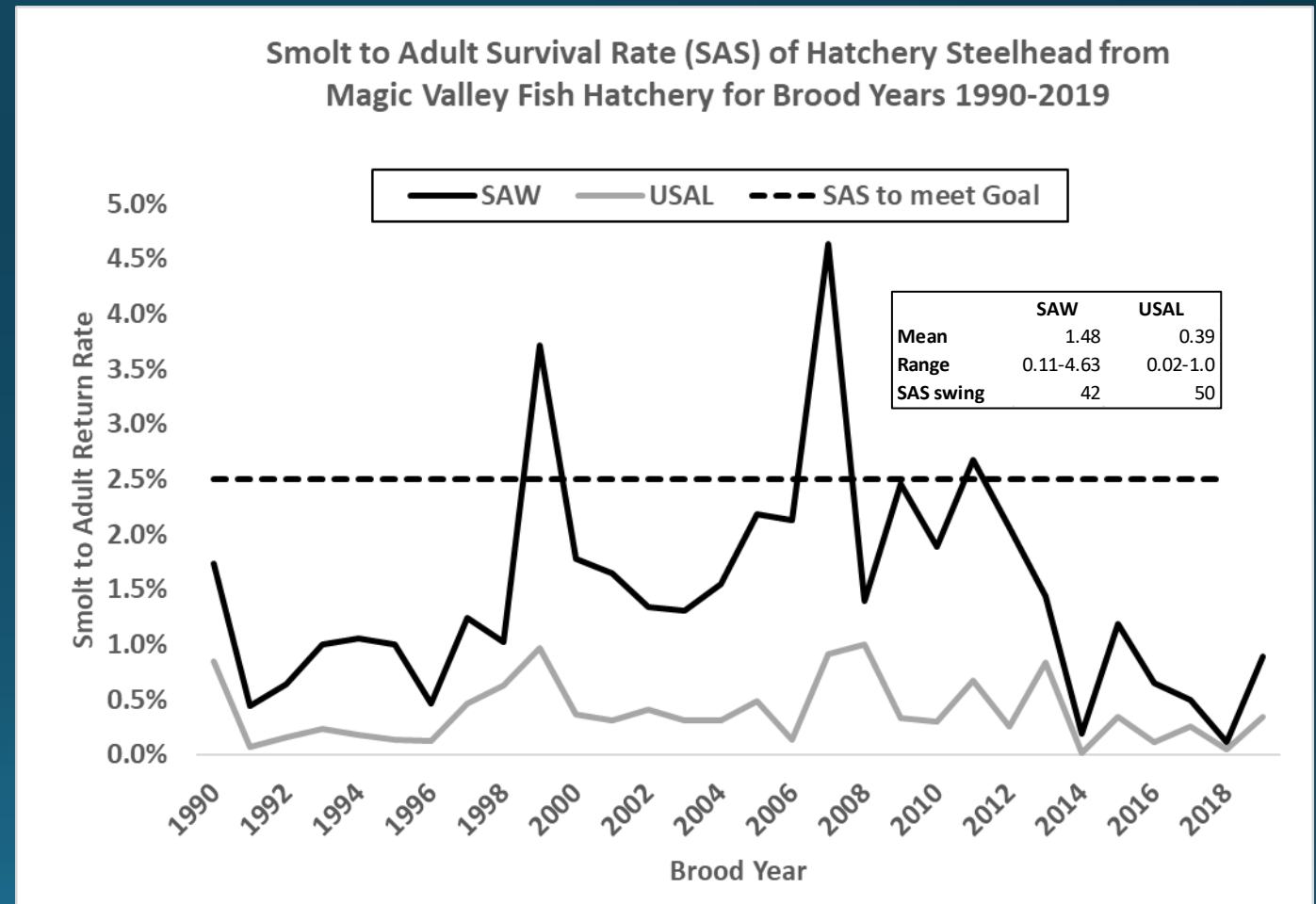
Hatchery Performance- Smolt to Adult Return Rate at Magic Valley Fish Hatchery

- 0.75% SAR needed to achieve project area goal.
- 40-50 fold swing in SARs
- 4x difference between stocks
- USAL represents 65% of MV smolt production
 - Recently reduced to 56%



Hatchery Performance- Smolt to Adult Survival Rate at Magic Valley Fish Hatchery

- 2.25% SAS needed to achieve total adult return goal
 - Met 4 times for SAW stock
 - Not achieved for USAL

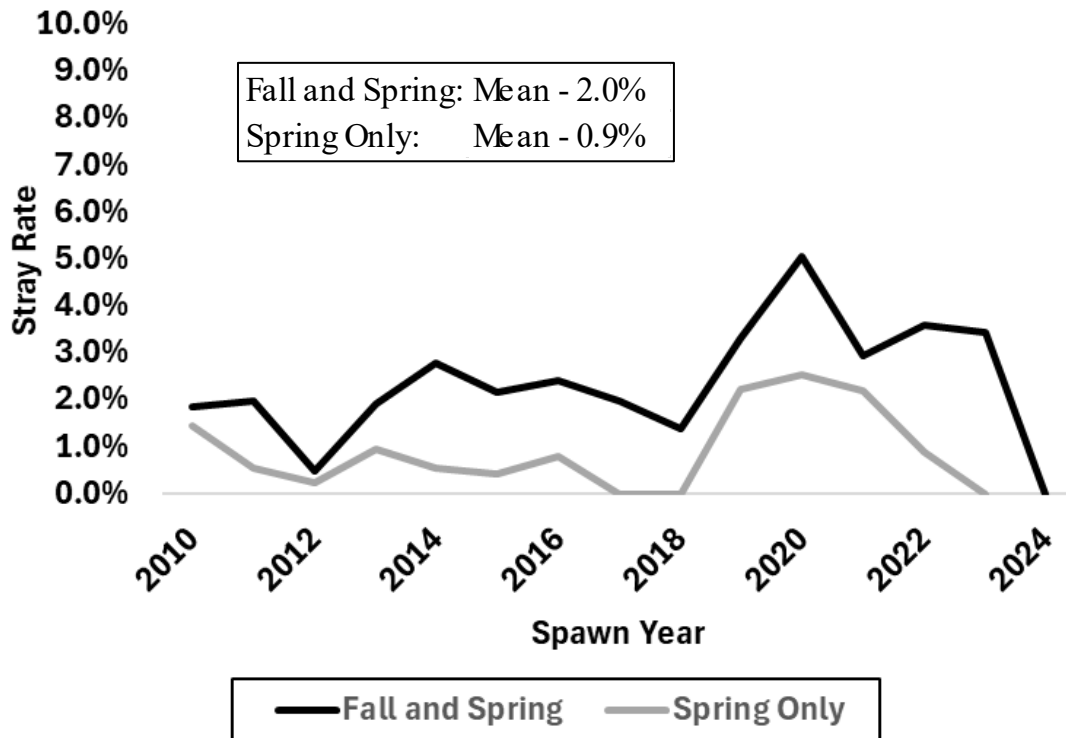


Hatchery Performance: Stray Rates

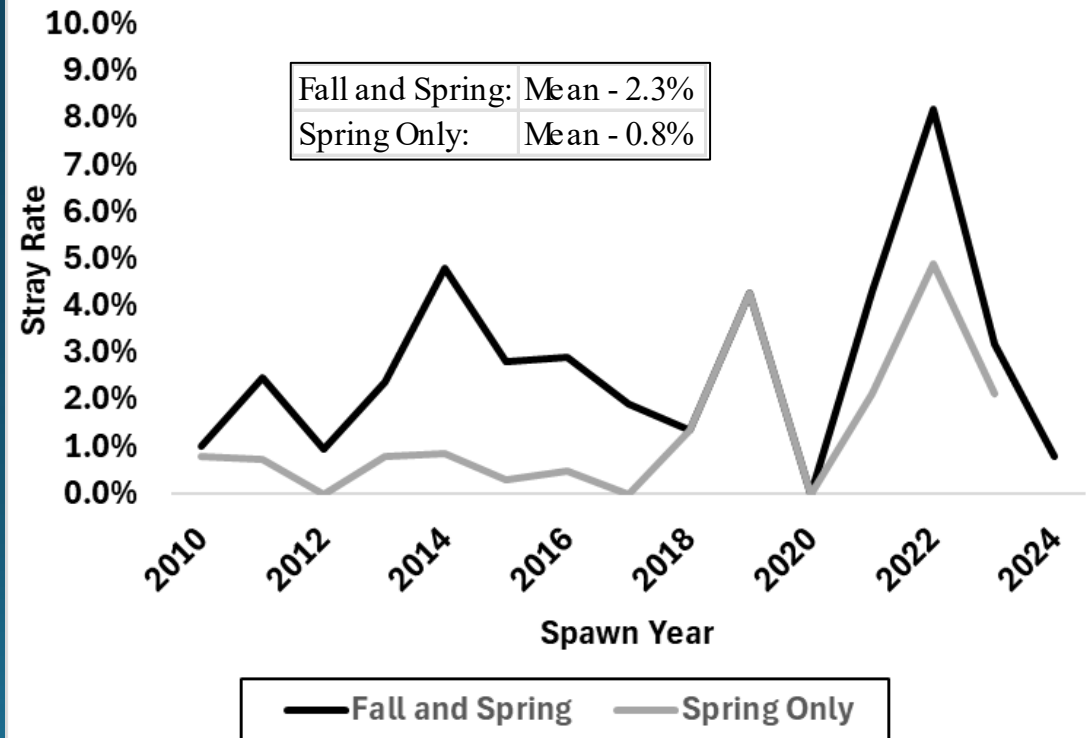
- **Stray Rate**
 - Percent of the PIT tagged fish detected at Bonneville or Lower Granite dams that are last detected at a location outside the path to the juvenile release location
 - Includes last detection that occurred in either the fall or spring
- **PIT tags used**
 - Hagerman and Magic Valley fish hatcheries from spawn years 2010 – 2024
 - Fish tagged as juveniles at the rearing hatchery

Adult Stray Rates- Downstream of LGD

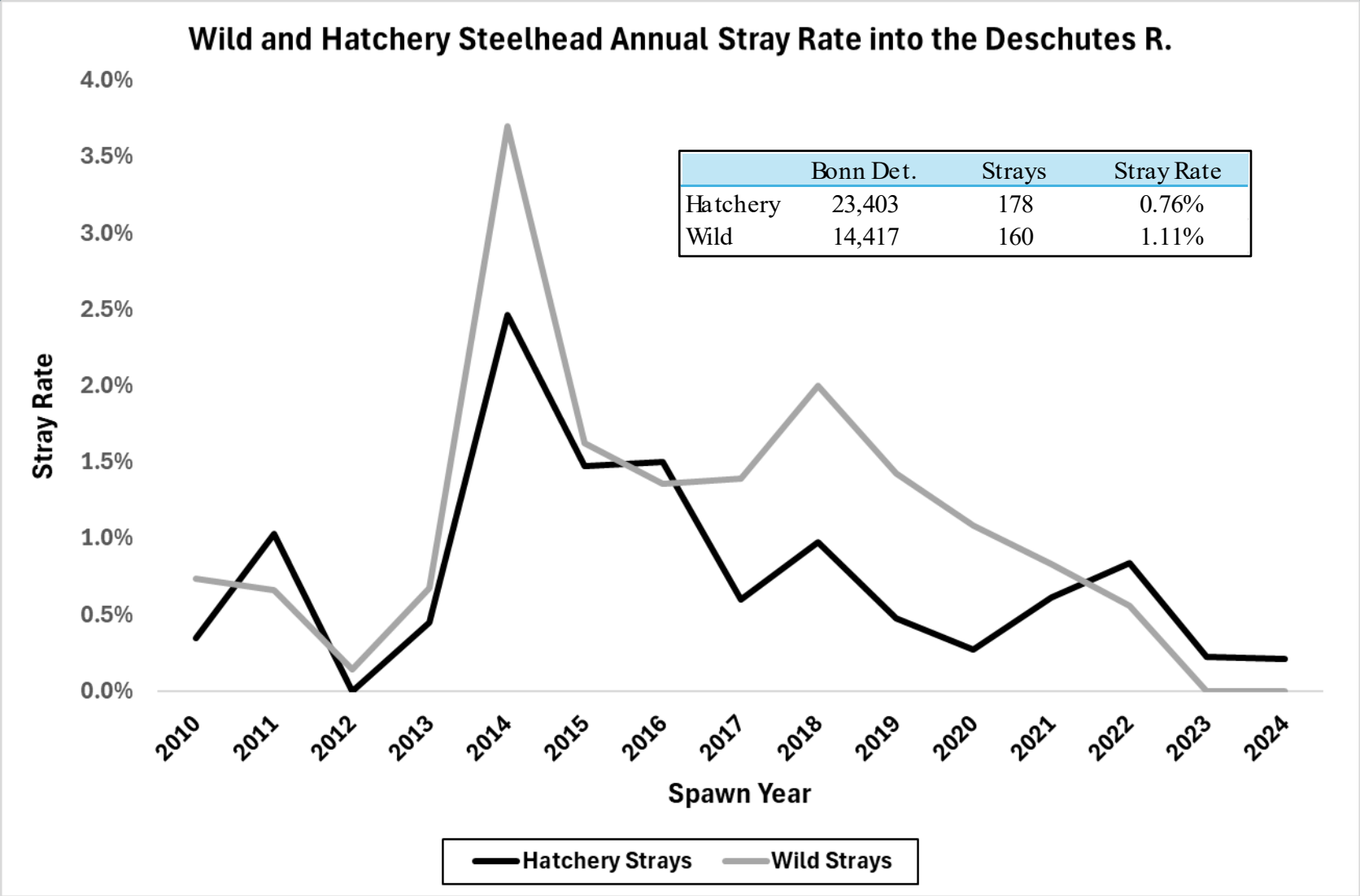
Hagerman National FH- Stray Rate Downstream of Lower Granite Dam



Magic Valley FH- Stray Rate Downstream of Lower Granite Dam

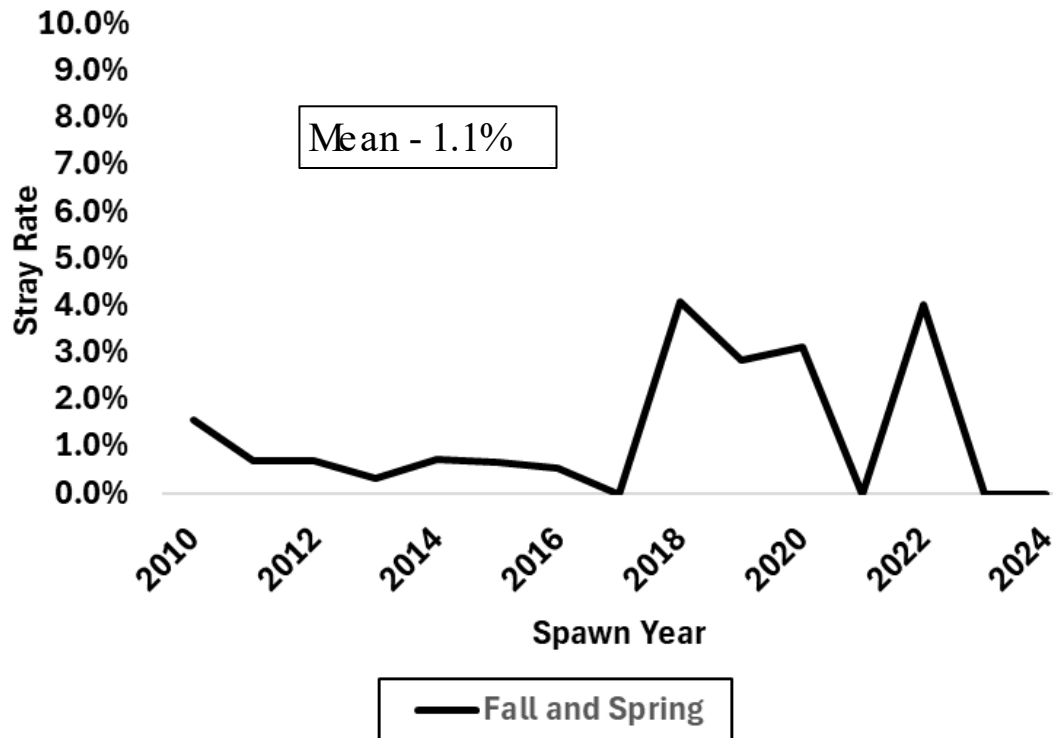


Stray Rates of Snake River Hatchery and Wild Steelhead into the Deschutes River for Spawn Years 2010-2024

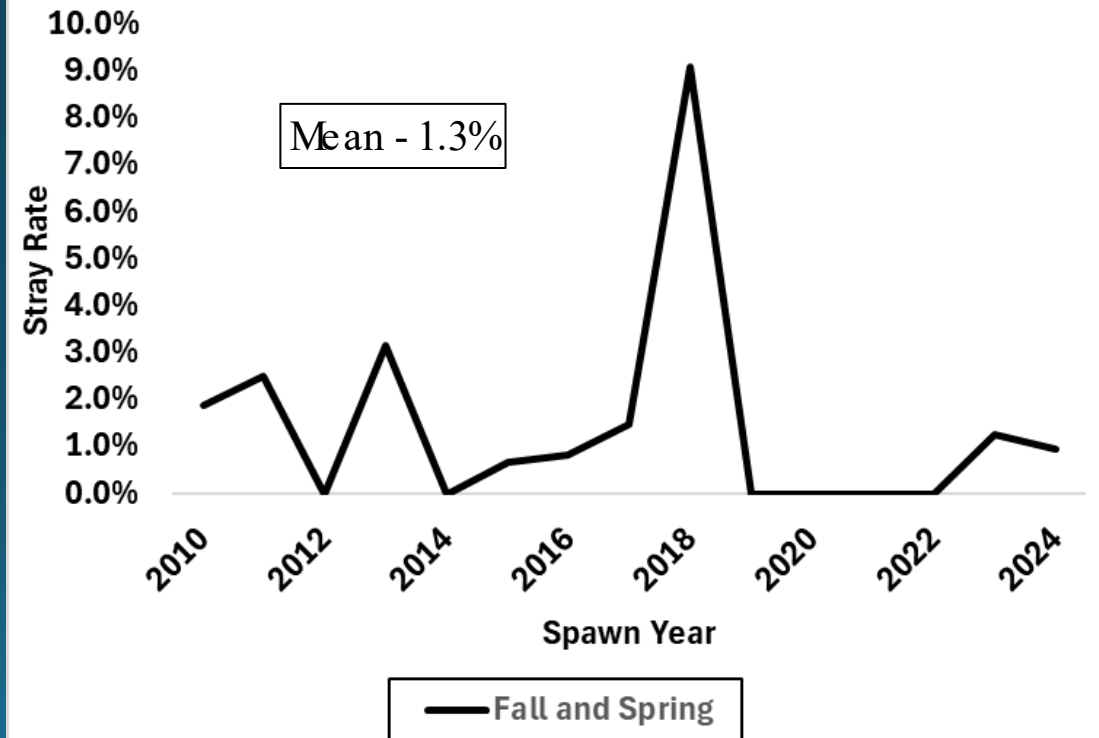


Adult Stray Rates- Upstream of LGD

Hagerman National FH- Stray Rate Upstream of Lower Granite Dam

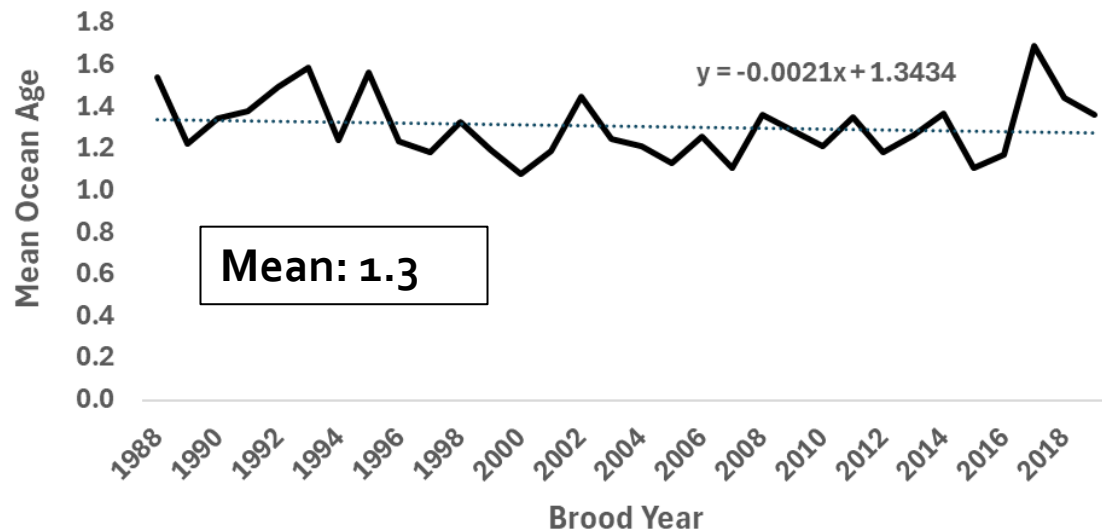


Magic Valley FH- Stray Rate Upstream of Lower Granite Dam

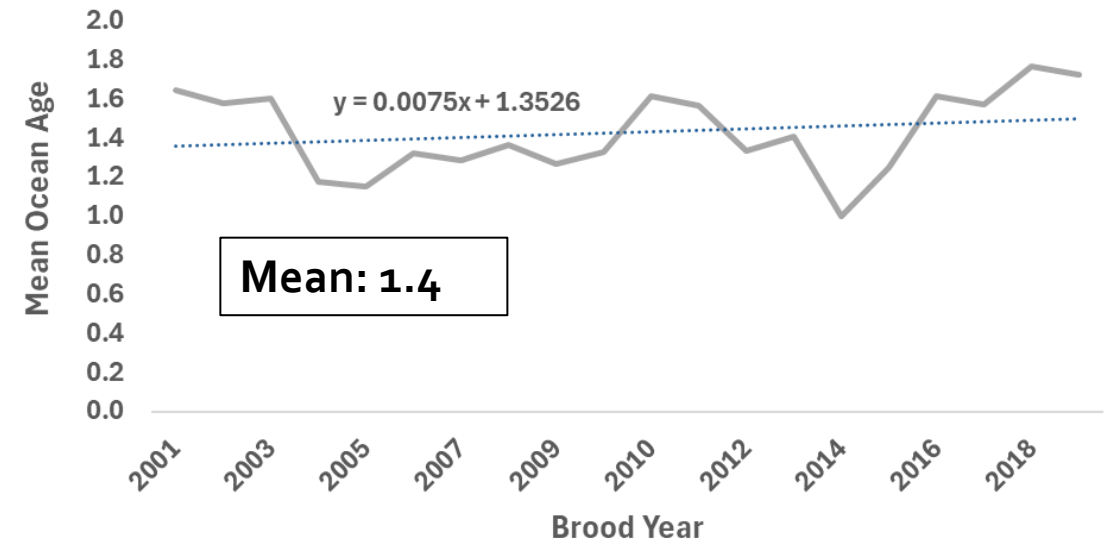


Hatchery Performance: Age Composition at Hagerman Fish Hatchery

Mean Ocean Age of SAW Stock at Hagerman Fish Hatchery for Brood Years 1988-2019



Mean Ocean Age of EF Nat Stock at Hagerman Fish Hatchery for Brood Years 1988-2019



SAW 1988-1998



SAW 1999-2009



SAW 2010-2019



EF Nat 2001-2009

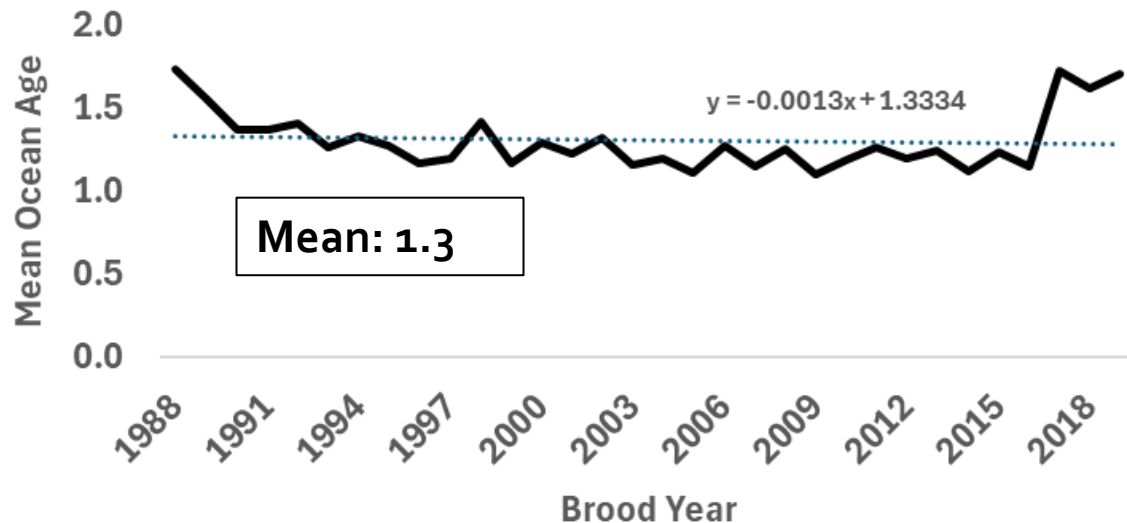


EF Nat 2010-2019

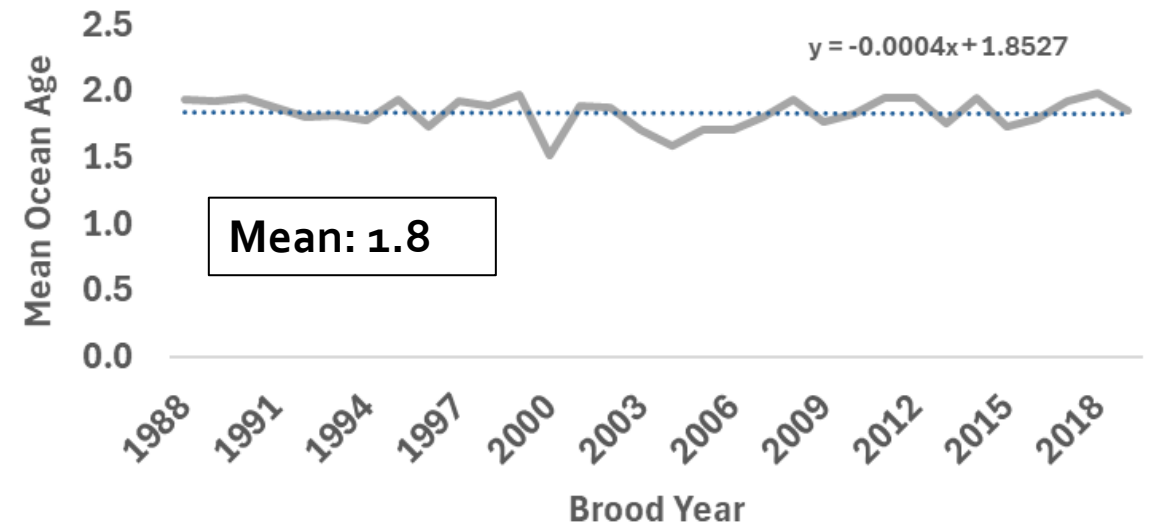


Hatchery Performance: Age Composition at Magic Valley Fish Hatchery

Mean Ocean Age of SAW Stock at Magic Valley Fish Hatchery for Brood Years 1988-2019



Mean Ocean Age of USAL Stock at Magic Valley Fish Hatchery for Brood Years 1988-2019



SAW 1988-1998



1 2 3

Mean: 1.4

SAW 1999-2009



1 2 3

Mean: 1.2

SAW 2010-2019



1 2 3

Mean: 1.3

USAL 1988-1998



1 2 3

Mean: 1.9

USAL 1999-2009



1 2 3

Mean: 1.8

USAL 2010-2019

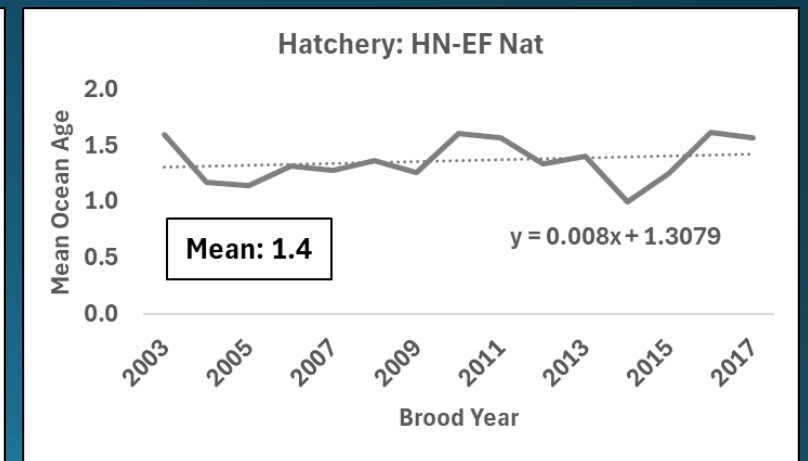
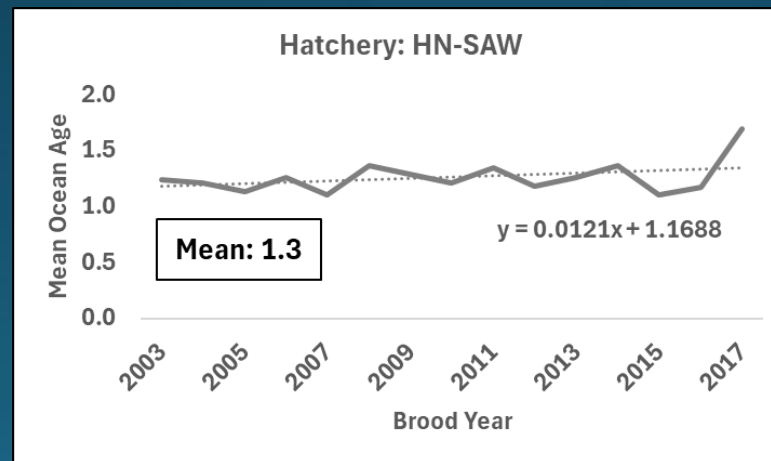
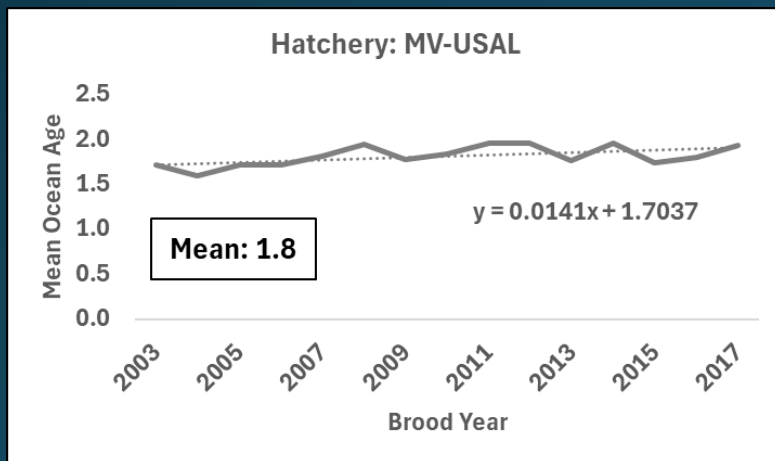
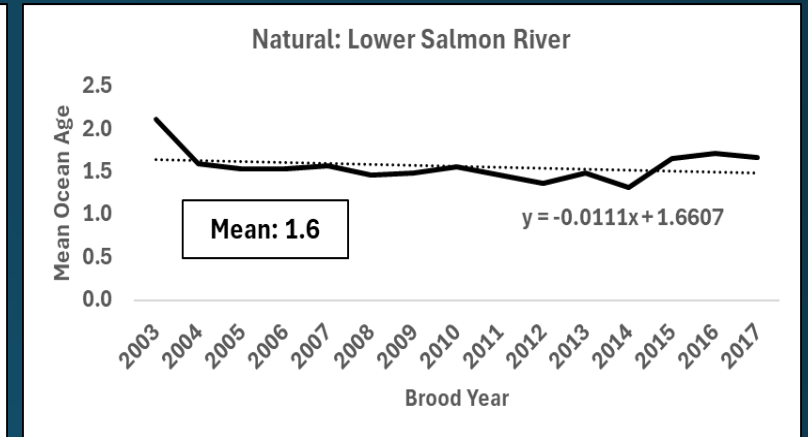
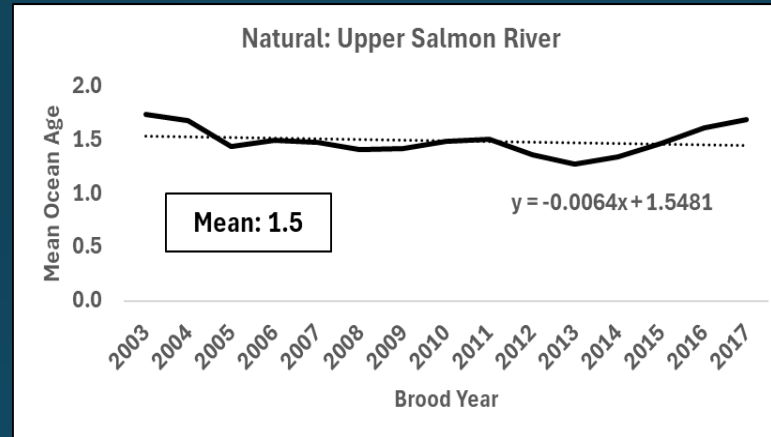
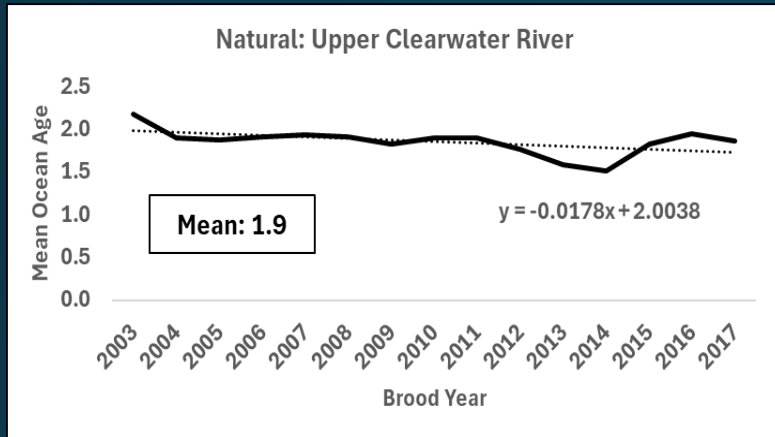


1 2 3

Mean: 1.9

Hatchery Performance: Age Composition

Comparison of Hatchery and Natural Populations



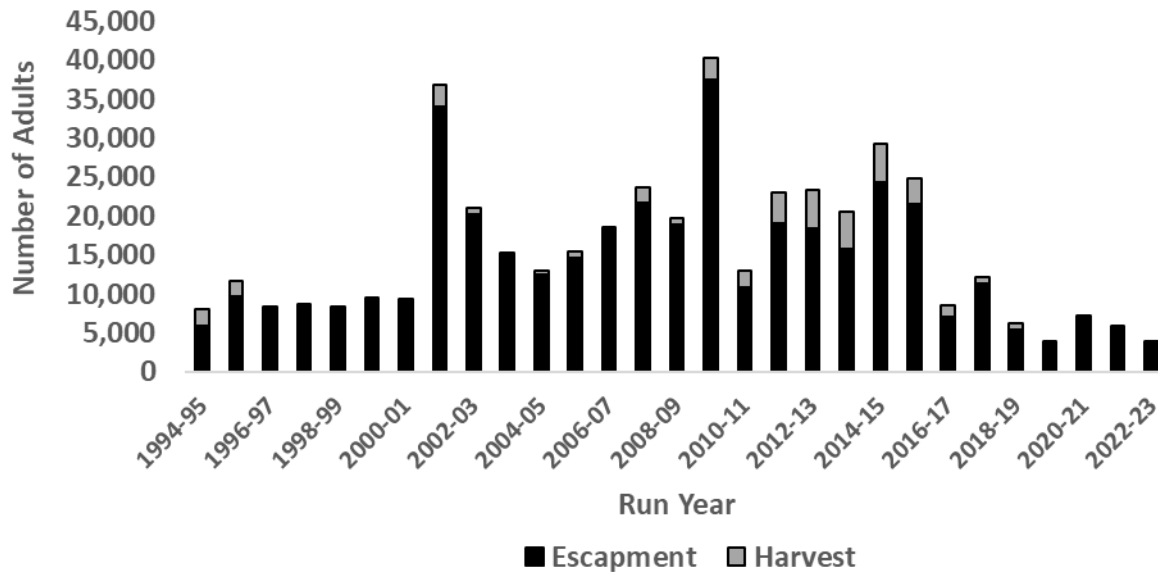


Harvest Mitigation: This is why these hatchery programs exist

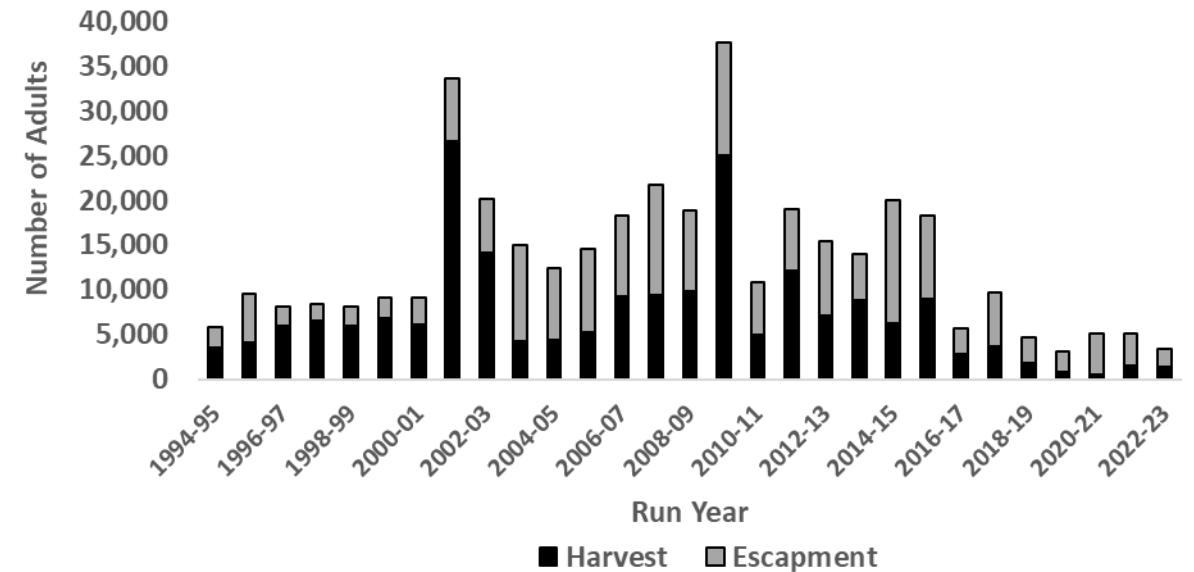


Harvest : Steelhead from Hagerman Fish Hatchery

Harvest of Hagerman Fish Hatchery Steelhead Downstream of Lower Granite Dam for Run Years 1994-2023



Harvest of Hagerman Fish Hatchery Steelhead Upstream of Lower Granite Dam for Run Years 1994-2023

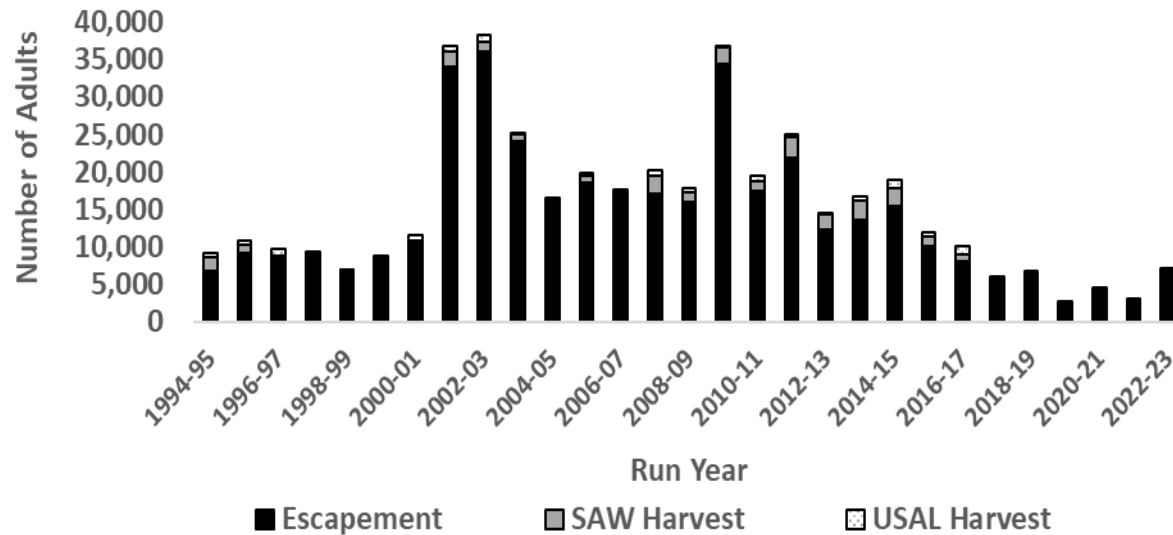


Average Harvest Rate: 9.2% (Range: 1-26%)

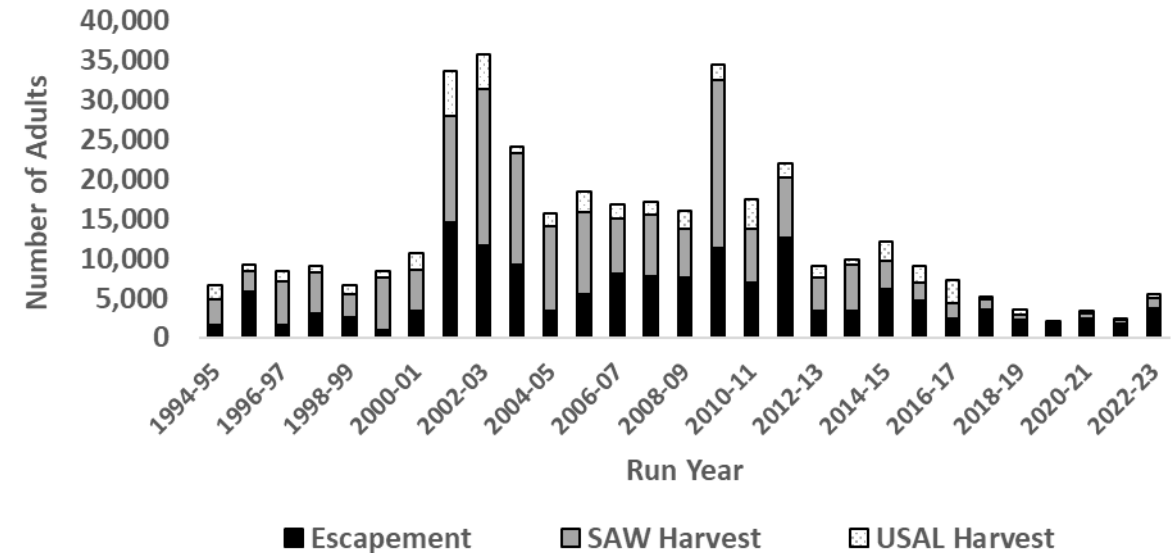
Average Harvest Rate: 50.7% (Range: 12-80%)

Harvest : Steelhead from Magic Valley Fish Hatchery

Harvest of Magic Valley Fish Hatchery Steelhead Downstream of Lower Granite Dam for Run Years 1994-2023



Harvest of Magic Valley Fish Hatchery Steelhead Upstream of Lower Granite Dam for Run Years 1994-2023

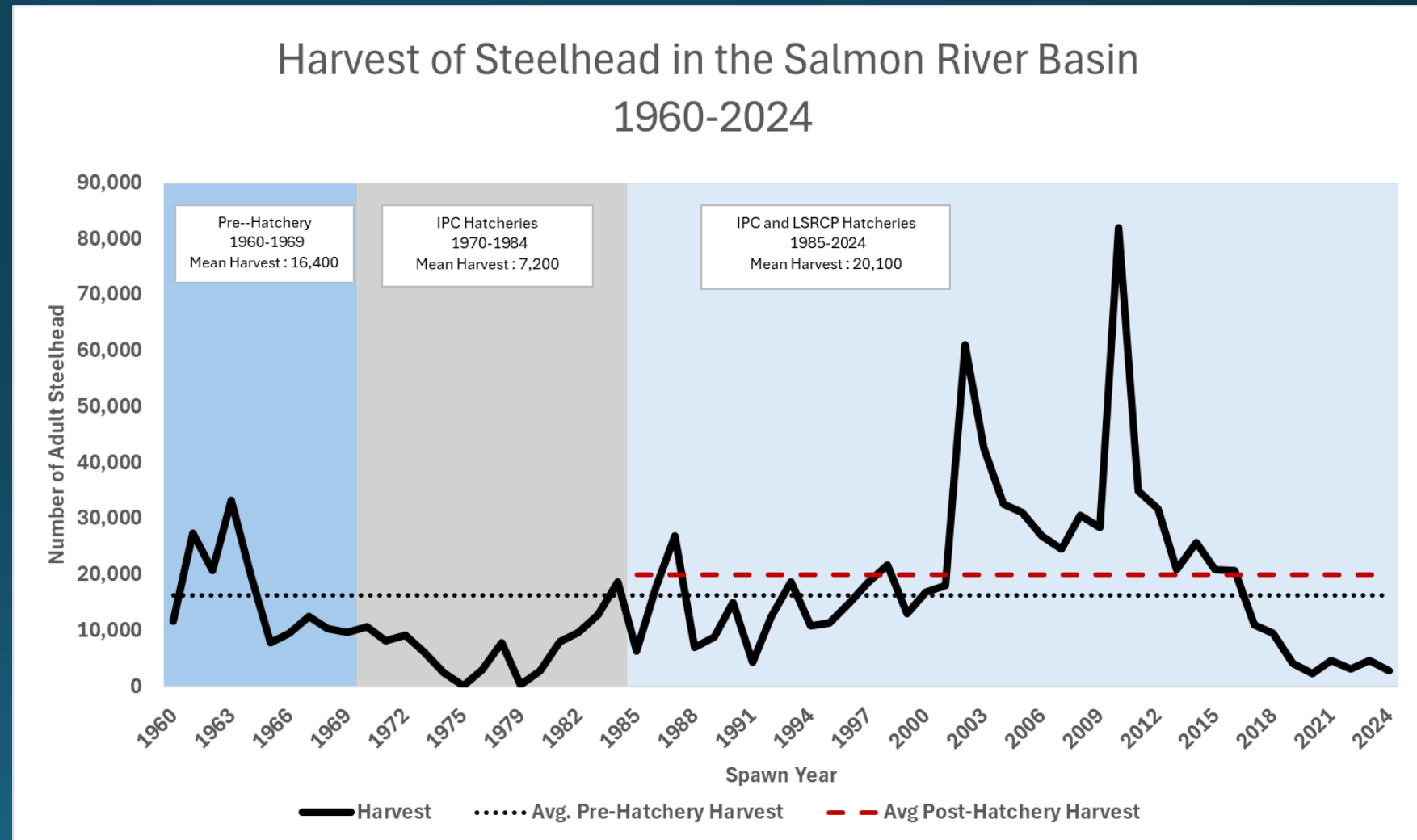


Average Harvest Rate: 9.5% (Range: 2-27%)

Average Harvest Rate: 56% (Range: 26-89%)

Restore and Maintain Harvest

- 1976-1982: anglers encouraged to release wild fish
- 1983: harvest restricted to hatchery fish only
- 1986-2024: average of 97,000 angler days of effort per year (range: 23k-184k)
- Angling Opportunity:
 - Seasons: Aug-Apr
 - 414 miles open (660 statewide)



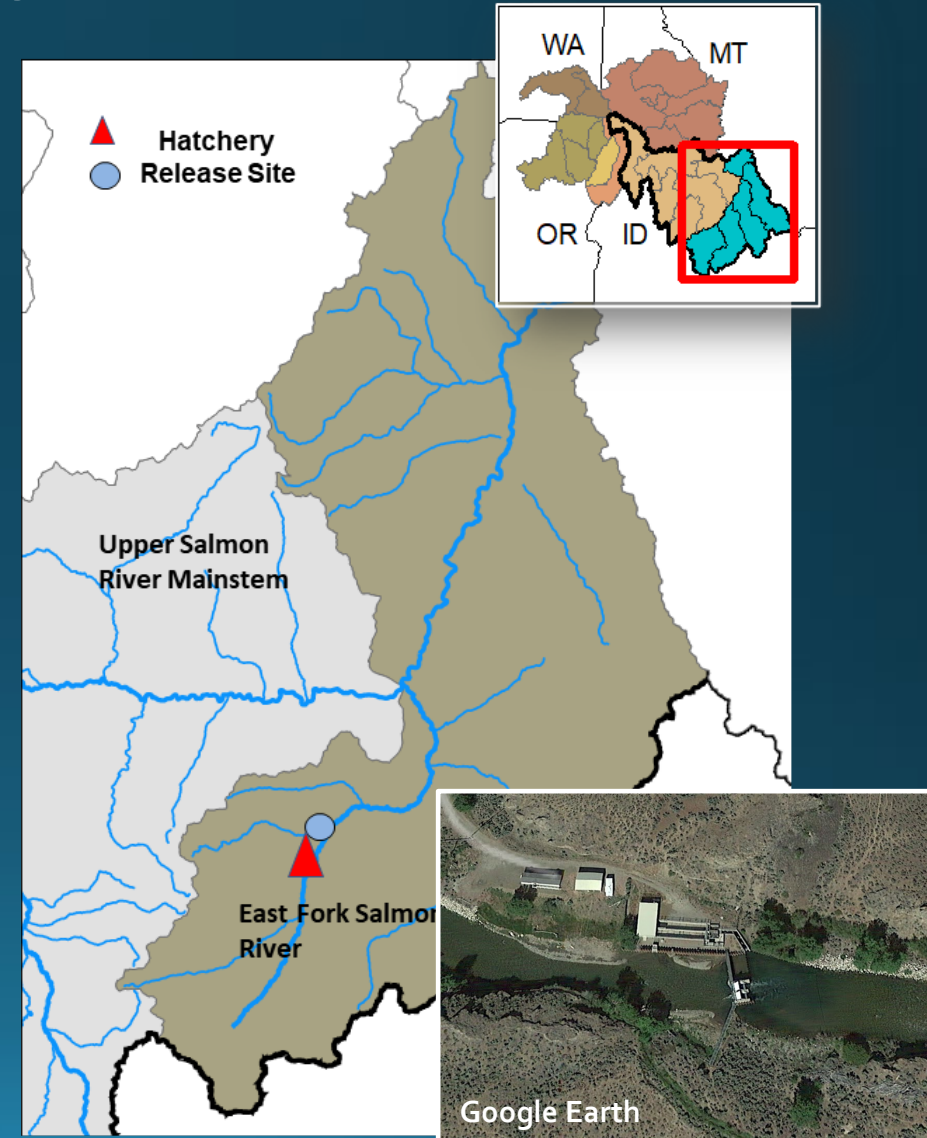
Backing up a Bit:

- East Fork Natural Steelhead Program
- USAL Steelhead Program

East Fork Natural Program

Background

- EF Salmon River population includes all of EF Salmon R and downstream to the Pahsimeroi R.
- Current ESA listing status is “Maintained”
- Hatchery smolt releases began in 1980
- EF satellite facility construction completed in 1984
- “Supplementation” in 1984-2000
- EF Natural Integrated program begins in 2001

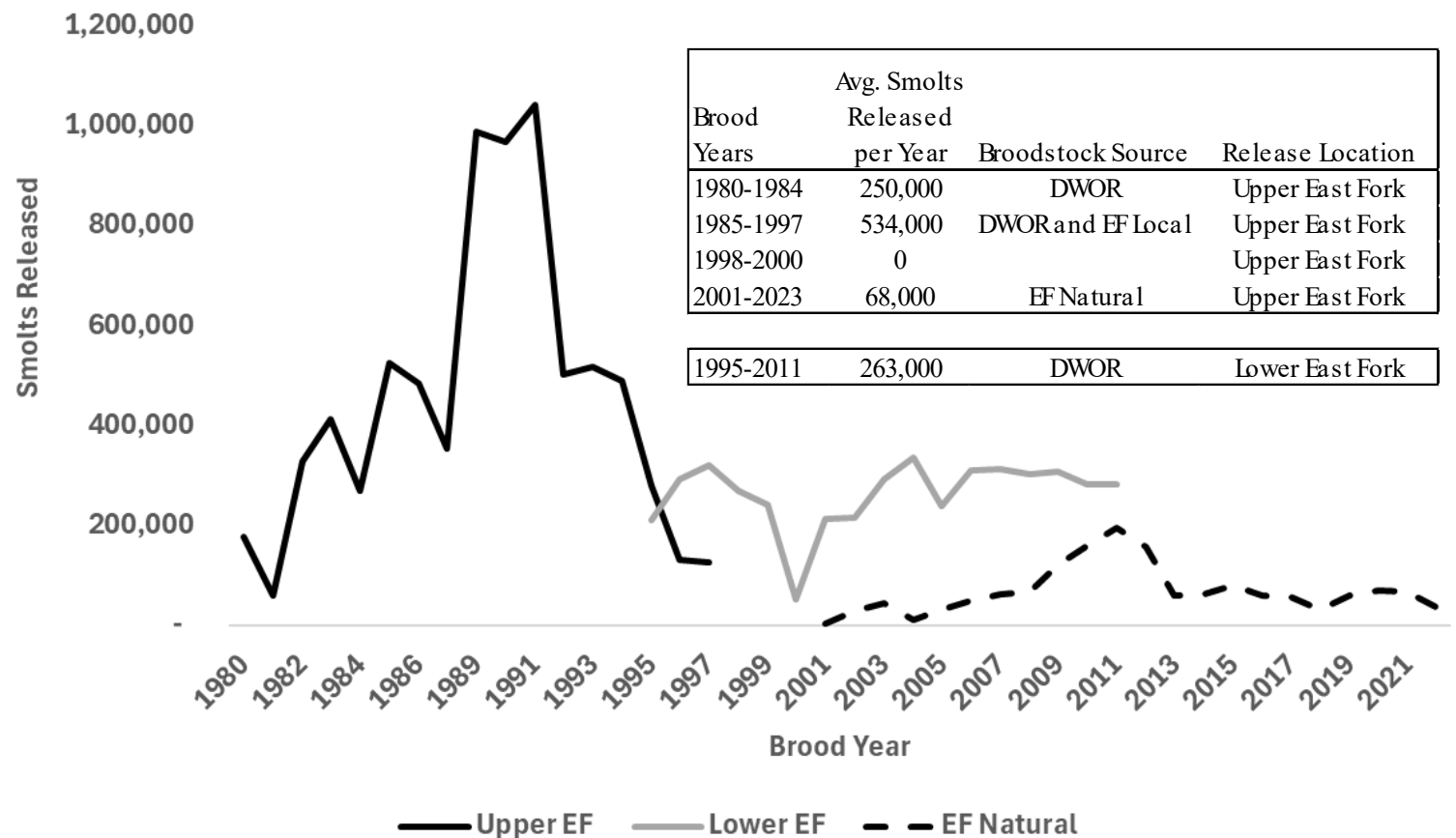


East Fork Natural Program

Background- Smolt Releases

- Original brood source is from Dworshak NFH in 1980
- Incorporated local EF returns beginning in 1984
- DWOR and EF Local stock released in upper EFSR 1985-1997 (55% DWOR, 45% EF)
- 1995-2011 DWOR stock released in lower East Fork

Number of Hatchery Steelhead Smolts Released into the EF Salmon R for Brood Years 1980-2023

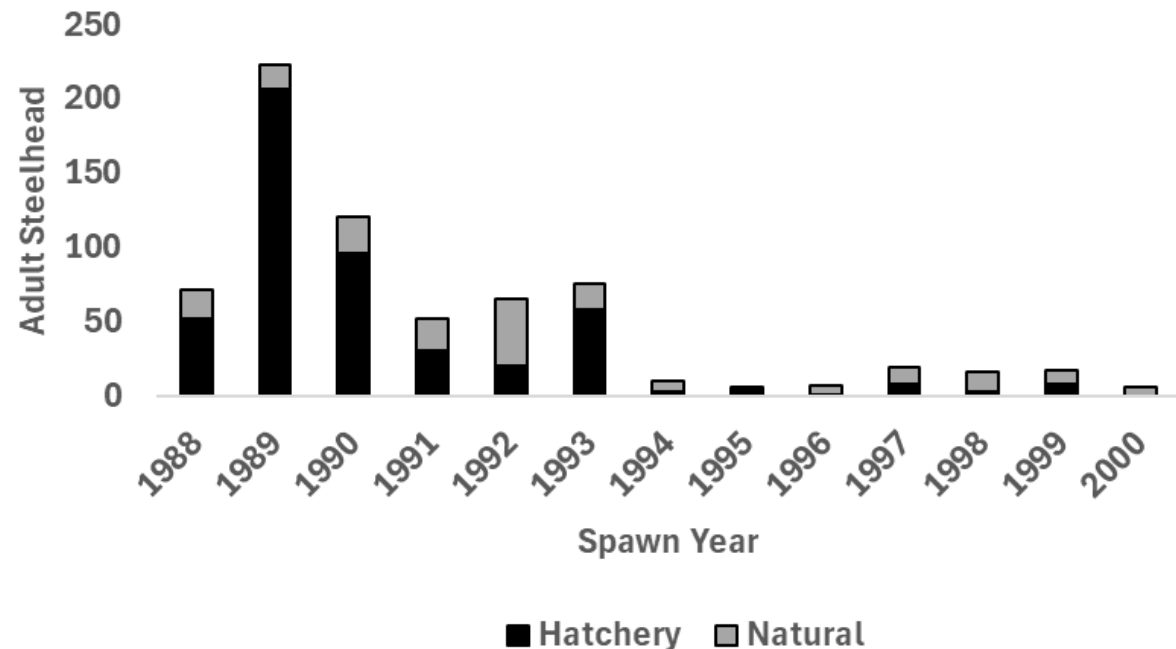


East Fork Natural Program

Background- Brood and Natural spawning

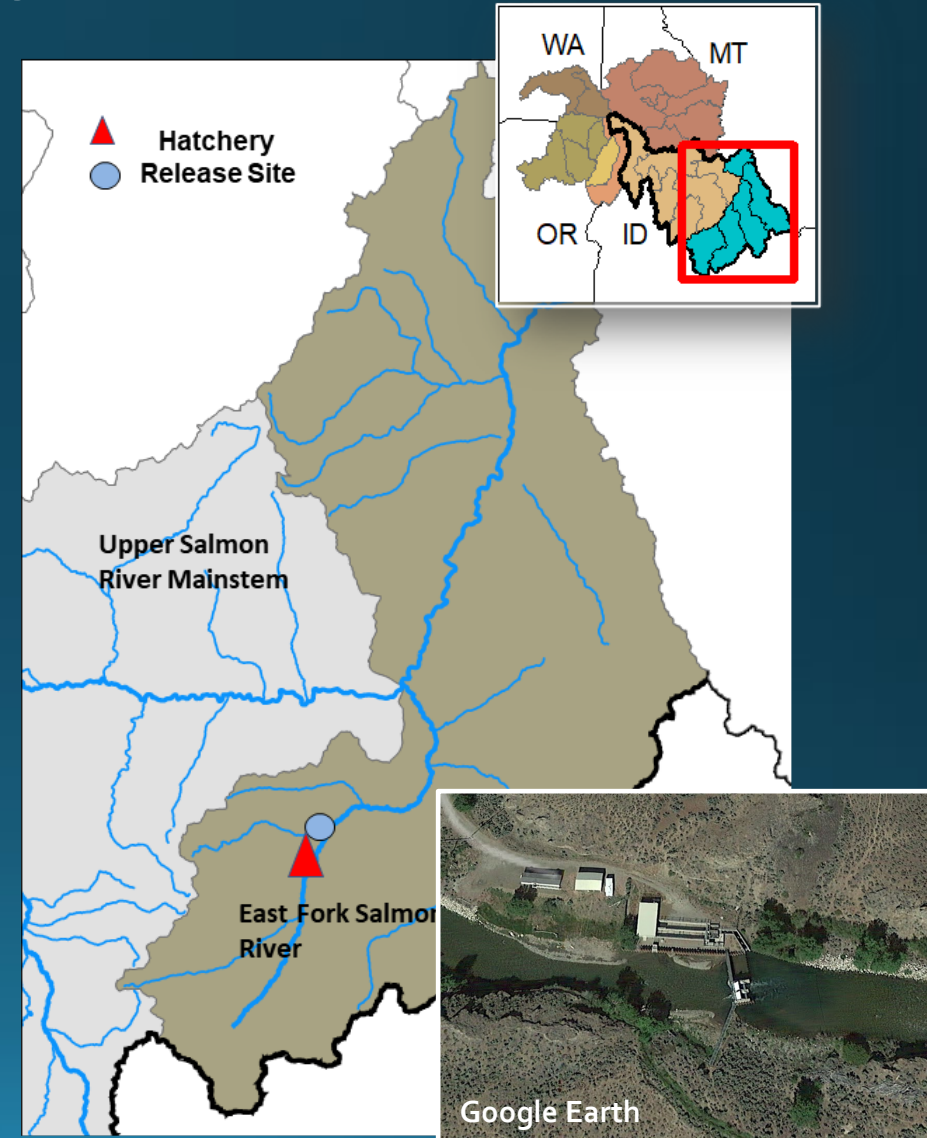
- Hatchery and natural adults released upstream of EF trap to spawn naturally beginning in 1984
 - Avg pHOS 1988-1993 = 69%
 - Avg pHOS 1994-2000 = 30%
- Broodstock is segregated 1980-2000.
- “East Fork Natural” Integrated program begins in 2001

Composition of Steelhead Spawners Upstream of the EF Salmon R. Trap 1988-2000



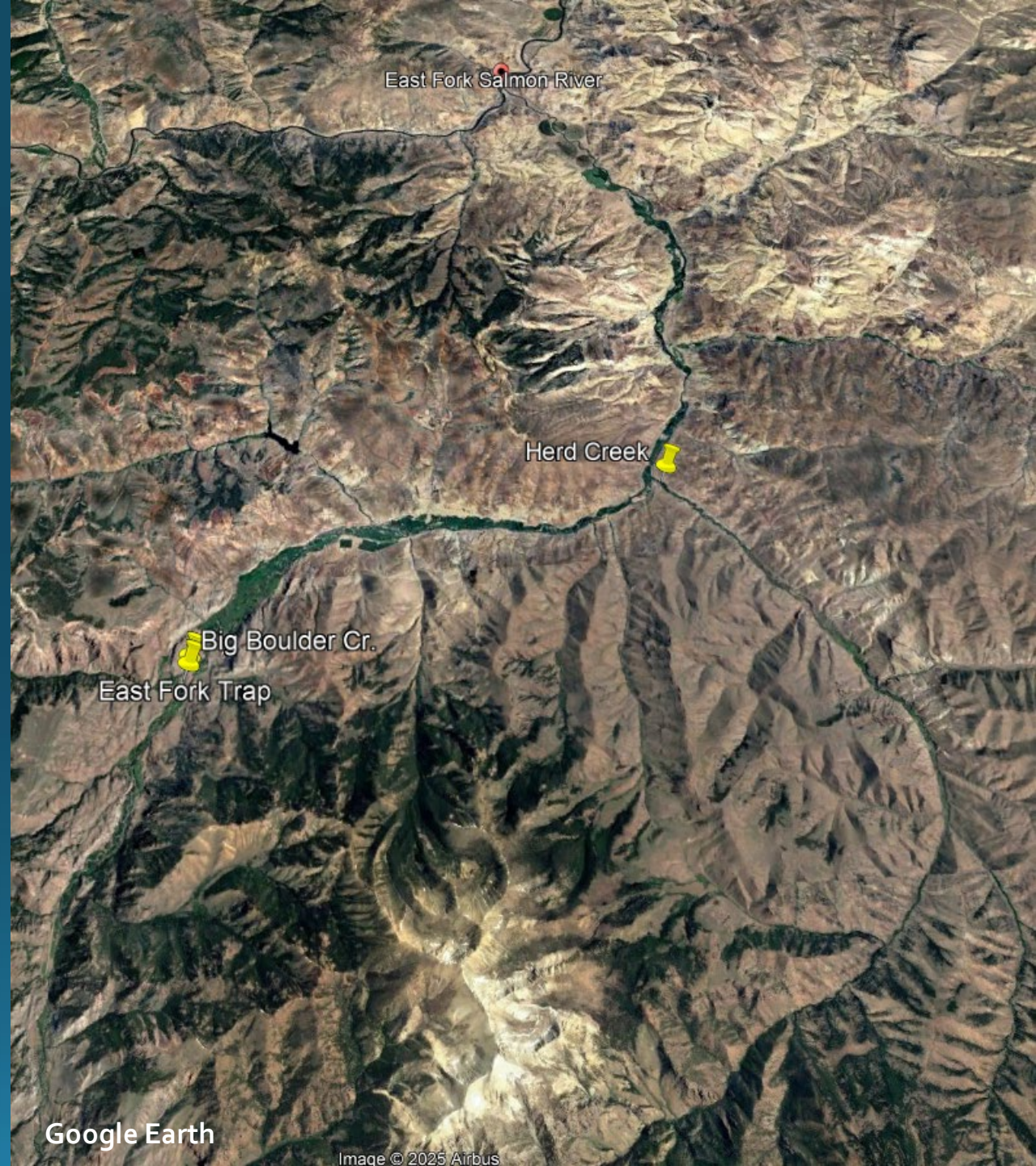
East Fork Natural Program

- Only integrated supplementation program in Idaho for steelhead
- Objective: increase the number of naturally produced steelhead in East Fork Salmon R. population.
- Smolt production and broodstock composition targets have varied over time but since 2013:
 - 60k smolt target
 - Target 100% natural origin adults in broodstock (pNOB)



East Fork Natural Program

- Limitations:
 - Trapping location (20 miles upstream of mouth)
 - No estimate of natural adults for entire EF population
 - Limited to area upstream of trap
 - No juvenile trapping infrastructure to estimate “fish out”



East Fork Natural Program

- Data Summary:
 - Smolt production targets
 - Broodstock (pNOB) and natural spawning composition (pHOS)
 - Performance of hatchery fish relative to segregated SAW stock.

Period	Percent of Smolt				
	Smolt Target	Target Achieved	Average pNOB	Average pHOS	Average PNI
2001-2008	50,000	75%	50%	70%	42%
2009-2012	170,000	93%	32%	87%	27%
2013-2023	60,000	96%	63%	88%	42%

In-Hatchery Survival		
Brood Years	Green-Smolt	
	SAW	EF Nat
2001-2009	79%	56%
2010-2023	84%	78%

Juvenile Outmigration Survival		
Brood Years	SAW	EF Nat
2009-2023	76%	63%

SAR		
Brood Years	SAW	EF Nat
2001-2009	1.45%	0.55%
2010-2023	0.72%	0.47%

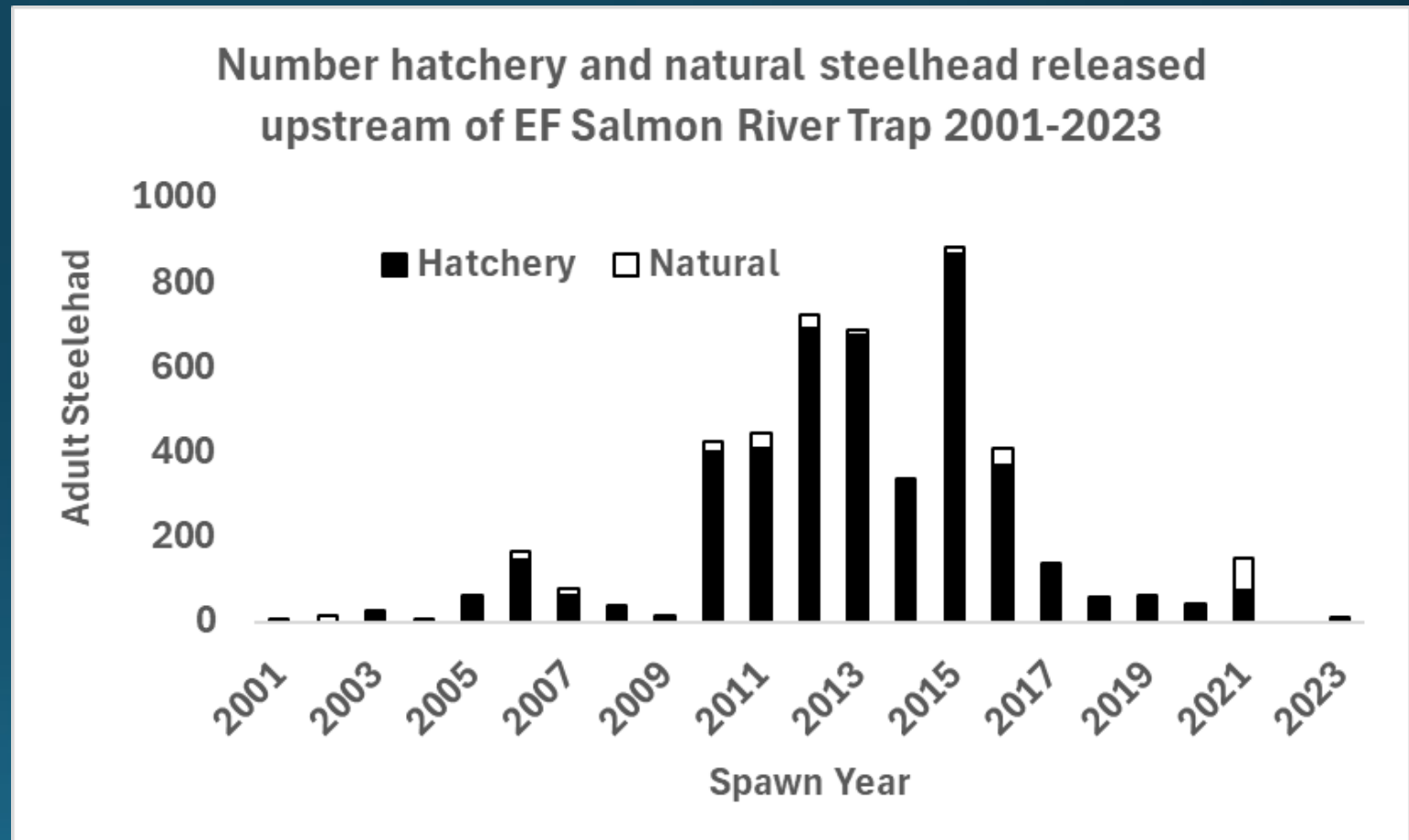
pHOS= proportion of spawners in nature that are hatchery-origin
pNOB= proportion of hatchery broodstock that are natural-origin
PNI= Proportionate Natural Influence= $pNOB/(pNOB+pHOS)$

East Fork Natural Program

- Composition of spawners upstream of EF Salmon R. trap

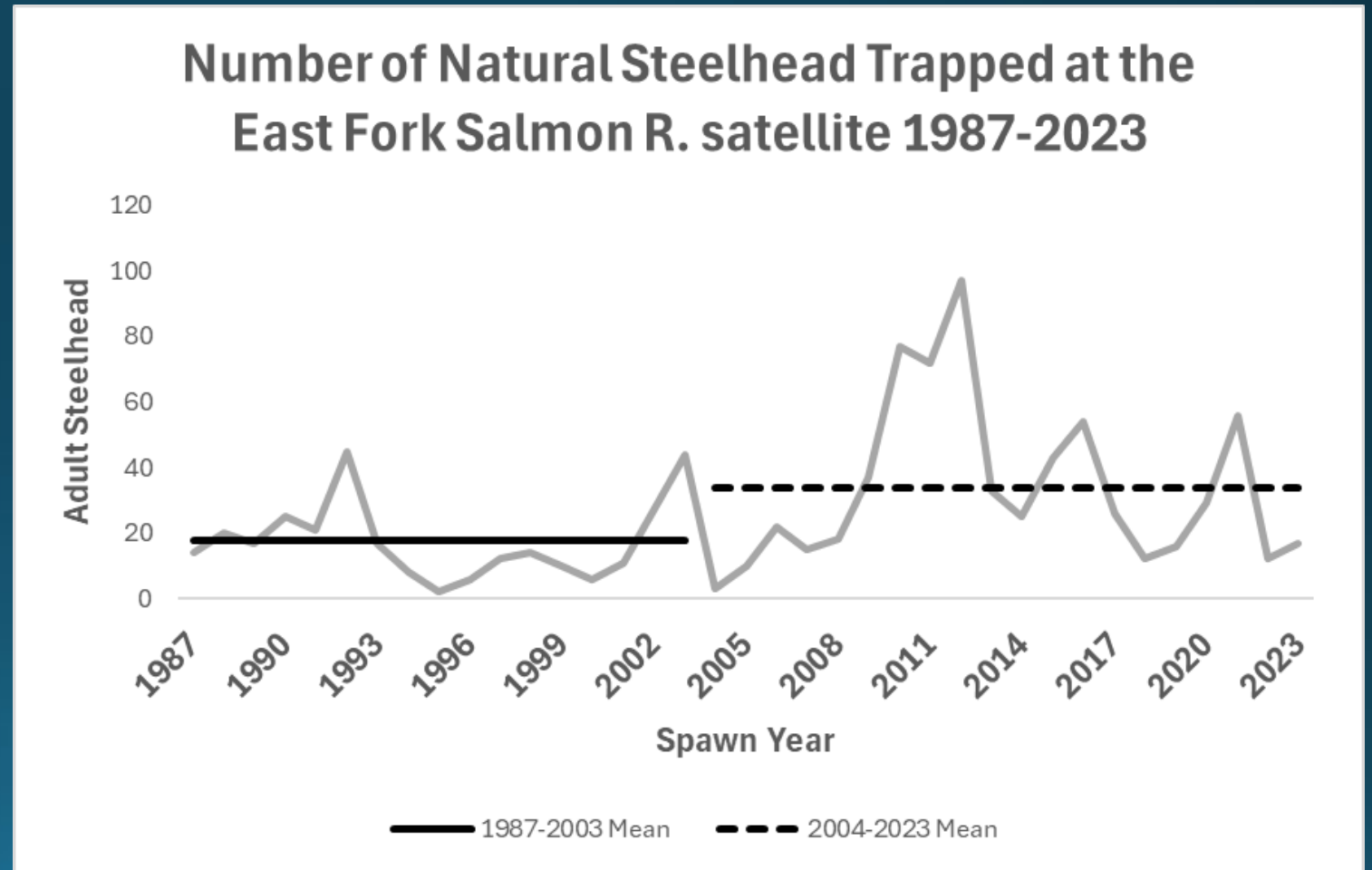
Mean pHOS

- 2001-2013 = 76%
- 2014-2023 = 80%



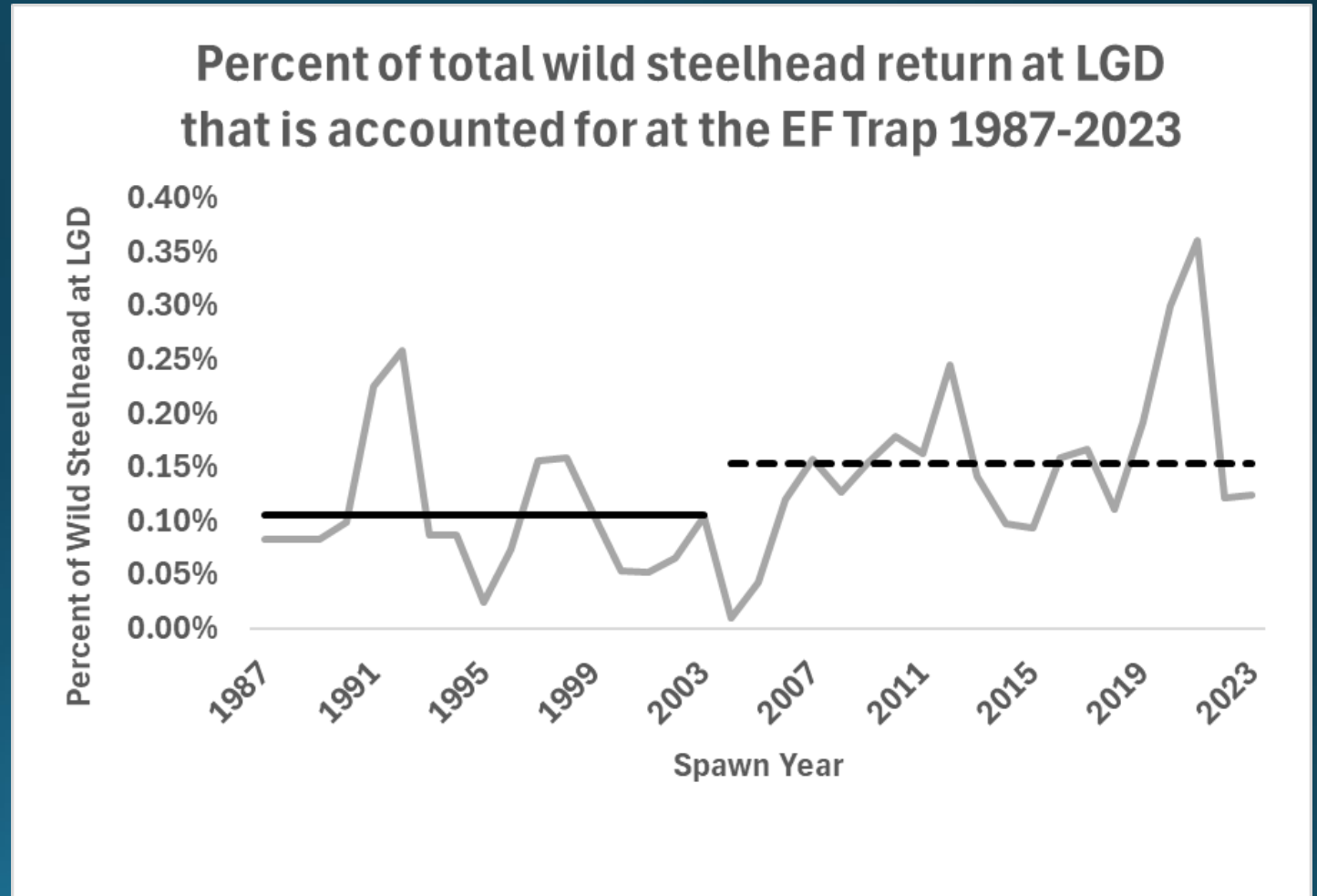
East Fork Natural Program

- Natural adult returns to EF Salmon R. Trap
 - 1987-2003 Mean = 17.6
 - 2004-2023 Mean = 33.7
- Mean number of natural spawners upstream of the trap
 - 1987-2003 Mean = 17.6
 - 2004-2023 Mean = 16.0



East Fork Natural Program

- Natural adult returns
 - Relative to Snake R. wild returns
 - EF Trapped/LGD total wild steelhead
 - 1987-2003 Mean = 0.11%
 - 2004-2023 Mean = 0.15%



East Fork Natural Program-Summary

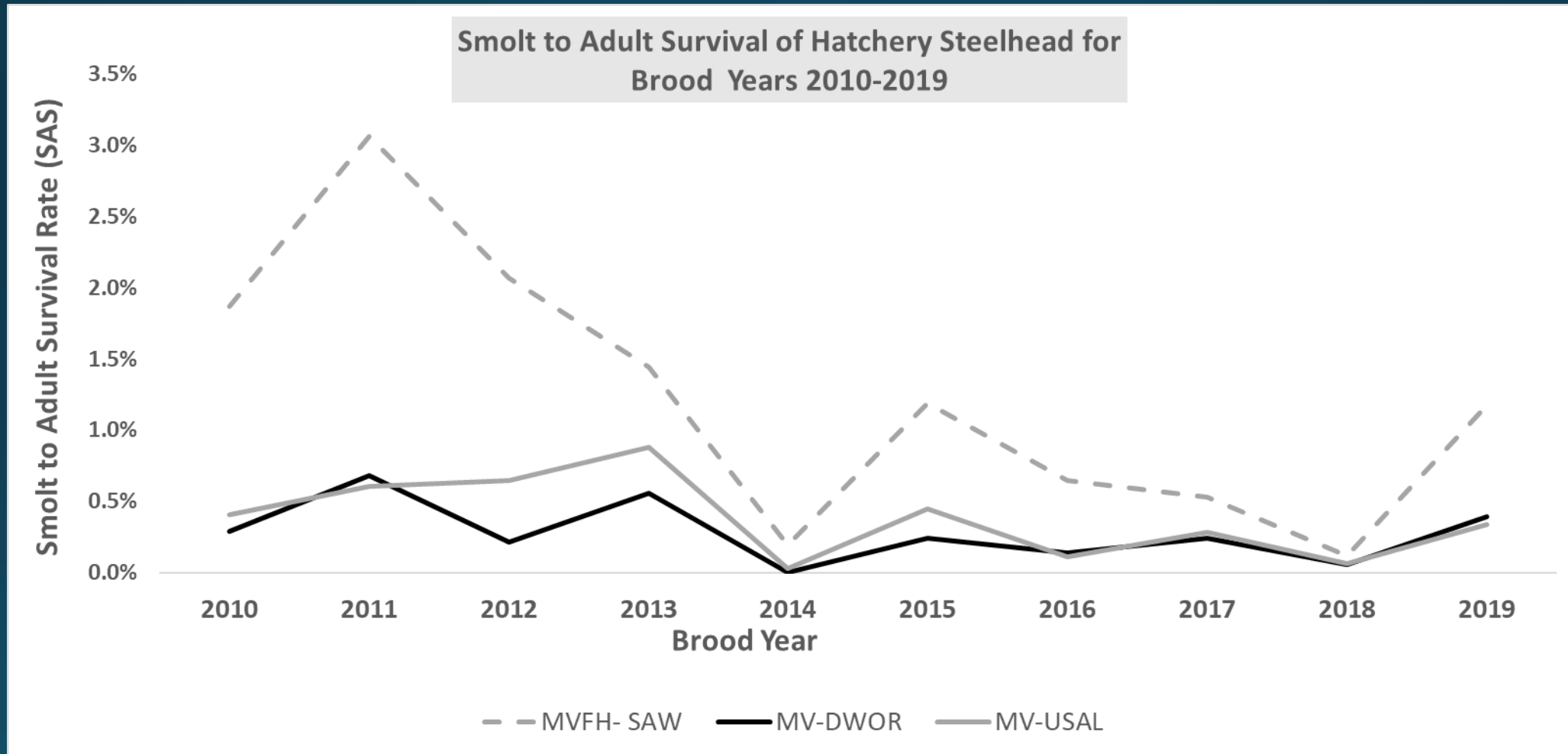
- Natural returns remain low
 - Higher than pre-integration period
 - Number of natural adults on the spawning grounds upstream of the trap is similar to pre-integration period
- Brood composition target (pNOB) is not met due to low natural returns
- Spawners upstream of EF trap are predominantly hatchery origin
- Unknown how much of the production upstream of the trap is returning as adults downstream of the trap.
- M&E infrastructure limits evaluation
 - Trap location
 - Juvenile sampling
- Program operations transferred to the Shoshone Bannock Tribe in 2022.

USAL Program

- Objective is to develop a locally adapted return of steelhead founded from DNFH for harvest mitigation purposes
 - Adults return older and larger than the SAW and PAH stocks.
 - In-place and in-kind mitigation (SFSR and MFSR)
 - Efforts began in the Salmon R. basin in the late 1970s (see E.F. Salmon R. program)
 - Lower performance of first generation DWOR fish in Salmon R.
 - Issues with establishing a suitable broodstock collection location



USAL Program- Adult Survival



USAL Program

Background-Trapping and Brood collection facilities

- 1981-1985 at Pahsimeroi Fish Hatchery (PFH)
- 1984-2000 EF Salmon R.
- 2000-2008 Paasasikwana Naokwaide Creek
- 2009 Moved back to PFH with the goal to eventually move to Yankee Fork when trapping infrastructure was established.
- 2009-2024 brood collection at PFH
 - Maintaining two brood stocks (PAH and USAL)
 - USAL stock – unclipped and 100% CWT
 - Smolt releases ramped up over the years from 180k to 434k
 - Remaining smolts released in Yankee Fork
 - Have consistently needed to backfill with eggs from DNFH

USAL Program

- Issues
 - Inability to meet all brood needs from local returns
 - Impacts to meeting LSRCP mitigation goals
 - lower SARs
 - Not developing multigeneration adaptation in the Salmon R.
- Recent Changes
 - Discontinued transferring eggs from DNFH to the Salmon R.
 - Reduced USAL smolt target from 1.085M to 868k
 - Increase smolt release at PFH from 341k to 434k
 - Use SAW stock eggs as alternative brood source for SBT streamside egg incubators (500k) in Yankee Fork
 - Resistance board weir in Yankee Fork for 2025

Summary:

- **Restore and Maintain Harvest**
 - Significant decrease in recent years
 - Reflective of regionwide reduction in abundance (hatchery and wild)
 - We are harvesting more fish now compared to pre-hatchery period
 - Fisheries occur every year with significant harvest opportunity in time and space
- **LSRCP Mitigation Objectives**
 - Dramatic reduction in recent years
 - Project area goal achievement 2010-2023
 - HNFH: 6 of 12 years; Mean-91%
 - MVFH: 4 of 12 years; Mean-88%
 - Project area goal achievement 1990-2023
 - HNFH: 13 of 34 years; Mean-91%
 - MVFH: 13 of 34 years; Mean-108%
 - Highly variable SARs
 - 40-50 fold swing in survival rates

Summary:

- **Reduce Impacts to Natural Populations**
 - Maintain significant areas without hatchery footprint
 - Continue to observe low stray rates
 - Efforts to estimate pHOS
 - Consolidation of release locations
- **Fish Culture**
 - High in-hatchery survival
 - Consistently meeting production targets
- **Inter-Agency Coordination**
 - Continues to be an integral component of program management
 - Transparency and trust
 - Results in more efficient use of the resource

Summary:

- **Changes Since Last Review**
 - Incorporation of PBT methods (harvest and escapement)
 - Direct estimation of project area escapement and stock composition at Lower Granite Dam
 - Consolidation of smolt release sites in upper Salmon R.
 - Transfer of EF Natural program to the Shoshone Bannock Tribe
 - Modifications to USAL program to improve performance

Questions

