

# Hatcheries and Recovery: Understanding Risks and Benefits

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# Agenda

## Benefits

- Conservation programs
- Harvest programs
  - Integrated
  - Segregated

## Risks

- Dispelling myths about hatcheries  
(Waples 1999)



**“....THE PREMISE THAT HATCHERY SUPPLEMENTATION CAN PROVIDE A NET LONG-TERM BENEFIT TO A NATURAL POPULATION IS A HYPOTHESIS THAT HAS NOT YET BEEN TESTED.”**

**- ROBIN WAPLES (IMST 2000)**

# Hamma Hamma steelhead

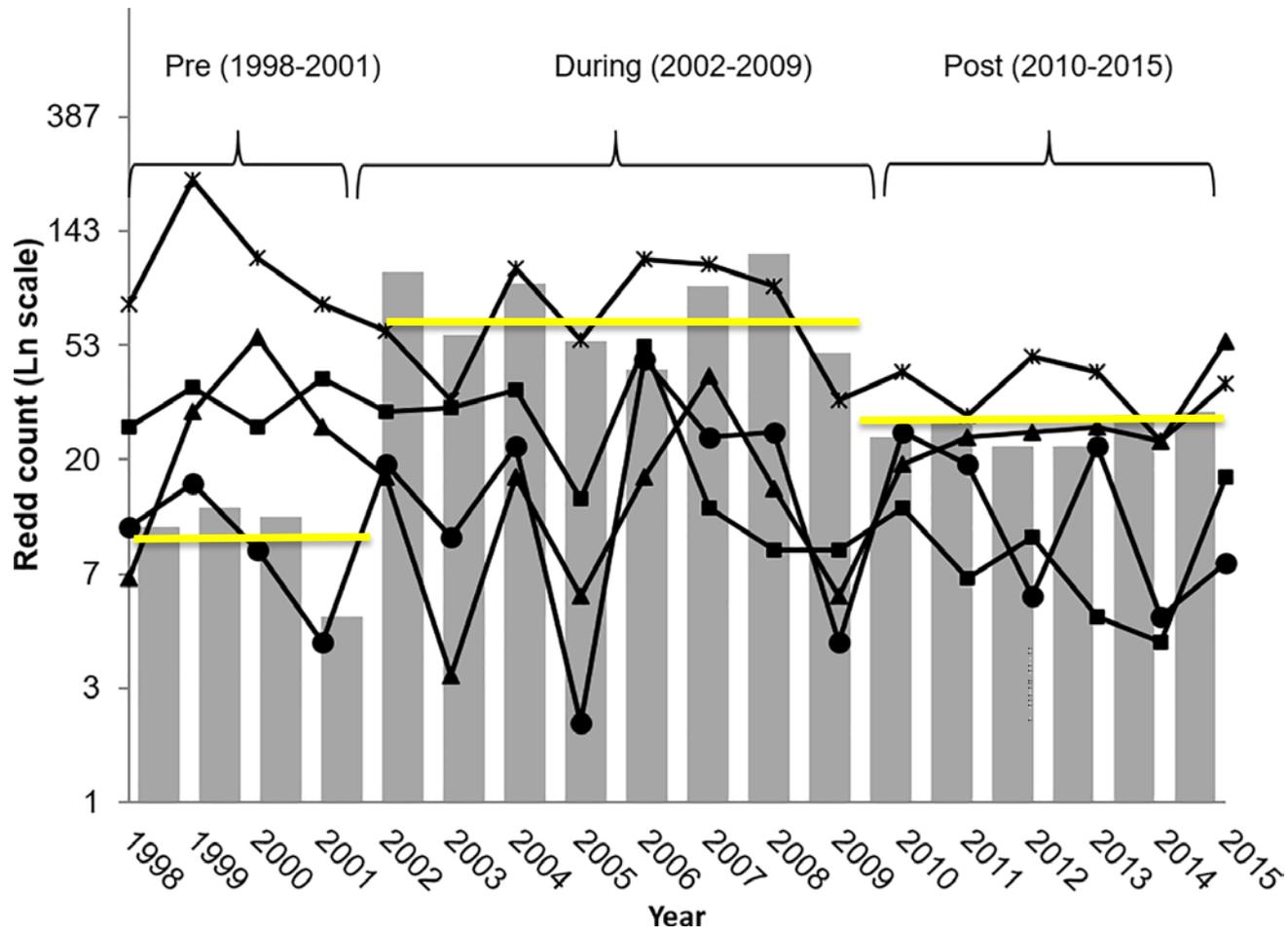
(Berejikian and Van Doornik 2018)

- BACI design (treatment vs. control)
- Atypical hatchery program
  - Collected eyed eggs from natural redds
  - Released relatively few 2-year old smolts
- Increase in redd abundance both during and after supplementation periods
- Average increase of 16 redds



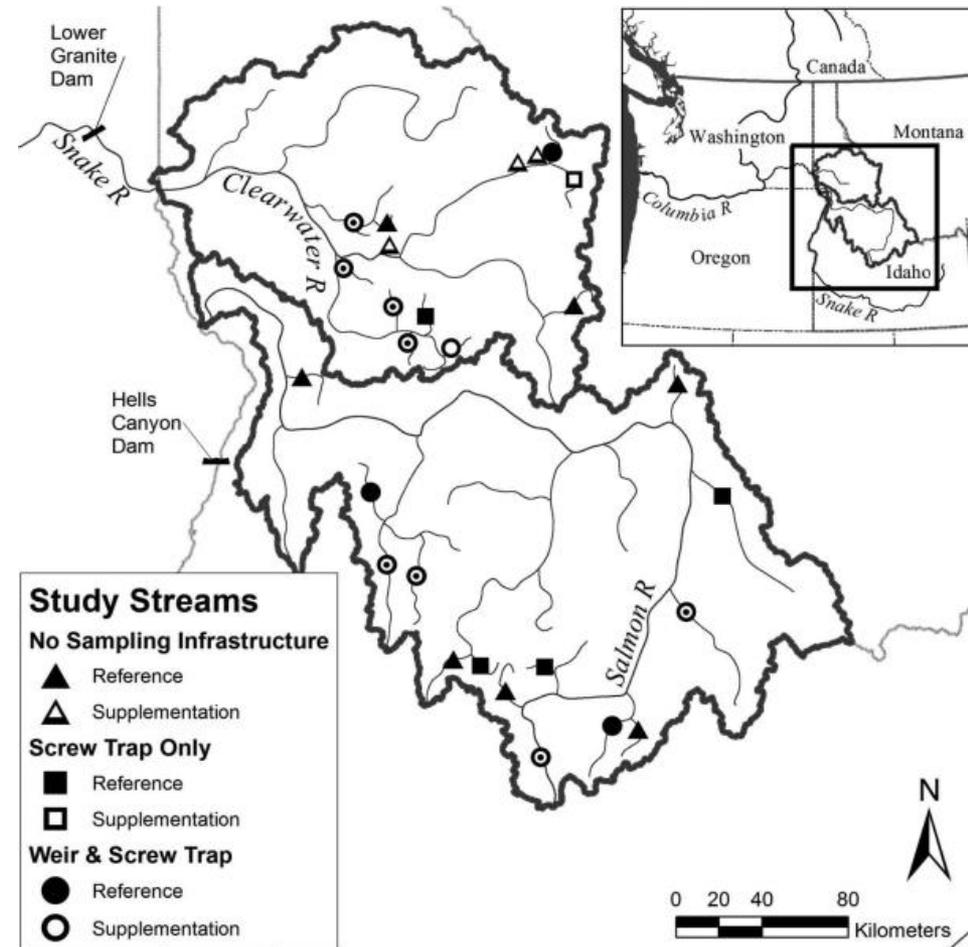
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(Berejikian and Van Doornik 2018)



# Idaho Supplementation Studies (Vendetti et al. 2018)

- More typical Chinook hatchery programs
- Clearwater and Salmon rivers
- BACI design
  - Control vs. treatment stream



# Idaho Supplementation Studies (Vendetti et al. 2018)

- No benefit in post-supplementation period
- Hatcheries won't work if limiting factors (i.e., bottlenecks) are still in place
- Use natural origin broodstock (genetic)
- Adaptively manage the program using sliding scales (pHOS)
- Beneficial purposes
  - Maintain smolt production in low return years (e.g., 2018-2019)
  - Seed unoccupied or restored habitat
  - Maintain harvest levels while not negatively impacting recovery efforts



# Integrated Harvest Programs

- Clearwater Coho (Sharma et al. 2006)
- Yakima Spring Chinook (Fast et al. 2015)
- Commonalities
  - Use of natural origin broodstock
  - Hatchery fish slightly less productive
  - No negative effect on natural origin fish
    - Abundance
    - Productivity



# Segregated Harvest Programs

- Little to no published studies (lower 48)
- Intent is to keep hatchery and wild fish from interacting with each other
- More common in Western Washington (N = 60) than Eastern Washington (N = 7)
- Little risk **assuming** hatchery fish remain segregated from wild fish and stray rates are acceptable



# Managing Risk/Impacts

Hatchery Program	Hatchery Fish
Goal	Best management practices (BMPs)
Water source	Minimize domestication
Number of fish released	Broodstock source
Rearing density	Mating scheme
Acclimation period and location	Feeding/growth rates
Time at release	
Marking scheme	



# Dispelling Some Myths about Hatcheries(Waples 1999)

1. Hatcheries are inherently bad (or good)
2. Risks can be avoided by better (hatchery) management
3. Hatcheries will always negatively impact wild fish
4. Risks are based on theoretical not empirical data
5. It's a fisheries management problem
6. M & E program will fix everything



# Myth 1. Hatcheries are inherently bad (or good)

- All hatchery programs have goals
- PUD programs are adaptively managed to better meet goals
  - M & E program objectives are all quantitative
  - Best available science



# “Bad” hatchery fish turned “Good”

- Wenatchee steelhead circa 1997
  - Wells Hatchery stock (~30 years)
  - Reared at Eastbank/Turtle Rock FH
  - Very high stray rates
- Wenatchee steelhead circa 2012
  - Wild Wenatchee broodstock
  - Overwinter acclimation
  - Low stray rates
  - RRS of  $W \times W \approx$  Wild fish



# “Bad” hatchery turned “good”

- Methow Summer Chinook circa 1997
  - High proportion of hatchery broodstock
  - Fish were at higher risk from disease
  - Short acclimation period in Methow
  - High stray rate/low survival
- Methow Summer Chinook circa 2015
  - Nearly all wild broodstock
  - Overwinter acclimation
  - Low stray rate/higher survival
  - High quality smolts



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# Myth 2. Risks can be minimized by better (hatchery) management

- Minimize not eliminate
- BMP's are used
  - Maximize survival of hatchery fish
  - Minimize negative ecological interactions
    - Pearsons 2008 in Fisheries
- Use wild broodstock and pHOS targets
  - Managing gene flow



# Myth 2. Risks can be minimized by better (hatchery) management

- Minimize not eliminate
- BMP's are used
  - Maximize survival of hatchery fish
  - Minimize ecological interactions
    - Pearsall 2008 Fisheries
- Work for broodstock and pHOS targets
  - Managing gene flow

**REALITY**



# Myth 3. Hatcheries will always negatively impact wild fish

- All hatchery programs are different.
  - But do overlap (space and time) with wild fish
- Segregated harvest programs (Icicle spring and Chelan summer Chinook)
  - Good acclimation = high homing rates
  - Disease BMPs = low risk to wild fish
  - High quality smolts
- Conservation programs
  - BMP minimize impacts
- Minimize not eliminate risks/impacts
  - Biologically significant impacts?



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# Myth 4. Risks are based on theoretical not empirical data

## Steelhead Relative Reproductive Success Summary

Sex	Cross	Wenatchee	Hood River	Little Sheep Creek
Male	HH	0.17		
	HW	0.37	0.39	
	WW	0.56	0.71	
	Mixed H			0.44
Female	HH	0.17		
	HW	0.50	0.50	
	WW	1.10	0.91	



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**BUSTED**



# Myth 5. It's a fisheries management problem (not a hatchery problem)

- Hatcheries are critical in meeting management goals
  - BMPs are not used everywhere
- Harvest is a tool used to manage hatchery fish
  - Selective harvest has been widely implemented
  - Some mixed stock fisheries (vs. terminal) are self-limiting due to excessive impacts
- It's everyone's problem



# Myth 5. It's a fisheries management problem (not a hatchery problem)

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# Myth 6. M & E program will fix everything

- The UCR has a robust M & E program
  - Ensure hatchery programs are achieving expected results (i.e., survival benefit)
  - Hatchery fish are contributing the hatchery program goals (recovery or harvest)
  - If not, why not.
- Data are used to adaptively manage the programs
- Adequate M & E programs simply don't exist everywhere (\$\$\$\$)
- Other reasons to prevent change (e.g., societal values differ among user groups)



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# Summary

- All hatchery programs are different
- Benefits should always outweigh risks
  - Risks (and benefits) are difficult to quantify
  - Benefit:Risk is more ambiguous than desired
- Much progress had been made in the last 23 years
- Much more progress will be made in the next 23 years





Questions?