Northwest Power and Conservation Council

September 4, 2013

MEMORANDUM

TO: Council members

FROM: Jim Ruff – Manager, Mainstem Passage and River Operations

SUBJECT: Briefing on experimental spill management by members of the Comparative Survival Study (CSS)

At the September 10, 2013, Council meeting in Coeur d'Alene, Dr. Steve Haeseker, PhD Fishery Biologist at the U.S. Fish and Wildlife Service and Margaret Filardo, PhD Biologist at the Fish Passage Center, will present a summary of the results of the fishery agencies and tribes' Comparative Survival Study's (CSS) prospective analyses related to experimental spill management at the eight federal mainstem dams on the Snake and Columbia rivers.

Background

The CSS study has been collecting life cycle monitoring data for upriver spring Chinook salmon and steelhead in the Columbia River Basin, including smolt-to-adult return rates, across a wide range of prevailing environmental conditions, including river and ocean conditions, for close to two decades. These data support extensive CSS analyses that have been reported to, and reviewed by, the region.

For example, in recent years CSS retrospective and prospective analyses have been presented and reviewed by scientists and others both within and outside the region. The accumulation and syntheses of these data and resulting analyses have precipitated a discussion of river operation conditions that are likely to increase salmon and steelhead survival and smolt-to-adult return rates. The presenters today will discuss the smolt-to-adult survival rates for spring Chinook salmon and steelhead, the prospective analyses, and the analyses describing improved mainstem passage survival and smolt-to-adult return rates which are possible with the present configuration of the mainstem hydropower system.

For additional background information, below is a link to all the presentations from the CSS annual meeting this year, which was held in Vancouver, WA on April 30, 2013.

http://www.fpc.org/documents/CSS/Presentations%20from%20the%202013%20CSS%20Annual%20Meeting.pdf

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Experimental Spill Management

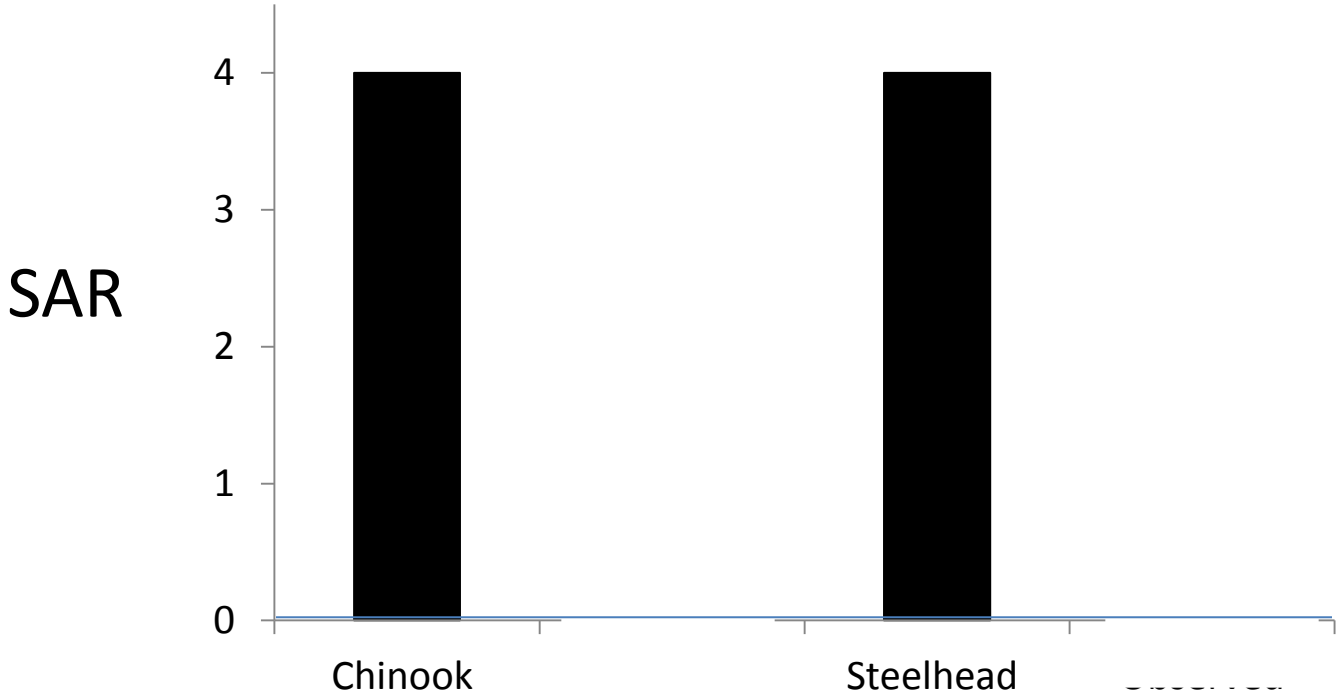
Presenters: Steve Haeseker, Margaret Filardo

Comparative Survival Study

- A regional, collaborative salmon and steelhead life-cycle monitoring program
- Successfully implemented since 1998
- Annually reviewed by the NPCC Independent Scientific Advisory Board and the region
- Analyses published in peer-reviewed scientific journals

NPCC Smolt-to-Adult Survival Goal-Recovery

- Achieve SARs averaging 4% for Snake River Chinook salmon and steelhead



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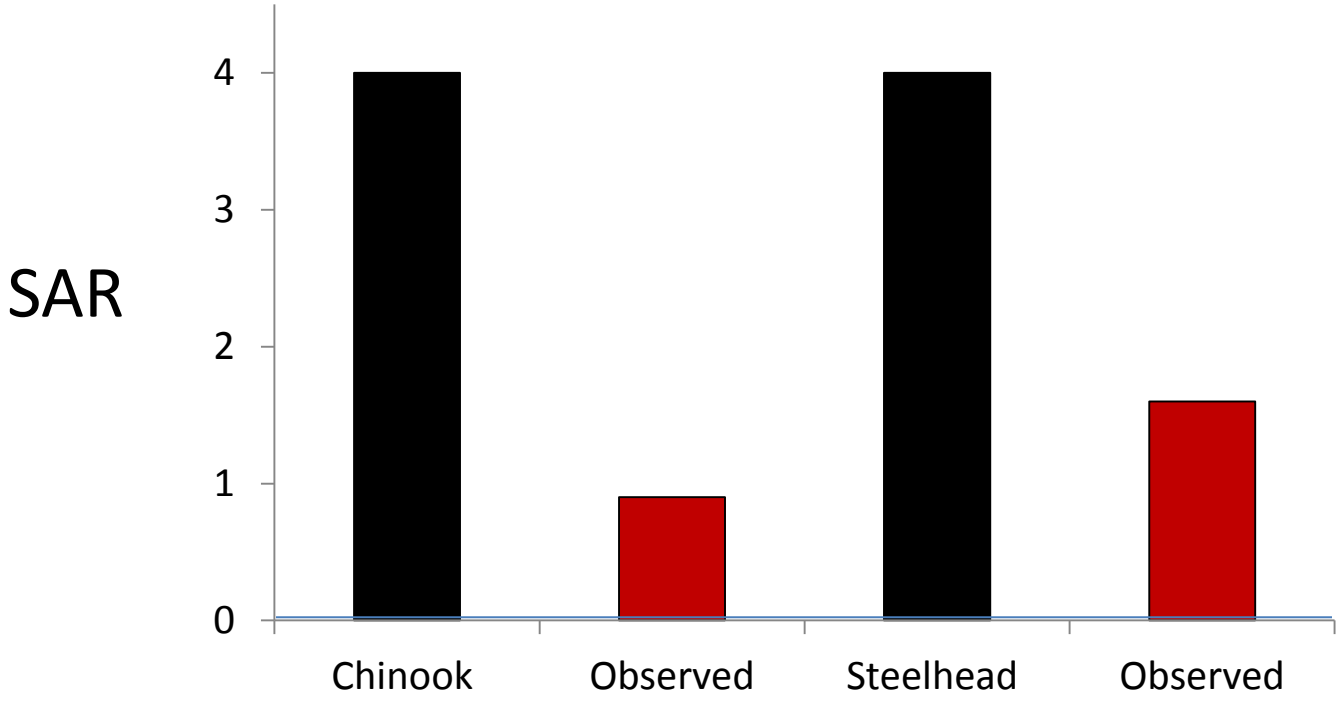
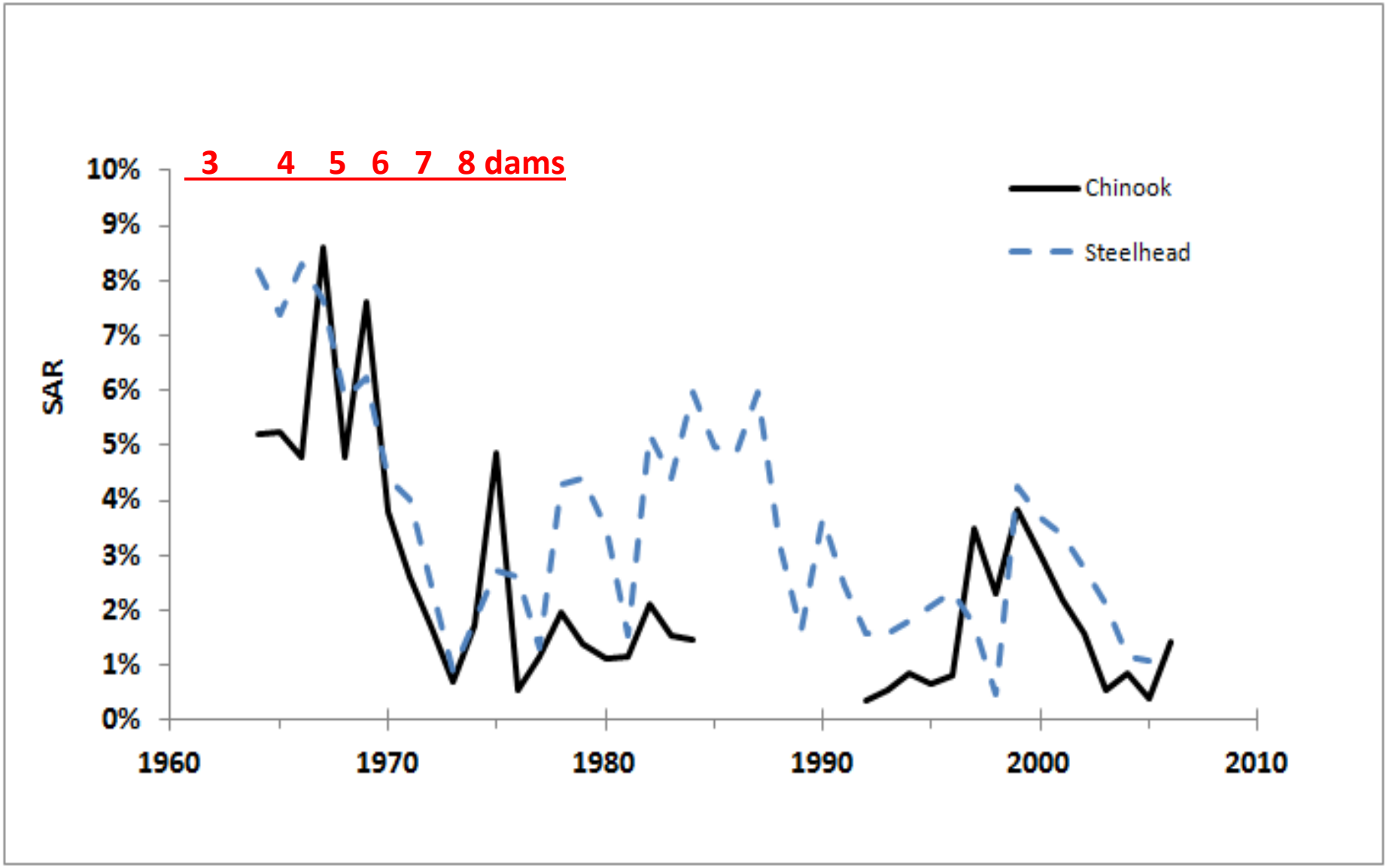
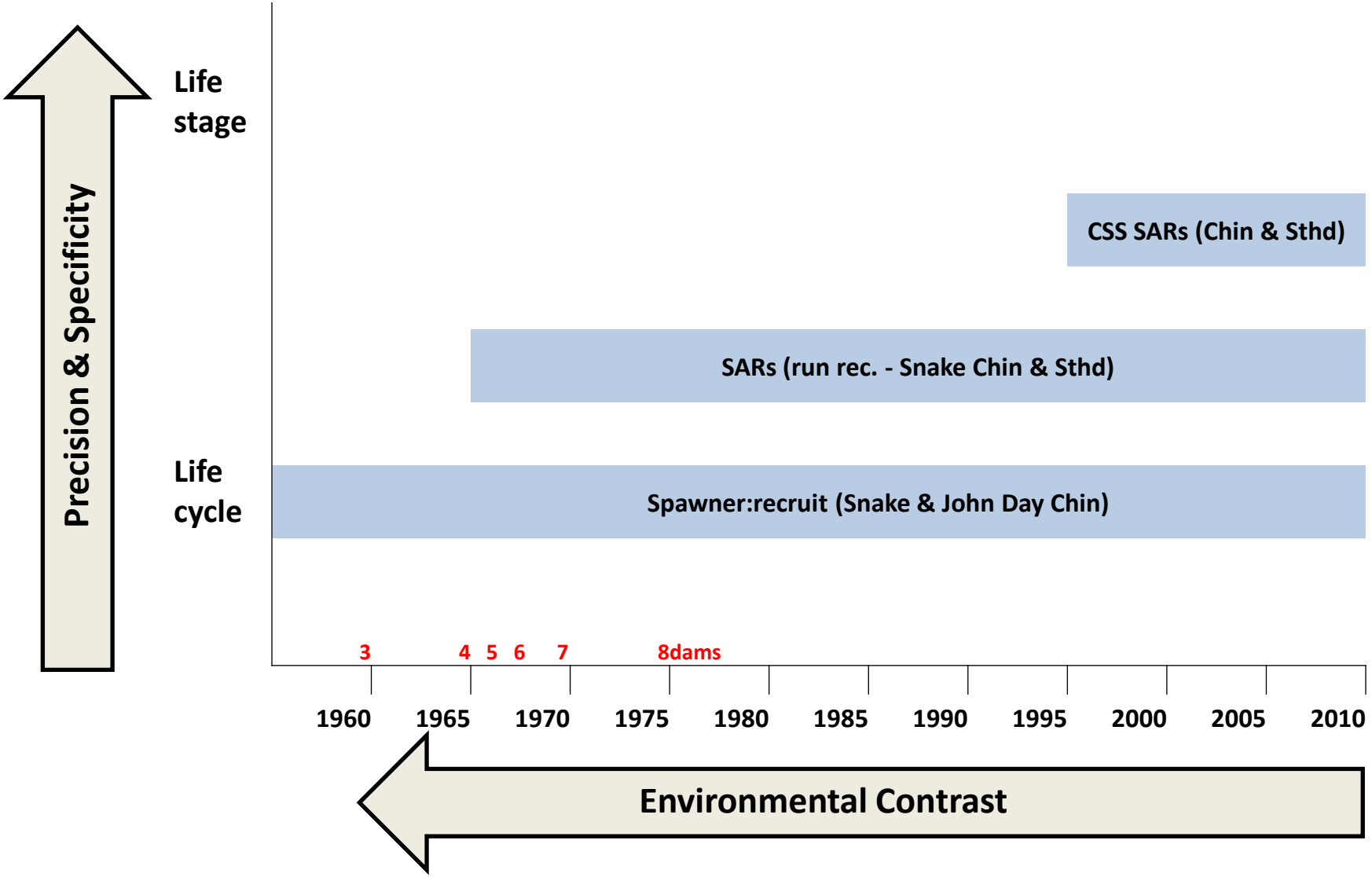


Decline in Snake R. Chinook & steelhead associated with dams…



Approach

Weight of evidence Multiple lines of evidence for relative importance of major factors influencing survival rates

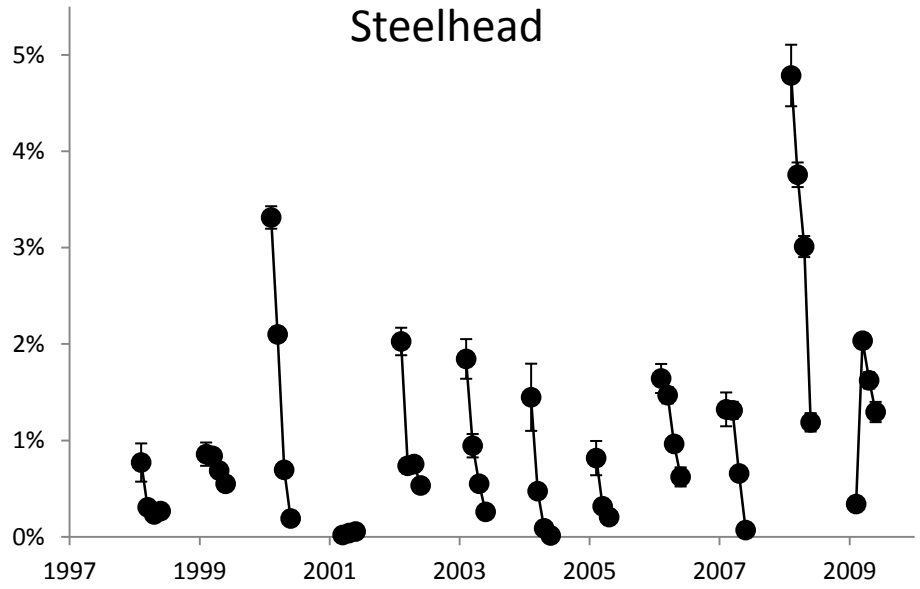


Key Studies

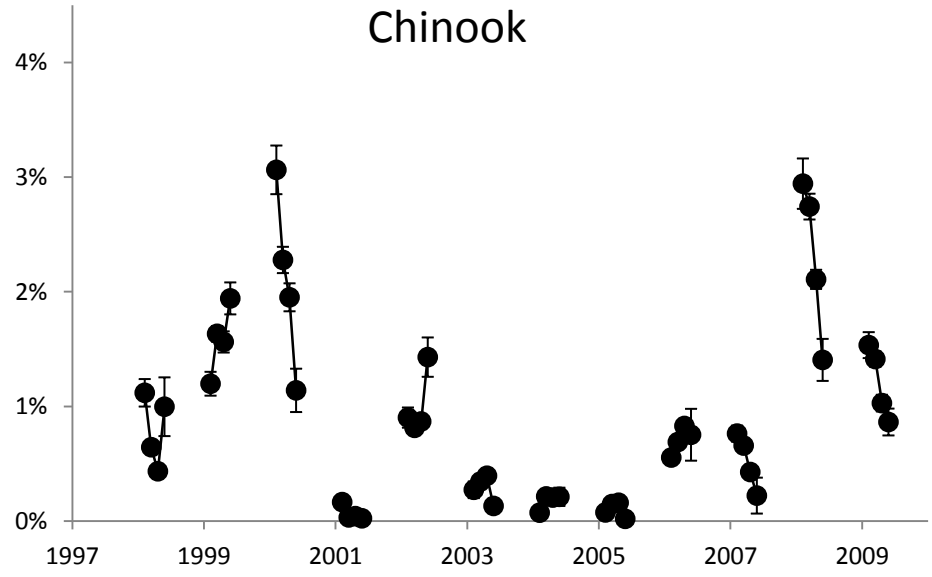
- Petrosky and Schaller 2010
  - Spill, water velocity and ocean conditions influence SARs
- Haeseker et al. 2012
  - Spill, water velocity and ocean conditions influence SARs
- Over a dozen peer reviewed publications

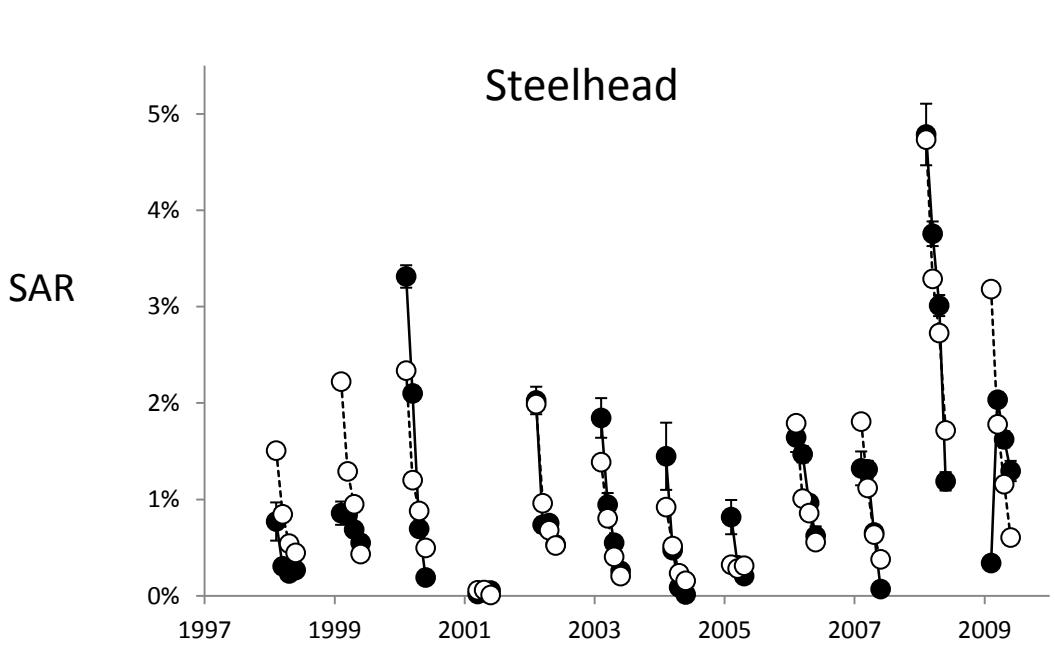
Relative Variable Importance

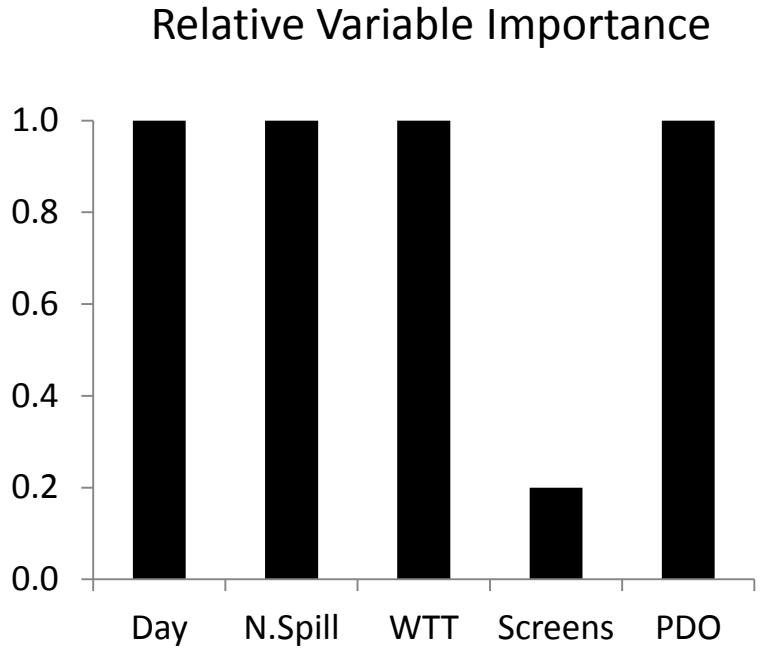
SAR

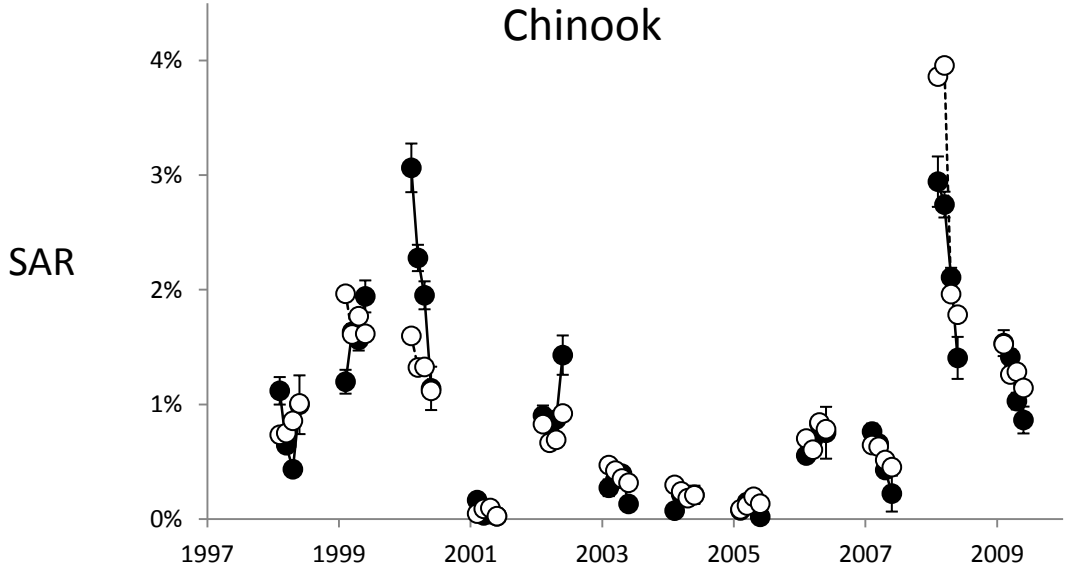


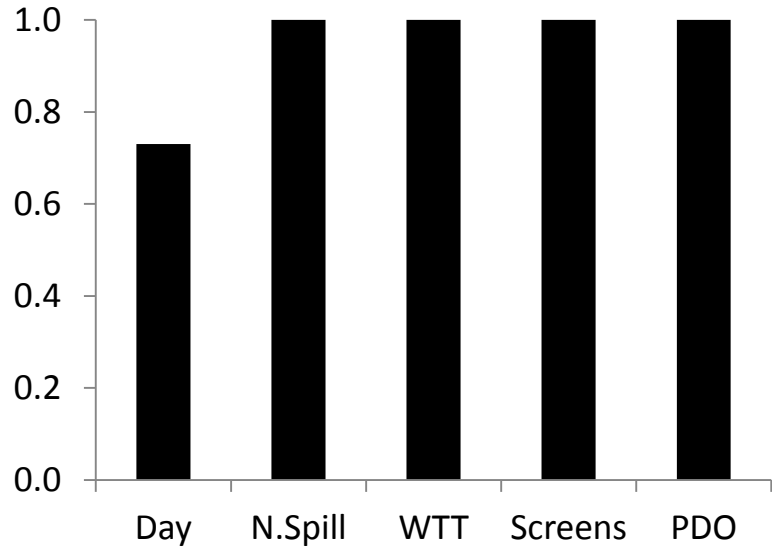
SAR




Steelhead
SAR
5%
4%
3%
2%
1%
0%
1997
1999
2001
2003
2005
2007
2009


Relative Variable Importance
1.0
0.8
0.6
0.4
0.2
0.0
Day
N.Spill
WTT
Screens
PDO


Chinook
SAR
4%
3%
2%
1%
0%
1997
1999
2001
2003
2005
2007
2009


1.0
0.8
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Summary of 2011 Workshop

- Survival (in freshwater and marine) increases:
  - faster water velocity
  - increased spill
  - lower % transported

- Current FCRPS configuration:
  - Little ability to speed water velocity
  - Opportunity to further manage spill combined with surface passage to reduce powerhouse passages

- Promising approach - management experiment to evaluate improvements to SARs by increasing voluntary spill- Adaptive Management approach

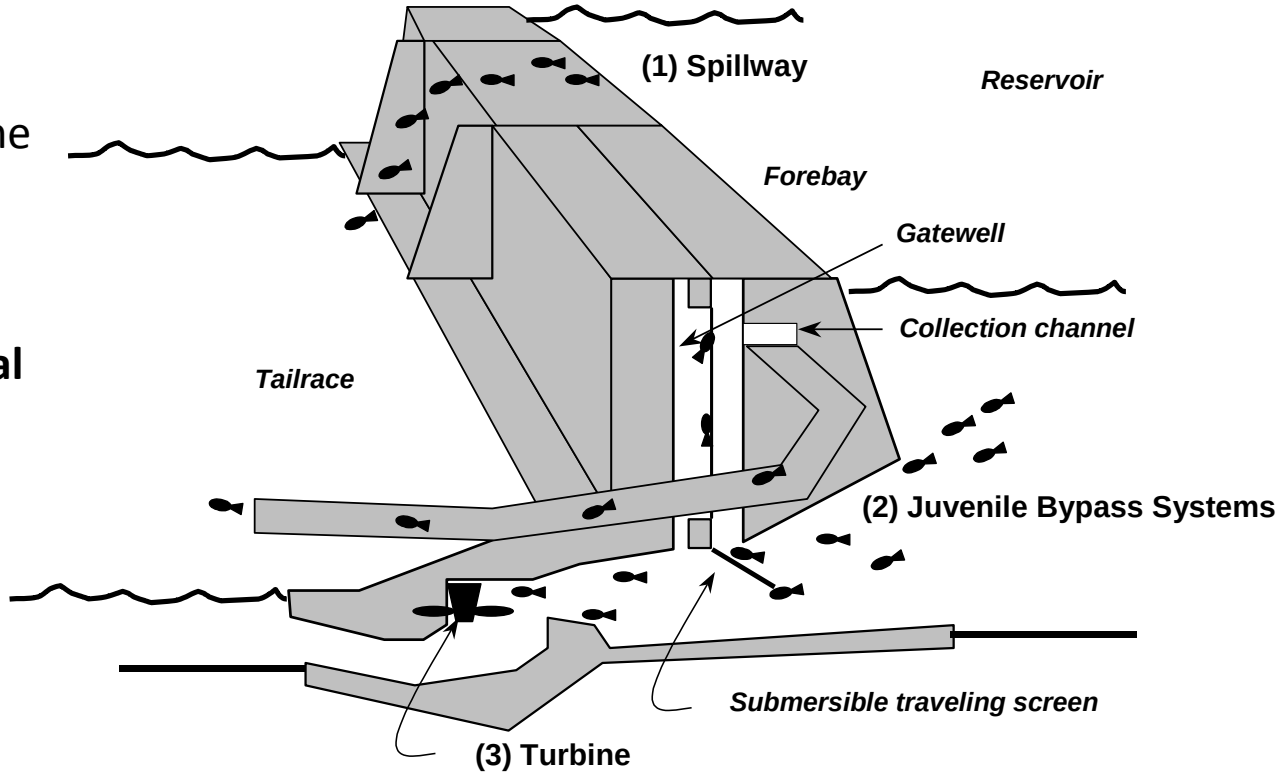
In-river Passage Routes

Non-powerhouse = Spill (traditional or surface spillway weirs)
Powerhouse = Turbine or juvenile collection/bypass

Direct survival:
spill ≥ bypass > turbine

Direct & indirect survival (delayed mortality):
spill > bypass
spill > turbine

Forebay & Tailrace TDG monitoring



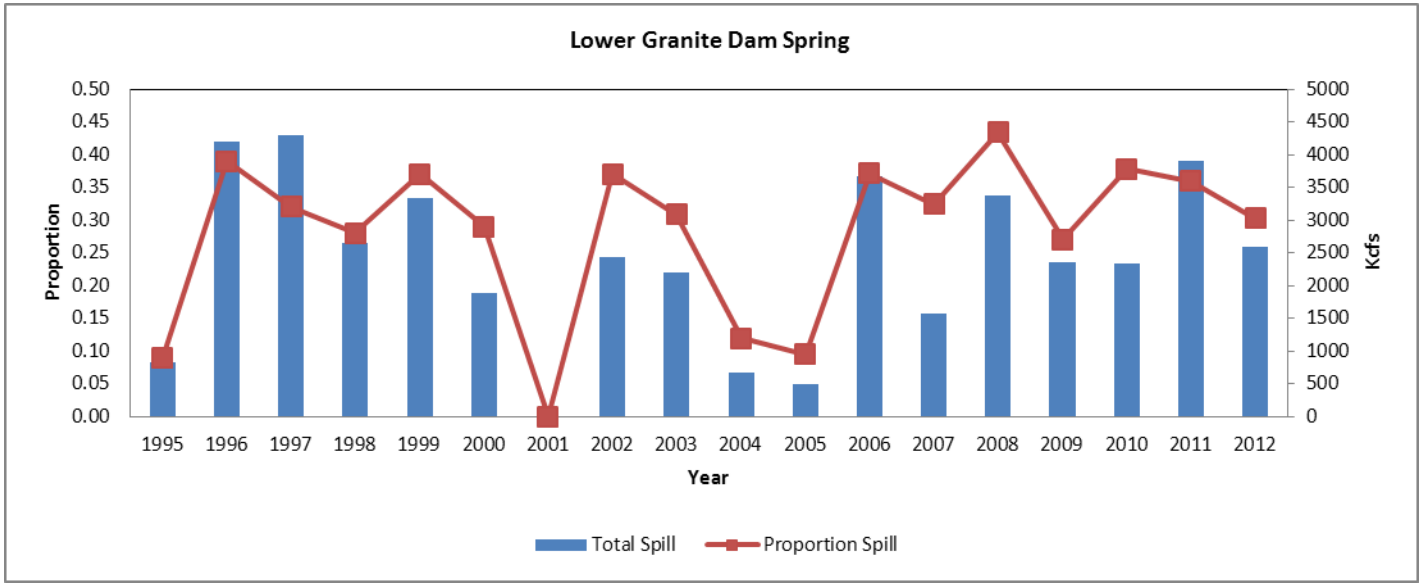
Spill Benefits

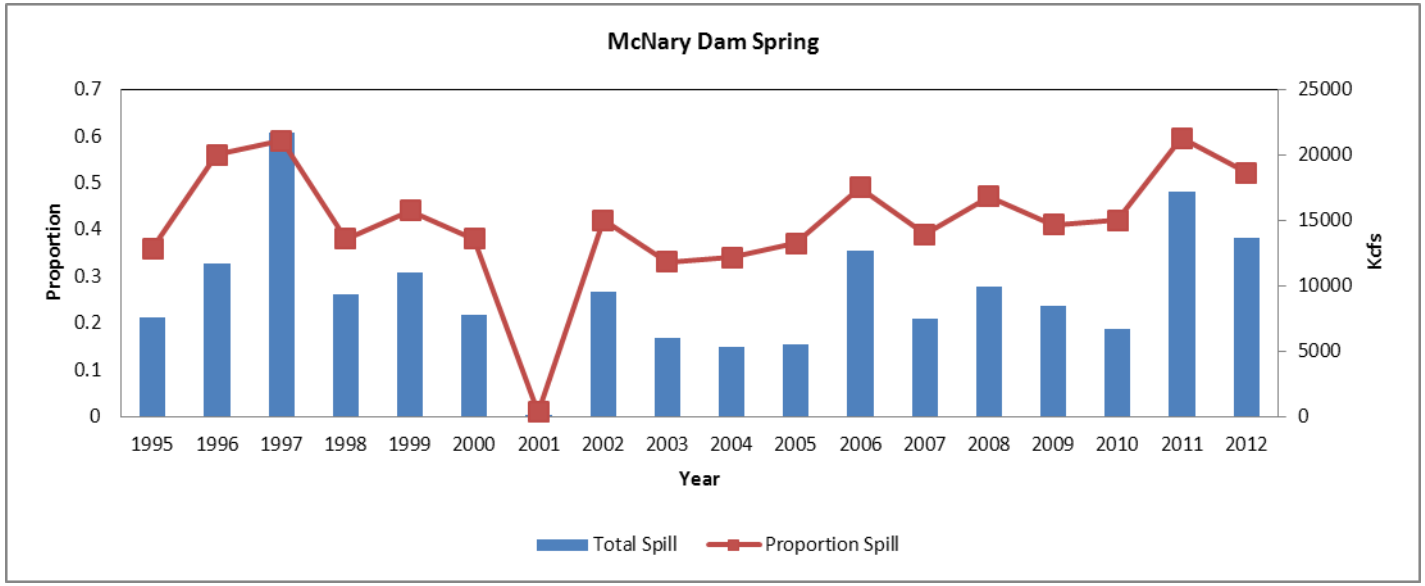
- Historic data has consistently shown a juvenile survival advantage.
- Spill is a mitigation measure that can be provided in every flow year.
- Spill can be provided without impact to reservoir elevations.

Risk Based Spill Program

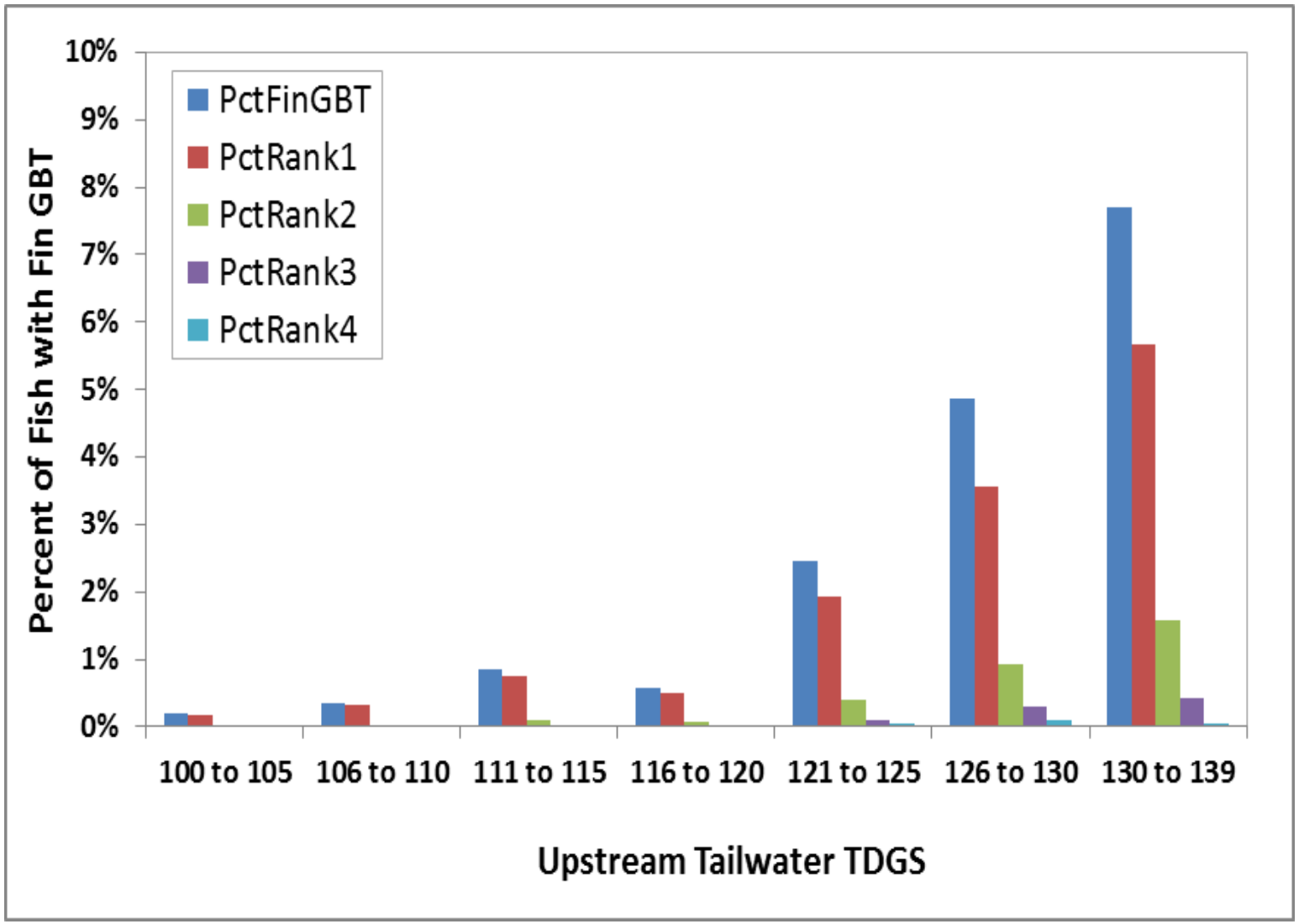
- Survival benefits of spill > potential TDG related mortality
- Adaptive Management approach- supported by empirical observations:
  - Juvenile survival
  - SARs
  - TDG effects

Variability of Spill 1995-2012





Summary of GBT Samples (1995-2012) as a function of TDG



In Preparation for 2013 Workshop

- Develop estimates of the amount of water that could be spilled (spill caps) at each of the hydroprojects on the Lower Snake and Columbia rivers for the various scenarios modeled for the 2013 workshop.

- Choose representative flow years for prospective modeling.

Summary of 2013 Workshop

- Reviewed historical dissolved gas effects.

- Presented and reviewed draft Experimental Spill Management Design.

- Evaluated four spill levels:
  - Biological Opinion-current
  - 115/120% - lowest increase
  - 120% Tailrace -moderate increase
  - 125% Tailrace - greatest increase

Summary of 2013 Workshop

- Applied peer-reviewed models to spill levels

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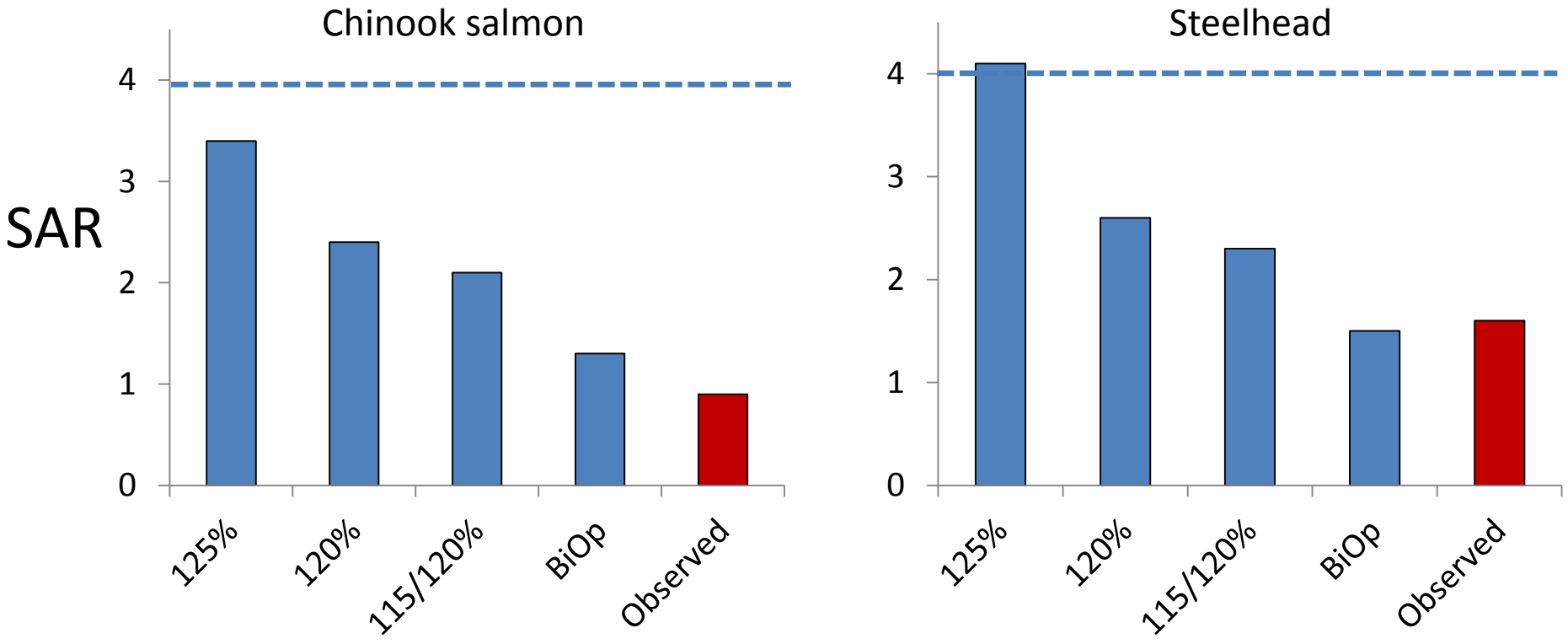

Summary:

- Definition of spill scenarios for simulations based on what appears technically possible with current FCRPS configuration
- Biological Planning tool indicates 125% spill level most likely to achieve SAR objectives
- Ongoing CSS analyses provide rigorous monitoring framework
- Expected benefits to Upper- & Mid-Columbia stocks
  - These stocks provide for additional monitoring/learning
- Simulations are encouraging in terms of:
  - expected response (conservation benefit)
  - likelihood of detecting response (learning)