



# 2008 AFEP Preliminary Research Results

Northwest Power and Conservation Council Meeting  
March 2009  
Boise, ID



## Focus Today

- Anadromous Fish Evaluation Program Purpose
- Juvenile Fish Passage
- Adult Fish
- Predation
  - Avian
  - Pinniped
- Lamprey



## AFEP Program Purpose

To produce scientific information to assist the Corps in making engineering, design, and operations decisions to support safe, efficient passage of fish past the eight mainstem Columbia and Snake River hydroelectric projects.



## How Research Results Are Used

- **Baseline Information**
  - Collect data necessary for design of improvements
- **Decision Support**
  - Hydroproject configuration, prototype development, operations
- **Monitoring**
  - Support of biological opinions, Fish Accords, confirmation of decisions
    - Performance of the hydrosystem
    - Check-ins
    - Research, Monitoring and Evaluation program (RM&E)



## Hydro Improvements

- Commitment to higher dam passage performance standards:
  - 96% average or better survival for spring migrants
  - 93% average for summer migrants
- Scheduled commitments to additional surface collectors (RSWs)
- Improvements to Juvenile Bypass Systems
- Transport when the science shows it's best for fish
- Improved water management for flow augmentation
- Maintain or improve adult passage systems
- \$500 million over 10 years



## Juvenile Transportation



- Seasonality
  - Snake River Yearling Chinook and Snake River Steelhead
- Snake River Fall Chinook



## Seasonality of Juvenile Fish Transportation Objectives

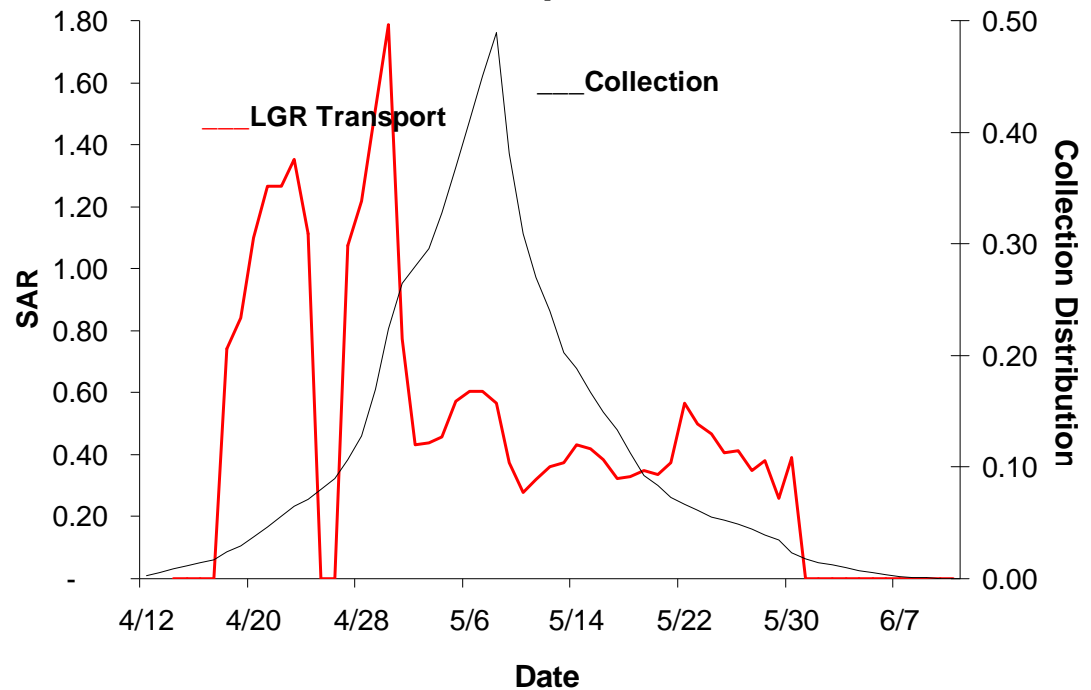
- Compare the seasonal (within year) Smolt to Adult Return (SARs) of transported, bypassed, and inriver groups of wild yearling Chinook salmon and wild steelhead smolts PIT tagged and released at Lower Granite Dam.
- Monitor SARs of returning adults on a seasonal basis to compare transported to inriver ratios (T/Is).
- Determine how size and timing of smolts below Bonneville Dam affects survival to adults.
- Determine how biological and physical conditions in the estuary and near-shore ocean are correlated with high or low levels of salmon ocean survival.



## Seasonality of Transportation Results

- No adults returned from inriver non-detected group.
- Transported wild steelhead highest adult return levels in April.
- Benefits of transporting spring/summer Chinook through May.

2005 Seasonal SAR Wild Steelhead Transported



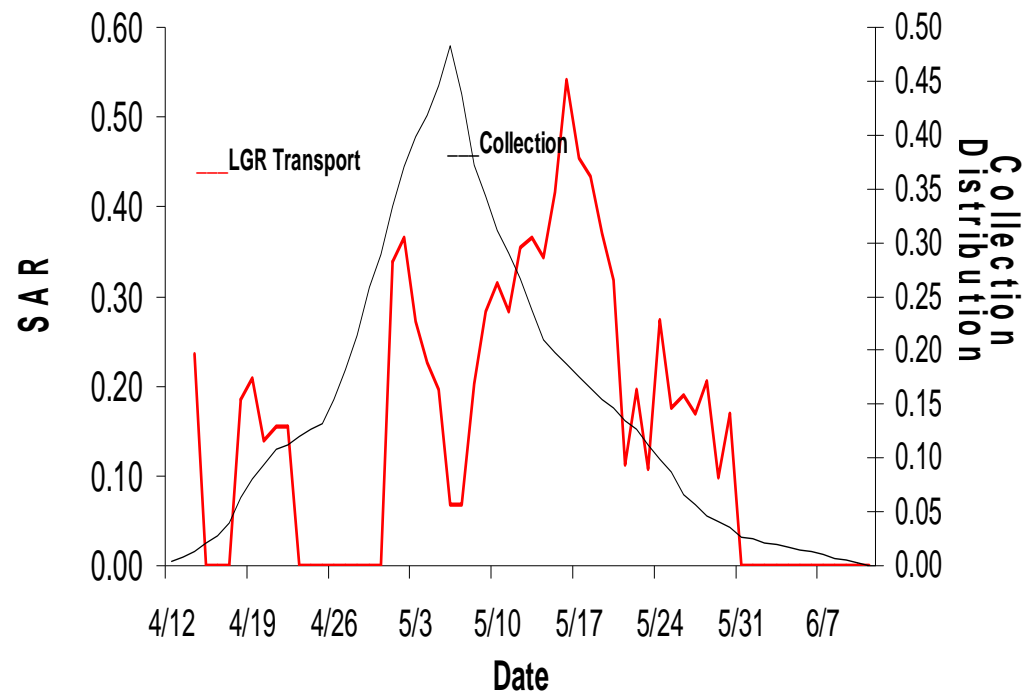




## Seasonality of Transportation Results

- Only three wild adult Spring/Summer Chinook returned from the Inriver group.
- No T/I ratios developed.
- No temporal SAR for inriver group due to low adult returns.
- Transport SARs highest during May 2008 BiOp period.

### 2005 Seasonal SAR Wild Spring/Summer Chinook





## Seasonality of Transportation Future Direction

- Continue building the data set
- Selectively use transportation or timed hatchery releases to optimize SARs
- Identify potential indicators of marine survival to improve management actions
- Adaptive Management
  - Continue the juvenile fish transportation program toward meeting system survival performance metrics of Snake and Columbia River salmon and steelhead with some modifications based on results of RM&E



## Fall Chinook Transportation Objectives

- Compare (SARs) of transported, bypassed and inriver groups of Snake River fall Chinook salmon released above Lower Granite Dam: 1) yearling, 2) subyearling production, and 3) surrogate subyearlings reared to match natural fish size.
- Monitor SARs of returning adults on a seasonal basis to compare transported to inriver ratios (T/Is).
- Determine how the performance of surrogate reared Snake River fall Chinook salmon compares to natural fish performance.
- Better understand the holdover behavior of Snake River fall Chinook salmon, their contribution to the returning adult population, and compare age at ocean entry with juvenile detection history.



## Fall Chinook Transportation Results

- Natural and surrogate subyearling performance is more similar than between natural and production subyearlings.
- In some years, Snake River holdover juvenile fall Chinook salmon comprise greater than 50% of the adult population returns.
- Snake River subyearling fall Chinook salmon tend to exhibit an (ocean-type life history) and migrate past Snake River projects by around mid-July.
- Clearwater River subyearling fall Chinook salmon tend to exhibit a (reservoir-type life history) and migrate through the FCRPS until early spring the following year.

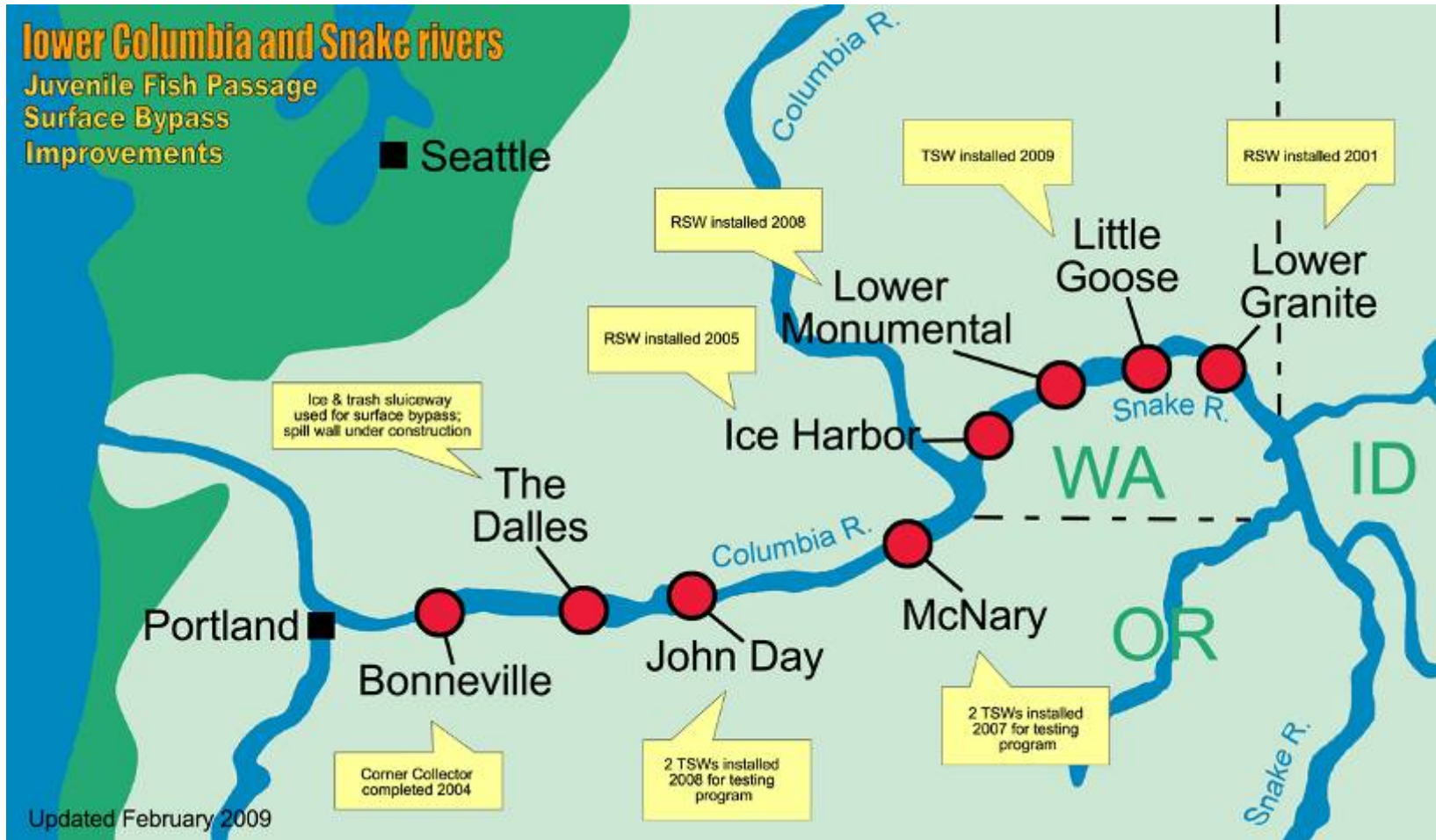


## Fall Chinook Transportation Future Direction

- Continue study implementation, coordination, and collaboration with regional parties and principal investigators (NMFS, FWS, and the Nez Perce Tribe). Two more outmigration years, minimum.
- Coordinate, schedule, and implement with principal investigators, Phase II - fall Chinook transportation study regional workshop to develop methods to analyze data.
- Monitor adult returns and collect scale samples to calculate SARs and understand life history strategies.
- Determine best FCRPS operation strategy for Snake River fall Chinook salmon that optimizes adult returns.



## Juvenile Passage Studies





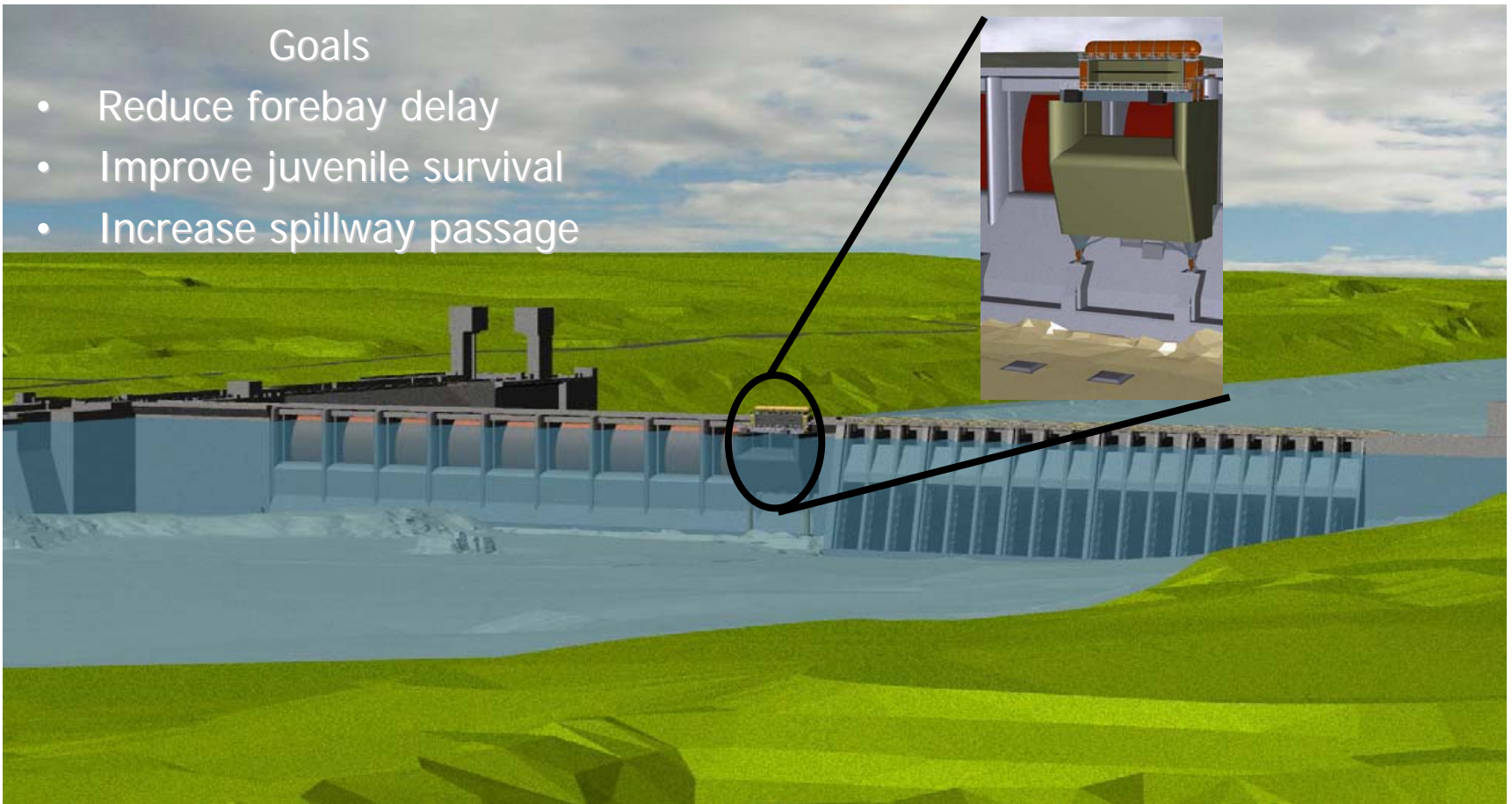
## Little Goose Dam Spillway Weir installed 2009 Testing 2009-2010



## Lower Monumental Dam RSW in Spillbay 8

### Goals

- Reduce forebay delay
- Improve juvenile survival
- Increase spillway passage





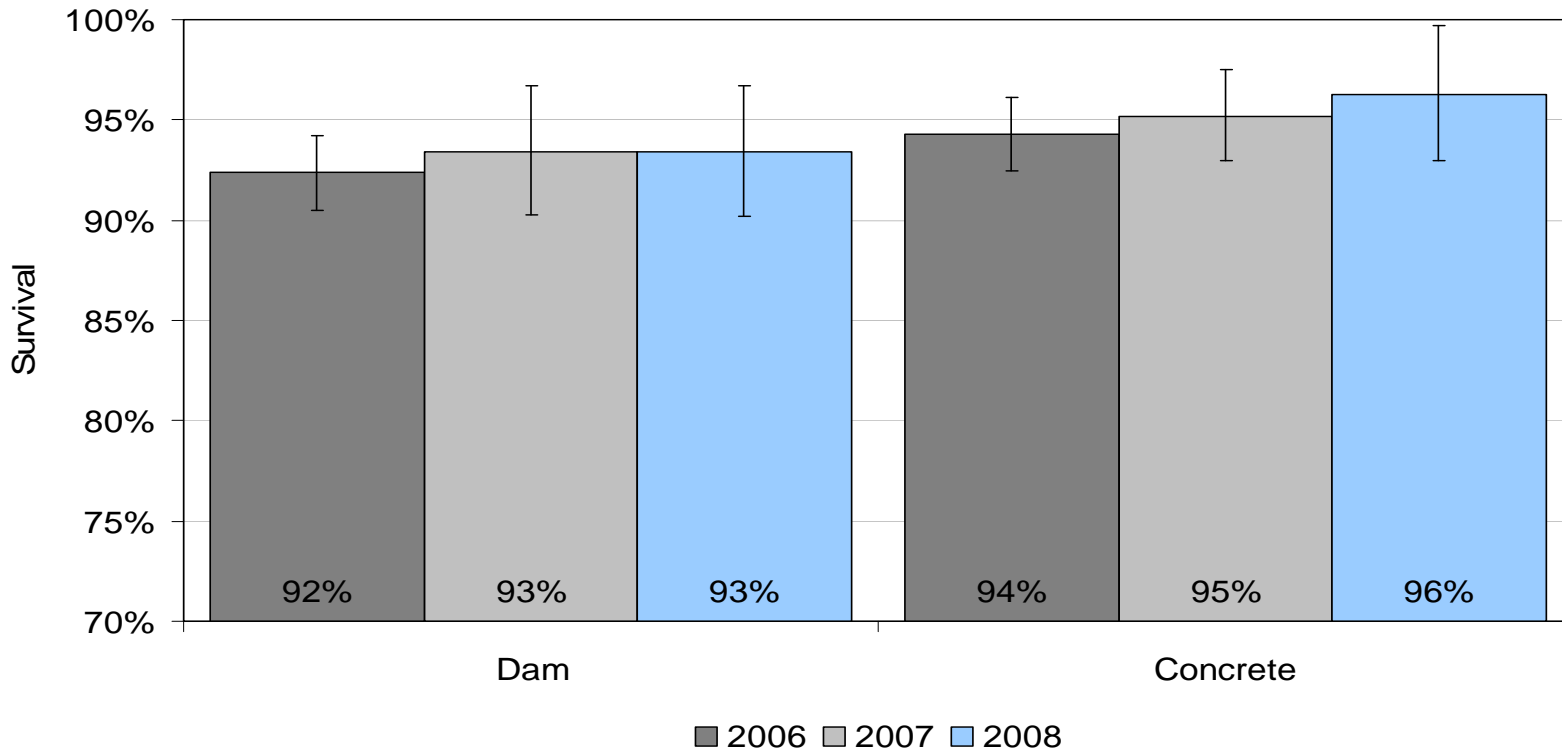


## Objectives

- Evaluate Passage Behavior
  - Forebay residence/delay
  - Approach distribution
  - Passage distribution
  - Tailrace egress
  - Fish Passage Metrics
- Estimate Relative Survival Using a Paired Release Design
  - Dam and concrete survival
  - Route specific survival
- Juvenile Chinook salmon and steelhead

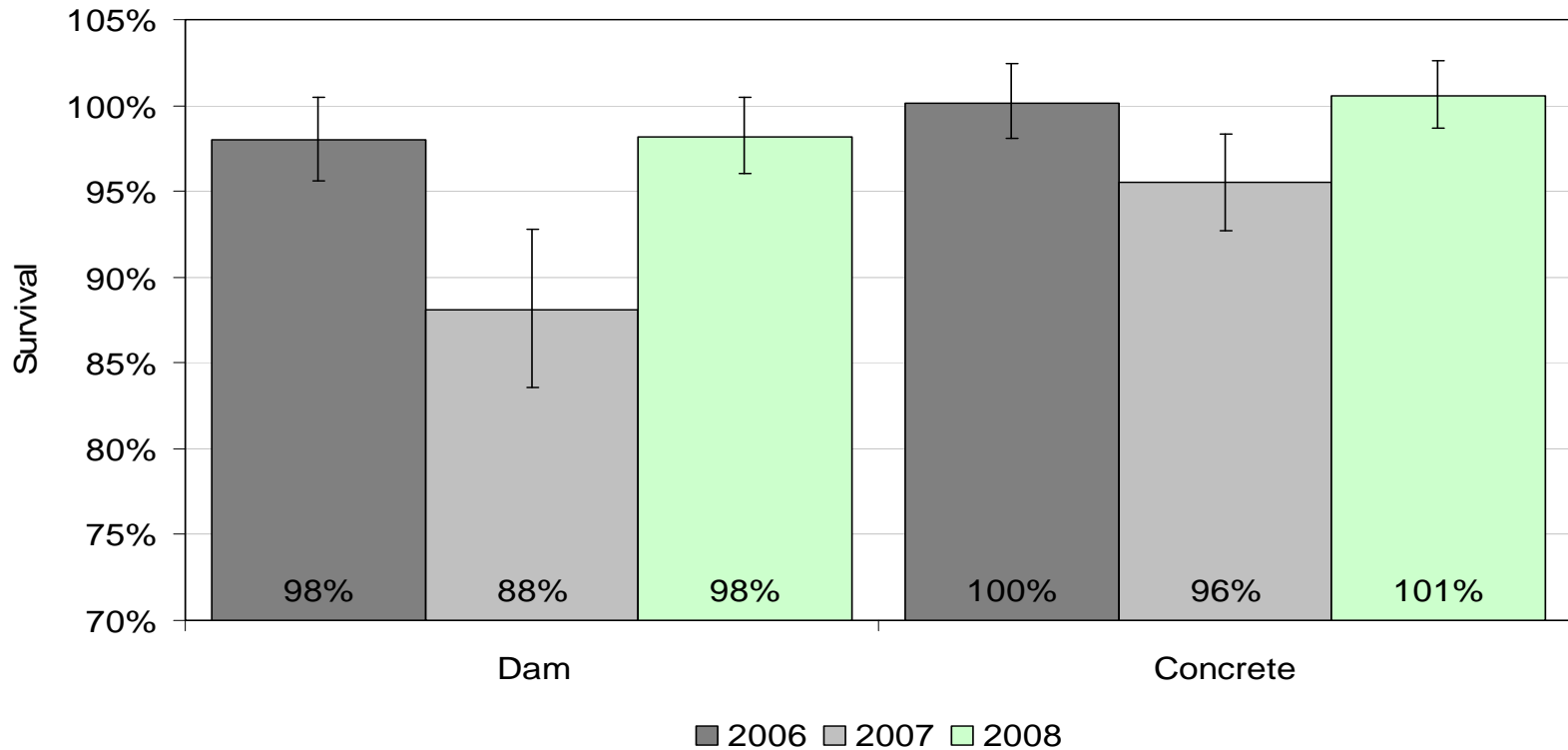


## Results – Dam and Concrete Survival Yearling Chinook Salmon



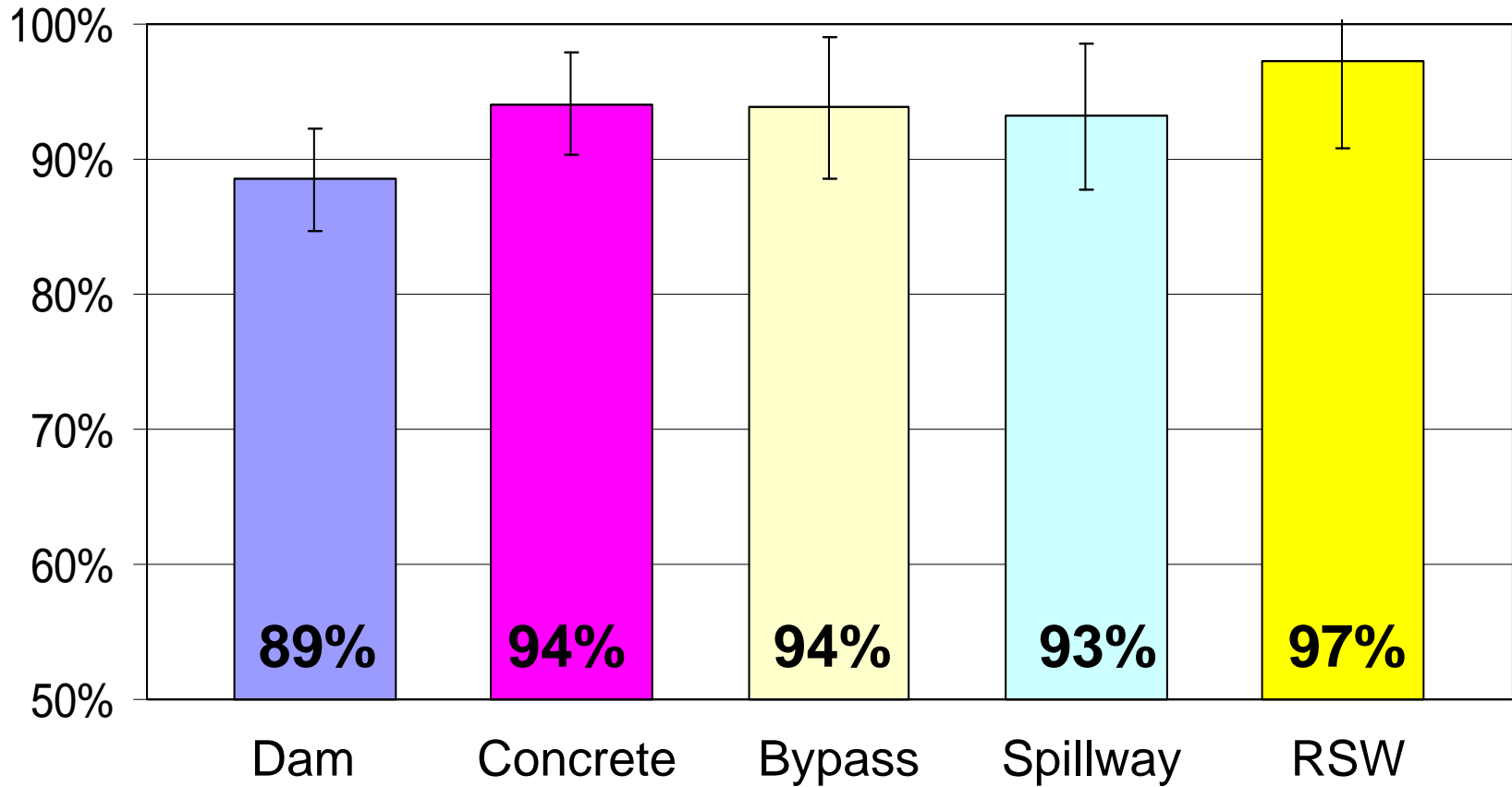


## Results – Dam and Concrete Survival Juvenile Steelhead





## Results - Relative Survival, 2008 Sub-yearling Chinook Salmon





## Future Direction

- Second year RSW evaluation 2009.
- Configuration and Operation Plan 2010.
- Bypass Outfall Relocation



## Ice Harbor Dam

Performance standard Test: 2010



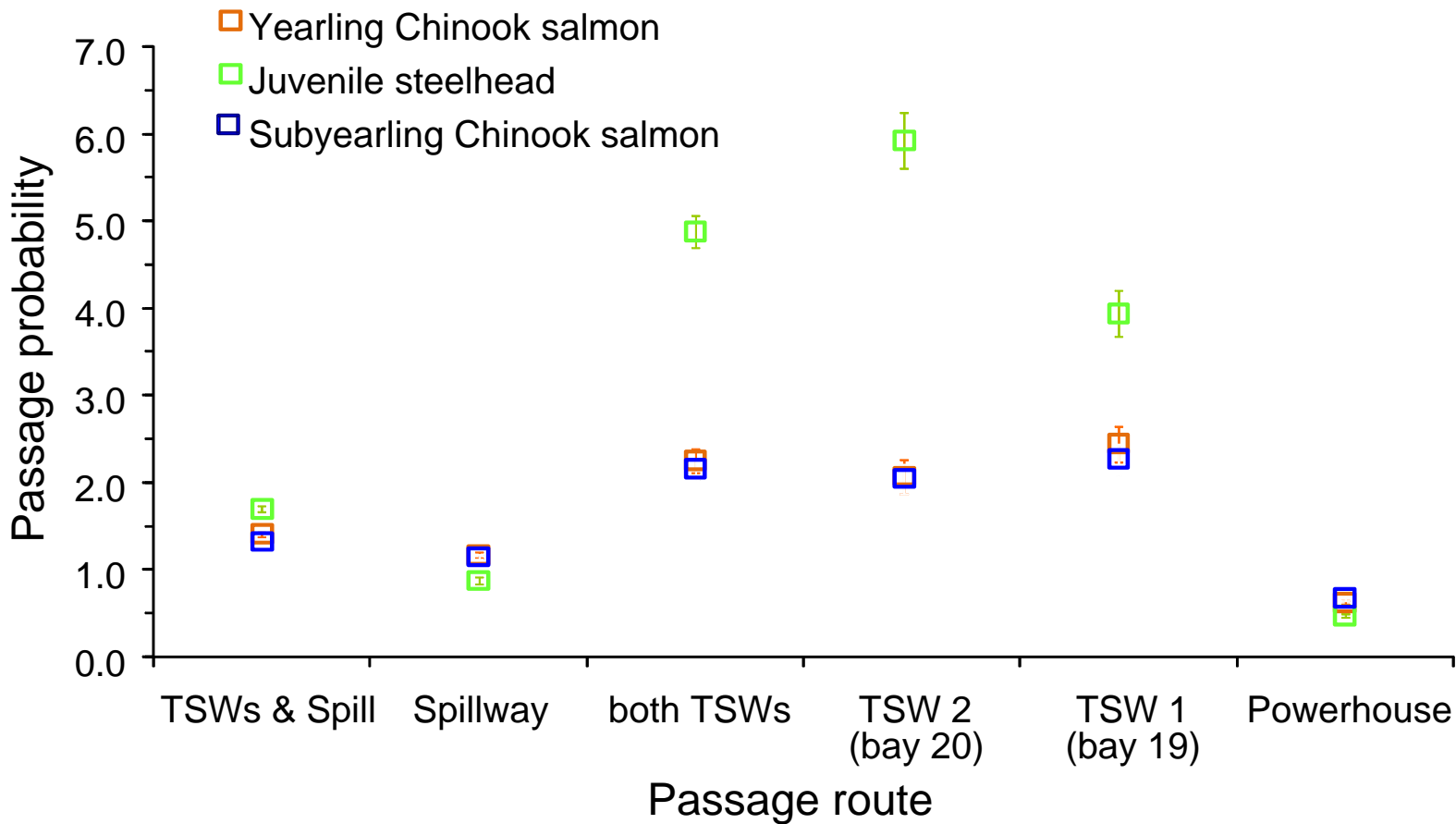


## Passage, Survival, and Behavior study during spring and summer at McNary Dam in 2008





## Passage Effectiveness in 2008







## McNary Dam TSW Conclusions

- Steelhead passage efficiency was reduced in 2008 when TSW's were located further from the powerhouse.
- Steelhead forebay residence time is reduced with surface passage availability.
- Mid-Columbia sockeye show a passage distribution similar to yearling Chinook.
- Drogue data suggest that egress through the tailrace may not be optimum with 40% spill during late summer low flows.
- Higher spill passage and higher dam survival with higher percent spill.
- Lower TSW and powerhouse passage with higher spill levels.

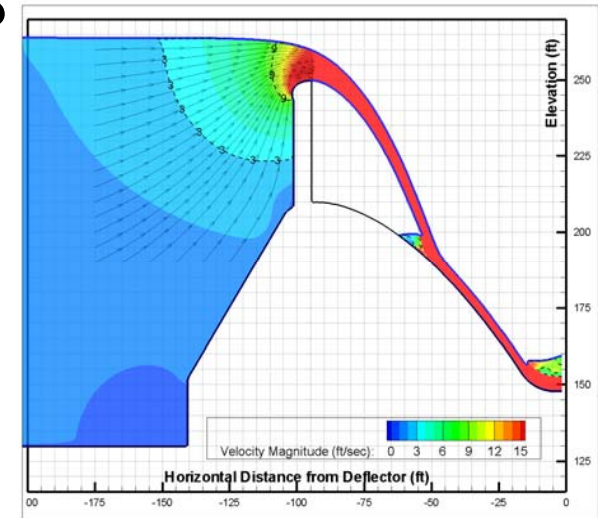


## Future Actions

- 2009 further resolve potential of spillway weir.
- Configuration & Operation Plan 2009.
  - Bypass improvement & outfall relocation.
  - Permanent Spillway Weir.
  - Powerhouse Surface Flow outlet.

## John Day Top Spillway Weir (TSW) 2008 Objectives

- Determine whether surface flow outlets will increase FPE at John Day Dam
- Estimate smolt passage distribution and survival





## John Day TSWs Results

	Steelhead		Yearling Chinook		Subyearling Chinook	
	08	Baseline	08	Baseline	08	Baseline
FPE	0.972	0.85-0.93	0.921	0.83-0.90	0.833	0.70-0.75
SPE	0.745	0.45-0.64	0.761	0.48-0.75	0.686	0.58-0.59
% TSW	0.496		0.234		0.206	
Dam S.	0.984	0.917	0.955	0.939	0.862	0.89

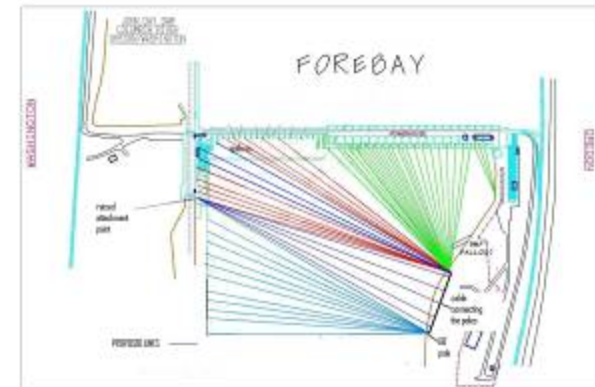


## John Day TSWs Results Summary

- Turbine entrainment was reduced by nearly 50% over previous years
- SPE and FPE were the higher for all species and age groups
- Steelhead and yearling chinook dam survival were high.
- Subyearling chinook estimates were lower than baseline estimates
  - Data and observations strongly suggest this is due to daytime predation by gulls

## John Day TSWs Future Direction

- 2<sup>nd</sup> year testing in 2009 to see if positive results are repeatable
- Install more extensive avian wire array to prevent gulls from feeding in TSW jet
- Investigate gull predation in more detail (daily surveys, diet composition)
- Continue engineering (model) study to determine best tailrace improvement / surface flow outlet configuration.





US Army Corps of Engineers



# The Dalles Spillwall 08-09 Construction



**BUILDING STRONG<sub>SM</sub>**

## Bonneville Behavior Guidance System (BGS) Objectives

- Determine Effect of the BGS on Juvenile Chinook and Steelhead
  - Passage Distribution at B2
  - Forebay Behavior
  - Forebay residence times







## Bonneville BGS Results Summary

- Yearling Chinook Corner Collector efficiency Increased
- Steelhead and Subyearling Chinook Similar to 2004-05
- May Increase Subyearling Chinook CC efficiency by Closing N Shore Gap



## Bonneville Spillway Survival Objectives

- Estimate Survival of Yearling Chinook and Steelhead that Pass Through the Spillway
  - 100 Kcfs, 24-hrs/day
- Estimate Survival of Subyearling Chinook that Pass Through the Spillway
  - 85 Kcfs Day
  - TDG Cap (120%) Night





## Bonneville Spillway Survival Results

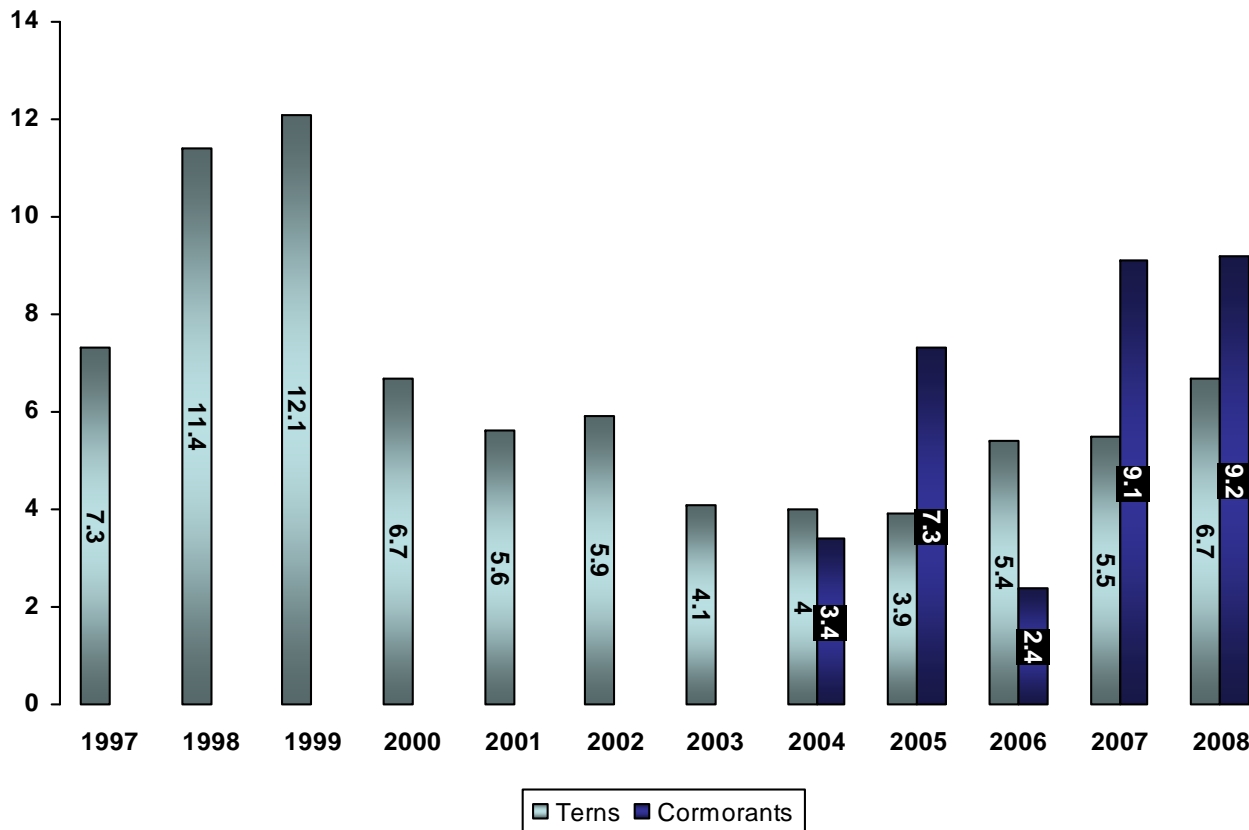
	2004-05	2007 Day	2008
Yearling Chinook	92%	96%	100%
Steelhead	97%	-----	-----
Subyearling Chinook	89%	95%	97%

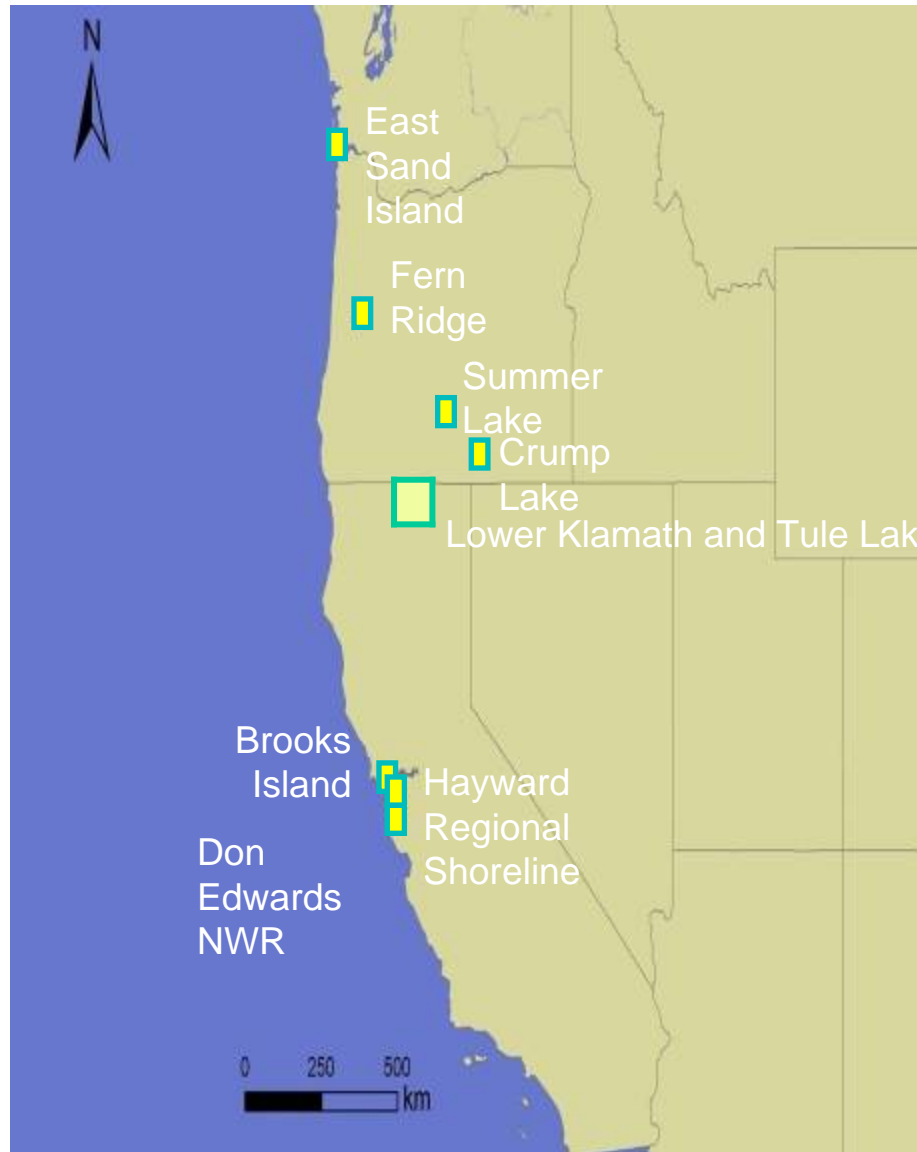


## Bonneville Future Direction

- 2010-11 Performance Check-in
  - 96% Yearling Chinook and Steelhead Dam Survival
  - 93% Subyearling Chinook Dam Survival
- JBS Follow-on Items
  - Gatewell Fish Condition
  - Orifice Rings and Lighting
- BGS Additional Year Study and Potential Mods

## Avian Predation in the Estuary





## Estuary Avian Predation

- Tern EIS
  - Population objective of 3,125 - 4,375 pairs in CR Estuary
  - Ramp habitat acreage down gradually
  - Maintain 1.5 - 2 acres of habitat on ESI
  - Redistribute tern population through nesting habitat (~7 ac) development and social facilitation at 6 locations
  - ROD – would allow for additional locations; Reduce acreage to 1.0 – 1.5 acres at ESI; Pop. obj. of 2,500 – 3,125 pairs



## Estuary Avian Predation

- Fern Ridge – Complete
- Crump Lake – Complete
- Summer Lake:
  - East Link – Complete
  - Dutchy Lake – Complete
  - Gold Dike – Sept 09
- SF Bay
  - Don Edwards Is. (2) – Dec 09
  - Hayward Reg Shoreline – Dec 09
  - Brooks Island – January 10
- N. California
  - Tule Lake NWR – Oct 09
  - Lower Klamath NWR (2) – Oct 11



## Mid-Columbia Avian Predation Results

### Foundation Island Cormorants

- Predation rates increasing in concert with colony size
- Impacts on salmonids comparable to Crescent Island terns
- Species-specific smolt vulnerability more equal; exceptions are SR and MCR steelhead and MCR Chinook







# Mid-Columbia Avian Predation Future Direction

- Finalize Steelhead Vulnerability and Overwintering Cormorant research in 2009-2010.
- Determine if management actions are warranted for inland Caspian terns and cormorants.
- Work with regional parties to develop Mid-Columbia avian predation management plan.
- 2009 Mid-Columbia Avian Predation Workshop, June 10, Tri-Cities, WA.



# Questions?



# Additional Information



## Adult Pacific Lamprey Passage Improvements

### Management Focus in 2008

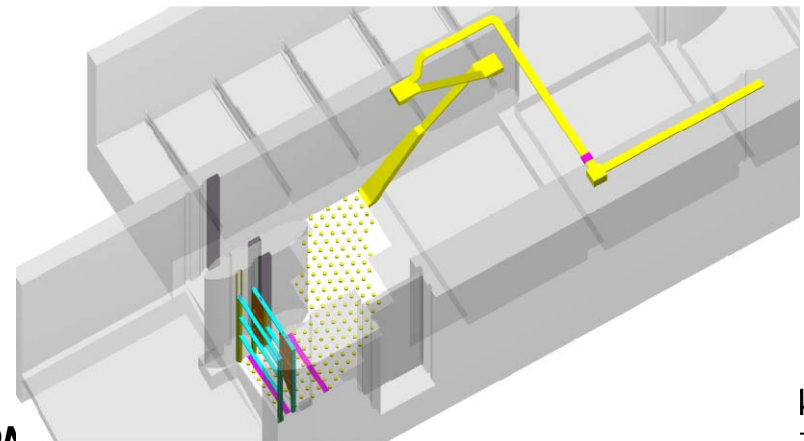
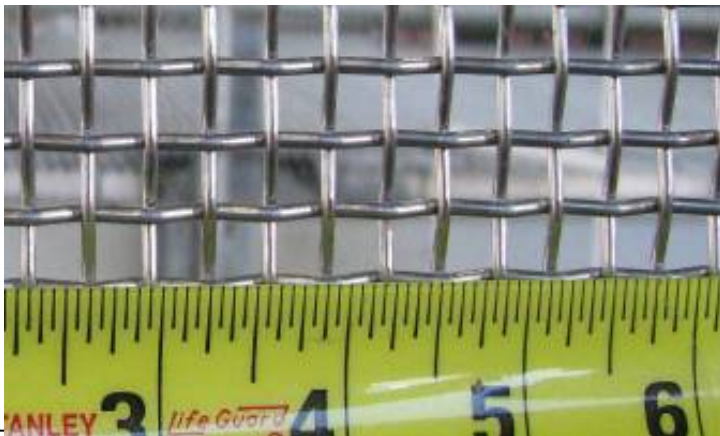
- Action Agency-Tribes Accord
- Corps Pacific Lamprey Passage Improvements Implementation Plan: 2008-2018
- Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin
- USFWS Pacific Lamprey Conservation Initiative



## Lamprey Passage Improvements 2008



- Lamprey passage systems (LPS)
  - B1 AWS
  - WA Shore LPS
  - Designed BON Cascades Island Entrance
  - Designing lamprey passage improvements into JDA North Ladder Improvements
- Nighttime entrance flow reduction test
- Adult lamprey counting
- Juvenile lamprey separation in bypass systems





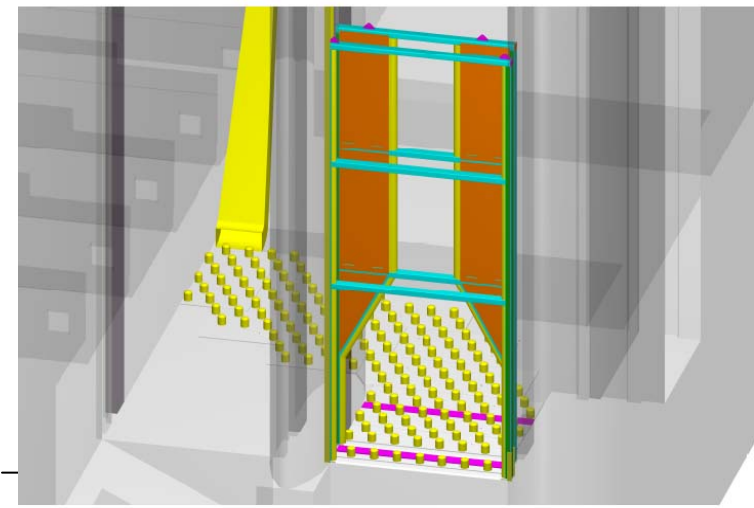
## Lamprey Passage Improvements 2009

### CI Entrance LPS

- New LPS from entrance area to forebay installed and being evaluated as part of entrance area modifications.

### Design Development

- JDA N ladder entrance designs being finalized
- Initiating design work on entrance area mods for BON WA & MCN ladders.





## Estimated salmonid catch by pinnipeds at Bonneville Dam, January 1 – May 31

Year (Jan. 1- May 31)	Salmonid Catch Estimate	Total Salmonid Passage at Bonneville	% of Run Caught by Sea Lions	Adjusted % of Run Caught by Sea Lions
2002	1,010	284,733	0.4%	-
2003	2,329	217,185	1.1%	-
2004	3,533	186,804	1.9%	-
2005	2,920+	82,006	3.4%+	-
2006	3,023	105,063	2.8%	3.1%
2007	3,859	88,474	4.2%	4.7%
<b>2008</b>	<b>4,466</b>	<b>147,543</b>	<b>2.9%</b>	<b>3.2%</b>



## 2008: Pinnipeds Key points

- Record high salmonid catch estimate (4,466; 2.9% of run) in 2008. Higher if unidentified fish are included.
- Steller sea lion predation on sturgeon continues to increase
- Sea lions coming earlier each year, and are staying in BON area longer once they arrive
- Overall number of California sea lions is not increasing, but peak daily abundance is
- Physical barriers effectively block access to fishways
- 3 years of active deterrence efforts failed to reduce predation on salmonids and sturgeon at the dam
- States are implementing actions under Sec. 120 of MMPA