

Evaluating the Responses of Snake River Basin Fall Chinook Salmon to Dam Passage Strategies and Experiences



Natural Subyearlings

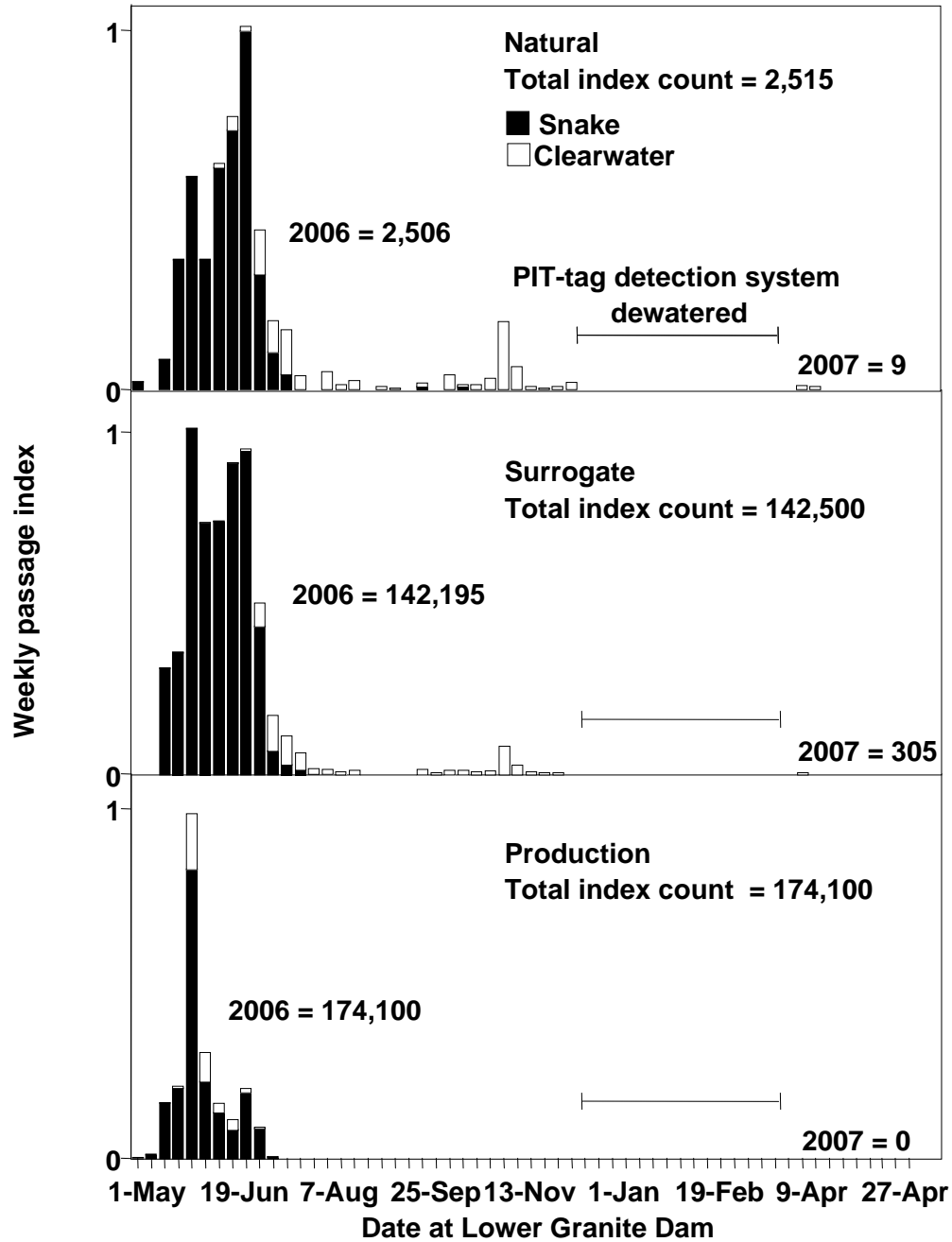
- Produced in the wild and exhibit juvenile life history diversity largely affected by temperature during incubation and early rearing.

Surrogate Subyearlings

- Cultured at hatcheries and released in the wild to provide data for research by approximating the juvenile life history diversity of natural subyearlings.

Production Subyearlings

- Cultured at hatcheries to accelerate juvenile development to provide supplementation releases of large smolts that migrate faster, migrate earlier, and survive at higher rates than natural subyearlings.



Natural Subyearlings

- The annual sample size of PIT-tagged natural subyearlings is too small for precise comparisons of SAR ratios.

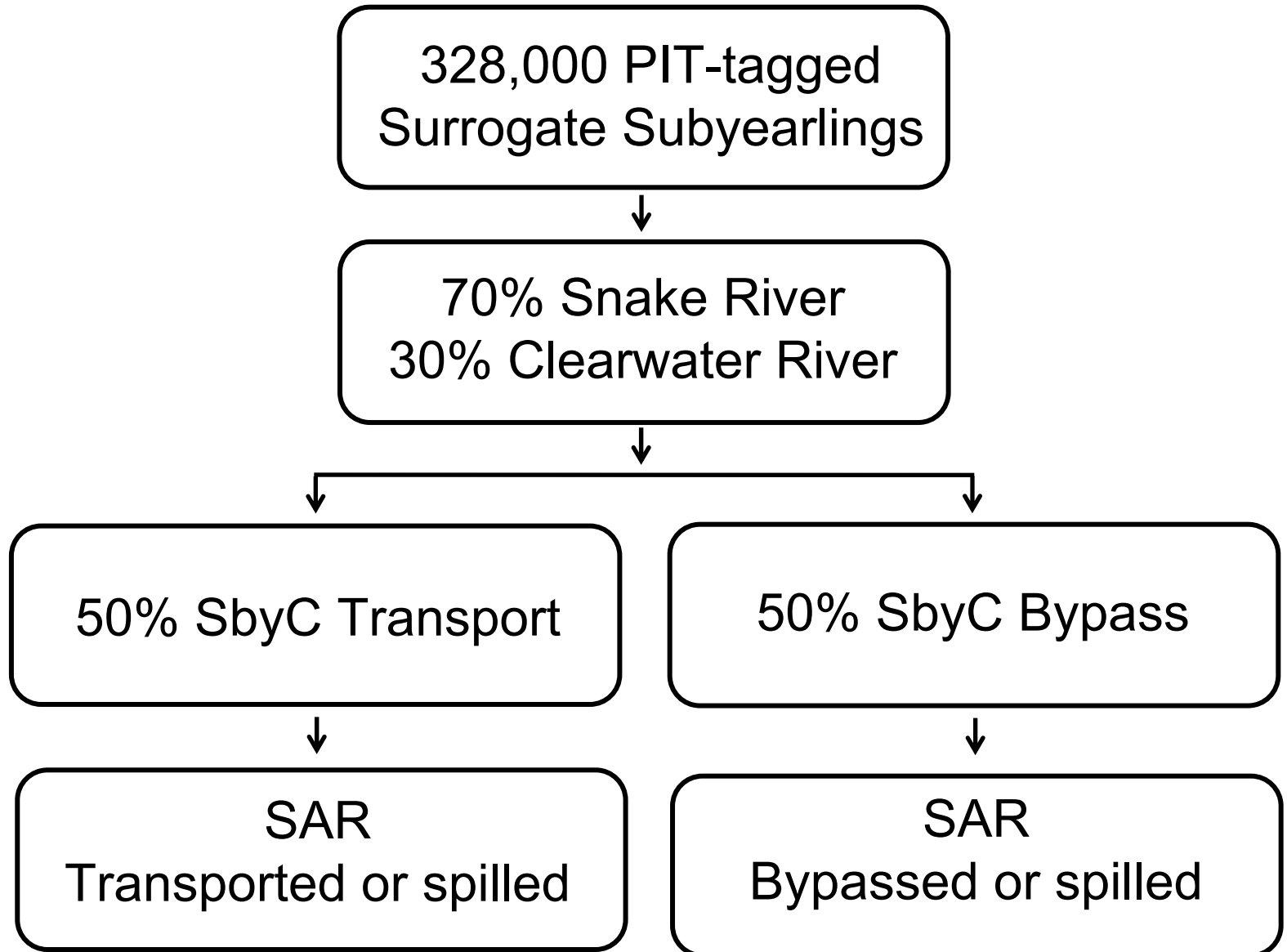
Surrogate Subyearlings

- The juvenile life history diversity of surrogate (and natural) subyearlings can violate assumptions of methods for calculating SARs for T_0 , C_0 , and C_1 groups.

Production Subyearlings

- Cannot be used to make inferences for managing the federal Columbia River power system to increase SARs for the entire Snake River basin population of natural subyearlings.

Passage Strategy Design



Passage Experience Design

250,000 PIT-tagged
Production Subyearlings



Tagged proportionately
among release sites



46% SbyC Transport



54% SbyC Bypass



SAR
T₀ group



SAR
C₀ group



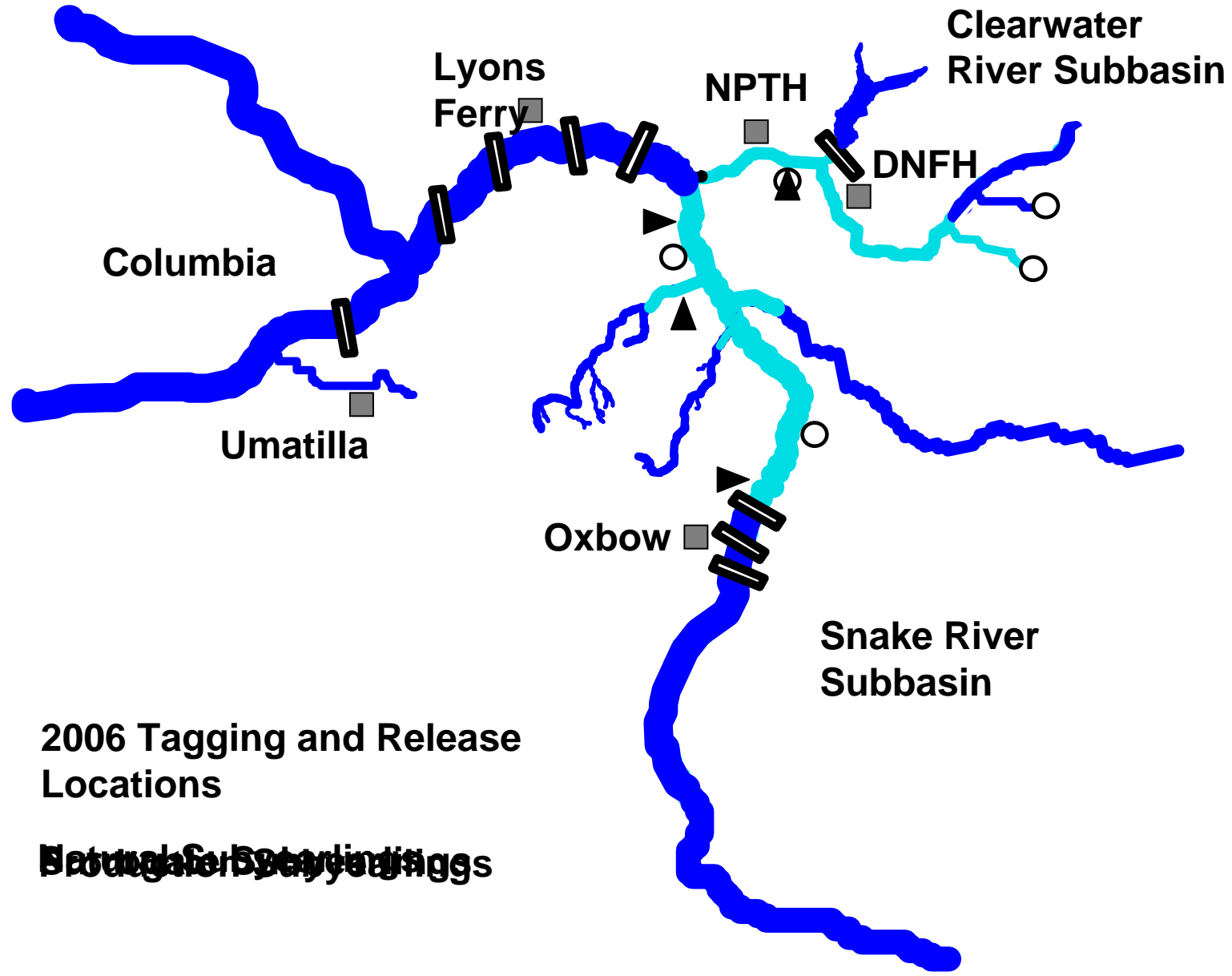
SAR
C₁ group

Post-release Performance of Natural and Hatchery Fall Chinook Salmon Subyearlings Released into the Snake and Clearwater Rivers in 2006



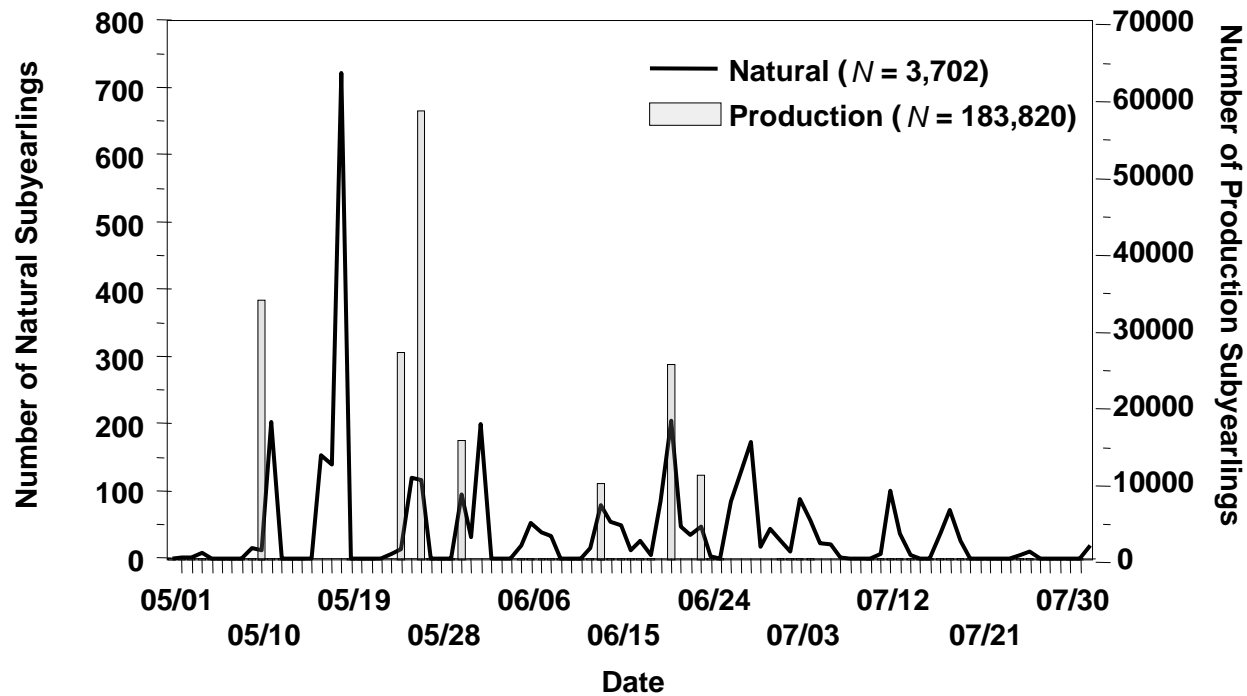
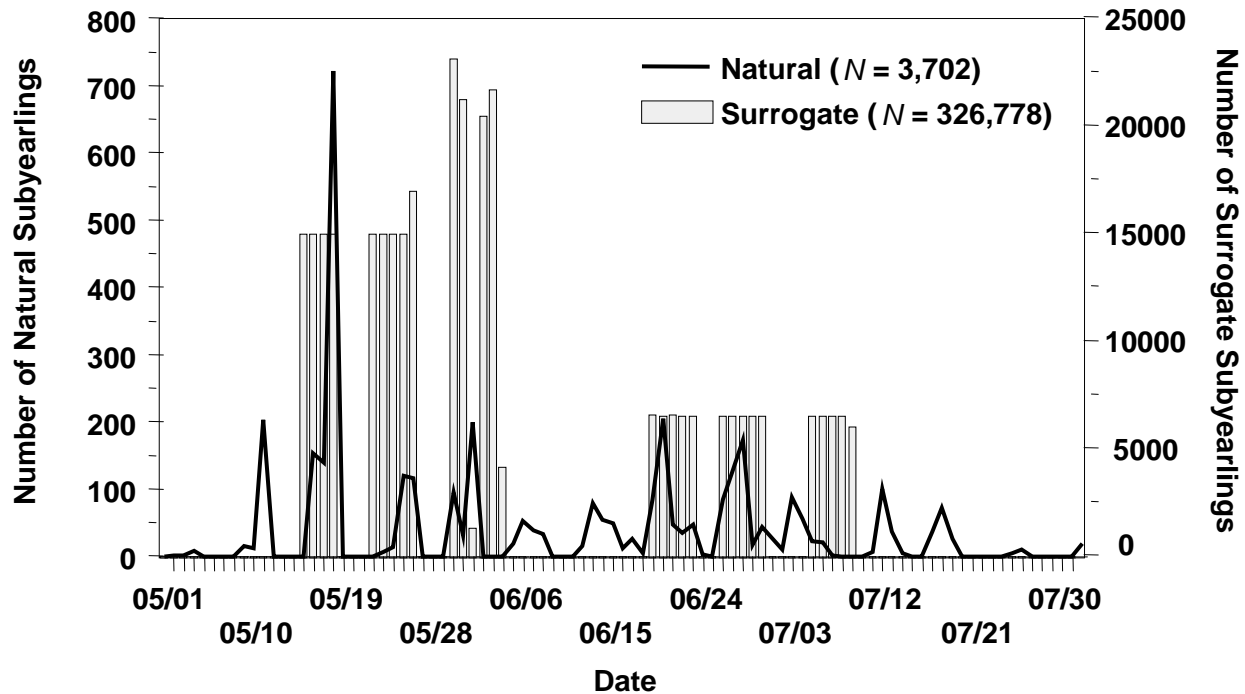
Objectives:

- 1) Describe the PIT tagging and release of natural, surrogate, and production subyearlings in 2006.
- 2) Compare selected post-release attributes between the 2006 releases of natural subyearlings and the two hatchery subyearling groups.



2006 Tagging and Release Locations

Natural Straggling Locations



Mean FL of PIT-tagged Subyearlings in 2006



Natural

Snake 69 ± 8 mm

Clearwater 68 ± 7 mm



Surrogate

Snake 74 ± 7 mm

Clearwater 78 ± 6 mm



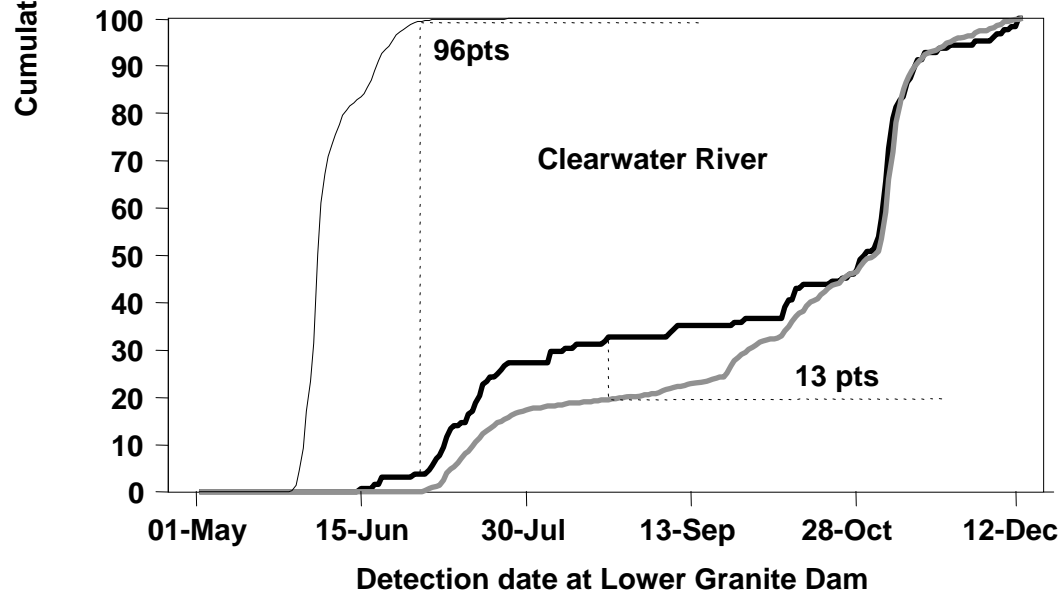
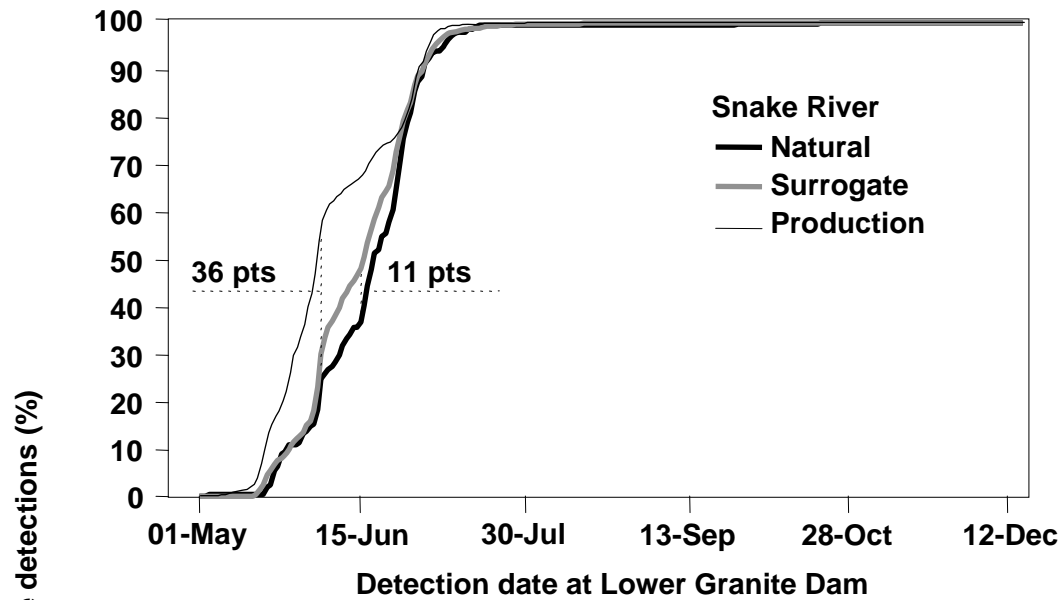
Production

Snake $91 \pm 7 - 102 \pm 6$ mm

Clearwater $92 \pm 7 - 109 \pm 6$ mm

Mean travel time (days \pm SD) to Lower Granite Dam for Snake River subyearlings and median travel time to the dam for Clearwater River subyearlings in 2006.

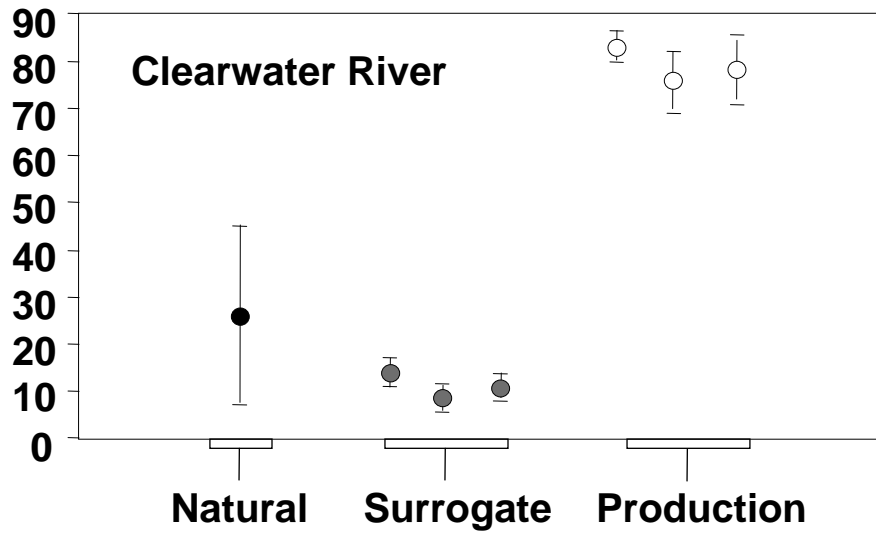
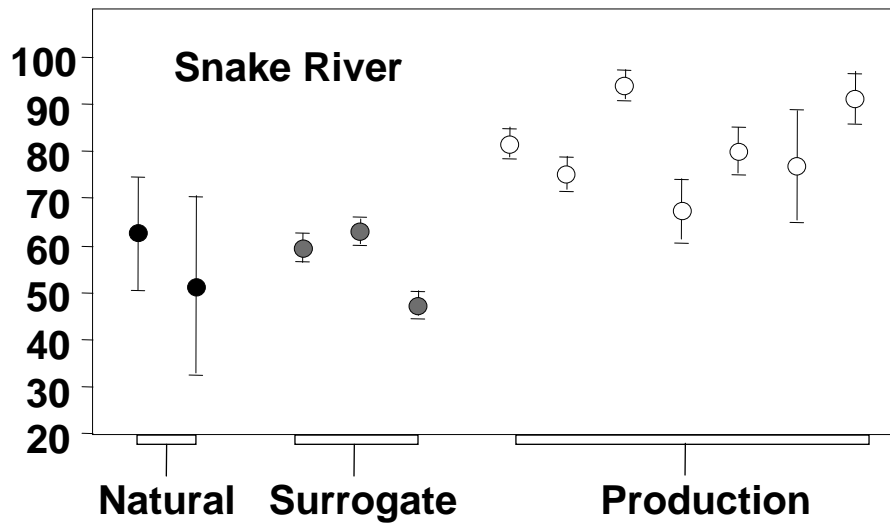
River	Group	<i>N</i>	Travel time
Snake	Natural	201	24 \pm 15
	Surrogate	16,572	22 \pm 14
	Production	6,982	14 \pm 8
Clearwater	Natural	128	113
	Surrogate	5,217	123
	Production	12,389	8



Weighted daily mean flow (KCFS), temperature (°C), and spill volume (KCFS) during detection of subyearlings at Lower Granite Dam in 2006

River	Group	Flow	Temperature	Spill
Snake	Natural	87	16.2	32
	Surrogate	93	15.8	34
	Production	109	14.8	42
Clearwater	Natural	35	13.4	6
	Surrogate	31	13.1	4
	Production	103	14.2	31

Joint probability of migration and survival (%)
From release to the tailrace of Lower Granite Dam



Similarity indices (SI: higher value divided by lower value of the attribute) for each comparison between 2006 releases of PIT-tagged Snake River natural and the two groups of hatchery subyearlings.

Attribute	Attribute values			Attribute values		
	Natural Surrogates		SI	Natural Production		SI
Lower Granite Dam						
Cumulative detection	36.8	48.2	1.3	18.4	54.0	2.9
Peak monthly detection	71.1	71.8	1.0	71.1	48.7	1.5
Summer spill detection	47.8	41.1	1.2	47.8	27.4	1.7
Travel time	24	22	1.1	24	14	1.7
2006 detection	100.0	100.0	1.0	100.0	100.0	1.0
Migrant size	94	91	1.0	94	103	1.1
Migration/survival	See Table A1		1.1	See Table A1		1.4
Little Goose Dam						
Cumulative detection	35.4	45.4	1.3	12.3	69.6	5.7
Peak monthly detection	56.3	63.0	1.1	56.3	35.9	1.6
Summer spill detection	73.9	65.8	1.1	73.9	23.9	3.1
Travel time	33	31	1.1	33	18	1.8
2006 detection	100.0	100.0	1.0	100.0	100.0	1.0
Lower Monumental Dam						
Cumulative detection	11.7	6.0	1.9	14.9	85.2	5.7
Peak monthly detection	60.6	64.5	1.1	60.6	36.3	1.7
Summer spill detection	47.9	48.9	1.0	47.9	7.8	6.1
Travel time	34	31	1.1	34	21	1.6
2006 detection	100.0	100.0	1.0	100.0	100.0	1.0
Overall mean			1.1			2.4
Overall median			1.1			1.7

Similarity indices (SI; higher value divided by lower value of the attribute) for each comparison between 2006 releases of PIT-tagged Clearwater River natural and the two groups of hatchery subyearlings.

Attribute	Attribute values		SI	Attribute values		SI
	Natural	Surrogates		Natural	Production	
	Lower Granite Dam					
Cumulative detection	32.8	19.6	1.7	3.9	99.6	25.5
Peak monthly detection	23.4	17.3	1.4	23.4	0.8	30.9
Summer spill detections	31.3	20.2	1.5	31.3	8.9	3.5
Travel time	113	123	1.1	113	8	14.1
2006 detections	98.5	98.8	1.0	98.5	100.0	1.0
Migration/survival	See Table A2		2.6	See Table A2		2.9
Overall mean			1.6			13.0
Overall median			1.5			8.8

In Closing:

- Releases of PIT-tagged surrogate subyearlings were made in 2005 (partial), 2006, and 2008. Surrogates were not released in 2007 because surrogates are a low priority in the production plan for Snake River basin hatchery fall Chinook salmon. Surrogate releases will likely be made in 2009 because escapement was high in 2008.
- We recommend releasing PIT-tagged surrogate subyearlings for the next few years to evaluate the response of natural subyearlings to dam passage strategies.
- We recommend releasing PIT-tagged production subyearlings for the next few years to evaluate the response of production subyearlings to dam passage experiences and to evaluate supplementation.