

Trade-offs Associated with Implementation of Hatchery Reform Recommendations for the Wenatchee Summer Steelhead Program

Catherine Willard, Chelan County Public Utility District





A Three-Pronged Approach to Reaching No-Net Impact



**7% Hatchery
Production**



**91% Combined
Adult/Juvenile Survival
93% Juvenile Survival**



**2% Tributary
Projects**

Rocky Reach and Rock Island Conservation Plan Hatchery Committees



Washington Department of
FISH and **WILDLIFE**



Permit Requirements and Hatchery Scientific Review Group (HSRG) Recommendations

**NATIONAL MARINE FISHERIES SERVICE
SECTION 10(a)(1)(A) PERMIT FOR TAKE OF
ENDANGERED/THREATENED SPECIES**

Permit Number: 18583

Permit Type: Scientific Research/Enhancement

Program Name: Operation, monitoring, and evaluation of the Wenatchee River summer steelhead hatchery program

Expiration Date: December 31, 2027

Joint Permit Holders:

Washington Department of Fish and Wildlife
600 Capitol Way N
Olympia, WA 98501-1091

Public Utility District No. 1 of
Chelan County
327 N. Wenatchee Ave.
Wenatchee, WA 98801

Authorized Agent

Yakama Nation, Fisheries Resource Management
P.O. Box 151
Toppenish, WA 98948

Contact:

Jim Unsworth, Director
Phone: (360) 902-2200
Fax: (360) 902-2947

Alene Underwood, Fish and Wildlife Manager
District Services
Phone: (509) 661-4364
Fax: (509) 661-8108

Contact

Steve Parker, Technical Services Coordinator
Phone: (509) 865-6262
Fax: (509) 865-6293

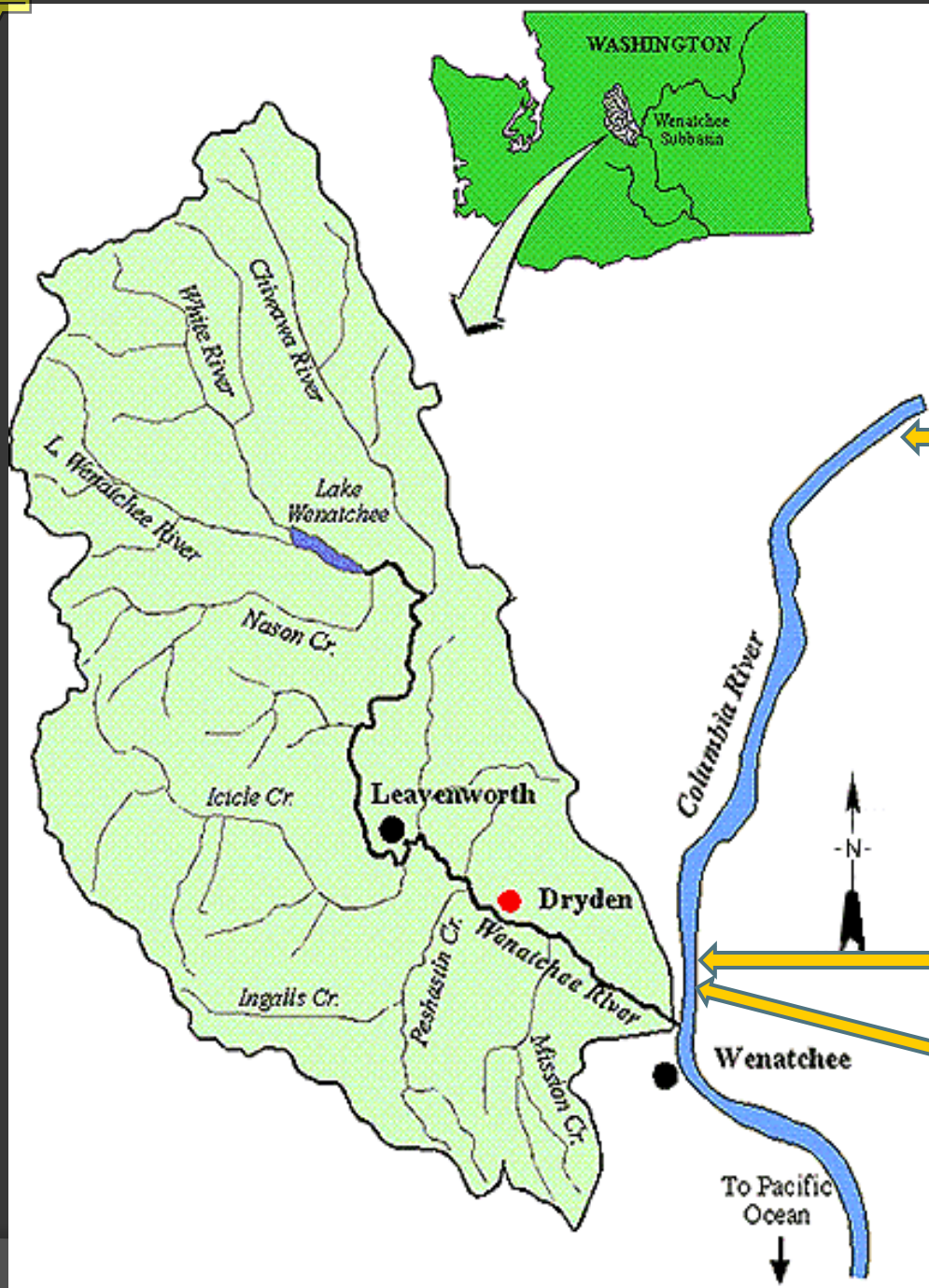
Hatchery Scientific Review Group Review and Recommendations

Wenatchee Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



Wenatchee Summer Steelhead



Wells Dam and Trap

Turtle Rock Island Acclimation Facility

Eastbank Fish Hatchery

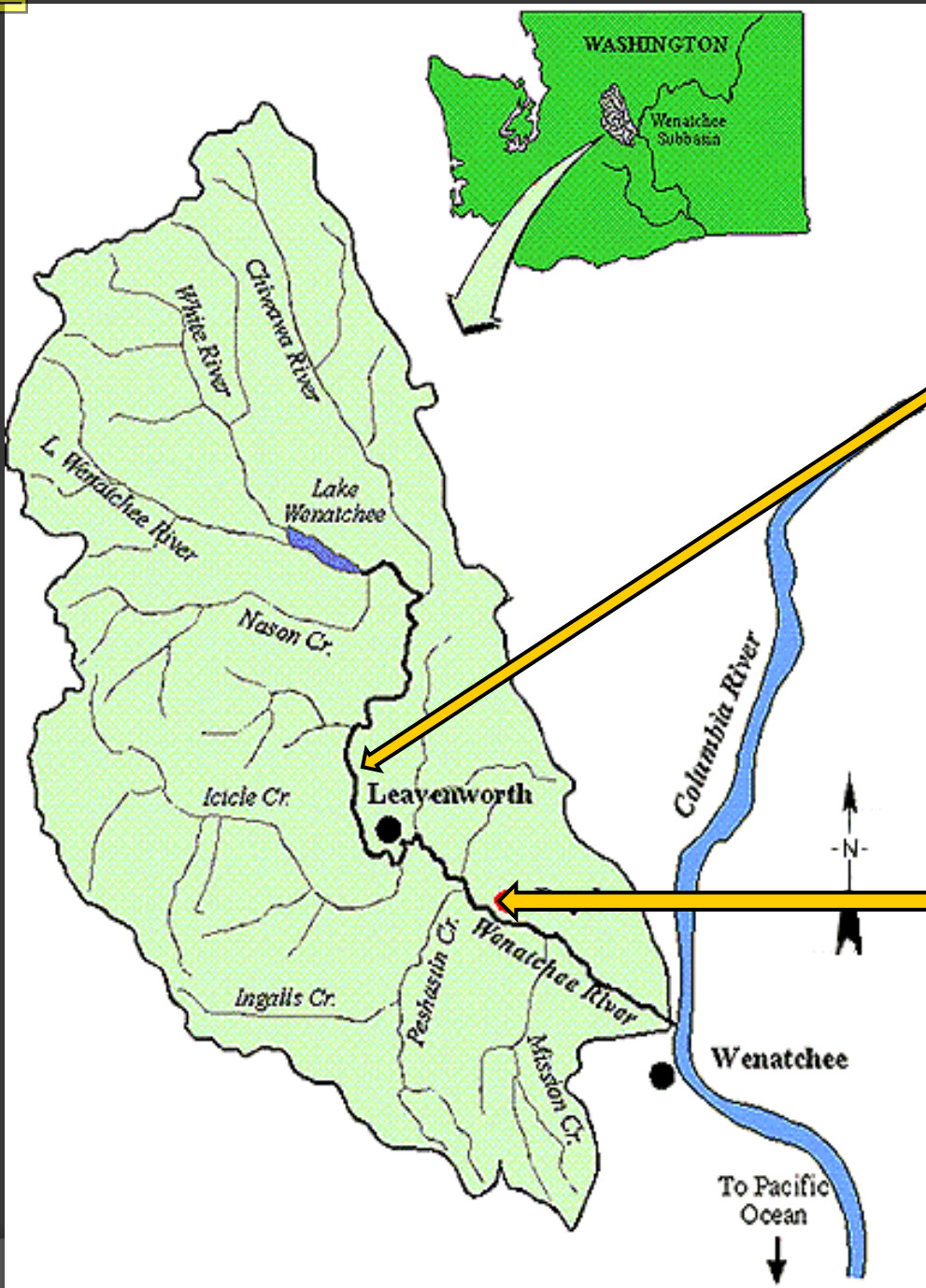


Hatchery Program Goal

“Support the recovery of ESA-listed species by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity.”

Wenatchee summer steelhead

Localized Broodstock Collection



Tumwater Dam and Trap



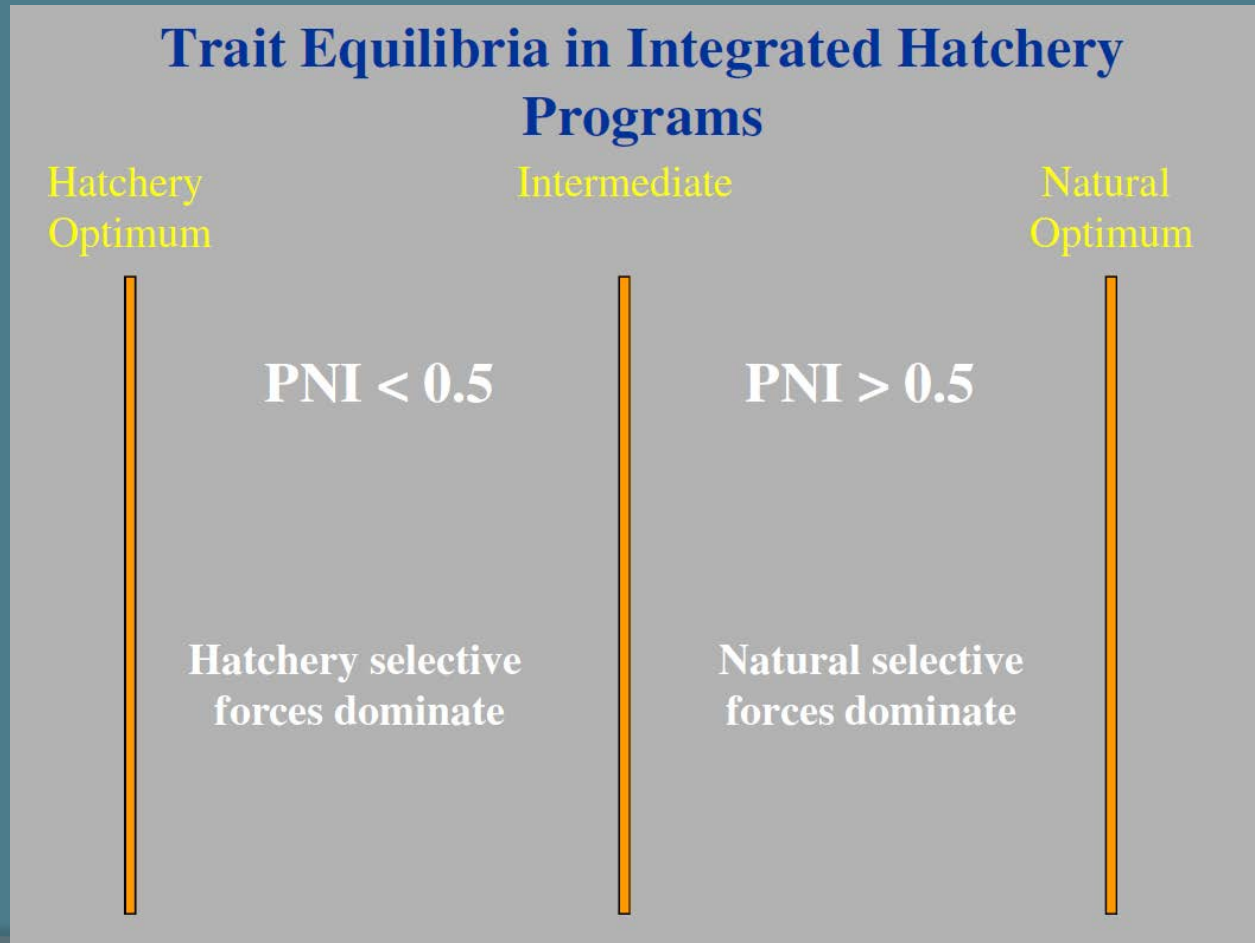
Dryden Dam and Trap





Maximize Proportionate Natural Influence (PNI)

- PNI=running five year average ≥ 0.67
(NMFS Section 10(a)(1)(A), 2017)





Maximize Proportionate Natural Influence (PNI)

- Maximizing proportionate natural influence (PNI) of integrated hatchery programs

$$PNI_{Approx} = \frac{pNOB}{pNOB + pHOS}$$

pNOB = mean proportion of a hatchery broodstock composed of natural-origin adults

pHOS = mean proportion of hatchery-origin spawners in a watershed or stream composed of natural-origin adults

Proportionate Natural Influence (PNI)

- Harvest
- Adult Management



Proportionate Natural Influence (PNI)

Brood year	Spawners			Broodstock			PNIb	PNI (5-yr mean)
	NOS	HOS	pHOS	NOB	HOB	pNOB		
2001	158	127	0.45	51	103	0.33	0.45	--
2002	731	542	0.43	96	64	0.6	0.59	--
2003	355	350	0.5	49	90	0.35	0.43	--
2004	371	445	0.55	75	61	0.55	0.51	--
2005	690	862	0.56	87	104	0.46	0.47	0.49
2006	253	210	0.45	93	69	0.57	0.57	0.51
2007	145	115	0.44	76	58	0.57	0.58	0.51
2008	168	279	0.62	77	54	0.59	0.5	0.53
2009	171	545	0.76	86	73	0.54	0.43	0.51
2010	524	970	0.65	96	75	0.56	0.48	0.51
2011	351	472	0.57	91	70	0.57	0.51	0.5
2012	381	209	0.35	59	65	0.48	0.59	0.5
2013	322	148	0.31	49	68	0.42	0.59	0.52
2014	476	363	0.46	64	68	0.48	0.54	0.54
2015	639	484	0.43	58	52	0.53	0.57	0.56
2016	280	324	0.54	66	66	0.50	0.50	0.56
<i>Average</i>	<i>376</i>	<i>403</i>	<i>0.52</i>	<i>73</i>	<i>71</i>	<i>0.51</i>	<i>0.52</i>	<i>0.52</i>
<i>Median</i>	<i>353</i>	<i>357</i>	<i>0.46</i>	<i>76</i>	<i>68</i>	<i>0.54</i>	<i>0.51</i>	<i>0.51</i>

2010 to 2016 between 218 to 1,236 steelhead surplusd at Tumwater.

Maximize Proportionate Natural Influence (PNI)

Trait Equilibria in Integrated Hatchery Programs

Hatchery
Optimum

Intermediate

Natural
Optimum

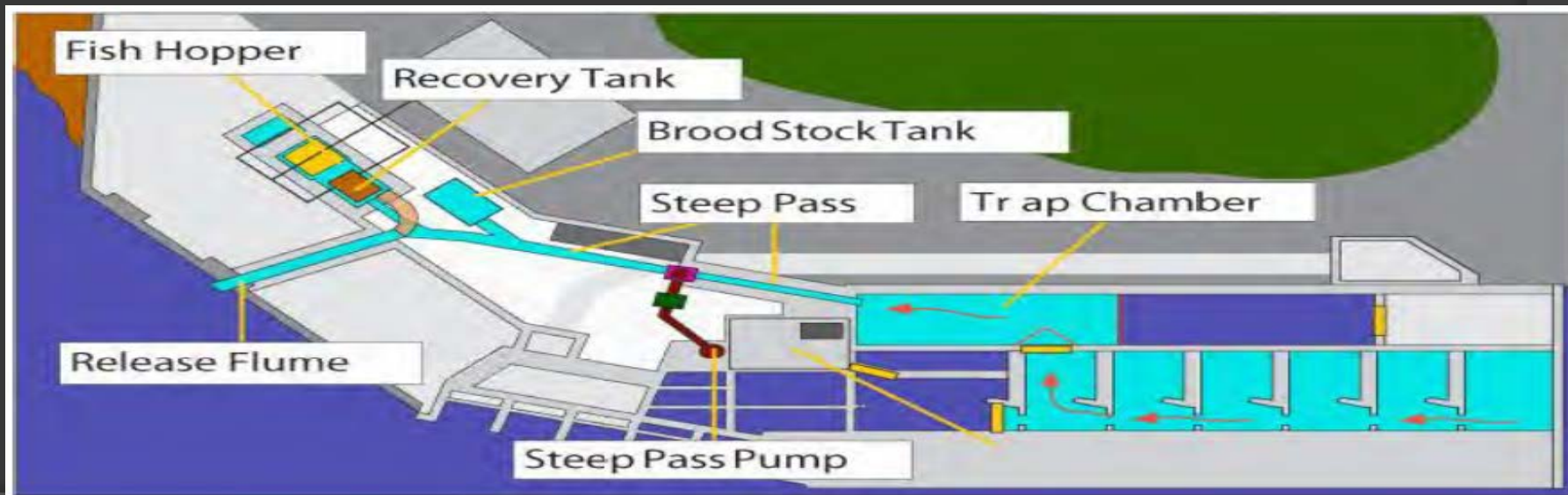
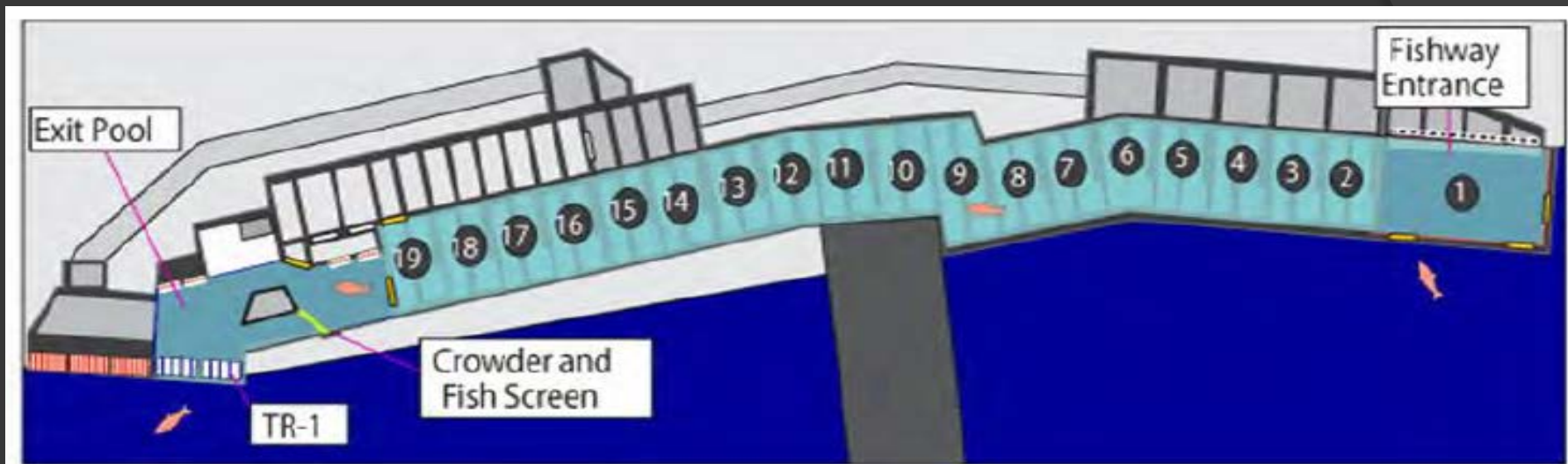
$PNI < 0.5$

$PNI > 0.5$

Hatchery selective
forces dominate

Natural selective
forces dominate







Trade-offs



Center for Biological Diversity

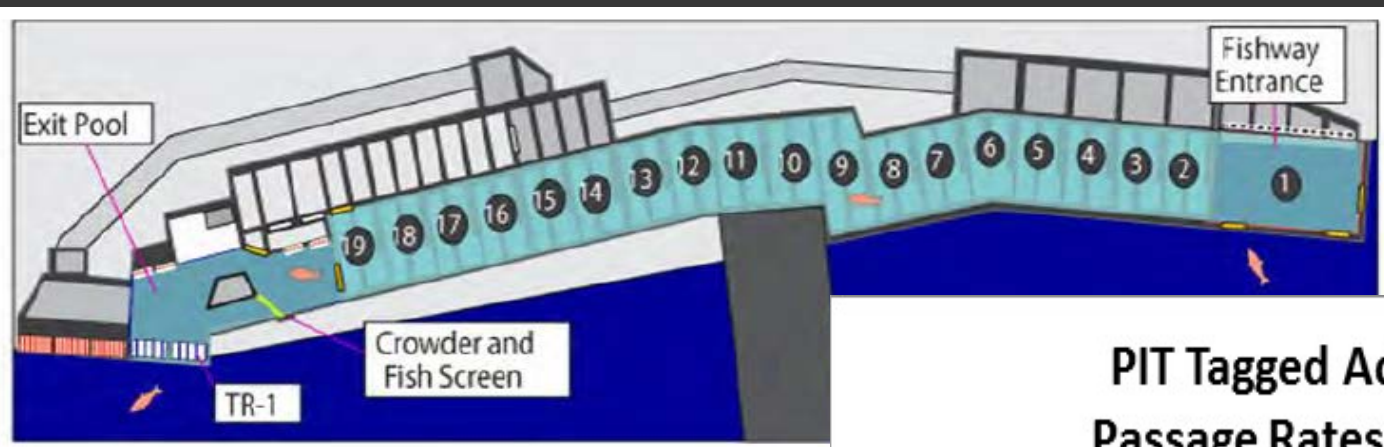


Trade-offs

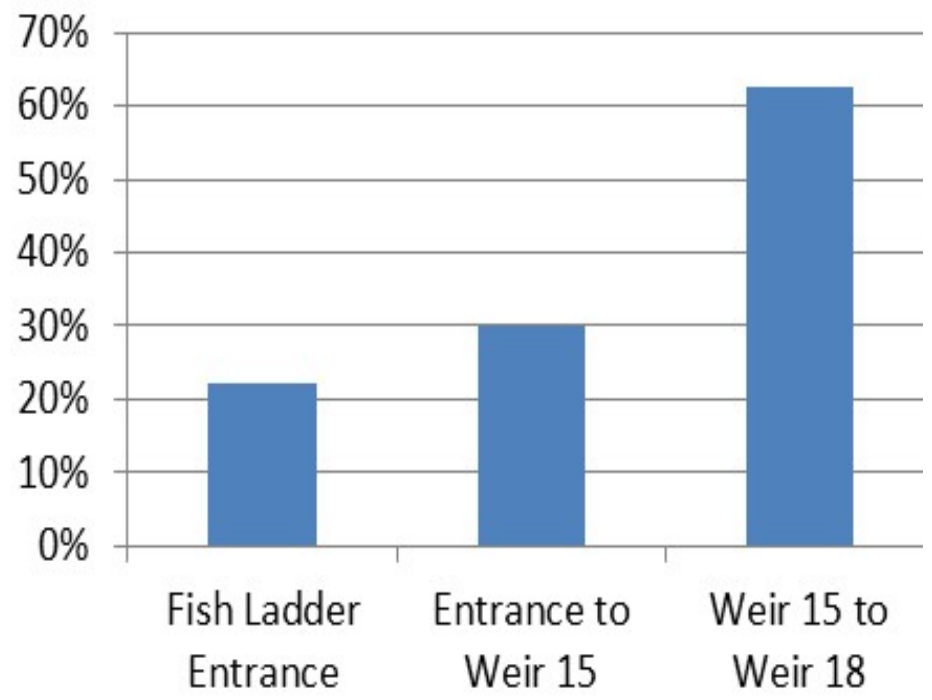
Subbasin	Lower Yakima				Upper Naches	Lower Yakima	Upper Methow	Lower Methow	Upper Wenatchee	Lower Wenatchee	Total
	Satus	Toppenish	Ahtanum	Yakima	Naches	Yakima	Methow	Methow	Wenatchee	Wenatchee	
2011-2012	15	-	-	-	-	-	-	-	-	-	15
2012-2013	46	45	46	-	-	-	-	-	-	-	137
2013-2014	92	78	85	4	-	-	-	-	-	-	259
2014-2015	209	219	201	39	-	102	-	-	-	-	770
2015-2016	117	128	130	72	-	-	249	-	110	100	906
2016-2017	30	30	29	324	-	-	140	30	122	187	892
Total	509	500	491	439	0	102	389	30	232	287	2979

R. Lampman (UCSRB Salmon Conference 2018)

Trade-offs



**PIT Tagged Adult Pacific Lamprey
Passage Rates thru Tumwater Dam**



Trade-offs

Columbia Basin Research

Columbia River DART

Status & Trends

Inseason Forecasts

Tools & Models

Publications

Search

Tumwater	2017-12-21												
Tumwater	2017-12-22												
Tumwater	2017-12-23												
Tumwater	2017-12-24												
Tumwater	2017-12-25												
Tumwater	2017-12-26												
Tumwater	2017-12-27												
Tumwater	2017-12-28												
Tumwater	2017-12-29												
Tumwater	2017-12-30												
Tumwater	2017-12-31												
Project	Date	Chinook Run	Chinook	Jack Chinook	Steelhead	Wild Steelhead	Sockeye	Coho	Jack Coho	Shad	Lamprey	Bull Trout	TempC
Tumwater	Total		5301	473	503	188	23854	201	0	0	10	82	

Tumwater

13042



8/10/2017

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81173



Straying

Rates of straying by hatchery-produced Pacific salmon (*Oncorhynchus* spp.) and steelhead (*Oncorhynchus mykiss*) differ among species, life history types, and populations

Peter A.H. Westley,^{ab} Thomas P. Quinn,^a Andrew H. Dittman^b
^aSchool of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, 98195, USA.

NOAA Tech Memo NMFS NWFSC-30:
Genetic Effects of Straying of Non-Native Hatchery Fish into Natural Populations

STRAYING OF HATCHERY FISH AND FITNESS OF NATURAL POPULATIONS

Bill Bakke

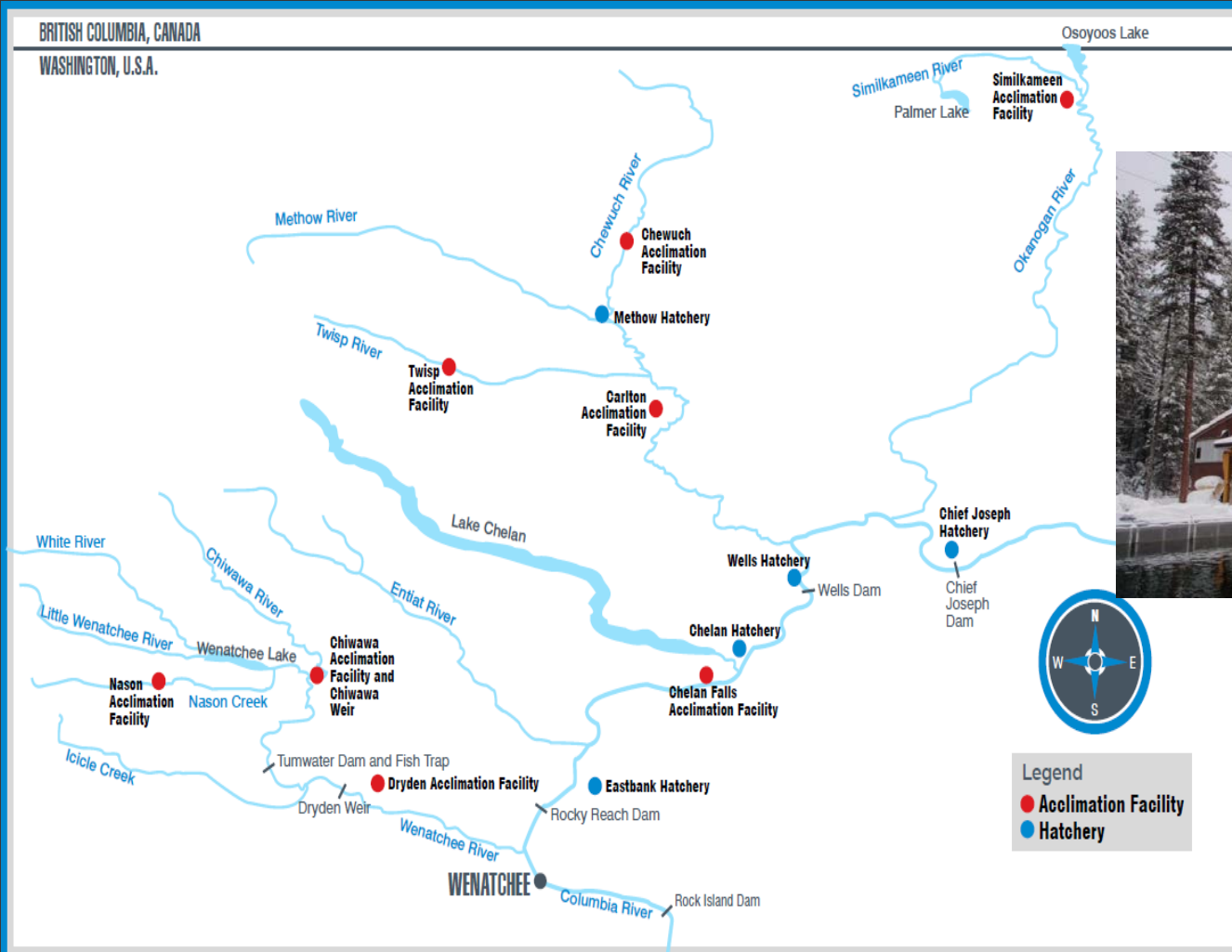
Washington Trout and Native Fish Society
P.O. Box 19570
Portland, OR 97280, USA

Straying of hatchery salmon in Prince William Sound, Alaska

Richard E. Brenner • Steve D. Moffitt •
William S. Grant

○ Straying

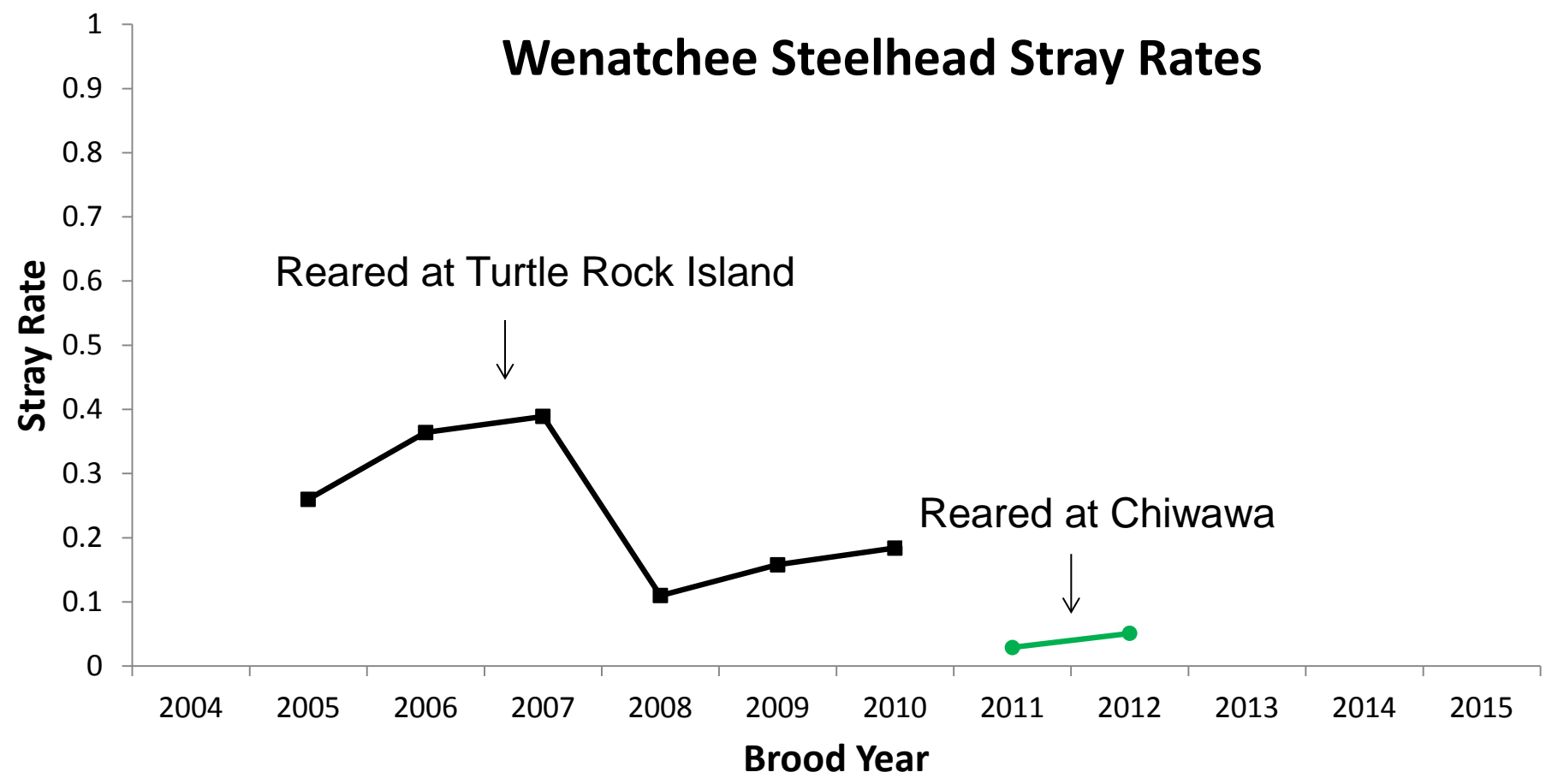
➤ Acclimation facilities





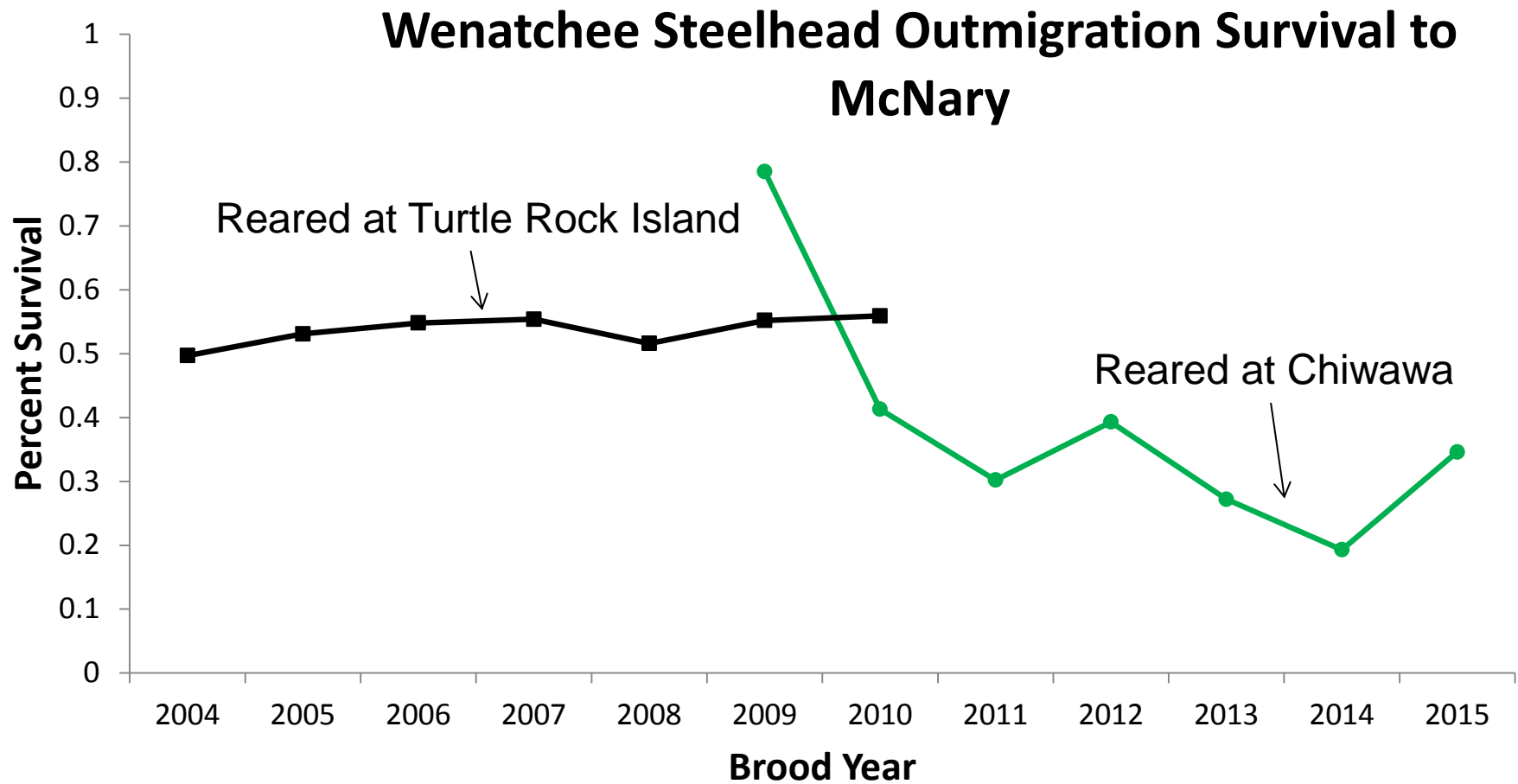
Straying

Wenatchee Steelhead Stray Rates





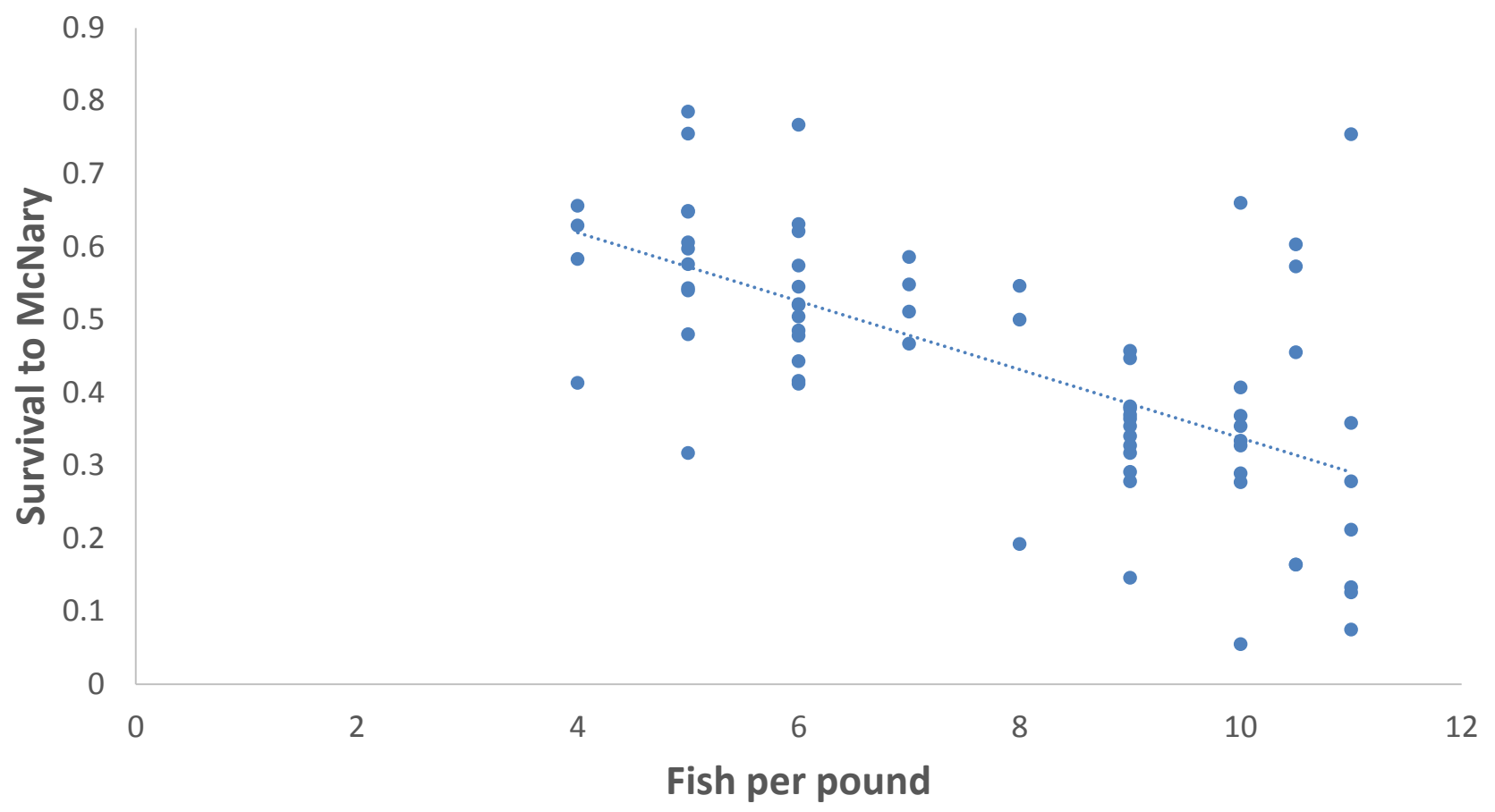
Trade-offs





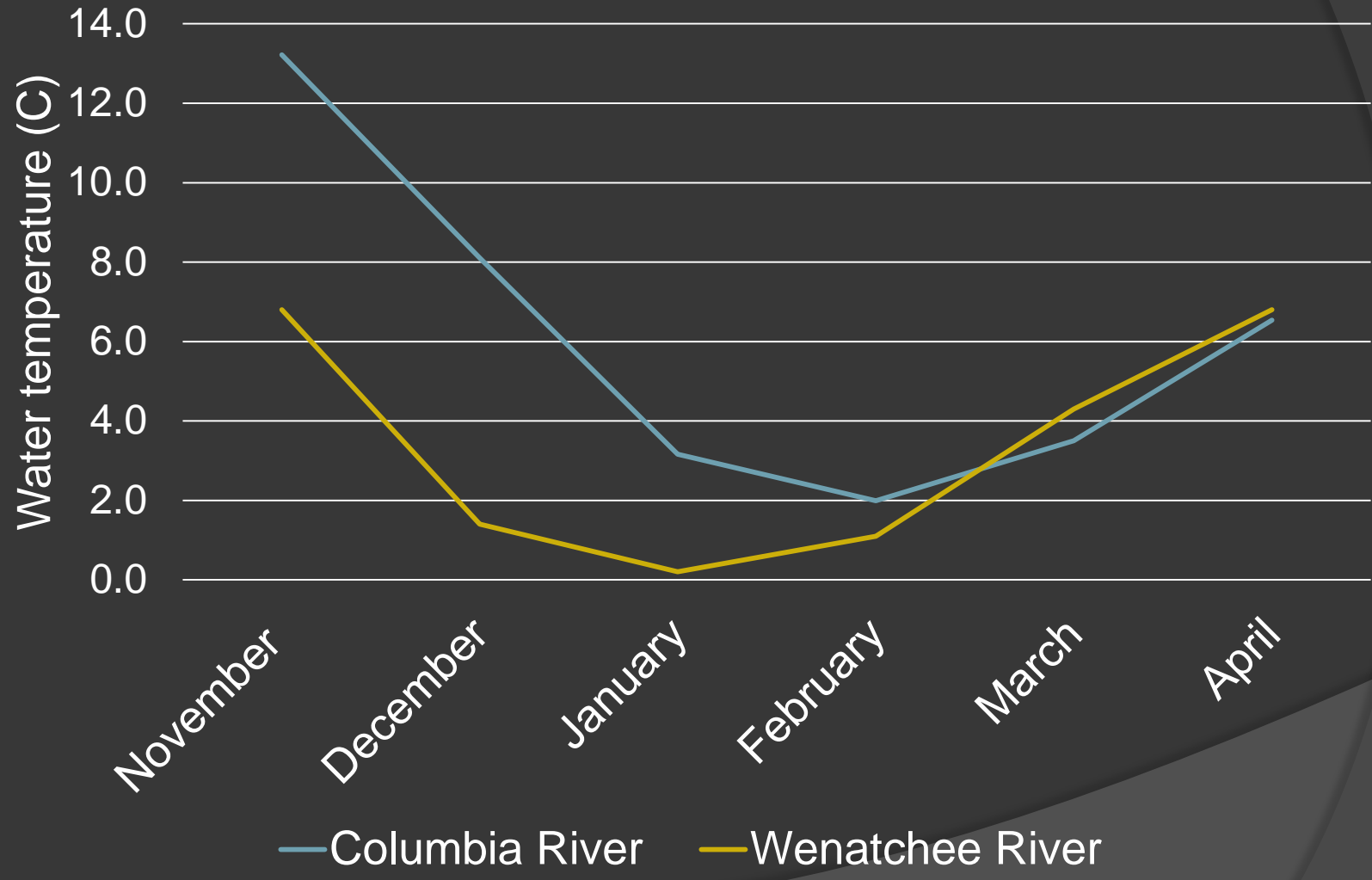
Trade-offs

Size at Release for Wenatchee Steelhead and Juvenile Outmigration Survival



Trade-offs

Mean Water Temperature During Acclimation



Trade-offs

Residualism

- “Minimize residualism rates for hatchery releases and maximize the rate and probability of downstream migration.

(NMFS Section 10(a)(1)(A) (2017))



Photo: M. Humling, USFWS

Trade-offs

◎ Residualism

- “If the hatchery program is found to exceed the agreed upon performance standard, additional minimization measures (e.g., not releasing “non-migrants” into anadromous waters) may be implemented to further limit the occurrence of residual hatchery steelhead in the natural environment.”

(NMFS Section 10(a)(1)(A), 2017)



Photo: M. Humling, USFWS



Questions?

