Killer Whales,
Salmon,
Taxes
&
The Lower Snake River Dams

The Connections,
The Visions,
And the Means to the Visions

Rev: Jan 2018

Start with the Ends in Mind……..The Visions

A *Truly* Abundant and Resilient Salish Sea for Generations…..
For "All Our Relations"

Jim Waddell, Jim Fetter & EPA Region 10

The Means With the Best and Very, Very Likely the Only Chance of Achieving the Visions…….

If we Act in a matter of months, ***NOT years***

Image Curtesy Army Corps of Engineers , from the 2002 EIS…..So they did study it!!

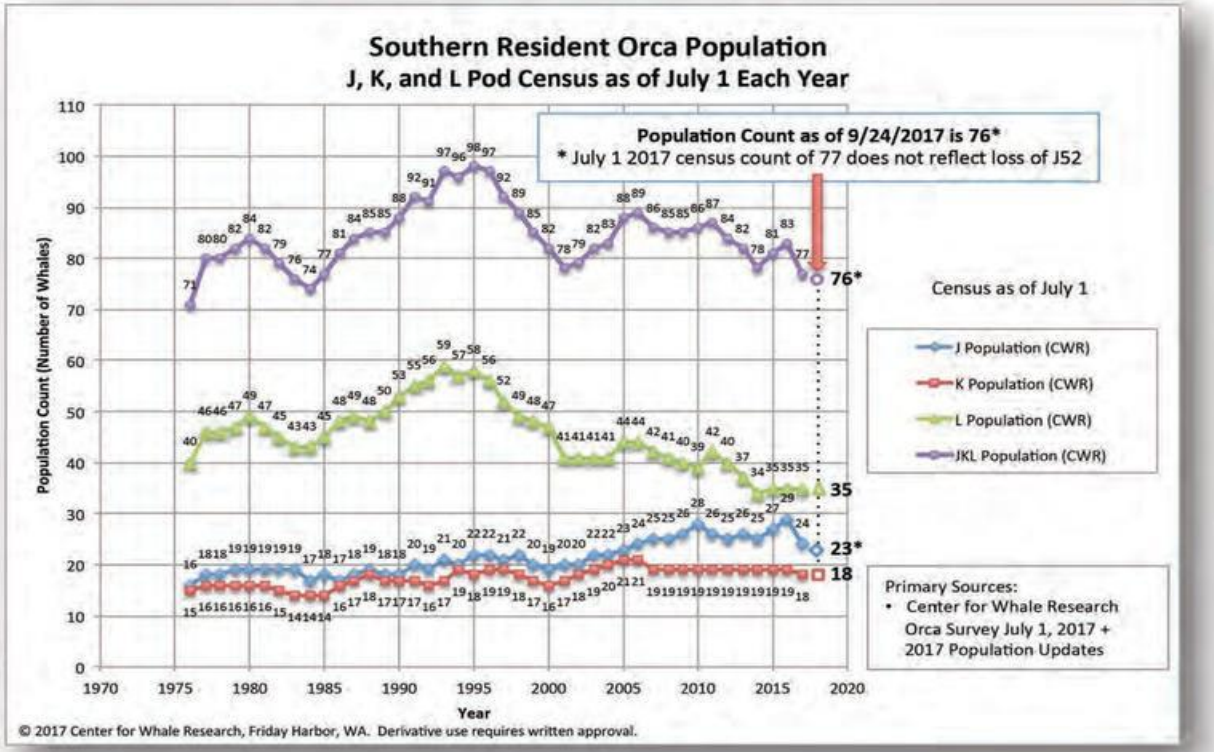
Southern Resident Killer Whales (SRKW) At Risk of Extinction

- Decrease in chinook, 80% of Diet
- About 50% come from Columbia Snake Rivers
- Increase in mortality
- J, K & L pods need ~1500 salmon a day
- Currently 76 whales
- Effective Breeding population is around 30, 5-6 more losses and recovery is unlikely

2017 SRKW Census – July 1

With Post-July Updates

- This is the population chart prepared by CWR each year for NOAA, DFO, and the general public.
- L pod has been driving the overall decline until recently.
- J pod has recently experienced many losses.
- The net changes in the total population are not as meaningful as the details (next slide).



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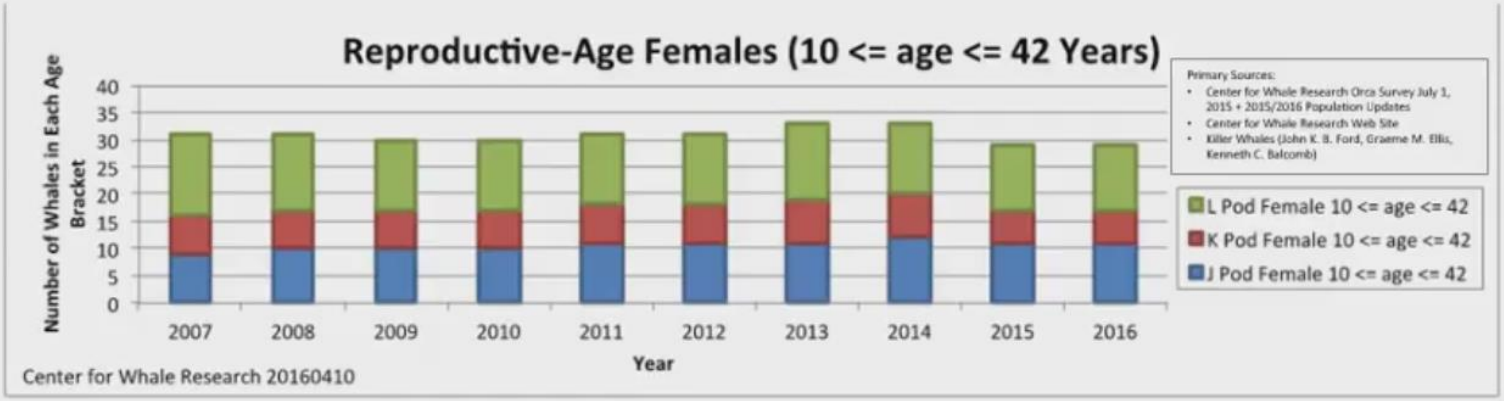
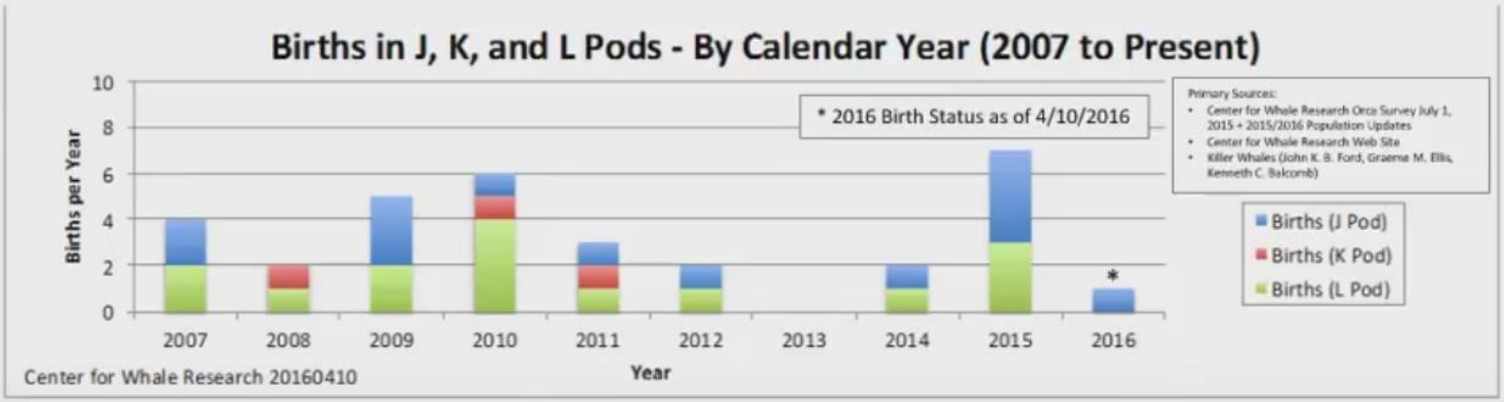
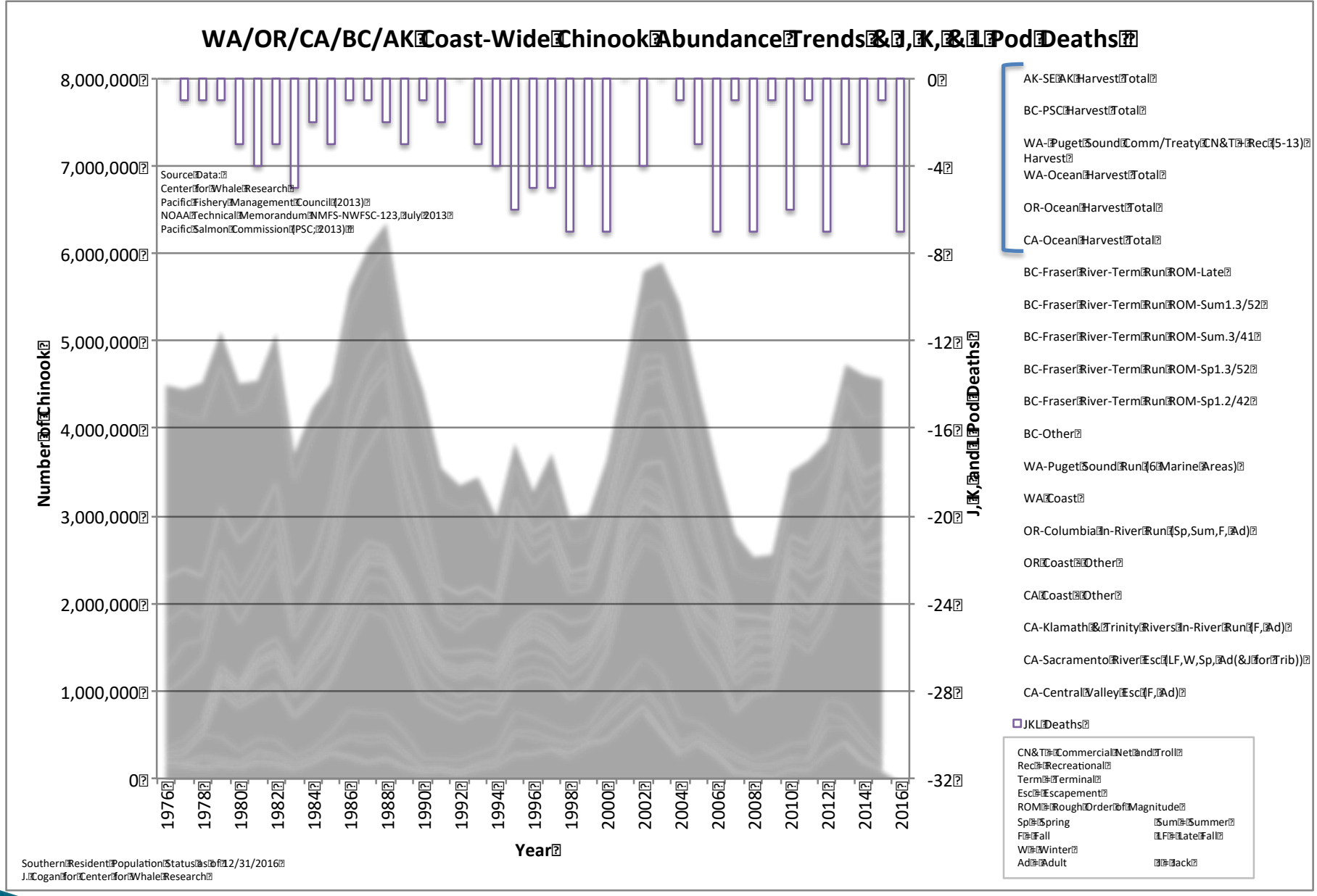
Southern Resident Population Data

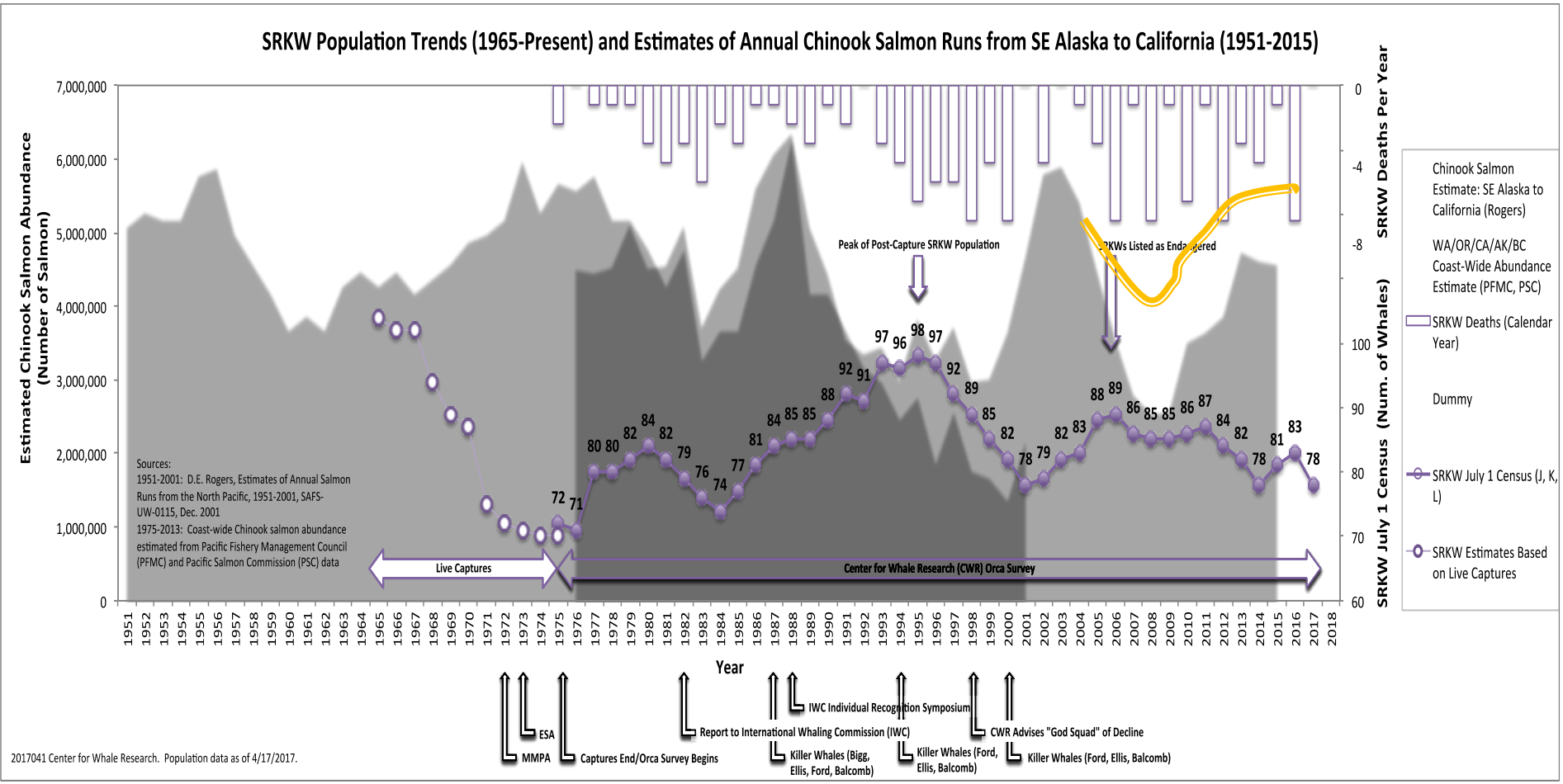
Center for Whale Research (2007 to Present)



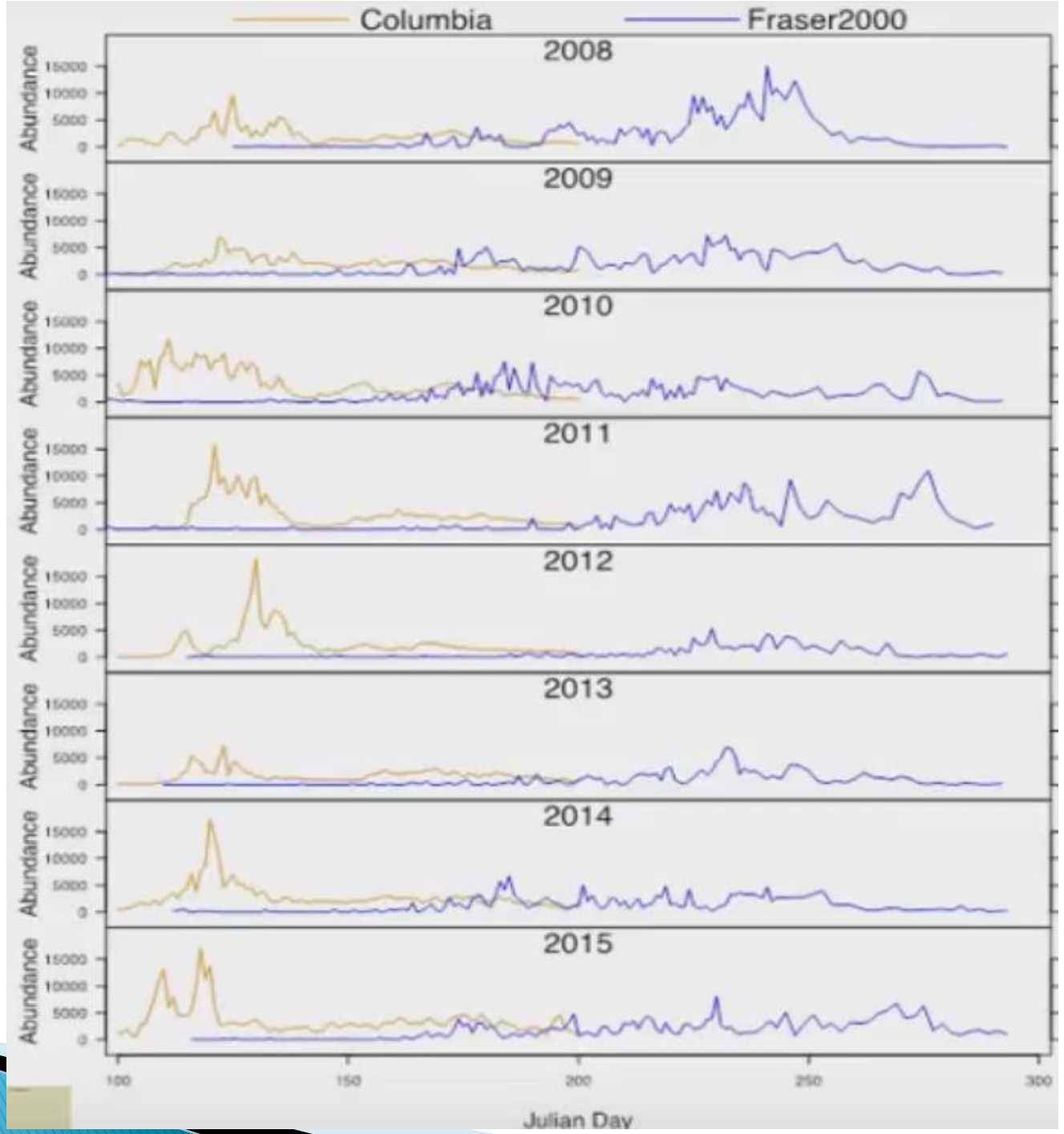




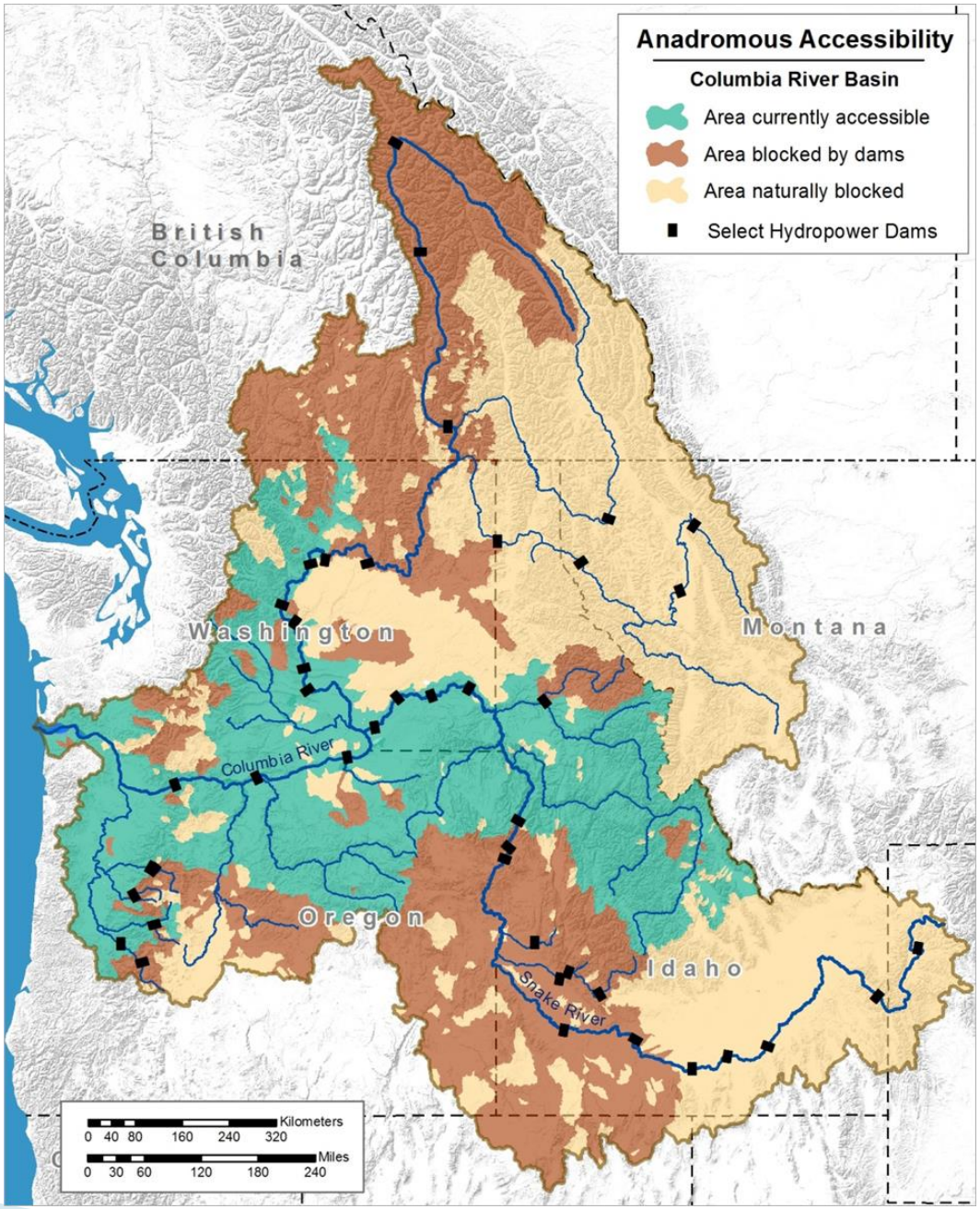
2016 SRKW Population Update
& 2016 Whale Sighting Data
Center for Whale Research & J. Cogan

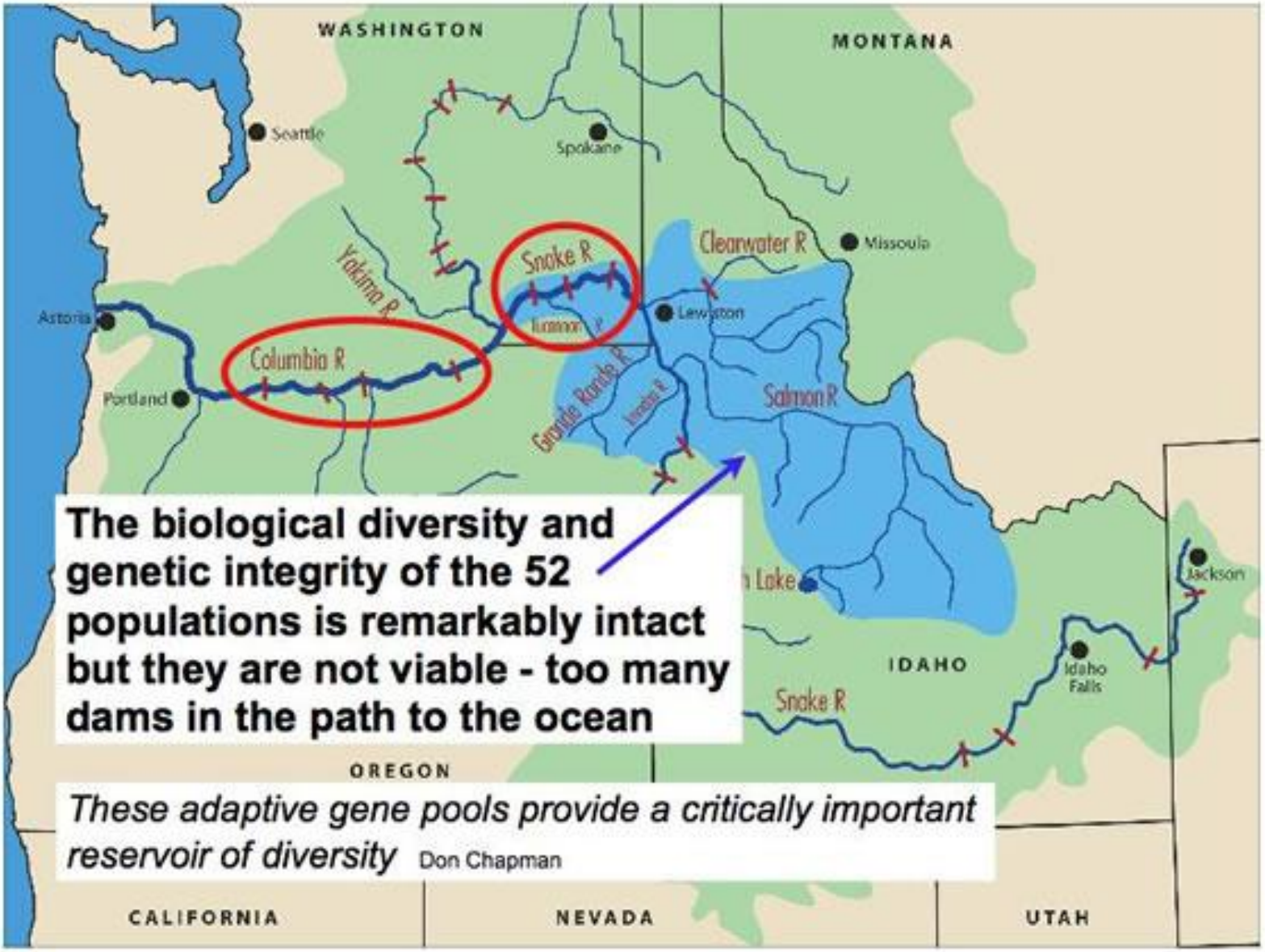


Yellow Line is estimate of additional chinook along Washington cost if the four Lower Snake Dams had been breached in the 2002 time frame. Projections are Based on Smolt to Adult Ratio in the 2002 EIS.


Columbia
Fraser2000
2008
2009
2010
2011
2012
2013
2014
2015
Abundance
15000
10000
5000
0
100
150
200
250
300
Julian Day

SRKW feeding on spring Columbia River Chinook


Anadromous Accessibility
Columbia River Basin
Area currently accessible
Area blocked by dams
Area naturally blocked
Select Hydropower Dams
British Columbia
Washington
Montana
Columbia River
Oregon
Idaho
Snake River
Kilometers
0 40 80 160 240 320
Miles
0 30 60 120 180 240


WASHINGTON
MONTANA
Seattle
Spokane
Missoula
Clearwater R
Snake R
Yakima R
Astoria
Lewiston
Columbia R
Portland
Grande Ronde R
Salmon R
Jackson
IDAHO
Idaho Falls
Snake R
OREGON
CALIFORNIA
NEVADA
UTAH
The biological diversity and genetic integrity of the 52 populations is remarkably intact but they are not viable - too many dams in the path to the ocean
These adaptive gene pools provide a critically important reservoir of diversity Don Chapman

39–

Tuesday

Showers today but sun's making a comeback B10

Grab the Money Tree

Great discounts on local dining and services B4

PENINSULA DAILY NEWS

SOUND PUBLISHING INC | Port Angeles-Sequim-West End | March 15, 2016 | 75¢

Closing salmon fisheries eyed

Officials mull options as coho forecasts fall short

and commercial ocean fisheries for chinook and coho.

"In many instances returns will likely be far below minimum levels needed to produce the next generation of salmon," said Lor-

fisheries off the Washington coast:

Alternative 1: 58,600 chinook and 37,800 coho. This option includes early season fisheries, from June 18-30, for hatchery chinook in Washington's ocean

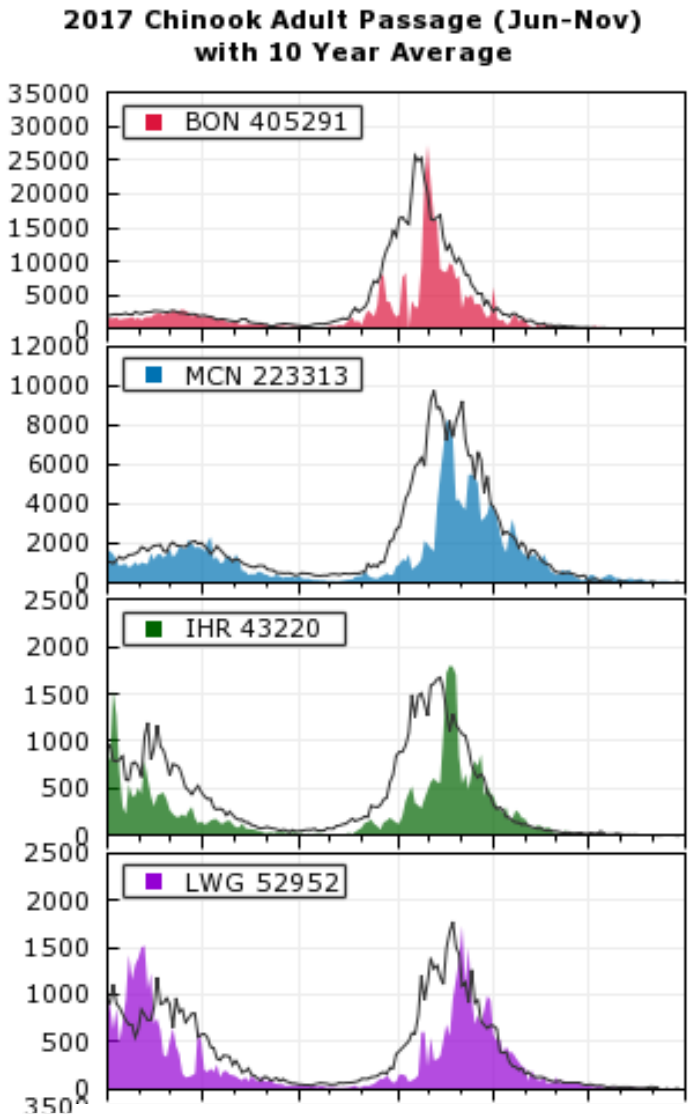
Marine Area 1 (Ilwaco).

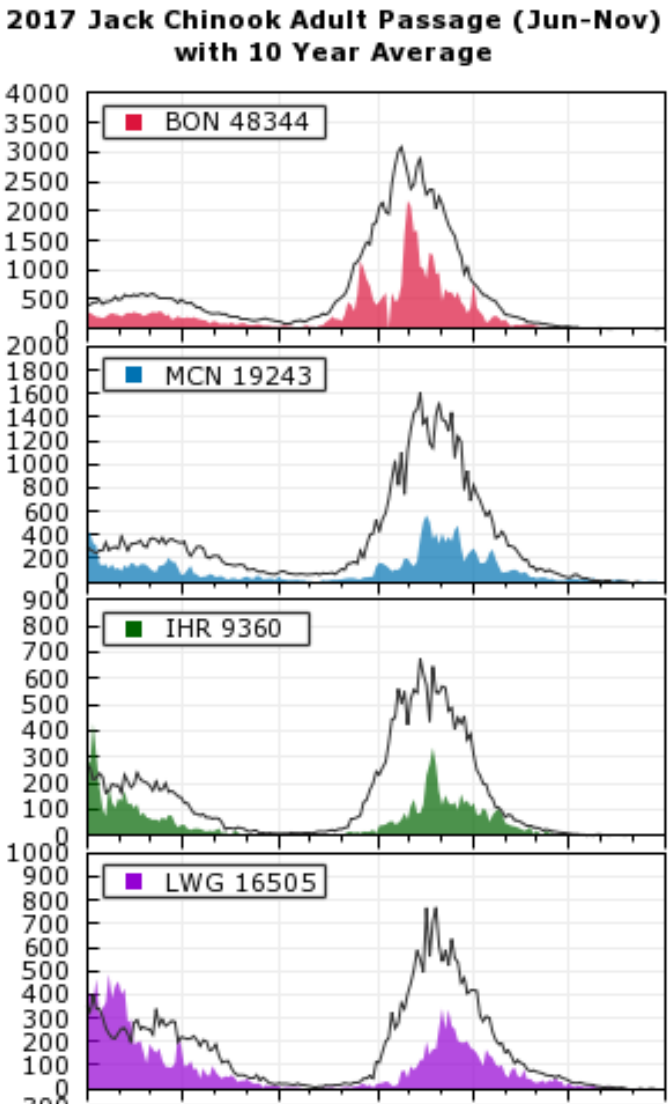
Alternative 3: No commercial or recreational salmon fisheries in Washington's ocean waters.

For more details about the options, visit the PFMC webpage

- Runs < 3% of historic mean of 10-16 million salmon & up to 30M in Columbia/Snake
- $1 billion & 16 years failed dam passage improvements since 2002 EIS signed. $1.5B since 1988
- Billions more in habitat wasted/sub optimized

What Is the Current Situation with Returns? Biologist tell me it is a “disaster”

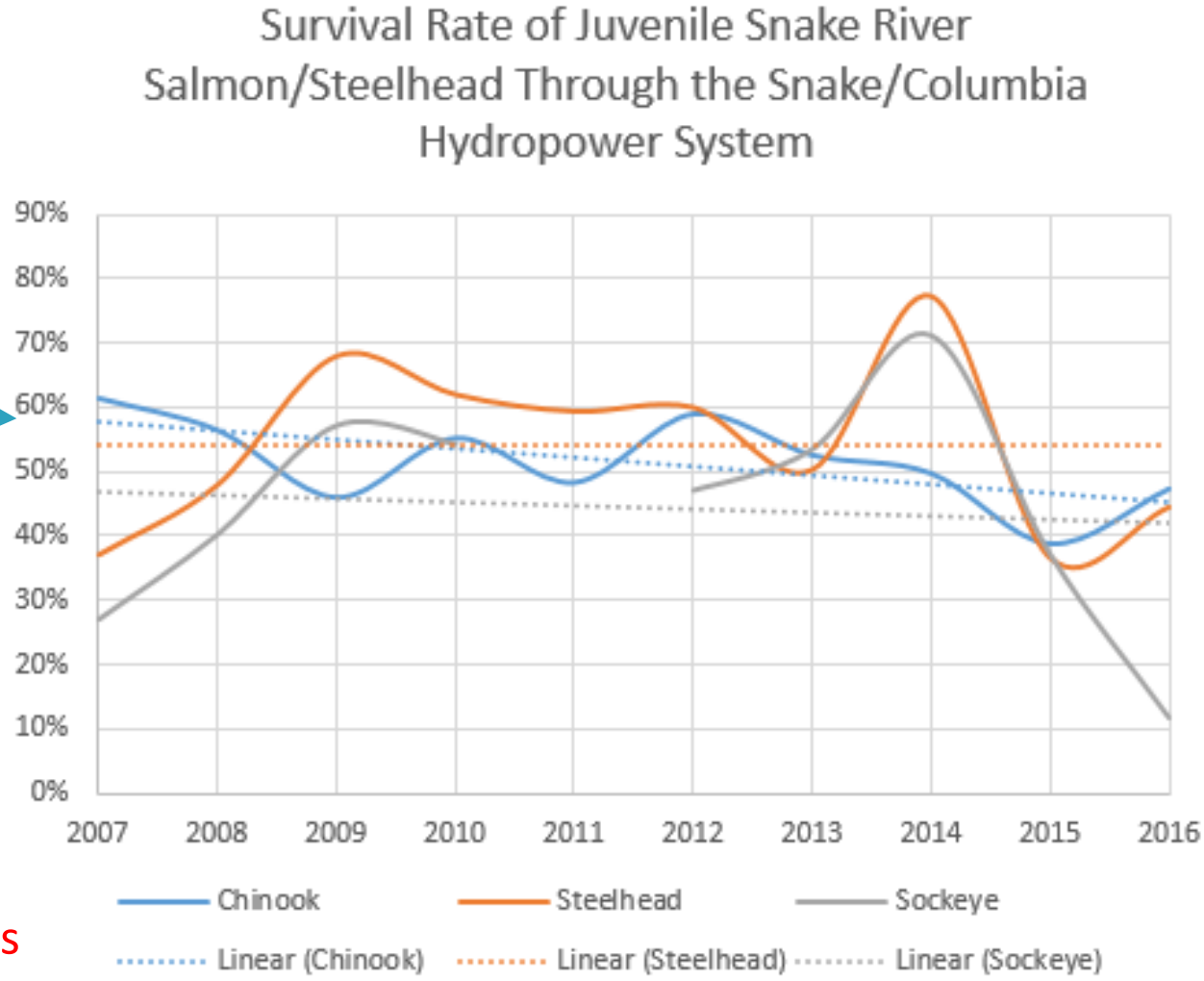




Hence, the Urgency ……. more so than each previous year

Source: Columbia Basin Research

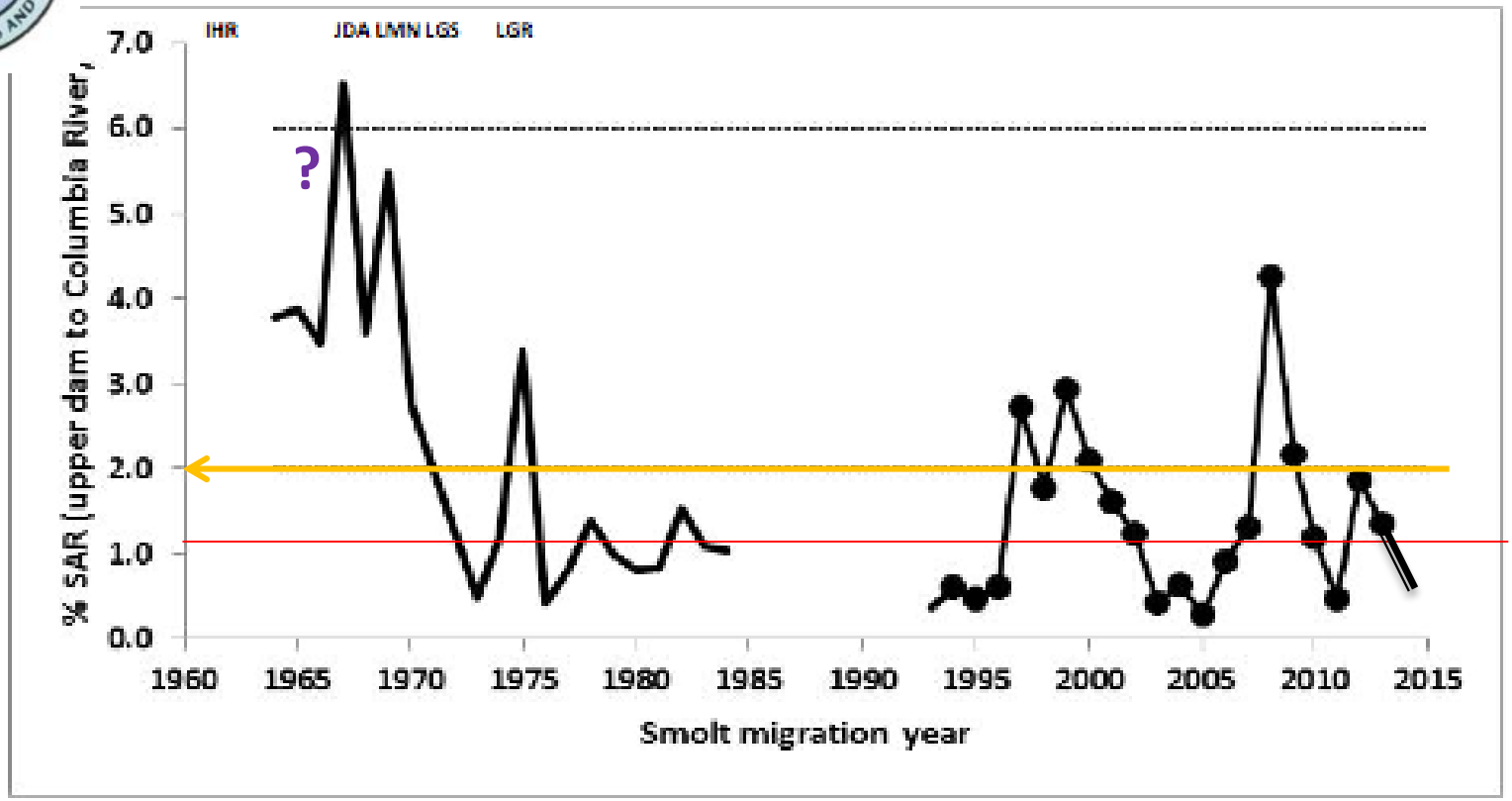
Note the Blue Dotted Line



A Drop of 10%
In 10 Years,
Even After $2Billion
In Passage Upgrades

Fish Passage Center

Wild Salmon Survival



"Figure 4.1. SARs from smolts at uppermost Snake River dam to Columbia River returns (including jacks) for wild Snake River spring/summer Chinook, 1964-2013. … The NPCC (2014) 2%-6% objective for listed wild populations is shown for reference; SAR for 2013 is complete through 2-salt returns only."

Reference: Fish Passage Center 2015 CSS Annual Report

Hatchery Fish Survival

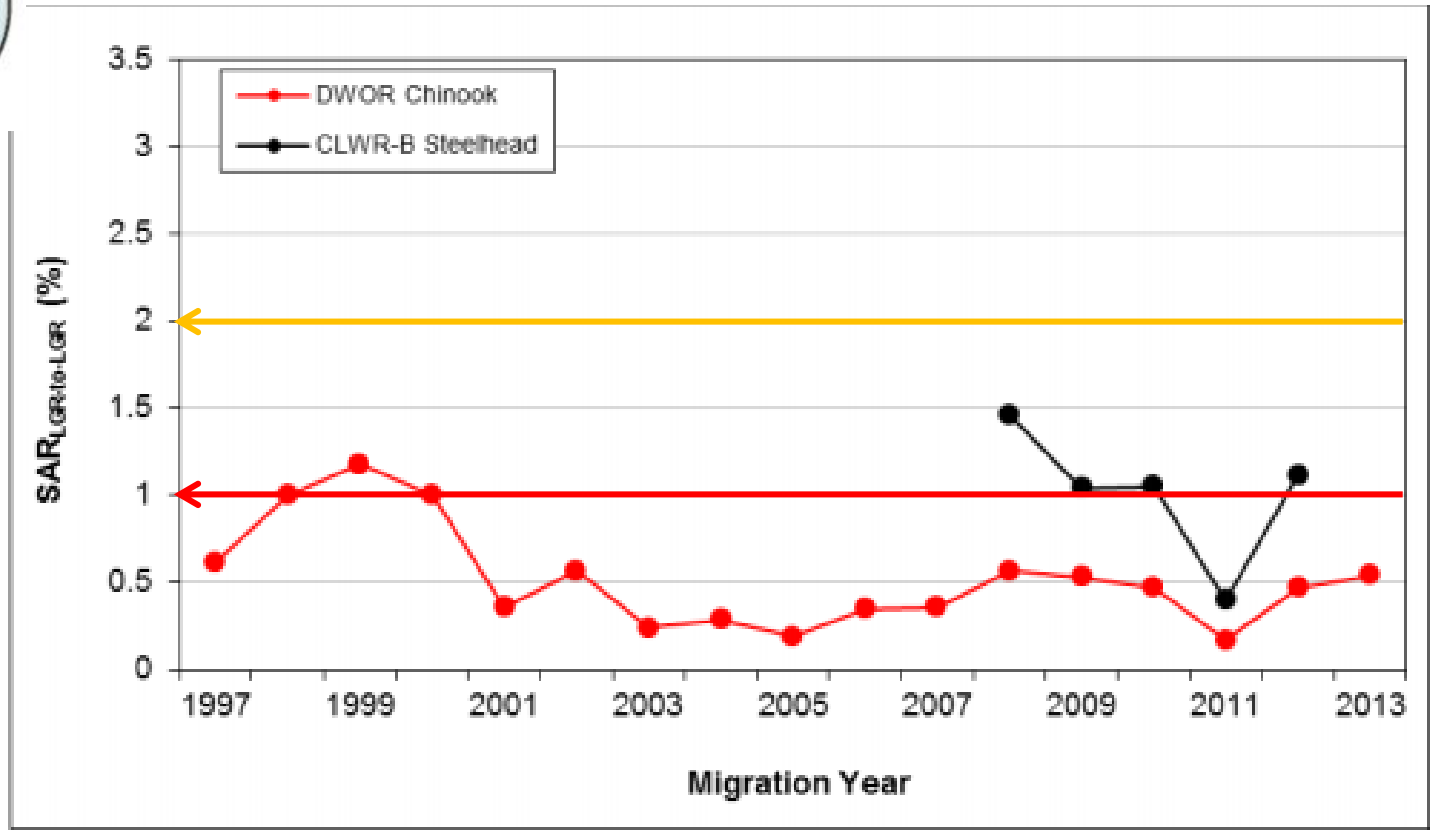


Figure 9. Weighted SARLGR-to-LGR for Dworshak NFH spring Chinook (1997–2013) and Clearwater-B hatchery steelhead (2008–2012). Migration year 2013 is incomplete for yearling Chinook, with Age 2-salt adult returns through 9/14/2015.
http://www.fpc.org/hatchery/dworshakhatchery2015.pdf

Reference: Fish Passage Center: 2015 Dworshak National Fish Hatchery Report

The Five Critical Policy Means Allow for Immediate Breach

1. The Corps needs no new authorities to place the 4 LSRDs into a "non-operational" status while normative river flows are reestablished by removing the dams' earthen portions.
2. The Corps' 2002 Environmental Impact Statement and Record of Decision provide the necessary NEPA coverage for breaching, although some updating may be required.
3. Neither the ongoing litigation over the 2014 Federal Biological Opinion nor the Court's order for a new EIS constrains the Corps from breaching the dams through channel bypass ***now***.
4. Breaching can be financed through existing debt reduction and credits mechanisms as a fish mitigation action by BPA. New appropriations are not needed.
5. Breaching is far easier than originally planned, making it possible to move from a decision to breach, to breaching in a matter of months, not years.

Source Doc at: http://damsense.org/reports/

The BiOp, 02 EIS & New EIS

1991
SOR

1994
Bi-Op

1995
Start NEPA

1998
Supplement Bi-Op

2000
New Bi-Op

2002
EIS / ROD

2016
Supplement 2-3 Months, Breach!

2004
New Bi-Op
SUED!

2008
New Bi-Op
SUED!

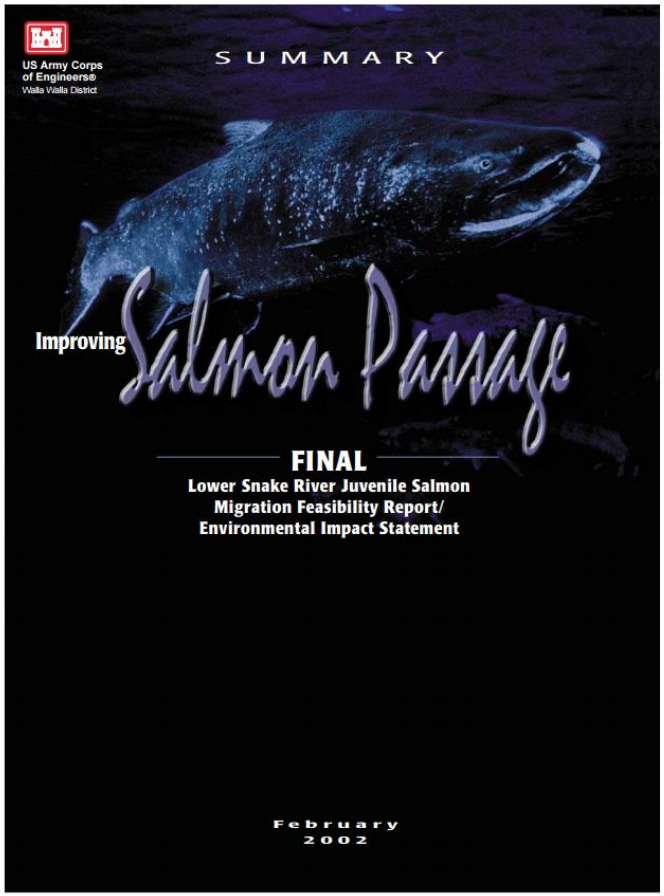
2010
Supplement 2008 Bi-Op **SUED!**

2014
Supplement 2008 Bi-Op Again **SUED!**

2016
Judge allows **5 Years** for FCRPS NEPA / EIS

2021 ?

Warm Colors Action **Litigated**,
Blue is **Policy** Approach



US Army Corps
of Engineers®
Northwestern Division

RECORD OF DECISION

Lower Snake River
Juvenile Salmon Migration
Feasibility Study

September 2002

http://www.nww.usace.army.mil/Library/2002-LSR-Study/

2002 EIS

- Breaching is the "preferred environmental alternative" "**further improvements in the hydrosystem passage system are unlikely to recover listed Snake River stocks**"
- 7 Years & $33 Million
- Dam maintenance underestimated
- Cost of breaching overestimated
- Remains the operable EIS for the dams, Asst Sec Army Reaffirmed this basic policy
- NO matter what the BiOp says, it is still an opinion for an action agency, ie., the Corps, to ***consider*** in an EIS

2002 EIS Summary

"…the chance of meeting NMFS survival and recovery criteria for the four listed species Alt 1 [doing nothing] would likely be the same or slightly better than Alternatives 2 and 3 [passage improvements]. Alternative 4 (breaching) provides the highest probability of meeting the survival and recovery criteria…... The analyses indicate that **further improvements in the hydrosystem passage system are unlikely to recover listed Snake River stocks…"**

Conclusion…..we gambled over a billion dollars on doing something that was slightly worse than doing nothing, lost, and point fingers at habitat loss, fisherman, birds, and marine mammals and the catch all excuse, Ocean Conditions.

And Wasted Several Billion Dollars or Your Tax Money and Caused Your Power Bills to Go Up.

A Few More Recent Gov Statements

- **NOAA's** 2016 & 2017 Snake River Spring/Summer Chinook Proposed Recovery Plan sums this up with this statement on page 219: *This recovery plan contains an extensive list of actions to move the ESU and DPS towards viable status; however, the* ***actions will not get us to recovery.***

- *For more than 20 years, the federal agencies have focused on essentially the same approach to saving [Snake River] salmon—minimizing hydro mitigation efforts and maximizing habitat restoration. Despite billions of dollars spent on these efforts, the listed species continue to be in a perilous state*. Judge Michael Simons, May 2016.

- Wild Snake river runs are trending down the last few years, NOAA data

Breaching's Effect On Other Recovery Efforts, eg., Habitat?

- Habitat restoration investments will be optimized in the Snake basin due to large numbers of returning fish that can make use of previous improvements.
- Opens roughly 80 miles of Chinook spawning and rearing habitat
- Millions in fish passage mitigation funding can shift to riparian restoration on lower Snake and habitat work on other tributaries.
- More Corps funds available to other restoration initiatives such as Puget Sound Near Shore Restoration.
- Increased Snake runs relieve fishing and prey pressures on Salish Sea and Coastal stocks speeding their recovery.

Thanks for Listening

Jim Waddell

Civil Engineer, PE, USACE Retired

All Supporting Documentation can be found at:
Damsense.org & WhaleResearch.com

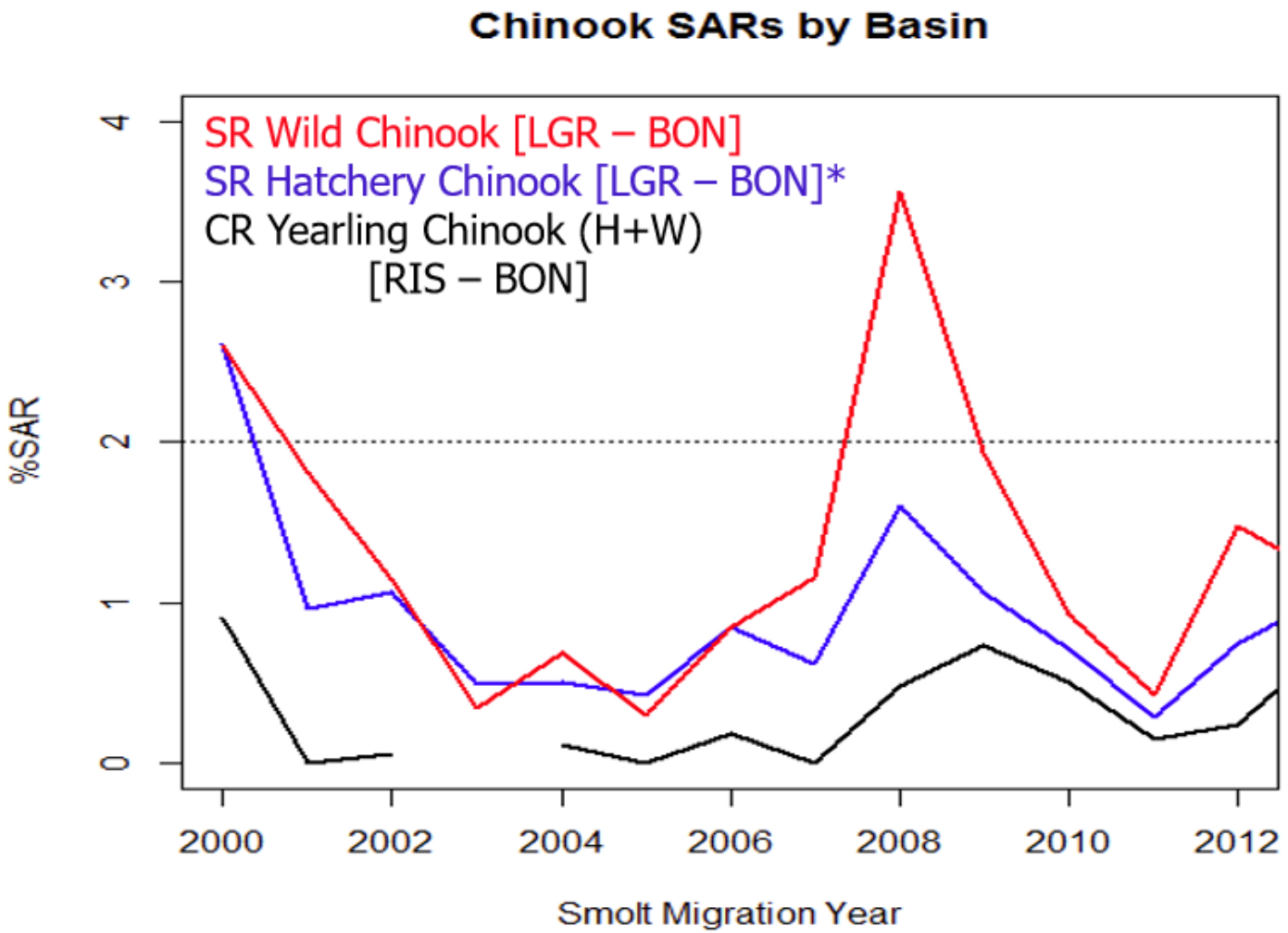
Supporting information follows…

After Breaching, Lower Granite Dam will look like this…

Image from the Corps 2002 EIS…..So they did study it!!

Four Lower Snake Dams Cost/Economics

- Benefit to Cost ratio over the life of the four dams is **.15 to 1**
- Annual expenditures over the last 5 years have exceeded earnings
- LSR Dams are 2-4 times more expensive than mainstem dams on Columbia
- Three Turbine rehabs at Ice Harbor are now 3-4 times costlier than original estimates and 10 years behind schedule.
- Turbine rehabs of remaining 21 turbines not economically viable for BPA thus consumers.
- $2.5 billion spent on passage improvements with no improvements in SAR's for Snake runs
- Oversupply of power in PNW increasing due to conservation, wind & solar.



LGR to BON is approximately 286 miles [7 dams]
RIS to BON is approximately 308 miles [6 dams]
*Snake River Hatchery Chinook is an average of annual hatchery specific estimates

Cost/Economics with Natural River

- Corrected breach cost now around $340 million, not 1 or 2 billion
- Benefit to cost ratio is at least 4 to 1 if the hydro power is replaced
- But, not really needed and will free up grid space allowing more wind and solar, 2000 megawatts of solar alone in BPA Integration que
- Breaching will save money for BPA/Corps which can be used on higher value dams and habitat restoration efforts. Eg., Puget Sound Near Shore, $400 million needed.
- Provides 7-8 thousand more jobs in State
- Land lease for restored viticulture and orchards could add $30 million a year to State School budgets and $200 million in direct economic benefit
- ETC…

But, Can It Be Done and In Time, YES!!

- Corps can place dams into a ”non-operational” status without Congressional authorization since dams do not provide an economic benefit and are causing significant harm to the environment.
- Since dams are 92% hydro, BPA pays the breach bill under the allocation rules and the 1980 Power Planning Act as Fish Mitigation.
- NEPA? The Corps has the **2002 EIS** that covers breaching, the only remaining reasonable alternative, can be updated in a matter of months.
- Breaching via removal of earthen berm portion of dam by controlled hydraulic breach requires little further engineering or complex contracting.
- Could and should begin in December of 2017!

Harvest

- More salmon and steelhead for fisheries, endangered Southern Resident Killer Whales, other marine mammals and critters.
- Removes stocks from endangered status thus eliminating incidental take restrictions in mixed stock fisheries.
- Increased fishing of ever more larger fish has numerous spinoff economic benefits to the State and region.

Hatcheries

- Lower Snake Compensation Plan hatcheries built to mitigate salmon losses due to dam construction along mainstem should be closed, others modified of phased out over time, BPA saving go to other hatchery programs or restoration efforts.

And lets not forget the greater PNW ecosystem

- Greater numbers of larger salmon will increase the amount of biomass and nutrients moving from the ocean to the interior
- Other endangered aquatic species such as lamprey and sturgeon will benefit with breaching
- Riparian areas in the Snake basin will see sustainable increases in overall diversity and population density.
- Fewer algae producing reservoirs reduces methane emissions, a powerful global warming gas.

So What Are We Waiting For?

- Many elected officials, government leaders, environmental NGO's and the media are fixated on the BiOp litigation over the last 15 years
- And, seemed to have gone out of their way to forget that the Corps is operating and conducting mitigation activities today with the 2002 EIS
- While a litigation "victory" for some NGO's, another decade of studies to develop the programmatic FCRPS EIS and then a breach EIS, is too long for salmon.
- Meanwhile actions in the 2002 EIS are an ongoing track and independent of the Court ordered studies, which do not relieve the Corps from acting sooner.
- These Court actions do not relieve the Corps from their inherent responsibilities to meet the Federal Objective and the Endangered Species Act.
- The 02 EIS has breaching as the only remaining reasonable alternative

Senior Corps officials have noted that neither the State, NW Delegation, Environmental NGO's nor the Tribes have actually asked ***the Corps*** to breach the dams since 2000. They have asked for many other things, such as more spill, flow augmentation, studies, even studies to honestly consider breaching, but not immediate breach.

And Then There Is the Money

$2.5 Billion spent since 1988 on the 4 LSRD's with No improvement

"Record Runs" are achieved by putting ever more hatchery fish into the Snake, since there SAR's are so low and will continue to decline because they are genetically inferior and depend on an ever declining number of wild stocks to boost their genetics. About $35 mill this year escalating at 5% per year.

Big looser is habitat investments that could have been made with this money.

Habitat investments that were made are sub optimized by lack of Snake stocks in the ecosystem.

Benefit Cost Ratios

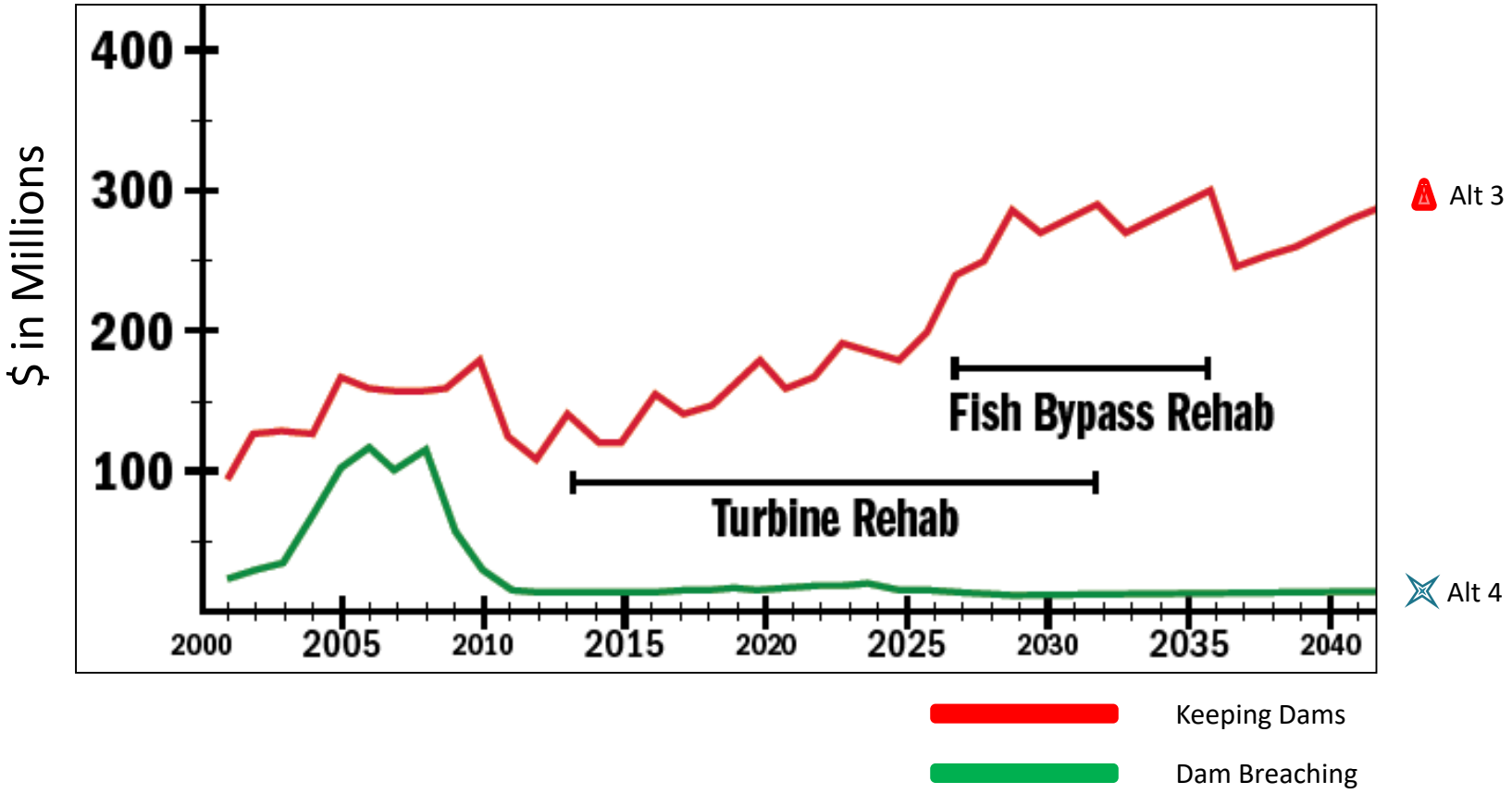
Economic / Ecologic Change

Positive Neutral Negative

AA = Average Annual Cost at 6.8% Discount Rate

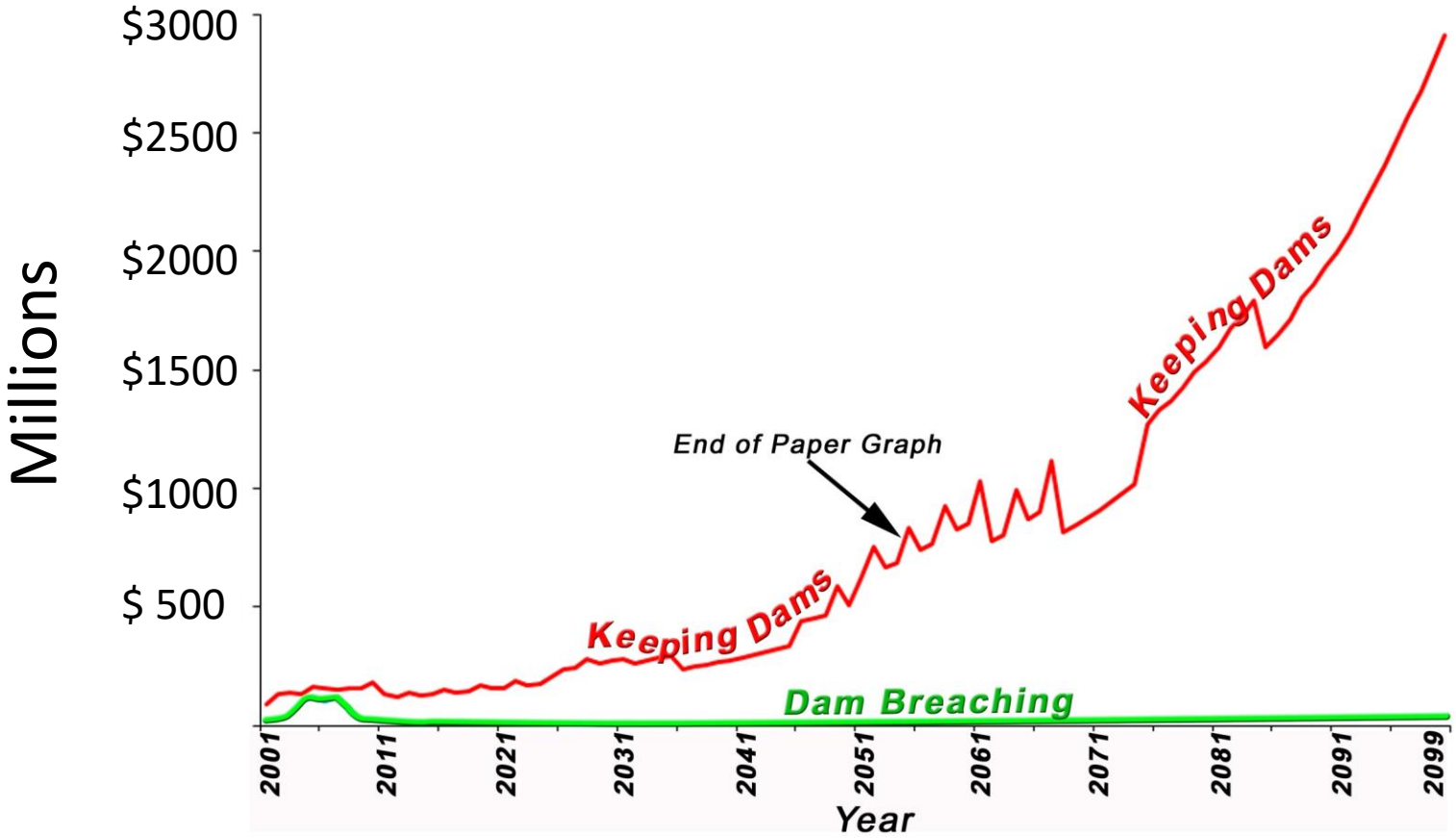
National Economic Development Benefit Cost Ratios →	Keep the Dams ***15¢ return on $1 spent***	Remove the Dams ***$4.30 – $19.76 return on $1 spent***
Endangered Species Mitigation		
Endangered Southern Resident Killer Whales (SRKW) & Salmon Species	The USACE spent $800.0M over 15 years on failed system improvement efforts for juvenile salmon passage thru the four dams	Only remaining alternative in EIS for ecosystem recovery, increasing salmon numbers *and* prey availability for SRKW
Climate Change Challenges	Warming reservoirs kill salmon and favor predators, methane emissions increase	Diurnal cooling in natural rivers increases fish survival, allowing more fish to utilize high elevation spawning grounds in Idaho
Hydropower		
Hydropower	Benefit $202.6M AA, *high side* Power generated is 2.9% of regional, with production trending downward due to aging infrastructure and the benefit likely a transfer from idle wind turbines	Cost $0 - $261.8M AA Shift to wind or other surplus sources; costs trending downward, regional grid surplus is 5 times production of LSR dams
Life Cycle Implementation	Cost $269.4M AA, 91% of costs	Cost $29.0M AA, breach 1 dam / yr
Transportation		
Inland N… …wn 50% over …	Be… …7.6M AA, *high side* …M AA, 9% of dam…	Cost / Loss $7.6… …rail improvements… …$100M
Agric…		

2002 Corrected + Future Costs



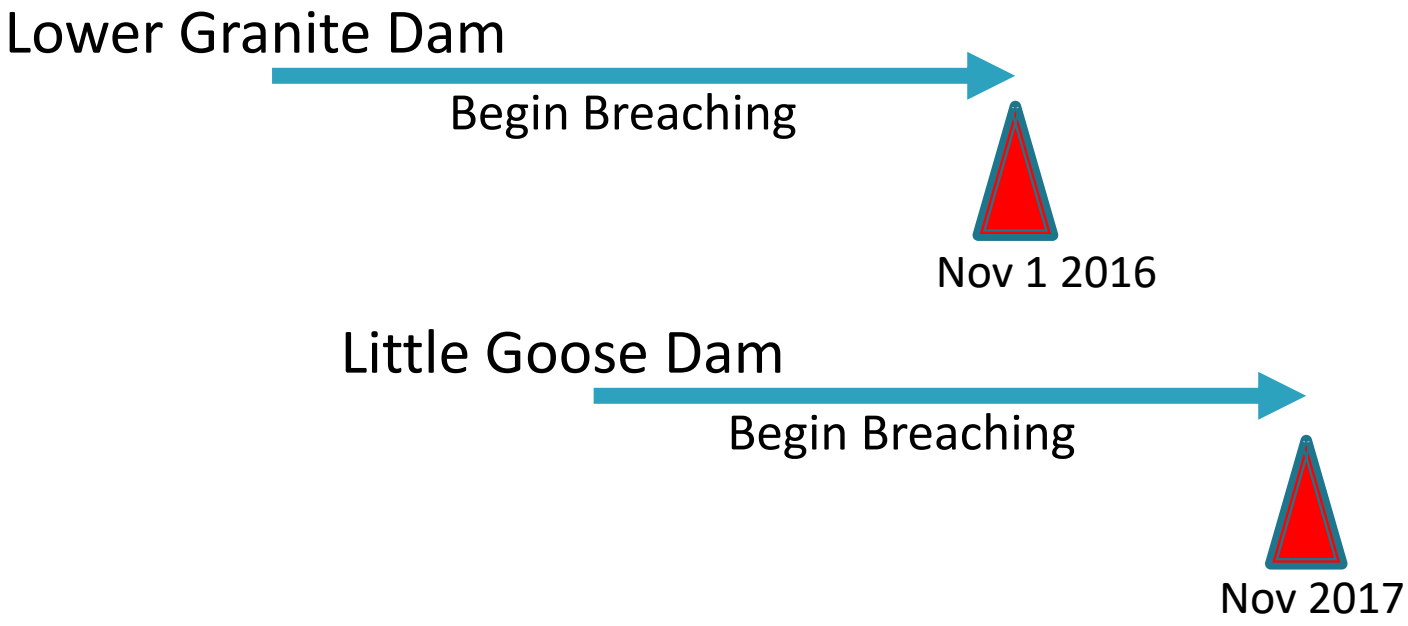
Reference: Cost Report, July 2014, Jim Waddell

Lower Snake River (LSR) Dam Costs



Solution Is Breaching 4 Dams

- Breaching is quick & far cheaper
- Dam removal is costly and unnecessary



Lower Snake River Slack Water

Lower Granite

Lower Monumental

Little Goose

Ice Harbor

Reasons For Breaching

Dams are driving species to extinction

$2.5 **Billion** failed efforts for salmon passage

Climate change poses new challenges

Dams could violate U.S. Treaties

River transportation in long-term decline, farmers shifting to rail

Hydropower already replaced

Corps Walla Walla District understated cost of keeping the dams by $161M per year

Dams cost millions in lost economic benefits

Increased recreation will provide 2,350 – 4,100 jobs

The Corps can no longer afford non-productive infrastructure

Why The Universal Belief That Dam Breaching Is Too Costly?

Ice Harbor Dam

Photo USACE Walla Walla District

2002 EIS Keep vs Breach

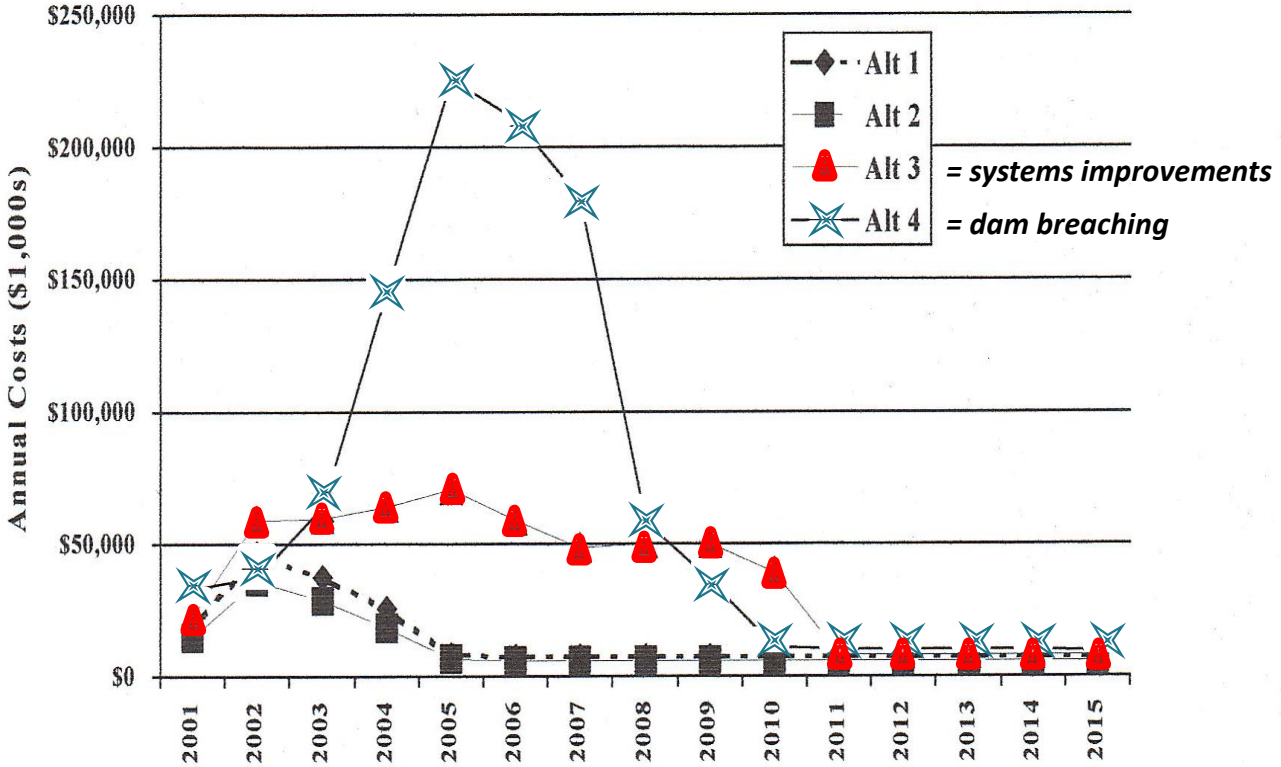
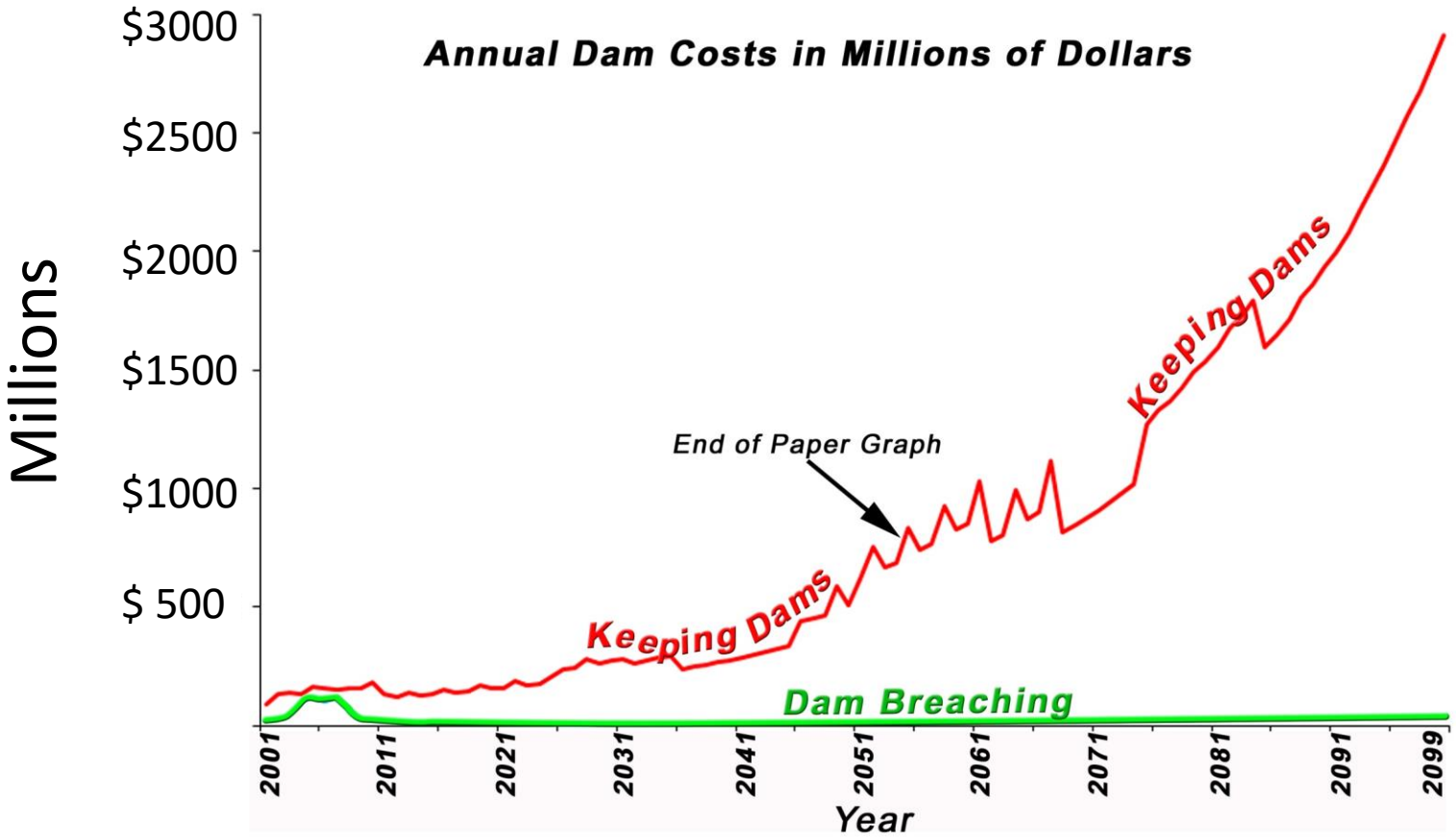


Figure 3.8-1. Comparison of Annual Implementation Costs

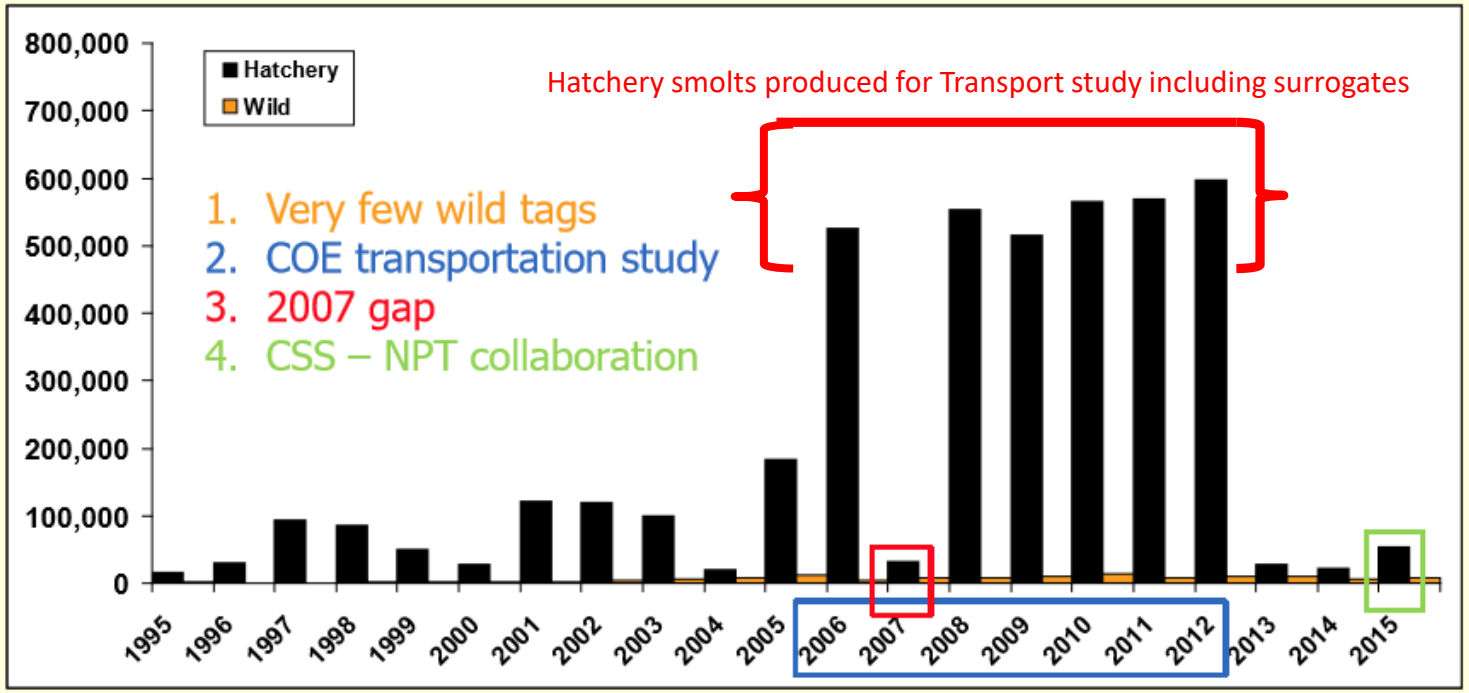
Reference: Lower Snake Feasibility Report / Environmental Impact Statement

2002 Corrected Annual Costs



Reference: Cost Report, July 2014, Jim Waddell

Tagging above Lower Granite Dam

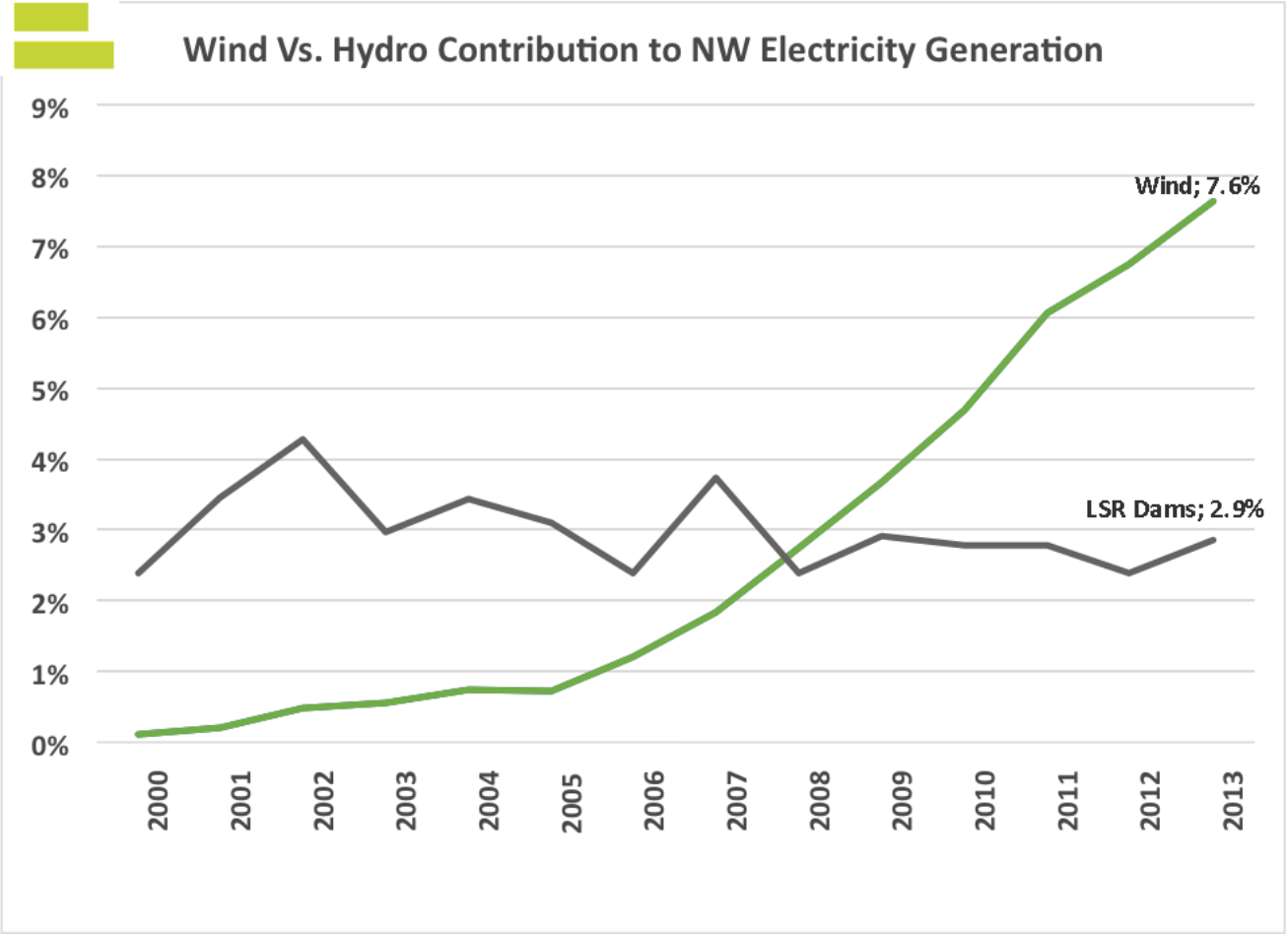


EARTH ECONOMICS

Supplementing 2002 EIS

- Cost errors revealed & corrected
- Breaching dams
  - Most Reasonable and Prudent Alternative
  - Frees up millions of dollars
  - Increases economic benefits

EARTH ECONOMICS



Reference: Mojica, J., Cousins, K., Briceno, T., 2016. National Economic Analysis of the Four Lower Snake River Dams: A Review of the 2002 Lower Snake Feasibility Report/Environmental Impact Statement. Economic Appendix (I). Earth Economics, Tacoma, WA.

EARTH ECONOMICS

Recreation

$290 - $501 Million

2,350 - 4,100

Jet boaters & skiers, rafters, kayakers, canoeists, swimmers, picnickers, campers, hikers, mountain bikers, hunters & anglers

White Salmon Before and After Condit Dam Photo Ben Knight

The spending associated with recreation along a free-flowing LSR will generate substantial economic activity throughout the region, with the greatest economic activity occurring in the first four years.

Opposition

- NOAA West Coast
- BPA
- Corps Northwest Division
- Lower Snake Ports, e.g. Port of Lewiston
- PNWA, NW River Partners

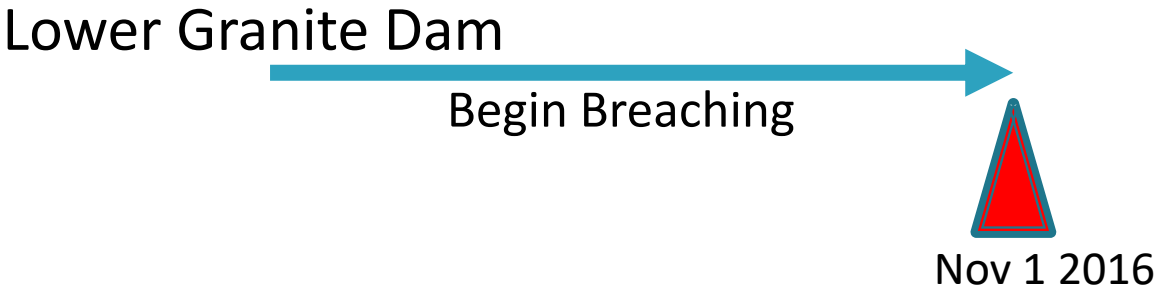
Local & Regional Politics

- Leaders have been misinformed since 2002
- Political Mission Impossible: keeping salmon ***and*** the four lower Snake River dams
- Lack of political will
- Lack of community insistence to breach dams ***now***

Why So Urgent?

- Snake wild salmon runs will be lost in 1-3 years, with hatcheries not far behind

- Obama can act before government change-over



Biological, technical, economic and financial data support dam breaching

US Army Corps of Engineers

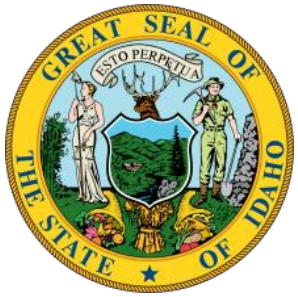
BONNEVILLE POWER ADMINISTRATION

EIS provides authority to breach and funding mechanisms in place: freed up money can be re-applied to Columbia River dams and Habitat work

Congressional action not necessary

National Congress of American Indians

- Over 50 affected tribes



- Leaders should seek corrected information

- Public must demand action

There Is Hope

Species **WIN** Economies **WIN** Taxpayers **WIN**

- Elwha River basin roaring back to health
- Klammath River dam removal project announced
- Update on LSR Dams & Federal Agencies
- Far more gain by breaching: salmon, jobs, reliable power

What Legacy Will We Leave?

A Free Flowing Snake River with Salmon for Life

or

Extinctions for Salmon and SRKWs

"You can always count on Americans to do the right thing – after they've tried everything else!"

Winston Churchill

Lower Snake River Feasibility Study

Summary - Economic Effects

(Relative Average Annual Costs - $Millions)

USER AREA	MAX TRANSPORT	SYSTEM IMPROVEMENT	DAM BREACHING
COST			
Power	-	-	($271)
Navigation	-	-	($24)
Irrigation	-	-	($15)
Implementation	-	($6)	($49)
S/T Costs	-	($6)	($359)
BENEFITS			
Comm. Fishing	-	-	$2
Avoided Costs	-	-	$29
Implementation	$4	-	-
Recreation	$2	$2	$82
Power	$8	$8	-
S/T Benefits	$14	$10	$113
NET ECONOMIC EFFECT	**$14**	**$4**	**($246)**

Note: Numbers reflect change from current condition (base case).

FROM CORPS 1999-2000 INFORMATION BRIEFINGS

Lower Snake River Feasibility Study

Summary - Economic Effects

(Relative Average Annual Costs - $Millions)

USER AREA	MAX TRANSPORT	SYSTEM IMPROVEMENT	DAM BREACHING
COST			
Power	-	-	($271) ?
Navigation	-	-	($~~24~~) ($2)
Irrigation	-	-	($15) ($8)
Implementation	-	($6)	($~~49~~) ($39)
S/T Costs	-	($6)	($~~359~~) ($320)
BENEFITS			
Comm. Fishing	-	-	$2 ?
Avoided Costs	-	-	$~~29~~ $217
Implementation	$4	-	-
Recreation	$2	$2	$~~82~~ $172
Power	$8	$8	-
S/T Benefits	$14	$10	$~~113~~ $389
NET ECONOMIC EFFECT	**$14**	**$4**	**[($~~246~~)]**

$69 MILL AVRG. ANC. BENEFIT

Note: Numbers reflect change from current condition (base case).

AS OF 1 JAN 2015

A DIFFERENCE OF $315 MILLION!!

Lower Snake River Feasibility Study

Summary - Economic Effects

(Relative Average Annual Costs - $Millions)

CORRECTED NUMBERS BROUGHT FORWARD to 2015 @ 6.88% DISCOUNT RATE

USER AREA	MAX TRANSPORT	SYSTEM IMPROVEMENT	DAM BREACHING
COST			
Power	-	-	($271) ?
Navigation	-	-	~~($24)~~ ($2)
Irrigation	-	-	~~($15)~~ ($8)
Implementation	-	($6)	~~($49)~~ ($50)
S/T Costs	-	($6)	~~($359)~~ ($331)
BENEFITS			
Comm. Fishing	-	-	$2 ?
Avoided Costs	-	-	~~$29~~ $313
Implementation	$4	-	-
Recreation	$2	$2	~~$82~~ $172
Power	$8	$8	-
S/T Benefits	$14	$10	~~$113~~ $489
NET ECONOMIC EFFECT	**$14**	**$4**	**[~~($245)~~]**

$158 MILLION AVRG. ANL. BENEFIT

Note: Numbers reflect change from current condition (base case).

Navigation / Transport

Overall, freight volumes passing through the Ice Harbor locks (the lowest on the Snake River) have declined 20 percent since the 2002 study. Barges on LSR reservoirs are used to transport wood chips, wheat and barley, pulses (e.g., garbanzo beans), and rapeseed (canola). Commodity producers can choose shipping via rail or road. Since 2008, in large part a pipeline has moved petroleum to a refinery in Salt Lake City. Container-on-barge shipping down the Columbia effectively ended after container ships abandoned the Port of Portland in 2015.

Table 3: Tonnage by Commodity Group (000 tons)

Commodity	1987-96	1992-97	2010-14	Percent change 1987-96 to 2010-14	Percent change 1992-97 to 2010-14
Wood chips	550.5	634.0	236.0	-57%	-63%
Grain	3,051.4	3,038.0	2,800.0*	-8%	-8%
Petroleum	116.4	120.0	15.8	-86%	-87%
Total	3,718.3	3,792.0	3,051.8	-18%	-20%

Reference: Mojica, J., Cousins, K., Briceno, T., 2016. National Economic Analysis of the Four Lower Snake River Dams: A Review of the 2002 Lower Snake Feasibility Report/Environmental Impact Statement. Economic Appendix (I). Earth Economics, Tacoma, WA.

Water Supply

WATER SUPPLY

Approximately 34,000 acres of irrigated farmland use the reservoirs produced by the Lower Snake River dams for water supply. Should the dams be breached, these farms would either need to drill wells to reach the aquifers or modify their water withdrawal systems. The water supply values do not reflect the value of the water that is supplied, but the modification costs that would be incurred if the dams were to be breached. Because of this, there are no costs or benefits associated in the "with dams" scenario.

WITH DAMS

Although the Snake River reservoirs provide irrigation to approximately 37,000 acres of farmland, the costs versus benefits have not been calculated as the 2002 FR/EIS assessed this as a net change over the existing with dam condition.

BREACH DAMS

There have been no additional studies conducted on the cost of not having a reservoir for irrigation, and therefore the point estimate used in the analysis is the $15.4 million ($22.5 million in 2015 dollars) estimate from the 2002 FR/EIS. However, review to date indicates that the pumping capacity used to calculate these increased pumping costs is significantly overstated. The FR/EIS shows that the increased pumping costs would yield 1 foot of water across 37,000 acres every 19 days. The FR/EIS also assumes that the land would no longer be used for crop production, as opposed to switching to crops that demand less water, e.g., wheat or wine grapes.

USACE 2002 Lower Snake River Juvenile Salmon Migration Feasibility Report / Environmental Impact Statement, Appendix I: Economics, Table 3.4-16 (pp I3-147), available at: www.nww.usace.army.mil/Library/2002LSRStudy.aspx

Reference: Mojica, J., Cousins, K., Briceno, T., 2016. National Economic Analysis of the Four Lower Snake River Dams: A Review of the 2002 Lower Snake Feasibility Report/Environmental Impact Statement. Economic Appendix (I). Earth Economics, Tacoma, WA.

Recreational Expenditures & Jobs Without Dams

The spending associated with recreation along a free-flowing LSR will generate substantial economic activity throughout the region, with the greatest economic activity occurring in the first four years.

- Jet Boating, Jet Skiing
- Raft / Kayak / Canoe
- Swimming
- Picnic / Primitive Camping
- Developed Camping
- Hike and Mountain Bike
- Hunting
- Angling

Table 5. Expected expenditures as a result of recreation from a free-flowing Lower Snake River (Values in millions, 2015 USD)

Year	Total	Asotin	Columbia	Franklin	Garfield	Walla Walla	Whitman
Year 1	$501.1	$120.4	$23.6	$141.8	$30.1	$50.5	$134.7
Year 5	$291.6	$74.5	$13.1	$77.4	$19.5	$28.8	$78.1
Year 10	$347.9	$86.8	$16.0	$94.7	$22.4	$34.7	$93.4
Year 20	$373.1	$92.4	$17.2	$102.5	$23.7	$37.3	$100.2

TABLE 7. JOBS SUPPORTED BY RECREATION EXPENDITURES

	Total	Asotin	Columbia	Franklin	Garfield	Walla Walla	Whitman
Year 1	4161	1104	181	1177	219	529	951
Year 5	2380	663	99	640	135	294	526
Year 10	2876	788	121	785	157	357	640
Year 20	3098	843	131	849	168	385	691

Reference: Mojica, J., Briceno, T., 2016. Regional Economic Analysis of the Four Lower Snake River Dams: A Review of the 2002 Lower Snake Feasibility Report/Environmental Impact Statement. Economic Appendix (I). Earth Economics, Tacoma, WA.

The 4 Dams Need to Be Breached Now But How?

- Reevaluate Corps 2002 Report
- Value Engineer Breach Plan
- Update the EIS
- Update the Cost and Economics
- Develop Financial Strategy
- Inform ALL of new & corrected information
- Develop Breach Execution Plans

Likely Last Call for Snake River Wild Salmon

Susitna River Wild Salmon

Photo Matt Stoecker

Like the Free Flowing Elwha Below Snake River Will Recover If We Let It

Elwha River

Photo Ben Knight