August 28, 2018

TO: Southern Resident Killer Whale Task Force
RE: Science supporting increased spill and lower Snake River dam removal

Dear Task Force members,

The recovery of Southern Resident orcas requires an urgent multi-pronged regional effort that addresses all three of the orcas’ main threats. It is the lack of sufficient prey—Chinook salmon—however, that is the most pressing factor contributing to the population’s alarming and accelerating decline. We write to recommend and provide scientific support for two actions the Task Force could endorse that would increase Chinook salmon in the near and long-term respectively: (1) increased ‘spill’ at the federal dams on the lower Columbia and lower Snake rivers up to 125% total dissolved gas and (2) restoration of the lower Snake River through removal of its four federal dams in southeast Washington State and replacement with zero-carbon alternatives.

It is the charge of Governor Inslee’s Southern Resident Orca Recovery Task Force to identify bold essential actions that will prevent the extinction of these whales and support their recovery. These two actions are recommended by a broad spectrum of regional salmon biologists and fisheries managers and meet that mandate.

The historic reliance of Southern Resident orcas on Chinook salmon populations in the Columbia-Snake River Basin is well established. In its 2008 Orca Recovery Plan, NOAA states:

Perhaps the single greatest change in food availability for resident killer whales since the late 1800s has been the decline of salmon in the Columbia River basin. Estimates of predevelopment run size vary from 10-16 million fish (Table 7; Northwest Power Planning Council 1986) and 7-30 million fish (Williams et al. 1999), with Chinook salmon being the predominant species present. Since 1938, annual runs have totaled just 750,000 to 3.2 million fish (WDFW and ODFW 2002). Returns during the 1990s averaged only 1.1 million salmon, representing a decline of 90 percent or more from historical levels.

Historically, the Columbia Basin supported the largest Chinook salmon runs in the world. The Snake River—the Columbia’s largest tributary—once supplied almost half the Basin’s total salmon. These salmon were also larger and fattier than other salmon, providing greater caloric benefits for orcas. Several factors have caused the decline of salmon runs in the Columbia Basin, but federal dams and reservoirs represent the largest source of human-caused mortality. In May of 2016, a federal judge for the fifth time since 2000, ruled that the current operation and configuration of the Columbia-Snake River dams remains a significant barrier to salmon protection and recovery in the region and, indeed, risks the extinction of thirteen species of salmon and steelhead.

Given the current Southern Resident crisis, the considerable scope and breadth of issues the Task Force has been asked to consider, and the limited timeframe to develop its initial set of recommendations for Governor Inslee, we have assembled a packet of resources to aid Task Force members in their review of the
suggested spill and restoring the lower Snake River through dam removal actions. The documents in this packet include summaries of various scientific studies, scientist letters, economic and energy analyses, recent polling results, and a bibliography and links to additional resources.

We hope that this packet is useful and provides you with the information needed as you develop your report to Governor Inslee. If you have any questions or would like additional information, please feel free to contact us.

Thank you for your diligent work to save the Southern Resident orcas from extinction.

Sincerely,

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Page 41 Map of the Pacific Northwest, with the Columbia-Snake River Basin highlighted (2018)


Page 51 Bibliography of additional scientific articles and reports related to the benefits of spill and Lower Snake River dam removal
A customized version of the below letter was sent to Northwest policymakers on August 16, 2017. It is signed by 47 regional scientists and communicates the benefits of – and the scientists' support for – increased spring and summer spill (water releases over federal dams on the lower Columbia and lower Snake Rivers) to improve survival of out-migrating endangered juvenile salmon and steelhead populations. Spill represents a critical immediate, interim salmon restoration tool available to policymakers and state/federal/tribal managers while the people of the Northwest develop a legally valid, scientifically credible Columbia Snake River Basin Salmon Plan or Biological Opinion over the next several years, as ordered by the U.S. District Court in Portland in 2016.

August 16, 2017

Dear Northwest Policymaker,

In this letter, the undersigned scientists and fishery managers reaffirm the benefits of spill for salmon and steelhead of the Snake/Columbia River Basin, as an essential interim measure awaiting a legally valid, scientifically credible long-term plan. Specifically, we support an immediate increase in spill levels to benefit Snake/Columbia fish, for reasons described more fully below. Increased spill allows more juvenile salmon to pass dams safely via spillways, rather than passing through powerhouses or bypass plumbing. With existing dams in place, spill offers the best potential to improve life cycle survival. This is an essential near-term step for at-risk salmon runs pending the conclusion of the ongoing court-ordered review and development of a new plan, now underway. We support an immediate increase in spill to the highest biologically safe Total Dissolved Gas levels allowed by current environmental regulations; additionally, we also support an adaptive management experiment that expands spring spill levels to 125% of total dissolved gas (TDG), with testable hypotheses and appropriate monitoring of salmon and steelhead responses. Both are fully justified today, from a scientific perspective.

Since a U.S. District Court in Portland ruled earlier this year in favor of expanded spill beginning in 2018, some in the region have questioned the value of spill in reducing the risk to threatened and endangered fish associated with passage through the federal hydro-system. This letter summarizes existing science on the topic and unequivocally supports expanded spill as an effective near-term measure to better protect ESA-listed populations.

Development of the Federal Columbia River Power System (FCRPS) transformed a free-flowing river system into a series of reservoirs and dams, dramatically impacting native salmon and steelhead. The Columbia River salmonid ecosystem, prior to development, was a network of complex interconnected habitats that had been created, periodically altered, and maintained by natural physical processes (ISG 1999; Williams 2006) and passage to and from natal habitats for anadromous fish was unimpeded. Now, the developed Columbia
River ecosystem bears little resemblance to a natural river, and juvenile salmon and steelhead face obstacles of reduced water velocity, dangerously warm water in reservoirs, increased predation, migration delays, mortality, injury and stresses during dam passage. In many cases, additional stresses are introduced by handling and collection of juveniles for transportation. These factors directly and indirectly reduce survival rates during seaward migration and in delayed mortality that occurs in the ocean environment e.g., (Budy et al. 2002, Scheuerell et al. 2009, Van Gaest et al. 2011).

Since FCRPS completion in the 1970s, the abundance and productivity of Snake River salmon – historically almost half of the Columbia basin’s entire spring/summer chinook and steelhead run – has declined dramatically. All native anadromous salmonids in the Snake River were listed under the Endangered Species Act (ESA) during the 1990s. The ESA listings were necessary despite a number of “technological fixes” undertaken in prior years to mitigate hydrosystem impacts, including screening of turbine entrances and collecting and transporting juvenile salmon (primarily barging) around dams and through slackwater reservoirs.

The Northwest Power and Conservation Council, in its Fish and Wildlife Program (NPCC 2014) has established a goal of achieving smolt-to-adult survival rates (SARs) of 2% - 6% (4% average) for listed Snake and Columbia River salmon and steelhead. Since the late 1990s SARs have averaged only 0.9% for Snake River wild spring/summer Chinook and 1.6% for Snake River wild steelhead, well short of even the minimum regional goal (McCann et al. 2016). Collecting and transporting (barging) juvenile salmon and steelhead around dams has also failed to compensate for the impacts of the FCRPS (McCann et al. 2016), despite implementing this strategy for decades.

Peer-reviewed literature indicates that life-cycle survival of Snake River spring/summer Chinook salmon and steelhead is related to both freshwater juvenile passage conditions and ocean conditions (Schaller and Petrosky 2007, Petrosky and Schaller 2010, Haeseker et al. 2012, Schaller et al. 2014). These analyses support the NPCC (2014) direction to explore the potential to improve life-cycle survival through new strategies for hydrosystem management and operations, while considering variation in marine conditions (ISAB 2013-1). Independent analyses of long-term (50 year) run-reconstruction and recent (1998-2015) PIT-tag data sets identified similar fresh water passage variables and ocean variables that characterize variation in life-cycle survival. Freshwater passage variables that positively influence survival include high water velocity (low water transit time) and higher spill, which helps smolts avoid dam powerhouses. With existing dams in place, spill offers the best potential to improve life-cycle survival. Only dam removals offer more benefits for salmon.

Fishery biologists widely accept that providing more natural habitat conditions (e.g., a “normative river”; ISG 1999; Williams 2006) is essential to restoring salmon and steelhead in the Snake and Columbia rivers. Factors in restoring more “normative” passage conditions would include reducing the time required
for juveniles to reach saltwater, passing more juveniles over dam spillways, speeding passage through reservoirs, and reducing juvenile collection and transportation (barging).

Last year, federal Judge Michael Simon of the U.S. District Court in Portland ruled that current operation of the FCRPS causes continued irreparable harm to imperiled salmon and steelhead and ordered the federal agencies responsible for managing fish, water, and power in the Columbia Basin to prepare a new analysis that complies with the law and moves wild salmon and steelhead populations toward recovery. The court has given the agencies until 2021 to complete this process. During this interim period, increasing spill at FCRPS dams is critical to the near-term protection and survival of Snake River salmon and steelhead, and other Columbia Basin species.

The groundwork has been laid for increasing spill above the levels allowed by current state water quality standards, and certainly at least to those levels, in recent work by the interagency Comparative Survival Study (CSS) coordinated by the Fish Passage Center. The CSS (2017) took advantage of retrospective analyses of independent data sets relating salmon and steelhead survival rates to freshwater passage conditions and ocean conditions (Petrosky and Schaller 2010, Haeseker et al. 2012, Schaller et al. 2014) and modeled likely responses to alternative future spill scenarios. Key findings include:

- **Modeling the effects of increased spill levels (up to 125% Total Dissolved Gas (TDG)) predicted the potential for significant improvement in juvenile fish travel times, in-river survival, ocean/marine survival, SARs and life-cycle survival of Snake River spring/summer Chinook and steelhead (CSS 2017).**

- **Increasing spill for fish passage up to safe limits of 125% TDG has a high probability of increasing SARs and may be capable of meeting regional 2-6% SAR goals. Increased spill is also predicted to lower the probability of extremely low SARs, thus reducing the extinction risk for ESA-listed populations (CSS 2017).**

- **Historical migration monitoring data indicate that spill for fish passage up to the 125% TDG level does not result in adverse conditions for downstream migration of juvenile salmon and steelhead. Currently, the State of Oregon allows spill to 120% TDG in tailrace monitors, and the State of Washington allows spill to 115% TDG in forebay/120% tailrace monitors (CSS 2017). Efforts are underway to align these standards in time for the 2018 outmigration, with a uniform 120% TDG limit.**

- **The modeling supports immediate implementation of spill for juvenile passage at the levels currently allowed and indicates that a large-scale adaptive management spring spill experiment across the FCRPS of up to 125% TDG is scientifically warranted. The monitoring structure to support this effort is already in place: current fish marking/tagging levels appear sufficient to monitor the effects of experimental spill management on Snake River spring/summer Chinook and steelhead (CSS 2017).**
Regardless of future decisions about dam management, including consideration of dam removal, increased spill holds immediate potential to provide substantial survival benefits for Snake and Columbia River salmon, and to provide important information for future policy and action. Increased spill would benefit all Interior Columbia Basin salmon and steelhead populations, including those in Oregon and Washington State that enter the Columbia mainstem below the Snake River confluence.

The undersigned members of the scientific community support an immediate increase in spill levels as discussed above as a well-documented benefit for the salmon and steelhead of the Snake/Columbia Basin. It is an essential benefit for at-risk salmon runs pending the conclusion of the ongoing court-ordered review and development of a new plan. Therefore, we support immediate increases in spill to the highest biologically safe TDG levels allowed by current environmental regulations, and in an adaptive management experiment, we support expanding spring spill to 125% TDG, with testable hypotheses and appropriate monitoring of salmon and steelhead responses.

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______________________________

REFERENCES:


Petrosky, C.E., and H.A. Schaller. 2010. Influence of river conditions during seaward migration and ocean conditions on survival rates of Snake River Chinook salmon and steelhead. Ecology of Freshwater Fish 10:520-536.


Comparative Survival Study of PIT-tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye

2017 Annual Report

BPA Project #19960200
Contract #74406
(12/16-11/17)

Prepared by

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December 2017
CHAPTER 2
LIFE CYCLE MODELING EVALUATION OF
ALTERNATIVE SPILL AND BREACH SCENARIOS

The CSS began developing life cycle models in 2013 for the purpose of examining survival at specific life stages, which is an important component of Adaptive Management (Holling 1978), and also a key element of NOAA’s Biological Opinion (BiOp) on the operation of the Federal Columbia River Power System (FCRPS). Since its inception, the life cycle modeling initiative has explored the potential to assess tributary smolt production, mainstem passage survival, ocean survival, and adult return rates. Empirical validation to abundance data and environmental time series has provided a detailed perspective of spatial and temporal variability in SAR estimates, while separating survival into freshwater and ocean components. Detailed separation of life stages included separating the juvenile migrants into transported and untransported fish for downstream migration, as well as the distinction that transported and untransported fish experience different survivals upon ocean entry.

The life cycle model was used to compare the predicted relative impacts that two key factors would have on long-term abundance increases: 1. Freshwater production as a function of habitat restoration, and 2. Survival in the mainstem as a function of hydrosystem operations. Through 2016, life cycle modeling analyses examined the potential for abundance to increase as a result of how these two factors can influence survival across the life cycle. Freshwater productivity is of interest because numerous habitat improvement activities are underway, and the benefits of those activities can likely be expected to result in increases in productivity and capacity. Hydro system operations are of interest because they have been shown to affect survival during juvenile migration and also survival at ocean entry. Analyses relying on empirical parameter estimates derived from historical life cycle reconstructions examined how alternative spill levels influence SARs and long-term return abundances. Alternative spill levels were examined, with each spill level predicting a rate of powerhouse passage at three characteristic flow levels (high flow, average flow, and low flow). The effect of powerhouse passage on in-river and ocean survival was predicted, and the life cycle model was used to predict SARs and long-term abundances of six Snake River Spring Chinook populations.

In a recent court Opinion (NWF v. NMFS 2016), Judge Simon ruled that NMFS, in its 2014 FCRPS BiOp, had violated the National Environmental Policy Act (NEPA) by failing to have a “hard look” at all reasonable alternatives to the recovery of listed salmon populations. Specifically, Judge Simon stated that federal agencies had ignored previous calls by federal Judges Marsh and Redden that federal agencies needed to consider a “major overhaul” of the FCRPS, including potentially breaching or removing one or more of the lower Snake River dams, the implication being that breach should be considered a reasonable alternative for recovery. NEPA requires that all agencies of the Federal Government complete an environmental impact statement (EIS) in connection with every recommendation in a BiOp. Judge Simon ordered that NMFS produce and file a BiOp by March 1, 2018 that complies with the Endangered Species Act (ESA), and prepare an EIS that complies with NEPA. A complete EIS will involve a comprehensive cost and benefit analysis of alternatives to avoid jeopardy under ESA. Given the
likelihood that breach will need to be examined in one way or another, an initial investigation focussed solely on the fish survival benefits of dam breaching seems warranted.

The CSS aims to provide meaningful and relevant perspectives on Columbia Basin salmonid recovery, and the 2016 NWF v. NMFS Court Opinion puts a spotlight on dam breaching as a potential subject of investigation. This analysis is a step toward bringing dam breach alternatives into the assessment of impacts on salmon population recovery. Specifically, it uses a life cycle model to examine the potential fish survival benefits of breaching the lower four Snake River dams. We present a prospective contrast of spill and breach scenarios by simulating future population trends using an empirically validated life cycle model sensitive to hydrosystem conditions affected by flow, spill, and breach. In like fashion to previous life cycle analyses the CSS has produced, we simulate population trends using predicted powerhouse passage rates under each spill and breach scenario. The analysis compares simulated return abundances and smolt to adult rates (SARs) to the physical location of Lower Granite dam when each spill and breach scenario is evaluated under a range of flow conditions.

Introduction and background

Since 2013, the CSS has been developing life cycle modeling analyses that link freshwater spawning and rearing (FSR) dynamics with historical records of survival rates and smolt-to-adult return rates. Relative numbers of 3, 4, and 5-year old fish were used to infer survival during the time between juvenile outmigration past Bonneville Dam (BON) and the end of the first year in the ocean. We focussed on the combined estuary and first year ocean survival (S.o.1) because early ocean survival is considered very crucial in the life history of salmonids. Ocean survival probabilities have been associated with indices of ocean conditions such as the Pacific Decadal Oscillation (PDO) (Mantua et al., 1997), upwelling indices indicative of primary production, and sea surface temperature (Petrosky and Schaller 2010). Additionally, evidence has emerged that environmental conditions in the river affect the physical condition of out-migrating fish, and influence the rate of mortality after the fish enter the ocean (Petrosky et al. 2001; Budy et al. 2002). Petrosky and Schaller (2010) showed that S.o.1 varied with PDO, upwelling and a variable describing juvenile interaction with powerhouses. An index powerhouse passage was created (termed NPH) where each powerhouse that fish come into contact with is discounted by the spill amount and spill efficiency. For example, a 50% spill can reduce a powerhouse passage rate from as high as 1.0 without spill to as low as 0.5 with spill (see Petrosky and Schaller (2010)). The study found that the sum of the spill-adjusted powerhouse passage values (NPH) was negatively correlated with survival below BON and during the first year in the ocean.

Life cycle modeling analyses were refined by partitioning mainstem passage survival into transported and untransported life histories, and accounting for survival differences both during these two routes of passage, as well as survival differences that occur upon ocean entry. The 2015 life cycle modeling analysis provided a quantitative assessment of the relative life cycle production benefits of improving survival conditions in the spawning and rearing versus improving survival conditions during juvenile outmigration through the mainstem. It used the same basic population prediction methods and statistical fitting methods developed in previous years analyses, but the 2015 analysis included additional years of abundance and survival data, and reconstructed population specific in-river harvest using US v OR Technical Advisory
Figure 2.10: Sensitivity analysis of predicted long-term average SAR at LGR between 2036 and 2045 at all combinations of spill levels and flow levels. Each cluster of three bars represent high flow (white boxes), average flow (light grey boxes), and low flow (dark grey boxes). Boxes represent the 25%-75% quartiles. Median values are shown with dark horizontal lines inside boxes.
relative to transportation assumptions, relative to harvest assumptions, and relative to downstream and upstream passage assumptions. The model’s assumptions are clearly stated, however, and predictions can be interpreted in relation to the scale of bias.

Conclusions

This analysis provides insight into the potential for dam breach to play a role in the recovery of Snake River spring/summer chinook. The results presented illustrate how survival and long-term return abundance respond to changes in hydrosystem operations. Relying on the empirical estimates of life cycle model parameters, and particularly the finding that powerhouse passage is a significant determinant of in-river survival and early ocean survival, we demonstrated that dam breaching and increased spill can benefit population recovery in relative proportion to the productivities and capacities of the populations. This analysis predicts that average return abundances and SARs increase at higher levels of spill and when dams are breached, owing to the empirical finding that survival is higher when powerhouse passage and water transit times are lower. The results are preliminary in the sense that the simulated future conditions are speculative and have a strong influence on predicted survival, and also that predicted powerhouse passage under breach conditions has not been empirically validated, but the results present a contrast of alternatives. The predicted outcomes represent approximations of the relative magnitude of increased survival and return abundance that are predicted relative to expected passage and water transit time values under flow, spill, and breach conditions. In a fully impounded river, we predict a 2-2.5 fold increase in return abundance above BiOp spill levels when spill is increased to 125% TDG. If the lower four Snake River dams are breached and the remaining four lower Columbia dams operate at BioP spill levels, we predict approximately a 2-3 fold increase in abundance above that predicted at BioP spill levels in an impounded system, and up to a 4 fold increase if spill is increased to the 125% TDG limit. This analysis predicts that higher SARs and long-term abundances can be achieved by reducing powerhouse passage and water transit time, both of which are reduced by increasing spill, and reduced further when the lower four Snake River dams are breached.
Snake River Adult Returns for wild Spring/Summer Chinook Salmon, Sockeye Salmon and Steelhead: 1950s to Present

Wild Snake River Spring/Summer Chinook

Historic Annual Spring-Summer Chinook Returns to the Snake River Basin: 2 million
Historic Annual Steelhead Returns to the Snake River Basin: 1 million
Historic Annual Sockeye Salmon Returns to the Snake River Basin: 100,000+ to central Idaho’s high mountain lakes
January 24, 2015

Hand delivered

The Honorable Patty Murray
United States Senate
Washington, DC 20510

Re: Recovering Federally Endangered Killer Whales by Breaching the Four Lower Snake River Dams

Dear Senator Murray:

We are writing to urge you to support breaching the four lower Snake River dams as a measure to increase Chinook salmon numbers and help save the critically endangered Southern Resident Killer Whales (*Orcinus Orca*) from extinction. This group of orcas is genetically and behaviorally very different from other killer whales and subsists largely on Chinook salmon.

As scientists who have spent years studying these whales, we are gravely concerned about their rapid decline. Since 1998, 61 Southern Residents have died, while only 38 have been born and survived. In the last two years, eight Southern Residents have died, a number of late-term calves have been miscarried by females, and surviving calves are not making it through their first year. In our opinion, these whales are dying due to cumulative pressures tied to nutritional stress and recovery actions taken to date are insufficient to prevent the extinction of these whales. These whales need a substantially larger Chinook salmon population to feed on as shown in multiple studies by both governmental\(^1\) and non-governmental\(^2\) researchers. Significantly, after nearly a decade on the endangered species list, these endangered killer whales are not recovering. Indeed, there were 88 whales when listed in 2005; today there are just 78.

These orcas are important to the Pacific Northwest both ecologically and culturally. Orca watching is a significant component of the Greater Puget Sound’s economy, adding approximately 65-70 million dollars to the ecotourism industry in Washington State alone. We are in danger of losing these whales.

Endangered Salmon Means Endangered Orcas

Within the United States, the Columbia-Snake River watershed is the most important source of salmon for these orcas. Over 50 large dams constructed on the rivers since 1933 are the major cause of salmon declines in the watershed. Today, only a small fraction of the historic numbers of salmon return to the watershed to spawn, reflecting high mortality of adults moving


upstream and juveniles moving downstream. Thirteen salmon and steelhead populations now face extinction and are listed under the Endangered Species Act (ESA). The ESA requires the federal government to recover these salmon species. For the Snake River in particular, both old and new research points in one direction - the dams are a major cause of decline of the salmon runs. The four lower Snake River dams, constructed in the 1960s and 1970s, are obstructing 140 miles of prime salmon migration waterways. The low survival rates of salmon passing over these dams is well documented. All Snake River salmon runs are now listed under the ESA, including the Chinook salmon needed by the orcas.

For millennia the Southern Resident orcas have depended on Chinook salmon from the Columbia River, which once produced millions of Chinook annually, supporting a rich ecosystem that included both killer whales and humans. In fact, according to NOAA Fisheries, “perhaps the single greatest change in food availability for resident killer whales since the late 1800s has been the decline of salmon from the Columbia River basin.” In 1992, both fall run and spring/summer-run Snake River Chinook were listed as threatened under the ESA. By 1999 Columbia River fall Chinook were also listed as threatened while the spring-run Chinook, which had collapsed to near extinction, warranted the highest listing as endangered. As the Columbia-Snake River Chinook have declined, so too have the Southern Resident killer whales.

The Southern Residents can be found in the coastal waters of the Northeast Pacific Ocean more than half the year. Research conducted over the last decade shows that Columbia-Snake River Chinook continue to be crucial to the Southern Residents’ continued existence. The whales appear to be especially reliant on the Snake River’s nutrient rich, high fat content early spring-run Chinook. Significantly, recent studies conducted by NOAA indicate that the Southern Residents’ visits to the coastal waters off Westport, Washington and the mouth of the Columbia River coincide with high concentrations of spring Chinook salmon.

As indicated, these amazing whales are in trouble. In the last two years alone the endangered orca population has declined 10%. Every birth and death matters in a population as

4 See e.g., Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv., 839 F. Supp. 2d 1117, 1131 (D. Or. 2011) (“[T]here is ample evidence in the record that indicates that the operation of the FCRPS causes substantial harm to listed salmonids. . . . NOAA Fisheries acknowledges that the existence and operation of the dams accounts for most of the mortality of juveniles migrating through the FCRPS.”)
6 U.S. Fish and Wildlife Service. Species profile for Chinook Salmon (Oncorhynchus tshawytscha), http://ecos.fws.gov/speciesProfile/profile/speciesProfile?spcode=E06D.
small as the Southern Residents. “[A]ny action that is likely to hinder the reproductive success or result in serious injury or mortality of a single individual is likely to appreciably reduce the survival and recovery of the [Southern Resident Killer Whales].” 10 The death of four Southern Resident killer whales in 2014 highlights a disturbing trend. The October death of a seven week old calf was a serious blow to this population of whales. Then, in December 2014, a female (J32) died carrying a full term calf. At 18 years, J32 was just entering her reproductive prime and was expected to contribute three to four calves to the SRKW population over her lifetime. Her necropsy results are pending. With her loss, the likelihood of extinction of this population increased. No new calf has survived since September 2012. There should be at least two to three calves born each year if the Southern Resident population is to survive, with more births necessary for the population to recover.

Recovery Measures Are Not Working

The federal government, through NOAA Fisheries, has a legal obligation to recover the populations of ESA listed salmon and orcas. 11 Still, after 23 years on the endangered species list, Chinook salmon runs on the Snake River are barely surviving, not recovering. It is clear NOAA’s recovery measures are not working for either salmon or the killer whales. In fact, a federal court has thrown out NOAA’s salmon recovery plan repeatedly for violating the Endangered Species Act, remanding with orders to rewrite the plan to include measures that will permit the Columbia-Snake River watershed salmon to recover. 12 Again and again the court has directed the federal agencies to consider removing the four lower Snake River dams. Yet to date, they have failed to do so.

To Recover Endangered Salmon and Killer Whales, Dam Breaching Is Required

It is clear that breaching the four federal dams on the lower Snake River is the major step needed to avert extinction of the Snake’s salmon and to restore access of salmon and steelhead to 15 million acres of cooler, high-elevation watershed. This would substantially increase spawning habitat for Snake River Chinook and greatly increase the availability of a critical food source for the endangered Southern Resident orcas.

The recovery of Southern Resident Killer Whales depends on abundant salmon. This will be impossible to provide without restoring productivity to the Columbia-Snake River watershed. Breaching the four lower Snake River dams is the single most likely measure to restore the abundant Chinook salmon runs the whales need to recover. No other action under consideration has the potential to increase the SRKW population to a level where they could be down-listed to threatened or removed from the ESA completely. For these reasons we urge you to support breaching the four lower Snake River dams.

10 NOAA/NMFS, Coordinated Long-term Operation of the Central Valley Project (CVP) and State Water Project (SWP) Biological Opinion (2009), p. 54.
11 In addition, the Army Corps of Engineers is required to review federal dam operations when advisable, to improve the quality of the environment in the overall public interest. 33 U.S.C. § 549a.
Sincerely,

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Dr. Katherine Ayres
Lead author
_Distinguishing the impacts of inadequate prey and vessel traffic on an endangered killer whale (Orcinus orca) population_ (2012)
San Luis Obispo, CA

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Dr. David Bain
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Dr. Richard Osborne
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Dr. Frances C. Robertson
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Dr. Val Veirs
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Dr. Scott Veirs,
President, Beam Reach
Marine Science School
Seattle, WA

Dr. Samuel Wasser
Endowed Chair in Conservation Biology
Director, Center for Conservation Biology
Research Professor, Department of Biology,
University of Washington, Seattle, WA
October 27, 2015

Will Stelle  
Regional Administrator, West Coast Region  
National Marine Fisheries Service – NOAA  
7600 Sand Point Way Northeast  
Seattle, WA 98115

Dear Mr. Stelle:

We are compelled to respond to your recent column in the Seattle Times, “NOAA Fisheries embraces – not ignores – climate research” (August 29, 2015). Your views omit more than they say and so present a misleading and incomplete picture of your agency’s unfortunate failure to take aggressive and necessary steps to address the effects of climate change on the freshwater habitat of threatened and endangered salmon and steelhead in the Columbia River Basin. This failure is not new; it has accumulated over nearly two decades of inadequate and ineffective action.

First, a bit of background that should be familiar to you. As the Northwest Power Council’s Independent Science Advisory Board (ISAB) pointed out nearly a decade ago in its report, “Climate Change Impacts on Columbia Basin Fish and Wildlife” (ISAB 2007-2), the impacts of climate change on Columbia Basin salmon will be profound. Moreover, even in 2007, these impacts were not obscure or unknown – warming water temperature, alterations in river and stream flows, and reduced ocean productivity were all effects that had been identified and documented. Indeed, many of the scientific studies of these effects cited in the ISAB’s 2007 review date back to the 1990s. Subsequently, in 2008, the ISAB also concluded that even NOAA’s worst-case scenario for assessing the potential effects of future warming ocean temperatures was not “sufficiently pessimistic.” (ISAB 2008-1 at 3.) To be sure, our understanding of climate change impacts on salmon has advanced and become more refined over the past five to ten years, but no one – least of all NOAA – can credibly claim that the increasing impacts of climate change on Columbia Basin salmon and steelhead is unforeseen or a surprise.

Second, you are correct that NOAA Fisheries has been a leader in conducting climate research and analyses. For example, its scientists have been lead or co-authors of numerous studies examining:

- the physical and biological impacts of climate change in freshwater, e.g., Crozier 2008; Crozier & Zabel 2013 (projecting different decreases in survival for Snake River spring/summer Chinook), Wu, et al. (2012) (projecting decreased summer stream flow of nearly 20% in 2020s to over 30% by 2080s and increases in summer stream temperatures from 0.92°C to 2.10°C);

- the shrinking ocean habitat, Abdul-Aziz 2011 (large contraction of 30% to 50% by the 2080s of the summer thermal range suitable for chum, pink, coho, sockeye, and steelhead in the marine environment, with an especially large contraction (86% to 88%) for chinook);

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Will Stelle  
Regional Administrator, West Coast Region  
October 27, 2015  
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- the effectiveness limitations of various freshwater habitat actions to address climate change, Beechie 2012 (only certain kinds of stream habitat restoration like shading and increases in flows can address climate effects); Wade 2013 (habitat protection alone will not save the species); and

- the need to consider whether any potential benefits from habitat restoration actions will be overtaken by the effects of climate change, Battin 2007.

Third, what NOAA has failed to do – and repeatedly – is actually apply the results of its research on climate change and salmon to support the major changes to dam operations that are necessary if we are going to continue to have wild salmon and steelhead in the Columbia and Snake Rivers in a climate change world. The recitation of NOAA’s “actions” to address climate change in your column does a good job of highlighting this failure:

(1) You point out that this summer fish managers were engaged in a last minute, ad hoc effort to address river temperature problems that we have known about for years, even decades. For example, over a decade ago the U.S. EPA conducted modeling to show that the reservoirs behind the four dams on the lower Snake River are the most significant contributor to increased water temperatures in the lower Snake River that are harmful to salmon. In 2013, we lost over one-third of the returning adult Snake River sockeye because of hot water in the adult fish ladder at Lower Granite Dam. The federal agencies decided then to jerry-rig pumps to get cooler water into the adult ladder but they failed for two years to undertake that work and faced the same problem again this summer. You also point to the cool water releases from Dworshak dam as part of the effort to address warm water this year. What you don’t say is that these releases are limited in both quantity and timing, and that they can only cool the River to a small degree and for a short distance. At best, they are a minor band-aid on a major temperature problem. And even then, using this limited cool water earlier this year – which you identify as an appropriate response – exposes later-migrating salmon like Fall Chinook to even greater risks. In short, the measures you identify amount to tinkering around the edges of the water temperature problems salmon face, with a very limited range of options, because we have avoided major change at the dams, changes that should have been made starting years ago.

(2) You also invoke the ISAB’s climate recommendations as justification for the habitat restoration and other measures NOAA and other federal agencies are pursuing to address climate impacts. What you don’t explain is that the actions in the federal salmon plan you describe are in the plan as an attempt to mitigate for the harmful effects of dam operations – and all of their hoped-for benefits are accounted for to meet this need. They are not there to mitigate for the additional impacts of climate change. The benefits of an action – even if they exist – can’t be counted twice to address to two different and additive problems. The question isn’t whether certain kinds of actions are generally good things to do in the face of climate change. The question is whether the agencies are implementing enough of the right kinds of the actions in the right places, with sufficient benefits to mitigate for both the harm from the dams and the additive adverse effects of climate change. The federal plan you point to doesn’t tackle this problem at all even though in other plans (like your agency’s recent biological opinion for the Central Valley Project in California) NOAA has considered both threats and identified separate and
additive actions to address each. Of course, the ISAB report you cite makes it very clear that climate change impacts are additive – they occur independently or on top of other impacts – and it stresses that failing to understand the magnitude of the additional climate impacts and their implications for other mitigation efforts is “like driving down the road looking in the rearview mirror while accelerating.”

(3) Likewise, the precautionary 11% to 44% reduction in ocean survival you say NOAA has used as part of a conservative approach to salmon restoration is a reduction only in comparison to the admittedly unreasonable assumption that future river conditions will be like those salmon experienced historically over the last century and more – without climate impacts. The current and future effects of climate change ensure that those days are not returning. NOAA has known (since the ISAB told the agency in 2008) that reduced salmon survival as a result of continuing and expanding climate impacts is likely to be far worse than the 11-44% “mid-range” reduction NOAA assumed. It was unreasonable and untenable for NOAA to assume only this mid-range (and comparatively small) decrease in survival in 2008 in light of the ISAB’s clear advice. NOAA’s continued reliance on this assumption even in the face of (its own) more recent scientific analyses – some noted above – is hardly grounds for asserting that the agency is pursuing a cautious approach to climate impacts on salmon restoration.

(4) Finally, we agree that protecting wetlands, floodplains and other important salmon habitat is useful and important, but these kinds of actions are simply nowhere near sufficient to mitigate for the harmful effects of dam operations and the slack water reservoirs they create in the Columbia and Snake Rivers. And such actions will be even less effective as the effects of a warming climate continue to increase. We must address the problem Columbia and Snake River salmon and steelhead face at the source: the dams and reservoirs that have had and continue to have such a profound impact on their survival.

Yes, as you say, this has been a tough year for our wild salmon. But all of the best science indicates that the future is likely to bring many more such years and more often. If we are to avoid losing endangered Snake River sockeye or threatened Snake River spring/summer Chinook – or any of the other imperiled species of salmon and steelhead in the Columbia basin – we need to be doing far more than following the processes and going through the motions you describe in your column. If the dead salmon up and down these rivers this summer did nothing else, they gave us a clear and unmistakable warning that continued reliance on the kinds of small steps and minimalist measures we have taken since Snake River sockeye were first listed under the Endangered Species Act over twenty years ago will not work.

Sadly, the loss of salmon this summer is not our first warning. In 1994, federal Judge Malcolm Marsh rejected the first of five subsequent federal plans for dam operations – all but one a failure – because the plan settled for minor adjustments when, in the Court’s words, “the situation literally cries out for a major overhaul.” We have now lost twenty years of lead time to heed the Judge’s warning. And yet the salmon are still waiting for that “major overhaul.” Your column does a major disservice to the urgency of the challenge we face. We believe it is imperative to heed the science, change course, and pursue a plan for salmon restoration that squarely faces the
need for major changes in both the existence and operation of the federal dams on the Columbia and Snake Rivers.

Sincerely,

Rod Sando
Former Chief Executive of Natural Resources for Minnesota
Former Director of Idaho Fish and Game Department

Don Chapman, Ph.D.
Fisheries Biologist (Retired)

Douglas A. DeHart, Ph.D.
Former Fisheries Chief, ODFW
Former Senior Fisheries Biologist, USFWS

Daniel H. Diggs
Former Assistant Regional Director for Fisheries
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Jim Martin
Former Chief of Fisheries
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Steve Pettit
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Bill Shake
Former Assistant Regional Director of Fisheries
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Don Swartz
Fisheries Biologist (Retired)
Oregon Department of Fish and Wildlife

CC:
Northwest Governors
Northwest Senators
Northwest Representatives

Eileen Sobeck, Administrator, National Oceanic Atmospheric Administration

Gina McCarthy, Administrator Environmental Protection Agency
Dennis McLerran, Administrator, Region 10, Environmental Protection Agency

Jo-Ellen Darcy, Assistant Secretary of the Army (Civil Works)

Elliott Mainzer, Administrator, Bonneville Power Administration

References


Breaching the Snake River Dams
to Support Southern Resident Killer Whale Recovery

There is compelling evidence to support the call for breaching the four lower Snake River dams as a measure to increase Chinook salmon numbers and help save the critically endangered Southern Resident Killer Whales (Orcinus orca) from extinction. This group of orcas is genetically distinct and differs in social structure, behaviors, physical characteristics, and geographical range from other orca populations. They have a strong feeding preference for Chinook salmon. Scientists who have spent years studying these whales are gravely concerned about their rapid decline. Since 1998, many Southern Residents have died, while far fewer have been born and survived.

Prior to late December 2014 the population had been reduced to only 76 orcas. In May, 2015 NOAA Fisheries, the agency in charge of their recovery, designated the Southern Resident Killer Whales one of the eight endangered species most likely to go extinct in the immediate future.¹ No new calves had survived between September 2012 and late December 2014. At least seven Southern Resident orcas had died during that period. The whales are dying due to cumulative pressures tied to nutritional stress and recovery actions taken to date are insufficient to prevent the extinction of these whales. These whales need a substantially larger Chinook salmon population on which to feed, as shown in multiple studies by both governmental² and non-governmental³ researchers. Significantly, after nearly a decade on the endangered species list, these endangered killer whales are not recovering.

Recently, however, the population has taken a more hopeful turn. Since late December 2014 the Southern Resident orcas have celebrated the birth of nine calves. Although this is good news, this means there are nine more mouths to feed with a declining number of salmon. While there is an expected 50% mortality rate in the first year of life for Southern Resident calves, hopefully all will survive. However, they are not light eaters. If all nine calves do live, the population will need between 30,000 and 50,000 additional Chinook salmon to sustain the calves as juveniles, and many more as they grow to adults. Breaching the Snake River dams in the immediate future likely would provide many of the additional fish the orcas need to recover. As the lower Snake River is restored, each year the runs should become larger and would support the growing needs of the orca population.

This abundant salmon supply is a necessity for the Southern Residents. The recent orca “baby boom” is not a mere coincidence, but likely is the result of larger than average Snake River Chinook salmon runs inflated by specially produced lower Snake River hatchery fish. The gestation period for orcas is approximately 17 months. That means the nine births coincide with the larger Snake River hatchery salmon runs that occurred in 2013 through 2015. These runs were inflated by hundreds of thousands of large fall Chinook salmon that had been specially bred as juveniles in a hatchery program for a transport research project. Many of the calves were conceived in the year

2013 when the Southern Residents largely were absent from the Salish Sea inland waters, presumably feeding on coastal Chinook, a number of which likely were the larger specially bred Chinook. The lower Snake River research project last released fish in 2012, which means the inflated fall Chinook runs will not continue. The fish were expensive to produce and the research project will not be resumed. Nonetheless, it is good evidence that when there are plentiful Snake River Chinook, the Southern Resident orcas can conceive, reproduce, survive and recover.

**Endangered Salmon Mean Endangered Orcas**

Within the United States, the Columbia-Snake River watershed is the most important source of salmon for the Southern Resident orcas. For millennia the Southern Residents have depended on Chinook salmon from this watershed, which once produced millions of Chinook annually, supporting a rich ecosystem that included both killer whales and humans. However, the number of salmon produced by the watershed has declined greatly. Indeed, in 2008 NOAA Fisheries stated that, “perhaps the single greatest change in food availability for resident killer whales since the late 1800s has been the decline of salmon from the Columbia River basin.”

Over 50 large dams constructed on the rivers since 1933 are the major cause of salmon declines in the watershed. Today, only a small fraction of the historic numbers of salmon return to the watershed to spawn, reflecting high mortality of adults moving upstream and juveniles moving downstream. Thirteen salmon and steelhead populations now face extinction and are listed under the Endangered Species Act (ESA). The ESA requires the federal government to recover these salmon species. For the Snake River in particular, both old and new research points in one direction - the dams are a major cause of decline of the salmon runs. The four lower Snake River dams, constructed in the 1960s and 1970s, are obstructing 140 miles of prime salmon migration waterways. The dams also have inundated the lower Snake River fall Chinook salmon’s mainstem spawning and rearing habitat. In 1992, both fall run and spring/summer-run Snake River Chinook were listed as threatened under the ESA. By 1999 Columbia River fall Chinook were added to the ESA list as threatened, while the spring-run Chinook, which had collapsed to near extinction, warranted the highest listing as endangered. As the Columbia-Snake River salmon declined, so did the orcas. By 2005 the Southern Resident killer whales had also earned the highest listing of endangered.

Even though the Columbia-Snake River prey resource is greatly reduced, the Southern Residents rely on it and can be found in the coastal waters of the Northeast Pacific Ocean more than half the year. Research conducted over the last decade shows that Columbia-Snake River Chinook

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6 See e.g., Nat’l Wildlife Fed’n v. Nat’l Marine Fisheries Serv., 839 F. Supp. 2d 1117, 1131 (D. Or. 2011) (“[T]here is ample evidence in the record that indicates that the operation of the FCRPS causes substantial harm to listed salmonids. . . . NOAA Fisheries acknowledges that the existence and operation of the dams accounts for most of the mortality of juveniles migrating through the FCRPS.”)
7 U.S. Fish and Wildlife Service. Species profile for Chinook Salmon (Oncorhynchus tshawytscha), http://ecos.fws.gov/speciesProfile/profile/speciesProfile?spcode=E06D.
remain crucial to the Southern Residents’ continued existence. The whales appear to be especially reliant on the Snake River’s nutrient rich, high fat content early spring-run Chinook.\(^9\) Significantly, recent NOAA Fisheries acoustic and satellite tag studies indicate that the Southern Residents’ visits to the coastal waters off Westport, Washington and the mouth of the Columbia River coincide with high concentrations of spring Chinook salmon.\(^{10}\) In fact according to the satellite tags, the orcas’ travels often center around the mouth of the Columbia River.

**Recovery Measures Are Not Working**

The federal government, through NOAA Fisheries, has a legal obligation to recover the populations of ESA listed salmon and orcas.\(^{11}\) Still, after 24 years on the endangered species list, wild salmon runs on the Snake River are not meeting federal survival goals, much less recovery goals.\(^{12}\) At this point it is obvious that NOAA’s recovery measures are not working for either wild salmon or the Southern Resident Killer Whales. In fact, a federal court has thrown out NOAA’s salmon recovery plan repeatedly for violating the Endangered Species Act, remanding with orders to rewrite the plan to include measures that will permit the Columbia-Snake River watershed salmon to recover.\(^{13}\) Again and again the court has directed the federal agencies to consider removing the four lower Snake River dams. Yet to date, they have failed to do so.

**To Recover Endangered Salmon and Killer Whales, Dam Breaching Is Required**

It is clear that breaching the four federal dams on the lower Snake River is the major step needed to avert extinction of the lower Snake’s salmon and to restore access of salmon and steelhead to 15 million acres of cooler, high-elevation watershed. This would substantially increase spawning habitat for lower Snake River Chinook and greatly increase the availability of a critical food source for the endangered Southern Resident orcas.

The recovery of Southern Resident Killer Whales depends on abundant salmon. This will be impossible to provide in the near term, without restoring productivity to the Columbia-Snake River watershed. Breaching the four lower Snake River dams is the quickest single measure most likely to restore the abundant wild Chinook salmon runs the whales need to recover. No other action under consideration has the potential to increase the SRKW population to a level where they could be down-listed to threatened or removed from the ESA completely.

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\(^{11}\) In addition, the Army Corps of Engineers is required to review federal dam operations when advisable, to improve the quality of the environment in the overall public interest. 33 U.S.C. § 549a.


Resolution of the Western Division of the American Fisheries Society on the
Role of Dams and Conservation of Snake River Salmon, Steelhead, Pacific Lamprey, and White Sturgeon

WHEREAS the first objective in the constitution of the American Fisheries Society is to promote the conservation, development, and wise use of fisheries, and the American Fisheries Society further commits to promote enlightened management of aquatic resources for optimum use and enjoyment by the public; and

WHEREAS past management of Snake River salmon, steelhead, Pacific lamprey, and white sturgeon populations and their environment has resulted in a failure to conserve and use wisely the fisheries, or to provide for optimum use and enjoyment by the public; and

WHEREAS Snake River salmon, steelhead, Pacific lamprey, and white sturgeon extinctions and declines occurred as a result of the impacts from a variety of physical, chemical, and biological factors, including climate change and ocean regime shifts plus those that have been summarized as the “four H’s” - Hatcheries, Harvest, Habitat, and Hydropower; and

WHEREAS four dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) have been constructed on the lower Snake River downstream from the Clearwater and Salmon rivers, which combined provide more anadromous fish spawning area than any other portion of the Columbia River Basin; and

WHEREAS many, and perhaps most, populations of wild Snake River salmon and steelhead are now extinct, and the remaining populations are currently listed as threatened or endangered under the Endangered Species Act; and

WHEREAS counts at Lower Granite Dam indicate order-of-magnitude reductions in the number of Pacific lamprey returning to the Snake River since the four lower Snake River dams were constructed; and

WHEREAS the four lower Snake River dams isolate white sturgeon, creating nonviable populations in each between-dam reach, and these populations are characterized as being demographic sinks and having poor recruitment because of insufficient spawning and rearing habitat; and

WHEREAS despite recent years of relatively large runs of some salmon and steelhead populations, and good flow and ocean conditions, it is prudent to expect a repeat of extended periods of smaller runs, and poor flow and ocean conditions, coupled with continued gradual warming of water temperatures; and

WHEREAS wild Snake River salmon and steelhead have continued to decline as a result of delayed mortality from the hydropower system, despite recent improvements in ocean productivity, passage and adult returns; and
WHEREAS recent incremental improvements and adjustments in management of hatcheries, harvest, habitat and hydropower facilities have not yet produced significant, sustained increases in abundance of wild Snake River salmon and steelhead, Pacific lamprey, or white sturgeon; and

WHEREAS the long-term viability of hatchery fish programs depends to some degree upon the conservation and availability of wild fish for their contributions of genetic material; and

WHEREAS the U.S. Fish and Wildlife Service Lower Snake River Compensation Plan Office, charged with compensating for salmon and steelhead losses associated with turbine mortality at the four lower Snake River dams, has concluded it cannot meet its salmon compensation objectives; and

WHEREAS failure to restore Snake River salmon, steelhead, Pacific lamprey, and white sturgeon to sustainable, fishable levels puts the federal government in a position of failing to meet its Treaty Trust responsibilities; and

WHEREAS restrictions associated with failed recovery of Snake River salmon, steelhead, Pacific lamprey, and white sturgeon directly affect the Columbia Basin’s fisheries management, conservation, and economic options (both present and future); and

WHEREAS past and recent scientific reviews, including those conducted as part of the Independent Scientific Advisory Review process, the collaborative and peer-reviewed Plan for Analyzing and Testing Hypotheses (PATH), the Fish and Wildlife Coordination Act report on the Corps of Engineers Lower Snake River Juvenile Salmon Migration Feasibility Study Environmental Impact Statement, the 2002 American Fisheries Society publication of the symposium titled Biology, Management, and Protection of North American Sturgeon, the 2005 American Fisheries Society Western Division Review of the Federal Columbia River Power System Biological Opinion, the 2010 American Fisheries Society Western Division Review of the Adaptive Management Implementation Plan, and the 2010 U.S. Fish and Wildlife Service Pacific Lamprey Draft Assessment and Template for Conservation, have all indicated that restoration of natural river conditions where the lower four Snake River dams occur has the highest likelihood of preserving and recovering salmon, steelhead, Pacific lamprey, and white sturgeon, and poses the least risk to their survival; and

WHEREAS the science associated with dam removals to help conserve and recover fish populations is advancing rapidly, with dams recently removed on many sizeable rivers (e.g., the Kennebec, Rogue, Sandy, Calapooia, Sprague, and Clark Fork rivers), and removals in progress on other rivers (e.g., the White Salmon and Elwha rivers), yet dam removals often take decades of planning; and

WHEREAS decisions regarding management of the lower four Snake River dams and recovering Snake River salmon, steelhead, Pacific lamprey and white sturgeon are ongoing and could benefit from a collective professional opinion; and

WHEREAS economic analyses have shown that river shippers pay only 9% of the total costs of maintaining and operating the lower Snake River navigation system (far exceeding subsidies for
rail and highway freight transportation), and the remainder is subsidized by electric ratepayers and federal taxpayers; and

**WHEREAS** the power generation of the four lower Snake River dams has constituted an average of 4% of the Pacific Northwest power needs (mostly during spring runoff when it is least needed and most replaceable), while only producing about 1% of regional power needs during high demand periods, and in the past 10 years approximately 11 times their average power production has been added to the regional power supply (about half in natural gas and half in wind);

**NOW, THEREFORE BE IT RESOLVED** that based on the best scientific information available, it is the position of the Western Division of the American Fisheries Society that the four lower Snake River dams and reservoirs are a significant threat to the continued existence of remaining Snake River salmon, steelhead, Pacific lamprey, and white sturgeon; and

**BE IT FURTHER RESOLVED** that if society-at-large wishes to restore Snake River salmon, steelhead, Pacific lamprey, and white sturgeon to sustainable, fishable levels, then a significant portion of the lower Snake River must be returned to a free-flowing condition by breaching the four lower Snake River dams, and this action must be comprehensively planned and implemented, using appropriate techniques and management practices, in a timely manner; and

**BE IT FURTHER RESOLVED** that in conjunction with actions to allow the lower Snake River to flow freely, without impoundment, actions to compensate dam and reservoir users, and to address detrimental impacts to habitat, from harvest, and from hatcheries will be required to further increase the likelihood of recovering Snake River salmon, steelhead, Pacific lamprey, and white sturgeon; and

**BE IT FURTHER RESOLVED** that The Western Division of the American Fisheries Society will contact the concerned federal and state agencies and tribes, and elected or appointed officials, to make them aware of this resolution.
November 20, 2007

Mr. Robert H. Lohn, Regional Administrator
NOAA Fisheries
7600 Sand Point Way NE
Seattle, WA 98115-0070

Dear Mr. Lohn,

As research scientists who have spent decades studying fish-eating (“resident”) killer whale (*Orcinus orca*) populations in the Pacific Northwest, we are writing to call for your leadership to protect and restore abundant, self-sustaining wild salmon and steelhead populations in the Snake and Columbia Rivers. As you are well aware, Columbia and Snake River salmon are intricately linked to the continued existence of Puget Sound’s Southern Resident killer whale population.

The Southern Resident killer whale population, like many of the once-abundant Columbia River Basin salmon and steelhead stocks, has been listed as endangered under the Endangered Species Act. We cannot hope to restore the killer whale population without also restoring abundant salmon upon which these whales have depended for thousands of years. As your own scientists have said, “[p]erhaps the single greatest change in food availability for resident killer whales since the late 1800s has been the decline of salmon in the Columbia River basin” (Proposed Recovery Plan, p. 82).

In addition to the clear science connecting these two icons of the Northwest, the federal government has a legal obligation to restore populations of salmon and killer whales. Yet, from all appearances, the forthcoming Federal Salmon Plan (FCRPS Biological Opinion) will continue the failed management practices of the past. The draft plan relies heavily on actions implemented over the past 25 years, but that science and time have proven will not restore these fish to the levels necessary for self-sustaining populations of salmon or abundant enough to provide a healthy food resource for these killer whales.

Documented sightings of Southern Resident killer whales at the mouth of the Columbia River during the winter months, especially L pod (as noted in NOAA’s *Draft Proposed Recovery Plan for Southern Resident Killer Whales*), underline the importance of this source of food for the whales. Considering that salmon coming out of the mouth of the Columbia each year historically numbered in the 10-16 million range, this was an important source of food for these whales during the crucial winter months. Many of the Columbia Basin salmon runs, especially fall chinook, migrate close to the coast where Southern Residents are frequently spotted during winter research cruises. Given the likely importance of chinook as a favored prey for the whales, and the potential for increased numbers of chinook should historic runs be recovered, the best available science demands that your agency take more seriously its mandate to restore Columbia Basin salmon. Beyond the importance of restoring salmon for their own sake, we must consider the impact those species have on the recovery potential for the Southern Resident killer whales.

The Columbia and Snake River Basin was once the world’s most productive salmon watershed. Today, only about 1% of the historic number of fish return. Over 200 large dams on the Basin’s rivers are the major cause of its salmon extinction crisis, with 13 populations now listed under the Endangered Species Act. Yet the Columbia-Snake Basin still holds more acres of wild land and miles of wild river than any watershed in the lower 48 states. It is this opportunity for salmon and steelhead
recovery that we must take advantage of as the last best hope for a substantial increase in prey availability for Southern Resident killer whales during the critical winter months.

The science is clear that removing four federal dams on the lower Snake River is needed to avert extinction of the Snake’s four unique salmon populations that migrate up to 900 miles inland from the ocean, but now face an eight-dam gauntlet. Coupled with sound harvest, appropriate land-use regulation, and hatchery/aquaculture reform, lower Snake dam removal could restore salmon abundance to 15 million acres of forest, high desert, and wilderness areas for productive use by people, communities, and iconic predators like the Southern Resident killer whales.

Removing those four outdated dams would: restore 140 miles of the Snake River to a more natural, free-flowing state, substantially increasing available spawning habitat for Snake River fall chinook; prevent extinction and allow restored abundance of wild salmon and steelhead to prime, nearly untouched habitat in eastern Washington, eastern Oregon and Idaho; and greatly increase the availability of a critical food source for endangered Southern Resident killer whales, particularly chinook salmon during the winter months. It will also help prevent extinction of the Northwest salmon species that are most likely to come through the warming decades ahead – because their high-elevation spawning streams will warm the least. Climate change effects are a key factor in the survival of species such as salmon and killer whales, and we urge NOAA Fisheries to include climate change adaptation in their formulation of recovery plans for these and other species.

We call on your agency to follow the science and include removal of the four lower Snake River dams as an essential element of a real recovery plan for these extremely important fish stocks. The recovery of Southern Resident killer whales depends on abundant food, which will be difficult if not impossible to provide without restoring productivity from the Snake River components of Columbia Basin salmon runs.

Thank you for your consideration of our comments. Please include this letter and its signers as part of the official public comment for the draft Federal Columbia River Power System biological opinion. We are also sending this letter to our members of Congress to urge their leadership to resolve this issue of critical regional and national significance.

Sincerely,

Dr. David Bain
Friday Harbor Labs
Friday Harbor, WA

Dr. Robin W Baird
Cascadia Research
Olympia, WA

Dr. Rich Osborne
Research Associate
The Whale Museum
Friday Harbor, WA

Dr. J. Pete Schroeder, DVM
Sequim, WA

Dr. Val Veirs
Professor of Physics
Colorado College
President of the Board,
The Whale Museum

CC: Governor Chris Gregoire
Governor Ted Kulongoski
Governor Arnold Schwarzenegger
Senator Patty Murray
Dams “Catch” More Salmon Than Fishermen: The Comparative Impact of Dams vs. Recreational and Commercial Fishing in the Columbia Basin

As the table below shows, the federal dams on the Snake and Columbia rivers are responsible for killing far more juvenile and adult salmon listed under the Endangered Species Act than is the incidental harvest of listed stocks in fisheries aimed at healthier stocks. This is the case whether the fish are harvested at sea or in the rivers or their tributaries. The dams kill as many as 92% of salmon headed out to sea, and up to another 25% on their way back upstream to spawn.

<table>
<thead>
<tr>
<th>Salmon or steelhead stock</th>
<th>% of salmon or steelhead killed by…</th>
<th>All ocean fishing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dams during downstream migration of young salmon to ocean¹</td>
<td>Dams during upstream migration of adult salmon²</td>
</tr>
<tr>
<td>Snake River spring/summer chinook</td>
<td>49% (47-51% range)</td>
<td>15.4% (6-25% range)</td>
</tr>
<tr>
<td>Snake River steelhead</td>
<td>51% (47-59% range)</td>
<td>16.8% (10-25% range⁶)</td>
</tr>
<tr>
<td>Snake River fall chinook</td>
<td>86% (78-92% range)</td>
<td>15.3% (8-20% range)</td>
</tr>
<tr>
<td>Snake River sockeye</td>
<td>N/A</td>
<td>16.9%</td>
</tr>
<tr>
<td>Upper Columbia River steelhead</td>
<td>53% (38-84% range)</td>
<td>5.9% (4-8% range⁷)</td>
</tr>
<tr>
<td>Upper Columbia River spring chinook</td>
<td>33% (25-45% range)</td>
<td>8% (7-9% range)</td>
</tr>
</tbody>
</table>

¹ Figures in this column are from the 2004 Federal Columbia River Power System (FCRPS) BiOp, Table 10.3, p. 10-4.
² Figures in this column are from the 2004 FCRPS BiOp, Table 10.4, p. 10-5. Actual adult mortality through the dam/reservoir system may be higher for upper Columbia spring chinook and Snake River spring/summer chinook (over 50% for the Snake River stock in some years) according to documents from the Joint Columbia River Management staff with the Washington and Oregon departments of fish and wildlife. See [http://wdfw.wa.gov/fish/crc/jan1806jointstaff.pdf](http://wdfw.wa.gov/fish/crc/jan1806jointstaff.pdf) at pp. 61-62.
³ This table does not include incidental tribal harvest of Endangered Species Act-listed salmon and steelhead stocks, as salmon fishing is guaranteed to the tribes by treaties with the United States and is unlikely to be significantly affected by upcoming federal salmon management decisions.
⁶ Figures for steelhead (both Snake River and upper Columbia River) do not include mortality for outmigrating would-be repeat spawning steelhead (kelts), which has not been addressed in federal dam management strategies.
ABOUT THE STUDY
The study was commissioned by the NW Energy Coalition and conducted by Energy Strategies, an independent consulting firm whose clients include power producers, transmission developers, utilities, and government agencies.

WHAT THE STUDY FOUND
• Balanced portfolios of clean energy resources, including solar, wind, energy efficiency, demand-response, and storage can replace the power and energy services provided to the Northwest by the four Lower Snake River Dams.
• New gas-fired generation is not required to address regional capacity needs.
• Replacing the dams with clean and renewable resources provides superior or equal results to replacing them with natural gas for cost, carbon emissions, system reliability, and ability to meet peak load requirements.
• The cost of replacing the dams with balanced clean energy portfolios is small compared to the cost of the regional power system and would amount to not much more than a dollar a month on an average residential bill.
• Balanced portfolios of clean energy resources have only minor impacts on GHG emissions (about 1%). If implemented in conjunction with regional greenhouse gas reduction policies, substantial emission reductions can be achieved.
• Even more cost effective and environmentally efficient outcomes than the study found are possible. That’s because the study did not try to identify an optimal mix of clean energy resources and its assumptions concerning the future costs of renewables were conservative.

WHAT THE FINDINGS MEAN
The Lower Snake River Dams Power Replacement Study has important implications for the federal agencies that own and operate the dams and who must, by court order, find an alternative management plan for the Columbia River power system that does not jeopardize the continued existence of salmon.
• Dam removal isn’t a choice between salmon and clean energy. The study shows that replacing the Lower Snake River dams with clean and renewable resources is a viable, reliable, and affordable option. The study also offers a framework from which the federal agencies can draw as they conduct their own court-ordered analysis.
• Even better solutions than the ones found by the study are possible. The study demonstrates the viability of replacing the dams with clean and renewable energy resources. However, it did not seek to identify an optimal clean energy solution. The court-ordered process offers the federal agencies an opportunity to do just that.
• A full study of dam removal needs to address factors beyond the scope of this study. These factors include the cost of decommissioning the dams, but also what are likely to be the even greater savings from avoided dam rehabilitation costs and the elimination of ineffective fish restoration programs.

For more information visit NWEnergy.org/LSRDStudy

April 4, 2018

“The region can remove the four Lower Snake River Dams and replace the power they provide with a portfolio of conservation and renewable energy resources while maintaining grid and transmission reliability at levels equal to or better than the current system and with little or no increase in greenhouse gas emissions.”

Energy Strategies, Lower Snake River Dams Power Replacement Study (April, 2018)
THE COLUMBIA-SNAKE RIVER BASIN:
With the four lower Snake River dams highlighted. The dark green below reflects intact, protected, contiguous, high-quality salmon and steelhead habitat upstream from the lower Snake River in southeast Washington, northeast Oregon and central Idaho.

Restoring a free-flowing lower Snake River and reconnectiong wild salmon to 5,500 miles of rivers and streams represents our very best Chinook salmon restoration opportunity on the West Coast.

For further information:
Joseph Bogaard, 206-300-1003
Sam Mace, 509-863-5696
Save Our wild Salmon Coalition
www.wildsalmon.org
TO: Interested Parties
FROM: Dave Metz and Miranda Everitt
FM3 Research
RE: Washington Voter Views of Wild Salmon and Snake River Dams
DATE: March 28, 2018

Fairbank, Maslin, Maullin, Metz & Associates (FM3) recently completed a survey of likely voters in Washington to assess their views of the state's salmon and the dams along the lower Snake River. The study found that Washington voters view preserving wild salmon as highly important; in fact, they prioritize it over preserving dams on the lower Snake River, and a majority supports a proposal to remove the dams. As voters learn more about the issue, support increases further.

Other key findings of the study include:

- Nearly four in five Washington voters say preventing the extinction of wild salmon in the state is "very important." At the same time, fully half (52%) call this "extremely important," and only 6 percent say this is "not too important" to them.

Figure 1: More than Three-Quarters Believe Preventing Salmon Extinction is Very Important

As you may know, we have had a significant decline of wild salmon in many areas of the state where there was a larger amount only a generation ago. Several species are now endangered. How important is it to you that we prevent the extinction of wild salmon in Washington State?

- Extremely important: 52%
- Very important: 26%
- Somewhat important: 15%
- Not too important: 6%
- DK/NA: 1%
• Given a direct choice between preserving wild salmon and preserving the dams on the lower Snake River, voters prefer salmon by a 38-point margin. In fact, nearly as many are undecided on the issue (19%) as put the dams first (22%).

**Figure 2: Voters Prefer Preserving Wild Salmon Over Dams**

*Overall, please tell me which of the following you think should be a higher priority.*

<table>
<thead>
<tr>
<th>Preference</th>
<th>% Chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preserving wild salmon in the Snake River</td>
<td>60%</td>
</tr>
<tr>
<td>Preserving the lower Snake River dams</td>
<td>22%</td>
</tr>
<tr>
<td>Neither/Don’t know</td>
<td>19%</td>
</tr>
</tbody>
</table>

• More than half (53%) of voters support removing the dams on the lower Snake River. As shown in Figure 3, voters favor removing the dams by a 21-point margin. Nearly three in ten (28%) "strongly support" dam removal, compared with 19% who "strongly oppose" it.

**Figure 3: A Majority Supports Removing Lower Snake River Dams**

*Over the past two decades, use of the Snake River dams for transportation has declined by 70%, and the dams only generate about 4% of the electricity used in Washington. At the same time, the dams have reduced wild salmon populations by acting as a barrier to adult salmon moving upriver to spawn, and young salmon moving back downstream. Having heard this, would you support or oppose removing these four dams on the lower Snake River in order to restore wild salmon?*

- **Strongly support**: 28%  
  - **Somewhat support**: 24%  
  - **Total Support**: 53%  
  - **Somewhat oppose**: 13%  
  - **Strongly oppose**: 19%  
  - **Total Oppose**: 32%  
  - **Undecided**: 16%

• Underscoring their support for dam removal and wild salmon protection, voters say they are willing to pay more personally to accomplish those goals. As shown in Figure 4 on the next page, solid majorities of Washington voters are willing to pay up to $7 monthly on their electric bills to restore wild salmon and improve water quality in the state. A majority (55%) is "very willing" to pay $3 per month.
Figure 4: Voters Are Willing to Pay More on Their Electric Bills to Restore Wild Salmon

Removing four dams on the lower Snake River would restore wild salmon and improve water quality, but might lead to a slight increase in electricity costs. Would you be willing to pay an additional ___ on your electric bill in order to ensure that wild salmon would be protected?

<table>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$7 per month</td>
<td>39%</td>
<td>24%</td>
<td>11%</td>
<td>22%</td>
<td></td>
<td>63%</td>
<td>33%</td>
</tr>
<tr>
<td>$5 per month</td>
<td>45%</td>
<td>21%</td>
<td>9%</td>
<td>22%</td>
<td></td>
<td>65%</td>
<td>32%</td>
</tr>
<tr>
<td>$3 per month</td>
<td>55%</td>
<td>14%</td>
<td>7%</td>
<td>21%</td>
<td></td>
<td>69%</td>
<td>28%</td>
</tr>
<tr>
<td>$1 per month</td>
<td>64%</td>
<td>11%</td>
<td>5%</td>
<td>18%</td>
<td></td>
<td>74%</td>
<td>23%</td>
</tr>
</tbody>
</table>

- **As voters learn more about dam removal and salmon, their support increases.** The survey also offered voters a variety of arguments for and against the dam removal proposal. Supportive messages increased support for dam removal to more than three in five (61%), while reducing the share of undecided voters by half, from 16 percent to 8 percent. Criticisms of dam removal reduced support (within the margin of error) to just below three in five (58%), but still left a majority in favor.

Figure 5: Majorities Support Removal Throughout an Exchange of Messaging

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Total Support</th>
<th>Total Oppose</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Opinion</td>
<td>53%</td>
<td>32%</td>
<td>16%</td>
</tr>
<tr>
<td>After Messages Supporting Removal</td>
<td>61%</td>
<td>31%</td>
<td>8%</td>
</tr>
<tr>
<td>After Messages Opposing Removal</td>
<td>58%</td>
<td>34%</td>
<td>8%</td>
</tr>
</tbody>
</table>

- **More than three in five (62%) oppose specific legislation to keep the dams.** More than two in five (42%) "strongly oppose" proposed legislation from Congresswoman Cathy McMorris Rodgers to maintain the dams, while just one-quarter (26%) support it (Figure 6 on the next page). In her home Congressional District (the 5th), patterns are similar -- 54 percent oppose the legislation (42% "strongly") and one-third (34%) support it.
Figure 6: Voters Oppose McMorris Rodgers' Bill

Representative Cathy McMorris Rodgers represents part of eastern Washington in Congress. Representative McMorris Rodgers has introduced legislation in Congress to keep the lower Snake River dams and prevent any new measures for aiding wild salmon. Does this legislation sound like something you support or oppose?

- Strongly support: 14%
- Somewhat support: 12%
- Somewhat oppose: 20%
- Strongly oppose: 42%
- Undecided: 12%

Total Support: 26%
Total Oppose: 62%

In sum, the survey results indicate that Washington voters strongly support a proposal to remove the four lower Snake River dams. They strongly prefer restoring salmon over keeping dams, and are willing to pay as much as $7 per month in additional costs on their electric bill to meet this goal. Majorities also oppose McMorris Rodgers' bill to preserve the dams -- including within her District.

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1 **Methodology:** From March 6-12, 2018, FM3 completed 400 telephone interviews (on both landlines and cell phones) with Washington voters who participated in the 2016 presidential election or have registered since then. The margin of sampling error for the study is +/-4.9% at the 95% confidence level; margins of error for population subgroups within the sample will be higher. Due to rounding, not all totals will sum to 100%.
EXCERPTS I – Southern Resident Orca
Studies and stories (Sept. 2017 – Feb. 2015)

Puget Sound’s Southern Resident Orca Population Drops To 30-Year Low”
-- NW Public Radio, Sept. 27, 2017
The southern resident orca population is suffering from two main problems: too much pollution, and not enough fish to eat. The two problems compound each other because, when orcas go through periods of starvation, they burn fat and release the toxins stored there into their bodies.

Endangered orcas are losing their unborn babies because they’re starving, study finds -- Oceana Blog, July 12, 2017
http://oceana.org/blog/endangered-orcas-are-losing-their-unborn-babies-because-they-re-starving-study-finds
The study is the first to demonstrate a clear link between orca miscarriage and poor nutrition brought on by the scarcity of their main prey.

Fate of Pacific Northwest orcas tied to having enough Columbia River salmon
-- Idaho Statesman, July 9, 2017
One of the most important food sources is spring chinook salmon from the Columbia River. Orcas use the mouth of the Columbia as a winter “buffet,” stopping on their annual migration from their home in the Salish Sea south to Monterey, Calif., and north to southeast Alaska.

“Every time they go by the Columbia, they stop and they forage for days and days and days on end,” Giles said. “They don’t behave like that in any (other) single location across their range.”

The decline of the orcas coincides with the drop in salmon numbers. Historically, two rivers were critical — the Columbia and the Fraser in Canada, where the salmon that the whales eat in the summer come from.

Study: Population growth is limited by nutritional impacts on pregnancy success in endangered Southern Resident killer whales. June 29, 2017
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0179824
The Southern Resident killer whale population (Orcinus orca) was listed as endangered in 2005 and shows little sign of recovery. These fish eating whales feed primarily on endangered Chinook salmon. Population growth is constrained by low offspring production for the number of reproductive females in the population...

Low availability of Chinook salmon appears to be an important stressor among these fish-eating whales as well as a significant cause of late pregnancy failure...

Results point to the importance of promoting Chinook salmon recovery to enhance population growth of Southern Resident killer whales....

Results of the SRKW study strongly suggest that recovering Fraser River (FRC) and Columbia River Chinook (CRC) runs should be among the highest priorities for managers aiming to recover this endangered population of killer whales. SRKW are
suffering significant reproductive loss due to lack of Chinook prey and associated effects.

**Without Major Interventions, the Orca's Days Are Numbered**
--Truthout Report, November 30 2016

*But the biggest issue is food.*

"They are very specific in the kinds of food they eat," Spong explained. "Orca prefer Chinook salmon and chum, and these are declining in recent decades, and this is directly impacting the whales." Like Spong, Garrett sees one of the primary issues facing orcas in the Pacific Northwest as that of food distribution and abundance, or lack thereof, and sees that as being directly related to ACD…

**'It's a sad day:' Researchers claim Puget Sound orcas are starving and dying**
--KOMO News, October 28 2016

Researchers claim, J-28, a 24-year-old resident orca, that they had watched from afar, died of malnutrition along with her calf.

*The founder of The Center for Whale Research and other activists used the occasion to renew calls for the removal or breaching of four dams located on the lower Snake River that feed into the Columbia River.*

**Survival of endangered orcas in the Salish Sea depends on restoring Chinook**
--Bellingham Herald Guest Opinion, February 27, 2015
http://www.bellinghamherald.com/opinion/article22278003.html

Recent research also confirms the importance of Columbia Basin chinook to southern resident killer whales. Southern residents often leave the Salish Sea to hunt at the Columbia’s mouth for both Snake and Columbia River chinook. But this isn’t actually news. In its 2008 orca recovery plan, NOAA acknowledges orcas’ historic reliance on Columbia Basin chinook and describes its population declines as “[p]erhaps the single greatest change in food availability for resident killer whales since the late 1800s...”

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**EXCERPTS II – Columbia-Snake Salmon Studies and stories (Oct. 2017 - 2016)**

**Acidic oceans and warm rivers that kill Idaho’s salmon might be norm in 50 years**
--Idaho Statesman, Oct. 9, 2017

*That year’s extraordinary combination of overheated river water and low flows killed hundreds of thousands of returning sockeye salmon, devastating a run that had rebounded from near-extinction...*

*Biologists say the high-elevation, pristine spawning habitat in Central Idaho’s roadless and wilderness areas can serve as Noah’s Ark for these remarkable, adaptable fish if we give them a chance...*

*But water temperatures in the Columbia and Snake rivers have been high for years, the federally funded Fish Passage Center in Portland noted in a 2015 report. The reservoirs*
behind eight dams built along those rivers since 1938 have acted like giant solar collectors, often heating up the slowed waters to the 68-degree threshold of concern...

Like the salmon, the residents of the Pacific Northwest are people of place. With the rest of the world, we must find ways to farm, produce energy and live while reducing greenhouse gases and adapting to climate change...

“Can fish, farms and communities, from Salmon to Lewiston to Portland, find common ground as the rivers we all use get hotter?” Ford said. “I think that common ground is healthier lands and waters, and not leaving people or salmon behind.”

Scientists survey Pacific Northwest salmon each year. For the first time, some nets are coming up empty. --Seattle Times, Oct 7, 2017
Surveys off Washington’s coast detected low numbers of juvenile salmon from the Columbia River, including spring chinook, a bad omen for orcas and other species that rely on the king of fish...

The scientists logged some of the lowest numbers of yearling Snake River spring chinook recorded since the survey began in 1998...

Low survival of juvenile salmon also portends a paltry return of adult salmon in two years and longer into the future — bad news for animals that depend on salmon for their own sustenance. Especially southern-resident killer whales, already at a 30-year low in their population, following the recent death of an emaciated calf...

That’s bad news for southern-resident killer whales, which just won’t switch to other prey, even when their preferred food — chinook salmon — are scarce. Their diet is culturally embedded in teachings reinforced in intergenerational family clans. The result is that orcas, so far, are starving rather than switching to seals and the other marine mammals that orca whales elsewhere devour...

The findings also underscore the powerful role the ocean plays in salmon survival, as well as the importance of creating and maintaining good freshwater habitat, to help salmon deal with the vagaries of the sea...

Remove 4 dams, leave these fish alone, and they may be able to replenish themselves --Idaho Statesman, Sept. 10, 2017
These native fish in Central Idaho’s pristine habitat are in the worst shape since 1995, when no chinook returned amid some of the worst recorded Pacific Ocean conditions for salmon, and 2015, when low river flows devastated their numbers.

These salmon have a high risk of going extinct if conditions downstream from the Middle Fork — the dams, predators like sea lions, the poor ocean conditions and climate change — don’t improve, said Russ Thurow, a U.S. Forest Service Rocky Mountain Research Station scientist.

Warm-water conditions in the Columbia and Snake Rivers are challenging cold water salmon and steelhead — and the problem is likely to get worse because of climate change. --Seattle Times, Aug. 18, 2017
Salmon and steelhead are in hot water — a problem scientists warn is going to get worse because of climate change. Steelhead returning this year to the Columbia and Snake rivers migrated out of the river during horrendous conditions in 2015, which included record low flows and high water temperatures.

Now those steelhead are migrating back through reservoirs where water temperatures at some Columbia and Lower Snake River dams, thanks to a record Northwest heat wave, have been stuck this summer above 70 degrees for days on end — potentially lethal for salmon and steelhead.

PRESS RELEASE: Scientists send letter to Northwest policymakers affirming the benefits of “spill” to provide critical interim help for endangered wild salmon and steelhead until a lawful plan is developed. Aug. 16, 2017

Dave Cannamela, retired fisheries biologist (Boise, Idaho): “Spill is without a doubt the most effective interim measure we can implement to help maintain critically endangered salmon, steelhead, and lamprey populations in the Columbia and Snake Rivers. While spill is only an interim measure it is a very important one because it buys us time to work collectively to develop a durable, effective, long-term solution. Everyone will benefit when salmon and the ecosystem, economy, and cultures they support are restored.”

A changing electrical grid may make Snake River dams expendable — and help save salmon – Tri-City Herald, August 4, 2017

The four dams of the Snake River in Washington are less valuable now due to a power surplus caused by wildly successful energy-efficiency programs, cheap natural gas, and rapidly growing wind and solar energy options.

Twenty years ago, arguments against breaching those dams centered around the loss of crucial power supplied to the region. But as the role of the dams in the Northwest hydrosystem changes, so does their role in the political and environmental ecosystem. As the four lower Snake dams become less relevant pieces of a larger, flexible network, they become more vulnerable.

Salmon Survival Study: Snake River Fish Not Meeting Return Goals
http://www.cbbulletin.com/437917.aspx

As it has found in each year it has produced the CSS, smolt-to-adult returns of salmon and steelhead out of the Snake River are not meeting the 2 percent to 6 percent SARs goals set by the Northwest Power and Conservation Council. However, fish out of the mid-Columbia River generally had SARs that fell within the NPCC range.

Overall SARs of Snake River wild spring/summer Chinook and steelhead fell well short of the Northwest Power and Conservation Council’s 2 – 6 percent SAR objectives, while those from the mid-Columbia region generally fell within this range,” the CSS report says. “For Snake River populations, none of the passage routes (in-river or juvenile transportation) have provided SARs within the range of the NPCC objectives.”
Lower Snake freight, Ice Harbor Dam

Data source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States
Additional Scientific Studies and Reports Pertaining to Spill and Lower Snake River Dam Removal

Comparative Survival Study of PIT-tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye (2017 Annual Report)  
(http://www.fpc.org/documents/CSS/CSS_2017_Final_ver1-1.pdf)

(http://www.fpc.org/documents/CSS.html)

Smolt Monitoring Gas Bubble Trauma and River Conditions. Fish Passage Center memo. (May 8, 2018).  

Ten year review of gas bubble trauma monitoring at FCRPS projects and related spill operations and total dissolved gas. Fish Passage Center memo (2008-2017).  
(http://www.fpc.org/documents/memos/65-17.pdf)

The effect of water temperature on steelhead upstream passage. Fish Passage Center memo. Oct. 31, 2016  
(http://www.fpc.org/documents/memos/56-16.pdf)

Data Request Regarding Drawing Down Lower Granite Reservoir to Better Meet Water Quality Standards for Temperature. Fish Passage Center memo, June 24, 2016.  
(http://www.fpc.org/documents/memos/42-16.pdf)

Preliminary 2015 juvenile survival estimates and environmental conditions. Fish Passage Center memo, March 29, 2016.  
(http://www.fpc.org/documents/memos/28-16.pdf)

Requested data summaries and actions regarding sockeye adult fish passage and water temperature issues in the Columbia and Snake rivers. Fish Passage Center. Fish Passage Center memo. October 28, 2015.  
(http://www.fpc.org/documents/memos/159-15.pdf)

Benefits of spill for juvenile fish passage at hydroelectric projects. Fish Passage Center memo, July 14, 2011.  

All Fish Passage Center Memos: 2018 – 2000.  
(http://www.fpc.org/documents/FPC_memos.html)


http://www.nw council.org/fw/program/2014-12/program/


Influence of river conditions during seaward migration and ocean conditions on survival rates of Snake River Chinook salmon and steelhead. Petrosky, C.E., and H.A. Schaller. 2010. Ecology of Freshwater Fish 10:520-536.


