The Case against Breaching the Four Lower Snake River Dams to Recover Wild Snake River Salmon,

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A Rebuttal To: "The Case for Breaching the Four Lower Snake River Dams to Recover Wild Snake River Salmon," Carl Christianson et al.

Introduction

The November 2015 report by Christianson et al makes several misleading arguments in favor of removing the four lower Snake River dams to bolster survival of four Snake River wild salmon runs listed as threatened or endangered under the Endangered Species Act.

The report minimizes the cumulative impact of all human activity in the Columbia-Snake River system and is overly optimistic in its premise that breaching the four dams on the lower Snake River would alleviate stress for anadromous fish and return Idaho's wild salmon runs to historic levels. The report fails to consider the historic impact of overharvest, the consequences of all dam construction on fish habitat and fish runs, and the effects of nearly 150 years of hatchery practices on the overall integrity of the wild fish populations. The report inaccurately states that the lower Snake dams inundated the majority of the fall Chinook spawning area, and blames 2015 warm water temperatures and losses of Snake River sockeye on those dams.

The report condemns the multitude of solutions that have been implemented to aid downstream and upstream salmon migration past the dams, and ignores sound science that demonstrates the success of multiple projects and improvements of many salmon runs. This rebuttal will argue against several key claims made by Christianson et al. These erroneous claims are: the lower Snake River dams kill or stun high percentages of juvenile salmon; the Juvenile Fish Transportation Program does not work; fish ladders impede adult fish moving upriver; the lower Snake River dams increase water temperatures and disease; with the dams there are more fish predators; dams interfere with juvenile physical development; hatchery fish have caused the decline in salmon size; breaching of the four lower Snake River dams can be compared to breaching of Elwha River dams.

A final point of consideration is that Christianson et al favors a narrow perspective over a holistic approach to the multiuse river system and the environmental benefits it brings to a world looking to limit global warming.

Snake River Salmon runs declined long before construction of the lower Snake River dams

The decline of the Columbia River salmon runs, including the Snake River runs, was started by over harvest in the lower Columbia from the 1860s to the early 1900s and in the lower Columbia and Pacific Ocean from the early 1900s to the 1970s. Overharvest and loss of spawning habitat due to upstream dams and human activities before the lower Snake River dams were built reduced the runs to levels far, far below the estimate of 12 to 16 million before Euro-Americans arrived.   Harvest data gathered by the fishery agencies of the 19th and early 20th centuries clearly show declines in the harvest of Chinook after it peaked in 1884 at nearly 43 million pounds. Declines of coho, sockeye, pink, and chum salmon followed and the combined harvest including Chinook peaked at over 46 million pounds in 1911. Harvest of all salmon populations declined severely thereafter falling to just over 5 million pounds by 1960.[1] Counting of Columbia River adult salmon became possible when Bonneville Dam went into operation in 1938. Less than 500,000 adult salmon (total of all species) escaped upstream in 1939, and runs averaged less than 600,000 per year until the 1970s. Because the lower Snake River dams became operational years later, Ice Harbor – 1962, Lower Monumental – 1969, Little Goose – 1970, and Lower Granite – 1975, they clearly could not be responsible for the over 95% decline from the historic

12 – 16 million. In fact, returns have increased markedly since 2000.   The 2015 return of the combined species of salmon over Bonneville Dam was over 2.5 million, the second highest count after 2014 at 2.66 million.[2,9]

Overharvest caused the initial and substantial decline in Snake River salmon runs.

Starting in 1866, introduction of the canning process to the Columbia Basin led to the mining of Columbia River salmon. The first cannery was built on the lower Columbia followed by over 50 more canneries upstream as far as The Dalles, OR. Gill nets, beach seines, traps, and fish wheels were the major methods of harvest. As stated above, harvest peaked first on Chinook in 1883 at 43 million pounds canned. The Chinook decline began and harvest peaked again in 1911 at over 46 million pounds on Chinook, coho, sockeye, pink, and chum salmon.[1] In the early 1900s, advent of the gasoline engine made it possible for fishermen in smaller boats to intercept fish in the ocean by trolling, or with gill nets or seines. This exacerbated overharvest as Columbia River salmon were taken in the ocean off Oregon, Washington, British Columbia, and Alaska. Overharvest continued until court actions began to restrain it in the 1970s and ESA listing curtailed it especially in the lower Columbia. Current harvest control measures have played a significant role in restoring the salmon runs.

Significant habitat loss is the result of multiple dam projects; spawning grounds were lost long before the construction of the lower Snake River dams

Christianson et al would have you believe that 85 percent of the Snake River fall Chinook spawned in the 140 mile stretch affected by the lower Snake River dams. That is not true. Historically, fall Chinook spawned in the Washington portion of the Snake River only near the mouths of the Palouse and Clearwater Rivers. Tom Meekin[4] of what was then the WA Department of Fisheries stated at a joint Corps/fisheries agency meeting in the 1970s that fall Chinook did not spawn in the mainstem lower Snake River because the water temperatures were too high. Eighty five percent of fall Chinook spawning took place from Hells Canyon Dam upstream to Shoshone Falls where migration ended naturally. [5,7] However, irrigation dams diverted so much water that the flow above Shoshone Falls was reduced to zero at Milner Dam (constructed in 1905) rendering much of the fall Chinook spawning area below the falls too shallow and too warm by the early 20th century. Only return flow in the Thousand Springs area provided reduced spawning area in the mainstem downstream.[6]   Mainstem dams without fish passage (Upper and Lower Salmon, Bliss, C.J. Strike, and Swan Falls dams) carved off segments of spawning habitat. Fall Chinook also spawned in the lower reaches of the Weiser, Payette, Boise, Bruneau, Owyhee, Malheur, Burnt, Salmon, Grand Ronde, Imnaha, and Clearwater rivers. All of these tributaries were dammed between the late 1800s and the 1940s except the Grand Ronde, and Imnaha.

Brownlee Dam blocked all salmon access above Hells Canyon in 1959 bringing the total loss of fall Chinook habitat to 85 percent, and loss of spring and summer Chinook and steelhead habitat to over 50 percent in the Snake River Basin. When Oxbow Dam closed in 1961, tens of thousands of fall Chinook piled up in the oxbow for which the dam is named. Charles Koski, [4] then of the Bureau of Commercial Fisheries (now NOAA Fisheries), asked Idaho Power Company to release water to provide Oxygen and cool water for the trapped fish. Idaho Power refused, but they did provide air compressors to aerate the water. The make-shift effort did not give the salmon a place to spawn, however, and they perished.

Fish ladders at the lower Snake River dams continued to provide access to the lower Salmon, Grand Ronde, Imnaha, and Clearwater, but Lewiston Dam blocked fall Chinook access up the Clearwater from 1937 to 1973 when it was removed by the Corps of Engineers.

Current fall Chinook spawning areas and programs

Removing Lewiston Dam re-opened the lower Clearwater to fall Chinook spawning. Supplemented with fall Chinook from Lyons Ferry Hatchery (production goal up to 9 million subyearling fall Chinook) and acclimated at the Big Canyon site near Peck, ID, the lower Clearwater natural production has increased substantially since the mid-1990s. The Nez Perce Tribe has also transported Lyons Ferry Hatchery fall Chinook to Captain John and Pittsburg Landing acclimation sites in Hells Canyon to supplement natural production. Lyons Ferry Hatchery also releases fall Chinook into Lower Monumental Reservoir to return brood stock to the hatchery and provide sport fisheries from the mouth upstream. Although the lower 140 miles were too warm for fall Chinook spawning before the dams were built, creating deeper, cooler reservoirs created conditions just below the dams where eggs and fry of fall Chinook were found during dredging activities and follow-up scientific investigations. Studies in the late 1990s revealed fall Chinook spawning below Lower Granite, Little Goose, and Lower Monumental dams. This new spawning area was enhanced from the mid-1990s to the present by the release of cool waters from Dworshak Reservoir on the North Fork of the Clearwater River. In addition to Lyons Ferry production and greatly increased natural spawning, Idaho Power funds the production of a million juvenile fall Chinook from Oxbow Hatchery. These sources combined to return 70,000 fall Chinook over Lower Granite Dam in 2015.

The NOAA Fisheries' draft Snake River Fall Chinook Recovery Plan now available for review

This plan includes an option of restoring fall Chinook above the Hells Canyon Complex.[7] Presumably adult salmon would be trapped at Hells Canyon Dam and transported above Brownlee Reservoir. Access for salmon to the mainstem Snake River would be restored from Brownlee Reservoir upstream to Swan Falls Dam. Access would also be restored to Eagle Creek, the Powder River, the Malheur River, the Weiser River, the Payette River, and Boise River up to dams on those tributaries. Some of those tributaries, Eagle Creek for example, also supported spring or summer Chinook and steelhead. Sockeye could be restored to the Payette basin if trapped and transported above Payette Dam. A program is underway at this time to restore Chinook and sockeye above Cle Elum Dam on the Yakima River. New juvenile salmon passage technology has been developed by the Bureau of Reclamation that was not available when passage above Brownlee Dam was abandoned in the early 1960s. As a slack water storage reservoir, the Bureau of Commercial Fisheries (now NOAA Fisheries) concluded that juvenile fish could not be screened out of the turbine intakes, and that without current in the reservoir, juvenile salmon could not find their way downstream. Recent moderately successful bypasses on the Deschutes River (OR) and Skagit River (WA) show that juvenile salmon can be attracted and bypassed from storage reservoirs. The new BR technology promises to be more successful because the inlets function over a 78 foot fluctuation of the reservoir, and are located on the shoreline like the outlet of a natural lake rather than offshore like the Deschutes and Skagit facilities.

150 years of fish hatcheries and cumulative impact

The first salmon hatchery in the Columbia Basin was constructed by commercial fisheries interests, not by fishery agencies that were little more than fish wardens at the time. Overharvest caused enough concern by 1877 that commercial fishing magnates brought an eminent fisheries expert, Livingston Stone, from the east coast to the Columbia Basin to start a salmon hatchery on the Clackamas River in Oregon.[1,5] Subsequent establishment of federal and state fishery agencies put them in the business of building hatcheries to bolster runs to support commercial and sport fisheries. In 1898, the Oregon Fish Commission dammed the Wallowa River and took all the Chinook, coho, sockeye, and steelhead for their eggs. The eggs were fertilized and taken to Bonneville Hatchery where the fry were released into the lower Columbia. They did not know that salmon returned to natal streams. The runs were wiped out by 1903 and the dam was removed in 1915. The first hatchery attempted in Idaho was below Swan Falls Dam in 1901 where fry were returned to the river and eyed eggs were transported to Bonneville to shorten the migration to the sea. From 1902 to 1904, Oregon and Idaho agencies operated a fall Chinook hatchery near Ontario at the head of Hells Canyon.[5,10] For a few years they collected up to 25 million eggs and released fry back into the Snake River. The hatchery failed because overharvest in the lower Columbia reduced the runs so much that sufficient eggs to warrant continuing could not be obtained. Years later the site was inundated by Brownlee Reservoir.

By the late 1980s, there were over 70 hatcheries in the Columbia Basin which released over 250 million juvenile Chinook, coho and steelhead into the Columbia and its tributaries. Because the huge releases did not produce the expected adult returns, production was reduced to 140 million juveniles by 2014. Hatcheries were first built to bolster runs for harvest. Then hatcheries were built to replace runs whose access to spawning areas was blocked by dams like Grand Coulee, Lewiston Dam, the Hells Canyon dams, Dworshak Dam and others. Eleven hatcheries compensate for juvenile salmon mortalities caused by the four lower Snake River dams (Lower Snake River Fish and Wildlife Compensation Plan - 1976). They were designed to replace juvenile salmon lost while migrating through the four dams and reservoirs. Although many criticize the use of hatchery fish, who demanded them? Federal laws, especially the Fish and Wildlife Act (1934 as amended 1946 and 1958) require federal water resource development agencies to coordinate with the federal and state fish and wildlife agencies and mitigate for losses caused by developments like dams. The Corps of Engineers did coordinate from the 1950s through 1975 to develop the LSRFW Comp. Plan. The Northwest Power Planning and Conservation Act of 1980 established the Northwest Power and Conservation Council and put the Administrator of the Bonneville Power Administration in charge of developing and funding a program to further compensate for the fish and wildlife losses caused by the Federal Columbia River Power System (FCPRS).[5] The NPPC and BPA have had a public coordination process since the early 1980s. The BPA has funded more hatcheries including the building of Springfield Hatchery for Idaho Fish and Game for a captive brood stock program to rebuild the Salmon River sockeye runs. Federally funded hatcheries in the Columbia Basin were demanded by the commercial fishery interests or by fishery agencies and/or Tribes under the Coordination Act or the Power and Conservation Act.

Use of hatchery fish by fishery agencies and Tribes

In their efforts to produce more fish for commercial, sport, and tribal fisheries, agencies and Tribes have transferred fish and/or eggs from hatchery to hatchery, or from one stream or river to another for over a century. In addition to the Wallowa and Swan Falls examples above, when Rapid River Hatchery did not gather enough spring Chinook to meet their mitigation goal (Hells Canyon Complex – Salmon River), eggs have been transferred from Dworshak Hatchery (Dworshak Dam – Clearwater river). A more extreme example is Idaho Fish and Game's effort to restore Salmon River sockeye. From 1983 through 1986 IDF&G transplanted Babine Lake (British Columbia, Fraser River) sockeye into Alturas and Stanley lakes in the Salmon River Basin.[10] In the 1960s, Skamania Hatchery steelhead stock was commonly used by many hatcheries in Oregon and Washington. Carson Hatchery stock spring Chinook from the Wind River hatchery were derived from spring Chinook destined for upriver tributaries removed from the fish ladder at Bonneville Dam (fishery managers had no idea what tributary each adult was destined for). Rapid River Hatchery on the Salmon River started with Carson Stock as did the Methow stock in the mid-Columbia. The litany could go on and on.

> ***Suffice it to say that stocks have been transferred or strayed willy-nilly all over whatever Columbia Basin spawning areas remain accessible. Returning salmon and steelhead now are either marked fish (marked in hatcheries or where captured for research) or un–marked fish (progeny of naturally spawning fish or fish released from hatcheries where they are not marked). It is highly unlikely that there are any truly "wild" fish in the Snake River Basin as purported by Christianson, et al., or even the Columbia River Basin for that matter.***

The lower Snake River dams are not responsible for increased water temperatures and thermal losses of Snake River sockeye

The lower Snake River dams have not increased water temperatures over historic levels as purported by Christianson, et al. In 1953, the water reached 83°F at the mouth of the Snake River. In a mid-1950s study, it reached up to 77°F. When Ice Harbor Dam went into operation (1961), a continuous record of water temperature became available. Highest summer temperatures never exceeded 77°F even after Lower Monumental (1969), Little Goose (1970) and Lower Granite (1975) impounded reservoirs upstream. Each dam has its own continuous record of water temperature.[2]

Instead of increasing water temperatures, the lower Snake River dams pass hot water downstream reservoir by reservoir. By starting with water temperatures above Lower Granite Reservoir in Hells Canyon (Anatone Gage: up to 78°F), and Clearwater River (Orofino Gage: 75 to 80°F), it is possible to follow the increase in temperature from reservoir to reservoir down to the mouth of the Snake River. The lower Snake River reservoirs are run of river reservoirs. That means that the water enters at the upper end and travels down to the dam in 2 to 7 days depending on the volume of flow. They are not slack water pools that stratify like storage reservoirs or natural lakes as often claimed, the water is continually moving.

The water temperature situation changed in the early 1990s when the Fish Passage Center representing the fishery agencies and Tribes requested cold water releases from Dworshak Reservoir on the Northfork of the Clearwater River. Their expressed purpose was to cool off the lower Snake River water temperatures for juvenile and adult fish migrations. For over 20 years, the Corps of Engineers has endeavored to keep the lower Snake River water temperature below 68°F if possible by releasing 50 to 55°F (Spalding Gage) water from Dworshak Reservoir. However, 2015 was an anomalous year. Air temperatures above 100°F in the Columbia Basin in June combined with low river flows plus Indian and sport fisheries to reduce a run of over 500,000 sockeye at Bonneville Dam to less than 280,000 over McNary Dam. The flow of the Columbia below McNary to Bonneville was lower and warmer sooner than normal, exposing sockeye and other cool water fishes to more stress and disease than usual.

Contrary to the lower Snake River dams causing this problem as espoused by Christianson et al, it was a region-wide environmental problem. Figure 1 shows fungus infected sockeye photographed in Drano Lake, a sub-impoundment of Bonneville Reservoir at the mouth of the Little White Salmon River. Figure 2 shows a similarly infected sockeye from the Fraser River in British Columbia in 2015, plus an example of pre-spawning mortalities from Shuswap Lake on a lower tributary of the Fraser River in 2010.[12] In 2015, nearly 50 percent of the Columbia River sockeye perished in the lower river, and fishery managers estimated over 90 percent pre-spawning mortality below the Stanley Basin. Mortalities from the mouth of the Fraser in warm years often range from 50 to over 90 percent depending on the distance and rigors of the trip to upstream tributaries and lakes. According to BC Biologists, diseases and delayed entry into freshwater stresses sockeye and they expend precious energy before they even enter freshwater on their spawning run. Then they face further stresses in unusually warm water using more energy and losing their ability to ward off fungus and diseases. Commercial salmon farms concentrate Atlantic salmon in rearing pens in the migration route of Fraser River sockeye smolts that migrate north through the Strait of Georgia. Sea lice that proliferate in the crowded pens attach to passing wild sockeye smolts greatly increasing juvenile mortality in the ocean. Salmon diseases like Infectious Salmon Anemia, Salmon Leukemia, and Piscine Reo-Virus have been introduced by Atlantic salmon brought from Norway in the 1990s. These diseases have caused significant curtailment of salmon farming in Norway, other European countries, and have devastated fish farms in Chile. Most Fraser River sockeye must swim past a multitude of fish farms in the Georgia Strait, and the diseases have been identified as the cause of mortality in the estuary and up the Fraser River. Because of their debilitated state, low water, and high temperatures, mortality to some tributaries was up to 99 percent before the sockeye could spawn. Thus, populations experience high mortalities in the Columbia River with dams and in the Fraser River with no dams.

Figure 1: Fungus infected Columbia River sockeye in Drano Lake, White Salmon, WA, in August 2015. USGS Photo.

Figure 2: Fraser River sockeye with fungus patches, 2015, and Fraser River prespawning mortality due to high water temperatures, Shuswap Lake, BC, 2010.

Meticulous planning and agency involvement are restoring salmon populations

Climate impact mitigated in 2015 Snake River sockeye run

Despite estimated losses of 50 percent in the lower Columbia River, and a drop from the normal 44 to 1 percent survival from Lower Granite Dam to the Redfish Lake trap, a combination of 800 captive brood stock and 56 natural returning adults (51 trucked from Lower Granite Dam) allowed the release of 494 sockeye into Redfish lake and 98 into Pettit Lake to spawn in 2015. Idaho Fish and Game also gathered over a million eggs from the remaining brood stock and expect to have 750,000 young fish for the 2017 release.[10]

Records show naturally spawning fish are being restored throughout the Snake River Basin

Idaho Department of Fish and Game has been surveying spring/summer Chinook spawning since 1957.[13] The lowest spring/summer Chinook count at Lower Granite Dam came in 1995 at 2,327 fish. IDF&G counted less than 270 redds. In 2015, 132,604 spring/summer Chinook crossed Lower Granite, an increase of almost 5,700 percent since 1995. Over 450 redds were found on the South Fork of the Clearwater River which had been blocked by Grangeville Dam until 1963. An estimated 28,000 naturally spawning fish produced over 4,100 redds in 2015, an increase of over 1,500 percent over 1995. In 2011, over 6,500 redds were found in Idaho streams.

Fishery agency/Corps collaboration

Before the passage of the Fish and Wildlife Coordination Act in 1934, the Corps of Engineers coordinated with the state and federal fishery agencies concerning fish passage at main stem dams on the Columbia. The Corps coordinated the permitting of Rock Island Dam (1933) including the first adult passage ladders. The Coordination Act was passed to ensure collaboration with state and Federal fish and wildlife agencies, and provided for mitigation of impacts to fish and wildlife. The Coordination Act was amended in 1946 and 1958 to increase the level of mitigation. Although the Corps collaborated with the fish and wildlife agencies prior to 1951, an official program was instituted in the Northwest Division that year, and official funding of the program began in 1953. That program primarily funded research related to adult fish passage through the early 1960s, and concentrated on juvenile fish passage and survival at the dams from then to the present. As stated by Christianson et al., hundreds of millions have been spent on studies and improvements to adult and juvenile fish passage and related dam caused issues. Earlier coordination committees have morphed into the Anadromous Fish Evaluation Program governing research, and the Technical Management Team at which the Corps, state and federal fishery agencies, the Tribes, and other interested parties coordinate the operation of the dams and reservoirs. The AFEP typically funds around 50 research projects by state, federal, university, and private contractors at a cost of around $100 million per year. Contracts are divided between the Portland and Walla Walla districts according to the dam or passage issue being studied.[14, 15] All fish passage issues and improvements at the dams have been thoroughly coordinated, researched, and evaluated under the AFEP program.

Rebuttal to specific claims made by Christianson et al

Dams kill or stun juvenile salmon

When Bonneville Dam was built in the late 1930s, studies showed 92 percent survival through the turbines. Studies at McNary Dam in the 1950s gave similar results for turbine passage, and spillway survival in the 95 percent range. As dam head increased and turbine size increased, estimated mortality increased depending on how the turbines were operated. Studies began in the 1960s to determine ways to safely bypass juvenile salmon around the turbines. These studies resulted in the development of turbine intake screens and juvenile bypass/collection systems. In the interim while studies were conducted and bypasses were being installed, juvenile fish were collected at uppermost dams and transported around lower dams. Special fish trucks were used in the 1970s, but their capacity was limited (up to 17,500 fish per load). As collection systems improved screening more fish into bypasses, and more bypasses were installed, transportation expanded. Responding to severe drought conditions in 1977, the Corps added barges for transport. The barge fleet expanded to two barges capable of transporting up to 230,000 fish per load (1978), two capable of 500,000 fish per load (1980 and 81), and two capable of 750,000 fish per load (1986). From Lower Granite, Little Goose, and Lower Monumental Dam up to 90 percent of the Snake River spring migrants were transported in the mid-1990s. Coupled with fish collected and transport from McNary Dam, at the peak over 22 million fish were transported.

Concurrent with the development of the transport program, juvenile fish bypass systems were being improved almost continuously from the 1960s to the present. Fish screens became more efficient, turbine operations less damaging to juvenile fish, and bypasses were designed to be safer and less stressful to juvenile salmon. Currently studies primarily by NOAA Fisheries estimate survival through turbines increasing from 93 to 97 percent (improved turbines) as old ones are replaced. Screens developed and improved since the 1970s divert up to 96 percent of steelhead, up to 85 percent of spring and summer Chinook, and up to 65 percent of fall Chinook into bypasses around the turbines. Bypass survival ranges from 96 to 100 percent.[15]

Spill is the safest way to pass fish

In addition to reducing turbine injuries and mortality, in the late 1990s, the Corps initiated a program to provide surface bypasses to avoid juvenile fish having to enter the turbine intakes. This culminated in the current spill program.

At all eight Corps dams spilled water passes under normal spillway gates at 40 to 50 feet of depth. The result is a jet of water shooting out from under the gates at about 35 miles per hour with an instantaneous release of 2.2 to 2.4 atmospheres of hydraulic pressure. With this instantaneous pressure drop, gas in the blood of the fish can boil causing gas bubble trauma similar to "the bends" in humans, causing stress, injury, or death.[15] The Corps planned to use overflow spillway weirs to pass water at a depth of about 10 feet, or 1 to 1.3 atmospheres hydraulic pressure. The fishery agencies required spill under a normal gate on either side of the new gate theoretically to minimize predation below the spillway. However, environmental activists convinced Judge James Redden that spill is the safest route for juvenile salmon to migrate past the dams, and the Judge ordered the Corps to provide spill at all spill bays. At Ice Harbor Dam, that meant one overflow spill bay and nine undershot spill bays. At the other three lower Snake River dams, that meant one overflow spill bay and seven undershot bays. Although spillway survival is about 98 percent, passing the additional water under the additional spill gates increases the amount of dissolved gas going into the river and the number of juvenile fish exposed to decompression going under the normal spill gates.

More research, facility modifications, and operational improvements have been done related to the lower Snake River and Columbia River dams than any other dams in the world. From an estimated 85 percent per project survival estimated by the fishery agencies in the 1970s, per project survival has improved to over 95 percent survival in optimal flow years. Even in 2015, survival was higher than in the 1970s although early and prolonged exposure to warmer water reduced survival dam to dam. Survival through the eight dam system varies greatly from year to year, inversely related to the amount of flow and temperature of the water. In higher flow years, system survival is approaches what some biologists think it was before the Corps dams.

The Juvenile Fish Transportation Program does not work

The transportation program was developed by what is now NOAA Fisheries. Research began at Ice Harbor Dam in 1965 and progressed to Little Goose (1970), then Lower Granite Dam (1975). By 1980, the fishery agencies concluded that it was an operational program. The Corps of Engineers began operating the program under the guidance of the Fish Transportation Oversight team comprised of a Corps biologist, a federal fishery biologist, and a state fishery biologist. To ensure proper handling of the fish at the dams, state biologists were employed at each collector dam (IDFG at Lower Granite, ODFW at Little Goose, and WDFW at Lower Monumental and McNary dams). Biologists were also hired seasonally by the Corps to monitor and assure the health of fish in the barges. A Corps biologist and assistant biologist along with seasonal bio-technicians and facility personnel operate and maintain facilities at Lower Granite, Little Goose, Lower Monumental, and McNary dams. At Ice Harbor, John Day, The Dalles, and Bonneville dams, the Corps also employs biologists for adult and juvenile fish bypass programs. Records are kept for each collector dam and for every truck or barge load of fish transported and released below Bonneville Dam.

Year after year, the survival rates have been over 95 percent for trucked fish and over 98 percent for barged fish with the vast majority of fish transported by barge. Transportation timing has been adjusted as continuous research results provided better information on adult return rates for in-river and transported fish. Originally, the intent was to get juvenile fish downstream to avoid loss at dams and delays caused by the reservoirs. As research showed that transport actually got fish downstream faster than the natural rate, start dates were adjusted later. In 2001, severe drought conditions reduced per project in-river survival to less than 75 percent for Snake River spring/summer Chinook and steelhead. Transport was maximized to get 90 percent of the Snake River juveniles below Bonneville Dam at 98 percent survival. In 2015, with in-river survival of 89 percent per project, the fishery agencies did not approve starting transport until May, and by the time it had started, half the Snake River outmigration had passed the collector dams, so adult returns will be affected by this decision in the coming years.

The transportation program has been evaluated by NOAA Fisheries and others for over 50 years. Although straying has been identified as a potential problem, rates of straying have not exceeded natural rates enough for the fishery agencies and Tribes to officially stop the program.

Fish ladders impede fish moving upriver

From the inception of Bonneville Dam through the development of the lower Snake River dams, the Corps drew upon the best expertise and collaborated fully with the state and federal fishery agencies in developing fish ladders for their dams. Concepts were modeled at the Bonneville Hydraulic Laboratory through the 1970s, then at the Waterways Experiment Station in Mississippi. Fishery agency personnel were involved in not only the design of the fish ladders, but also in design and hydraulic testing of powerhouse collections systems, location of fishway entrances, design of entrances, and location of exits into the forebay above the dam. Powerhouse collection systems typically include main entrances near the shore, main entrances near the spillway, and a series of small entrances across the downstream face of the powerhouse. In addition to water flowing down the ladder from the reservoir above, auxiliary water is added at locations within the ladder, at junction pools near entrances, and across the face of the powerhouse to make up for water flowing out through entrances. At most Corps dams, a second ladder with auxiliary flow is provided on the other side of the spillway. At Lower Granite Dam, the fish ladder starts with 75 cubic feet per second (cfs) from the forebay, and another 1,750 cfs are added to attract fish at the two south shore entrances, at six entrances across the downstream face of the powerhouse, at two north power house entrances, and at the north shore entrance on the far side of the spillway. Fish swim from the north spillway entrance through a tunnel under the spillway to the powerhouse collection system, joining fish there to go up the ladder and over the dam.

Fish ladder design evolved from the 1930s to the 1960s. Ice Harbor Dam has two ladders. The north or spillway ladder is the culmination of years of research and hydraulic modeling. It is a design widely copied at dams built after 1960 including the other lower Snake River dams. In 2007, University of Idaho fisheries researchers trapped adult spring Chinook and steelhead at Ice Harbor Dam and radio tracked them from below Ice Harbor to their spawning grounds in Idaho. Spring Chinook and steelhead survival exceeded 99 percent through four dams and reservoirs and many miles above the dams to spawning areas. The rate of movement of fish up the ladders is typically less than a day; and passage through the reservoirs is faster than it is in undammed stretches up the Snake River or tributaries. The issue of warm water entering the ladder exit being a deterrent to fish passage has been exacerbated by the cold water releases from Dworshak Reservoir. Warmer water from the Snake River rides over the cooler Clearwater River water at Clarkston and continues to stay at the surface down to Lower

Granite Dam. There, passage through turbines or the spillway mixes the water so it is cooler below the dam than at the surface of the reservoir above the dam. The cooler water is pumped back into the powerhouse collection system to attract fish to the ladder. Fish moving up the ladder run into warm water from the forebay near the exit and fall back down the ladder.[13] The Corps is pumping cool water up from depth in the forebay to the ladder exit so it can flow down the ladder to resolve this problem at Lower Granite Dam. That method will be implemented at the other dams as necessary.

Dams increase water temperatures and disease

This blanket statement is not true for the lower Snake River dams. As stated above, these four dams are run-of-river dams. They do not stratify like storage reservoirs or natural lakes. Water heated in tributaries and the main Snake River upstream of Lower Granite Reservoir can be traced downstream through temperature data from USGS gaging stations and at the the dams.[2] It is all public information and the picture is clear to those who take the time to look. As for diseases, it is true that they are more prevalent and salmon are more susceptible in warmer water. That is addressed above as it relates to sockeye survival. The dams do not cause diseases and run of river dams do not heat the water. Fishery agencies and commercial interests caused the spread of diseases over the last century or more by their hatchery and fish introduction and transplanting practices. Millions have been spent to correct disease problems, and hatchery practices have evolved to deal with many of them. Nonetheless, climatic changes like those that occurred in 2015 exacerbate disease problems for Columbia and Fraser River salmon and will continue in the future whether the dams are removed or not.[16]

Dams provide ideal conditions for fish predators

There are two types of fish predators in the Snake River, native species and introduced species. The northern pike minnow is a native species. There has been a bounty program on them funded by the Bonneville Power Administration since 1990. Millions have been paid, and over four million pike minnows have been removed from the Snake and Columbia rivers.[5] Non-native salmon eaters include large and smallmouth bass, walleye, yellow perch, channel catfish, and other warm water fish introduced by fishery agencies or sportsmen in the late 1800s.[10] For decades, the fishery agencies have blamed the dams for the decline of the salmon while protecting the bass, catfish and walleye as game fish. It is only within the past few years that Oregon and Washington have removed the size and bag limits on these fish in the "migration corridor." Walleye, for example, are very rarely seen migrating up fish ladders at the dams. Columbia River walleye are said to have come from those introduced into Banks Lake in the 1950s. More recently, the lower Snake River has become a walleye fishing hotspot due to transplants to the Snake River from reservoirs upstream by Idaho sportsmen. Not only are walleye now numerous, but they are also large compared to their eastern cousins. Photos of walleye approaching 20 pounds are available in marinas and sporting goods stores from the Lewiston-Clarkston area to Portland.

Dams interfere with juvenile physical development

There are two juvenile salmon life history types that migrate through the lower Snake River, usually referred to as yearling migrants or subyearling migrants.

- Spring and summer Chinook, sockeye, and steelhead rear in freshwater for 1 to 3 years before migrating to the ocean – all are referred to as yearlings. They are on a hormonal cycle that drives them to migrate to the sea. It is called smoltification, and they all migrate as smolts – that is they have undergone transformation that adapts them to life in saltwater. They feed very little in their rush to the sea. It was this phenomenon and the development of a series of reservoirs that drove NOAA Fisheries to propose, and the Corps to develop, the Juvenile Fish Transportation Program. From a historic 2 to 3 weeks, migration from the Snake to the sea would take up to 2 months with the reservoirs. Instead, juvenile salmon could be transported in 2 days. Over time research showed that transport early in the spring got the fish to the ocean too soon. Either they weren't quite ready to enter saltwater, or the forage base in the ocean was not ready for them. The Transportation Program was adjusted in collaboration with the fishery agencies and Tribes. The current spill program does not speed up the flow of water through the system. The water travels downstream at the same rate whether it passes through generators or spill bays. However, it does speed up the migration of the smolts past each dam structure. Without spill, smolts are reluctant to go down into the turbines or normal spillway bays of the dams, delaying up to a couple of days per dam. The overflow weirs took care of that problem. The smolts are not reluctant to go over the overflow weirs, usually passing within hours of approaching the dam. Therefore, passing the four lower Snake River dams was speeded up by about 8 days and migration to the estuary by up to 3 weeks. By delaying the start of the Transport Program, more late migrating smolts reach the ocean near optimal entry time than have for decades.

- Fall Chinook normally migrate as subyearlings. After the eggs hatch and the fry emerge from the gravel, they begin migrating downstream instead of holding over for a year or more. They feed and grow as they migrate. By the time they reach the lower river, they are nearly as large as their high speed cousins. This may have been an adaptation for dealing with high water temperatures in the main stem as the hatchlings migrate before the water gets too warm, rear in the estuary then enter the sea. One thing that has become apparent is that the reservoirs are now better rearing habitat than most people think. Juvenile fall Chinook that are collected at the dams in the fall are large (5 to 7 inch), robust fish. Fish sampled in the reservoirs are also larger and more robust than expected. One reason is because there are introduced invertebrates like Asian copepods, Mysis shrimp, and Siberian prawns present in the reservoirs. Juvenile American shad also add to the food web. Shad spawn in the flowing reservoirs from Lewiston downstream add a significant amount of eggs, tiny fry, and small juvenile fish as food for juvenile fall Chinook and other fish predators. The deeper, cooler reservoirs aided by cold-water releases from Dworshak Reservoir have improved the rearing capacity of the lower Snake River compared to historic conditions.

Hatchery fish have caused the decline in salmon size

A century and a half of commercial fishing, primarily the gillnet fishery, reduced the size of returning salmon, especially the spring and summer Chinooks. Large mesh gillnets targeted the most robust salmon as fishery managers attempted to limit the harvest of steelhead (a sport fish not allowed for commercial harvest). Historic photos show cannery room floors knee deep in large, fat Chinook salmon in the late 1800s and early 1900s. They were weeded out of the gene pool leaving the progeny of the smaller salmon that could escape from or pass through the gillnets to carry on the fish runs. Spring Chinook that averaged 40 pounds in the 1800s might average 20 pounds today, and the "June hogs" of summer are no more due to net size, not the dams.

Comparing breaching of the lower Snake River dams to the breaching of Elwha River dams is ludicrous

The Elwha River dams had no upstream or downstream fish facilities. In other words, survival of salmon moving upstream or downstream was zero – for over a century. Except for those reared in a hatchery downstream, the large Elwha Chinook were extinct. Removing the dams did restore access to spawning areas that were seeded with hatchery fish in preparation for the restored access. Survival of juvenile and adult salmon past the lower

Snake River dams is high as described above. **However, only a fraction of the historic spawning area is available with or without the lower Snake River dams in place. Removing them will not change that.** Fall Chinook are now spawning in the reservoirs because the water is cooler than before the dams, but removing the dams cannot provide the level of fall Chinook spawning lost above Hells Canyon. The draft Snake River Fall Chinook Recovery Plan released last month by NOAA Fisheries includes an option of restoring Fall Chinook above the Hells Canyon complex. That would increase the spawning area by providing access to mainstem Snake River habitat, and habitats in the reaches of tributaries below their many dams. Breaching the Hells Canyon dams would make more fall Chinook habitat available by far than would breaching the lower Snake River dams.

For final consideration, a holistic approach to the multiuse river system

Christianson et al minimizes the benefit of navigation and hydropower production on the lower Snake River. Having the ability to import and export commodities via the river system is a benefit now and will continue to be a significant asset in the future. Each barge tow carries the equivalent of 140 rail cars, or 538 semi-trucks, and has the lowest carbon emission of any mode of freight transport, beating out rail and trucking by significant margins. In a world striving reduce carbon emissions and limit global warming, we should transport more, not less, goods by environmentally friendly methods like barging. Christianson et al inaccurately indicates there are virtually no shipments occurring on the river system. In 2012, nearly 10 percent of all wheat exports in the U.S. moved through the Snake River dams. Overall in 2012, 3,253,000 tons of cargo moved on the Snake River. In 2015 major steamship lines terminated service at the Port of Portland, which impacted container shipping from the Port of Lewiston. As of November 2015, limited container service from Lewiston resumed and full service to Portland should return in the near future. Bulk wheat shipments will continue to be strong.

The report also inaccurately indicates hydropower produced by the Snake River dams is insignificant and unneeded. Again, in a world trying to reduce carbon emissions, it makes no sense to eliminate any current source of clean, non-polluting energy. The lower Snake River dams produce enough clean, renewable, carbon free energy to power 1.87 million homes. The dams also complement other renewables, particularly wind and solar, to balance the load through the grid when those sources are not producing because the wind isn't blowing, or it is dark or cloudy. Having the ability to tie new wind and solar projects into the existing power grid is critical for bringing more clean energy online and maintaining a reliable power system. Furthermore, only hydropower can store energy in the reservoirs, and provide it when demanded for power peaking or to meet the load on the Northwest power grid.

Christianson et al. also suggest the lower Snake River dam reservoirs release methane and contribute significantly to greenhouse gas emissions. The report includes no scientific data to back up this suggestion. Methane is produced in bodies of still, warm water that support high levels of aquatic vegetation. Deep bodies of water that stratify with a large difference between surface and deep water temperatures are also necessary. The current through each reservoir created by the lower Snake River dams is more than enough to mix the water, circulate oxygen and preventing a large temperature gradient from forming. Vegetation and algae growth in the reservoirs is not high enough to produce the necessary plant matter for massive decomposition. Because the Snake River dams do not form large, still, deep reservoirs, they produce very little methane.

The report also suggests the Southern Resident Killer Whale population, listed as an endangered species 2005, will face further decline without the removal of the Snake River dams. Like salmon returns, the Southern Resident Killer Whale population has actually increased in recent years, with the current population estimate at approximately 80 whales. The Southern Resident Killer Whale population has declined from its estimated historic level of about 200. Beginning in the late 1960s, the live-capture fishery for seaquarium display removed an estimated 47 whales and caused an immediate decline in Southern Resident numbers. The population fell an estimated 30 percent to about 67 whales by 1971. The live-capture practice was stopped in the early 1970s. Over the last 28 years there has been only an average 0.4 percent increase per year for the population, but eight births were recorded in 2015. Concern for the Southern Resident Killer Whale population, like the listed Snake River salmon species, is certainly valid. However, like the salmon, it is unlikely that removing the lower Snake River dams would solve problems the Southern Resident Killer Whales face. Fraser River Chinook salmon make up the bulk of the whales' summer diet while they are in the Salish Sea. Sampling in coastal waters indicates they also consume Chinook from the Columbia, Sacramento, Klamath and other coastal river systems. Their range during the spring, summer, and fall includes the inland waterways of Washington State and the transboundary waters between the United States and Canada. Relatively little is known about the winter movements and range of the Southern Resident stock. However, in recent years, they have been regularly spotted as far south as central California during the winter months and as far north as Southeast Alaska.

In closing

Everyone is concerned about the survival of the Northwest's iconic salmon and Southern Resident Killer Whale populations. However, it is shortsighted to suggest removal of the lower Snake River dams would solve the problems these species face and restore runs to historic levels. Historic practices such as overharvest, in the case of salmon, and live-capture, in the case of Southern Resident Killer whales, were arguably more detrimental to populations than these four dams. Furthermore, dams on the lower Snake River are a small portion of man-made impediments to anadromous fish. Hundreds of millions have been spent on studies and improvements to adult and juvenile fish passage and related dam caused issues on the Columbia-Snake River System. More research, facility modifications, and operational improvements have been made to the lower Snake River and Columbia River dams than any other dams in the world. From an estimated 85 percent per project survival in the 1970s, per project survival has improved to over 95 percent survival in optimal flow years.   Low system survival in years like 2001 and 2015 is due to regional climate changes, not to the lower Snake River dams.

The Northwest is poised to celebrate a river system that benefits the environment – by providing a low-carbon option for transporting goods and producing clean hydropower – and that benefits the economy by supporting inland commerce. At the same time, multiple agencies have been and continue to be dedicated to finding solutions to support healthy fish populations and the Northwest is seeing the results improved salmon runs. Opting to breach the dams now would not only set our region back in efforts to reduce carbon emissions, but there are also no guarantees salmon and whale populations would see a substantial benefit from such a drastic and costly measure.

I encourage you to seek the truth before taking a position on the future of the Lower Snake River dams.

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