February 7, 2017

Via Electronic and United States Mail

Scott A. Spellmon, Brigadier General
U.S. Army Corps of Engineers Northwestern Division
Attn: CRSO EIS
P.O. Box 2870
Portland, OR 97208–2870
Email: comment@crso.info

Elliot E. Mainzer, Administrator
Bonneville Power Administration
905 NE 11th Ave.
Portland, OR 97232

Lorri J. Lee, Pacific Northwest Regional Director
Bureau of Reclamation
1150 North Curtis Road, Suite 100
Boise, ID 83706

Re: Notice of Intent to Prepare the Columbia River System Operations Environmental Impact Statement and Scoping Comments

Dear Mr. Spellmon, Mr. Mainzer, and Ms. Lee,

I am writing on behalf of the Natural Resources Defense Council and our 2.4 million members and activists, tens of thousands of whom reside in the Pacific Northwest. I am writing to offer technical comments on the scope of the Columbia River System Operations Environmental Impact Statement.

If you have any questions about these comments, please do not hesitate to contact me directly at ggoodstefani@nrdc.org or (310) 434-2333.

Sincerely,

Giulia Good Stefani
Staff Attorney
Natural Resources Defense Council
Introduction

On behalf of the Natural Resources Defense Council (“NRDC”) and our 2.4 million members and activists, we submit the following letter regarding the proper scope of the Environmental Impact Statement (“EIS”) being prepared by the U.S. Army Corps of Engineers, Bonneville Power Administration, and Bureau of Reclamation (hereafter “the agencies”) to assess the environmental impacts and reasonable alternatives to the current operation of the Federal Columbia River Power System.¹

We recognize that the planned EIS must consider the impact of the agencies’ Columbia and Snake River dams on a comprehensive array of environmental factors. In particular, we are cognizant of the fact that the EIS must take into consideration (1) climate change and a pronounced warming trend in the region, (2) all of the listed fish runs in the Columbia Basin as well as other impacted wildlife and habitat, (3) the impact on Native American rights and culture, and (4) all indirect and cumulative impacts. These impacts, and many more, are more fully discussed in comment letters submitted by our allies, partners, and friends. For that reason, our letter focuses on two aspects of the scope of the EIS in particular.

- First, NRDC strongly urges the agencies to include a thorough analysis of the impact of the Columbia and Snake River power system hydroelectric dams on the survival and recovery of Southern Resident Killer Whales (“SRKW”s).
- Second, we ask the agencies to give full and fair consideration to the reasonable alternative of retiring and removing the four lower Snake River dams and replacing their energy with a portfolio of efficiency growth and renewable resources that will not increase the region’s greenhouse gas emissions.

It is our position that if the EIS fails in either of these two respects, it would be legally inadequate under the National Environmental Policy Act (“NEPA”). It would also fail to take advantage of the best opportunity in decades to right the trajectory of these imperiled and iconic whales—of which only 78 individuals remain—and to restore unimpeded access to pristine salmon habitat that is at the heart of ensuring the survival of Columbia Basin salmon as they face the increasing threat of climate change.

I. The EIS must take a “hard look” at the effect of the Columbia Power System dams on the Southern Resident killer whales.

NEPA requires federal agencies to prepare “a detailed statement...on the environmental impact” of any proposed federal project “significantly affecting the quality of the human environment.”² Although NEPA does not define what constitutes an environmental impact, the Council on Environmental Quality (“CEQ”) regulations states the term “impact” is synonymous with the word “effect” for purposes of NEPA.³ CEQ mandates a discussion of the direct and indirect effects as well as cumulative impacts to the environment:

Effects include: (a) Direct effects, which are caused by the action and occur at the same time and place. (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may

---

¹ 81 FR 67382 et seq. (Sept. 30, 2016)
² 42 U.S.C. § 4332(2)(C)(i)
³ 40 C.F.R. § 1508.8(b)
include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.  

NEPA is a “process” oriented statute. Consequently, courts examine whether “the agency has taken a ‘hard look’ at environmental consequences.” A court will reject an EIS if it “omits relevant information and thus precludes informed decision-making and public participation.” Here, the agencies must take a “hard look” at the Columbia and Snake River dams’ impact on SRKWs in recognition of the established nexus between the Columbia Basin salmon and SRKW survival.

First, the Columbia and Snake River dams’ impact on SRKWs is reasonably foreseeable. In the EIS impact analysis, the agencies are required to address all reasonably foreseeable effects of the action under review, and courts will reject an EIS that leaves some effects unexamined—especially when a comment letter has called attention to those potential effects. The substantial body of science summarized in and submitted with this comment letter demonstrates a direct relationship between the survival and reproduction success of the SRKWs and Chinook salmon abundance. And, the science also shows a close relationship between SRKWs and the Columbia Basin’s salmon in particular.

Second, the impact of the Columbia and Snake River dams on SRKWs is not speculative. The plaintiffs in Center for Biological Diversity v. Bureau of Land Management argued that it was highly speculative to find that the recreational use of off-highway vehicles would impact endemic invertebrates known to be present in the region but not named or analyzed in the EIS. However, the court disagreed and held that the EIS violated NEPA because it “completely ignored” analysis of the unnamed invertebrates in spite of a replete administrative record placing the agency on notice of potential impacts to those invertebrates. Here, like Biological Diversity, the administrative record will contain tens of

---

4 40 C.F.R. § 1508.8
7 City of Carmel-By-The-Sea v. U.S. Dep't of Transp., 123 F.3d 1142, 1163 (9th Cir. 1997)
8 See Oregon Nat. Res. Council v. Marsh, 52 F.3d 1485, 1488 (9th Cir. 1995), as amended on denial of reh'g (June 29, 1995)
9 40 C.F.R. § 1508.7; Ground Zero Ctr. for Non-Violent Action v. U.S. Dep't of Navy, 383 F.3d 1082, 1089 (9th Cir. 2004)
10 See 40 C.F.R. § 1502.22(b)(4); City of Davis, 521 F.2d at 676; Found. for N. Am. Wild Sheep v. U.S. Dep't of Agr., 681 F.2d 1172, 1179 (9th Cir. 1982); Methow Valley Citizens Council v. Reg'l Forester, 833 F.2d 810, 817 (9th Cir. 1987), rev'd sub nom. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 109 (1989); Natl' Audubon Soc'y v. Dep't of Navy, 422 F.3d 174, 192-94 (4th Cir. 2005)
11 Indeed, other agencies have found it necessary to analyze the impacts to SRKWs where local salmon populations were affected by dam operations and flooding. See e.g. Klamath Facilities Removal Final EIS/EIR, at 495 (Dec. 2012); Puyallup River Basin EIS, at 157-168 (Mar. 2016).
12 No GWEN All. of Lane Cty., Inc. v. Aldridge, 855 F.2d 1380, 1386 (9th Cir. 1988)
14 Id. at 1162-64
thousands of public comments and a wealth of scientific evidence putting the agency on notice that the operation of the Columbia and Snake River dams impacts SRKWs.

Third, the dams are part of a larger cumulative impact on SRKWs. The agencies must include a thorough analysis of the cumulative impacts of the Columbia and Snake River dams, including other “past, present, and reasonably foreseeable future actions” by government and private actors in their EIS. That analysis should include the cumulative impact of the dams on SRKWs. In Oregon National Resources Council v. Marsh, the court found the content of the agency’s EIS violated NEPA because it narrowly limited the scope of cumulative impacts from all dam projects in the area. Namely, the EIS did not include analysis of the effect on wild coho salmon, a species classified as “sensitive” in the area. The court stated that cumulative impacts are not limited only to specific impacts addressed previously by the court, but also to foreseeable cumulative environmental effects like those that a dam system may have on endangered fish species. Moreover, the court was particularly “disturbed” by the fact that the agency did not address the impact to wild coho salmon given the importance of protecting a species considered “sensitive.” In this case, we not know that the SRKWs are impacted by, among other things, depressed salmon runs throughout their range, the dams on the other rivers that supply them with year-round food (including the Klamath, Sacramento, and Fraser Rivers), high toxic loads in their waters, competition from commercial and recreational fishing of salmon, predation of salmon by other predators, poor ocean conditions, vessel traffic, and increased oil and gas activity in their range. The impact of many of those secondary stressors is compounded by the nutritional stress the SRKWs suffer from the relatively low abundance of salmon in the Columbia Basin.

In sum, the agencies must include a full analysis of the Columbia and Snake River dams’ impact on SRKWs in the EIS. NEPA mandates that the “environmental information...must be of high quality” and that accurate scientific analysis is essential to implementing NEPA. In Center for Biological Diversity v. U.S. Forest Service, plaintiffs alleged that the U.S Forest Service improperly omitted contradicting scientific viewpoints concerning the habitat of a sensitive bird species. The court agreed, holding that because the record contained scientific evidence directly challenging the scientific basis upon which the EIS stood, the agency was required “to disclose and respond to such viewpoints” in the EIS. Here, the agencies cannot ignore the large body of science that directly links SRKW survival to salmon abundance.

A. The primary threat to Southern Resident killer whale survival is a shortage of their preferred prey, Chinook salmon.

1. OVERVIEW: Southern Resident killer whale biology is well understood and confirms that he whales are at serious and federally recognized risk of near-term extinction

SRKWs are perhaps the most well-studied distinct whale population in the world. Each whale has been photographed, identified by its unique markings, and given an identifying alpha-numeric

---

15 Oregon Nat. Res. Council, 52 F.3d at 1491
16 40 C.F.R. § 1508.7
17 Oregon Nat. Res. Council, 52 F.3d at 1491
18 Id.
19 Id. at 1490
20 Id. at 1490-91
21 40 C.F.R. § 1500.1; see also 16 U.S.C. § 1536(a)(2) (when an endangered or threatened species is involved, the “agency shall use the best scientific and commercial data available.”)
22 Ctr. for Biological Diversity v. U.S. Forest Serv., 349 F.3d 1157, 1167 (9th Cir. 2003)
23 Id.; 40 C.F.R. § 1502.9
designated. This data provides a uniquely personal window into the SRKW community, offers rare insight into the health and wellbeing of the whales over time, and informs our collective understanding of their social structure and relationships in ways that would not be possible without such detailed, life-span observation.

Highly intelligent, social creatures, SRKWs live in complex matrilineal families, communicate with distinctive calls and whistles, create a culture of learning by modeling specific behaviors to younger animals, and demonstrate cooperation and sharing. In addition to being charismatic, the SRKWs are ecologically and economically vital to the Pacific Northwest. Ecologically, they sit atop the food chain and serve as an indicator species for environmental health. Economically, an estimated forty-two whale watching companies operate in Washington State, and the Pacific Whale Watch Association recently estimated the direct annual revenues from whale watching to be $65 million and the total annual revenue, when direct and indirect effects are considered, to be $145 million.

Unfortunately, the whales are at serious and federally recognized risk of extinction. The U.S. National Oceanic and Atmospheric Administration listed the SRKW population as endangered under the federal ESA in November 2005 and designated their summer range as critical habitat in 2006. Despite more than ten years of these added federal protections, the SRKW population is declining at a faster rate today than it was when they were listed. In 2015, NOAA itself identified the SRKW as one of eight species most likely to go extinct in the near future unless immediate action is taken.

2. **PREY: Southern Resident killer whales primary source of food is Chinook salmon.**

Among killer whale ecotypes\(^{24}\), the SRKWs are unique in their prey preference. SRKWs are obligate fish eaters and strongly prefer salmonids over other prey items. They are believed to have evolved their highly specific diet and foraging strategies in association with what was once a historically abundant prey resource (Ford and Ellis 2002).

The SRKW’s dependency on Chinook salmon in particular has been confirmed through multiple research efforts (Ford and Ellis 2006, Ford et al. 2010a and 2010b, Ford et al. 2016, Hanson et al. 2010a, Ward et al. 2009).

Most recently, Michael Ford, Director of the Conservation Biology Program at the Northwest Fisheries Science Center, confirmed that Chinook salmon is the preferred prey of SRKW through fecal DNA analysis. Ford ran a DNA analysis of 175 fecal samples collected in the wild between 2006 and 2011 and revealed that from May through September Chinook salmon comprise 79.5% of the Southern Resident diet (Ford et al. 2016). Winter samples, though more limited, indicate that Chinook are preferentially targeted year-round (Ford 2012) and to a lesser degree chum, lincod, steelhead, coho, halibut and even skate (Hanson et al., in prep 2016).

During the winter and spring months, the SRKWs travel along the Washington, Oregon, Northern California, and (on rare occasion) Alaska coast. During this time of year, they have been spotted as far south as Monterey, California, and as far north, in one 2007 documented encounter, as Chatham Strait, Southeast Alaska. While their winter range is large, the whales have demonstrated a documented

---

\(^{24}\) The North Pacific Ocean is home to three distinct ecotypes of killer whales, termed residents, transients, and offshores. Despite considerable overlap in their ranges, these populations do not interbreed (Morin et al., Stevens et al. 1989, Hoelzel and Dover 1991, Hoelzel et al. 1998, Barrett-Lennard 2000, Barrett-Lennard and Ellis 2001, Hoelzel 2004, Krahm et al. 2004a) and exhibit significant genetic differences accompanied by important differences in ecology, behavior, morphology, and acoustics (Baird 2000, Ford et al. 2000).
preference for the waters off the mouth of the Columbia River, a place where NOAA tagging data has consistently shown they frequently hang out to forage.25

3. **POPULATION STATUS AND TREND:** The SRKW population is declining in abundance at a higher rate today than when the whales were first listed over a decade ago.

Today the extinction risk of the SRKWs is higher than it was when they were first listed. This is true despite NOAA’s recovery efforts and over a decade of federal endangered species protection.

Starting in 1995, the population entered a period of significant decline, with K and L pod suffering the steepest losses, and recent data suggest the rate of decline may be accelerating. This is particularly true if you consider the troubling trends the Center for Whale Research has documented in its long-term studies, discussed in greater detail below, of (1) a sex ratio of calves that is skewed towards males, (2) a high rate of miscarriage and still births, (3) frequent complications related to reproduction in reproductive age females, and (4) high numbers of reproductive age females that are not producing calves.

Because of their proximity to the coast and their predictable return to the inland waters of Washington State each spring following Chinook salmon runs bound for the Fraser River in BC Canada, the SRKW population was once heavily targeted for live-capture for marine parks and aquariums. Between 1965 and 1975, an estimated 47 whales were removed from the population and shipped to marine parks, causing an immediate and significant decline in population numbers (Ford and Ellis, 1999, Ford et al., 2000). These practices no longer take place in the United States or Canada but the effects continue to reverberate through the population.

Although the whales have not been hunted for live-capture since 1975, they have failed to return to their historic numbers and remain at grave risk of extinction. Indeed, despite extensive research efforts and increased knowledge of threats to survival by NOAA, SRKWs are closer to extinction today than they were when they were listed as endangered in 2005.26 Recent models indicate an expected 0.91% annual population decline under status quo conditions and an extinction risk of 49% in 100 years (Vélez-Espino et al. 2014).

After the end of the live captures, the SRKW population reached a peak recorded abundance of 98 whales in 199527. Since 1995, the Southern Resident population has been in a lengthy period of closely documented decline.

As required by the ESA, in 2008 NOAA prepared and published a federal recovery plan for Southern Resident killer whales. The stated goal of the plan is to restore the endangered SRKW DPS to a point where they no longer require protections under the ESA. The plan’s delisting criteria include “an

---


26 The 2011 5-year species status review gives Southern Residents a recovery priority number of three,26 based on “low population numbers and continuing threats to recovery, a moderate recovery potential based on uncertainty regarding most important threats” (NMFS 2011a). According to the 2016 Species in the Spotlight Action Plan, Southern Residents are now classified as recovery priority number one: “a species whose extinction is almost certain in the immediate future because of a rapid population decline or habitat destruction, whose limiting factors and threats are well understood and the needed management actions are known and have a high probability of success” (NOAA Fisheries 2016).

27 The highest on record but still far below the historic estimated minimum abundance (NMFS 2008)
average growth of 2.3 percent per year for 28 years,” and population parameters consistent with a
growing population, including an “adequate number of individuals of both sexes and mixed ages,” and
more than two reproductive-aged males in each pod. To date, the federal delisting criteria have not been
met, and the chances of them being met anytime in the near future appear increasingly dim.

As of 2010, the population had averaged a 0.4% increase per year from 1982 to 2010. However,
in the last half of that 28-year period, 1996 through 2010, the population decreased by 0.8% per year
(NMFS 2011a). In the 20 years following the 1995 peak, the population had an annual average decline of
0.7%. If the new calves, which may not survive, are excluded from the 2015 total, the decline is 1.05%.²⁸

Figure 1. Southern Resident killer whale census total population 1976-2016. Source: Center for
Whale Research.

The population-level picture is highly concerning, but if you look at the individual pods (the
Southern Resident population is comprised of three pods referred to as J, K, and L pod) the future picture
is even bleaker. Stark differences in fecundity based on pod are evident with J pod experiencing the most
births, followed by L pod. K pod has not produced a viable calf since 2011, leaving the total number of K
pod whales at a mere 19 animals. However, while J pod has experienced the most births in recent history,
it has also suffered some significant setbacks to recovery. In 2016 alone, six critical members of the pod
died including two breeding age females, two young adult males, and two calves. Long considered the
most robust of the three pods, today J-pod has a mere 24 animals in that pod.

²⁸ Calculated from Center for Whale Research population information
The census population size, or the total number of animals making up the Southern Resident killer whale population, has declined from 88 individuals when they were listed on the endangered species list in 2005 to merely 78 at the end of 2016 – eleven years later. Furthermore, and perhaps more disturbingly, the effective population size, or the number of individuals in a population who contribute offspring to the next generation is also declining. At the end of 2016, there were only 30 breeding age females in the population, down from 36 breeding age females in the population when the whales were listed in 2005.

Gestation in killer whales takes 17-18 months and females nurse their young for approximately one year, so even in the best-case scenario, a killer whale female is able to birth a healthy calf only once every 3 years. In healthy populations, it is common for females to have calves once every five years. But the birth rates of J, K, and L pods are dramatically below the best-case or healthy population numbers.

With approximately 30 reproductive age females in the Southern Resident killer whale population, if they each had a calf every three years, this would mean that on average there would be ten viable calves produced each year. Over the past 20 years the average number of calves born to this population has been just three annually.

---

29 Personal communication with Dr. Deborah Giles, Center for Whale Research (January 2016).
30 Center for Whale Research long-term status and trend study.
Overall, since the population was federally listed, J pod has been the most productive pod, starting with 23 whales in 2005 and ending 2016 with a total of 24 pod members. K pod has been the most stagnant pod with a population of just 19 whales since 2007. Further, while several K pod females have been observed to be pregnant, no whale in this pod has produced a viable calf since 2011. L pod has suffered the most losses since the listing, going from 44 animals in 2005 to just 35 whales by the end of 2016.

The population growth of the SRKWs is constrained by low offspring production for the number of reproductive females in the population. Recent data tell us that SRKW females are having miscarriages, particularly late-term miscarriages, at alarmingly high rates. Based on fecal samples collected between 2008 and 2014, scientists found that up to 60% of all detectable pregnancies spontaneously aborted. Of these, 38% occurred relatively late in gestation when the cost to the mother is especially high. These late-term miscarriages are alarming not only because of the failure of those calves to join the population, but also because of the high metabolic cost to reproductive-age females in the population of growing a fetus to near term.

In recent years, the Center for Whale Research has documented a concerning uptick in pregnancy-related complications in Southern Resident females. One piece of evidence to support a theory that the cause is related to nutritional stress is the fact that females in the SRKW population appear to be experiencing a higher rate of pregnancy complications compared to their closest counterparts, the marine mammal eating Northern Resident killer whale females who are giving birth to healthy calves at regular intervals.

Another troubling trend that the Center for Whale Research data makes apparent, documented in its long-term census, is the reduced life expectancy of SRKWs. Both female and male SRKWs are not living as long as they used to. Although the exact cause for why the whales are not living as long as they once did is unknown, we do know that they are suffering from a chronic shortage of prey. Chronic food scarcity is known to cause illness and reduced lifespans in many other mammals, including humans.

The loss of older female individuals is troubling for a number of reasons. Females are crucial to the survivability and long-term recovery of SRKWs, not only for their singular ability to contribute to population recovery, but for the unique role they play in their later years in a matriarchal society. Females typically stop reproducing in their 30s-40s but have a significant post-reproductive lifespan (Franks et al 2016). Post reproductive females play a key role in the population and provide important survival benefits for their adult offspring (Foster et al 2012b). Older, post-reproductive females are repositories of ecological knowledge, vital to community survival. They remember and guide their groups to historic safe zones and productive foraging grounds, which can buffer their family group against environmental hardship especially in times of low prey abundance. They direct the social interactions of their families (Brent et al. 2015), and affect the survival rates of male offspring. Recent aerial photos posted by NOAA

---

31 The difference in population of just one whale does not reflect the significant population gains and losses between late 2014 and late 2016
32 Pregnancy complications include birthing difficulties, such as where the calf gets lodged in the birth canal. For example, J32 was an 18-year old female who died as a result of her full-term calf dying in utero before it could be born. Another whale, J16, was an x-year old female whose calf (J50) became stuck in the birth canal. The calf was ultimately pulled out of her mother by another whale using their teeth. Recently, a young 23 year old female, J28, began to deteriorate in condition almost immediately after the birth of her calf. Ten months later, she, and shortly thereafter the still nursing calf, both died. Although a final necropsy has not been publicly released, preliminary results suggest that the proximate cause of her death was a complication from the birth of her calf. These birthing complications are not only potentially deadly to the mother, but they also contribute to the overall strain—physical and mental—the reproductive-age females in this population live under.
even documented an old female (J2), who was clearly thin and in poor body condition herself, capturing and presenting prey to younger members of their family. Loss of older females from the population may thus have significant consequences for future generations due to the loss of vital ecological information.

SRKWs that lose their mother have lower survival rates. And the benefit is not limited to calves and young whales. Adult killer whales benefit from their mother’s presence: in the year after their mother’s death, mortality risk increases up to 2.7-fold in adult daughters and 8.7-fold in adult sons (Foster et al 2012b).

The young age of the majority of male SRKWs is also of concern. Reproductive success for males increases with age and size (Ford et al. 2011) indicating that a greater number of younger males may reduce the overall reproductive rate of the population. However, many young males are also dying, due to various causes, long before they reach sexual maturity. For example, with the recent loss of two young male J pod whales, the possibility that too few males will live long enough to reach their maximum size and thus their full breeding potential, is of significant concern going into the future.

4. PRIMARY THREAT TO SURVIVAL: The single greatest threat to SRKW survival is the reduction and shortage of Chinook salmon, their primary source of food, and Columbia Basin are a critically important source of these fish.

Depletion of their preferred prey, Chinook salmon, also a federally listed endangered species, is the single greatest threat to SRKW survival. There is a direct connection between the survival of the Southern Resident population and the recovery of endangered Chinook salmon. Adequate prey availability is critically important for the recovery of the SRKWs.

SRKW birth and mortality rates are strongly correlated with Chinook abundance. SRKWs suffer in years following low Chinook abundance (Ford et al. 2005). In 2013, the second of two consecutive years in which Fraser River Chinook salmon returned in historically low numbers, SRKWs spent less than half of the usual amount of time in their summer habitat, where they typically rely on Chinook bound for the Fraser River and Puget Sound watersheds (Cogan 2013, Ford et al. 2016, Hanson et al. 2010a). In the midst of this shortage, the Southern Resident population lost seven individuals reducing their number to just 78 in 2014. Conversely, when coastal conditions are favorable for Chinook, SRKWs experience an increase in successful reproduction (Ford et al. 2005, 2010b).

33 Evolutionarily Significant Units (ESUs) of Chinook salmon are listed as threatened or endangered under the federal ESA. 5 of these ESUs are in the Columbia basin or Puget Sound, including all 4 Snake River Runs. An additional 8 ESUs of other Pacific salmon species are listed as threatened or endangered. Endangered and Threatened Marine Species under NMFS’ Jurisdiction. http://www.nmfs.noaa.gov/pr/species/esa/listed.htm/fish Accessed 5/15/2016
34 Center for Whale Research
A presentation by Ford discussed the evidence that there is a strong relationship between Chinook salmon abundance and SRKW social structure, activity budget, foraging success, and body condition. First, aerial photogrammetry in 2008 revealed that older adult SRKWs were significantly longer in body size on average than younger whales of adult age, which Ford hypothesized is contributable to a long-term reduction in food availability that causes reduced early growth and subsequent adult size. Second, Ford pointed to a study conducted in 2004, which revealed a significant relationship between ‘critical group size’ and Chinook salmon in the Johnstone Strait between 1995 and 2003. Third, another study found social bond strength through greater cluster coefficient, group size and rate of association in SRKWs during periods of Chinook abundance from 1984 to 2006. Fourth, there were 13 documented cases of “peanut-head” condition (a sign of emaciation that often precedes death) in SRKW during 1976-2008.

35 Ford et al. (2012), Causation or Correlation: Lines of evidence regarding the importance of Chinook salmon in resident killer whale population dynamics
36 See also Fearnbach et al. (2011), Size and long-term growth trends of Endangered fish-eating killer whales
37 See Lusseau et al. (2004), Estimating relative energetic costs of human disturbance to killer whales (Orcinus orca)
38 Parsons et al. (2009), Social network correlates of food availability in an endangered population of killer whales, Orcinus orca
A study conducted by Kim Parsons, Center for Whale Research, sought to examine the relationship between Chinook salmon abundance and its effect on SRKW social structure. Specifically, the study examined a long-term data set (1984-2007) to test the hypothesis that variations in salmon abundance correlates to a variation in SRKWs social network. Parsons’ results indicated a strong relationship between availability of prey and SRKW social structure, finding a more interconnected social network in years of high salmon abundance. Further, “[g]iven the central importance of the social network for population processes such as the maintenance of cooperation and the transmission of information and disease, a change in social network structure caused by a change in food availability may have significant ecological and evolutionary consequences.”

In addition to those scientific findings, a separate study of the mortality and birth indices of SRKWs from 1979 to 2003 revealed a correlation between SRKW survival and prey abundance. The study analyzed 25 years of demographic data from two separate populations of killer whales in the northeastern Pacific Ocean. Specifically, the study indicated that “population trends are driven largely by changes in survival, and that survival rates are strongly correlated with the availability of their principal prey species, Chinook salmon.” Further, the study found that SRKWs were “constrained to a narrow range of prey species by culturally inherited foraging strategies,” which was a causative factor in their inability to adapt to changing prey availability.

As noted above, in 2016, Ford conducted another study with the goal of analyzing the diet composition of SRKWs to better understand the interactions between SRKWs and Chinook salmon. There, Ford analyzed 175 fecal samples retrieved between May and September of the years 2006 through 2011. The samples were analyzed to qualitatively estimate the diet composition of SRKWs in their summer range in the Salish Sea. The results revealed that “[t]he early summer samples were >96% Chinook salmon in all five years. The mid-summer samples were also mostly Chinook salmon, but in 2008 and 2011 also contained some sockeye salmon (12.1% and 18.3%, respectively).” As such, Ford’s results confirmed earlier studies indicating that salmon, and especially Chinook salmon, is by far the dominant component of SRKW diet during the summer months.

NOAA wildlife biologist Bradley Hanson retrieved two predation event samples from SRKW L Pod just offshore of Ocean Shores, Washington between March 23rd and April 6th 2009. Both samples were genetically confirmed Chinook salmon with the most likely regions of origin in the Columbia River; one from the Upper Columbia and the other from the Snake River.

40 Parsons et al. (2009), Social network correlates of food availability in an endangered population of killer whales, Orcinus Orca
42 Id.
43 Id.
44 Ford et al. (2016), Estimation of a Killer Whale (Orcinus Orca) Population’s Diet Using Sequencing Analysis of DNA from Feces
45 Id.
46 Id.
47 Id.
48 Id.
49 Hanson et al. (2010a), Species and stock identification of scale/tissue samples from southern resident killer whale predation events collected off the Washington coast during PODs 2009 cruise on the McArthur II
50 Id.
Eric J. Ward, research scientist at NOAA, sought to understand the link between low SRKW birth rates and limited availability of Chinook salmon. Ward’s results indicated that SRKW “fecundity is highly correlated with the abundance of Chinook salmon.” Specifically, Ward found that female calving differed by 50% when comparing the years of low salmon abundance and high salmon abundance. Moreover, Ward’s findings discredited any linkage of fecundity to other variables, such as sea surface temperature.

The Center for Whale Research has done research to evaluate the body condition of SRKWs using aerial photogrammetry. Their study encompassed observation of over three-quarters of the SRKW population and used the Center for Whale Research long-term photo-identification catalogue to match individual whales of known age and sex. Demographic analysis of the data showed the SRKWs were “food-limited with a highly significant correlation between the survival probability of individuals and the abundance of Chinook salmon.” Similarly, as Ford’s study previously noted, the data indicated 13 cases of “‘peanut-head’ condition, [n]one was seen prior to 1994, and 8 of 13 were between 1994 and 2001, the years of low Chinook abundance.”

NOAA Fisheries recognized the connection between SRKWs and Columbia River basin salmon before the SRKW population was declared endangered, noting in the 2004 Biological Review and restating in the 2013 response to a delisting petition that SRKWs likely “historically utilized the large runs of salmon to the Sacramento and Columbia River basins as a major source of prey,” and reiterated this connection in the 2008 federal recovery plan: “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” (emphasis added, NMFS 2008).

Like most marine mammals, Southern Resident’s movements are determined by their food source – they must follow the salmon – and they do so with exceptional skill. Satellite tagged Southern Resident killer whales travel the outer coast and have been observed foraging near the mouth of the Columbia River in late March, when spring Chinook salmon return to the basin to spawn (Zamon et al. 2007).

These early spring Chinook are ‘interior race’ salmon known to have particularly high fat content to sustain long spawning migrations (Mesa & Magie 2006) making them a nutritionally superior food source for SRKWs at a critical time of year. This behavior, observed and recorded with satellite tags for three study years (2013, 2015, and 2016; in 2014 no whales were tagged during the spring returns) confirms that Columbia River basin Chinook are an important prey resource for SRKWs. Indeed, based on three satellite tagged whales: K25 in December 2012, L84 in February 2015, and K33 in December 2015, it is evident that K and L pod whales spend a significant amount of time (20% of the total amount of time tagged) at or near the mouth of the Columbia River (Brad Hanson, unpublished data presented at the Whale Museum Scientist’s talk September 7, 2016).

---

51 Ward et al. (2009), Quantifying the effects of prey abundance on killer whale reproduction
52 Id.
53 Id.
54 Id.
55 Durban et al. (2009), Size and Body Condition of Southern Resident Killer Whales. Contract report to the Northwest Regional Office, National Marine Fisheries Service
56 Id.
57 Id.
58 Durban et al. (2009), quoting Ford et al. (2012), Causation or Correlation: Lines of evidence regarding the importance of Chinook salmon in resident killer whale population dynamics
59 Negative 12-month finding on a petition to delist the Southern Resident killer whale, 78 FR 47277
A recent increase in Columbia River fall Chinook, stimulated by court ordered spill, likely contributed to the increased Southern Resident reproductive recruitment in 2015. This “baby boom” brought the highest number of surviving calves in a single year since 1986. Seven of the eight surviving calves born since December 2014 were born in 2015. This is the same number born in 1986, also a time of increasing coastal abundance of Chinook. New calves are a hopeful sign for the population but if the calves are to survive and SRKWs are to recover in the long-term, an effective, science-based plan to protect and recover endangered salmon, particularly spring, “interior race” Chinook, is essential.

The Snake River basin provides the best potential for recovering abundant wild salmon runs necessary for the continued survival of the SRKW population. Yet, the agencies have opted to maintain the status quo for salmon recovery, including a reliance on a federal salmon plan for the Columbia River basin that has been consistently rejected by federal courts since 2003. The current approach merely maintains depleted salmon populations, ignores the best available scientific information on the effects of dam operation, and fails to take adequate measures to protect salmon from the negative impacts of dams.

On May 4, 2016, the U.S. District Court for the District of Oregon invalidated the federal government’s Columbia River basin salmon plan for the fifth time. Judge Michael Simon ruled that the latest plan violates the federal Endangered Species Act and the National Environmental Policy Act. Judge Simon’s ruling highlights the need for dramatic changes in federal dam management but falls short in making the connection to SRKWs, ignoring a large body of research that indicates a linear relationship between Chinook salmon abundance and killer whale survival in favor of a single hotly contested study that questioned this connection61.

Hilborn et al. (2012) primarily analyzed whether a reduction in Chinook salmon harvest – with a strong focus on a reduction in ocean fisheries – would increase the availability of Chinook salmon to SRKWs. This is a fundamentally different issue than salmon depletion caused by the Federal Columbia River Power System. In fact, the authors concluded that “Efforts to rebuild Chinook salmon runs depend primarily on restoring the productivity and carrying capacity of freshwater spawning, rearing and migratory habitats” (Hilborn et al. 2012) such as those behind the cold-water climate shield in central Idaho above the lower Snake River dams (Isaak et al. 2015).

Judge Simon also gives deference to NOAA’s assertion that “Southern Residents’ dominant diet in the summer does not consist of [Federal Columbia River Power System]-affected salmon” (Ruling page 146). Typically, Southern Residents are found from May – September in the inland waters of the Salish Sea, an area designated by the federal government as “core summer critical habitat.” Their diet during this time normally consists of approximately 80-90% Chinook salmon bound for the Fraser River watershed in Canada. Adequate prey availability throughout their entire range at all times of the year, not just the summer months, is critically important for the recovery of SRKWs. Furthermore, during a time of historically low Chinook returns to the Fraser River in 2013, SRKWs were markedly absent from this inland core range. Documented in this core habitat on less than half the number of days as compared to previous years, it is reasonable to speculate that Southern Residents were instead foraging on Chinook salmon returning to the mouth of the Columbia River during this period.

Judge Simon also gives deference to NOAA analysis that “hatchery salmon are more than sufficient to offset the FCRPS-caused reduction in salmon abundance.” Hatchery salmon undeniably have not made up for the damage to wild salmon populations caused by the Federal Colombia River Power System, nor do they create abundance levels sufficient for SRKW survival, as exhibited by the whales’ current population decline. Artificial hatchery systems cannot replace wild fish and in the long-term can cause myriad problems resulting in crashes of hatchery and wild salmon populations. Most significantly, hatchery fish lack genetic diversity and are therefore less resilient and adaptable to the ever increasing threat of climate change. When genetically inferior hatchery fish are released to spawn with wild fish they dilute diversity of with wild population and make it more susceptible to crash.

5. SECONDARY THREAT TO SURVIVAL—TOXINS: The threat to Southern Resident killer whales from toxics and other contaminants is compounded by the nutritional stress the animals’ suffer.

Persistent Organic Pollutants (POPs), the most concerning environmental contaminants, are organic compounds resistant to environmental degradation. Although the production of many POPs – DDT and PCBs specifically – were banned in the United States and other developed countries decades ago, they remain ubiquitous in the environment due to their wide dispersal through leaks, spills, and vaporization. Additionally, POPs are still used in many developing nations, where they enter the watershed and resistant to breakdown, they spread throughout the oceans. POPs are lipophilic – they bioaccumulate in the fatty tissues of animals at a rate greater than that which is lost and biomagnify or concentrate through the trophic levels of the food chain promoting deleterious biological effects most prominently in top predator marine mammals, like SRKW, considered among the most contaminated marine mammals in the world.

Lipophilic contaminants remain sequestered in blubber until the whale experiences a scarcity of food. In the absence of an adequate food supply, killer whales metabolize their fat stores and flood their bloodstream with hormone-mimicking toxins known to interfere with gene expression, and cause immune-suppression, endocrine dysfunction, brain deficits, reproductive impairments, and birth defects in marine mammals (de Swart et al. 1994, O’Hara and O’Shea 2001, Buckman et al. 2011, Lundin et al. 2015, Wasser et al. in prep, Mongillo et al. in press). This explains why the eastern North Pacific population of transient killer whales, despite their higher contaminant burdens, is increasing. Though, they overlap in geographic range, transients are marine mammal eaters and enjoy a wide variety and abundance of prey (NMFS 2008).

PBDEs, flame retardants with toxic properties were only recently discovered in marine mammals. (Alava et al. 2015) found that PBDE concentrations in Southern Residents exceed the only toxicity reference value known for PBDEs in marine mammals, and that observed levels indicate a doubling time of approximately five years. Only recently recognized as a POP, PBDE regulation has been slow, and cleanup virtually non-existent.

Perhaps most concerning of the aforementioned host of deleterious effects of POPs, is the influence of toxic contaminants on the ability of Southern Residents to successfully reproduce. Research indicates that contaminant burdens are linked to increasing age of first successful birth, effectively shortening reproductively viable years for female Southern Residents (Lundin et al. in prep) and that toxins are metabolized from the blubber of females and passed to calves in utero and through lactation has been documented (Krahn et al. 2007, 2009, Lundin et al. 2015).

Population growth in Southern Residents is constrained by low offspring production for the number of reproductive females in the population. Based on fecal samples collected between 2008 and 2014, up to 60% of all detectable pregnancies spontaneously aborted; of these, 38% occurred relatively.
late in gestation when the cost is especially high. (Lundin et al. in prep) Low availability of Chinook salmon appears to be the most important stressor among these fish-eating whales as well as a significant cause of late pregnancy failure. Release of lipophilic toxicants during fat metabolism and stress related to vessels and associated noise may also negatively impact this nutritionally deprived population of animals. Results point to the importance of promoting Chinook salmon recovery to enhance population growth of Southern Resident Killer Whales. (Lundin et al. in prep).

6. SECONDARY THREAT TO SURVIVAL—VESSEL TRAFFIC: The threat to Southern Resident killer whales from vessel traffic is compounded by the nutritional stress the animals’ suffer.

Killer whales rely extensively on sound for orientation and navigation, prey detection, and communication vital to maintenance of group cohesion. Vessels affect SRKWs directly through their presence and indirectly by increasing underwater ambient noise. Vessel regulation has been a principle recovery action enacted by NOAA since the Southern Resident population was listed as an endangered species under the ESA in 2005. In 2011, NOAA adopted new regulations regarding the distance vessels must maintain from all killer whales, with the intent to protect endangered SRKWs. The regulations prohibit approaching any killer whale within 200m and positioning a vessel in the path of oncoming killer whales within 400 yards apply to all motorized and non-motorized vessels (including kayaks), with exceptions for safe navigation and for certain types of vessels (i.e. government vessels in the course of official duties, ships in shipping lanes, research vessels under permit, and vessels lawfully engaged in commercial or treaty Indian fishing actively setting, retrieving, or closely tending fishing gear).

This distance may, to some degree, limit the direct effects of a vessel’s physical presence. Behavioral reactions in response to vessel presence depend on a number of factors, including the activity state of the whales; however, SRKWs appear to be most vulnerable to vessel disturbance while feeding (NMFS 2011b) and energetically costly disruptions to natural behaviors have been observed. Holt et al. (2009) indicates that for every 1 dB increase in noise, SRKWs increase their call amplitude by 1 dB and Lusseau et al. (2009) and Williams et al. (2009) observed increased swimming speed and evasive swimming patterns, increased travel time and altered dive lengths, and reduced foraging time.

A scientific study conducted on behalf of NOAA analyzed the effect of vessel traffic on SRKWs. The study found that the inadequacy of SRKW’s preferred prey, not vessel traffic, is the main causative factor in SRKW’s population decline. In light of those results, this data indicates that vessel impacts have a cumulative effect on SRKWs stress response, especially during years of low Chinook salmon abundance. As such, this study provides evidence that secondary stressors, such as vessel traffic, are exacerbated when Chinook salmon abundance is low.

A study conducted by David Lusseau, University of Aberdeen Institute of Biological and Environmental Sciences, measured the behavior of SRKWs in the presence and absence of vessels at two different sites along San Juan Island, Washington. The study found SRKW activity conditions were significantly affected by vessel traffic. Specifically, the study found a reduction in the amount of time SRKWs spent foraging, and if “reduced foraging effort results in reduced prey capture, this would result in decreased energy acquisition.” Similarly, a study of SRKW’s sister species, Northern Resident Killer

---

63 Katherine L. Ayers, Distinguishing the Impacts of Inadequate Prey and Vessel Traffic on an Endangered Killer Whale (Orcinus Orca) Population (June 6, 2012), http://journals.plos.org
64 Id.
65 Lusseau et al. (2009), Vessel traffic disrupts the foraging behavior of southern resident killer whales Orcinus Orca
Whales, found that those whales spent less time feeding when vessels were present, which could have resulted in 18% estimated decrease in energy intake.66

A study conducted by Dawn Noren, research fishery biologist at NOAA, sought to determine whether SRKWs perform surface active behaviors (SABs), such as tail slaps, in correlation to vessel proximity.67 Noren’s study found that SRKW behavioral responses are most pronounced when vessels are present, and in particular, when vessels are within 100 meters of the whales.

A study conducted by Rob Williams, Sea Mammal Research Unit at St. Andrews University, found vessel traffic impacts SRKW behavior and foraging.68 Namely, the study found that SRKW swimming path directness was affected by the presence of vessels. The whales travelled greater distances when vessels were present, which Williams hypothesized could contribute to increased energy expenditure relative to the unaffected whales. Notably, “[t]he high proportion of time that southern resident killer whales spend during summer in proximity to vessels raises the possibility that the short-term behavioural changes reported here may have biologically significant consequences.” Further, William’s study acknowledged the larger concern of prey availability for SRKWs, and that limiting boat traffic around SRKWs may improve foraging efficiency by reducing the masking effect of boat noise on echolocation.

Vessel size and speed have a significant effect on the level and frequency of noise introduced into the underwater environment. Houghton et al. (2015) determined that vessel speed is the most important factor determining received noise levels for individual whales and Veirs et al. (2016) determined that large vessels (over 65 feet in length) elevate noise levels at both low and high frequencies, including those used by killer whales for communication and echolocation necessary for navigation and foraging. This is of particular concern for SRKWs already coping with an inadequate prey supply. Approximately 20 large vessels travel through Haro Strait, within the core SRKW summer range, each day. This increases noise above average ambient levels by 20-30 dB at low frequencies (from 100-1000Hz) and 5-13dB at high frequencies (10,000-40,000 Hz) (Veirs et al. 2016). Slowing down has the potential to be an effective noise mitigation strategy and has been recommended previously as an operational ship quieting option (Southall & Scholik-Schlomer 2008). Veirs et al. (2016) suggests that on average, each reduction in a ship's speed by 1 knot could reduce broadband noise levels by 1 dB. This strategy has other inherent benefits such as reducing the likelihood of vessel strikes, and is consistent with environmental efforts to increase fuel efficiency. Vessel speed regulations on the east coast (specifically designed for the protection of right whales) have proven to be effective in preventing ship strikes and reducing noise, in addition to in reducing emissions and fuel costs for vessels (Cappa et al. 2014, Conn and Silber 2013, Psaraftis et al. 2009).

The acoustic environment and threat of vessel traffic should be considered in the agencies’ cumulative analysis, particularly in light of the recent approval, by Canadian Prime Minister Justin Trudeau, of the expansion of the Kinder Morgan pipeline that will bring oil from the tar sands in Alberta Canada west to Burnaby, BC. This expansion will increase shipping by 35 or more transits per month through the heart of the SRKW critical habitat, exponentially increasing the odds of a catastrophic oil spill. In addition, there are three proposed terminals in Grays Harbor, the proposed Tesoro-Savage and NuStar projects on the lower Columbia River, and expanded capacity at Shell's refinery near Anacortes. Vessel traffic and accompanying underwater noise pollution could increase substantially in the SRKW summer range and current designated critical habitat, as well as their coastal range.

66 Lusseau et al. (2004), Estimating relative energetic costs of human disturbance to killer whales (Orcinus orca)
67 Noren et al. (2009), Close approaches by vessels elicit surface active behaviors by southern resident killer whales
68 Williams et al. (2009), Effects of vessels on behaviour patterns of individual southern resident killer whales Orcinus orca
II. Retiring and replacing the four lower Snake River dams with carbon neutral alternatives is a reasonable alternative that should be fully and fairly analyzed, assessed, and considered in the Draft EIS.

Every year, salmonids travel up and down the Columbia and Snake Rivers, hatch in fresh water, migrate downstream to the Pacific on their way to adulthood, and later return upstream to spawn and die. Historically, ten to sixteen million wild salmon returned each year to the Snake/Columbia River Basin.69 Since the construction of dams on the lower Snake River (Lower Granite, Little Goose, Lower Monumental, and Ice Harbor Dam), abundance of wild salmon has decreased drastically. Today, of the thirteen listed salmonids, eleven are listed as “threatened” and two, the Upper Columbia River spring Chinook salmon and the Snake River sockeye salmon, are listed as “endangered.”70 The decline of the Columbia River Basin salmon has had major consequences on species that depend on them for sustenance.

For decades, the FCRPS has relied on mitigation strategies that assume the continued operation of the dams. The most prominent measures include (1) fish ladders, (2) habitat improvement, (3) hatcheries, and (4) increasing “spill” over the dams. These measures have proved unable to slow the decline of wild salmon populations.

In the face of these failures, new strategies must be considered. Voices in the scientific, legal, and economic communities have called for breaching the dams, which would be accomplished by removing the earthen portions of the dams to allow water to flow naturally. Breaching is believed by a host of scientific experts, including fish biologists, to be the most effective and quickest way to recover sustainable populations of salmon.

We join in the widespread request that the agencies consider breaching the four lower Snake River dams as a reasonable alternative in the EIS, and that the agencies dam breaching alternative fully, fairly, and with the best science evaluate the feasibility of replacing the energy of the four lower Snake River dams with zero carbon alternatives—first and foremost efficiency gains, followed by growth in wind and solar. This analysis will need to include a forward-looking power system assessment of the technical feasibility of replacing the dams with an energy portfolio that does not increase the region’s greenhouse gas emissions. We believe that a full and fair consideration of this alternative is in line with what NEPA requires.

NEPA requires federal agencies to issue an EIS before taking any action “significantly affecting the quality of the human environment.”71 In an EIS, in addition to considering the environmental impacts of an action, agencies must “[r]igorously explore and objectively evaluate all reasonable alternatives.”72 The purpose for exploring reasonable alternatives is to “provid[e] a clear basis for choice among options by the decisionmaker and the public.”73 Ultimately, “[t]he existence of a viable but unexamined alternative renders an environmental impact statement inadequate.”74

---

70 Id. at M4 18
71 42 USC § 4332.
74 Morongo Band of Mission Indians v. F.A.A., 161 F.3d 569 (9th Cir. 1998).
The range of alternatives considered in an EIS is impermissibly narrow if the agency fails to evaluate all “reasonable [and] feasible” alternatives in light of the ultimate purposes of the project.75 “Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant.”76

Here, breaching the lower Snake River dams is technologically feasible. The Army Corps of Engineers at Walla Walla recognized the technological feasibility of breaching the four lower Snake River dams in the 2002 feasibility report.77 Breaching is also legally feasible. “The mere fact that an alternative requires legislative implementation does not automatically establish it as beyond the domain of what is required for discussion.”78 In Morton, plaintiffs challenged the exclusion of alternatives including “federal legislation or administrative action freeing current offshore and state-controlled offshore production from state market demand proratoning, or changing the Federal Power Commission's natural gas pricing policies.”79 Holding for the plaintiffs, the court drew a distinction between alternatives requiring an overhaul of basic legislation, like an alternative requiring repeal of antitrust laws, and those merely requiring legislative implementation.

In addition to its feasibility, dam breaching is also an attractive alternative for its unparalleled direct benefits to Snake River salmon. Salmon spawn in flowing, well-oxygenated, cold-water riffles of streams.80 Cold water and good flow provide oxygen to eggs and carry off waste products. Good flow of pure water is critically important to survival through the egg-to-fry stage, which is the period of greatest mortality in an anadromous fish’s life cycle.81 However, dams have turned 140 miles of the mainstem Snake River into slack water reservoirs.82 These reservoirs are unfit for spawning because they both drastically decrease flow and raise temperatures, compromising the spawning process. The four Snake River dams can add an estimated 6 to 12 degrees Fahrenheit to water temperatures.83 Consequently, the

75 City of Carmel–by–the–Sea v. U.S. Dep’t of Transp., 123 F.3d 1142, 1155 (9th Cir. 1997).
76 COUNCIL ON ENVIRONMENTAL QUALITY, MEMORANDUM: FORTY MOST ASKED QUESTIONS CONCERNING CEQ’S NATIONAL ENVIRONMENTAL POLICY ACT REGULATIONS, Question 2a, available at https://ceq.doe.gov/nea/rega/40/1-10.HTM#2.
79 Id. at 837.
83 EPA, COLUMBIA/SNAKE RIVERS TEMPERATURE TMDL PRELIMINARY DRAFT (July, 2003), pg. 30, http://columbiariverkeeper.org/wp-content/uploads/2015/07/Preliminary-Draft-TMDL-Draft-6-30-03-editing-9-5-03.pdf; see also MICHAEL DeHART, FISH PASSAGE CENTER, MEMORANDUM: REQUESTED DATA SUMMARIES AND ACTIONS REGARDING SOCKEYE ADULT FISH PASSAGE AND WATER TEMPERATURE ISSUES IN THE COLUMBIA AND SNAKE RIVERS (10/28/15), pp. 1-2, http://www.fpc.org/documents/memos/159-15.pdf (stating “[h]ydrosystem development has had a significant effect on temperature in the mainstem Columbia and Snake rivers. By slowing water flow and increasing surface area for solar radiation, dams caused increased water temperatures in the reservoirs.” “Significant long-term actions to address these temperature issues are necessary for the continued survival of salmon populations.”)
Dams have limited the spawning habitat of Snake fall chinook to only 17% of historic habitat. Breaching would restore salmon spawning habitat by increasing flow and reducing temperature. Flow would increase towards natural conditions because riverine conditions would be reestablished along over 140 miles of the lower Snake River (although flows originating in the upper Snake River Basin and the North Fork Clearwater River would still be controlled by dam operations at Hells Canyon Complex and Dworshak Dams). A decrease in temperature would accompany the increase in flow. Because fall Chinook salmon generally spawn in the mainstem river as opposed to tributaries and streams, breaching is expected to increase the carrying capacity (available habitat) for fall chinook salmon by more than 70 percent. Spring and summer chinook generally spawn and rear in smaller, higher-elevation tributaries of the Snake River, but they also have been known to spawn in the lower Snake River. Thus, spring/summer chinook would also see habitat benefits.

Second, breaching would decrease stress on migrating salmon by decreasing water temperature. In addition to decreasing availability of spawning habitat, increased temperature can be lethal to migrating salmon by delaying migration and depleting their limited energy resources. These negative effects on migration have been observed at temperatures less than the 20°C (68°F) water quality standard. Nonetheless, from 2005–2014, temperatures exceeded the 20°C (68°F) standard for 20%–30% of the passage season (April–August) at most FCRPS projects. In 2015, temperatures exceeded the standard 35%–45% of the season at the Ice Harbor, Lower Monumental, and Little Goose dams. Breaching would decrease temperatures in the lower Snake River by reestablishing riverine conditions.

Third, breaching would reduce predation on migrating salmon. Since construction of the dams, cool, swift rivers have changed to deep, warm, low flow reservoirs. This change invited the proliferation of invasive species that prey on salmon, such as the northern pike minnow and smallmouth bass. Dam breaching would decrease predation by increasing flow velocity and decreasing duration of elevated water temperatures in the lower Snake River. Salmon would move through the lower Snake River at a faster rate and be exposed to predators for a shorter time. Population densities of predators would also decline, as habitat conditions they prefer are reduced.

Fourth, breaching would eliminate the issue of dams interrupting salmon physical development. Juveniles undergo a complex transformation that involves physiological, biochemical, morphological, and

---

86 Id. at M ES-8.
87 Id. at Appendix M, pg. A ES-6; Richard N. Williams, Return to the River: Restoring Salmon Back to the Columbia River (Elsevier Academic Press, 2006) at 126.
88 Lower Snake River Juvenile Salmon Migration Feasibility Report, supra note 135, p. M4-3
90 Id. at pg. 3.
91 Id. at pg. 10.
93 Id. at Appendix M, p. M10-19.
behavioral changes (smoltification) as they migrate downriver.\textsuperscript{96} This allows juveniles to transition from living in freshwater to living in saltwater. Interrupting smoltification interferes with their ability to adapt to the marine environment. Both the slow moving water in the reservoirs and navigating around or through the dams delay the outward migration of juveniles, which can interrupt smoltification. Transporting juveniles disrupts and interferes with smoltification timing, resulting in delayed mortality after smolts are discharged below Bonneville dam.\textsuperscript{97}

Fifth, breaching would return downriver migration time to near-natural conditions. Dams lengthen the juvenile downriver migration time, which increases exposure to predation, depletes critical energy reserves, and interrupts smoltification (among other hazards).\textsuperscript{98} Salmon are genetically programmed for a one to two week swim to the sea, swept downriver tail first by the cold, fast-flowing water associated with spring snow melt.\textsuperscript{99} But today, “median travel times for yearling Chinook from the Snake River to Bonneville Dam range from 14 days to 31 days depending on flow conditions, an increase of 40 to 50% over travel times measured in 1966.”\textsuperscript{100}

In addition to the direct benefits dam breaching would have on salmon, and the SRKWs that depend on them, dam breaching would benefit a host of other wildlife. The Snake River headwaters of central Idaho were formerly characterized by abundant salmon runs. These fish served as a major food source for a diverse assemblage of terrestrial carnivores. After accumulating 95% of their biomass in the marine environment, salmon return to freshwater streams to spawn and eventually die.\textsuperscript{101} This transfer of marine-derived nutrients (“MDN”) supports many animal populations—and exerts significant influence over the ecological condition of inland ecosystems.\textsuperscript{102,103} Along with grizzly bears and wolves, research shows that 137 species of fish and wildlife in the Pacific Northwest rely on salmon for their survival.\textsuperscript{104}


\textsuperscript{97} Id. at pg. 5-9.

\textsuperscript{98} Id. at pg. 5-7,8.


\textsuperscript{100} SUPPLEMENTAL COMPREHENSIVE ANALYSIS OF THE FEDERAL COLUMBIA RIVER POWER SYSTEM AND MAINSTEM EFFECTS OF THE UPPER SNAKE AND OTHER TRIBUTARY ACTIONS, NOAA FISHERIES (May 5, 2008), Pg. 5-7, http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fcrps/final-sca.pdf, (stating that while it is not known how long it took juvenile salmon to traverse the free-flowing river, it has been estimated that migrating smolts traveled about one-third (in lower flow conditions) to one-half (in higher flow conditions) as fast through the impounded reaches as through the free-flowing reaches.)


The construction of the four lower Snake River dams has caused the substantial decline of native salmon stocks in the Snake River basin. This watershed is home to the 22 million-acre Salmon-Selway ecosystem of central Idaho, a pristine parcel of land capable of supporting the mammals historically found in the Northern Rockies. Pacific salmon (Onchorynchus spp.) previously represented a substantial component of the grizzly bear (Ursus arctos) diet in the Snake River basin.

Similar research on wolves (Canis lupus) has not been conducted, yet there is significant evidence that wolves also consume salmon in comparable inland freshwater ecosystems. While observing the spawning salmon in the Salmon River in 1833, Captain Bonneville wrote in his journal, “The bears and wolves assemble to banquet on them.” It is widely recognized that salmon play an important role in the diet of coastal wolf populations. Due to current research on inland wolves, the diet benefit of salmon for these packs is now well-documented. According to a study conducted in Denali National Park, during times of spawning, salmon remains occur in up to 70% of gray wolf scats. Although they are highly opportunistic predators, salmon are a preferred food source for wolves when available. Salmon offer several adaptive benefits: (a) salmon provide greater nutrition than ungulate meat, particularly in fat and energy, (b) salmon are predictably clumped and locally abundant in spawning areas, and (c) it is significantly less risky and energetically costly to acquire salmon than ungulate prey. Based on this relationship between availability of salmon and use by wolves, it is apparent that salmon consumption occurs wherever habitats of wolves and salmon overlap.


Irving, W., B. L. E. de Bonneville, and A. Powers. 1963. Adventures of Captain Bonneville. Binfords & Mort Portland, OR.


Ibid.

Ibid.

Wolves in central Idaho were completely exterminated by 1933.118 In 1995, wolves were reintroduced to the wilderness of central Idaho.119 The population of wolves in Idaho in 2015 was estimated at 786 wolves.120 The return of the salmon population to central Idaho would provide an exceptionally high quality food source for wolves.

Besides grizzly bears and wolves, many terrestrial vertebrates consume salmon—including black bears, coyotes, mountain lions, raccoons, otters, pine martens and mink. All of these species are found in the Columbia River basin. Research shows these secondary consumers directly remove salmon from streams. More frequently, they are observed scavenging the remains of salmon carcasses left uneaten by bears or wolves. Due to different hunting and scavenging behaviors of these mammals combined with the highly variable spatial and temporal distribution of salmon—it is difficult to quantify the abundance of salmon in each species diet. It is clear that many carnivores other than wolves and bears utilize salmon as a meat source. This pulse of marine energy propagates through every trophic level of the terrestrial food-web.

Salmon is an important food source to 89 documented bird species in the Columbia River basin, including bald eagles, ravens, herring gulls, terns, ospreys, herons, grebes, jays, mergansers, and even owls.121 Similar to secondary mammalian predators, most of these birds are largely visual predators as well as scavengers, often eating the remains of salmon carcasses.122 In particular, eagles receive a major source of energetic intake from salmon consumption in the summer and fall.123 Eagles are often limited by food availability in late winter when salmon have disappeared from the watershed. Consequently, eagles forage over large areas and congregate in the thousands on late fall salmon runs in preparation for the winter months.124

Salmon biomass provides energetic input and numerous benefits to inland freshwater ecosystems. Many carnivores, ranging from apex predators to avian scavengers rely on salmon as a meat source. It is evident that salmon are not merely an alternative food source, but rather a primary, preferred and targeted source of energy. This food source has been dramatically eliminated from this ecosystem. It is necessary for the management of this watershed that the entire ecosystem be considered, connected from the Pacific Ocean to the high alpine lakes of central Idaho. It is also necessary for continued research on the role of salmon in the needs of terrestrial consumers. This research must be incorporated into the salmon management plans of the Pacific Northwest. The removal of the four lower-Snake River dams will connect a currently fragmented landscape and allow salmon to restore this important marine-terrestrial link.

119 Ibid.
120 Idaho Department of Fish and Game. 2015. 2015 Idaho wolf monitoring progress report. Idaho Department of Fish and Game, 600 South Walnut, Boise, Idaho. 71 pp.
124 Ibid.
A full and fair dam breaching alternative analysis must consider the many socio-economic and community benefits of removing these dams. Restoring the river would provide fish not just to wildlife but to people too, including tribal, commercial, and recreational fishermen. Restoring the Snake River would open up a world of outdoor adventure and recreation possibilities as well.

Finally, this analysis must be conducted in light of climate change and predicted warming in the region. Earlier snow melts and lower summer flows has impacts on both the projected energy production of the dams and on the survival of salmon that should be considered. The four Lower Snake River dams are the gateway to a vast expanse of high-elevation spawning and rearing streams that crisscrosses millions of acres of unspoiled wilderness. This habitat is arguably the most pristine Chinook salmon habitat remaining in the Lower 48. It is the sort of habitat that has been identified as a “cold-water climate shield” (Isaak et al. 2015), providing a cold-water refuge uniquely buffered from the effects of climate change. Restoring full, unimpeded access to the habitat above the lower Snake River dams is an essential part of ensuring that Snake River salmon survive in a climate changing world.

II. Conclusion

In 1994, District Judge Marsh stated that the Federal Columbia River Power System “cries out for a major overhaul” in light of its impacts on listed salmon species. Over two decades later, that call has only become more urgent. For all the reasons discussed above, we ask that the agencies consider the impact of the Columbia and Snake River dams on SRKWS and give full and fair analysis to the reasonable alternative of retiring and removing the four lower Snake River dams and replacing their energy with zero-carbon alternatives.

Respectfully Submitted,

Giulia Good Stefani
Staff Attorney
Natural Resources Defense Council

125 Idaho Dept. of Fish & Game v. NMFS, 850 F. Supp. 886, 900 (D. Or. 1994).
REFERENCES


Exxon Valdez Oil Spill Trustee Council. 2010. 2010 Update Injured Resources and Services.


Lundin et al. in prep


National Marine Fisheries Service. 2015. Listing endangered or threatened species; 12-month finding on a petition to revise the critical habitat designation for the southern resident killer whale distinct population segment. *Federal Register* 80(36):9682-9687.


Wasser et al. in prep

