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Columbia River System Operations and the Future of the Lower Snake River Dams

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Congress has repeatedly engaged in debates on how to operate and allocate resources from federal projects—such as multipurpose federal dams—to serve various human needs while protecting or conserving species listed under the Endangered Species Act (ESA; 16 U.S.C. §§1531-1544). The Columbia River Basin, which includes the Snake River, is home to numerous federal and nonfederal dams that provide an array of services within the basin but whose operations have affected certain fish species.

The Columbia River Basin supports anadromous salmon and steelhead trout populations, many of which are now listed as endangered or threatened under the ESA. Four of these listed populations inhabit the Snake River watershed, a subbasin that encompasses over 40% of the larger Columbia River Basin. Federal courts have recognized that certain fish populations in the Columbia River Basin have economic and religious importance to local Tribes, and the federal government has acted to establish and protect the treaty fishing rights of Tribes occupying the Columbia River Basin. Despite federal and nonfederal efforts to protect and recover fish populations through actions such as altered dam operations and habitat-focused initiatives, listed salmon and steelhead trout populations remain low in the Columbia River Basin.

SUMMARY

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Anna E. Normand, Coordinator
Specialist in Natural Resources Policy

Pervaze A. Sheikh, Coordinator
Specialist in Natural Resources Policy

Erin H. Ward, Coordinator
Coordinator of Research Planning/ALD

Due to the potential for operation of the Columbia River Basin dams to affect listed species, the federal agencies operating the dams have consulted with the National Marine Fisheries Service under the ESA regarding their operation plans for the dams since the mid-1990s. Stakeholders have repeatedly sued the federal government over the biological opinions and decision documents that have resulted from these processes. Much of the litigation has centered on whether the federal agencies have properly justified their operational plans in light of alternative actions that some argue would better protect listed species. One significant issue is whether the federal agencies may or must evaluate the alternative of breaching one or more of four dams owned and operated by the U.S. Army Corps of Engineers on the lower Snake River. In a 2020 environmental impact statement, the federal agencies considered removal of the dams as one course of action. In a 2020 record of decision (ROD), the agencies selected an alternative approach that retains the dams and increases the flow at certain times through several of the dams in the system to benefit migrating fish.

In response to the 2020 ROD, the plaintiffs in the ongoing litigation added claims related to the 2020 biological opinion, environmental impact statement, and ROD. The litigation was stayed in October 2021 to allow for settlement negotiations. During the stay, in September 2023, President Biden signed a presidential memorandum directing federal agencies to prioritize their authorities and available resources to advance the restoration of native fish populations in the Columbia River Basin. On February 8, 2024, the court granted certain parties' request to stay the litigation through 2028 to allow them to implement a memorandum of understanding (MOU), which they submitted with the motion to stay. The MOU states that the federal government agrees to implement commitments, consistent with the 2023 presidential memorandum, in support of a restoration plan known as the Columbia Basin Restoration Initiative that was developed by four Tribes and two states. The MOU also commits to 10-year interim operations of the dams to balance fish and energy needs.

Congress may consider various legislative options regarding the operations of federal dams in the Columbia River Basin in general and in the lower Snake River in particular. Such options include whether to continue or alter dam operations and whether or not to remove the lower Snake River dams. Members of Congress have proposed legislative options regarding this issue in the 117th and 118th Congresses. These proposals and other options may entail tradeoffs between the benefits that the dams currently provide and the recovery of ESA-listed fish populations, among other issues. Significant uncertainty remains as to the potential effects and costs of most options under consideration. For example, estimates of the cost to replace existing benefits provided by the lower Snake River dams have ranged from $10 billion to $31 billion, mostly for electricity generation and grid services. Congress's preferred course on how to address Columbia River System operations, including the lower Snake River dams, may also impact the solutions considered for other similarly situated federal projects and listed species habitats.

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Introduction

Dams serve many purposes, such as generating hydroelectric power, enabling navigation, and controlling water supply. Dams also often negatively affect ecosystem processes and aquatic species mobility. For example, dams may impede anadromous fish migrating between the ocean and upriver spawning areas.[1] Congress has repeatedly debated how to allocate resources and operate federal projects—such as multipurpose federal dams—to serve human needs while also protecting ecosystems and facilitating the recovery of depleted fish and other species that depend on the river ecosystems, including species that are threatened with extinction and listed under the Endangered Species Act (ESA; 16 U.S.C. §§1531-1544).

One area of continued interest to Congress is the Columbia River Basin, which contains numerous federal and nonfederal dams that provide an array of services within the basin but whose operations some consider controversial for their effects on certain fish species.[2] The Columbia River Basin supports Pacific salmon and steelhead trout populations, many of which are now listed as endangered or threatened. Four of these listed populations inhabit the Snake River watershed, which encompasses over 40% of the larger Columbia River Basin.[3]

While the U.S. Army Corps of Engineers (USACE) and the Bureau of Reclamation (Reclamation) are obligated to operate federal dams that they manage within the Columbia River Basin to serve their authorized purposes, they and all federal agencies also have obligations under the ESA to facilitate the recovery of listed species and ensure that their actions do not jeopardize the existence of such species. They also have obligations under the National Environmental Policy Act (NEPA; 42 U.S.C. §§4321 et seq.) to consider the effects of their actions on the human environment. In addition, federal courts have recognized the treaty rights of some federally recognized Tribes ("Tribes") to access fish in the Columbia River Basin.[4] Accordingly, federal agencies have implemented conservation efforts and considered the effects of the operation of federal dams in the Columbia River Basin through consultation under the ESA, environmental review under NEPA, and engagement with stakeholders such as Tribes.

[1] Fish are *anadromous* if they spend most of their lives in salt water and then swim up a river to spawn. Young anadromous fish hatch and then swim downstream to grow to adulthood in the ocean. For example, most salmon and some sturgeon species are anadromous.

[2] *Federal dams* are dams owned by the federal government and managed by one or more federal agencies. Federal dams include dams that were constructed based on congressional authorizations specific to each dam (e.g., most dams managed by the U.S. Army Corps of Engineers [USACE] and the Bureau of Reclamation [Reclamation]) and dams that were constructed or acquired through broader authority not specific to an individual dam (e.g., most dams managed by federal land management agencies). For individually authorized dams, the authorizing statute for each dam provides the primary guidance for the dam's management to satisfy authorized purposes; subsequent acts may provide additional operating authority.

[3] National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), *Rebuilding Interior Columbia Basin Salmon and Steelhead*, September 30, 2022, pp. 1-42, https://www.fisheries.noaa.gov/resource/document/rebuilding-interior-columbia-basin-salmon-and-steelhead (hereinafter NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*).

[4] A *federally recognized Tribe ("Tribe")* is an American Indian or Alaska Native entity that is recognized as having a government-to-government relationship with the United States, which makes the entity eligible for certain programs and services. For the 2024 list of Tribes, see Department of the Interior (DOI), Bureau of Indian Affairs (BIA), "Indian Tribal Entities Within the Contiguous 48 States Recognized by and Eligible to Receive Services from the United States Bureau of Indian Affairs," 89 *Federal Register* 944-948, January 8, 2024, https://www.govinfo.gov/content/pkg/FR-2024-01-08/pdf/2024-00109.pdf. Sample court cases include *United States v. Winans*, 198 U.S. 371 (1905), and *United States v. Washington*, 520 F.2d 676 (9th Cir. 1975) ("the Boldt Decision").

Despite federal and nonfederal efforts to protect and recover salmon and steelhead trout populations (e.g., modifying dam operations and restoring habitat), several populations remain listed under the ESA.[5] The low population sizes of listed salmon and steelhead trout in the Columbia River Basin combined with ongoing stressors such as dams, climate change, and drought have led to concerns among several stakeholders. Efforts and proposed actions to address these declines have met resistance from other stakeholders who value the services that federal dams provide, such as hydropower, navigation, and irrigation, among others. These stakeholders have expressed concern that these services may be diminished in order to support listed fish species. The debate between various stakeholders with different interests in the region over which resources and services to prioritize has led to various proposals and approaches to address the issue.

Litigation is one way some stakeholders have pursued their interests in this issue. For example, the decline of salmon and steelhead trout populations has prompted some stakeholders to sue the federal government under the ESA and other environmental statutes for failing to adequately protect listed fish in the Columbia River Basin. While cases challenging Columbia River Basin dam operation plans and associated ESA consultation and NEPA review documents date back to the 1990s, shortly after the first fish populations were listed, current litigation was originally filed by the National Wildlife Federation (NWF) and other nonprofit organizations to challenge a 2000 biological opinion (BiOp) on the operations of federal dams.[6] NWF's most recent supplement to its complaint raises claims under the ESA, NEPA, and Administrative Procedure Act (APA) related to a BiOp, NEPA review, and final agency record of decision (ROD) issued in 2020. In December 2023, the court granted the parties' request to stay the litigation for five years while the federal government implements a memorandum of understanding (MOU), which outlines commitments in support of a Columbia Basin Restoration Initiative (CBRI) developed by four Tribes and the states of Washington and Oregon.

Outside of litigation, some Tribes, states, and environmental groups have proposed plans, such as the CBRI, to recover listed fish populations in the basin. Some proposals promoted by stakeholders with interests in the listed species and river ecosystems include actions in support of removing (i.e., *breaching*) four federal dams on the lower Snake River (collectively referred to as the *lower Snake River dams*) in the Columbia River Basin. These dams are owned and operated by USACE for congressionally authorized purposes of navigation, hydropower, and irrigation, among other benefits. The estimated cost of replacing the benefits currently provided by the lower Snake River dams generally has ranged from $10 billion to $31 billion, with replacement of electricity generation and grid services driving most of these costs.[7]

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[5] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead.*

[6] A *biological opinion* (BiOp) is a written statement from NMFS or the U.S. Fish and Wildlife Service (FWS), or both, analyzing whether a federal agency's proposed action is likely to jeopardize the continued existence of listed species or adversely modify or destroy critical habitat. The BiOp sets forth the agency's opinion and provides supporting information for the analysis. 16 U.S.C. §§1536(a)-(b).

[7] See Table 2 in the *Lower Snake River Dams: Benefit Replacement Report*, August 2022, published by the Office of Governor Jay Inslee of Washington jointly with Sen. Patty Murray. The report was prepared by a consulting team composed of Seattle-based firm Ross Strategic and DC-based Kramer Consulting. The cost estimate largely reflects the range of estimates from other groups including the Bonneville Power Administration (BPA) and dam breaching advocates. Costs are expressed as the present value of total costs in 2022 dollars. The methodology for discounting and converting costs from all studies into 2022 dollars is explained in the report. The report excludes some high-end estimates from earlier studies that relied primarily on new wind and solar energy as replacement resources, because "Senator Murray and Governor Inslee have determined an energy replacement portfolio only relying on intermittent resources is not a valid path forward." The report is at https://governor.wa.gov/sites/default/files/2022-11/LSRD%20Benefit%20Replacement%20Final%20Report_August%202022.pdf. Hereinafter Murray and Inslee, *Lower Snake River Dams*.

Congress may consider various legislative options regarding the operations of federal dams in the Columbia River Basin, such as whether to dictate specific operational plans and activities related to the lower Snake River dams, including whether to pursue dam removal and replacement of benefits. Members of Congress have proposed various legislative options in the 117th and 118th Congresses related to these issues. Administrative or legislative actions may entail tradeoffs between the benefits that the dams provide and actions to promote the recovery of ESA-listed fish populations. In addition, such potential actions may also impact considerations for other similarly situated federal projects and listed species habitats.

This report provides background on the lower Snake River dams in the context of federal dam operations in the Columbia River Basin, ESA-listed Snake River fish populations and associated recovery initiatives, and recent litigation over operation plans and associated ESA consultation and NEPA review documents. The report also discusses potential considerations for Congress, particularly regarding the lower Snake River dams and efforts to recover ESA-listed Snake River fish populations. This report does not include a detailed analysis of potential legislative options and their impacts. However, at various points, the report provides context of lower Snake River dam operations, in regards to both commerce and ESA-listed species.

Columbia River System

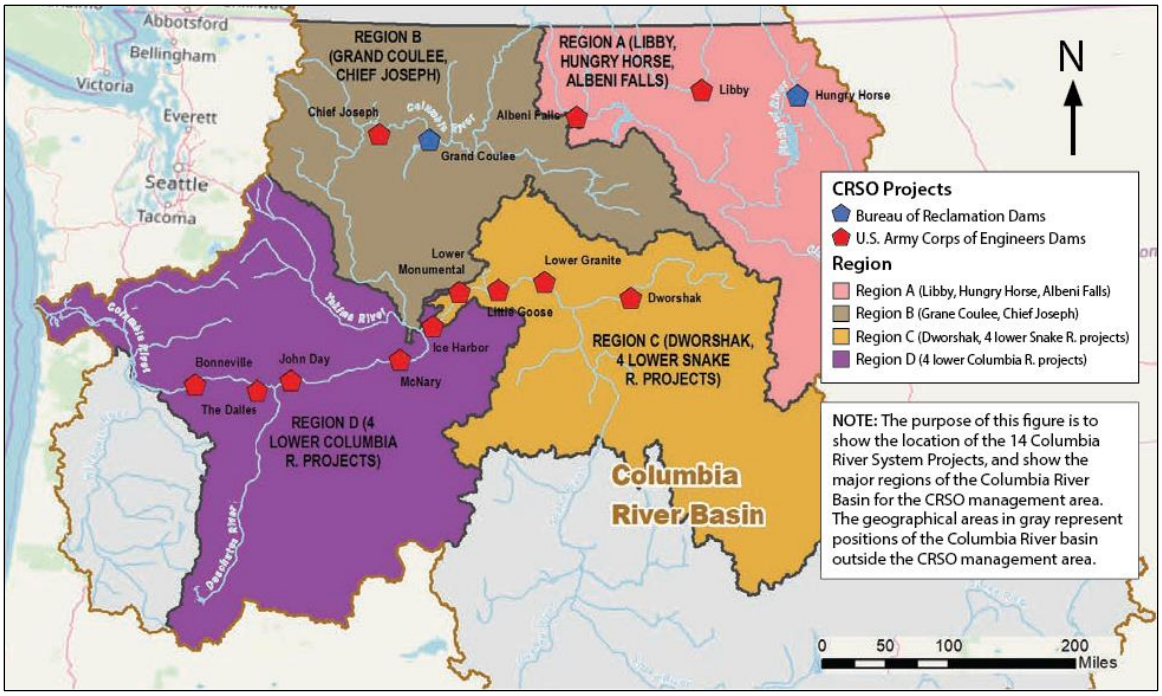
Federal dams have affected salmon and steelhead trout populations in the Columbia River Basin since the 1938 construction of Bonneville Dam, the first dam in the Federal Columbia River Power System (FCRPS). The FCRPS now includes 31 federal hydropower dams in the Columbia River Basin operated by either USACE or Reclamation.[8] The Bonneville Power Administration (BPA) markets electric power from these projects.[9] USACE, Reclamation, and BPA are generally referred to in this context as the *action agencies*. The action agencies consider 14 of the FCRPS federal dams in the Columbia River Basin to be primary mainstem facilities and refer to these dams as the *Columbia River System* (see **Figure 1**);[10] this system includes the four lower Snake River dams operated by USACE.

[8] Reclamation, "Federal Columbia River Power System," https://www.usbr.gov/pn/fcrps/index.html.

[9] In 1937, the Bonneville Project Act (P.L. 75-329; 50 Stat. 731) created the Bonneville Power Project and the BPA to market and transmit power from federal dams in Pacific Northwest, particularly to public bodies and cooperatives. BPA is one of four federal power marketing administrations (PMAs). BPA differs from the other three PMAs in that it is self-financed: it receives no federal appropriations. The Federal Columbia River Transmission System Act of 1974 (16 U.S.C. §838) authorized BPA to cover its operating costs through power rates set to ensure repayment to the Treasury of capital and interest on funds used to construct the Columbia River power system. For background on PMAs, see CRS Report R45548, *The Power Marketing Administrations: Background and Current Issues*.

[10] Fourteen of the Federal Columbia River Power System (FCRPS) projects are operated as a coordinated system known as the Columbia River System within the interior Columbia River Basin in the states of Idaho, Montana, Oregon, and Washington. Projects in the upper Snake, Willamette, and Rogue River Basins are excluded from the Columbia River System because these projects are coordinated and operated separately. Therefore, the multipurpose operation of these other FCRPS projects is generally not factored into the coordinated planning scenarios of the Columbia River System. USACE, Reclamation, and BPA, *Columbia River System Operations Environmental Impact Statement*, July 31, 2020, p. 3-374, https://www.nwd.usace.army.mil/CRSO/Final-EIS/. Hereinafter USACE, Reclamation, and BPA, *2020 EIS*.

Figure 1. Columbia River System



Source: CRS modification of map obtained from U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration, "Executive Summary," in *Columbia River System Operations Environmental Impact Statement*, July 31, 2020, p. 6, https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/14957.

Notes: This figure depicts the 14 dams of the Federal Columbia River Power System that comprise the Columbia River System within the interior Columbia River Basin. Other Federal Columbia River Power System dams and nonfederal dams in the Columbia River Basin are not shown.

Lower Snake River Dams

Some studies have identified the Snake River as being one of the most productive and largest salmon-producing tributaries of the Columbia River prior to the construction of dams in the basin.[11] The lower Snake River reach, as defined by the 2020 Environmental Impact Statement (EIS), extends approximately 178 river miles between Cache Creek (which is upriver from Lewiston, ID) through the Clearwater River confluence near Lewiston to the Columbia River confluence downstream near Pasco, WA (see **Figure 2**).[12] Over this reach, USACE constructed four dams that began operation between 1962 and 1975: Ice Harbor, Lower Monumental, Little Goose, and Lower Granite.[13] (See the "Origins of the Lower Snake River Dams" text box below for information on the authorization and construction of these dams.) The four dams are run-of-

[11] Randall F. Schalk, "Estimating Salmon and Steelhead Usage in the Columbia Basin Before 1850: The Anthropological Perspective," *Northwest Environmental Journal*, vol. 2, no. 2 (1986), pp. 1-29; D.J. Nemeth and Russell B. Kiefer, "Snake River Spring and Summer Chinook Salmon—The Choice for Recovery," *Fisheries*, vol. 24, no. 10 (1999), pp. 16-23. Hereinafter Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999.

[12] Inflow contributions to the lower Snake River comprise regulated outflows from the upper Snake River Basin and unregulated flows from the Salmon, Grande Ronde, and Imnaha Rivers. Tributary inflows downstream of the Snake and Clearwater confluence are fairly limited. The Idaho Power Company completed construction of the Hells Canyon Dam in 1967, which is upstream of the four lower Snake River dams, and blocked fish passage to the upper Snake River Basin. USACE, Reclamation, and BPA, *2020 EIS*, p. C-2-14.

[13] USACE, "Lower Snake River Dams," https://www.nww.usace.army.mil/Missions/Lower-Snake-River-Dams/.

river systems that are equipped with fish passage facilities.[14] Despite operation of fish passage facilities and other conservation measures, investigations have reported that construction and operation of these dams, in addition to effects from four dams downstream on the Columbia River, have, in part, resulted in an overall decrease of salmon returns to the Snake River basin.[15] Some scientists have suggested that the lower Snake River dams are the primary limiting factor for attaining healthy Snake River salmon and steelhead trout populations listed under the ESA and that restoring some level of pre-dam ecosystem function has the greatest probability of achieving healthy and harvestable populations of fish.[16] Other studies have identified additional factors affecting salmon and their potential impact on populations (see "Factors Affecting Snake River Salmon and Steelhead Trout Populations").

Figure 2. Lower Snake River Dams

Source: CRS modification of map obtained from U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration, *Columbia River System Operations Environmental Impact Statement*, July 31, 2020, pp. 3-374, https://www.nwd.usace.army.mil/CRSO/Final-EIS/.

[14] A *run-of-river system* uses a river's current to generate electricity. In contrast, *storage systems* use reservoirs to store water to generate electricity. U.S. Energy Information Administration, "Hydropower Explained," updated April 20, 2023, https://www.eia.gov/energyexplained/hydropower/.

[15] Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999; H.A. Schaller et al., "Contrasting Patterns of Productivity and Survival Rates for Stream-Type Chinook Salmon (*Oncorhynchus tshawytscha*) Populations of the Snake and Columbia Rivers," *Canadian Journal of Fisheries and Aquatic Sciences*, vol. 56, no. 6 (1999), pp. 1031-1045. Hereinafter Schaller et al., "Contrasting Patterns of Productivity and Survival Rates for Stream-Type Chinook Salmon," 1999.

[16] Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999; Schaller et al., "Contrasting Patterns of Productivity and Survival Rates for Stream-Type Chinook Salmon," 1999; NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*, 2022.

Origins of the Lower Snake River Dams

Congress initially authorized the U.S. Army Corps of Engineers (USACE) in 1902 and 1910 to provide open river improvements for sections of the lower Snake River. USACE ultimately determined that these methods were not adequate to ensure a five-foot channel depth between the mouth of the Snake River and Lewiston, ID. The 1925 Rivers and Harbors Act (43 Stat. 1186) directed the Secretary of War, through USACE, and the Federal Power Commission to estimate the cost of studying the navigable streams and tributaries of the United States for navigation improvement in combination with the most efficient development of hydropower, flood control, and irrigation needs. In response, the Secretary of War submitted a report to Congress in 1926 (known as the *308 Report*) proposing rivers to study, including the Columbia River and minor tributaries and the Snake River and tributaries. Congress authorized USACE to conduct some of these studies in the 1927 Rivers and Harbors Act (44 Stat. 1010).

USACE transmitted a report to Congress in 1938 following direction from the Rivers and Harbors Act of 1935 (49 Stat. 1028) and a 1938 resolution from the Senate Commerce Committee to further surveys authorized in 1927 while also taking into account economic, scientific, and environmental changes and "relief of unemployment." The report recommended general plans for the development of the Columbia and Snake Rivers between the Bonneville Dam (which began operation in 1938) and Lewiston, ID, for the combined interests of navigation, irrigation, and hydroelectric power. The report also recommended that Congress authorize and modify portions of the plan as desired. The Rivers and Harbors Act of 1945 (P.L. 79-14; 59 Stat. 10) authorized USACE to construct the McNary Dam (on the Columbia River) and authorized "construction of such dams as are necessary, and open channel improvement for purposes of providing slack water navigation and irrigation" along the lower Snake River from its confluence with the Columbia River to Lewiston. The act also directed that surplus electric energy generated at the dams be disposed of in accordance with the Bonneville Project Act (P.L. 75-329; 50 Stat. 731). USACE sited and constructed four dams with lockage facilities: Ice Harbor (began operation in 1962), Lower Monumental (began operation in 1969), Little Goose (began operation in 1970), and Lower Granite (began operation in 1975). Completion of the series of dams allowed a barge route from Portland, OR, to the port of Lewiston, ID, starting in 1975.

Sources: Public laws and reports to Congress from the Secretary of the Army.

Navigation Supported by the Lower Snake River Dams

Each of the four lower Snake River dams has navigation locks allowing for boat and barge transportation of people and goods to and from the Pacific Ocean and inland ports.[17] USACE established water elevations behind each dam to maintain an authorized 14-foot channel depth for the river. The federal government funds operation and maintenance of the locks and navigation channels on the Snake River. Barge and cruise transportation would not be possible on the Snake River without the USACE dams and locks.

Wheat is the primary commodity carried on the Snake River; it is transported for export at ship loading terminals at Portland, OR, and at Vancouver, WA, Kalama, WA, and Longview, WA. Snake River shipping contributes about 2.5-3 million tons, or a little less than 20%, of the wheat loaded at the deep-draft terminals between Portland and Longview.[18] To help contextualize the Snake River's wheat tonnage, a commonly sized grain ship loads about 60,000 tons, so the Snake

[17] Ibid., p. 1-31. Run-of-river dams pass water at the dam at nearly the same rate it enters, but some water backs up behind the dam. Levels of the water behind these run-of-river dams typically vary from three to five feet in normal operations. Maintaining water levels within the normal operating range allows the facilities at the dams (e.g., navigation locks, hydropower turbines, fish ladders, juvenile fish bypass facilities) to function as designed.

[18] USACE, Institute for Water Resources Website, Waterborne Commerce Statistics Center, *Waterborne Commerce of the United States Annual Report, Lock Statistics by River*, https://www.iwr.usace.army.mil/About/Technical-Centers/WCSC-Waterborne-Commerce-Statistics-Center-2/. Railroads along the entire length of the Snake River's shoreline could carry the amount of wheat that is presently barged, but likely at higher cost to the shippers; a transition to rail also would likely require additional investment to upgrade track and build new facilities. Trucking also could transport wheat to Columbia River terminals, but the cost of trucking is even higher than the cost of wheat transport by rail. Trucking wheat may limit the quantity transported due to cost constraints. "Executive Summary" in USACE, Reclamation, and BPA, *2020 EIS*, p. 33.

River in a typical year transports the equivalent of around 42 shiploads of wheat; this represents about 10% of the nation's total wheat exports.[19] Several barge-loading elevators are dispersed along the segment of the Snake River that traverses Washington State and in Lewiston, ID.[20] In a typical year, about two-thirds of the wheat shipped on the Snake River originates from the eastern region of the segment of the river with navigation locks in Washington State.[21] The Columbia River Basin also hosts cruise and riverboat passenger operations. Passengers typically board at Portland, OR. Some operators sail up the Snake River as far as Clarkston, WA, which is adjacent to Lewiston, ID.

Water Provided by Lower Snake River Dams for Irrigation and Municipal Use

Both small- and large-scale nonfederal pumping plants divert slack water behind the four lower Snake River dams for irrigation at an average of 316,000 acre-feet of water annually.[22] These dams are authorized for irrigation, but no water is stored for irrigation purposes and the projects do not include specific features to accommodate irrigation or have federal irrigation contracts.[23] As of 2017, agriculture production in the Columbia River Basin comprises a diverse mix of tree fruit, herbs, hay, vegetables, cereal grains, pulse crops, and grapes.[24] In general, acreage devoted to cereal grains and pulse crops in this region is not irrigated (e.g., dryland wheat). The region's irrigated crops tend to be higher-value annual and perennial crops (e.g., apples, grapes, onions). The approximately 48,000 irrigated acres are primarily located near the Ice Harbor and Lower Monumental dams.

Water users along the Snake River also divert slack water behind the lower Snake River dams for municipal and industrial (M&I) purposes. The largest surface water withdrawals for M&I purposes are from slack water behind the Lower Granite dam. M&I users of these water supplies include the cities of Lewiston, ID, and Clarkston, WA, as well as the Clearwater Paper Mill.[25]

Hydropower from Lower Snake River Dams

The four lower Snake River dams all have hydropower facilities, which can generate electricity and provide additional grid services necessary for electric reliability. Debate about costs and benefits of the lower Snake River dams frequently encompasses the generation and grid services provided by the dams, as well as the potential costs of replacing those services if the dams were breached. Grid services provided by hydropower can be categorized as follows:

- **Capacity.** Capacity is a measure of the theoretical maximum potential output of an electric generator, typically measured in megawatts (MW).[26]

[19] USACE, Institute for Water Resources Website, Waterborne Commerce Statistics Center, *Waterborne Commerce of the United States Annual Report.*

[20] Upriver from Lewiston, ID, the dams on the Snake River have no navigation locks; thus, there is no barge transportation service. Lewiston, ID, marks the eastern limit of commercial navigation on the Snake River.

[21] USACE, Institute for Water Resources Website, Waterborne Commerce Statistics Center, *Waterborne Commerce of the United States Annual Report, Lock Statistics by River.*

[22] USACE, Reclamation, and BPA, *2020 EIS*, p. 3-1302.

[23] Ibid., p. 3-1297.

[24] U.S. Department of Agriculture, National Agricultural Statistics Service, Census of Agriculture, "Quick Stats," 2017, https://quickstats.nass.usda.gov/.

[25] USACE, Reclamation, and BPA, *2020 EIS*, pp. 3-1301–3-1303.

[26] Capacity can be reported for an individual electric generator or for the combined output of all generators at a particular facility (e.g., a dam). Capacity is typically determined by the manufacturer for standard conditions (*nameplate capacity*) but also can be reported as a function of typical weather conditions (e.g., *winter capacity*).

- **Annual generation.** Annual generation (energy) is a measure of the actual output of an electric generator over the course of a year, typically measured in megawatt-hours (MWh).[27]
- **Peak generation.** Peak generation is a measure of the output of an electric generator during particular hours of the year when electricity demand is highest.
- **Ancillary services.** Ancillary services is an umbrella term for a number of grid services that contribute to electric reliability over short timescales, typically minutes or less.[28]

Some of these services, such as capacity and annual generation, are easy to quantify, and information about them is readily available. The capacity and annual generation of the lower Snake River dams are provided below. Information about other services, such as peak generation and ancillary services, is less readily available, because formal reporting mechanisms for these services do not exist. Peak generation and ancillary services are nonetheless important to consider because they are critical for maintaining electric reliability.

Combined, the lower Snake River dams have a nameplate capacity of over 3,000 MW. Ice Harbor has a nameplate capacity of 603 MW,[29] and each of the other three dams has a nameplate capacity of 810 MW.[30] The nameplate capacity of the lower Snake River dams represents about 17% of the total capacity in the FCRPS.[31]

The lower Snake River dams' ability to provide generation and ancillary services changes depending on water levels, operational constraints, conditions within the regional grid, and other factors. Dry years and seasonal operational constraints for fish protection can limit the dams' ability to provide these services compared to wet years or when operational constraints are not limiting. **Table 1** shows these dams' annual generation for recent years, demonstrating the year-to-year variability. The annual generation from the lower Snake River dams is reportedly around one-tenth of BPA's total system-wide generation.[32] As noted above, information about peak generation and ancillary services from the dams is less readily available. According to the 2020 EIS, the dams provide "more than 2,000 MW of sustained peaking capabilities during the winter, and a quarter of Bonneville's [BPA's] current reserves holding capability."[33]

[27] Electric generation from hydropower facilities is sometimes reported in terms of average megawatt (aMW). One aMW is the amount of energy that a power plant with 1 megawatt (MW) capacity would generate if it operated continuously for a full year. Energy expressed in aMW can be converted to megawatt-hours (MWh) by multiplying by the number of hours in a year (i.e., 8,760 hours, when not accounting for leap years).

[28] For background on ancillary services, see the appendix in CRS Report R45764, *Maintaining Electric Reliability with Wind and Solar Sources: Background and Issues for Congress*, by Ashley J. Lawson; and Federal Energy Regulatory Commission, *Reliability Primer*, April 23, 2020.

[29] In 2016, USACE began replacing the power turbines at Ice Harbor, with the goals of improving fish safety, lowering maintenance costs, and increasing efficiency. Walla Walla District USACE, "USACE Plans Fish Survival Testing This Fall on the Second Improved Fish Passage Turbine," July 25, 2023, https://www.nww.usace.army.mil/Media/News-Stories/Article/3470373/usace-plans-fish-survival-testing-this-fall-on-the-second-improved-fish-passage/.

[30] BPA, *A Northwest Energy Solution: Regional Power Benefits of the Lower Snake River Dams*, March 2016, p. 4, https://www.bpa.gov/-/media/Aep/about/publications/fact-sheets/fs-201603-A-Northwest-energy-solution-Regional-power-benefits-of-the-lower-Snake-River-dams.pdf.

[31] Ibid. Based on FCRPS capacity of 17,462 MW from all resource types (i.e., hydropower, nuclear, and others).

[32] Murray and Inslee, *Lower Snake River Dams*, p. 66.

[33] USACE, Reclamation, and BPA, *2020 EIS*, p. 3-944.

Table 1. Annual Net Generation from the Lower Snake River Dams, 2018-2022

(generation in megawatt-hours [MWh])

Year	Generation (MWh)
2018	9,013,162
2019	8,257,768
2020	6,606,896
2021	5,437,905
2022	6,497,687

Source: U.S. Energy Information Administration, Form 923, https://www.eia.gov/electricity/data/eia923/.

Note: Net generation is total output from generating facilities minus any electricity consumed on-site.

Columbia River System Operations

The action agencies' existing authorities for operating the Columbia River System provide significant discretion to operate the system for the respective projects' various authorized purposes,[34] subject to legal requirements such as the ESA, NEPA, and the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act; P.L. 96-501; 16 U.S.C. §§839a-h).[35] These operations are also subject to available funding, which is generally provided by congressional appropriations or BPA revenues. For example, in a 2022 memorandum, USACE explained its understanding of the source of its authority and the nature of its discretion as follows:

> [USACE] interprets its project authorities to require that constructed Civil Works projects be operated and maintained in such a manner that the projects continue to serve their Congressionally authorized purposes, subject to appropriations and budgeting principles. Only Congressional action to change the authorization or deauthorize an existing Civil Works project can alter or terminate this responsibility. However, the manner in which operation, maintenance, repair, replacement, and rehabilitation is performed is often discretionary and subject to ESA section 7 consultation.[36]

[34] Congress enacted numerous specific statutes authorizing the construction and operation of each Columbia River System project, which may differ on the specific purposes for which Reclamation or USACE must operate a project and may vary in defining how that purpose is implemented at each specific project. Columbia River System projects' authorizing statutes include hydroelectric power generation, and most also include navigation. All USACE projects are authorized to support recreation and fish and wildlife conservation per general authorization under the Flood Control Act of 1944 (P.L. 78-534). The lower Snake River dams also are authorized to provide irrigation as an incidental benefit, and fish and wildlife mitigation of these projects resulted from negotiations under the Fish and Wildlife Coordination Act (P.L. 85-624).

[35] The Pacific Northwest Electric Power Planning and Conservation Act (P.L. 96-501; 16 U.S.C. §§839a-h) requires federal agencies, including the action agencies (USACE, Reclamation, and BPA), to exercise their responsibilities for operating and maintaining Columbia River System projects "to adequately protect, mitigate, and enhance fish and wildlife … affected by such projects or facilities in a manner that provides equitable treatment for such and fish and wildlife with the other purposes" of the projects. The act also obligates the action agencies to take into account, at the relevant stages of their decisionmaking and to the fullest extent practicable, the Columbia River Basin Fish and Wildlife Program adopted by the Northwest Power and Conservation Council. For information on the program, see "Bonneville Power Administration Fish and Habitat Initiatives."

[36] USACE and NOAA, "Memorandum Between the Department of the Army (Civil Works) and NOAA," January 5, 2022, https://www.noaa.gov/sites/default/files/2022-01/NOAA%20and%20Army%20Civil%20Works%27%20joint%20memorandum%20to%20advance%20Endangered%20Species%20Act%20Consultations_0.pdf.

For example, USACE has discretion to change the timing and frequency of how it operates a fish passage facility,[37] but USACE does not consider itself to have discretion to breach or decommission a congressionally authorized dam without action from Congress.[38]

Discretionary decisions regarding the Columbia River System operations and maintenance plans, which include the lower Snake River dams, must comply with the ESA and NEPA.[39] Both the ESA and NEPA impose certain procedural requirements on federal agencies when they propose or modify actions. The ESA also imposes a substantive constraint on federal agencies; Section 7 of the ESA generally requires federal agencies, such as the action agencies for the Columbia River System, to ensure—in consultation with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) (together, *the Services*)—that their actions do not jeopardize listed species or adversely modify critical habitat.[40] If the action agency or the relevant Service determines the federal action is likely to adversely affect listed species or critical habitat, the Service issues a BiOp analyzing whether the action as proposed would in fact jeopardize the continued existence of a listed species or adversely modify its critical habitat.[41] If the Service concludes that the proposed action would jeopardize listed species, the Service is required to suggest reasonable and prudent alternatives (RPAs) to the proposed action that the Service believes would avoid jeopardy.[42] The Service also must recommend mitigation measures to limit the action's impacts on the listed species.[43] In the case of the Columbia River System, protective measures for fish included in RPAs or mitigation measures often require the action agencies to reduce energy generation or irrigation supply from the Columbia River System.[44]

After ESA consultation on and NEPA review of system operations, the action agencies issued a ROD on September 28, 2020, for the Columbia River System. The ROD contained the agencies'

[37] USACE develops fish passage plans as part of its operation and maintenance strategy to improve fish survival in the Columbia River System, in accordance with all current and applicable Endangered Species Act (ESA; 16 U.S.C. §§1531-1544) Section 7 BiOps. Actions in the plan are to be in compliance with all other regulatory requirements (e.g., National Environmental Policy Act [NEPA; 42 U.S.C. §§4321 et seq.]) and regional agreements that are in effect at the time (e.g., fish accords, spill agreements). USACE Columbia River Operational Hydrometeorological Management System, "Fish Passage Plan (FPP) Homepage," https://pweb.crohms.org/tmt/documents/fpp/.

[38] For example, the Assistant Secretary of the Army for Civil Works testified at a 2024 hearing that the memorandum of understanding (MOU) signed by the federal government on December 13, 2023, "recognize[s] that any breaching of the lower Snake River dams would require specific authorization and appropriations from Congress." U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy, Climate and Grid Security, *Exposing President Biden's Plan to Dismantle the Snake River Dams and the Negative Impacts to the United States*, 118th Cong., 2nd sess., January 30, 2024 (hereinafter *Snake River Dam hearing*, January 30, 2024).

[39] For more information on recent actions related to the ESA and NEPA for the lower Snake River dams, see "Recent Litigation Challenging Agency Actions Related to the Snake River Dams."

[40] 16 U.S.C. §1536(a)(2); 42 U.S.C. §4332.

[41] 16 U.S.C. §1536(b)(3). If the FWS and NMFS (together, *the Services*) or action agencies determine that the agency action is not likely to adversely affect listed species or critical habitat, the consultation process can be concluded without a BiOP.

[42] 16 U.S.C. §1536(b)(3).

[43] 16 U.S.C. §1536(b)(4)(ii).

[44] The reduction in electricity generation for fish and wildlife protection within the Columbia River Basin led to almost $500 million in costs in FY2022. Foregone power revenues cost $251.9 million and power purchases (e.g., buying power from wholesale markets when water was being spilled for fish protection instead of being used for electricity generation) cost $237.9 million. For comparison, BPA estimates total costs for fish and wildlife protection operations for that year (inclusive of the above values) at $931.8 million. The majority of other costs ($249.4 million) were for direct fish and wildlife program expenses (see such actions described in "Bonneville Power Administration Fish and Habitat Initiatives"). Northwest Power and Conservation Council, "Graphs and Tables Used in the FY2022 Columbia River Basin F&W Program Costs Report," https://www.nwcouncil.org/f/18354/2023-3_FY22AnnualReport.xlsx.

plan for operating and maintaining the dams through 2034.[45] By agreement, the agencies subsequently incorporated amended spill operations into the operation plan (see section, "2020 Biological Opinion, Environmental Impact Statement, and Record of Decision").

Snake River Salmon and Steelhead Trout Populations Listed Under the ESA

The ESA was enacted to conserve species identified as endangered or threatened and their habitats.[46] Three species of anadromous fish listed under the ESA are currently found in the Snake River: Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), and steelhead trout (*O. mykiss*).[47] (Coho salmon [*O. kisutch*] previously occupied the Snake River but are considered to have been extirpated from the area prior to the 1950s.[48])

Anadromous salmonids are often subdivided into specific populations based on spawning run timing and other biological characteristics (e.g., reproductive isolation from other populations).[49] Salmon and steelhead trout populations can be designated as evolutionarily significant units (ESUs) or distinct population segments (DPSs) for listing under the ESA.[50] Under this classification, four segments (three ESUs and one DPS) of salmon and steelhead trout in the Snake River are listed as either threatened or endangered under the ESA (**Table 2**).[51] (Snake River coho salmon (*Oncorhynchus kisutch*) are considered functionally extinct and not listed under the ESA.) In the entire Columbia River Basin, 13 salmon and steelhead trout segments are listed as either threatened or endangered.

[45] The consultation in the 2020 Columbia River System BiOP encompasses operations and maintenance of the Columbia River System for a 15-year period. USACE, Reclamation, and BPA, *2020 EIS*.

[46] 16 U.S.C. §1531. For more detail on the listing of species, agency consultation requirements, and several other ESA processes, see CRS Report R46677, *The Endangered Species Act: Overview and Implementation*, by Pervaze A. Sheikh and Erin H. Ward.

[47] These Pacific salmon and steelhead trout species are all classified to the Salmonidae family. The term *salmon* is used in this report to include the three listed Snake River salmon and steelhead trout species. This report does not consider other resident fish species or other salmonids, such as bull trout. FWS, Environmental Conservation Online System (ECOS), https://ecos.fws.gov/ecp/ (hereinafter FWS, ECOS).

[48] Extinction of the stock was acknowledged by NMFS in its 1991 notice for lower Columbia River coho salmon. NMFS, "Endangered and Threatened Species; Lower Columbia River Coho Salmon," 56 *Federal Register* 29553-29554, June 27, 1991.

[49] The migration of salmon from the sea upstream to spawn is known as a *run*.

[50] The evolutionarily significant unit (ESU) and distinct population segment (DPS) designations are used to identify meaningful biological units for listings of Pacific salmon and steelhead trout under the ESA. The stock must satisfy two criteria to be considered an ESU: (1) It must be substantially reproductively isolated from other nonspecific population units, and (2) it must represent an important component in the evolutionary legacy of the species. The DPS definition uses the term *marked separation* rather than *reproductive isolation*, which is used in the ESU definition. FWS and NOAA, NMFS, "Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act," 61 *Federal Register* 4722-4725, February 7, 1996; NOAA, NMFS, "Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon," 56 *Federal Register* 58612-58619, November 20, 1991.

[51] Columbia River Basin Federal Caucus, "The Columbia River Basin Federal Caucus and salmonrecovery.gov," https://www.salmonrecovery.gov/AboutUs.aspx; FWS, ECOS.

Table 2. Snake River Salmon and Steelhead Trout Species Segments and ESA Status

Species	Segment	Status Under the ESA
Snake River spring/summer run Chinook salmon (*Oncorhynchus tshawytscha*)	ESU	Threatened, listed in 1992
Snake River fall-run Chinook salmon (*Oncorhynchus tshawytscha*)	ESU	Threatened, listed in 1992
Snake River sockeye salmon (*Oncorhynchus nerka*)	ESU	Endangered, listed in 1991
Snake River steelhead trout (*Oncorhynchus mykiss*)	DPS	Threatened, listed in 1997

Source: U.S. Fish and Wildlife Service, Environmental Conservation Online System (ECOS), https://ecos.fws.gov/ecp/; National Oceanic and Atmospheric Administration, National Marine Fisheries Service, "Pacific Coastal Salmon Recovery Fund, Project and Performance Metrics Database: Snake River Coho Restoration IV," https://www.webapps.nwfsc.noaa.gov/apex/f?p=309:19:::::P19_PROJECTID:48461776.

Notes: ESA = Endangered Species Act (16 U.S.C. §§1531-1544); DPS = distinct population segment; ESU = evolutionarily significant unit. Coho salmon (*Oncorhynchus kisutch*) previously occupied the Snake River but are considered to have been extirpated from the area prior to the 1950s. The Nez Perce Tribe is actively stocking the Snake River with coho salmon in an attempt to restore the salmon run.

NMFS has designated critical habitat for Snake River Chinook and sockeye salmon and steelhead trout under the ESA. This habitat includes four types of areas: (1) spawning and juvenile rearing areas, (2) juvenile migration corridors, (3) areas for growth and development to adulthood, and (4) adult migration corridors.[52]

While Pacific salmon and steelhead trout generally have similar life cycles (**Figure 3**), the Snake River salmon ESUs and the steelhead trout DPS differ to some degree in their life history characteristics and habitat requirements. For example, Snake River sockeye salmon spawn in inland lakeshore gravel and develop in lakes for one to three years before migrating to the ocean.[53] The only remaining Snake River sockeye salmon population returns to Redfish Lake, ID, approximately 900 miles from the ocean.[54] Snake River fall-run Chinook salmon generally spawn in areas in or near the mainstem of the Snake River, and their juveniles spend less than a year in freshwater before migrating to the ocean.[55] In contrast, Snake River spring/summer-run Chinook salmon spawn in tributaries, and their juveniles spend more than a year in the freshwater environment.[56] Snake River steelhead trout use many of the same tributaries during their summer runs as Snake River spring/summer Chinook salmon.[57] They generally remain in these areas for less than two years and reach maturity within streams.[58] All Pacific salmon species spawn only

[52] For example, NOAA, NMFS, "Designated Critical Habitat: Revision of Critical Habitat for Snake River Spring/Summer Chinook Salmon," 64 *Federal Register* 57399-57403, October 25, 1999. The ESA requires NMFS to designate critical habitat for any species it lists under the ESA. The ESA defines *critical habitat* as the areas within the geographical area occupied by the species at the time it is listed and the areas outside the geographical area occupied by the species at the time it is listed that are essential for the conservation of the species. 16 U.S.C. §1532.

[53] NMFS West Coast Region, *ESA Recovery Plan for Snake River Sockeye Salmon (*Oncorhynchus nerka*)*, June 8, 2015, pp. 1-431, https://repository.library.noaa.gov/view/noaa/16001.

[54] Ibid., pp. 47-53.

[55] NMFS West Coast Region, *ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon (*Oncorhynchus tshawytscha*) & Snake River Basin Steelhead (*Oncorhynchus mykiss*)*, November 2017, pp. 1-282, https://media.fisheries.noaa.gov/dam-migration/final-snake-river-spring-summer-chinook-salmon-and-snake-river-steelhead-recovery-plan-2017.pdf. Hereafter, NMFS, *Recovery Plan*, 2017.

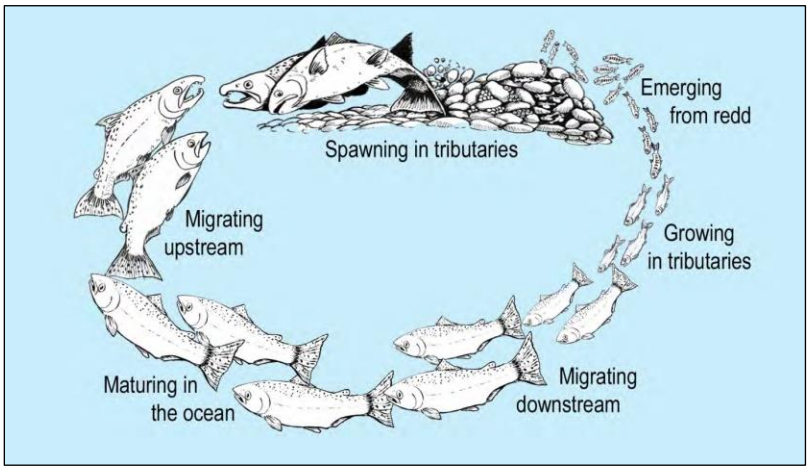
[56] Ibid.

[57] NMFS West Coast Region, *2022 5-Year Review: Summary & Evaluation of Snake River Basin Steelhead*, July 26, 2022, pp. 1-95, https://repository.library.noaa.gov/view/noaa/45368.

[58] Ibid.

once before dying at the end of their first breeding season, whereas steelhead trout may spawn more than once.[59]

Figure 3. Anadromous Salmon and Steelhead Trout Life Cycle



Sources: National Marine Fisheries Service (NMFS), *ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon (*Oncorhynchus tshawytscha*) & Snake River Basin Steelhead (*Oncorhynchus mykiss*)*, November 2017, p. 64; NMFS, *ESA Recovery Plan for Snake River Sockeye Salmon (*Oncorhynchus nerka*)*, June 8, 2015, pp. 39, 47; NMFS, *ESA Recovery Plan for Snake River Fall Chinook Salmon (*Oncorhynchus tshawytscha*)*, November 2017, p. 30.

Notes: This graphic shows the life cycle for *stream-type* salmon and steelhead trout: those that mature for a year or more in freshwater before migrating to the ocean. In addition to growing in tributaries, Snake River sockeye salmon also rear in Redfish Lake for one to three years before beginning their downstream migrations. There are also *ocean-type* salmon, which migrate to the ocean in their first year, largely skipping the "Growing in Tributaries" step of this diagram. Unlike Pacific salmon species, steelhead trout can spawn more than once.

Some ESUs, such as Snake River spring/summer-run Chinook salmon and Snake River steelhead trout, consist of different populations that are segregated by their natal streams. Persistence of the ESUs depends on their resilience to threats, such as habitat alteration, poor water quality, and drought; their genetic diversity, and their ability to adapt to changing conditions.[60]

Population Trends

Over the last 150 years, many wild Pacific salmon and steelhead trout populations in the Pacific Northwest have declined; in some cases, their populations are now absent from specific rivers or tributaries.[61] The current return of wild salmon to the Columbia River Basin is less than 10% of

[59] NMFS West Coast Region, *Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Continued Operation and Maintenance of the Columbia River System*, WCRO-2020-00624, July 22, 2020, p. 27, https://repository.library.noaa.gov/view/noaa/29126/noaa_29126_DS1.pdf. Hereafter, NMFS, *Biological Opinion*, 2020.

[60] Ibid. and Lisa G. Crozier et al., "Climate Vulnerability Assessment for Pacific Salmon and Steelhead in the California Current Large Marine Ecosystem," *PLoS ONE*, vol. 14, no. 7 (2019), article e0217711, pp. 1-49 (hereinafter Crozier et al., "Climate Vulnerability Assessment"). The Crozier et al. study identifies Snake River sockeye salmon as one of the species most vulnerable to climate change and Snake River spring/summer and fall Chinook salmon among species that are high in their adaptive capacities to climate change.

[61] NMFS, "Endangered and Threatened Species; Lower Columbia River Coho Salmon," 56 *Federal Register* 29553-29554, June 27, 1991.

those values estimated to have been present in the mid-1800s.[62] According to scientists, these declines resulted from many factors, including overfishing, habitat loss, water quality, climate change, and dam construction, as discussed in the section "Factors Affecting Snake River Salmon and Steelhead Trout Populations."[63]

Experts have estimated that at least 16 million salmon and steelhead trout returned to the Columbia River Basin annually during the 1800s.[64] Although specific previous abundance of salmon and steelhead trout in the Snake River is uncertain, some experts estimate an abundance of approximately 2.4 million fishes during that time.[65] During the mid-1950s through the 1960s, an estimated average of 16,000 wild Chinook salmon were harvested annually in Idaho.[66] From 1962-1967, the five years following the initial operation of the first lower Snake River dam, approximately 45,000 adult spring and summer Chinook salmon entered the Snake River basin.[67] During the five years immediately following the initial operation of the Lower Granite Dam in 1975, the return of wild spring and summer Chinook salmon declined to approximately 27,000 fish annually, representing "a 40% decrease from 1962-1966 averages."[68]

Trends of listed fish populations have fluctuated over various time spans, and illustrate the interannual variability associated with their abundance estimates. For example, adult passage counts—estimates of the actual number of passing fish moving upstream at a particular point—for Snake River Chinook salmon measured at the Lower Granite Dam have fluctuated since measurements began in 1975 (**Figure 4**). Adult passage counts are used to estimate abundance and migration of fish populations, and have fluctuated in roughly 2 to 10-year spans and at values two to three times greater than values observed in 2022. These variations may be the result of natural and human-associated factors.[69] For example, peak adult passage counts observed during 2001 included high passage counts during April (i.e., approximately 91,000 adults) and May (i.e., approximately 61,000 adults) in excess of typical values measured during those months. One study observed greater escapement rates of spring-summer Chinook salmon during 2001, which the authors concluded may be associated with decreased seasonal Columbia River discharge, as

[62] Columbia Basin Partnership Task Force of the Marine Fisheries Advisory Committee, *A Vision for Salmon and Steelhead: Goals to Restore Thriving Salmon and Steelhead to the Columbia River Basin Phase 1 and Phase 2 Report*, NOAA, 2019 and 2020, https://s3.amazonaws.com/media.fisheries.noaa.gov/2020-10/MAFAC_CRB_Phase2ReportFinal_508.pdf?null (hereinafter Columbia Basin Partnership Task Force, *Phase 1 and 2 Report*).

[63] Ibid.

[64] Randall F. Schalk, "Estimating Salmon and Steelhead Usage in the Columbia Basin Before 1850: The Anthropological Perspective," *Northwest Environmental Journal*, vol. 2, no. 2 (1986), pp. 1-29; Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999.

[65] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*, p. 8.

[66] These harvest estimates were reported for all Chinook salmon cumulatively and independent of seasonal spawning run. J.F. Keating, *The Harvest of Salmon and Steelhead as Determined from Salmon and Steelhead Permits*, Annual completion report. Statewide Fishing Harvest Survey, Federal Aid in Sport Fish Restoration. Project F-18-R-14, Boise, ID, 1969; J.F. Keating et al., *Annual Survey of the Salmon and Steelhead Sport Fishery Harvest in Idaho, Check Station surveillance of Chinook Salmon Fisheries*, Annual completion report. Statewide Fishing Harvest Survey, Federal Aid in Sport Fish and Wildlife Restoration. Project F-18-R-17, Boise, ID, 1971; Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999.

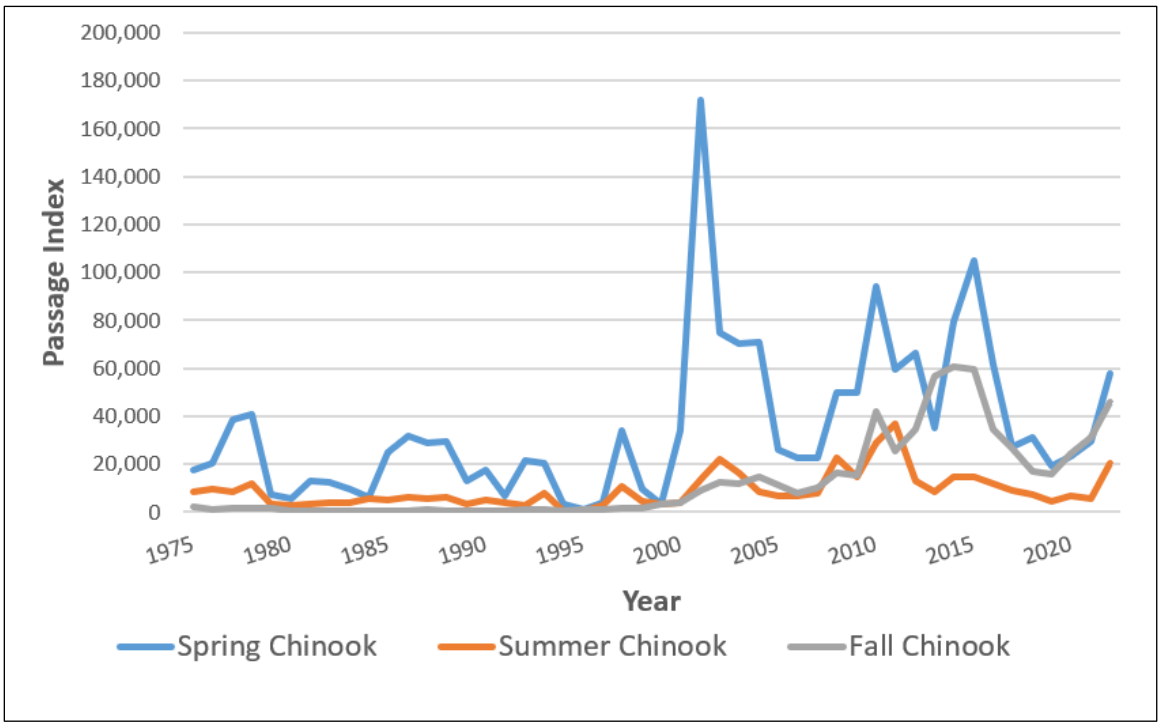
[67] Washington Department of Fish and Wildlife (WDFW) and Oregon Department of Fish and Wildlife (ODFW), *Status Report, Columbia River Fish Runs and Fisheries (1938-96)*, Clackamas, OR, 1997. Hereinafter WDFW and ODFW, *Status Report, Columbia River Fish Runs and Fisheries (1938-96)*, 1997; Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999.

[68] WDFW and ODFW, *Status Report, Columbia River Fish Runs and Fisheries (1938-96)*, 1997; Nemeth and Kiefer, "Snake River Spring and Summer Chinook Salmon," 1999.

[69] See, for example, NMFS West Coast Region, *2022 5-Year Review: Summary & Evaluation of Snake River Spring/Summer Chinook Salmon*, 2022, https://repository.library.noaa.gov/view/noaa/45367.

measured at Bonneville Dam.[70] They propose that higher discharge rates may lead to passage difficulty, increased passage delay, disorientation, or bioenergetic exhaustion for certain salmon species.

Figure 4. Adult Passage of Chinook Salmon Runs at Lower Granite Dam
(1975-2022)



Source: Columbia Basin Research, *Columbia River DART (Data Access in Real Time)*, University of Washington, School of Aquatic and Fishery Sciences, accessed November 2023, https://www.cbr.washington.edu/dart.

Notes: This figure sums annual adult passage visual counts of Chinook salmon observed during particular times of the year (i.e., spring Chinook counts from March 1 to June 17, summer Chinook counts from June 18 to August 17, and fall Chinook counts from August 18 to December 15 of a given year). The passage index is not a population estimate but is used to adjust collection counts for daily fluctuations in the site's or project's operations. It is considered representative of population trends.

Table 3 provides information about identified past (i.e., since the 1800s) and recent populations for each of the four Snake River salmon and steelhead trout populations listed under the ESA. Despite efforts to improve tributary and mainstem habitat and dam passage conditions since the species were listed under the ESA in the 1990s, most of the populations remain at low abundance compared to earlier estimates, according to scientists.[71]

[70] M.L. Keefer et al., "Escapement, Harvest, and Unknown Loss of Radio-Tagged Adult Salmonids in the Columbia River Snake River Hydrosystem," *Canadian Journal of Fisheries and Aquatic Sciences*, vol. 62, no. 4 (2005), pp. 930-949.

[71] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*; Joint Columbia River Management Staff, *Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and Other Species*, Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife, February 4, 2021 (hereinafter Joint Columbia River Management, *Stock Status*).

Table 3. Identified Past and Recent Snake River Salmon and Steelhead Trout Populations

ESU/DPS	Number of Populations Identified Since the 1800s	Number of Currently Identified (Extant) Populations	ESA Listing Status	Approximate Mean Abundance from 2010 to 2019 (Calculated as a Geometrical Mean)
Snake River spring/summer-run Chinook salmon ESU	68	28	Threatened	Approximately 7,000
Snake River fall-run Chinook salmon ESU	2	1	Threatened	Approximately 9,200
Snake River sockeye salmon ESU	9	1	Endangered	Approximately 46
Snake River steelhead trout DPS	40	25	Threatened	Approximately 18,700
Snake River coho salmon ESU	6	2	Extirpated	Approximately 100 being restocked by the Nez Perce Tribe

Sources: CRS, with data from National Marine Fisheries Service (NMFS), Rebuilding Interior Columbia Basin Salmon and Steelhead, September 30, 2022; Columbia Basin Partnership Task Force of the Marine Fisheries Advisory Committee, A Vision for Salmon and Steelhead: Goals to Restore Thriving Salmon and Steelhead to the Columbia River Basin Phase 1 and Phase 2 Report, National Oceanic and Atmospheric Administration (NOAA), 2019 and 2020; Joint Columbia River Management Staff, Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife, 2023 Joint Staff Report: Stock Status and Fisheries for Fall Chinook Salmon, Coho Salmon, Chum Salmon, Summer Steelhead, and White Sturgeon, July 10, 2023, https://www.dfw.state.or.us/fish/oscrp/crm/reports/23_reports/2023%20OR%20WA%20Fall%20Joint%20Staff%20Report_FINAL_23.07.10.pdf; Joint Columbia River Management Staff, Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife, 2023 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and Other Species, February 2, 2023, https://www.dfw.state.or.us/fish/oscrp/crm/reports/23_reports/2023%20OR_WA%20Spring%20Joint%20Staff%20Report.pdf; W.P. Connor et al., "A Retrospective (circa 1800-2015) on Abundance, Spatial Distribution, and Management of Snake River Basin Fall Chinook Salmon: Draft 2 Parts I, II, and III," 2016; NMFS, Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest, NOAA Technical Memorandum NMFS-NWFSC-171, January 2022, https://repository.library.noaa.gov/view/noaa/34363; NMFS West Coast Region, Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Continued Operation and Maintenance of the Columbia River System, WCRO-2020-00624, July 22, 2020; NMFS, *ESA Recovery Plan for Snake River Fall Chinook Salmon (*Oncorhynchus tshawytscha*)*, NOAA, 2017; NMFS West Coast Region, *ESA Recovery Plan for Snake River Sockeye Salmon (*Oncorhynchus nerka*)*, June 8, 2015, pp. 1-431, https://repository.library.noaa.gov/view/noaa/16001; Columbia Basin Partnership Task Force, A Vision for Salmon and Steelhead: Goals to Restore Thriving Salmon and Steelhead to the Columbia River Basin, National Oceanic and Atmospheric Administration, Phase 2 Report of the Columbia Basin Partnership Task Force of the Marine Fisheries Advisory Committee, October 2020, p. 161, https://s3.amazonaws.com/media.fisheries.noaa.gov/2020-10/MAFAC_CRB_Phase2ReportFinal_508.pdf?null; L.A. Fulton, Spawning Areas and Abundance of Steelhead Trout and Coho, Sockeye, and Chum Salmon in the Columbia River Basin-Past and Present, NMFS, Special Scientific Report, No. 618, Washington, DC, December 1970, pp. 1-37, https://spo.nmfs.noaa.gov/SSRF/SSRF618.pdf.

Notes: DPS = distinct population segment; ESU = evolutionarily significant unit. Approximate mean abundances (2010-2019) for fall Chinook salmon include release mortalities. Approximate mean abundances (2010-2019) for

spring/summer Chinook salmon include Lower Granite River Dam passage plus Tucannon River escapement. Approximate mean abundances (2010-2019) for steelhead trout are based on passage from July 1 to June 30 the following year. NMFS calculated approximate mean abundance values from 2010 to 2019 as a geometric mean, which is defined as the nth root of n products. Experts consider geometric means to be a better measure than simple averages of central tendency for fish abundance data, which are typically skewed. The geometric mean also smooths the contribution of periodic large run sizes that can inflate simple averages relative to typical population values. Scientists typically select a ten-year period to represent an interval of sustained abundance across multiple generational cycles. Geometric means do not provide exact values of abundance as they have variance associated with them; NMFS typically does not report that variance in its assessments and reports.

Factors Affecting Snake River Salmon and Steelhead Trout Populations

Dams in the Columbia River Basin, and in the Snake River specifically, may change the natural flows, temperature, and turbidity of rivers and may create barriers to salmon and steelhead trout migration. These factors may alter habitat and affect water quality for fish species. Other activities, apart from dams, may also affect salmon and steelhead trout populations. These activities include climate change, drought, predation, development, and non-point and point source pollution, among others. These activities may affect species by altering stream, tributary, and estuary habitats; lowering water quality; and increasing predation of fish from pinnipeds,[72] native and non-native fishes, and colony nesting waterbirds.

In many cases, these activities affect fish populations throughout the Columbia River Basin, but may be particularly impactful on endangered or threatened species. Also, some of these factors have occurred consistently over time, but may have greater impacts in recent and future years. Some factors may be sensitive to dam operations, while others may be less so. Some salmon and steelhead trout runs are fished for commercial, tribal, and recreational uses. Harvest-related mortality was a significant contributor to the initial decline of these species; however, this is not a major contributor to the decline of salmon and steelhead trout today.[73] The following sections discuss selected key factors that affect Snake River salmon and steelhead trout populations.

Dams and Their Operations

Dams and their operations may change water quantity in rivers, alter natural flow rates and temperature, and change turbidity.[74] These alterations can change river structure and alter aquatic and riparian habitat, which can affect salmon and steelhead trout species during their life cycles and natural migrations.[75] Dams structurally affect fish species by preventing migration and causing entrainment in hydropower blades. For example, dams can make it more difficult for adult fish to migrate upstream to spawning grounds, thus cutting salmon and steelhead trout off from their once occupied spawning habitats. Operations that reduce water velocity behind dams, often creating reservoirs, slow juvenile migrations, alter the food web, increase water temperature and create habitat for native and non-native predators and competitors.[76]

[72] Pinnipeds are aquatic mammals in the order Pinnipedia. Seals and sea lions are the most relevant pinnipeds for the purposes of this report.

[73] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead.*

[74] NMFS, *Biological Opinion,* 2020, p. 101.

[75] NMFS, *Recovery Plan,* 2017, p. 126, 140-149.

[76] NMFS, *Biological Opinion,* 2020, p. 140. Northwest Power Council, *Dams: Impacts on Salmon and Steelhead,* https://www.nwcouncil.org/reports/columbia-river-history/damsimpacts/. Adam J. Storch et al., "A Review of Potential Conservation and Fisheries Benefits of Breaching Four Dams in the Lower Snake River (Washington, USA)," *Water*
(continued...)

Scientists note that the lower Snake River dams act as a barrier for fish swimming upstream trying to access portions of their identified spawning habitat and for fish swimming downstream to the ocean.[77] In addition, some scientists note that passage through dam complexes (e.g., passage through fish ladders) can stress fish populations and possibly cause delayed mortality.[78] They assert that the effect of dams on fish species varies with how many dams the fish must pass. Populations of Chinook salmon and steelhead trout species in the Columbia River Basin that pass through four or fewer dams have higher survival rates than those populations that must pass through eight dams, such as Snake River spring/summer Chinook salmon.[79] Scientists found that summer steelhead trout originating in the Yakima subbasin, which must pass only four mainstem dams, also exhibit greater survival rates than those originating in the Snake River Basin.[80]

Scientists calculate *smolt-to-adult return rates* (SARs) of Snake River salmon and steelhead trout to estimate the effects of various factors on their population viability.[81] An estimated minimum SAR of 2% is required to consistently sustain populations, whereas an SAR of >2% is indicative of population growth and an SAR of >4% is estimated to lead to a high likelihood of recovery.[82] These criteria reportedly have informed Northwest Power and Conservation Council regional stock rebuilding goals for Snake River and upper Columbia River salmon and steelhead trout (i.e., SARs in the 2-6% range).[83]

The annual Comparative Survival Study (CSS) measures the effects of hydropower operations on juvenile and adult salmon and steelhead trout survival in the Columbia River System.[84] The CSS reported SARs for salmon and steelhead trout most recently in 2023 and predicted that climate change, poor ocean conditions, and poor flow conditions (which is affected by dams) would

Biology and Security, vol. 1 (2022) (hereinafter Storch et al., "Review of Potential Conservation and Fisheries Benefits").

[77] *Biological Opinion*, 2020, p. 299.

[78] Storch et al., "Review of Potential Conservation and Fisheries Benefits."

[79] Ibid.

[80] Ibid.

[81] *Smolt-to-adult return rate* (SAR) is the survival rate of salmon and steelhead trout from when they are smolts to when they return to a certain point as adults. SARs are an indicator of survival and population health for salmon and steelhead populations. SARs in the Snake River are typically calculated for each of the listed population segments. SARs for populations could be for wild fish only, hatchery-origin fish, or both combined. Michele DeHart et al., *Comparative Survival Study of PIT-Tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye 2023 Annual Report*, Comparative Survival Study Oversight Committee and Fish Passage Center, December 2023, https://www.fpc.org/documents/CSS/CSS%20Report%202023%20Final.pdf (hereinafter DeHart et al., *Comparative Survival Study*).

[82] D.R. Marmorek et al., *Plan for Analyzing and Testing Hypotheses (PATH)*, ESSA Technologies, Ltd., Final Report for Fiscal Year 1998, Vancouver, British Columbia, December 16, 1998, p. 41, http://rem-main.rem.sfu.ca/papers/peterman/PATH_final_report_for_fiscal_year_1998.pdf; DeHart et al., *Comparative Survival Study*; David W. Welch et al., "A Synthesis of the Coast-wide Decline in Survival of West Coast Chinook Salmon (*Oncorhynchus tshawytscha*, Salmonidae)," *Fish and Fisheries*, vol. 22, no. 1 (2021), pp. 194-211 (hereinafter Welch et al., "A Synthesis of the Coast-wide Decline in Survival of West Coast Chinook Salmon (*Oncorhynchus tshawytscha*, Salmonidae)," 2021).

[83] Northwest Power and Conservation Council, *Columbia River Basin Fish and Wildlife Program 2014*, October 2014, p. 29, https://www.nwcouncil.org/sites/default/files/2014-12_1.pdf; Welch et al., "A Synthesis of the Coast-wide Decline in Survival of West Coast Chinook Salmon (*Oncorhynchus tshawytscha*, Salmonidae)," 2021.

[84] DeHart et al., *Comparative Survival Study*. The annual Comparative Survival Study measures the effects of hydropower operations on juvenile and adult salmon and steelhead trout survival in the Columbia River System; see also B.P. Sanford and S.G. Smith, "Estimation of Smolt-to-Adult Return Percentages for Snake River Basin Anadromous Salmonids, 1990-1997," *Journal of Agricultural, Biological, and Environmental Statistics*, vol. 7 (2002), pp. 243-263 (hereinafter Sanford and Smith, "Estimation of Smolt-to-Adult Return Percentages for Snake River Basin Anadromous Salmonids, 1990-1997," 2002).

prevent salmon and steelhead trout populations from meeting SAR goals noted above.[85] Some studies have characterized the SAR goals as being ambitious, and questioned the feasibility of achieving them in light of these stressors.[86] One study also noted the inability for some salmon populations in more "pristine" conditions than in the Columbia River (e.g., southeast Alaska) to achieve these SAR percentages, suggesting that larger scale environmental factors may be impeding their productivity and recovery more broadly.[87]

The CSS reported that the most important factors influencing SARs for salmon and steelhead trout are water transit time,[88] the number of dam passages, and certain indices of ocean conditions (e.g., upwelling, sea surface temperature).[89] Other studies have emphasized the importance of broad ocean drivers and harvest as key factors affecting SARs and salmon production as well.[90] Dam operations affect water transit times (e.g., fish bypasses and reservoirs), in most cases increasing them. Scientists note that increased water transit times may disrupt the natural timing of ocean entry and have negative latent effects on fishes.[91] The CSS stated that water transit times of Snake River fish populations did not significantly improve between 1994 and 2023.[92] Furthermore, additional studies have related SARs and survival of Snake River salmon with water transit time, the timing of ocean entry, and the percentage of river flow spilled over dams.[93]

In some cases, dams and their operations can benefit fish species in a multiuse situation. Dams can be operated to supplement low water flows and decrease water temperature downstream for fish and their habitats during periods of drought.[94] In multiuse systems where water is allocated to the environment, agricultural uses, hydropower, and other uses, dams provide operators with increased control over water flows. For example, one study asserted that managed flows were

[85] Ibid.

[86] Welch et al., "A Synthesis of the Coast-wide Decline in Survival of West Coast Chinook Salmon (*Oncorhynchus tshawytscha*, Salmonidae)," 2021; NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*, p. 3.

[87] Welch et al., "A Synthesis of the Coast-wide Decline in Survival of West Coast Chinook Salmon (*Oncorhynchus tshawytscha*, Salmonidae)," 2021; see also B. Dorner et al., "Spatial and Temporal Patterns of Covariation in Productivity of Chinook Salmon Populations of the Northeastern Pacific Ocean," *Canadian Journal of Fisheries and Aquatic Sciences*, vol. 75, no. 7 (2018), pp. 1082-1095.

[88] The Comparative Survival Study Oversight Committee and Fish Passage Center define *water transit time* as "the time it takes the average particle of water to pass through a reservoir (or series of reservoirs). It measures water velocity through a reservoir in [a] way that accounts for reservoir volume relative to the discharge at a dam. It is calculated by dividing the reservoir volume relative to the discharge at a dam." DeHart et al., *Comparative Survival Study*, p. 20.

[89] DeHart et al., *Comparative Survival Study*.

[90] Welch et al., "A Synthesis of the Coast-wide Decline in Survival of West Coast Chinook Salmon (*Oncorhynchus tshawytscha*, Salmonidae)," 2021; N.J. Mantua et al., "A Pacific Interdecadal Climate Oscillation with Impacts on Salmon Production," *Bulletin of the American Meteorological Society*, vol. 78, no. 6 (1997), pp. 1069-1079; Steven L. Haeseker et al., "Assessing Freshwater and Marine Environmental Influences on Life-Stage-Specific Survival Rates of Snake River Spring-Summer Chinook Salmon and Steelhead," *Transactions of the American Fisheries Society*, vol. 141, no. 1 (2012), pp. 121-138 (hereinafter Haeseker et al., "Assessing Freshwater and Marine Environmental Influences on Life-Stage-Specific Survival Rates of Snake River Spring-Summer Chinook Salmon and Steelhead," 2012).

[91] Ernest T. Smerdon et al., *Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival*, National Research Council, 2004, p. 94.

[92] DeHart et al., *Comparative Survival Study*.

[93] Haeseker et al., "Assessing Freshwater and Marine Environmental Influences on Life-Stage-Specific Survival Rates of Snake River Spring-Summer Chinook Salmon and Steelhead," 2012; Erin L. Rechisky et al., "Estuarine and Early-Marine Survival of Transported and In-River Migrant Snake River Spring Chinook Salmon Smolts," *Scientific Reports*, vol. 2, no. 1 (2012), 448, pp. 1-9.

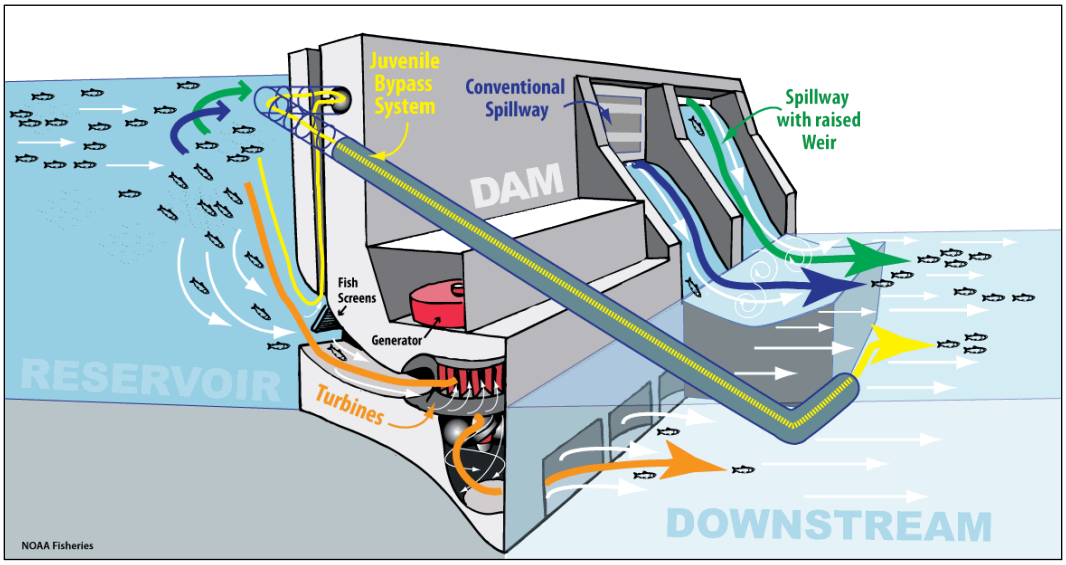
[94] Kristen Sellheim et al., "Informed Water Management Alternatives for an Over-Allocated River: Incorporating Salmon Life Stage Effects into a Decision Tree Process During Drought," *Fisheries Management and Ecology*, vol. 27, no. 5 (2020), pp. 498-516.

better than natural flows for reducing non-native species and achieving societal needs (e.g., hydropower, agricultural water supply).[95] This assertion was based on a comparison between managed flows and simulated natural flows.

Some dam owners have constructed infrastructure to mitigate the effects of dams on fish (see **Figure 5**). For example, USACE has added surface passage facilities such as spillway weirs, implemented surface passage structures, and modified turbine designs to reduce entrainment at the lower Snake River dams to reduce juvenile mortality.[96] These systems can improve how and where fish maneuver through the river in the presence of dams.[97] Juvenile survival also is enhanced by bypass systems and turbine improvement programs to help juveniles travel downstream to the ocean.[98] Fish ladders allow adult fish returning from the ocean to spawn to bypass dams. USACE constructed ladders when it built the lower Snake River dams and have modified the ladders over time.

Dam owners also may modify operations to reduce fish mortality. For example, USACE adjusts spill (i.e., the amount of water that is allowed to pass through spillways and over dams) at the lower Snake River dams to improve the survival of juvenile fish passing through the dams.[99]

Figure 5. Systems Used to Improve Juvenile Passage Through Dams



Source: National Marine Fisheries Service, "Juvenile Downstream Passage on the West Coast," https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/juvenile-downstream-passage-west-coast.

Habitat Loss and Alteration

Habitat loss affects salmon and steelhead trout populations, especially if it alters spawning or rearing areas. It can be caused by many factors, including urbanization along stream and river

[95] William Chen and Julian D. Olden, "Designing Flows to Resolve Human and Environmental Water Needs in a Dam-Regulated River," *Nature Communications*, vol. 8, no. 1 (December 18, 2017).

[96] Surface passage structures allow fish to move through spillways and over dams, whereas bypass channels guide fish around dams.

[97] *Biological Opinion*, 2020, p. 201.

[98] USACE, "Lower Snake River Dams," https://www.nww.usace.army.mil/Missions/Lower-Snake-River-Dams/.

[99] *Biological Opinion*, 2020, p. 140.

corridors; resource extraction, such as logging, mining, and agriculture; channelization of streams; water withdrawals; and dams and other physical barriers that alter water flows. The condition of salmon habitat varies throughout the Columbia River Basin. In protected areas, such as federal wilderness areas, spawning and rearing habitat may remain in near-pristine condition. In areas more accessible to humans, past and present human activities have left habitat in conditions ranging from marginally to highly degraded. For instance, more than 70% of the original marshes and spruce swamps of the Columbia River estuary (a key habitat used by juvenile and adult salmon during their migration to and from the ocean) have been converted to industrial, transportation, recreational, agricultural, or urban areas.[100] Some scientists also note various biological effects on habitats such as lower or excess nutrients in some tributaries. Habitat degradation in the Snake River Basin leads to (1) reduced stream complexity and channel structure, (2) excess fine sediment, (3) elevated summer water temperature, (4) diminished streamflow during critical periods, (5) reduced floodplain connectivity and function, and (6) degraded riparian condition.[101]

Estuary habitat degradation also affects fish. In the Columbia River estuary, downriver of the Snake River, some scientists estimate that, in the last 100 years, mean river flow has declined 16% and peak spring flows have declined 44%.[102] Lower flows into the estuary can alter habitat and cause mortality. For Snake River populations, the estimated mortality of juvenile salmon (not due to predation) from habitat impacts in the estuary ranges from approximately 15% to 30%, with greatest impacts observed for fall-run Chinook salmon and summer-run steelhead trout.[103]

Water Quality

Various activities, including agricultural, urban, and industrial activities, contribute pollutants to the Columbia River Basin. For instance, excess nutrients from sewage or agricultural runoff helps catalyze algal blooms that decrease the dissolved oxygen content in the water, causing hypoxia, which can be lethal to fish.[104] These factors, together with other chemical pollutants, can be detrimental for salmonid growth, immune function, and survival.[105]

Temperature is another component of water quality that can affect the health of fish populations. Low water flows, high air temperature, and other factors may cause high water temperatures. For example, in 2015, high water temperatures led to significant mortality of Upper Columbia River and Snake River sockeye salmon populations as these populations migrated through the rivers of the Columbia River Basin.[106] To address high water temperatures in the Columbia and lower

[100] NMFS, *Recovery Plan*, 2017, p. 187.

[101] *Biological Opinion*, 2020, p. 349.

[102] NMFS, *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead*, NMFS Northwest Region. Prepared for NMFS by the Lower Columbia River Estuary Partnership (contractor) and PC Trask Associates, Inc., subcontractor, Portland, OR, 2011, pp. 3-6 and 4-3, https://repository.library.noaa.gov/view/noaa/17401; NMFS, *ESA Recovery Plan for Snake River Fall Chinook Salmon (*Oncorhynchus tshawytscha*)*, NOAA, 2017.

[103] Columbia Basin Partnership Task Force, *A Vision for Salmon and Steelhead*, 2020, p. 63.

[104] John R. Waldman and Thomas P. Quinn, "North American Diadromous Fishes: Drivers of Decline and Potential for Recovery in the Anthropocene," *Science Advances*, vol. 8, no. 4 (January 28, 2022).

[105] Lyndal Johnson et al., "Persistent Organic Pollutants in Juvenile Chinook Salmon in the Columbia River Basin: Implications for Stock Recovery," *Transactions of the American Fisheries Society*, vol. 142, no. 1 (2013), pp. 21-40; James P. Meador et al., "Altered Growth and Related Physiological Responses in Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) from Dietary Exposure to Polycyclic Aromatic Hydrocarbons (PAHs)," *Canadian Journal of Fisheries and Aquatic Sciences*, vol. 63, no. 10 (October 2006).

[106] Lisa G. Crozier et al., "Snake River Sockeye and Chinook Salmon in a Changing Climate: Implications for Upstream Migration Survival During Recent Extreme and Future Climates," *PLoS ONE*, vol. 15, no. 9 (2020).

Snake Rivers, the U.S. Environmental Protection Agency (EPA) established the Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load (TMDL).[107] The TMDL provides information about the primary sources of temperature impairments in the Columbia River Basin. With this information, federal, state, and tribal governments, and the public may engage on ways to reduce temperatures in the Columbia and lower Snake Rivers, including as impacted by dams and their operations. (For more information, see the text box below.)

Temperature Total Maximum Daily Load for the Columbia and Lower Snake Rivers

The U.S. Environmental Protection Agency (EPA) established a temperature total maximum daily load (TMDL) for the Columbia and lower Snake Rivers in 2020, pursuant to Section 303(d) of the Clean Water Act (33 U.S.C. §1313(d)). The EPA established this TMDL after the states of Washington and Oregon identified portions of the Columbia and lower Snake Rivers as impaired due to water temperatures that exceeded state water quality standards. EPA found that water temperatures frequently exceeded values that protect salmonid and steelhead trout migration, especially in August at two of four monitoring locations on the lower Snake River. (The warmest temperatures in the Snake River have occurred in the lower part of the river.)

EPA's TMDL analysis considered all known sources of temperature impairments in the lower Snake River. It found that climate change and nonpoint source dam impacts are the dominant sources of impairment. According to the EPA, warming trends since the 1960s have led to increases in water temperatures. The EPA also noted that dams and their operations can cause higher sustained river temperatures in the summer, higher temperatures at the water surface and in fish ladders, and delayed cooling in the fall. The EPA estimated that dams on the lower Snake River have a warming impact on the mainstem river in the late-summer period.

Dam owners can use temperature control strategies to manage water temperatures. For example, deep reservoirs with temperature control structures (e.g., Dworshak Dam above the lower Snake River dams) can release cold water and reduce temperatures over substantial distances downstream (e.g., to the upper portion of the lower Snake River in the summer). National Pollutant Discharge Elimination System permits issued to be consistent with the TMDL include a requirement to implement temperature control strategies and meet the load allocations in the Columbia and lower Snake Rivers TMDL.

Sources: EPA, *Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load*, August 13, 2021, https://www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers; EPA, "Discharge Permits for Federal Hydroelectric Projects in the Lower Snake River," https://www.epa.gov/npdes-permits/discharge-permits-federal-hydroelectric-projects-lower-snake-river.

Predation

Salmon and steelhead trout have numerous natural predators, including birds, pinnipeds (e.g., seals, sea lions), orcas, fish, and terrestrial mammals (e.g., bears).[108] Many of the predator-prey dynamics between salmonids and other species are affected by anthropogenic changes in the Columbia River Basin. For example, construction and operation of the Columbia River System and disposal of dredge material in the tributaries of the Columbia and Snake Rivers and in the Columbia River estuary have altered species' habitats. These altered habitats support a wide range of predator species, including native and non-native predatory fish species, such as North pikeminnow (*Ptychocheilus oregonensis*); predatory birds, such as terns, cormorants, gulls, mergansers, and pelicans; and marine mammals.[109]

[107] U.S. Environmental Protection Agency (EPA), *Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load*, August 13, 2021, https://www.epa.gov/system/files/documents/2022-06/tmdl-columbia-snake-temperature-errata-update-05102022.pdf.

[108] NMFS, *Recovery Plan*, 2017, p. 156.

[109] Ibid.

In addition, seals and sea lions are a key predator of salmon in the mouth of the Columbia River. These pinnipeds consume salmon entering the ocean and may lower salmon populations.[110] Sea lions are also observed to concentrate downstream of the Bonneville Dam to feed on salmon and steelhead trout staging for passage through fish ladders.[111] Populations of pinnipeds in the Pacific Ocean have increased substantially since the Marine Mammal Protection Act (MMPA; P.L. 92-522; 16 U.S.C. §§1361-1423h) was enacted in 1972.[112] The MMPA lowered pinniped harvests by humans, resulting in increases to some pinniped populations. To address pinniped predation of salmon, the MMPA allows the Secretary of Commerce to authorize the intentional lethal removal of "individually identifiable pinnipeds" causing significant negative impacts to certain salmonid species.[113]

Drought

Drought in the western United States plays a role in salmon survival. Drought causes streams to run low and warm during certain times of the year, which can impact fish populations. Several highwater-temperature events provide examples of fish kills of salmon in the Pacific Northwest, as discussed in the "Water Quality" section above. Drought also can alter migration signals for salmon. For example, a study of salmon in California found that drought-induced low flows and warming altered migration signals for young coho salmon and led to a smaller timeframe for migration.[114] According to scientists, salmon that begin migration on a false signal can become stranded and die in portions of streams or rivers that become dry rather than increasing in water flow.[115]

Climate Change

Climate change influences and exacerbates many of the existing threats to salmonids. Some scientists assert that climate change will increasingly imperil certain salmon populations.[116] For example, some scientists note that climate change is increasing water temperature, which can directly harm fishes, increase the range and populations of invasive species, and alter food webs.[117] Climate change also may exacerbate low flow rates in rivers or increase flooding from

[110] Schindler et al., *Pinniped Predation*, p. 7.

[111] Columbia Basin Partnership Task Force, *Phase 1 and 2 Report*.

[112] Daniel Schindler et al., *Pinniped Predation on Salmonids in the Washington Portions of the Salish Sea and Outer Coast*, Washington State Academy of Sciences, November 2022, pp. 1-81, https://app.leg.wa.gov/ReportsToTheLegislature/Home/GetPDF?fileName=Pinniped%20Predation%20on%20Salmonids%20in%20the%20Washington%20Portions%20of%20the%20Salish%20Sea%20and%20Outer%20Coast_5d43c6d6-3aad-442a-9271-0315d351eaf2.pdf (hereinafter Schindler et al., *Pinniped Predation*). For more information on the Marine Mammal Protection Act, see CRS Report R47892, *The Marine Mammal Protection Act (P.L. 92-522): Primer and Issues for Congress*, by Anthony R. Marshak.

[113] 16 U.S.C. §1389. The statute includes salmonid fishery stocks that have been listed as threatened or endangered species under the ESA. NOAA, *Marine Mammal Protection Act Section 120 Pinniped Removal Program*, https://www.fisheries.noaa.gov/west-coast/marine-mammal-protection/marine-mammal-protection-act-section-120-pinniped-removal.

[114] Brian Kastl et al., "Migration in Drought: Receding Streams Contract the Seaward Migration Window of Endangered Salmon," *Ecosphere*, vol. 13, no. 12 (December 2022), pp. 1-11.

[115] For example, reportedly approximately 65,000 wild salmon in Canada perished due to false migration signals and dried up streams caused by drought, according to some scientists. See Leyland Cecco, "Thousands of Salmon Found Dead as Canada Drought Dries Out River," *The Guardian*, October 5, 2022, https://www.theguardian.com/environment/2022/oct/05/canada-dead-salmon-drought-british-columbia.

[116] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*, p. 9.

[117] Crozier et al., "Climate Vulnerability Assessment."

high-precipitation events. In addition, sea level rise might result in tidal wetland habitat loss in the Columbia River floodplain, which might affect salmon populations.[118]

Some scientists provide a mixed assessment of the possible effects of climate change and existing conditions on salmon. For example, they contend that the effects of climate change on freshwater habitats of salmon may affect salmon species and populations differently at certain timescales. In some cases, they assert that climate change may lead to an increase in Chinook salmon survival in the short term, partially related to the species' adaptive capacity, but that the effects of climate change may be detrimental in the long term.[119]

Climate change also may affect ocean habitat in ways that may impact salmon. Climate change may increase the frequency and magnitude of marine heat waves, change the intensity and timing of coastal upwelling, increase hypoxia events, and increase ocean acidification.[120] For example, rising sea surface temperatures could harm migrating salmon in the Pacific Northwest. Additionally, coho salmon returns to Puget Sound, WA, and to coastal waters off Washington and Oregon were among the lowest on record following the 2013-2015 Pacific marine heatwave.[121] Rising marine temperatures also may alter the marine community, leading to changes in zooplankton, krill, squid, and other fish that salmon consume.[122]

Conserving and Restoring Snake River Fishes

Federal, state, local, and tribal stakeholders have collectively conducted activities to conserve and restore Snake River salmon and steelhead trout. In addition, the Biden Administration has highlighted federal activities aimed at restoring salmon and steelhead trout in the Columbia River Basin.[123] Most of these activities are implemented by NOAA and BPA, although other agencies also contribute to these efforts.[124] This section summarizes selected federal restoration efforts for conserving salmon and steelhead trout populations in the Columbia River Basin.

Bonneville Power Administration Fish and Habitat Initiatives

BPA has a fish and wildlife program that aims to protect, enhance, and mitigate adverse effects to fish and wildlife in the Columbia River Basin from the Columbia River System. BPA funds projects to improve fish passage through the Columbia River System, increase fish populations

[118] Columbia Basin Partnership Task Force, *Phase 1 and 2 Report*.

[119] Xiao Zhang et al., "On the Variable Effects of Climate Change on Pacific Salmon," *Ecological Modelling*, vol. 397, no. 1 (2019), pp. 95-106.

[120] Lisa G. Crozier et al., "Climate Change Threatens Chinook Salmon Throughout Their Life Cycle," *Communications Biology*, vol. 4, no. 222 (2022) (hereinafter Crozier et al., "Climate Change Threatens Chinook Salmon").

[121] William Peterson, Nicholas Bond, and Marie Robert, "The Blob Is Gone but Has Morphed into a Strongly Positive PDO/SST Pattern," *North Pacific Marine Science Organization (PICES) Press*, vol. 24, no. 2 (2016), pp. 46-47, 50.

[122] Crozier et al., "Climate Change Threatens Chinook Salmon."

[123] White House, "President Biden Takes Action to Restore Healthy and Abundant Wild Salmon and Steelhead in the Columbia River Basin," fact sheet, September 27, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/27/fact-sheet-president-biden-takes-action-to-restore-healthy-and-abundant-wild-salmon-and-steelhead-in-the-columbia-river-basin/.

[124] In addition to funding fish and wildlife conservation, BPA, NMFS, and other federal agencies fund fish and wildlife restoration in the Columbia River Basin. These federal agencies are part of the Columbia Basin Federal Caucus and include USACE, Reclamation, EPA, FWS, NMFS, the U.S. Forest Service, and others. See Office of Management and Budget, *A Budget for America's Future Analytical Perspectives FY2021, Columbia River Basin Crosscut Report,* Office of Management and Budget, 2020, https://www.govinfo.gov/content/pkg/BUDGET-2021-PER/xls/BUDGET-2021-PER-8-8.xlsx; Columbia River Basin Federal Caucus, "Federal Caucus Members," https://www.salmonrecovery.gov/AboutUs/CaucusAgencies.aspx.

through hatcheries, monitor fish populations, and increase the conservation of wildlife and fish populations through land acquisitions and habitat restoration. BPA designed its fish and wildlife program to be consistent with provisions under the Northwest Power Act, the ESA, and other environmental laws, in addition to honoring the federal trust responsibility (including upholding tribal treaty rights). The program also is guided by the Northwest Power and Conservation Council (Council) program, discussed below.

The Northwest Power Act expanded BPA's responsibilities, adding a directive to mitigate the effects of the federal hydropower system on fish and wildlife in the Columbia River Basin.[125] The act also directed that fish and wildlife in the Columbia River Basin should be protected and enhanced.[126] The Northwest Power Act authorized the creation of the Council and directed it to develop a program to conserve and improve fish and wildlife.[127] BPA addresses its Northwest Power Act responsibilities for fish and wildlife mitigation by funding the implementation of the Council's Columbia River Basin Fish and Wildlife Program (FWP). The FWP has a set of goals and objectives (see **Table 4**) and a strategy to achieve them. The Council's fish and wildlife conservation activities are described in the *2020 Addendum to the Columbia River Basin Fish and Wildlife Program 2014*.[128]

Table 4. Columbia River Basin Fish and Wildlife Program Goals and Objectives

Program Area	Description
Anadromous Salmon and Steelhead Goal and Objectives	Focus on increasing adult salmon and steelhead runs and abundance
All Other Native Aquatic Focal Species Goal and Objectives	Focus on protecting, enhancing, and mitigating impacts on other native aquatic species affected by the FCRPS, such as white sturgeon and Pacific lamprey
Wildlife Goal and Objectives	Focus on mitigation for wildlife losses caused by the FCRPS
Ecological Goal and Objectives	Address environmental conditions and processes to conserve the ecosystems that support native anadromous and resident fish and wildlife adversely affected by the FCRPS
Communication, Assessment, and Coordination Goal and Objectives	Aim to inform and involve the public in the Fish and Wildlife Program, track and report program implementation, and make program-related information and data available

Source: Northwest Power and Conservation Council, *2020 Addendum to the 2014 Columbia River Basin Fish and Wildlife Program*, Council Document 2020-9, October 2020, https://www.nwcouncil.org/sites/default/files/2020-9.pdf.

Note: FCRPS = Federal Columbia River Power System.

Restoration activities undertaken by BPA and other parties also are managed through the Columbia Basin Fish Accords.[129] BPA partnered with seven Tribes, two federal agencies, and three states to sign the Columbia Basin Fish Accords in 2008. The accords lay out plans for federal funding to address fish operations, habitat, and hatchery projects over a 10-year period.

[125] 16 U.S.C. §839.

[126] Ibid.

[127] Two people from each of Idaho, Montana, Oregon, and Washington are appointed to be on the Northwest Power and Conservation Council. 16 U.S.C. §839b.

[128] Northwest Power and Conservation Council, *2020 Addendum to the 2014 Columbia River Basin Fish and Wildlife Program*, Council Document 2020-9, October 2020, https://www.nwcouncil.org/sites/default/files/2020-9.pdf.

[129] For more information, see Federal Caucus, "Columbia Basin Fish Accords," https://www.salmonrecovery.gov/Partners/FishAccords.aspx.

Federal funding was provided to Tribes and states over the period. Several entities have extended their accords multiple times; the most recent extension was to 2025.[130] Council habitat protection and restoration expenditures have ranged from approximately $95 million to $124 million per year during 2013-2022.[131]

BPA Fish and Wildlife Activities. BPA funds three types of fish and wildlife projects: (1) fish passage structures; (2) hatchery facility construction and maintenance, including in the Snake River Basin; and (3) land acquisition and maintenance, which involves projects that aim to protect and enhance fish and wildlife habitat throughout the Columbia River Basin. BPA coordinates its fish and wildlife priorities with the Council, federal resource management agencies (e.g., NMFS, FWS, USACE, Reclamation), states, Tribes, and other stakeholders. These investments and corresponding activities are in BPA strategic asset management plans.[132]

BPA funds fish and wildlife activities in various ways. BPA incurs direct program costs for fish and wildlife projects for ESA-listed species, reimburses USACE and Reclamation for the agencies' operation and maintenance costs for fish and wildlife species, repays the U.S. Treasury for capital expenditures incurred by the federal government for constructing hatcheries and fish passage projects, and purchases power to supply customer demand when fish operations prevent electricity generation at its dams. In addition, BPA incurs opportunity costs when water is spilled over the dam to support ESA-listed species instead of using that water for power generation. BPA previously estimated that its annual investments in fish and wildlife program areas from 2007 to 2018 ranged from approximately $450 million to $875 million per year.[133] In FY2023, the majority of BPA fish and wildlife expenditures were related to habitat restoration and protection (41%); research, monitoring, and evaluation (29%); and hatchery production (14%).[134]

NOAA Pacific Salmon Management and Conservation Activities

NOAA management and conservation efforts for Pacific salmon and steelhead trout are guided by recovery plans and status reviews for listed species;[135] conservation plans; a fishery management plan for Pacific Salmon off the West Coast as developed by the Pacific Fishery Management Council;[136] and recommendations, treaties, and input from the Pacific States Marine Fisheries Commission, state agencies, and stakeholders.[137]

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[130] For more information and text of accords, see BPA, "Columbia Basin Fish Accords," https://www.bpa.gov/environmental-initiatives/efw/columbia-basin-fish-accords.

[131] Northwest Power and Conservation Council, *FY22 Direct Program Expenditures*, 2022 Columbia River Basin Fish and Wildlife Program Costs Report, June 9, 2023, pp. 1-4, https://www.nwcouncil.org/reports/2023-3/.

[132] BPA's Strategic Asset Management Plans are at BPA, "Strategic Asset Management Plans," https://www.bpa.gov/about/finance/strategic-asset-management-plans.

[133] BPA, "BPA Invests in Fish and Wildlife," fact sheet, January 2019, https://www.bpa.gov/-/media/Aep/about/publications/fact-sheets/fs-201901-BPA-invests-in-fish-and-wildlife.pdf.

[134] BPA, *BPA Invests in the Environment, Fish and Wildlife. What We Accomplished in FY 2023*, April 2024, p. 15, https://www.bpa.gov/-/media/Aep/environmental-initiatives/fish-wildlife/bpa-fish-and-wildlife-2023-review.pdf.

[135] Pacific salmon management in this context applies to salmon species occurring in the state and federal waters of California, Oregon, Washington, and Idaho. Recovery plans created by NOAA exist for all listed Snake River species of salmon and steelhead trout.

[136] As developed by the Pacific Fishery Management Council and implemented by NOAA. Pacific Fishery Management Council, *Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California as Revised Through Amendment 23*, December 2022, pp. 1-84, https://www.pcouncil.org/documents/2022/12/pacific-coast-salmon-fmp.pdf/.

[137] The Pacific States Marine Fisheries Commission (PSMFC) is an interstate compact agency that helps state resource agencies and the fishing industry manage ocean resources in a five-state region that includes California, Oregon, (continued...)

NOAA collaborates with several entities to manage salmon and steelhead trout fisheries in the Columbia River Basin. Management is authorized and guided, in part, by the 2018-2027 *United States v. Oregon* Management Agreement.[138] The agreement's purpose is to protect and rebuild upper Columbia River salmon and steelhead trout runs while providing harvests for the Columbia River Treaty Tribes (*CRT Tribes*) and non-treaty fisheries.[139] The agreement sets up a process for management that is guided by CRT Tribes and selected states (Idaho, Oregon, and Washington) pursuant to state laws, treaties such as the Columbia River Compact and Pacific Salmon Treaty, and federal laws such as the ESA and Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. §§1801 et seq.). Fisheries managers meet throughout the year to review information, set regulations and seasons for fishing, and plan the operation of fisheries. The agreement extends to 2027.

NOAA, through NMFS, also conserves ESA-listed salmon and steelhead trout species through several actions, including the following:

- **Planning and Implementing Recovery Actions.** NMFS prepares and implements recovery plans for Snake River listed species, as required by the ESA.[140] Recovery plans contain actions that aim to restore listed species so they no longer need protection under the ESA. The plans do not create binding obligations for NMFS under the ESA but instead are organizing tools for guiding and coordinating recovery efforts across multiple stakeholders (i.e., federal, tribal, state, local, and private entities).[141]
- **Restoring Habitat.** NMFS aims to improve wetlands, restore spawning and rearing habitat, and improve fish passage, among other goals, for Pacific salmon, steelhead trout, and other fish species.
- **Implementing Hatchery Programs** (see the text box below).
- **Improving Fish Passage.** NMFS improves upstream and downstream passage for salmon and steelhead trout, including by implementing culverts, fish screens, and tide gates.[142]
- **Conducting Reintroduction Efforts.** The ESA authorizes the reintroduction of listed species, such as salmon, under Section 10(j) of the act.[143]

Washington, Idaho, and Alaska. Each state is represented by three Commissioners in the Commission. PSMFC, "Pacific States Marine Fisheries Commission," https://relief.psmfc.org/.

[138] This agreement was created under ongoing litigation under United States v. Oregon, Civil No. 68-513-MO (D. Or.). For more information and text of the agreement, see NMFS, FWS, Bureau of Indian Affairs, *Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response: Consultation on Effects of the 2018-2027* U.S. v. Oregon *Management Agreement*, NMFS Consultation Number WCR-2017-7164, https://media.fisheries.noaa.gov/dam-migration/s7-_usvoregon_2018-2027_mgmagmnt__final_signed.pdf.

[139] Columbia River Treaty Tribes are Tribes that are parties to the Columbia River Treaty and include the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation.

[140] 16 U.S.C. §1533(f).

[141] See "Recovery Planning and Implementation" section at NMFS, "Pacific Salmon and Steelhead: ESA Protected Species," https://www.fisheries.noaa.gov/species/pacific-salmon-and-steelhead.

[142] In addition to annual appropriations, the Infrastructure Investment and Jobs Act (P.L. 117-58) provided NMFS with funding to improve fish passage. For instance, see funding announcements at NMFS, "Fish Passage," https://www.fisheries.noaa.gov/tags/fish-passage.

[143] 16 U.S.C. §1539(j).

Salmon and Steelhead Trout Hatcheries

Hatcheries aim to provide short-term benefits for declining fish populations by increasing fishery production during periods of low natural abundance. Federal, state, and tribal entities produce hatchery salmon and steelhead trout in the Snake River and Columbia River Basin. Hatchery production for salmon and steelhead trout in the basin peaked at 200 million juvenile fish per year in the late 1980s and early 1990s and has reduced to approximately 140 million juvenile fish per year since 2010 due to concerns over protecting the genetic diversity of wild fish. Annual hatchery production in the Columbia River Basin is mostly composed of fall Chinook salmon (45%), with additional production of spring Chinook salmon (24%) and coho salmon (12%). Hatchery-origin fish account for approximately two-thirds of the total return of adults to the Columbia River Basin and comprise the majority of salmon and steelhead trout harvested in the basin.

Sources: Columbia Basin Partnership Task Force, *A Vision for Salmon and Steelhead: Goals to Restore Thriving Salmon and Steelhead to the Columbia River Basin*, National Oceanic and Atmospheric Administration, Phase 2 Report of the Columbia Basin Partnership Task Force of the Marine Fisheries Advisory Committee, October 2020, pp. 53, 149; J.E. Siegel et al., "Environmentally Triggered Shifts in Steelhead Migration Behavior and Consequences for Survival in the mid-Columbia River," *PLoS ONE*, vol. 16, no. 5 (2021), article e0250831, p. 19.

These conservation actions are implemented through several programs and activities within NMFS, including the Pacific Coastal Salmon Recovery Fund,[144] as well as Pacific salmon under the Protected Resource Science and Management budget line.[145]

Salmon and steelhead trout conservation is informed by documents and plans generated by NMFS. For example, NMFS's 2022 report titled *Rebuilding Interior Columbia Basin Salmon and Steelhead* outlined actions aiming to achieve the Columbia River Basin Partnership's mid-range goals for salmon and steelhead trout abundance for 2050 (i.e., those exceeding low-range abundance thresholds and representing progress toward-high range goals).[146] The Columbia Basin Partnership has identified low-, mid-, and high-range natural-origin population abundance goals.[147] The low-range abundance goals are generally consistent for recovery under the ESA, whereas the high-range abundance goals are consistent with "healthy and harvestable stocks."[148] The "healthy and harvestable" standard of recovery is different from the standard set for species listed under the ESA. In the context of the ESA, NMFS generally defines the standard of recovery for ESA-listed salmon and steelhead trout as the abundance necessary to limit extinction risk to 5% over a 100-year timeframe.[149] The standard for "healthy and harvestable" stock levels are

[144] See NMFS, "Pacific Coastal Salmon Recovery Fund," https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/pacific-coastal-salmon-recovery-fund.

[145] For more information on the implementation of salmon and steelhead conservation activities within NMFS, see NOAA, *National Oceanic and Atmospheric Administration Budget Estimates: FY2025*, 2024, https://www.noaa.gov/sites/default/files/2024-03/NOAA_FY25_Congressional_Justification.pdf.

[146] The Columbia Basin Partnership was a Task Force chartered by NOAA's Marine Fisheries Advisory Committee in 2017 to develop a common vision and goals for the Columbia River Basin's salmon and steelhead. NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead.*

[147] Ibid.

[148] Ibid. NOAA specifically states that "rebuilding healthy and harvestable stocks is a substantially more ambitious goal than meeting ESA recovery standards, which are intended to achieve delisting, or the mandates of ESA Section 7(a)(2), which are meant to avoid jeopardizing the continued existence of ESA-listed species."

[149] NMFS, *ESA Recovery Plan for Idaho Snake River Spring/Summer Chinook Salmon and Snake River Basin Steelhead*, Chapter 5, West Coast Region, November 2017, pp. 73, 114, 184, 219, 253, https://media.fisheries.noaa.gov/2021-12/final-idaho-mu-recovery-plan-chapter-5.pdf; NMFS, "Endangered and Threatened Species; Recovery Plans," 74 *Federal Register* 50165-51072, September 30, 2009.

generally set at three-to-five-times the minimum abundance levels necessary to ensure the long-term survival of the population, stock, or species.[150]

In its 2022 report, NMFS qualitatively assigned priorities for rebuilding Columbia River basin salmon and steelhead trout populations based on five criteria: level of extinction risk; current spatial structure and diversity; importance to tribal communities; habitats available for essential life-cycle needs; and resilience of habitat to climate change.[151] The rebuilding priorities assigned were "high," "higher," and "highest" (NOAA considered priority for rebuilding to be at least high for all populations).[152] NMFS asserts that the Snake River spring/summer Chinook salmon and Snake River steelhead trout populations are "critically important to Columbia River basin Tribes, as well as to the economy and overall ecological health of the region."[153] NMFS designated that rebuilding of those two Snake River populations to healthy and harvestable levels is "highest" priority.[154] The report recommended several actions that aim to achieve abundance goals, including

- Reducing direct and indirect mortality resulting from mainstream dams on the Snake River;
- Restoring the Snake River through dam breaching;
- Managing predator and competitor species associated with salmon and steelhead trout;
- Restoring tributary and estuarine habitat and improving water quality;
- Enhancing passage and reintroducing fish in certain areas that are blocked, including the upper Columbia River;
- Securing a more functional salmon ocean ecosystem;
- Addressing effects of climate change on fish populations and habitat; and
- Reforming hatcheries and harvest levels.[155]

Columbia River Basin Tribal History and Current Activities

Steelhead trout, Pacific lamprey, and other native fish have played a key role in the history, culture, religion, and economic development of Indigenous peoples in the Pacific Northwest. Salmon, in particular, has provided sustenance, strengthened social and cultural ties, and afforded economic opportunities. According to the Columbia River Inter-Tribal Fish Commission

[150] For listed salmon and steelhead trout, these minimum abundance levels (i.e., low-range natural production goals) are, in most cases, consistent with ESA delisting goals. Columbia Basin Partnership Task Force, *A Vision for Salmon and Steelhead*, 2020, pp. 44-45 and Haley Ohms, "Salmon Recovery Must be Built on Ambitious, Achievable Goals Instead of Bare Minimums," *Trout Magazine*, June 21, 2023, https://www.tu.org/magazine/conservation/barriers/dam-removal/salmon-recovery-must-be-built-on-ambitious-achievable-goals-instead-of-bare-minimums/.

[151] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*, pp. 5-6.

[152] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead*, p. 6.

[153] Ibid.

[154] NMFS, *Rebuilding Interior Columbia Basin Salmon and Steelhead.* Furthermore, p. 6 of the report identifies the rebuilding of Snake River fall Chinook salmon and sockeye salmon as "higher priority" among northwest salmon populations.

[155] Ibid., p. 16.

(CRITFC), "salmon are at the center of the diets, cultures, and religions of Columbia Plateau tribes."[156] Fishing is central to many tribal ceremonies and traditions.

Due to their historical connection to salmon and other native fish, some of the Tribes in the Pacific Northwest reserved rights to continue hunting, fishing, or gathering on lands they ceded to the federal government by treaty. Many Tribes in the Columbia River Basin retain treaty reserved rights to hunt or fish in "usual and accustomed" places.[157] Courts have affirmed these rights even when the usual and accustomed places are not located within the boundaries of a reservation.[158] (See **Figure 6** for a map of the Columbia River Basin that includes federal and tribal lands.) Courts also have held that the right to fish by extension includes a right to protect the habitat on which the fish rely.[159] In addition, courts have recognized the federal trust responsibility, which can include obligations to protect tribal treaty rights, lands, assets, and resources on behalf of Tribes and tribal members.[160]

Throughout the 20th century, many Tribes in the Columbia River Basin opposed the construction and operation of dams because the dams would limit their access to historic tribal lands and off-reservation fishing rights.[161] According to USACE, 19 Tribes may be affected by the Columbia River System.[162] The lower Snake River dams primarily affect five Tribes: the Nez Perce Tribe, the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Shoshone-Bannock Tribes of the Fort Hall Reservation.[163] As outlined in the "Factors Affecting Snake River Salmon and Steelhead Trout Populations" section of this report, the lower Snake River dams block fish species from accessing portions of their once occupied spawning habitat, which some Tribes have argued has reduced tribal access to the fish guaranteed by treaties.[164] Some Tribes have been parties to lawsuits relating to federal dam operations and fish management in the basin, including recent litigation in response to the operation of the Columbia River System (see below section "Recent Litigation Challenging Agency Actions Related to the Snake River Dams").

[156] Columbia River Inter-Tribal Fish Council, "Tribal Salmon Culture," https://critfc.org/salmon-culture/tribal-salmon-culture/.

[157] For example, see Treaty with the Yakima, 1855, Art. 3; Treaty with the Tribes of Middle Oregon, 1855; Treaty with the Walla Walla, Cayuse, etc., 1855, Art. 1; and Treaty with the Nez Perces, 1855. Art. III.

[158] See, for example, United States v. Winans, 198 U.S. 371 (1905) and United States v. Washington, 520 F.2d 676 (9th Cir. 1975) ("the Boldt Decision"). The Supreme Court also ruled that treaty Tribes are entitled to a maximum of 50% of the harvestable fish (Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 443 U.S. 658 (1979)).

[159] United States v. Washington, 506 F. Supp. 187, 203 (W.D. Wash. 1980) and United States v. Washington, 853 F.3d 946, 963 (9th Cir. 2017).

[160] The federal trust responsibility is a legal obligation under which the United States, through treaties, acts of Congress, and court decisions, "has charged itself with moral obligations of the highest responsibility and trust" toward Tribes. Seminole Nation v. United States, 316 U.S. 286, 296-297 (1942). For a general overview of the trust relationship, see United States v. Jicarilla Apache Nation, 564 U.S. 162 (2011).

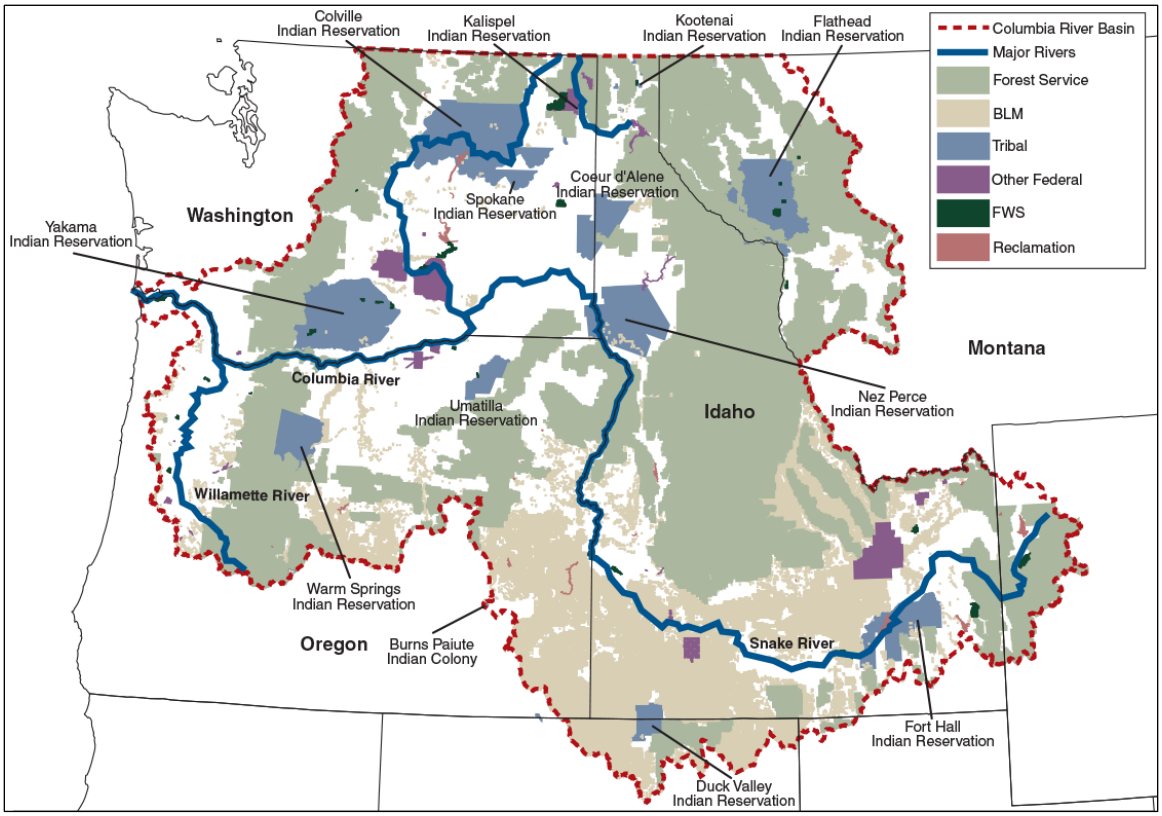
[161] See, for example, Columbia River Inter-Tribal Fish Commission (CRITFC), *Tribal Circumstances & Impacts from the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs, and Shoshone Bannock Tribes*, p. 3, https://critfc.org/wp-content/uploads/2021/10/circum_exec.pdf (hereinafter CRITFC, *Tribal Circumstances & Impacts*).

[162] "Executive Summary" in USACE, Reclamation, and BPA, *2020 EIS*, p. 11.

[163] Washington Governor's Office, *Lower Snake River Dams Stakeholder Engagement Report*, p. 22, https://www.washingtonpolicy.org/library/docLib/LSRD-Report.pdf.

[164] NMFS, *Biological Opinion*, 2020, p. 299. See also CRITFC, *Tribal Circumstances & Impacts*, p. 9.

Figure 6. Federal and Tribal Lands in the Columbia River Basin



Source: CRS modification of map obtained from U.S. Government Accountability Office, *Columbia Basin Fish and Wildlife Activities*, 04-602, June 2004, p. 8, https://www.gao.gov/assets/gao-04-602.pdf.

As a way to secure their fishing rights, many Tribes in the Pacific Northwest have sought to influence regional fish management through intertribal fish commissions, advocacy targeting dam operations or removal, and restoration work. Tribes have used intertribal fish commissions such as the Northwest Indian Fisheries Commission and the CRITFC.[165] Furthermore, the MSA requires the Pacific Fishery Management Council to include a representative from a Pacific Northwest Tribe with fishing rights.[166] In addition to advocating for optimizing spill to benefit salmon at the dams and restoring salmon behind blocked areas in the basin, some Tribes have advocated for removal of the lower Snake River dams.[167] Several area Tribes also have established hatcheries to supplement fish stock in the basin.[168]

[165] Pacific Fishery Management Council, "Tribes," https://www.pcouncil.org/fishingcommunities/tribes/.

[166] 16 U.S.C. §1852(b)(5). The required representative is appointed by the Secretary of Commerce. Representation rotates among the Tribes in consideration of individuals' qualifications, the rights of the Tribes involved, judicial cases that set forth the exercise of those rights, and geography. The current representative is from the Nez Perce Tribe Fisheries Department; he is serving his third term through August 2024.

[167] National Congress of American Indians (NCAI), "Calling on the President and Congress to Invest in Salmon and River Restoration in the Pacific Northwest," NCAI Resolution #AK-21-009, 2021. See also Affiliated Tribes of Northwest Indians (ATNI), "Calling on the President of the United States and the 117th Congress to Seize the Once-in-a-Lifetime Congressional Opportunity to Invest in Salmon and River Restoration in the Pacific Northwest, Charting a Stronger, Better Future for the Northwest, and Bringing Long-Ignored Tribal Justice to Our Peoples and Homelands," ATNI Resolution #2021-23.

[168] See the list of tribal restoration efforts in U.S. Government Accountability Office, *Columbia River Basin: Additional*

(continued...)

The Department of the Interior (DOI) and other federal agencies have collaborated with Pacific Northwest Tribes to ensure compliance with tribal treaty rights and other laws providing for tribal management of fisheries and access to fish harvests. For example, DOI's Bureau of Indian Affairs provides funding to support tribal fish hatching, rearing, and stocking programs.[169] The Pacific Northwest Tribes operate 45 hatcheries and rearing facilities that benefit from this funding.[170] In 2024, the Nez Perce Tribe is expected to assume full responsibility for fish production at the Dworshak National Fish Hatchery, which USACE built in the 1960s on the tribal reservation, near the Dworshak Dam.[171]

Congress has, at times, enacted laws to mitigate Columbia River Basin dam impacts on tribal treaty rights. For example, in 1938, Congress passed the Mitchell Act, which directed the Secretary of Commerce to establish one or more "salmon-cultural stations" in the Columbia River Basin.[172] In 1988, Congress directed the Secretary of the Army to acquire land next to the Bonneville Pool/Dam (along the Columbia River) to provide certain Tribes with "treaty fishing access sites."[173] These sites were then transferred to DOI.[174]

Recent Litigation Challenging Agency Actions Related to the Snake River Dams

Operating the Columbia River System dams has the potential to affect species listed under the ESA and the Columbia River Basin environment in general. Due to these potential effects, the action agencies generally must consult with NMFS pursuant to Section 7 of the ESA and conduct environmental reviews pursuant to NEPA before finalizing proposed changes to the system's operating plans.[175]

Both the ESA and NEPA impose certain procedural requirements on federal agencies when proposing or modifying actions, and the ESA also imposes a substantive constraint on federal agencies. Section 7 of the ESA generally requires federal agencies, such as the action agencies, to ensure—in consultation with the Services (FWS or NMFS)—that their actions do not jeopardize listed species or adversely modify or destroy critical habitat.[176] If the action agencies or the Services determine that the federal action is likely to adversely affect listed species or critical habitat, the relevant Service issues a BiOp analyzing whether the action as proposed would in fact jeopardize the continued existence of a listed species or adversely modify its critical habitat.[177] If the Service concludes that the proposed action would jeopardize listed species, the Service is

Federal Actions Would Benefit Restoration Efforts, GAO-18-561, August 2018, pp. 87-92, https://www.gao.gov/assets/gao-18-561.pdf.

[169] DOI, Bureau of Indian Affairs, *Budget Justifications and Performance Information Fiscal Year 2025, Bureau of Indian Affairs*, https://www.bia.gov/sites/default/files/media_document/fy2025-508-bie-greenbook.pdf.

[170] Ibid.

[171] FWS, "Dworshak National Fishery," https://www.fws.gov/fish-hatchery/dworshak.

[172] Mitchell Act, May 11, 1938, 52 Stat. 345 and 25 C.F.R. §248. NOAA administers the Mitchell Act program and supports hatcheries. The term *salmon cultural station* is not defined in statute (NOAA, *Final Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs*, 2014, https://media.fisheries.noaa.gov/2021-11/mitchell-act-hatcheries-feis-final.pdf).

[173] P.L. 100-581 and 25 C.F.R. §247.

[174] 25 C.F.R. §247.1.

[175] 16 U.S.C. §1536(a)(2); 42 U.S.C. §4332.

[176] 16 U.S.C. §1536(a)(2); 42 U.S.C. §4332.

[177] 16 U.S.C. §1536(b)(3).

required to suggest RPAs to the proposed action that the Service believes would avoid jeopardy.[178] The Service also must recommend mitigation measures to limit the action's impacts on the listed species.[179]

Operation plans for the FCRPS, and more recently for the Columbia River System specifically, have been analyzed through the ESA Section 7 consultation process. Due to the potential impacts on listed salmon and steelhead trout species, the action agencies of the FCRPS have consulted with NMFS on the effect of their proposed operation plans on those species and their designated critical habitat. Since 1992, NMFS has issued a series of BiOps assessing the likely impact of various operation plans for the FCRPS or the Columbia River System subset of dams, depending on the plan.[180]

Under the APA, stakeholders affected by federal agency actions, such as modifications to dam operating plans, generally may challenge the agency action or any related BiOps or NEPA documents in court.[181] A variety of stakeholders have repeatedly challenged operating plans for the FCRPS or Columbia River System, resulting in a number of decisions that required the action agencies and NMFS to revisit the plans, BiOps, and NEPA reviews.[182] Courts have repeatedly determined that the BiOps NMFS has prepared with respect to the FCRPS are inconsistent with the ESA and/or the APA.[183] Although courts have consistently remanded the BiOps to NMFS for reconsideration, the courts generally have allowed the federal agencies to keep operating the FCRPS in accordance with all or portions of each BiOp, or a modified version thereof, so that operations could continue while NMFS reconsidered the BiOp.[184]

This section provides an overview of recent litigation over various federal agency actions related to the FCRPS or Columbia River System operations (with a focus on decisions related to the lower Snake River dams), as well as how the agencies have adjusted the operation plans to address successive court orders and changing natural and political environments.

Litigation over FCRPS Biological Opinions and Supplements from 2000 to 2014

Although numerous different cases have been filed since NMFS's BiOps were first challenged in the 1990s, the current litigation over Columbia River System operations and the associated BiOp and EIS stems from a complaint originally filed in 2001 by NWF and an array of other

[178] Ibid.

[179] 16 U.S.C. §1536(b)(4)(ii).

[180] For copies of and information about the BiOps since 2000, see, for example, Federal Caucus, "NOAA Fisheries Biological Opinion for Operation and Maintenance of the Columbia River System Operations," https://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx; NOAA Fisheries, "Federal Columbia River Power System Biological Opinion," updated October 11, 2023, https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/federal-columbia-river-power-system-biological-opinion.

[181] 5 U.S.C. §704.

[182] For example, an original complaint and eight subsequent supplemental complaints have been filed in NWF v. NMFS, No. 3:01-CV-00640, in the U.S. District Court for the District of Oregon since 2001.

[183] See, for example, Idaho Dep't of Fish & Game v. NMFS, 850 F. Supp. 886 (D. Or. 1994), vacated as moot by Idaho Dep't of Fish & Game v. NMFS, 56 F.3d 1071 (9th Cir. 1995); NWF v. NMFS, 254 F. Supp. 2d 1996 (D. Or. 2003); NWF v. NMFS, 2005 WL 1278878 (D. Or. May 26, 2005); Am. Rivers v. NOAA Fisheries, 2006 WL 1455629 (D. Or. May 23, 2006); NWF v. NMFS, 839 F. Supp 2d 1117 (D. Or. 2011).

[184] See, for example, NWF v. NMFS, 2005 WL 2488447 (D. Or. Oct. 7, 2005); Am. Rivers v. NOAA Fisheries, 2006 WL 2792675 (D. Or. Sept. 26, 2006); NWF v. NMFS, 839 F. Supp. 2d 1117 (D. Or. 2011).

nongovernmental advocacy organizations in federal court in the District of Oregon.[185] The 2001 complaint in *National Wildlife Federation v. National Marine Fisheries Service* challenged a 2000 BiOp issued by NMFS pursuant to Section 7 of the ESA.[186] In the 2000 BiOp, NMFS assessed the potential impact of an operating plan for the FCRPS on species listed under the ESA and their designated critical habitats.[187] In 2003, the district court remanded the 2000 BiOp to NMFS to address deficiencies related to the action area and mitigation actions.[188]

NWF has supplemented the complaint eight times since it was initially filed to address new BiOps for revised operation plans. Each of the complaints includes allegations against the action agencies or agencies that issued BiOps under the ESA in connection with operation plans, for either the FCRPS as a whole or the Columbia River System specifically.[189] The claims generally have alleged violations of the APA, the ESA, and, more recently, NEPA. The most recent supplemental complaint was filed in January 2021 and raised claims related to NMFS's 2020 BiOp for operations of the Columbia River System as well as the action agencies' 2020 EIS and a 2020 ROD.[190]

NMFS issued the 2020 BiOp in response to a 2016 court order, after the court concluded that NMFS's second supplement to its 2008 BiOp for FCRPS operations violated the ESA, APA, and NEPA. NWF had supplemented its complaint to challenge the 2008 BiOp after NMFS issued it in May 2008.[191] Before the court issued a decision on the 2008 BiOp, the federal defendants requested—and the court granted—a limited, voluntary remand of the 2008 BiOp. NMFS released a supplemental BiOp in May 2010 (2010 Supplement). NWF then amended its complaint to challenge both the 2008 BiOp and 2010 Supplement.[192]

The district court concluded that the portion of the 2008 and 2010 BiOps addressing operations through the end of 2013 complied with the ESA, identifying "specific and beneficial mitigation measures" to address effects on species.[193] However, for the portion of the BiOp addressing operations between 2014 and 2018, the court held that NMFS relied on "habitat mitigation measures that are neither reasonably specific nor reasonably certain to occur, and in some cases not even identified."[194] The court remanded the 2008 and 2010 BiOps for further consultation on post-2013 operations.[195] The court order required NMFS to produce a supplement by January 1,

[185] Complaint for Declaratory and Injunctive Relief, Nat'l Wildlife Fed'n (NWF) v. Nat'l Marine Fisheries Service (NMFS), No. 3:01-CV-00640 (D. Or. May 3, 2001).

[186] See Opinion and Order, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. May 7, 2003).

[187] Ibid.

[188] NWF v. NMFS, 254 F. Supp. 2d 1196 (D. Or. 2003).

[189] The action agencies generally have prepared operation plans for the entire FCRPS. The 2020 operation plan—and associated BiOp, environmental impact statement, and record of decision—addressed only the operation of the Columbia River System.

[190] Eighth Supplemental Complaint for Declaratory and Injunctive Relief, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. Jan. 20, 2021).

[191] Fourth Supplemental Complaint for Declaratory and Injunctive Relief, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. July 14, 2008). NWF amended the complaint further in September 2008 to include additional actions by and information related to NMFS and to add Reclamation and USACE as defendants. Fifth Supplemental Complaint for Declaratory and Injunctive Relief, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. Sept. 12, 2008).

[192] Sixth Supplemental Complaint for Declaratory and Injunctive Relief, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. Sept. 8, 2010).

[193] NWF v. NMFS, 839 F. Supp. 2d 1117, 1121 (D. Or. 2011).

[194] NWF v. NMFS, 839 F. Supp. 2d at 1125.

[195] NWF v. NMFS, 839 F. Supp. 2d at 1130.

2014, that considered "whether more aggressive action, such as dam removal and/or additional flow augmentation and reservoir modifications are necessary to avoid jeopardy."[196]

In response to the court's order, NMFS issued a second supplement in January 2014 (2014 Supplement) to the 2008 BiOp. The 2014 Supplement concluded, as the 2008 BiOp had, that the agencies could avoid jeopardizing listed species through RPAs.[197] The 2014 Supplement included RPA measures that had been included in the 2008 BiOp and 2010 Supplement as well as habitat mitigation projects that the action agencies had identified for implementation in 2014-2018.[198]

Following the issuance of the 2014 Supplement, the plaintiffs amended their complaint to challenge the 2014 Supplement under the ESA and the APA and, for the first time, included a claim for violating NEPA.[199] The action agencies had not prepared a NEPA analysis for the 2014 Supplement. The agencies instead relied on existing NEPA documents that had been prepared for prior operation plans for the FCRPS and other related actions.[200]

In May 2016, the district court held that the 2014 Supplement to the 2008 BiOp violated the ESA, the APA, and NEPA.[201] In concluding that the BiOp violated the ESA, the court cited flaws in NMFS's conclusion that protected species could be "trending toward recovery" even if the overall population levels remained critically low.[202] The court also considered NMFS's habitat improvement data "too uncertain" to rely upon and found that NMFS did not properly analyze the effects of climate change.[203]

The court held that the action agencies violated NEPA by failing to prepare a new EIS to support the decisions in their RODs about how they planned to operate the FCRPS pursuant to the 2014 Supplement. The court observed that, in conducting their NEPA analysis on remand, the action agencies would have to consider reasonable alternatives that may have to include the impacts and benefits of removing one or more of the four lower Snake River dams.[204]

Although the court concluded that the 2014 Supplement was arbitrary and capricious, it opted not to vacate the BiOp. Instead, on July 6, 2016, the court remanded the BiOp and RODs to the

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[196] Ibid.

[197] NMFS, *Endangered Species Act Section 7(a)(2) Supplemental Biological Opinion: Consultation on Remand for Operation of the Federal Columbia River Power System*, January 14, 2014, p. 36, https://www.fisheries.noaa.gov/resource/document/supplemental-consultation-remand-operation-federal-columbia-river-power-system.

[198] Ibid., p. 33.

[199] Seventh Supplemental Complaint for Declaratory and Injunctive Relief, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. July 9, 2014).

[200] See USACE, Northwestern Division, Supplemental Record of Consultation and Statement of Decision: NOAA Fisheries' 2014 Supplemental Biological Opinion Endangered Species Act Section 7(a)(2) Supplemental Biological Opinion Consultation on Remand for Operation of the Federal Columbia River Power System, February 28, 2014, p. 10, https://www.salmonrecovery.gov/Files/BiologicalOpinions/2014/Corps_2014_Supplemental_ROCASOD.pdf; Reclamation, Pacific Northwest Region, 2014 Supplemental Decision Document Following the January 2014 NOAA Fisheries Supplemental Consultation on Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin, and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program, June 11, 2010, pp. 23-24, https://www.usbr.gov/pn/fcrps/documents/2014supbiopdecision.pdf; BPA, Record of Decision Following NOAA's January 2014 Supplemental Biological Opinion to the May 2008 FCRPS Biological Opinion and May 2010 Supplemental Biological Opinion for Operation of the Federal Columbia River Power System, February 27, 2014, pp. 25-26, https://www.bpa.gov/-/media/Aep/about/publications/records-of-decision/rod-20140227-2014-bpa-rod-following-noaas-january-2014-supplemental-biological-opinion.pdf.

[201] NWF v. NMFS, No. 3:01-CV-00640 (D. Or. May 4, 2016) (order granting in part and denying in part motions for summary judgment).

[202] Ibid., pp. 36-53.

[203] Ibid., pp. 13-15.

[204] Ibid., p. 136.

agencies to reconsider their actions and issue a new BiOp and RODs consistent with the ESA, the APA, and NEPA.[205] In the interim, the court ordered that the 2014 Supplement would govern the operations of the FCRPS.

2020 Biological Opinion, Environmental Impact Statement, and Record of Decision

In response to the court's order and a presidential memorandum dated October 19, 2018,[206] NMFS issued a new final BiOp (2020 BiOp) for operation of the Columbia River System in July 2020.[207] The 2020 BiOp determined that Columbia River System operations would not jeopardize listed species and identified reasonable and prudent measures to minimize the impacts of incidental take associated with operation and maintenance.[208] USACE, Reclamation, and BPA released a final EIS for operation of the Columbia River System on July 31, 2020, which analyzed alternatives related to the operation of the system, including an alternative that considered breaching the four lower Snake River dams.[209]

On September 28, 2020, USACE, Reclamation, and BPA signed a joint ROD for the Columbia River System operations, which selected a *preferred operating alternative* that increased spill at eight dams to help migrating fish and kept the four lower Snake River dams in place.[210] According to the EIS, the intent of the preferred alternative was to benefit salmon and steelhead trout through a combination of measures, including increased spill at lower Columbia River and lower Snake River dams. The preferred alternative's flexible spill operation would spill more water for fish passage when power generation was less valuable and would spill less water when power generation was more valuable.[211] In addition, the preferred alternative included an adaptive management approach to implement new findings in future operations without a net reduction in fish or power benefits.[212]

Recent Litigation and 2023 Memorandum of Understanding

After the action agencies issued the 2020 ROD, NWF and the other plaintiffs in existing litigation over Columbia River System operations filed an eighth supplemental complaint in January 2021 seeking review of the 2020 BiOp, the Columbia River System Operations EIS, and the 2020

[205] NWF v. NMFS, No. 3:01-CV-00640 (D. Or. July 6, 2016).

[206] A 2018 presidential memorandum directed the action agencies and NMFSs to develop a schedule to complete the Columbia River System EIS and the associated BiOp by 2020 (a year earlier than planned). Executive Office of the President, "Promoting the Reliable Supply and Delivery of Water in the West," 83 *Federal Register* 53961, October 25, 2018.

[207] NMFS, *Biological Opinion for Operation and Maintenance of the Fourteen Multiple-Use Dam and Reservoir Projects in the Columbia River System*, July 24, 2020, https://www.fisheries.noaa.gov/resource/document/biological-opinion-operation-and-maintenance-fourteen-multiple-use-dam-and.

[208] Ibid.

[209] USACE, Reclamation, and BPA, *2020 EIS*.

[210] BPA, "Record of Decision; Columbia River System Operations Environmental Impact System," 85 *Federal Register* 63834, October 8, 2020, https://www.govinfo.gov/content/pkg/FR-2020-10-08/pdf/2020-22147.pdf.

[211] The preferred alternative also required a study to evaluate the potential benefits and unintended consequences of significantly higher spill levels.

[212] *Adaptive management* is the process of incorporating new scientific and programmatic information into the implementation of a project or plan to ensure the activity's goals are being reached efficiently. It promotes flexible decision-making to modify existing activities or create new activities if new circumstances arise (e.g., new scientific information) or if projects are not meeting their goals.

ROD.[213] The complaint alleged violations of the ESA, the APA, and NEPA.[214] (Plaintiffs included Tribes, as discussed in the text box below.)

On October 21, 2021, the parties filed a joint request to stay the litigation while they engaged in settlement discussions.[215] The court granted the stay. The request to stay included an agreement for short-term operations of the Columbia River System that modified how long certain dams provide increased spill for fish passage. During this period, the Council on Environmental Quality (CEQ) engaged the Federal Mediation and Conciliation Service to facilitate dialogue with states, Tribes, and stakeholders in the region participating in the mediation.[216]

On September 27, 2023, President Biden signed a presidential memorandum that established the following points as federal policy for the Columbia River Basin:[217]

- Honoring the federal trust responsibility (including upholding tribal treaty rights);
- Restoring native fish populations;
- Securing a clean and resilient energy future;
- Supporting local agriculture; and
- Investing in communities.

The memorandum directed federal agencies to assess, utilize, and prioritize their authorities and available resources to advance the policy, including the restoration of salmon, steelhead trout, and other native fish populations in the Columbia River Basin.[218] The memorandum also directed the Chair of CEQ and the Director of the Office of Management and Budget to "explore opportunities and mechanisms to develop an intergovernmental partnership, including through a memorandum of understanding, to advance the policy."

On December 14, 2023, NWF and other nonprofit plaintiffs, Oregon, Washington, four tribal groups, and the federal defendants (together, the *moving parties*) filed a joint motion requesting a new stay of the litigation for five years to implement an executed MOU.[219] Signed by the moving

[213] Eighth Supplemental Complaint for Declaratory and Injunctive Relief, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. Jan. 20, 2021). In addition to the NWF, the plaintiffs to the Eighth Supplemental Complaint include American Rivers, Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Resources, Sierra Club, Idaho Rivers United, Northwest Sportfishing Industry Association, NW Energy Coalition, Columbia Riverkeeper, and Idaho Conservation League, with the State of Oregon joining as an intervenor-plaintiff. The complaint is filed against the federal defendants, which are the NMFS, USACE, and Reclamation, with Northwest Irrigation Utilities, Public Power Council, Columba-Snake River Irrigators Association, Washington State Farm Bureau Federation, Franklin County Farm Bureau Federation, Grant County Farm Bureau Federation, Northwest River Partners, Clarkston Golf & Country Club, Confederated Salish and Kootenai Tribes, the State of Montana, Inland Ports and Navigation Group, Kootenai Tribe of Idaho, and the State of Washington joining as intervenor-defenders.

[214] Ibid.

[215] NWF v. NMFS, No. 3:01-CV-00640 (D. Or. Oct. 21, 2021).

[216] Mediation facilitated by the Federal Mediation and Conciliation Service is confidential to the participating litigation parties. However, regarding public input into the process, the Council on Environmental Quality (CEQ) hosted six listening sessions with stakeholder groups in 2022 and the Federal Mediation and Conciliation Service hosted three public listening sessions in 2023. CEQ also published "Columbia River Salmon and Other Native Fish Request for Information," 88 *Federal Register* 28532, on May 4, 2023, and received over 72,000 comments. Testimony of Brenda Mallory, Chair of the CEQ, for the *Snake River Dam hearing*, January 30, 2024.

[217] Executive Office of the President, "Restoring Healthy and Abundant Salmon, Steelhead, and Other Native Fish Populations in the Columbia River Basin," 88 *Federal Register* 67617, October 10, 2023.

[218] The memorandum directed the federal agencies to report their assessment to the Director of the Office of Management and Budget.

[219] Joint Motion to Stay Litigation Through 2028, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. December 14, 2023).

parties, the MOU states that federal agencies agree to implement the federal government's commitments—consistent with the presidential memorandum and in partnership with Tribes, states, and other stakeholders in the region—"to make headway on the objectives in the CBRI," referring to the CBRI (see description of the initiative in the text box below).[220] The MOU further states that the parties are to work together to consider modifications to the commitments if there is congressional action to authorize and fund dam breaching. The MOU includes commitments for 10-year interim operations (2024-2033), specified in an Appendix to the MOU, for the four lower Snake River dams and the four lower Columbia River dams.[221] The MOU also contains provisions that address collaboration and communication among parties, dispute resolution, termination and withdrawal from the MOU, and enforceability of the MOU, among other things.

Columbia Basin Restoration Initiative

Many Tribes and other entities in the Columbia River Basin attempted to influence development of the 2020 record of decision (ROD) for the Columbia River System; however, many claimed that the federal agencies provided little feedback about whether their comments and suggestions were incorporated in the analysis for the ROD. After the ROD was published, some Tribes and environmental groups pursued litigation, as outlined in "Recent Litigation and 2023 Memorandum of Understanding," to address tribal and other concerns.

Four basin Tribes (the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation, and the Nez Perce Tribe), and the States of Oregon and Washington collectively developed the Columbia Basin Restoration Initiative (CBRI) as a basis for settlement discussions with the federal government. The CBRI is a framework aimed at "restoring salmon and steelhead with other native species and their habitats and investing in fisheries infrastructure." The CBRI is also aimed at "modernizing and investing in clean energy, agriculture, and transportation." In addition, its purpose includes "honoring federal commitments to tribes."

The CBRI has six objectives to be supported by "key elements and actions." The first objective includes advancing a strategy to restore salmon and steelhead trout to "healthy and abundant levels" consistent with National Oceanic and Atmospheric Administration's *Rebuilding Interior Columbia Basin Salmon and Steelhead* report. The strategy also is to "complete the actions and investments necessary to secure continuity of services associated with Lower Snake River (LSR) restoration prior to LSR dam breaching." The CBRI calls for a coordinated federal approach using all available authorities and funding to execute the initiative. The initiative notes that some of its objectives may require Congress to authorize activities and appropriate funds.

Sources: U.S. Army Corps of Engineers, Bureau of Reclamation, Bonneville Power Administration, "Executive Summary," in *Columbia River System Operations Environmental Impact Statement*, 2020; Joint Motion to Stay Litigation Through 2028, Ex. A, National Wildlife Federation v. National Marine Fisheries Service, No. 3:01-CV-00640 (D. Or. December 14, 2023).

The moving parties stated that they have further agreed to request that the stay be extended for another five years in 2028 if the MOU is still in place and the moving parties are continuing to work in partnership on Columbia River Basin restoration.[222] Several parties opposed staying the

[220] Ibid.

[221] According to BPA, this includes shifting some summer spill to the spring and limiting summer spill to the end of July. BPA states that this will allow more flexibility in August, when the area usually experiences increased power demand. *Snake River Dam hearing*, January 30, 2024.

[222] The MOU includes an agreement not to litigate over the Columbia River System operations for a period of 10 years, so long as the MOU remains in effect. The moving parties agreed to internal monthly status briefings and information sharing. In addition, the moving parties committed to meeting annually to review implementation progress and jointly develop and post online an annual progress report. Joint Motion to Stay Litigation Through 2028, NWF v. NMFS, No. 3:01-CV-00640, at *5 (D. Or. December 14, 2023).

litigation.[223] On February 8, 2024, the court granted the motion to stay the litigation through December 13, 2028.[224]

The federal government's commitments in the MOU include various programs and activities to be implemented by the Executive Office of the President; the Departments of the Interior, Commerce, Army, Energy, Transportation, and Agriculture; and the EPA.[225]

Federal commitments attached to the MOU broadly address

- Energy analyses and activities for developing a tribal energy program and accounting for replacement power in case Congress authorizes the lower Snake River dams to be breached (e.g., the Department of Energy would facilitate the development of at least 1-3 gigawatts of tribally sponsored "clean energy resources" such as renewable energy, energy efficiency, and electricity transmission);[226]
- Evaluations and plans for alternatives to replace the services provided by the lower Snake River dams (e.g., transportation, recreation, water supply) in case Congress authorizes them to be breached;
- Improvements for salmon and steelhead trout populations, which include restoring habitat, conducting interim fish operations to improve stocks, management and contracting reforms to fish and wildlife mitigation programs, upgrades to fish hatcheries, evaluating water quality standards, and developing cold water refuges;[227] and
- Ecosystem restoration through addressing ocean and estuary issues, water quality impacts, and fish passage improvements.[228]

[223] Inland Ports and Navigation Group's Response in Opposition to Joint Motion to Stay Litigation Through 2028, NWF v. NMFS, No. 3:10-cv-00640 (D. Or. December 21, 2023); State of Idaho's Response in Opposition to Joint Motion to Stay Litigation Through 2028, NWF v. NMFS, No. 3:10-cv-00640 (D. Or. December 22, 2023); Intervenor-Defendant State of Montana's Notice of Jointer in Intervenor-Defendant/Counterclaimant State of Idaho's Response in Opposition to Joint Motion to Stay, NWF v. NMFS, No. 3:10-cv-00640 (D. Or. December 28, 2023); Intervenor-Defendant Public Power Council's Response to Joint Motion to Reinstate Stay of Litigation Through End of CY2028, NWF v. NMFS, No. 3:10-cv-00640 (D. Or. December 29, 2023); Northwest River Partners' Opposition to the Joint Motion to Stay Litigation and Reservation of Rights, NWF v. NMFS, No. 3:10-cv-00640 (D. Or. December 29, 2023).

[224] Amended Order, NWF v. NMFS, No. 3:10-cv-00640 (D. Or. Feb. 8, 2024).

[225] The MOU notes that modifications may be needed over time and that the moving parties commit to engaging in regular discussions to advance the federal government's commitments to support the Columbia Basin Restoration Initiative. Joint Motion to Stay Litigation Through 2028, Ex. A, NWF v. NMFS, No. 3:01-CV-00640 (D. Or. December 14, 2023).

[226] Three gigawatts are approximately equal to the combined nameplate capacity of the four Lower Snake River dams. In addition, the federal government commits to completing a regional energy needs planning process to inform meeting the region's energy goals and the specific resources capable of replacing the energy services of the lower Snake River dams. Testimony of Brenda Mallory, Chair of the CEQ, at *Snake River Dam hearing*, January 30, 2024. The White House, "Biden-Harris Administration Announces Ten-Year Partnership with Tribes & States to Restore Wild Salmon, Expand Clean Energy Production, Increase Resilience, and Provide Energy Stability in the Columbia River Basin," December 14, 2023, https://www.whitehouse.gov/ceq/news-updates/2023/12/14/biden-harris-administration-announces-ten-year-partnership-with-tribes-states-to-restore-wild-salmon-expand-clean-energy-production-increase-resilience-and-provide-energy-stability-in-the-col/.

[227] Actions also include supporting other native fish in the Columbia River Basin such as sturgeon, bull trout, and sea lamprey.

[228] Commitments for fish passage improvements include funding for culvert removals and analysis of removing the nonfederal Enloe dam, which is located on the Similkameen River near the Canadian border.

The federal commitment attachment to the MOU also outlines funding and authorities to implement the commitments. The Biden Administration stated that BPA will invest $300 million over 10 years for some of these commitments (with an estimated BPA rate increase of 0.7%).[229] CEQ stated that the federal government will use previously appropriated funding from the Infrastructure Investment and Jobs Act (P.L. 117-58), P.L. 117-169 (commonly referred to as the Inflation Reduction Act), annual appropriations, and BPA revenues to implement commitments in the MOU.[230]

Congressional Considerations

Administrative or legislative options to continue or modify Columbia River System operations, and in particular for the lower Snake River dams (including the option of dam breaching), may entail tradeoffs between the benefits that the dams provide and actions to promote the recovery of ESA-listed fish populations. The tradeoffs between operating federal dams for their authorized project purposes while conserving listed species are not unique to the Columbia River Basin. Other federal projects, such as the Central Valley Project in California and the Willamette Valley Project in Oregon have similarities to the Columbia River Basin.[231] Operating for authorized project purposes under drought conditions or other effects of climate change, constrains the quality and quantity of water available for aquatic species, including listed species and species of particular importance to local communities such as Tribes.

The action agencies have adjusted project operations in such cases in an effort to balance competing uses. Adjustments to operation plans have often led to litigation. Against the backdrop of litigation and the uncertainty it brings to operations, some Members of Congress and some stakeholders have sought longer-term solutions. One relatively novel approach is the long-term stay of litigation and associated MOU for the Columbia River System. Further, some have proposed authorizing the removal of one or more of the lower Snake River dams. Others aim to prohibit such actions – both implementation of the MOU and authorizing dam removal. As Congress and other stakeholders consider how to address Columbia River System operations, including the lower Snake River dams, they may also consider the precedential impact of the solutions they select on similar federal projects.

Selected Member Proposals and Legislation in the 117th and 118th Congresses

Members of Congress have proposed various legislative options related to the operations of federal dams in the Columbia River System, in particular the lower Snake River dams, and restoration measures for listed species in the Columbia River Basin. In February 2021, Representative Mike Simpson released a $33 billion proposal that included breaching the four lower Snake River dams and establishing a fund to support fish restoration and economic sectors

[229] Of this amount, BPA will provide $200 million to fund FWS for Lower Snake River Compensation Plan for hatchery modernization, upgrades, and maintenance, and $10 million annually to the four tribal groups, Oregon, and Washington for fish restoration projects.

[230] During her testimony, CEQ Chair Brenda Mallory stated that "the agreement does not commit dollars that have not already been appropriated." *Snake River Dam hearing*, January 30, 2024.

[231] For more information on the Central Valley Project, CA, see CRS Report R45342, *Central Valley Project: Issues and Legislation*, by Charles V. Stern, Pervaze A. Sheikh, and Erin H. Ward. For more information on the Willamette Valley Project, OR, see USACE, "The Willamette Valley Dam System," https://www.nwp.usace.army.mil/Locations/Willamette-Valley/Evaluation/.

affected by dam removal.[232] No legislation related to this proposal was introduced in the 117th or 118th Congresses. Title V of the Water Resources Development Act of 2022 (H.R. 7776 as passed by the House on June 8, 2022) would have established a Columbia River Basin Trust consisting of various nonfederal stakeholders and a Columbia River Basin Task Force (comprising various federal agency representatives).[233] This title would have directed the task force to prepare and approve a restoration plan for the basin to address various issues (e.g., salmon recovery, water quality and water supply along the Snake River system) and for the plan to be transmitted to Congress. The bill also would have directed USACE and the task force to identify critical restoration projects and implement projects that are less than $10 million in federal expense.

Some legislation introduced in the 118th Congress aims to ensure continued operation of the lower Snake River dams, bar implementation of certain MOU actions, or achieve related outcomes. H.R. 1762 and S. 966 would direct the action agencies to "operate the FCRPS in a manner consistent with the reasonable and prudent alternative set forth" in the 2020 ROD,[234] and H.R. 8157 would bar any spill at the lower Snake River dams unless approved by the Secretary of the Army and Administrator of BPA. Other bills, such as H.R. 8161, H.R. 8160, and H.R. 8159, would prohibit agencies from breaching dams or retiring power plants under certain circumstances. Those circumstances include crossing specified thresholds related to electric reliability, carbon emissions, prices of barged goods, land use, and other factors. H.R. 7066 would prohibit the use of any federal funds (1) to study the breach of the lower Snake River dams or replacement of benefits that the dams provide or (2) to implement the CBRI, as proposed in the MOU. Further, H.R. 8156 would require a report on CEQ from the Government Accountability Office that must include information on the roles, responsibilities, and practices of CEQ regarding the Columbia River Systems operation litigation and determinations regarding their involvement.

Selected Issues and Questions for Congress

MOU Implementation. The MOU is an agreement for operations of the Columbia River System while implementing federal commitments in support of the CBRI. Congress may have a role in the implementation by conducting oversight and potentially enacting legislation to address certain activities or programs associated with the MOU. Some questions that Congress might consider include the following:

- How could Congress conduct oversight or provide direction over the implementation of the MOU?

[232] See Rep. Mike Simpson, "The Columbia Basin Initiative," https://simpson.house.gov/uploadedfiles/simpson_presentation_idaho.pdf.

[233] After House passage of H.R. 7776, the Senate struck the House language and amended the bill on July 28, 2022, with its Water Resources Development Act of 2022 (WRDA 2022) provisions. The WRDA 2022 included a provision authorizing a study for an aquatic ecosystem restoration project, including habitat for endangered salmon, in the Columbia River Basin. The House then amended H.R. 7776 on December 8, 2022, with the text of the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, which included another version of WRDA 2022 as Title LXXXI of Division H. The amended text did not include any provision related to Columbia River Basin restoration. The James M. Inhofe National Defense Authorization Act for Fiscal Year 2023 was enacted on December 23, 2022.

[234] These bills would allow flexibility for the Secretaries of the action agencies to amend the operations in certain circumstances. The bills also would require explicit authorization by federal statute to undertake any structural modification, action, study, or engineering plan that would restrict electrical generation at any FCRPS hydroelectric dam or limit navigation on the Snake River. These bills are similar to H.R. 8016, the Federal Columbia River Power System Certainty Act, introduced in the 117th Congress.

- Should Congress consider enacting the MOU or parts of the MOU? If so, what would the enacting legislation include regarding MOU actions?
- Should Congress consider opposing implementation of the MOU? If so, what legislative action may Congress consider to amend or terminate federal actions pursuant to the MOU?
- What additional authorizations or funding is need to implement the MOU?
- If the MOU were rescinded and/or not implemented, what would be the potential effects, including on the survival of ESA-listed species? Outside of efforts outlined in the MOU, what are the alternatives for restoring species and/or preserving the benefits currently provided by the lower Snake River dams during droughts or other effects of climate change?

Dam Removal. Congress might have a role in prohibiting, investigating, or authorizing and funding lower Snake River dam removal. Congress might consider several questions, including the following:

- What is the appropriate federal role in (1) studying the benefits and costs provided by the lower Snake River dams and (2) replacing benefits if dams are removed? How much would lower Snake River dam removal cost and how long would it take? How much would replacing the benefits of the lower Snake River dams cost? Through what means and on what timeline would these benefits be replaced?
- How would lower Snake River dam removal affect fish species, including ESA-listed species, in the short and long term? What effects would dam removal have in achieving healthy and harvestable stocks of listed species? How does current scientific understanding support our understanding of the impact of lower Snake River dam removal on ESA-listed species and are further studies needed?
- How will factors other than the presence of dams or removal of dams (e.g., drought and water quality) affect fish populations, including ESA-listed species, in the short and long term?
- How could the effects of climate change alter the anticipated outcomes of lower Snake River dam removal for fish populations? Alternatively, how might climate change affect fish populations if the dams remain?

Restoring Fish Populations. Dams and other factors affect several species of Snake River fish listed as threatened or endangered (see "Factors Affecting Snake River Salmon and Steelhead Trout Populations"). Congress may consider the extent to which existing or additional restoration activities are needed to conserve populations. Some questions Congress may consider are as follows:

- What are the potential benefits and challenges of having a goal to either restore fish populations in the Basin to healthy and harvestable populations or a goal to restore populations that no longer require listing under the ESA?
- Should Congress provide more authorizations and appropriations to restore listed fish and other native fish species in the Columbia River Basin, or are existing authorizations and funding sufficient?
- How can collaboration be increased among tribal, state, and private stakeholders to address fish populations, and what are the potential benefits or challenges of creating a new collaborative entity to address fish populations (e.g., task force or advisory committee)?

Tribal Concerns. Certain Tribes in the Pacific Northwest reserved rights to continue hunting, fishing, or gathering on lands they ceded to the federal government by treaty. In the Columbia River Basin, some Tribes advocate for changing dam operations to benefit salmon and for restoring salmon habitat, including four Tribes that created the CBRI along with two states. Some Tribes have also created hatcheries to supplement fish populations. Some questions Congress may consider are as follows:

- What is the extent of the federal government's obligation to maintain federal trust and treaty rights to fish in the Columbia River System? How should the government balance tribal interests against other interests?
- To what extent does the MOU and accompanying federal commitments balance the support of tribal rights and interests against other stakeholder interests?

Litigation and the MOU. Litigants entered into an MOU and requested—and were granted—a long-term stay of the litigation, rather than obtaining a final court decision or entering into an enforceable settlement agreement. Some questions Congress may consider are as follows:

- What are the possible legal and practical impacts in the event one or more of the parties to the MOU is unable or unwilling to fulfill their obligations under the MOU? If litigation were to resume, what options might Congress consider, if any, for addressing the federal defendants' legal obligations and the competing uses of resources in the Columbia River System?
- How sustainable is this approach to address the issues associated with the Columbia River System? What advantages and disadvantages does a voluntary set of commitments have compared to other approaches?
- How does the federal government adopting this approach for the Columbia River System affect debates and actions regarding other authorized federal projects still serving their purposes that may be affecting populations of listed species?

Author Information

Anna E. Normand, Coordinator
Specialist in Natural Resources Policy

Pervaze A. Sheikh, Coordinator
Specialist in Natural Resources Policy

Erin H. Ward, Coordinator
Coordinator of Research Planning/ALD

Ashley J. Lawson
Specialist in Energy Policy

Mariel J. Murray
Specialist in Natural Resources Policy

Anthony R. Marshak
Analyst in Natural Resources Policy

John Frittelli
Specialist in Transportation Policy

Megan Stubbs
Specialist in Agricultural Conservation and Natural Resources Policy

Elena H. Humphreys
Analyst in Environmental Policy

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