February 22, 2021

TO: **Northwest Governors, Members of Congress, Policymakers**

RE: **Scientists' letter on the need for lower Snake River dam removal to protect salmon and steelhead from extinction and restore abundant, fishable populations.**

The attached letter, authored and signed by 68 of the nation's and Northwest region's premier salmon and fisheries scientists, summarizes actions necessary to protect and restore abundant salmon and steelhead runs to the Snake/Columbia River Basin.

This letter's major conclusions are:

1. The negative impacts of Federal Columbia River Power System (FCRPS) dams and reservoirs on ESA-listed salmon are clearly and unequivocally impeding their recovery and restoration.
2. Recovery of ESA-listed salmon and steelhead in the Snake River basin cannot be accomplished without removing four FCRPS dams on the Lower Snake River – regardless of other environmental and management factors – including ocean conditions.
3. These four dams must be removed not only to avoid extinction of Snake River fish, but, because these dams block the gateway to high quality, resilient spawning habitat in a world facing increasing impacts of climate change, their removal is essential to restore abundant, harvestable salmon, and provide the highest likelihood of achieving the region-wide goals of the Columbia Basin Partnership and the Northwest Power and Conservation Council, and to honor the nation's promises to Northwest tribes.
4. The actions set forth in the 2020 federal Environmental Impact Statement (EIS) and Biological Opinion (BiOp) are insufficient and will not reverse salmon declines, much less rebuild populations to sustainable levels.

Please share this letter among other Northwest and national decision makers. Refer questions to these members of the science team:

Howard Schaller (Oregon scientist): howie.a.schaller@gmail.com 503-560-6189

Terry Holubetz (Idaho scientist): tbholubetz@gmail.com 208-871-0292

Deborah Giles (Washington scientist): giles7@uw.edu 916-531-1516

Thank you for your attention to this urgent matter.

February 22, 2021

2021 Scientists' Letter: Snake/Columbia salmon and dam removal

This letter, authored and signed by 68 of the nation's and region's best qualified salmon and fisheries experts, summarizes the scientific consensus on key aspects of salmon recovery in the Snake/Columbia River Basin. The letter is intended to help inform regional and national leaders on the policies and actions necessary to restore to a healthy abundance salmon currently listed under the federal Endangered Species Act (ESA).

When all of the credible scientific evidence is taken into account, it is clear that removing the four lower Snake River dams is necessary to restore Columbia Basin salmon populations, especially those originating in the Snake River. Specifically:

1. The science shows that in the Columbia Basin, salmon populations that must pass more than four mainstem dams and reservoirs migrating to and from the Pacific Ocean face an especially high risk of extinction. Naturally spawning yearling salmon populations that pass four mainstem dams or fewer generally exhibit much higher smolt to adult survival rates and, in many cases, are thriving.
2. The negative impacts of federal Columbia River Power System (FCRPS) dams and their reservoirs on salmon survival are clear and unequivocal. The survival problems of various ESA-listed salmon and steelhead species in the Columbia basin cannot be solved without removing four FCRPS dams on the Lower Snake River. These four dams must be removed to not only avoid extinction, but also to restore abundant salmon runs, and to achieve the region-wide goals of the Columbia Basin Partnership and the Northwest Power and Conservation Council (NWPCC).
3. The actions set forth in the 2020 federal Environmental Impact Statement (EIS) and Biological Opinion (BiOp) are insufficient and will not reverse salmon declines, let alone rebuild the populations of these species to sustainable levels.

I. BACKGROUND:

In the early 1900s, salmon populations declined because of industrial-scale overharvest. In recent decades, harvest has been tightly controlled, but salmon runs have been devastated by the alteration or destruction of spawning, nursery, and migratory habitats. Since the completion of the FCRPS in 1975, and in spite of considerable effort and expenditure, salmon populations have plummeted, with many now facing extinction. Nowhere is this decline more visible than the Snake River Basin, where a vast area of high-quality spawning and nursery habitat remains. This basin once sustained almost 50% of the Chinook and steelhead in the entire Columbia Basin, and today presents our best recovery opportunity. Unfortunately, today only 1-2% of historic wild fish numbers return to the Snake River Basin (Thurow et al., 2019), and all of its salmon and steelhead populations face extinction.

Development of the FCRPS transformed a free-flowing river system into a series of reservoirs and dams, dramatically impacting native salmon and steelhead. The Columbia River ecosystem, prior to development, was a network of complex interconnected habitats that had been created, periodically altered, and maintained by natural physical processes (ISG 1999; Williams 2006) and passage to and from natal habitats for anadromous fish was unimpeded. Now, the developed Columbia River ecosystem bears little resemblance to a natural river, and juvenile salmon and

steelhead face obstacles of reduced water velocity, dangerously warm water in reservoirs (Cannamela, D. et al, Letter to Northwest Policy Makers re: River Temperatures, Oct. 22, 2019), increased predation, migration delays, mortality, injury and stresses during dam passage. In many cases, additional stresses are introduced by handling and collection of juveniles for transportation around the dams. These factors, directly and indirectly, very substantially reduce juvenile survival rates during seaward migration, and Snake River populations experience significant delayed mortality in the marine environment as a result of their out-migration experience through the FCRPS (Deriso et al. 2001; Williams et al. 2005; Buchanan et al. 2011; Schaller and Petrosky 2007; Marmorek et al. 2011; Schaller et al. 2014). The juvenile seaward migration through the FCRPS results in an accumulation of injuries, multiple stress events, and alteration of estuary arrival timing: mechanisms that may explain the delayed mortality that is observed and documented (Budy et al. 2002; Muir et al. 2006; Scheuerell et al. 2009; Rechisky et al. 2012).

Since the 1980s, a number of salmon recovery strategies have been attempted with little or no success, including: major structural modifications at dams aimed at improving passage survival; extensive collection and transportation of juvenile salmon (smolt barging and trucking); improvement and restoration of additional spawning habitat in central Idaho, SE Washington, and NE Oregon; some estuary improvements; avian and piscivorous predator controls; increased flows through slackwater FCRPS reservoirs; and, increased spill over FCRPS dams to aid fish passage. These efforts, singly and in combination, have not reversed the continuing decline of these species.

II. SALMON AND STEELHEAD POPULATION GOALS:

In the past two years, the Columbia Basin Partnership (CBP) developed and adopted abundance goals for fish populations in the Columbia Basin. In the Snake basin (where four ESA-listed populations originate), the CBP Phase 1 report establishes a high-end abundance target for sockeye of 9000 wild fish annually; for wild spring/summer Chinook 127,000, and for wild steelhead 105,000. Further, in 2014 the NW Power and Conservation Council (NWPCC) reaffirmed its goal of smolt-to-adult returns (SAR) that average 4% (a 2-6% range) for Spring/Summer Chinook (NWPCC 2014). As the NWPCC has explained, a minimum of 2% SAR is required to maintain existing populations; SARs above 2% indicate movement towards rebuilding (Peters and Marmorek 2001, Petrosky et al. 2020). SARs at and above 4% on a sustained basis will lead to recovery and a sustainable abundance (Petrosky et al. 2020). The Independent Scientific Advisory Board (2017; 2018) extensively reviewed the 2-6% SAR objective and identified extensive analyses in the Comparative Survival Studies (CSS) to support these goals, noting that "…SAR objectives provide a readily measured, first-order objective for restoring stocks."

Based on the weight of scientific evidence, this letter endorses those goals and provides explicit recommendations on actions to achieve them.

III. DAMS AND SALMON SURVIVAL IN THE SNAKE/COLUMBIA BASIN:

Researchers have analyzed and compared, both spatially and temporally, the productivity and survival rates from spawner to adult return of Chinook from the upper and middle ranges of their distribution in the Columbia River basin (Schaller et al. 1999, Schaller et al. 2014, Petrosky et al. 2020).

Declines of ESA listed Snake River spring/summer Chinook populations have been associated with the completion and operation of the eight dams of the FCRPS. In contrast, John Day River spring Chinook populations that pass only three dams have declined to a lesser extent, exhibited healthier levels of productivity and are not ESA-listed. (Figure 2; from Petrosky et al. 2020). These patterns of complete life cycle survival rates are strongly driven by smolt-to-adult return rates (SAR).

The SARs of various salmon and steelhead populations in the Columbia Basin reflect the life cycle impact of various factors in the life histories of each population, including outmigration flow and temperature conditions, impacts of hydrosystem passage, estuary survival, delayed mortality, ocean conditions, predation, harvest, and freshwater temperatures and flow conditions during the adult return migration. Yearling Chinook and steelhead populations whose migration requires passing four dams or fewer are surviving adequately, or thriving: e.g., in the Deschutes River basin, above 2 FCRPS dams, the wild steelhead SAR is 5% (brood years 2006-2016); in the John Day River above 3 FCRPS dams, wild steelhead SAR is 5% (2004-2016) and wild Chinook SAR is 3.6% (2000-2017). For the Yakima River basin, above four FCRPS dams, the wild steelhead SAR is 4% (2002-2016) and the wild Chinook SAR is 2.5% (2000-2017) (McCann et al. 2019).

By contrast, in the Snake River basin (above eight FCRPS dams), all salmon populations are facing likely extinction. The wild steelhead SAR is only 1.4% (2000-2016), and the wild spring/summer Chinook SAR is only 0.7% (2000-2017) – both well under the minimum to persist, resulting in generational declines in these Snake River populations (McCann et al. 2019, Petrosky et al. 2020).

IV. THE CUMULATIVE IMPACT OF MULTIPLE DAM PASSAGE:

In the Columbia basin, yearling chinook salmon and steelhead populations that must pass four dams or fewer on the journey to and from the Pacific generally exhibit much higher smolt to adult survival rates and in many cases are thriving, despite all other factors - including ocean conditions. Snake River salmon populations that must pass eight dams on both their juvenile and adult migration are not surviving at a level to sustain themselves, much less achieve rebuilding goals, regardless of other factors. Breaching the four lower Snake River dams would provide more certainty of achieving long-term survival and recovery than would any other measure or combination of measures that do not include dam breaching.

Breaching the four lower Snake Dams was identified in both the 2000 FCRPS Biological Opinion and the 2020 FCRPS Biological Opinion as yielding the highest survival improvements for Snake River species. That conclusion was supported by extensive evidence from a peer-reviewed, interagency process established in the 1990s, the Plan for Analyzing and Testing Hypotheses (PATH), which summarized the available empirical evidence, retrospectively analyzed patterns of survival in the various life stages and across the life cycle, and performed prospective analyses using a wide range of assumptions. PATH analyses showed that dam breaching options were the most likely to recover Snake River salmon and steelhead with the lowest risk under a wide range of assumptions (Marmorek et al. 1998). The preponderance of evidence accumulated since the PATH process has continued to consistently demonstrate major adverse impacts from the Snake and Columbia River dams (FCRPS) on salmon and steelhead. This evidence, from multiple data sets and analytical approaches, has repeatedly demonstrated that survival of Snake River

spring/summer Chinook – in the smolt-to-adult stage, in the ocean, and across the life cycle – is lower than that of similar populations that experience fewer dams.

There is also considerable evidence that Snake River spring/summer Chinook experience substantial delayed mortality in the marine environment as a result of their outmigration experience through the FCRPS. This outmigration experience results in an accumulation of injuries, multiple stress events, depleted energy reserves, and alteration of estuary arrival timing: mechanisms that may explain observed and documented levels of delayed mortality.

Decreased water velocity and increased number of powerhouse passages have been related to large increases in the time required for juveniles to migrate to sea, and reductions in life cycle survival, smolt to adult returns, and marine survival rates for Snake River Chinook Salmon.

This large body of scientific evidence and analyses identifies a significant level of hydrosystem-related mortality (latent or delayed mortality) for Snake River Chinook populations (Budy et al. 2002, Schaller et al. 2007, Petrosky and Schaller 2010, Marmorek et al. 2011; Haeseker et al. 2012, Schaller et al. 2014). Recently papers by Faulkner et al. 2019 and Welch et al. 2020, suggest that hydrosystem impacts are not significant factors in the decline of salmon survival. However, both of these studies contain serious scientific flaws and come to erroneous conclusions, as extensively identified and detailed in Storch et al. 2020 and Fish Passage Center 2020.

The limiting factor in salmon recovery is clear, after many studies and decades of analyzing survival data. Snake/Columbia salmon simply face too many dams to allow salmon populations to recover.

In many rivers across the USA, dam removals have restored fish populations. In the Columbia Basin, especially for Snake River salmon populations, four dams on the lower Snake River in SE Washington State (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) must be removed. In addition, adequate spill for fish passage at the remaining lower Columbia River dams must be provided if salmon populations are to be restored.

V. THE 2020 CRSO FEIS AND FCRPS BIOLOGICAL OPINION (BiOp):

The primary benefit for fish described in the proposed action evaluated in the 2020 BiOp (which is also essentially the Preferred Alternative from the FEIS) is a "flexible spill" operation designed to increase spill over FCRPS projects to the 125% total dissolved gas cap for about 16 hours daily, and reduce it during a period of up to 8 hours, when energy generation is favored. However, the BiOp "focuses only on assuring the "continued existence" of the species, not on improving the likelihood of either survival, recovery, or "the attainment of an improved status" (NOAA, 2020)." Thus, the actions of the 2020 BiOp ***will not reverse the decline of ESA-listed fish*** and are unlikely to accomplish even their stated goal of assuring the "continued existence" of these species. The analyses underlying the BiOp and FEIS actually conclude that restoration of the lower Snake River, including breaching the four dams there (alternative "MO3" in the FEIS), is the only option that can restore Snake River salmon and steelhead, avoid extinction, and achieve significant progress towards rebuilding these species to a sustainable abundance.

In the final 2020 EIS, the three federal agencies that prepared it state unequivocally that lower Snake River dam breaching would provide the greatest benefit for fish, but it was not their

"preferred alternative." In summary**, the best available scientific and other relevant evidence, when fully and objectively evaluated, shows that breaching the four lower Snake River dams, with adequate spill at the remaining lower Columbia River dams, is <u>the only viable option</u> to both protect and restore salmon and steelhead.**

VI. CONCLUSION:

The 2020 EIS and BiOp are insufficient and leave Columbia Basin salmon (and specifically Snake River salmon) at high risk of extinction. When all of the existing credible scientific evidence is taken into account, it is clear that removing the four lower Snake River dams, with adequate spill at remaining lower Columbia River dams, is necessary to restore Snake River salmon populations.

Respectfully,

Margaret J. Filardo, Ph.D.
Doctorate, Oceanography, Old Dominion University
Senior Fishery Biologist
Fish Passage Center, retired
Portland, Oregon

Charles E. Petrosky, Ph.D.
Doctorate, Fishery Resources, University of Idaho
Fisheries Biologist, Idaho Department of Fish and Game, retired
Boise, Idaho

Howard Schaller, Ph.D.
Doctorate, Biological Oceanography, Old Dominion University
Fish population Dynamics, 35 yrs. evaluating Pacific NW natural resource Mgmt.
U.S. Fish and Wildlife Service, retired
Portland, Oregon

Rick Williams, Ph.D.
Doctorate, Conservation Biology, University of Brigham Young
Research Associate, Department of Biology, The College of Idaho
Caldwell, Idaho

Carl Safina, Ph.D.
Doctorate, Ecology, Rutgers University
Ecologist, Founder of the Safina Center, Stony Brook University
Long Island, New York

Douglas DeHart, Ph.D.
Doctorate, Fisheries Science, University of Washington
ODFW Chief of Fisheries, USFWS Senior Fishery Biologist, retired
Oregon City, Oregon

Deborah A. Giles, Ph.D.
Resident Scientist, University of Washington Center for Conservation Biology
Science & Research Director, Wild Orca
Friday Harbor, Washington

Jack E. Williams, Ph.D.
Doctorate, Fisheries Science, Oregon State University
Emeritus Senior Scientist, Trout Unlimited
Medford, OR

Jack A. Stanford, Ph.D.
Doctorate, Limnology, University of Utah
Emeritus Professor of Ecology, University of MT
Flathead Lake Biological Station
Polson, Montana

Peter A. Bisson, Ph.D.
Doctorate, Fisheries and Wildlife, Oregon State University
Senior Scientist, Weyerhaeuser Co. and US Forest Service, Pacific NW region
Vice chair (retired), Independent Scientific Review panel, NW Power/Conservation Council
Olympia, Washington

Sammy Matsaw, Ph.D.
Doctorate, Water Resources, Science, Management, University of Idaho
Anadromous Fish Program Research Biologist, Shoshone-Bannock Tribe
Pocatello, Idaho

Richard J. Scully, Ph.D.
Doctorate, Fisheries and allied Aquacultures, Auburn University
Regional Fisheries Manager, Idaho Department of Fish and Game, retired
Lewiston, Idaho

Helen Neville, Ph.D.
Doctorate, Ecology, Evolution and Conservation Biology, University of Nevada-Reno
Senior Scientist, Trout Unlimited
Boise, Idaho

Donald W. Chapman, Ph.D.
Doctorate, Fisheries, Oregon State University
Fisheries Biologist for University of Idaho, and independent consultant
McCall, Idaho

Jonathan Rosenfield, Ph.D.
Doctorate, Evolution, Ecology, and Behavior, University of New Mexico
Senior Scientist, San Francisco Baykeeper
Berkeley, California

Keith A. Johnson, Ph.D.
Doctorate, Pathogenic Microbiology, Oregon State University
Chief of Sockeye fish culture, Idaho Department of Fish and Game, retired
Emmett, Idaho

John W. Sigler, Ph.D.
Doctorate, Fisheries Biology and Management, University of Idaho
Consultant - multiple land and water management projects;
Senior Environmental Coordinator, City of Pocatello, retired
Author; *Fishes of Idaho, a Natural History Survey, 2018*
Pocatello, Idaho

Philip R. Mundy, Ph.D.
Doctorate, Fisheries, University of Washington
Associate Professor, University of Alaska (retired)
Founding member, Scientific Review Group, BPA (retired)
Fish Passage Development and Evaluation Program, U.S. Army Corps of Engineers (retired)
Juneau, Alaska

David Bain, Ph.D.
Doctorate, Biology, University of California Santa Cruz
Chief Scientist, Orca Conservancy: population dynamics, ecology
Bothell, Washington

Bruce P. Finney, Ph.D.
Doctorate, Oceanography, Oregon State University
Professor, Biological and Geo Sciences; Director, Stable Isotope Laboratory
Idaho State University
Pocatello, Idaho

James B. Reynolds, Ph.D.
Doctorate, Fisheries Biology, Iowa State University
Emeritus, University of Alaska Fairbanks
Salmonid Fisheries Biologist, USGS, retired
Apache Junction, Arizona

Christopher A. Walser, Ph.D.
Doctorate, Biology, Tulane University
Chair, Natural Sciences and Mathematics, The College of Idaho
Caldwell, Idaho

William H. Miller, Ph.D.
Doctorate, Fisheries, University of Idaho
30 years, salmon research and management, US Fish and Wildlife Service, retired
Orofino, Idaho

David C. Burns, Ph.D.
Doctorate, Fisheries Science, Fisheries Scientist Emeritus
McCall, Idaho

Daniel Matlock, Ph.D.
Doctorate, Cell Biology and Genetics, Oregon State University
Research, Biology, Marine Organisms, Seattle University
Freeland, Washington

Rodney W. Sando, M.S.
Master of Science, Fisheries, University of Idaho
Former Chief of Natural Resources, Minnesota
Former Executive Director, Columbia Basin Fish & Wildlife Authority
Director, Idaho Department of Fish and Game, retired
Woodburn, Oregon

Jim Martin, M.S.
Master of Science, Fisheries, Oregon State University
Chief of Fisheries, Oregon Department of Fish and Wildlife, retired
Mulino, Oregon

Bill Shake, M.S.
Master of Science, Wildlife Biology, Western Illinois University
Former Assistant Director of Fisheries, USFWS, Portland Regional Office
Special Assistant to the Regional Director on Columbia River salmon, retired
Portland, Oregon

James Lichatowich, M.S.
Master of Science, Fisheries Science, Oregon State University
45 years in salmon research and management
Author: *Salmon without Rivers, a History of the Pacific Salmon Crisis, and People and Place - a Biologist's Search for Salmon Recovery*
Columbia City, Oregon

Russell B. Kiefer, M.S.
Master of Science, Aquatic Biology, SW Texas State University
Salmon and Steelhead Research Biologist
Member, Regional Forum Teams improving Snake/Columbia Fish Passage
33 Years, Idaho Dept of Fish and Game, retired
Boise, Idaho

David A. Cannamela, M.S.
Master of Science, Aquatic Science, Murray State University/Idaho State University
Fisheries Research Biologist/Fisheries Biologist, Idaho Dept. Fish & Game, retired
Boise, Idaho

Bert Bowler. M.S.
Master of Science, Fisheries, University of Idaho
Fisheries Biologist, Snake River Salmon Solutions
Boise, Idaho

Frederick E. Olney, M.S.
Master of Science, Fisheries, University of Washington
Senior Fisheries Scientist, US Fish and Wildlife Service, Regional Office, retired
Monroe, Washington

Tony Nigro, M.S.
Master of Science, Fish and Wildlife Sciences, Virginia Tech University
Program Manager, Columbia River and Ocean Salmon Program
Oregon Department of Fish and Wildlife, retired
Clackamas, Oregon

Brian Brooks, M.S.
Master of Science Natural Resources, University of Idaho
Restoration Ecologist
Boise, Idaho

Terry B. Holubetz, M.S.
Master of Science, Fisheries Management, Oregon State University
Idaho Department of Fish and Game, retired
Cottonwood, Idaho

Stephen Pettit, M.S.
Master of Science, Zoology, University of Idaho
Fisheries Research Biologist, Idaho Fish and Game, retired
Lewiston, Idaho

Alan R. Sands, M.S.
Master of Science, Wildlife Management, Humboldt State University
40 years, BLM, Nature Conservancy, Sage Wildlife Consulting
Upland & Riparian Habitat Restoration & Management, retired
Boise, Idaho

Amy Stuart, M.S.
Master of Science, Wildlife Management, Colorado State University
Oregon Department of Fish and Wildlife, retired
Prineville, Oregon

Roger S. C. Wolcott, Jr., M.S.
Master of Science, Fishery Science, University of Washington
U.S. Fish & Wildlife Svc., Research & Mgmt. of Anadromous Fish & Habitat
NMFS, Mgmt. of Anadromous Fish, Habitat, Water Policy, retired
Bend, Oregon

David A. Moskowitz, J.D.
Juris Doctor, Environmental and Natural Resource Law, Lewis and Clark College
Environmental Law and Policy
Portland, Oregon

Bill McMillan
Co-Founder, Wild Fish Conservancy,
Science Advisor, the Conservation Angler
Concrete, Washington

Kimberly A. Apperson, M.S.
Master of Science, Zoology, University of Idaho
Fisheries Scientist, retired
McCall, Idaho

John McMillan, M.S.
Master of Science, Fisheries, Oregon State University
Steelhead Science Director, Trout Unlimited
Port Angeles, Washington

Charles L. Blair. M.S.
Master of Science, Wildlife Biology, South Dakota State University
Senior Wildlife Ecologist, CH2M Hill, Retired
Boise, Idaho

Signe Sather-Blair. M.S.
Master of Science, Wildlife Biology, South Dakota State University
Idaho BLM State Program Lead for Wildlife and Endangered Species, Retired
Boise, Idaho

Ned J. Horner, M.S.
Master of Science, Fisheries, University of Idaho
Regional Fisheries Manager, Idaho Department of Fish and Game, retired
Coeur d'Alene, Idaho

Larry Brooke, M.S.
Master of Science, Fish & Wildlife Mgmt./Biology, Eastern Michigan University
Senior Scientist, Aquatic Toxicology, Univ. of Wisconsin-Superior
Superior, Wisconsin

Marvin Yoshinaka, M.S.
Master of Science, Fisheries, University of Washington
US Fish and Wildlife Service, Columbia River Fisheries Program, retired
Vancouver, Washington

Gregg L. Servheen, M.S.
Master of Science, Wildlife and Fisheries Sciences, Texas A&M University
Wildlife Program Coordinator, Idaho Department of Fish and Game, retired
Boise, Idaho

Thomas Hemker, M.S.
Master of Science, Wildlife Ecology, Utah State University
State Wildlife Habitat Manager, Idaho Dept. of Fish and Game, retired
Boise, Idaho

Richard Howard, M.S.
Master of Science, Wildlife Ecology, Utah State University
Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, retired,
Boise, Idaho

Leonard Corin, M.A.
Master of Arts, Biology, Northern Michigan University
Fisheries and Ecological Services, USFWS, retired
Oak Harbor, Washington

Gary Gadwa, M.S.
Master of Science, Wildlife and Fisheries Resources, University of Idaho
Wildlife and Fisheries Biologist, Idaho Department of Fish and Game, retired
Stanley, Idaho

William H. Goodnight, M.S
Master of Science, Fisheries Management, University of Idaho
Idaho Dept. Fish & Game, retired
Boise, Idaho

Roy Heberger, M.S.
Master of Science, Fisheries/Aquatic Ecology, University of Michigan
U.S. Fish and Wildlife Service, retired
Boise, Idaho

Raymond R. Boyce, M.S.
Master of Science, Fish and Wildlife, Oregon State University
Columbia River Fish Biology, Passage and Hydro Management, ODFW, retired
Lake Oswego, Oregon

Fred E. Partridge, M.S.
Master of Science, Fisheries, Humboldt State University
Fisheries Scientist, Regional Supervisor, Idaho Department of Fish and Game, retired
Jerome, Idaho

Scott Bosse, M.S.
Master of Science, Fisheries and Wildlife Biology, University of Montana
Bozeman, Montana

Samuel Mattise, M.S.
Master of Science, Wildlife Biology, South Dakota State University
Wildlife Mgmt. Biologist, Bureau of Land Management, retired
Boise, Idaho

William H. Mullins, M.S.
Master of Science, Wildlife Management, University of Idaho;
Biologist for US BuRec, USFWS, US Geological Survey, retired
Boise, Idaho

John Heimer, M.S.
Master of Science, Fisheries management, University of Idaho
Idaho Fish and Game Department, retired
Boise, Idaho

Herbert Pollard, M.S.
Master of Science, Fisheries Management, University of Idaho
Fisheries management for IDFG and NMFS, retired
Boise, Idaho

Paul Wilson, B.S.
Bachelor of Science, University of Virginia
Graduate studies, Fisheries, University of Washington
Biometrician, Columbia River Fisheries Program, USFWS, retired
Author, *Conservation Biology: Evaluating recovery strategies for Snake R spring/summer chinook*
Portland, Oregon

William D. Horton, B.S.
Bachelor of Science, Fisheries Management, University of Idaho
State Fisheries Manager, Idaho Department of Fish and Game, retired
Boise, Idaho

Allan R. Van Vooren, B.S.
Bachelor of Science, Fisheries Biology, Iowa State University
State Fish Research Supervisor, State Fish Mgr., Idaho Department of Fish and Game, retired
Sandpoint, Idaho

Daniel H. Diggs B.S.
Bachelor of Science, Fisheries Science, Oregon State University
Assistant Regional Director of Fisheries, USFWS, Pacific Region, retired
Beaverton, Oregon

Timothy Roth, B.A.
Bachelor of Arts, Biological Sciences, Northwest Nazarene College
USFWS Fisheries Biologist, 38 years, retired
Columbia River Fisheries Management, including Pacific Fisheries Management Council
Ridgefield, Washington

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