Snake River Sockeye Salmon Recovery Plan Summary

Introduction

This recovery plan (Plan) serves as a blueprint for the protection and restoration of Snake River Sockeye Salmon (*Oncorhynchus nerka*). Snake River Sockeye Salmon were listed as an endangered species under the Endangered Species Act (ESA) in 1991. The listing was reaffirmed in 2005. The species remains at risk of extinction.

Today, the last remaining Snake River Sockeye Salmon spawn in Sawtooth Valley lakes, high in the Salmon River drainage of central Idaho in the Snake River basin. While very few Sockeye Salmon currently follow an anadromous life cycle, the small remnant run of the historical population migrates 900 miles downstream from the Sawtooth Valley through the Salmon, Snake and Columbia Rivers to the ocean (Figure ES-1). After one to three years in the ocean, they return to the Sawtooth Valley as adults, passing once again through these mainstem rivers and through eight major federal dams, four on the Columbia River and four on the lower Snake River. Anadromous Sockeye Salmon returning to Redfish Lake in Idaho's Sawtooth Valley travel a greater distance from the sea (900 miles) to a higher elevation (6,500 feet) than any other Sockeye Salmon population. They are the southernmost population of Sockeye Salmon in the world.

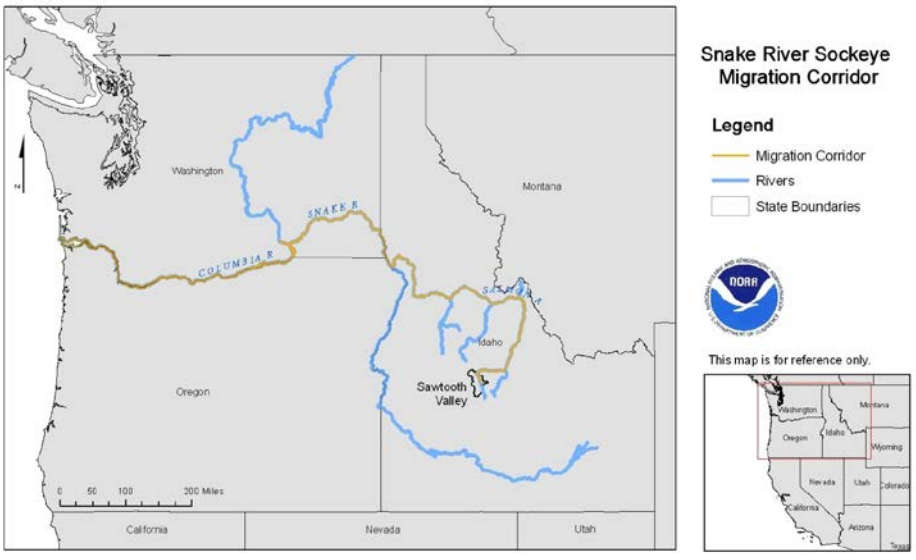

Figure ES-1. Snake River Sockeye Salmon migration corridor from Columbia River estuary to Sawtooth Valley lakes.

Before the turn of the twentieth century, an estimated 150,000 Sockeye Salmon returned annually to the Snake River basin. Sockeye Salmon ascended the Snake River to the Wallowa River basin in northeastern Oregon and the Payette and Salmon River basins in Idaho to spawn in natural lakes. Within the Salmon River basin, Sockeye Salmon spawned in Warm Lake in the South Fork Salmon River basin, as well as in the Sawtooth Valley lakes: Stanley, Redfish, Yellowbelly, Pettit and Alturas Lakes. A smaller Sawtooth Valley lake, Hellroaring Lake, may have also supported some Sockeye Salmon production. The historical relationships between the different fish populations are not known.

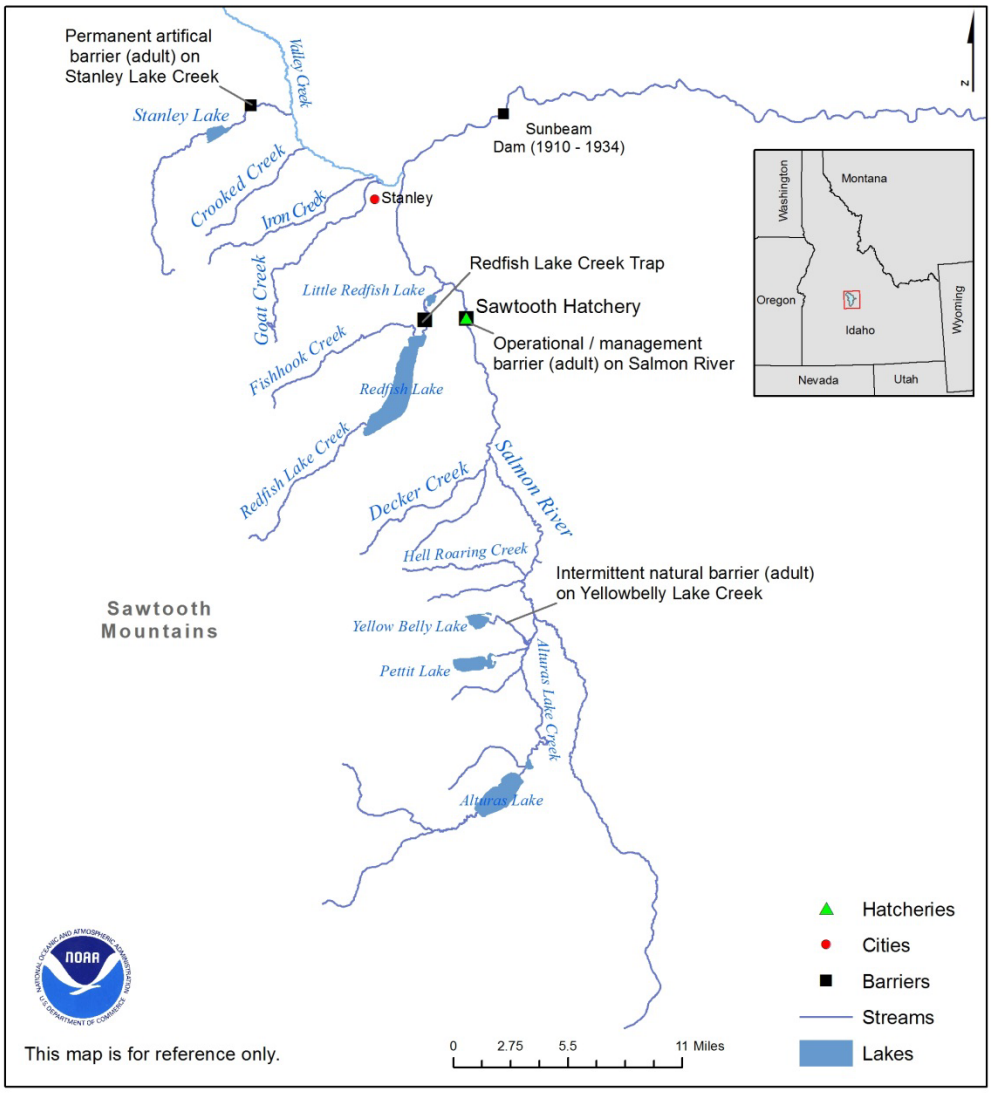

Figure ES-2. Map of the Sawtooth Valley, Idaho.

The Sockeye Salmon populations declined through the early- and mid-1900s, leading to the National Marine Fisheries Service (NMFS) ESA-listing of the species in 1991. NMFS is a branch of the National Oceanic and Atmospheric Administration (NOAA) and is sometimes referred to as NOAA Fisheries. As the federal agency charged with stewardship of the nation's marine resources, NMFS has the responsibility for listing and delisting salmon and steelhead species under the ESA.

When Snake River Sockeye Salmon were ESA-listed as endangered in 1991, all of the Snake River Sockeye Salmon populations but one, the Redfish Lake population in the Sawtooth Valley, were gone, and that population had dwindled to fewer than 10 fish per year. In some years before 1998, no anadromous Sockeye Salmon returned to the Snake River basin. Many human activities contributed to the near extinction of Snake River Sockeye Salmon. The NMFS status review that led to the original listing decision attributed the decline to "overfishing, irrigation diversions, obstacles to migrating fish, and eradication through poisoning." NMFS' 1991 listing decision for Snake River Sockeye Salmon noted that such factors as hydropower development, water withdrawal and irrigation diversions, water storage, commercial harvest, and inadequate regulatory mechanisms represented a continued threat to the species' existence.

In 1991, a partnership of state, tribal and federal fish managers initiated a captive broodstock hatchery program to save the Redfish Lake Sockeye Salmon population. Between 1991 and 1998, all 16 of the natural-origin adult Sockeye Salmon that returned to the weir at Redfish Lake were incorporated into the captive broodstock program, as well as out-migrating smolts captured between 1991 and 1993, and residual Sockeye Salmon captured between 1992 and 1995. The program has used multiple rearing sites to minimize chances of catastrophic loss of broodstock and has produced several million eggs and juveniles, as well as several thousand adults, for release into the wild.

The Sawtooth Valley is seeing results from the captive broodstock program. Sockeye Salmon returns to the valley have increased, especially in recent years, to 650 in 2008 (including 142 natural-origin fish), 833 in 2009 (including 85 natural-origin fish), 1,355 in 2010 (including 179 natural-origin fish), 1,117 in 2011 (including 142 natural-origin fish), 257 in 2012 (including 52 natural-origin fish), and 272 in 2013 (including 78 natural-origin fish). However, while the program has successfully prevented extinction and preserved the genetic lineage of Redfish Lake Sockeye Salmon, the species remains at risk of extinction. Snake River Sockeye Salmon cannot be said to be recovered until it is made up of natural-origin fish spawning in the wild and surviving their two-way journey in far greater numbers.

Why restore Snake River Sockeye Salmon?

Snake River Sockeye Salmon are listed as endangered under the Endangered Species Act because they are in danger of becoming extinct. Their numbers have dramatically declined from historical levels. In some years before 1998, no anadromous Sockeye Salmon returned to the Snake River basin.

What is the captive broodstock program?

A captive broodstock program for Snake River Sockeye Salmon began in May 1991. The program has prevented extinction in the near term and preserved the genetic lineage of Redfish Lake Sockeye Salmon. The program was developed using captured adult Sockeye Salmon that returned to Redfish Lake (1991-98), out-migrating smolts (1991-93), and residual adult Sockeye Salmon (1992-95). Reintroduction of captive broodstock progeny has followed a "spread-the-risk" philosophy, incorporating multiple release strategies into Redfish, Pettit, and Alturas Lakes.

What does "recovery" mean?

Biological recovery for a salmon species means that it is naturally self-sustaining — enough fish spawn in the wild and return year after year so they are likely to persist in the long run, defined as the next 100 years. The species also has to be resilient enough to survive catastrophic changes in the environment, including natural events such as floods, storms, earthquakes, and decreases in ocean productivity.

What about other fish species in the lakes?

Other fish species will also benefit from habitat and passage improvements for Snake River Sockeye Salmon.

About This Recovery Plan

The ESA requires NMFS to develop recovery plans for species listed under the ESA. This Plan was developed to comply with the law.

This Plan provides information required by NMFS to satisfy the requirements of section 4(f) of the ESA. It describes: 1) recovery goals and objective, measurable criteria which, when met, will result in a determination that the species be removed from the threatened and endangered species list; 2) site-specific management actions necessary to achieve the plan's goals; and 3) estimates of the time required and cost to carry out the actions needed to achieve the plan's goals. It also includes direction for monitoring and evaluation and adaptive management to fine-tune the course towards recovery when needed.

NMFS has directed preparation of this Plan. The Plan is the product of a collaborative process with contributions by a wide group of governments, sovereigns (tribes), and organizations with the potential

to contribute to recovery. Participants included Idaho Department of Fish and Game, Shoshone-Bannock Tribes, NMFS' Northwest Fisheries Science Center, members of NMFS' Interior Columbia Technical Recovery Team, Bonneville Power Administration, Stanley Basin Sockeye Salmon Technical Oversight Committee, and the U. S. Forest Service. The goal is to produce a Plan that meets NMFS' ESA requirements for recovery plans as well as State of Idaho's needs. NMFS intends to use the Plan to organize and coordinate recovery of the species in partnership with state, tribal and federal resource managers.

The Plan builds upon ongoing Snake River Sockeye Salmon recovery and research efforts. It describes the limiting factors and threats that impact survival and recovery. It then identifies a set of strategies and actions to address the limiting factors and threats, and restore natural Sockeye Salmon populations in Sawtooth Valley lakes to levels that will achieve Snake River Sockeye Salmon recovery. It also describes a comprehensive research, monitoring and evaluation program so that species status is evaluated over time, and based on new information, recovery actions can be adjusted as part of an adaptive management strategy. The actions are voluntary and may be taken to restore the species to a healthy, naturally self-sustaining condition.

Contents of Recovery Plan

The document describes:

- Purpose and uses of the Plan, and context of Plan development (Section 1)
- Relationship of the Plan to other planning processes and other ESA mandates (Section 1)
- The geographic area that supports the historical population (Section 2)
- Characteristics that define the species, including critical habitat (Section 2)
- Salmonid biological structure used in recovery planning (Section 2)
- Recovery goals and ESA requirements for delisting (Section 3)
- Desired Status —biological and threats criteria for delisting; broad sense recovery goals (Section 3)
- Current status of Snake River Sockeye Salmon and populations (Section 4)
- Limiting factors and threats (habitat, hydropower, hatcheries, fisheries, predation, competition, toxics, climate change) and critical uncertainties (Section 5)
- Recovery strategies for Snake River Sockeye Salmon (Section 6)
- Site-specific actions for recovery of Snake River Sockeye Salmon (Section 7)
- Predicted effectiveness of proposed actions (Section 8)
- Time and Cost estimates for recovery (Section 9)
- Framework for implementation, defining progress, and status assessment (Section 10)
- Framework for research, monitoring and evaluation for adaptive management (Section 11)

Several modules developed by NMFS provide key support to the Plan. NMFS produced these modules, which address regional-scale issues affecting Snake River Sockeye Salmon, as well as other ESA-listed Columbia River salmon and steelhead species, to assist in recovery planning. These modules provide a consistent set of assumptions and recovery actions that recovery planners incorporated into species-specific recovery plans. The following modules are used in the Snake River Sockeye Recovery Plan: (1) Columbia River Estuary Module (Estuary Module), (2) Columbia River Hydro Module (Hydro Module), (3) Columbia River Harvest Module (Harvest Module), and (4) Module for the Ocean Environment (Ocean Module). The modules will be updated periodically to reflect new data.

Scientific Foundation

NMFS' belief that it is critically important to base recovery plans on a solid scientific foundation that sets the stage for developing recovery plans. NMFS appointed teams of scientists with geographic and species expertise to develop recovery plans for each ESA-listed species from a common scientific foundation. The team responsible for Snake River Sockeye Salmon, the Interior Columbia Technical Recovery Team (ICTRT), includes biologists from NMFS and several states, tribal entities, and academic institutions.

This common approach recognizes that, historically, most salmon or steelhead species contained multiple populations connected by some small degree of genetic exchange with spawners straying in from other areas. Thus, the overall biological structure of a species is hierarchical. The species is essentially a metapopulation defined by the common characteristics of populations within a geographic range.

The ICTRT treats Sawtooth Valley Sockeye Salmon as the single major population group (MPG) within the Snake River Sockeye Salmon evolutionarily significant unit (ESU). The MPG contains one extant population (Redfish Lake) and two (Alturas Lake and Pettit Lake) to four (Stanley and Yellowbelly Lakes) other historical populations.

What is an evolutionarily significant unit (ESU)?

An ESU is a group of Pacific salmon that is (1) substantially reproductively isolated from other groups of the same species and (2) represents an important component of the evolutionary legacy of the species. ESUs are defined based on geographic range as well as genetic, behavioral and other traits.

All Pacific salmon belong to the family Salmonidae and the genus Oncorhynchus. Sockeye Salmon belong to the species *Oncorhynchus nerka*.

The Snake River Sockeye Salmon ESU

The Sawtooth Valley supports three forms of *O. nerka.* The Snake River Sockeye Salmon ESU includes two of the forms: anadromous and residual Sockeye Salmon.

- Anadromous Sockeye Salmon usually spend 1 to 3 years in the nursery lakes before migrating to sea as smolts. They remain at sea for 1 to 3 years before returning to natal areas to spawn.
- Residual Sockeye Salmon are genetically aligned with the anadromous form but have adopted a resident life history pattern, remaining in freshwater to mature and reproduce.
- Kokanee are a type of *O.nerka* that is genetically distinct from Sockeye Salmon and is not included in the Snake River ESA listing. Kokanee are a self-perpetuating, non-anadromous form of *O.nerka* whose parents, for several generations, have spent their whole lives in freshwater. Kokanee are not the focus of this recovery plan

Adult Sockeye Salmon in Redfish Lake. *Photo courtesy Mike Peterson, Idaho Fish & Game.*

Recovery Goals and Criteria

The Plan (Section 3) identifies the recovery goals and criteria that NMFS will use in future status reviews of the Snake River Sockeye Salmon ESU. The primary goal is to ensure that the species is viable and no longer needs ESA protection. Two types of criteria are used to describe viability and inform future ESA-delisting decisions: "Biological viability" criteria define population or demographic parameters. "Threats" criteria relate to the five listing factors detailed in the ESA. This Plan addresses these criteria for Snake River Sockeye Salmon populations. In addition, broad sense recovery goals identify a future species status beyond ESA delisting.

Biological Viability Criteria: The primary goal is for biological recovery to support removal of Snake River Sockeye Salmon from the threatened and endangered species list. The delisting decision must be based on the best available science. Biological recovery for a salmon species (the basis for delisting) means that it is naturally self-sustaining — enough fish spawn in the wild and return year after year so they are likely to persist in the long run, defined as the next 100 years. The species also has to be resilient enough to survive catastrophic changes in the environment, including natural events, such as floods and changes in ocean productivity.

The ICTRT proposed biological criteria for the ESU that define a viable salmonid population. A viable salmonid population (VSP) is defined in terms of four parameters: abundance, population productivity or growth rate, population spatial structure, and diversity. A viable ESU is naturally self-sustaining, with a high probability of persistence over a 100-year time period. Table ES-1 shows the ICTRT's proposed biological viability criteria for Snake River Sockeye Salmon. The ICTRT-recommended quantitative criteria (including minimum abundance thresholds) reflect the best information currently available. Information gained from ongoing studies of production potential and exchange rates among the lakes as natural reintroduction efforts progress will be periodically reviewed to determine if the basic assumptions behind the current quantitative criteria are valid, or if updates are warranted.

What is the goal of this recovery plan?

The primary recovery goal for Snake River Sockeye Salmon is to ensure that the species is self-sustaining and no longer needs the protection of the ESA. The ESU-level objectives are the following:

- Population-level persistence in the face of year-to-year variations in environmental influences.
- Resilience to the potential impact of catastrophic events.
- Maintaining long-term evolutionary potential.

Once the fish achieve recovery under the ESA, the recovery plan will help meet other "broad sense" goals that go beyond delisting and provide social, cultural or economic values.

What is delisting?
Who makes the decision?

Under the ESA, listing and delisting of marine species, including salmon, are the responsibility of NMFS. If a fish or other species is listed as threatened or endangered, legal requirements to protect it come into play. When NMFS decides through scientific review that the species is doing well enough to survive without ESA protection, NMFS will "delist" it. The decision must reflect the best available science concerning the current status of the species and its prospects for long-term survival.

Table ES-1. Viable salmonid population (VSP) parameters and proposed biological viability criteria for Snake River Sockeye Salmon.

VSP Parameter	Proposed Biological Viability Criteria
Abundance	• Minimum spawning abundance threshold measured as a ten-year geometric mean of estimated natural-origin spawners: 1,000 for Redfish Lake and Alturas Lake populations (intermediate size category); • Minimum spawning abundance threshold measured as a ten-year geometric mean of estimated natural-origin spawners: 500 for populations in the smaller historical size category (Pettit, Stanley, or Yellowbelly Lakes)
Productivity	• Population growth rate is stable or increasing
Spatial Structure and Diversity	• Very low to low risk rating for a highly viable population; and • Moderate risk rating for a viable population

Threats Criteria: At the time of a delisting decision for Snake River Sockeye Salmon, NMFS will examine whether five listing factors (or threats) detailed in section 4(a)(1) of the ESA have been addressed:

A. Present or threatened destruction, modification, or curtailment of [the species'] habitat or range;

B. Over-utilization for commercial, recreational, scientific, or educational purposes;

C. Disease or predation;

D. Inadequacy of existing regulatory mechanisms; or

E. Other natural or human-made factors affecting [the species'] continued existence.

The listing factors, or threats, need to have been addressed to the point that delisting is not likely to result in their re-emergence. NMFS also expects that the relative priority of threats will change over time and that new threats may emerge. NMFS will examine whether the listing factors have been addressed during its five-year reviews.

The Plan identifies threats criteria for each of the relevant listing/delisting factors. Addressing these criteria will help to ensure that underlying causes of decline have been addressed and mitigated before a species is considered for delisting. NMFS expects that if the proposed actions described in the Plan are implemented, they will make substantial progress toward meeting the threats criteria.

Broad Sense Recovery: The immediate goal of this Plan is ESA delisting. Once the fish achieve recovery under the ESA, the recovery plan will help meet broader goals. These "broad sense" goals may go beyond the requirements for delisting to acknowledge social, cultural or economic values regarding the listed species.

Current Status of the ESU

The endangered Snake River Sockeye Salmon ESU has a long way to go before it will meet the biological viability criteria that signal it is self-sustaining and naturally producing at targeted levels. Still, annual returns of Snake River Sockeye Salmon through 2013 show that more fish are returning than before initiation of the captive broodstock program (Table ES-2). Between 1999 and 2007, more than 355 adults returned from the ocean from captive brood releases — almost 20 times the number of wild fish that returned in the 1990s. However, this total is primarily due to large returns in the year 2000. Returns dropped from 2003 through 2007, but began building in 2008. Adult returns the last six years have ranged from a high of 1,355 fish in 2010 (including 179 natural-origin fish) to a low of 257 adults in 2012 (including 52 natural-origin fish). Two-thirds of the fish were captured at the Redfish Lake Creek weir and the remaining fish were captured at the Sawtooth Hatchery weir on the mainstem Salmon River upstream of the Redfish Lake Creek confluence. Sockeye Salmon returns to Alturas Lake ranged from one fish in 2002 to 14 fish in 2010. No fish returned to Alturas Lake in 2012 or 2013.

Table ES-2. Hatchery and natural-origin Sockeye Salmon returns to Sawtooth Valley, 1999 - 2013.

Return Year	Total Return	Natural Return	Hatchery Return	Alturas Returns*
1999	7	0	7	0
2000	257	10	233	0
2001	26	4	19	0
2002	22	6	9	1
2003	3	0	2	0
2004	27	4	20	0
2005	6	2	4	0
2006	3	1	2	0
2007	4	3	1	0
2008	650	142	457	1
2009	833	85	732	1
2010	1,355	179	1,143	14
2011	1,117	142	957	2
2012	257	52	190	0
2013	272	78	192	0

*These fish were assigned as sockeye salmon returns to Alturas Lake and are included in the natural return numbers.

Survival by life stage

Building to target levels of adult hatchery returns and gaining knowledge of key survival rates are important steps towards successfully reestablishing natural production in the Sawtooth Valley. Recent increased returns of anadromous Snake River Sockeye Salmon from captive brood releases have made it possible to compare survival/mortality during different life stages, and to determine key areas, concerns and strategies for recovery. Recent survival estimates during different life stages are summarized below.

- *Spawner to smolt survival:* Currently, the hatchery program controls productivity and survival for this life stage. An increase in parent spawning levels in the lakes will provide insights into juvenile production and survival levels in the lakes.
- *Juvenile migrant survival —Sawtooth Valley to Lower Granite Dam:* Juveniles migrate quickly through the Salmon River to Lower Granite Dam. Estimated survival of hatchery juveniles in the reach has been highly variable, ranging from 11.4% in 2000 to 77.6% in 2008.

- *Juvenile migrant survival — Lower Granite Dam to Bonneville Dam:* Juvenile survival from Lower Granite to Bonneville Dam since 2008 has ranged from 40% to 57%. Within this reach, mean survival is estimated at 60% from Lower Granite to McNary Dam (1996-2010) and at 54% from McNary to Bonneville Dam (1998-2003, 2006-2010).
- *Juvenile and adult migrant survival — Estuary, Plume and Ocean:* Survival rates for Snake River Sockeye Salmon during this life stage remain unknown due to small numbers of migrants.
- *Adult migrant survival — Bonneville Dam to Lower Granite Dam:* Estimated survival rates for 2010-2013 show that survival averaged 56% to 83% from Bonneville to McNary, 92% to 99% from McNary to Ice Harbor, and 71% to 97% from Ice Harbor to Lower Granite.
- *Adult migrant survival — Lower Granite Dam to Sawtooth Valley:* Estimated survival rates for PIT-tagged Sockeye Salmon show that 73% of the adults that passed Lower Granite Dam (2008-2012) were recovered at Redfish Lake, the Sawtooth Hatchery weir or other locations.

Historical Snake River Sockeye Salmon Life Cycle

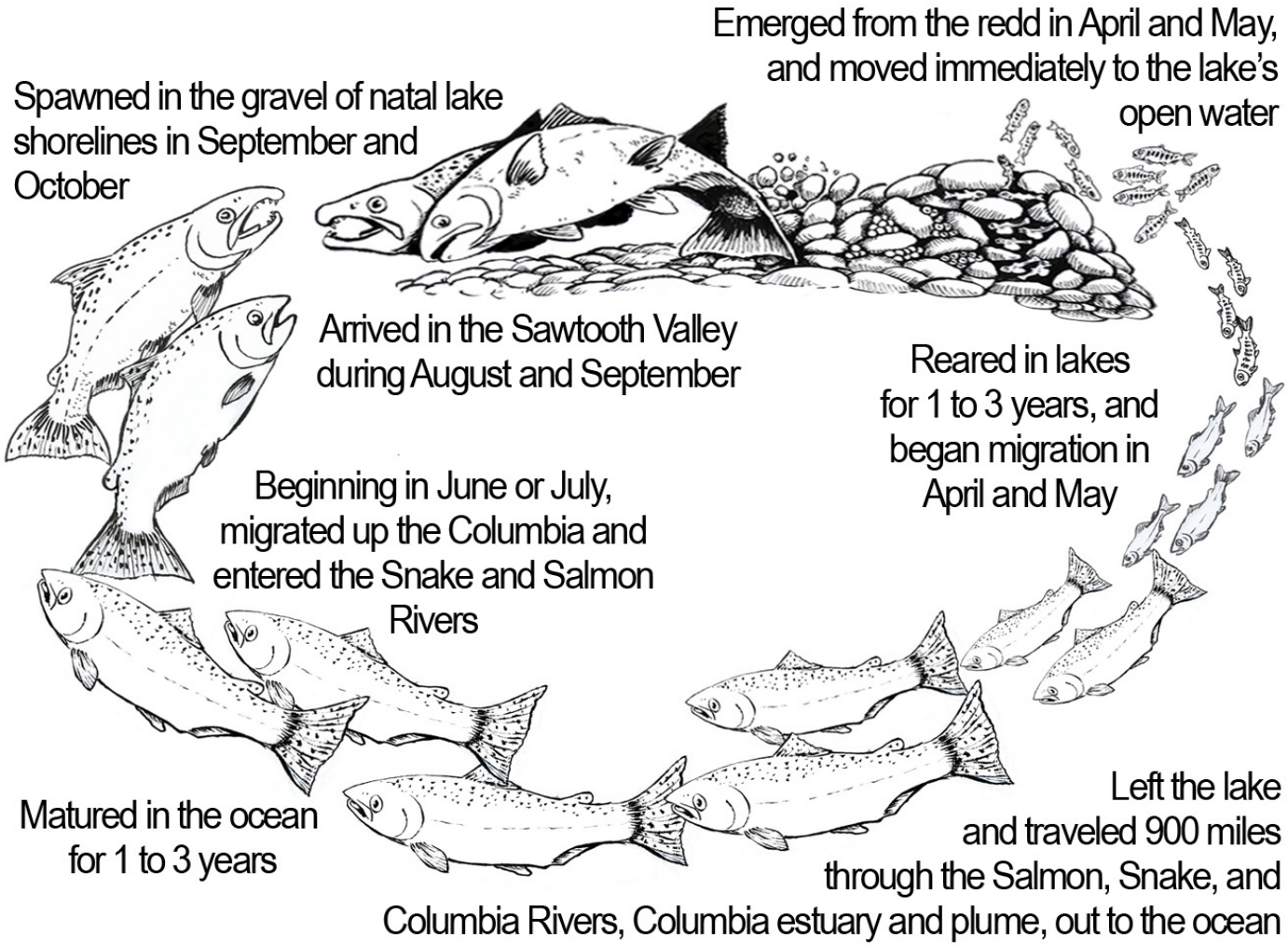

Figure ES-3. Historical Snake River Sockeye Salmon Life Cycle.

Limiting Factors and Threats Analysis

NMFS biological review teams have concluded that the decline of the Snake River Sockeye Salmon ESU is the result of widespread habitat degradation, impaired mainstem and tributary passage, historical commercial fisheries, chemical treatment of Sawtooth Valley lakes in the 1950s and 1960s, and poor ocean conditions. These combined factors reduced the number of Sockeye Salmon to the single digits. The decline in abundance itself has become a major limiting factor, making the remaining population vulnerable to catastrophic loss and posing significant risks to genetic diversity.

The Idaho Department of Fish and Game, Shoshone-Bannock Tribes, NMFS, and many independent researchers have conducted decades of scientific research and analysis concerning Snake River Sockeye Salmon. Key findings are summarized below. Section 5 of the Plan provides a detailed discussion of these limiting factors and threats.

What are limiting factors and threats?

Limiting factors are the biological and physical conditions that limit a species' viability (e.g. high water temperature).

Threats are the human activities or natural processes that cause the limiting factors.

The term "threats" carries a negative connotation; however, they are often legitimate and necessary activities that at times may have unintended negative consequences on fish populations. These activities can be managed to minimize or eliminate the negative impacts.

Sawtooth Valley Lakes

Sockeye Salmon historically spawned and reared in five nursery lakes in the Sawtooth Valley: Redfish, Pettit, Alturas, Yellowbelly and Stanley Lakes. They usually spent one to three years in the nursery lakes before migrating to sea as smolts. Because of the captive broodstock program and reintroduction work, Sockeye Salmon currently spawn in Redfish, Alturas, and Pettit Lakes. The lakes lie within the Sawtooth National Recreation Area, managed by the U.S. Forest Service. The headwaters of each lake drain lands in the Sawtooth Wilderness Area. Overall, habitat conditions for Snake River Sockeye Salmon in these high mountain lakes remain in relatively pristine condition. The lakes are, and were historically, oligotrophic—lacking in nutrients and with relatively low natural aquatic productivity compared to lower elevation lakes in other areas. In addition, zooplankton abundance and composition vary across the lakes, which may be an important factor in successfully reintroducing anadromous Sockeye Salmon production. Lake nutrient supplementation has been implemented in Redfish, Pettit and Alturas Lakes to increase Sockeye Salmon carrying capacity. Summer water temperatures in the lakes also temporarily spike to levels that make Sockeye Salmon more susceptible to disease and infection. Introduction and continued stocking of non-native fish species such as brook trout, lake trout and kokanee creates competition and predation risks. Potential interbreeding between hatchery-origin fish and natural-origin spawners could further reduce genetic diversity. Providing connectivity of migratory corridors and increasing spatial distribution is critical to successful Sockeye Salmon recovery. Passage is now available to Redfish Lake, but a weir at Sawtooth Hatchery blocks passage in the Salmon River to upstream lakes. Providing passage at the weir is critical to reestablishing production in Alturas and Pettit Lakes —important early steps in the recovery strategy. A weir on Stanley Lake Creek also prevents access to Stanley Lake. Potential removal of this weir will receive further consideration.

Salmon River Mainstem

The Salmon River flows 410 miles through central Idaho to join the Snake River in lower Hells Canyon and represents almost half the length of the Sockeye Salmon migration route. Juvenile Sockeye Salmon leave the natal lakes in late spring and early summer, often arriving at Lower Granite Dam about seven

days later. Juvenile Sockeye Salmon survival varies between years and reaches. Tracking studies indicate that a large portion of the loss of outmigrating juvenile hatchery Sockeye Salmon in the Salmon River occurs between release sites and the North Fork Salmon confluence, with higher losses occurring within Little Redfish Lake, in the reach just above Valley Creek near Stanley, between the Pahsimeroi and Lemhi Rivers, and in the slow-river reach at Deadwater Slough. Predation appears to cause much of the juvenile mortality in the upper Salmon River; however, loss of juvenile migrants may also reflect competition with non-native species, environmental conditions, or rearing and release strategies.

Adult Sockeye Salmon return to the Salmon River in late summer and travel approximately 30 days to reach the Sawtooth Valley. A number of adult migrants are lost in the Salmon River corridor. The factors responsible for the losses of adult Sockeye Salmon migrants are not fully established, but are believed to be strongly related to stream flow and temperature. Adult Sockeye Salmon return to the Salmon River in late summer, when flows often reach low levels and water temperatures peak. Research continues to identify how and where these conditions in the Snake and Salmon Rivers affect Sockeye Salmon migrants. A weir at Sawtooth Hatchery on the Salmon River restricts Sockeye Salmon passage to natal lakes.

Columbia and Snake River Mainstem

The Columbia and Snake River hydrosystem remains a threat to the viability of Snake River Sockeye Salmon. Four federal dams on the lower Snake River mainstem (Lower Granite, Little Goose, Lower Monumental and Ice Harbor) and four federal dams on the lower Columbia River mainstem (McNary, John Day, The Dalles and Bonneville) limit passage for juvenile Sockeye Salmon migrating to the ocean, and adult Sockeye Salmon returning to their natal lakes. All eight dams are part of the Federal Columbia River Power System (FCRPS). Specific limiting factors that impact viability include mortality and delayed upstream passage (adults), direct and indirect mortality on downstream migrants (juveniles), alteration of the hydrograph and riverine habitat, delayed migration and reduced survival due to high water temperatures, and predation by birds, pinnipeds, and non-native fish species. Some incidental take of Snake River Sockeye Salmon occurs in mainstem fisheries. The length and duration of the Snake River Sockeye Salmon migration (approximately 900 miles) also increases their risk of exposure to agricultural and industrial chemicals.

Columbia River Estuary, Plume and Ocean

The cumulative impacts of past and current land use (including dredging, filling, diking, and channelization) and alterations to the Columbia River flow regimes have reduced the quality and quantity of estuarine and plume habitat. Snake River Sockeye Salmon, like other stream-type salmonids, move relatively quickly through the estuary, probably passing through the area within two to three days. Juveniles Sockeye Salmon may use the low-salinity gradients of the plume to achieve growth and gradually acclimate to saltwater. They would be affected by changes in flow and sediment in these areas. They are also vulnerable to bird predation in the estuary, as well as to pinniped predation when they return to the estuary as adults. High concentrations of urban and industrial contaminants in some areas of the lower Columbia River and estuary may affect fish health and behavior.

Ocean conditions and food availability contribute to the health and survival of Sockeye Salmon returning to the Columbia Basin, and eventually the Sawtooth Valley. Early ocean life is a critical period for the fish. Most early marine mortality likely occurs during two critical periods: The first period is believed to be predation-based mortality that occurs during the first few weeks to months. The second period occurs during and following the first winter at sea and is believed to be driven by food availability/starvation. Poor ocean conditions in 1977 through the late 1990s contributed, together with other factors, to drive the stock to a very small remnant population.

Future Implications from Climate Change

Likely changes in temperature, precipitation, wind patterns, and sea-level height due to climate change have profound implications for survival of Snake River Sockeye Salmon populations in both freshwater and marine habitats. Stream flows and temperatures—the environmental attributes that climate change will affect—already limit Sockeye Salmon productivity in areas of the Sawtooth Valley lakes, Salmon River, and mainstem Columbia and Snake Rivers. In the ocean, climate-related changes are expected to alter primary and secondary productivity, the structure of marine communities, and in turn, the growth, productivity, survival, and migrations of salmonids, although the degree of impact on listed salmonids is currently poorly understood. All other threats and conditions remaining equal, future deterioration of water quality, water quantity, and/or physical habitat due to climate change can be expected to reduce viability or survival of naturally produced adult Sockeye Salmon returning to the Sawtooth Valley lakes.

Recovery Strategies and Actions

Strategies and actions for the Snake River Sockeye Salmon ESU aim to recover self-sustaining, naturally spawning populations that are likely to persist for at least 100 years. Consistent with the long-term recovery scenario for Snake River Sockeye Salmon (discussed in Section 3), the strategies (Section 6) and actions (Section 7) intend to restore at least two of the three historical lake populations in the ESU to highly viable status, and one to viable status. The recovery strategies focus on Redfish, Alturas, and Pettit Lakes. As recovery efforts progress over time, expansion of reintroductions into Stanley Lake and Yellowbelly Lake will be considered.

Principles for sound salmon recovery

- Assess, protect and maintain biological and habitat processes.
- Reconnect isolated habitat to increase spatial structure.
- Restore ecological processes.
- Restore degraded habitat.
- Conserve or restore evolutionary processes.
- Develop goals and objectives based on a deep understanding of ecological properties of the system.
- Manage actions to be adaptive and minimally intrusive.

Overall Recovery Strategy

Overall, the strategy aims to reintroduce and support adaptation of naturally self-sustaining Sockeye Salmon populations in the Sawtooth Valley lakes. An important first step toward that objective has been the successful establishment of anadromous returns from natural-origin Redfish Lake resident stock gained through a captive broodstock program. That program is transitioning as higher levels of anadromous Sockeye Salmon return to spawn in Redfish Lake. The long-term strategy is for the naturally produced population to achieve escapement goals in a manner that is self-sustaining and without the reproductive contribution of hatchery spawners.

Our recovery strategy recognizes that efforts to address habitat, fisheries, hatchery and hydrosystem issues affecting Snake River Sockeye Salmon need to be planned and implemented with a clear understanding of ecological processes — both biological and habitat processes — and how past and current activities affect these processes. Since the ESU is at risk for extinction, the first phase in recovery, the captive broodstock program, helped maintain the population and prevent species extinction. The second phase, recolonization, which we are now entering, will incorporate more natural-origin Sockeye Salmon returns in the hatchery-spawning program to maintain the genetic fitness of the natural population and to provide anadromous adults to recolonize available habitat in Redfish, Pettit and Alturas Lakes. Ultimately, the program will move to a third phase emphasizing natural adaptation

and viability. At the same time, recovery efforts will address habitat, fisheries, and hydro-related issues affecting Snake River Sockeye Salmon. Together, these efforts aim to provide sufficient fish to restore populations adapted to the specific conditions of lakes in the Sawtooth Valley, while also protecting and improving habitat conditions, and addressing passage, competition and predation concerns, to support a self-sustaining population.

The approach is adaptive in nature. The strategy for Redfish Lake is based on the working assumption that fostering relatively high numbers of returns from hatchery releases will lead to increasing numbers of naturally produced adult returns in the future, ultimately leading to natural production at self-sustaining levels. This strategy is based on a careful assessment of the best available scientific information and has associated monitoring and evaluation studies targeting key assumptions and uncertainties to support future adaptations to achieve the recovery objectives. In addition, the strategies for Pettit and Alturas Lakes are tailored to specific circumstances associated with each lake and are designed to evaluate variations on the basic restoration strategy. Taken as a whole, the information from each of the approaches in combination will guide future adaptation of the overall program to meet natural production recovery objectives.

The proposed recovery strategy contains elements to address limiting factors and threats at the local level (Sawtooth Valley and upper Salmon River) and regional level (Salmon, Snake and Columbia Rivers, Columbia River estuary and plume, and ocean). The recovery strategy for Snake River Sockeye Salmon is summarized in the box: Recovery Strategy for Snake River Sockeye Salmon ESU.

Site-Specific Actions

Section 7 of the Plan describes specific actions proposed under each of the local and regional recovery strategies discussed in Section 6 to address problems for Sockeye Salmon. The actions build on recovery actions that have been implemented over the last 20 years. Table 7-1 defines over 90 specific actions that correspond to the different local-level recovery strategies and address problems for Sockeye Salmon in the natal lakes and upper Salmon River. The table identifies the actions as well as the sites, VSP parameters, limiting factors, and threats that each action targets. The table also provide estimated costs and potential implementing entities for each action, and priority for implementation. The Plan also identifies actions needed at the regional level (mainstem Salmon, Snake and Columbia Rivers and the estuary, plume and ocean) to support recovery of Snake River Sockeye Salmon. Many of these proposed actions are designed to be integrated with current, ongoing programs and regulations.

RECOVERY STRATEGY FOR SNAKE RIVER SOCKEYE SALMON ESU

At the local level (Sawtooth Valley and upper Salmon River):

- Conserve population genetic and life history diversity, and spatial structure.
- Increase naturally spawning Snake River Sockeye Salmon abundance.
- Improve Sockeye Salmon passage to natal lakes.
- Reestablish a self-sustaining anadromous Sockeye Salmon population in Redfish Lake.
- Investigate/develop strategies for future actions to support Sawtooth Valley Sockeye Salmon reintroduction and adaptation phases for Pettit Lake.
- Investigate and evaluate the potential for restoring natural production of anadromous Sockeye Salmon from returning residual outmigrants from Alturas Lake.
- As sufficient numbers of natural-origin adults return, develop an integrated approach to manage natural- and hatchery-origin adults in the hatchery program and in the wild.
- As sufficient numbers of hatchery-origin anadromous adults return to the basin, identify options for future harvest.
- Continue research and actions to reestablish natural populations in other natal lakes.
- Continue research on natal lakes' carrying capacity, nutrients, and ecology.
- Protect and conserve natural ecological processes at the watershed scale that support population viability.
- Protect, restore and manage spawning and rearing habitat.
- Maintain unimpaired water quality and improve water quality as needed.
- Investigate and improve conditions in Salmon River and tributaries to support increased survival of migrating Snake River Sockeye Salmon.
- Monitor for predation, disease, aquatic invasive species, and competition and develop actions as needed.
- Create an adaptive management feedback loop to track progress toward recovery, monitor and evaluate key information needs, assess results, and refine strategies and actions accordingly.

At the regional level (mainstem Salmon, Snake and Columbia Rivers; estuary; plume; and ocean):

- Implement 2008/2010 FCRPS BiOp's reasonable and prudent alternative to reduce mortalities associated with migration through the mainstem Salmon, Snake and Columbia Rivers, estuary and plume.
- Continue research and monitoring on Snake River Sockeye Salmon survival/mortality in mainstem Salmon, Snake and Columbia River migration corridor; estuary; plume; and ocean.
- Update Snake River Sockeye Salmon life cycle models using latest information on survival through mainstem Salmon, Snake, and lower Columbia River migration corridor; estuary; and plume.
- Manage to maintain current low impact fisheries and reduce fishery impacts in those fisheries that affect Snake River Sockeye Salmon.
- Protect and conserve natural ecological processes that support population viability.
- Improve degraded water quality and maintain unimpaired water quality.
- Address ecosystem imbalances in predation, competition, and disease through the strategies and actions in this Plan, the Estuary Module and FCRPS BiOp.
- Respond to climate change threats by implementing research, monitoring and evaluation to track indicators related to climate change and by preserving biodiversity.
- Implement this recovery plan through effective communication, coordination and governance.
- Continue research, monitoring and evaluation for adaptive management.
- Prioritize and address key information needs and create an adaptive management feedback loop to revise recovery actions as needed.

Considerations for Setting Priorities

Based on the current endangered status of the Snake River Sockeye Salmon ESU, our goal is to have viable independent populations in at least three or more natal lakes to expand spatial distribution and diversity, and protect the relatively healthy habitat conditions in the Sawtooth Valley. The following are recommendations for prioritizing the sequence of implementing recovery actions. These recommendations reflect the principles for sound salmon recovery:

- *Implement the current captive broodstock program.* Actions support conservation of life histories and genetic attributes.
- *Reestablish self-sustaining anadromous Sockeye Salmon populations in Redfish, Pettit and Alturas Lakes***.** Actions enhance viability and protection of multiple Sockeye Salmon populations through continued implementation of the Redfish Lake program, implementation of introduction strategies for Pettit and Alturas Lakes, and reconnection of isolated habitat to improve spatial structure and diversity.
- *Protect and enhance existing habitat conditions and conserve natural ecological processes.* Actions support the viability of the populations and their primary life history strategies throughout their entire life cycle. Continued implementation of the Management Plan for the Sawtooth National Recreation Area, together with continued wilderness protections in the Sawtooth Valley will protect habitat processes for the natal lakes watersheds. Additional habitat protection and restoration actions for the migration corridor are identified in Sections 6 and 7.
- *Improve survival for all life stages in the migration corridor.* Strategies and actions to improve survival in the migration corridor are described in Section 6.3.2.
- *Carry out research, monitoring and evaluation actions.* Actions provide critical information needed to assess fish viability responses and making adaptive management decisions as needed based on this information. Section 11 identifies the adaptive management approach, together with research, monitoring and evaluation actions to continually adapt recovery actions over time.

We believe the recovery strategies and management actions identified in the Plan will be effective in improving survival of Snake River Sockeye Salmon; however, we have uncertainties about whether they will be sufficient to achieve viability. Thus, the Plan depends on an adaptive management framework that implements the actions based on best available science, monitors to improve the science, and updates actions based on new knowledge.

Summaries describing strategies and actions for Sockeye Salmon recovery in Redfish Lake, Pettit Lake and Alturas Lake, and potentially in Stanley and Yellowbelly Lakes, follow.

Redfish Lake Sockeye Salmon Population

Redfish Lake. *Photo courtesy the Shoshone-Bannock Tribes.*

Redfish Lake Sockeye Salmon Population

Current Status

- Extant population; at high risk of extinction in its current state.

Proposed Recovery Scenario

- Achieve highly viable (<1% extinction risk) or viable (<5% extinction risk) status for population.
- Achieve a minimum spawning abundance threshold measured as a ten-year geometric mean of 1,000 natural-origin spawners, with a stable or increasing population growth rate.
- Achieve a spatial structure/diversity rating of low risk for highly viable status or maintained for viable status.

Recovery Strategy

As the only extant population of Snake River Sockeye Salmon, the Redfish Lake population plays a key role in ESU recovery. A captive broodstock program has successfully prevented the population's extinction in the near term and preserved its genetic lineage. That program will now transition to increase hatchery releases to support sufficient natural-origin anadromous Sockeye Salmon returns. Next, it will shore up adaptation to reestablish a natural self-sustaining anadromous Sockeye Salmon population.

Key Strategies and Actions

- Conserve population genetics and life history diversity by establishing a composite hatchery and natural Sockeye Salmon population in Redfish Lake.
- As natural-origin adult returns increase, reestablish a self-sustaining anadromous Sockeye Salmon population in the lake.

- Maintain current wilderness protection and protect pristine habitat and natural ecological processes.
- Continue research on lake carrying capacity, nutrients and ecology.
- Investigate whether water quality, including temperatures, affects Sockeye Salmon carrying capacity in the lake and improve water quality as needed.
- Protect and enhance spawning and rearing habitat in Redfish Lake and Fishhook Creek.
- Investigate and improve conditions in Salmon River and tributaries to support increased survival of migrating juvenile and adult Sockeye Salmon.
- Implement FCRPS BiOp actions to reduce mortalities associated with passage through the mainstem Columbia and Snake River hydroelectric projects.
- Continue research on Sockeye Salmon survival/mortality in Snake and Columbia Rivers, estuary, plume and ocean.
- Manage risks from mainstem Columbia River and lower Snake River fisheries through *U.S. v. Oregon*.
- Identify options for future fisheries as sufficient numbers of hatchery-origin Sockeye Salmon adults return to basin.
- Monitor and control predation, disease, aquatic invasive species and competition.
- Respond to climate change threats by implementing research, monitoring and evaluation (RM&E) to track indicators and by preserving biodiversity.

Pettit Lake. *Photo courtesy the Shoshone-Bannock Tribes.*

Pettit Lake Sockeye Salmon Population

Current Status

- Potential historical population; now functionally extirpated.

Proposed Recovery Scenario

- Achieve highly viable (<1% extinction risk) or viable (<5% extinction risk) status for population.
- Achieve a minimum spawning abundance threshold measured as a ten-year geometric mean of 500 natural-origin spawners, with a stable or increasing population growth rate.
- Achieve a spatial structure/diversity rating of low risk for highly viable status or maintained for viable status.

Recovery Strategies

Reintroduction strategies for the extirpated Pettit Lake Sockeye Salmon population will be further developed and refined during implementation of the Redfish Lake strategy. An interim strategy may include initial reintroductions to Pettit Lake from volitional spawning of Pettit Lake-origin anadromous adults and release of captive broodstock. The reintroduction plan will be refined over time through an adaptive management process to achieve a naturally adapted anadromous population.

Key Strategies and Actions

- Improve Sockeye Salmon passage at the Sawtooth Hatchery weir on the Salmon River.
- Improve/replace juvenile trapping structure on Pettit Lake Creek.
- Allow anadromous adult Sockeye Salmon to return to Pettit Lake for volitional spawning.

- Release captive broodstock (or, if available, hatchery anadromous) adults into Pettit Lake representing the entire genetic diversity of the broodstock for several years.
- After several years of direct outplanting of adults sourced from the Redfish Lake population, stop stocking and evaluate the natural production response; continue to allow anadromous Pettit Lake-origin adults to return for volitional spawning.
- Evaluate and refine the reintroduction program as needed to reestablish a locally adapted population in Pettit Lake.
- Maintain current wilderness protection and protect pristine habitat and natural ecological processes.
- Continue research on lake carrying capacity, nutrients and ecology.
- Investigate whether water quality affects Sockeye Salmon carrying capacity in the lake and improve water quality as needed.
- Protect and enhance spawning and rearing habitat in Pettit Lake.
- Investigate and improve conditions in Salmon River and tributaries to support increased survival of migrating Sockeye Salmon.
- Implement FCRPS BiOp actions to reduce mortalities associated with passage through the mainstem Columbia and Snake River hydroelectric projects.
- Continue research on Sockeye Salmon survival/mortality in Snake and Columbia Rivers, estuary, plume and ocean.
- Manage risks from mainstem Columbia River and lower Snake River fisheries through *U.S. v. Oregon*.
- Identify options for future fisheries as sufficient numbers of hatchery-origin Sockeye Salmon adults return to basin.
- Monitor and control predation, disease, aquatic invasive species and competition.
- Respond to climate change threats by implementing RM&E to track indicators and by preserving biodiversity.

Alturas Lake. *Photo courtesy the Shoshone-Bannock Tribes.*

Alturas Lake Sockeye Salmon Population

Current Status

- Historical population; now functionally extirpated.

Proposed Recovery Scenario

- Achieve highly viable (<1% extinction risk) or viable (<5% extinction risk) status for population.
- Achieve a minimum spawning abundance threshold measured as a ten-year geometric mean of 1,000 natural-origin spawners, with a stable or increasing population growth rate.
- Achieve a spatial structure/diversity rating of low risk for highly viable status or maintained for viable status.

Recovery Strategies

The Alturas Lake population exhibits an earlier return time than the Redfish Lake population and maintaining this diversity is important. Reintroduction strategies for Alturas Lake will be developed based on investigations and evaluations regarding the potential to restore natural production of anadromous Sockeye Salmon from returning early-spawning residual outmigrants from the lake. Careful steps will be taken to maintain the population's unique genetic diversity and spatial structure, and capture the benefits of local adaptation. Reintroduction options will be refined over time through adaptive management.

Key Strategies and Actions

- Improve Sockeye Salmon passage at the Sawtooth Hatchery weir on the Salmon River.
- Trap and transport anadromous adults identified as Alturas Lake origin to Alturas Lake for volitional spawning.
- Investigate spawning locations, spawn timing and other differences that may exist between remnant residual Sockeye Salmon and resident kokanee. Document spawning interactions.
- Establish a new hatchery program for Alturas Lake anadromous Sockeye Salmon using returning anadromous Alturas Lake-origin adults.
- Identify appropriate donor stocks and investigate strategies to establish a new hatchery captive broodstock program for anadromous Alturas Lake Sockeye Salmon. Investigate alternative strategies for residual Alturas Lake population that will support and enhance anadromy.
- Construct and operate trapping structure in Alturas Lake Creek.

- Maintain current wilderness protection and protect pristine habitat and natural ecological processes.
- Continue research on lake carrying capacity, nutrients and ecology.
- Investigate whether water quality affects Sockeye Salmon carrying capacity in the lake and improve quality as needed.
- Protect and enhance spawning and rearing habitat in Alturas Lake.
- Investigate and improve conditions in Salmon River and tributaries to increase survival of migrating Sockeye Salmon.
- Implement FCRPS BiOp actions to reduce mortalities associated with passage through the mainstem Columbia and Snake River hydroelectric projects.
- Continue research on Sockeye Salmon survival/mortality in Snake and Columbia Rivers, estuary, plume and ocean.
- Manage risks from mainstem Columbia River and lower Snake River fisheries through *U.S. v. Oregon*.
- Identify options for future fisheries as sufficient numbers of hatchery-origin Sockeye Salmon adults return to basin.
- Monitor and control predation, disease, aquatic invasive species and competition.
- Respond to climate change threats by implementing RM&E to track indicators and by preserving biodiversity.

Stanley Lake and Yellowbelly Lake Sockeye Salmon Populations

Current Status

- Historical populations; now functionally extirpated.

Proposed Recovery Scenario

- As recovery efforts progress over time, expansion of Snake River Sockeye Salmon reintroductions into Stanley Lake and Yellowbelly Lake will be considered.

Recovery Strategies

The long-term recovery scenario for the Snake River Sockeye Salmon ESU focuses initial efforts on restoring self-sustaining, naturally producing populations in Redfish, Pettit and Alturas Lakes. Currently, stocking Sockeye Salmon in Stanley and Yellowbelly Lakes is not a priority. This may change as adult returns increase and passage to the upper basin is restored. It is likely that Sockeye Salmon may return to Yellowbelly Lake through straying and natural recolonization. Reintroduction efforts for Stanley Lake would include developing a lake trout management strategy and re-establishing adult passage at the outlet of Stanley Lake that currently prevents adult Sockeye Salmon immigration.

Key Potential Strategies and Actions

- Continue research on lake carrying capacity, nutrients and ecology.
- Investigate whether water quality affects Sockeye Salmon carrying capacity in the lakes and improve water quality as needed.
- Reconcile lake trout management in Stanley Lake vs. removing the barrier to volitional adult Sockeye Salmon passage into the lake. Based on resolution of lake trout management, develop a program to support Sockeye Salmon recovery.
- Investigate and manage risks to native kokanee in Stanley Lake.
- Develop and implement a study in Yellowbelly Lake to evaluate lake-carrying capacity of Sockeye Salmon in the absence of resident kokanee.
- Determine whether a rockfall at the outlet of Yellowbelly Lake is a passage barrier to returning adult Sockeye Salmon.
- Investigate how varying flow regimes might affect Sockeye Salmon migration and passage below and above Yellowbelly Lake.
- Evaluate potential predation and competition issues with non-native trout and kokanee in Yellowbelly Lake.
- Evaluate the potential effects of cutthroat trout on Sockeye Salmon in Yellowbelly Lake.
- Maintain current wilderness protection and protect pristine habitat and natural ecological processes.
- Protect and enhance spawning and rearing habitat in Stanley and Yellowbelly Lakes.
- Investigate and improve conditions in Salmon River and tributaries to support increased survival of migrating Sockeye Salmon.
- Implement FCRPS BiOp actions to reduce mortalities associated with passage through the mainstem Columbia and Snake River hydroelectric projects.
- Continue research on Sockeye Salmon survival/mortality in Snake and Columbia Rivers, estuary, plume and ocean.
- Manage risks from mainstem Columbia River and lower Snake River fisheries through *U.S. v. Oregon*.
- Identify options for future fisheries as sufficient numbers of hatchery-origin Sockeye Salmon adults return to basin.
- Monitor and control predation, disease, aquatic invasive species and competition.
- Respond to climate change threats by implementing RM&E to track indicators and by preserving biodiversity.

Adaptive Management, Research, Monitoring and Evaluation

Adaptive management plays a critical role in recovery planning. The long-term success of recovery efforts will depend on the effectiveness of incremental steps taken to move the one remaining extant Snake River Sockeye Salmon population from its current status to a viable level, and to restore naturally self-sustaining Sockeye Salmon populations in other Sawtooth Valley lakes. Adjustments will be needed if actions do not achieve desired goals, and to take advantage of new information and changing opportunities. Adaptive management provides the mechanism to facilitate these adjustments.

Adaptive management works by binding decision making with data collection and evaluation. Most importantly, it offers an explicit process through which alternative approaches and actions can be proposed, prioritized, implemented, and evaluated. Successful adaptive management requires that monitoring and evaluation plans be incorporated into overall implementation plans for recovery actions. These plans should link monitoring and evaluation results explicitly to feedback on the design and implementation of actions.

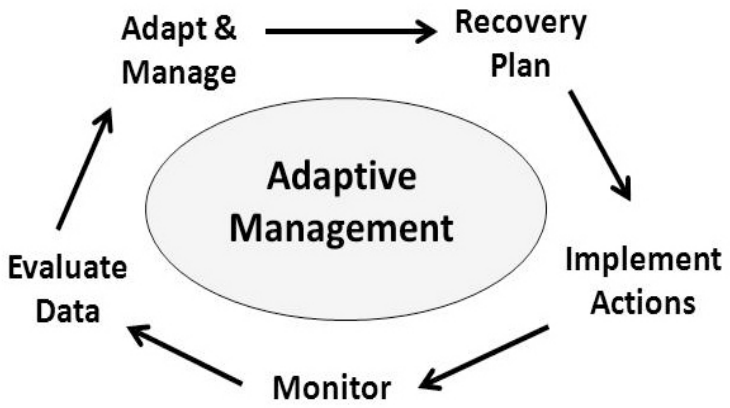

Figure ES-4. The adaptive management process.

The research, monitoring, and evaluation plan described in Section 11 identifies the level of monitoring and evaluation needed to determine the effectiveness of recommended actions, and whether they are leading to improvements in population viability. The RM&E plan also identifies critical data gaps in species and habitat knowledge. The data obtained through RM&E plan implementation will be used to assess and, if necessary, correct current restoration strategies. The Snake River Recovery Implementation and Science Team will oversee implementation of the adaptive management process in coordination with participating agencies, tribes, and entities (Section 10).

A major challenge facing the development and implementation of an effective adaptive management strategy for Snake River Sockeye Salmon is the large number of organizations that implement management actions, as well as the complexity in jurisdictional and management decision authority. These organizations include, but are not limited to: Idaho Department of Fish and Game, Idaho Governor's Office of Species Conservation, Shoshone-Bannock Tribes, state agencies, counties, irrigation districts, agriculture and private forest land managers, NMFS, U.S. Forest Service, BLM, other federal agencies, utilities, citizen groups, and others. The intent of the adaptive management plan is to develop a collaboration and coordination process that uses the current implementation structures and allows for sharing of information and decisions that influence recovery of Snake River Sockeye Salmon.

Implementation

Implementation of recovery actions has been occurring for all threats since ESA listing in 1991. Successful implementation of recovery actions, research and monitoring projects will build upon the over 20 years of leadership and Sockeye Salmon recovery work carried out by the Stanley Basin Sockeye Salmon Technical Oversight Committee, with the Idaho Department of Fish and Game, Shoshone-Bannock Tribes, U.S. Forest Service, NMFS and other partners to prevent ESU extinction. Plan implementation will also involve counties, other state and federal agencies, private landowners and individuals.

Section 10 proposes an overall framework for coordinated implementation of this Plan. The proposed implementation framework includes several integrated components with different responsibilities, including the Snake River Sockeye Salmon Implementation and Science Team, Stanley Basin Sockeye Salmon Technical Oversight Committee, and the NMFS' Snake River Coordination Group. The figure below illustrates how these different groups will work together. The proposed framework will be revised based on input and review during the public comment period. The different groups will work closely with existing groups and seek collaborative initiatives to recover Snake River Sockeye Salmon populations.

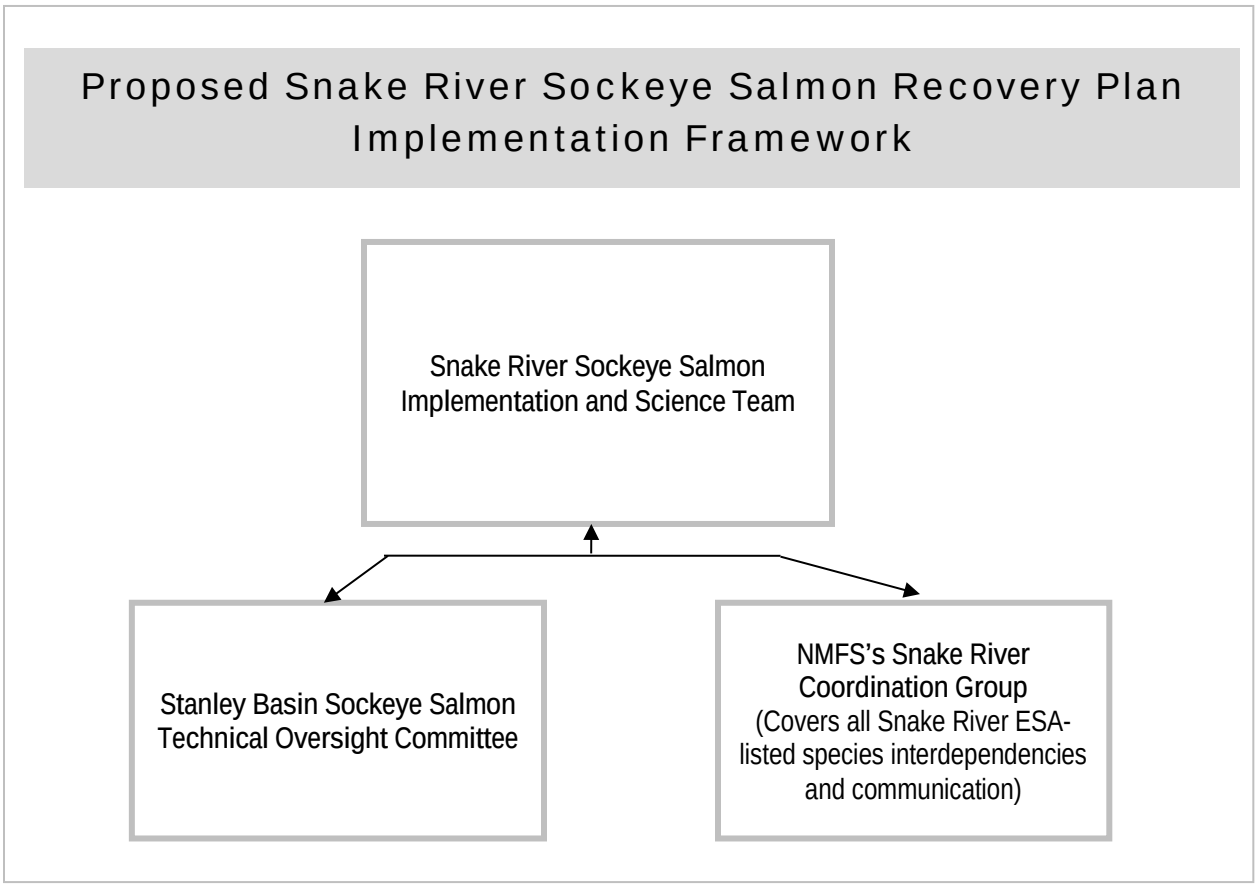

Figure ES-5. Proposed Snake River Sockeye Salmon Recovery Plan implementation framework.

Time and Cost Estimates

It is important to consider the unique challenges of estimating time and cost for salmon and steelhead recovery, given the complex relationship of these fish to the environment and to human activities on land and water. NMFS estimates that recovery of Snake River Sockeye Salmon could take 50 to 100 years. The recovery plan (Section 7) contains an extensive list of actions to recover the populations; however, it recognizes that there are many uncertainties involved in predicting the course of recovery and in estimating total costs over such a long recovery period. Such uncertainties include biological and ecosystem responses to recovery actions, as well as long-term and future funding.

NMFS believes it is most appropriate to focus on the first five years of implementation and in five-year intervals thereafter, with the understanding that before the end of each five-year implementation period, specific actions and costs will be estimated for subsequent years. The Plan (Section 9) discusses cost estimates for all projects judged to be feasible and projected to occur over the initial five-year period of Plan implementation, fiscal years (FY) 2014 through 2018. It also estimates the total cost of recovery over the next 25 years. The estimated total cost for implementation of all actions during the initial five-year period, FY 2014 to FY 2018, where costs are available, is approximately $20,293,955. The total estimated cost of recovery actions for the ESA-listed Snake River Sockeye Salmon ESU over the next 25 years is projected to be about $101,469,775. The Recovery Cost Summary Table in Appendix A provides the estimated costs for specific recovery actions identified in the Plan for the first five-year period.

There are several cautions that must be highlighted regarding these costs. Many of these costs may be incomplete in scope, scale or magnitude until actions are better defined. Specifically, costs for potentially expensive projects such as land and water acquisition, water leasing, and research, monitoring and evaluation have not yet been estimated for this ESU. Costs estimates may be adjusted up or down, as unit cost estimates, scale of projects, total number of actions, and currently unforeseen costs for actions are determined.