Klamath River Basin

NOAA

2009 Report to Congress

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Executive Summary

The Magnuson-Stevens Reauthorization Act of 2006 (MSRA) established two requirements for National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) for Klamath River Basin salmonids: develop a recovery plan for Klamath River coho (completed in 2007) and submit an annual report to Congress beginning in 2009 addressing recovery actions, progress in restoration, status of anadromous fish populations, and status of actions in response to National Research Council recommendations on Klamath Basin salmon stocks. This document is the first annual Klamath River Basin Report to Congress.

The Klamath River Basin historically was home to robust and resilient populations of salmon and steelhead populations. Today, sustaining and rebuilding these populations is often in conflict with communities competing for limited supplies of water and other factors impacting the species. Salmon and steelhead populations have declined significantly in abundance and viability over the past century. The State of California and NMFS listed coho salmon as a threatened species under state and federal Endangered Species Acts, including populations in the Klamath River Basin. Recently, NMFS severely restricted West Coast salmon fisheries in part due to low returns of fall run Chinook salmon to the Klamath. While once the most abundant salmon run returning to the distant spawning areas in the upper Klamath River Basin Sprague and Williamson Rivers, only remnant populations of wild spring run Chinook salmon return to the Klamath River Basin today due to the presence of dams without fish passage. Hatchery programs intended to mitigate the effects of the dams and loss of hundreds of miles of historic salmon habitat have augmented commercial, recreational, and tribal fisheries for decades. However, current hatchery programs on the Klamath and Trinity Rivers also reduce potential conservation benefits gained from investments in habitat restoration projects and continue to limit full restoration and recovery of wild salmon and steelhead populations. Periods of drought throughout the region have put pressure on limited water resources and increased tensions among Klamath River Basin communities.

To offset the myriad factors responsible for the current status of Klamath River salmon and steelhead populations, NMFS and other federal, state, local, tribal, not-for-profit, and private sector entities annually fund and contribute to implement important restoration and recovery activities. Through partnerships and collaboration, Klamath River Basin communities have worked together to help make important improvements to watershed habitat conditions for salmon and steelhead. Due to the importance of conservation partnerships to salmon restoration, this 2009 Klamath Report to Congress showcases many of the "partnership projects" occurring throughout the Klamath River Basin.

Restoration and recovery of salmonid species within the Klamath River Basin requires investments and collaboration, as well as effective means to measure progress. Investments in monitoring to establish linkages between restoration activities and the components of viable salmon populations are needed to understand the effectiveness of the efforts and to prioritize future activities. In this report NMFS tracks the financial investment towards Klamath River Basin salmon and steelhead restoration and recovery and identifies many of the partners engaged in funding activities. Future reports will continue to track progress such as stream miles or acres restored. Over the long-term, these measures of progress will help to establish linkages between improved habitat conditions and measures of salmon population viability. While substantial restoration investments have been made in the Klamath River Basin, funding for monitoring salmon populations to understand such linkages has been unreliable.

Introduction

Only a century ago, people of the Klamath River Basin could rely on healthy salmon populations to provide essential subsistence and cultural values. Fishing communities once thrived on the abundant salmon while rural agricultural and timber communities depended on vast land and water resources for economic and social stability. Today, these uses are often in conflict as salmon runs decline and communities compete for limited supplies of water and other natural resources. Once the third-largest producer of salmon on the West Coast, the Klamath River requires conscientious and continued stewardship based on partnerships among federal, state, local, tribal, private and non-profit entities to restore its salmon heritage.

Lands and People in the Klamath River Basin

The Klamath River Basin encompasses over 10 million acres of southern Oregon and northern California (see Appendix A). The region includes approximately 96,000 acres of tribal trust lands, 4 million acres of private lands, and 6 million acres of public lands. Public lands are managed under the authority of several different federal agencies and programs, while tribal lands serve six different tribes in the Basin (Exhibit 1).

Exhibit 1: Example Land Management Responsibilities in the Klamath River Basin

US Fish and Wildlife Service National Wildlife Refuge	Bear Valley
	Clear Lake
	Klamath Marsh
	Lower Klamath
	Tule Lake
	Upper Klamath
US Forest Service National Forests	Fremont-Winema
	Klamath
	Modoc
	Shasta-Trinity
	Six Rivers
National Parks & Monuments	Crater Lake National Park (National Park Service)
	Cascade-Siskiyou National Monument (Bureau of Land Management)
	Lava Beds National Monument (National Park Service)
Wild and Scenic River Designations	Portions of the Klamath River (including Scott and Salmon Rivers)
	Portions of the Trinity River
	North Fork Sprague River
	Sycan River
Federally Recognized Indian Tribes	Hoopa Valley Indian Tribe
	Karuk Tribe
	Klamath Tribes of Oregon
	Quartz Valley Indian Tribe
	Resighini Rancheria
	Yurok Tribe

Water and Fish in the Klamath River Basin

The Klamath River originates in southern Oregon, east of the Cascade Mountain range and flows 263 miles through southern Oregon and northern California bisecting the Cascade and Coast mountain ranges before entering the Pacific Ocean. The Wood, Williamson, Sprague, and Sycan Rivers are significant headwater tributaries that flow into Upper Klamath Lake. Water flows from Upper Klamath Lake into the Link River, and then into Lake Ewauna near Klamath Falls, Oregon. The Klamath River officially begins at the downstream end of Lake Ewauna. Iron Gate Dam, approximately 73 miles from Lake Ewauna, is a dividing point, artificially creating the upper and lower river basins of the Klamath River. Major tributaries of the lower Klamath River are the Shasta, Scott, Salmon, and Trinity Rivers. The Klamath River enters the Pacific Ocean about 22 miles south of the California-Oregon border, 190 miles below the Iron Gate Dam.

The fish community of the Klamath River Basin is comprised of several anadromous species, including Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), steelhead trout (*Oncorhynchus mykiss*),[1] green sturgeon (*Acipenser medirostris*), Pacific eulachon (*Thaleichthys pacificus*), and Pacific lamprey (*Lampetra tridentate*). Chi-

[1] Steelhead are the anadromous life form of freshwater rainbow trout that migrate to the ocean and return to freshwater streams to spawn.

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nook salmon, coho salmon, and steelhead are the focus of this Report. They spend all or part of their adult life in saltwater and return to freshwater streams and rivers to spawn. The habitat required by salmonids as they progress from egg, fry, juvenile and adult life-stages includes the mainstem Klamath River and tributaries, coastal estuary and wetlands, and the Pacific Ocean. Depending on the species, juvenile salmon can spend a few months to more than a year in freshwater until migrating to the open ocean. During their in-river life stages, salmonids utilize a variety of complex habitat types to maximize their chance of survival. Wild salmonids generally spend one to four years in the open ocean before returning to spawn in their birth streams, thus isolating them into genetically and geographically distinct populations.

The National Marine Fisheries Service (NMFS) groups distinct and individual populations of salmon into Evolutionary Significant Units (ESUs) for salmon and Distinct Population Segments (DPSs) for steelhead (see Appendix B). There are four ESUs/DPSs in the Basin. The Southern Oregon/Northern California Coast (SONCC) coho salmon ESU includes the Klamath River coho salmon population, listed as a threatened species in 1997 under the federal Endangered Species Act (ESA).[2] The SONC Chinook salmon ESU, the Upper Klamath and Trinity Rivers Chinook salmon ESU, and the Klamath Mountain Province steelhead DPS were reviewed by NMFS for possible federal listing, and were determined not to warrant protection under the ESA. In 2002, the California Fish & Game Commission officially listed coho salmon populations from San Francisco to the Oregon border, including Klamath River Basin populations, under the California Endangered Species Act (CESA).[3]

Purpose of this Report

Originally enacted by Congress in 1976, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act - MSA) is the primary law governing management of marine fisheries in federal waters of the United States.[4] On January 12, 2007, President Bush signed the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA).[5] The MSRA included two requirements for NMFS regarding the Klamath River Basin salmonids.[6] NMFS was required to prepare a recovery plan for Klamath River coho salmon. This plan was completed in 2007.[7] Additionally, the MSRA required NMFS to submit an annual report to Congress beginning in 2009 and describing the following:

- Actions taken by NMFS and other agencies under the MSRA Klamath River Coho Salmon Recovery Plan and other laws relating to the recovery of Klamath River coho salmon and how those actions specifically contribute to recovery;
- Progress made on restoration of salmon spawning habitat, including water conditions as they relate to salmon health and recovery, with emphasis on the Klamath River and tributaries below the Iron Gate Dam;
- Status of other Klamath River anadromous fish populations, particularly Chinook salmon; and
- Actions taken by the NMFS to address the 2003 National Research Council (NRC) recommendations regarding monitoring and research on Klamath River Basin salmon stocks.[8]

This "2009 Report to Congress" fulfills the MSRA 2009 reporting requirement while providing a synopsis of programs and activities established under other state and federal laws, including the ESA, the federal Clean Water Act, the CESA, and the Federal Power Act (FPA). Due to the importance of successful conservation partnerships to salmon restoration, this Report also highlights "partnership projects" throughout the Klamath River Basin.

[2] 62 Fed. Reg. 24588, May 6, 1997 (codified at 50 CFR Section 223.102).

[3] California Fish and Game Code. Section 2050-2068.

[4] Magnuson-Stevens Fishery Conservation and Management Act. Public Law 94-265, approved April 13, 1976.

[5] Magnuson-Stevens Fishery Conservation and Management Reauthorization Act. Public Law No. 109-479, 120 Stat. 3575 (2007). Available online at: http://www.nmfs.noaa.gov/msa2007/index.html.

[6] MSRA Section 113(b).

[7] NMFS Southwest Region. The Magnuson-Stevens Reauthorization Act Klamath River Coho Salmon Recovery Plan. 10 July 2007. Available at: http://swr.nmfs.noaa.gov/salmon/MSRA_RecoveryPlan_FINAL.pdf.

[8] NRC. Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery. Committee on Endangered and Threatened Fishes in the Klamath River Basin, Nation Research Council. 424 pp. Available at: http://www.nap.edu/catalog/10838.html.

Partnership Project: Scott Valley Diversion Dam Removals

Scott Valley communities rely on agriculture for their livelihoods. In past seasons, farmers have diverted irrigation water by creating gravel berms directly in rivers and creeks. This activity resulted in disturbances to salmon and steelhead habitat and blocked juvenile and adult migration to upstream spawning and rearing habitat. The Scott Valley Resource Conservation District has partnered with local landowners to install a series of boulder step pools in place of the gravel push-up dams. These pools gradually increase stream elevation with areas for salmon to rest. As designed, these pools provide fish passage through the diversion dams at all times of the year while continuing to allow farmers to withdraw water through their existing head-gates without blocking access to upstream habitat.

Status of Species

In the early 1900s Klamath River salmonids were abundant, supporting numerous communities and uses, their numbers rivaled only by populations in the Columbia and Sacramento Rivers. A century later, fish populations have declined to a fraction of their historical numbers. The causes of these declines are based on a myriad of factors.

Evaluating the Viability of Salmonid Populations

NMFS uses the concept of a Viable Salmonid Population (VSP) to evaluate the status and assess the factors affecting a fish population and its chances for recovery.[9] A VSP is an independent population of any salmonid that has a negligible risk of extinction due to population variation, local environmental changes, and genetic changes over a 100-year time frame. The VSP approach helps address the lack of reliable data on population numbers for some species by developing a better understanding of threats to populations and identifying actions to enhance viability. To meet ESA recovery standards, a species must exhibit high levels of resiliency. Resiliency allows for activities that may reduce the abundance or habitat of populations. NMFS uses VSP to examine the complex linkages between human impacts and parameters that affect specific populations. The VSP approach also considers factors such as climate change and ocean conditions.

The principal VSP parameters identified by NMFS to evaluate the risk of extinction of salmonid populations include abundance, population growth rate (productivity), population spatial structure, and genetic or life-history diversity (Exhibit 2). A decline in any of these factors means reduced population resilience to environmental variation at local or landscape-level scales.

[9] McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-42,156 p. Available at: http://www.nwfsc.noaa.gov/assets/25/5561_06162004_143739_tm42.pdf.

Exhibit 2: Parameters for Viable Salmonid Populations

Parameter	Definition
Abundance	The number of individuals in a population at a given life stage or time. Higher levels of environmental variability require greater abundance to maintain a population.
Productivity	A population's potential for increasing or maintaining its abundance over time (i.e., growth rate).
Spatial Distribution	The distribution of a population at any life stage among available or potentially available habitats.
Diversity	A measure of life history variation, and other characteristics expressed by individuals within a population, including genetic and behavioral variation.

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Trends in Abundance

Long-term population abundance data are limited for anadromous Klamath River salmonids. The earliest data primarily consist of catch records for Chinook salmon from early 20th century canneries. Through the mid-1900s, monitoring efforts in the Klamath River Basin primarily focused on fall Chinook salmon due to their commercial fishery and tribal harvest value. The data and information on Chinook salmon indicate that population levels have declined significantly since the early 20th century. Data for other species of salmonids are sparse. Due to the differences in the timing of runs and commercial value, long-term monitoring efforts rarely focused on coho salmon and steelhead. Despite the lack of cohesive long-term data sets to assess population trends, the data that do exist indicate significant population declines in all species throughout the 1900s, leading to a current state of low abundance. Currently, a significant portion of Chinook salmon and coho salmon that return to spawn in the Klamath River Basin are fish that were spawned in hatcheries.

Chinook Salmon

Chinook salmon continue to be the most abundant salmonid in the Klamath River Basin, supporting important commercial, sport and tribal fisheries. Chinook salmon from the ESU spawn in the mainstem Klamath River and tributaries up to

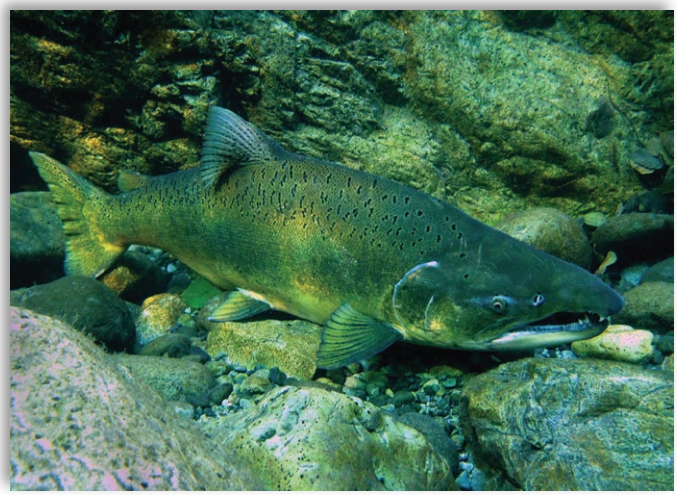
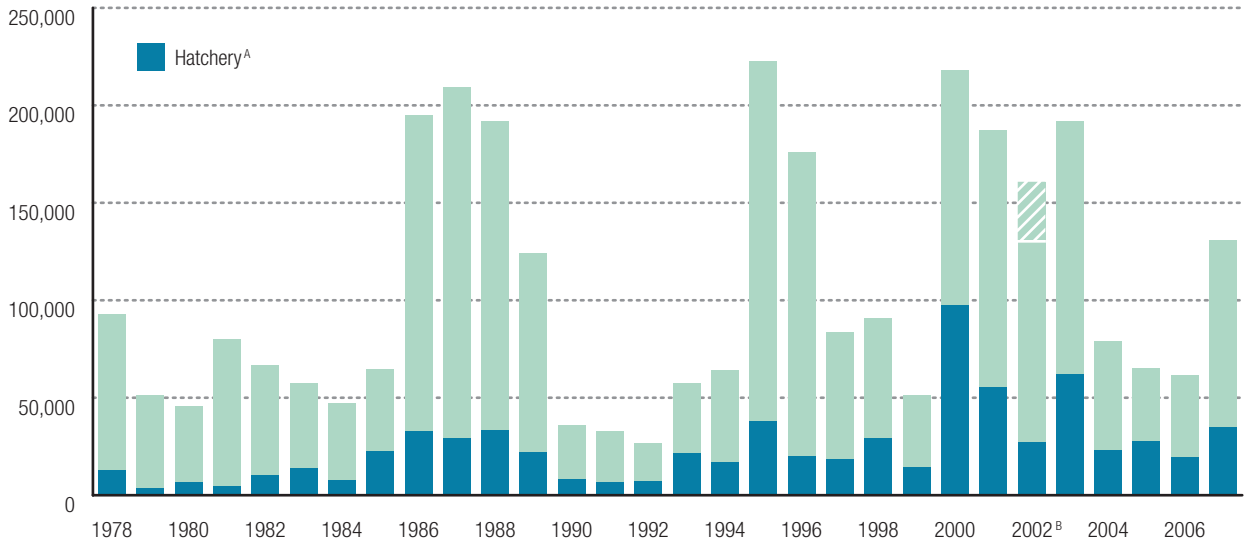


Photo courtesy of Thomas Dunklin

Adult Chinook (spawning colors)

Exhibit 3: Estimated Fall Run Chinook Salmon Abundance from 1978 to 2007 in the Klamath River Basin



[A] Fall Chinook abundance numbers are the sum of wild and hatchery fish escapement and fish harvest estimates. Hatchery estimates may be unreliable due to the limited number of hatchery fish marked in the Basin.

[B] 2002 abundance numbers include a mortality estimate of 30,550 hatchery and wild adult fall Chinook due to a fish die-off. Data provided by U.S. Fish and Wildlife Service, available at http://www.fws.gov/arcata/fisheries/reports/technical/Klamath_River_Dieoff_Mortality_Report_AFWO_01_03.pdf.

Source: Pacific Fishery Management Council. 2008. *Review of 2007 Ocean Salmon Fisheries.* (Document prepared for the Council and its advisory entities.) Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, Oregon 97220-1384.

the confluence of the Trinity River. Chinook salmon from the Upper Klamath and Trinity River ESU spawn in the Klamath River upstream of the confluence of the Trinity River, in the Trinity River, and in many of the tributaries of these two rivers. Historical populations of Klamath River Basin Chinook salmon included spring, summer, and fall runs. Chinook salmon in the Klamath River Basin are not listed under the state or federal ESA, but low abundance predictions of Klamath River Fall Chinook in recent years have forced severe harvest restrictions to West Coast fisheries.

Klamath River Fall Chinook salmon enter the Klamath River in August and September of each year, spawning shortly thereafter in the lower reaches of rivers and streams. Based on records of commercial harvest, fall-run Chinook are likely to have numbered 400,000 to 500,000 in the early 1900s. Runs in the last several decades have ranged from below 50,000 to 225,000 fish (Exhibit 3). These runs are substantially lower than historic levels.

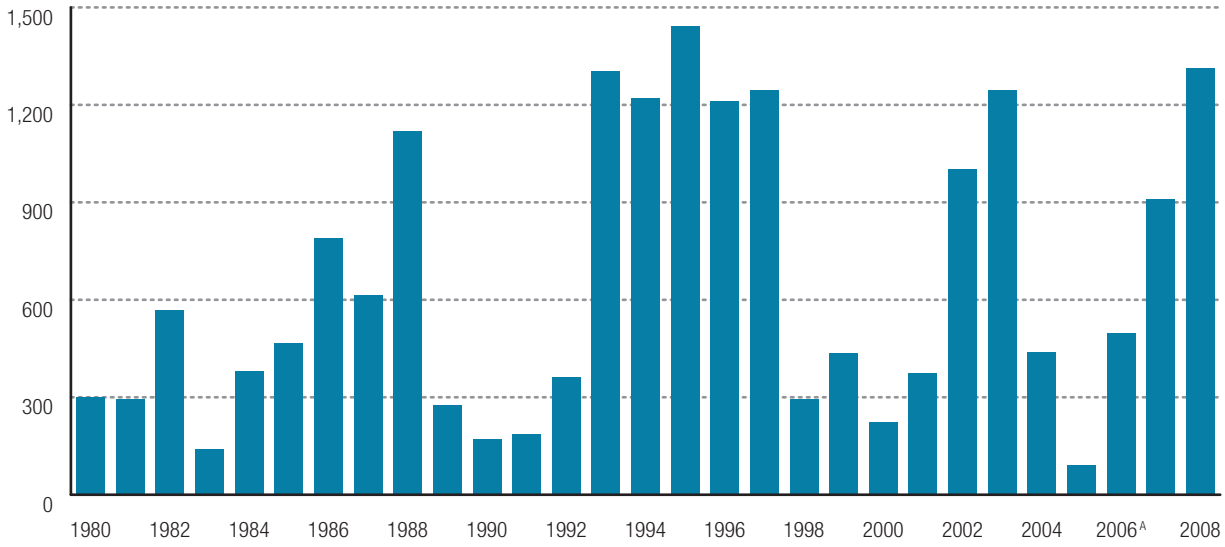
Spring-run Chinook salmon enter the Klamath River from April to June of each year before migrating to smaller headwater tributaries. They require cold, clear rivers and streams with deep pools to sustain them through the warm summer months. These areas have been greatly reduced in the Basin due to dams and degradation of habitat. The spring Chinook salmon run was historically abundant and may have been the dominant run prior to commercial harvest commencing in the mid-1800s. Wild spring-run Chinook salmon populations are now a remnant of their historical abundance and primarily occur in the South Fork Trinity River and Salmon River Basins (Exhibit 4).

Coho Salmon

Historically, coho salmon inhabited an expansive range of the Klamath River Basin, including habitat upstream of current dams - Iron Gate, Lewiston and Dwinnell. Coho salmon populations within the Basin have declined dramatically and currently exist only within a limited portion of their historical range. Analyses by the California Department of Fish and Game (CDFG) in 2002 suggest SONCC populations have stabilized at low adult abundance levels since the late 1980s, but numbers could decline even further if stream and river conditions shift.[10] More recently, NMFS determined that coho salmon populations throughout the SONCC coho salmon ESU continue to be

[10] CDFG 2002. "Status Review of California Coho Salmon North of San Francisco." Report to the California Fish and Game Commission. 336 pp. Available at: http://www.dfg.ca.gov/fish/documents/SAL_SH/SAL_Coho_StatusNorth_2002/SAL_Coho_StatusNorth_2002.pdf.

Exhibit 4: Estimated Salmon River Spring Run Chinook Salmon Abundance from 1980 to 2008 in the Salmon River



[A] 2006 abundance numbers are only estimates due to wildfires preventing access to 35% of the Salmon River.

Source: Data collected by the Salmon River Restoration Council (http://www.srrc.org). Hatchery production estimates are not available for the Salmon River.

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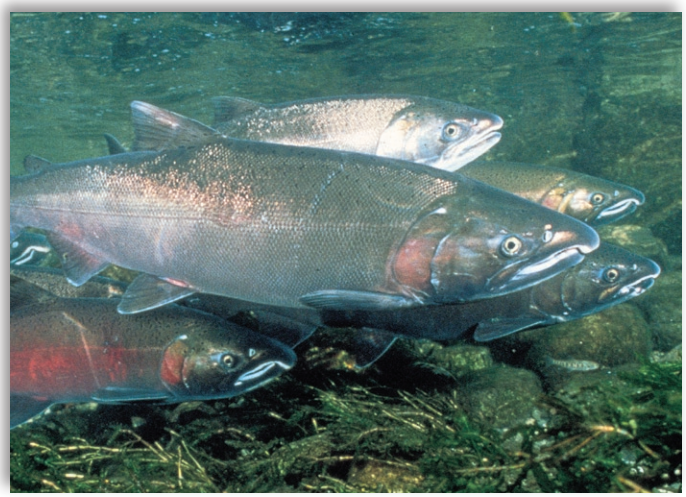


Photo courtesy of Barrie Kovish

Adult Coho Salmon

depressed relative to historical numbers, and strong indications exist that breeding groups have been lost from a significant percentage of streams within their historical range.[11]

[11] Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p. Available at: http://www.nwr.noaa.gov/Publications/Biological-Status-Reviews/upload/SR2005-allspecies.pdf.

Current abundance of Klamath River coho salmon was recently estimated from a number of sources (Exhibit 5). "Low risk annual abundance level" describes the minimum number of adult spawners required for a population to be considered at low risk of extinction based on thresholds defined in the VSP criteria. "High risk annual abundance level" describes a population threshold where populations are considered to be at a high risk of extinction.[12]

Steelhead

Steelhead are widely distributed throughout the Klamath River Basin. Populations in the Basin are considered part of the Klamath Mountains Province steelhead DPS and are comprised of three distinct runs; summer, fall and winter. Winter and summer steelhead historical abundance levels are not well known but winter steelhead abundance was estimated to be over 200,000 fish in the Klamath and Trinity Rivers in

[12] Williams, T.H., C. Spence, W. Duffy, D. hillemeier, G. Kautsky, T.E.. Lisle, M. McCain, T.E. Nickelson, E. Mora, and T. Pearson. 2008. Framework for assessing the viability of threatened coho salmon in the Southern Oregon/Northern California Coasts Evolutionary Significant Unit. U.S. Dept. Commerce, NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-432, 113 p. Available at: http://swfsc.noaa.gov/uploadedFiles/Divisions/FED/Endangered_Species_Act/Salmon_TRTs/TM%20432%20%20Williams%20et%20al_2008.pdf.

Exhibit 5: Estimated Abundance and VSP Thresholds for Coho Salmon Populations in the Klamath Basin [A,B]

Population Unit	Approximation of Run Size Estimates from 2001-2004	High Risk Annual Abundance Level	Low Risk Annual Abundance Level
Lower Klamath River	0–2,000	205	5,900
Middle Klamath River [C]	0–1,500	113	3,900
Upper Klamath River	100–4,000	425	8,500
Scott River	10–4,000	441	8,800
Shasta River	100–400	531	10,600
Salmon River	50	115	4,000
South Fork Trinity River	500–9,000	242	6,400
Lower Trinity River		112	3,900
Upper Trinity River		64	2,400

[A] Williams, et al. 2006. Historical Population Structure of Coho Salmon in the Southern Oregon/Northern California Coasts Evolutionarily Significant Unit. U.S. Dept. Commerce., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-390.

[B] All population units are estimated at run sizes below the threshold for low risk. The 2001-2004 population run-size estimates were established in the NMFS 2007 Biological Opinion.

[C] While run-size approximations based on adult counts may be as low as zero in this time period, USFS personnel observed young-of-year coho salmon in tributaries of the Middle Klamath in 2001-2004.

Source: National Marine Fisheries Service. 2007b. Biological Opinion for the Federal Energy Regulatory Commission's proposed licensing of PacifiCorp's Klamath Hydroelectric Project. NMFS Southwest Region, Long Beach, California. 137 pp.

Photo courtesy of The Nature Conservancy

Adult Steelhead

the 1960s.[13] The limited data on summer steelhead abundance indicates this run is depressed as shown by the data available from the Salmon River (Exhibit 6).

[13] Busby, P.J., T.C. Wainwright, and R.S. Waples. 1994. Status Review for Klamath Mountains Province Steelhead. NOAA Technical Memorandum NMFS-NWFSC-19. National Marine Fisheries Service, Seattle, WA. 130 pp. Available at: http://www.nwfsc.noaa.gov/publications/techmemos/tm19/tm19.html.

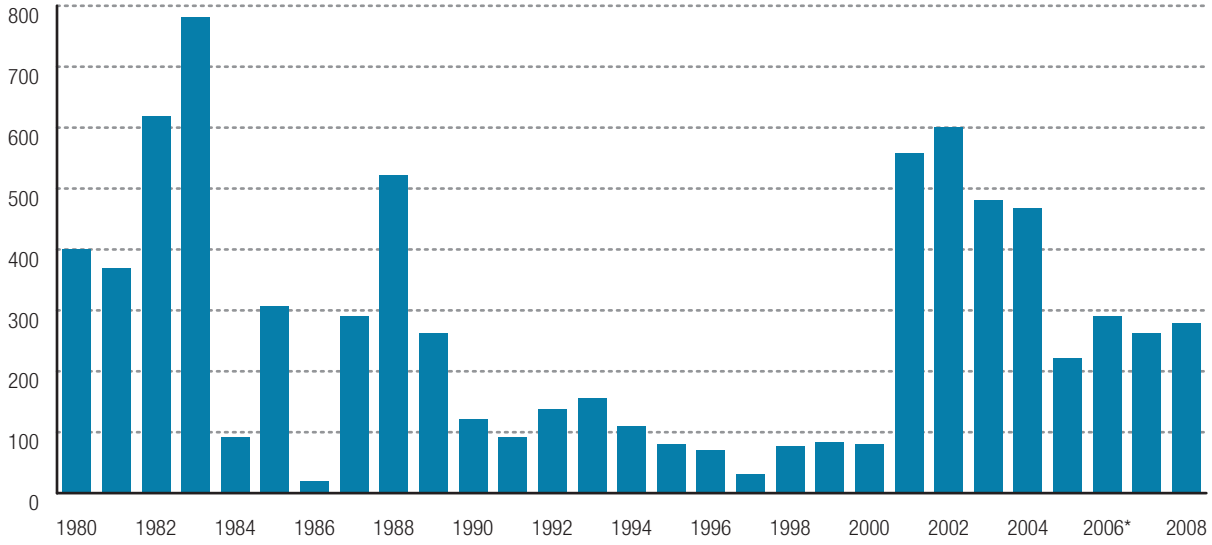
Hundreds of miles of historical habitat were lost to steelhead in 1919 with the construction of the first Copco Dam on the mainstem Klamath River. In 1963, hundreds of additional miles of habitat were lost with the construction of Lewiston Dam on the Trinity River. Hatcheries at the Iron Gate and Lewiston Dams currently produce fall steelhead as mitigation for habitat loss upstream of these facilities. Summer steelhead are not part of the hatchery production program in the Klamath River Basin. NMFS reviewed the status of Klamath Mountains Province steelhead in 2001 and determined the DPS did not warrant listing under the ESA at the time.[14]

Factors Affecting Populations

The decline of Klamath River Basin anadromous salmonid populations illustrates the impacts from a history of human-caused factors affecting populations and their habitat. The main factors impacting Klamath River Basin salmonids can be categorized as water, land, and fish management activities,

[14] 66 Fed. Reg. 17845, April 14, 2001.

Exhibit 6: Estimated Summer Steelhead Abundance from 1980 to 2008 in the Salmon River [A]



[A] 2006 abundance numbers are only estimates due to wildfires preventing access to 35% of the Salmon River.

Source: Data collected by the Salmon River Restoration Council (http://www.srrc.org). Summer steelhead are not part of the hatchery production program in the Basin.

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including dams, diversions, timber harvest, hatcheries, and fish harvest.[15, 16]

Identifying the factors causing threats and creating stress on populations is important to understanding approaches for achieving recovery (Exhibit 7). Investments for recovery should be targeted to address these factors.

Water Management Activities

Dams: Dams and impoundments throughout the Klamath River Basin block hundreds of miles of historical anadromous salmonid habitat and alter the hydrology of the river system. Dams on the Klamath River have been barriers to upstream migration since the first Copco Dam was constructed in 1919. Mainstem flow peaks have been altered and summer flows have been reduced. Hydrological alterations and lost habitat have impeded the viability of salmonid populations. The loss of bed load, impaired water quality, and increased water temperatures have reduced suitable habitat and exacerbated fish disease.

Diversions: Stream flows in many Klamath River Basin tributaries have been reduced by domestic, agricultural and municipal diversions. Diversions impact salmonid viability by reducing flows and availability of habitat, increasing water temperatures, and reducing water quality. Unscreened diversions create additional impacts by entraining young fish (e.g., trapping fish in the current). Return flows from irrigated lands can also reduce water quality conditions, impacting salmonid viability.

Land Management Activities

Timber Harvesting: The Klamath River Basin is comprised of large portions of public and private forestlands that have been heavily logged over the past century. Logging and accompanying road-building activities increase the amount of sediment that enters streams and rivers during rainstorms and with snowmelt. The effects are particularly severe in the Basin where steep slopes are naturally unstable and subject to landslides. Increased sedimentation of spawning grounds leads to reduction of early survival due to loss of cover, filling in of pools, and increased water temperatures. In addition, improperly constructed culverts associated with logging roads are barriers to upstream spawning and rearing areas. Over the past decade, federal land management has improved its forestry

[15] Peter B. Moyle, B. Peter, Israel A. Joshua and Purdy E. Sabra. 2008. Salmon, Steelhead, and Trout in California: Status of an Emblematic Fauna. A report commissioned by California Trout. Center for Watershed Sciences, University of California, Davis, Davis, CA. 316 pp. Available at: http://www.caltrout.org/SOS-Californias-Native-Fish-Crisis-Final-Report.pdf.

[16] NRCS. 2004. Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery. Washington, DC: The National Academies Press. 397 pp. Available at: http://www.nap.edu/catalog.php?record_id=10838.

Exhibit 7: Threats and Stressors to Anadromous Salmonids in the Klamath and Trinity Rivers

Threats and Stressors	Trinity River Basin	Klamath River Basin
Barriers to migrations, including dams, impassable culverts.	High risk	High risk
Altered sediment supply due to land management, dams, fires.	High risk	High risk
Altered hydrologic function due to dams and diversions.	High risk	Low risk
Endemic disease infection	High risk for Chinook salmon and coho salmon, medium risk for steelhead trout	Low risk
Adverse effects from hatcheries including disease, competition and loss of genetic integrity.	High risk for Chinook salmon and coho salmon, medium risk for steelhead trout.	Medium risk
Impaired water quality due to land management practices.	High risk	Medium risk
Altered floodplain and channel structure due to dams, road construction and diking.	Medium risk	High risk
Fish harvest	Low risk	Low risk

Source: NMFS-SWR 2009. Recovery Plan for the Evolutionarily Significant Unit of Southern Oregon Northern California Coast Coho Salmon Internal Review Draft.

practices in the Basin, including road building and maintenance programs that have reduced sediment delivery to streams. Several industrial timberland companies have also shifted to improved forest practices on their privately owned lands.

Gold Mine Dredging: Mining activities in the Klamath River Basin date back to the late 1800s and continue today. In the past, mines diverted water for use in sluicing and hydraulic mining operations resulting in dramatic increases in water turbidity levels and altering stream morphology. Declines in fish abundance due to stream siltation were observed as early as the 1930s and streams containing high volumes of silt seldom supported large populations of salmonids. Since the 1970s, mining activities have been reduced by stricter environmental regulations, but suction dredging, placer mining, gravel mining, and lode mining operations continue in the Basin. These operations can reduce salmonid spawning gravel habitat resulting in increased poaching activity, decreased survival of fish eggs and juveniles, and decreased abundance of benthic invertebrates on which young fish feed.

Fish Management Activities

Hatcheries: Two hatcheries are currently operated by CDFG as mitigation for lost habitat above Iron Gate and Lewiston Dams. While hatcheries may increase the abundance of salmonid populations in the short term, hatchery fish can also harm native populations by increasing disease risks, increasing competition for limited resources, and reducing the genetic integrity of native populations.

Fish Harvest: Commercial, recreational, and tribal fishing have affected Klamath River Basin anadromous salmonids since the 19th century. Harvesting intensified with the introduction of canning technology in the early 20th century. Due to a variety of factors, including fishing, federal managers have decreased commercial salmon fishing over the past two decades off the California and Oregon Coasts. These reductions have helped reduce impacts from past overfishing practices. In the Klamath River, the State of California prohibits recreational fishing for coho salmon while it manages Chinook salmon and steelhead recreational fishing with the objective of maintaining sustainable populations. In federal and state waters off of California, fishing for coho salmon and the retention of coho salmon are prohibited.

Restoration and Recovery

Restoration and recovery of salmonid species within the Klamath River Basin requires investments and collaboration, as well as effective means to measure progress. Investments in monitoring are needed to establish linkages between activities (e.g., habitat improvements) and the parameters of VSP (e.g., population abundance and distribution) to understand the effectiveness of current activities and to assist in the prioritization of future activities.

Essential Role of Conservation Partnerships

Restoration of species and a healthy Klamath River Basin ecosystem depends on the establishment of conservation partnerships among its diverse communities. Klamath River Basin communities encompass many public agencies at all levels of government, Indian tribes, small and large private landowners, and industrial timber and agricultural interests. Many of these entities actively participate in collaborative efforts to develop and implement restoration actions and sustainable land- and water-use practices. Fishing, conservation, and watershed groups also conduct important outreach and advocacy activities and play a role in salmon restoration planning and implementation in the Klamath River Basin. In 2008, at least 12 federal and state agencies in California and Oregon worked to conserve and manage natural resources under various mandates while also trying to balance and ensure sustainable economic activities within the Klamath River Basin.

Given the lack of a singular authoritative entity and limited funding, enhancing and conserving the Klamath River ecosystem requires collaborative activities among federal, state, local and tribal governments, private, non-profit institutions, and individuals. Local communities and citizens play a substantive and central stewardship role within the Klamath River watershed where they live, work, and enjoy recreational pursuits. Recent voluntary and incentive-based activities have created unique partnerships in the Basin and are highlighted in the Partnership Project sidebars throughout this Report. These partnerships pursue common conservation goals and provide practical options to the legacy of litigation and polarization that has divided Klamath River communities for two decades.

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Lasting resolution of the complex natural resource problems in the Klamath River Basin requires integrated, comprehensive solutions that rely on partnerships among diverse communities and interests.

Measuring Progress

In the following sections, NMFS tracks financial investments towards Klamath River Basin salmon and steelhead restoration and recovery and describes examples of specific activities. Future reports will continue to track progress such as stream miles or acres restored. Over the long-term, these measures of progress will help to establish linkages with habitat conditions and measures of population viability (Exhibit 8).

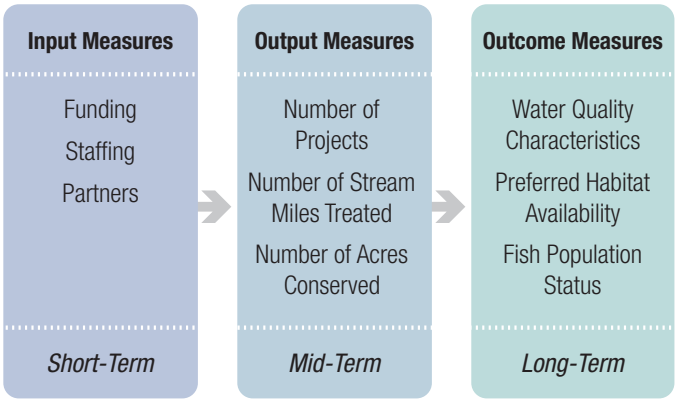
Funding for Restoration and Recovery

Klamath River Basin restoration activities are supported by a variety of federal, state, private and local sources including the NOAA Restoration Center, NMFS-Southwest Region, NMFS Pacific Coastal Salmon Recovery Fund (PCSRF), CDFG, California Coastal Conservancy, U.S. Bureau of Reclamation (BOR), U.S. Fish and Wildlife Service (USFWS) and the U.S. Department of Agriculture (Exhibit 9). These federal and state entities manage and subsequently distribute funding to various partners to carry out Klamath River Basin restoration and recovery activities on an annual basis. Final recipients of the funding include tribes, non-profit conservation organizations, public municipalities, universities, private landowners, and for-profit consulting firms.

Restoration Activities

Collaborative efforts by federal, state, tribal and local organizations aim to restore a healthy, naturally diverse, and productive Klamath River Basin ecosystem. Restoration projects and activities generally fall within two areas: (a) improvement of hydrological conditions and, (b) improvement of ecological functions. The hydrological improvements in the Klamath River Basin primarily address restoring water quantity and flow timing of the Klamath River (i.e., upper lake systems and groundwater), enhancing cold water contributions, and removing and/or retrofitting water diversion systems (dams and irrigation systems). Efforts to restore the Basin ecological functions include sediment reduction, riparian restoration, and instream habitat restoration. The following examples showcase some of the many recently completed and ongoing projects that address the complex and wide range of threats and stressors impacting Klamath River salmonids.

Exhibit 8: Measuring Progress from Investments to Results



Partnership Project: Five Counties Salmonid Conservation Program

Stemming from a partnership that began in 1997 between five California counties (Humboldt, Del Norte, Trinity, Siskiyou, and Mendocino) and NMFS, the NMFS-Southwest Region qualified the jointly developed "Water Quality and Stream Habitat Protection Manual for County Road Maintenance in Northwestern California Watersheds" (the Manual) as providing adequate conservation to lift the prohibition on take for certain road maintenance activities. The Manual includes guidance on best management practices for road maintenance that minimize erosion and improve fish passage under roads. Collectively, since the formation of the partnership, the counties have repaired or replaced several road culverts, increasing accessible fish habitat by hundreds of miles. Additional conservation is expected as the counties continue to implement the Manual.

Exhibit 9: Annual Allocations in the Klamath Basin by the NMFS, and Other Federal and State Agencies

	NOAA			State of California		Other Federal Agencies			
Fiscal Year	NMFS PCSRF	NMFS [A]	NOAA Restoration Center	Department of Fish and Game	Coastal Conservancy	Fish and Wildlife Service	Klamath National Forest	Bureau of Reclamation	Natural Resources Conservation Service
2000	$2,477,000	$500,000	$36,000	$3,208,300	$100,000	$347,600	$629,000	$342,300	NA
2001	$5,948,000	$500,000	$100,000	$491,800	$100,000	$311,800	$1,352,000	$339,700	NA
2002	$4,453,000	$600,000	$20,000	$3,202,800	NA	$464,100	$1,273,000	$883,500	$189,200
2003	$2,398,300	$600,000	$32,000	$1,931,000	$600,000	$339,000	$1,959,000	$3,493,600	$1,130,800
2004	$3,154,400	$750,000	$100,000	$978,900	$140,000	$297,700	$4,798,000	$1,812,200	$1,539,800
2005	$2,391,800	$675,000	$125,000	$1,930,300	$300,000	$349,300	$2,110,000	$8,234,300	$1,662,900
2006	$951,000	$1,000,000	$117,000	$11,565,100	$375,800	$525,900	$2,264,000	$5,426,100	$1,079,100
2007	$1,380,000	$1,050,000	$370,000	$784,600	$580,000	$1,016,800	$1,267,000	$8,290,700	$926,800
2008	$1,363,000	$3,000,000	$345,000	$467,700	$128,000	$880,200	$1,352,000	$5,284,600	$1,397,600
TOTAL	**$24,516,500**	**$8,675,000**	**$1,245,000**	**$24,560,500**	**$2,323,800**	**$4,532,400**	**$17,004,000**	**$34,107,000**	**$7,926,200**

[A] 2006 funding does not include an additional $60,340,000 for Klamath Basin disaster relief.

Nelson Ranch

Driven by snowmelt from 14,162-foot Mount Shasta, the cold flows of the Shasta River create one of the most important spawning tributaries for Chinook salmon in the Klamath River Basin. In 2005, The Nature Conservancy California Program and its partners made an investment in the Shasta Valley with the purchase of the 1,700-acre Nelson Ranch, which includes five miles of the Shasta River. This is the first time a private conservation group has purchased a property of this size in the Shasta Valley, representing an important step in the Conservancy's effort to find common ground between conservationists and the local community.

Photo courtesy of The Nature Conservancy

Nelson Ranch

The Conservancy purchased the Nelson Ranch for $3.375 million through a partnership with Stillwater Development, a conservation-minded investment company. Together, Stillwater Development, the Nelson family, and The Nature Conservancy developed a program that ensures the protection of the fragile natural areas of the ranch, while allowing for conservation-compatible grazing. As a result, the ranch will continue to support the local agricultural economy and contribute to the county tax rolls. Simultaneously, the Conservancy will continue to have access for monitoring, research, and restoration activities.

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Mid-Klamath Tributary Access Restoration

Excessive summer water temperatures in the mainstem of the Klamath River reduce the amount of suitable habitat for salmonids and can decrease their survival. Tributaries flowing into the mainstem Klamath River can provide cooler temperatures for salmonids. In 2008 the Karuk Tribe of California, in partnership with the Mid-Klamath Watershed Council, worked to enhance cover in the mainstem and improve access at the confluence of tributary mouths by installing wood, willow, and brush structures and opening up access corridors. The result of the Karuk Tribal tributary enhancement project is an increase in the amount and use of suitable habitat by salmon and steelhead.

Photo courtesy of Will Harling, Mid-Klamath Restoration Council

Karuk Sandy Bar Creek Mid-Klamath Tributary Restoration

Shasta River Small Dam Removal Projects

Photo courtesy of Amy Hansen, Shasta Valley Resource Conservation District

The Araujo Dam Before Removal from the Shasta River

Photo courtesy of The Nature Conservancy

The Araujo Dam After Removal from the Shasta River

The legacy of impacts limiting salmonid populations in the Shasta River include blocked access to high quality habitat. Impairments to fish passage have included a series of small flashboard diversion dams on the Shasta River blocking salmon and steelhead from access to upstream habitat. In addition, these flashboard dams create an upstream ponding effect that encourages invasive aquatic plants, increases water temperatures in the river, and reduces dissolved oxygen available for fish.

The Western Shasta Resource Conservation District (RCD) has removed three of the fish migration barrier dams, including Araujo Dam, to facilitate unimpeded fish passage to upstream rearing habitat. The Western Shasta RCD has also installed more efficient water delivery systems to local farmers as part of each dam removal project, resulting in a greater volume of water remaining in the river for fishery needs.

Lower Klamath Instream Habitat Restoration

Salmon and steelhead survival is improved if complex and diverse habitat structures are available for winter and summer rearing. The legacy of timber harvest and stream clearing of woody debris has resulted in the lack of habitat complexity in the Klamath River and its tributaries. Historically, the Klamath River tributaries contained large amounts of instream wood that created habitat complexity. The Yurok Tribe is working with Green Diamond Timber Company to add large, complex wood structures in tributaries, including McGarvey and Tectah creeks. Over the long-term, the addition of this woody debris will help scour deeper pools and create more diverse habitat for spawning and rearing salmonids.

Scott Valley Water Trust

Located in the center of the Klamath River Basin, the Scott River supports both farms and annual runs of salmon and steelhead. The Scott River and its tributaries suffer from significant water diversions that reduce water quantity and impair water quality during critical periods of salmonid life history. The Scott River Water Trust is the first active Water Trust in California, obtaining its first water leases in 2007. The purpose of the program is to improve stream-flow in priority reaches of fish habitat through incentive-based voluntary leases with agricultural water users in the Scott Valley. To improve the survival and growth of juvenile salmon and steelhead, the Scott Valley Water Trust focuses on leasing water during irrigation season in the late summer months primarily in the cooler, west side tributaries. The Trust is also obtaining leases for use during dry years to increase mainstem Scott River flows during the fall months for improved upstream migration access for adult salmon and steelhead. The Water Trust is monitoring stream-flow in the Scott River to prioritize areas for water leasing and measure the flow increases associated with their leases.

Photo courtesy of Sari Sommerstrom, Scott River Water Trust

Water Flow Measurement Activities

Indian Creek Trinity River Channel Rehabilitation Project

The Indian Creek Trinity River Channel Rehabilitation Project was built in the summer 2007 to increase juvenile salmonid rearing habitat and reduce Trinity River flow impacts to homes and structures adjacent to the River. The project used heavy equipment to remove vegetation and widen the Trinity River floodplain along portions of approximately three river miles to accommodate planned flows of 11,000 cfs without damage to private property. This was the fourth channel rehabilitation project built in the Trinity River Basin to enhance river processes and increase fish habitat downstream of Lewiston Dam. Tailings from the grading project and floodplain materials were processed and reclaimed for use up-river to enhance habitat complexity by adding various sized gravel to the riverbed and improving river bed mobility and spawning gravel availability. First year monitoring of the project area in 2008 found juvenile salmonids in greater abundance than pre-project in the newly created habitats (e.g., side channel, locations with large wood, and vegetated stream banks). This

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project was implemented under direction of the Trinity River Restoration Program (TRRP) and Trinity County. Funding was provided by the U.S. Bureau of Reclamation, the CDFG's Fisheries Restoration Grant Program, and the U.S. Environmental Protection Agency's (EPA) Targeted Watershed Grants Program. Trinity County worked as a partner agency under the EPA program with the Yurok Tribe and the Trinity County Resource Conservation District.

Actions Taken Under the MSRA and Other Laws

Guidance for Klamath River Basin recovery actions is provided by the MSRA, ESA, federal Clean Water Act, CESA, and Federal Power Act. When applied to the Klamath River Basin, these laws collectively help to address and rectify factors that affect Klamath River fisheries.

The MSRA

The following recovery actions were identified by NMFS as high priority in the MSRA Klamath River Coho Recovery Plan:

- Complete and implement the NMFS recovery plan for the SONCC coho salmon under the ESA,
- Restore access for coho salmon to the upper Klamath River Basin by providing passage beyond existing mainstem dams,
- Fully implement the Trinity River Restoration Program,
- Provide incentives for private landowners and water users to cooperate in: (1) restoring access to tributary streams that are important for coho spawning and rearing; and (2) enhancing mainstem and tributary flows to improve instream habitat conditions,
- Continue to improve the protective measures already in place to address forestry practices and road building/maintenance activities that compromise the quality of coho salmon habitat,

Partnership Project: The Trinity River Restoration Program

The Trinity River Restoration Program (TRRP) was initiated under the Trinity River Basin Fish and Wildlife Management Act of 1984.[A] The intent of the TRRP is to restore and maintain the fish and wildlife stocks of the Trinity River Basin to levels that existed just prior to construction of the Central Valley Project (CVP) Trinity River Division. The CVP Improvement Act of 1992 further supported restoration objectives and established completion dates for the program documents.[B]

Alluvial river systems are complex and dynamic. The understanding of these systems and how they evolve in the future improve continually. The Adaptive Environmental Assessment and Management (AEAM) approach of the TRRP gives decision makers the ability to refine previous decisions in light of the increase in knowledge and understanding of the river and catchment. The AEAM approach relies on teams of scientists, managers, and policy makers' jointly identifying and bounding management problems in quantifiable terms. The adaptive approach to management recognizes that information available for decision-making is almost always incomplete and encourages managers to use management actions to increase knowledge of complex systems. These actions, in turn, contribute to better future decisions. AEAM needs to not only monitor changes in the ecosystem, but also develop and test hypotheses about the causes of those changes to promote desired outcomes. The result is informed decisions and increasing certainty within the management process.

Many dedicated individuals—federal and state employees, local residents, tribal governments, resource professionals from other agencies, and other interested groups—have devoted the past 30 years to restoring the salmon and steelhead fisheries of the Trinity River. Although restoration is not complete and all issues are not entirely resolved, the TRRP is an evolving success story, and an excellent example of communication, consultation, and cooperation, in the service of conservation.

[A] Pub. L. No. 98-541, 98 Stat. 2721 (amended by the Trinity River Basin Fish and Wildlife Reauthorization Act of 1995, Pub. L. No. 104-143, 110 Stat. 1338 (1996)).

[B] Pub. L. No. 102-575, Title XXXIV, 106 Stat. 4706.

- Implement restorative measures identified through fish disease research results to improve the health of Klamath River coho salmon populations.

The following three sections highlight key recovery plans and restoration strategies established under the direction of these mandates.

Partnership Project: Agricultural Partnerships in the Shasta and Scott River Watersheds

In response to listings of coho salmon, under the ESA and CESA, the Shasta and Siskiyou Resource Conservation Districts (RCD), NMFS, and CDFG are working to develop programmatic approaches that institute watershed-wide agricultural management best practices for salmonids and prioritize restoration efforts under the RCD's Incidental Take Permit and the state's Stream Bed Alteration Permit Programs. Participation by local ranchers and farmers in these programs would lead to ESA and CESA protections and state Streambed Alteration Agreements (SAA). The intent of these programs is to provide a streamlined approach to regulatory compliance while addressing site specific and watershed-wide threats to coho salmon.

These programs address restoring riparian vegetation, minimizing the impacts of stream crossings, installing and maintaining fish friendly water surface water diversions, removing fish passage barriers, and managing water and adjudicating and verifying water rights. Efforts to date include the publication of draft Environmental Impact Reports for both the Shasta and Scott River CESA and SAA programs. Although many of the protective and restorative activities have begun, formal state permit issuance and program implementation is anticipated to begin in 2009. NMFS has provided technical assistance through the development of these programs with the goal of identifying protective and restorative actions that are consistent with its recovery planning efforts and instituting monitoring and protective practices that can support and be integrated into a future Federal ESA permit.

The Southern Oregon–Northern California Coast Recovery Plan

In 2002, NMFS began ESA recovery planning for the SONCC coho salmon ESU through establishment of a technical recovery team. By 2008, the scientific "building blocks" of the plan were prepared. Recovery plans serve as a "road map to recovery," and function as an important tool for promoting sound scientific and logical decision-making throughout the recovery process. The final phase of recovery planning for the SONCC coho salmon ESU is underway and consists of developing a recovery plan containing: (1) a list of prioritized recovery actions to achieve the plan's goals for the conservation and survival of the species; (2) objective, measurable criteria which, when met, would result in the species being de-listed; and (3) estimates of time and costs required to achieve the plan's goal and the intermediate steps towards that goal.

NMFS has coordinated with various co-managers in both Oregon and California to develop the draft recovery plan. NMFS recognizes that California has recently undertaken extensive conservation and recovery planning efforts for coho salmon in collaboration with a variety of stakeholders. Oregon has also developed coho salmon conservation planning strategies. NMFS' development of the SONCC coho salmon recovery plan will recognize, consider, and utilize, to the maximum extent possible, the coho salmon conservation plans of Oregon and California. NMFS is working with tribes, local governments, and other entities to conduct public outreach as it prepares drafts of the recovery plan. NMFS expects to make the draft SONCC coho salmon recovery plan available to the public for comment in 2009.

California Coho Recovery Strategy

In August 2002, the California Fish and Game Commission listed coho salmon north of San Francisco Bay under the CESA. Coho salmon between Punta Gorda and the Oregon border (including the Klamath River Basin) were listed as threatened. Prior to the final listing of coho salmon under CESA, the California Fish and Game Commission directed CDFG to develop a recovery strategy for restoring native California coho salmon (Recovery Strategy for California Coho

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Salmon).[17] CDFG created both a multi-stakeholder Coho Recovery Team to address recovery issues across the full range of the species, and a sub-working group (Shasta–Scott Recovery Team) to develop coho salmon recovery strategies associated specifically with agricultural management within the Scott and Shasta Rivers. The teams are comprised of members from a broad range of state, federal, and local interests and continue to meet on an annual basis to track the progress of the Recovery Strategy. The primary objective of the Recovery Strategy is to "return coho salmon to a level of sustained viability, while protecting the integrity of both ESUs, so they can be delisted and regulations or other protections under the CESA will not be necessary."

Ocean Fisheries Harvest Restrictions

Ocean harvest of salmon off the coasts of California, Oregon, and Washington is managed under the Pacific Coast Salmon Fishery Management Plan (Salmon FMP), in accordance with the MSA. The Salmon FMP was developed by the Pacific Fishery Management Council (PFMC), and approved by the Secretary of Commerce (Secretary) through NMFS. Each year, the PFMC develops management measures for the ocean salmon fisheries, subject to Secretarial approval, consistent with requirements of the MSA, such as preventing and ending overfishing while achieving optimum yield, minimizing bycatch,[18] and protecting essential fish habitat.[19]

Management measures for ocean salmon fisheries are also developed for consistency with the ESA. Management of the fishery is complicated by the fact that salmon stocks from different spawning areas co-mingle in the ocean, making it a "mixed stock" ocean fishery. Management, therefore, is designed to protect the weakest stocks, such as ESA listed salmon. To protect stocks in the Klamath River Basin, management measures are developed for consistency with the 1999 biological opinion that analyzed the effects of West Coast ocean salmon fisheries on the Central California Coast coho

[17] California Department of Fish and Game. 2004. Recovery strategy for California coho salmon. Report to the California Fish and Game Commission. 594 pp. Available online: http://www.dfg.ca.gov/nafwb.cohorecovery.

[18] 16 U.S.C. Sections 1851(a)(1) and (9).

[19] 16 U.S.C. Section 1853.

Partnership Project: Klamath River Basin Habitat Conservation Plan Partnerships

Habitat conservation plans (HCPs) are developed and implemented to identify actions to protect threatened and endangered species, while still allowing resource development and use. Two examples of HCPs within the Klamath Basin are described below.

The Green Diamond Resource Company (GDR) in partnership with NMFS and the USFWS completed and began implementing its Aquatic HCP in June 2007. The 50-year HCP covers GDR's timber operations on over 400,000 acres of forest land in Northern California. The HCP minimizes and mitigates impacts to aquatic species, including coho and Chinook salmon and steelhead trout, through stream side conservation measures, protection of unstable slopes, retention and promotion of large trees in riparian areas, and a program to improve and maintain over 4,000 miles of forest roads. The HCP will reduce sediment from roads and hill slopes, maintain and promote cool water habitats, and contribute to deep rearing pools and clean spawning gravels. The Plan incorporates a state of the art monitoring program coupled with an adaptive management feedback loop, enabling GDR and federal agencies to refine protective measures.

The Fruit Growers Supply Company (FGS), working in partnership with the NMFS, the USFWS, and CDFG, is developing an HCP that will apply landscape level restorative and protective measures for coho salmon. The HCP will cover forest practices on over 150,000 acres of timberland within the mid Klamath region and will provide benefits to the 33 miles of fish bearing streams on FGS lands and surrounding 700 miles of fish bearing streams impacted by FGS's operations. The HCP will provide for enhanced riparian protections, removal of fish passage barriers, and an accelerated road improvement program. These activities will reduce road related delivery of sediment to watercourses by 50% within the first 10 years of the 50 year plan. The HCP will complement recovery actions identified in the SONCC coho salmon Recovery Plan. While the NMFS anticipates public review of the HCP in early 2009 and finalization and full implementation in 2010, FGS has already begun to implement some of the protective measures of the plan.

salmon ESU and the SONCC coho salmon ESU.[20] Specifically, the fishery is managed so as not to exceed an ocean exploitation rate of 13% on SONCC coho salmon (including all harvest related mortality). Coho salmon-directed fisheries off California and coho salmon retention fisheries off California are prohibited. Monitoring of harvest and stock composition is required to ensure full implementation of and compliance with management measures and to allow for a thorough post-season analysis of fishery impacts on listed species.

In April 2008, the PFMC recommended and the Secretary approved the most restrictive salmon fisheries in the history of the West Coast, responding to the sudden collapse of Sacramento River fall Chinook (SRFC) salmon. Because the stocks co-mingle in the ocean, all Chinook salmon ocean fisheries south of Cape Falcon, Oregon, were closed and only a limited hatchery coho salmon fishery of 9,000 in Oregon was allowed. This reduced fishing pressure on Klamath River stocks. NMFS, at the request of the PFMC, convened a scientific investigation of the potential causes of the decline of the SRFC stock and an analysis of the potential depression of other salmon stocks contributing to West Coast ocean salmon fisheries. The findings determined ocean conditions as the proximate cause of the decline.[21] Additionally, the PFMC provided recommendations to NMFS in September 2008 for a plan to rebuild Klamath River fall Chinook salmon, for which an "overfishing concern" had been triggered in 2007. If a stock becomes subject to overfishing, MSA section 304(e)[22] requires fishery managers to end overfishing and to specify a strategy to rebuild the stock to a sustainable level within a certain time frame. Until a final rebuilding plan is approved for implementation by the Secretary, pending further analysis and public review, the Council has been following their recommended rebuilding plan.

[20] Endangered and threatened species: Threatened status for Central California Coast coho salmon Evolutionarily Significant Unit. Federal Register 61 (31 October 1996), pp. 56138-56149.

[21] *What caused the Sacramento River fall Chinook stock collapse*? S. T. Lindley et al. Pre-publication report to the Pacific Fishery Management Council, March 18, 2009.

[22] 16 U.S.C. Section 1854 (e).

The Clean Water Act

Under the Clean Water Act, states are required to establish a priority ranked list of "impaired" waters that do not meet federally mandated water quality standards and the total maximum daily load (TMDL) for certain pollutants.[23] Within the California range of coho salmon, the Klamath River has been identified as an impaired water body.

The TMDL process leads to a 'pollution budget' designed to restore the health of a polluted body of water. The TMDL process provides a quantitative assessment of water quality problems, contributing sources of pollution, and the pollutant load reductions or control actions needed to restore and protect the beneficial uses of an individual water body. The North Coast Regional Water Quality Control Board is in the process of developing TMDLs for the Klamath River in California. Pursuant to a consent decree entered into by the U.S. Environmental Protection Agency, the Klamath River TMDLs are scheduled to be approved by December 2010. A public review draft of the TMDLs was scheduled to be made available June 15, 2009.

The Federal Power Act

The Federal Power Act (FPA) gives resource agencies authority to prescribe or recommend to the Federal Energy Regulatory Commission (FERC) certain conditions for it to include in new hydropower licenses.[24]

FERC re-licensing

PacifiCorp's FERC license for its Klamath Hydroelectric Project, which includes the Iron Gate, Copco I and II, and J.C.Boyle Dams on the mainstem Klamath River, expired on March 1, 2006. Until a new license is issued, PacifiCorp will operate the Project under an annual license with the same terms and conditions of the existing license. Iron Gate Dam currently blocks passage of anadromous fish to any habitat higher in the Basin. The existing license contains no provision for passage of anadromous salmon, steelhead, and lamprey.

[23] 33 U.S.C. 1313(d).

[24] 16 U.S.C. Sections 803(j) and 811.

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Under the authority of the FPA, the Department of Commerce through NMFS, and the Department of the Interior filed with FERC joint preliminary fishway prescriptions for the relicensing of the Project, including volitional fish passage for the Project's dams. FERC is required to include these fishway prescriptions in a new license for operation of the Project.[25] Pursuant to sections 10(a) and 10(j) of the FPA and FERC's licensing regulations, NMFS filed 16 detailed recommendations to improve habitat conditions for anadromous fish in the Klamath River.

In the Project area, the fishway prescriptions would restore access to approximately 58 miles of habitat for Chinook salmon and steelhead, and Pacific lamprey, and improve habitat connectivity for resident redband trout. This includes approximately 46 miles of habitat (mainstem and tributary) for threatened coho salmon. Fish passage could also result in the reintroduction (return) of Chinook salmon, steelhead and lamprey to more than 350 miles of habitat above the Project area and significantly improve the viability of salmonid populations in the Klamath River Basin.

Settlement Discussions

Discussions associated with FERC relicensing of PacifiCorp's hydroelectric Project have brought together for the first time a diverse group of interests to resolve some of the Klamath River Basin's longstanding water resource allocation disputes. The group consists of three counties, several irrigation districts, four tribes, conservation and fishing organizations, and federal and state agencies. Released in January 2008, the proposed Klamath River Basin Restoration Agreement was developed to rebuild fisheries, sustain agricultural communities, and resolve disputes related to the allocation of water resources. Although a fundamental assumption of the Klamath River Restoration Agreement is the removal of the four PacifiCorp dams listed above, these negotiations with PacifiCorp are occurring on a separate, parallel course. In November 2008, an Agreement in Principle between PacifiCorp, the federal government, the State of Oregon, and the California Natural Resources Agency was released. This Agreement memorializes broad principles designed to function as a framework for the development of a final agreement related to removal of these dams starting in 2020 and will specify the procedures, timetables, agency and legislative actions, and other steps to do so. The voluntary and dedicated efforts by private, non-profit and public entities joining together in full partnership to craft mutually agreeable, comprehensive solutions to challenging resource conflicts represents an outstanding illustration of cooperative conservation in the Klamath River Basin.

Research and Monitoring Recommendations of the National Research Council

The NRC, as part of the National Academies, formed a Committee in 2001 on "Endangered and Threatened Fishes in the Klamath River Basin." A goal of the Committee was to provide input on the current state of knowledge of federal listed fish species in the Basin. The Committee evaluated the strength of scientific support for biological opinions and assessments of listed fish species and made several recommendations. One recommendation specifically identified ways to improve salmon research and monitoring efforts in the Basin. In response to this NRC recommendation, NMFS has focused efforts on the three activities described in this section of the Report.

Klamath River Basin Monitoring, Research and Restoration Planning Efforts

In 2006, federal agencies and other stakeholders in the Klamath River Basin discussed the need for a coordinated, ecosystem-based approach that supports the recovery of species, including salmonids, and sustains the Basin's resources and its

[25] 16 U.S.C. Section 811.

resource-dependent communities. In response, the NMFS-Southwest Region coordinated between federal and state agencies, tribes, local governments, and other stakeholders to develop an approach to monitoring, research, and restoration in the Basin for a variety of species. After gaining formal support from federal resource agencies and Oregon and California's principal resource agencies for the coordinated approach, the project was temporarily suspended in 2007 at the request of participating tribes due to obligations and priorities being generated by the Klamath River Basin settlement discussions mentioned above.

With release of the draft "Proposed Klamath River Basin Restoration Agreement for the Sustainability of Public and Trust Resources and Affected Communities" in January 2008, the NMFS-Southwest Region saw the need to take an expanded role in identifying available data in the Basin on a variety of natural resources, including salmonids, suckers, lampreys, and water quality. NMFS is querying federal agencies, tribes, state agencies, academic and university extension programs, and a variety of key stakeholders representing fisheries, agriculture, power generation, water, local government and environmental interests, on the availability of data useful for monitoring, research and restoration of targeted threatened and endangered species and water quality. The primary mechanism for developing an inventory of current Basin databases is an on-line survey.[26] The goal is to create one data repository to facilitate better coordination of monitoring, research, and restoration in the Basin. This effort will contribute to developing better outcome measures of progress.

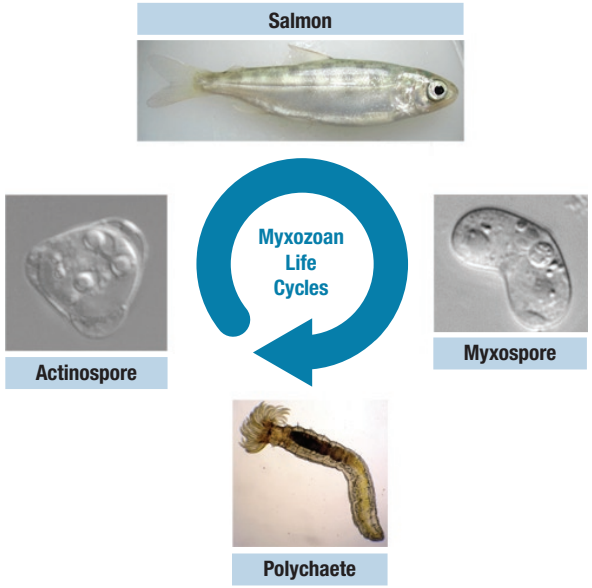
Klamath River Fish Disease Plan

Since 2004, NMFS has sponsored annual Klamath River Fish Health Conferences in cooperation with the USFWS, the BOR, and the U.S. Geological Survey (USGS). The conferences provide a forum for the exchange of current information on fish disease in the Klamath River. Information has primarily focused on research related to the critical disease outbreaks that have caused significant mortality in juvenile salmon in the Klamath River downstream of Iron Gate Dam. Presentations focused on the disease pathogens *Ceratomyxa shasta* (C. shasta), *Parvicapsula minibicornis* (Parvicapsula), and their intermediate host, the polychaete worm, *Manayunkia speciosa* (Exhibit 10). In past years, high rates of infection have likely increased juvenile salmon mortality rates, however the resulting effects of disease mortality on population viability are not well understood at this time.

Participants in the conference have universally expressed concern that fish health research and monitoring are funded on a piece-meal basis and that future funds are uncertain. To address these concerns, the USGS presented an integrated strategic plan for Klamath River fish health research and monitoring. The estimated cost of the research and monitoring is $2 million annually for 10 years ($20 million total). The Klamath River Fish Health Conference has been successful in bringing together agencies, tribes, stakeholders, and the public, and providing a forum for sharing information on fish health issues of the Klamath River Basin. The conference remains an annual event, convening again in the winter of 2009.

Exhibit 10: Life Cycle of C. Shasta and P. Minibicornis.

Life cycle shows release of actinospore stages of both parasites from the polychaete, infection of the salmon, and release of myxospore stages that infect the polychaete. Diagram is courtesy of J. Bartholomew, Oregon State University.



[26] The Klamath Basin Metadata Inventory Project survey is available at: http://watershedexplorer.com/klamath/wiki/index.php?wiki=Index.

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California Coastal Monitoring Plan

NMFS and CDFG are collaborating to develop a comprehensive monitoring plan to evaluate population trends of anadromous salmonids. The Coastal Monitoring Plan is designed to provide information on CESA and ESA listed salmonids for the four VSP parameters—abundance, productivity, spatial structure, and diversity; for freshwater and ocean survival; for freshwater habitat conditions; and for habitat restoration effectiveness. Management decisions are routinely made by both state and federal agencies based on their understanding of these concepts. There is a pressing need for improved salmonid information to better inform these decisions. Sampling will occur in a spatially explicit and balanced way to support flexibility in the analyses of larger or smaller spatial groupings of the data. The biological information from the Plan will be regularly organized by northern and southern areas, ESUs and DPSs, and individual populations, but will support analyses at other scales. The Plan also provides organizational structure to ensure efficient, effective, and timely data flow from the collection phase to central databases for editing and analysis.

Summary

NMFS is committed to further strengthening conservation program partnerships for the recovery of salmonid populations within the Klamath River Basin. Habitat restoration and conservation, along with improved scientific knowledge of the threats to population viability are furthering efforts to recover and restore anadromous salmonids in the Klamath River Basin. Continued commitment to these activities is imperative to restoring the River ecosystem and the communities that depend on it for their livelihood and cultural heritage. Future progress on these efforts will continue to be reported annually to Congress.

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Appendices

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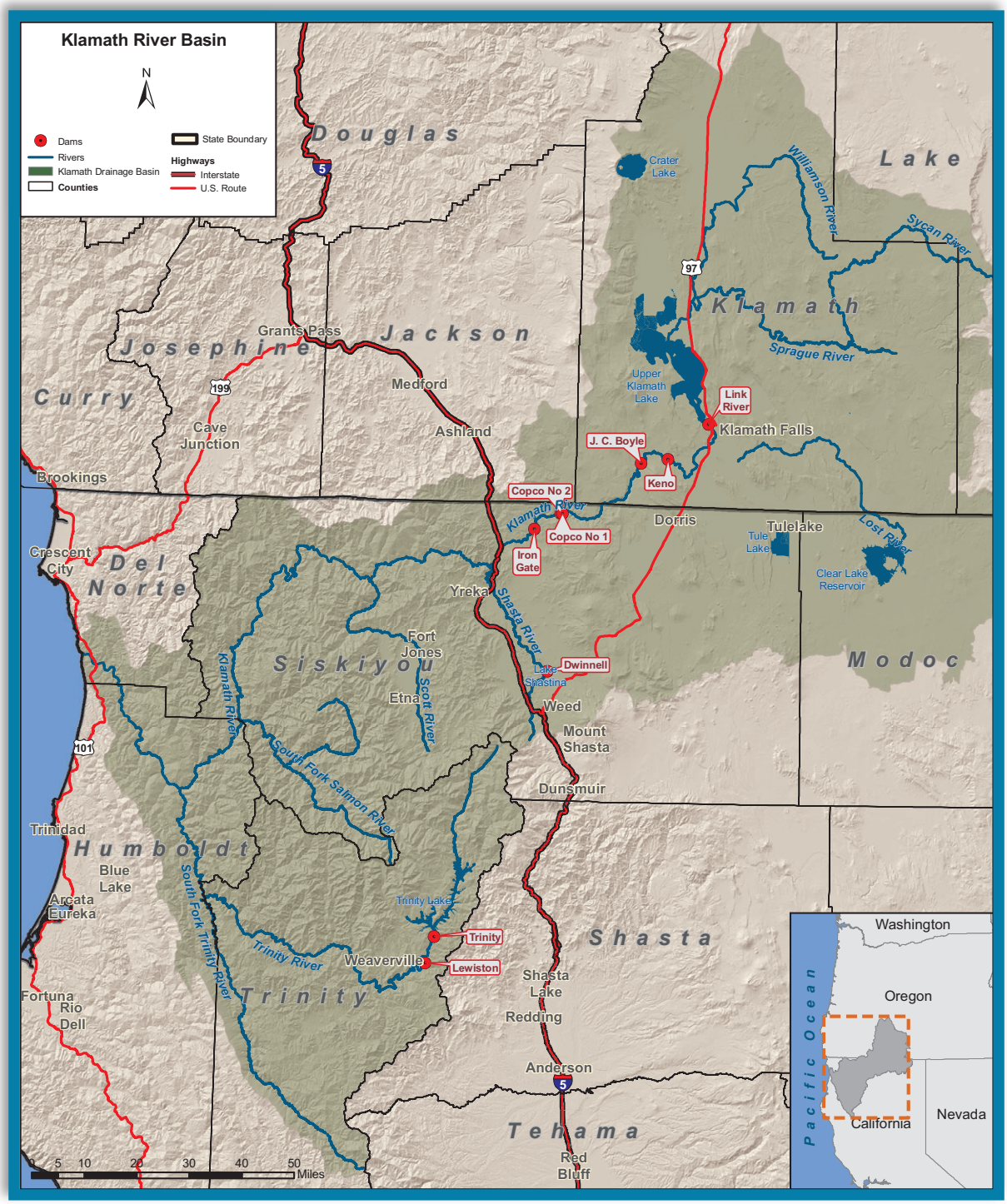
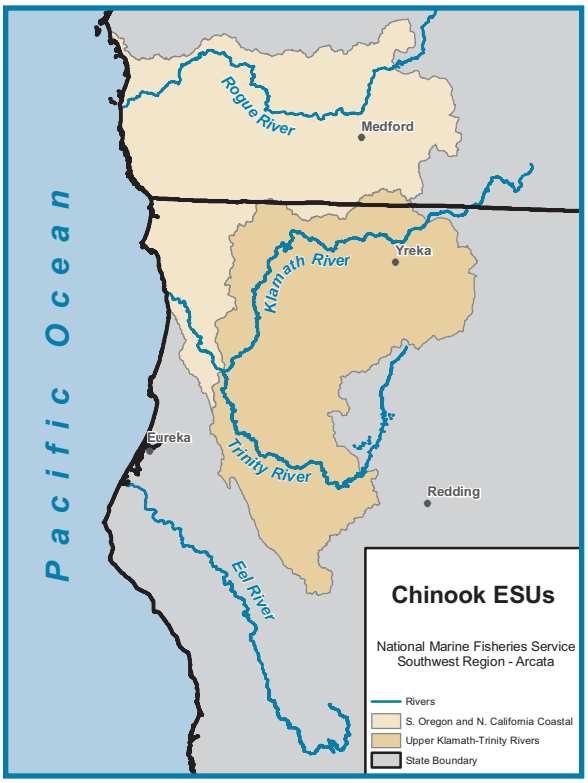
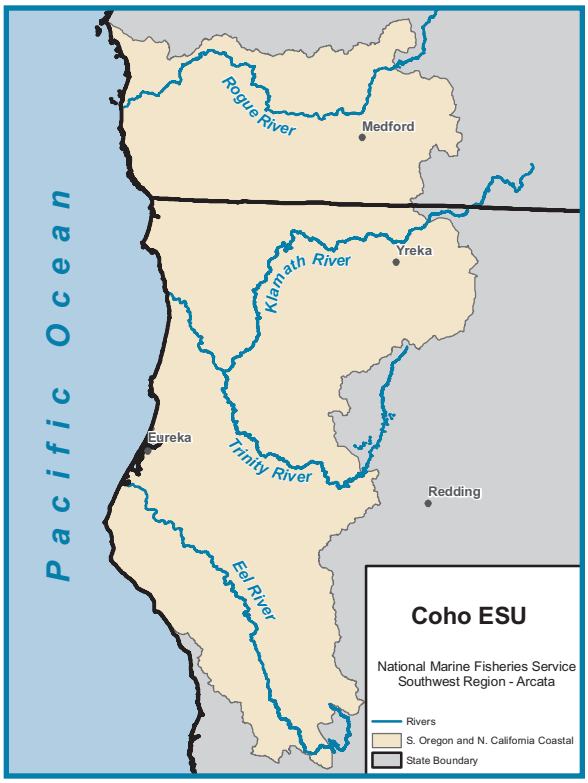
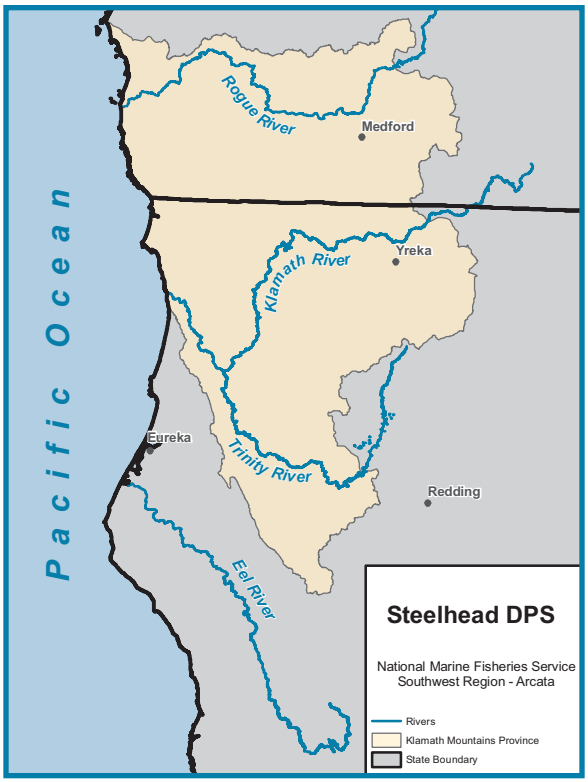
Appendix A: Klamath River Basin Map



Appendix B: Klamath River Basin ESUs and DPSs







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