SPECIES in the SPOTLIGHT
Priority Actions 2021–2025

Central California Coast Coho Salmon
(Oncorhynchus kisutch)
Cover: Juvenile Central California Coast coho salmon, Kingfisher Flats. Photo: David Stafford, NOAA Fisheries.
The *Species in the Spotlight* Initiative

In 2015, the National Marine Fisheries Service (NOAA Fisheries) launched the *Species in the Spotlight* initiative to provide immediate, targeted efforts to halt declines and stabilize populations, focus resources within and outside of NOAA on the most at-risk species, guide agency actions where we have discretion to make investments, increase public awareness and support for these species, and expand partnerships. We have renewed the initiative for 2021–2025.
The criteria for *Species in the Spotlight* are that they are endangered, their populations are declining, and they are considered a recovery priority #1C (84 FR 18243, 4/30/2019). A recovery priority #1C species is one whose extinction is almost certain in the immediate future because of rapid population decline or habitat destruction, and because of conflicts with construction, development, or economic activity.

As of January 2021, the following nine species are our *Species in the Spotlight*.

- Atlantic salmon Gulf of Maine distinct population segment (DPS)
- Central California Coast coho salmon evolutionarily significant unit (ESU)
- Cook Inlet beluga whale DPS
- Hawaiian monk seal
- North Atlantic right whale (added in 2019)
- Pacific leatherback sea turtle
- Sacramento River winter-run Chinook salmon ESU
- Southern Resident killer whale DPS
- White abalone

For some of these species, their numbers are so low that they need to be bred in captivity; others are facing human threats that must be addressed to prevent their extinction. In most cases, we understand the limiting factors and threats to these species, and we know that the necessary management actions have a high probability of success. In some cases, we are prioritizing research to better understand the threats so we can fine-tune our actions for the maximum effect. We know we can’t do this alone. A major part of the *Species in the Spotlight* initiative is to expand partnerships and motivate individuals to work with us to get these species on the road to recovery.

**Priority Action Plans**

The 5-year action plan is part of a strategy to marshal resources for species listed under the Endangered Species Act of 1973 (ESA) for which immediate, targeted efforts are vital for stabilizing their populations and preventing their extinction.

In its first 5 years, the *Species in the Spotlight* initiative has been successful at raising awareness, increasing partnerships, and prioritizing funding—providing or leveraging more than $113 million toward projects that will help stabilize these highly at-risk species.

We renewed the *Species in the Spotlight* initiative for 2021–2025, and have updated the priority action plans that outline what we need to do to prevent their extinction.

The 2021-2025 5-year action plans build upon existing action, recovery, or conservation plans and detail the focused efforts needed over the next 5 years to reduce threats and stabilize population declines. We will continue to engage our partners in the public and private sectors in actions they can take to support this important effort. We will report on our progress through the *Biennial Recovering Threatened and Endangered Species Report to Congress*, and on our *Species in the Spotlight* web pages.

This strategy will continue to guide agency actions where we have the discretion to make critical investments to safeguard these most endangered species. The strategy will not divert resources away from the important and continued efforts to support all ESA-listed species under our authority. Many of our species have long-standing conservation programs supported by multiple partners. We remain committed to those programs.

This action plan builds on the success of the past 5 years and highlights the actions that can be taken by us, other federal and state resource agencies, environmental organizations, Native American tribes, and other partners to work toward turning the trend around for this species from a declining trajectory and toward recovery. We appreciate all of our current partners and collaborators, as the steps we need to take to stabilize these species would not be possible without them.

**NOAA Fisheries Contact**

If you are interested in working with us, or if you have questions about any of the priority actions contained in this plan, please contact: Erin Seghesio, Recovery Coordinator, West Coast Region, Santa Rosa, California, (707) 578-8515, Erin.Seghesio@noaa.gov.
Central California Coast Coho Salmon Status

Central California Coast (CCC) coho salmon were first listed as a threatened species in 1996 and subsequently reclassified as endangered in 2005. At the southern extent of the species’ range, this unique run of coho salmon has teetered on the brink of extinction. Populations reached extremely low levels during the height of California’s recent extended drought (2011–2016), though some have rebounded in the past several years. Nevertheless, all populations remain depressed and well below recovery targets, particularly those in the most southern portion of the ESU, which are highly vulnerable to extinction and dependent on ongoing conservation hatchery programs (Spence 2021, in preparation).

Central California Coast Coho Salmon Key Conservation Efforts/Challenges

Since 2015, NOAA Fisheries has invested in key conservation efforts for CCC coho salmon, including improving habitat quality and expanding conservation broodstock operations. In coordination with our partners, we have enhanced more than 200 stream miles by adding more than 6,000 pieces of large woody debris, providing access to floodplains, and removing fish passage barriers. We have also expanded conservation broodstock programs by establishing new partnerships to capture and rear Garcia River and Navarro River coho salmon. In the Southern Coho Salmon Captive Broodstock program, we have experimented with varying the lifestage that is released. Please see the past two Biennial Recovering Threatened and Endangered Species Report to Congress, and our Species in the Spotlight web pages for further information.

A critical emerging challenge to CCC coho salmon survival and recovery is the increased frequency of severe weather patterns resulting from climate change. California has experienced above-average temperatures since 2012 and well below average precipitation from 2012–2015 and 2017-2018, and in 2020. A series of large atmospheric river storm events during relatively dry winters from 2016–2018 scoured coho salmon reds and large woody debris. Unprecedented wildfires throughout the species’ range have become a significant habitat concern (Figure 1). The Russian River watershed was severely impacted by the 2017 Pocket and Tubbs Fires, the 2019 Kincade Fire, and the 2020 Walbridge Fire. In Santa Cruz County, the 2020 CZU Lightning Complex Fire burned a significant portion of the best remaining habitat for CCC coho salmon south of San Francisco. Fires of this magnitude cause substantial

In coordination with our partners, we have enhanced more than 200 stream miles by adding more than 6,000 pieces of large woody debris, providing access to floodplains, and removing fish passage barriers.

1 CZU refers to the Cal Fire designation for its San Mateo–Santa Cruz Unit, the administrative division for San Mateo, Santa Cruz, and San Francisco counties.
damage to riparian habitat and instream wood shelter, as well as increased landslides and sediment input to streams. Roads and fire breaks cut by bulldozers to access and stop the fire's movement also remove vegetation and can be a source of fine sediment input into streams. The impact of droughts, fires, and flooding on CCC coho salmon habitat will remain for many generations to come. Restoration and additional monitoring of habitat and species response to these events is necessary to repair and re-evaluate how climate-driven processes influence CCC coho salmon's survival and recovery.

In addition to the severe weather and wildfires, and despite substantial restoration efforts toward habitat improvement, CCC coho salmon are still challenged with a lack of instream habitat complexity, access to floodplains, and lack of instream water. As the human population grows, urbanization and rural residential growth will become an even more significant threat to coho salmon and their habitat. The current pace of habitat restoration is not able to keep up with the changing climate and human disturbances. Meanwhile, Conservation Broodstock Programs are being expanded into new watersheds as a stop-gap measure to halt coho salmon population extirpation. We have outlined the following key actions needed in the next 5 years to stabilize the decline of CCC coho salmon: (1) Summit to Sea—Restoration at a Watershed Scale; (2) Improving Instream Flow; (3) Continuing and Expanding Captive Broodstock Programs; (4) Partnering and Outreach; and (5) Monitoring and Research—Dynamic and Changing Landscape.

Figure 1: Recent Wildfires in the Central California Coast coho salmon ESU.
Key Actions Needed 2021–2025

Summit to Sea—Restoration at a Watershed Scale

**Description and Background:** The scale and pace of CCC coho salmon habitat restoration is not meeting the rate of climate change, catastrophic wildfires, multiyear droughts, flooding, and human population growth. Restoring watershed function and the freshwater habitats that coho salmon rely upon to complete their life cycle would provide resilience for the species to buffer the changing climate’s effects. Strategically focused restoration at the ecosystem or larger watershed scale is needed to recover the full range of life history diversity. To stabilize the species’ decline, watershed-scale restoration in the next 5 years should focus on CCC coho salmon Core Areas and address key limiting factors identified in the Final Recovery Plan for Central California Coast Coho Salmon Evolutionarily Significant Unit (Recovery Plan) (NMFS 2012).

**Expected Benefits to the Species:** Watershed-scale restoration improves ecosystem productivity, the survival of coho salmon across all life stages, genetic diversity, and resiliency to landscape disturbances. In addition, it improves socio-economic factors, building a community restoration and recovery network for ecosystem resiliency.

**Source:** Recovery Plan Population-Level Recovery Actions (Vol II) and in the Priority Action Coho Team (PACT) report, Chapter 1 (CDFW and NMFS 2019).

**Location:** Usal Creek, Mendocino County, California, south to and including Aptos Creek, Santa Cruz County, California.

**Partners:** The partnerships between state, federal, public, and private entities are vital to planning, permitting, and implementing restoration throughout the species’ range.

**Current Status:** Shifting from individual restoration actions to a more strategic and coordinated watershed- and ecosystem-scale approach is underway. The Salmon Habitat Restoration Priorities (SHaRP) effort is an example of a multi-agency and stakeholder process that focuses on high-priority actions to restore CCC coho salmon habitat at an ecosystem- or watershed-scale level. Examples of ecosystem-scale initiatives in progress are the Garcia River Estuary Restoration Project and Scott Creek Lagoon and Marsh Restoration Project. Several initiatives to identify and develop watershed-scale actions to develop CCC coho salmon strongholds are outlined below in Partnering and Outreach.

**Resources:** Extensive coordination and long-term funding are needed for watershed- and ecosystem-scale restoration efforts. These types of restoration projects are eligible for California’s Fisheries Restoration Grant Program, which is funded by the Pacific Coastal Salmon Recovery Fund, California Proposition 1 and Proposition 68 funding, and federal grant programs such as the NOAA Restoration Center’s Community-based Coastal and Marine Habitat Restoration Grants.

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2 Core Areas are locations known to have current or recent occupancy of CCC coho salmon according to (a) status reviews conducted prior to the initial listing on October 31, 1996 (61 FR 56138) and (b) data provided by numerous agencies, individuals, and others including the presence/absence database developed by CDFW; and areas identified for immediate focus of restoration and threat abatement actions (NMFS 2012).
Improving Instream Flow

Studies conducted within the CCC coho salmon geographic range show that critically low flows are currently suppressing juvenile survival during summer and early fall (Obedzinski et al. 2018). This threat is expected to intensify under future climate change scenario predictions. Low summer streamflows are caused directly by surface diversions and indirectly by interconnected groundwater extraction via wells for municipal, residential, and agricultural purposes. The vast majority of rivers and tributaries throughout the species’ range have been altered such that they can no longer store the amount of water needed to accommodate both human use and species’ needs. Flow restoration efforts are being developed to restore flows for fish, while providing water supply and regulatory certainty for human needs.

Individual Efforts Highlighted Under This Action

1. Safe Harbor Agreements

Description and Background: NMFS is developing Safe Harbor Agreements that encourage private landowners to augment summer streamflow volume using off-channel water sources. Safe Harbor Agreements are voluntary agreements between private or other non-federal property owners and NOAA Fisheries to implement actions that contribute to the recovery of species. In exchange, participating property owners receive formal assurances that we will not require any additional or different management activities by the participants without their consent.

Expected Benefits to the Species: Elevating instream flow volume will improve juvenile coho salmon summer survival. While projects are currently being developed in urban watersheds, they are also needed within drier watersheds situated near the southern geographic boundary.

Source: Recovery Plan Action: cccc-CCC-4.1.1.4, cccc-CCC-4.1.1.9, and cccc-CCC-5.1.1.1.

Location: We are currently working on three Flow Augmentation Safe Harbor Agreements; on a large private ranch in Porter Creek, Russian River watershed; another to be implemented by a consortium of vineyard owners in Sonoma and Mendocino Counties; and a California coast-wide programmatic agreement that will cover actions by individual landowners throughout the species’ range.

Partners: California Department of Fish and Wildlife (CDFW), California State Water Resources Control Board, California Regional Water Quality Control Board, non-governmental organizations, and private landowners.

Current Status: The Porter Creek Safe Harbor Agreement is in final review and will likely be issued by the end of 2020. The other two Safe Harbor Agreements are ongoing with expected completion in 2022.

Resources: Grants to assist private landowners with developing augmentation projects and monitoring their success would benefit these efforts by expanding the number of participants under the Safe Harbor Agreements, especially for the ESU-wide programmatic agreement.

Irrigation Farm Pond on San Gregorio Creek to reduce impacts of dry season pumping on salmonids. Photo: Erin Seghesio, NOAA Fisheries.
2. Sustainable Groundwater Management Act

**Description and Background:** California's 2015 Sustainable Groundwater Management Act (SGMA) requires over-drawn groundwater basins throughout California to develop and implement Groundwater Sustainability Plans that achieve sustainability by 2042. Per SGMA, achieving sustainability requires avoiding specific “undesirable results” defined in the regulations, one of which is streamflow depletion caused by groundwater extraction. We have been actively engaged in the Groundwater Sustainability Plan development process, emphasizing groundwater management criteria that adequately protect anadromous salmonids from streamflow depletion impacts.

**Low summer streamflow is a significant threat to the over-summer survival of CCC coho salmon juveniles.**

**Expected Benefits to the Species:** Minimizing streamflow depletion impacts resulting from groundwater pumping will appreciably improve instream flow volumes during the summer and early fall months when streamflows are naturally at their lowest. Low summer streamflow is a significant threat to the over-summer survival of CCC coho salmon juveniles.

**Source:** Recovery Plan Action cccc-CCC-4.2.1.1 and cccc-CCC-4.2.1.4, cccc-CCC-4.2.1.5, cccc-CCC-25.1.1.7.

**Location:** Groundwater Sustainability Plans are currently being produced for the Ukiah Valley and Santa Rosa Plain basins within the Russian River watershed and the Mid-County basin in Santa Cruz County (which underlies portions of Branciforte, Soquel, and Aptos creeks).

**Partners:** CDFW, Department of Water Resources, various environmental groups, and the local Groundwater Sustainability Agencies.

**Current Status:** Final Groundwater Sustainability Plans must be submitted to the Department of Water Resources by January 2022, at which time they will review the plans for consistency with SGMA regulations. Reviews are expected to take upwards of 2 years.

**Resources:** No resources are needed to continue our engagement in the Groundwater Sustainability Plan development process. Completed plans are expected to include groundwater recharge projects. Restoration funding could encourage these projects to be “multi-benefit,” allowing for raised groundwater levels, improved salmonid winter rearing habitat, and reduced downstream flooding risk.
3. San Mateo Resource Conservation District’s Water for Farms, Fish and People

Description and Background: This initiative constructs, repairs, enhances, and restores farm ponds and other water retention features for various environmental, salmonid, agricultural, and economic benefits. The ponds capture and store rainwater and runoff during high flow events. The farmers can then use this stored water during the irrigation season when the streams have the least amount of water.

Expected Benefits to the Species: The ponds result in more water in streams during the dry season when it is most critical for CCC coho salmon survival. Increased streamflow is especially important during droughts, which are expected to become more frequent with climate change.

Source: Recovery Plan Action cccc-CCC-4.1.1.5 and cccc-CCC-4.1.1.7.

Location: Streams within San Mateo County.


Current Status: Ongoing, seven ponds have been completed to date.

Resources: Ongoing funding is needed to support pond planning, permitting, and implementation.
Continue and Expand Captive Broodstock Programs

Captive Broodstock Programs utilize traditional hatchery programs to: (1) temporarily rear and enhance the survival of captured wild fish for release or (2) improve the populations’ genetic diversity, abundance, and fitness via spawning guided by NOAA geneticists. Since Captive Broodstock Programs were instituted in 2001, increases in the number of ocean-returning adults and naturally spawned offspring have been observed in target populations and colonizing once-extirpated watersheds.

Individual Efforts Highlighted Under This Action

1. Russian River Coho Salmon Captive Broodstock Program

Description and Background:
The program has successfully increased adult returns to the Russian River from only 10 adults in 2001 to nearly 1,000 adults in 2020, with natural reproduction occurring in most tributaries. With support and guidance from NOAA's Southwest Fisheries Science Center (SWFSC), regional expansion of the program to other CCC coho salmon populations (i.e., Scott and Redwood Creeks, and Garcia and Navarro Rivers) has facilitated recovery stocking efforts in various watersheds across the species’ range from Mendocino to Santa Cruz counties.

Conservation-based captive broodstock programs can provide the needed boost in numbers, distribution, and genetic fitness as unoccupied habitats are restored and threats are abated.

Expected Benefit to the Species: Conservation-based captive broodstock programs can provide the needed boost in numbers, distribution, and genetic fitness as unoccupied habitats are restored and threats are abated. The intent of the programs is to prevent extinction and improve genetic diversity by supplementing coho salmon population numbers or reintroducing extirpated populations or year classes.
Species in the Spotlight: Central California Coast Coho Salmon  |  PRIORITY ACTIONS: 2021–2025

Source: Recovery Plan Action cccc-CCC-10.4.1.2, cccc-CCC-10.4.1.5, cccc-CCC-17.1.1.2, coas-CCC-10.3.1.1, coas-CCC-10.3.1.2, coas-CCC-10.3.1.6, RR-CCC-10.1.1.1, RR-CCC-10.1.1.5, and PACT RR-1.

Location: Don Clausen Fish Hatchery, Geyserville, California.

Partners: U.S. Army Corps of Engineers (USACE), CDFW, SWFSC, California Sea Grant, Sonoma Water, U.S. National Park Service, Marin Municipal Water District, North Coast Regional Water Quality Control Board, non-profit organizations, and private landowners.

Current Status: Funding and capacity (250,000 juveniles and 1,700 adults, with planned increased incubation capacity to 500,000 eggs) for the Russian River program is provided by the USACE. Evaluation surveys, genetic management, and smolt stocking are conducted via requirements within a Section 7 Biological Opinion with the USACE. A Hatchery Genetic Management Plan and a Technical Advisory Committee provides strategic guidance for annual rearing and release elements.

Resources: This program requires a significant commitment of resources to provide adequate staffing, land, equipment, electricity, water, and water cooling, as well as genetic management, research, and monitoring. The USACE provides operating costs of $1.5 million annually (including personnel), and recent updates for incubation and water quality treatment ($750,000). We have provided matching funding for numerous partner groups (see Partners).

2. Southern Coho Salmon Captive Broodstock Program

Description and Background: As a result of the extensive decline and extirpation of coho salmon populations south of San Francisco, the Southern Coho Salmon Captive Broodstock Program was initiated in 2002 to preserve remaining CCC coho salmon genetics and to restore impacted populations. Since 2002, changes have been made to increase program performance, including: (1) adjustments to the husbandry and spawning protocols for captive broodstock, (2) outbreeding with neighboring coho salmon populations to counter increasing rates of relatedness, and (3) implementation of various juvenile coho salmon release strategies. These changes have resulted in improved freshwater survival of juvenile fish released, occurrence of natural-origin juvenile coho salmon in nearby non-program watersheds, and record spawning, egg collection, and fry production in 2020. Monitoring of the program includes: (1) collecting broodstock individuals from regional streams, (2) tagging (PIT-tag) of juvenile fish prior to release, and (3) performing genetic screening of program fish to inform annual spawning matrices. In addition, the continued operation of the Lifecycle Monitoring Station in Scott Creek provides estimates of freshwater and marine survival, the rate and timing of migration, and information on occupancy and distribution.

Expected Benefit to the Species: The program is necessary to preserve and recover CCC coho salmon populations south of San Francisco.

Source: Recovery Plan Action cccc-CCC-10.4.1.5, ScC-CCC-10.1.1.6, ScC-CCC-10.1.2.1, PACT-SSF-2.

Location: The program operates at three facilities. The primary facility, Kingfisher Flat Conservation Hatchery, is located in the Scott Creek watershed, Santa Cruz County. Captive broodstock are also held at the SWFSC and the Don Clausen Fish Hatchery.

Juvenile coho salmon. Photo: Eric Ettlinger, Marin Municipal Water District.
Partners: Monterey Bay Salmon and Trout Project, SWFSC, CDFW, Big Creek Lumber Company, University of California Santa Cruz, California Polytechnic State University, local municipalities, Resource Conservation Districts, non-governmental organizations, and private landowners.

Current Status: The annual maximum production capacity for the program is below what is needed for recovery, at approximately 65,000 juveniles and 380 adult broodstock. While the adjustments have improved program operations and in-hatchery survival, returns of program adult coho salmon to Scott Creek overall have remained low in the past 5 years. This period has encompassed a series of catastrophic habitat disturbances including the end of the 2012–2016 drought, the return of warm ocean temperatures in the northeast Pacific Ocean in 2019, and most recently the CZU Lightning Complex Fire in August 2020. This fire resulted in extensive damage to outdoor facilities and equipment at Kingfisher Flat hatchery as well as instream monitoring equipment used to evaluate the program.

Resources: The annual cost for the program is approximately $750,000, which includes operation and some of the monitoring costs. Notwithstanding the annual operational costs, an additional $500,000 is needed to repair and modernize Kingfisher Flat hatchery following the fire. Dedicated funding is needed to continue the program beyond 2022, and to expand and adjust the existing monitoring program to better track the program’s performance.

Partnering and Outreach

Recovery of CCC coho salmon will depend on our partners’ dedication and support, especially because most of the land (approximately 85 percent) in the CCC coho salmon’s range is privately owned. Developing and nurturing strategic alliances with private landowners, concerned citizens, various state and federal agencies, local governmental groups, and non-governmental organizations are essential for coho salmon recovery. Strong collaborations also help facilitate the dissemination of information regarding coho salmon recovery priorities and actions to a broad array of interested parties.

Individual Efforts Highlighted Under This Action

1. New Regional Conservation Hatchery for Coho Salmon South of San Francisco

Description and Background: The Kingfisher Flat hatchery is located in a narrow, forested canyon, which limits physical expansion; the current water supply is also limited. In addition, the geographic location is in constant threat of natural hazards including tree fall, floods, and wildfires. In 2009 and again in 2020, the Scott Creek watershed was at the center of a major wildfire that nearly destroyed the hatchery. Additionally, water treatment systems at the hatchery are inadequate to fully minimize the risk of fungal outbreaks and disease. While the current use of two ancillary facilities offers some protection from these hazards, it also increases operational costs and logistics. Recognizing the limitations and precarious nature of the current hatchery location, NOAA Fisheries and CDFW have determined that a new regional conservation hatchery is necessary for the successful recovery of coho salmon populations south of San Francisco. The new hatchery would replace and consolidate coho salmon production at Kingfisher Flat and its ancillary facilities and enable NOAA Fisheries and CDFW to meet production targets necessary for recovery.

Expected Benefits to the Species: A new hatchery with an annual production capacity of 250,000 to 300,000 smolts would meet the goals of the program to protect and maintain remaining genetic diversity south of San Francisco, and help recover the nine populations in the Santa Cruz Mountains. A new regional hatchery would also provide space for expanded research, education, and public outreach opportunities that, collectively, will strengthen local partnerships and improve progress toward species recovery.

Location: Watersheds of the Santa Cruz Mountains from and including San Gregorio Creek, south to and including Aptos Creek.

Partners: CDFW, SWFSC, NOAA Restoration Center, County and City of Santa Cruz, California Polytechnic State University, Resource Conservation District, private landowners, academia, non-governmental organizations, and all interested parties.

Recovery of CCC coho salmon will depend on our partners’ dedication and support.

Current Status: Ongoing. In 2016 CDFW, NOAA Fisheries, and SWFSC formed a technical team to investigate and develop plans for a new conservation hatchery south of San Francisco. The technical team developed estimates of fish production necessary to meet recovery targets and of the water supply necessary for this production, and coordinated with local partners to identify and visit multiple sites within the Santa Cruz Mountains that might support a new regional conservation facility.

Resources: Next steps include securing funding for site assessments and a feasibility study, and eventually for design, permitting, and construction costs for the new facility. While precise cost estimates will vary depending on site selection and environmental characteristics, we anticipate that up to $25 million will be necessary to accomplish these initial steps. Private-public partnerships will likely be necessary for acquiring the land and funds necessary for the construction and operational costs of a new hatchery.

2. Mendocino Coho Salmon Supplementation Program Partnership

**Description and Background:** As a result of historically low diversity stratum adult abundances and concerns regarding potentially missing year-classes, in 2018 the partnership started collecting juvenile coho salmon from the Navarro and Garcia Rivers and bringing them to rear at the Don Clausen Fish Hatchery to advance their survival.

**Expected Benefits to the Species:** This program will improve the abundance of southern coastal Mendocino coho salmon populations by reducing early life stage mortality. The program also reduces the risk of CCC coho salmon population extirpations by increasing genetic diversity and spatial distribution, supporting ESU health amongst the northern CCC coho salmon populations.

**Source:** Recovery Plan Actions: cccc-CCC-10.4.1.1, GR-CCC-10.1.1.5, GR-CCC-10.1.1.6, GR-CCC-10.1.1.7, GR-CCC-10.1.3.1, NaR-CCC-10.1.2.1, and PACT CMC-1, CMC-2.

**Location:** Garcia and Navarro Rivers, Mendocino County, California.


**Current Status:** To date, three year-classes of coho salmon have been captured and are being raised to adulthood. The release strategy includes using a breeding matrix to guide which pairs of adults are released together back into the Navarro and Garcia Rivers to spawn naturally. Additionally, the partnership is exploring the use of Remote Site Incubators to increase the potential effectiveness of the program via acclimation and imprinting of early life stage releases to various tributaries in the watersheds.

**Resources:** Without this partnership, funding, land access, outreach, technical assistance, collection of coho salmon, and rearing of coho salmon in the hatchery would not be possible. The Nature Conservancy and The Conservation Fund have a cost-share agreement in place with the USACE for hatchery rearing ($10,000/year), while the SWFSC provides genetic management for the program. CDFW and other partners provide survey and capture efforts, with continued landowner access and support from Mendocino Redwood Company and The Conservation Fund. Monitoring is accomplished through existing efforts of CDFW, which conducts life-cycle monitoring spawner and redd counts via state and federally funded grants.

Mendocino Coho Salmon Supplementation Program Partnership collecting Central California Coast coho juvenile salmon from the Garcia River. Photo: Jennifer Carah, The Nature Conservancy.
3. Salmonid Habitat Restoration Priorities (SHaRP) Partnership

Description and Background: SHaRP is a successful, collaborative, data-driven process used to develop near-term (10 years) restoration recommendations at the watershed level (HUC-12). Partners collaborate to rank limiting factors within the watershed, then develop a priority plan, including reach-scale restoration treatments.

Expected Benefits to the Species: The SHaRP process is guided by the principle of focusing limited salmonid recovery dollars in watersheds with the highest potential for recovery, then building out restoration partners and funding for these core areas. This action is directly tied to the action: Summit to Sea: Restoring a Watershed.

Source: Recovery Plan Assessment of Protective Efforts (Vol I: Chapter 5), and Actions, Costs, Implementation (Vol. 1 Chapter 9).

Location: SHaRP is currently being implemented in Lagunitas Creek, Russian River, and throughout Mendocino County streams. The program could be expanded to include other priority watersheds, such as in the Santa Cruz Diversity Stratum, especially in the wake of the recent CZU Lightning Complex Fire.

Partners: NOAA Restoration Center, CDFW, Resource Conservation Districts, National Park Service, non-governmental organizations, water districts, timber companies, agricultural and private landowners, and federal, state, and local agencies.

Current Status: Ongoing. Initial Restoration Priority Plans are expected to be finalized in 2021–2022.

Resources: The continuation of SHaRP relies on in-kind funding resources. CDFW has contributed staff resources as part of their North Coast Salmon Project Initiative. Restoration funding will be needed to implement the priority restoration plans. Potential sources include federal and state funds, and the NOAA Restoration Center’s Community-based Coastal and Marine Habitat Restoration Grants.
Monitoring and Research—Dynamic and Changing Landscape

Description and Background:
The continuation and strategic expansion of monitoring and research remain priorities as they will: (1) increase our understanding of species’ status, life history, and adaptation to intense disturbance regimes; (2) allow for innovation and adaptation of conservation broodstock programs; (3) identify the scope and magnitude of restoration actions needed to abate existing and future threats across a changing landscape; and (4) strengthen and expand our collaboration with partners and capacity for recovery. Research, specifically conducted by the SWFSC, has made significant contributions to our understanding of coho salmon biology, genetic structure, and ecology—the life history of a species at the southernmost extent of its range. The collective body of research also includes studies on: (1) marine survival; (2) patterns of fish movement and recolonization within and among recovery basins; (3) the efficacy of coho salmon reintroduction strategies such as optimization of life stage releases and locations; and (4) the influence of changing climate on streamflow, lagoon temperature regimes, and access of coho salmon to and from the ocean.

Expected Benefits to the Species:
Dedicated monitoring and research provides the demographic, life history, and genetic data required to make informed decisions and adaptively manage populations in real time. This level of involvement and stewardship is critical to guarantee viability and recovery, especially now in the face of unprecedented and catastrophic disturbances of wildfires, warming ocean conditions, and extreme drought. Tracking species response through these disturbances and adaptively managing our conservation initiatives will improve our ability to alter monitoring strategies and target more resilient habitats through restoration. In addition, long-term trend monitoring is
necessary to validate responses to restoration and track population trajectory on watershed scales. Intensively Monitored Watersheds in the Pacific Northwest monitor fish population responses to restoration actions and provide evidence of restoration effectiveness. This approach has improved the understanding of the fish-habitat relationships.

**Source:** Recovery Plan Monitoring Chapter (Vol I: Chapter 11). In addition, the framework for the California Monitoring Program (CMP) developed by CDFW and NOAA Fisheries is outlined in Fish Bulletin 180 (Adams et al. 2011).

**Location:** Usal Creek, Mendocino County, California, south to and including Aptos Creek, Santa Cruz County, California

**Partners:** SWFSC and CDFW are assisted in monitoring and research across the species range by numerous public and private entities such as Sonoma Water, California Sea Grant, U.S. National Park Service, University of California Santa Cruz, Resource Conservation Districts, Marin Municipal Water District, Pacific States Marine Fisheries Commission, the County and City of Santa Cruz, non-governmental organizations, and regional timber companies.

**Current Status:** Lapses in funding have resulted in the interruption or discontinuation of several essential monitoring programs; whether they will be resumed remains uncertain (e.g., Santa Cruz Mountains Diversity Stratum and populations along the Mendocino Coast).

**Resources:** Monitoring to assess the viability of state and federally listed salmonids has operated under the CMP. Funding for the CMP has been made available, in large part, through the federal funds are administered by CDFW. Annual cost for monitoring CCC coho salmon populations is estimated at $4 to 6 million, with an additional $4 to 6 million for critical research. Dedicated funding is also needed to develop and implement a series of Intensively Monitored Watersheds as well as a habitat monitoring component for the CMP. The CMP would also benefit from having a dedicated full-time employee to support needed communication and coordination among CDFW, WCR, and the SWFSC. CDFW and NOAA Fisheries acknowledge the funding challenges and continue to collaborate on CMP priorities and examine funding opportunities with non-federal partners.

**References**


Back cover: Ben White, U.S. Army Corps of Engineers, releases juvenile coho salmon into Walker Creek. Photo: U.S. Army Corps of Engineers.