

Priority Action Coho Team: Strategic Partnering to Accelerate Central California Coast Coho Salmon Recovery



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List of Acronyms and Abbreviations

AB	Assembly Bill
BMPs	Best management practices
BO	Biological opinion
BOF	Board of Forestry
CALFIRE	California Department of Forestry and Fire Protection
CalTrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CEERF	California Environmental Round Table
CESA	California Endangered Species Act
CAMP	Campaign against Marijuana Planting
CTM	Campbell Timberland Management
CatEx	Categorical exclusion
CCC	Central California Coast
CD	Consistency determination
CORPS	U.S. Army Corps of Engineers
DA	District Attorney
ESA	Endangered Species Act
EPA	Environmental Protection Agency
HER	Erosion hazard rating
ESU	Evolutionarily Significant Unit
FRGP	Fisheries Restoration Grant Program
FPR	Forest Practice Rules
ITP	Incidental Take Permit

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LSAA	Lake and Streambed Alteration Agreement
LWD	Large woody debris
MOU	Memorandum
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA RC	NOAA Restoration Center
OLE	Office of Law Enforcement
PACT	Priority Action Coho Team
PRD	Protected Resources Division
RGP	Regional General Permit
RWQCB	Regional Water Quality Control Board
RPE	Regulation, Permitting, and Enforcement
SVRCD	Shasta Valley Resource Conservation District
SONC	Southern Oregon/Northern California
SWRCB	State Water Resources Control Board
SusCon	Sustainable Conservation
TNC	The Nature Conservancy
THP	Timber harvest plan
TU	Trout Unlimited
TWG	Technical Working Group
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WLPZ	Watercourse and Lake Protection Zone

Executive Summary

The *Priority Action Coho Team (PACT)* is a joint initiative of the California Department of Fish and Wildlife (CDFW) and the National Oceanic and Atmospheric Administration (NOAA Fisheries). The main goals of PACT are to prevent further extirpations of Coho Salmon populations in coastal watersheds in the Central California Coast Evolutionarily Significant Unit (CCC ESU) and to implement actions that will eventually lead to population recovery. This report outlines the PACT strategy and lists a wide range of proposals to promote the recovery of Coho Salmon populations in CCC ESU coastal watersheds. These proposals were made as part of the PACT initiative by six technical working groups (TWGs), comprising agency staff and representatives from other stakeholder groups.

The PACT recommendations were specifically designed to expeditiously identify and implement the highest priority actions needed to avoid further extirpations and accelerate the recovery of Coho Salmon populations in Central California Coast watersheds. The implementation of the recommendations included in this report will involve the coordination of State, Federal, and local agency representatives and diverse private sector stakeholders involved in Coho Salmon recovery. The PACT strategy builds on both State and Federal Coho Salmon recovery plans and provides a combined focused approach to implementing priority recovery actions common to both plans.

The PACT strategy was initiated in 2011 by CDFW and NOAA Fisheries in response to declining populations of Coho Salmon in coastal watersheds in the Central California Coast Coho Salmon Evolutionarily Significant Unit. Coho Salmon in the CCC Coho Salmon ESU are listed as endangered under both the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). The most adversely affected areas are coastal watersheds south of San Francisco Bay, where most Coho Salmon populations are either extirpated or are extremely low in abundance and may be approaching extirpation. The primary goal of the PACT initiative is to identify and

implement immediate, short-term, high priority actions to accelerate recovery and prevent further extirpations of CCC ESU Coho Salmon populations.

The development of the PACT strategy was overseen by a joint-agency coordination group and a management committee who directed the activities of six technical working groups (TWGs). The membership of the six TWGs included representatives from CDFW, NOAA Fisheries, and various stakeholder groups, including representatives from State and Federal agencies, environmental groups, land and water managers, sport fishing interests, and landowners. The six TWGs each developed a set of recommendations intended to prevent further population extirpations and to assist with recovery of Coho Salmon in coastal watersheds in the CCC ESU.

The focus and goals of the six TWGs were as follows:

1. *Habitat Restoration and Protection TWG* - to develop a list of priority instream and riparian habitat restoration projects, taken from CDFW and NOAA Fisheries Coho Salmon recovery plans and strategies, to be strategically implemented in identified CCC Coho Salmon ESU watersheds;
2. *Captive Rearing and Rescue TWG* – to 1. develop a framework for captive rearing of selected Coho Salmon populations in the CCC Coho Salmon ESU to prevent further extirpations and to preserve genetic integrity, and 2. create a fish rescue protocol for CCC Coho Salmon;
3. *Instream Flow and Conservation TWG* – to develop a list of actions that will result in immediate benefits to stream flow and water quality conditions in CCC Coho Salmon ESU watersheds;
4. *Regulations, Permitting and Enforcement TWG* – to identify opportunities that will facilitate efficient permitting of restoration projects and improvements to regulatory mechanisms (i.e., permits and law enforcement) on high priority issues adversely affecting extant populations of CCC Coho Salmon and their habitat;
5. *Funding TWG* – to identify a list of potential funding sources available for Coho Salmon recovery programs in the CCC Coho Salmon ESU;

6. *Education, Outreach & Media Interaction TWG* – to develop activities and materials to promote outreach and education regarding CCC Coho Salmon and PACT activities.

Since PACT was initiated, considerable progress has been made in implementing the various TWG recommendations to recover CCC Coho Salmon populations in coastal watersheds north and south of San Francisco Bay. For example, this includes the following activities;

- Restoring and improving stream and estuarine habitat in coastal watersheds, such as Scott Creek, Santa Cruz County, and the Russian River, Sonoma County
- Improving stream conditions to allow for improved fish passage to upstream spawning and rearing areas in coastal watersheds, such as Scott Creek and the San Lorenzo River.
- Improving stream flow and water quality conditions in affected coastal watersheds
- Installing large woody debris in coastal streams, such as Scott Creek and San Vicente Creek, to provide enhanced shelter for juveniles and adults
- Reducing sediment erosion from riparian and road sediment sources in the San Lorenzo River
- Improving fish access to floodplain habitat, such as by breaching old levees in the lower riparian reaches of Scott Creek
- Active management of estuaries and lagoons, such as Pescadero Creek and the Russian River, to improve environmental conditions and prevent fish mortalities,
- Conducting fish rescues in drought affected streams, such as Redwood Creek, and relocating fish to more suitable hatchery or stream environments
- Improvements in the operation of Warm Springs Conservation Hatchery, Sonoma County, and the Kingfisher Flat Conservation Hatchery, located on Big Creek in Santa Cruz County

- Evaluating the release of surplus adult Coho Salmon from Warm Springs Hatchery into Walker Creek and Salmon Creek to help reestablish populations
- Collection of two broodyears from Southern Coastal Mendocino watersheds for genetic analysis, and the development of a Technical Advisory Committee to evaluate and identify release strategies
- Joint agency planning for a new Coho Salmon Conservation Hatchery, to be located south of San Francisco Bay
- Streamlining of permitting and regulatory requirements for habitat restoration and improvement projects, water supply, forest management etc.
- Development of education and outreach materials for public and stakeholder involvement
- Implementing '*Low Flow Fishery Closure Regulations*' in the Russian River and North Central Coastal streams

In addition, numerous other recovery actions have been developed, are planned or are already underway, to accelerate the recovery and prevent further extirpations of Coho Salmon populations in CCC coastal watersheds. These recovery actions will be guided by the many recommendations developed by the PACT TWGs, which are outlined in this report.

Introduction

The natural geographic range of Coho Salmon (*Oncorhynchus kisutch*) in California includes mostly coastal watersheds extending from the Oregon border south to Santa Cruz County, and historically included streams draining into San Francisco Bay. Two distinct units of Coho Salmon have been defined in California, the Southern Oregon/Northern California Coast Coho Salmon Evolutionarily Significant Unit (SONCC Coho Salmon ESU) and the Central California Coast Coho Salmon Evolutionarily Significant Unit (CCC Coho Salmon ESU). Coho Salmon populations throughout California have declined considerably over recent years, with the CCC Coho Salmon ESU being in a particularly dire condition, with many historical populations now extirpated (i.e. locally extinct) and many others also threatened with extirpation (CDFG 2004; CDFW 2015; Williams et al. 2016).

Coho Salmon in the Central California Coast ESU are listed as endangered under both the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). A recent status report by NOAA Fisheries (Williams et al. 2016), stated; *“Central California Coast ESU Coho Salmon populations are well below recovery targets... the status of Coho Salmon in the Santa Cruz Mountain Stratum is especially dire, and the entire ESU continues to be in danger of extinction”*. Additionally, in 2015, CCC Coho Salmon was one of eight species listed nationally by NOAA Fisheries as a ‘*Species in the Spotlight*’, identifying this species as among the most at risk of extinction (NMFS 2015).

Many, if not most, populations of Coho Salmon in coastal streams south of San Francisco Bay are already extirpated or close to extirpation. The endangered status of CCC Coho Salmon means that, without immediate intervention, many populations across the entire CCC Coho Salmon ESU could reach such low levels as to be beyond their ability to recover naturally. Consequently, there is an urgent need to identify recovery actions that can yield immediate benefits to recover CCC Coho Salmon populations and prevent further extirpations. It is acknowledged by both CDFW and NOAA Fisheries that to avoid the extinction of CCC Coho Salmon it will be necessary to

expedite the implementation of identified actions to improve the probability of survival across all freshwater life-stages. These actions may include but are not limited to: 1) captive rearing and release of juvenile Coho Salmon, 2) prioritization and restoration of freshwater and estuarine habitats, 3) improving water quality and stream flow conditions in affected watersheds; and 4) furthering understanding of population status through biological monitoring. Statutory and policy-related issues, such as fishing regulations, are also currently under discussion and consideration by agencies.

To further develop and implement these actions, in September 2011 CDFW and NOAA Fisheries jointly initiated the *Priority Action Coho Team (PACT)* recovery strategy. The main aims of PACT are to prevent further local extinctions and to accelerate the recovery of Coho Salmon populations in coastal watersheds in the Central California Coast, ranging from Santa Cruz County in the south to Mendocino County in the north. The PACT strategy outlined in this document utilizes and builds upon both the *Recovery Strategy for California Coho Salmon*, released by CDFW in 2004, and the *Recovery Plan for the Evolutionarily Significant Unit of Central California Coho Salmon*, released by NOAA Fisheries in 2012.

Both recovery plans acknowledge the likelihood that, owing to the severely depleted status of most Coho Salmon populations in California's streams and rivers, complete recovery leading to delisting of the species is likely to be a long-term process requiring a broad range of recovery actions. In comparison, the PACT strategy identifies numerous priority short-term implementation actions, developed by agency scientists and stakeholders, which when implemented are expected to accelerate the recovery of Coho Salmon populations in coastal watersheds and so prevent further population extirpations, while also contributing to ongoing long-term recovery efforts.

The many recommendations described in this report were developed by six Technical Working Groups (TWGs), comprised of both agency staff and stakeholders. The PACT initiative was overseen by a joint-agency Management Committee and a Coordination Group. The Management Committee consisted of senior program managers and

administrators from the offices of CDFW and NOAA Fisheries who provided the final approval to PACT documents and the recommendations of the Coordination Group and TWGs. The Coordination Group consisted of senior fisheries managers and Coho Salmon recovery coordinators from CDFW Bay Delta Region, CDFW Fisheries Branch, and NOAA California Programs and North Central Coast Office. The Coordination Group provided technical guidance to the TWGs, reviewed proposed recommendations, provided feedback, encouraged local and private sector initiatives, and presented CDFW and NOAA Fisheries recommendations to the Management Committee.

The six TWGs each had two co-leads, including one representative from CDFW and one from NOAA Fisheries. Additional agency staff who were also assigned to each TWG are referred to in this report as core TWG representatives. Representatives from various stakeholder groups, who were also invited to join each TWG, provided valuable contributions and insights, many of which were included in the final TWG reports and PACT plan. This progress report lists the goals, objectives and recommendations of the six TWGs, each of which provided a range of proposals to accelerate Coho Salmon recovery in CCC coastal watersheds. The TWG proposals are listed, where applicable, by watershed and geographic region.

The main objectives of the six PACT TWGs are summarized below:

1. *Habitat Restoration & Protection TWG* – to develop a list of priority instream and riparian habitat restoration projects, taken from CDFW and NOAA Fisheries Coho Salmon recovery plans and strategies, to be strategically implemented in identified CCC Coho Salmon ESU watersheds.
2. *Captive Rearing and Rescue TWG* – to (1) develop a framework for captive rearing of selected Coho Salmon populations in the CCC Coho Salmon ESU to prevent further extirpations and to preserve genetic integrity; and (2) create a Coho Salmon rescue protocol for CCC Coho Salmon.
3. *Instream Flow and Conservation TWG* – to develop a list of actions that will result in immediate benefits to stream flow and water quality conditions in CCC Coho Salmon ESU watersheds.

4. *Regulations, Permitting and Enforcement TWG* – to identify opportunities that will facilitate efficient permitting of restoration projects and improvements to regulatory mechanisms (i.e., permits and law enforcement) on high priority issues adversely affecting extant populations of CCC Coho Salmon and their habitat.
5. *Funding TWG* – to identify a list of potential funding sources available for Coho Salmon recovery programs in the CCC Coho Salmon ESU.
6. *Education, Outreach & Media Interaction TWG* – to develop techniques to promote outreach and education regarding CCC Coho Salmon and PACT activities.

Additionally, during the process of preparing the PACT recovery strategy some of the recommendations developed by the TWGs were either fully or partially realized and implemented. This includes, for example, focused recovery actions such as habitat restoration, water and flow studies, broodstock actions, out-planting of adults, fish rescues and plans for captive rearing. Some of the actions which have already been implemented, or are in development, are listed below:

- Restoring and improving stream and estuarine habitat in coastal watersheds, such as Scott Creek, Santa Cruz County and the Russian River, Sonoma County;
- Improving stream conditions to allow for increased fish passage to upstream spawning and rearing areas in coastal watersheds such as in Scott Creek and the San Lorenzo River;
- Improving stream flow and water quality conditions in affected coastal watersheds, such as Aptos Creek and Soquel Creek;
- Installing large woody debris in coastal streams, such as Scott Creek and San Vicente Creek, to provide enhanced shelter for juveniles and adults;
- Reducing sediment erosion from riparian and road sediment sources in the San Lorenzo River;
- Improving fish access to floodplain habitat, such as by breaching old levees in the lower riparian reaches of Scott Creek, located in Santa Cruz County;

- Active management of estuaries and lagoons, such as those of Pescadero Creek and the Russian River, to improve environmental conditions and prevent fish mortalities;
- Conducting fish rescues in drought affected streams, such as Redwood Creek, in Marin County, and relocating fish to more suitable hatchery or stream environments;
- Improvements in the operation of Warm Springs Conservation Hatchery¹, Sonoma County, and the Kingfisher Flat Conservation Hatchery, located on Big Creek in Santa Cruz County;
- Release of surplus adult Coho Salmon from Warm Springs Hatchery into Walker Creek and Salmon Creek, Marin County, to help reestablish populations;
- Joint agency planning for a new Coho Salmon Conservation Hatchery, to be located south of San Francisco Bay, in Santa Cruz County;
- Streamlining of permitting and regulatory requirements for habitat restoration and improvement projects, water supply, forest management etc;
- Development of education and outreach materials for public and stakeholder involvement; and
- Implementing ‘Low Flow Fishery Closure Regulations’ in the Russian River and North Central Coastal streams.

Further Recovery Actions

In addition, numerous other recovery actions related to PACT have already been developed, are planned or are underway to accelerate recovery and prevent further extirpations of Coho Salmon populations in CCC ESU coastal watersheds. These recovery actions have been guided by the recommendations developed by the TWGs in the PACT strategy, as outlined in this report.

¹ Also known as the Don Clausen Fish Hatchery (DCFH)

1. Habitat Restoration & Protection Technical Working Group

Introduction

The intent of the PACT Habitat Protection and Restoration TWG (Habitat TWG) was to work from State and Federal Coho Salmon recovery plans to develop a list of immediate and short-term habitat restoration actions to be strategically implemented in identified CCC Coho Salmon watersheds.

Goals and Objectives

- Compile a list of habitat restoration actions, taken from the CDFW Coho Salmon Recovery Strategy (CDFG, 2004) and the NOAA CCC Coho Salmon Recovery Plan (NMFS, 2012)
- Develop a prioritized list of watershed restoration projects for immediate and short-term implementation
- Develop a strategy to implement identified tasks
- Coordinate CDFW/NOAA Fisheries short-term habitat restoration efforts (Core Habitat TWG with Agency support group)
- Identify specific entities who can assist with plan implementation (including regional and local entities)

Summary of Habitat Restoration and Protection TWG Efforts

1. The Habitat TWG prepared a list of high priority habitat restoration actions using the *State Recovery Strategy for California Coho Salmon* (CDFG, 2004) and the *NOAA Fisheries Recovery Plan for the ESU of CCC Coho Salmon* (NMFS, 2012). These habitat restoration actions can serve to meet the requirements of FGC section 1652(c)(4)².
2. The Habitat TWG co-leads developed a list, which was a subset of all the recovery actions in the two plans, specifically focused on habitat protection and restoration of key limiting factors for Coho Salmon. This collection of recovery

² The Habitat Restoration and Enhancement Act [FGC section 1652(c)(4)] States an applicant is required to demonstrate a restoration project is consistent with, “or identified in” a restoration document to be eligible for funding.

actions served as a preliminary list for further discussion by CDFW and NOAA Fisheries.

3. CDFW and NOAA Fisheries Habitat TWG representatives met with agency staff possessing geographic, field, and technical expertise. Together, they reviewed the list of recovery actions, removed duplications, and developed a spreadsheet of the actions. Recovery actions considered too general to be implemented immediately, or long term (>10 years) before any positive biological effect could be measured, were not included. The group further revised the list to filter for actions that could result in near-term recruitment (e.g. removing barriers) and high priority tasks such as instream improvements and riparian restoration in undeveloped watersheds.
4. CDFW and NOAA Fisheries Habitat TWG representatives then met with regional and local entities comprised of agencies, non-government organizations, and private and technical representatives to discuss the draft list of habitat related recovery actions.
5. The Habitat TWG co-leads, with assistance from TWG members, finalized the recovery action list in an Excel spreadsheet format and added additional sorting options to facilitate the development of strategic priorities according (See Table 1).
6. The final master spreadsheet may be used to refine search criteria to a specific geographical location, hydrology, diversity strata, population type, life stage, and/or project type. This spreadsheet, when combined with the final products from the other PACT TWGs (water, captive rearing, etc.), can identify the highest needs and priority areas within the CCC Coho Salmon ESU where recovery projects will have the most short-term benefit to Coho Salmon recovery.

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Table 1: List of Priority Habitat Restoration Projects. Actions are organized alphabetically by Hydrologic Unit.

Task Source: Federal or State Recovery Plan or partner-generated.

Recovery Strategy Number: Original federal and State Recovery Plan identifier, or partner-generated (P).

Population Type: A = Wild spawning population; B = Wild/Conservation supplemented spawning population; C = Targeted for supplementation; D = Functionally Extinct.

Primary Life Stage Benefitted: 1 = Adults; 2 = Smolts; 3 = Juveniles; 4 = Eggs; 5 = All.

Project Type: FP* = Fish Passage at Stream Crossings; HA = Habitat Acquisition and Conservation Easements; HB* = Instream Barrier Modification for Fish Passage; HI* = Instream Habitat Restoration; OF = Off Channel Habitat Restoration; ES = Estuary Restoration; HR* = Riparian Restoration; HS* = Instream Bank Stabilization; HU* = Watershed Restoration (Upslope); PD* = Project Design; PL* = Watershed Evaluation, Assessment, and Planning; RE* = Cooperative Rearing; SP = Spawning Habitat Creation; SC* = Fish Screening of Diversions.

* = consistent with FRGP coding.

Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	ScC-CCC-1.1.1.1	Restore estuarine habitat and the associated wetlands and sloughs by providing fully functioning habitat (CDFG 2004).	BIG BASIN	Santa Cruz Mountains	Scott Creek	Investigate expanding the upper marsh through easements on agriculture lands and increasing stream meander by possibly reestablishing old channel and reducing channel confinement. Include complex habitat features in the estuary that facilitate the creation of deeper pools and cover.	B	2	ES

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	ScC-CCC-1.1.3.1	Highway 1 bridge reconstruction should restore historical river mouth dynamics to minimize delayed natural breaching.	BIG BASIN	Santa Cruz Mountains	Scott Creek	Increase stream meander by expanding the span of the highway 1 bridge to allow for unimpeded movement of the stream channel, and possibly reestablish pre-bridge channel. These changes could reduce the delayed winter opening of the sandbar at the mouth as occurs with the current alignment.	B	2	ES
State	BB-SL-04	Improve adult Coho Salmon passage at locations named in the San Lorenzo River Enhancement Plan, the Santa Cruz Road Crossing and Salmonid Passage Assessment (Taylor 2003) and those identified by the Department as being problematic.	BIG BASIN	Santa Cruz Mountains	San Lorenzo River	Treat high priority passage issues identified in plan and assessment if still applicable. Prioritize and focus on a few key tributaries; increase outreach related to roads and large wood	D	1	FP
Partners	P1	Prioritize Laguna for habitat conservation easements and restoration projects	BIG BASIN	Santa Cruz Mountains	Laguna Creek		D	3	HA
Partners	P2	Address blockage into Butano Creek	BIG BASIN	Santa Cruz Mountains	Butano Creek		D	1	HB

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State	BB-AP - 01	Implement elements of the Soquel Creek Watershed Assessment and Enhancement Project Plan that are consistent with the Coho Salmon recovery strategy. Specifically focusing on preservation of base flow, restoration of flood plains, improvements to Coho Salmon passage, BMPs to reduce sedimentation of instream habitat.	BIG BASIN	Santa Cruz Mountains	Aptos-Soquel	Address floodplain restoration, agricultural users, riparian habitat; continue to work with Cal Fire in Soquel Demonstration Forest; increase enforcement for poaching	D	1	HB
Federal	ApC-CCC-1.1.2.4	Enhance streambed aquatic cover and substrate in estuary.	BIG BASIN	Santa Cruz Mountains	Aptos	This recommendation includes installations of two types of structures: (1) log/boulder structures and (2) cobble and cattail bulrush structures. Although the site is heavily constrained, implementation of these recommendations would benefit water quality by reducing temperature, providing cover to juvenile salmonids, and improving water quality.	D	2	HI
Federal	ApC-CCC-1.1.6.1	Identify key locations and install large wood structures (or other appropriate surrogate) targeting increased pool depth and shelter within the estuary.	BIG BASIN	Santa Cruz Mountains	Aptos		D	3	HI

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Federal	ApC-CCC-3.1.1.1	Install large woody material, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth.	BIG BASIN	Santa Cruz Mountains	Aptos	Efforts should be directed at the lower reach, which may respond to LWD input. Unsecured LWD input should be evaluated for the portion of Aptos managed by State Parks and if feasible.	D	3	HI
Federal	GaC-CCC-3.1.3.2	Maintain current LWD, boulders, and other structure providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004).	BIG BASIN	Santa Cruz Mountains	Gazos Creek		B	3	HI
Federal	ScC-CCC-4.1.1.1	Install properly sized large woody debris to appropriate viability table targets.	BIG BASIN	Santa Cruz Mountains	Scott Creek		B	3	HI
Federal	SLR-CCC-3.1.1.2	Install LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth.	BIG BASIN	Santa Cruz Mountains	San Lorenzo		D	3	HI
Federal	SVC-CCC-3.1.1.1	Increase shelter ratings to optimal conditions (>80 pool shelter value) in mainstem San Vicente Creek.	BIG BASIN	Santa Cruz Mountains	San Vicente Creek	Shelter enhancements should be based on species utilization data (what are Coho Salmon using in that stream).	B	3	HI
Federal	SVC-CCC-3.1.3.1	Increase pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams).	BIG BASIN	Santa Cruz Mountains	San Vicente Creek	Pool frequency would be based on species utilization data and need in that stream.	B	3	HI

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Federal	WadC-CCC-1.1.2.1	Install structures designed to enhance scour to increase residual pool depth and shelter for smolt transition and feeding during the spring.	BIG BASIN	Santa Cruz Mountains	Waddell Creek		B	2	HI
State	BB-DA-03	Improve riparian vegetation by implementing established BMPs designed to reduce bank erosion, temperature, and removal of LWD; also include livestock fencing where needed, reclamation or reconstruction of flood plains, and active revegetation (this recommendation applies especially to Scott Creek).	BIG BASIN	Santa Cruz Mountains	Davenport		D	3	HR
Federal	ScC-CCC-9.1.1.3	Restoration projects that upgrade or decommission high risk roads or other infrastructure in Core areas should be considered an extremely high priority for funding (e.g., PCSRF).	BIG BASIN	Santa Cruz Mountains	Scott Creek		B	4	HU
State	BB-SL-01	Reduce sediment from road erosion using established BMPs accounting for public safety standards; this applies especially to San Lorenzo River.	BIG BASIN	Santa Cruz Mountains	San Lorenzo River	Treat high risk and/or riparian road sediment sources	D	4	HU
Federal	WadC-CCC-11.1.1.1	Identify source of ongoing low fish abundance in upper East Waddell Creek and implement appropriate remediation and restoration actions.	BIG BASIN	Santa Cruz Mountains	Waddell Creek	Install continuous water quality and quantity monitoring gauges on E. Waddell Creek to investigate possible issue(s) related to low fish abundance.	B	3	MD

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Federal	ApC-CCC-2.1.1.2	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	BIG BASIN	Santa Cruz Mountains	Aptos	Many of the historical floodplain areas have been built upon. Remaining floodplains should be considered a high priority for preservation and enhancement actions.	D	3	OF
Federal	ScC-CCC-2.1.1.1	Encourage breaching of old levees in the lower riparian reaches of Scott Creek.	BIG BASIN	Santa Cruz Mountains	Scott Creek	Remove or breach levels where possible to improve floodplain function and provide high water refuge for juvenile salmonids.	B	2	OF
Federal	SVC-CCC-2.1.1.1	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	BIG BASIN	Santa Cruz Mountains	San Vicente Creek	Determine scientifically what if any type of enhancement features is needed (data supported), focusing efforts in low-gradient sections of the stream.	B	2	OF
Federal	ApC-CCC-3.1.4.1	Increase the frequency of riffle habitat in 75% of the streams within the watershed	BIG BASIN	Santa Cruz Mountains	Aptos		D	1	SP
Federal	SC-CCC-3.2.1.1	Increase pool frequency across 60% of watershed to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in select reaches of Nolan, Tannery, Fay, and Thurston Creeks	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	3	HI

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Federal	SC-CCC-3.2.2.1	Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in select reaches of Fay, Tannery, Finley, and Thurston Creeks	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	3	HI
Federal	SC-CCC-3.2.2.2	Increase LWD frequency to optimal conditions (>2 key LWD pieces/100 meters) in Salmon Creek	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	3	HI
Federal	SC-CCC-3.2.3.1	Increase shelter ratings in 75% of watershed to optimal conditions (>80 pool shelter value) in select reaches of Fay, Tannery, Finley, Thurston and Salmon Creeks	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	3	HI
Federal	SC-CCC-8.1.1.1	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	3	HR
Federal	SC-CCC-8.2.2.1	Increase the average stream canopy to a minimum of 80% within select reaches of Salmon, Nolan and Coleman Valley Creeks.	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	3	HR

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Federal	SC-CCC-2.2.1.3	Improve conditions to re-create, and restore alcove, backwater, or perennial pond habitats where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity. Develop and implement site specific plans to improve these conditions to re-create, and restore alcove, backwater, or perennial pond habitats in lower Salmon Creek.	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek	Estuary capacity includes increasing tidal prism, eliminating levees or causeways that confine estuarine profile, and restore historical freshwater inflow during seasonal rearing periods.	B	2	OF
Federal	SC-CCC-3.2.4.1	Increase riffle frequency in 50% of watershed to achieve optimal conditions (20% riffles) by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Coleman Valley, Fay and Finley Creeks	BODEGA - MARIN COASTAL	Coastal Gualala	Salmon Creek		B	1	SP

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State	BM-BO-02	Continue restoration efforts on Bolinas and Big lagoons to benefit Coho Salmon during all life phases and seasons.	BODEGA-MARIN COASTAL	Coastal Gualala	Bolinas	Redwood Cr/Muir Beach/Big Lagoon: rotate parking lot for wetland restoration; connect new channel; acquire funding and install new Pacific Way Bridge; complete side channel restoration; riparian restoration. Restore Green Gulch Cr, tributary to Redwood Cr for near-term overwintering habitat and future-term spawning and summer rearing habitat. Pine Gulch Cr: construct off-stream reservoirs to reduce water diversions from creek, manage time of use, and protect instream flows.	D	2	ES
State	BM-HU-14	Implement Coho Salmon passage improvements as identified in inventories conducted by the Salmon Protection and Watershed Network (SPAWN), Taylor and Associates, Trout Unlimited and the NPS. Expand inventories as needed for a comprehensive watershed approach for Coho Salmon passage.	BODEGA-MARIN COASTAL	Coastal Gualala	Core Areas		A	1	FP

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State	BM-HU-18	Systematically work to restore Coho Salmon passage at county facilities.	BODEGA-MARIN COASTAL	Coastal Gualala	Core Areas	Marin County has designs to remove barriers at Larsen Creek and San Geronimo Cr. mainstem and is continuing to work on Montezuma Creek. County will reconvene working group to reassess fish passage priorities for future.	A	1	FP
State	BM-BO-08	Treat Coho Salmon passage barriers in the Redwood Creek drainage.	BODEGA-MARIN COASTAL	Coastal Gualala	Bolinas	Identify and remediate any passage barriers remaining in Green Gulch	D	1	HB
State	BM-LA-19	Continue riparian protection and sediment control projects with a focus on working with landowners to manage livestock to protect riparian areas, and to implement erosion control projects on State and Federal park and private lands (e.g., Devil's Gulch).	BODEGA-MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Install livestock fencing where needed within the Lagunitas Creek watershed. Address impacts to streams associated with equestrian centers mainstem Lagunitas Creek.	A	3	HR
State	BM-LA-11	Restore Olema Marsh, Bear Valley Creek, and the mouth of Olema Creek, to benefit Coho Salmon. The restoration should provide rearing habitat refuge during high flows, habitat protection, and hydrologic connectivity between marshes.	BODEGA-MARIN COASTAL	Coastal Gualala	Lagunitas Creek		A	2	OF

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Federal	LaC-CCC-1.2.2.1	Restore estuarine wetlands and sloughs, develop floodplain and backwater habitat projects, and improve prey abundance by increasing shoreline perimeter and planting native emergent and riparian species to improve foraging and cover.	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Implement Landowner Assistance Program projects; create flood refuge habitat in San Geronimo Valley; assess fish use of winter base flow and high flow refuge habitat and identify potential locations (e.g. Tocaloma, SPAWN property on San Geronimo Cr, Castro Pools, etc.)	A	2	ES
Federal	PGC-CCC-1.1.1.1	Increase capacity of estuarine habitat in Bolinas Lagoon according to the recommendations in the Gulf of the Farallones National Marine Sanctuary preferred alternative.	MARIN COASTAL	Coastal Gualala	Pine Gulch Creek		A	2	ES
Federal	LaC-CCC-6.1.1.1	Restore fish passage at Roy's Pools to facilitate unimpeded passage for all life stages into the San Geronimo Core Area.	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Fund a feasibility study for fish passage at Roy's Pools; design the needed improvements which include the County bridge downstream; work with Golf Course throughout the process.	A	1	HB
Federal	LaC-CCC-6.1.1.2	Remove all barriers in the Woodacre, Arroyo, Larsen, Montezuma, and San Geronimo sub-watersheds	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Obtain permission from private landowners with barriers on their land. Acquire County permits to allow repairs on County roads Montezuma Ck. Barrier needs design. Identify possible project on private property, El Cerrito in Forest Knolls	A	1	HB

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Federal	LaC-CCC-6.1.1.3	Removal all remaining Core area barriers in the Cheda, Devil's Gulch and Olema sub-watersheds.	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Identify and implement passage improvements in small tributaries such as Jewell Creek, Fenceline Creek, and Gallaghers Creek. Highway One culverts at Olema Creek are priorities. John West culvert top priority. Assess tributary watersheds/culverts on Cross-Marin Trail to see if any would provide cost effective habitat	A	1	HB
Federal	LaC-CCC-3.1.1.2	Increase shelter ratings to optimal conditions (>80 pool shelter value) by installing multiple log structures in select reaches of Larsen, San Geronimo, Woodacre, and Olema Creeks	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Significantly upgrade LWD (larger material) structures. Implement placement of large woody debris in San Geronimo Valley (in particular, San Geronimo Golf Course) and untethered small woody debris in streams for summer cover. Support ongoing multi-agency efforts to increase large woody debris in Lagunitas Creek.	A	3	HI
Federal	LaC-CCC-3.1.2.2	Increase pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in select reaches of Olema, Woodacre and San Geronimo Creeks	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Plan and Install LWD projects on Devils Gulch proposed by TU and others. Install untethered small woody debris in lower Lagunitas Creek in streams for summer cover. Additionally, increase number of LWD structures in State Parks reach.	A	3	HI

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Federal	LaC-CCC-3.1.4.2	Increase LWD frequency to optimal conditions (>2 key LWD pieces/100 meters) in select reaches of Olema Creek	MARIN COASTAL	Coastal Gualala	Lagunitas Creek		A	3	HI
Federal	LaC-CCC-3.1.4.3	Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in select reaches of Larsen, Woodacre, San Geronimo, and Devils Gulch Creeks	MARIN COASTAL	Coastal Gualala	Lagunitas Creek		A	3	HI
Federal	PGC-CCC-3.1.1.1	Identify historic CCC Coho Salmon habitats lacking in channel complexity and promote restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover. Prioritize Core and Phase I areas first.	MARIN COASTAL	Coastal Gualala	Pine Gulch Creek		A	3	HI
Federal	ReC-CCC-2.2.1.6	Restore connectivity and enhance habitat in Green Gulch.	MARIN COASTAL	Coastal Gualala	Redwood Creek		B	2	HI
Federal	LaC-CCC-18.2.1.1	Exclude livestock from riparian areas, specifically on State and Federal Park and private lands (e.g. Devils Gulch).	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Manage livestock and horses on private lands to enhance riparian corridors in San Geronimo Valley. State Park to remove Graveside Rd. from equestrian facility in Devil's Gulch for erosion control.	A	3	HR

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Partners	P3	Support Marin RCD efforts to implement Ranch plans and other actions that include improving and monitoring riparian zone conditions (fencing, riparian planting etc.); 2). Support the Marin RCD permit streamlining program which facilitates stream and riparian restoration on ranch lands; 3) support Marin RCD efforts to improve dairy water management as dairy waste causes eutrophication and low DO in creeks	MARIN COASTAL	Coastal Gualala	Bodega-Marin		C	1	HR
Federal	LaC-CCC-23.2.1.3	In the Lagunitas Creek watershed, implement results of existing sediment source surveys, and assess remaining watershed road networks to eliminate high priority and high sediment yield sources. Upgrade and decommission sites and road networks where appropriate. These actions include out-sloping roads, ditch relief culverts, and installing rolling dips.	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	Support implementation of MMWD Assessment Road Drainage Improvements (Dec. 2011); Continue to implement Marin Co. Open Space and SPAWN roads and trails improvements.	A	4	HU

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Federal	LaC-CCC-13.1.1.2	Conduct rehabilitation activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows. (Evaluate the Tocaloma reach of the lower Lagunitas mainstem)	MARIN COASTAL	Coastal Gualala	Lagunitas Creek	1) Tocoloma: create in-stream base flow habitat (large LWD) that is hydrologically connected to floodplain, secondary channels, laying back eroded banks or other off-channel habitat; 2) all reaches: create high flow refuge in low gradient reaches of tributary junctions-long term	A	2	OF
Federal	PGC-CCC-13.2.1.2	Conduct restoration activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows.	MARIN COASTAL	Coastal Gualala	Pine Gulch Creek		A	2	OF
Federal	PGC-CCC-2.1.1.1	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	MARIN COASTAL	Coastal Gualala	Pine Gulch Creek		A	2	OF
Federal	ReC-CCC-1.1.1.4	Support efforts of NPS to restore functional floodplain and lagoon habitat in the lower portion of the watershed.	MARIN COASTAL	Coastal Gualala	Redwood Creek		B	2	OF
Federal	ReC-CCC-2.2.1.3	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	MARIN COASTAL	Coastal Gualala	Redwood Creek	Develop these projects in lower Redwood Creek and estuary.	B	2	OF

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Federal	ReC-CCC-2.2.1.4	Identify potential sites for construction/restoration of alcoves, backwaters, etc. based on land use and geomorphic constraints.	MARIN COASTAL	Coastal Gualala	Redwood Creek	Replace the Pacific Way bridge to improve hydrologic function.	B	2	OF
Federal	ReC-CCC-2.2.1.5	Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NOAA and/or CDFW geomorphologist on design features and implementation techniques.	MARIN COASTAL	Coastal Gualala	Redwood Creek		B	2	OF
Federal	ReC-CCC-3.1.1.4	Assess and prioritize restoration of channelized sections to enhance pool depths in Redwood Creek through Muir Woods while maintaining the historic resource to the greatest degree possible.	MARIN COASTAL	Coastal Gualala	Redwood Creek		B	2	OF
Partners	P4	Restore historical floodplains or off-channel habitats in Redwood Creek through conservation easements, etc.	MARIN COASTAL	Coastal Gualala	Redwood Creek	.	B	2	OF

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Federal	LaC-CCC-3.1.3.2	Increase riffle frequency to achieve optimal conditions (20% riffles) by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of San Geronimo Creek	MARIN COASTAL	Coastal Gualala	Lagunitas Creek		A	1	SP
Partners	P5	Evaluate the amount and quality of spawning gravel below Peters dam and potentially add gravel if needed.	MARIN COASTAL	Coastal Gualala	Lagunitas Creek		A	1	SP
Federal	WagC-CCC-1.1.1.1	Evaluate feasibility of enhancing the estuary with physical habitat improvement. Implement project if feasible and if determined to result in benefits to salmonid survival.	MENDOCINO COAST	Lost Coast	Wages Creek	Evaluate the estuary to determine if conditions could be improved for salmonid survival or if due to various constraints the overall habitat potential is too small.	A	2	ES
State	MC-GA-06	If appropriate, restore estuary function to benefit Coho Salmon.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia River	Ensure proper estuary function by remediating the limiting factor(s). Begin by evaluating estuary function and evaluate/prioritize necessary steps	A	2	ES
Federal	GuaR-CCC-6.1.1.1	Evaluate, design, and implement appropriate fish passage at South Beach Road Crossing on Fuller Creek (Wheatfield Fork sub-basin; See CALFISH: PAD_ID 736904; Passage ID 13268)	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	1	FP

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Federal	GR-CCC-6.1.1.10	Evaluate, design, and implement appropriate fish passage at culvert at mouth on SF Garcia River (See CALFISH: PAD_ID 712859; Passage ID 16063).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.11	Evaluate, design, and implement appropriate fish passage at culvert on Fleming Creek (See CALFISH: PAD_ID 723443; Passage ID 9525)	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.12	Evaluate, design, and implement appropriate fish passage at unnamed tributary to SF Garcia River (See CALFISH: PAD_ID 723441; Passage ID 9523).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.13	Evaluate, design, and implement appropriate fish passage at culvert on unnamed tributary to main stem Garcia River (See CALFISH: PAD_ID 723440; Passage ID 9522).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.2	Evaluate, design, and implement appropriate fish passage at Bridge at Highway 1 on Hathaway Creek (Gasker Slough) (See CALFISH: PAD_ID 716762; Passage ID 26883).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP

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Federal	GuaR-CCC-6.1.1.2	Evaluate, design, and implement appropriate fish passage designs in Palmer Canyon and McKenzie creeks (Wheatfield Fork sub-basin; Klamt et al. 2003).	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	1	FP
Federal	GR-CCC-6.1.1.3	Evaluate, design, and implement appropriate fish passage at private road crossing on Mill Creek (See CALFISH: PAD_ID 713213; Passage ID 16601).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.4	Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Mill Creek (See CALFISH: PAD_ID 705892; Passage ID 7210)	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.5	Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Mill Creek (See CALFISH: PAD_ID 705893; Passage ID 7211).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.6	Evaluate, design, and implement appropriate fish passage at private road crossing on Mill Creek (See CALFISH: PAD_ID 713212; Passage ID 16600).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.7	Evaluate, design, and implement appropriate fish passage at private road crossing on Mill	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
		Creek (See CALFISH: PAD_ID 713213; Passage ID 16601).							
Federal	GR-CCC-6.1.1.8	Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Sled Creek (See CALFISH: PAD_ID 713211; Passage ID 16599)	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	GR-CCC-6.1.1.9	Evaluate, design, and implement appropriate fish passage at private road crossing on Hathaway Creek (See CALFISH: PAD_ID 716763; Passage ID 26884).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	1	FP
Federal	NaR-CCC-2.1.1.2	Evaluate Highway 128 and associated crossings with focus on the segment from the North Fork Navarro Bridge to Barton Gulch. Many crossing may need to be modified to provide access to historical floodplain habitats.	MENDOCINO COAST	Navarro Pt. - Gualala	Navarro		A	1	FP
Federal	NaR-CCC-6.1.1.1	Restore passage in high priority areas of the Navarro watershed as identified by the Mendocino RCD, MRC, the County of Mendocino, Caltrans (HWY 128), and existing fish passage databases. Core areas?	MENDOCINO COAST	Navarro Pt. - Gualala	Navarro	Use the priority list of barriers identified in the task in Core areas with the greatest miles of habitat connectivity for multiple life stages. Focus projects in Lower NF and mainstem Navarro for winter habitat	A	1	FP

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	PC-CCC-1.1.1.2	Evaluate habitat potential and benefits of providing passage under Highway 1 to the impoundment at Ocean Lake Mobile Home Park.	MENDOCINO COAST	Lost Coast	Pudding Creek		A	1	FP
State	MC-HU-37	Adequately fund prioritization and upgrading of culverts to provide Coho Salmon passage within the range of Coho Salmon to pass 100-year flows and the expected debris loads.	MENDOCINO COAST	Lost Coast	Core Areas		A	1	FP
State	MC-GA-11	Where necessary and with willing landowners, protect riparian vegetation buffer zones through conservation planning, acquisition, and easements.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia River		A	3	HA
State	MC-GU-03	Where necessary and with willing landowners, protect riparian vegetation buffer zones through conservation planning, acquisition, and easements.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HA
State	MC-NA-08	Where necessary and with willing landowners, protect riparian vegetation buffer zones through conservation planning, acquisition, and easements.	MENDOCINO COAST	Navarro Pt. - Gualala	Navarro River		A	3	HA

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GuaR-CCC-3.1.2.2	Design and implement a SF Gualala mainstem migration project. Focus should include a higher frequency of significantly large wood structures to enhance staging pool development.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	1	HB
Federal	GR-CCC-6.1.1.14	Evaluate, design, and implement appropriate fish passage at identified logjams throughout the Garcia watershed (only if necessary).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia	Logjams are ephemeral in nature therefore necessity should be clear and data supported.	A	1	HB
Federal	NoR-CCC-6.1.1.1	Assess and restore passage at barriers associated with the California Western Railroad.	MENDOCINO COAST	Lost Coast	Noyo River	specifically remove the Duffy Gulch barrier	A	1	HB
State	MC-AR-07	Modify stream barriers to allow Coho Salmon passage while maintaining LWD.	MENDOCINO COAST	Lost Coast	Albion River	Conduct Albion lower River winter habitat survey to identify locations/priorities	A	1	HB
Federal	GuaR-CCC-3.1.1.2	Design and install LWD structures in McKenzie and Wild Hog creeks, and the SF sub-basin to the extent that optimal LWD frequency is achieved at strategic locations.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HI

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GuaR-CCC-3.1.3.1	Evaluate, design, and implement strategies to improve shelter pools ratings within the Rockpile and Buckeye sub-basins and the following tributaries: Boyd, Buckeye, Camper, Carson, Danfield, Doty, Dry, Franchini, Fuller, Grasshopper, Groshong Gulch, House, Little NF GR, Log Cabin, Marshall, McGann, McKenzie, NF Fuller, Lower NF GR, Palmer Canyon, Pepperwood, Rockpile, SF Fuller, Sullivan, Tombs, Wheatfield Fork, and Wild Hog creeks.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HI
Federal	GuaR-CCC-3.1.4.1	Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches within the following tributaries: Boyd, Doty, Dry, Fuller, Little NF GR, Log Cabin, Marshall, McGann, McKenzie, Palmer, Robinson, Tombs, and West Fork Fuller.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HI
Federal	GR-CCC-3.1.4.2	Evaluate, identify, and improve shelter ratings in pools within the mainstem Garcia River and the following tributaries: Blue Waterhole, Fleming Creek, Graphite Creek, Inman Creek, Little SF Garcia, NF Garcia, and Signal Creek (and tribs).	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	3	HI

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GuaR-CCC-6.1.1.1	Place instream structures to improve pool depth and habitat complexity.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HI
Federal	NaR-CCC-3.1.1.1	Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (CDFG 2004). Focus on tributaries of Flynn Creek, North Fork Navarro, South Branch Navarro, and Mill Creek.	MENDOCINO COAST	Navarro Pt. - Gualala	Navarro		A	3	HI
Federal	NoR-CCC-3.1.1.2	Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (CDFG 2004). Use information, where germane, from MRC Noyo Watershed Analysis to determine stream locations with high instream LWD demand and utilize CDFG stream habitat data to help determine reaches for LWD placement. Core areas of the South Fork Noyo, Little North Fork Noyo and Redwood Creek are priorities for restoration of LWD.	MENDOCINO COAST	Lost Coast	Noyo River	include the development of winter habitat refugia projects	A	3	HI

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	PC-CCC-3.1.1.1	Implement a large woody debris supplementation programs to increase stream complexity and gravel retention and improve pool frequency and depth (CDFG 2004).	MENDOCINO COAST	Lost Coast	Pudding Creek	Unsecured woody material (sized at 1.5 to 2 times bank full) should be considered over engineered structures. Large woody material should be targeted to reach density and volume outlined in the CCC Coho Salmon recovery document. Maintain natural recruitment in the watershed. Consider including supplementation programs as part of future timber harvest plans.	A	3	HI
Federal	UsC-CCC-3.1.1.2	Mechanically recruit alder from floodplain surfaces into the stream channel.	MENDOCINO COAST	Lost Coast	Usal	Recruit alders at least 20 feet away from the stream banks to maintain bank integrity. Rather than felling trees by chainsaw, pull over with winches and place root balls in the channel. Recruit at a rate of one tree per channel width in the lower portions of North Fork and South Fork Usal and appropriate locations on the mainstem. This action should occur within the context of a larger overall large wood (conifer) enhancement effort throughout the watershed.	A	3	HI

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Partners	P6	Add LWD to Little North Fork Big River; Establish connectivity to Dry Dock Gulch and Railroad Gulch; Complete LWD installations in tributaries with insufficient wood in Big R.	MENDOCINO COAST	Lost Coast	Big River		A	3	HI
Partners	P7	Add wood to Big Salmon tribes not yet treated	MENDOCINO COAST	Lost Coast	Big Salmon Creek		A	3	HI
Partners	P8	Add wood to Little North Fork Noyo and Hare creeks	MENDOCINO COAST	Lost Coast	Noyo River		A	3	HI
Partners	P9	Complete N. Fork and S. Fork Usal creek wood project and conduct feasibility analysis of Lower Usal sediment removal or scouring; Complete LWD enhancement on N. Fork to S. Fork Cottaneva creeks.	MENDOCINO COAST	Lost Coast	Usal/Wages		A	3	HI
Partners	P10	Develop LWD projects in Pudding Creek and fund Pudding-Caspar BACI Validation monitoring proposal	MENDOCINO COAST	Lost Coast	Pudding Creek		A	2	HI
State	MC-HU-18	Introduce instream wood to improve shelter value, pool frequency, and pool depth. Focus on key streams for Coho Salmon.	MENDOCINO COAST	Lost Coast	Core Areas	Cottaneva, Pudding, Casper, Big Salmon, Elk creeks; NF Navarro, Little NF Ten Mile, Albion, NF Big, SF Garcia, NF Gualala rivers.	A	3	HI

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GuaR-CCC-18.1.1.1	Reduce livestock and feral pig access to the riparian zone to encourage bank stabilization and re-vegetation of riparian areas within the following sub-basins: Gualala Main stem/ SF Garcia, Wheatfield Fork, Rockpile (Klamt et al. 2003).	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HR
Federal	GuaR-CCC-8.1.2.3	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the NF Gualala sub-basin: upper reaches of Dry Creek, Robinson Creek, the central and higher reaches of the mainstem, and the lower reaches of Bear and Stewart Creeks (Klamt et al. 2003).	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HR

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GuaR-CCC-8.1.2.4	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the Rockpile sub-basin: mainstem Rockpile Creek, Red Rock Creek, and Horsetheif (Klamt et al. 2003).	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HR
Federal	GuaR-CCC-8.1.2.5	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the Buckeye sub-basin: upper reaches of Buckeye Creek, Franchini, Grasshopper, and Soda Springs creeks (Klamt et al. 2003).	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	3	HR

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	NoR-CCC-8.1.1.1	Implement riparian canopy projects in the Noyo River watershed using Albin (2006) as guidance. Tributaries to have riparian canopy restoration are: Hayshed Gulch, middle Noyo River, Duffy Gulch, Hayworth Creek, Olds Creek and its tributaries.	MENDOCINO COAST	Lost Coast	Noyo River		A	3	HR
Federal	PC-CCC-8.1.1.2	Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to ameliorate instream temperature and provide a source of future large woody debris recruitment.	MENDOCINO COAST	Lost Coast	Pudding Creek	Little Valley Watershed	A	3	HR
Federal	TMR-CCC-11.1.1.1	Plant native vegetation to promote streamside shade where otherwise deficient (i.e., lower reaches of North Fork and South Fork).	MENDOCINO COAST	Lost Coast	Ten Mile River		A	3	HR
Federal	WagC-CCC-8.1.2.1	Plant native vegetation in lower Wages and Rider Gulch to promote streamside shade.	MENDOCINO COAST	Lost Coast	Wages Creek		A	3	HR
Federal	GaR-CCC-8.1.1.2	Complete the remaining 25% of erosion control sites identified in the South Fork Garcia River by the Trout Unlimited North Coast Coho Project.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia	Only those areas identified as high risk or within riparian areas	A	4	HU

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GR-CCC-23.1.1.4	Restoration projects that upgrade or decommission high risk roads in Core areas should be considered an extremely high priority for funding (e.g., PCSRF). Where no Core areas are designated, apply this action to Phase I areas.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia	Primarily focusing on decommissioning of roads. High risk roads are defined as road systems with high erosion potential, within close proximity to surface water bodies, and/or direct delivery of sediment to coho spawning and rearing habitat.	A	4	HU
Federal	GuaR-CCC-23.1.1.6	Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following Gualala mainstem/ SF Gualala Sub-basin tributaries: McKenzie Creek, Marshall Creek, Palmer Canyon Creek, Wild Hog Creek, South Fork, and Marshall Creek.	MENDOCINO COAST	Navarro Pt. - Gualala	Gualala		D	4	HU
Federal	GR-CCC-9.1.1.3	Complete the remaining 25% of erosion control sites identified in the South Fork Garcia River by the Trout Unlimited North Coast Coho Project.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	4	HU

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GR-CCC-9.1.1.4	Treat high and medium priority sites that are identified in the MRC Garcia River Watershed Analysis, Garcia River Forest Integrated Resource Management Plan and other credible landowner assessments.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	4	HU
Federal	GR-CCC-9.1.1.6	Continue the implementation of the Garcia River TMDL and associated sediment reduction efforts.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	4	HU
Federal	NaR-CCC-9.1.1.1	Address high and medium priority sediment delivery sites as identified by the Mendocino RCD, Mendocino Redwoods Company, or other credible assessments.	MENDOCINO COAST	Navarro Pt. - Gualala	Navarro	Focus efforts on Core Areas	A	4	HU
Federal	PC-CCC-11.1.1.1	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Include County of Mendocino in regard to inclusion of Sherwood Ridge Road.	MENDOCINO COAST	Lost Coast	Pudding Creek	Rapid implementation of this recommendation is more feasible within the Pudding Creek watershed because a large portion of the watershed is owned by one landowner.	A	4	HU
Federal	GR-CCC-2.1.1.2	Work with landowners and encourage rehabilitation activities within the lower Hathaway Creek area in efforts to enhance backwater/off-channel and floodplain habitat for winter rearing salmonids.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	2	OF

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	GR-CCC-2.1.1.3	Identify, design, and implement rehabilitation projects that target winter rearing floodplain habitat within the lower reaches of the Garcia River.	MENDOCINO COAST	Navarro Pt. - Gualala	Garcia		A	2	OF
Federal	PC-CCC-1.1.2.1	Repair dam as appropriate to maintain over wintering habitat in the estuary (CDFG 2004).	MENDOCINO COAST	Lost Coast	Pudding Creek	The dam should only be repaired following completion of the evaluation study and only if benefits are found to outweigh the detriments to the Pudding Creek Coho Salmon population. If evaluation study concludes the dam does not facilitate improved rearing conditions compared to an unimpaired estuary for Coho Salmon, the dam should be removed, and the estuary restored to historical conditions.	A	2	OF
Federal	PC-CCC-1.1.3.1	Improve dissolved oxygen concentrations in the Pudding Creek impoundment from installation of aeration devices (such as SolarBees)	MENDOCINO COAST	Lost Coast	Pudding Creek	Do an evaluation to determine if dissolved oxygen levels are limiting salmonid use of the Pudding Creek impoundment during the summer. This evaluation should be considered in conjunction with a comprehensive evaluation of the impoundment including the effects from non-native plant decomposition.	A	2	OF

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Partners	P11	Create/restore lower river floodplain winter habitat; Add LWD to streams lacking cover and wood; Get site control to secure landowner permission	MENDOCINO COAST	Lost Coast	Ten Mile River		A	2	OF
State	MC-AR-01	Place instream structures to improve gravel retention and habitat complexity.	MENDOCINO COAST	Lost Coast	Albion River		A	3	SP
State	RW-ES-02	Restore estuarine and associated wetland ecosystems.	RANGE WIDE	Santa Cruz Mountains	San Gregorio, Pescadero Creek and Ana Nuevo	Improve Pescadero Creek lagoon by restoring it to a seasonal freshwater lagoon and eliminating annual fish kill. Improve Gazos Creek lagoon by increasing scour / depth to provide transitional habitat between the stream and ocean. Do not connect San Gregorio Creek lagoon / tidal zone with the upland marsh habitat as this could have sensitive species impacts.	C	2	ES
State	RW-HF-01	Restore habitat hydrologic connectivity between Coho Salmon populations in coastal and low-gradient inland streams.	RANGE WIDE	Santa Cruz Mountains	San Gregorio Creek, Pescadero Creek, Ana Nuevo		C	2	HI

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
State	RW-SD-04	Restore natural drainage patterns and minimize hydrologic connectivity of roads, where feasible. Provide annual funding for restoring natural drainage patterns.	RANGE WIDE	All	Core Areas	On streamside or high risk roads only on high priority streams north of San Francisco, and specifically within the Scott Creek watershed; San Gregorio Watershed (reach of San Gregorio, Alpine, La Honda, Harrington, Bogess, El Corte De Madero creeks); Pescadero Watershed (Peters, Slate. Oil creeks); Gazos watershed (Old Womans Cr and upper watershed including the reach upstream of the Mountain Camp and upper watershed tributaries of Gazos Creek). Implement Lagunitas and Marin County Parks and Open Space Roads and Trails Assessments.	C	4	HU
State	RW-SC-02	Where appropriate and feasible, reconfigure levees and channelized streams to benefit Coho Salmon.	RANGE WIDE	Santa Cruz Mountains	San Gregorio Creek	Restore incised reach of San Gregorio Creek (from La Honda to upstream of the lagoon) --Do not reconfigure lagoon / tidal zone as this could have sensitive species impacts.	D	2	OF

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
State	RW-WR-11	Follow CDFG-NOAA Fisheries screening criteria when constructing, repairing, upgrading, reconstructing, and maintaining diversion screens within the range and distribution of Coho Salmon.	RANGE WIDE	Santa Cruz Mountains	San Gregorio Creek	San Gregorio Creek watershed (reach extending from La Honda to the lagoon). Some diversions are temporarily placed in stream so it may be difficult to locate all of them. Include maintenance, compliance, scheduled inspections and enforcement.	D	3	SC
Federal	RR-CCC-1.1.1.1	Restore estuarine habitat and the associated wetlands and sloughs by providing fully functioning habitat (CDFG 2004).	RUSSIAN RIVER	Coastal	Russian River	Include Willow Creek in focus for expanding floodplain capacity; increasing shelter for summer/winter rearing.	B	2	ES
State	RR-CCC-1.1.1.2	Per the Russian River Biological Opinion, utilize adaptive management to guide future estuary management	RUSSIAN RIVER	Coastal	Russian River	Remove Jetty at mouth to increase river mouth variability and possibly increase permeability of sand bar. Address structure issues in flood plain. Utilize PWA study ongoing (1-3 years ETA)	B	2	ES
Federal	RR-CCC-6.1.2.4	Improve passage at existing County culvert barriers on Pole Mountain Creek, Kid Creek and Kohute Gulch.	RUSSIAN RIVER	Coastal	Russian River		B	1	FP
Partners	P12	Determine what high priority fish passage barriers still exist, use Ross Taylor's report.	RUSSIAN RIVER	Coastal	Core Areas		B	1	FP

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Partners	P13	Resolve upstream grade issues causing flooding over road; investigate passage issues on Green Valley Road Crossings	RUSSIAN RIVER	Coastal	Green Valley		B	1	FP
Partners	P14	Evaluate potential acquisitions in the lower RR estuary	RUSSIAN RIVER	Coastal	Russian River		B	2	HA
Federal	RR-CCC-6.1.2.12	Evaluate and implement passage opportunities in the Maacama Creek sub-watershed and its tributaries. Priority streams include: Redwood Creek, Foote Creek, Kellogg Creek and Yellowjacket Creek.	RUSSIAN RIVER	Coastal	Russian River		C	1	HB
Federal	RR-CCC-6.1.2.2	Remove or modify the flashboard dam on lower Mill Creek near the confluence with Wallace Creek. This barrier is the highest priority barrier within the Russian River population for remediation.	RUSSIAN RIVER	Coastal	Russian River		B	1	HB
Federal	RR-CCC-6.1.2.7	Improve passage at sites identified in Mill, Pena and Grape Creek. The falls on lower Mill Creek and on lower Felta Creek need to be evaluated for passage periodically and improved/maintained if necessary. (CDFG 2004).	RUSSIAN RIVER	Coastal	Russian River	Restore lower Mill Creek falls to its natural condition by removing all concrete and mortared rock.	B	1	HB

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	RR-CCC-3.1.3.2	Increase shelter ratings to optimal conditions (>80 pool shelter value) in all reaches of Green Valley, Purrington, Atascadero, Redwood, Jonive, Castellini and Sexton Creeks	RUSSIAN RIVER	Coastal	Russian River		B	3	HI
Federal	RR-CCC-3.1.3.3	Increase shelter ratings to optimal conditions (>80 pool shelter value) in select reaches of Austin, Bearpen, Black Rock, Kidd, Kohute Gulch, Clear, Ward, Pole Mtn, Blue Jay, Tiny, and Ward Creeks and Holmes Canyon Creeks	RUSSIAN RIVER	Coastal	Russian River		B	3	HI
Partners	P15	Enhance lower Mill Creek over summering juvenile habitat	RUSSIAN RIVER	Coastal	Mill Creek		B	3	HI
Federal	RR-CCC-18.2.3.5	Fence riparian areas within the Dry Creek watershed from grazing by using fencing standards that excludes cattle but allows other wildlife to access the stream. High priority stream reaches include Pechaco Creek (reach 1 and 2) and Pena Creek (reach 3) (CDFG stream survey reports).	RUSSIAN RIVER	Coastal	Russian River		B	3	HR

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Partners	P16	Utilize if appropriate surplus salmon carcass from hatcheries and/or salmon carcass analogs to temporarily restore Marine Derived Nutrient (MDN) cycling until adult abundance improves.	RUSSIAN RIVER	Coastal	Russian River	Develop and implement a scientifically valid experiment to evaluate the benefits of MDN (using salmon carcasses and/or salmon carcass analogs) loading to salmonid growth, macro-invertebrate and periphyton production	B	2	RE
Federal	RR-CCC-3.1.4.2	Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Green Valley, Atascadero, Jonive, Castellini and Sexton Creeks	RUSSIAN RIVER	Coastal	Russian River	As identified in the Gold Ridge RCD Green Valley Creek watershed plan. Consult Broodstock Monitoring team for verification of potential spawning development sites	B	1	SP
State	SM-HU-08	Restore Coho Salmon passage to Coho Salmon habitat by using the prioritized list.	SAN MATEO	Santa Cruz Mountains	San Gregorio Creek	San Gregorio Creek Watershed (remediate passage to fish ladder on Alpine Creek located approximately 8,000 ft upstream of confluence with San Gregorio Creek; improve passage through Highway 84 culvert at Bogess Creek). Collect and summarize fish passage information, and update existing fish passage priorities.	D	1	HB

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Task Source	Recovery Strategy Number	Action Description/Task	Hydrologic Unit	Diversity Strata	HSA Name / Population	Specific Focus for Action/Task (CDFW, NOAA and Partners recommendation)	Population Type	Primary Life-stage Benefitted	Project Type
Federal	SGC-CCC-3.1.1.2	Install LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth.	SAN MATEO	Santa Cruz Mountains	San Gregorio Creek	Due to the urbanized nature of the watershed (particularly adjacent to riparian areas) and flooding concerns, it is anticipated that most LWD structures will require engineering.	D	3	HI
Federal	SGC-CCC-2.1.1	Create flood refuge habitat, such as hydrologically connected floodplains with riparian forest.	SAN MATEO	Santa Cruz Mountains	San Gregorio Creek		D	2	HR
State	SM-HU-11	Establish adequate spoils storage sites throughout the counties so that material from landslides and road maintenance can be stored safely away from streams inhabited by Coho Salmon. Coordinate these efforts with Caltrans.	SAN MATEO	Santa Cruz Mountains	San Gregorio Creek, Pescadero Creek, Ana Nuevo	Develop storage sites utilizing input from CALTRANS and County.	D	4	HU
Federal	SGC-CCC-2.1.1.3	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	SAN MATEO	Santa Cruz Mountains	San Gregorio Creek		D	2	OF

2.Captive Rearing and Rescue Technical Working Group

Introduction

The intent of the PACT Captive Rearing and Rescue Technical Work Group (CRR TWG) was as follows; (1) develop a decision framework for CCC Coho Salmon ESU captive rearing efforts and (2) create a specific protocol for CCC Coho Salmon ESU rescue operations.

Goals and Objectives

- Coordinate CDFW/NOAA Fisheries Coho Salmon captive rearing and rescue efforts.
- Evaluate and develop a list of CCC Coho Salmon ESU populations that may benefit from captive rearing.
- Develop a strategic approach and recommendations for captive rearing of CCC ESU Coho Salmon consistent with existing CDFW and NOAA Fisheries policy and practices.
- Develop a specific protocol for CCC ESU Coho Salmon rescues in accordance with the effective Interagency Anadromous Fish Rescue Strategy and other pertinent guidelines (see Appendices 1, 3).

Rescue Protocol for CCC Coho Salmon ESU

A CCC ESU Coho Salmon Rescue and Handling Protocol and Coho Rescue Record were developed by the CRR TWG (see Appendix 2) in accordance with the 2014-2019 Interagency Anadromous Fish Rescue Strategy (see Appendix 3) and other policies. The objective of the protocol is to prevent the unnecessary loss of CCC Coho Salmon due to inappropriate handling of Coho Salmon during rescue actions in response to potentially lethal environmental conditions (e.g., drought conditions). The protocol guides how CDFW and NOAA Fisheries will work together with partner agencies and stakeholders on fish rescue operations and describes fish handling, holding, transport, and release procedures as well as permitting and authorization.

Captive Rearing Plan for CCC Coho Salmon ESU

To be viable, the CCC Coho Salmon ESU must contain sufficient fully functional high-quality freshwater habitat for Coho Salmon populations to complete the freshwater phase of their life cycle. In addition, populations must be robust enough to withstand environmental fluctuations without suffering catastrophic demographic losses or decreases in genetic diversity. In places where historical Coho Salmon habitat is lacking essential features or has become impaired through anthropogenic degradation, habitat restoration programs should focus their efforts on remediation of those factors that significantly limit Coho Salmon production. Yet, despite such efforts, continued improvements in habitat quality beyond remediation of limiting factors may yield few or no results if a population has declined to a level of abundance that is too low to respond to habitat improvements with increased production (i.e., a population that is experiencing a depensatory decline).

It is generally accepted that populations below certain abundance levels lose their ability to respond to favorable environmental conditions with a concomitant increase in production and become increasingly susceptible to genetic drift and stochastic events that may result in accelerated decline, extirpation, or extinction. At very low densities populations experience a reduction in per capita growth rate with declining abundance, a phenomenon referred to as depensation (Spence et al., 2008). Populations that have fallen below their depensation threshold are at a high risk of extirpation due to their low abundance, regardless of habitat availability. For Coho Salmon, the negative effects of low abundance are exacerbated if meta-population structure has been compromised sufficiently to make gene flow through migration an ineffective mechanism to counteract inbreeding and promote increased abundance in local populations.

Preservation of locally adapted genotypes is critical to the recovery of the CCC Coho Salmon ESU. Strategically placed captive rearing programs, as well as rescue and relocation of juvenile Coho Salmon, would be most effective and are necessary to maintain genetic diversity and, prior to depensatory decline, redirect the species' trajectory away from local extinction towards recovery.

The use of recovery hatcheries in salmonid recovery is described in both the Federal Recovery Plan for the CCC Coho Salmon ESU (NMFS, 2012) and the CDFW 2004 Recovery Strategy for California Coho Salmon (Strategy): “*The purpose of a recovery hatchery ... is to aid and/or accelerate recovery of Coho Salmon by reducing risk of extinction...and improve natural production ...*” (CDFG, 2004). Furthermore, many historical Coho Salmon populations within the CCC Coho Salmon ESU meet one or more of the criteria for establishment and operation of a recovery hatchery program outlined in the Strategy (CDFG, 2004), including:

- very low abundance;
- low abundance and declining;
- low abundance relative to available habitat and production capacity;
- two of three brood-years consistently missing or extremely weak; and
- historically present but currently extinct, good habitat is available and potential for natural recolonization is low.

Applying the Coho Salmon recovery hatchery decision flow chart of the Strategy (CDFG, 2004, p. H.7) results in a determination that a “Recovery Hatchery” is appropriate for several CCC Coho Salmon ESU populations. However, it is recognized that not all historical or current Coho Salmon populations are of equal importance to the recovery and persistence of the CCC Coho Salmon ESU and that achieving the historical setting under which Coho Salmon evolved may not be feasible. Therefore, captive rearing efforts for Coho Salmon in this ESU and the utilization of a recovery hatchery program must consider the current biological, environmental, political, and economic conditions, while also providing biologically relevant benefits towards Coho Salmon recovery.

Recovery hatcheries can support Coho Salmon rescue and captive rearing efforts in two ways: (1) they can provide temporary rearing of rescued Coho Salmon until environmental conditions have improved sufficiently to allow release back into the natural environment and (2) recovery hatcheries can facilitate captive rearing of Coho Salmon to aid in the recovery of low-abundance populations. For the CCC Coho

Salmon ESU, the Don Clausen Fish Hatchery (DCFH, also known as Warm Springs Hatchery), is the only recovery hatchery north of San Francisco engaged in CCC Coho Salmon recovery efforts, primarily through the Russian River Coho Salmon Captive Broodstock Program (RRCSCBP). The RRCSCBP plays an integral part in Coho Salmon recovery in California, and its operation at DCFH is described in detail in the Hatchery and Genetic Management Plan (HGMP) (in prep.). Although DCFH was not included in the California Hatchery Review Report (HSRG, 2012), the recommendations in the report pertain to Coho Salmon and form the basis of the HGMP.

During the extreme drought from 2015-2016, DCFH provided temporary rearing of juvenile Coho Salmon rescued from drying habitat in several Russian River tributaries throughout the summer months. The RRCSCBP also includes captive rearing of Coho Salmon from several CCC Coho Salmon ESU populations to prevent local extirpations. These efforts at DCFH constitute a part of the larger approach to Coho Salmon recovery in California envisioned by the CRR TWG, combining captive rearing with complementary habitat-based recovery activities. This vision is consistent with the California Hatchery Review Report (HSRG, 2012) which states that “... *hatcheries in California should be operated not as isolated entities, but as components within the broader context of habitat restoration and protection, water management ...*” The report further states: “*Protecting the remaining available habitats and restoring former habitats must be a priority if viable natural populations of salmon and steelhead are desired and the abundance of natural-origin fish is expected to increase.*”

Methods

Guided by the State and Federal recovery plans, the CRR TWG utilized the following six-step process to identify potential candidate Coho Salmon populations and watersheds for captive rearing. These identified Coho Salmon populations represent streams where natural and social factors combine to make recovery efforts feasible. They include remnant Coho Salmon populations that are below self-sustaining levels, appear in imminent danger of extirpation and whose extirpation would have a significant negative impact on the trajectory of Coho Salmon recovery in the CCC Coho Salmon ESU.

The CRR TWG conducted a conceptual evaluation of the risks, rewards, costs, and benefits associated with captive rearing, and in formulating recommendations, relied on the historical population structure (Figure 1) and biological viability factors outlined in the federal recovery plan (NMFS, 2012). Consideration was also given to recent and current patterns of abundance and distribution, basin or watershed size, habitat availability and quality, location and production of existing recovery hatcheries, and the cost and effectiveness of various captive rearing techniques.

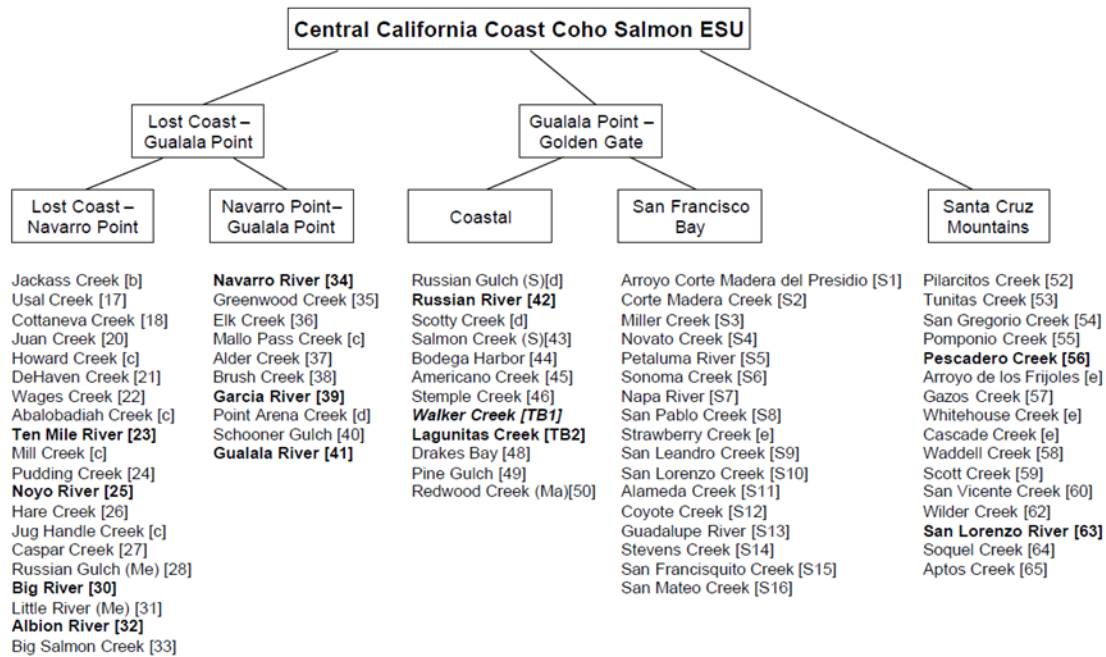


Figure 1: Historical population structure of the CCC Coho Salmon ESU (from Spence et al. 2008). Functionally independent populations are listed in **bold** font. Potentially independent populations are listed in **bold-italic** font. Dependent populations are listed in regular font.

To determine which Coho Salmon populations might warrant captive rearing, the CRR TWG used the following decision process for evaluating each extant Coho Salmon population. This step-wise decision process is recommended for future evaluations regarding establishment of captive rearing programs.

1. Utilize the NOAA Fisheries 5-Year Status Reviews, recent abundance data or initiate new adult abundance surveys to evaluate Coho Salmon population abundance relative to High Extinction Risk Depensation Abundance (Depensation N_a) numbers for those populations, as described in Spence et al. 2008. Ideally, use or compile 9-12 years of adult Coho Salmon population abundance data, or evaluate the use of other available population data.
2. Identify Coho Salmon populations whose recent abundance levels are trending towards, or are expected to fall below, the Depensation- N_a level. These populations are good candidates for captive rearing.
3. Evaluate the feasibility, type, and appropriateness of a captive rearing program for candidate Coho Salmon populations relative to historical and current population structure, limiting factors, flow conditions, annual variation in abundance, and other pertinent natural and anthropogenic factors.
4. Determine target abundance levels or other management goals for captive rearing programs that define their duration (5 x Depensation- N_a or a minimum of 50 adult Coho Salmon).
5. Determine a Coho Salmon release strategy for each captive rearing program that optimizes the program's chance of re-establishing self-sustaining populations.
6. Coordinate and prioritize captive rearing programs with other TWG efforts (e.g., habitat restoration, water flow, enforcement, etc.) to ensure that Coho Salmon released under a captive rearing program have a high probability of survival in their natural environment.

The benefits of evaluating population abundance relative to the High Extinction Risk Depensation Abundance (Depensation- N_a) threshold are threefold:

1. Provides a quantitative basis for the identification and evaluation of candidate populations that are trending towards extirpation.

2. Provides a basis for the decision to establish, monitor, and terminate captive rearing programs for Independent and Dependent³ populations to support the goals of preventing extirpation and recovering Coho Salmon at the ESU-level.
3. Provides a biological justification for focusing and maximizing the effectiveness of supporting efforts such as habitat restoration, water flow modification and enforcement in watersheds where Coho Salmon populations are above critical depensation levels.

Spence et al. (2008) define depensation as *a high risk of Coho Salmon extinction where a population has average spawner densities of 1 adult spawner per kilometer of functional stream habitat (1P km)*. However, other authors have suggested depensation thresholds of <1 to >3 spawners per km. For example, Barrowman (2003) estimates depensation for Coho Salmon at 0.6 spawners per km; Sharr et al. (2000) estimate that extinction probabilities in Oregon Coho Salmon populations trend higher at densities below 3.1 spawners per km; Chilcote (1999) estimates a depensation threshold of 2.4 spawners per km for several Coho Salmon populations of the lower Columbia River downstream of the Willamette River; and Wainwright et al. (2008) reports a threshold of 2.5 spawners per km in a model of Oregon Coast Coho Salmon. These authors further suggest that at an abundance of 6 spawners per km depensation is likely not occurring, and at 12 spawners per km the depensation is highly likely not occurring. Based on this range of reported values for depensation, it is recommended that captive rearing efforts should be evaluated, planned and initiated prior to reaching a threshold of 1 spawner per km (Depensation- N_a), and that a target of 5 spawners per km (5 x Depensation- N_a) should be established for the initial consideration of termination of captive rearing efforts.

The captive rearing thresholds and targets proposed in Table 2, Table 3, and Table 4

³ Independent Populations are populations with a high likelihood of persisting over 100-year time scales due to their population size and relatively independent dynamics (i.e., negligible influence of migrants from neighboring populations on extinction risk); Dependent Populations are populations with a substantial likelihood of going extinct within a 100-year time period in isolation due to smaller population size, but receive sufficient immigration to alter their dynamics and reduce extinction risk.

are based on the rationale that a captive rearing program will be associated with certain start-up costs, which are likely to be much higher than the running costs. Therefore, captive rearing programs should not be terminated before natural escapement (naturally produced Coho Salmon) has reached a level equal to or above 5 x Depensation- N_a threshold annually for three consecutive generations. Setting the termination threshold at 5 x Depensation- N_a level will minimize the necessity and frequency of repeated start-up and termination of any given captive rearing intervention and should allow a population to reach a level of abundance which has a higher probability of being self-sustaining. Since smaller basins (i.e. < 10 km²) are limited by a relatively low carrying capacity, managing for a minimum population abundance of at least 50 adults will help to reduce inbreeding depression.

Results and Regional Recommendations

The following two recommendations were developed by the CRR TWG for the CCC Coho Salmon ESU and apply to all three focus areas within the CCC Coho Salmon ESU which were evaluated for potential captive rearing efforts by the PACT CCR TWG (South of San Francisco Bay, North of San Francisco Bay and Coastal Mendocino County).

CCC Coho Salmon ESU-wide Recommendations

ESU-1. Develop and implement a mechanism that focuses existing and potential future habitat restoration funds on watersheds where captive rearing of Coho Salmon is ongoing, or Coho Salmon presence has been observed within the last three years.

Status: Under development/in progress.

ESU-2. Continue to develop and implement the Coastal Salmonid Monitoring Program (CMP) in the CCC Coho Salmon ESU. Status: In progress.

The following sections describe the results and recommendations regarding consideration of captive rearing efforts for the geographic areas north and south of San Francisco Bay.

South of San Francisco Bay

Historically, the region south of San Francisco Bay contained two functionally independent Coho Salmon populations: Pescadero Creek and San Lorenzo River. Neither of these currently has an extant wild Coho Salmon population, although a few naturally produced Coho Salmon have been observed in these and a few other, smaller regional watersheds over the past decade or more (e.g., Gazos Creek, Waddell Creek, San Vicente Creek) (Williams et al., 2016). In the absence of any significant level of wild Coho Salmon production, it is highly unlikely that recovery of robust, self-sustaining Coho Salmon populations in these streams can occur without hatchery intervention. To prevent complete extirpation of Coho Salmon from watersheds south of San Francisco, the few remaining Coho Salmon need to be protected, and their genotypes preserved. Additionally, Coho Salmon abundance in selected watersheds needs to be increased to levels where natural production can lead to population growth. Protection of remnant populations and preservation of genotypes can be accomplished by collecting natural-origin juvenile Coho Salmon from regional streams, wherever possible, so they can be used as broodstock in a captive rearing program.

Currently, the only significant source of Coho Salmon broodstock in this region is the Kingfisher Flat Conservation Hatchery (KFH) located on Big Creek in the Scott Creek watershed in Santa Cruz County, operated by the Monterey Bay Salmon and Trout Project (MBSTP). The KFH operates under the advisement and management oversight of the NOAA South West Fishery Science Center (SWFSC) and CDFW. This conservation hatchery is supported by a Coho Salmon captive broodstock program located at the NOAA Fisheries SWFSC, located in Santa Cruz. However, several years of poor marine survival, in combination with hatchery capacity limitations, site-specific production problems, the adverse effects of the 2009 Lockheed Fire and several years of drought, have resulted in the functional extirpation of all three Coho Salmon year classes in Scott Creek. As a result, KFH has relied almost exclusively on captive broodstock production to produce the last several Coho Salmon cohorts. Only about 3,000 Coho Salmon smolts were available for release into Scott Creek in spring 2012, although that number increased to over 30,000 in 2013 and 2014.

In 2014 and 2015, both adult and juvenile broodstock Coho Salmon, held at the KFH, experienced significant mortalities from epizootic fungal infections (*Saprolegnia spp*) due to drought-exacerbated poor water quality at the hatchery. Under normal environmental conditions, and in immunologically uncompromised Coho Salmon, fungal infections usually do not reach epizootic levels. However, under drought conditions (warm water of poor quality) and in physiologically stressed salmon (during spawning and smoltification), the balance between host, pathogen, and environment can quickly shift in favor of an epizootic outbreak of the pathogen. For these reasons, a percentage of Coho Salmon from each year class produced at KFH is reared temporarily at Don Clausen Fish Hatchery (DCFH) in Sonoma County to act as a backup until rearing conditions at KFH are adequate to support the entire cohort.

The discussion of potential captive Coho Salmon rearing efforts south of San Francisco in general, and the performance of the KFH specifically, have assumed a new level of importance considering the severe and persistent drought conditions in central California from 2012-2016. The KFH program has been essential in preventing the local extirpation of Coho Salmon south of San Francisco Bay; however, given the existing environmental, biological and political constraints, it is unlikely that it can operate as an effective regional recovery hatchery. To make progress towards Coho Salmon recovery south of San Francisco, and to avoid further significant mortality events, the CRR TWG has concluded that expanded captive rearing of Coho Salmon south of San Francisco is required, preferably at a new and adequately sized state-of-the-art conservation hatchery which would be able to augment and re-establish Coho Salmon in various regional watersheds through artificial spawning of broodstock and release of progeny in selected watersheds.

Captive rearing should continue until natural escapement (natural-origin adult abundance) reaches levels that are significantly above depensation levels (e.g., 5 x depensation- N_a). The critical depensation thresholds (Depensation- N_a , equivalent to

one spawner per IP-km⁴ for Scott Creek, Pescadero Creek and San Lorenzo River are listed in Table 2. An initial wild Coho Salmon abundance target of five times the depensation threshold for these three watersheds south of San Francisco would require a total sustained annual escapement of 975 adult Coho Salmon (Scott Creek: 75; Pescadero Creek: 305; San Lorenzo River: 595). These minimum escapement levels combined equal less than 15% of the NOAA Fisheries Coho Salmon ESU delisting targets for these three watersheds (510, 2,300 and 3,800, respectively) (NMFS 2012). The population depensation threshold is based on the amount of IP-km, proposed captive rearing target, and NOAA Fisheries delisting targets for each watershed, listed in Table 2.

Current situation

In January 2016, CDFW and NOAA Fisheries began to jointly investigate the potential development of a new regional Coho Salmon conservation hatchery, to serve primarily Coho Salmon populations south of San Francisco Bay. The main goals and objectives of the proposed hatchery program are as follows;

- I. To conserve, restore, and increase numbers (and populations) of Coho Salmon in watersheds south of the Golden Gate.
- II. To the maximum extent possible, conserve or increase the existing unique genetic composition of Coho Salmon populations.
- III. To provide opportunities to conduct research related to salmonid conservation and recovery, and for public education and outreach.

The geographic area under consideration for the proposed conservation hatchery is in the Santa Cruz Mountains in San Mateo and Santa Cruz counties. This includes coastal streams such as Pescadero Creek, Waddell Creek, Scott Creek, San Vicente Creek, San Lorenzo River, San Gregorio Creek and Aptos Creek. Several potential sites for the

⁴ IP is defined as the intrinsic potential of streams to historically support Coho Salmon and was modeled by the NOAA Fisheries technical recovery team to establish density-based low extinction risk abundance targets (Spence et al. 2008). Populations potentially at high risk of depensation are defined as those with average spawner densities of less than 1 adult spawner per IP km (Spence et al., 2008).

proposed hatchery have been identified and visited. Other potential sites may also be investigated before a final decision is made.

To increase the production of hatchery-reared juveniles and supplement the natural production of Coho Salmon in the affected coastal watersheds, the following theoretical options are potentially available:

1. Increase the production capacity of the Kingfisher Flat conservation hatchery.
2. Increase the production capacity of the Warm Springs conservation hatchery.
3. Construct a new regional conservation hatchery/research facility south of San Francisco Bay.

There are several logistical constraints to increasing the production capacity of the Kingfisher Flat conservation hatchery. These include the space constraints at the existing hatchery location, and the lack of an adequate and reliable water supply. In addition to inadequate water supply, there are also potential disease issues related to fungal infestations related to poor water quality, as well as ever-present potential of wildfires near the hatchery.

A proposal to increase the production capacity at the Warm Springs conservation hatchery may present limitations related to space, water supply and costs. Although it may be feasible to increase the production capacity at the DCFH, any expansion of the RRCSCBP would most likely be used to increase hatchery Coho Salmon releases in the Russian River or other regional Coho Salmon watersheds north of San Francisco. In addition, DCFH is located at a considerable distance from watersheds south of San Francisco Bay which further limits its potential to serve as a conservation hatchery for southern Coho Salmon.

A sub-group of regional hatchery specialists from the joint CDFW/NOAA Technical Review Group has considered the requirements for a new regional Coho Salmon conservation hatchery. It is estimated that approximately an annual production level of 250,000 - 300,000 Coho Salmon smolts may be adequate to protect or increase genetic

diversity and help re-establish populations in watersheds in the area of the Santa Cruz Mountains. The hatchery specifications needed to meet this production goal are currently under consideration. The hatchery proposal is currently being considered by CDFW and NOAA Fisheries. For further information see;

http://www.westcoast.fisheries.noaa.gov/stories/2016/23_11252016_ccc_coho_hatchery.html

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Table 2: South of San Francisco Bay CCC Coho Salmon ESU watersheds, population depensation threshold, proposed captive rearing target, federal recovery target and recent Coho Salmon abundance, 2008-2017.

Watershed ¹	IP-km Depensation-N _a Threshold	Captive Rearing Target ²	NOAA Fisheries Delisting Target	Estimated Adult Abundance									
				2008/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	
Scott Creek	15	75	510	23	1	3	1	30	16	167	13	16	
Pescadero Creek	61	305	2,300	Functionally extirpated ⁵									
San Lorenzo River	119	595	3,800	Functionally extirpated									
Gazos Creek	8	50	279	Functionally extirpated									
Waddell Creek	9	50	313	Functionally extirpated									
Soquel Creek	33	165	1,122	Functionally extirpated ³									
San Vicente Creek	3	50	105	Functionally extirpated ³									
Total	248	1,290	8,429	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

¹ Streams listed in bold are Historically Independent populations

² Captive Rearing Target = 5 x Depensation-N_a or 50, whichever is greater

³ Small numbers of Coho Salmon juveniles and/or adults were released into this creek in 2011–2015 and some natural production may have occurred.

⁵ The population is below the depensation level and is no longer viable

South of San Francisco (SSF) Recommendations

SSF-1: Build a new regional Coho Salmon conservation hatchery in the CCC Coho Salmon ESU south of San Francisco.

Status: Planning efforts involving CDFW, NOAA Fisheries management and local entities are in progress.

SSF-2: Provide logistical and financial support and resolve all outstanding permitting issues at the Kingfisher Flat facility, to ensure maximum productivity and effectiveness of the MBSTP/NOAA Coho Salmon recovery hatchery program on Scott Creek until a new regional Coho Salmon recovery facility is operational.

Status: In progress.

SSF-3: Provide financial support for a robust monitoring and evaluation program to determine effectiveness of different release sites and strategies of any current or future captive rearing program, including genotyping of all fish being handled in the program.

Status: In progress.

North of San Francisco Bay

Russian River

The Russian River basin presents a unique situation within the CCC Coho Salmon ESU as it represents the largest watershed in the ESU, has a functionally extirpated wild Coho Salmon population, and supports the largest Coho Salmon recovery hatchery program in California. Historically, the Russian River had been the largest functionally independent Coho Salmon population in the CCC Coho Salmon ESU with an estimated current 506 IP-km of suitable Coho Salmon habitat (NMFS, 2012). Located at the DCFH at Lake Sonoma Dam, the RRCSCBP currently produces approximately 200,000 juvenile Coho Salmon annually for release into 20-30 Russian River tributaries.

Although the RRCSCBP initially only included Coho Salmon of Russian River origin, it now also rears small numbers of Lagunitas Creek/Olema Creek (Marin Co.) Coho Salmon which are used in part for outbreeding and in part for releases to other Sonoma and Marin County populations (discussed in next section). Since 2009, the program has implemented systematic outcrossing of Russian River Coho Salmon with Lagunitas

Creek/Olema Creek Coho Salmon to counteract inbreeding. On a temporary basis, Scott Creek (Santa Cruz Co.) Coho Salmon are also reared for part of their life cycle at DCFH to produce high-quality Coho Salmon broodstock for the MBSTP/NOAA Fisheries recovery hatchery program in Santa Cruz.

The RRCSCBP is well situated to serve as a regional Coho Salmon recovery hatchery for populations north of San Francisco. Located at the base of Lake Sonoma dam, it is close to the lower Russian River as well as Salmon Creek, Walker Creek, Lagunitas Creek, Pine Gulch and Redwood Creek to the south and the Gualala River and other Coho Salmon-bearing streams to the north. Equally importantly, the program has developed the technical and biological expertise to effectively operate a recovery hatchery, including implementing genetically optimal mating protocols. The main limitation to the effectiveness of the RRCSCBP at DCFH is the restricted hatchery production capacity, including limited water supply and rearing space. It is unlikely that DCFH will be able to increase its annual production above 200,000 Coho Salmon, without an increase in its water supply, staffing and other required resources.

It is recommended that captive rearing of Coho Salmon should continue in the Russian River basin until natural escapement (wild adult abundance) reaches levels that are significantly above depensation levels (e.g., 5 x depensation- N_a). The population depensation threshold based on available habitat (IP-km), proposed captive rearing target, and NOAA Fisheries delisting targets for the Russian River are listed in Table 3.

Russian River (RR) Conservation Hatchery Program Recommendations

RR-1: Develop a DCFH Expansion Plan to provide for:

- a) a production capacity increase to 800 spawners, 1 million eggs and 500,000 juvenile Coho Salmon annually (as described in the RRCSCBP Coho Salmon HGMP);
- b) the provision of an adequate number of circular tanks to accommodate rearing of additional 2,000 Coho Salmon to adulthood.

Status: Under development

RR-2: Fund and implement projects identified through PACT that address factors currently limiting Coho Salmon production in all current RRCSCBP program streams

and other Russian River tributaries and regional watersheds where Coho Salmon are likely to be released through the recovery hatchery program.

Status: In progress.

Coastal Marin and Sonoma Counties

Besides the Russian River, this region contains five streams that are part of the NOAA Fisheries Coho Salmon Recovery Plan list of focus streams (NMFS, 2012). These streams are Redwood, Lagunitas, Salmon and Walker creeks and Pine Gulch. Only Lagunitas Creek is classified as a historically independent population, with Walker Creek being listed as a potentially independent⁶ population.

Surplus juveniles and adults from the RRCSCBP (Russian River and Olema Creek Coho Salmon) have also been released into regional streams lacking extant Coho Salmon populations (Salmon Creek and Walker Creek). Adult Olema Creek and Russian River Coho Salmon not used for spawning at DCFH have been released into Salmon Creek (Sonoma Co.) for several consecutive years (2008-2015), and in Walker Creek (2017). In Salmon Creek, these releases have been relatively successful in producing Coho Salmon offspring of all possible cross types (pure Olema Creek Coho Salmon, pure Russian River Coho Salmon and hybrids).

Although the release of adult Coho Salmon is a relatively new recovery technique, the Salmon Creek experience shows that adult releases may have the potential to be more widely used as recovery technique. The potential benefits of adult releases include reduced husbandry requirements (no artificial spawning), free mate choice after release into wild habitat, full exposure of naturally produced F₁ progeny to prevailing selective regimes, and significantly reduced hatchery costs and space requirements. Additionally, surplus juvenile Coho Salmon have been released into Walker Creek since 2008. The Salmon Creek and Walker Creek efforts may continue without a significant increase in resource requirements.

⁶ Populations having a high likelihood of persisting in isolation over 100-year time scales, but are too strongly influenced by immigration from other populations to exhibit independent dynamics

Starting in 2014, a small number of Coho Salmon have been collected from successive year classes in Redwood Creek, Marin County, and reared at DCFH with the goal of future adult releases (up to 200 each year) back into Redwood Creek to supplement naturally returning wild populations. This program relies on a Memorandum of Understanding and financial support between the National Park Service and the US Army Corps of Engineers and is dependent on juvenile rearing space at DCFH following installation of additional adult holding tanks.

In developing potential captive rearing programs for this group of streams, the CRR TWG considered historical population structure, availability of hatchery facilities, different captive rearing approaches, and factors limiting expansion of the RRCSCBP at DCFH. As discussed elsewhere in this document, and in accordance with generally accepted principles of meta-population dynamics, the CRR TWG evaluated captive rearing programs for Lagunitas Creek, Salmon Creek, Walker Creek and Redwood Creek (the TWG did not formulate any recommendations for potential captive rearing efforts of salmon for release into Pine Gulch Creek).

DCFH currently rears Lagunitas Creek/Olema Creek Coho Salmon, primarily for systematic outbreeding of Russian River Coho Salmon and, secondarily, for the potential purpose of returning mature adult Coho Salmon back into Olema Creek, should the risk of year-class extirpation remain due to highly depressed natural returns, as seen over the past three years. Also, if the Lagunitas Creek population continues to decline, a captive rearing program may need to be established to increase population abundance. This could help return the Coho Salmon population to abundance levels which could once again function as a source population for other smaller, dependent populations in this region.

The population depensation threshold based on amount of IP-km, proposed captive rearing target, and NOAA Fisheries delisting targets for each watershed are listed in Table 3.

Marin and Sonoma County (MSC) Recommendations

MSC-1: Continue to capture juvenile Lagunitas/Olema Creek Coho Salmon for use in the Russian River Coho Salmon Captive Broodstock Program, while also monitoring wild Coho Salmon populations (and the captive Coho Salmon) for genetic integrity.

Status: In progress.

MSC-2: Develop a Memorandum of Understanding with the Point Reyes National Seashore Association to formally establish and operate a cooperative Coho Salmon captive rearing and conservation program for Marin County Coho Salmon streams, to include potential juvenile and adult Coho Salmon releases in Lagunitas/Olema Creek, which is consistent with current captive rearing and fish rescue protocols.

Status: Under development

MSC-3: For Redwood Creek, develop a rescue rearing program to re-stock rescued fish as adults (or other captive rearing program, if appropriate).

Status: Program developed, implementation in progress until 2019, when the program will be reassessed.

MSC-4: In Salmon Creek, continue the adult Coho Salmon release program until captive rearing targets or other specified management targets are achieved.

Status: Releases in progress since 2008.

MSC-5: In Walker Creek, continue to release Coho Salmon not used for outbreeding purposes at DCFH until captive rearing targets or other specified management targets are achieved.

Status: Releases in progress since 2003.

MSC-6: Provide financial support for a robust monitoring and evaluation program to determine the effectiveness of different release sites and strategies.

Status: Under development (the Russian river program is funded by USACE, Marin County). Population monitoring partially implemented by National Park Service and Marin Municipal Water District.

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Table 3: North of San Francisco Bay CCC Coho Salmon ESU watersheds, population depensation threshold, proposed captive rearing target, Federal recovery target and recent Coho Salmon abundance, 2008-2017.

Watershed ¹	IP-km Depensation-N _a Threshold	Captive Rearing Target ²	NOAA Fisheries Delisting Target	Estimated Adult Abundance								
				08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Russian River	506	2,530	10,100	5	9	206	401	536	313	397	122	456
Salmon Creek ⁴	48	240	1,367	310	300	62	200	239	219	319	309	295
<i>Walker Creek</i> ^{3, 5}	69	345	2,600	100	0	0	0	2	7	3	11	N/A
Lagunitas Creek ⁶	70	350	2,600	52	130	202	274	498	440	286	584	330
Pine Gulch	7	50	394	4	0	0	0	0	0	0	0	0
Redwood Creek	8	50	272	4	46	6	8	50	10	8	30	26
Total	708	3,565	17,333	475	485	494	883	1,325	1,302	1,013	1,056	1,107

¹ Streams listed in bold are Historically Independent populations.

² Captive Rearing Target = 5 x Depensation-N_a or 50, whichever is greater.

³ Streams listed in italics are Potentially Independent populations.

⁴ Functionally extirpated. Data presented are adult Coho Salmon released by the RRCSCBP.

⁵ Functionally extirpated. Data for 2009 are adult Coho Salmon of Olema Creek origin released by the RRCSCBP.

⁶ Adult Coho Salmon abundance estimated from redd counts, assuming 2 spawners per redd.

Coastal Mendocino County

The coastal streams of Mendocino County support Coho Salmon populations which, combined, constitute a significant proportion of the abundance of CCC Coho Salmon.

The region includes two Diversity Strata⁷:

1. The Lost Coast Diversity Stratum, (including extant populations in Pudding and Caspar Creeks as well as the Ten Mile, Noyo, Big, and Albion Rivers).
2. The Navarro Point – Gualala Point Diversity Stratum, (including extant populations in the Garcia and Navarro Rivers).

These populations represent a critical component of Coho Salmon recovery in the CCC Coho Salmon ESU (NMFS 2012).

Despite significant decreases in CCC Coho Salmon ESU abundance during the coast-wide decline of salmon populations between 2006 and 2009, and more recently during the drought of 2014-2016, some northern streams in the CCC Coho Salmon ESU in Mendocino County still exhibit relatively robust population abundance and distribution patterns. This suggests that meta-population dynamics, especially the subsidy of smaller (dependent) populations by larger (independent) populations, remain more functional in these northern streams than in the southern part of the CCC Coho Salmon ESU. The presumed ability of larger populations (e.g., those in Ten Mile, Noyo and Navarro Rivers) to provide naturally straying Coho Salmon to geographically proximate smaller watersheds (e.g., Wages Creek, Pudding Creek, Caspar Creek, Big Salmon Creek), suggests that the approach to captive rearing of Coho Salmon in Mendocino County should differ from that suggested for the southern part of the ESU.

The CRR TWG recommends that captive rearing efforts in Coastal Mendocino County streams should focus on maintaining and improving Coho Salmon populations in historically independent populations so that these populations can serve as sources of migrants for smaller, dependent populations. Due to the low levels of Coho Salmon

⁷ Diversity Strata are described in the NOAA Fisheries CCC Coho Salmon ESU recovery plan as groups of “geographically proximate populations that reflect the diversity of selective environments, phenotypes and genetic variation across the ESU” (NMFS, 2012).

abundance in the Garcia, Navarro, and Gualala Rivers, these watersheds are currently being evaluated as priority streams for captive rearing programs.

Due to a lack of appropriate rearing facilities on the Mendocino coast, any captive rearing efforts for coastal Mendocino Coho Salmon would likely involve operational support and expertise from the Russian River Coho Salmon Captive Broodstock Program at DCFH. This would involve the development of additional labor resources, partnerships, and funding for operations and required monitoring. Coho Salmon populations in nearby watersheds will be evaluated as potential sources for needed Mendocino coastal broodstock, and the specific rearing and release approaches will be developed by the CRR TWG. The population depensation thresholds, based on the amount of IP-km, proposed captive rearing targets, and NOAA Fisheries delisting targets for each watershed, are listed in Table 4.

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Table 4: Coastal Mendocino CCC Coho Salmon ESU diversity strata, watersheds, population depensation threshold, proposed captive rearing target, Federal recovery target, and recent Coho Salmon abundance⁸, 2008-2017.

Watershed ¹	IP-km Depensation N _a Threshold	Captive Rearing Target ²	NOAA Fisheries Delisting Target	Estimated Adult Abundance								
				08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Lost Coast Diversity Stratum (LC)				08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Usal Creek	11	55	360	10	2	0	10	13	0	0	0	N/A ³
Cottaneva Creek	14	70	469	0	0	N/A	0	N/A	N/A	N/A	0	N/A
Juan Creek	6	50	N/A	N/A	N/A	N/A	0	N/A	N/A	25	N/A	N/A
DeHaven Creek	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wages Creek	10	50	340	0	0	0	N/A	N/A	0	N/A	N/A	N/A
Ten Mile River	105	525	3700	0	190	395	1127	440	3	1654	241	N/A
Pudding Creek	29	145	963	50	9	199	415	283	0	539	135	N/A
Noyo River	118	590	4000	294	286	411	228	784	723	3468	5112	N/A
South Fork Noyo River	Included in above	Included in above	Included in above	19	63	39	38	398	305	616	1047	N/A
Hare Creek	12	60	N/A	N/A	0	0	N/A	0	0	N/A	N/A	N/A
Jug Handle Creek	5	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Caspar Creek	13	65	435	6	5	27	20	10	0	0	56	N/A
Russian Gulch	61	305	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Big River	192	960	5500	80	134	160	269	519	155	1344	744	N/A

⁸ Recent data from Holloway, W., Gallagher, S. P., Thompson, S., Lang, E., and D. Ulrich. 2016

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Watershed ¹	IP-km Depensation N _a Threshold	Captive Rearing Target ²	NOAA Fisheries Delisting Target	Estimated Adult Abundance								
				08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Lost Coast Diversity Stratum (LC)				08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Little River	71	355	N/A	4	2	8	2	2	2	65	15	N/A
Albion River	60	300	2300	8	0	162	66	894	0	467	137	N/A
Big Salmon Creek	17	85	578	0	N/A	N/A	19	0	N/A	N/A	N/A	N/A
Lost Coast DS Total	730	3,695	18,645	471	691	1,401	2,194	3,343	1,188	8,178	7,487	N/A
Navarro Point - Gualala Point Diversity Stratum (NP-GP)				08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Navarro River	201	1005	5700	70	452	420	244	354	0	423	395	N/A
Greenwood Creek	5	50	N/A	9	0	N/A	N/A	0	N/A	2	N/A	N/A
Elk Creek	10	50	N/A	N/A	N/A	0	N/A	N/A	0	N/A	N/A	N/A
Alder Creek	61	305	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brush Creek	18	90	N/A	0	0	0	0	0	0	0	0	0
Garcia River	76	380	2800	69	9	90	0	211	3	469	170	N/A
Gualala River	252	1260	6200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Navarro Point- Gualala Point DS Total	623	3,180	14,700	148	461	510	244	565	3	892	565	N/A
Grand Total	1,353	6,875	33,345	619	1,152	1,911	2,438	3,908	1,191	9,070	8,052	N/A

1 Streams listed in bold are Historically Independent populations

2* Captive Rearing Target = 5 x Depensation-N_a or 50, whichever is greater.

3*** N/A = No data available/not surveyed

Coastal Mendocino County (CMC) Recommendations

CMC-1: Focus evaluation of captive rearing projects on Historically Independent populations (Ten Mile, Noyo, Big, Albion, Navarro, Garcia and Gualala Rivers) with adult abundance status near or below the NOAA 2012 high risk depensation thresholds. Status: In progress.

CMC-2: Due to low population status of Coho Salmon and extirpation of year classes, give highest priority to the evaluation of captive rearing for Coho Salmon in the Navarro-Gualala Point Diversity Strata. Status: In progress.

CMC-3: Conduct summer juvenile salmonid population spatial structure surveys in the Navarro-Gualala Point Diversity Strata to locate and evaluate the potential and suitability for broodstock collection. Status: Pending.

CMC-4: Evaluate the feasibility of expanding the Russian River Coho Salmon Captive Broodstock Program to facilitate and support captive rearing projects in coastal Mendocino County streams. Status: In progress.

Integration of Captive Rearing with other Efforts

The CRR TWG recommends integrating potential Coho Salmon captive rearing programs with complementary recovery efforts described by the other five Technical Work Groups to maximize the probability of success of any captive rearing effort in terms of increasing population abundance and reducing extinction risk. Complementary efforts include habitat protection and restoration, population trend monitoring, hatchery evaluation, genetic assessment and harvest monitoring. Although long-term monitoring efforts in many Coho Salmon bearing watersheds have been implemented for years, their methods have not always been consistent.

The Coastal Salmonid Monitoring Program (CMP) provides a consistent and standardized approach to trend monitoring of California salmonid populations (Adams et al., 2011). Data provided by the CMP is essential in assessing the status of Coho

Salmon throughout the State and allowing direct comparison of monitoring results across watersheds. Hatchery evaluation is also a critical component of population monitoring efforts to provide for a robust evaluation of program effectiveness (e.g. release strategy comparison) and success (e.g. increase in spawners).

Trend monitoring of Coho Salmon within the framework of the CMP is currently funded through the Fisheries Restoration Grants Program (FRGP) with support from local sponsors in selected watersheds of the CCC Coho Salmon ESU. Hatchery evaluation monitoring is currently funded by the USACE (northern part of CCC ESU) and the SWFSC (southern part of CCC ESU). Genetic assessment is funded by the NMFS through the SWFSC.

Summary

1. Due to the extremely depressed status of many Coho Salmon populations in the CCC Coho Salmon ESU, it is likely that habitat restoration alone will be insufficient to prevent further widespread population extirpation. Captive rearing and rescue will likely be required to preserve genotypes and rebuild remnant Coho Salmon populations in the CCC ESU.
2. The existing conservation hatchery facilities at DCFH in the Russian River and KFH in Scott Creek are currently insufficient to accomplish the immediate goals of preventing further population extirpation, preserving genotypes, and rebuilding Coho Salmon populations above depensation levels. A new regional recovery hatchery south of San Francisco and a significant expansion of DCFH production levels are required to achieve these goals.
3. The ongoing operation of the RRCSCBP will include supplementation of depressed or extirpated populations of Coho Salmon in Sonoma and Marin counties with fish surplus to the needs of the spawning requirements of the RRCSCBP. This strategy involves collection of wild juvenile Coho Salmon from various sub-watersheds, integration into the broodstock program guided by a genetically informed breeding matrix, hatchery rearing, and release of juveniles and adults into targeted basins

4. Captive rearing efforts for coastal Mendocino County Coho Salmon populations should focus on those watersheds that have been identified as functionally independent populations of the Lost Coast and the Navarro Point – Gualala Point Diversity Strata by NOAA Fisheries (NMFS, 2012) and have a population abundance below the high risk depensation threshold.
5. Coho Salmon rescue operations must be authorized by NOAA Fisheries or CDFW and should follow the specific Coho Salmon rescue protocol (see Appendix 1) and be documented in a rescue record (see Appendix 2).

3.Instream Flow and Conservation Technical Working Group

Introduction

The Instream Flow and Conservation (IFC) Technical Working Group (TWG) developed recommendations for actions that would result in immediate benefits to stream flow in CCC Coho Salmon ESU watersheds. This section presents the IFC TWG goals, methods, and recommended actions.

Goals and Objectives

The goal of this chapter is to identify information relevant to instream flow issues affecting CCC Coho Salmon streams, and to prioritize actions based on those findings.

This includes:

- An assessment of existing stream flow gauging information and locations for additional gauging needed in each watershed.
- An assessment of existing surface water diversions, impoundments and sources of groundwater use and bypass flow conditions.
- A determination of available instream flow recommendations and completed instream flow studies.
- The generation of appropriate corrective actions to protect, restore, or enhance stream flow in priority watersheds.

Background

Many of central California coastal watersheds, due to the mounting needs of both consumptive and non-consumptive use, are experiencing the effects of increased water demand. These increased demands for water have resulted in alterations to the instream flow of many streams that support populations of CCC Coho Salmon. Changes to a streams' natural flow regime can modify instream and riparian habitats and affect water quality in ways that can influence the survival and recovery of salmonids. The quantity of flow in a stream can affect various components of water quality including: physical characteristics such as sediment and temperature; chemical characteristics like dissolved oxygen, nitrogen, and pH; and biological attributes including bacteria, and the productivity of aquatic communities, such as benthic

macroinvertebrates and fish. Therefore, while an inadequate quantity of stream flow is evident in many of the CCC Coho Salmon watersheds, water quality, while less apparent, is also being degraded. For these reasons, the IFC TWG focuses primarily on instream flow quantity issues affecting CCC Coho Salmon watersheds, with the acknowledgment that adequate water quality and quantity are interconnected and that both are necessary to restore, manage, and enhance fishery resources.

Current Programs and Policy

Current State and Federal efforts which are underway with the aim of restoring, maintaining, and/or protecting CCC Coho Salmon ESU flow-dependent habitats include:

- National Marine Fisheries Service 2012 Final Recovery Plan for Central California Coast Coho Salmon Evolutionary Significant Unit: Developed under the Federal Endangered Species Act, the recovery plan provides a road map that prioritizes threat abatement and restoration actions necessary to recover and eventually delist CCC Coho Salmon. An evaluation of instream flow conditions throughout the species' range indicated low summer flow threatened juvenile Coho Salmon survival in multiple watersheds.
- California Department of Fish and Wildlife 2004 Recovery Strategy for California Coho Salmon: The objectives of the Recovery Strategy are to return Coho Salmon to a level of sustained viability, while protecting the genetic integrity of both CCC and Southern Oregon Northern California Coast Coho Salmon ESUs, and to reach and maintain harvestable population levels. Instream flow modifications through land and water use changes were identified as a threat to CCC Coho Salmon, with many occupied watersheds having flow levels reduced from the natural regime.
- The California Water Action Plan 2014 Action 4: Protect and Restore Important Ecosystems, Enhance Water Flows in Stream Systems statewide: This action requires the State Water Resources Control Board (SWRCB) and CDFW to enhance flows statewide in at least five stream systems that support critical habitat for anadromous fish. Mark West Creek, a tributary to the Russian River,

has been identified as one of the five watersheds for which flow enhancement efforts are needed.

- NOAA Fisheries “Species in the Spotlight 2015” Central California Coast Coho Salmon: CCC Coho Salmon were selected as one of NOAA’s eight species nationwide considered to be most at risk for extinction in the near future. The Spotlight highlights actions currently underway as well as requests for continued collaboration between partners.
- NOAA Habitat Blueprint - The Russian River Valley watershed, California: NOAA selected the Russian River watershed as its first Habitat Focus Area because of the threat to salmonids (including CCC Coho Salmon), demand for competing uses of water, as well as the flooding frequency of the river. The goal of the Focus Area is to pool resources and expertise to maximize conservation efforts in the watershed.
- Voluntary Drought Initiative 2015: With this program, CDFW and NOAA Fisheries developed agreements with landowners and water users in the Russian River system to conserve and enhance stream flows. This was done to maintain subsistence flows for juvenile rearing in high priority streams, and to implement other collaborative actions like fish rescue, relocation, monitoring, and habitat restoration.
- SWRCB 2015 Drought Response in the Russian River: On June 17, 2015 the SWRCB adopted an emergency regulation to help protect Coho Salmon and steelhead in four Russian River tributary watersheds (Dutch Bill Creek, Green Valley Creek, Mark West Creek, and Mill Creek). The emergency regulation was in effect for 270 days and placed limits on the use of water for non-essential uses and enhanced water use disclosure information in critical areas upon request of the SWRCB.
- North Coast Regional Water Board Actions 2015: On March 11, 2015, the North Coast Regional Water Quality Control Board (Regional Board) adopted the 2014 Triennial Review List of Priority Basin Planning Projects for the North Coast Region (Triennial Review). The Triennial Review identifies three priorities related to instream flows: (1) criteria to determine when augmenting stream flows with

treated effluent is appropriate, (2) development of flow objectives for the Navarro River watershed, and (3) development of a regional method for establishing flow objectives. Additionally, the Regional Board is exploring opportunities to require or incentivize water conservation through its waste discharge authority. To support these efforts, the Regional Board has established a Flow Specialist position and formed a cross-program Flow Team to assist and provide advice on flow related projects that address the impacts of low flows on beneficial uses and water quality.

- Since January 2014, the Department has conducted stream and wildlife population monitoring, fish rescues, restoration projects, and many other actions to protect native fish and wildlife threatened or impacted by the statewide drought. These reports reflect efforts at various locations along the coast, the Central Valley, mountains, and deserts of California. Periodically, new reports and updates will be posted to keep the public informed on continued efforts during the drought. <https://www.wildlife.ca.gov/Drought/Projects>

Procedures and Recommendations

The following priorities were developed by considering all watersheds with respect to location, restoration potential, risk, and potential current or near future presence of CCC Coho Salmon in streams located in Sonoma, Marin, San Mateo, Mendocino and Santa Cruz Counties. The IFC TWG developed three separate subgroups to develop priorities by geographic area. Each of these subgroups set an initial meeting with CDFW and NOAA Fisheries biologists to gather local knowledge on each watershed. Using the NOAA CCC Coho Salmon recovery plan (NMFS, 2012) as a guide, each subgroup listed site specific flow recommendations for each watershed. The three subgroups identified are as follows:

- 1) The South of San Francisco subgroup, which addressed Scott Creek, Waddell Creek, Pescadero Creek, San Gregorio Creek and the San Lorenzo River.
- 2) The North of San Francisco subgroup, which addressed Redwood Creek, Lagunitas Creek, Walker Creek, Salmon Creek, the Russian River and the Gualala River.

- 3) The third group covers the northernmost area from the Navarro River north to the boundary of the CCC Coho Salmon ESU.

The IFC TWG evaluated the need for increased funding for flow restoration projects and to provide greater focus on projects that promote and assist:

- 1) installation and maintenance of water flow gauges;
- 2) funding for watershed runoff retention restoration and groundwater recharge projects;
- 3) development and implementation of instream flow studies; and
- 4) development of winter storage infrastructure for existing water diversions.

In addition, the group evaluated existing flow related regulations and developed priorities for improved implementation, including: Lake and Streambed Alteration permits, existing water right conditions, and existing Watermaster⁹ requirements. A dominant theme emerging from the TWG discussions was the need to protect low summer stream flows. Summer demand for water exceeds available summer flow in many of the CCC Coho Salmon streams; however, many of those streams also had low cumulative flow impairment indexes for winter diversion storage. This implies opportunities to protect summer low-flow period by shifting water diversions to the winter period (and providing storage for the summer demands) in CCC Coho Salmon streams.

The IFC TWG also examined opportunities to better coordinate enforcement efforts with the intent of developing a list of priority enforcement actions which would identify known illegal diversions. Enforcement actions could then be prioritized by stream and by most egregious diversions. The group also recognized the need to utilize the full spectrum of enforcement options, including coordination with County, State, and Federal agencies. In addition, the IFC TWG provided recommendations to the Outreach TWG on opportunities to promote, fund, and assist watershed groups with flow-specific charters,

⁹ A Watermaster is an entity appointed by the California State Department of Water Resources to uphold court order on water use in adjudicated basins.

and develop and implement education forums for stakeholders on instream flow issues, with the goal of engaging local communities.

Improved stream flow gauging and implementation of instream flow studies were identified as core needs to develop site specific flow recommendations that can improve fish survival. This includes updating the Public Resource Code 10004 list to focus on streams that support CCC Coho Salmon, as well as, prioritization of funding, and installation and maintenance of instream flow gauges. This program will be essential in guiding and refining our priorities and recommendations.

Priority Actions for Flow Enhancement

The first step in implementing priority actions should be to concentrate efforts in those streams recently, or currently occupied by CCC Coho Salmon, or those used for juvenile out-planting by conservation hatchery programs. These areas correspond roughly to the priority restoration areas in Sonoma, Marin, Mendocino, San Mateo, and Santa Cruz counties, as defined in the NOAA Fisheries Recovery Plan for the ESU of CCC Coho Salmon (NMFS, 2012). However, modifications to these suggested areas may be made in response to recent changes in Coho Salmon distribution. In addition, instream flow impairment is not an issue in all streams, so our recommendations are limited to those where water demands, and therefore flow impairments, are likely to impair CCC Coho Salmon survival. Any future refinement to the list of priority streams should consider the overall benefits of flow restoration in habitats that may potentially have a greater influence on Coho Salmon recovery.

We recommend priority actions for flow enhancement should be focused in the following lists of priority watersheds, located north and south of San Francisco (see Table 5).

Table 5: List of Priority Watersheds for Instream Flow and Conservation TWG’s Actions

Lists of Priority Watersheds for IFC TWG Actions	
South of San Francisco	North of San Francisco
Scott Creek	Navarro River
Waddell Creek	Gualala River
San Vicente Creek	Big River
Pescadero Creek	Noyo River
San Gregorio River	Garcia River
Laguna Creek	Albion River
Zayante Creek (San Lorenzo River)	Ten Mile River
Bean Creek (San Lorenzo River)	Green Valley Creek (Russian River)
Gazos Creek	Salmon Creek (Russian River)
Soquel Creek	Dutch Bill Creek (Russian River)
Aptos Creek	Mark West Creek (Russian River)
	Redwood Creek (Russian River)
	Gray Creek (Russian River)
	Lagunitas Creek
	Walker Creek
	Redwood Creek (coastal)
	Mill Creek (Russian River)

Region-Wide Priority Actions

The IFC TWG recommends eight region-wide actions to address the following instream flow issues (see Table 6).

1. Instream Gauging

Priority should be given to identify funding for equipment and personnel needed to install and maintain stream flow gauges in potentially flow impaired systems. Although many new gauges are being deployed in some of these drainages (mostly the Russian River), hydrologic data records are short or non-existent for many streams. In order to further define areas of concern and provide data support for management decisions, additional gauges are needed in the above streams. As such, funding and personnel should be prioritized to install and maintain stream gauges and to analyze all this stream flow data into a meaningful form. Furthermore, in those areas where

groundwater depletion has been identified as a limiting factor, assessment of groundwater/surface water interactions should be conducted. Since the State recently adopted the Sustainable Groundwater Management Act (SGMA), NMFS/CDFW participation in the SGMA should also be a priority where management plans are proposed within the range of CCC Coho Salmon.

Table 6: List of Instream Flow and Conservation Region-Wide Priority Actions.

Region-Wide Priority Actions		
Priority	Action	Description
IFC-1	Instream Gauging	Instream flow gauges are necessary assessment tools that help define reaches where stream flow is impaired. Comprehensive monitoring in priority watersheds is therefore recommended.
IFC-2	Instream Flow Studies	Flow studies are a necessary prerequisite to establishing bypass flows for diversions but are often lacking. Therefore, funding of such studies in priority watersheds is recommended.
IFC-3	Develop Water Storage	Funding of flow restoration efforts that alleviate the need to divert water during the summer low flow period, via increased storage capacity, should be given a high priority.
IFC-4	Compliance for Permitted Diverters and Dischargers	Increased inspection and enforcement of bypass flow conditions for diversions with existing water rights will improve the rate of compliance and support flow restoration. Improved compliance for sources of return flow, runoff and discharge is also recommended.
IFC-5	Minimize Illegal Diversions and Discharges	Many diversions exist with no legal claim of water right. Improved enforcement will deter such actions and support flow restoration. Similar recommendations are given for water quality issues.
IFC-6	Regulatory Streamlining	The State typically takes many years to issue water rights. Reducing this processing time will allow for implementation of bypass flows in a timelier manner. Additional regulatory mechanisms may also be recommended.
IFC-7	Enhance Summer Base Flow	Under certain conditions, the discharge of stored water into streams can improve survival of rearing juveniles. Planning and coordination of these releases is recommended to enhance the limited availability of summer rearing habitat observed in many priority areas.
IFC-8	Public Outreach	Public awareness of impacts to Coho Salmon and appropriate means of addressing such problems is not widely understood. Improved communication with the public is therefore recommended.

2. Instream Flow Studies

- Should allow watershed assessments that enhance CDFW understanding of streams with highest levels of cumulative impairments and support PACT actions.
- Should determine site-specific flow regimes necessary for the long-term protection, maintenance, and proper stewardship of fish and wildlife resources and support the following:
 - are explicitly protective of fish and wildlife resources;
 - evaluate levels of impairment to the natural hydrograph, particularly to base flows;
 - evaluate juvenile salmonid survival related to low flows;
 - evaluate effects of low flows on water quality; and
 - evaluate effects of diversions on recession flows.
- That coordinate with CDFW Instream Flow Program on planning, implementation, and reporting and follow CDFW guidelines, standard operating procedures, and study planning templates with the intent of developing site-specific flow recommendations shall be given preference.
- Should be conducted in response to new water right applications under the regional instream flow policy (AB2121) or as part of watershed or sub-watershed scale planning activities intended to enhance instream flows. Protocols used for these studies should be developed using the best available information and in collaboration with NOAA Fisheries and CDFW.
- Should prescribe flow regimes as well as develop flow criteria necessary for consideration in water allocation and appropriation actions or used in proceedings related to appropriation of water or other water planning activities.
- Should provide information to stakeholders and allow modification to water rights or current operations to avoid diversions during times that fish may be impacted.

3. Develop Water Storage

Priority should be given to projects which will support and expand on existing efforts to build off-stream storage capacity (e.g. ponds) to offset summer diversions. These

projects would require the information collected from the instream flow studies and stream gauging to ensure adequate protective measures for CCC Coho Salmon. If information is available in a specific watershed to support the construction of off-stream storage, implementation funding for those projects should be prioritized. Examples of existing programs of this nature include the Coho Partnership/National Fish and Wildlife Foundation (NFWF) Coho Salmon restoration program and the Trout Unlimited Wine and Water program.

The following recommendations should also be implemented:

- Rain water harvest, gray water re-use, low impact development and water conservation have great value for cost and should be prioritized as storage development options;
- Storage development should not be prioritized if there is high potential for environmental damage;
- Reservoir placement in the following areas is not advised:
 - Within riparian corridors, frequent or hazardous flood zones, geologically complicated areas, where headwater stream networks are lost or altered, areas where flows have been adversely disrupted, wetlands, or those that have potential to impact rare natural communities, or botanical resources.
- Overflow piping and outlets should be screened, and operations should avoid the spread of non-native species and reduce water pollution.

4. Compliance for Permitted Diverters and Dischargers

- Priority should be given to outreach with SWRCB staff for enforcement of existing bypass flow requirements, in those areas where bypass flows have already been included as conditions of either an Appropriative Water Right, adjudication of the watershed, or a Streambed Alteration Agreement.
- Agencies with jurisdiction over the project should conduct audits to assure compliance with the required terms are ongoing. In those instances where the bypass regimes are not considered adequately protective, agencies should pursue the imposition of more protective flow regimes.

5. Diversions and Discharges

- Prioritize development of an enforcement task force to specifically target diverters lacking legal authorization to divert water in priority watersheds.
- Communication between fisheries and enforcement is encouraged.
- Enforcement should focus on un-permitted direct diversions and non-compliance with bypass flow requirements.
- Those diversions that do not have either an Appropriative Water Right or are diverting under a Riparian Right should be notified of their noncompliance and be provided with information on how to come into compliance with State and Federal codes. Those diverters that wish to come into compliance will be provided with information on available resources and those who do not wish to come into compliance may be considered for enforcement actions through the SWRCB, County District Attorney's Office, the CDFW 1600 program, or through State or Federal Endangered Species Act authorities.
- CDFW outreach to the County Mendocino DA office to have meaningful enforcement of FGC section 1602, 5650, 5652, 5901, and 5937.
- Enforcement should be used in all the priority streams described here to identify flashboard dam structures and other instream water diversion infrastructure that may be adversely affecting downstream flow. Resulting solutions could range from voluntary redress of the problem to enforcement referrals.

6. Regulatory Streamlining

- Agency regulatory staff should prioritize review and processing of pending water right projects and other permits within priority watersheds. Evaluation should also include the need to make recommendations to the SWRCB on deeming watersheds fully appropriated, whether diversions constitute a waste and unreasonable use, or whether existing adjudications should be modified.

7. Enhance Summer Base Flow

- Prioritize implementation and funding for the development of projects that would coordinate summer releases in priority streams. Many existing stock ponds and

small reservoirs must be drained to comply with invasive species plan requirements included as components of their Permits. Those releases are usually scheduled to occur in the dry months of August, September, and/or October when many priority streams are known to be flow deficient. Coordinating these releases to supplement rearing flows could represent potentially significant improvements to juvenile survival during that critical period. Studies should be conducted to evaluate whether these releases can be conducted in manner that would not impair water quality. Further, programs cannot occur in systems with multiple unpermitted diversions without evaluating whether releases would be diverted downstream.

8. Public Outreach

- Provide guidance and technical support to watershed groups, communities, and land owners on the effects of lagoon breaching, diversions, rainwater harvesting, offstream storage, frost protection, and the CCC Coho Salmon life cycle.

Watershed-Specific Priority Actions

In addition to regional priorities, the IFC TWG recommended more specific actions within each priority watershed. The actions are grouped by watershed and by regional priority; see Table 7 (south of S.F. Bay) and Table 8 (north of S.F. Bay).

Table 7: List of Priority Actions for Watersheds South of San Francisco.

Priority Actions South of San Francisco			
Task #	Watershed	Regional Action	Site-Specific Action
W-SC-01	Scott Creek	Compliance for Permitted Diversifiers	Revise bypass flow conditions on existing water rights based on CDFW flow studies. Establish bypass flows below dam for Lockhead water right licenses. Establish bypass flows below CDFG hatchery
W-SC--2	Scott Creek	Regulatory Streamlining	Develop Streambed Alteration Agreement for Cal Poly diversions and establish bypass flows.
W-W-01	Waddell Creek	Minimize Illegal Diversions and Discharges	Investigate potential pollution discharge on East Waddell Creek. Survey East Waddell Creek above Last Chance Creek for illegal diversions.
W-W-02	Waddell Creek	Instream Gauging	Fund and install gauges on East Waddell, mainstem below East Waddell and above lagoon.
W-W-03	Waddell Creek	Public Outreach	Educate Last Chance Creek community on effects of diversions.
W-SV-01	San Vicente Creek	Minimize Illegal Diversions and Discharges	Investigate residential diversions in the town of Bonny Doon.
W-SV-02	San Vicente Creek	Regulatory Streamlining	Contact Peninsula Open Space Trust and develop a Streambed Alteration Agreement for the Davenport diversion.
W-P-01	Pescadero Creek	Minimize Illegal Diversions and Discharges	File a complaint with the SWRCB on summer diversions. Prevent artificial breaching of the lagoon and install monitoring camera in support. Conduct enforcement sweep of diversion screens.
W-P-02	Pescadero Creek	Regulatory Streamlining	Develop Streambed Alteration Agreements with bypass flows for diversions in Peters Creek and Shingle Mill area.
W-P-03	Pescadero Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies.
W-SG-01	San Gregorio River	Compliance for Permitted Diversifiers	Develop bypass flows for inclusion in the adjudication.
W-SG-02	San Gregorio River	Regulatory Streamlining	Develop Streambed Alteration Agreements for existing water right holders.
W-SG-03	San Gregorio River	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens.

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Priority Actions South of San Francisco			
Task #	Watershed	Regional Action	Site-Specific Action
W-SG-04	San Gregorio River	Instream Gauging	Fund and install a watershed-wide network of stream gauges.
W-L-01	Laguna Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep for unpermitted diversions.
W-Z-01	Zayante Creek (San Lorenzo River)	Regulatory Streamlining	Develop Streambed Alteration Agreements with the San Lorenzo Valley Water District and the Lompico Water District.
W-Z-02	Zayante Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep for unpermitted diversions. Conduct enforcement sweep for summer dams.
W-Z-03	Zayante Creek	Instream Gauging	Fund and install a watershed-wide network of stream gauges.
W-Z-04	Zayante Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies.
W-B-01	Bean Creek (San Lorenzo River)	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep for unpermitted diversions. Conduct enforcement sweep for summer dams.
W-B-02	Bean Creek	Instream Gauging	Fund and install a watershed-wide network of stream gauges.
W-B-03	Bean Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies.
W-G-01	Gazos Creek	Instream Gauging	Fund and install a watershed-wide network of stream gauges.
W-G-02	Gazos Creek	Minimize Illegal Diversions and Discharges	Prevent artificial breaching of the lagoon and install monitoring camera in support. Investigate sewage odor at the lagoon.
W-S-01	Soquel Creek	Compliance for Permitted Diverters	Develop bypass flows for inclusion in the adjudication. Appoint a water master.
W-S-02	Soquel Creek	Instream Gauging	Fund and install a watershed-wide network of stream gauges.
W-S-03	Soquel Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies.
W-A-01	Aptos Creek	Instream Gauging	Fund and install a watershed-wide network of stream gauges.

Table 8: List of Priority Actions for Watersheds North of San Francisco.

Priority Actions North of San Francisco			
Task #	Watershed	Regional Action	Site-Specific Action
W-GV-01	Green Valley Creek (Russian River)	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-GV-02	Green Valley Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies.
W-GV-03	Green Valley Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-GV-04	Green Valley Creek	Regulatory Streamlining	Petition the SWRB to declare Green Valley a fully appropriated stream. Develop Streambed Alteration Agreements for existing water right holders.
W-GV-05	Green Valley Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens.
W-GV-06	Green Valley Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.
W-S-01	Salmon Creek	Regulatory Streamlining	Develop Streambed Alteration Agreements for existing water right holders.
W-S-02	Salmon Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Survey Fay, Tannery and Coleman Creeks for illegal diversions.
W-S-03	Salmon Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-S-04	Salmon Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-S-05	Salmon Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer for high-volume uses such as agriculture and ranching.
W-DB-01	Dutch Bill Creek (Russian River)	Regulatory Streamlining	Petition the SWRB to declare Dutch Bill Creek a fully appropriated stream. Develop Streambed Alteration Agreements for existing water right holders.
W-DB-02	Dutch Bill Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-DB-03	Dutch Bill Creek	Minimize Illegal Diversions and Discharges	Investigate whether residential wells are drawing from subterranean stream flow and recommend water right application. Conduct enforcement sweep of diversion screens.
W-DB-04	Dutch Bill Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-DB-05	Dutch Bill Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-DB-06	Dutch Bill Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.

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Priority Actions North of San Francisco			
Task #	Watershed	Regional Action	Site-Specific Action
W-MW-01	Mark West Creek (Russian River)	Compliance for Permitted Diverters	Petition the SWRB to declare Mark West Creek a fully appropriated stream. Inspect bypass flow conditions and ensure compliance.
W-MW-02	Mark West Creek	Regulatory Streamlining	Develop Streambed Alteration Agreements for existing water right holders.
W-MW-03	Mark West Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-MW-04	Mark West Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Investigate whether residential wells are drawing from subterranean stream flow and recommend water right application.
W-MW-05	Mark West Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-MW-06	Mark West Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-MW-07	Mark West Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.
W-R-01	Redwood Creek (Russian River)	Regulatory Streamlining	Petition the SWRB to declare Redwood Creek a fully appropriated stream. Develop Streambed Alteration Agreements for existing water right holders.
W-R-02	Redwood Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-R-03	Redwood Creek	Compliance for Permitted Diverters	Inspect bypass flow conditions and ensure compliance.
W-R-04	Redwood Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Investigate whether residential wells are drawing from subterranean stream flow and recommend water right application.
W-R-05	Redwood Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-R-06	Redwood Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-R-07	Redwood Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.
W-M-01	Mill Creek (Russian River)	Regulatory Streamlining	Petition the SWRB to declare Mill Creek a fully appropriated stream. Develop Streambed Alteration Agreements for existing water right holders.
W-M-02	Mill Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-M-03	Mill Creek	Compliance for Permitted Diverters	Inspect bypass flow conditions and ensure compliance.

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Priority Actions North of San Francisco			
Task #	Watershed	Regional Action	Site-Specific Action
W-M-04	Mill Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Investigate whether residential wells are drawing from subterranean stream flow and recommend water right application.
W-M-05	Mill Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-M-06	Mill Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-M-07	Mill Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.
W-G-01	Gray Creek (Russian River)	Regulatory Streamlining	Petition the SWRB to declare Gray Creek a fully appropriated stream. Develop Streambed Alteration Agreements for existing water right holders.
W-G-02	Gray Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-G-03	Gray Creek	Compliance for Permitted Diverters	Inspect bypass flow conditions and ensure compliance.
W-G-04	Gray Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Investigate whether residential wells are drawing from subterranean stream flow and recommend water right application.
W-G-05	Gray Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-G-06	Gray Creek	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-G-07	Gray Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.
W-L-01	Lagunitas Creek	Regulatory Streamlining	Develop Streambed Alteration Agreements for existing water right holders.
W-L-01	Lagunitas Creek	Compliance for Permitted Diverters	Inspect operations and bypass flow conditions below Seeger and Peters dams to ensure compliance.
W-L-02	Lagunitas Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Investigate whether residential wells are drawing from subterranean stream flow in San Geronimo Creek and recommend water right application.
W-L-03	Lagunitas Creek	Instream Gauging	Obtain gauge data from Marin Municipal Water District.
W-L-04	Lagunitas Creek	Instream Flow Studies	Review instream flow study for Kent Reservoir/Peters Dam. Investigate mainstem channel incision and hydrologic connectivity with tributaries Investigate groundwater/surface water interactions.
W-L-05	Lagunitas Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.

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Priority Actions North of San Francisco			
Task #	Watershed	Regional Action	Site-Specific Action
W-W-01	Walker Creek	Regulatory Streamlining	Evaluate current operations and bypass flows below Soulajoule Reservoir. Develop Streambed Alteration Agreements for existing water right holders.
W-W-02	Walker Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens.
W-W-03	Walker Creek	Enhance Summer Base Flow	Fund and implement exclusion fencing along Chileno and Salmon Creeks.
W-W-04	Walker Creek	Instream Gauging	Fund and install a watershed-wide network of stream gauges.
W-W-05	Walker Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and the effects of diversions on them.
W-RC-01	Redwood Creek (Coastal)	Instream Flow Studies	Include in CDFW PRC 10004 list of priority streams for instream flow studies. Investigate groundwater/surface water interactions.
W-RC-02	Redwood Creek	Compliance for Permitted Diverters	Inspect bypass flow conditions for NPS and Community Services District to ensure compliance.
W-RC-03	Redwood Creek	Regulatory Streamlining	Develop Streambed Alteration Agreements for existing water right holders.
W-RC-04	Redwood Creek	Develop Water Storage	Fund flow restoration projects that store water in winter for use in the summer.
W-RC-05	Redwood Creek	Minimize Illegal Diversions and Discharges	Conduct enforcement sweep of diversion screens. Prevent artificial breaching of the lagoon and install monitoring camera in support.
W-RC-06	Redwood Creek	Instream Gauging	Fund and install stream gauges to supplement a watershed-wide network.
W-RC-07	Redwood Creek	Enhance Summer Base Flow	Support the NPS in their proposal for a flow enhancement project.
W-RC-08	Redwood Creek	Public Outreach	Provide funds and forums to educate the community on the status of Coho Salmon and lagoon alterations.

4.Regulations, Permitting and Enforcement Technical Working Group

Introduction

The Regulations, Permitting and Enforcement (RPE) Technical Working Group (TWG) was tasked to develop a strategy to assist CDFW and NOAA Fisheries in accomplishing the following goals:

1. Identify opportunities to facilitate more efficient permitting of restoration projects and effective oversight of other projects to directly benefit CCC Coho Salmon survival and recovery.
2. Identify opportunities for focused regulatory oversight through permitting and law enforcement actions on high priority issues adversely affecting extant populations of Coho Salmon and their habitat.

Goals and Objectives

- Identify specific recommendations to increase efficiencies and effectiveness for CDFW and NOAA regulatory and enforcement staff.
- Address immediate circumstances impacting Coho Salmon and their habitats in key watersheds in the ESU.
- Develop recommendations to immediately benefit CCC Coho Salmon.

Background

The RPE TWG generally focused on important limiting factors for CCC Coho Salmon and the intersection of various authorities, policies, and practices of CDFW and NOAA Fisheries, including NOAA Office of Law Enforcement (OLE), CDFW Law Enforcement Division. CDFW and NOAA Fisheries are the primary State and Federal regulatory agencies with mandated authority in the State of California to protect and recover Coho Salmon; thus, the RPE TWG focused on improvements to the agencies' internal regulatory processes.

The RPE TWG limited their investigations to analyzing regulations, permitting and enforcement as carried out by CDFW and NOAA and did not analyze the actions of

other agencies within the range of CCC Coho Salmon that also administer regulations, permits and enforcement. The main reasons for this include: (1) the PACT Coordination and Management Committees are comprised of NOAA and CDFW staff who have authority to rapidly initiate changes within the respective agencies and (2) the number of other regulatory agencies with regulatory authority over land-use, water-use, *etc.*, were determined too numerous to advance recommendations in a timely fashion.

Recommendations in this document are separated into two main sections: (I) Regulation and Permitting, and (II) Enforcement. These separate sections were developed to address differences in authority, jurisdiction, and chains of command structure between biological staff and law enforcement officers. Generally, biological staff at NOAA and CDFW write, administer, implement, and enforce regulations and issue permits for specific projects that may impact CCC Coho Salmon and their habitat. Law enforcement staff generally investigate and enforce specific laws in response to complaints, emergencies, and violations. In both agencies, the chain-of-command between biological staff and law enforcement staff is separate and the degree of coordination between biological staff and enforcement staff is highly variable.

The RPE TWG identified numerous enforcement, regulatory, and permitting recommendations. To help prioritize recommendations into a more manageable number, the recommendations were ranked as 1, 2, or 3 based on the following criteria:

- A rank of “1” is a high priority for rapid implementation.
- A rank of “2” is a medium priority, but may warrant further investigation later, depending on time and resources.
- A rank of “3” is a low priority but may warrant future consideration.

High priorities were further refined and advanced to the PACT Coordination Group as the most important recommendations for their consideration and are discussed in further detail below. The reasons for assigning medium or low ranking were variable but were often due to issues associated with lengthy implementation, rather than importance or effectiveness of the recommendation. In other words, medium and low

ranked projects would likely take too long to implement considering the short time-lines prescribed by the PACT plan. Many of these medium and low priorities should however be considered for long-term protection and conservation efforts.

I. Regulation and Permitting

Intent

The intent of the RPE working group was to identify opportunities that: (a) facilitate efficient permitting of restoration projects to benefit Coho Salmon recovery; (b) provide for focused regulatory oversight for high priority issues; and (c) broaden regulatory partnerships.

The RPE TWG identified several possible changes to regulatory and permitting processes that may help accelerate Coho Salmon recovery:

- Streamlining of existing regulatory framework for restoration projects.
- Changes to, or modification of, existing regulations, while maintaining the valid and important purposes of these regulations.
- Increased understanding of existing regulations.
- Increased oversight, enforcement, and periodic re-evaluation of existing regulations, permits and programs.

Background

Permitting options covered in this section include CESA, CEQA, NCCP, Safe Harbor, and are described below.

California Endangered Species Act Permitting (CESA)

CESA allows CDFW to authorize project proponents to ‘take’¹⁰ State-listed threatened, endangered, or candidate species, if certain conditions are met. The permitting program administers the incidental take provisions of CESA to ensure regulatory compliance and statewide consistency. See <https://www.wildlife.ca.gov/Conservation/CESA>

¹⁰ In the California Endangered Species Act, ‘take’ is defined as “to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.”

California Environmental Quality Act Review (CEQA)

CDFW consults with lead and responsible agencies and provides the requisite biological expertise to review and comment upon environmental documents and impacts arising from project activities under the California Environmental Quality Act. See <http://resources.ca.gov/ceqa/>

Lake and Streambed Alteration Program (LSA)

Fish and Game Code Section 1602 requires any entity to notify CDFW before beginning any activity that may substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake. If CDFW determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared. See <https://www.wildlife.ca.gov/conservation/lsa>

Timberland Conservation Program

Forest practices on private timberlands in California are overseen by multiple State agencies to address the variety of potential impacts that timber operations may have on the environment. For example, CDFW often issues permits for building roads across streams and for water drafting from streams and lakes. Occasionally, CDFW issues incidental take permits when timber operations impact threatened and endangered species. See <https://www.wildlife.ca.gov/Conservation/Timber>

Natural Community Conservation Planning (NCCP)

The Natural Community Conservation Planning Program is a cooperative effort designed to protect species and their habitats through adopting an ecosystem approach. The program helps identify and provide for large area-wide protection of plants, animals, and their habitats while allowing for compatible and appropriate economic activity. See <https://www.wildlife.ca.gov/conservation/planning/nccp>

Conservation and Mitigation Banking

Mitigation banking in California is overseen and undertaken by several Federal and State Agencies. The Banking Program coordinates with other agencies and develops

statewide policy and guidance for the establishment and operation of conservation and mitigation banks to protect fish and wildlife. See

<https://www.wildlife.ca.gov/Conservation/Planning/Banking>

The RPE TWG narrowed down the original list of recommendations to the following high priorities.

1. Restoration Permit Streamlining

The highest priority identified by the RPE TWG was improvements to the existing regulatory framework which could lead to more rapid implementation of restoration projects. The complexity of permitting is frequently cited as an issue of concern by restoration entities. Thus, one of the main objectives of the RPE TWG was to identify and recommend ways to streamline the process. In addition, at least 85% of the historical range of CCC Coho Salmon is in private ownership and many private land owners lack the expertise or financial resources to apply for the suite of necessary permits for restoration projects. With such a large proportion of the range in private ownership it is important to streamline the permitting process to minimize landowner reticence to engage in restoration activities. It is equally important for non-governmental organizations such as Resource Conservation Districts to help educate and assist landowners in the preparation of permits. The Fisheries Restoration Grants Program (FRGP) and Habitat Restoration and Enhancement Act (HREA) are two possible central permitting processes.

AB 2193/AB1961 The Habitat Restoration and Enhancement Act of 2014

The HREA, Assembly Bill No. 2193 and approved by Governor on September 26, 2014, was established to simplify the permitting process with CDFW for landowners, State, local government agencies, and conservation organizations wanting to implement small-scale, voluntary habitat restoration projects across California. Restoration and Enhancement projects approved by CDFW, pursuant to the Act, will not require additional permits from CDFW, such as a Lake or Streambed Alteration agreement or California Endangered Species Act permit.

Additionally, CDFW will approve complete applications within 30-days or 60-days depending on the type of request submitted (i.e., Fish & G. Code, §§ 1652 or 1653).

Habitat restoration or enhancement projects, as defined by the Act, are projects with the primary purpose of improving fish and wildlife habitat and meet the eligibility requirements for the State Water Resources Control Board's Order for Clean Water Act Section 401 General Water Quality Certification for Small Habitat Restoration Projects. Projects approved under the Act must also be consistent with widely recognized restoration practices, must avoid or minimize any incidental impacts, and must result in measurable environmental benefits. For further information see

<https://www.wildlife.ca.gov/Conservation/Environmental-Review/HRE-Act>.

a. Assembly Bill 1961- Coho Salmon Habitat Enhancement Leading to Preservation Act (Coho HELP¹¹ Act) Fish and Game Code Section 6950 et seq.

On January 1, 2013, the Coho Salmon Habitat Enhancement Leading to Preservation Act, or Coho HELP Act, went into effect. This five-year program was designed to hasten the CDFW permitting process required for instream habitat restoration work, especially review and permitting required under the California Endangered Species Act (CESA) and CDFW Lake and Streambed Alteration.

Small restoration projects, less than five acres and 500 linear feet, may qualify for approval include; fish passage improvement, streambank restoration, and culvert removal or modification. In January 2017, by the fourth year of the act, eight Coho HELP projects were completed in the Southern Oregon Northern California Coho Salmon ESU and five were completed in the CCC Coho Salmon ESU. See <https://www.wildlife.ca.gov/Conservation/Inland-Fisheries/Coho-HELP>

¹¹ Assembly Bill 1961 was repealed on January 1, 2018.

AB 2193 and AB1961 streamline CDFW permitting for qualifying restoration projects, but not the review and permitting required by other agencies. Existing programmatic biological opinions (NOAA RC/USACE 2006; NOAA RC/USACE 2012) and Regional Water Quality Control Board (RWQCB) waivers (projects < 5 acres) could also be used to permit some restoration projects. However other regulatory requirements are still likely, particularly regarding CESA and USFWS listed species (e.g., tidewater goby, marbled murrelet, California red-legged frog, and northern spotted owl).

b. Fisheries Restoration Grants Program (FRGP)

Many restoration actions in coastal watersheds which benefit Coho Salmon are funded through the FRGP grant program. FRGP projects are required to use techniques described in the California Salmonid Habitat Restoration Manual (CDFG, 2010).¹² A major benefit of the FRGP program is a streamlined and coordinated framework that meets permitting requirements for the Clean Water Act sections 404 and 401. However, FRGP is not the only funding source available or the only funding source used for restoration projects. Other funding sources include various grants administered by the NOAA Restoration Center (NOAA RC), Environment Protection Agency, Coastal Conservancy, private foundations, CDFW grant programs (e.g., Prop 1, Drought, Wetlands, etc.) as well as self-funded restoration projects by private and some public landowners. The RPE TWG believes encouraging project proponents to find additional funding sources is necessary to recover CCC Coho Salmon. The Federal CCC Coho Salmon recovery plan estimated that full recovery will cost roughly \$1.5 billion dollars. However, project proponents applying for funding outside of FRGP may experience considerable project delays and permitting difficulties. These delays were identified as a major disincentive for proponents wishing to implement restoration projects. See <https://www.wildlife.ca.gov/Grants/FRGP>

Regulatory streamlining would require close multi-agency coordination to create

¹² California Department of Fish and Game. 2010. California Salmonid Habitat Restoration Manual, 4th Edition.

and oversee a comprehensive permitting program. Existing programmatic biological opinions and exemptions could be used to address permit issues; however, this would likely require substantial time to address (e.g., Lake and Streambed Alteration Agreement (LSAA), CESA, USFWS, and Coastal Commission).

Two options were identified to address California Environmental Quality Act (CEQA) and LSAA requirements that could allow permit coverage under FRGP.

- a. CEQA and LSAA are addressed on a year-by-year basis by CDFW. CDFW issues a mitigated negative declaration that covers, in part, restoration projects that will be supported by FRGP. LSAA's are written and submitted by the applicant on a project-by-project basis and processed by LSAA staff in CDFW. To be able to adequately process more LSAA's and/or better integrate FRGP LSAA's into the overall CDFW process, additional staff resources would be needed.
- b. To provide a means to further extend the scope of existing monies for Coho Salmon restoration, project proponents are more likely to bear a larger portion of the restoration project permitting costs if permitting incentives were available (e.g., collective coverage for all restoration projects in a sub-watershed).

2. Education

The RPE TWG recommends that regulatory agencies conduct educational workshops to help project proponents understand the regulatory process. Many applications are delayed due to a fundamental lack of understanding regarding various agency permitting requirements. Frequent workshops could help to minimize this issue. Such workshops would provide a list of organizations, consultants, and volunteers with permitting expertise within and outside of the regulatory agencies to help project proponents to fill out necessary applications.

3. Lake and Streambed Alteration Audits (for non-restorative actions)

The RPE TWG recommends that CDFW staff (or specially trained designees) conduct compliance and effectiveness audits of LSAA's in priority watersheds.

Audits would be conducted using a two-tiered approach – compliance checks on existing agreements within key watersheds and compliance sweeps to determine if there are any unpermitted activities potentially impacting Coho Salmon.

Mitigation measures for LSAA agreements should be targeted to address specific life history impacts and be clearly written to achieve the intended goals: -

- a. CDFW endeavors to increase compliance checks on LSAA's. Priority lists based on the Task Force concept (discussed later in the document) could be used to help prioritize LSAA compliance actions. Conversely, review of LSAA compliance audits in Coho Salmon watersheds could help prioritize Task Force activities.
- b. Coordination between enforcement staff and biological staff should be prioritized, especially where compliance sweeps of undocumented activities are envisioned.
- c. LSAA is the only regulatory tool available to address riparian water diversions, which many of the PACT TWGs considered one of the greatest threats to CCC Coho Salmon.
- d. CDFW may consider resurrecting Game Warden position(s) focused on enforcement (not issuance) of LSAAs. Game Wardens can enter private property and enforce the terms and conditions of an LSAA. This could improve enforcement of LSAAs, the evaluation of impacts, and compliance in key Coho Salmon watersheds.

4. Facilitate Large Woody Debris (LWD) Input through the THP Process

Currently, timberland owners do not fell riparian trees into streams for restoration purposes if the action is part of a timber harvest plan (THP) because of the required CEQA and ESA project approval process and the risk of incidental take of State listed CCC Coho Salmon. However, riparian trees can be felled into a stream outside of a THP through other permitting processes. Timberland owners in the CCC Coho Salmon ESU have successfully applied to CDFW for FRGP funding and permitting to fell large diameter riparian trees into watercourses deficient in large wood.

Many timberland owners and registered professional foresters have expressed a desire to fell trees into streams as part of ongoing timber operations to improve habitat conditions for salmonids. For their part, California Department of Forestry and Fire (CALFIRE) is supportive of this concept but recognizes there are required legal processes to conduct such an activity.

Implementing instream restoration (e.g., LWD enhancement) concurrent with THP operations, especially in remote watersheds, can provide restoration opportunities which would not otherwise be available. THP operations can provide the equipment and personnel needed to carry out the habitat restoration work. However, permitting of this action through the THP process has sometimes proven difficult in the past because felling of trees into wetted streams requires the need for incidental take authorization by State and Federal agencies. In addition, stream-side timber operations may involve activities prohibited by the California Forest Practice Rules (FPRs).

NOAA Fisheries has worked with NOAA General Counsel to address the challenges of incorporating large wood projects that are part of a THP. Incidental take under the 2016 NOAA Restoration Center/USACE programmatic restoration Biological Opinion (BO) can be authorized for large wood enhancement associated with a THP. Other aspects of the THP, including harvesting of trees, road construction and maintenance, etc. would not be covered under the NOAA Recovery Center programmatic restoration BO and would not have incidental take coverage. To date, only one large wood project as a component of THP has been proposed and authorized.

II. Enforcement

Intent:

The RPE TWG was charged with: (a) identifying opportunities to facilitate more efficient communication and coordination with enforcement and regulatory staff; (b) providing guidance on prioritization of key issues impacting CCC Coho Salmon; and (c) increasing outreach and collaboration with other regulatory agencies with jurisdiction in the CCC Coho Salmon ESU.

A number of issues were identified by the RPE TWG that could benefit Coho Salmon recovery. Due to the large number of recommendations, it was necessary to prioritize them in order of importance. The TWG individually scored the recommendations in order of priority. The scores were compiled and aggregated into three categories: high, medium and low. High priority recommendations are described below with medium and low priorities described in a later section. Reasons for medium or low rank were variable, but often were due to issues associated with lengthy implementation, rather than likely benefits or effectiveness. Many of these recommendations should be considered for future efforts.

High Priority Recommendations:

1. Contact List

Establishing and improving communication between regulatory and enforcement staff were identified as a high priority by the RPE TWG. Improved communication can lead to more effective enforcement of regulations in key CCC Coho Salmon watersheds. The first step to address this issue is to provide enforcement staff with a list of key agency biologists who have responsibility and knowledge of priority watersheds. Agency biologists should also be provided with an equivalent list of enforcement staff and their assigned jurisdictions. This list should be updated at regular intervals and could be formatted along the lines of the *Field Guide for Coordinated Enforcement Response* (October 2011) developed between the CDFW and California Water Boards. The list should also

include staff contact information for the RWQCB, State Water Resources Control Board, and CALFIRE. Annual meetings are recommended between CDFW enforcement and biological staff for each county and between Regions. Finally, the RPE TWG recommends designating a CDFW/NOAA Fisheries point-of-contact for enforcement staff to provide guidance on priorities and recovery issues.

2. Outreach to County District Attorneys

The involvement of County District Attorneys (DAs) was considered a critical step to prosecute cases developed by NOAA OLE and CDFW Wardens. Two steps were recommended to increase DA agreement and involvement:

- A. Initiate at least one group meeting with all five County District Attorney (DA) environmental prosecutors (Mendocino, Sonoma, Marin, San Mateo, and Santa Cruz) and the traveling environmental prosecutor (for California Attorney General's office) to highlight the status of Coho Salmon and potential need for enforcement actions. NOAA can file cases with DAs on behalf of CDFW for violation of Fish and Game Codes 1600 (i.e., LSAA) and 5650 (i.e., unlawful pollution). A sustained effort to establish regular communication with DA's was deemed essential. It is recommended that the Education and Outreach TWG, RPE TWG and appropriate management staff initiate the first meeting with County DAs. Consider holding the first meeting in Mendocino County where DA involvement in past environmental compliance actions has so far been less successful. Mendocino County has an Environmental Crimes Task Force which is comprised of many local and State agencies and this organization should also be invited to participate.
- B. Outreach to County DAs should also be coordinated when enforcement cases are initiated. Wardens and OLE agents should work with NOAA and CDFW biologists to provide a narrative when submitting CCC Coho Salmon related 1600, CESA and ESA cases to County DAs. The narrative would provide context by describing the status of CCC Coho Salmon; the actions needed for recovery of the species and explain how illegal and potentially legal unpermitted activities are affecting species recovery. At that time, cases

could be submitted to the DA that are representative of the issues described. In 2016, the Governor signed SB-839 that among other things established CESA permit application fees and increased fines for violating the provisions of CESA. Specifically, the fine for each violation is at least \$25,000 and not more than \$50,000. One-half of the fines collected are deposited in the county treasury of the county in which the violation occurred. SB-839 emphasized the priority of the fines allocated to counties is to reimburse costs incurred by the DA investigating and prosecuting the CESA violation. Wardens and agents could work with Deputy DA's as well as county Fish and Game Commissions to encourage directing fine monies to priority Coho Salmon restoration projects. To facilitate ongoing compliance, wardens and agents should work with DA's on appropriate language in Court Orders and Plea Agreements which would allow NOAA/CDFW biologists access to violation locations as appropriate.

3. Multiagency Task Force

An enforcement Task Force to address high priority watershed issues was ranked as a high priority by the RPE TWG. The Task Force concept would be a collaborative effort with the five counties District Attorney offices, enforcement, management and biological staff at NOAA, CDFW, SWRCB, RWQCB, and possibly CALFIRE. Important components of the Task Force concept include:

A. Task Force Priorities and Goals

- a) CCC Coho Salmon life history and biology
 - i) Identify priority recovery issues and locations identified in NOAA and CDFW recovery plans
 - ii) Identify PACT priorities for extinction prevention and recovery
 - iii) Information on presence/absence and relative abundance of CCC Coho Salmon
- b) Severity of violation
- c) Publicity and potential for bringing others into voluntary compliance

B. Task Force Requirements

- a) List of incentives such as grant programs and compliance options to remedy situation(s) prior to enforcement filing a case.
- b) Funding - NOAA's Joint Enforcement Agreement funding could be appropriated specifically for the Task Force.
- c) Involvement of biologists with Wardens and NOAA OLE agents in the development of cases.
- d) DA involvement on the process, requiring:
 - i) Thorough documentation for all cases brought to the DA's office. In many circumstances documentation will require a take statement. The take statement should include a synthesis on the importance of the violation to Coho Salmon viability.
 - ii) Coordination among DA's such as a joint meeting with representatives from all five counties in the CCC Coho Salmon ESU (See Enforcement Priority 2A).
- e) If a DA does not agree to bring a case forward, other alternatives are available and should be explored such as U.S. Department of Justice, California Attorney General – California Environmental Attorney, NOAA's Office of General Council, and United States Attorney's Office.
- f) Scientists' ability to understand enforcement thresholds and willingness to act as an expert witness in court. Biologists should receive suitable training on the preparation of a Natural Resources Damage Assessment report (when applicable).
- g) Close coordination with Mendocino and Sonoma Counties Environmental Crimes Task Forces with CDFW and NOAA biological staff participating in Environmental Crimes Task Forces to keep other agencies with enforcement authorities (*i.e.*, county planning, CALFIRE) apprised of status of Coho Salmon and high priorities for recovery.

Enforcement staff will require the involvement of management staff to develop cases and engage in landowner outreach. Staff will need to be able to work with DAs and help to provide outreach tools. This is outside of the regular work

assignments of most NOAA, SWRCB, RWQCB, and CDFW staff and would likely require rebalancing workloads. Cases can often take years to develop, particularly complex cases involving multiple indirect stressors. Close inter- and intra-agency coordination will be important due to the differences in chains of command between NOAA OLE and NOAA Area Offices, CDFW, CDFW Wardens, RWQCB, SWRCB, CALFIRE, and County DA offices.

4. Timber Harvest Plan Review (Postharvest and Winter Operations)

Inspections of active THPs in priority CCC Coho Salmon watersheds post THP and winter-period operations were identified as high priorities by the RPE TWG. These may require modifying inspection priorities within certain CALFIRE Administrative Units and the other “review team” agencies (RWQCB, California Geologic Survey and CDFW) involved in active winter period THP inspections. The RPE TWG recommends increased winter-period THP review by CALFIRE and other review team agencies in key CCC Coho Salmon watersheds. In particular, winter review of THPs operating in high risk areas (e.g., timber operations in areas with extreme or high erosion hazard ratings, activities within designated watercourse and lake protection zones (WLPZs), and all seasonal/permanent watercourse crossing).

The RPE TWG envisions that CALFIRE staff would conduct these additional reviews rather than staff from other review team agencies. Staff from the CDFW’s Timberland Conservation Program may also be able to assist in post-harvest effectiveness monitoring. Winter period inspections by other review team agencies is encouraged to provide additional expertise when evaluating the effectiveness of the Forest Practice Rules to protect Coho Salmon and their habitats.

It is recommended that NOAA and CDFW staff conduct a workshop for CALFIRE inspectors prior to implementation of these recommendations. The workshop should highlight the endangered status of CCC Coho Salmon, priority watersheds, *etc.* CALFIRE can administer fines and other regulatory actions in

violation of the FPRs while RWQCB and CDFW may also administer fines and regulatory actions under their authorities (e.g. Porter-Cologne and Clean Water Acts and Fish and Game Code).

RPE TWG - Regulation and Permitting: Medium and Low Priorities

These recommendations were not further developed following the RPE TWG's identification of high priority projects. They are included here for future consideration by the Coordination Committee and others.

Medium Priorities

1. Statutory changes to prevent certain projects from obtaining an LSAA agreement. CDFW may consider supporting or promoting changes to statute to prevent certain types of impacts from occurring in CCC Coho Salmon watersheds. A regulation should be crafted which would allow CDFW to simply deny some projects from occurring as opposed to the current standard of mitigating impacts for LSAA projects. Statutory changes would be subject to legislative review and approval. Recommend CDFW and or RPE TWG identify projects and guidelines.
2. Consider requiring Federal and State incidental take permits for all new water diversions in watersheds with extant populations of CCC Coho Salmon. Recommend CDFW/NOAA and or RPE TWG identify regulatory obligations, feasibility, and benefits of requiring incidental take permits.
3. Initiate electronic water rights information management (eWRIMs) query on all Priority watersheds. Cross check these results with LSAA compliance. All landowners/diversion operators who are not in compliance would receive a letter that clearly formalizes CDFW expectations. Query should begin as soon as possible.
4. Evaluate NMFS/CDFW reinitiating THP reviews in priority watersheds for plans that propose operations with a potential to adversely affect Coho Salmon and/or their habitats. Watersheds with high erosion hazard ratings, high rates of harvest, and new road construction in sensitive/unstable areas are likely

candidates for review. Standards of review should be commensurate with NOAA Fisheries' 1999 Short-Term Habitat Conservation Plan guidelines.

Lower Priorities

1. CDFW's LSAA fees associated with non-FRGP large woody material programs may be a disincentive to restoration actions for some landowners. Solutions may include identifying sources to underwrite the fees or developing an alternative fee schedule for a narrow suite of appropriate restoration actions under the LSAA program. A fee schedule change would require a change in the CDFW regulations and if sources to underwrite the LSAA fees are not available, the LSAA program would not recover the full costs associated with administering and enforcing the program. Recommend CDFW initiate the process to ameliorate the LSAA fee issue for specific, highly beneficial, projects (including FRGP projects).
2. Conservation/mitigation banks and in-lieu fee programs have a long and successful history of providing strong conservation benefits. Such efforts have been recognized in California since 2006 with a memorandum of understanding (MOU) between seven State and Federal agencies. This MOU set the bar for the nation and was recently expanded to include an eighth agency. The 2006 MOU was also the basis of much of the USACE and EPA 2008 final rule that established conservation banking as a priority to compensate for unavoidable impacts. Although it remains challenging, particularly for small and rural private landowners, State and Federal agencies have worked to streamline and expedite review and approval of conservation banks. In spite of these efforts, regulations designed to ensure stream protection may provide disincentive to some private landowners. The RPE TWG recommends a review of applicable policies, such as access alternatives and delineation standards for service areas and identify opportunities to review and improve regulatory requirements.
3. Considerations should be made regarding a coordinated and sustained multi-agency effort at the level of the California Board of Forestry (BOF) to refine the California FPRs regarding winter operations. The RPE TWG recommends CDFW, NOAA, RWQCB assign appropriate staff and engage in this effort at the BOF level.

4. The RPE TWG recommends reviewing the more relaxed riparian FPR standards of the Anadromous Salmonid Protection Rules for streams south of the Golden Gate (the southern edge of the range for CCC Coho Salmon).
5. Coordinate with the USACE to include oversight of all land use practices under section 404 of the Clean Water Act. Currently, the USACE exempts forestry, farming, and ranching activities under 404. Within the remaining range of CCC Coho Salmon forestry, farming, and ranching are major land uses that receive almost no Federal oversight.
6. Investigate other regulatory exemptions issued by Federal, State, and local agencies that may adversely impact Coho Salmon and their habitats. Convene a sub-committee to further identify regulatory exemptions and develop a white paper if other notable exemptions are identified, with further recommendations.
7. Increase efforts to heighten awareness of regulatory process requirements for agency staff, key landowners, and consultants. The efforts will likely result in better application packages for restoration projects. This type of effort would likely reduce applicant frustration and expedite recovery actions that are sometimes hindered by existing regulatory issues. Implementation of this recommendation would consist of at least one (preferably two) workshop(s) held on a yearly basis with appropriate regulatory agencies.
8. Scientific collection in Coho Salmon watersheds – consider using other sampling techniques (e.g., visual surveys via snorkeling) to reduce adverse effects of electro-fishing for non-essential research (*i.e.*, evaluating species response to habitat improvement efforts). Recommend reviewing all NOAA Section 10(a)(1)(A), 2081(a), and CDFW scientific collection permits regarding Coho Salmon and modifying permits to further minimize electrofishing.
9. Revisit bypass flow agreements on Kent Lake (Marin County, CA) - The dams on Lagunitas Creek (Marin County) are the only major dams in this priority watershed with significant potential impacts to CCC Coho Salmon. Summer bypass flows of eight cubic feet per second as well as prescribed winter releases may be sufficient to maintain adequate conditions for spawning and rearing in

various water years. Some refinement of the flows could possibly improve conditions.

10. Develop a CCC Coho Salmon “strike team” based on the principles of other emergency response teams (e.g., Washington State Emergency Drought Operation Center or teams that address toxic spills, etc.). To date, interagency coordination and response to emergencies could be improved to rapidly address containment, mitigation, and remediation issues. Circumstances that may adversely impact Coho Salmon could include:
 - a. Drought and low flow conditions (See Captive Rearing and Rescue Report).
 - b. Toxic spills and illegal dumping.
 - c. Habitat alterations (‘emergency’ situations such as jams of large wood and the frequent social and political pressure to remove them during winter storms).

Existing regulatory mechanisms exist to address many of these situations, but it is often difficult to assemble the necessary personnel in a timely manner. A ‘strike team’ could have a clear chain of command with emergency contact information including various County DAs. A “strike team” should be composed of appropriate agency staff experienced at addressing a wide variety of issues. Staff should be empowered to make immediate decisions regarding remediation, fish relocation, etc. ‘Strike team’ staff should be familiar with many of the priority watersheds and issues affecting CCC Coho Salmon in those areas. CDFW/NOAA enforcement staff should be assigned to the “strike team” with necessary authorization to work and make rapid decisions within all priority watersheds within the CCC Coho Salmon ESU. The ‘strike team’ should be integrated with NOAA Enforcement hotline and/or CalTip:

<https://www.wildlife.ca.gov/enforcement/caltip>.

RPE TWG – Enforcement – medium and low priorities

These recommendations were not further developed following the RPE TWG’s identification of high priority projects. They are included here for future consideration by the Coordination Committee and others.

Medium Priorities

1. Prioritize patrol efforts by enforcement officers to ensure fishing compliance in priority watersheds.
2. Request Outreach TWG initiate a comprehensive effort to educate CDFW Wardens and NOAA OLE special agents on: (1) the status of CCC Coho Salmon; (2) important habitat requirements; (3) key issues limiting their survival; (4) potential vulnerability to various human-caused activities (particularly water diversion related impacts); and (5) areas of special biological significance. The education effort would consist of a series of yearly one-day workshops for the next three years for all enforcement staff (it is likely that two workshops per year would be necessary to ensure wide participation). One module of the workshop would consist of a primer on water law. These workshops could be similar in structure to the yearly LSAA updates held prior to 2003, by CDFW biologists for Wardens.
3. Evaluate conditions and enforce permit standards for fish passage devices, including ladders, weirs, and baffles in priority watersheds at least three times during the Coho Salmon adult migration season (and/or after significant rainfall events).

Lower Priorities

1. Ensure biological staff are available to assist enforcement staff in the development of Coho Salmon related cases regarding ESA violations and LSAA violations. Biological staff should be available to conduct site visits and provide guidance and/or assist in the writing and development of take statements and damage assessment reports on actions impacting Coho Salmon and their habitat in Priority watersheds. Regulatory staff should be available to work with County DAs on these cases as needed. A letter of agreement between CDFW/NOAA enforcement and CDFW/NOAA regulatory divisions codifying this internal arrangement with firm timelines should be developed to ensure clear lines of communication and responsibility.

2. Begin participation in the California Environmental Enforcement Roundtable Forum (CEERF) to increase awareness of the condition of CCC Coho Salmon. The CEERF is a recently created forum with the stated purpose of addressing important environmental issues by fostering collaboration across various jurisdictions and professional disciplines. Numerous State, county, and Federal regulatory agencies participate in CEERF. Recommend creation of a subgroup to specifically highlight CCC Coho Salmon enforcement opportunities. Agency participation should include CDFW/NMFS regulatory and enforcement staff.
3. Request greater involvement from SWRCB enforcement staff in priority watersheds. Currently, SWRCB inspectors do not have authority to conduct site visits on private property without landowner permission. The need for greater communication and collaboration and access agreements in SWRCB permits has been identified. Recommend adopting a MOU or similar framework between NOAA/CDFW/SWRCB, for the creation of a more inclusive and collaborative working relationship for the benefit of CCC Coho Salmon recovery. Development of a document like the *Field Guide for Coordinated Enforcement Response* (October 2011) developed between the CDFW and California Water Boards should be considered.
4. Target key areas accessible to the public where potential harassment and or take to remaining populations may occur. Create a list for enforcement staff of vulnerable areas with map locations and landowner contact information. Examples include San Vicente pond on San Vicente Creek (Santa Cruz County) and portions of Lagunitas Creek.
5. After a review of the Electronic Water Rights Information Management System (eWRIMS), evaluate the bypass flows and minimization measures to ensure compliance with Fish and Game Codes 5937 and 5901. Evaluation should be in coordination with A4(e). Prioritize patrol efforts regarding LSAA compliance for both Riparian and Appropriative water diversions in priority watersheds where water flow is considered a limiting factor.

6. Provide information to County sheriff departments, Campaign Against Marijuana Planting (CAMP), and others to highlight areas in priority watersheds for marijuana eradication efforts.
7. Roads Manuals to implement Watershed Protection Standards have been developed and implemented by Santa Cruz and San Mateo counties. These documents were reviewed and approved by NOAA, CDFW and RWQCB. These five counties have conducted CDFW funded training to each of the County's Public Works and Parks staff on the use of these BMPs. These BMPs have now become standard for all projects. Regulatory relief in the form of programmatic permits to facilitate implementation of projects using these standards should be considered.

5.Funding Technical Working Group

Introduction

The intent of the Funding TWG was to develop a list of all known potential sources of potential funding for CCC Coho Salmon recovery.

Goals and Objectives

- Coordinate with all funding agencies to assemble detailed application materials and information to compile into a spreadsheet to disseminate to restoration partners.
- Update this list on annual basis to reflect current and outdated opportunities.
- Meet with Management and Coordination groups to investigate prioritizing funds for identified projects outlined in other TWG groups.

Summary

The Funding TWG has compiled a list of funding opportunities to present to the Outreach TWG to disseminate to restoration partners within the California Central Coast (see Table 9). Other potential funding sources will be included into the table later, as more sources are identified.

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Table 9: A partial list of potential funding sources for PACT.

Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
CA Department of Fish & Wildlife	Fisheries Restoration Grant Program	http://www.dfg.ca.gov/fish/Administration/Grants/RGP/Solicitation.asp	Coastal CA watersheds	No limits	Applicants must be government agency, nonprofit, or tribe; cost share of at least 25% recommended, but not required; Grant projects must be within specified "focus" with regard to location, project type, and species benefitted.
CA Department of Fish & Wildlife Office of Spill Prevention and Response (along w/ NFWF)	Environmental Enhancement Fund Grants	www.dfg.ca.gov/osp/Science/eep.aspx	Selected areas - depends on source	Varies	These penalty monies are associated with oil spills and are to be used only to support environmental enhancement projects approved by the Environmental Enhancement Committee (Committee). Projects funded by the Committee must be located within or adjacent to the marine waters of the State.
CA Department of Fish & Wildlife	Endangered Species Conservation and Recovery Program	https://www.wildlife.ca.gov/Grants/Endangered-Species	Statewide	Applicants must provide a minimum of 25% of the total project cost in non-Federal matching funds or in-kind services.	Projects that will further the conservation and recovery of federally listed threatened and endangered species in the State. Eligible projects are those that target species which are currently federally listed as threatened or endangered, proposed for listing, candidates for listing, or recently recovered
CA Department of Fish & Wildlife	Proposition 1 Restoration Grant Programs	https://www.wildlife.ca.gov/Conservation/Watersheds/Restoration-Grants	Restoration projects of Statewide importance outside of the Sacramento-San Joaquin Delta	Unlimited	California public agencies (CWC §79712[a]) which, includes public universities/colleges, are eligible to apply.
NOAA Restoration Center	American Rivers Partnership	http://www.habitat.noaa.gov/funding/southwest.html	Coastal CA watersheds	Feasibility/design limit - \$100K, implementation limit - \$150K	Funds marine and anadromous fish habitat restoration projects that benefit recreationally fished species.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
NOAA Restoration Center	The Nature Conservancy Partnership	http://www.habitat.noaa.gov/funding/southwest.html	Coastal CA watersheds	\$25-85K & up to \$250K	Funds marine and coastal habitat restoration projects that benefit fish and shellfish around the coastal U.S. Preference will be given to projects at priority sites identified through Marine Ecoregional Assessments and other TNC priority setting approaches at the State and territory level.
NOAA Restoration Center	Fish America Partnership	http://www.habitat.noaa.gov/funding/southwest.html	Coastal CA watersheds	\$10-75K	Funds marine and anadromous fish habitat restoration projects that benefit recreationally fished species.
NOAA Restoration Center	Trout Unlimited/North Coast Coho Project Partnership	http://www.tucalifornia.org/index.php?page=north-coast-coho-recovery	Mendocino County watersheds	Varies	The NCCP assesses watershed conditions, develops and implements projects to reduce sediment input to streams, installs large woody debris and rocks to diversify instream habitat, and improves fish passage.
NOAA Restoration Center	California Conservation Corps Partnership	http://www.ccc.ca.gov/Pages/default.aspx	Coastal CA watersheds	Varies	The NOAA Restoration Center focuses grant opportunities through area CCC coordinators.
NOAA Restoration Center	Estuary Restoration Act	http://www.habitat.noaa.gov/funding/southwest.html	Coastal CA watersheds	\$100K to \$1M	Funds estuary habitat restoration projects. These projects should achieve cost-effective restoration while promoting partnerships among agencies and between public and private sectors. Selected projects must provide ecosystem benefits, have scientific merit, be technically feasible, cost-effective, and support the Estuary Habitat Restoration Strategy.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
NOAA Restoration Center	Community-based Restoration Program's FY17 Federal Funding Opportunity	http://www.grants.gov/view-opportunity.html?oppId=291268	Coastal CA watersheds	\$100K - \$4M	Funds marine and anadromous fish habitat restoration projects that benefit recreationally fished species.
NOAA Restoration Center	NOAA's Coastal Resiliency Grant Program	https://www.coast.noaa.gov/resiliency-grant/	Coastal CA watersheds	\$250K - \$1M	Funds marine and coastal habitat restoration projects that benefit fish and shellfish around the coastal U.S. Preference will be given to projects at priority sites identified through Marine Ecoregional Assessments and other TNC priority setting approaches at the State and territory level.
USFWS	National Coastal Wetlands Conservation Grant Program	http://www.fws.gov/ventura/cpartnerships/coastal/	Santa Cruz County	Varies	Restore and protect coastal habitats through collaborative projects; provide technical assistance in the restoration process; and provide cost share where appropriate.
USFWS	National Coastal Wetlands Conservation Grant Program	http://www.fws.gov/sacramento/CP/Coastal-Program/cp_coastal-prog.htm	SF Bay Region	Varies	The mission of the Coastal Program at San Francisco Bay is to conserve coastal ecosystems by engaging external partners and other Service programs in activities that restore, enhance and protect fish and wildlife habitats.
California Coastal Conservancy	CCC Grants	http://scc.ca.gov/category/grants/	North Coast (Del Norte through Marin counties)	Varies	Most Conservancy-funded projects are developed over time through the joint efforts of Conservancy staff and potential grantees. For information about making and developing a proposal for a Conservancy grant, please contact the manager of the region where your project is located.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
California Coastal Conservancy	CCC Grants	http://scc.ca.gov/category/grants/	Central Coast (San Mateo and Santa Cruz counties)	Varies	Most Conservancy-funded projects are developed over time through the joint efforts of Conservancy staff and potential grantees. For information about making and developing a proposal for a Conservancy grant, please contact the manager of the region where your project is located.
State Water Resources Control Board	Clean Water Act §319(h) NPS Grant Program	http://www.waterboards.ca.gov/water_issues/programs/nps/solicitation_notice.shtml	North Coast Region (including Mendocino, Sonoma & Marin counties)	Planning/assessment - \$75 - \$125K, implementation - \$250 - \$750K	Annually, the California NPS Program allocates approximately \$4.5 million of CWA Section 319(h) (CWA 319[h]) funding from the U.S. Environmental Protection Agency (USEPA) to support implementation and planning projects that address water quality problems in surface and ground water resulting from NPS pollution. The goal of these projects is to ultimately lead to restoring the impacted beneficial uses in these water bodies. Projects are required to be in a watershed that has an adopted/nearly adopted Total Maximum Daily Load (TMDL) for the constituent of concern and has been identified in the NPS Program Preferences. Projects focused on working toward achieving the goals of the TMDL to restore beneficial uses will be the most competitive in the selection process.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
State Water Resources Control Board	Clean Water Act §319(h) NPS Grant Program	http://www.waterboards.ca.gov/water_issues/programs/nps/solicitation_notice.shtml	San Francisco Bay Region (including Sonoma, Marin and San Mateo counties)	Planning/assessment - \$75 - \$125K, implementation - \$250 - \$750K	Annually, the California NPS Program allocates approximately \$4.5 million of CWA Section 319(h) (CWA 319[h]) funding from the U.S. Environmental Protection Agency (USEPA) to support implementation and planning projects that address water quality problems in surface and ground water resulting from NPS pollution. The goal of these projects is to ultimately lead to restoring the impacted beneficial uses in these water bodies. Projects are required to be in a watershed that has an adopted/nearly adopted Total Maximum Daily Load (TMDL) for the constituent of concern and has been identified in the NPS Program Preferences. Projects focused on working toward achieving the goals of the TMDL to restore beneficial uses will be the most competitive in the selection process.
State Water Resources Control Board	Clean Water Act §319(h) NPS Grant Program	http://www.waterboards.ca.gov/water_issues/programs/nps/solicitation_notice.shtml	Central Coast Region (including San Mateo & Santa Cruz counties)	Planning/assessment - \$75 - \$125K, implementation - \$250 - \$750K	Annually, the California NPS Program allocates approximately \$4.5 million of CWA Section 319(h) (CWA 319[h]) funding from the U.S. Environmental Protection Agency (USEPA) to support implementation and planning projects that address water quality problems in surface and ground water resulting from NPS pollution. The goal of these projects is to ultimately lead to restoring the impacted beneficial uses in these water bodies. Projects are required to be in a watershed that has an adopted/nearly adopted Total Maximum Daily Load (TMDL) for the constituent of concern and has been identified in the NPS Program Preferences. Projects focused on working toward achieving the goals of the TMDL to restore beneficial uses will be the most competitive in the selection process.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
State Water Resources Control Board	Timber Regulation and Forest Restoration Fund	http://www.waterboards.ca.gov/water_issues/programs/nps/solicitation_notice.shtml	North Coast timberlands	varies	
CA Department of Water Resources	Integrated Regional Water Management Grants	http://www.northcoastirwmp.net	North Coast IRWMP	Varies	Focus areas for the NCIRWMP include salmonid recovery, enhancement of the beneficial uses of water, and the synchronization of State and Federal priorities with local priorities, knowledge, and leadership.
CA Department of Water Resources	Integrated Regional Water Management Grants	http://www.waterboards.ca.gov/irwm/index.cfm	SF Bay Region IRWMP	Varies	DWR has several IRWM grant program funding opportunities. Current IRWM grant programs include: planning, implementation, and storm water flood management. Links to these programs and other IRWM grant funding information can be found on the menu bar to the left while the latest IRWM news items (provided as "quick links") are referenced to the right.
CA Department of Water Resources	Integrated Regional Water Management Grants	http://www.santacruzirwmp.org/	Santa Cruz IRWMP	Varies	The Santa Cruz Integrated Regional Water Management Plan (IRWMP) provides a framework for local stakeholders to manage this region's water and water-related resources. The plan includes strategies for developing and implementing policies and projects to ensure sustainable water use, reliable water supply, better water quality, improved flood protection and storm water management, and environmental stewardship.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
Natural Resources Conservation Service	Environmental Quality Incentives Program	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/	Northern CA Region (including Mendocino, Sonoma & Marin counties)	Varies	The Wildlife Initiative for Declining Species is offered to provide accelerated financial and technical assistance to producers who want to create, improve or enhance fish or wildlife habitat for declining species on farms and ranches. The NRCS State Conservationist in California has determined that a separate funding pool will be established from California's general Environmental Quality Incentive Program allocation in Fiscal Year 2012 to provide support to producers to fund implementation of fish or wildlife habitat-related conservation practices on eligible agricultural operations.
County of Sonoma	Sonoma County Fish and Wildlife Commission Grant Program	http://www.sonoma-county.org/wildlife/grants.htm	Sonoma County	Varies	California Fish and Game Code Section 13100 requires that funds deposited into the Sonoma County Fish and Game Special Revenue Fund because of environmental enforcement actions prosecuted by the District Attorney, be distributed to deserving projects that benefit fish and wildlife.
County of Marin	Marin County Fish and Wildlife Commission Grant Program	http://cemarlin.ucdavis.edu/Programs/The_Marin_County_Fish_and_Wildlife_Commission/	Marin County	Varies	The Marin County Fish and Wildlife Commission advises the Board of Supervisors on expenditures of funds obtained through fines levied for fish and wildlife violations in Marin County. These funds are designated by Section 13100 of the Fish and Game Code to be used to enhance fish and wildlife resources in the county and for public education.
National Fish & Wildlife Foundation	Five Star Grant Program	http://www.nfwf.org/AM/Template.cfm?Section=Charter_Programs_List&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=60&ContentID=24301	Depends on funding availability	Varies	Provides modest financial assistance on a competitive basis to support community-based wetland, riparian, and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities.

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Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
National Fish & Wildlife Foundation	Keystone Initiative Grants	http://www.nfwf.org/Content/NavigationMenu/GrantPrograms/ProgramsOverview/Keystones/default.htm	Depends on funding availability	Varies	
National Fish & Wildlife Foundation	Conservation Partners (NRCS)	http://www.nfwf.org/AM/Template.cfm?Section=Charter_Programs_List&Template=/TaggedPage/TaggedPageDisplay.cfm&PLID=60&ContentID=25136	"Northwest Salmon Rivers"	\$50 to \$250K	The purpose of this program is to provide grants on a competitive basis to support field biologists and other habitat conservation professionals (ecologists, foresters, range cons, etc.) working with NRCS field offices in providing technical assistance to farmers, ranchers, foresters and other private landowners to optimize wildlife habitat conservation on private lands.
NOAA Fisheries	Programmatic Biological Opinion for Non-FRGP Restoration	http://www.westcoast.fisheries.noaa.gov/stories/2016/02_08032016.html	Mendocino to San Luis Obispo counties		
Fish America		http://www.fishamerica.org/grants/		\$10,000-75,000	50% match recommended; marine and anadromous restoration projects; Proposals due in spring.
The Nature Conservancy				\$35,000-85,000	Marine and coastal habitat restoration projects. Proposals due in spring

PACT 2019 Report CDFW/NOAA Fisheries

Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
National Association of Counties		http://www.naco.org/blog/protecting-healthy-fisheries		\$50,000-100,000	Marine and anadromous restoration projects
State Water Resources Control Board	State Water Board's Division of Financial Assistance	http://www.waterboards.ca.gov/water_issues/programs/grants_loans/			The Division of Financial Assistance (DFA) administers the implementation of the State Water Resources Control Board's (State Water Board) financial assistance programs, that include loan and grant funding for construction of municipal sewage and water recycling facilities, remediation for underground storage tank releases, watershed protection projects, nonpoint source pollution control projects, etc.
California Department of Water Resources	Integrated Regional Water Management Grant	http://www.water.ca.gov/irwm/grants/	Regional	Varies	Integrated Regional Water Management (IRWM) is a collaborative effort to identify and implement water management solutions on a regional scale that increase regional self-reliance, reduce conflict, and manage water to concurrently achieve social, environmental, and economic objectives. IRWM is the application of Integrated Water Management (IWM) principles on a regional scale.
State Coastal Conservancy	State Coastal Conservancy Grant	http://scc.ca.gov/category/grants	Coastal	NA	Awards may be granted to public agencies and nonprofit organizations; kinds of projects that may fund include trails, other public access to coast, restoration in the coastal zone, protection of coastal agricultural land, and resolution of land use conflicts; the stages of a project generally funded include pre-project feasibility, property acquisition, planning and design, environmental review, construction, monitoring, and, in limited circumstances, maintenance.

PACT 2019 Report CDFW/NOAA Fisheries

Organization	Funding Title	Website	Area Availability	Amount Availability	Important Notes
U.S. Fish and Wildlife Service	Fish and Wildlife Coastal Program	http://www.fws.gov/coastal/CoastalGrants/index.html	Coastal States	varies	Eligible entities: Federal, State, interstate and intrastate agencies; local and tribal governments; public nonprofit organizations, private landowners including individuals and businesses. The program is geographically limited to its geographic focus areas -- only projects that address coastal habitat conservation in these specified areas can be funded. Contact your local Coastal Program coordinator if you are interested in requesting assistance for a coastal habitat conservation project

6. Education, Outreach & Media Interaction Technical Working Group

Introduction

The Education/Outreach and Media Interaction (EO) TWG intent is to serve as the internal and external communication arm of PACT, to raise public awareness of the situation facing CCC Coho Salmon, and to facilitate a call to action by partners to help prevent their further extirpation.

Goals and Objectives

- Formalize an action plan and implement a Coho Salmon recovery education and outreach campaign that promotes an informed and active community involvement in river restoration and salmon advocacy
- Draft an outreach strategy incorporating PACT TWG recommendations
- Conduct internal CDFW/NOAA outreach to ensure agency messages are concordant
- Identify messages, audiences, and delivery modes
- Outline communication tools, costs, and methods including a process to work with public affairs

Summary of EO TWG Activities

- A. The EO TWG developed the following outreach products:
1. A draft work plan
 2. Several draft PACT Coho Salmon logos
 3. A draft PACT Coho Salmon slogan; *“California Coho Salmon – Keep Them Running”*
 4. A draft PACT Coho Salmon recovery ‘Power Point’ presentation
 5. Coho Salmon and drought-related efforts
 - Fliers and posters
 - Drought Power Point presentations
 - Drought press release
 - CDFW Drought webpage: <https://www.wildlife.ca.gov/Drought>

- CDFW Drought Reports:

<https://www.wildlife.ca.gov/Drought/Projects>

B. Identified strategies:

1. Distribution of primary campaign elements such as logo/slogan sticker or patch.
2. Development of a Power Point presentation widely available internally & to stakeholders.
3. Coho Salmon fact sheet and other hard copy media such as brochures, etc.
4. Press releases developed in conjunction with NOAA/CDFW Offices of Communication.
5. Development of web/social media (e.g., YouTube videos).
6. Packaging restoration “success stories” that target landowners (e.g., Farm Bureau).
7. Public and stakeholder educational workshops for Coho Salmon and drought related issues.

C. Strategies identified for comprehensive outreach:

1. Originating events such as Coho Salmon Month, or Coho Salmon Festival.
2. Enlisting a local/State celebrity to champion Coho Salmon recovery.
3. Developing a Public Service Announcement.
4. Development of material for Coho Salmon-based college and school curriculum to involve students, teachers and academics.
5. NOAA Fisheries’ “Species in the Spotlight” (see Appendix 1).

Alignment of messages from PACT Technical Working Groups:

The EO-TWG has integrated the recommendations and priorities from the Habitat, Captive Rearing, Flow, and Enforcement TWGs into the overall outreach messages and products. Preliminary outcomes and essential points include the following:

A) Regulatory / Enforcement TWG

Communication and coordination with Game Wardens and local District Attorneys; outreach to potential project applicants on priorities, funding opportunities, and permitting processes; provide a consistent message to

internal staff; maximize permitting efficiency; facilitate restoration such as large woody debris via timber harvest plans; encourage the importance of a multi-agency enforcement task force

B) Habitat Restoration TWG

Outreach to landowners; encourage restoration and preservation of the best occupied habitats; further define actions according to the two recovery plans; focus increasing Coho Salmon recruitment on life cycle stage linked to habitat needs; improve smolt refugia (riparian/bank stabilization, fencing, off-channel habitat, instream large woody debris); improve estuary function and stream passage

C) Captive Rearing TWG

Emphasize captive rearing is a complementary recovery technique to habitat restoration; highlight Don Clausen Warm Springs Fish Hatchery as a model recovery hatchery for CCC Coho Salmon; raise awareness that broodstock are held and raised to adults to spawn; publicize use of DNA to determine health of local genetic pools; consider implementing a captive breeding threshold in regard to a given area before abundance level falls below 50 breeders per generation

D) Water Flow TWG

Develop flow recommendations to protect instream flows for all life stages; highlight the importance of stream gauges to improve flow data and decisions; promote off-stream storage for changing “the timing of water abstraction”; message: restore water flow ~ return fish

References Cited

- Adams, P.B., L.B. Boydstun, S.P. Gallagher, M.K. Lacy, T. McDonald and K.E. Shaffer. California Coastal Salmonid Population Monitoring: Strategy, Design, and Methods. 2011. California Department of Fish and Game, Fish Bulletin 180. 80 pp.
- Barrowman, N. J., R. A. Myers, R. Hilborn, D. G. Kehler and C. A. Field. 2003. The Variability among Populations of Coho Salmon in the Maximum Reproductive Rate and Depensation. *Ecological Applications* 13: 784-793.
- CDFG (California Department of Fish and Game). 2004. Recovery Strategy for California Coho Salmon: Report to the California Fish and Game Commission. California Department of Fish & Game., 594 pp.
http://www.dfg.ca.gov/fish/documents/SAL_SH/SAL_Coho_Recovery/ReportToCommission_2004/CohoRecoveryStrategy.pdf
- CDFW (California Department of Fish and Wildlife). 2015. Recovery Strategy for California Coho Salmon: Progress Report 2004-2012. Report to the California Fish and Game Commission. California Department of Fish & Wildlife.
http://www.fgc.ca.gov/public/reports/FGC_Coho_Report_2015.pdf
- California Hatchery Scientific Review Group (California HSRG). 2012. California Hatchery Review Report. Prepared for the US Fish and Wildlife Service and Pacific Marine Fisheries Commission. June 2012. 100 pgs.
- Chilcote, M. W. 1999. Conservation status of lower Columbia River Coho Salmon. Oregon Department of Fish and Wildlife, Fish Division Information Report 99-3. Portland, Oregon.
- Holloway, W., Gallagher, S. P., Thompson, S., Lang, E., and D. Ulrich. 2016. Coastal Mendocino County Salmonid Life Cycle and Regional Monitoring: Monitoring Status and Trends for 2015. 2014-15 Annual Report. Pacific States Marine Fisheries Commission and the
- NMFS (National Marine Fisheries Service). 2012. Final Recovery Plan for Central California Coast Coho Salmon (*Oncorhynchus kisutch*) Evolutionarily Significant Unit. National Marine Fisheries Service, Southwest Region, Santa Rosa, California.
http://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/north_central_california_coast/central_california_coast_coho/ccc_coho_salmon_esu_recovery_plan_vol_i_sept_2012.pdf

- NMFS (National Marine Fisheries Service). 2015. Species in the Spotlight Priority Actions: 2016-2020 – Central California Coast Coho Salmon *Oncorhynchus kisutch*. NOAA Fisheries. 17pp.
http://www.nmfs.noaa.gov/pr/species/Species%20in%20the%20Spotlight/central_california_coast_coho_salmon_spotlight_species_5-year_action_plan_final_draft_1_.pdf
- Sharr, S., C. Melcher, T. Nickelson, P. Lawson, R. Kope and J. Coon. 2000. 2000 Review of Amendment 13 to the Pacific Coast Salmon Plan. Exhibit B.3.b. OCN workgroup report. Pacific Fisheries Management Council, Portland, OR.
- Spence, B. C., E. P. Bjorkstedt, J. C. Garza, J. J. Smith, D. G. Hankin, D. Fuller, W. E. Jones, R. Macedo, T. H. Williams, and E. Mora. 2008. A Framework for Assessing the Viability of Threatened and Endangered Salmon and Steelhead in the North-Central California Coast Recovery Domain. U.S. Department of Commerce, National Marine Fisheries Service, Southwest Fisheries Service Center, NOAA-TM-NMFS-SWFSC-423, Santa Cruz, CA.
- Wainwright, T.C., M.W. Chilcote, P.W. Lawson, T.E. Nickelson, C.W. Huntington, J.S. Mills, K.M.S. Moore, G.H. Reeves, H.A. Stout, and L.A. Weitkamp. 2008. Biological recovery criteria for the Oregon Coast Coho Salmon Evolutionarily Significant Unit. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-91, 199 p.
- Williams, T.H., B.C. Spence, D.A. Boughton, R.C. Johnson, L. Crozier, N. Mantua, M. O'Farrell, and S.T. Lindley. 2016. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 2 February 2016 Report to National Marine Fisheries Service – West Coast Region from Southwest Fisheries Science Center, Fisheries Ecology Division 110 Shaffer Road, Santa Cruz, California, 95060.
http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/2016/2016_swfsc.pdf

Appendix 1. Drought and NOAA Fisheries' 'Species in the Spotlight'

Coho Salmon and Drought Workshops

In 2015, in response to the fourth year of drought in California, CDFW initiated a Coho Salmon education and outreach campaign to educate the public and all stakeholders on the effects of the drought on the survival of Coho Salmon in the ESU. Initial outreach activities started in May, 2015 when the California Department of Fish and Wildlife, Bay Delta Region (CDFW-BDR) Fisheries and Habitat Conservation staff met with staff from the National Marine Fisheries Service (NMFS), the National Oceanic Atmospheric Administration Restoration Center (NOAA), the Gold Ridge Resource Conservation District (GRRCD), the Sonoma Resource Conservation District (SRCD), the Sonoma County Farm Bureau (FB), the North Coast Regional Water Quality Control Board (NCRWQCB), Trout Unlimited (TU), UC Extension (UCCE), and the Sonoma County Water Agency (Sonoma Water). The purpose of the meeting was to advise these organizations on CDFW-BDR's intent to conduct Coho Salmon and water conservation outreach to landowners and residents living along creeks. In these meetings CDFW-BDR requested residents to conserve water and in order to reduce water extraction from creeks and wells near streams to protect in-stream flows for the benefit of Coho Salmon and steelhead.

CDFW-BDR initially selected four tributaries in the Russian River Watershed – Dutch Bill, Green Valley, Mark West, and Mill creeks. The selection was based on, 1) quality and restorability of Coho Salmon habitat; 2) program tributaries for the Russian River Coho Salmon Captive Broodstock Program; 3) past and current investment in habitat restoration; and, 4) density of water extraction from creeks and nearby wells.

Direct mailings to creekside residents and landowners, posting of fliers, and advertising in local newspapers were conducted by CDFW-BDR staff and RCD staff (Attachment A - Flyer).

Public outreach workshops were conducted for Dutch Bill, Green Valley, Mark West, and Mill creeks in May 2015. CDFW-BDR staff requested that landowners and residents conserve creek and well water for the benefit of in-stream flows and Coho

Salmon. Additionally, landowners that owned reservoirs near these creeks were solicited to participate in a Volunteer Drought Initiative (VDI) Program (Attachment B - VDI Forms) developed to release of cold and clean reservoir water into creeks and/or access onto private properties to assess fish populations and in-stream flow conditions.

The attendance by landowners and residents at the workshops was low as was the response from our mailings requesting water conservation and VDI participation. As a result, the State Water Resources Control Board (SWRCB) approved water conservation regulations developed in cooperation with CDFW and NOAA Fisheries in Dutch Bill, Green Valley, Mark West, and Mill creeks and added a mandatory water use information order. CDFW-BDR and SWRCB staff followed up with four workshops in July 2015 throughout Sonoma County to explain the conditions of the regulations and order that went into effect in the summer of 2015 through fall 2016 (Attachment C - CDFW/SWRCB workshop fliers).

In January 2016, CDFW-BDR, NCRWQCB, SWRCB, RCDs, TU and other organizations conducted an informational meeting to educate the public on water conservation reporting requirements, how water conservation can determine Coho Salmon survival, and grant funding opportunities for water conservation/storage projects (Attachment D - Water Conservation meeting announcement).

In Phase 3, February 2016, CDFW-BDR reached out to Marin RCD, National Park Service, Marin Municipal Water District and other local stakeholders and landowners in the San Geronimo (Lagunitas Creek watershed, Marin County), Redwood Creek (Marin County), and Salmon Creek (Sonoma County). We requested volunteer water conservation practices and measures and VDI agreements as we did for the four Russian tributaries. Again, attendance and response were low. CDFW-BDR and the SWRCB did not recommend water conservation regulations or a water use information order for these watersheds as there was uncertainty about the continuation of the drought and an expected wet season due to El Nino.

In Phase 4, Spring, 2016, CDFW-BDR met with the NMFS, NOAA, TU, The Nature Conservancy (TNC), City of Santa Cruz, San Mateo RCD (SMRCD), Santa Cruz RCD (SCRCD), San Jose State University, CalTrout, and San Lorenzo Valley Water District to plan Coho Salmon and drought public workshops designed from the previous workshops (Attachment E - Santa Cruz/San Mateo workshop flyer). Two workshops were conducted in Santa Cruz and San Mateo counties where they were relatively well attended. CDFW-BDR and the SWRCB did not recommend water conservation regulations or a water use information order for these watersheds. Prior to the workshops, CDFW-BDR, the CDFW Coho Recovery Coordinator submitted a press release that was published in the Santa Cruz Sentinel (Attachment F - Press Release).

Drought Stressor Monitoring

CDFW-BDR Fisheries staff worked with CDFW-BDR Habitat Conservation Program staff, the NCRWQCB, and UCCE to conduct drought stressor monitoring, including wet/dry mapping, critical riffle identification and cross-sectional measurements, riffle crest thalweg measurements, stream flow, and water quality monitoring and assessment throughout the BDR since Summer 2015. See, <https://www.wildlife.ca.gov/Drought/Projects> for reports on drought stressor monitoring.

Fish Rescue (Coho Salmon)

Due to drought conditions, CDFW-BDR staff conducted fish rescues and relocations of Coho Salmon and steelhead since summer 2015 – 2017 throughout the Region. Staff coordinated these rescues with the broodstock needs for the Russian River Coho Salmon Recovery Program. Some of the rescued fish were relocated within the watershed; others were transferred to Warm Springs Coho Salmon Conservation Hatchery facility for use in the broodstock program. See, <https://www.wildlife.ca.gov/Drought/Projects> for reports on fish rescue in various watersheds.

NOAA Fisheries' "Species in the Spotlight"

NOAA Fisheries launched the "Species in the Spotlight: Survive to Thrive" initiative, a concerted agency-wide effort to spotlight and save highly at-risk species. Included in the eight "Species in the Spotlight" is Central California Coast Coho Salmon.

On February 10, 2016, NOAA Fisheries released 5-Year Action Plans for the eight "Species in the Spotlight." These plans outline efforts vital for stabilizing their populations and preventing their extinction and serve as road maps for their recovery.

See http://www.nmfs.noaa.gov/stories/2015/05/05_14_15species_in_the_spotlight.html.

Attachment A



Russian River Voluntary Drought Initiative Public Information Meeting

Join Us! Thursday May 14th, 2015 6:30 – 8:30 PM

Salmon Creek School • 1935 Bohemian HWY • Occidental, CA 95465

We need your immediate help to conserve water and protect endangered coho salmon and threatened steelhead trout in Dutch Bill and Green Valley creeks. These creeks are priority rearing habitat for the listed species, and streamflows from right now through the early fall will make a crucial difference in their survival.

Please join the Department of Fish and Wildlife and other conservation organizations for this important, informational event concerning landowner participation in voluntary drought agreements. Learn how you can do your part and share your suggestions on how together we can save our young coho and steelhead in the Russian River Watershed.



For more information please contact the Department of Fish and Wildlife

(707) 944-5555 • BDRdrought@wildlife.ca.gov

www.wildlife.ca.gov/Conservation/Inland-Fisheries/Projects/Russian-River-Coho

If you cannot attend, contact Gail Seymour • Gail.Seymour@wildlife.ca.gov

Attachment B



Save the Salmon In the Russian River Creeks

The ongoing drought is devastating the juvenile coho salmon populations in Sonoma County and the Department of Fish and Wildlife is asking for your immediate help.

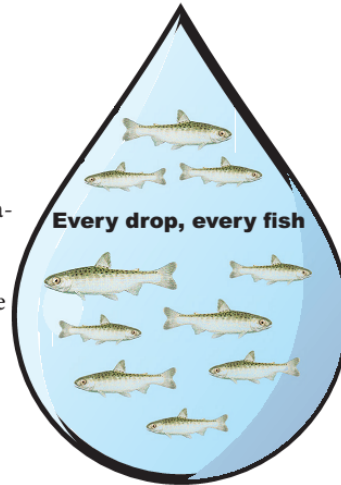
The salmon in four Russian River creeks need your help NOW before they die from low water levels this year.

The department is asking for two actions from the watershed residents; reduce your water usage and allow us on your lands to check the water and fish.

The Salmon need your help now whether or not there are mandatory water restrictions this year.

Please review and sign this Agreement (on the back) and return, by May 15 preferred, but ANYTIME will help.

Every drop counts!



Will you help?

Whether or not you use creek water or well water or have a lawn or use water for a garden or landscaping, water conservation in and around your home will help the young salmon in the stream. If you are already taking the following water conservation actions or are willing to implement the water conservation actions that are applicable to you... please sign this Voluntary agreement and help the salmon.

- | | | |
|--|---|--|
| <input type="checkbox"/> Take shorter showers | <input type="checkbox"/> Compost food | <input type="checkbox"/> Replace old toilets |
| <input type="checkbox"/> Stop watering lawns | <input type="checkbox"/> Water efficient improvements | <input type="checkbox"/> Plant drought resistant plants |
| <input type="checkbox"/> Turn the water off when shaving | <input type="checkbox"/> Fill the dishwasher before using | <input type="checkbox"/> Only wash full loads of laundry |

If you're willing to help please sign the agreement on the back and return it to us by mail, e-mail (take a good cell phone photo) or fax. If you have questions call 707.944.5555 and we'll do our best to respond the same day. CDFW, 7329 Silverado Trail, Napa, CA 94558 / bdrdrought@wildlife.ca.gov / Fax 707.555.1212

Time is critical, we need your help NOW!

Attachment C



State Water Resources Control Board

**INFORMATION MEETINGS FOR RUSSIAN RIVER TRIBUTARIES
WATER CONSERVATION AND INFORMATIONAL ORDER
EMERGENCY REGULATION**

The State Water Resources Control Board (State Water Board) is scheduling five meeting opportunities during the week of July 6, 2015 to provide information on the Russian River Tributaries Emergency Regulation and hear from residents and businesses on additional steps that should be considered to help fish survive in this fourth year of dry conditions. A quorum of the State Water Board may be present at the meetings. However, no State Water Board action will be taken.

DATE	TIME	LOCATION
July 6, 2015 (Monday)	6:00 – 9:00 pm	Salmon Creek School 1935 Bohemian Highway Occidental, CA 95464
July 7, 2015 (Tuesday)	6:00 – 9:00 pm	Healdsburg City Council Chambers 401 Grove Street Healdsburg, CA 95448
July 8, 2015 (Wednesday)	6:00 – 9:00 pm	Forestville Fire Department 6554 Mirabel Road Forestville, CA 95436
July 9, 2015 (Thursday)	1:00 – 4:00 pm and 6:00 – 9:00 pm	North Coast Regional Water Quality Control Board 5550 Skylane Boulevard, Suite A Santa Rosa, CA 95403

To ensure we have adequate facilities, interested parties that plan to attend a meeting are requested to RSVP at least 48 hours in advance to the Russian River email address (rr_tribs_emergency_reg@waterboards.ca.gov) or Russian River Phone Hotline (916.322.8422). Please provide your name and organization (if applicable). Note that providing your name and organization are optional.

The State Water Board is interested in other opportunities to provide information to those that may be affected by the Russian River Tributaries Emergency Regulation. Please email the Russian River email address or call the Russian River Phone Hotline (provided above) if you would like to recommend an upcoming event for additional State Water Board outreach.

Background


On June 17, 2015, the State Water Board approved the Emergency Enhanced Water Conservation and Additional Water User Information for the Protection of Specific Fisheries in Tributaries to the Russian River (Russian River Tributaries Emergency Regulation). (Cal. Code Regs., tit. 23, §876.) The emergency regulation is designed to provide a small amount of additional water in four tributaries to the

FELICIA MARCUS, CHAIR | THOMAS HOWARD, EXECUTIVE DIRECTOR


1001 I Street, Sacramento, CA 95814 | Mailing Address: P.O. Box 100, Sacramento, CA 95812-0100 | www.waterboards.ca.gov



Attachment D



Live on a Creek? Know Your Water Rights




Please join an informational meeting with State Water Resources Control Board and California Department of Fish and Wildlife staff, as well as other entities, to discuss the reliability of your water supply and learn what you can do to reduce impacts on salmon and steelhead fisheries.

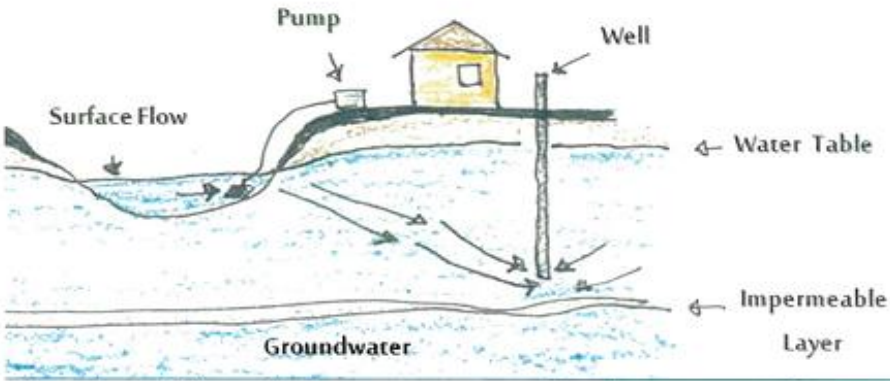
Date: Tuesday January 26, 2016
Time: Join us anytime between 3:00 pm – 7:00 pm
Location: North Coast Regional Water Quality Control Board, Hearings Room
5550 Skylane Boulevard, Suite A Santa Rosa, CA 95404

Learn More About:

- Are you in compliance with water reporting requirements? Find out!
- Your water use on the creek may determine survival or extinction
- Grant funding opportunities for water conservation and water storage projects
- How the actions of your neighbors have improved creek flow



coho young of year trapped in a drying pool



The diagram illustrates the relationship between surface water and groundwater. On the left, a stream labeled 'Surface Flow' flows towards a house. A 'Pump' is shown drawing water from the stream. A 'Well' is shown drawing water from the 'Groundwater' below. The 'Water Table' is indicated by a horizontal line with arrows pointing to it. Below the water table is an 'Impermeable Layer'. Arrows show water flowing from the stream into the ground and from the well into the house.

Open Forum: *We want to hear your concerns. Come have your questions answered face-to-face by agency representatives. Resource Conservation Districts and other local organizations will also be present.*

To receive additional information, please subscribe to the State Water Board's "California Water Action Plan/Statewide Instream Flows" email list under "Water Rights" on the following webpage:
http://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml

Appendix 2. Interagency CCC Coho Salmon Rescue Strategy

The need to rescue anadromous fish from potentially lethal environmental conditions in California has been recognized by State and Federal government agencies charged with their protection. Guidelines for potential rescue activities of salmon and steelhead trout in California have been set forth in three recent documents:

1. 2014-2019 Interagency Anadromous Fish Rescue Strategy (NOAA Fisheries, United States Fish and Wildlife Service, California Department of Fish and Wildlife, US Fish and Wildlife Service) (See CRR TWG Appendix 3)
2. Policy and Procedural Guidance for Fish Rescues (CDFW, March 20, 2013)
3. Fish Rescue Drought Matrix (CDFW, March 20, 2014)

Based on these documents and consistent with known science, practices, and agency policies, the Captive Rearing and Rescue Technical Work Group (CRR TWG) has developed a specific Coho Salmon Rescue Protocol and Coho Salmon Rescue Record (see below) to be used in conjunction with any rescue of Coho Salmon in the Central California Coast Evolutionarily Significant Unit (CCC Coho Salmon ESU) (see below).

Emergency Rescue

An emergency rescue is defined as the removal of one or more Coho Salmon from a location where continued exposure to prevailing environmental conditions is likely to result in their imminent death. Emergency rescues may be initiated by agency personnel or any other entity. If initiated by a non-agency entity, CDFW or NOAA Fisheries must be contacted for permission and guidance before any fish are retrieved or handled. Any Coho Salmon rescue must follow the guidelines set forth in the current Interagency Fish Rescue Policy (CRR TWG Appendix 3) and be documented in the Coho Salmon Rescue Record (CRR TWG Appendix 2).

Permits and Authorization

Potential take of listed salmon in need of rescue has been addressed by NOAA Fisheries in several current Endangered Species Act (ESA) permitting authorizations.

CDFW's section 10(a)(1)(A) permit (#1067M3) authorizes rescue of juvenile Coho Salmon throughout the CCC Coho Salmon ESU.

The National Park Service's (NPS) section 10(a)(1)(A) permit (#15169) authorizes rescue of juvenile Coho Salmon in specific watersheds in Marin and San Mateo Counties. The Salmon Protection and Watershed Network's (SPAWN) section 10(a)(1)(A) permit (#15730) authorizes rescue of juvenile Coho Salmon within the San Geronimo watershed, tributary to Lagunitas Creek, Marin County. Additional Section 10(a)(1)(A) enhancement permits may be required.

CCC Coho Salmon Rescue and Handling Protocols

1. Under any rescue operation, Coho Salmon must be treated with extreme care and handling should be kept to a minimum. All rescue operations must follow Federal permit conditions and should adhere to the following guidelines. Generally, the goal of a Coho Salmon rescue is to remove Coho Salmon from environmental conditions that may lead to their imminent death and relocate them to a location where the fish have a reasonable chance to survive and where adverse ecological consequences such as predation, resource competition and disease are deemed to be acceptably low.
2. Before any rescue is attempted, either CDFW or NOAA Fisheries must be contacted for permission and guidance. An appropriate release site must be identified and be available, preferably within the same watershed, and legal and physical access must be secured. Alternatively, if no release site is available and the rescued Coho Salmon are to be transported to DCFH, the hatchery must be contacted before any fish are rescued.
3. A field biologist with experience in identification of Coho Salmon should be present during any rescue attempt. Coho Salmon should be collected with minimal handling to reduce stress-related mortality, preferably by seining or dip-netting, or other methods with a minimum of physical stress and potential injury. Electroshocking should only be used if no other collection technique can feasibly be employed. Electroshocking will be conducted only by CDFW/NOAA Fisheries-approved biologists.

4. Any collected Coho Salmon must be kept in a closable container in an adequate amount of cool, clean, well-oxygenated water (e.g., a cooler with lid containing stream water and a battery-operated air stone). Water temperature should be monitored and kept below 60°F. If necessary, water should be cooled with ice without introducing ice-borne chemical contaminants. Transport containers should have a water volume of no less than 5-gallons, preferably more. Coho Salmon density in the transport container should not exceed 10 Coho Salmon (40-80mm) per gallon of water. Collected Coho Salmon must not be anesthetized at any point during the rescue operation. A representative sample of all Coho Salmon collected from any site (at least ten fish or 10% of total number if more than 100) should be measured for total length and at least two Coho Salmon should be photographed.
5. Transport of Coho Salmon to the release location should commence as soon as possible following collection. During transport, water temperature should be monitored, water should be oxygenated continuously by an air stone and the container should be closed to prevent loss of water or fish.
6. Upon arrival at the release site, the fish should be released immediately after confirming that the receiving water has a similar temperature as the water in the transport container. Additionally, the receiving habitat, especially if it is a disconnected pool, should not contain a significant number of other fish such as steelhead trout that would compete with Coho Salmon for natural resources, or potential predators of juvenile Coho Salmon. If fish are to be released in more than one location, they should be dip-netted out of the transport container, ensuring that the remaining Coho Salmon have an adequate amount of water until release.
7. Following release, the release site should be monitored for some time (5-10 minutes) to detect potential mortalities or moribund fish. Each release site should be identified by its location, preferably with corresponding GPS coordinates, and at least one photograph of the site should be taken. Moribund fish should be observed if feasible for signs of recovery.

8. Mortalities should be collected and frozen with pertinent date, location, and rescue effort information, and reported to CDFW and NOAA Fisheries. A brief rescue report describing date, number of Coho Salmon collected, number of Coho Salmon released, location of collection site, description and documentation of the offending environmental conditions, location of release site(s) and conditions at those sites, and number of mortalities should be sent to CDFW and NOAA Fisheries (see below for addresses).

Tissue Sampling for Genetic Analysis

CDFW and NOAA Fisheries may direct rescuers to collect tissue samples for genetic analysis. If, at the direction of CDFW and NOAA Fisheries, tissue samples are to be taken from any or all the collected Coho Salmon, a small piece of fin tissue from the tip of the upper lobe of the caudal fin ($\leq 2\text{mm}^2$) should be clipped with a sharp pair of scissors. Fin clips should immediately be placed in a folded small clean piece of filter paper and placed in a small envelope labeled with date, location, species, and name and affiliation of collector. All collected tissue samples should be sent to Dr. Carlos Garza, NOAA Fisheries Southwest Fisheries Science Center (see below for address).

Coho Salmon Rescue Record

Any Coho Salmon rescue must be documented in the Coho Salmon Rescue Record (Attachment E).

Contacts:

Department of Fish and Wildlife

Manfred Kittel, (707) 944-5522; manfred.kittel@wildlife.ca.gov

NOAA Fisheries

Bob Coey, (707) 575-6090; bob.coey@noaa.gov

Warm Springs Hatchery

Ben White, (707) 431-4520; ben.white@wildlife.ca.gov

NOAA Fisheries Southwest Fisheries Science Center

Dr. Carlos Garza, (831) 420-3903; carlos.garza@noaa.gov

Southwest Fisheries Science Center - Fisheries Ecology Division

110 McAllister Way, Santa Cruz, CA 95060

Coho Salmon Rescue Record

General Information

Name of stream/watershed:

County:

Date of rescue:

Name(s) and affiliation of person(s) with primary responsibility for rescue operation:

Number of Coho Salmon collected/released:

Number and cause(s) of mortalities and disposition of dead Coho Salmon:

Number of Coho Salmon measured: _____; Mean length: _____; Mean weight: _____

Number of Coho Salmon PIT-tagged: _____

Number of pictures taken: _____

Collection Site Information

Specific location (lat./long., etc.):

Time of day/water temp./air temp./DO:

Physical description of habitat (pool size, depth, etc.):

Duration of captivity phase:

Release Site Information

Specific location (lat./long., etc.):

Time of day/water temp./air temp./DO:

Physical description of habitat (pool size, depth, etc.):

Duration of post-release monitoring:

To facilitate adaptive management of Coho Salmon recovery activities, all Coho Salmon rescues performed in the State of California must be documented in an official record. Completed Coho Salmon rescue records and all pictures taken of the rescue should be sent to:

Manfred Kittel
California Department of Fish and Wildlife
7329 Silverado Trail
Napa, CA 94558
manfred.kittel@wildlife.ca.gov

Appendix 3. Interagency Anadromous Fish Rescue Strategy

2014 to 2019

Interagency Anadromous Fish Rescue Strategy

National Marine Fisheries Service, West Coast Region

California Department of Fish and Wildlife

United States Fish and Wildlife Service, Region 8

1. Background

As a result of the many regulated rivers and artificial systems in California that are inhabited by anadromous fish, there is a continuing need to rescue fish as a last resort to provide the best opportunity for survival. Whether the stranded fish are a result of inoperable barriers, drought conditions, lack of streamflow, stranding due to false pathways or any combination of these or other impacts, we must develop an agreed upon strategy to provide a framework to use the best available science and most efficient process to ensure the protection of listed species. Even during dry or wet years, fish rescue operations are not uncommon. This strategy outlines how to approach the fish rescue situation each year and make sure our three agencies approach the challenge in a coordinated and consistent manner.

The fishery agencies generally consider fish rescue efforts a last resort as long-term survival benefits of such activities are unclear. Fish rescues can mask important underlying land and water development problems that might be causing or contributing to the isolation or stranding of fish. In addition, periodically disconnected habitats and isolation caused by drought and fluctuating water supply are in some degree natural events and likely important to natural selection processes.

It is generally assumed that relocated fish will be introduced within the same footprint of their current distribution. Translocation of rescued fish can create new ecological and demographic issues such as exposure of translocated fish to new diseases, introduction of diseases to resident species, and competition with resident fish of the same or different species. Fish relocated to other tributaries/basins may stray as adults, affecting recruitment of individual populations; and create genetic issues. While translocation above hatchery operations is generally avoided due to concerns about the introduction of new diseases, there may be occasional circumstances where this may be prudent, such as extreme drought. These concerns can be offset when considered in light of the risk of extinction to any specific natural dependent or independent population and the availability of appropriate upstream refugia in historic habitat or identified critical habitat.

Goals

- To ensure that all anadromous fish rescue operations fully comply with the Federal Endangered Species Act (ESA) and California Endangered Species Act (CESA).
- To agree on a streamlined, efficient process of fish rescue operations.
- To ameliorate short-term, survival bottlenecks (water temperature, flow, etc.) and boost chances for survival of distressed fish.
- To prioritize fish rescue efforts based on species extinction risk and long-term recovery efforts.
- To learn more about the effectiveness of various rescue approaches, catalogue areas within the hydrological system most prone to isolation episodes during dry or wet years and use this information as an indicator for development of Habitat Conservation Plans and/or collaboration with agencies to prevent future fish stranding or isolation events.

2. Recommendations

a. Agency Roles

California Department of Fish and Wildlife (DFW) will serve as the lead fishery agency for all fish rescue actions. In that capacity, DFW will make the final decision about whether to pursue a rescue effort in accordance with the Key Rescue Objectives and Principles listed below, in coordination with NOAA's National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS).

DFW will form an interagency Fish Rescue Committee in 2014 and beyond to coordinate fish rescues, comprised of staff from DFW, NMFS, USFWS, California Department of Water Resources, and the Bureau of Reclamation, as well as appropriate partners and cooperating entities. DFW will ensure the DFW's most recent Fish Rescue Policy is implemented consistent with this Interagency Anadromous Fish Rescue Strategy.

The fishery agencies will develop a State-wide map of known areas prone to fish stranding during years of drought or recurring water management operations. This would be a start in developing a standardized program that would include these areas for monitoring each year.

DFW will work closely with NMFS and other involved agencies to prioritize and authorize fish rescue activities under the CESA.

NMFS will work closely with DFW and other involved agencies to prioritize and authorize fish rescue activities under the ESA.

b. Rescue Approaches

All rescued fish will be relocated to the nearest suitable upstream or downstream habitat within the same stream or river to the maximum extent possible. The agencies will also consider Hazard Analysis and Critical Control Point Plans (HACCP) for relocations (hold until conditions improve, place back into native stream). Recolonizing desirable habitats should be accompanied by effectiveness monitoring and management plans to gauge success. If time and resources permit, research designs and monitoring should be part of rescue operations to better inform future management decisions.

If suitable habitat within the same stream or river is unavailable or is fully occupied, DFW will decide in consultation with the partner agencies whether to relocate the rescued fish to suitable habitat in a nearby stream or river or to a recovery facility, if available, for rearing or propagation. Development of an HACCP should be considered if fish are being relocated to a facility.

In some cases, the agencies need to consider translocation of fish above major reservoirs. These cases would be considered experimental and additional tagging and related monitoring and studies will be implemented. Landowner assurances might also be used if ESA/CESA-listed species were introduced outside their current range and translocation considerations identified above will be considered. NMFS, USFWS, and DFW will collaborate to determine what form of tailor-fit assurance may be appropriate based on site-specific circumstances. Consideration will be made for reservoir hatcheries that are certified as disease-free.

Not all stranded anadromous fish may be suitable for relocation. In cases where fish have visible signs of disease, relocation and exposure to healthy populations will be avoided.

c. Federal Endangered Species Act Authorization

Below, we identify several alternative ESA mechanisms that allow take of endangered and threatened salmon, steelhead and green sturgeon for the purposes of rescuing stranded fish.

- Emergency Provision: Section 7 regulations (50 CFR §402.05) provide ESA emergency provisions for situations involving acts of God, disasters, national defense or security emergencies, etc. These acts of God include flooding and resultant levee breakages and other infrastructure problems. The Section 7 regulations recognize the need for consultations to be expedited to respond to an emergency and may require the development of alternative consultation procedures.
 - ESA Section 4(d) rules: The ESA provides exemptions to the section 9 take prohibitions for fish rescue and salvage activities via 4(d) rule Limit

Number 3 *Rescue and Salvage Actions* (50 CFR §223.203(b)(3)) for threatened salmon and steelhead and the 4(d) rule *Emergency Fish Rescue and Salvage Exception* (50 CFR §223.210(b)(3)) for green sturgeon. Therefore, under the existing section 4(d) rules, the Federal ESA has not affected DFW's Statewide authority to rescue or salvage anadromous fishes that are listed as a threatened species under the ESA.

Rescue activities for threatened anadromous fishes that include research and monitoring can be exempted from the take prohibitions via 4(d) rule Limit Number 7 *Scientific Research Activities Conducted by the States* (50 CFR §223.203(b)(7)) for threatened salmon and steelhead and the 4(d) rule *State Coordinated Scientific Research and Monitoring Exemption* (50 CFR §223.210(b)(1)) for threatened green sturgeon. These rules allow NMFS to annually approve State coordinated "research programs" that adequately conserve listed species and are carried out or permitted by State fishery agencies. DFW has implemented a 4(d)-research program with annual approval from NMFS since December 2003.

- ESA Section 10(a)(1)(A) Scientific Research and Enhancement Permits: Section 10 regulations (50 CFR §402.05) allows for an exemption to the take prohibitions for the intentional direct take of threatened and/or endangered species for scientific research and/or activities that enhance the survival of the listed species. This is the only authorization option available for rescues of anadromous fishes listed as endangered.

When endangered species need to be rescued and an ESA take authorizing mechanism is not available, NMFS Office of Law Enforcement (OLE) will rely on NMFS managers to determine on a case-by-case basis whether OLE should get involved.

d. California Endangered Species Act Authorization

Below, we identify the various CESA take authorization approaches for endangered and threatened salmon.

- CESA 2081 (a) Research Permit: Fish rescue activities that incorporate scientific research or monitoring that involves intentional take of threatened or endangered species can be permitted through this section.
- Fish and Game Code section 1001 provides that CDFW employees are not prohibited from taking fish, for scientific, propagation, public health or safety, prevention or relief of suffering, or law enforcement purposes. California Code of Regulations, title 14, section 783.1, subdivision (c) further provides that the possession or take of endangered, threatened, or candidate species by employees and agents of the DFW for scientific, educational, and management purposes, and for law enforcement purposes, is not prohibited.

e. General Guidance on Rescue Priority

Fish rescue activities will prioritize those species at greatest risk of extinction. For example, endangered fish would be rescued over those that are threatened and threatened species would be rescued before those that are not listed under the ESA. Within a species, independent populations would be rescued before dependent populations because of their importance to the persistence of the overall species.

Sacramento River winter-run Chinook salmon, Central California Coast Coho Salmon, and Southern California steelhead are all listed as endangered and would, therefore, receive the greatest priority for rescue efforts.

Adult fish will generally be rescued over juveniles because there is often high juvenile mortality in the freshwater environment; however, some juvenile population levels may be at critically low levels and rescue efforts would be prioritized equally with adults. For example, the status of endangered Central California Coast Coho Salmon and endangered southern California steelhead may warrant juvenile rescues because of their very low abundance.

f. General Guidance on Captive Rearing in Emergency Situations

Captive rearing should be accompanied with adaptive management plans and related studies. Consideration will be made for hatcheries that are certified “disease free” in critical habitat.

Limited hatchery capacity exists throughout the State. Livingston Stone National Fish Hatchery (NFH) could accommodate up to 250 more adult winter-run Chinook salmon and some spring-run Chinook salmon. However, there may not be sufficient capacity for egg incubation or juvenile rearing. The following should be considered when deciding whether to relocate adults to Livingston Stone NFH or other hatchery facilities:

- (a) If habitat conditions become suitable and the fish have not been treated with restricted chemicals, consider returning adults to the environment to spawn.
- (b) If necessary, spawn rescued adults at the hatchery to avoid loss of gametes.
- (c) If there is suitable incubation space at the facility, incubate eggs on-site, otherwise attempt in-stream incubation at suitable locations.
- (d) If there is suitable rearing space available at the facility, rear fry/juveniles on-site, otherwise release fry/juveniles at a suitable habitat location.

The three fishery agencies recognize the likelihood of additional interventions, and that conservation hatchery facilities might be needed in the future.

g. Documentation

The three fishery agencies will develop a standard form to assess consistency

with the key objectives and principles outlined in this strategy. At a minimum the standard form would document the fish rescue objective, estimated number of fish to be rescued, criteria for decision, type of rescue operation, HACCP analysis, desired outcome, and how the outcome would be monitored and evaluated. Completed forms would be shared with agency staff, stakeholder groups, and interested members of the public if appropriate. The agencies recognize that timely decisions are important for rescues, and that documentation may be completed after-the-fact to meet urgent conditions.

The three fishery agencies will also work to develop the following to further advance and improve coordinated rescue of anadromous fish species:

- (a) Effectiveness monitoring protocols and guidance for critical creeks and rivers where rescue operations are often required;
- (b) Public education and outreach materials to better inform the public of fish rescue in California;
- (c) An interagency communication plan to improve coordination and implementation of the strategy.

h. General Legal Disclaimer

Nothing in this agreement overrides agency authority and authorizations, pursuant to State and Federal statutes and regulations.

This agreement will be in effect for five years upon signature, unless the agencies agree to modify the strategy sooner. The three agencies agree to meet annually to review the effectiveness and progress of the Interagency Anadromous Fish Rescue Strategy.