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## 4.0 FACTORS LEADING TO FEDERAL LISTING

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"Man in his misguidance has powerfully interfered with Nature. He has devastated the forests, and thereby even changed the atmospheric conditions and the climate. Some species of plants and animals have become entirely extinct through man, and the purity of the air is affected by smoke and the like, and the rivers are defiled. These and other things are serious encroachments upon Nature, which men nowadays entirely overlook but which are of the greatest importance, and at once show their evil effect not only upon plants but upon animals as well, the latter not having the endurance and power of resistance of man."

Goethe, 1832

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### 4.1 PURPOSE

ESA Section 2(a) states that:

- *"various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern for ecosystem conservation;*
- *these species are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people;*
- *the United States has pledged itself...to conserve to the extent practicable the various species of fish or wildlife and plants facing extinction...; and*
- *Congress encourages the States and other interested parties...to develop and maintain conservation programs...to better safeguard, for the benefits of all citizens, the Nation's heritage in fish, wildlife, and plants (16 U.S.C. 1531)."*

Furthermore, ESA Section 3 outlines that to conserve species is to use all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act (ESA) are no longer necessary (16 U.S.C. 1531 §3). Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in

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the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulatory taking (16 U.S.C. 1531 §3).

To comply with the ESA, case law and recovery planning policies, an assessment of the Section 4(a)(1) factors (listing factors) identified at the time of listing was conducted. These assessments are required under Section 4(b)(1) of the ESA during the listing process and require that Federal agencies review the species' status using the best scientific and commercial data available and determine whether a species is endangered or threatened from any one or a combination of the following factors:

**Section 4(a)(1) Factors:**

- (A) The present or threatened destruction, modification or curtailment of habitat or range;**
- (B) Overutilization for commercial, recreational, scientific, or educational purposes;**
- (C) Disease or predation;**
- (D) Inadequacy of existing regulatory mechanisms; and**
- (E) Other natural or man-made factors affecting its continued existence.**

A secondary assessment was performed for this recovery plan to determine if the factors have changed over time. These assessments conform with:

1. Directives by the U. S. Government Accountability Office (USGAO 2006), from an audit of recovery plans, to ensure new recovery plans have criteria evidencing consideration of the Section 4(a)(1) factors identified for the species at time of listing; and
2. Case law outlining that plans must recognize identified threats and recommend appropriate actions to address threats. The administrative record should reflect the agency considered new ESA section 4(a)(1) threats that have arisen since listing, document the existence of new threats or the elimination of a threat since listing, and develop criteria that address these threats (Fund for Animals v Babbitt, 903F. Supp. 96, 111 (D.D.C. 1995); Defenders of Wildlife v. Babbitt, 130 F. Supp. 2d. 121 (D.D.C. 2001).

All pertinent *Federal Register* notices (FRN), including both proposed and final listing determinations for the CCC coho salmon were reviewed (Table 5). The listing factors described in this Chapter are those that were: (1) specified in the FRN at the time of listing and explicitly described in the listing determination notices for which the notice pertained, or (2) specified in earlier proposed FRNs and incorporated into the final FRN by reference. The current status of all listing factors were assessed in context to the recovery plan threats analysis and through consultation with staff from NMFS, CDFG, and other entities. Information has been catalogued into the administrative record, and described here, for use during 5-year status reviews and for downlisting/delisting decisions by NMFS.

Table 5: Federal Register Notices analyzed

Date	Citation	Title	Content Description
July 25, 1995	60 FR 38011	Endangered and Threatened Species; Proposed Threatened Status for Three Contiguous ESUs of Coho Salmon Ranging From Oregon Through Central California	Proposed rule: threatened status for CCC coho salmon.
October 31, 1996	61 FR 56138	Endangered and Threatened Species; Threatened Status for CCC Coho Salmon ESU	Final rule: threatened status for CCC coho.
June 14, 2004	69 FR 33102	Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids	Proposed rule: endangered status for CCC coho salmon, threatened status update for CC Chinook, threatened status update for CCC steelhead, threatened status update for NC steelhead.
June 28, 2005	70 FR 37160	Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs	Final rule, endangered status for CCC coho salmon, threatened status update for CC Chinook salmon. Extend final listing for <i>O. mykiss</i> DPSs.

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## 4.2 FACTORS AFFECTING CCC COHO SALMON AT, AND SINCE, LISTING

Through the regulatory process, the Secretary of Commerce determined the CCC coho salmon ESU is an endangered species based on a combination of the five factors summarized below. The factors threatening naturally reproducing coho salmon throughout its range are numerous and varied. For CCC coho salmon ESU, the present depressed condition of the population is the result of several long-standing human-induced factors (*e.g.*, habitat degradation, harvest, water diversions, and artificial propagation) that serve to exacerbate the adverse effects of natural environmental variability from such factors as drought and poor ocean conditions (61 FR 56138).

This chapter outlines the factors affecting CCC coho salmon as they were identified in 1996, and re-affirmed in 2005, when CCC coho salmon were relisted to an endangered status. The chapter outlines changes in: (a) the severity of threats and (b) threats that have been reduced or removed since publication of the final listing rule. The discussion of these listing factors at the time of listing consolidates the major identified threats from both 1996 and 2005 and, where appropriate, focuses on the threats as of 2005, since this is the most recent information analyzed in the Federal Register.

### 4.2.1 FACTOR A: PRESENT OR THREATENED DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

#### *Factor A: At Listing*

Logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals and unscreened diversions for irrigation contributed to the decline of the CCC coho salmon ESU. Land use activities associated with logging, road construction, urban development, mining, agriculture, and recreation have significantly altered coho salmon habitat quantity and quality (61 FR 56138). Impacts of concern associated with these activities included the following: alteration of streambank and channel morphology, alteration of ambient stream

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water temperatures, elimination of spawning and rearing habitat, fragmentation of available habitats, elimination of downstream recruitment of spawning gravels and large wood, removal of riparian vegetation resulting in increased stream bank erosion, and degradation of water quality (61 FR 56138). Of particular concern was the increased sediment input into spawning and rearing areas resulting from the loss of channel complexity, pool habitat, suitable gravel substrate, and LWD (61 FR 56138). Decreased large woody material in streams has also reduced habitat complexity and contributed to the loss of cover, shade, and pools which are required by juvenile coho salmon (60 FR 38011).

Agricultural practices had contributed to the degradation of salmonid habitat in the ESU through water diversions for irrigation, inadequate riparian protections, sedimentation, overgrazing in riparian areas, and compaction of soils in upland areas from livestock. Urbanization had degraded coho salmon habitat through stream channelization, changes to the hydrologic regime (including floodplain processes), riparian damage, and inputs of point source and non-point pollution (including sediments with trace metals, pesticides, herbicides, fertilizers, gasoline, and other petroleum products).

Water diversions and storage of natural flows had drastically altered natural hydrologic cycles in many central California rivers and streams. Alteration of stream flows had increased juvenile salmonid mortality for a variety of reasons (61 FR 56138). Reduced flows degrade or diminish fish habitats via increased deposition of fine sediments in spawning gravels, decreased recruitment of new spawning gravels, encroachment of riparian and nonnative vegetation into spawning and rearing areas, and increased water temperatures (60 FR 38011; 61 FR 56138). The destruction or modification of estuarine areas has resulted in the loss of important rearing and transitional habitats necessary for successful migration.

***Factor A: Since Listing***

Since 1996 and 2005, restoration work has improved habitats and captive rearing activities have prevented CCC coho salmon extinction. Additionally, active habitat rehabilitation has

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facilitated watershed recovery from legacy effects of logging prior to California's Forest Practice Rules (FPRs) (e.g., many sub-watersheds in the Garcia River, Mendocino County, CA). While some improvements are still needed, in general, the FPRs for logging and forestry activities on private and state lands have advanced from 1996 and 2005, to the present. The continuation of efforts to reduce impacts and restore streams is critical to CCC coho salmon recovery. Nevertheless, land uses causing the destruction, modification or curtailment of habitat or range continue to outpace restoration. Forest conversions, urban growth, water diversion, and agricultural activities continue to detrimentally impact streams and coho salmon habitats, which diminish the ability of coho salmon to survive and reproduce. Noteworthy activities needing to be addressed under this factor are: urban growth, riparian removal for land uses unregulated by counties, stream channelization, floodplain disconnection or encroachment, road building, road/bridge reconstruction work disregarding stream or estuarine needs (e.g. U.S. Highway 1 bridge over Scott Creek in Santa Cruz County, CA), impacts of rural residential development, decentralized oversight of agricultural activities, adverse effects of marijuana cultivation, conversion of forestlands to other land uses and authorized/unauthorized water diversions (1,771 existing unauthorized dams have been identified within the North Coast Area (SWRCB, North Coast Instream Flow Policy, Appendix E, Table ES.1)).

#### **4.2.2 FACTOR B: OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC, OR EDUCATIONAL PURPOSES**

##### ***Factor B: At Listing***

Coho salmon historically supported a recreational, commercial and tribal fisheries. Modification and degradation of natural habitats in combination with overfishing led to the depletion of many stocks of salmonids (69 FR 33102). Marine harvest of coho salmon occurred primarily in nearshore waters off British Columbia, Washington, Oregon, and California and exploitation rates were higher than many populations could withstand. Prohibitions on the retention of coho salmon in ocean commercial fisheries were instituted in 1993 and 1994. State

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sport fishing regulations continued to allow fishing for coho salmon in inland waters. The contribution of coho salmon to the in-river sport catch was unknown, and losses due to injury and mortality from incidental capture in other authorized fisheries, principally steelhead, are also unknown. Funding and personnel were not available to implement monitoring programs to evaluate these impacts.

Illegal harvest occurs on spawning beds and in rearing/holding areas. Recreational fishing is pursued in many streams and recent regulations on river harvest have resulted in the closure or severe curtailment of fishing impacts. During periods of decreased habitat availability (*e.g.*, drought conditions) the impacts of incidental capture from recreational fishing may be increased.

Collection for scientific research and educational programs had likely little or no impact on California coho salmon populations. In California, most scientific collection permits are issued to environmental consultants, Federal resource agencies, and educational institutions by CDFG and NMFS. Regulation of take is controlled by conditioning individual permits. CDFG and NMFS require reporting of any coho salmon incidentally taken by other monitoring activities; however, no comprehensive total or estimate of coho salmon mortalities related to scientific sampling are kept for any watershed in California. CDFG does not believe that indirect mortalities associated with scientific research were detrimental to coho salmon in California (61 FR 56138).

***Factor B: Since Listing***

The global moratorium on high seas driftnet fishing (via a United Nations resolution implemented by the US in 1992) and ocean commercial fisheries closures in 1994 have reduced this threat to CCC coho salmon. Furthermore, the PFMC instituted no-directed coho fisheries or retention-of-coho salmon in all commercial and recreational fisheries off California. Marine fisheries impacts should be no more than 13.0 percent to protect endangered CCC coho salmon as indicated by projected impacts on Rogue/Klamath hatchery coho salmon. The current degree

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of impact (mortality resulting from (a) hook-and-release, (b) drop off before being boated, and (c) non-compliance) associated with existing regulations for non-retention and mark-selective coho salmon fisheries to the wild CCC coho salmon fishery, as of 2011, was estimated at 3.8%.

State sport fishing regulations no longer allow retention of CCC coho salmon in California inland or nearshore waters. Impacts associated with incidental capture from freshwater recreational fishing still occur. Freshwater steelhead sport fishing is allowed in many rivers and streams where CCC coho salmon persist, including many of the focus watersheds identified in the plan. There is some overlap in run-timing between CCC coho salmon and adult steelhead (October through late February); adult CCC coho salmon have been misidentified by recreational anglers and have recently been incidentally caught and retained. This is particularly a concern in the Russian River watershed where both conservation hatchery coho salmon and traditional hatchery steelhead are adipose fin-clipped.

The Russian River Coho Salmon Captive Broodstock Program was initiated in 2001, to prevent the extirpation of coho salmon in the watershed. The program propagates coho salmon while adhering to conservation hatchery practices using a genetic matrix and releases fry and smolts into Russian River tributaries; a portion of the young will return two to three years later as adults to spawn. The programs' goal is to re-establish a natural self-sustaining population of CCC coho salmon. Because these coho share a common mark with hatchery steelhead, misidentification has occurred and resulted in the harvest of coho salmon. To address these problems, an outreach campaign has been implemented and is underway to raise angler awareness with informational press releases, fliers, and species identification signs at popular angling access points (Figure 14). Species identification and proper handling and release techniques, when incidental capture of CCC coho salmon occurs, is critical to reduce likelihood of mortality and ensure coho salmon adult survival. Releasing coho salmon unharmed requires specific handling, hook removal, revival efforts and minimal air exposure time (*i.e.*, time out of the water). Due to misidentification, marking techniques of coho salmon in the Russian River are being reassessed.

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To compound this problem, some angling resources lack clarity or are inaccurate. For example, current fishing regulations indicate that hatchery steelhead may be caught in streams where there is a very low likelihood of hatchery trout occurring (See Fishing in Appendix B) and the Northern California DeLorme Atlas & Gazette (2003) mistakenly indicates that freshwater fishing is allowed for coho salmon in several streams (*i.e.*, Albion River, Big River, Garcia River, Navarro River, Noyo River, Russian River, San Lorenzo River, and Ten Mile River). Education, outreach, improvements to regulations (*e.g.*, consideration of low flow closures, emergency regulations for CCC coho and other mechanisms) and focused enforcement by Game Wardens would appreciably reduce the risk of this factor to coho salmon.

# Attention Anglers!

## If Mouth Has Black, Put It Back!

**It's Illegal to Keep Russian River Coho Salmon, Chinook Salmon, and Wild Steelhead**



**Coho Salmon \***  
Lower Jaw



**Coho Salmon \*\***

**BEWARE! Adipose fin is removed on recovery Coho Salmon**

Spotting only on upper lobe of tail

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**Chinook Salmon \***  
Lower Jaw



**Chinook Salmon \*\***

Spotting on upper and lower lobes

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**Steelhead \***  
Lower Jaw



**Steelhead \*\*\***

**Release Wild Steelhead with intact adipose fin. No adipose fin on Hatchery Steelhead!**

Spotting on upper and lower lobes

**Coho Salmon Recovery Program Partners:**









CDFG Fish Phone: 707-944-5594  
 CALTIP: 1-888-DFG-CALTIP NOAA OLE: 1-800-853-1964

Photography Credits: \* California Department of Fish & Game, \*\* Washington Department of Fish & Wildlife, \*\*\* National Marine Fisheries Services Sonoma County Water Agency

Figure 14: Attention Anglers signage as part of outreach and education.

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Scientific research and educational programs are believed to have little or no impact on coho salmon populations; however, the amount of incidental take associated with these is not being tracked. Therefore, it is relatively unknown how these factors are affecting CCC coho salmon populations. Given the extremely low population and endangered status, any impacts associated with this factor such as angling, research, education, *etc.* may have a significant adverse effect and should be monitored.

#### **4.2.3 FACTOR C: DISEASE OR PREDATION**

##### ***Factor C: At Listing***

Relative to the effects of fishing, habitat degradation, and hatchery practices, disease and predation were not believed to be major factors contributing to the decline of West Coast coho salmon populations. However, disease and predation were believed to have substantial episodic adverse impacts in local areas. Coho salmon are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Specific diseases known to be present in, and affect, salmonids are listed in 69 FR 33102. Very little current or historical information existed to quantify changes in infection levels and mortality rates attributable to these diseases for coho salmon. However, studies have shown native fish tend to be less susceptible to these pathogens than hatchery-reared fish (Buchanan *et al.* 1983; Sanders *et al.* 1992). In California, many natural and hatchery coho salmon populations were tested positive for the bacterium *Renibacterium salmoninarum*, a causative agent of bacterial kidney disease (BKD). Within the CCC coho salmon ESU, the overall incidence of BKD infection in fish at Scott and Waddell Creeks (Santa Cruz County, CA) was believed to be 100 percent (61 FR 56138). Stress, caused by migration or poor water quality (including poor water quality due to increased water temperature) or quantity, may trigger the onset of the disease. CDFG initiated a treatment protocol to attempt to control BKD outbreaks in hatchery fish released into the Russian River and Scott Creek (61 FR 56138).

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Piscivorous predators, such Pacific hake (*Merluccius productus*) and pollock (*Theragra chalcogramma*) are known to consume salmon smolts (Holtby *et al.* 1990) and likely affect the abundance and survival of CCC coho salmon. Predation by marine mammals (seals and sealions) and birds (such as gulls, grebes (*Podicipedidae*); and loons (*Gavia spp.*), herons, egrets, bitterns (*Ardeidae*); cormorants (*Phalacrocorax spp.*), terns (*Sterna spp.*), mergansers (*Mergus spp.*), pelicans (*Pelecanus spp.*), was of concern in areas experiencing dwindling run sizes of salmon or low juvenile coho salmon densities. Introductions of non-native species and habitat modifications may have resulted in increased predator populations in numerous rivers and near shore environments. It is important to note that these predators are opportunistic feeders, preying upon the most abundant and easiest to catch. Although predation does occur, it was believed to be a minor factor in the overall decline of coastwide salmonid populations at the time of listing but may have contribute to keeping low populations at low levels. The combination of increased predator populations and large-scale habitat modifications that favor predators may have shifted predator-prey balance in some areas. The accumulating effects of reduced population size, decreases in cover habitat and stream flow likely made coho salmon more vulnerable to predation.

#### ***Factor C: Since Listing***

Since 1996 and 2005, disease and predation were not found to be major factors contributing to CCC coho salmon decline relative to other effects (*i.e.*, habitat degradation). BKD treatment protocols and the discontinuation of conventional production hatcheries may have addressed one of the main sources of this threat. Habitat conditions such as low water flows and high temperatures can exacerbate susceptibility to both disease and predation through increased physiological stress and physical injury. Additional studies are necessary to determine the effects other diseases, under a range of conditions, may have on the population. The potential of some disease outbreaks, due to introductions and straying of out-of-basin and other non-native fishes, are less likely than at the time of listing due to implementation of policies by CDFG prohibiting interbasin transfers.

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Predation by marine mammals is coincidental and watershed specific with some probability of coho salmon depletion occurring in locally areas and where populations are low (NMFS 1997; Quinn 2005). While predation was not found to be a major factor, additional investigations should be conducted to assess the relative impact to depressed populations in the marine and freshwater environments from avian predators and marine mammals and non-native fishes such as smallmouth bass and striped bass.

#### **4.2.4 FACTOR D: INADEQUACY OF EXISTING REGULATORY MECHANISMS**

*Summary: At the time of listing a variety of state and Federal regulatory mechanisms were in place to protect coho salmon and their habitats. Due to funding and implementation uncertainties, and the voluntary nature of many programs, the regulatory mechanisms that existed at the time of listing were determined as not providing sufficient certainty that combined Federal and non-federal efforts are reducing threats to CCC coho salmon. Since listing, a number of factors outlined in the 1996 Federal Register listing CCC coho salmon persist, have improved or have been identified as not relevant. The primary regulatory mechanisms that protect coho salmon are not comprehensive and are vastly different across the landscape and land use type. Timber operations abide by California's Forest Practice Rules while other land uses have little to no oversight or coho protections rely on State regulations or county ordinances when those mechanisms are triggered. Consistent protection measures in a watershed should be pursued regardless of land use. Activities are outside the ESU, and are henceforth excluded from the listing factor analysis. These programs are PACFISH, Northwest Forest Plan, Redwood National and State Park General Management Plan, Green Diamond Habitat Conservation Plan (HCP), PALCO HCP, and Humboldt Bay Municipal Water District HCP.*

Currently, regulatory mechanisms for Factor D needing improvements include:

- (1) Lack of coordination between NMFS and other Federal agencies to use their authorities in furtherance of the purposes of the ESA and Section 4 of the ESA to conserve endangered CCC coho salmon according to Sections 2(c) and 7(a)(1) of the ESA;

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- (2) Need for full implementation of ESA programs to create more efficient and effective public/private partnerships (over 85% of the CCC coho salmon ESU is in privately held ownerships);
  - (3) Increased collaboration between State agencies and NMFS regarding policies, information sharing, permit streamlining, and coordinated efforts to recover CCC coho salmon;
  - (4) Improvements to, and implementation of, policies and regulations of the U.S. Army Corp of Engineers, Federal Emergency Management Agency and other Federal/State agencies protective of coho salmon and their habitat; and
  - (5) Collaboration by NMFS with entities (including RCD's, county governments, private landowners, and others) to provide information on recovery priorities and needs.

#### **4.2.5 FEDERAL EFFORTS**

In the ESA, Congress declared it “to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA” (16 U.S.C. § 1531 (c)). The legislative history reveals an explicit congressional decision to require agencies to afford first priority to the declared national policy of saving endangered species and a “conscious decision by Congress to give endangered species priority over the ‘primary missions’ of the federal agencies” (Tennessee Valley Auth. v. Hill 1978).

To ensure Federal regulatory mechanisms are no longer a threat to CCC coho salmon, Federal agencies should fully embrace the rule of interagency cooperation as outlined in the ESA Section 7(a)(1). ESA Section 7(a)(2) imposes a procedural duty on the “action agency” to consult with the “consultation agency” (*i.e.*, NMFS) if the agency’s action “may affect” a listed species (50 C.F.R. § 402.14(a)); Turtle Island Restoration Network, 340 F.3d at 974; Pacific Rivers Council v. Thomas, 30 F.3d 1050, 1054 n.8 (9th Cir. 1994).

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**U.S. Army Corps of Engineers (USACE) At Listing:**

USACE regulates dredging and filling in the waters of the United States through the Federal Clean Water Act (CWA) Section 404 Program. The USACE program is implemented through the issuance of a variety of individual, nation-wide and emergency permits. USACE is obligated to not permit a discharge that would cause or contribute to significant degradation of the waters of the United States. At listing, it was determined implementation of the CWA was not effective in adequately protecting fishery resources, particularly in regard to non-point sources of pollution. One factor that was considered in this determination is cumulative effects. USACE guidelines did not specify a methodology for assessing cumulative impacts or how much weight to assign them in decision-making. Furthermore, there was no USACE process to address the cumulative effects of the continued development of water front, riverine, coastal, and wetland properties. A variety of factors, including inadequate staffing, training, and in some cases policy direction, was found to result in ineffective protection of aquatic habitats important to migrating, spawning, or rearing coho salmon. The deficiencies of the program were found particularly acute during large-scale flooding events, such as those associated with El Niño conditions, which can put additional strain on the administration of the CWA Section 404 program.

**U.S. Army Corp of Engineers Since Listing:**

The USACE continues to lack a comprehensive and consistent process to address the cumulative effects of the continued development of water front, riverine, coastal, and wetland properties. USACE need for staffing, training and consistency in application of laws and policies still remains. A new development since listing is the USACE policy on *Compensatory Mitigation for Losses of Aquatic Resources* (73 FR 19594); a policy not being uniformly interpreted nor applied between Districts. The significance of different interpretations and priorities within USACE is currently being demonstrated in the Russian River. The USACE operates a hatchery facility at Warm Springs Dam which is instrumental in the Russian River Coho Salmon Recovery Program (a broad coalition of government agencies, scientists, water agencies, private landowners, and others). The program has been in operation since 2001, to raise young coho

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salmon from wild broodstock and release them into Russian River tributaries. While rearing coho salmon at the hatchery is successful, there is a critical need for outplanting sites with high quality habitat for these young coho salmon to survive in the impaired Russian River watershed. Nearly all of the Russian River is privately owned and many property owners are reluctant to collaborate with the agencies. Thus, securing properties for the outplanting of coho salmon is critical; yet there are few tools to establish such public/private partnerships. Conservation and Mitigation Banking has been identified by NMFS as a tool to secure land in perpetuity towards that cause. Unfortunately, staff at the District office of the USACE, and unconnected with the Russian River Program, is interpreting the policy on *Compensatory Mitigation for Losses of Aquatic Resources* (73 FRN 19594) in a manner different from other Districts that make Conservation Banks economically non-viable and thus a conservation tool unlikely to be used by public entities for CCC coho salmon recovery. Other USACE Districts are interpreting the policy more broadly and have realized demonstrated benefits to salmonids. To reduce this threat for CCC coho salmon, the USACE should consider working with NMFS to determine a service area for salmonids that is more biologically relevant for Conservation and Mitigation Banks and utilize their authority to fulfill their Section 2 and Section 7(a)(1) responsibility. This alone could widen the market for mitigation credits, provide an incentive for private landowners to manage their land for the recovery of CCC coho salmon, and reduce this threat category.

In addition, there is a lack of oversight or consultation with NMFS by USACE for activities (where navigable waters are impaired and coho salmon habitat degraded) that result from normal farming, silviculture, ranching, agriculture, emergency reconstruction of structures, farm ponds, and construction/maintenance of farm or forest roads. Section 404 of the CWA requires permits for the discharge of dredged or fill material into waters of the United States, but exempts activities as outlined in Section 404(f)(1)(A-E):

- A. Normal farming, silviculture, and ranching activities such as plowing, seeding, cultivating, minor drainage, harvesting for the production of food, fiber, and forest products or upland soil and water conservation practices;

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- B. Maintenance, including emergency reconstruction of recently damaged parts of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, and bridge abutments or approaches, and transportation structures;
  - C. Construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance of drainage ditches;
  - D. Construction of temporary sediment basins on a construction site which does not include placement of fill material into the navigable waters; and
  - E. Construction or maintenance of farm roads or forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained, in accordance with best management practices, to assure that flow and circulation patterns and chemical and biological characteristics of the navigable waters are not impaired, that the reach of the navigable waters is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized.

Some of these activities have been found to impair salmonid streams, but without a clear trigger for Federal oversight many of these activities will continue to degrade habitats. This policy should be amended for activities where significant impacts are likely to occur to salmonid streams.

**Federal Emergency Management Agency (FEMA) At Listing:**

FEMA administers programs which influence development in waterways and floodplains. Through the Public Assistance, Individual and Households and Hazard Mitigation Grant programs, FEMA provides technical and financial assistance to public and private property owners in preparation, response, and recovery from disasters, including flooding events. In the past, FEMA's actions often result in infrastructure repair that only provided funding for replacement of damaged facilities and structures in their original locations and original configurations (*i.e.*, undersized culverts that cannot pass flood flows). These types of repairs are prone to repeated damage from future flooding and have led to repeated disturbance of riparian and aquatic habitats important to migrating, spawning, or rearing coho salmon.

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FEMA administers the National Flood Insurance Program (NFIP) which enables property owners in participating communities to purchase insurance as a protection against flood losses. In exchange, state and community floodplain management regulations are implemented, with the goal of reducing future flood damages. Regulations allow for development in the margins of active waterways (if they are protected against 100-year flood events), and do not raise water surface elevations within the active channel (floodway) more than one foot during such flood events. This standard was found to not adequately reflect the dynamic, mobile nature of watercourses in the CCC coho salmon ESU, and the critical role that margins of active waterways (riparian areas) play in the maintenance of aquatic habitats.

**Federal Emergency Management Agency Since Listing:**

In 2004, a judge ruled (U.S. District Court, Western District of Washington, Seattle, Order No. C03-2824Z) that “FEMA has violated Section 7(a)(2) of the ESA” and directed FEMA to initiate consultation with NMFS on the impacts of its implementation of the NFIP on Chinook salmon. A NMFS Biological Opinion was completed in 2008 and concluded the NFIP, as currently implemented, caused jeopardy to listed Puget Sound salmonids and Southern Resident Killer Whales and adversely modified critical habitat (NMFS 2008a).

A second lawsuit (Audubon Society of Portland *et al.* v FEMA Case 3:09-cv 00729-HA) alleged FEMA violated Section 7 of the ESA by not consulting with NMFS regarding the potential effects of the NFIP on ESA listed salmonids in Oregon. The lawsuit further asserted that FEMA failed to use its authorities to carry out programs to conserve listed species. On July 9, 2010, FEMA entered into an agreement with the plaintiffs settling the lawsuit (U.S. District Court Case 3:09-cv-00729-HA: Settlement Agreement and [Proposed] Court Order). The settlement agreement required FEMA to initiate formal consultation with NMFS on FEMA’s implementation of the NFIP and its associated discretionary components including the mapping of floodplains and revisions thereof, and the implementation of the Community Rating System (CRS) for the 15 salmon and steelhead ESUs/DPSs listed under the ESA in Oregon. Due in part to these lawsuits and the Puget Sound area NFIP biological opinion, a

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national consultation effort is underway between FEMA and NMFS regarding FEMA's proposed revision of its NFIP. The timing for its finalization is unknown at this time; however, staff in the Northwest Region and SWR are currently providing technical assistance to FEMA for that consultation and have provided comments through the NEPA comment process. Through this process, the inadequacy of the regulatory mechanisms of the FEMA NFIP was outlined by NMFS in a July 12, 2012, letter (NMFS 2012b). The letter highlighted the following issues:

- (1) Current mapping protocols fail to accurately recognize and reflect the full range of flood hazards to people and property, and simultaneously fail to recognize and protect natural resource values of the floodplain;
- (2) Existing minimum floodplain management criteria promote construction in floodplains rather than discourage development in floodplains, to the detriment of ESA listed species and their critical habitat; and
- (3) The community rating system should better incentivize flood damage minimization practices that are compatible with preservation/restoration of natural functions of floodplains.

Currently, work in the SWR is underway on a programmatic biological opinion on implementation of FEMA's programs for disaster preparation response, and recovery, including flooding events. NMFS and FEMA have been engaged in discussions to improve implementation of these programs and include standard conservation measures for the protection of salmonids and their designated critical habitat. Conservation measures will also include regeneration of riparian habitat, improvements to passage, and provisions for restoration of natural and historical channel processes that are necessary to support listed salmonids including CCC coho salmon. If the NFIP and Disaster Relief Program consultations improve these programs for salmon and steelhead, the threat will be reduced.

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***EPA, Water Quality Control Board and Total Maximum Daily Loads (TMDL) At Listing:***

The CWA is administered by the Environmental Protection Agency (EPA), is intended to protect and fully support the beneficial uses of water such as aquatic life, fisheries, drinking water, recreation, industry and agriculture. The State of California inventoried a list of water bodies, known as the 303(d) lists, and characterized water as either; fully supported, impaired, or in some cases threatened, as beneficial uses. Section 303(d)(1)(C) and (D) of the CWA requires states to prepare Total Maximum Daily Loads (TMDLs) for all water bodies failing to meet water quality standards. TMDLs are a method for quantitative assessment of environmental problems in a watershed and identifying pollution reductions necessary to protect drinking water, aquatic life, recreation, and other use of rivers, lakes, and streams. The states either develop a numeric criteria or a narrative description for the maximum amount of a pollutant that a water body can receive while still meeting water quality standards.

EPA delegated its authority to each state to enact the CWA. In California, both EPA and the California Regional Water Quality Control Boards (RWQCB) establish TMDLs for impaired rivers and streams on the 303(d) list. In the late 1990's, the state of California committed to, and completed, the development of TMDLs for 18 basins in California by 2007. EPA outlined a plan to develop TMDLs for the remaining impaired basins and agreed to complete all TMDLs if the State failed to meet its commitments in 2007. The North Coast Regional Water Quality Control Board (NCRWQCB) was in the process of updating its north coast basin plan, which would establish water quality standards for all of the northern California rivers and streams (including Ten Mile, Noyo, Navarro, Garcia, Gualala, and Russian rivers). Basin plans are considered living documents and are continually updated and refined.

At the time of listing, NMFS was concerned about the inadequacy of existing regulatory mechanisms to protect and conserve CCC coho salmon ESU through the development and implementation of TMDLs in California (62 FR 43937). NMFS determined implementation of the existing regulatory mechanisms had not been adequate to protect coho habitat.

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**EPA, Water Quality Control Board and Total Maximum Daily Loads (TMDL) Since Listing:**

Since the original listing and the recent 5-year status review for CCC coho salmon, the EPA and State have established a number of TMDL's in watersheds for various constituents (*i.e.*, sediment, temperature, nutrient, *etc.*) to reduce pollutant loads to impaired water bodies. Based on the current 303(d) list with over 1,883 water body/pollutant combinations, the SWRCB has estimated that the total number of TMDLs needed is over 400 projects across the State. The Regional Boards are currently engaged in developing over 120 TMDLs, many addressing multiple pollutants. Schedules have been developed for establishing all required TMDLs over a 13-year period (see web site for more information at: [http://www.waterboards.ca.gov/water\\_issues/programs/tmdl/docs/303dlists2006/epa/r1\\_06\\_303d\\_reqtmlds.pdf](http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r1_06_303d_reqtmlds.pdf)). More detailed schedules of work to be undertaken in the 3- and 5-year periods have also been developed.

Approved TMDLs are improving CCC coho salmon habitats in some watersheds (*e.g.* Garcia River, Mendocino County, CA); in other watersheds substantial progress or improvement is needed (*e.g.*, San Lorenzo, Santa Cruz County, CA). These differences are largely the result of staff availability and varying implementation schedules time by the various WQCBs.

In 2011, the NCRWQCB, the Central California Coast RWQCB, and the San Francisco Bay RWQCB updated their basin plans to establish water quality standards for rivers, streams, and tributaries in the CCC ESU. NMFS expects the development and implementation of TMDLs will improve CCC coho salmon ESU habitat; however, their efficacy in protecting coho salmon habitat will be unknown for years to come. Monitoring of the TMDLs process is essential to the recovery CCC coho salmon.

Considerable work has been done to improve water quality in California's streams, rivers, and tributaries; however, there are a number of additional water quality issues that need to be addressed to protect and conserve coho salmon. For example, impacts to fish habitat from agricultural practices have not been closely regulated. The State of California does not have regulations that directly manage agricultural practices, but instead relies on the TMDLs under

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the CWA to improve water quality from all sources and parties, including agricultural sources. Numerous streams in the CCC coho salmon ESU are currently impacted by agricultural practices, but do not have TMDLs (SWRCB 2010), and many are not scheduled for completion until 2019. The majority of TMDLs focus on sediment and temperature requirements with little focus on pesticide toxicity. Pesticide toxicity is currently believed to be an upcoming issues regarding stream impairment but little is known about its effects to CCC coho salmon.

Many pesticides are applied in CCC coho salmon watersheds to control pests associated with agricultural crops, residential homes, commercial and industrial facilities, transportation corridors, parks, golf courses, and timberlands. Pesticides can be transported to salmon habitats as a result of point source (*e.g.*, discharges from industrial and municipal outfalls) and non-point source (*e.g.*, agricultural and urban runoff) pathways. The direct impact of pesticides (and pesticide mixtures) on salmon health is an emerging research area (Eder *et al.* 2009; Laetz *et al.* 2009) in the context of population recovery (Baldwin *et al.* 2009); however, the indirect impacts of pesticides on salmonids via their supporting aquatic food webs remain poorly understood (MacNeal *et al.* 2010). Results by Baldwin *et al.* (2009) indicated short-term (*i.e.*, four-day) exposures (representative of seasonal pesticide use) may be sufficient to reduce the growth and size at ocean entry of juvenile steelhead. Overall, results indicate exposure to common pesticides may place important constraints on the recovery of ESA listed salmon species, and that simple models can be used to extrapolate toxicological impacts across several scales of biological complexity (Baldwin *et al.* 2009). Despite these gaps, there is considerable evidence pesticides may have toxic effects on the biological communities that support ESA-listed salmon (reviewed in NMFS 2008b; NMFS 2009). Research on this topic for CCC coho salmon is critically needed.

At the Federal level<sup>11</sup>, the EPA initiated ESA section 7 consultations with the NMFS' Office of

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<sup>11</sup> The California Department of Pesticide Regulations (CDPR) regulates pesticides. The CDPR has a statutory mandate to encourage the development and implementation of pest management systems that stress biological, mechanical and cultural pest control. The CDPR uses "integrated pest management" (IPM) to ensure the least possible harm to non-target organisms, public health and the environment.

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Protected Resources for the re-registration of 37 pesticide active ingredients. At present, five biological opinions have been completed with NMFS with the conclusion that numerous<sup>12</sup> insecticides, fungicides, herbicides and insecticides, used in both agricultural and urban settings, likely jeopardize and adversely modify designated critical habitat for CCC coho salmon ESU (NMFS 2008b; NMFS 2009; NMFS 2010b; NMFS 2011; NMFS 2012c). Two biological opinions for the remaining eight active ingredients are scheduled for completion by 30 June 2013.

In summary, some improvements in some watersheds in the CCC ESU are occurring where TMDLs are developed and actively implemented. The State has developed many TMDLs but the list of additional impaired waterbodies remains very large and TMDL development will likely take many more years to fully implement. TMDLs development and implementation has significant potential to provide long term benefits to listed salmonids and their habitat. However, it will take time to develop and implement TMDL standards for all pollutants and to determine the magnitude of the benefits of existing programs.

**NMFS Efforts At Listing (ESA Section 7 Consultations):**

NMFS conducts ESA section 7 consultations with Federal action agencies that fund, conduct or authorize projects in the range of CCC coho salmon. NMFS evaluates impacts to CCC coho salmon from a wide variety of projects including: irrigation and water diversion, timber harvest, watershed restoration, fish passage, gravel mining, grazing, and transportation projects. From 2000 to 2005, NMFS had conducted approximately 2,300 ESA section 7 consultations with over 20 Federal action agencies in California. Of this total, approximately 1,500 consultations involved projects in coastal watersheds occupied by listed coho salmon, Chinook salmon, and steelhead ESUs/DPSs. NMFS has also provided technical assistance to Federal agencies on hundreds of additional projects throughout the State of California. The

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<sup>12</sup> Chlorpyrifos, diazinon, malathion, carbaryl, carbofuran, methomyl, 2,4-D, oryzalin, pendimethalin trifluralin, and pesticide products containing the active ingredient naled, phosmet, ethoprop, phorate and methidathion.

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majority of consultations were with BOR, USACE, FHWA, FWS, USFS, BLM, and BIA. In addition to consulting with other Federal agencies, NMFS has also consulted with itself regarding the effects of recreational and commercial fishing on listed salmonid ESUs. These consultations improved, or minimized adverse impacts to, and resulted in more consistent approaches to management of listed salmonid and their habitats throughout coastal watersheds in California. Two consultations the Potter Valley Project (which included the Russian River) and the USACE and the Sonoma County Water Agency (for the Russian River) were expected to improve, or minimize adverse impacts to salmonids and their associated habitat.

**NMFS Efforts Since Listing (ESA Section 7 Consultations):**

Both the Potter Valley Project and the USACE and Sonoma County Water Agency consultations have been completed. The Potter Valley Project does not directly relate to CCC coho salmon; however the Sonoma County Water Agency consultation is expected to realize significant benefits to CCC coho salmon when fully implemented. A small percentage of the CCC coho salmon ESU falls within the jurisdiction of Section 7 consultations due to the large percentage of privately held land. Nonetheless, Section 7 consultations can provide benefits to CCC coho salmon if recommendations in this plan are fully implemented. Some programmatic biological opinions have been completed with the USACE for restoration and enhancement actions. See Chapter 12 “Implementation by NMFS” for more details.

**NMFS Efforts At Listing (ESA Section 10):**

Habitat Conservation Planning (HCP) under section 10 of the ESA addresses species protection on non-Federal lands. HCPs are particularly important since much of the habitat in the range of CCC coho salmon is in non-Federal ownership.

**NMFS Efforts Since Listing (ESA Section 10):**

Section 10 of the ESA involves both the development of HCPs as well as scientific research.

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An HCP with Mendocino Redwood Company has been in development since 2000, but has yet to be finalized. Due to the high non-Federal ownership in the CCC coho salmon, the use of HCPs will be critical to recovery.

Scientific research and educational programs are believed to have little or no impact on coho salmon populations; however, the amount of incidental take associated with these is not being tracked. Therefore, it is relatively unknown how these factors are affecting CCC coho salmon populations. Given the extremely low population and endangered status, any impacts associated with this factor such as angling, research, education, *etc.* may have a significant adverse effect and should be monitored.

**Other NMFS Efforts Since Listing:**

Conservation and advance mitigation planning efforts are being considered or proposed by many agencies and project proponents. An increasing number of conservation banks targeting NMFS species and their habitats are being proposed by bank sponsors. The SWR is currently engaged in a number of conservation banking activities which include the operation of established bank sites, developing new banks, developing regional and state-wide mitigation initiatives with state agencies, and interagency efforts to improve and maintain consistent coordination. In 2011, the SWR issued policy guidance for the review, establishment, use, and operations of conservation banks and in-lieu fee mitigation programs within the Southwest Region. Conservation banks use the free-market enterprise to offer landowners an economic incentive to protect, preserve and restore habitats for species listed under the federal ESA. In exchange, the landowner banks habitat “credits” that may be sold to groups to compensate for adverse impacts to these listed species or their habitats that are caused from projects. Banks are usually held in perpetuity. A summary of ongoing and potential banking efforts in the CCC coho salmon ESU are described below.

- ❑ The Austin Creek Conservation Bank was signed in 2010 and is the first NMFS approved Conservation Bank in the CCC coho salmon ESU. The ownership is roughly 400 acres and lies along several stream miles of upper East Austin Creek and Devils Creek in the Russian River watershed and adjacent to Austin Creek State Recreation

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Area. The bank agreement is on file at the SWR's North Central California Coast Office. The bank targets Central California Coast coho and steelhead and has credits for riparian and upland habitats that maintain natural stream processes. The service area is a 2-tiered system. The primary service area includes Marin and Sonoma Counties, and may be utilized for mitigation and conservation. The secondary area includes the entire Central California Coast coho and steelhead ESU/DPSs, and may be used for conservation purposes. Phase 1 of the bank involves 144 acres and Phase 2 will bring in the remaining acreage of the property into the bank. The bank owner has initiated restoration and is allowing the Russian River Coho Salmon Captive Broodstock Program staff to outplant juvenile coho salmon on the property. Wild coho salmon adults spawned on the property in 2011 and their young were confirmed by snorkel surveys. To continue the good work, NMFS and other agencies should continue to ask project proponents to consider banks as a way of offsetting impacts.

- ❑ The Statewide Advance Mitigation Initiative (SAMI) Memorandum of Understanding (MOU) establishes a mutual framework for developing a coordinated advanced mitigation plan for projects proposed by the California Department of Transportation (Caltrans). The MOU was signed in 2011 by Caltrans, CDFG, Corps, the Environmental Protection Agency (EPA), the US Fish and Wildlife Service (USFWS), and NMFS. The SAMI may include conservation and mitigation banks, in-lieu fee (ILF) programs, or other appropriate mitigation or conservation measures. The MOU addresses unavoidable impacts to aquatic ecosystems resulting from transportation projects and specifically requires Caltrans to first avoid then minimize impacts.
- ❑ The Regional Advanced Mitigation Project (RAMP) MOU was signed by in 2009 by Caltrans, the Business Transportation and Housing Agency, the Wildlife Conservation Board, EPA, USACE and the California Department of Water Resources (DWR) to improve project mitigation and streamline the mitigation process for transportation and flood control infrastructure projects. A copy of the MOU is on file at the NMFS SWRO. The RAMP MOU establishes a working group that will develop a regional plan to develop, implement and institutionalize strategies that encourage the use of advanced

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regional mitigation planning and projects in the planning, design, and implementation of transportation and flood infrastructure projects. The workgroup is pursuing a pilot project to apply these principles and strategies.

*Northwest Forest Plan (NFP) and PACFISH At Listing:*

The NFP is a Federal management policy with potential benefits for CCC coho salmon. Under the NFP the US Forest Service (USFS) and the Bureau of Land Management (BLM) made efforts to reduce adverse effects to aquatic and riparian dependent species including salmon in the range of the Northern spotted owl. The most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy, which includes an objective for salmon habitat conservation. However, Federal lands comprise only about five percent of the CCC coho salmon ESU, a proportion too small to secure recovery even with the strictest of Federal forest management practices.

PACFISH is a cooperative effort between USFS and BLM to develop coordinated Management and Land Use Plans for the Federal lands they manage in eastern Oregon and Washington, Idaho, and portions of Northern California. PACFISH is intended to provide protection of anadromous fish aquatic and riparian habitat conditions while a longer term, basin scale aquatic conservation strategy is developed. PACFISH provides objective standards and guidelines that are applied to all Federal land management activities such as timber harvest, road construction, mining, grazing, and recreation.

*Northwest Forest Plan (NFP) and PACFISH Since Listing:*

The NFP and PACFISH should not be considered in further status reviews nor listing evaluations as they are not issues affecting the CCC coho salmon ESU.

*Pacific Fisheries Management Council (PFMC) At Listing:*

Ocean fisheries are managed by the PFMC. Since the listing of Pacific salmon and steelhead under the ESA, substantial harvest reform has been instituted to reduce impacts to listed stocks.

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Each year the PFMC develops fishing regulations that are established by NMFS in Section 7 consultations for listed ESUs in California, Oregon, Washington, and Idaho. The ocean fisheries have been implemented consistent with NMFS' requirements and have been effective at reducing harvest impacts.

**Pacific Fisheries Management Council Since Listing:**

The PFMC continues to institute no directed coho fisheries or retention of coho in all commercial and recreational fisheries off California. The marine fisheries impacts should be no more than 13.0 percent to protect endangered CCC coho salmon.

**Pacific Coastal Salmon Recovery Fund (PCSRF) At Listing:**

The PCSRF was established in Fiscal Year (FY) 2000 to address a coast-wide need to protect, restore and conserve Pacific Chinook, coho, chum, sockeye, and pink salmon and steelhead, including their habitats. The PCSRF supplements existing state and tribal programs to foster development of federal-state-tribal-local partnerships in salmon recovery and conservation by providing grants for restoration of anadromous salmonids to the eligible states and tribes. States must provide a minimum 33% match as a condition for use of these funds. NMFS oversees the administration of PCSRF and distributes the congressional appropriations to states and tribes in the Pacific Coast Region. CDFG administers the funds through the Fisheries Restoration Grant Program (FRGP). Funded projects include, but are not limited to, fish passage barrier removals, stream bank stabilization, fish habitat improvements that increase the frequency of pools, removal of and/or storm-proofing of roads that contribute sediment to streams, stabilizing eroding hill slope area adjacent to stream channels, revegetation of upslope areas and riparian areas, monitoring programs to provide baseline and/or population trend data, and support of local watershed organizations and education projects. The Federal funds provided to the State and California Tribes have been important in furthering conservation efforts in coastal watersheds. The funds have been successfully used to leverage additional State and local salmon recovery funding sources, and have precipitated a substantial increase in overall funding in the coastal counties of California.

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***Pacific Coastal Salmon Recovery Fund (PCSRF) Since Listing:***

The PCSRF program has been continuous since FY 2000, and many restoration actions have been implemented with meaningful benefits realized for CCC coho salmon and their habitats. The DFG Fisheries Grant Program (FRGP) that uses PCSRF monies has improved since listing. The PCSRF program has also improved the focus to ensure ESA listed species are considered top priorities for PCSRF money. For FY 2012, NMFS initiated a solicitation for the states to seek applications for projects to allocate Federal funds and demonstrate how the money is anticipated to be used according to new NMFS priorities. Specifically, in accordance with the Congressional authorization, that funding is used for projects *“necessary for conservation of salmon and steelhead populations that are listed as threatened or endangered, or identified by a State as at-risk, or for maintaining populations necessary for exercise of tribal treaty fishing rights or native subsistence fishing, or for conservation of Pacific coastal salmon and steelhead habitat.”* (Public Law 112-55 in NOAA 2012). New program priorities for FY2012 PCSRF applications are (ranked in order):

- (1) Projects that address factors limiting the productivity of ESA-listed Pacific salmonids as specified in approved, interim or proposed Recovery Plans. This includes projects that are a necessary precursor to implementing priority habitat actions for ESA-listed salmonids (*e.g.*, project planning/design);
- (2) Projects that restore or protect the habitat of anadromous salmonids that are at-risk of being ESA listed or are necessary for exercise of tribal treaty fishing rights or native subsistence fishing. This includes projects that are a necessary precursor to implementing habitat actions (*e.g.*, project planning/design);
- (3) Effectiveness monitoring of habitat restoration actions at the watershed or larger scales for ESA-listed anadromous salmonids, status monitoring projects that directly contribute to population viability assessments for ESA-listed anadromous salmonids, or

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monitoring necessary for the exercise of tribal treaty fish rights or native subsistence fishing on anadromous salmonids; and

- (4) Other projects consistent with the Congressional authorization with demonstrated need for PCSRF funding. This includes habitat restoration and planning projects not included in the above priorities, as well as outreach, coordination, research, monitoring, and assessment projects that can be justified as directly supporting one of the priorities.

The FRGP program, supported in part by PCSRF funding, is one of the single most important restoration programs in California. Continued PCSRF funding is a critical component to prevent extinction, focus restoration, conduct monitoring and support entities interested in recovery of CCC coho salmon.

**Other Federal Efforts Since Listing:**

See Chapter 12 “Implementation by NMFS” for more details on actions associated with the ESA.

**4.2.6 NON-FEDERAL EFFORTS**

**State Programs**

**California Department of Fish and Game At Listing:**

Coho salmon were first listed under the CESA in 1995, in coastal streams south of the Golden Gate. The original State listing did not encompass the entire ESU and NMFS determined it is essential to manage the ESU as a population unit. NMFS concluded that CDFG may intend to expand its recovery planning effort to the entire ESU, the protective measures of the State ESA needed to be expanded to encompass the remainder of the ESU. The State of California eventually listed the remainder of the CCC coho salmon ESU as endangered under the State ESA. Freshwater fishing regulations were identified as a threat to coho salmon at the time of listing (see Listing Factor B for further discussion).

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*California Department of Fish and Game Since Listing:*

In 2004, the California Fish and Game Commission finalized the California State Coho Salmon Recovery Strategy (CDFG 2004) which identified and addressed recovery needs of coho salmon and their habitats. The State recovery strategy established six goals:

1. Maintain and improve the number of key populations and increase the number of populations and brood years of coho salmon;
2. Maintain and increase the number of spawning adults;
3. Maintain the range and maintain and increase the distribution of coho salmon;
4. Maintain existing habitat essential for coho salmon;
5. Enhance and restore habitat within the range of coho salmon; and
6. Reach and maintain coho salmon population levels to allow for the resumption of Tribal, recreational, and commercial fisheries for coho salmon in California.

To achieve these goals the plan provides recommendations to address stream flow, water rights, fish passage, water temperature, pool habitat structure, riparian habitat, watershed planning, and gravel mining activities. Recovery priorities have been included into the operations of both conservation hatchery programs (Warm Springs and Kingfisher Flat Monterey Bay Salmon and Trout Project in Scott Creek) and the CDFG FRGP, though currently the plan has not been evaluated for its effectiveness due to lack of funding for State monitoring programs.

Many projects have been implemented in the CCC coho salmon ESU under the CDFG FRGP on public and private lands. FRGP funds have been used by watershed groups, non-profit organizations and others to promote important conservation actions. CDFG conducts site specific implementation and effectiveness monitoring to track the success and benefits of these efforts. FRGP has recently been revamped to more effectively coordinate and comport with State and Federal priorities. Furthermore, a more equitable distribution of funds is underway to ensure projects for all federally listed salmonids are represented. The overall benefits of the FRGP have improved significant acres of watersheds and miles of habitat; however effectiveness monitoring has been lacking due to limited funding. It is critical that the FRGP

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program is funded, and expanded, to ensure continued restoration and monitoring work critical to prevent CCC coho salmon extinction and shift their trajectory towards recovery. Long-term funding is critically needed for the State to expand its monitoring programs that are currently funded by FRGP.

Freshwater fishing regulations no longer allow for fishing of coho salmon (see Listing Factor B for further discussion).

CDFG established the range-wide Coho Salmon Recovery Team (CRT) in December, 2002. The CRT is made up of 21 members from a wide range of interests, professions, and perspectives which represents county, State, and Federal governments, tribes, commercial and recreational fishing, forestry, agriculture, ranching, water management, and environmental interests. The team addressed many significant issues affecting coho salmon range-wide which were incorporated into the California Recovery Strategy for Coho Salmon (CDFG 2004). The CRT continued meeting after completion of the recovery strategy and, in recent years, has convened on average of two times per year to address issues ongoing and recent developments in regard to the continued decline of coho salmon in the State.

***Coastal Monitoring Plan (CMP) At Listing:***

A major concern in risk assessments for salmonid ESUs in California has been the lack of comprehensive abundance and trend data for coastal salmonids. In 1994, the state's habitat restoration program funded a major coastal salmonid monitoring program development effort that is being carried out by the CDFG and NMFS. The development of a statewide, coastal monitoring program plan is critical to assessing the viability of listed ESUs and their response to extensive habitat restoration efforts and other conservation efforts. While the program was expected to be developed within a year of listing, sufficiency of long-term funding for implementation was an identified as a major uncertainty.

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**Coastal Monitoring Plan (CMP) Since Listing:**

The *California Coastal Salmonid Population Monitoring: Strategy, Design and Methods* (Adams *et al.* 2011) was finalized and is the first iteration of the CMP to guide monitoring of salmonid populations for the State. Joint CDFG-NMFS committees have been formed to oversee program development and implementation to further detail both population and habitat monitoring protocols and analysis techniques. The progress of the CMP and work by the committees is an improvement from the time of listing and a step forward to broaden and intensify monitoring. Unfortunately, the long-term and consistent data collection needed to inform us on status and trends cannot be realized with short-term and uncertain funding. New partners and assured funding for monitoring are critically needed for the CMP to become a viable program. The lack of sustained and secured funding to implement the CMP, and essential to conduct long-term monitoring, remains a concern and threat to CCC coho salmon.

**California State Water Resources Control Board (SWRCB) At Listing:**

SWRCB administers a water rights permitting system which controls utilization of waters for beneficial uses throughout the State. This permitting system, while it contains provisions (including public trust provisions) for the protection of instream aquatic resources, does not provide an explicit regulatory mechanism to implement CDFG Code Section 5937 requirements to protect fish populations below impoundments. Additionally, SWRCB generally lacks the oversight and regulatory authority over groundwater development comparable to surface water developments for out-of-stream beneficial uses.

**California State Water Resources Control Board (SWRCB) Since Listing:**

Assembly Bill 2121 (Stats. 2004, ch. 943, §§ 1-3) added sections 1259.2 and 1259.4 to the California Water Code. Water Code section 1259.4 requires the SWRCB to adopt principles and guidelines for maintaining instream flows in northern California coastal streams for the purposes of water right administration. The principles and guidelines were adopted as part of state policy for water quality control pursuant to chapter 3, article 3 (commencing with section 13140) of the Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 *et seq.*).

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On May 4, 2010, the State Water Board adopted a policy for water quality control titled “*Policy for Maintaining Instream Flows in Northern California Coastal Streams.*” The policy contains principles and guidelines for maintaining instream flows for the purposes of water right administration. The geographic scope of the policy encompasses coastal streams from the Mattole River to San Francisco and coastal streams entering northern San Pablo Bay and extends to five counties: Marin, Sonoma, and portions of Napa, Mendocino, and Humboldt Counties.

Implementation of the Policy for Maintaining Instream Flows in Northern California Coastal Streams should result in major benefits to coho salmon in the northern portions of the CCC ESU if properly implemented and enforced. The policy includes provisions to address seasons of diversions, minimum bypass flows, maximum cumulative diversions, onstream dams, and assessment of cumulative effects for new water diversion applications. The policy does not apply to previously authorized water diversions. Numerous unpermitted and out-of-compliance water diversions are present in the CCC ESU. Resources are lacking to monitor and enforce these diversions to ensure adequate instream flow is available for rearing coho salmon.

**California Forest Practice Rules (FPRs) At Listing:**

The California Department of Forestry and Fire Protection (CalFire) enforces California's FPRs which are promulgated through the State Board of Forestry (BOF). The FPRs contain provisions that could provide significant protection for salmon if fully implemented. NMFS however believes the FPRs did not provide adequate protection of properly functioning conditions. It is unclear what level of protection would be afforded to coho salmon on private lands and in non-forested areas.

**FPRs Since Listing:**

Forest practice rules regulate management of non-Federal timberlands in California and are promulgated by a governor-appointed Board of Forestry. Because of the preponderance of private timber land and timber harvest activity in the CCC coho salmon ESU, the FPRs are

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critically important for the species' conservation. Since listing, NMFS, RWQCB, and CDFG have expended considerable time and effort working with the Board of Forestry to increase protections for listed salmonids and their habitats. These efforts have resulted in varying degrees of success. For example:

1. At the time of listing the Board of Forestry did not adopt CDFG's proposal to designate coho salmon as a sensitive species pursuant to 14 CCR 898.2(d).
2. Efforts between NMFS, CALFIRE, and the BOF to develop guidelines for timber harvest plans which do not result in take of coho salmon or damage to coho habitat were only partially successful. Guidelines to prevent take of coho salmon were never fully developed or adopted. Guidelines to protect habitat have resulted in considerable efforts to address necessary increases in habitat protections while allowing operational flexibility based on site specificity.
3. In 1998, the expected implementation of a NMFS/State of California Memorandum of Agreement (MOA) was a critical factor in NMFS' decision to not list NC steelhead as threatened in 1998 (63 FR 13347). The MOA committed the State to implement measures in the State Strategic Plan for steelhead, implement the California Watershed Protection Program, and review and revise (if found necessary) the State's FPRs. In accordance with the MOA, a scientific review panel was appointed to undertake an independent review of the FPRs. In 1999, the review panel concluded the FPRs, including their implementation through the timber review process, did not ensure protection of anadromous salmonid habitats and populations. To address these shortcomings, and as specified in the MOA, the California Resources Agency and the California Environmental Protection Agency jointly presented the BOF with a proposed rule change package in July 1999.
4. The State's Threatened and Impaired Value Rules (T/I Rules) were developed and intended to minimize impacts to salmonid habitat resulting from timber harvest by requiring management actions in watersheds with State and Federally listed threatened, endangered, and or candidate populations of anadromous salmonids. Following several months of public review, the BOF took no action on the package in October 1999,

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thereby precluding any possibility of implementing improvements in California's FPRs by January 1, 2000, as the State had committed in the MOA. The California State Legislature gave special authority to the BOF to adopt new rules twice during the year 2000, for the specific purpose of revising the State's FPRs to meet ESA requirements for salmonids. On March 14, 2000, the BOF adopted only a subset of rule changes. It was determined the full implementation of these provisions was critically important to protecting the habitat of the NC steelhead DPS (and other salmonids as well, including CCC coho salmon). NMFS' decision to list the NC steelhead DPS as a threatened species (65 FR 36074) was largely due to the BOF approving only a portion of the 1999 T/I rule package and not fully implementing critically important conservation measures (*e.g.*, Class II and Class III protections).

5. In July 2000, CDFG began imposing stricter guidelines to protect and restore watersheds with threatened or impaired values (T/I rules). Examples of the special management actions required include constructing watercourse crossings that allow for unrestricted fish passage, increasing large woody debris recruitment, increasing soil stabilization measures, and requiring coordination between CDFG, CalFire, and Regional Water Quality Control Boards to minimize sediment discharge. The T/I rules were never permanently adopted, but instead have been re-authorized numerous times since their inception in 2000. The T/I rules were replaced by the Anadromous Salmonid Protection (ASP) rules in 2010. The BOF's primary objectives in adopting the ASP rules were to: (1) ensure rule adequacy in protecting listed anadromous salmonid species and their habitat, (2) further opportunities for restoring the species' habitat, (3) ensure the rules are based on credible science, and (4) meet Public Resources Code (PRC) § 4553 for review and periodic revisions to the FPRs. The coastal watersheds south of San Francisco Bay were specifically excluded from the increased protections provided by the ASP rules, despite the fact coho salmon in these watersheds are critically close to extirpation.
6. A number of items identified as inadequacies of the forest practice rules remain unresolved. These are (1) rate of harvest; (2) winter operations; (3) road planning,

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construction, maintenance and decommissioning; (4) loss of riparian function and chronic sediment input from streamside roads; (5) unstable areas; (6) planning, implementation and enforcement; (7) exemptions and conversions and (8) watershed analysis. Until a watershed analysis process is put in place in California the rules will continue to be decoupled from addressing the limiting factors to salmonids.

**Other Non-Federal Entities At Listing:**

*Resource Conservation Districts (RCDs):*

An extensive network of RCDs exists within the range of ESA-listed salmonids in northern coastal California. These RCDs represent an important vehicle through which the agricultural community and other private landowners can voluntarily address and correct management practices that impact ESA-listed salmonids and their habitats. Working with individual landowners or through organizations such as the California Farm Bureau and NRCS, these RCDs can assist landowners in developing and implementing best management practices that are protective of salmonids. Active participation of the agriculture community and other private landowners is critical to the conservancy and recovery of ESA-listed ESUs in California. Programmatic biological opinions issued to the Corps for the permitting of instream restoration and enhancement projects were in development for some RCDs.

A voluntary certification program was developed by the Sotoyome Resource Conservation District for agricultural properties in Sonoma and Mendocino counties who implement land management practices that decrease soil erosion and sediment delivery to streams. The development of the Fish Friendly Farming Program resulted in the creation of a workbook of Beneficial Management Practices. The growers participate in a series of workshops to develop and finalize a farm plan that is presented to a certification team comprised of NMFS, CDFG, and the Northern California Regional Water Quality Control Board.

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*Livestock Ranching and Farming:*

The Rangeland Management Advisory Committee developed a management plan for inclusion in the State's Non-point Source Management Plan. The purpose of the plan was to maintain and improve the quality and associated beneficial uses of surface water that passes through rangeland resources.

*Gravel Mining:*

Long-term sustained gravel mining plans have been, or are being, developed by three northern California counties (Del Norte, Humboldt, and Mendocino), which comprise a substantial portion of the range of several listed ESUs. The intent is for the impacts of all gravel extraction projects to be evaluated at the watershed scale. Approved projects (by the USACE) will require annual monitoring reports on gravel recruitment, river geomorphology, and fisheries impacts. Mendocino County is in the process of obtaining plan approval. NMFS will work with the counties to ensure any approved plans for gravel mining are sufficiently protective of coho salmon.

*FishNet 4C & 5 Counties Road Maintenance Program:*

FishNet 4C is a multi-county group comprised of representatives from Mendocino, Monterey, Sonoma, Marin, San Mateo, and Santa Cruz Counties. The goals are to facilitate effective local actions that will maintain or improve the region's water quality and riparian habitat, provide increased assistance and education for local government and the private sector, and encourage cooperation and coordination among all levels of regulatory responsibility for fisheries restoration. The program seeks to accomplish these goals through a process of evaluating existing activities, recommending model programs, tracking legislation, soliciting outside funding, and increasing communications among interested agencies and the public. The program has coordinated county efforts such as road maintenance, fish barrier assessment and removal, riparian and grading ordinances, erosion control, implementation of bioengineering projects and the development of guidelines for public works departments that enhance or

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protect salmonid habitat. Continuation of FishNet 4C is in jeopardy due to a lack of funding from FRGP.

A Memorandum of Understanding between NMFS and five northern California counties (the 5 Counties Salmonid Conservation Program which includes Mendocino County) was developed to create standardized county routine road maintenance manual to assist in the protection of ESA listed species and their habitat. This manual includes best management practices (BMPs) for reducing impacts to listed species and the aquatic environment, a five-county inventorying and prioritization of all fish passage barriers associated with county roads, annual training of road crews and county planners, and a monitoring framework for adaptive management. The 5 Counties Manual was found to adequately conserve salmonids by NMFS and take prohibitions under section 9 and applicable 4(d) rules would not apply. It is unknown the level of implementation of the 5 Counties Manual has been done by Mendocino County. Continuation of 5 Counties Program is in jeopardy due to a lack of funding from FRGP.

*Watershed Councils, Groups and others:*

Local watershed councils and other groups throughout California successfully developed restoration plans and worked to implement habitat restoration projects expected to contribute to the conservation of listed salmonids. Many watershed groups, landowners, environmental groups, and non-profit organizations throughout the range of CCC coho salmon conduct habitat restoration and planning efforts contributing to species conservation.

Local governments have the most direct responsibility for permitting land uses on non-Federal and non-state owned lands. Local efforts to control development within the floodplains and active channels is, in many cases, limited to the protection of public properties such as county or city roads, bridges, and other infrastructure. Local government regulation of floodplain development depends to a large extent on the standards provided by FEMA's FIP which did not explicitly provide for the protection of natural fluvial processes essential for the

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maintenance of naturally functioning riverine and riparian habitats important for coho salmon migration, spawning, and rearing.

**Other Non-Federal Entities Since Listing:**

Improvements in threats since listing include: (1) DFG's development and implementation of a California State Coho Salmon Recovery Strategy; (2) changes to California's Forest Practice Rules; (3) implementation of AB2121 by the SWRCB; (4) ongoing implementation of FRGP for restoration projects on private and public lands; (5) issuance of programmatic biological opinions for enhancement and restoration actions to the Santa Cruz County, Marin County, and Mendocino County RCDs; (6) continuation of Fish Friendly Farming although issues of water use need to be addressed; (7) coordination with gravel mining operations (especially those in the Russian River who are assisting with restoration work); (8) projects implemented under the FishNet 4C program; and the work of many watershed groups or collaborations to monitor, restore and protect CCC coho salmon and their habitats (*i.e.*, Usal Forest, CDFG and Campbell Timberland Pudding Creek monitoring, Mendocino Land Trust, CDFG monitoring on Caspar Creek, Big River Program, TNC work in the Garcia, Gualala Watershed Council, Russian River Broodstock program, Lagunitas Technical Advisory Committee, SPAWN, CalPoly, San Vicente Watershed Group, Trout Unlimited and many others coordinating their activities for the benefit of salmon). See Chapter 5 outlining Protective Efforts for more information.



Photo Courtesy 43: Rootwads for input into Austin Creek; Bob Snyder and Homer Canellis Austin Creek Materials; *David Hines, NMFS.*

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#### 4.2.7 FACTOR E: OTHER NATURAL AND MAN-MADE FACTORS AFFECTING THE SPECIES' CONTINUED EXISTENCE

##### *Factor E: At Listing*

Long-term trends in rainfall and marine productivity associated with atmospheric conditions in the North Pacific Ocean had a major influence on coho salmon production. Natural climatic conditions may have exacerbated or mitigated the problems associated with degraded and altered riverine and estuarine habitats (69 FR 33102). Coho salmon have evolved behaviors and life history traits allowing them to survive a variety of environmental conditions. When populations are fragmented or reduced in size and range, however, they are more vulnerable to extinction by natural events.

The effects of extended drought on water supplies and water temperatures were a major concern for California populations of coho salmon. Drought conditions reduced the amount of water available, resulting in reductions (or elimination) of flows needed for adult coho salmon passage, egg incubation, and juvenile rearing and migration. Although the decline of many coho salmon populations began prior to numerous years of drought conditions in California, these conditions have further reduced already small populations. Reductions in population size can lead to adverse genetic effects, such as inbreeding and a reduction in future potential for adaptation.

Flood events increased sedimentation to streams, particularly in areas with inherent erosion risk, urban encroachment, intensive timber management, and land disturbances resulting from logging, road construction, mining, urbanization, livestock grazing, agriculture, and fire. Sedimentation of stream beds was implicated as a principal cause of declining salmonid populations throughout their range. Central coastal California has some of the most erodible terrain in the world. In this region, catastrophic erosion and subsequent stream sedimentation (such as during the 1955 and 1964 floods) resulted from areas which had been clearcut or had roads constructed on unstable soils (61 FR 56138). These events can reduce flood flow capacity and widening and loss of pool-riffle sequence due to aggradation. Many north coast streams

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continue to show impacts from large debris flows and some of these streams have remained wide, warm, and unstable. Flooding events can also cause scour and redeposition of spawning gravels which can lead to loss of eggs in redds and filling in of streams and pools with sediment.

Poor ocean conditions were believed to have a prominent role in the decline of coho salmon populations in California. Variables from the Coastal domains which appear to have undergone shifts during the late 1970s and fluctuate out-of-phase include, current transport, sea surface temperature, and upwelling. Variability in the Subarctic Front (the most prominent feature of the North Pacific Transitional Region) is probably characterized by indirect trophic interactions rather than a direct cause-effect relationship (Rogers 1984; Fisher and Pearcy 1988; Pearcy 1992). Associations between salmon survival during the first few months at sea and ocean conditions such as sea surface temperature and salinity have been reported (Vernon 1958; Holtby *et al.* 1989; Holtby *et al.* 1990) and likely significant influence salmonid abundance. Coho salmon along the California coast may be especially sensitive to upwelling patterns because of the lack of other coastal habitat types that normally buffer adverse oceanographic effects (*i.e.*, extensive bays, straits, and estuaries). Additionally, unusually warm ocean surface temperatures and associated changes in coastal currents and upwelling, known as El Niño conditions, resulted in ecosystem alterations such as reductions in primary and secondary productivity and changes in prey and predator species distributions. El Niño was often cited as a cause for the decline of West Coast salmonids. Near-shore conditions during the spring and summer months along the California coast may have dramatically affected year-class strength of salmonids (Kruzic *et al.* 2001). The paucity of high quality near-shore habitat, coupled with variable ocean conditions, makes freshwater rearing habitat more crucial for the survival and persistence of many coho salmon populations.

The use of artificial propagation had a significant impact on the production of West Coast coho salmon. Non-native coho salmon stocks were introduced as broodstock in hatcheries and widely transplanted in many coastal rivers and streams in central California (Bryant 1994;

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Weitkamp *et al.* 1995). Potential problems associated with hatchery programs include genetic impacts on indigenous, naturally-reproducing populations (Waples 1991), disease transmission, predation of wild fish, difficulty in determining wild stock status due to incomplete marking of hatchery fish, depletions of wild stock to increase brood stock, and replacement rather than supplementation of wild stocks through competition and continued annual introduction of hatchery fish (61 FR 56138).

Impacts associated from wildfires include impairment to water quality as a result of short-term increases in sedimentation. These increases can lead to pool gravel quality during spawning leading to decreased egg survival and filling of pools which can reduce juvenile carrying capacity. Other impairments to water quality can include degradation from chemical agents (such as fire retardants dropped by aircraft) to control fire.

Many concerns existed regarding the impacts of artificial propagation on wild stocks of salmon. While non-native stocks were introduced in the CCC coho salmon ESU, most of the recent long-term hatchery programs were conducted with minimal inter-ESU import of broodstock. Intra-ESU transfers did occur and negative impacts were likely. Impacts may have included increased competition for resources such as food and spawning sites, displacement of wild cohorts from their usual microhabitats, genetic impacts to indigenous populations, introduction of diseases, increased exploitation and reduction in size of wild populations. These impacts could result in replacement rather than supplementation of wild stocks through competition and annual introduction of hatchery fish. At time of listing, most hatchery programs had modified their practices and hatchery fish releases were conducted based on a determination that the hatchery stocks were considered similar to native runs. Efforts were made to return hatchery fish to their natal streams, and were held for an acclimation period to increase the probability of imprinting.

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*Factor E: Since Listing*

No significant improvements related to climate change, ocean conditions, floods, or droughts have occurred since listing and the threats remain. The best available scientific information indicates that the Earth's climate is warming, driven by the accumulation of greenhouse gasses in the atmosphere (Oreskes 2004; Battin *et al.* 2007; Lindley *et al.* 2007). Because CCC coho salmon depend upon freshwater streams and the ocean during different stages of their life history cycle, the population is likely to be significantly impacted by climate change (See Appendix A for more information on marine and climate conditions). Impacts associated with ocean conditions, floods, and droughts are anticipated to continue into the future.

The Noyo River Fish Station egg-take program began in 1962 and was the only fish culture facility in California that has focused exclusively on coho salmon. The program was discontinued in 2004.

Hatchery management practices in the ESU have improved since listing through the adoption of conservation hatchery practices at the two remaining coho salmon hatcheries in the CCC ESU. These hatchery programs are the Russian River Captive Broodstock Program and the Monterey Bay Salmon and Trout Project Coho Salmon Broodstock Program.

The Russian River Coho Salmon Captive broodstock program was created in 2001, when coho in the Russian River were teetering on the brink of extinction. Remaining Russian River coho were captured by CDFG biologists, in coordination with biologists from other agencies, and brought to the Don Clausen Fish Hatchery at Lake Sonoma, where they were spawned based on a genetic matrix developed to mimics natural spawning. This initial effort to save the last remaining Russian River coho led to the formation of a multi-agency broodstock program. Partnership agencies include the USACE, NMFS, CDFG, University of California Cooperative Extension, and Sonoma County Water Agency. Unlike traditional hatcheries, the broodstock program releases young coho into their historic spawning grounds where, as adults, they return to spawn. The goal of the program is to recover the self-sustaining wild population. In 2004,

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more than 6,000 young coho raised from the program were released into three tributaries of the Russian River. The program is currently releasing 172,000 juvenile coho annually into 19 tributaries of the Russian River. In winter 2011-2012, 185 adult coho released as juveniles were counted migrating upstream in the Russian River. Other adult coho were found in tributaries. Until now, the program has been located outdoors in net-covered tanks that have been exposed to the elements and predators. A new building has been purchased that provides necessary light and air, while better protecting the tanks and allowing for a higher degree of quality control and fish health. The new structure is also designed to allow for expansion of the broodstock program. Monitoring is also conducted to include downstream smolt trapping, snorkel surveys in the summer and spawner surveys in the winter. Biologists use PIT-tag technology to track program fish.

The Monterey Bay Salmon and Trout Project (MBSTP) maintains a conservation broodstock program at the Kingfisher Flat Fish Facility on Big Creek, a tributary of Scott Creek in Santa Cruz county, California. The program was started with progeny from the 2002 broodyear and is a collaborative effort between CDFG, SWFSC, the MBSTP and others.

Conservation hatchery practices being used by the broodstock programs are designed to prevent extinction and preserve wild genetics. Local wild fish are used in the hatchery broodstock in sufficient numbers such that the genetic composition represents a wild population. The practices are significantly different than augmentation programs designed to simply increase the number of fish available for harvest. While improvements and/or expansion are needed for both facilities each are critical to preventing extinction of CCC coho salmon. Currently there is no hatchery threat to CCC coho salmon; in fact, these captive broodstock programs are likely the lifeboats to save the species.

Table 6: Listing Factors and Status

<b>Listing Factor A: Habitat &amp; Range</b>	<b>Status of Listing Factor</b>
Agriculture	Persisting; Expected to worsen
Estuarine modification	Persisting; Expected to worsen
Forestry	Threat Reduced; Improvements still needed
Freshwater Conditions	Persisting; Improvements due to restoration
Habitat Degradation	Persisting; Expected to worsen
Mining	Persisting; Watershed specific (some improvements)
Removal of Riparian Habitat	Persisting; Expected to worsen
Removal of Wetland Habitat	Persisting; Expected to worsen
Urbanization	Persisting; Expected to worsen
Water Diversions	Persisting; Expected to worsen
Wildfires	Currently Low; Expected to worsen

<b>Listing Factor B: Overutilization</b>	<b>Status of Listing Factor</b>
Collection	Persisting; Assessment needed
Freshwater Harvest	Persisting; Improvements needed
Illegal Harvest	Persisting; Assessments needed
Overfishing	Threat Reduced; Bycatch and freshwater interception persisting; Assessments needed

<b>Listing Factor C: Disease &amp; Predation</b>	<b>Status of Listing Factor</b>
Avian Freshwater Predation	Persisting; Expected to worsen
Predation	Persisting; Watershed specific
Disease and Predation	Disease Threat Reduced; Predation Persisting; Watershed specific
Infectious Disease	Reduced
Marine Mammal Predation	Persisting; Magnitude watershed specific
Marine Predation	Threat Unknown; Assessments needed
Piscivorous Predators	Persisting; Assessments needed
Predation	Persisting; Assessments needed
Predation by non-native species	Persisting; Assessments needed
Predation by seabirds	Persisting; Expected to worsen

<b>Listing Factor D: Inadequate Regulatory Mechanisms</b>	<b>Status of Listing Factor</b>
All Federal, State, local governments, municipalities and others	Some Improvement; Assessments needed

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<b>Listing Factor : Other manmade or other factors</b>	<b>Status of Listing Factor</b>
Artificial Propagation	Improved; Conservation practices implemented
Drought	Persisting; Expected to worsen
El Nino conditions	Persisting; Expected to worsen
Floods	Persisting; Expected to worsen
Floods – scour	Persisting; Expected to worsen
Floods – sediment	Persisting; Expected to worsen
Floods – sedimentation	Persisting; Expected to worsen
Floods – erosion	Persisting; Expected to worsen
Forest Fires	Persisting; Expected to worsen
Hatchery Programs	Improved; Conservation practices implemented
Natural Climatic Conditions	Persisting; Expected to worsen
Natural Events	Threat Persisting; Expected to worsen
Ocean Conditions	Threat Persisting; Expected to worsen
Ocean Conditions - El Nino	Threat Persisting; Expected to worsen