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COASTAL MULTISPECIES PLAN

Photo Courtesy: Justin Smith, SCWA, California Coastal Chinook Salmon Adult, Russian River, CA

VOLUME II

CALIFORNIA COASTAL CHINOOK SALMON

FINAL

2016

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INTRODUCTION TO CC CHINOOK SALMON ESU RECOVERY

The California Coastal (CC) Chinook salmon Evolutionarily Significant Unit (ESU) includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (Humboldt County, CA.) to the Russian River (Sonoma County, CA) (70 FR 37160). The ESU was historically comprised of 38 populations which included 32 fall-run populations and 6 spring-run populations across four Diversity Strata (Spence *et al.* 2008). All six of the spring-run populations were classified as functionally independent, but are considered extinct (Williams *et al.* 2011). The delineation of the CC Chinook salmon ESU Diversity Strata was based on environmental and ecological similarities and life history differences between fall-run and spring-run Chinook. Four strata were identified by Bjorkstedt *et al*. (2005): North Coastal, North Mountain Interior, North-Central Coastal and Central Coastal. Of the 32 fall-run populations, 15 populations were considered either functionally independent or potentially independent, while the remaining populations were classified as dependent populations (Spence *et al.* 2008). We have selected 17 of the 32 fall-run populations across the four Diversity Strata to represent the recovery scenario for the CC Chinook salmon ESU (Figure 1). The biological recovery criteria for these populations are (See also ESU Recovery Goals, Objectives and Criteria):

1. 13 Independent essential populations attaining low extinction risk criteria (*i.e.*, Bear River, Big River, Garcia River, Humboldt Bay tributaries, Lower Eel River (Van Duzen and Larabee), Lower Eel River (South Fork and Lower mainstem Eel), Little River, Mad River, Mattole River, Noyo River, Redwood Creek (Humboldt Co.), Russian River, and Upper Eel River);
2. Three Supporting Independent populations attaining moderate extinction risk criteria (*i.e.*, Gualala River, Navarro River and Ten Mile River);
3. One Dependent population contributing to redundancy and occupancy (*i.e.*, Albion River).

All populations in the ESU will retain ESA protections and critical habitat designation regardless of their status or role in the recovery scenario.

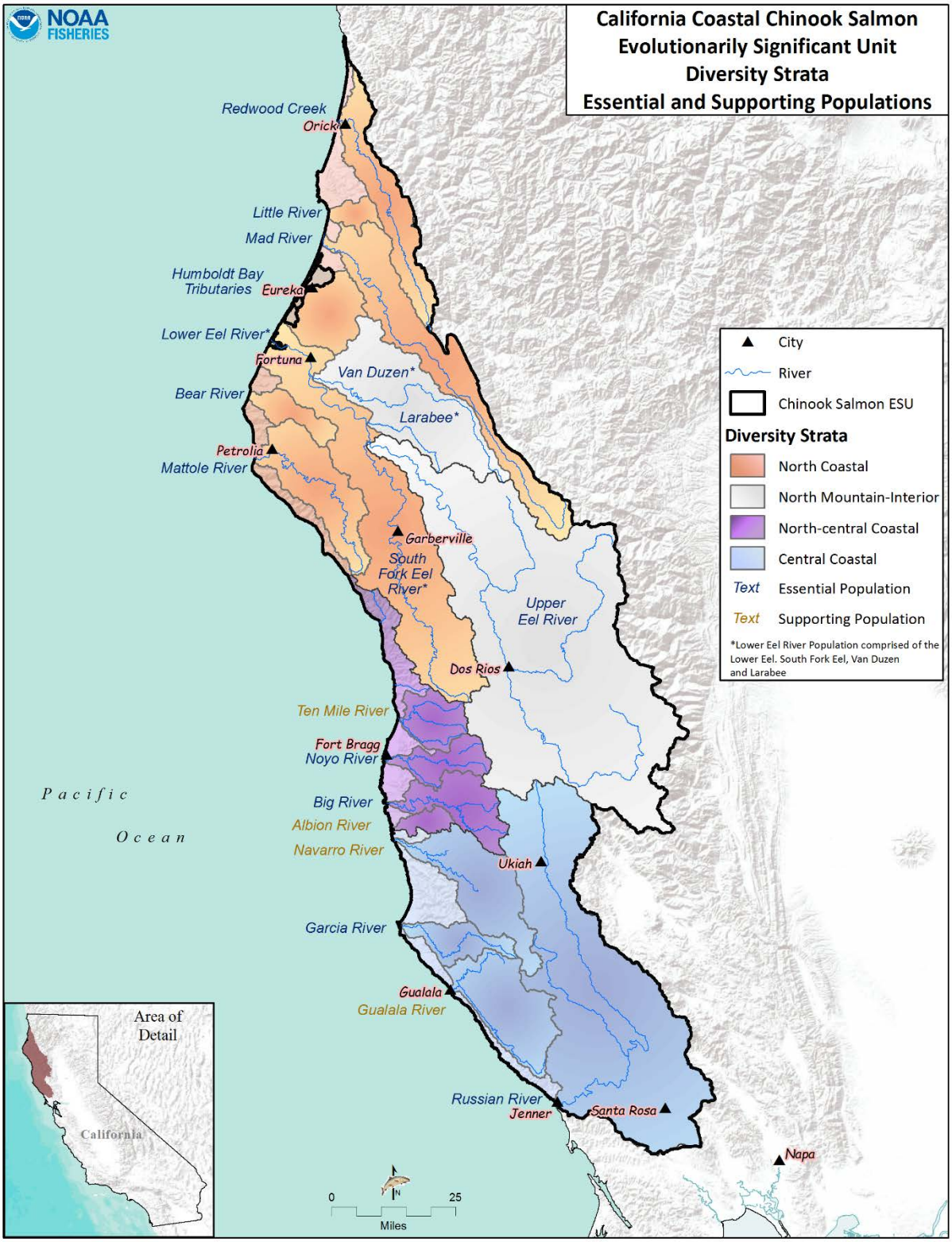

Figure 1: CC Chinook salmon ESU, Diversity Strata and Essential and Supporting Populations

CC CHINOOK SALMON ESU LISTING, STATUS REVIEWS & RECOVERY

The CC Chinook salmon ESU was originally listed as a federally threatened species in 1999 (64 FR 50394). Status reviews have been conducted in 2005, 2010, 2016 affirming the threatened status of the species. Details in this section of Volume II include the listing decision for CC Chinook salmon, a summary of the ESA section 4(a)(1) threats identified at listing, a summary of findings from the two status reviews including the status of protective/conservation efforts, prioritization of populations and CC Chinook salmon recovery criteria.

CC Chinook Salmon Listing

In September, 1994, NMFS initiated a status review of West Coast Chinook salmon populations in California, Oregon, Washington, and Idaho in response to a petition to list several populations of Chinook salmon in Washington under the ESA (Myers *et al.* 1998). Shortly thereafter, NMFS received a petition to list West Coast Chinook salmon throughout its entire range (63 FR 11482). NMFS' status review identified the Southern Oregon and California Coastal Chinook salmon ESU, which included all naturally spawned coastal spring- and fall-run Chinook salmon from Cape Blanco, Oregon, south to Point Bonita, California, and determined that this ESU was likely to become endangered in the foreseeable future (63 FR 11482). Following public input and a status review update, on September 16, 1999, NMFS published a final rule, in which NMFS indicated that it concluded that the Southern Oregon and California Coastal Chinook salmon ESU should be split into two smaller ESUs: (1) the Southern Oregon and Northern California Coastal Chinook salmon ESU, extending from Euchre Creek, Oregon, south through the Lower Klamath River, California (inclusive), which NMFS found to not warrant listing at that time; and (2) the CC Chinook salmon ESU, including all naturally spawned populations of Chinook salmon from Redwood Creek, California, south through the Russian River, California (inclusive), which NMFS listed as threatened under the ESA (64 FR 50394 ; Busby *et al.* 1999). Although several CC Chinook salmon hatchery stocks were considered part of the ESU at the time of listing, hatchery stocks were not considered to be essential for the ESU's recovery and were not included in the threatened listing in 1999 (64 FR 50394). In *Alsea Valley Alliance v. Evans*, 161 F.Supp.2d 1154 (D. Or. 2001) (Alsea Valley Alliance v. Evans 2001), the U.S. District Court in Eugene, Oregon, set

aside NMFS' 1998 ESA listing of Oregon Coast coho salmon (*O. kisutch*) because it impermissibly excluded hatchery fish within the ESU listing. The court ruled that the ESA does not allow listing a subset of a Distinct Population Segment (DPS) and that, since we had found an ESU constitutes a DPS, we had improperly excluded stocks from the listing that we had determined were part of the ESU. Following the *Alsea* decision, NMFS received numerous petitions to delist, or to redefine and list, 17 salmonid ESUs (70 FR 37160). In response, NMFS reinitiated a status review of 28 ESUs of West Coast salmon and steelhead (Good *et al.* 2005). On June 28, 2005, NMFS confirmed the listing of CC Chinook salmon as threatened under the ESA and also added seven artificially propagated populations from the following hatcheries or programs to the listing: Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs (70 FR 37160). However, these hatchery programs are no longer active.

CC Chinook Salmon Section 4(a)(1) Threats

Section 4(a)(1) of the ESA and the listing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce must determine through the regulatory process if a species is endangered or threatened based upon any one, or a combination of, the following ESA section 4(a)(1) factors:

(A) the present or threatened destruction, modification, or curtailment of its habitat or range;

(B) overutilization for commercial, recreational, scientific, or educational purposes;

(C) disease or predation;

(D) the inadequacy of existing regulatory mechanisms; and

(E) other natural or manmade factors affecting its continued existence.

Through the regulatory process, the Secretary of Commerce determined the CC Chinook salmon ESU was a threatened species based on their status and threats associated with the five section 4(a)(1) factors. The specific threats associated with the section 4(a)(1) factors at, and since, listing are summarized below.

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Factor A At Listing:

Reduced habitat complexity, riparian removal, sedimentation, altered instream flows, degradation of water quality, instream wood removal and poor estuarine habitats were Factor A threats identified for CC Chinook salmon at the time of listing. At listing both natural conditions and anthropogenic activities were identified as the source of the habitat degradation. These included: agriculture, logging, ranching, recreation, mining, habitat blockages, water diversions, artificial propagation, estuarine destructions or modification, flooding, , hydropower development, instream habitat problems, lack of data, general land use activities, poaching, predation, recreational angling, urbanization, and water management.

Additionally, the distribution of the Chinook salmon in this ESU was curtailed by dam construction. The spring-run life history form, which historically used upstream habitat that was heavily impacted by construction of dams, was believed extirpated. Several dams were cited as curtailing or blocking access to spawning and rearing habitat within this ESU including Scott Dam on the Eel River. Peters Dam on Lagunitas Creek was also cited as a migration barrier even though the watershed was not included in the ESU.

Factor A Since Listing:

A more recently recognized threat, illicit agriculture (specifically, illicit marijuana cultivation, a growing new threat within the ESU), falls within the previously recognized threat category of agriculture, generally, but is distinguished by being an illegal unregulated activity that does not benefit from the resource management oversight afforded by regulated agricultural operations. Unregulated pesticides use, habitat destruction, and illegal damming and diversion of rural streams and rivers for the purpose of irrigating illegal marijuana growing operations is likely now the paramount threat to salmonid survival and habitat function in many first and second-order streams located in remote, rural areas.

The concept of expanding the range of CC Chinook salmon was raised since listing and during the 2010 status review. Tissue samples from 17 adult Chinook salmon found in Lagunitas Creek were analyzed (Garza, unpublished data in Williams *et al.* 2011). Half of the fish were found to be closely related to Central Valley Fall Chinook and the other half related to CC Chinook. Williams *et al.* (2011) suggests these fish are most likely part of the CC Chinook salmon ESU given the ecological similarities between Lagunitas Creek and other coastal basins and recommends Lagunitas Creek and other populations between the Russian River and the Golden Gate be placed in the CC Chinook salmon ESU. NMFS has not extended the ESU boundary to include these populations at this time. During the 2016 status review it was determined that there was no new information or recommendations at this time to include these coastal basins into the ESU due to the rare incidences of their presence in Lagunitas Creek (NMFS 2016; Williams *et al.* 2016). Nonetheless, this subject should be evaluated in future status reviews and recovery plan updates.

The restoration of salmon and steelhead habitats has been a primary focus of Federal, State and local entities. The State of California Fisheries Restoration Grant Program (FRGP) alone has invested over $250 million dollars and supported approximately 3,500 salmonid restoration projects[1]. These projects include fish passage, water conservation, improving instream habitats, watershed monitoring, education and organizational support to watershed groups. Many other entities have made investments to improve the range and habitat of steelhead. Please see the CC Chinook salmon 2016 ESA 5-Year Status Review for more details on the current status of Listing Factor A (NMFS 2016).

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Factor B At Listing:

Harvest, hatchery and research were identified at listing as mortality factors for CC Chinook salmon. Harvest was identified as a potential contributor to the decline of some CC Chinook

[1] http://www.dfg.ca.gov/fish/Administration/Grants/FRGP/FundSummary.asp

populations. Harvest impacts to Chinook salmon in this ESU occurred primarily from incidental catch during the ocean fisheries of hatchery-produced Chinook salmon from outside the ESU (*i.e.* the Klamath basin and Central Valley). Limited data on the harvest of Chinook salmon in this ESU suggested that Chinook salmon from this ESU and Klamath River (*i.e.* Klamath River fall Chinook [KRFC]) shared a similar ocean distribution concentrated between central California and central Oregon. For this reason, the KRFC age-4 ocean harvest rate is used as a proxy for the ocean harvest rate on the CC Chinook salmon ESU. Concerns were expressed at listing that using these numbers was not representative and not protective of smaller weaker coastal stocks of CC Chinook salmon. Hatchery and research mortality was acknowledged at listing but there was no indication whether these were significant threats contributing to CC Chinook salmon declines.

Factor B Since Listing:

Direct mortality in Chinook salmon fisheries

All marine fishing occurring within three nautical miles off the coast of California is managed by the California Fish and Game Commission. NMFS, in coordination with the Pacific Fishery Management Council (PFMC), manages Chinook salmon fisheries in the Federal Exclusive Economic Zone (EEZ; 3 to 200 nautical miles offshore of California). State and federal fishing regulations are coordinated and harvest of Chinook salmon is permitted subject to seasonal closures, area and gear restrictions, and bag and size limits (78 FR 25865 ; CDFW 2016) .

There are still no quantitative population estimate or exploitation rate for CC Chinook salmon at this time (O'Farrell *et al.* 2015). Harvest of marked and unmarked Chinook salmon is permitted in commercial and recreational fisheries. A portion of hatchery Chinook salmon are marked (*e.g.*, Klamath River Fall-run Chinook and Central Valley Fall-run Chinook) and analyzed following capture to evaluate effectiveness of fishing regulations, however, a large portion of hatchery and wild Chinook salmon are unmarked (including CC Chinook salmon). Without analysis of tissue samples (*e.g.*, Genetic Stock Identification, otolith microchemistry, *etc*.), the origin and composition of unmarked populations are unknown. Thus, the specific level of CC Chinook

salmon caught in commercial and recreational Chinook salmon fisheries remains relatively unknown (O'Farrell *et al.* 2012; O'Farrell *et al.* 2015).

Restriction of Klamath River Fall-run Chinook (KRFC) harvest is used to control Chinook salmon fisheries to a level that allows for persistence of CC Chinook at low abundances. In addition, seasonal and area restrictions are implemented to achieve a preseason-predicted KRFC age-4 ocean harvest rate of no greater than 16 percent (81 FR 26157). The area between Humboldt South Jetty and Horse Mountain has been closed to commercial salmon fishing since the early 1990s, largely for the purpose of protecting CC Chinook populations (O'Farrell *et al.* 2012). These restrictions reduce the catch of CC Chinook salmon that share common ocean ranges with KRFC (O'Farrell *et al.* 2012).

In ocean salmon fisheries, wild CC Chinook salmon are most commonly contacted from the Oregon state border to San Francisco (Weitkamp 2010; Satterthwaite *et al.* 2014). Genetic Stock Identification of Chinook salmon from the Fort Bragg area in 2010 and 2011 indicated catch per unit effort was similar for CC Chinook salmon and KRFC in the early season and higher for CC Chinook salmon than KRFC in July and August (Satterthwaite *et al.* 2014). Although CC Chinook harvest does occur in northern California, mortality levels have likely been reduced through limits to KRFC age-4 ocean harvest rates and commercial fishing area restrictions.

NMFS and CDFW met in 2014 to discuss an abundance-based fishery management (ABM) approach and to evaluate the feasibility of collecting that level of information needed for the CC-Chinook ESU (O'Farrell *et. al* 2015). It was determined that the collection of sufficient data to enable ABM will be difficult to achieve in the CC-Chinook salmon ESU (O'Farrell *et. al* 2015). The level of data needed for ABM is greater than the level of data currently collected, and is greater than the level of data that would be generated with full implementation of the California Coastal Monitoring Plan (CMP) (O'Farrell *et. al* 2015). There are substantial technical difficulties associated with spawner surveys in the ESU and new programs would need to be developed to obtain ocean harvest data (O'Farrell *et. al* 2015). Looking toward the future, important steps

would include (1) addressing the technical challenges associated with implementation of the CMP and moving toward full implementation, (2) giving consideration to a pilot study aimed at assessing the feasibility of marking and tagging programs that would provide sufficient information for estimation of ocean harvest and enable cohort reconstruction assessments, and (3) identification of stable funding for this monitoring work (O'Farrell *et. al* 2015).

Indirect mortality from catch and release of undersized Chinook salmon

Ocean harvest of any undersized Chinook salmon is not permitted in California, however, indirect mortality may occur from the catch and release of undersized CC Chinook salmon. Estimated mortality of released Chinook salmon in ocean fisheries (*e.g.*, KRFC) ranges from approximately 12 to 42 percent depending on fish size, fishery, method, and location (Grover *et al.* 2002; PFMC 2007). Undersized Chinook salmon are routinely encountered in commercial and recreational fisheries and some degree of CC Chinook salmon mortality is inevitable. It is difficult to quantify the mortality of undersized CC Chinook salmon from catch and release methods because unmarked Chinook salmon that are caught could be either CC or KRFC Chinook salmon.

In addition to causing mortality to CC Chinook salmon, fisheries can indirectly reduce diversity of life history strategies and alter the population structure, especially in small populations. There is a minimum size limit for harvest of Chinook salmon off the California coast and older Chinook salmon can be removed from the population at a disproportionately higher rate. Over time this selective pressure can lead to a predominance of Chinook salmon spawning at a younger age, which could reduce the resiliency of a population to environmental variability. This population structure and life history effect is somewhat reduced for CC Chinook salmon because the exploitation rate is presumably lower than targeted stocks such as KRFC.

Bycatch in federal non-salmon fisheries

The PFMC manages three fisheries in Federal waters potentially affecting CC Chinook salmon and CCC and NC steelhead through fishery bycatch: Groundfish, Coastal Pelagic Species (CPS), and Highly Migratory Species (HMS). The highest level of Chinook salmon bycatch occurs in the

Groundfish fishery, however, NMFS evaluated the Groundfish Fishery Management Plan (FMP) in their 1999 Biological Opinion and determined Groundfish fishery activities and implementing regulations were not likely to jeopardize the continued existence of listed salmon and steelhead (NMFS 1999).

Chinook salmon are incidentally captured in fisheries targeting CPS but at relatively low levels (PFMC 2005). Furthermore, NMFS evaluated the CPS FMP in their 2010 Biological Opinion and determined fishery activities and implementing regulations were not likely to jeopardize any endangered or threatened species under their jurisdiction. The HMS fishery targets various species of tunas, sharks, and billfishes as well as mahi-mahi. Although all listed salmonid ESUs and DPS could occur in the area where HMS fishing occurs, there are no records indicating any instance of take of listed salmonids in any HMS fisheries (NMFS 2005).

Freshwater Fishing

The 2016-2017 California state sport fishing regulations allow retention of hatchery steelhead in streams critical for CC Chinook salmon recovery. For Chinook salmon the regulations call for a catch and release fishery in the Eel River; however, mortality or reductions to spawning success associated with catch and release are relatively unknown. Many streams where fishing is allowed do not have a hatchery and the watershed has a very low likelihood of supporting hatchery-origin steelhead. Recreational fishing on the Eel River and Russian River are particularly high and anglers are likely to intercept Chinook salmon on a regular basis. Poaching and illegal retention is likely a threat in some populations. CDFW and the California Fish and Game Commission have made an effort to lessen this threat by implementing low flow fishing closures. CDFW has closed some waters to fishing in order to protect native salmon and steelhead from low water flows in California streams and rivers that have been significantly impacted by drought. CDFW has the authority under Title 14, California Code of Regulations, Section 8.00 to close select streams to fishing during specific months (depending on the area) when it determines that stream flows are below specific minimum flows or are inadequate to provide fish passage for migrating steelhead trout and salmon (depending on the area). Although fishing is prohibited in many

areas and fines for violations are high, protection of summer steelhead populations requires special enforcement efforts (Moyle *et al.* 2008). Species identification and proper handling and release techniques, when incidental capture of CC Chinook salmon occurs, is critical to reduce likelihood of mortality and ensure CC Chinook salmon adult survival. Releasing CC Chinook salmon unharmed requires specific handling, hook removal, revival efforts and minimal air exposure time (*i.e.*, time out of the water). An outreach campaign in the Russian River 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 2).

Figure 2: Signage to inform recreational fishermen of differences between salmonid species found in the Russian River.

Scientific Collecting

Since the listing of this ESU the take of fish for scientific research and other purposes has been closely controlled by CDFW and NMFS through the issuance and conditioning of collection permits via a Biological Opinion (NMFS 2012) and NMFS' approval of the CDFW Research Program under 50 CFR 223.203 (promulgated by NMFS under ESA section 4(d), this regulation includes an exception to take prohibitions for a state research program approved by NMFS). Tracking of authorized take began in 2004. Beginning in 2009, project applications were submitted online at the NMFS online application website Authorizations and Permits for Protected Species (APPS). APPS has allowed for improved annual tracking of lethal and non-lethal take requested, approved, and reported for natural and listed hatchery-origin adults, smolts and juveniles. APPS data are analyzed annually to determine level of take for the ESU. Between 2004 and 2010, the actual reported percent mortality of CC Chinook juveniles and smolts for each year was at, or less than, 1 percent. The conclusion in the Biological Opinion (NMFS 2012) is that take associated with the CDFW Research Program is not likely to jeopardize the continued existence of CC Chinook salmon.

Artificial production, supplementation, and broodstock collection activities have also been terminated since the last review, and therefore, no fish are being collected for these purposes at present.

Please see the CC Chinook salmon 2016 ESA 5-Year Status Review (NMFS 2016; Williams *et al.* 2016) for more details on the current status of Listing Factor B.

Factor C: Disease or Predation

Factor C At Listing:

Disease, freshwater predation and marine predation were threats identified for Factor C at the time of listing. Diseases associated with diminished water quantity and quality, introduced non-native fish, and hatchery programs, such as bacterial kidney disease (BKD), were considered a threat. Freshwater predation was considered a threat mostly in circumstances with introduced

non-natives, low populations, and habitat conditions concentrating Chinook salmon in small areas or where avoidance habitats such as deep pools, undercut banks, or quality estuarine areas were compromised or lost. Predators such as smallmouth bass, striped bass, channel catfish and the Sacramento pikeminnow were identified as a significant threat to Chinook salmon at the time of listing. Marine mammal predation was believed to be a minor factor for Chinook salmon decline. Nonetheless, it was acknowledged that the combination of increased predator populations and large-scale modifications to salmon habitat could favor predators and shift the predator-prey balance.

Factor C Since Listing:

Disease, freshwater predation and marine predation continue as threats for some populations. 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 CDFW prohibiting interbasin transfers. BKD treatment protocols at hatcheries have significantly reduced the threat of disease. Habitat conditions, such as low water flows and high temperatures, continue to exacerbate susceptibility to both disease and predation through increased physiological stress and physical injury. Salmonids appear to be a minor component of the diet of marine mammals (NMFS 1998). Predation by marine mammals coincidental with salmonid migrations may, in some cases, kill a significant fraction of a run and local depletion might occur (NMFS 1997; Quinn 2005).

Please see the CC Chinook salmon 2016 ESA 5-Year Status Review for a more details on the current status of Listing Factor C (NMFS 2016).

Factor D: Inadequacy of Existing Regulatory Mechanisms

Factor D At Listing:

At the time of listing, a variety of state and Federal regulatory mechanisms were in place to protect CC Chinook and their habitats. However, due to funding and implementation uncertainties and the voluntary nature of many programs, those regulatory mechanisms did not

provide sufficient certainty that combined Federal and non-federal efforts were successfully reducing threats to CC Chinook salmon. The following entities and their associated regulatory mechanisms were discussed under Factor D at the time of listing:

- California Department of Transportation (Caltrans)
- California Fish and Game Commission
    - Rearing programs
    - Steelhead policy
    - Water development and wetlands resources policy
- California Forest Practice Rules
- California Regional Water Quality Control Board
- California Department of Fish and Wildlife
    - Hatchery and Harvest Management
    - State Fishing Regulations
    - California Fish and Game Code Sections 1602/1603, 2786, 6900-6930
    - Keene-Nielsen Fisheries Restoration Act of 1985
    - Bosco-Keene Renewable Resources Investment Fund
    - Salmon and Steelhead Stock Management Policy
    - Steelhead Trout Catch Report-Restoration Card
    - Trout and Steelhead Conservation and Management Planning Act of 1979
    - Steelhead Restoration and Management Plan
    - Fishery Restoration Grant Program (FRGP)
    - California Coastal Salmonid Monitoring Program
- California Water Code 1243
- County Planning Efforts
- EPA/Water Quality
    - Water Quality Programs and TMDLs
    - Coastal Waters Program
    - Comprehensive Conservation and Management Plan for the San Francisco Bay-Delta Estuary

    - Wetland Protection Grants
- Five Counties MOU
- Gravel Mining Plans
- Green Diamond HCP
- NMFS
    - ESA section 7
    - Section 10 and HCPs, including Alameda Creek HCP, Green Diamond HCP, and Pacific Lumber Company (PALCO) HCP
    - Pacific Coastal Salmon Recovery Fund
    - California Coastal Salmonid Monitoring Program
- Northcoast Regional Water Quality Control Board
- Pacific Fisheries Management Council
- Pacific Coast Ocean Salmon Fishery Management Plan and Magnuson-Stevens Act
- RCDs, Watershed Organizations and Private Companies
- US Army Corp of Engineers
    - Dredge, Fill and Inwater Construction Programs
    - Section 404 of the Clean Water Act
- USDA Forest Service: Northwest Forest Plan and PACFISH

Factor D Since Listing:

Since listing, a number of factors outlined in the Federal Register listing CC Chinook salmon persist, have improved or have been identified as not relevant. The primary regulatory mechanisms that protect CC Chinook salmon are not comprehensive and are vastly different across the landscape and land use type. For example: timber operations abide by California's Forest Practice Rules while other land uses have little to no oversight or salmonid protections rely on State regulations or county ordinances when those mechanisms are triggered.

Federal and State Land Management

Timber harvest and associated road building was noted as a limiting factor during listing. Federally, the Northwest Forest Plan (NFP) has generally accomplished the goal of slowing aquatic degradation that had been accelerating under previous forest management programs (Reeves *et al.* 2006). Recent changes to the California Forest Practice Rules have improved riparian habitat protection on private timber lands, which make up the vast majority of timberland in the CC Chinook salmon ESU. Aside from updates to the California Forest Practice Rules, few changes to state land management programs have occurred since the last status review in 2011. Sonoma County adopted their Vineyard Erosion and Sediment Control Ordinance (VESCO) in 2012 that aims to reduce sediment discharge into stream resulting from vineyard and orchard development. While VESCO may minimize potential erosion from these activities (both NMFS and CDFW formally questioned various ordinance underpinnings), the ordinance nevertheless fails to analyze the impact a vineyard's future water use may have on adjacent streams. Mendocino County has no ordinance or effective regulation concerning agricultural grading.

Regulating and managing marijuana cultivation, while not specifically a land management issue, is nevertheless critically important in the effort to minimize environmental damage resulting from illegal marijuana grows. Medical Marijuana Regulation and Safety Act, which was signed into law in October 2015, has strong potential in minimizing marijuana cultivation impacts to the environment. This new law established a state-controlled regulatory and enforcement program that will control the permitting, regulation, and taxing of the medical marijuana industry.
While political efforts may dramatically change the marijuana cultivation landscape in California, the efficacy of any regulatory scheme to minimize grow-related environmental impacts would depend on specific details unknown at this time. Having environmental advocates (*i.e.*, resource agencies or environmental NGOs) included as part of any legislative deliberations on the subject is critical toward crafting strong legalization laws that adequately and effectively minimize grow-related impacts.

The North Coast Regional Water Quality Control Board (NCRWQCB) currently has implemented a waste discharge waiver for state-legal medicinal marijuana cultivation[2]. The waiver program attempts to regulate and manage waste discharge into surface water bodies in a manner similar to other agricultural industries in the state, such as vineyards and grazing, with a tiered approach that places prospective operations into one of four different levels based largely on the areal size of the operation. All growers regulated under the waiver program will be required to implement specific Best Management Practices identified by the NCRWQCB, with program compliance verified either through self-reporting (for the smaller farms) to inspection by state agency personnel for larger operations. While the marijuana cultivation waste discharge waiver shows promise toward minimizing water quality-related impacts resulting from marijuana cultivation, the realized benefit may be smaller than anticipated due to the suspected large number of illegal grows (*i.e.*, not for medicinal uses, but for black market sales) and the low likelihood that criminal operators will voluntarily register with a state agency.

Federal and State Water Management

Groundwater regulation and management should improve in the coming decades following the 2014 passage of the Groundwater Sustainability Management Act; however, surface water throughout the state is heavily over-allocated (Grantham and Viers 2014), and little change to the regulatory status quo concerning surface water rights and permitting is expected in the near future. As the state adapts to future climate variability combined with a period of accelerated population growth, the demands placed upon streams and rivers for surface water supplies will likely grow. Many large rivers and stream in the CC Chinook salmon ESU are listed by the Environmental Protection Agency and State Water Quality Control Board as impaired for temperature and sediment pollution (per Section 303(d) of the Clean Water Act[3]). Many of the waterbodies listed will have Total Maximum Daily Loads identified, and an action plan for

[2] http://www.waterboards.ca.gov/northcoast/water_issues/programs/cannabis/

[3] Information on the 303(d) list can be found at:
http://www.swrcb.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

achieving that load, by 2019, which when implemented will improve salmonid habitat in affected streams.

Dredge, fill and instream construction programs

The U.S. Army Corps of Engineers, through their authority under the Clean Water Act, regulate dredge and fill within the ordinary high water mark of streams, rivers, wetlands, and other waterbodies. Anyone proposing to conduct a project that requires a federal permit or involves dredge or fill activities that may result in a discharge to U.S. surface waters and/or "Waters of the State" is required to obtain a Clean Water Act Section 401 Water Quality Certification and/or Waste Discharge Requirements (Dredge/Fill Projects) from the Regional Water Quality Control Board, verifying that the project activities will comply with state water quality standards. These Water Quality Certifications establish enforceable conditions necessary for compliance with California State water quality standards. In addition, the RWQCBs issue permits for dredge and fill activities outside of the U.S. Army Corps of Engineers' jurisdiction. These permits include the Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction (Order No. 2004-0004-DWQ), and in the North Coast Region the Categorical Waiver for Minor Dredging and Fill Operations, adopted through Resolution No. R1-2012-0099. CDFW performs a similar role through their Streambed Alteration Agreement program (Fish and Game Code section 1602).

Please see the CC Chinook salmon 2016 ESA 5-Year Status Review for a more details on the current status of Listing Factor D (NMFS 2016).

Factor E: Other Natural and Man-made Factors Affecting the Species' Continued Existence

Factor E At Listing:

Man-made factors of artificial propagation and introduction of non-native Chinook and the natural factors of ocean conditions, El Nino events, terrestrial conditions, floods, droughts and fire were identified at the time of listing as contributing to the threatened status of CC Chinook

salmon. The threats associated with the man-made factor of propagation included competition, genetic introgression, disease transmission, non-native introductions and the taking of wild fish for broodstock purposes negatively impacting already small populations.

In conjunction with the status review for the CC Chinook salmon ESU (Good *et al.* 2005), NMFS reviewed available information on hatchery stocks and programs within the range of the ESU. This review and analysis concluded that seven artificially propagated hatchery stocks (Freshwater Creek, Yager Creek/Van Duzen, Redwood Creek, Hollow Tree Creek, Van Arsdale Fish Station, Mattole River, and Mad River) were closely related to naturally spawning populations in the ESU (SSHAG 2003) based on genetic information, the source of the broodstock, and the hatchery management practices. Based on this review and evaluation, these seven hatchery stocks were ultimately included in the listed ESU in 2005 (70 FR 37160).

Marine conditions were identified as the dominant natural factor influencing Chinook salmon population abundance, distribution, migration and survival. Near-shore conditions during the spring and summer months were believed to dramatically affect year-class strength. Freshwater systems were characterized as having lost the natural processes and functions that provide resiliency to systems and the species to withstand natural variations. Furthermore, poor conditions combined with droughts and floods were thought as events causing straying and exacerbating predation, stress and disease. At listing it was hypothesized that changes in upland habitats altering flow and delivery of surface water to streams often caused earlier and higher peak flows, decreased spawning success for Chinook salmon adults and increased the mortality of emerging juveniles. Fire was identified as a threat due to the alteration of habitats.

Factor E Since Listing:

All seven artificial propagation programs that were included in the listed ESU have been terminated. The natural factors of ocean conditions, El Nino events, terrestrial conditions, floods, droughts and fire remain as threats contributing to the threatened status of CC Chinook salmon. Many populations of CC Chinook salmon have declined in abundance to levels that are well

below low-risk extinction risk abundance targets, and several are, if not extirpated, likely below the high-risk depensation thresholds specified by Spence *et al.* (2008). These populations are at risk from natural stochastic processes, in addition to deterministic threats, that may make recovery of Chinook more difficult. As natural populations get smaller, stochastic processes may cause alterations in genetics, breeding structure, and population dynamics that may interfere with the success of recovery efforts and need to be considered when evaluating how populations respond to recovery actions.

Please see the CC Chinook salmon 2016 ESA 5-Year Status Review for a more details on the current status of Listing Factor E (NMFS 2016).

Protective/Conservation Efforts for CC Chinook Salmon

Protective and conservation efforts have been underway for CC Chinook salmon and these efforts have reduced some of the threats and poor conditions for the species. However, these efforts need to increase in spatially and in intensity to have a measurable positive effect on the species. Please see the CC Chinook salmon 2011 and 2016 ESA 5-Year Status Reviews for a more details on protective efforts (NMFS 2011, NMFS 2016).

ESU RECOVERY GOALS, OBJECTIVES AND CRITERIA

Recovery goals, objectives and criteria provide a means by which the public can measure progress in the efforts at recovery and are used to link listing with status reviews and reclassification determinations. We developed eight categories of recovery criteria for the CC Chinook salmon ESU: biological viability, criteria for each of the five listing factors, degree recovery actions have been implemented, and certainty conservation efforts are ameliorating threats.

The goal for this plan is to remove the CC Chinook salmon ESU from the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11; 50 CFR 223.102) due to their recovery. Our vision is to have restored freshwater and estuarine habitats that are supporting self-sustaining,

well-distributed and naturally spawning salmonid populations that provide ecological, cultural, social and economic benefits to the people of California.

Recovery plan objectives are to:

1. Reduce the present or threatened destruction, modification, or curtailment of habitat or range;
2. Ameliorate utilization for commercial, recreational, scientific, or educational purposes;
3. Abate disease and predation;
4. Establish the adequacy of existing regulatory mechanisms for protecting CC Chinook salmon now and into the future (*i.e.*, post-delisting);
5. Address other natural or manmade factors affecting the continued existence of CC Chinook salmon; and
6. Ensure the status of CC Chinook salmon is at a low risk of extinction based on abundance, growth rate, spatial structure and diversity.

Biological Recovery Criteria

Populations selected for recovery scenarios must achieve the following criteria based on their role in recovery. Populations selected for recovery scenarios in all the diversity strata of the DPS or ESU must meet these criteria in order for the DPS or ESU to meet biological recovery criteria. See Volume 1, Chapter 4 and 5 for more information.

Low Extinction Risk Criteria: For the essential independent populations selected to be viable, the low extinction risk criteria for effective population size, population decline, catastrophic decline, hatchery influence and density-based spawner abundances must be met according to Spence *et al*. (2008) (Table 1) (See Vol. I Chapter 3)

AND

Moderate Extinction Risk Criteria: Spawner density abundance targets have been achieved for Supporting Independent populations

AND

Redundancy and Occupancy Criteria: Spawner density and abundance targets for dependent populations, which are the occupancy goals for each of those populations, have been achieved (See the discussion of Spence *et al*. (2008) in Vol. I, Chapter 3)

The selected populations and associated recovery criteria for the CC Chinook salmon ESU (Also see Table 2. Selected populations in all four Diversity Strata achieving biological recovery criteria;

a. **CC-BR1** 13 Independent Essential populations attaining low extinction risk criteria (*i.e.*, Bear River, Big River, Garcia River, Humboldt Bay tributaries, Lower Eel River (Van Duzen and Larabee), Lower Eel River (South Fork and Lower Eel), Little River, Mad River, Mattole River, Noyo River, Redwood Creek (Humboldt Co.), Russian River, and Upper Eel River);
b. **CC-BR2:** Three Supporting Independent populations attaining moderate extinction risk criteria (*i.e.*, Gualala River, Navarro River and Ten Mile River);
c. **CC-BR3**: One Supporting Dependent population contributing to redundancy and occupancy (*i.e.,* Albion River).

Table 1: Criteria for assessing the level of risk of extinction for CC Chinook salmon populations. Overall risk is determined by the highest risk score for any category. N_a is total abundance of adult spawners in a year. N_e is effective population size per generation. N_g is total number of spawners for the generation.

Population Characteristic	Extinction Risk		
	High	**Moderate**	**Low**
Extinction risk from population viability analysis (PVA)	≥ 20% within 20 yrs	≥ 5% within 100 yrs but < 20% within 20 yrs	< 5% within 100 yrs
	- or any ONE of the following -	- or any ONE of the following -	- or ALL of the following -
Effective population size per generation *-or-* Total population size per generation	$N_e \leq 50$ *-or-* $N_g \leq 250$	$50 < N_e < 500$ *-or-* $250 < N_g < 2500$	$N_e \geq 500$ *-or-* $N_g \geq 2500$
Population decline	Precipitous decline[a]	Chronic decline or depression[b]	No decline apparent or probable
Catastrophic decline	Order of magnitude decline within one generation	Smaller but significant decline[c]	Not apparent
Spawner density	$N_a/IPkm$[d] ≤ 1	$1 < N_a/IPkm <$ MRD[e]	$N_a/IPkm \geq$ MRD[e]
Hatchery influence[f]	Evidence of adverse genetic, demographic, or ecological effects of hatcheries on wild population		No evidence of adverse genetic, demographic, or ecological effects of hatchery fish on wild population

[a] Population has declined within the last two generations or is projected to decline within the next two generations (if current trends continue) to annual run size $N_a \leq 500$ spawners (historically small but stable populations not included) *or* $N_a > 500$ but declining at a rate of ≥10% per year over the last two-to-four generations.

[b] Annual run size N_a has declined to ≤ 500 spawners, but is now stable *or* run size $N_a > 500$ but continued downward trend is evident.

[c] Annual run size decline in one generation < 90% but biologically significant (e.g., loss of year class).

[d] *IPkm* = the estimated aggregate intrinsic habitat potential for a population inhabiting a particular watershed (i.e., total accessible km weighted by reach-level estimates of intrinsic potential; see Bjorkstedt et al. [2005] for greater elaboration).

[e] MRD = minimum required spawner density and is dependent on species and the amount of potential habitat available. Figure 5 summarizes the relationship between spawner density and risk for each species.

[f] Risk from hatchery interactions depends on multiple factors related to the level of hatchery influence, the origin of hatchery fish, and the specific hatchery practices employed.

Table 2: CC Chinook Salmon ESU Diversity Strata, Populations, Historical Status, Population's Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting. The Diversity Stratum recovery targets are only comprised of the essential populations because these are the populations that are expected to be viable. *The Lower Eel River Chinook population is divided between two diversity strata, and as a result has one recovery target for the North Mountain Interior DS (Van Duzen and Larabee) and one for the North Coastal DS (Lower and South Fork Eel River).

Diversity Strata	CC Chinook salmon Populations	Historical Population Status	Population's Role In Recovery	Current Weighted IP-km	Spawner Density	Spawner Abundance
North Coastal	Bear River	I	Essential	39.4	37.8	1,500
	Humboldt Bay Tributaries	I	Essential	76.6	33.7	2,600
	Little River (Humboldt County)	I	Essential	17.4	40.0	700
	Lower Eel River ~ *Lower Mainstem/ South Fork Eel River**	I	Essential	368.4	20	7,400
	Mad River	I	Essential	94.4	31.7	3,000
	Mattole River	I	Essential	177.5	22.5	4,000
	Redwood Creek (Humboldt Co)	I	Essential	116.1	29.3	3,400
	North Coastal Diversity Stratum Recovery Target					**22,600**
North Mountain Interior	Lower Eel River ~ *Larabee Creek/ Van Duzen River**	I	Essential	144.0	20.0	2,900
	Upper Eel River	I	Essential	528.5	20.0	10,600
	North Mountain Interior Diversity Stratum Recovery Target					**13,500**
North-Central Coastal	Albion River	D	Supporting	17.6	6-12	104-209
	Big River	I	Essential	104.3	30.6	3,200
	Noyo River	I	Essential	62.2	35.3	2,200
	Ten Mile River	I	Supporting	67.2	6-12	401-804

North-Central Coastal Diversity Stratum Recovery Target						**5,400**
Central Coastal	Garcia River	I	Essential	56.2	36.0	2,000
	Gualala River	I	Supporting	175.6	6-12	1,052-2,105
	Navarro River	I	Supporting	131.5	6-12	787-1,576
	Russian River	I	Essential	465.2	20.0	9,300
Central Coastal Diversity Stratum Recovery Target						**11,300**
CC Chinook ESU Recovery Target						**52,800**

ESA § 4(a)(1) Factors Recovery Criteria

The following are the recovery criteria for the section ESA 4(a)(1) listing factors. The primary metrics for assessing whether each of the listing factor criteria have been achieved will be to utilize the CAP analyses to reassess habitat attribute and threat conditions in the future, and track the implementation of identified recovery actions unless otherwise found unnecessary.

All recovery actions were assigned to a specific section 4(a)(1) listing factor in order to track progress of implementation of actions for each factor. Recovery Action Priorities are assigned to each action step in the implementation table in accordance with NMFS' Interim Recovery Planning Guidance (NMFS 2010) and the NMFS Endangered and Threatened Species Listing and Recovery Priority Guidelines (55 FR 24296) (See Chapter 4 for more information).

Factor A: Present or threatened destruction, modification or curtailment of habitat or range

A1 CAP/Rapid Assessment attribute ratings for:

- **a. Essential Populations** found Good or better for all attributes in each Stratum.
- **b. Supporting Populations** found Good or better for 50 percent[4] and the remaining rated Fair throughout the DPS/ESU.

[4] The role of supporting populations within the recovery scenario is to provide for redundancy and occupancy across Diversity Stratum. Because of their role, we use lower criteria for Factor A (*i.e.*, 50 percent as Good or better and the remaining as Fair). A "Fair" CAP/rapid assessment rating means that habitat conditions, while impaired to some degree, are functioning. Therefore, at least all habitat conditions are

A2 All recovery actions have been implemented under Listing Factor A, or the actions are deemed no longer necessary for recovery.

Listing Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

B1 CAP/Rapid Assessment threat ratings for Fishing and Collecting:

a. Essential and Supporting Populations found Medium or Low.

B2 All recovery actions have been implemented under Listing Factor B, or the actions are deemed no longer necessary for recovery.

Listing Factor C: Disease, Predation and Competition

C1 CAP/Rapid Assessment threat ratings for Disease, Predation and Competition:

a. Essential and Supporting Populations found Medium or Low.

C2 All recovery actions have been implemented under Listing Factor C, or the actions are deemed no longer necessary for recovery.

Listing Factor D: The Inadequacy of Existing Regulatory Mechanisms

D1 CAP/Rapid Assessment threat ratings related to Listing Factor D (see list below):

a. Essential and Supporting Populations found Medium or Low.

Listing Factor D Threats

- Agriculture
- Channel Modification
- Fire, Fuel Management and Fire Suppression
- Livestock Farming and Ranching
- Logging and Wood Harvesting
- Mining
- Residential and Commercial Development

expected to function within these populations, and at least half are expected to be in proper condition (*i.e.*, Good), which NMFS expects will be sufficient for these populations to fulfill their role within the recovery scenario.

- Roads and Railroads
- Water Diversions and Impoundments

D2 All recovery actions have been implemented under Listing Factor D, or the actions are deemed no longer necessary for recovery.

Listing Factor E: Other Natural and Manmade Factors Affecting the Species' Continued Decline

E1 CAP/Rapid Assessment threat ratings for Hatcheries and Aquaculture, Recreational Areas and Activities, and Severe Weather Patterns:

a. Essential and Supporting Populations found Medium or Low.

E2 All recovery actions have been implemented under Listing Factor E, or the actions are deemed no longer necessary for recovery.

Conservation Efforts

CE1 Formalized conservation efforts applicable to the ESU or DPS have been implemented and are effective in ameliorating any remaining threats associated with the five section 4(a)(1) factors.

PRIORITIZATION POPULATIONS FOR RESTORATION AND FOCUS

While immediately working to restore and recover all populations simultaneously would be preferable, the cost to implement such an effort is prohibitive. Instead, initially focusing efforts in fewer watersheds provides the best chance for species recovery. Decisions to focus efforts and funding to specific areas do not imply other areas are less important or not needed for recovery. Rather, decisions to prioritize populations are necessary to ensure efforts are optimizing benefits to fisheries and ecosystem processes across each of the ESU/DPSs. This prioritization protocol was used to identify essential populations, based on a consistent protocol, that are closest to achieving recovery and that are important to the recovery of the overall Diversity Strata.

NOAA Fisheries evaluated all the essential (i.e. must meet low viability criteria) CCC and NC steelhead and CC Chinook salmon populations within the recovery plans using a prioritization framework based on Bradbury et al. (1995). Oregon State Senate President, Bill Bradbury, asked

the Pacific Rivers Council for help in assembling a diverse group to create a prioritization process for effective and scientifically-sound watershed protection and restoration. The framework developed provides a common basis from which diverse groups can develop mutually agreed-upon restoration priorities reflecting a strong scientific basis (Bradbury et al. 1995).

The prioritization framework uses three criteria groupings for ranking populations:

1. biological and ecological resources (Biological Importance);
2. watershed integrity and risk (Integrity and Risk); and
3. potential for restoration (Optimism and Potential).

The following tables are the prioritization results for each species. Please see Appendix H for a more detailed discussion of methods and for the scores and supporting information for each population.

Table 3: CC Chinook Restoration and Focus Prioritization Results

Diversity Strata	California Coastal Chinook Salmon Populations	Biological & Ecological			Integrity & Risk			Optimism & Potential			Total	Priority #
		CAP Biological Viability (Weighted)	Number of Listed Species	High IP-km	CAP Watershed Characterization	CAP Threats	Public Lands	CCC Coho Focus Population	SONCC Core 1 Population	Monitoring (LCM) Priority		
North Coastal	Redwood Creek	4	3	3	3	1	3	0	1	1	19	A
	Little River	2	3	1	1	1	1	0	0	0	9	B
	Mad River	6	3	2	2	1	3	0	0	0	17	A
	Humboldt Bay Tributaries	4	3	2	1	1	2	0	1	1	15	B
	South Fork/ Lower Mainstem Eel River	4	3	3	2	1	2	0	1	1	17	A
	Bear River	6	3	1	1	1	1	0	0	0	13	B
	Mattole River	6	3	3	3	3	3	0	0	0	21	A
North Mountain Interior	Van Duzen River	4	3	2	1	1	2	0	1	1	15	B
	Larabee Creek	4	3	1	1	3	1	0	1	0	14	B
	Upper Eel River	2	3	3	3	3	3	0	0	0	17	A
North-Central Coastal	Ten Mile River											C
	Noyo River	2	3	1	1	3	2	1	0	1	14	B
	Big River	2	3	2	3	3	3	1	0	0	17	A
	Albion River											C
Central Coastal	Navarro River											C
	Garcia River	2	3	1	3	1	1	1	0	1	13	B
	Gualala River											C
	Russian River	2	3	3	2	1	1	1	0	1	14	A

ESU AND DIVERSITY STRATA RESULTS

All CAP viability and threat tables were assembled for the CC Chinook salmon ESU to evaluate patterns in the ESU across Diversity Strata and populations. Attribute and threat results are discussed first for Diversity Strata followed by results across lifestages for the ESU. A subset of CAP indicators and threat results were evaluated under a climate change scenario which is provided in Appendix B.

DIVERSITY STRATA ATTRIBUTE AND THREAT RESULTS

The delineation of the CC Chinook salmon ESU Diversity Strata was based on environmental and ecological similarities and life history differences between fall run and spring run adult populations. Four strata were identified by Bjorkstedt *et al*. (2005): North Coastal, North Mountain Interior, North-Central Coastal and Central Coastal.

Attribute Results

Across strata, the North Mountain Interior stratum had the highest percentage of viability attribute ratings reported as Poor or Fair (74%), followed by the Central Coastal (67%) and North-Central Coastal (62%), and North Coastal (61%). Although the North Coastal Stratum shared the lowest combined ratings reported as Poor or Fair, it received the highest percentage of Poor ratings (31%) overall (Figure 3).

Threat Results

The North Coastal and Central Coastal Diversity Stratum had the highest combined threat ratings of Very High and High (30%) followed by the North Mountain Interior (18%) (Figure 4). All threats in the North-Central Coastal strata were rated as either Medium (33%) or Low (37%), with an additional 30% that were deemed not applicable.

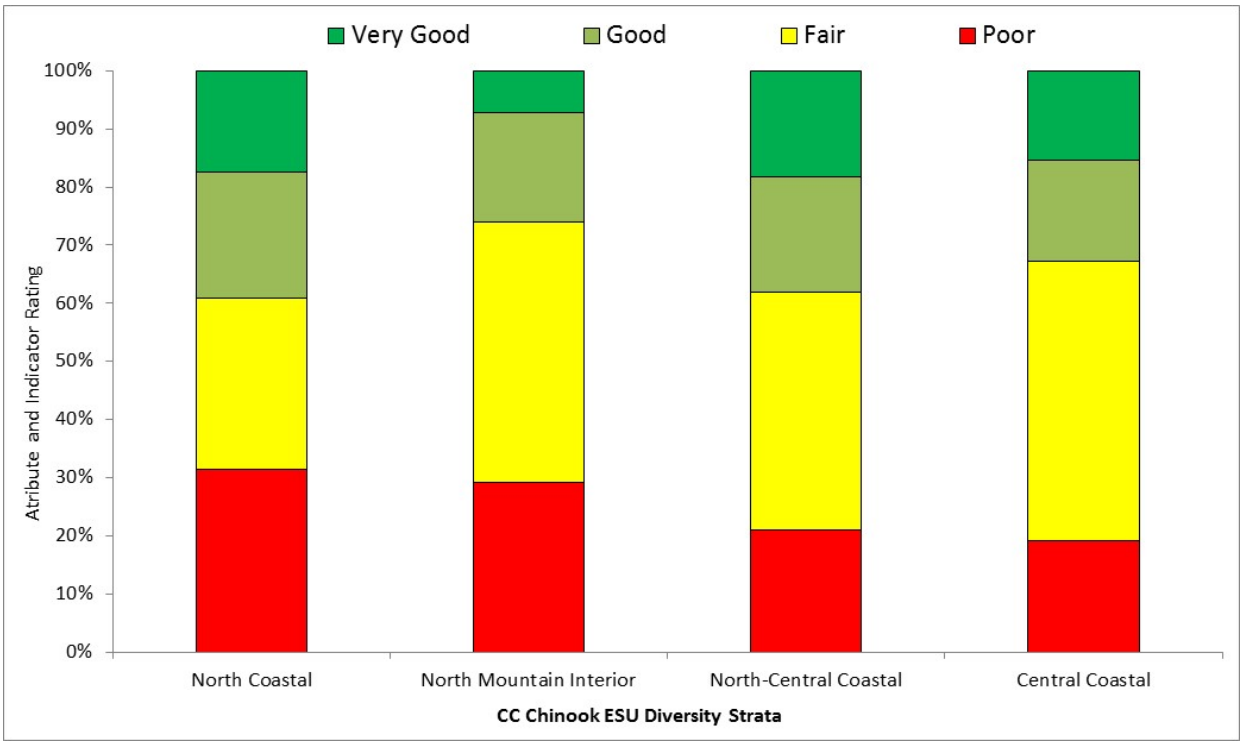

Figure 3: Attribute Indicator ratings for the CC Chinook salmon ESU by Diversity Strata.

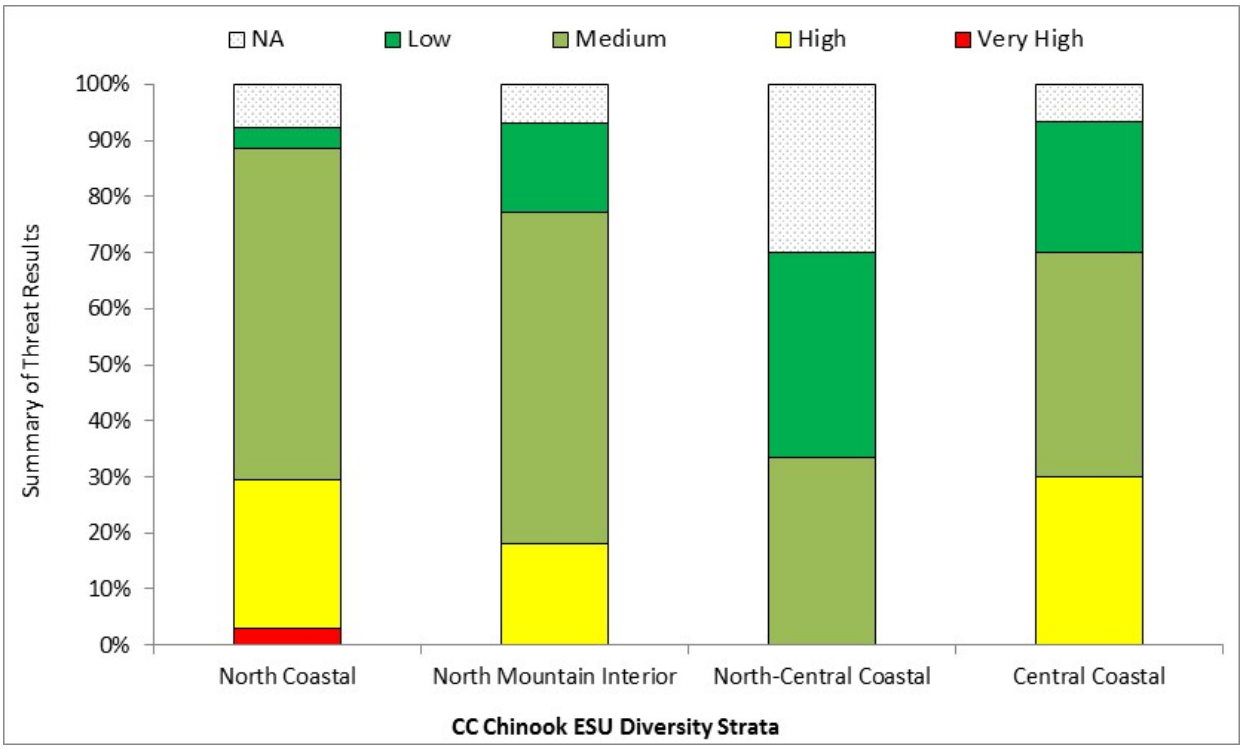

Figure 4: CC Chinook salmon Diversity Strata Threat ratings.

North Coastal Diversity Stratum Results

The North Coastal Diversity Stratum CAP populations include: Redwood Creek (Humboldt County), Little River (Humboldt County), Mad River, Humboldt Bay, South Fork Eel River, Bear River, and the Mattole River. These populations are influenced by coastal climate conditions of northern California.

Attribute Results

Across the stratum, attribute indicators of greatest concern were habitat complexity (LWD, percent staging pools, pool/riffle/flatwater ratio, and shelter), sediment transport (road density and stream side road density), estuary/lagoon (quality and extent) and water quality (turbidity) (Table 4). Attribute indicators of low concern included landscape patterns (agriculture, urbanization), passage/migration (passage at mouth or confluence, physical barriers), and water quality (toxicity).

Life Stage Results

All lifestages are impaired in the North Coastal Diversity Stratum with approximately 45% or more of attribute ratings reported as Poor or Fair for each lifestage (Figure 5). The adult lifestage is the most impaired followed closely by pre smolt with 69% and 63% indicators rated as Poor or Fair, respectively. Watershed Processes are also impaired with nearly 50% of indicators reported as Poor or Fair, of which 35% were rated Poor. Attribute indicators of greatest concern for the adult lifestage included habitat complexity (large woody debris, percent staging pools, pool/riffle/flatwater ratio), riparian vegetation (tree diameter), and water quality (turbidity) (Table 5). Eggs were most impacted by sediment (gravel quantity and quality). Estuary/lagoon, habitat complexity (shelter), velocity refuge (floodplain connectivity), and water quality (turbidity) were the indicators of most concern for the pre smolt and smolt lifestages. Streamside road density was rated Poor for all populations in the stratum and road density was rated Poor for all but one population in the stratum (Mattole River).

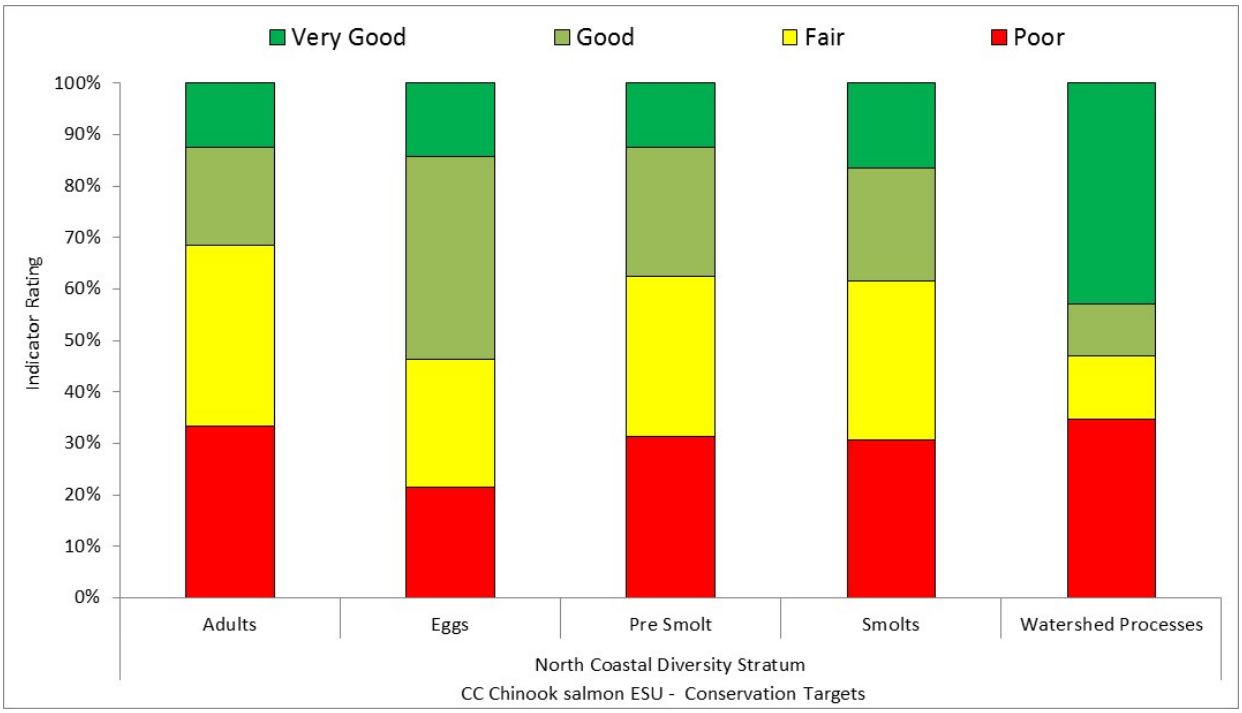

Figure 5: Attribute Indicator Ratings for the North Coastal Diversity Stratum Conservation Targets.

Threat Results

Threats of greatest concern for the North Coastal Diversity Stratum were channel modification, logging and wood harvesting, roads and railroads, and severe weather patterns (Figure 6). Threats of minimal concern included fishing and collecting, hatcheries and aquaculture, recreational areas and activities, and residential and commercial development. Across threats 4% were rated as Low, 63% were rated as Medium, 23% were rated as High, 1% were rated as Very High and an additional 8% (mostly hatcheries and aquaculture) were deemed not applicable within the stratum (Figure 6).

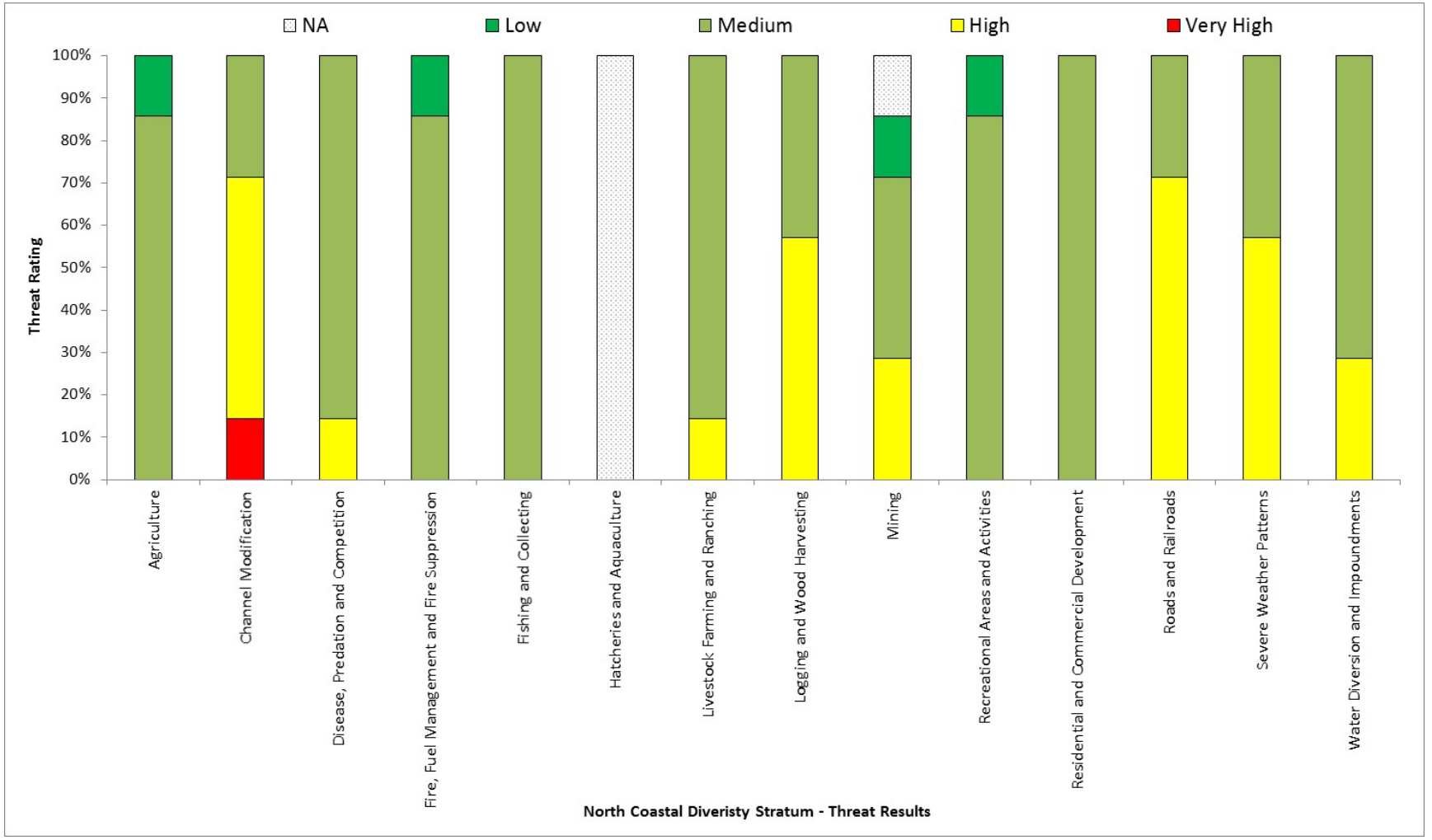

Figure 6: Threat ratings for the North Coastal Diversity Stratum.

North Mountain Interior Diversity Stratum Results

The North Mountain Interior Diversity Stratum CAP populations are the Van Duzen River, Larabee Creek, and Upper Mainstem Eel River populations. These populations are influenced by likely snowmelt events in the Eel River Watershed.

Attribute Results

Of the four Diversity Strata, the North Mountain Interior had the highest percentage (74%) of Poor or Fair indicator ratings (Figure 3). Although the Eel River estuary is not located within the stratum boundaries, all Chinook salmon populations within the Eel River watershed will rely upon the estuary during portions of their life cycle. Estuary/lagoon was rated Poor for all life stages and populations in the North Mountain Interior Diversity Stratum. Across the stratum, other attribute indicators of great concern included habitat complexity (large woody debris, percent primary pools, percent staging pools, pool/riffle/flatwater ratio, shelter), riparian vegetation (tree diameter), sediment (gravel quality), and sediment transport (road density, streamside road density) (Table 4). Attribute indicators of low, or of less concern were hydrology (impervious surfaces), landscape patterns (agriculture, urbanization), passage/migration (physical barriers), and riparian vegetation (species composition).

Life Stage Results

All lifestages in the North Mountain Interior Diversity Stratum are impaired with more than 74% of indicator ratings for each lifestage reported as Poor or Fair (Figure 7). Pre smolt was the most impaired lifestage with 81% of indicator ratings reported as Poor or Fair. For adults, attributes of greatest concern were estuary/lagoon, habitat complexity, riparian vegetation (tree diameter), and water quality (turbidity) (Table 5). Gravel quality and, to a lesser degree, quantity were the indicators of most concern for the egg lifestage. Attribute indicators impacting the pre smolt lifestage were estuary/lagoon, habitat complexity (percent primary pools, shelter rating), flow conditions (baseflow), riparian vegetation (tree diameter), sediment (gravel embeddedness), and turbidity. Many of the same indicators identified as a concern for pre smolts were also identified

for the smolt lifestage (Table 5). Smolts were also rated Poor for smoltification water temperatures. Like the North Coastal stratum, road density and streamside road density are the primary contributors to the degraded conditions in these populations. Timber harvest was also rated Poor in two of the three populations within the stratum.

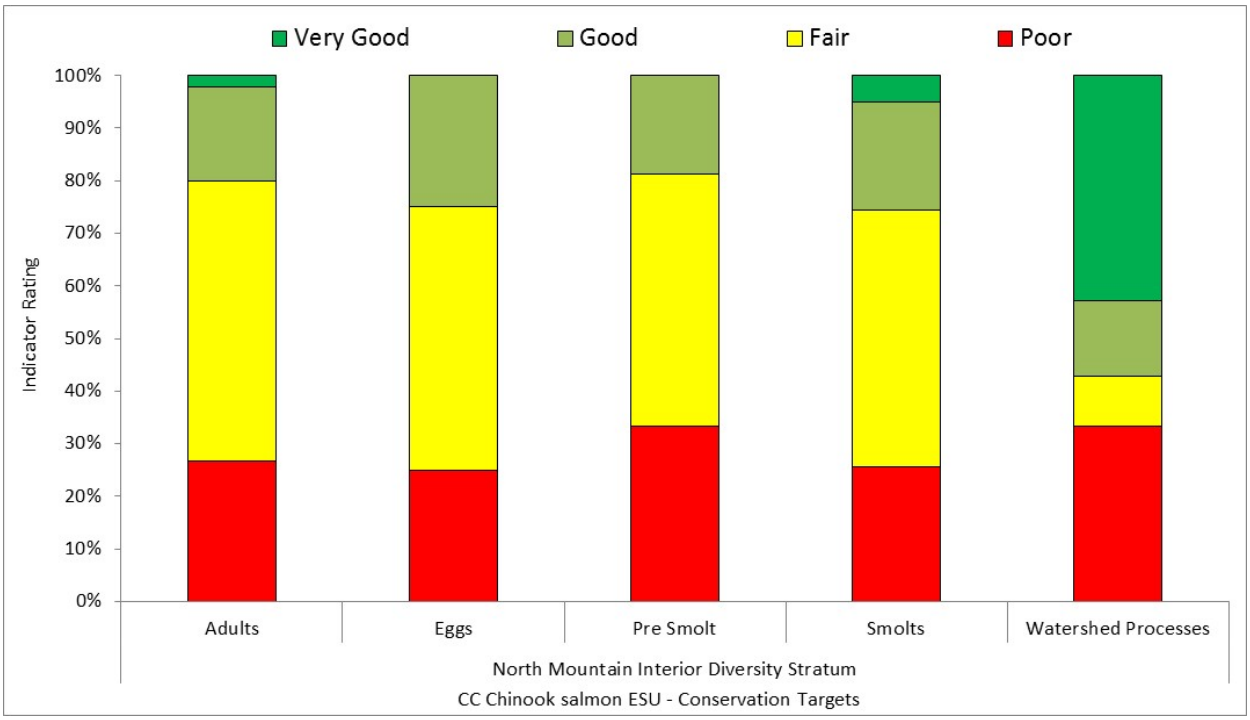

Figure 7: Attribute Indicator Ratings for the North Mountain Interior Diversity Stratum Conservation Targets.

Threat Results

Despite Poor viability ratings throughout the stratum, most threat ratings (79%) were either Low or Medium and there were no Very High ratings (Figure 8). Disease, predation, and competition (*e.g.,* introduced Sacramento pikeminnow in the Eel River) was the most significant threat followed by roads and railroads, water diversions and impoundments, and channel modification. Across all threats, 17% were rated as Low, 62% were rated as Medium, 14% were rated as High, 0% were rated as Very High, and an additional 7% (all hatcheries and aquaculture) were deemed not applicable within the stratum (Figure 8).

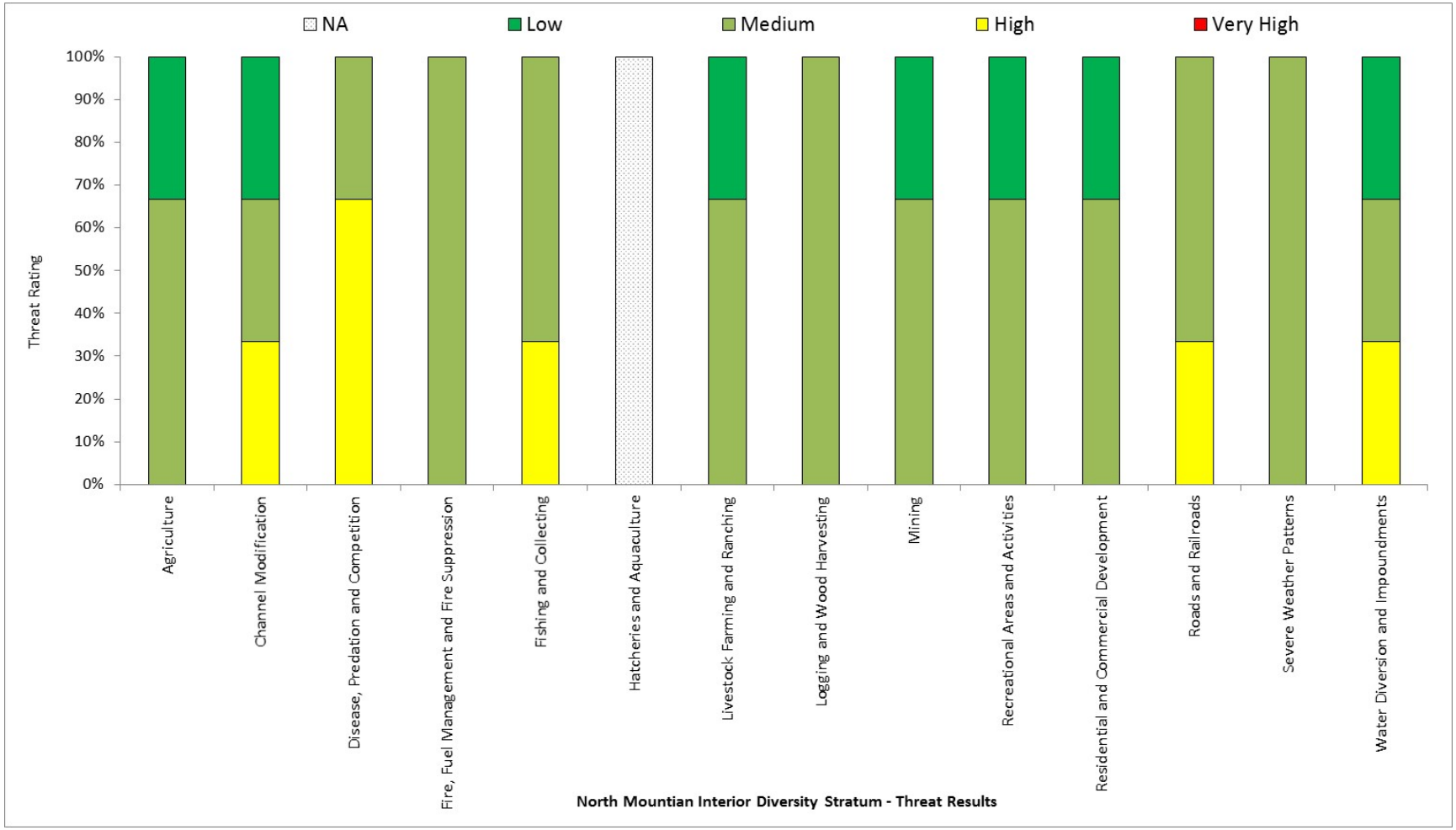

Figure 8: Threat ratings for the North Mountain Interior Diversity Stratum.

North-Central Coastal Diversity Stratum Results

The North-Central Coastal Diversity Stratum CAP populations include the Noyo River and Big River. This stratum is comprised almost entirely of a forested landscape, and timber harvest is the dominant land use. Coastal and rural developments are also present.

Attribute Results

In these two populations, attribute indicators of most concern were those related to reduced habitat complexity (large woody debris, primary and percent staging pools, pool/riffle/flatwater ratio, shelter), sediment transport (streamside road density), and species viability (abundance, density, spatial structure) (Table 4). The two estuaries were rated Fair for all lifestages. Overall, indicators for hydrology and landscape patterns were generally rated as Good or Very Good for both populations indicating that in general, habitat conditions should favor the persistence of Chinook salmon populations. This, however, conflicts with the current depressed population status and Poor viability ratings.

Life Stage Results

All lifestages in the stratum are impaired. Smolts received the most Poor or Fair ratings (76%) followed closely by eggs (75%) and adults (70%). However, adults had the highest percentage of Poor ratings alone (33%), which was nearly twice as much as any other lifestage (pre smolts, 19%) (Figure 9). Adults are most impaired by poor habitat complexity and low viability. As in all strata, eggs are most limited by impaired gravel quality and quantity while reduced habitat complexity (*e.g.,* shelter) and viability (abundance) are the indicators of most concern for the pre smolt and smolt lifestages (Table 5). Streamside road density was rated Poor in both populations.

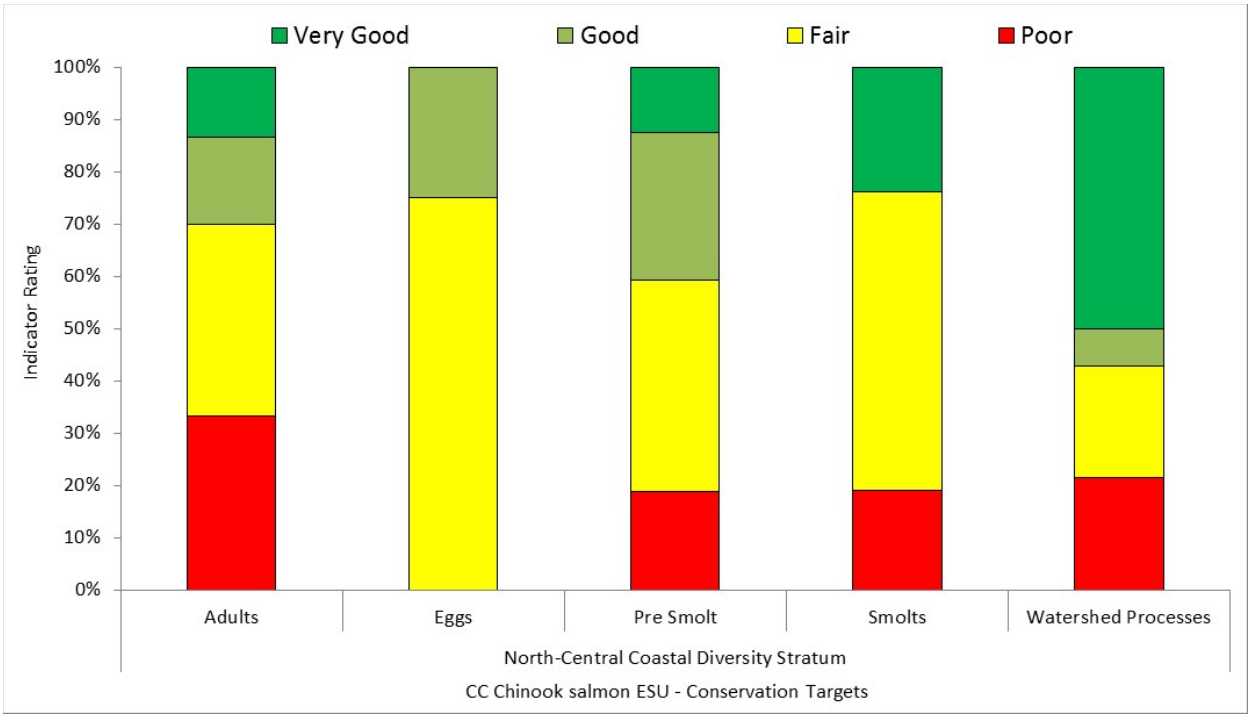

Figure 9: Attribute Indicator Ratings for the North-Central Coastal Diversity Stratum conservation targets.

Threat Results

The North-Central Coastal was the only stratum without High or Very High threats identified, though roads, severe weather, and logging were identified as medium threats in both populations (Table 6 and Figure 10). Many threats (32%) were deemed not applicable for the stratum. Across threats, 39% were rated as Low, 29% were rated as Medium, and 0% were rated as High or Very High (Figure 10).

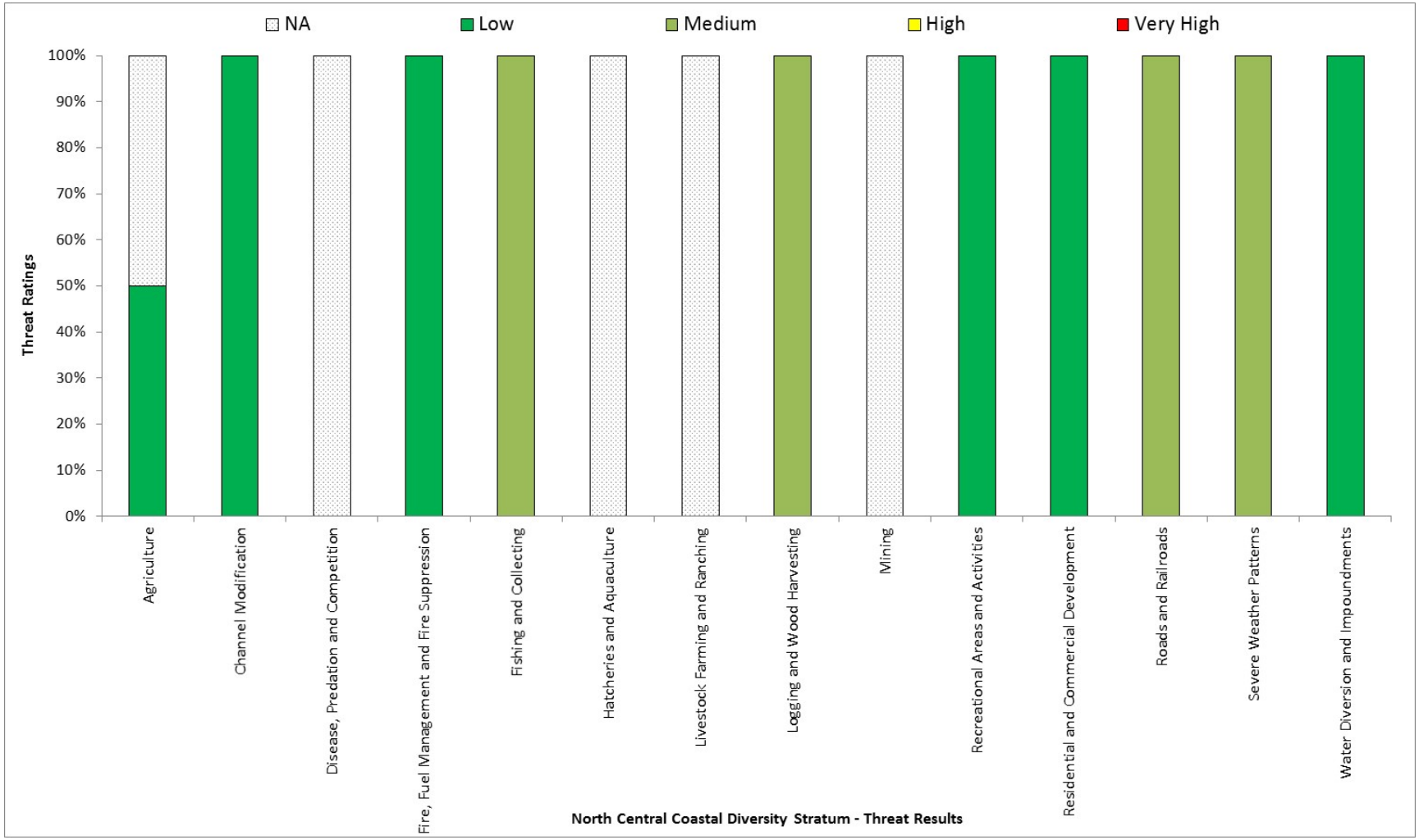

Figure 10: Threat ratings for the North-Central Coastal Diversity Stratum.

Central Coastal Diversity Stratum Results

The Central Coastal Diversity Stratum CAP populations are the Russian River (the most southern and urbanized population in the ESU) and the Garcia River. Chinook salmon have also been observed recently in the Navarro and Gualala rivers, but sightings are uncommon and they are believed to only occur sporadically in these basins.

Attribute Results

Both the Garcia River and Russian River populations were rated Poor for shelter and streamside road density and the Garcia population was rated Poor for floodplain connectivity for all life stages (Table 4). Aside from these indicators, the Garcia population had Poor ratings for viability indicators but the remainder were rated Fair or better with many rated as Good or Very Good. The Russian River population was rated Poor for many other indicators including habitat complexity (large woody debris, pool/riffle/flatwater ratio, and shelter), passage/migration (pre smolt), tree diameter (adult and pre smolt), floodplain connectivity and turbidity (pre smolt). Despite some degraded conditions within the watershed, the Russian River is the only population in the ESU that has recently exhibited a trend toward viability based on increased adult escapement.

Life Stage Results

All lifestages in the stratum are impaired with more than 66% of indicator ratings as either Poor or Fair (Figure 11). Based on the percentage of Poor and Fair indicator ratings, eggs were the most impaired lifestage with 75% of all indicator ratings reported as Fair (although none were rated Poor), followed by smolt (73%), pre smolt (72%), then adult (70%) lifestages. Attribute indicators most limiting for adults included reduced habitat complexity (Russian) and low viability (Garcia). Pre smolt and smolt lifestages were most limited by impaired habitat complexity (large wood frequency and shelter) and estuary/lagoon conditions and reduced floodplain connectivity. In the Russian River, pre smolt and smolt are also impaired by degraded

riparian conditions (tree diameter), passage and migration (passage at mouth or confluence), reduced floodplain connectivity, and elevated turbidity.

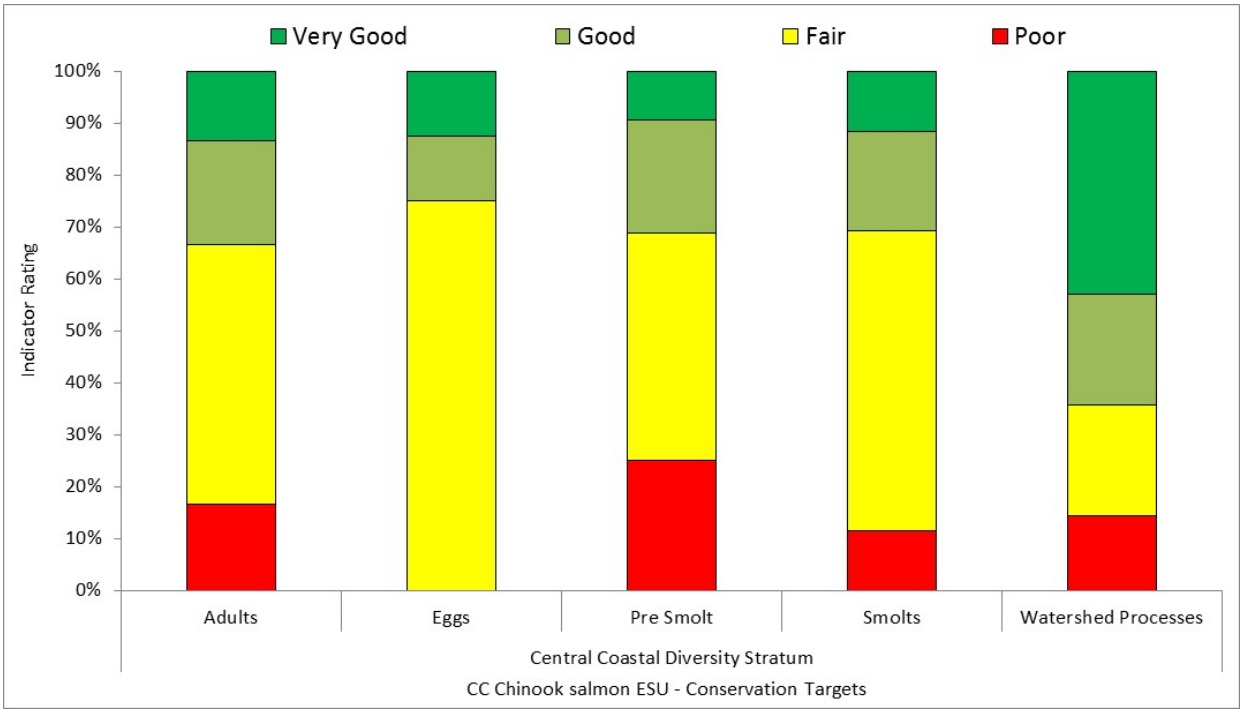

Figure 11: Attribute Indicator Ratings for the Central Coastal Diversity Stratum Conservation Targets.

Threat Results

The most significant threat identified for the Central Coastal Diversity Stratum was roads and railroads (both populations were rated as High) (Table 6 and Figure 12). Channel modification, fishing and collecting, logging and wood harvesting, residential and commercial development, and water diversions and impoundments were also identified as concerns with one of two populations rated as High and the other as medium. Fire, fuel management and fire suppression as well as recreational areas and activities were considered low threats for both populations in the stratum. Across threats, 7% were rated as not applicable (all hatcheries and aquaculture), 25% were rated as Low, 43% were rated as Medium, 25% were rated as High, and 0% were rated as Very High (Figure 10).

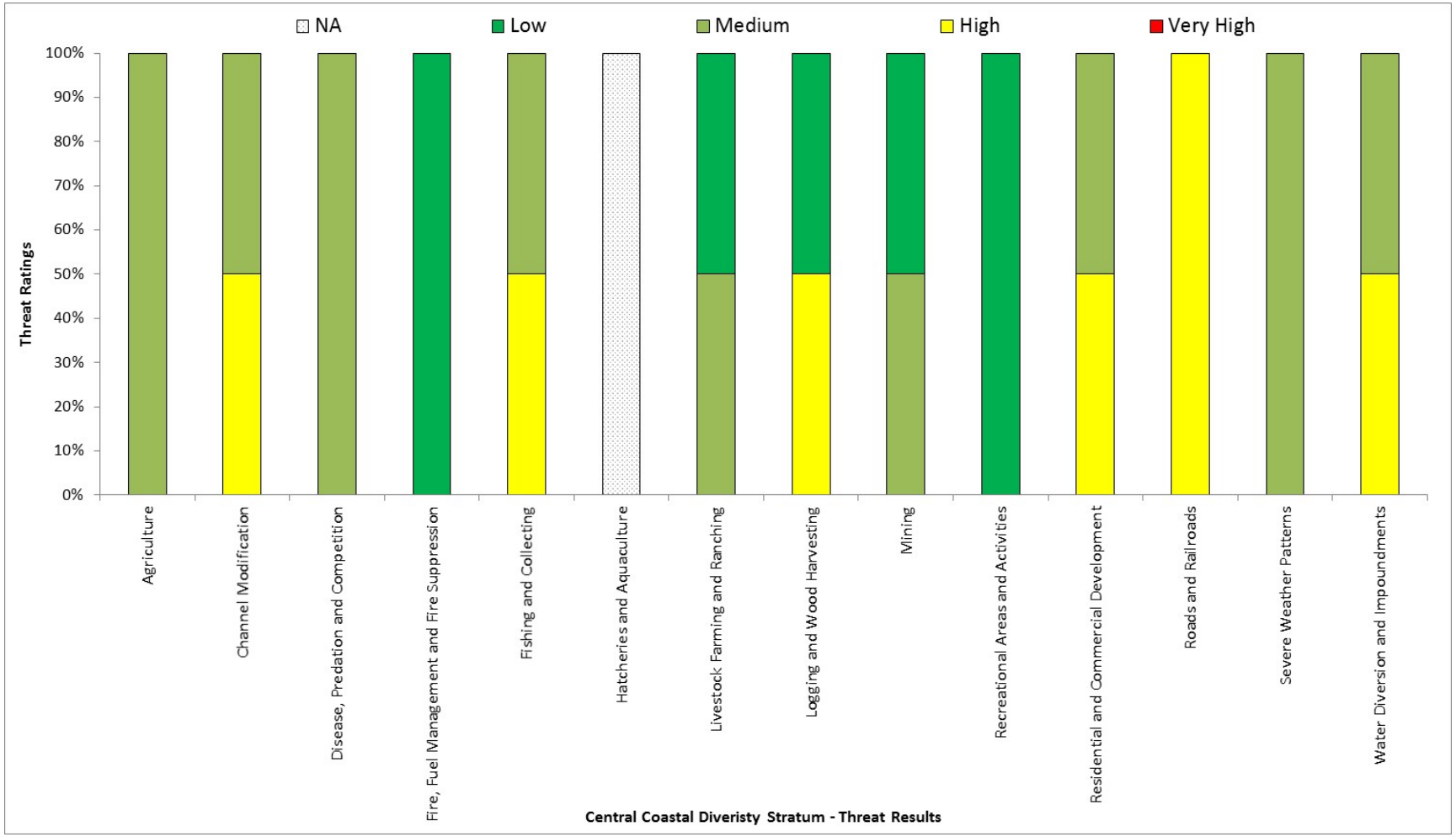

Figure 12: Threat ratings for the Central Coastal Diversity Stratum.

ESU CAP VIABILITY RESULTS

Attributes

Across the ESU and lifestages, viability attribute indicators for habitat complexity (large wood frequency, percent primary pools, pool/riffle/flatwater ratio, and shelter rating) and sediment transport (road density and stream-side road density) were rated Poor (Table 4). In addition, estuary/lagoon (quality and extent) and riparian vegetation (species composition and tree diameter) were rated Poor or Fair for nearly all populations and applicable lifestages.

Attribute indicator ratings that received a high percentage of Good or Very Good ratings throughout the ESU included passage/migration (physical barriers) and watershed processes (impervious surfaces, agriculture, and urbanization (Table 4). These ratings reflect the limited extent of urbanization and agriculture throughout the region.

Table 4: CC Chinook Salmon ESU CAP Viability Summary by Attribute.

CC Chinook Salmon Population Conditions (Sorted By Attribute)			North Coastal							North Mountain Interior			North-Central Coastal		Central Coastal	
Target	Attribute	Indicator	Redwood	Little River	Mad River	Humbold Bay	S. F. Eel River	Bear River	Mattole River	Van Duzen	Larabee Creek	Upper Eel River	Noyo River	Big River	Garcia River	Russian River
Adults	Estuary/Lagoon	Quality & Extent	P	F	G	F	P	F	F	P	P	P	F	F	F	F
Pre Smolt	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	F	P	P	P	F	F	G	F
Smolts	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	P	P	P	P	F	F	F	F
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	F	P	F	P	P	F	F	P	P	F	G	P
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	P	F	F	P	P	P	F	F	P	P	P	F	P
Pre Smolt	Habitat Complexity	Percent Primary Pools	G	F	P	V	F	G	F	P	F	P	F	P	V	F
Adults	Habitat Complexity	Percent Staging Pools	P	G	P	P	P	P	P	P	F	F	F	P	V	F
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	V	P	V	F	P	F	F	F	P	P	P	V	F
Pre Smolt	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	V	P	V	F	P	F	F	F	F	G	P	V	P
Pre Smolt	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Pre Smolt	Hydrology	Flow Conditions (Baseflow)	F	G	G	G	P	G	P	P	P	F	G	F	F	F
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	G	G	V	V	G	G	G	G	G	F	G	G	F	F
Pre Smolt	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Smolts	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Watershed Processes	Hydrology	Impervious Surfaces	V	V	V	F	V	V	V	V	V	V	V	V	V	V
Pre Smolt	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	P	F	G	V	V	G	F
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	P	F	G	V	V	G	F
Adults	Hydrology	Passage Flows	F	V	G	G	F	G	F	P	F	G	V	G	F	G
Pre Smolt	Hydrology	Passage Flows	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Smolts	Hydrology	Passage Flows	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Eggs	Hydrology	Redd Scour	P	V	G	P	F	G	F	F	F	F	F	F	F	F
Watershed Processes	Landscape Patterns	Agriculture	V	V	V	V	V	V	V	F	G	V	V	V	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	V	P	G	P	G	G	V	P	P	V	F	V	G	V
Watershed Processes	Landscape Patterns	Urbanization	V	V	V	P	V	V	V	V	V	V	V	V	V	F
Adults	Passage/Migration	Passage at Mouth or Confluence	F	G	G	G	P	V	F	P	G	F	V	G	F	F
Pre Smolt	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	F	V	G	F	P
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	G	V	G	F	F
Adults	Passage/Migration	Physical Barriers	V	V	V	G	V	V	V	G	V	F	V	V	V	V
Smolts	Passage/Migration	Physical Barriers	V	V	V	V	V	V	V	G	V	V	V	V	V	V
Watershed Processes	Riparian Vegetation	Species Composition	G	F	F	G	F	P	F	V	G	F	F	F	G	F
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	F	F	F	F	P	P	F	F	P	P	F	F	F	P
Pre Smolt	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	P	P	F	F	P	P	F	F	F	P
Eggs	Sediment	Gravel Quality (Bulk)	F	F	V	G	P	F	P	P	G	F	F	F	F	G
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	F	G	F	G	P	P	F	P	F	F	V	F
Adults	Sediment	Quantity & Distribution of Spawning Gravels	F	F	G	F	G	P	F	F	F	G	G	G	F	G
Pre Smolt	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Smolts	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Watershed Processes	Sediment Transport	Road Density	P	P	P	P	P	P	F	P	P	G	P	G	G	F
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Smoltification	Temperature	P	V	F	G	P	F	P	F	F	F	F	F	F	F
Adults	Velocity Refuge	Floodplain Connectivity	P	G	G	P	F	F	P	F	G	F	F	F	P	F
Pre Smolt	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	P	P
Smolts	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	P	F
Smolts	Viability	Abundance	F	P	G	F	F	F	F	F	F	F	P	P	P	F
Adults	Viability	Density	F	P	F	P	F	F	F	F	F	F	P	P	P	F
Adults	Viability	Spatial Structure	G	F	V	G	G	V	V	G	G	F	P	P	P	F
Pre Smolt	Viability	Spatial Structure	G	F	V	G	G	V	V	G	G	F	P	P	P	F
Pre Smolt	Water Quality	Temperature (MWMT)	P	V	F	G	F	F	P	F	G	F	G	G	G	F
Adults	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	G	F	G	F
Pre Smolt	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Smolts	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Adults	Water Quality	Turbidity	P	P	F	P	P	F	P	P	F	F	F	F	G	F
Pre Smolt	Water Quality	Turbidity	P	P	P	P	F	F	P	P	F	F	F	V	G	P
Smolts	Water Quality	Turbidity	P	P	F	F	P	F	P	P	F	F	F	F	G	F

Table 5: CC Chinook Salmon ESU CAP Viability Summary by Conservation Target.

CC Chinook Salmon Population Conditions (Sorted By Conservation Target)			North Coastal							North Mountain Interior			North-Central Coastal		Central Coastal	
Target	Attribute	Indicator	Redwood	Little River	Mad River	Humbold Bay	Lower-S. F. Eel River	Bear River	Mattole River	Van Duzen	Larabee Creek	Upper Eel River	Noyo River	Big River	Garcia River	Russian River
Adults	Estuary/Lagoon	Quality & Extent	P	F	G	F	P	F	F	P	P	P	F	F	F	F
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	F	P	F	P	P	F	F	P	P	F	G	P
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	P	F	F	P	P	P	F	F	P	P	P	F	P
Adults	Habitat Complexity	Percent Staging Pools	P	G	P	P	P	P	P	P	F	F	F	P	V	F
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	V	P	V	F	P	F	F	F	P	P	P	V	F
Adults	Hydrology	Passage Flows	F	V	G	G	F	G	F	P	F	G	V	G	F	G
Adults	Passage/Migration	Passage at Mouth or Confluence	F	G	G	G	P	V	F	P	G	F	V	G	F	F
Adults	Passage/Migration	Physical Barriers	V	V	V	G	V	V	V	G	V	F	V	V	V	V
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	F	F	F	F	P	P	F	F	P	P	F	F	F	P
Adults	Sediment	Quantity & Distribution of Spawning Gravels	F	F	G	F	G	P	F	F	F	G	G	G	F	G
Adults	Velocity Refuge	Floodplain Connectivity	P	G	G	P	F	F	P	F	G	F	F	F	P	F
Adults	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	G	F	G	F
Adults	Water Quality	Turbidity	P	P	F	P	P	F	P	P	F	F	F	F	G	F
Adults	Viability	Density	F	P	F	P	F	F	F	F	F	F	P	P	P	F
Adults	Viability	Spatial Structure	G	F	V	G	G	V	V	G	G	F	P	P	P	F
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	G	G	V	V	G	G	G	G	G	F	G	G	F	F
Eggs	Hydrology	Redd Scour	P	V	G	P	F	G	F	F	F	F	F	F	F	F
Eggs	Sediment	Gravel Quality (Bulk)	F	F	V	G	P	F	P	P	G	F	F	F	F	G
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	F	G	F	G	P	P	F	P	F	F	V	F
Pre Smolt	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	F	P	P	P	F	F	G	F
Pre Smolt	Habitat Complexity	Percent Primary Pools	G	F	P	V	F	G	F	P	F	P	F	P	V	F
Pre Smolt	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	V	P	V	F	P	F	F	F	F	G	P	V	P
Pre Smolt	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Pre Smolt	Hydrology	Flow Conditions (Baseflow)	F	G	G	G	P	G	P	P	P	F	G	F	F	F
Pre Smolt	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Pre Smolt	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	P	F	G	V	V	G	F
Pre Smolt	Hydrology	Passage Flows	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Pre Smolt	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	F	V	G	F	P
Pre Smolt	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	P	P	F	F	P	P	F	F	F	P
Pre Smolt	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Pre Smolt	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	P	P
Pre Smolt	Water Quality	Temperature (MWMT)	P	V	F	G	F	F	P	F	G	F	G	G	G	F
Pre Smolt	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Pre Smolt	Water Quality	Turbidity	P	P	P	P	F	F	P	P	F	F	F	V	G	P
Pre Smolt	Viability	Spatial Structure	G	F	V	G	G	V	V	G	G	F	P	P	P	F
Smolts	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	P	P	P	P	F	F	F	F
Smolts	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	P	F	G	V	V	G	F
Smolts	Hydrology	Passage Flows	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	G	V	G	F	F
Smolts	Passage/Migration	Physical Barriers	V	V	V	V	V	V	V	G	V	V	V	V	V	V
Smolts	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Smolts	Smoltification	Temperature	P	V	F	G	P	F	P	F	F	F	F	F	F	F
Smolts	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	P	F
Smolts	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Smolts	Water Quality	Turbidity	P	P	F	F	P	F	P	P	F	F	F	F	G	F
Smolts	Viability	Abundance	F	P	G	F	F	F	F	F	F	F	P	P	P	F
Watershed Processes	Hydrology	Impervious Surfaces	V	V	V	F	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Agriculture	V	V	V	V	V	V	V	F	G	V	V	V	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	V	P	G	P	G	G	V	P	P	V	F	V	G	V
Watershed Processes	Landscape Patterns	Urbanization	V	V	V	P	V	V	V	V	V	V	V	V	V	F
Watershed Processes	Riparian Vegetation	Species Composition	G	F	F	G	F	P	F	V	G	F	F	F	G	F
Watershed Processes	Sediment Transport	Road Density	P	P	P	P	P	P	F	P	P	G	P	G	G	F
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Life Stages

The viability attribute results indicate all lifestages of CC Chinook salmon are impaired in each Diversity Strata (Table 5 and Figure 13). Adults are the most impaired lifestage across the ESU with 71% of all indicator ratings reported as Poor or Fair, followed by the pre smolt (67%), smolt (66%), and egg (61%) lifestages (Figure 13). The adult lifestage had the highest percentage of Poor ratings overall (30%), followed closely by pre smolt (29%). Watershed processes, on an ESU level, had a combined 44% of attribute indicators reported as Poor or Fair (Figure 13), of which 30% were rated as Poor.

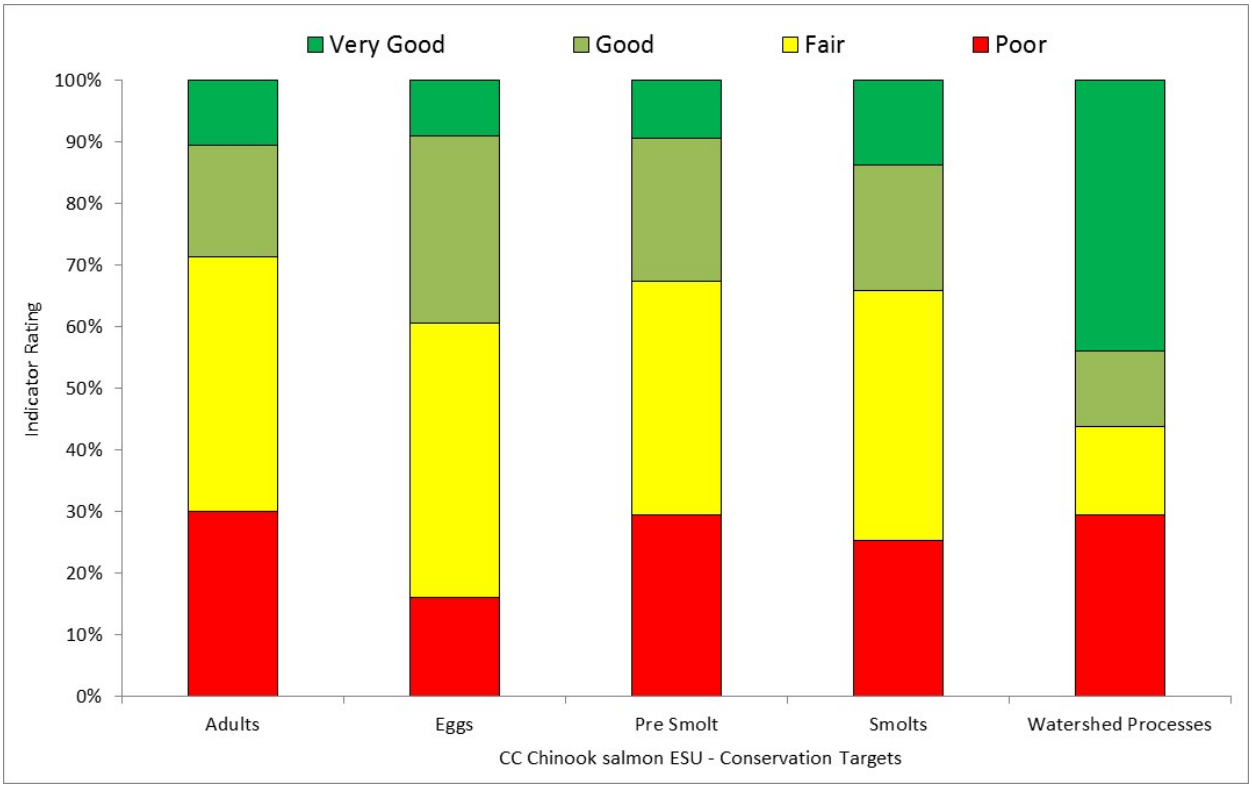

Figure 13: Attribute Indicator ratings for the CC Chinook salmon ESU by lifestage.

Adults Attribute Results: Across the ESU, most indicators for the adult lifestage had a high percentage (> 70%) of Poor or Fair ratings with the exceptions being passage flows, passage at mouth or confluence, physical barriers, quality and distribution of spawning gravels, and toxicity (Figure 14). The indicators of greatest concern, based on the percentage of Poor ratings alone

were large wood frequency (BFW 0-10m and BFW 10-100m), percent staging pools, pool/riffle/flatwater ratio, and turbidity. Across all attributes, 30% were rated Poor, 41% were rated Fair, 19% were rated Good, and 10% were rated as Very Good (Figure 14).

Eggs Attribute Results*:* Of the four indicators applicable to the egg lifestage, the most concerning were those related to gravel quality (embeddedness) followed by gravel quantity (bulk), and the potential for redd scour, which is related to overall gravel quality (Figure 15). Across all attributes, 16% were rated Poor, 45% were rated Fair, 30% were rated Good and 9% were rated as Very Good (Figure 15).

Pre Smolt Attribute Results*:* Like adults, most indicator ratings for the pre smolt lifestage had a high percentage (>65%) of Poor or Fair ratings (Figure 16) with the exceptions being flow conditions (instantaneous), passage flows, passage flows at mouth or confluence, and toxicity. The indicators of greatest concern were estuary/lagoon quality and extent, shelter rating, turbidity, tree diameter, and viability (spatial structure) in the southern populations (Figure 16). Across all attributes, 29% were rated Poor, 38% were rated Fair, 24% were rated Good and 9% were rated as Very Good (Figure 16).

Smolt Attribute Results*:* More than half of the indicator ratings (7 out of 13) for the smolt lifestage had a high percentage (> 60%) of Poor or Fair ratings (Figure 17) with the exceptions being flow conditions, stream flow diversions, passage flows, passage at mouth or confluence, physical barriers, and toxicity. The indicators of greatest concern for the smolt lifestage were estuary/lagoon quality and extent, shelter rating, gravel quality, viability (abundance), temperature, velocity refuge (floodplain connectivity), and turbidity. Across all attributes, 25% were rated Poor, 41% were rated Fair, 21% were rated Good and 14% were rated as Very Good (Figure 17).

Watershed Processes Results*:* Road density and streamside road density are the greatest overall source of impairment to current watershed conditions followed by timber harvest (Figure 18).

Streamside road density was rated Poor for all populations. The extent of impervious surfaces and agriculture received Very Good ratings throughout the ESU. Across all attributes, 30% were rated Poor, 13% were rated Fair, 13% were rated Good and 44% were rated as Very Good (Figure 18).

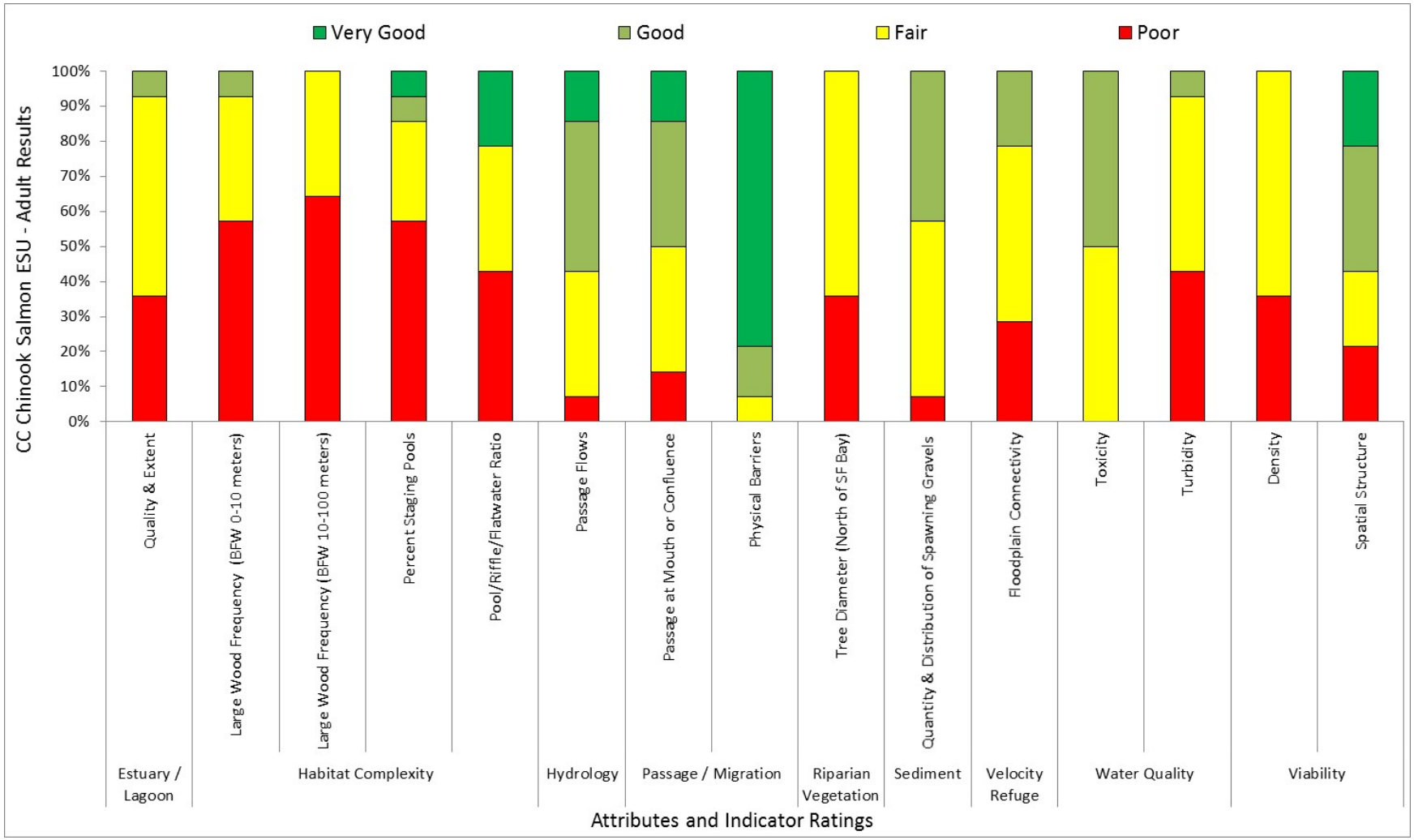

Figure 14: Attribute Indicator ratings for the Adult lifestage.

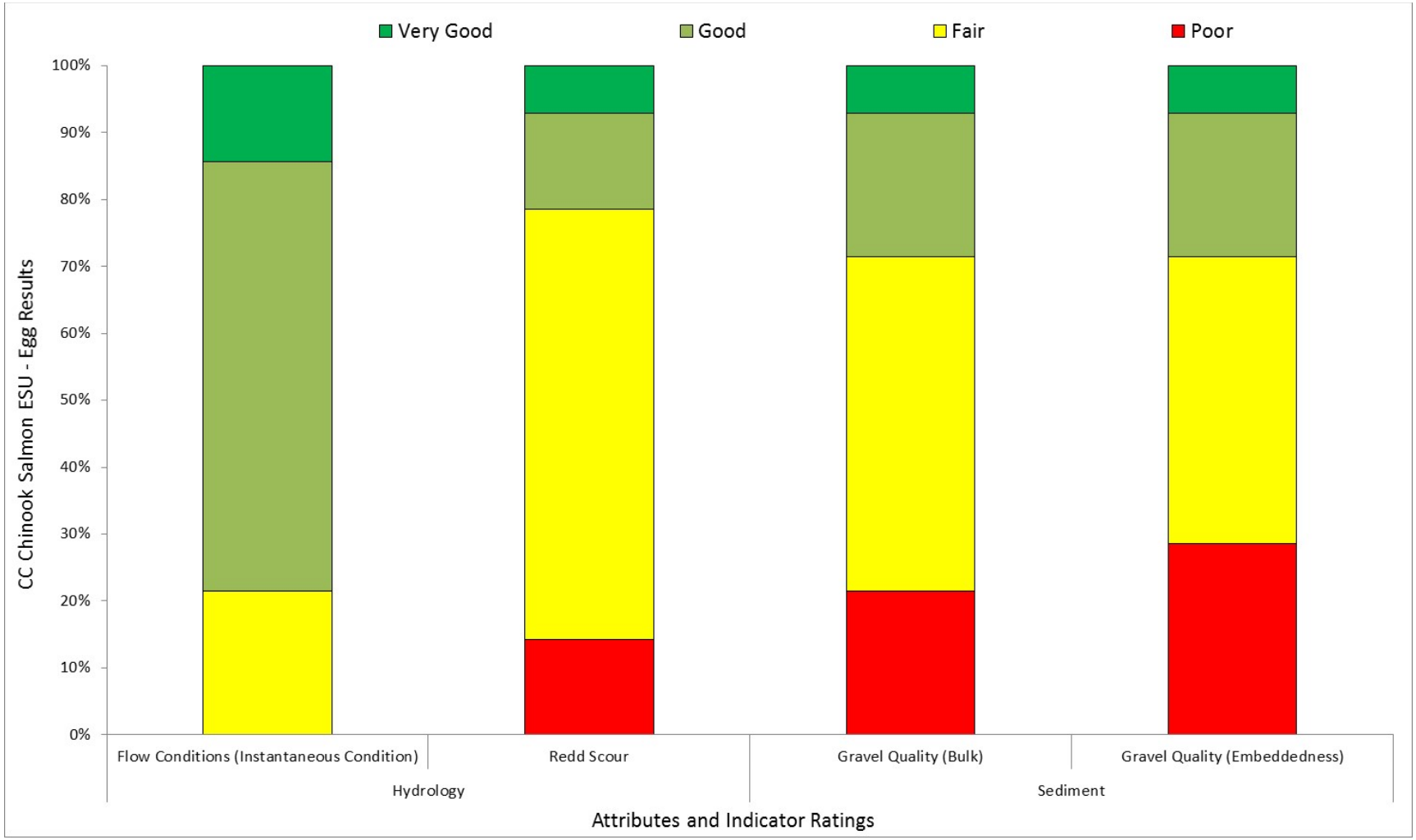

Figure 15: Attribute Indicator ratings for the Egg lifestage.

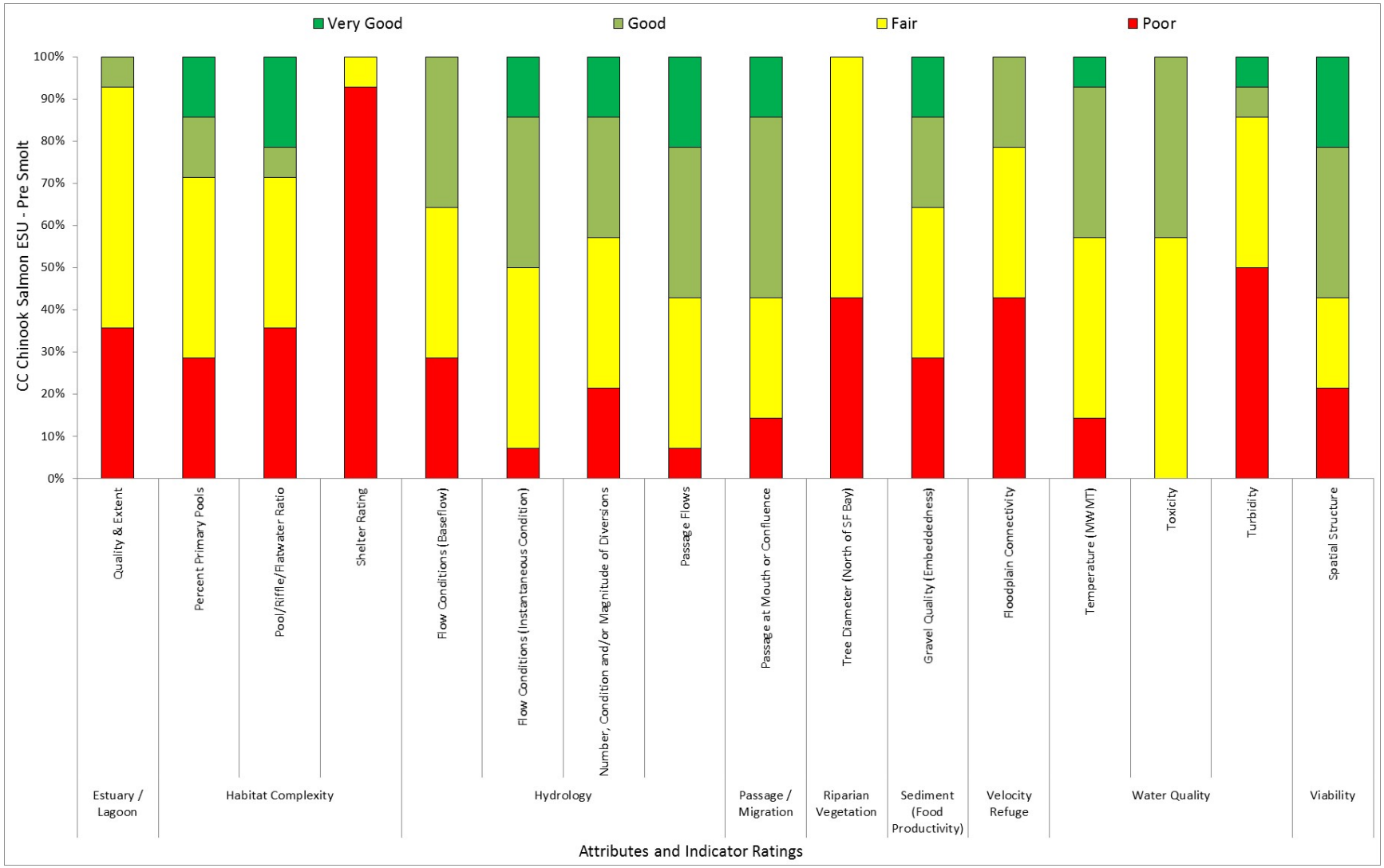

Figure 16: Attribute Indicator ratings for the Pre Smolt lifestage.

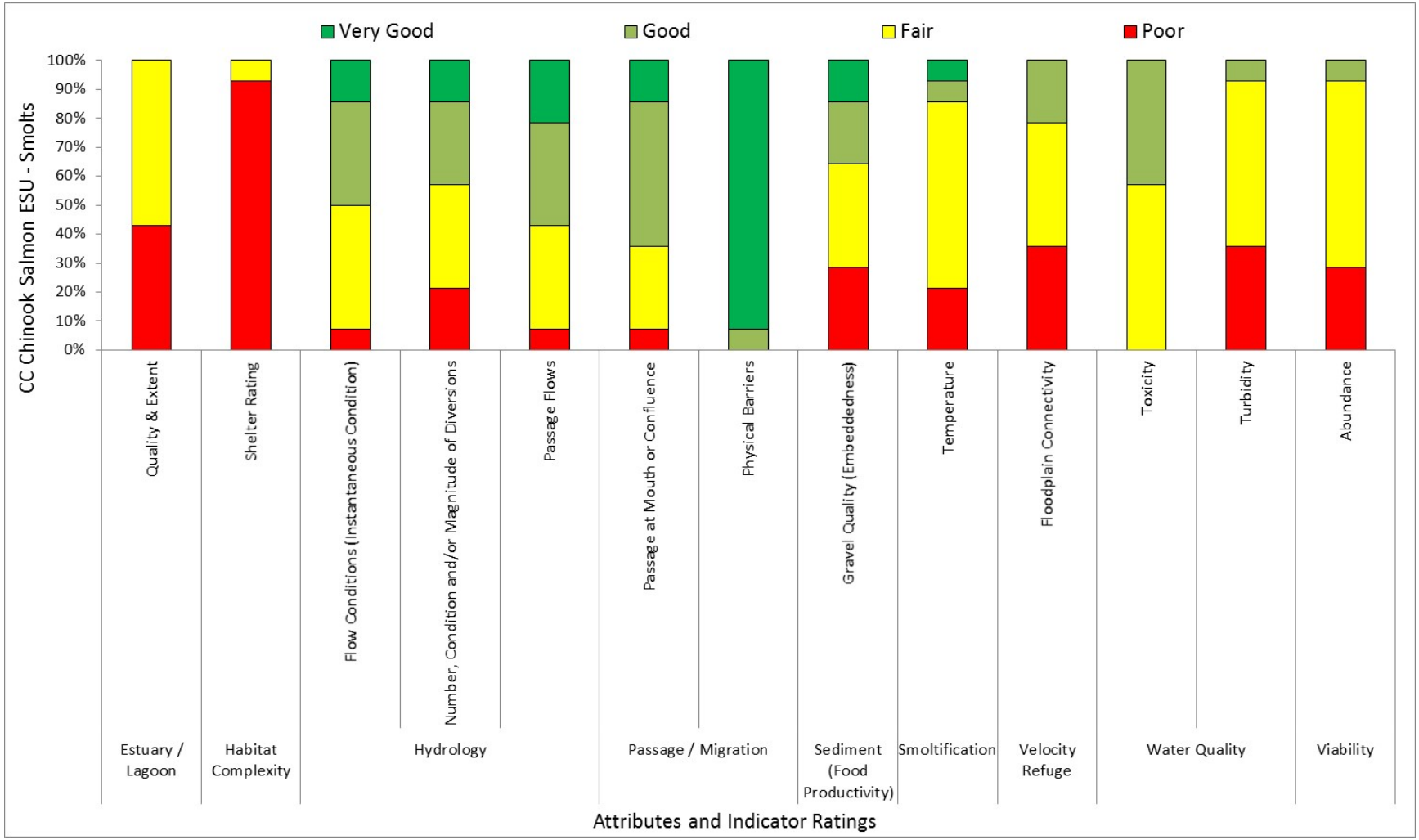

Figure 17: Attribute Indicator ratings for the Smolt lifestage.

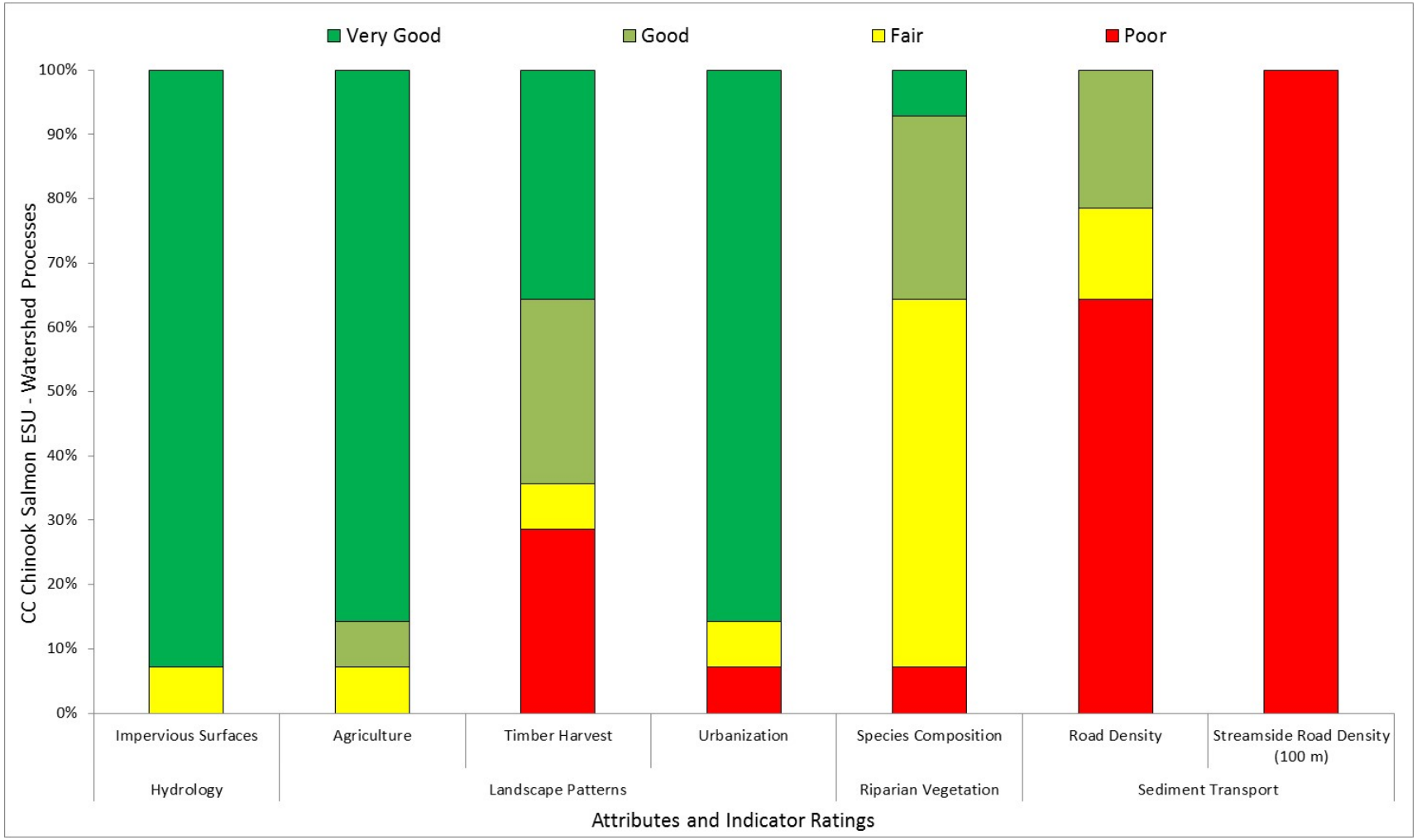

Figure 18: Attribute Indicator ratings for Watershed Processes.

ESU CAP THREAT RESULTS

Table 6 summarizes the CAP threat results across the ESU. Of the 15 identified threats, the four threats of greatest concern throughout the ESU based on the percentage of High and Very High ratings are channel modification (50%), roads and railroads (57%), logging and wood harvesting (36%), and both water diversion and impoundments and severe weather patterns (29%) (Figure 19).

Table 6: CC Chinook salmon ESU Threat Summary Table. Cells with [-] were not rated or not applicable.

Diversity Strata	North Coastal							North Mountain Interior			North-Central Coastal		Central Coastal	
CC Chinook Threat/Population	Redwood Creek	Little River	Mad River	Humbold Bay	Lower - S. F. Eel River	Bear River	Mattole River	Van Duzen River	Larabee Creek	Upper Eel River	Noyo River	Big River	Garcia River	Russian River
Agriculture	M	M	M	M	M	M	L	M	M	L	L	-	M	M
Channel Modification	VH	H	H	H	H	M	M	H	M	L	L	L	M	H
Disease, Predation and Competition	H	M	M	M	M	M	M	H	H	M	-	-	M	M
Fire, Fuel Management and Fire Suppression	M	M	M	L	M	M	M	M	M	M	L	L	L	L
Fishing and Collecting	M	M	M	M	M	M	M	M	M	H	M	M	H	M
Hatcheries and Aquaculture	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Livestock Farming and Ranching	M	M	M	M	M	H	M	M	M	L	-	-	M	L
Logging and Wood Harvesting	H	H	M	H	M	H	M	M	M	M	M	M	H	L
Mining	H	-	H	L	M	M	M	M	M	L	-	-	L	M
Recreational Areas and Activities	M	M	M	L	M	M	M	M	M	L	L	L	L	L
Residential and Commercial Development	M	M	M	M	M	M	M	M	M	L	L	L	M	H
Roads and Railroads	H	H	H	M	H	H	M	M	M	H	M	M	H	H
Severe Weather Patterns	H	M	M	H	H	M	H	M	M	M	M	M	M	M
Water Diversion and Impoundments	M	M	M	M	H	M	H	H	M	L	L	L	M	H

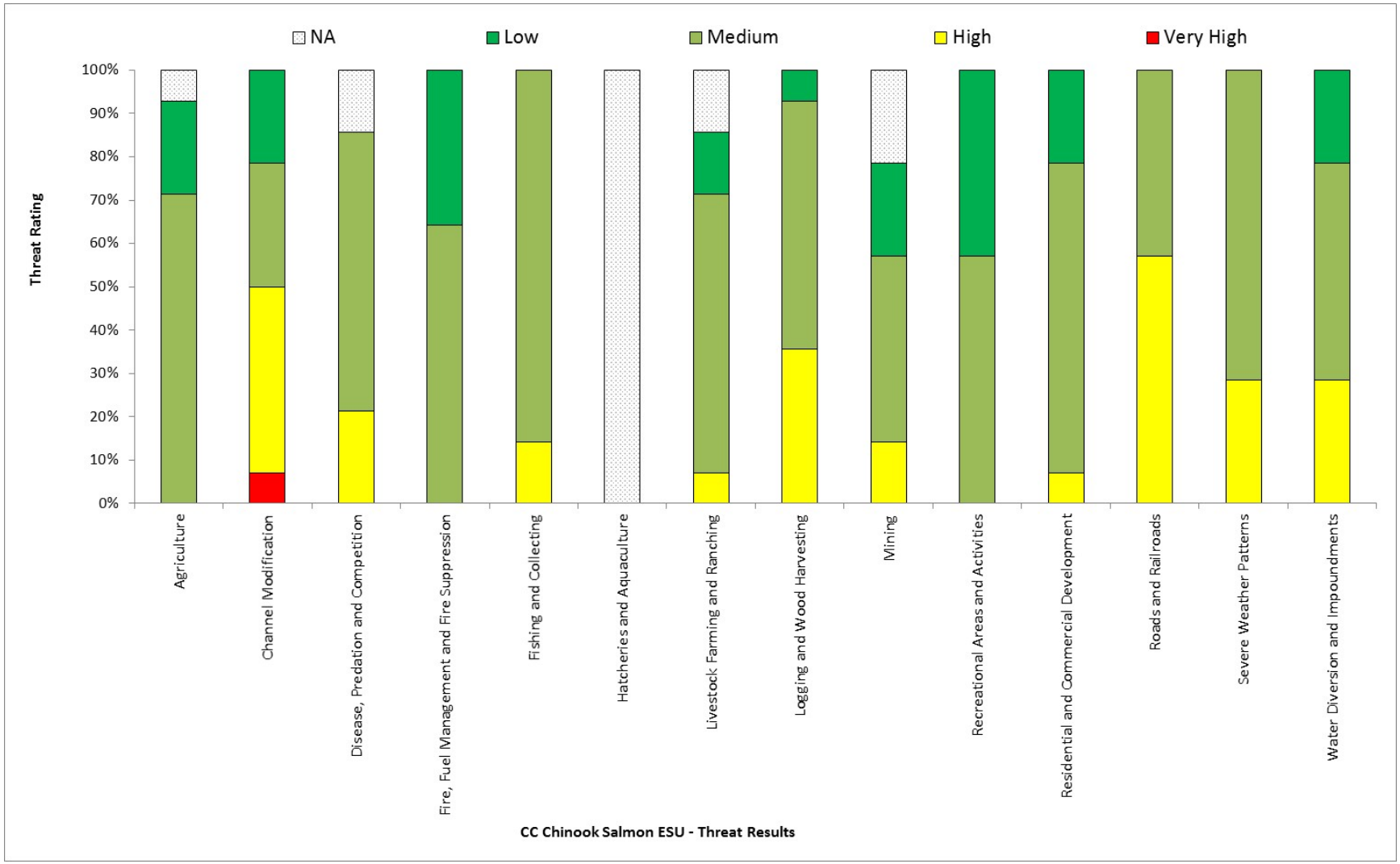

Figure 19: Threat ratings for the CC Chinook salmon ESU.

ESU LEVEL RECOVERY ACTIONS

The following recovery actions are ESU-wide recovery actions. ESU-wide recovery actions are recommendations that are designed to address widespread and often multiple threat sources across the range, such as the inadequate implementation and enforcement of local, state, and federal regulations.

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-1.1.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat.				
ESU-CCCh-1.1.1.1	Action Step	Estuary	In estuary/lagoons when applicable, remove problematic infrastructure and fill material to promote the historical seasonal formation and timing of an estuary/lagoon barrier beach	3	20	County, State, NMFS	
ESU-CCCh-1.1.1.2	Action Step	Estuary	Implement patrols by citizens groups, city employees, and law enforcement to ensure seasonal sandbars are not illegally breached.	1	50	City, Citizens, County, CDFW Wardens, NMFS OLE, Non-Profits, Private Landowners,	
ESU-CCCh-1.2	**Objective**	**Estuary**	**Address the inadequacy of existing regulatory mechanisms.**				
ESU-CCCh-1.2.1	Recovery Action	Estuary	Increase quality and extent of estuarine habitat.				
ESU-CCCh-1.2.1.1	Action Step	Estuary	Develop and implement Estuary Inflow Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.	2	20	CDFW, NMFS, SWRCB	
ESU-CCCh-1.2.1.2	Action Step	Estuary	Work with local county/city and state organizations to develop alternative methods of flood control to reduce artificial breaching frequency and adverse impacts.	1	10	City, County, NMFS, State	
ESU-CCCh-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of habitat or range.**				
ESU-CCCh-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity				
ESU-CCCh-2.1.1.1	Action Step	Floodplain Connectivity	Evaluate opportunities and implement actions for planned retreat of urban development or other incompatible land uses from floodplains, estuaries and alluvial valley streams to recreate natural floodplain processes and complex off-channel habitat and implement such opportunities where appropriate.	1	50	City, County	
ESU-CCCh-2.2	**Objective**	**Floodplain Connectivity**	**Address the inadequacy of existing regulatory mechanisms**				
ESU-CCCh-2.2.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity				
ESU-CCCh-2.2.1.1	Action Step	Floodplain Connectivity	County zoning should consider the 20-year and 100-year floodprone areas and design protective ordinances and compatible land use designations in these locations.	1	50	County	
ESU-CCCh-3.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**				
ESU-CCCh-3.1.1	Recovery Action	Hydrology	Improve flow conditions				
ESU-CCCh-3.1.1.1	Action Step	Hydrology	Encourage water conservation and the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	2	50	EPA, City, County, NGO, Private Landowners, State, RWQCB	
ESU-CCCh-3.1.1.2	Action Step	Hydrology	Work with rural residential communities to develop water conservation strategies protective of salmonids while allowing for domestic water use.	2	20	City, County, NGO, Private Landowners, State, SWRCB	
ESU-CCCh-3.1.1.3	Action Step	Hydrology	Work with partners to reduce stormwater run-off by removing impervious surfaces, and creating or expanding flood retention land and groundwater recharge basins.	3	20	City, County, Private Landowners, State, SWRCB	
ESU-CCCh-3.1.1.4	Action Step	Hydrology	Work with the SWRCB to encourage landowners to increase groundwater recharge, permeable surfaces, and percolation through swales and recharge basins in an effort to reduce the flashiness of hydrographs and increase summer baseflow.	1	20	NMFS, Private Landowners, State, RWQCB	
ESU-CCCh-3.1.1.5	Action Step	Hydrology	Work with partners to expand stream flow gaging networks in streams supporting salmonids and/or their habitat.	3	50	CDFW, City, County, NMFS, Private Landowners, State, SWRCB, USGS	See also Monitoring Chapter.
ESU-CCCh-3.1.1.6	Action Step	Hydrology	Meter water diversions for the purposes of measuring instantaneous demand.	2	5	CDFW, City, County, NMFS, Private Landowners, State, SWRCB	
ESU-CCCh-3.1.1.7	Action Step	Hydrology	Use the best scientifically available technology to keep the public informed on stream flows in real time.	3	5	County, NGO, RWQCB, SWRCB	
ESU-CCCh-3.1.1.8	Action Step	Hydrology	Provide financial and technical support and develop partnerships to characterize watershed hydrology and to assess water availability and create water resource budgets.	1	10	CDFW, City, County, NMFS, State, SWRCB	

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-3.1.1.9	Action Step	Hydrology	Effects of consumptive water uses on both the timing and quantity of flow should be minimized. Water-management technologies promoting restoration of natural runoff patterns and water quality should be encouraged.	1	10	CDFW, City, County, NMFS, State, SWRCB	Patterns of water runoff, including surface and subsurface drainage, should match to the greatest extent possible the natural hydrologic pattern for the region in both quantity and quality.
ESU-CCCh-3.1.1.10	Action Step	Hydrology	Evaluate geological patterns in the ESU to identify areas provide sources of cool water and serve as locations to buffer populations against climate change and on-going water diversions.	3	15	County, NMFS, State, USGS	
ESU-CCCh-3.1.1.11	Action Step	Hydrology	Analyze the impacts of well development on stream flow prior to approval.	2	10	County, DWR, NMFS, RWQCB	
ESU-CCCh-3.1.1.12	Action Step	Hydrology	Encourage groundwater recharge through floodplain inundation.	2	15	CDFW, City, County, DWR, NMFS, State, SWRCB	
ESU-CCCh-3.2	**Objective**	**Hydrology**	**Address the inadequacy of existing regulatory mechanisms**				
ESU-CCCh-3.2.1	Recovery Action	Hydrology	Improve flow conditions				
ESU-CCCh-3.2.1.1	Action Step	Hydrology	Encourage local governments to condition new development to minimize adverse impacts to fisheries resources by integrating hydro-modification concerns into development planning.	2	50	CDFW, City, County, NMFS	For example: new homes should have drought-tolerant landscaping, rainwater catchment systems, and permeable surfaces; new vineyards should demonstrate that their water supply development would minimize adverse impacts to fisheries resources.
ESU-CCCh-3.2.1.2	Action Step	Hydrology	SWRCB in coordination with NMFS, CDFW, and other qualified parties, should develop state-wide minimum summer baseflow requirements protective of salmonids and their habitat.	1	5	CDFW, NMFS, SWRCB	Enforcing the minimum baseflow requirement is necessary to ensure salmonid persistence during drought periods and water right curtailment or when watershed surface flow is over-allocated, and when prosecuting illegal diversions.
ESU-CCCh-3.2.1.3	Action Step	Hydrology	Improve coordination between the agencies, particularly with the SWRCB, to effectively identify and address illegal water diverters and out-of-compliance diverters, seasons of diversion, off-stream reservoirs, and bypass flows fully protective of listed salmonids.	1	5	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB	
ESU-CCCh-3.2.1.4	Action Step	Hydrology	Collaborate with and support the DWR and SWRCB and local agencies to increase oversight for regulating groundwater extraction from aquifers hydrologically connected to surface flows. In addition collaborate to develop groundwater surface water management plans and implement groundwater recharge projects in all alluvial basins.	1	5	DWR, City, County, CDFW, NMFS, Private Landowners, RWQCB	
ESU-CCCh-3.2.1.5	Action Step	Hydrology	NMFS should actively participate in Groundwater Management Plan development (per California's Sustainable Groundwater Management Act) where groundwater pumping is impacting hydrologically connected streamflow.	1	5	DWR, City, County, CDFW, NMFS, RWQCB	
ESU-CCCh-3.2.1.6	Action Step	Hydrology	Encourage local governments to integrate meaningful groundwater regulation for land use planning and to increase coordination with State agencies to ensure applicants secure necessary State permits (e.g., water rights) as part of local permitting processes.	1	5	City, County, CDFW, DWR, NMFS, Private Landowners, RWQCB	
ESU-CCCh-3.2.1.7	Action Step	Hydrology	Extend California Water Code Section 1259.4 dealing with instream flows to protect instream beneficial uses, including native fishes, to central and northern California recovery planning areas with appropriate provisions to address regional differences, including but not limited to construction of off-stream storage as alternative to direct diversions during the dry season.	1	5	SWRCB	
ESU-CCCh-3.2.1.8	Action Step	Hydrology	Water conservation projects should be focused on shifting reliance from on-stream storage to offstream storage, resolve frost protection issues (water withdrawals), and ensure necessary flows for all freshwater lifestages in all water years.	2	10	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB	
ESU-CCCh-3.2.1.9	Action Step	Hydrology	Investigate illegal water diversion and well pumping related to marijuana propagation or other agricultural activities and prosecute violations accordingly	1	10	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB	
ESU-CCCh-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of habitat or range.**				
ESU-CCCh-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers.				

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-5.1.1.1	Action Step	Passage	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) need to accommodate 100-year flood flows and associated bedload and debris.	2	50	City, County, NMFS, State	
ESU-CCCh-5.1.1.2	Action Step	Passage	Monitor and update barriers in the Passage Assessment Database (PAD) (https://nrm.dfg.ca.gov/PAD/)	3	50	City, County, NGO, RCD, State	
ESU-CCCh-6.2	**Objective**	**Habitat Complexity**	**Address the inadequacy of existing regulatory conditions**				
ESU-CCCh-6.2.1	Recovery Action	Habitat Complexity	Improve habitat complexity				
ESU-CCCh-6.2.1.1	Action Step	Habitat Complexity	Work with Federal and State to develop an application of a programmatic permit for restoration work not funded by FRGP. The objectives of the programmatic should be to reduce costs and fast-track the implementation of high priority recovery actions.	2	5	City, County, CDFW, NGO, NMFS, NOAA RC, Private Landowners, RCD	
ESU-CCCh-6.2.1.2	Action Step	Habitat Complexity	Work with California BOF through implementation of California Forest Protection Rules, Section V, CDFW, RWQCB and others to modify the timber harvest permitting process (including CDFW Lake and Streambed Alteration Agreement process) and provide opportunities and incentives for the implementation of LWD placement and other restoration priorities during timber harvest operations.	3	5	BOF, CDFW, NMFS, RWQCB, Timber Landowners	
ESU-CCCh-6.2.1.3	Action Step	Habitat Complexity	Work with CDFW and the California Fish and Game Commission to remove beavers from California Fish and Game Code Section 4181 that provides any owner or tenant of land or property that is being damaged or destroyed or is in danger of being damaged or destroyed by certain mammals, including beaver, may apply to the department for a permit to kill the mammals.	3	10	CDFW, California Fish and Game Commission, NMFS	
ESU-CCCh-6.2.1.4	Action Step	Habitat Complexity	Work with CDFW and the California Fish and Game Commission to modify Title 14 of the California code of Regulations to prohibit recreational hunting/trapping of beavers within all counties within the NCCC Recovery Domain.	3	10	CDFW, California Fish and Game Commission, NMFS	
ESU-CCCh-6.2.1.5	Action Step	Habitat Complexity	Utilize non-lethal methods where feasible to manage beaver depredation issues (e.g. flooding, crop damage) such as flow devices, fencing, and beaver re-location and enhance habitat complexity.	3	10	CDFW, California Fish and Game Commission, NMFS, Private Landowners	
ESU-CCCh-6.2.1.6	Action Step	Habitat Complexity	Where non-lethal methods prove unfeasible to resolve depredation issues, relocate beaver populations to remote streams where habitat enhancement is needed and resource conflict is low.	3	10	CDFW, California Fish and Game Commission, NMFS, Private Landowners	
ESU-CCCh-6.2.1.7	Action Step	Habitat Complexity	Develop and update a Beaver Management Plan for California to benefit salmonids.	3	10	CDFW, California Fish and Game Commission, NMFS	
ESU-CCCh-6.2.1.8	Action Step	Habitat Complexity	Investigate the current conditon of the high IP reaches in each population and assess the status and develop a restoration plan for those areas.	2	10	City, County, CDFW, NGO, NMFS, NOAA RC, Private Landowners, RCD	
ESU-CCCh-7.1	**Objective**	**Riparian**	**Address the inadequacy of existing regulatory conditions**				
ESU-CCCh-7.1.1	Recovery Action	Riparian	Improve riparian conditions				
ESU-CCCh-7.1.1.1	Action Step	Riparian	Develop adequately sized riparian setbacks/buffers to protect salmonids habitat where they do not currently occur, and enforce requirements of local regulations where they do.	1	10	County	
ESU-CCCh-7.1.1.2	Action Step	Riparian	Counties should develop a riparian strategy to grow older larger diameter trees for improved canopy and appropriate natural recruitment to the stream. This could be achieved by creating ordinances (where currently non-existent) that limit or prevent the removal of mature trees during infrastructure upgrades or implementation of restoration projects.	3	10	County	
ESU-CCCh-7.1.1.3	Action Step	Riparian	Coordinate with RWQCB to promote policies and planning for adequate riparian area restoration, conservation and protection.	2	10	NMFS, RWQCB, State	
ESU-CCCh-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-8.1.1	Recovery Action	Sediment	Improve instream gravel quality				
8.1.1.1	Action Step	Sediment	Fund and implement sediment TMDLs within the range of listed salmonids.	2	10	EPA, RWQCB	
ESU-CCCh-8.1.1.2	Action Step	Sediment	Evaluate stream crossings for their potential to impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.	2	10	BOF, CalFire, Caltrans, County, CDFW, NMFS	
ESU-CCCh-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-10.1.1	Recovery Action	Water Quality	Reduce toxicity and pollutants.				
ESU-CCCh-10.1.1.1	Action Step	Water Quality	Work with EPA, RWQCBs and CDFW to identify and prioritize potential contaminants of concern and develop protective standards and programs for issues that directly or indirectly adversely affect the continued existence of listed salmonids.	2	5	EPA, CDFW, RWQCB	
ESU-CCCh-10.1.1.2	Action Step	Water Quality	Conduct outreach to increase awareness of the effects of pharmaceuticals, pesticides and contaminants that impact the continued existence and habitat of listed salmonids.	2	5	EPA, CDFW, NGO, NMFS, RWQCB	
ESU-CCCh-10.1.1.3	Action Step	Water Quality	Support the development and implementation of stormwater BMPs in cities, towns and rural areas.	2	5	City, County, Local, Private Landowners, State, RWQCB	
ESU-CCCh-10.1.1.4	Action Step	Water Quality	Implement performance standards in Stormwater Management Plans.	2	5	City, County, Private Landowners, State, RWQCB	
ESU-CCCh-10.1.1.5	Action Step	Water Quality	Work with pesticide users to educate and advocate for an "integrative pest management framework (IPM)" for pesticide control.	2	5	City, County, NMFS, Private Landowners, State, RWQCB	Best management practices within the IPM include biological control, pesticide choices, removal of pest habitat and resources, barriers, optimal fertilization and irrigation, trap plants, intercropping, and cover crops, and synthetic mulches.
ESU-CCCh-10.1.1.6	Action Step	Water Quality	Work with the California Department of Pesticide Regulation (CDPR) to support changes to professional pesticide application methodologies and timing to limit the potential exposure of watercourses to pesticide runoff.	3	5	City, County, NMFS, Private Landowners, State, RWQCB	For example: change building infrastructure applications of pyrethorids on monthly schedules throughout the entire year including the rainy season to seasons of interest.
ESU-CCCh-10.1.1.7	Action Step	Water Quality	Work with the academic, local, government and non-profit entities (Natural Resource Conservation District, etc.) to support funding of research and use of pesticide alternatives.	3	15	Academic, Local, Government, NGO	These alternatives may include technologies that reduce the amount of pesticides that need to be applied or pest management strategies that require very little pesticide use.
ESU-CCCh-10.1.1.8	Action Step	Water Quality	Work with EPA, RWQCBs, and local stakeholders to implement actions under section 303(d)(1)(C) and (D) of the Clean Water Act requiring States to prepare TMDLs for all water bodies targeted in this recovery plan not currently meeting State of California water quality standards.	2	25	EPA, NMFS, RWQCB, State	
ESU-CCCh-10.1.1.9	Action Step	Water Quality	Install bollards at fire hydrants that are in proximity to streams inorder to prevent hydrants from being hit and discharging chlorinated water into thestreams.	3	10	CalFire, City, County, Local Fire Departments	Hit hydrants will discharge very high volumes of chlorinated water that has thepotential to wipe out a steelhead population in a stream. This action could preventcatastrophic loss of steelhead.
ESU-CCCh-10.1.1.10	Action Step	Water Quality	Research into the potential level of impacts from and solutions to environmental estrogens associated with wastewater discharge and domestic septic leakage are needed.	2	10	RWQCB, Cities, Water Agencies	
ESU-CCCh-10.1.2	Recovery Action	Water Quality	Reduce sedimentation				
ESU-CCCh-10.1.2.1	Action Step	Water Quality	Support actions and tasks identified in the Regional Water Board Staff Work Plan to Control Excess Sediment in Sediment-Impaired Watersheds.	2	10	NMFS, RWQCB	http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/sediment_workplan/
10.2	**Objective**	**Water Quality**	**Address Inadequacy of existing regulatory conditions**				
ESU-CCCh-10.2.1	Recovery Action	Water Quality	Reduce toxicity and pollutants.				
ESU-CCCh-10.2.1.1	Action Step	Water Quality	Work with the RWQCB to support and fast track promulgation of methods to detect impacts from pharmaceuticals and pesticides and other CECs under 40 C.F.R. Part 136, followed by adoption of water quality criteria for pollutants covered by these methods.	2	10	NMFS, RWQCB, State	
ESU-CCCh-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-11.1.1	Recovery Action	Viability	Increase abundance, spatial structure and diversity				
ESU-CCCh-11.1.1.1	Action Step	Viability	Finalize and implement the California Coastal Salmonid Monitoring Plan.	1	50	CDFW, County, NGO, RCD, Watershed Partners, Water Agencies	Implementing the California Coastal Monitoring Plan is essential for evaluating the long-term viability of listed salmonids in California. For specific components of the Coastal Monitoring Plan see Vol.1 Chapter 6.

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-11.1.1.2	Action Step	Viability	Prioritize restoration funds, notably the Pacific Coast Salmon Restoration Fund and California's Fisheries Restoration Grant Program (FRGP), to address issues in critical watersheds identified within this recovery plan.	1	50	CDFW, NMFS	
ESU-CCCh-11.1.1.3	Action Step	Viability	Work with the SWFSC to revise the "Intrinsic Potential" model in areas where the model predictions has a severe or high bias and evaluate current conditions where the model indicates the highest values, in order to direct the prioritization of restoration funds.	2	5	NMFS, SWFSC	
ESU-CCCh-11.1.1.4	Action Step	Viability	Support all educational and outreach conferences, events, workshops, etc. that advance the understanding of anadromous salmonid life history, ecology, history, biology, threats, habitat restoration, recovery, and species viability to include all those with a science, restoration, and policy focus.	2	50	Academic, BOF, CalFire, CDFW, NGO, NMFS, SWFSC	
ESU-CCCh-11.1.1.5	Action Step	Viability	Support studies, assessments, science, research, and monitoring (including associated modeling, data management, data analysis, and reporting) that will improve our understanding of species life history and genetic diversity, historical distribution, habitat relationships, status, trends, viability, and spatial structure including those for drought and climate change	2	50	Academic, BOF, CalFire, CDFW, NGO, NMFS, SWFSC	
ESU-CCCh-11.1.1.6	Action Step	Viability	Develop and implement watershed based restoration plans for essential and supporting populations.	1	100	CDFW, Cites, Counties, NGOs, NMFS, RCDs, Water Agencies	Watershed plans should focuses on restoring processes that form, connect, and sustain habitats and provide watershed-wide and reach-specific, detailed restoration actions. Such a plan should be based on geomorphic and ecosystem principles and scientific assessments that: 1) identify the types and natural rates of habitat-forming processes, 2) determine where processes are altered and the factors responsible, 3) decide how to restore the disrupted processes, and 4) provide watershed-wide and reach-specific restoration actions. Once developed, the watershed plans should fit into an adaptive management process and be used to refine actions described in the recovery plan.
ESU-CCCh-11.1.1.7	Action Step	Viability	Federal and State regulatory agencies should encourage city, county and water agencies to incorporate the Multispecies Recovery Plan into their watershed planning documents and Habitat Conservation Plans.	2	100	CDFW, Cites, Counties, NMFS, Water Agencies	
ESU-CCCh-11.2	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
ESU-CCCh-11.2.1	Recovery Action	Viability	Monitor habitat quality and extent and watershed land use change				
ESU-CCCh-11.2.1.1	Action Step	Viability	Establish at least one Intensively Monitored Watershed (IMW) within each diversity stratum (preferably a population with a LCM station) to assess the habitat conditions and the effectiveness of implemented restoration actions.	2	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, Water Agencies	IMWs are watersheds that are monitored to the extent that the limiting factors are followed and the impact of management actions on fish or habitat can be demonstrated (see ISEMP at http://www.isemp.org/). Conduct power analysis early in development to determine amount of watershed required to be treated necessary to detect 30-50 percent change in population response. Also, use salmonid response (i.e., presence, abundance, and fitness monitoring) at restoration sites to inform effectiveness over time

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-11.2.1.2	Action Step	Viability	Conduct implementation, effectiveness and validation monitoring for restoration projects where necessary and appropriate.	2	50	CDFW, Cities, Counties, NGO, NOAA SWFSC, NPS, NRCS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, USFS, Water Agencies	Monitoring must be in accordance with the following specifications: a). The design and implementation of restoration actions should be reported and correlated with known habitat limiting factors, so cumulative impacts can be tracked across the ESU/DPS. b). Where restoration actions are implemented, effectiveness monitoring should be conducted at both the reach and site-specific scales following the Before After Control Impact (BACI) design; and c) Use salmonid response (i.e., presence, abundance, and fitness monitoring) at restoration sites to inform effectiveness over time□
ESU-CCCh-11.2.1.3	Action Step	Viability	Monitor land use and other non-landscape attributes using GIS. In addition to general land use patterns (i.e. agriculture, timber, and urban), other watershed-specific attributes that should be measured include: the extent of impervious surfaces, landslides, watershed road density, and overall riparian conditions. This should be repeated approximately every 10 years.	1	50	CDFW, Counties, NGO, NMFS, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, US EPA, USFS, Water Agencies	
ESU-CCCh-11.2.1.4	Action Step	Viability	Monitor storm-water and agricultural runoff to assess status/trends of turbidity and concentrations of other identified toxins and identify their sources. Where necessary, expand monitoring beyond those already implemented and required by other agencies or laws.	2	50	Cities, Counties, Farm Bureau, NGO, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, State Water Resources Control Board, Trout Unlimited, USEPA, USFS	Where necessary, expand monitoring beyond to other areas or increased frequency than those already required of by other agencies or laws.
ESU-CCCh-11.2.1.5	Action Step	Viability	Monitor water temperature throughout individual populations using arrays of automated data loggers (Isaak et al. 2011), particularly within populations with an LCM station or in populations where water temperature has been identified as a potential limiting factor.	1	50	California Coastal Conservancy, CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, Trout Unlimited, USEPA, USFS, USGS, Water Agencies	Temperature data loggers (e.g., Onset HOBO v2 Data Loggers) cost approximately $130 per unit. Cost estimates per population would depend on the size of the watershed and number of units needed within each watershed. Also, cost for data management and analysis would need to be considered.
ESU-CCCh-11.2.1.6	Action Step	Viability	Monitor the status and spatial pattern of stream flows, particularly for populations where impaired stream flow was identified as a potential limiting factor.	2	50	CDFW, Cities, Counties, NGO, NOAA SWFSC, NPS, PG&E, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, State Water Resources Control Board, USEPA, USFS, USGS, Water Agencies	Where necessary, coordinate with USGS and/or local governments, non-governmental organizations and water agencies to install additional stream flow gages to assist with stream flow tracking. Seek funding to maintain existing facilities, particularly long-term monitoring gages that may be discontinued due to funding shortages.
ESU-CCCh-11.2.1.7	Action Step	Viability	In accordance with the Coastal Monitoring Plan, develop and implement a water-quality and habitat-condition monitoring program for estuaries and seasonal bar-built lagoons	2	50	CDFW, Counties, NGO, NOAA/NMFS, NPS, Resource Conservation Districts, State Parks	As of Fall 2016, protocols and methods for monitoring water quality and habitat conditions in the estuaries/lagoons have not been developed for the CMP. At a minimum, lagoon water quality monitoring should be conducted for populations where the quality and extent of estuarine/lagoon habitat was identified as a current stress. This should include diurnal, seasonal, and event-based (i.e., a sudden change in weather, inflow, or management actions) monitoring of water temperature, dissolved oxygen, salinity profiles as well as an analysis of seasonal changes in freshwater inflow, depths, and invertebrate abundance and community composition.□ addition, monitor the frequency, timing, and associated impacts (see above) of sand bar breaching for all lagoons where authorized and unauthorized manual breaching occurs.

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-11.2.1.8	Action Step	Viability	As part of the Coastal Monitoring Plan, develop and implement a GRTS-based habitat status and trend monitoring program coordinated with the juvenile spatial structure evaluations	1	50	CDFW, Counties, NGO, SWFSC, Resource Conservation Districts, State Parks	The general methods for assessing habitat attributes will follow established programs such as the Columbia River Habitat Monitoring Program (CHaMP)
ESU-CCCh-11.3	**Objective**	**Viability**	**Address the overutilization for commercial, recreational, scientific or educational purposes**				
ESU-CCCh-11.3.1	Recovery Action	Viability	Monitor density, abundance, spatial structure and diversity				
ESU-CCCh-11.3.1.1	Action Step	Viability	In accordance with the Coastal Monitoring Plan, implement an unbiased GRTS-based monitoring program to assess CC Chinook salmon adult spawner abundance estimates at the ESU, diversity stratum, and, population level.	1	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, Trout Unlimited, USACE, USGS, Water Agencies	See the Monitoring and Adaptive Management Chapter in Volume 1 for more information on adult spawner abundance cost estimates.
ESU-CCCh-11.3.1.2	Action Step	Viability	In accordance with the Coastal Monitoring Plan, establish a minimum of one (or preferably two) Life Cycle Monitoring stations within each diversity stratum to estimate spawner : redd ratios, conduct annual smolt abundance/trends, calibrate regional redd counts, and estimate smolt/adult ratios for marine/freshwater survival.	1	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, USACE, USGS, Water Agencies	Strive to have abundance estimates at the LCM stations with a CV on average of 15 percent or less.
ESU-CCCh-11.3.1.3	Action Step	Viability	In accordance with the Coastal Monitoring Plan, implement GRTS-based summer and fall sampling to assess the abundance, distribution and diversity of juvenile steelhead and Chinook salmon.	1	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, Trout Unlimited, USACE, USGS, Water Agencies	Juvenile Chinook salmon are generally not present in freshwater during late summer and fall and their rare presence during this period would be observed while conducting spatially balanced surveys for juvenile steelhead. See DPS-NCSW-11.3.1.3 and DPS-CCCS-11.3.1.3
ESU-CCCh-11.3.1.4	Action Step	Viability	In accordance with the Coastal Monitoring Plan, develop a biological monitoring program for estuaries and seasonal, bar-built lagoons (particularly in LCM populations) that will track salmonid abundance and use of these habitats over time.	1	50	CDFW, Counties, NOAA SWFSC, NPS, Private Consultants, Resource Conservation Districts, State Parks, Trout Unlimited, USACE, USFWS, Water Agencies	These data can be used to document potential limiting factors (e.g., stresses) affecting salmonid rearing in these habitats and highlight emerging threats over time. The estuary/lagoon monitoring protocol for the CMP has not been developed yet.
ESU-CCCh-11.3.1.5	Action Step	Viability	Monitor incidental capture and mortality rates of CC Chinook salmon, NC steelhead, and CCC steelhead in the recreational freshwater fisheries reported from Steelhead Fishing Report-Restoration Cards and creel surveys conducted by CDFW	2	50	CDFW	
ESU-CCCh-11.3.1.6	Action Step	Viability	Continue to annually monitor and assess intentional and incidental capture and mortality rates of CC Chinook salmon, NC steelhead, and CCC steelhead resulting from permitted research to ensure established take limits are adequate to protect these species.	2	50	CDFW, NMFS PRD	
ESU-CCCh-11.3.2	Recovery Action	Viability	Prevent reduced density, abundance, and diversity				
ESU-CCCh-11.3.2.1	Action Step	Viability	Develop Fisheries Monitoring and Evaluation Plans (FMEP) that incorporate delisting criteria, does not limit attainment of population-specific criteria and are specifically designed to monitor and track catch and mortality of wild and hatchery salmon and steelhead stemming from recreational fishing in freshwater and the marine habitats	2	20	CDFW, NMFS	
ESU-CCCh-11.3.2.2	Action Step	Viability	Develop and implement an expanded Genetic Stock Index (GSI) monitoring program for Pacific salmonids. This will help track ocean migrations of Chinook salmon, their origin, and an index of incidental capture and mortality rates in the commercial and recreational fisheries.	3	50	CDFW, NMFS, NOAA SWFSC	
ESU-CCCh-11.3.2.3	Action Step	Viability	Encourage continued scientific research on the effects of Chinook salmon and steelhead population declines on reduced marine-derived nutrients in freshwater habitats (Hill et al. 2010; Moore et al. 2011)	2	50	CDFW, NMFS, NOAA SWFSC	
ESU-CCCh-11.3.2.4	Action Step	Viability	Continue coordination between NMFS and CDFW on revisions to freshwater sport fishing regulations to ensure impacts do no preclude CC Chinook salmon, NC steelhead, and CCC steelhead recovery and impacts to their populations during migrations are minimized.	2	50	CDFW, NMFS	
11.4	**Objective**	**Viability**	**Address disease or predation**				

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-11.4.1	Recovery Action	Viability	Increase density, abundance, spatial structure and diversity				
ESU-CCCh-11.4.1.1	Action Step	Viability	Annually, estimate the infection and mortality rates of juvenile Chinook salmon and steelhead from pathogens in populations where diseases are identified as a High or Very High threat	3	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, State Parks, USGS, Water Agencies	Infection rates may be determined during spatial sampling throughout the ESU/DPS.
ESU-CCCh-11.4.1.2	Action Step	Viability	Annually monitor the status and trends of non-native predators in populations where predation is identified as a High or Very High threat.	3	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, Water Agencies	General status and trends of non-native predators would partially be assessed during the spatially balanced GRTS sampling for juvenile distribution and abundance. Additional monitoring/funding may be necessary for populations with large or fluctuating populations of these species.
ESU-CCCh-11.4.1.3	Action Step	Viability	Coordinate with CDFW to develop and implement plans to assess the impacts of non-native predators on Chinook salmon and steelhead populations, and where necessary, reduce populations of these species	2	50	CDFW, NMFS	
ESU-CCCh-11.4.1.4	Action Step	Viability	During the 5-year status reviews, re-assessing the status of non-native predatory species in populations where predation was not originally identified as a High or Very High threat to ensure expansion of non-native predatory species or the introduction of new predatory species has not occurred	3	50	CDFW, NMFS	
ESU-CCCh-11.4.1.5	Action Step	Viability	Compile information on predation rates of juvenile steelhead and Chinook salmon by birds (freshwater and marine), pinnipeds, and introduced fish species (e.g., striped, largemouth, and smallmouth bass) and encourage additional research and monitoring to further evaluate their impacts and potential strategies for predation reduction	2	50	CDFW, NMFS	
ESU-CCCh-11.4.1.6	Action Step	Viability	Where applicable encourage implementation of Conservation Hatchery programs for severely depressed populations that follow criteria outlined in Spence et al. (2008) an d CDFG (2004)	2	50	CDFW, NMFS, SWFSC	
11.5	**Objective**	**Viability**	**Address the inadequacy of existing regulatory mechanisms**				
ESU-CCCh-11.5.1	Recovery Action	Viability	Increase density, abundance, spatial structure and diversity				
ESU-CCCh-11.5.1.1	Action Step	Viability	Develop a recovery plan tracking system to track the implementation status of specific recovery actions identified in this recovery plan	1	20	NMFS	
ESU-CCCh-11.5.1.2	Action Step	Viability	Monitoring the implementation and effectiveness of Best Management Practices (BMPs)	3	50	BLM, CDFW, Counties, NGO, NMFS, NRCS, Private Consultants, Resource Conservation Districts, State Parks, State Water Resources Control Board, USGS, Water Agencies	With the assistance of other Federal, State, and local resource agencies, track voluntary and required implementation of best management practices (BMPs) within each diversity stratum, compile any post-implementation data that may indicate the effectiveness of the implemented BMPs, and where necessary, conduct effectiveness monitoring of BMPs
ESU-CCCh-11.5.1.3	Action Step	Viability	Develop and implement a randomized sampling program to determine whether permitees are in compliance with permits issued under local and State regulatory actions designed to protect riparian and instream habitat and applicable agencies are enforcing permit requirements.	2	50	CDFW, NMFS, SWRCB, USACE, USEPA, USFWS	
ESU-CCCh-11.5.1.4	Action Step	Viability	Work with CDFW to develop a revised protocol for implementing fish rescue for threatened species under NMFS' ESA section 4(d) rule (50 C.F.R. 223.203(b)(3)) that will enhance rescue response and efficiency, tracking relevant fisheries data obtained during the rescues (e.g., number/densities of fish per area rescued, age classes of rescued fish, and sex ratios of rescued adults), and developing criteria for estimating population-level benefits from the rescues.	1	50	CDFW, NMFS	
ESU-CCCh-11.6	**Objective**	**Viability**	**Address other natural or manmade factors affecting the species' continued existence**				
ESU-CCCh-11.6.1	Recovery Action	Viability	Increase density, abundance, spatial structure and diversity				
ESU-CCCh-11.6.1.1	Action Step	Viability	Develop and implement Hatchery and Genetic Management Plans (HGMPs). This will rely on the development of a consistent and timely approval process between CDFW and NMFS	2	20	CDFW, NMFS	

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-11.6.1.2	Action Step	Viability	Conduct annual assessments of the percent of hatchery origin spawners (pHOS) where applicable	1	50	CDFW, NGO, NMFS, NOAA SWFSC, NPS, Pacific States Marine Fisheries Commission, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, Water Agencies	To achieve broad sense recovery, pHOS should not exceed 10 percent in any population. Estimates of percent hatchery origin would developed using data obtained from spawning ground surveys and from both LCMs and hatcheries.
ESU-CCCh-11.6.1.3	Action Step	Viability	Encourage funding for the continuation and expansion of the SWFSC's ocean net surveys conducted as part of their California Current Salmon Ocean Survey	2	50	CDFW, NMFS, NOAA SWFSC, Pacific States Marine Fisheries Commission	
ESU-CCCh-12.1	**Objective**	**Agriculture**	**Address the present of threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-12.1.1	Recovery Action	Agriculture	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-12.1.1.1	Action Step	Agriculture	Continue existing cooperative conservation programs (such as Fish Friendly Farming or Fish Friendly Ranching, farming organically/biodynamically) in order to minimize the impacts of agricultural operations on habitat quality.	2	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State	
ESU-CCCh-12.1.1.2	Action Step	Agriculture	Encourage and assist the NRCS and RCDs to increase the number of landowners participating in sediment reduction planning and implementation.	2	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State	
ESU-CCCh-12.1.1.3	Action Step	Agriculture	Develop incentive programs and incentive-based approaches for landowners who conduct operations in a manner compatible with salmonid recovery requirements.	3	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State	
ESU-CCCh-12.1.1.4	Action Step	Agriculture	Continue and expand the use of cover crops in agriculture fields to reduce sediment runoff.	3	10	Private Landowners	
ESU-CCCh-12.1.2	Recovery Action	Agriculture	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-12.1.2.1	Action Step	Agriculture	Support projects that build agricultural ponds as an alternative to summer riparian diversions.	2	15	NMFS, NRCS, Private Landowners, RCD, RWQCB, State, SWRCB	
ESU-CCCh-12.1.2.2	Action Step	Agriculture	If water is used for frost protection measures, encourage SWRCB to require the use of flow metering in such circumstances to ensure flows are maintained for other beneficial uses.	2	5	NMFS, Private Landowners, RWQCB, State, SWRCB	
ESU-CCCh-12.1.2.3	Action Step	Agriculture	Utilize BMP's for irrigation (cover crop, drip) and frost protection (wind machines, cold air drains, heaters, or micro-sprayers) which eliminate or minimize water use.	2	10	NMFS, NRCS, Private Landowners, RCD, RWQCB, State	
ESU-CCCh-12.1.2.4	Action Step	Agriculture	Re-design levee systems to back-flood alluvial basin recharge zones in flood tolerant agricultural areas.	3	20	Corps, County, NMFS	
12.2	**Objective**	**Agriculture**	**Address the inadequacies of existing regulatory mechanisms.**				
ESU-CCCh-12.2.1	Recovery Action	Agriculture	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-12.2.1.1	Action Step	Agriculture	NMFS and CDFW should request to be included as technical experts in ongoing legislative efforts to craft marijuana cultivation regulations.	2	5	CDFW, NMFS	
ESU-CCCh-12.2.1.2	Action Step	Agriculture	Counties should condition approval of new developments (e.g. vineyards) in order to require developers to demonstrate that water is available, without adversely affecting public trust resources.	2	10	County, Private, SWRCB	
ESU-CCCh-12.2.1.3	Action Step	Agriculture	Promote the use of reclaimed waste water for agricultural, landscape and other appropriate applications.	2	10	City, County, Private, NMFS, State, RWQCB, SWRCB	
ESU-CCCh-12.2.1.4	Action Step	Agriculture	Encourage the use of low-flow alternatives such as micro-sprinklers, and encourage alternative forms of frost protection that do not use water, such as wind machines.	2	10	City, County, Private Landowners, NMFS, State	
ESU-CCCh-12.2.1.5	Action Step	Agriculture	NMFS and CDFW should work with state/federal attorneys and the Counties District Attorney's office to coordinate prosecutorial strategies for environmental crimes arising from marijuana cultivation.	2	5	CDFW, County, NMFS, State	
ESU-CCCh-12.2.2	Recovery Action	Agriculture	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-12.2.2.1	Action Step	Agriculture	Minimize impacts from new vineyard development by enforcement of land use zoning appropriate to the site to protect floodplain and riparian processes.	2	20	County, CDFW, NMFS	
ESU-CCCh-13.1	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-13.1.1	Recovery Action	Channel Modification	Prevent or minimize increased landscape disturbance.				

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-13.1.1.1	Action Step	Channel Modification	Collaborate with local, state, and federal agencies and non-governmental organizations to acquire fee-title to parcels or conservation easements over strategically-selected stream and riparian corridors to protect salmon and steelhead migratory, spawning, and rearing habitats.	3	50	City, County, Federal, Local, NGO, State	
ESU-CCCh-13.1.1.2	Action Step	Channel Modification	Eliminate the use of gabion baskets and undersized rock within the bankfull channel. Where riprap and other bank hardening is necessary, integrate other habitat-forming features – including large woody debris and riparian plantings and other methodologies to minimize habitat alteration effects.	2	10	City, County, Private Landowner, State, Water Agencies	
ESU-CCCh-13.1.1.3	Action Step	Channel Modification	When bank stabilization projects are required to protect existing infrastructure require bio-engineering methods including use of vegetated soil lifts, log crib walls, willow matresses and planted rock embankments where rip rap is required.	2	10	City, County, Private Landowner, State, Water Agencies	
ESU-CCCh-13.1.1.4	Action Step	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Focus on ensuring minimal disruption to watershed processes.	2	10	City, County, Private Landowner, State, Water Agencies	
ESU-CCCh-13.2	**Objective**	**Channel Modification**	**Address the inadequacy of existing regulatory mechanisms.**				
ESU-CCCh-13.2.1	Recovery Action	Channel Modification	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-13.2.1.1	Action Step	Channel Modification	Encourage Counties and municipalities to adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	15	County, County Municipalities, NMFS	
ESU-CCCh-13.2.1.2	Action Step	Channel Modification	Encourage FEMA to set regulatory standards in its Flood Insurance Program to explicitly address the protection of natural fluvial processes essential for the maintenance of naturally functioning riverine and riparian habitats.	2	15	FEMA, NMFS	
ESU-CCCh-14.1	**Objective**	**Disease/Predation/Competition**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-14.1.1	Recovery Action	Disease/Predation/Competition	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
ESU-CCCh-14.1.1.1	Action Step	Disease/Predation/Competition	Provide funding to investigate and remediate impacts of disease and predation to overall viability.	3	20	Academic, CDFW, NMFS, SWFSC	
ESU-CCCh-14.1.1.2	Action Step	Disease/Predation/Competition	Evaluate impacts of striped bass predation in coastal estuaries to juvenile and smolt salmonids and implement abatement strategies where appropriate.	2	10	CDFW, NMFS	See Monitoring Chapter
ESU-CCCh-14.1.1.3	Action Step	Disease/Predation/Competition	Support CDFW, and other resource agencies to control and contain invasive species in California.	2	10	CDFW, NMFS	
ESU-CCCh-14.1.1.4	Action Step	Disease/Predation/Competition	Provide support to the Invasive Species Council of California (ISCC), and the California Invasive Species Advisory Committee (CISAC) in their efforts to effectively control invasive species.	2	10	CISAC, ISCC, NMFS	
ESU-CCCh-14.1.1.5	Action Step	Disease/Predation/Competition	Work with Counties to modify existing tree ordinances (e.g., Heritage Tree Ordinance) to exclude protection of non-native trees (e.g., *Eucalyptus* sp.) and waive any associated fees for non-native tree removal, particularly when part of a restoration project or on pubic lands.	3	10	County, NMFS, CDFW	
ESU-CCCh-14.1.1.6	Action Step	Disease/Predation/Competition	Promote the practice of Clean, Drain, and Dry for watercraft and equipment used in aquatic environments. Additional information can be found at https://www.wildlife.ca.gov/Conservation/Invasives	2	5	Citizens, CDFW, NMFS	
ESU-CCCh-14.1.1.7	Action Step	Disease/Predation/Competition	Minimize channel modifications that create bare rock walls along migration routes to avoid creating predation habitat for bass. Where feasible modify existing sites that currently act as predation habitat hotspots.	2	19	County, NMFS, CDFW	
ESU-CCCh-15.1	**Objective**	**Fire/Fuel Management**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-15.1.1	Recovery Action	Fire/Fuel Management	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-15.1.1.1	Action Step	Fire/Fuel Management	Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
ESU-CCCh-15.1.1.2	Action Step	Fire/Fuel Management	Identify historical fire frequency, intensities and durations and manage fuel loads in a manner consistent with historical parameters.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-15.1.1.3	Action Step	Fire/Fuel Management	Include CDFW and NMFS participation on rehabilitation planning teams. During rehabilitation, consider leaving felled trees in streams as LWD source. Re-contour massively modified areas. Storm-proof roads immediately after use. Dispose of suitable organic materials by dispersing them on disturbed soils on the contour. Where larger organic material is available, place in severely burned-out watercourses (assure CDFW/NMFS is a part of this design and decision). Seeding, preferably with local seed-stock, at high hazard/risk areas should be done whenever feasible.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
ESU-CCCh-15.1.1.4	Action Step	Fire/Fuel Management	Establish fire contingency plans that involve CalFire, local fire districts and regulatory agencies with expertise in fisheries issues.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
ESU-CCCh-15.1.1.5	Action Step	Fire/Fuel Management	Use controlled, low severity fire to dampen fuel loading and crowding of forest vegetation.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
ESU-CCCh-15.1.2	Recovery Action	Fire/Fuel Management	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
ESU-CCCh-15.1.2.1	Action Step	Fire/Fuel Management	Disseminate recommendations from NMFS' October 9, 2007, jeopardy biological opinion on the use of fire retardants and its impacts to salmonids, to local firefighting agencies and CalFire.	2	5	CalFire, CDFW, Local Fire Districts, NMFS	
ESU-CCCh-15.1.2.2	Action Step	Fire/Fuel Management	Locate chemicals, petroleum products, latrines, camp sites, etc., out of riparian buffer and place on flat ground.	2	5	CalFire, CDFW, Local Fire Districts, NMFS	
ESU-CCCh-15.1.3	Recovery Action	Fire/Fuel Management	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-15.1.3.1	Action Step	Fire/Fuel Management	Obtain water from lakes and reservoirs not occupied by listed salmonids when possible. Require all water trucks/tenders be fitted with CDFW and NMFS approved fish screens when water is acquired at fish bearing streams. Put up a silt fence or other erosion controls around the water extraction locations. Avoid significantly lower stream flows during water drafting.	2	100	CalFire, CDFW, Local Fire Districts, NMFS	NMFS anticipates that it will take up to 5 years for this to be implemented but should continue in perpetuity
ESU-CCCh-16.1	**Objective**	**Fishing/Collecting**	**Address the overutilization for commercial, recreational, scientific or educational purposes.**				
ESU-CCCh-16.1.1	Recovery Action	Fishing/Collecting	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
ESU-CCCh-16.1.1.1	Action Step	Fishing/Collecting	Fishery managers should work with NMFS to develop Fishery Management and Evaluation Plans to prevent extinction and ensure fishery management is consistent with recovery of the species, and cover incidental take of federally listed salmonids.	1	5	CDFW, CA Fish and Game Commission, NMFS SFD, SWFSC	
ESU-CCCh-16.1.1.2	Action Step	Fishing/Collecting	Collaborate with CDFW to develop appropriate fisheries data in select indicator watersheds that will support Fishery Management and Evaluation Plans (FMEPs).	1	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.3	Action Step	Fishing/Collecting	Work with CDFW and Fish and Game Commission to refine freshwater sport fishing regulations to minimize unintentional and unauthorized take, and incidental mortality, of listed species by anglers during the migration period. This effort could include development of specific emergency regulations during adult migration periods between September and January, low-flow closures (much like Washington State) and angler outreach programs.	1	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.4	Action Step	Fishing/Collecting	Work with CDFW to develop protective regulations and seek funds for additional Game Wardens to minimize impacts from fishing during the migratory period (e.g., until sandbars open naturally) within one mile of the river mouths of watersheds with essential or supporting populations.	1	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.5	Action Step	Fishing/Collecting	Improve CDFW's Freshwater Sport Fishing Regulations by considering prohibiting removal of wild salmonids from the water in catch-and-release fisheries.	2	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.6	Action Step	Fishing/Collecting	Consider additional data/information requirements on the Steelhead Report Card. Consider the recording of Chinook and coho salmon incidental catch and if they are of wild or hatchery origin (adipose clipped).	2	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.7	Action Step	Fishing/Collecting	Utilizing the "reminder postcard" in efforts to increase Steelhead Report Card (SRC) return rates has worked well and is applauded by fisheries managers. Work with CDFW to consider providing, additional incentives to return SRCs by the January 31 deadline to save time and money while gaining more angler participation, which will provide more accurate information for agency evaluation.	2	5	CDFW, CA Fish and Game Commission, NMFS	Example: Oregon DFW holds a drawing each year for anglers that return their salmon/steelhead/sturgeon/halibut harvest cards before the pre-determined date. Prizes are substantial, typically including a drift boat etc.

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-16.1.1.8	Action Step	Fishing/Collecting	Work with CDFW to bring more awareness to special salmonid conservation propagation programs and improve salmonid identification outreach; especially in areas where a mixed stock fishery occurs (example: Russian River).	2	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.9	Action Step	Fishing/Collecting	Consider banning felt sole wading boots in California waters in efforts to minimize or eliminate the spread of aquatic diseases and invasive species (example: didymo, New Zealand mud snails, whirling disease, etc.).	2	5	CDFW, CA Fish and Game Commission, NMFS	
ESU-CCCh-16.1.1.10	Action Step	Fishing/Collecting	Consider other incentives for greater angler participation in fisheries restoration efforts.	2	10	CDFW, CA Fish and Game Commission, NMFS	For example, the Game Warden Stamp is an excellent way to gain more angler and hunter participation and support. Other stamp, sponsorships, and/or lottery fundraising programs that support recovery objectives should be discussed and developed.
ESU-CCCh-16.1.1.11	Action Step	Fishing/Collecting	Collaborate with NOAA OLE, CDFW, Tribes and stakeholders groups to enhance anti-poaching efforts in essential and supporting populations.	2	5	CDFW, Local Citizens, NOAA OLE, Tribes	
ESU-CCCh-16.1.1.12	Action Step	Fishing/Collecting	Determine impacts of ocean fisheries management on CC Chinook salmon in terms of VSP parameters. Identify level of ocean fishing impacts that would not limit attainment of population-specific viability criteria.	1	10	CDFW, CA Fish and Game Commission, NMFS, NMFS SFD, SWFSC	
ESU-CCCh-16.1.1.13	Action Step	Fishing/Collecting	If actual ocean fishing impacts limit attainment of population-specific viability criteria, modify management so that ocean fishing impacts do not limit attainment of population-specific viability criteria.	1	10	CDFW, CA Fish and Game Commission, NMFS, NMFS SFD	
ESU-CCCh-17.1	**Objective**	**Hatcheries**	**Address other natural or manmade factors affecting the species' continued existence.**				
ESU-CCCh-17.1.1	Recovery Action	Hatcheries	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
ESU-CCCh-17.1.1.1	Action Step	Hatcheries	For all hatchery operations, develop and implement HGMPs consistent with 50 CFR 223.203(b)(5) and hatchery criteria identified in Spence et al. (2008).	1	10	CDFW, Hatchery Managers, NMFS	Ensure the threat of hatcheries remains low for listed salmonids for current, and all future, hatchery programs.
ESU-CCCh-17.1.1.2	Action Step	Hatcheries	Hatchery managers need to implement the recommendations in the California Hatchery Scientific Review Group report (California HSRG 2012), where appropriate.	2	10	CDFW, Hatchery Managers, NMFS	
ESU-CCCh-17.1.1.3	Action Step	Hatcheries	Where applicable, for severely depressed populations investigate the implementation of Conservation Hatchery programs that follow criteria outlined in Spence et al. (2008) and CDFG (2004).	2	20	CDFW, Hatchery Managers, NMFS, SWFSC	
ESU-CCCh-18.1	**Objective**	**Livestock**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**				
ESU-CCCh-18.1.1	Recovery Action	Livestock	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-18.1.1.1	Action Step	Livestock	Aid and encourage willing landowners to fence livestock from the stream channel, municipal water sources and riparian zones and develop offstream alternative water sources.	2	15	NRCS, RCD, Private Landowners	
ESU-CCCh-18.1.1.2	Action Step	Livestock	Encourage Livestock and Ranch Managers to utilize Groundwork: A Handbook for Small-Scale Erosion Control in Coastal California (MRCD, 2007), and Management Tips to Enhance Land & Water Quality for Small Acreage Properties (Sotoyome RCD, 2007), and The Grazing Handbook (Sotoyome RCD, 2007)	3	15	NRCS, RCD, Private Landowners	
ESU-CCCh-18.1.1.3	Action Step	Livestock	Establish conservative residual dry matter (RDM) targets per acre to ensure areas are not overgrazed at the end of grazing season. Remove cattle from pasture before soils dry out.	3	15	NRCS, RCD, Private Landowners	
ESU-CCCh-18.1.1.4	Action Step	Livestock	Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff, improve soil conditions, minimize noxious weeds, and encourage native revegetation.	3	15	NRCS, RCD, Private Landowners	
ESU-CCCh-18.1.1.5	Action Step	Livestock	Work with existing cooperative conservation programs (such as Fish Friendly Farming or Fish Friendly Ranching) in order to minimize the impacts of Livestock operations on habitat quality.	3	15	NRCS, NMFS, RCD, Private Landowners	
ESU-CCCh-18.1.2	Recovery Action	Livestock	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
ESU-CCCh-18.1.2.1	Action Step	Livestock	Implement practices as outlined in the University of California guidelines for water quality protection (Ristow 2006)	2	10	NRCS, RCD, Private Landowners	
ESU-CCCh-18.1.2.2	Action Step	Livestock	Implement recommendations of the California Rangeland Water Quality Management Program.	2	10	NRCS, RCD, Private Landowners	

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of habitat or range.**				
ESU-CCCh-19.1.1	Recovery Action	Logging	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-19.1.1.1	Action Step	Logging	Encourage development of a GCP/HCP/Natural Community Conservation Plan (NCCP), conservation easements, conservation banks, or safe harbor agreements with industrial or non-industrial forestland owners.	2	50	County, Private Landowners, NMFS, State, Timber Landowners	
ESU-CCCh-19.1.1.2	Action Step	Logging	Investigate opportunities to programmatically permit the forest certification program to authorize incidental take for landowners through ESA Section 10(a)(1)(B).	3	15	NMFS, Private Landowners, Timber Landowners	
ESU-CCCh-19.1.1.3	Action Step	Logging	Consider assigning NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004) and work to implement recommendations as a result of these reviews	3	5	NMFS	
ESU-CCCh-19.1.1.4	Action Step	Logging	The State should consider a Salmonid Watershed Database (similar to the CDFW Northern Spotted Owl database) for RPFs to acquire standardized information on populations and habitat conditions in the watersheds associated with their harvest plan.	3	15	BOF, CDFW, Timber Landowners	
19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms.**				
ESU-CCCh-19.2.1	Recovery Action	Logging	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-19.2.1.1	Action Step	Logging	Discourage Counties from rezoning forestlands or identified TPZ areas to rural residential or other land uses (e.g., vineyards).	3	50	County, NMFS	
ESU-CCCh-19.2.1.2	Action Step	Logging	Increase THP inspections by CalFire especially during winter months.	3	50	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners	
ESU-CCCh-19.2.1.3	Action Step	Logging	Encourage to CalFire and BOF to explore a statewide Forestry HCP (similar to that developed in Washington State), GCP, safe harbor agreements, and seek funding opportunities to support the effort.	2	20	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners	
ESU-CCCh-19.2.1.4	Action Step	Logging	Work with the BOF through implementation of California Forest Practice Rules, Section V, CalFire, CDFW, professional organizations and landowners to modify the timber harvest permitting process to provide opportunities and incentives for LWD recruitment during timber harvest operations.	1	25	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners	
ESU-CCCh-19.2.1.5	Action Step	Logging	California BOF should consider requiring (1) EIRs for all forestland conversions, (2) adopting a forestland Conversion THP, (3) elimination of the subdivision exemption, (4) raising forestland conversion permit fees, (5) developing requirements to offset loss of timberland, (6) incentivize restoration of unproductive timberlands, (7) investigate conservation banking programs and (8) coordinate with the other agencies involved for more CalFire oversight on forestland conversions.	1	10	BOF, CDFW, NMFS, Private Landowners, Timber Landowners	
ESU-CCCh-20.1	**Objective**	**Mining**	**Address the present or threatened destruction, modification, or curtailment of habitat or range.**				
ESU-CCCh-20.1.1	Recovery Action	Mining	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-20.1.1.1	Action Step	Mining	In sites with legacy terrace gravel mining pits, remove, setback, or breach levees and re-contour mining pits to an elevation inundated by frequent winter river/stream flows; Restore the inset floodplain at elevation appropriate for modern channel and regulated winter/spring base flows.	2	20	County, EPA, NMFS, Private, State	
ESU-CCCh-20.1.1.2	Action Step	Mining	Where economically and geomorphically feasible use gravel mining to create seasonal off-channel wetland, pond, alcove and secondary channel floodplain habuitats to increase winter refuge and rearing habitat.	2	10	County, EPA, NMFS, Private, State	
20.2	**Objective**	**Mining**	**Address the inadequacy of existing regulations**				
ESU-CCCh-20.2.1	Recovery Action	Mining	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-20.2.1.1	Action Step	Mining	NMFS National Gravel Extraction Guidance (2005, 2014) and NMFS Southwest Region (2004) should be followed for all existing and proposed projects.	2	20	County, EPA, NMFS, Private, State	
ESU-CCCh-20.2.1.2	Action Step	Mining	Given the need for enormous amounts of water during fracking, oil companies and state/federal regulators should consult with NMFS/CDFW to ensure adequate water resources exist prior to developing the well. Avoid fracking operations that obtain water from underground aquifers hydrologically connected with surface streamflow.	2	10	County, EPA, NMFS, Private, State	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-20.2.1.3	Action Step	Mining	Evaluate the potential for fracking to impact surface water quality (and thus impact salmon and steelhead) where hydrologic connectivity between ground and surface water exists.	2	10	EPA, NMFS, RWQCB, State	
ESU-CCCh-21.1	**Objective**	**Recreation**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**				
ESU-CCCh-21.1.1	Recovery Action	Recreation	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)				
ESU-CCCh-21.1.1.1	Action Step	Recreation	Manage or limit mountain bike and equestrian activity on trails within state parks, state forests and on other publically-owned land that cause soil compaction, increased surface erosion, increased storm runoff and increased sediment input to stream channels.	3	10	City, County, Public, State	
ESU-CCCh-22.1	**Objective**	**Residential/Commercial Development**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**				
ESU-CCCh-22.1.1	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
ESU-CCCh-22.1.1.1	Action Step	Residential/Commercial Development	Design new developments to avoid or minimize impact to unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to the habitat of listed salmonids.	3	20	City, County, County Planners, Public Works, State	
ESU-CCCh-22.1.2	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-22.1.2.1	Action Step	Residential/Commercial Development	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining a mature and properly functioning riparian zone.	3	5	City, County, County Planners, Public Works, State	
ESU-CCCh-22.1.2.2	Action Step	Residential/Commercial Development	New development in all watersheds with essential and supporting populations should be designed to minimize storm-water runoff and changes in duration or magnitude of peak flow.	3	20	City, County, County Planners, RWQCB, State	
ESU-CCCh-22.2	**Objective**	**Residential/Commercial Development**	**Address the inadequacy of existing regulatory mechanisms.**				
ESU-CCCh-22.2.1	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to stream hydrology (impaired water flow).				
ESU-CCCh-22.2.1.1	Action Step	Residential/Commercial Development	As mitigation for potential adverse consequences to a watershed's hydrograph, municipalities and counties should develop and implement larger or more effective stormwater detention methods in key watersheds with ongoing channel degradation or in sub-watersheds where impervious surface area > 10 percent.	2	20	CDFW, County, Municipalities, NMFS, SWRCB	
ESU-CCCh-22.2.1.2	Action Step	Residential/Commercial Development	Develop and implement regulations for activities that intercept groundwater recharge.	2	10	CDFW, County, DWR, NMFS	
ESU-CCCh-22.2.1.3	Action Step	Residential/Commercial Development	Work with partners to develop legislation that will fund county planning for environmentally sound growth and water supply development and work in coordination with California Dept. of Housing, and other government associations (CDFG 2004).	2	30	County, NMFS, State	
ESU-CCCh-22.2.2	Recovery Action	Residential/Commercial Development	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-22.2.2.1	Action Step	Residential/Commercial Development	Enforce existing building permit programs to minimize unpermitted construction.	3	50	City, County, County Planner	
ESU-CCCh-22.2.2.2	Action Step	Residential/Commercial Development	Modify Federal, State, city and county regulatory and planning processes to prevent or minimize new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all watersheds with essential and supporting populations.	2	15	City, County, Federal, NMFS, State	
ESU-CCCh-22.2.2.3	Action Step	Residential/Commercial Development	Identify forestlands or oak woodland areas at high risk of conversion, and develop incentives and alternatives for landowners to discourage conversion.	3	15	City, County, County Planner	
ESU-CCCh-22.2.2.4	Action Step	Residential/Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential development.	2	50	City, County, County Planner, NMFS, State	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-22.2.2.5	Action Step	Residential/Commercial Development	Develop legislation that will fund county planning for environmentally sound growth and water supply and work in coordination with California Dept. of Housing, Association of Bay Area Governments, and other government associations (CDFG 2004).	2	15	City, County, County Planner, NMFS, State	
ESU-CCCh-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
ESU-CCCh-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
ESU-CCCh-23.1.1.1	Action Step	Roads/Railroads	For all rural (unpaved) and seasonal dirt roads apply, at a minimum, the road standards outlined in the most recent version of the California Forest Practice Rules.	2	50	BOF, Local, RWQCB, Timber Landowners	For roads subject to the California Forest Practices Rules
ESU-CCCh-23.1.1.2	Action Step	Roads/Railroads	Design new roadways to avoid or minimize effects to unstable slopes, wetland, floodplains and other areas of high habitat value.	2	50	BOF, Local, RWQCB, Timber Landowners	This action is consistent with requirements in California Forest Practices Rules at 14 CCR §§ 923 - 923.9.1.
ESU-CCCh-23.1.1.3	Action Step	Roads/Railroads	Conduct annual inspections of roads prior to winter. Correct conditions that are likely to deliver sediment to streams.	2	50	BOF, Local, RWQCB, Timber Landowners	This action is consistent with requirements in California Forest Practices Rules at 14 CCR §§ 923 - 923.9.1.
ESU-CCCh-23.1.1.4	Action Step	Roads/Railroads	Restoration projects that upgrade or decommission high risk roads adjacent to streams supporting listed salmonids should be considered an extremely high priority for funding (e.g., PCSRF).	2	50	BOF, Local, RWQCB, Timber Landowners	
ESU-CCCh-23.1.1.5	Action Step	Roads/Railroads	Conduct outreach and continual education regarding the adverse effects of roads and the types of best management practices protective of salmonids. Education should address watershed process and the adverse effects of improper road construction and maintenance on salmonids and their habitats.	3	50	BOF, CalTrans, CDFW, NMFS, Timber Landowners	
ESU-CCCh-23.1.1.6	Action Step	Roads/Railroads	Evaluate and mitigate (where appropriate) the effects of transportation corridors and infrastructure on estuarine and stream fluvial processes. Mitigating measures may include, elevating existing approach, fill and maximizing clear spanning of upstream active channel(s), floodways, and floodplains to accommodate natural riverine and estuarine fluvial processes.	3	50	CDFW, NMFS, Timber Landowners	
ESU-CCCh-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration.				
ESU-CCCh-23.1.2.1	Action Step	Roads/Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and review appropriate barrier databases when developing new or retrofitting existing road crossings.	2	50	CalTrans, CDFW, City, County, County Planner, Engineers, NMFS, State	
ESU-CCCh-23.1.2.2	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents (i.e., pilings) feasible in order to minimize drift accumulation and facilitate fish passage.	2	50	CalTrans, CDFW, City, County, County Planner, Engineers, NMFS, State	
ESU-CCCh-23.1.2.3	Action Step	Roads/Railroads	For impact pile driving during construction, develop and implement sound attenuation methods that ensure sound levels are (1) below thresholds for onset of physical injury to fish (see NMFS' 2008 Interim Criteria for Injury to Fish from Pile Driving), (2) avoiding adverse behavioral effects (e.g., during adult migration, etc.), and (3) minimized by a reduction in the sound field (e.g., reduce the size of the area impacted). In situations where sound attenuation is not able to keep sound pressure at sub-injurious levels (i.e., sound levels that will not harm or injure fish), work should be conducted during seasonal work windows to avoid migrating salmonids.	2	50	CalTrans, CDFW, City, County, Engineers, NMFS, State	
ESU-CCCh-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance.				
ESU-CCCh-23.1.3.1	Action Step	Roads/Railroads	Encourage implementation of Vegetation Management Plans for the roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.	3	50	CalTrans, CDFW, City, County, NMFS, State	
ESU-CCCh-23.2	**Objective**	**Roads/Railroads**	**Address the inadequacy of existing regulatory mechanisms.**				
ESU-CCCh-23.2.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-23.2.1.1	Action Step	Roads/Railroads	Support and engage CalTrans, counties and others with oversight on road practices to reduce sediment delivery to streams from road networks and channelization from poorly situated roads.	2	50	CalTrans, County, NMFS, RWQCB	
ESU-CCCh-23.2.1.2	Action Step	Roads/Railroads	Encourage enforcement of existing regulations regarding grading, riparian and building violations and sediment release from county roads.	2	50	CalTrans, County, NMFS, RWQCB	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-24.1	**Objective**	**Severe Weather Patterns**	**Address other natural or manmade factors affecting the species continued existence.**				
ESU-CCCh-24.1.1	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-24.1.1.1	Action Step	Severe Weather Patterns	Actively conduct outreach to stakeholders and the public regarding anticipated effects of climate change to salmonids and increase awareness that human actions can offset these effects. The public, local, state and federal agencies should become familiar with, and implement as necessary through lifestyle and policy changes, recommendations of the Intergovernmental Panel on Climate Change (IPCC).	3	5	Federal, Local, NMFS, Public, State	See the website http://www.ipcc.ch to view a summary of climate change issues for North America and the suite of actions from the IPCC to be considered for ecosystem (and human health) due to climate change.
ESU-CCCh-24.1.1.2	Action Step	Severe Weather Patterns	Develop a climate strategy that addresses simultaneously the reduction of fossil fuels and the protection of forestlands.	3	15	Academic, NWFSC, State, SWFSC,	For example, promote biological carbon sequestration best management practices (BMPs), where feasible, that are consistent with NMFS policies and guidelines. Develop incentives to maintain and rehabilitate forestlands, manage for older forests, discourage conversions or forest changes. Forestlands store carbon and reduce greenhouse gases.
ESU-CCCh-24.1.1.3	Action Step	Severe Weather Patterns	Expand research and monitoring to improve predictions of climate change and its effects on salmon recovery.	2	15	Academic, NWFSC, State, SWFSC,	Tools such as the Regional Climate System Model, Sea Level Rise and Coastal Flooding Impacts Viewer, etc. should be used to improve ecological forecasting of the threat of climate change, human population growth, and their impacts to salmonids and their habitats.
ESU-CCCh-24.1.1.4	Action Step	Severe Weather Patterns	Minimize anthropogenic increases in water temperatures by maintaining well-shaded riparian areas. Work to encourage and incorporate climate change vulnerability assessments and climate change scenarios in consultations, permitting, and restoration projects.	2	50	CDFW, Corps County, NMFS, NOAA RC, State	
ESU-CCCh-24.1.1.5	Action Step	Severe Weather Patterns	Maintain headwater areas in an undisturbed state to ensure a continuous source of cool water downstream.	1	50	CDFW, Corps, County, NMFS, NOAA RC, State	
ESU-CCCh-24.1.1.6	Action Step	Severe Weather Patterns	Maximize connectivity, and increase diversity, of instream habitats to allow a full range of opportunities for salmonids to exploit as environmental conditions shift.	2	100	CDFW, County, NMFS, State	
ESU-CCCh-24.1.1.7	Action Step	Severe Weather Patterns	Evaluate feasibility and benefits of establishing an Emergency Drought Operations Center (similar to the Emergency Drought Operations Center developed in Washington State), comprised of the SWRCB, CDFW, NMFS, and others to develop emergency rules for augmenting water supplies and mitigating the effects of drought and extreme climate listed salmonids and their habitats.	2	5	CDFW, NMFS, SWRCB	
ESU-CCCh-24.1.1.8	Action Step	Severe Weather Patterns	Institute water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	1	50	CDFW, DWR, Local Government, Private Landowners, NMFS, SWRCB	
ESU-CCCh-24.1.1.9	Action Step	Severe Weather Patterns	Partner with land owners and local governments to explore the use of groundwater sources with high yield, such as Karst formations, and manage them as groundwater storage/banking, particularly during drought periods, or for adverse climate change conditions.	3	50	DWR, Local Government, Private Landowners, NMFS, USGS	
ESU-CCCh-24.1.2	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to estuarine quality and extent				
ESU-CCCh-24.1.2.1	Action Step	Severe Weather Patterns	Investigate the potential impact of sea level rise from climate change on the amount of salinity intrusion into fresh and brackish water habitats.	2	15	Academic, NWFSC, State, SWFSC,	
ESU-CCCh-25.1	**Objective**	**Water Diversion/Impoundments**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
ESU-CCCh-25.1.1	Recovery Action	Water Diversion/Impoundments	Prevent or minimize impairment to watershed hydrology				

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-25.1.1.1	Action Step	Water Diversion/Impoundments	Encourage cooperation among water users and coordination of their diversions where they share a common water source to minimize adverse effects of diversions on the species' habitat.	2	50	Private Landowners, NGO, NMFS, SWRCB	
ESU-CCCh-25.1.1.2	Action Step	Water Diversion/Impoundments	Work with partners to promote and build water storage as an alternative to direct diversion during periods of low stream flow.	2	50	Private Landowners, NGO, NMFS, SWRCB	The off-stream storage can also be used to store water for fish and then release it in times of low-flow. See also Hydrology
ESU-CCCh-25.1.1.3	Action Step	Water Diversion/Impoundments	Support projects that provide rainwater catchment systems to rural residential as an alternative to summer riparian diversions.	2	50	Private Landowners, NGO, NMFS	
ESU-CCCh-25.1.1.4	Action Step	Water Diversion/Impoundments	Partner with water rights holders to dedicate water already claimed under existing appropriative right to be used instead for instream benefits under California Water Code Section 1707.	2	50	CDFW, Private Landowners, NMFS, SWRCB	
ESU-CCCh-25.1.1.5	Action Step	Water Diversion/Impoundments	Explore the possibility of using other easement mechanisms to dedicate water to instream uses.	2	50	CDFW, NMFS, SWRCB	
ESU-CCCh-25.1.1.6	Action Step	Water Diversion/Impoundments	Support temporary urgency change petitions by appropriative water right holders during critically dry periods if it will provide a benefit to salmonids.	2	50	CDFW, NMFS, SWRCB	
ESU-CCCh-25.1.1.7	Action Step	Water Diversion/Impoundments	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	3	50	CDFW, NMFS, Private Landowners, SWRCB	
ESU-CCCh-25.1.1.8	Action Step	Water Diversion/Impoundments	Support improvement of major dam/reservoir operations. Evaluate water release schedules and work with partners to modify as needed to improve conditions for salmonids downstream.	1	50	CDFW, NMFS, Public Works, Water Agencies, SWRCB	
ESU-CCCh-25.1.1.9	Action Step	Water Diversion/Impoundments	Support technical solutions to improved short-term precipitation forecasting where such information will facilitate more efficient management of reservoir storage.	3	50	NMFS, NOAA NWS	
ESU-CCCh-25.2	**Objective**	**Water Diversion/Impoundments**	**Address the inadequacy of existing regulatory mechanisms**				
ESU-CCCh-25.2.1	Recovery Action	Water Diversion/Impoundments	Prevent or minimize impairment to watershed hydrology				
ESU-CCCh-25.2.1.1	Action Step	Water Diversion/Impoundments	Encourage the SWRCB to exercise greater regulatory authority over summer water diversions.	1	50	CDFW, NMFS, SWRCB	
ESU-CCCh-25.2.1.2	Action Step	Water Diversion/Impoundments	Work with the SWRCB and explore the feasibility of upgrading bypass flow conditions for water rights developed prior to the establishment of AB 2121.	2	10	NMFS, Private Landowners, Public Works, Water Agencies, SWRCB	
ESU-CCCh-25.2.1.3	Action Step	Water Diversion/Impoundments	Support State agencies in implementing groundwater legislation (AB 1739, SB 1168, and SB 1319) where it may result in improved surface water conditions via groundwater/surface water interaction.	2	10	County, DWR, NMFS, Private Landowners, Public Works, Water Agencies	
ESU-CCCh-25.2.1.4	Action Step	Water Diversion/Impoundments	Improve coordination between the agencies, particularly the SWRCB and county District Attorneys, to effectively identify and address illegal water diverters and out-of-compliance diverters, seasons of diversion, off-stream reservoirs, and bypass flows to protect listed salmonids.	1	5	County, NMFS, Private Landowners, Public Works, Water Agencies, SWRCB	
ESU-CCCh-25.2.1.5	Action Step	Water Diversion/Impoundments	Evaluate the recovery benefits of declaring some watersheds as fully appropriated and petition the SWRCB to formally declare it if appropriate.	2	10	NMFS, SWRCB	
ESU-CCCh-25.2.1.6	Action Step	Water Diversion/Impoundments	Provide technical assistance to the SWRCB in its implementation of the frost protection regulation.	2	10	Agriculture Owners, County, NMFS, Private Landowners, SWRCB	
ESU-CCCh-25.2.1.7	Action Step	Water Diversion/Impoundments	Encourage the SWRCB to conduct interagency consultation with CDFW, and seek technical assistance from NMFS on the issuance of water rights permits.	2	10	CDFW, NMFS, SWRCB	
ESU-CCCh-25.2.1.8	Action Step	Water Diversion/Impoundments	Counties should consider forbearance agreements that eliminate withdrawals during low-flow conditions.	2	5	CDFW, County, NMFS, Private Landowners, SWRCB	
ESU-CCCh-25.2.1.9	Action Step	Water Diversion/Impoundments	Coordinate with CDFW and the SWRCB to ensure the effective implementation of California Fish and Game Code Sections 5935-5937 regarding the provision of fishways and fish flows associated with dams and diversions.	2	5	CDFW, NMFS, SWRCB	

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
ESU-CCCh-25.2.1.10	Action Step	Water Diversion/Impoundments	Encourage development of a GCP/HCP/Natural Community Conservation Plan (NCCP), conservation banks, or safe harbor agreements for new water diversions in watersheds with essential and supporting populations.	3	5	CDFW, NMFS	
ESU-CCCh-25.2.2	Recovery Action	Water Diversion/Impoundments	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
ESU-CCCh-25.2.2.1	Action Step	Water Diversion/Impoundments	Adequately screen water diversions to prevent juvenile salmonid mortalities.	1	50	CDFW, County, NMFS, Private Landowners	
ESU-CCCh-25.2.2.2	Action Step	Water Diversion/Impoundments	Screen all off stream catchments, ponds, reservoirs with overflows and properly maintain them at all times especially before and after storm events to insure protection of listed species from escaped non-native fish.	2	50	CDFW, County, NMFS, Private Landowners	

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