

COASTAL MULTISPECIES PLAN



Photo Courtesy: Morgan Bond, NOAA Southwest Fisheries Science Center, CCC Steelhead, Scott Creek, CA

VOLUME IV

CENTRAL CALIFORNIA COAST STEELHEAD

**PUBLIC DRAFT
OCTOBER 2015**



DISCLAIMER

Recovery plans delineate such reasonable actions as may be necessary, based upon the best scientific and commercial data available, for the conservation and survival of listed species. Plans are published by the National Marine Fisheries Service (NMFS), sometimes prepared with the assistance of recovery teams, contractors, State agencies and others. Recovery plans do not necessarily represent the views, official positions or approval of any individuals or agencies involved in the plan formulation, other than NMFS. They represent the official position of NMFS only after they have been signed by the Assistant or Regional Administrator. Recovery plans are guidance and planning documents only; identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in any one fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C 1341, or any other law or regulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery actions.

LITERATURE CITATION SHOULD READ AS FOLLOWS:

National Marine Fisheries Service. 2015. Public Draft Coastal Multispecies Recovery Plan. National Marine Fisheries Service, West Coast Region, Santa Rosa, California.

ADDITIONAL COPIES MAY BE OBTAINED FROM:

Attn: Recovery Team
National Marine Fisheries Service
Protected Resources Division
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95467

Or on the web at:

http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead.html

TABLE OF CONTENTS

Disclaimer	i
Table of Contents for Volume IV Populations.....	iii
Introduction to CCC Steelhead DPS Recovery	1
CCC Steelhead DPS Listing, Reviews & Recovery Criteria	4
CCC Steelhead Listing.....	4
CCC Steelhead Section 4(a)(1) Threats.....	4
DPS Recovery Goals, Objectives and Criteria.....	19
Biological Recovery Criteria	20
ESA § 4(a)(1) Factors Recovery Criteria.....	24
Conservation Efforts.....	26
DPS and Diversity Strata Results.....	27
Diversity Strata Attribute and Threat Results	27
North Coastal Diversity Stratum Results	29
Interior Diversity Stratum Results.....	33
Santa Cruz Mountains Diversity Stratum Results	37
Coastal San Francisco Bay Diversity Stratum Results	41
Interior San Francisco Bay Diversity Stratum Results	44
DPS CAP Viability Results	47
DPS CAP Threat Results	59
DPS Level Recovery Actions	62
Literature Cited	80

TABLE OF CONTENTS FOR VOLUME IV POPULATIONS

Population-Level Results and Recovery Actions

Russian River Overview

North Coastal Diversity Stratum

- Austin Creek
- Green Valley Creek
- Lagunitas Creek
- Salmon Creek
- Walker Creek
- North Coastal Diversity Strata Rapid Assessment
 - Drakes Bay Tributaries
 - Estero Americano Creek
 - Pine Gulch
 - Redwood Creek (Marin Co.)
- North Coastal Diversity Strata: Russian River Populations Rapid Assessment
 - Dutch Bill Creek
 - Freezeout Creek
 - Hulbert Creek
 - Porter Creek
 - Sheephouse Creek
 - Willow Creek

Interior Diversity Stratum

- Dry Creek
- Maacama Creek
- Mark West Creek
- Upper Russian River
- Interior Diversity Stratum Rapid Assessment
 - Crocker Creek

- Gill Creek
- Miller Creek (Russian)
- Sausal Creek

Coastal San Francisco Bay Diversity Stratum

- Corte Madera Creek
- Guadalupe River
- Novato Creek
- San Francisquito Creek
- Stevens Creek
- Coastal S.F. Bay Rapid Assessment
 - Arroyo Corte Madera del Presidio
 - Miller Creek (Marin Co.)
 - San Mateo Creek

Interior San Francisco Bay Diversity Stratum

- Alameda Creek
- Coyote Creek
- Green Valley/Suisun Creek
- Napa River
- Petaluma River
- Sonoma Creek
- Interior SF Bay Diversity Stratum Rapid Assessment
 - Codornices Creek
 - Pinole Creek
 - San Leandro Creek
 - San Lorenzo Creek
 - San Pablo Creek
 - Wildcat Creek

Santa Cruz Mountains Diversity Stratum

- Aptos Creek
- Pescadero Creek
- Pilarcitos Creek
- San Gregorio Creek
- San Lorenzo River
- Scott Creek
- Soquel Creek
- Waddell Creek
- Santa Cruz Mountains Diversity Stratum Rapid Assessment
 - Gazos Creek
 - Laguna Creek
 - San Pedro Creek
 - San Vicente Creek
 - Tunitas Creek

INTRODUCTION TO CCC STEELHEAD DPS RECOVERY

The Central California Coast (CCC) steelhead Distinct Population Segment (DPS) historically consisted of five Diversity Strata with 38 independent populations of winter-run steelhead (12 functionally independent and 26 potentially independent) and 22 dependent populations (Spence *et al.* 2008; Spence *et al.* 2012). The delineation of the CCC steelhead DPS Diversity Strata was based on environmental and ecological similarities and life history. Five strata were identified by Bjorkstedt *et al.* (2005): North Coastal, Interior, Santa Cruz Mountains, Coastal San Francisco Bay, and Interior San Francisco Bay. From the historical structure, we have selected a total of 56 populations across the five Diversity Strata to represent the recovery scenario for the CCC steelhead DPS (Figure 1). To meet the minimum biological viability criteria set forth in Spence *et al.* (2012), passage above several man-made dams is recommended for the CCC steelhead recovery scenario (See Appendix G for more information). The biological recovery criteria for the 56 populations are (Biological Recovery Criteria):

- 28 essential independent populations attaining a low extinction risk (*i.e.*, Corte Madera Creek, Guadalupe River, Novato Creek, San Francisquito Creek, Stevens Creek, Dry Creek, Maacama Creek, Mark West Creek, Upper Russian River, Alameda Creek, Coyote Creek, Green Valley/Suisun Creek, Napa River, Petaluma River, Sonoma Creek, Austin Creek, Green Valley Creek, Lagunitas Creek, Salmon Creek, Walker Creek, Aptos Creek, Pescadero Creek, Pilarcitos Creek, San Gregorio Creek, San Lorenzo River, Scott Creek, Soquel Creek and Waddell Creek);
- Five supporting independent populations attaining moderate extinction risk criteria (*i.e.*, San Mateo Creek, San Leandro Creek, San Lorenzo Creek, Americano Creek and Laguna Creek); and
- 18 supporting dependent populations contributing to redundancy and occupancy criteria (*i.e.*, Miller Creek (Marin Co.), Arroyo Corte de Madera Creek; Crocker Creek, Gill Creek, Miller Creek (Russian), Sausal Creek, San Pablo Creek, Dutch Bill Creek (Russian), Freezeout Creek (Russian), Hulbert Creek (Russian), Pine Gulch, Porter Creek (Russian), Redwood Creek (Marin Co.), Sheephouse Creek (Russian), Willow Creek (Russian), Gazos Creek, San Vicente Creek, and Tunitas Creek).

- Five supporting dependent populations with no IP that contribute to the redundancy and occupancy criteria; Codornices Creek, Pinole Creek, Wildcat Creek, Drakes Bay tributaries, and San Pedro Creek.

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



Figure 1: CCC Steelhead DPS, Diversity Strata, and Essential and Supporting Populations

CCC STEELHEAD DPS LISTING, REVIEWS & RECOVERY CRITERIA

The CCC steelhead DPS was listed as a federally threatened species in 2000 (65 FR 36074). Status reviews conducted in 2005 and 2010 affirmed the threatened status of the species. This section of Volume IV includes a description of the listing decision for the CCC steelhead DPS, 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, and CCC steelhead recovery criteria.

CCC STEELHEAD LISTING

In response to numerous petitions, and as the result of a comprehensive status review of West Coast steelhead (Busby *et al.* 1996), the CCC steelhead ESU was proposed for listing as endangered under the ESA on August 9, 1996 (61 FR 56138). On August 18, 1997, the CCC steelhead ESU was listed as threatened under the ESA (62 FR 43937). On January 5, 2006, after an updated status review on a number of West Coast salmonid ESUs, NMFS reaffirmed the threatened status of CCC steelhead and applied the DPS policy to the species noting that the resident and anadromous life forms of *O. mykiss* remain “markedly separated” as a consequence of physical, physiological, ecological, and behavioral factors, and may thus warrant delineation as separate DPSs (71 FR 834). The listed DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations in California streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. In addition, the listed DPS includes two artificial propagation programs: the Don Clausen Fish Hatchery, and the Kingfisher Flat Hatchery/Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs.

CCC STEELHEAD 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 CCC steelhead DPS 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 are summarized below.

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

Factor A At Listing:

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

Factor A Since Listing:

The restoration of steelhead habitats has been a primary focus of Federal, State and local entities. The State of California Fisheries Restoration Grant Program alone has invested over \$250 million dollars and supported approximately 3,500 salmonid restoration projects. These projects include fish passage, water conservation, improving instream habitats, watershed monitoring, education, and organizational support to watershed groups. Restoration efforts have improved conditions in some areas; however, the activities that led to habitat degradation continue, and some populations and strata remain nonviable.

All threats identified at listing continue to impair CCC steelhead and their habitats, and several threats (urbanization, habitat blockages, water diversions, water management, instream habitat problems, and certain agriculture [illegal marijuana cultivation operations]), pose particularly severe threats to the DPS. Specifically, habitat blockages and instream habitat problems associated with water diversions, water management, and urbanization, impair viability of populations and, in some areas (*e.g.*, the greater San Francisco Bay Area), multiple strata. In particular, the combined effects associated with water diversions and management (particularly dams, reservoirs, and diversions) and urbanization are leading to further destabilization and impairment of the DPS overall. Combined, these effects contribute significantly to the imperiled status of these populations, have likely worsened since listing, and, without significant improvement, may be expected to contribute to the worsening of the ongoing poor viability of these affected populations. Existing and expanding urban and water system development¹ has the potential to further destabilize already imperiled populations, leading to destabilization and non-viability of affected strata and further destabilization of the DPS overall. When considered with the population structure of CCC steelhead, these population-

¹ Although more local governments are now attempting to consider the environment in their management and development decisions, urban-related impacts are likely to worsen in the future as the Bay Area population grows by a predicted 30% between the years 2010 and 2040 (ABAG 2013). The recently approved California State Water Bond (the 2014 Proposition 1) includes \$2.7 billion for future reservoir and dam construction. Although potential reservoir sites have not yet been identified, the possibility remains that new water storage facilities, and associated effects, may be developed within the CCC steelhead DPS.

and strata-level effects result in DPS-level effects; suggesting that these ongoing and worsening impairments preclude the conservation and recovery of the species.

In addition to the traditional surface water impairments associated with water development and urbanization, a new, or newly recognized, threat associated with groundwater overuse (an ongoing water development threat, but recently recognized, specifically, by state legislation) in California deserves special attention. Groundwater, which is often hydrologically linked to surface flow in adjacent stream channels, has been recognized as overallocated in California, and recent state legislation has been developed to address this (Groundwater Sustainability Management Act [GSMA], signed into state law in October 2014). Importantly, with the GSMA, environmental beneficial uses, including cold water fisheries, are to be considered when balancing competing uses for an aquifer's safe yield, which suggests that minimizing groundwater pumping impacts on streamflow will be an integral part of future groundwater management. These anticipated improvements to groundwater management have the potential to improve stream habitat impaired by long-term over extraction. However, the resource benefits may take time to be realized - the GSMA allows 40 years to achieve sustainability criteria; thus, currently impaired streamflow and habitat conditions will generally persist across the DPS during at least the next decade or two.

A more recently recognized threat, illicit agriculture (specifically, illicit marijuana cultivation, a growing new threat within the DPS), 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. 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, particularly within the northern portions of the DPS. While the threat from legal agriculture is generally stabilizing, or lessening in its rate of threat, due to regulation and implementation of voluntary practices (*e.g.*, Fish Friendly Farming and Ranching), illegal marijuana cultivation has

grown unchecked since listing and will continue to degrade steelhead habitat and impair recovery until adequate controls and regulations, such as those that govern legitimate agriculture, are enacted. Where prevalent, activities associated with illegal marijuana cultivation have the potential to further destabilize populations and strata; thereby posing a new and growing threat with the potential to impair or preclude recovery of the DPS.

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

Factor B At Listing:

Threats identified for Factor B at listing included historical over-fishing, poaching, unauthorized driftnet fishing on the high seas, scientific utilization and commercial, recreational and tribal harvest. Over-fishing in the early days of European settlement led to the depletion of many stocks of steelhead even before extensive habitat degradation. During periods of decreased habitat availability (*i.e.*, drought or low flow conditions), recreational fisheries have had greater impact on wild steelhead. Poaching was considered a serious problem on several tributaries to San Francisco Bay and on coastal rivers south of San Francisco Bay.

Utilization for scientific research and education programs was identified as having little impact on CCC steelhead populations since take of this nature is through the issuance and conditioning of scientific permits. However, no comprehensive total or estimate of steelhead mortalities related to scientific sampling was available for any watershed or steelhead stock in the state.

Factor B Since Listing:

Legal Harvest: Ocean harvest of steelhead is rare and an insignificant source of mortality for the DPS, and recreational fishing is limited to hatchery-origin fish (NMFS 2011). To address

potential drought-related exacerbation of freshwater recreational fishing impacts², low-flow fishing closures will be implemented for the first time on coastal rivers in Sonoma and Mendocino counties (Sonoma County is located within the range of the CCC steelhead DPS), which will likely lower angling pressure by banning fishing during low baseflow conditions when adult fish (predominantly steelhead, Chinook salmon and coho salmon) are most vulnerable to capture and harassment. In conclusion, overfishing as a threat to CCC steelhead survival has diminished significantly since the time of initial listing.

Illegal Harvest: Freshwater poaching may occur, and losing several adult fish could significantly impact population productivity and genetic diversity in watersheds where current abundance is below the “high risk” threshold (per Spence *et al.* 2006). The overall risk of illegal harvest has remained much the same since the initial listing of the species.

Scientific Collection: Since the listing of this DPS, the take of CCC steelhead 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 approval 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 DPS. Between 2004 and 2010, the actual reported percent mortality of CCC steelhead 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

2 The previous 5 year status review for CCC steelhead (NMFS 2011) identifies that periods of drought or low flow can reduce habitat availability and concentrate fish and that this may result in increased fishing impacts in localized areas even though overall fishing efforts may be unchanged.

Research Program is not likely to jeopardize the continued existence of CCC steelhead. This is consistent with the original listing (71 FR 834; January 5, 2006) which determined that collection for scientific research and education programs was determined to have little or no impact on populations in CCC steelhead DPS. Impacts associated with scientific collection are believed to be unchanged since the last status review (NMFS, 2011) and not expected to be an important source of mortality for the DPS. Thus, scientific research is not a threat under Factor B contributing to the decline and threatened status of CCC steelhead.

Factor C: Disease or Predation

Factor C At Listing:

Disease, freshwater predation, and marine predation were identified as threats for Factor C at listing. Specific diseases that affected steelhead were bacterial kidney disease (BKD), *ceratomyxosis*, *columnaris*, *Furunculosis*, infectious hematopoietic necrosis (IHNV), redmouth and black spot disease, Erythrocytic Inclusion Body Syndrome (EIBS) and whirling disease. In general, very little information existed to quantify changes in infection levels and mortality rates attributable to these diseases. Studies showed naturally spawned fish tended to be less susceptible to pathogens than hatchery-reared fish but could contract disease if they interbred with infected hatchery fish. Steelhead co-evolved with specific communities of these organisms, but the widespread use of artificial propagation introduced exotic organisms not historically present. Juvenile steelhead infected with BKD were found unable to make appropriate changes in kidney function for a successful transition to saltwater. Habitat conditions, such as low water flows, high temperatures, and artificial passage routes through man-made barriers, exacerbated susceptibility to infectious diseases.

Freshwater predation increased as a result of low flow conditions and spillways, water conveyances or other outfalls from water development which crowded and disoriented steelhead. Bass, channel catfish, squawfish (*e.g.*, Sacramento pikeminnow) and others were found to consume significant numbers of juvenile steelhead. Striped bass was of particular concern for many watersheds including the Russian River. Predation by pinnipeds (*e.g.*, harbor

seals and California sea lions, in particular) was a concern due to the increase in their numbers along the Pacific Coast combined with the dwindling run sizes of CCC steelhead. Steelhead historically coexisted with pinnipeds and although predation could have potentially suppressed recovery, it was found unlikely to cause the low numbers of fish existing at the time of listing. It was reported that predation on anadromous salmonids by harbor seals and California sea lions at the mouth of the Russian River was minimal (Hanson 1993). Most investigators at the time of listing considered predation to be an insignificant contribution to the large declines.

Factor C Since Listing:

Many common disease pathogens exist in wild populations of steelhead, but increased individual resistance and natural ecological dynamics limit disease outbreaks and any resulting population-level impacts. No new information has emerged since listing that would suggest disease impacts have elevated in the time since, or that disease impacts are more than a minor factor in the present depressed state of the CCC steelhead DPS.

Predation was not considered a significant threat to CCC steelhead recovery during the past status review or at the time of listing (NMFS 2011; 71 FR 834, January 5, 2006), and there is no information indicating that predation is a significant threat to CCC steelhead or that the risk of predation has increased. Adult and juvenile steelhead encounter many natural predators, and the resultant loss in abundance and productivity is likely one (albeit a minor one) of myriad stressors preventing the species from attaining population viability. Predation by robust (per historical standards) pinniped populations likely impact adult steelhead escapement in larger river systems where seals/sea lions tend to aggregate (e.g., Russian River and San Lorenzo River). However, abundant pinnipeds off the California coast are nothing new; huge population growth was spurred by passage of the federal Marine Mammal Protection Act in 1972, suggesting that whatever impact pinniped predation may have on steelhead populations has likely been operating at a similar level for decades. A similar conclusion can likely be reached regarding other predators, both native and invasive. Habitat conditions, such as low

water flows and high temperatures, do continue to exacerbate susceptibility to both disease and predation, however, through increased physiological stress and physical injury.

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 steelhead 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 CCC steelhead. The following were identified as having inadequate regulatory mechanisms 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
- 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
- NMFS
 - ESA section 7
 - Section 10 and HCPs, including 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 CCC steelhead persist, have improved or have been identified as not relevant. The primary regulatory mechanisms that protect CCC steelhead 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 2006). However, although the NFP generally contains effective regulations that minimize timber harvest-related impacts that harm salmonid habitat, its impact within the CCC steelhead DPS is rather limited given the relatively small percentage of federal land. 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 CCC DPS. However, many of these riparian-specific rule changes were not adopted in the forest district that overlies the southern portion of the ESU, meaning riparian habitats in this area are not protected to the same degree as districts located farther north. 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. San Mateo and Santa Cruz counties have grading ordinances or regulations less protective of aquatic habitat than Sonoma County, and 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. The issue of marijuana regulation will likely be a

contentious topic in the coming few years -- a ballot initiative legalizing recreational use of marijuana is expected on the state ballot in 2016, and a legislative effort to craft a bill legalizing recreational use may gain traction in 2015. While these 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.

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. Most large rivers and stream in the CCC steelhead DPS 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 Act³). Many of the waterbodies listed will have Total Maximum Daily Loads identified, and an action plan for 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, regulates dredge and fill within the ordinary high water mark of streams, rivers, wetlands, and other waterbodies. Likewise, CDFW performs a similar role for the state through their Streambed Alteration Agreement program (Fish and Game Code section 1602). Though both these programs analyze potential environmental impacts of the

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

instream dredging, fill, and construction project in question, damage from upslope land grading remains largely under county oversight and is not properly analyzed or considered.

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

Factor E At Listing:

The manmade factors of artificial propagation and hatchery programs and the natural factors of drought, floods, El Nino events, climatic conditions, fires, variability in natural environmental conditions and ocean conditions were identified as threats under Factor E at the time of listing.

Artificial propagation was identified as negatively affecting wild stocks of salmonids through interactions with non-native fish, introductions of disease, genetic changes, competition for space and food resources, straying and mating with native populations, loss of local genetic adaptations, mortality associated with capture for broodstock and palliating the destruction of habitat and concealing problems facing wild stocks. In conjunction with the status review for the CCC steelhead DPS (Good *et al.* 2005), NMFS reviewed all available information on hatchery stocks and programs within the range of the DPS. This review and analysis concluded that two artificially propagated hatchery stocks (Don Clausen Fish Hatchery and the Scott Creek/Monterey Bay Salmon and Trout Project) were closely related to naturally spawning populations in the DPS (SSHAG 2003) based on genetic information, the source of the brood stock, and the hatchery management practices. The hatcheries were managed as conservation facilities and not for fishing supplementation. In accordance with NMFS' 2006 hatchery listing policy, these two hatchery stocks were found to be part of this DPS and subsequently evaluated as part of the listing process. Based on this review and evaluation, these two hatchery stocks (Don Clausen Fish Hatchery and the Scott Creek/Monterey Bay Salmon and Trout Project) were ultimately included in the listed DPS in 2006 (71 FR 834).

Persistent drought conditions were found to further reduce already limited spawning, rearing and migration habitats. Drought conditions combined with agriculture and urban water use

was identified as likely to result in substantial reduction or elimination of water flows in streams needed by all life stages of steelhead. Flooding was found to contribute sediment to already degraded habitats as northern California has some of the most erodible terrain in the world. Wildfires were identified as contributing to short-term sediment runoff to streams and chemical agents used to control fires have degraded water quality conditions.

Decreased ocean productivity and lower ocean survival of steelhead combined with lower freshwater survival due to degraded and altered riverine and estuarine habitats were found to be significant factors for decline.

Factor E Since Listing:

An assessment of the two ongoing hatchery programs, Don Clausen Fish Hatchery and the Scott Creek/Monterey Bay Salmon and Trout Project, was conducted and both hatchery programs continue to be operational and propagate stocks that are part of the DPS. The two artificial propagation programs discussed above are likely to provide some limited benefits to the CCC steelhead DPS viability by contributing to local population abundance, however these programs do not substantially reduce extinction risk to the CCC steelhead DPS. Genetic diversity risk associated with out-of-basin transfers appears to be minimal, but diversity risk from domestication selection and low effective population sizes in the remaining hatchery programs is a concern. Broodstock collection is closely monitored and constrained to minimize impacts to this DPS. Disease transmission (including BKD) has been substantially reduced due to strict screening and treatment protocols. CDFW has adopted policies designed to ensure artificial propagation measures are conducted in a manner consistent with the conservation and recovery of natural, indigenous steelhead stocks. The careful monitoring and management of current programs, and the continued scrutiny of proposed programs, are necessary to minimize impacts on listed salmonid species.

The natural factors of ocean conditions, El Nino events, terrestrial conditions, floods, droughts and fire remain as threats contributing to the threatened status of CCC steelhead. Many

populations 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 CCC steelhead 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.

Protective Efforts for CCC Steelhead

Provided below is a list of the organizations and their protective efforts at, and since, listing.

Table 1: Protective Efforts in 2014

Organization	Protective Effort Identified at Listing	Status in 2015	Notes
Association of California Water Agencies	Conducting restoration efforts	Conducting restoration for CCC steelhead	Benefits CCC steelhead
Bring Back the Natives: National Fish and Wildlife Foundation	Will improve the status of native aquatic species on public land	Provides funds for conservation of fish habitat; No projects for CCC steelhead identified	Not a benefit
CalTrout	Unspecified	Voluntary efforts and funding	Unknown
Fish Friendly Farming	Provides guidance and certification to grape growers to manage lands and use practices which decrease soil erosion and sediment delivery to streams	Currently program has properties only in the Russian River	Benefiting Russian River and Napa River CCC steelhead populations
FishNet 4C	Multicounty effort to enhance and protect salmonid habitats	Defunded and no longer an active program	No longer active
Gravel Mining Plans	Unspecified	See Factor D discussion	N/A

National Parks Service: Redwood National Park	Directs management to restore aquatic and terrestrial ecological functions	The Park conducts restoration, monitoring, and outreach for salmon and steelhead in Redwood Creek	Beneficial to Redwood Creek CCC steelhead
Watershed Groups	Unspecified	Many watershed groups are conducting outreach, securing funds, implementing restoration actions and are contributing to CCC steelhead recovery in meaningful ways.	Benefits to CCC steelhead

Protective Efforts Since Listing: While many protective efforts are in place to restore and protect CCC steelhead habitats, NMFS has not analyzed the certainty of their implementation and effectiveness to support a conclusion whether these efforts ameliorate the threats associated with the five section 4(a)(1) factors.

DPS RECOVERY GOALS, OBJECTIVES AND CRITERIA

Recovery goals, objectives and criteria provide a means by which the public can measure progress and are used to link listing with status reviews and reclassification determinations. We developed eight categories of recovery criteria for the CCC steelhead DPS: 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 CCC steelhead DPS 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 CCC steelhead now and into the future (*i.e.*, post-delisting);
5. Address other natural or manmade factors affecting the continued existence of CCC steelhead; and
6. Ensure CCC steelhead status 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.

BR1 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) (See Vol. 1 Chapter 3).

AND

BR2 Moderate Extinction Risk Criteria: Spawner density abundance targets have been achieved for Supporting Independent populations

AND

BR3 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. 1 Chapter 3).

AND

BR4 For the Pinole Creek, San Pedro Creek, Drakes Bay, Wildcat Creek, and Codornices Creek dependent populations, that did not have IP developed for them by the SWFSC, confirm presence of steelhead juveniles and/or adults for at least one year class over 4 generations (*i.e.*, a 16 year period).

The selected populations and associated recovery criteria for the CCC Steelhead DPS (See also Table 2):

- a. Selected populations in all five Diversity Strata achieving biological recovery criteria;
- b. **BR-1** 28 essential independent populations attaining a low extinction risk (*i.e.*, Corte Madera Creek, Guadalupe River, Novato Creek, San Francisquito Creek, Stevens Creek, Dry Creek, Maacama Creek, Mark West Creek, Upper Russian River, Alameda Creek, Coyote Creek, Green Valley/Suisun Creek, Napa River, Petaluma River, Sonoma Creek, Austin Creek, Green Valley Creek, Lagunitas Creek, Salmon Creek, Walker Creek, Aptos Creek, Pescadero Creek, Pilarcitos Creek, San Gregorio Creek, San Lorenzo River, Scott Creek, Soquel Creek and Waddell Creek);
- c. **BR-2:** Five supporting independent populations attaining moderate extinction risk criteria (*i.e.*, San Mateo Creek, San Leandro Creek, San Lorenzo Creek, Americano Creek and Laguna Creek); and
- d. **BR-3:** 18 supporting dependent populations contributing to redundancy and occupancy criteria (*i.e.*, Miller Creek (Marin Co.), Arroyo Corte de Madera Creek; Crocker Creek, Gill Creek, Miller Creek (Russian), Sausal Creek, San Pablo Creek, Dutch Bill Creek (Russian), Freezeout Creek (Russian), Hulbert Creek (Russian), Pine Gulch, Porter Creek (Russian), Redwood Creek (Marin Co.), Sheephouse Creek (Russian), Willow Creek (Russian), Gazos Creek, San Vicente Creek, and Tunitas Creek).
- e. **BR-4:** Five supporting dependent populations that did not have IP developed for them by the SWFSC, contributing to the redundancy and occupancy criteria; Codornices Creek, Pinole Creek, Wildcat Creek, Drakes Bay tributaries, and San Pedro Creek

Table 2: CCC steelhead DPS Diversity Strata, Populations, Historical Status, Population’s Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting. *IP was not developed for these populations by the SWFSC.

Diversity Strata	CCC Steelhead Population	Historical Population Status	Population’s Role In Recovery	Current Weighted IP-km	Spawner Density	Spawner Abundance
North Coastal	Austin Creek	I	Essential	95.1	29.0	2,800
	Drakes Bay Tributaries*	D	Supporting	N/A	N/A	N/A
	Dutch Bill Creek	D	Supporting	13.2	6-12	77-156
	Estero Americano Creek	I	Supporting	35.4	6-12	210-423
	Freezeout Creek	D	Supporting	1.2	6-12	5-12
	Green Valley Creek	I	Essential	37.1	38.8	1,400
	Hulbert Creek	D	Supporting	10.2	6-12	59-120
	Lagunitas Creek	I	Essential	85.0	30.4	2,600
	Pine Gulch	D	Supporting	9.7	6-12	56-114
	Porter Creek	D	Supporting	10.3	6-12	60-122
	Redwood Creek (Marin Co.)	D	Supporting	6.7	6-12	38-78
	Salmon Creek	I	Essential	33.6	37.6	1,300
	Sheephouse Creek	D	Supporting	3.7	6-12	20-42
	Walker Creek	I	Essential	73.3	32	2,300
	Willow Creek	D	Supporting	8.2	6-12	47-96
North Coastal Diversity Stratum Recovery Target						10,400
Interior	Crocker Creek	D	Supporting	4.5	6-12	25-52
	Dry Creek	I	Essential	115.9	26.1	3,000
	Gill Creek	D	Supporting	8.1	6-12	47-95
	Maacama Creek	I	Essential	76.2	31.6	2,400
	Mark West Creek	I	Essential	164.2	20	3,300

		Miller Creek (Russian)	D	Supporting	3.1	6-12	17-35
		Sausal Creek	D	Supporting	11.1	6-12	65-131
		Upper Russian River	I	Essential	422.9	20	8,500
Interior Diversity Stratum Recovery Target							17,200
Coastal Bay	S.F.	Arroyo Corte Madera del Presidio	D	Supporting	6.8	6-12	39-80
		Corte Madera Creek	I	Essential	19.8	39.5	800
		Guadalupe River	I	Essential	50.8	35.2	1,800
		Miller Creek (Marin Co.)	D	Supporting	9.1	6-12	53-107
		Novato Creek	I	Essential	28.7	38.2	1,100
		San Francisquito Creek	I	Essential	35.6	37.3	1,300
		San Mateo Creek	I	Supporting	6.7	6-12	38-78
		Stevens Creek	I	Essential	22.7	39.1	900
Coastal San Francisco Bay Diversity Stratum Recovery Target							5,900
Interior Bay	S.F.	Alameda Creek	I	Essential	108.3	27.2	2,900
		Codornices Creek*	D	Supporting	N/A	N/A	N/A
		Coyote Creek	I	Essential	109.3	27.0	3,000
		Green Valley/Suisun Creek	I	Essential	64.3	33.3	2,100
		Napa River	I	Essential	233.2	20	4,700
		Petaluma River	I	Essential	64.9	33.2	2,200
		Pinole Creek*	D	Supporting	N/A	N/A	N/A
		San Leandro Creek	I	Supporting	5.4	6-12	30-63
		San Lorenzo Creek	I	Supporting	18.6	6-12	110-221
		San Pablo Creek	I	Supporting	8.6	6-12	50-101
		Sonoma Creek	I	Essential	128.7	24.3	3,100
		Wildcat Creek*	D	Supporting	N/A	N/A	N/A

Interior San Francisco Bay Diversity Stratum Recovery Target						18,000
Santa Cruz Mountains	Aptos Creek	I	Essential	25.1	38.7	1,000
	Gazos Creek	D	Supporting	12.5	6-12	73-148
	Laguna Creek	I	Supporting	4.5	6-12	25-52
	Pescadero Creek	I	Essential	66.1	33.0	2,200
	Pilarcitos Creek	I	Essential	28.5	38.3	1,100
	San Gregorio Creek	I	Essential	46.6	35.7	1,700
	San Lorenzo River	I	Essential	146.2	21.9	3,200
	San Pedro Creek*	D	Supporting	N/A	N/A	N/A
	San Vicente Creek	D	Supporting	5.7	6-12	32-66
	Scott Creek	I	Essential	16.4	39.9	700
	Soquel Creek	I	Essential	52.0	35	1,800
	Tunitas Creek	D	Supporting	10.7	6-12	62-126
Waddell Creek	I	Essential	10.8	40	500	
Santa Cruz Mountains Diversity Stratum Recovery Target						12,200
CCC Steelhead DPS Recovery Target						63,600

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 2010a) 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 percent⁴ and the remaining rated Fair throughout the DPS/ESU.
- 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.

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 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.

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
- 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.

DPS AND DIVERSITY STRATA RESULTS

All CAP viability and threat tables were assembled for the CCC steelhead DPS to evaluate patterns in the DPS across Diversity Strata and populations. Attribute and threat results are discussed first for Diversity Strata followed by results across life stages for the DPS. A subset of CAP indicators and threat results were evaluated under a climate change scenario and are provided in Appendix B.

DIVERSITY STRATA ATTRIBUTE AND THREAT RESULTS

The delineation of the CCC steelhead DPS Diversity Strata was based on environmental and ecological similarities and life history differences. Five strata were identified by Bjorkstedt *et al.* (2005): North Coastal, Interior, Santa Cruz Mountains, Coastal San Francisco Bay and Interior San Francisco Bay.

Attribute Results

Across strata, the Coastal San Francisco Bay Diversity Strata had the highest percentage of Poor or Fair attribute indicator ratings (92%, of which 53% were Poor), followed by the Interior San Francisco Bay (86%) and Interior strata (81%) (Figure 2). Current conditions in the North Coastal and Santa Cruz Mountains strata were rated similarly with 65% and 67% of attribute indicators rated Poor or Fair respectively. Figure 2 shows the percentage of ratings for Very Good, Good, Fair and Poor for each Stratum in the DPS.

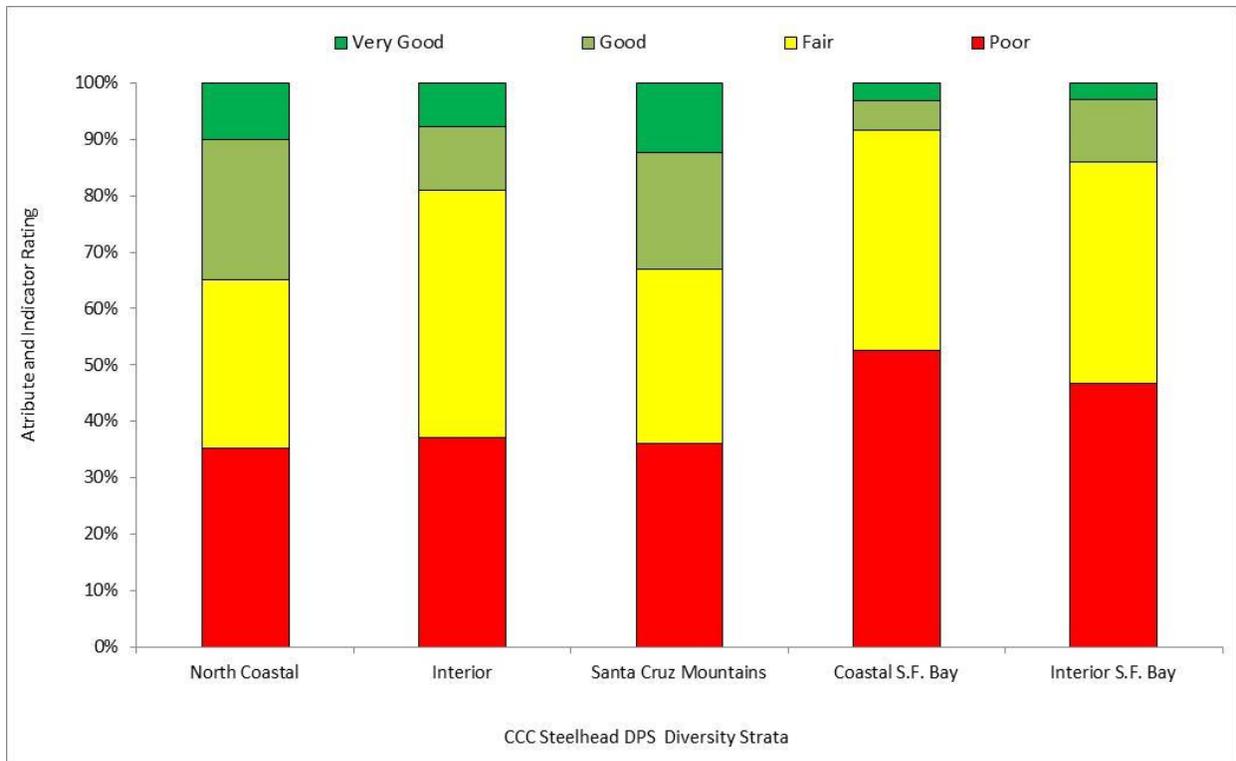


Figure 2: Attribute Indicator ratings for the CCC steelhead DPS by Diversity Strata.

Threat Results

The Interior San Francisco Bay Diversity Stratum received the highest percentage of Very High and High threat ratings (43%) followed by the Santa Cruz Mountains (41%) and Coastal San Francisco Bay strata (36%) (Figure 3). The North Coastal Diversity Strata had the fewest combined Very High and High threat ratings (27%) followed by the Interior Diversity Stratum (29%), which was the only strata that did not receive a Very High threat rating (Figure 3).

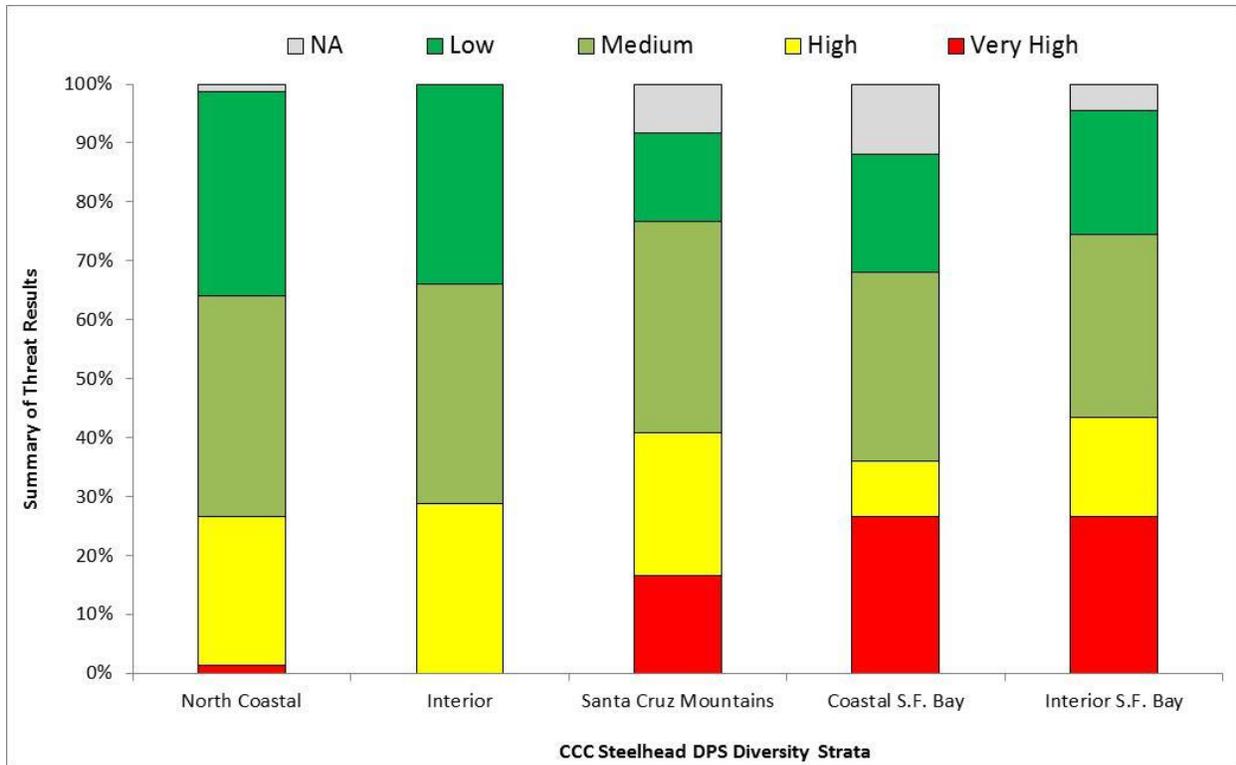


Figure 3: CCC steelhead DPS Diversity Strata Threat ratings.

NORTH COASTAL DIVERSITY STRATUM RESULTS

The North Coastal Diversity Stratum is influenced by the coastal climate conditions of Marin and southern Sonoma counties (Figure 1). CAP populations in the North Coastal stratum include: Austin Creek, Green Valley Creek, Salmon Creek, Walker Creek, and Lagunitas Creek. These coastal watersheds have little urban development with ranching, logging, agriculture and parklands as the dominant land uses.

Attribute Results

Although the North Coastal Diversity Stratum received the fewest combined indicators rated as Poor or Fair (65%) and Poor alone (35%) of any strata in the DPS (Figure 2, Figure 4 and Table 3), habitat conditions throughout much of these populations are degraded. In general, attribute indicators of greatest concern for all life stages included estuary/lagoon (quality and extent), indicators related to in-stream habitat complexity, riparian vegetation (tree diameter), sediment

transport (road density, particularly streamside road density), velocity refuge (floodplain connectivity), and in Walker Creek, water quality (turbidity and toxicity). Indicators of least concern across the DPS included those associated with hydrology, landscape patterns, passage/migration (except Green Valley Creek), and water toxicity with the exception of Walker Creek (Table 3).

Life Stage Results

In the North Coastal stratum, more than 50% of indicator ratings for each life stage were rated as Poor or Fair and more than 60% for 4 of the 5 life stages (Figure 4). Winter rearing juveniles are the most impaired life stage with 76% of indicators rated as Poor or Fair followed closely by summer rearing juveniles with 69%. Nearly half (49%) of the indicators for watershed process were rated either Poor or Fair, of which 29% were rated Poor. Across the stratum, indicators of concern for the adult life stage were those associated with a lack of habitat complexity, diminished floodplain connectivity, small riparian tree diameter, degraded substrate quality, and in Green Valley and Walker creeks, reduced viability (abundance, smolts and density, adults) (Table 4). Impaired gravel quantity and quality necessary for successful spawning and egg incubation were the indicators identified as most limiting for the egg life stage, particularly in the Green Valley Creek and Walker Creek populations. For summer rearing juveniles, winter rearing juveniles, and smolts, degraded estuary/lagoon quality and extent (summer rearing juveniles and smolts only), and reduced in-stream habitat complexity were common impairments. For summer and winter rearing juveniles, all populations were rated Poor for riparian vegetation (tree diameter). Reduced viability (abundance) is a concern for smolts in Green Valley and Walker creeks. Streamside road density was rated Poor in all populations.

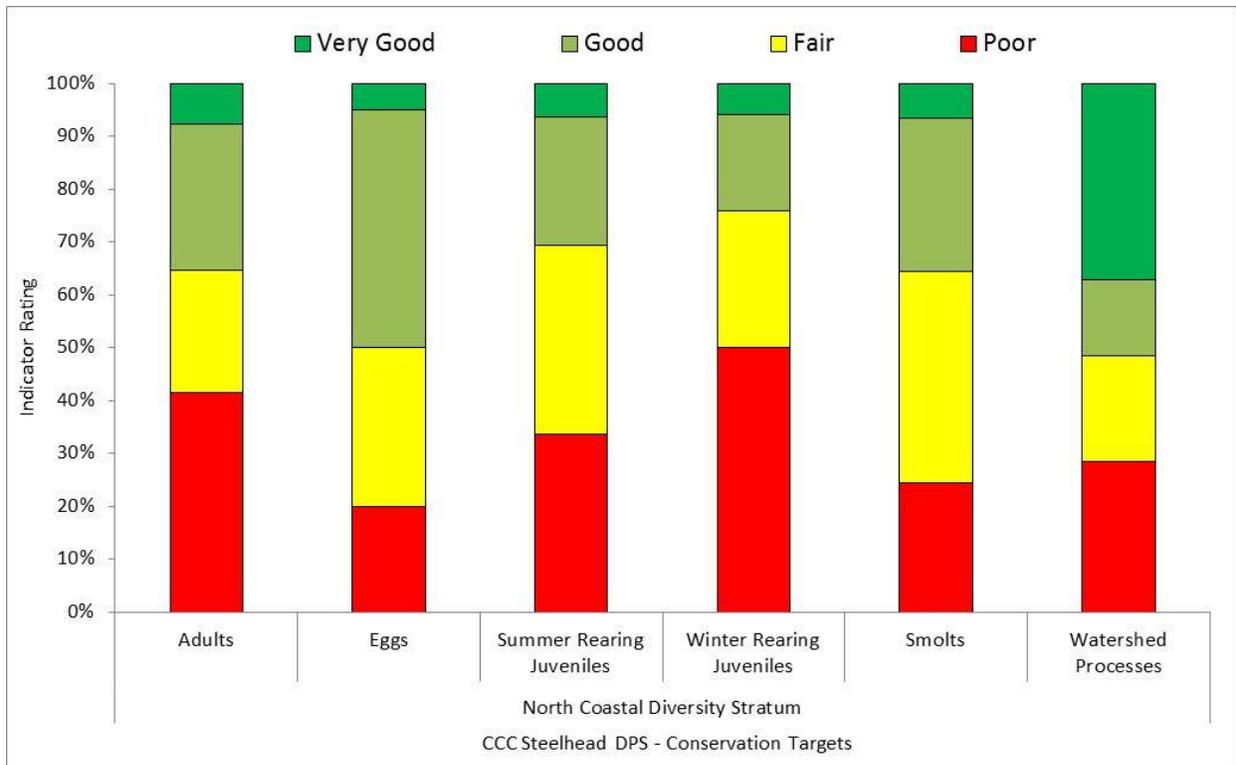


Figure 4: Attribute Indicator Ratings for the North Coastal Diversity Stratum Conservation Targets.

Threat Results

Throughout the stratum, the percentage of threats rated Very High or High was 26% (Figure 5). Threats of greatest concern were roads and railroads and residential and commercial development, followed by agriculture and channel modification (Figure 5 and Table 5). With the exception of Walker Creek (Medium), all populations were rated High for roads and railroads (Table 5).



Figure 5: Threat ratings for the North Coastal Diversity Stratum.

INTERIOR DIVERSITY STRATUM RESULTS

The Interior Diversity Stratum consists of four CAP steelhead populations all within the interior of the Russian River Watershed: Mark West Creek, Dry Creek, Maacama Creek, and the Upper Russian River (Figure 1). Agriculture (primarily vineyards), livestock farming and ranching, mining (primarily instream gravel mining), rural residential, and minor timber harvest are the primary land uses. The City of Santa Rosa, located adjacent to Mark West Creek, is the largest urban center in the DPS and there are several smaller suburban communities throughout the Russian River valley floor.

Attribute Results

Based on the CAP viability results, the Interior Diversity Stratum is highly impacted with more than 80% of attribute indicator ratings as Poor or Fair (Figure 2). Steelhead from each of the four populations in the stratum utilize the same estuary which was rated Poor for summer rearing juveniles and Fair for smolts. Other attribute indicators that were largely rated Poor or Fair throughout the stratum and across life stages were habitat complexity (large wood frequency, percent primary pools, shelter rating), hydrology (baseflow conditions), riparian vegetation (tree diameter), sediment quality (embeddedness), sediment transport (streamside road density), velocity refuge (floodplain connectivity), and water quality (water temperature and toxicity). Indicators that were less impaired included hydrology (impervious surfaces), landscape patterns (agriculture, timber, and urbanization), passage/migration (physical barriers), and water temperatures for smoltification (Table 3).

Life Stage Results

Across the stratum, each of the target life stages are impaired with more than 80% of all attribute indicators rated as Poor or Fair for each life stage (Figure 6 and Table 4). Eggs were the most impacted life stage with 94% of attribute indicators rated as Poor or Fair, followed by winter rearing juveniles (90%) and summer rearing juveniles (88%) (Figure 6). Watershed processes overall had 39% of attribute indicators rated as Poor or Fair and sediment transport

(streamside road density) was rated Poor in all but one population in the stratum (Upper Russian River). Like other strata, attribute indicators of greatest concern for the adult life stage are habitat complexity (large wood frequency, percent staging pools, pool/riffle/flatwater ratio), riparian vegetation (tree diameter), and velocity refuge (floodplain connectivity). For eggs, gravel quality (embeddedness) was rated Poor for all populations except Maacama Creek (Fair) and both redd scour and gravel quantity were rated Poor or Fair in all populations. In addition to the indicators for adult and egg life stages, estuary/lagoon (quality and extent), riparian vegetation (canopy cover), water temperature, and viability (low density) were also mostly rated Poor or Fair for summer rearing juveniles. Meanwhile, habitat complexity (large wood frequency, shelter), riparian tree diameter, substrate (embeddedness), and velocity refuge (floodplain connectivity) are the most limiting for winter rearing juveniles. For smolts, habitat complexity (shelter rating) was rated Poor for all populations, while estuary/lagoon, hydrology, toxicity, and low viability (low abundance) were rated Fair in all populations.

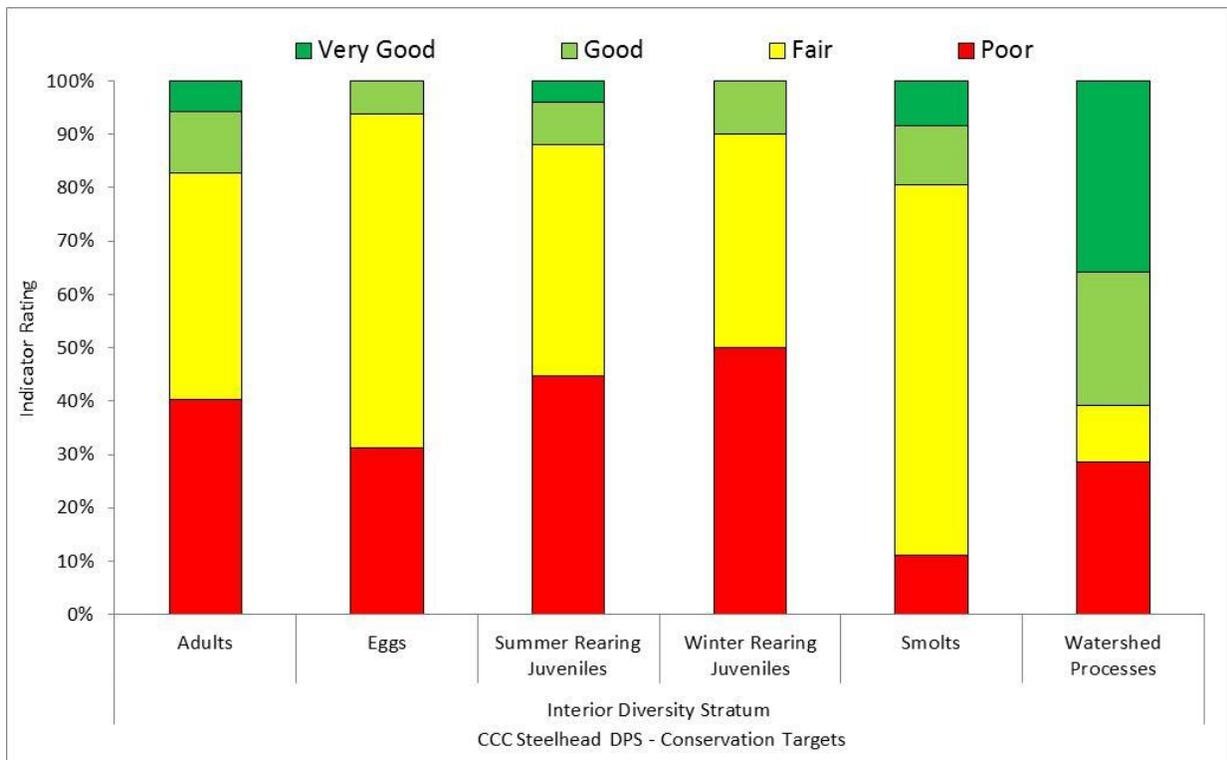


Figure 6: Attribute Indicator Ratings for the Interior Diversity Stratum Conservation Targets.

Threat Results

Despite the degraded habitat conditions reported for all life stages throughout the stratum (see Figure 6), the threat ratings for the Interior Diversity Stratum were fairly positive with 70% of the threats rated as Low (33%) or Medium (Figure 7 and Table 5). No threats were rated Very High. Those that received a High rating (28%) were agriculture (all populations), channel modification, residential and commercial development, roads and railroads, and water diversions and impoundments.

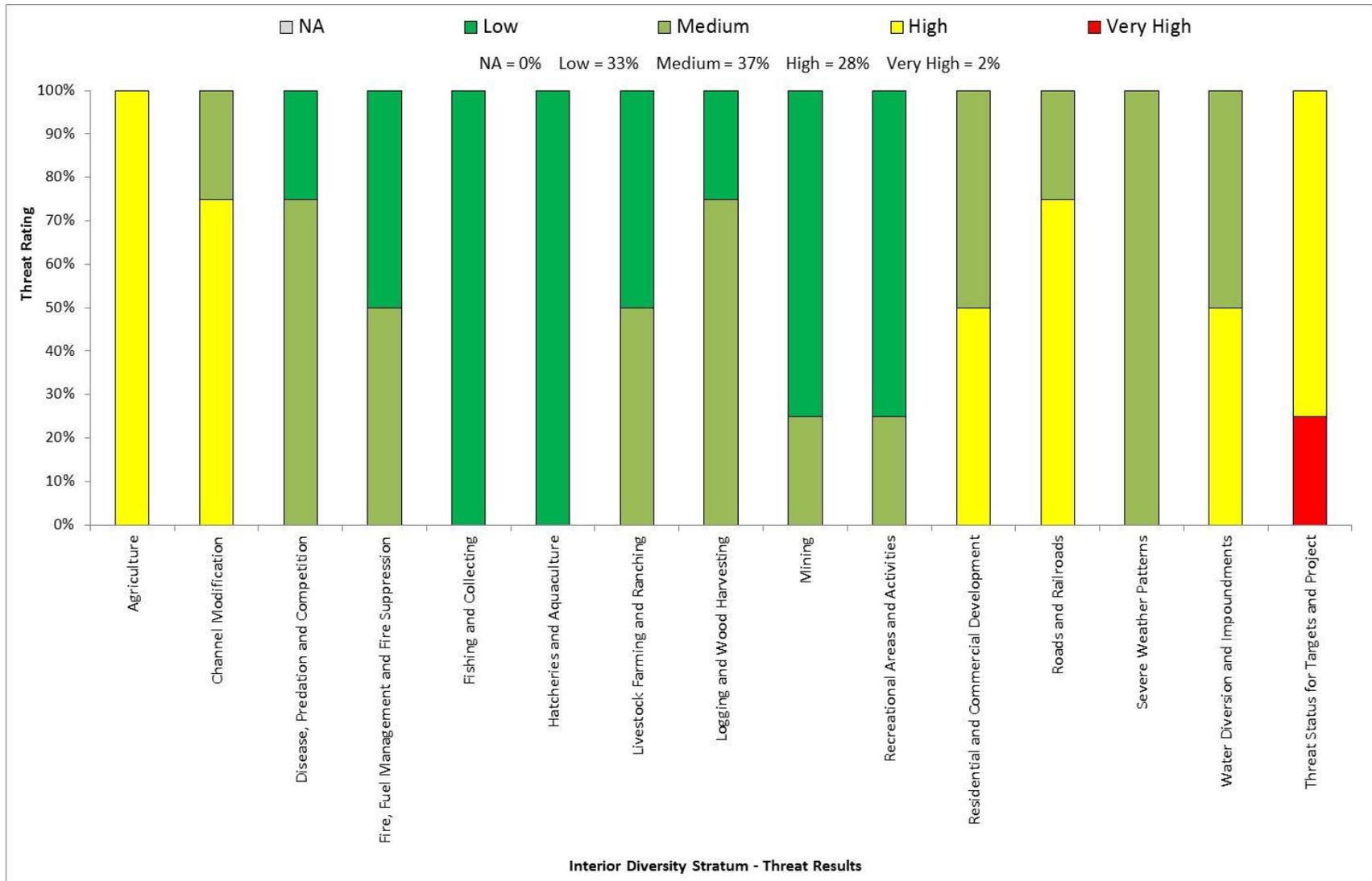


Figure 7: Threat ratings for the Interior Diversity Stratum.

SANTA CRUZ MOUNTAINS DIVERSITY STRATUM RESULTS

The Santa Cruz Mountains Diversity Stratum includes eight populations of coastal San Mateo and Santa Cruz counties (Figure 1). These include (from north to south) the Pilarcitos Creek, San Gregorio Creek, Pescadero Creek, Waddell Creek, Scott Creek, San Lorenzo River, Soquel Creek, and Aptos Creek populations. Primary land uses in this region include agriculture, livestock farming and ranching, parklands, and minor timber harvest. Urban and suburban development is largely concentrated along the coast within the cities of Half Moon Bay and Santa Cruz, with smaller and more isolated communities scattered throughout the DPS.

Attribute Results

Across strata, the Santa Cruz Mountains had the second lowest percentage of Poor or Fair indicator ratings (67%), of which 36% were rated Poor (Figure 2). Estuary/lagoon was rated Poor or Fair for all applicable life stages and populations with the exception of Pescadero Creek which was rated Good for the smolt life stage (Table 3). Other attributes with a large percentage of Poor or Fair ratings across the stratum were habitat complexity, riparian vegetation (canopy cover and tree diameter), gravel quality, streamside road density, viability (low abundance and density), and water quality (toxicity, turbidity). Pilarcitos Creek is the most impacted of the populations with 86% of its attribute indicators rated Poor or Fair and 63% rated Poor alone. Most populations and life stages in the Santa Cruz Mountains Diversity Stratum were rated Good or better for attribute indicators related to hydrology (impervious surfaces, passage flows), landscape patterns, and passage/migration (Table 3). Exceptions for landscape patterns were urbanization (Pilarcitos Creek, San Lorenzo River, Soquel Creek and Aptos Creek) and agriculture (Pilarcitos Creek). Water temperature conditions for smoltification were rated Good or better for all populations in the stratum.

Life Stage Results

In the Santa Cruz Mountain Diversity Stratum, all life stages are impaired with 61% or more of attribute indicators rated as Poor or Fair for each life stage (Figure 8). Eggs (84%) were rated the

most impaired life stage, followed by winter rearing juveniles (78%). Streamside road density was rated Poor for all populations and is the most concerning of the watershed processes in the stratum. Results on indicators limiting individual life stages were similar for other strata. Adults are most limited by habitat complexity, turbidity, and to a lesser extent, low viability, and eggs are most limited by gravel quantity and quality as well as a high potential for redd scour (Table 4). Estuary/lagoon quality and extent, habitat complexity, sediment (gravel embeddedness), water temperature, and low densities of fish are of greatest concern for summer rearing juveniles, while winter rearing juveniles are most limited by reduced habitat complexity, high gravel embeddedness, and turbidity. The smolt life stage is most impacted by poor estuarine habitat, degraded in-stream shelter conditions, elevated turbidity, and reduced abundance. All populations in the stratum were rated Poor for streamside road densities and half of the populations were rated Poor for urbanization.

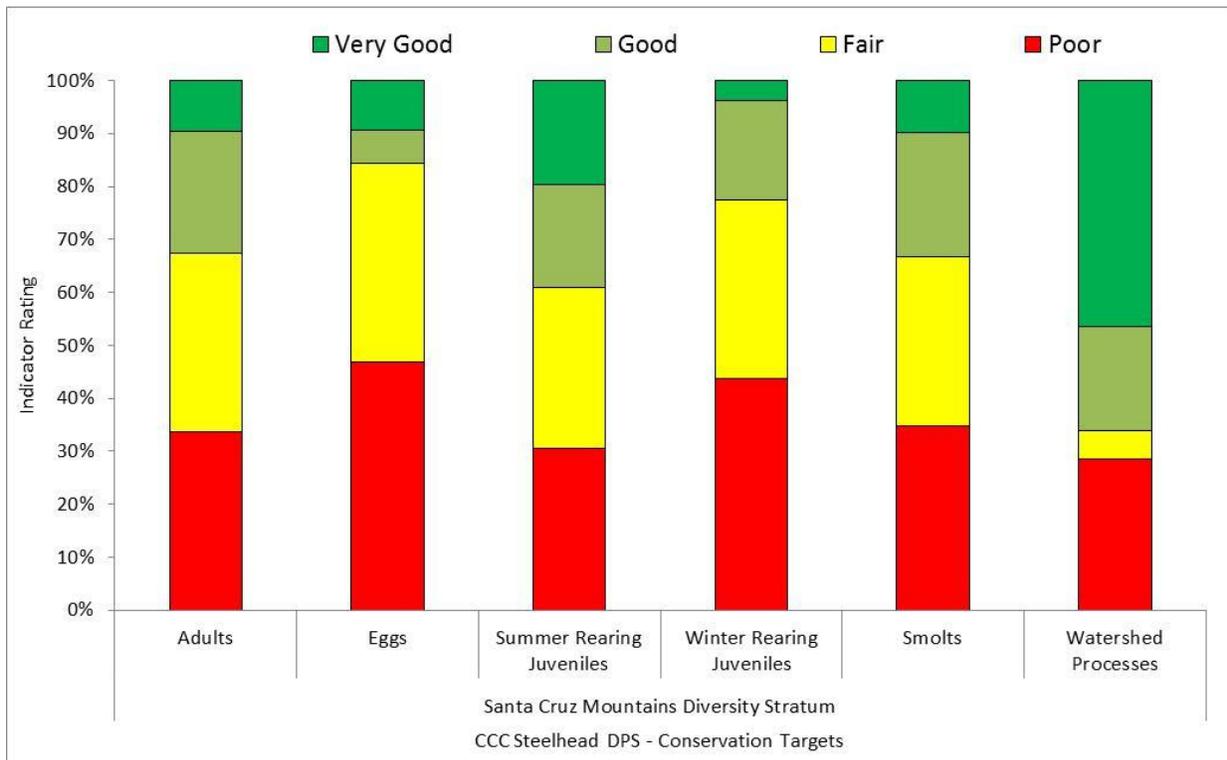


Figure 8: Attribute Indicator Ratings for the Santa Cruz Mountains Diversity Stratum Conservation Targets.

Threat Results

The percentage of threats in the Santa Cruz Mountains Diversity Stratum rated Very High or High (41%), which is substantially greater than the North Coastal Diversity Strata (26%) (Figure 9). Roads and railroads was rated Very High or High for all populations. With the exception of Waddell and Scott creeks, residential and commercial development was rated Very High or High. Also, severe weather patterns and water diversions and impoundments were rated Very High or High in nearly all populations (Table 5). In Pilarcitos Creek, channel modification and agriculture were rated Very High. Threats of minimal concern throughout the stratum were disease, predation and competition, fishing and collecting, hatcheries and aquaculture, livestock and farming and ranching, and mining.



Figure 9: Threat ratings for the Santa Cruz Mountains Diversity Stratum.

COASTAL SAN FRANCISCO BAY DIVERSITY STRATUM RESULTS

CAP steelhead populations in the Coastal San Francisco Bay Diversity Stratum are located along the eastern slopes of the coastal mountain ranges of San Francisco Bay (Figure 1). These include Novato and Corte Madera creeks in Marin County and San Francisquito Creek, Stevens Creek and the Guadalupe River in Santa Clara County. The stratum is heavily urbanized, particularly within the foothill and lowland areas near the Bay.

Attribute Results

The Coastal San Francisco Bay Diversity Stratum is the most impaired stratum in the DPS with 92% of its attribute indicators rated Poor or Fair and 53% rated Poor alone (Figure 2). A lack of large wood, the vast extent of urbanization, high road density (including streamside road density), and low density and abundance for multiple life stages were all rated Poor throughout the stratum (Table 3). Estuary ratings were Poor for all populations and life stages with the only exception being Novato Creek for smolts. Within the stratum, much of the historic tidal marshes and mudflats along the edges of San Francisco Bay have been lost to urban development and the streams entering the Bay have been channelized and isolated from the remaining marshlands. Only landscape patterns (extent of agriculture and timber harvest) were rated favorably throughout the stratum.

Life Stage Results

Throughout the stratum, all life stages are severely impacted by the current habitat conditions. Adults and winter rearing juveniles are the most impacted with 98% of attribute indicators rated Poor or Fair, of which more than half were rated Poor alone (Figure 10 and Table 3). Watershed processes are also severely impacted with most (74%) rated Poor or Fair of which 60% were rated Poor.

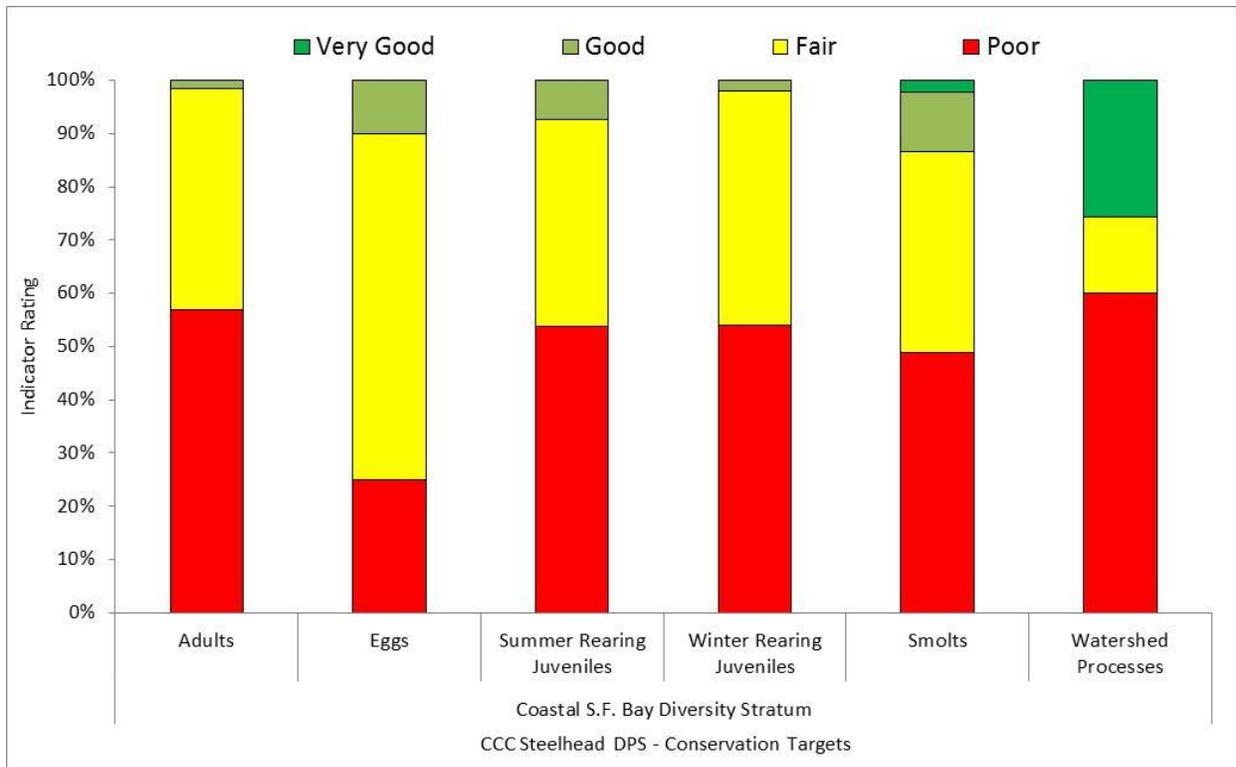


Figure 10: Attribute Indicator Ratings for the Coastal San Francisco Bay Diversity Stratum conservation targets.

Threat Results

Throughout the Coastal San Francisco Bay Diversity Stratum, channel modification, residential and commercial development, roads and railroads, and water diversions and impoundments were identified as the most significant threats based on the frequency of Very High and High ratings (Figure 11 and Table 5). These ratings stem from the wide extent of urbanization across the landscape. While most of the urban development occurred several decades ago, it will continue to limit the quality and extent of stream habitats in the future.

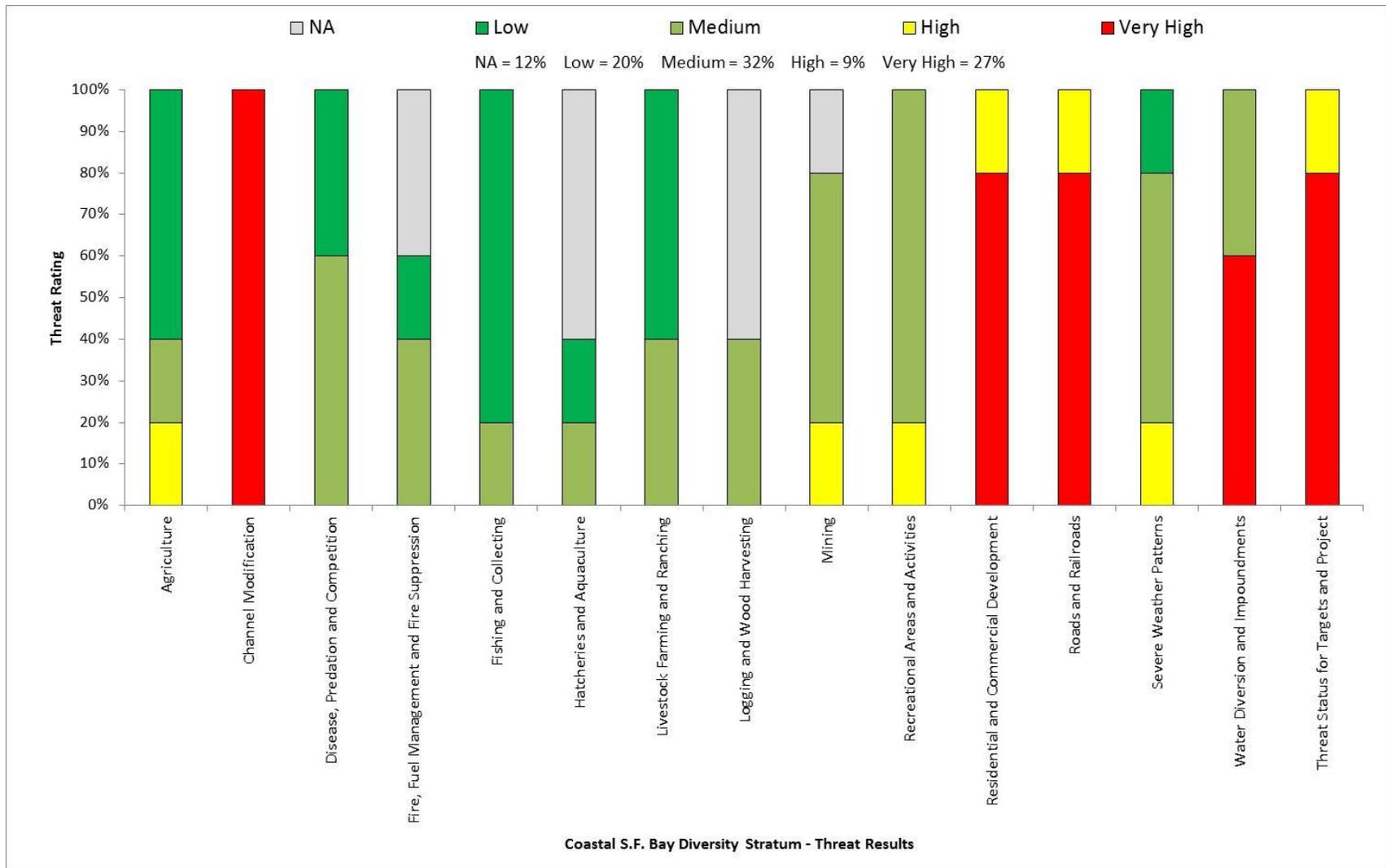


Figure 11: Threat ratings for the Coastal San Francisco Bay Diversity Stratum.

INTERIOR SAN FRANCISCO BAY DIVERSITY STRATUM RESULTS

The Interior San Francisco Bay Diversity Stratum includes the following CAP steelhead populations: Petaluma River and Sonoma Creek (southern Sonoma County), Napa River (Napa County), Green Valley/Suisun Creek (Solano County), Alameda Creek (Alameda County), and Coyote Creek (Santa Clara County) (Figure 1). Agriculture, livestock farming and ranching, parklands, along with urban development are the common land uses in the stratum.

Attribute Results

Similar to the coast side of the Bay, the Interior San Francisco Bay Diversity Stratum is heavily impacted with 86% of attribute indicators rated Poor or Fair and nearly half (47%) rated Poor (Figure 2 and Table 3). Overall, attribute ratings were similar to those for the Coastal San Francisco Bay stratum with notable differences for hydrology (impervious surfaces) and passage/migration (Table 3). Estuary ratings for summer rearing juveniles were Poor for all populations. Based on the number of Poor ratings alone, Coyote Creek (62%) is the most impacted population in the stratum.

Life Stage Results

All life stages in the Interior San Francisco Bay stratum are severely impacted with 88% or more attribute indicator ratings reported as Poor or Fair (Figure 12 and Table 4). Adults are the most impacted life stage with 92% of indicators rated Poor or Fair followed closely by smolts (91%) and winter rearing juveniles (90%). The high percentages of Poor and Fair ratings are attributed to the overall degraded quality of multiple habitat attributes and watershed processes impacting each life stage throughout the stratum.

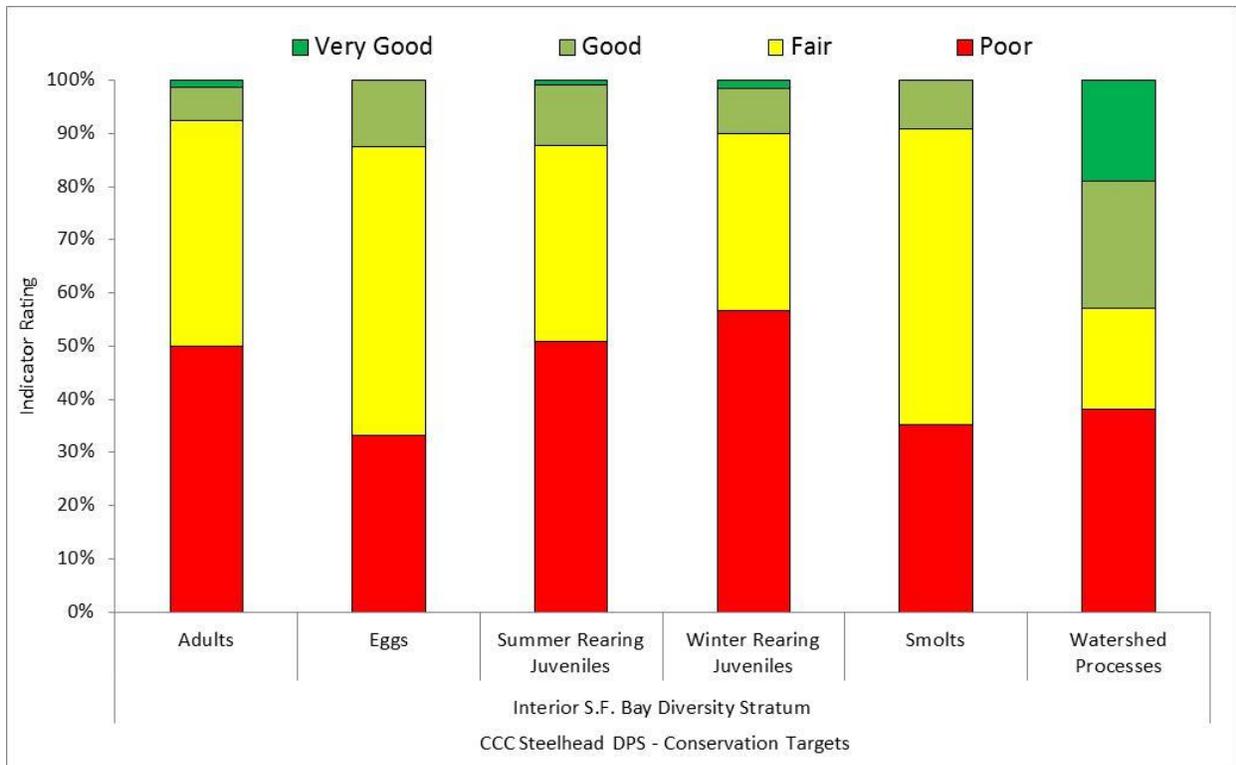


Figure 12: Attribute Indicator Ratings for the Interior San Francisco Bay Diversity Stratum Conservation Targets.

Threat Results

According to the CAP analysis 44% of the threats are considered Very High or High to steelhead populations in the Interior San Francisco Bay Diversity Stratum (Figure 13). Water diversions and impoundments, residential and commercial development, roads and railroads, and channel modification were rated the most severe threats. Urban development in the Interior San Francisco Bay stratum is less extensive and concentrated than in the Coastal San Francisco Bay stratum. As a result, land uses such as agriculture, livestock farming and ranching, and mining remain with some populations rated Very High or High for these threats (Figure 13 and Table 5).

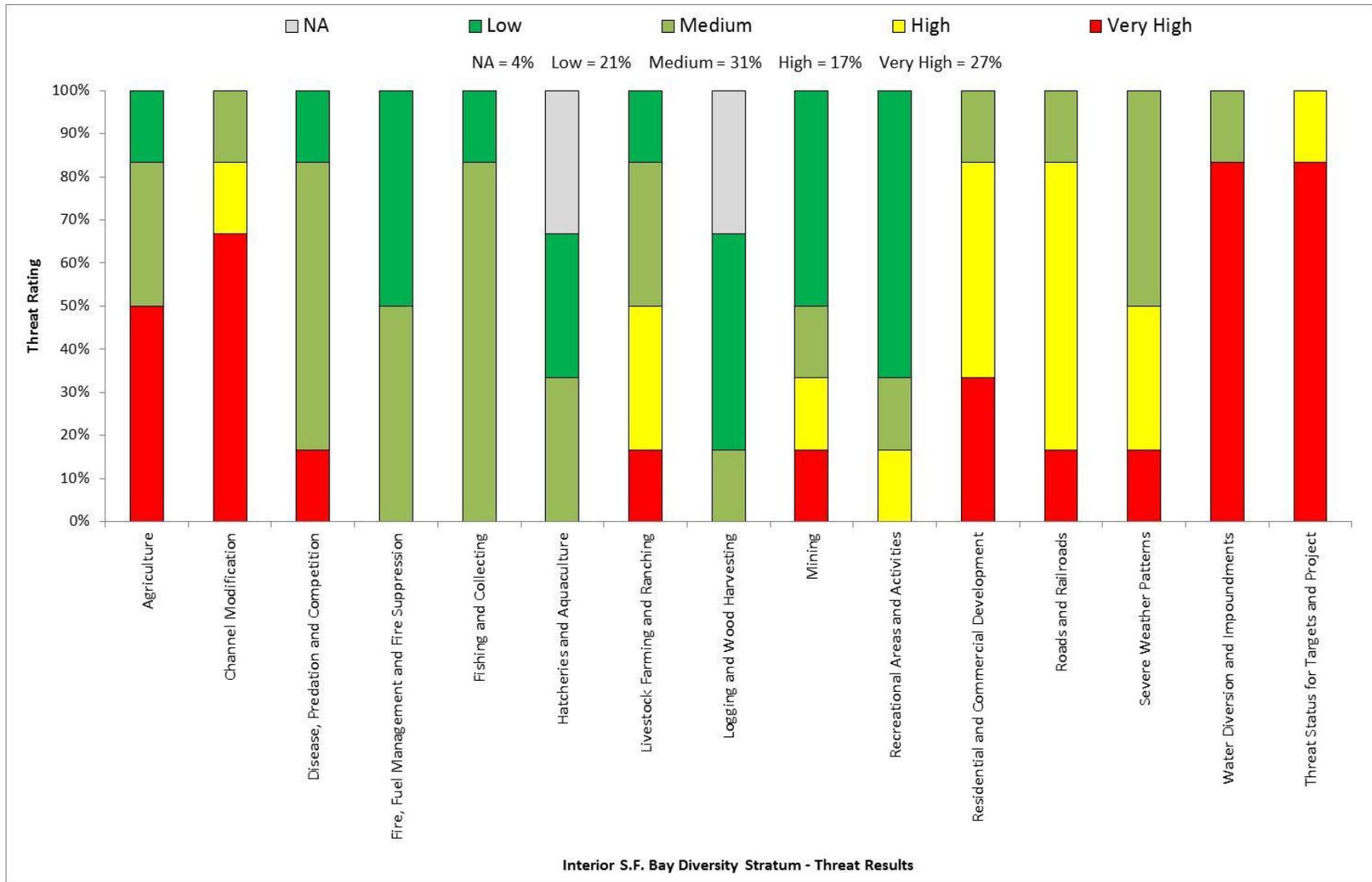


Figure 13: Threat ratings for the Interior San Francisco Bay Diversity Stratum.

DPS CAP VIABILITY RESULTS

Attributes

Throughout the DPS and across life stages, indicators most impacted are those associated estuary/lagoon quality and extent, habitat complexity, sediment quality and quantity, and sediment transport (road density, streamside road density) (Table 3). Overall, timber harvest was rated Fair or better in all populations throughout the DPS with most rated Good or Very Good, and indicators associated with hydrology, passage/migration, viability, and water quality are more impacted in strata draining to San Francisco Bay (Table 3). Riparian tree diameter was rated Poor in all populations north of San Francisco Bay and Fair or better in most populations south of San Francisco Bay (exceptions being San Francisquito and Coyote creeks). Substrate quality in relation to food productivity is a concern for multiple life stages in many populations throughout the DPS, particularly in the Santa Cruz Mountains Diversity Stratum. Water temperatures for smoltification were rated Fair or better in all populations except for Walker and Corte Madera creeks.

Table 3: CCC Steelhead DPS CAP Viability Summary by Attribute.

CCC Steelhead by Diversity Strata and Population			North Coastal				Interior				Santa Cruz Mountains				Coastal S. F. Bay				Interior S. F. Bay											
Target	Attribute	Indicator	Austin Creek	Green Valley Creek	Salmon Creek	Walker Creek	Lagunitas Creek	Mark West Creek	Dry Creek	Maacama Creek	Upper Russian River	Piarctos Creek	San Gregorio Creek	Pascadero Creek	Waddell Creek	Scott Creek	San Lorenzo River	Sequel Creek	Aplos Creek	Corte Madera Creek	Novato Creek	Guadalupe River	Stevens Creek	San Francisco Creek	Petaluma River	Sonoma Creek	Napa River	Green Valley/Suisun Creek	Alameda Creek	Coyote Creek
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Winter Rearing Juveniles	Estuary/Lagoon	Quality & Extent	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	G	P	F	F	F	F	F	F	F	F	G	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Summer Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	G	P	F	F	F	F	F	F	F	F	G	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	G	P	F	F	F	F	F	F	F	F	G	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Adults	Habitat Complexity	Shelter Rating	F	P	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	F	P	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	F	P	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Habitat Complexity	Shelter Rating	F	P	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	F	P	F	F	F	F	F	F	F	F	F	G	F	P	P	G	P	P	P	P	P	P	P	P	P	P	P	P
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	F	F	G	G	G	G	F	F	F	F	F	G	G	V	F	F	F	F	F	F	F	G	F	G	F	F	F	G
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	F	F	G	G	G	G	F	F	F	F	F	G	G	V	F	F	F	F	F	F	F	G	F	G	F	F	F	G
Watershed Processes	Hydrology	Impervious Surfaces	F	F	F	F	F	F	F	F	F	F	F	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	F	F	F	F	F	F	F	F	F	P	P	F	G	F	P	P	G	F	F	F	F	F	F	F	F	F	F	F
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	F	F	F	F	F	F	F	F	F	P	P	F	G	F	P	P	G	F	F	F	F	F	F	F	F	F	F	F
Adults	Hydrology	Passage Flow s	G	F	G	F	F	F	F	F	F	F	F	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Smolts	Hydrology	Passage Flow s	G	F	G	F	F	F	F	F	F	F	F	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Eggs	Hydrology	Redd Scour	G	P	F	F	F	F	F	F	F	P	G	F	F	P	P	P	F	F	F	F	G	F	P	F	F	F	F	F
Watershed Processes	Landscape Patterns	Agriculture	F	F	G	P	G	P	V	P	P	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	F	G	G	P	G	G	V	G	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Urbanization	F	P	P	V	G	P	V	G	P	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Adults	Passage/Migration	Passage at Mouth or Confluence	G	G	G	V	G	F	F	F	G	F	F	G	F	G	G	G	G	G	P	P	F	G	F	F	F	F	F	F
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	G	P	F	F	G	F	F	F	F	P	F	G	F	G	F	G	G	G	P	P	F	F	G	F	F	F	F	F
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	P	F	F	G	F	F	F	F	P	F	G	F	G	F	G	G	G	P	P	F	F	G	F	F	F	F	F
Adults	Passage/Migration	Physical Barriers	G	F	G	V	G	F	F	F	F	F	G	G	V	F	F	F	F	F	P	P	F	F	F	F	F	F	F	F
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	G	P	F	G	V	G	F	F	F	F	G	G	V	F	F	F	F	F	P	P	F	F	F	F	F	F	F	F
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	G	P	F	G	V	G	F	F	F	F	G	G	V	F	F	F	F	F	P	P	F	F	F	F	F	F	F	F
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	F	V	G	F	P	F	P	P	P	F	F	F	G	V	V	V	V	P	P	F	G	P	F	F	G	P	F	F
Watershed Processes	Riparian Vegetation	Species Composition	G	F	F	P	F	P	G	F	P	F	G	G	G	G	G	G	G	F	P	F	F	F	F	F	F	F	F	F
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eggs	Sediment	Gravel Quality (Bulk)	G	F	G	P	G	P	F	F	F	P	P	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P	
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	G	P	F	P	F	F	P	P	V	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Adults	Sediment	Quantity & Distribution of Spawning Gravels	P	G	P	G	P	G	G	G	P	G	F	F	F	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	G	P	F	P	F	F	P	P	V	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	G	P	F	P	F	F	P	P	V	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Watershed Processes	Sediment Transport	Road Density	G	P	F	V	F	P	G	V	F	G	F	F	G	V	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Smoltification	Temperature	F	G	F	P	F	G	G	F	G	G	G	G	G	G	G	G	G	P	P	F	G	F	G	F	F	F	F	F
Adults	Velocity Refuge	Floodplain Connectivity	G	P	F	P	P	P	G	F	F	P	F	G	G	G	F	F	P	P	P	P	F	F	F	F	F	F	F	F
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	G	P	F	P	P	P	G	F	F	P	F	G	G	G	F	F	P	P	P	P	F	F	F	F	F	F	F	F
Smolts	Viability	Abundance	F	P	F	P	G	F	F	F	F	P	P	P	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Adults	Viability	Density	F	P	F	P	G	F	F	F	F	P	P	P	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Viability	Density	F	P	F	P	G	F	F	F	F	P	P	P	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Viability	Spatial Structure	G	G	G	F	G	F	G	P	G	F	F	G	V	F	V	V	G	G	F	F	P	P	G	G	F	F	G	P
Summer Rearing Juveniles	Water Quality	Temperature (MMMT)	G	F	F	P	F	P	F	F	P	G	P	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Adults	Water Quality	Toxicity	G	F	G	P	G	P	F	F	F	F	F	G	F	F	F	F	F	F	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Water Quality	Toxicity	F	P	G	P	G	F	F	F	F	F	F	F	F	F	F	F	F	F	P	P	P	P	P	P	P	P	P	P
Winter Rearing Juveniles	Water Quality	Toxicity	F	P	G	P	G	F	F	F	F	F	F	F	F	F	F	F	F	F	P	P	P	P	P	P	P	P	P	P
Smolts	Water Quality	Toxicity	G	F	G	P	G	F	F	F	F	F	F	G	F	F	F	F	F	F	P	P	P	P	P	P	P	P	P	P
Adults	Water Quality	Turbidity	G	F	P	F	G	F	F	F	F	P	P	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Summer Rearing Juveniles	Water Quality	Turbidity	G	F	P	F	G	F	F	F	F	P	P	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Winter Rearing Juveniles	Water Quality	Turbidity	G	F	P	F	G	F	F	F	F	P	P	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Water Quality	Turbidity	G	F	P	F	G	F	F	F	F	P	P	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P

Table 4: CCC steelhead DPS CAP Viability Summary by Conservation Target.

CCC Steelhead by Diversity Strata and Population			North Coastal		Interior		Santa Cruz Mountains				Coastal S. F. Bay			Interior S. F. Bay																	
Target	Attribute	Indicator	Austin Creek	Green Valley Creek	Salmon Creek	Walker Creek	Lagunitas Creek	Mark West Creek	Dry Creek	Mascama Creek	Upper Russian River	Pilarcos Creek	San Gregorio Creek	Pascadero Creek	Weddell Creek	Scott Creek	San Lorenzo River	Soquel Creek	Aptos Creek	Corte Madera Creek	Novato Creek	Guadalupe River	Stevens Creek	San Francisco Creek	Petaluma River	Sonoma Creek	Napa River	Green Valley/Suisun Creek	Alameda Creek	Coyote Creek	
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	G	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Adults	Habitat Complexity	Shelter Rating	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Adults	Hydrology	Passage Flows	G	F	G	G	F	F	F	F	F	F	F	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
Adults	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	G	F	F	F	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
Adults	Passage/Migration	Physical Barriers	F	G	F	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	P	P	P	P	P	P	P	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Adults	Sediment	Quantity & Distribution of Spawning Gravels	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	
Adults	Velocity Refuge	Floodplain Connectivity	G	P	F	P	P	P	P	P	P	P	F	G	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Adults	Water Quality	Toxicity	G	F	G	P	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Adults	Water Quality	Turbidity	G	F	F	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Adults	Viability	Density	F	P	F	P	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	F	F	G	G	G	G	G	F	F	F	F	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
Eggs	Hydrology	Redd Scour	G	P	F	F	F	F	F	F	F	F	P	G	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Eggs	Sediment	Gravel Quality (Bulk)	G	F	G	P	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	G	P	F	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	P	P	P	F	F	P	P	P	P	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	F	F	G	P	G	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	G	P	F	P	F	P	F	F	P	P	F	G	G	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	F	P	F	F	F	F	F	F	F	F	F	G	F	P	P	G	G	G	G	G	G	G	G	G	G	G	G	G	
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	F	P	G	G	G	F	F	F	F	F	F	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	F	F	F	G	F	G	F	F	F	F	F	F	G	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	G	P	G	F	G	G	P	F	F	F	F	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	G	P	G	F	G	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	F	G	F	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	P	P	P	P	P	P	P	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	G	P	F	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Summer Rearing Juveniles	Water Quality	Temperature (MWM)	G	F	F	P	F	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Water Quality	Toxicity	F	P	G	P	G	F	F	F	F	F	F	P	G	F	P	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Water Quality	Turbidity	F	F	G	P	G	F	F	F	F	F	F	G	G	F	P	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Viability	Density	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Summer Rearing Juveniles	Viability	Spatial Structure	G	G	G	F	G	G	P	G	F	F	G	G	F	F	F	G	G	G	G	G	G	G	G	G	G	G	G	G	
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	G	P	F	P	F	P	F	F	P	P	F	G	G	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	G	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	P	P	P	P	P	P	P	P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	G	F	P	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	G	P	F	P	P	P	P	P	P	P	F	F	G	G	F	P	P	P	P	P	P	P	P	P	P	P	P	P	
Winter Rearing Juveniles	Water Quality	Toxicity	F	F	G	P	G	F	F	F	F	F	F	G	G	F	P	F	F	F	F	F	F	F	F	F	F	F	F	F	
Winter Rearing Juveniles	Water Quality	Turbidity	F	F	P	P	G	F	F	F	F	F	F	P	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Smolts	Estuary/Lagoon	Quality & Extent	F	P	P	P	F	F	F	F	F	F	F	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Smolts	Habitat Complexity	Shelter Rating	F	P	P	P	F	F	F	F	F	F	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	F	F	F	G	F	F	F	F	F	F	F	F	G	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Smolts	Hydrology	Passage Flows	G	F	F	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	P	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	
Smolts	Smoltification	Temperature	F	G	F	P	G	F	G	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	
Smolts	Water Quality	Toxicity	G	F	G	P	G	F	F	F	F	F	F	G	G	F	P	F	F	F	F	F	F	F	F	F	F	F	F	F	
Smolts	Water Quality	Turbidity	G	F	F	P	G	F	F	F	F	F	F	P	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Smolts	Viability	Abundance	F	P	F	P	G	F	F	F	F	F	F	P	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Watershed Processes	Hydrology	Impervious Surfaces	F	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Watershed Processes	Landscape Patterns	Agriculture	F	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Watershed Processes	Landscape Patterns	Timber Harvest	F	G	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Watershed Processes	Landscape Patterns	Urbanization	V	P	P	G	P	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Watershed Processes	Riparian Vegetation	Species Composition	G	F	F	P	F	P	G	F	P	F	G	G	V	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
Watershed Processes	Sediment Transport	Road Density	G	P	F	F	F	P	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	

Life Stages

Based on the CAP viability results, all CCC steelhead life stages are impaired (Table 4 and Figure 14). Winter rearing juveniles were the most impaired life stage across the DPS with 85% of all indicator ratings reported as Poor or Fair (50% Poor), followed by eggs (81%) and summer rearing juvenile (80%) (Figure 14). Watershed processes, on a DPS level, had a combined 49% of attribute indicators reported as Poor or Fair (Figure 14), of which 36% were rated as Poor.

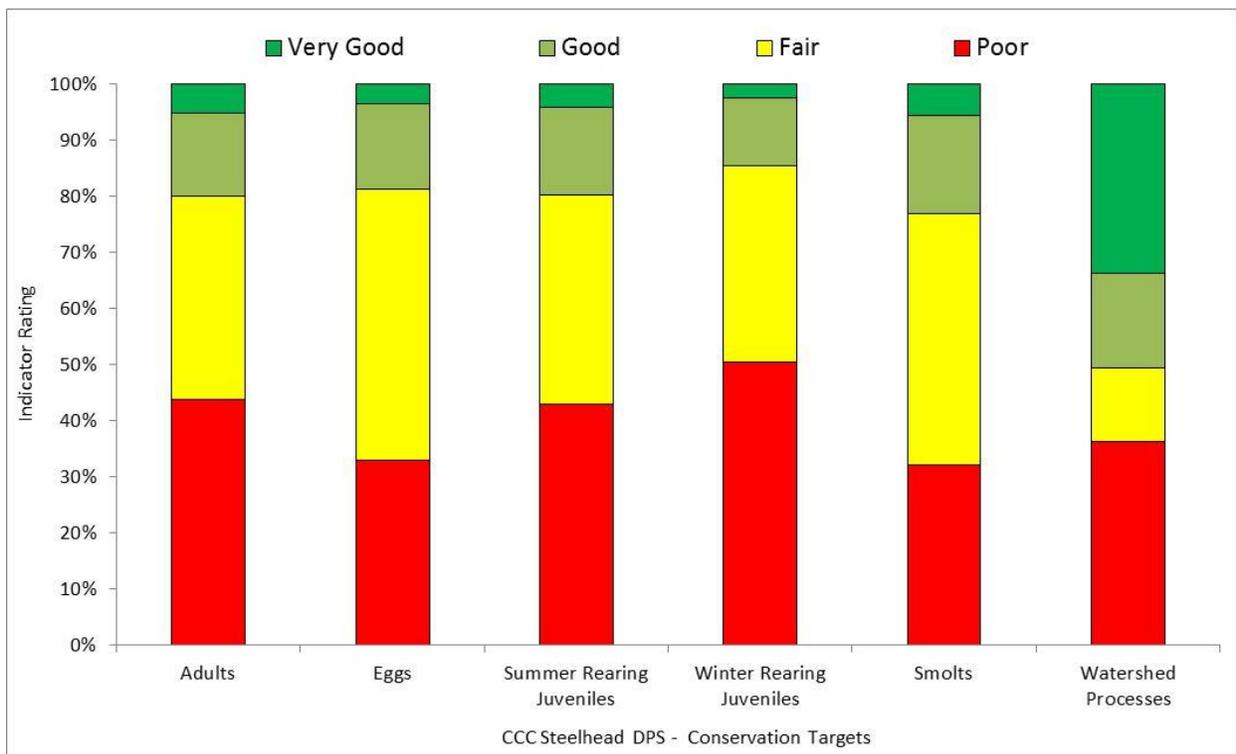


Figure 14: Attribute Indicator ratings for the CCC steelhead DPS by life stage.

Adult Attribute Results: Across the DPS, adults had a high percentage (80%) of Poor or Fair ratings with the most notable exceptions being passage flows, passage at mouth or confluence, physical barriers, and the quality and distribution of spawning gravels in some populations (Figure 15 and Table 4). The four indicators of greatest concern, based on the percentage of Poor ratings alone were large wood frequency, shelter rating, floodplain connectivity, and pool/riffle/flatwater ratio (Table 4). Riparian tree diameter was rated Poor for all populations north of San Francisco Bay and viability (density) was rated Poor in 43% of populations overall.

Eggs Attribute Results: Of the four indicators assessed for the egg life stage, the most concerning based on the percentage of Poor ratings was gravel embeddedness followed by gravel quantity (Figure 16). However, redd scour and gravel quantity received the highest percentage of Poor and Fair ratings combined (89%).

Summer Rearing Juvenile Attribute Results: Across the DPS, 80% of attribute indicators were rated Poor or Fair (Figure 17). The most impaired indicators across the DPS were estuary/lagoon (quality and extent), habitat complexity (large wood frequency, percent primary pools, and shelter rating), riparian vegetation (tree diameter north of San Francisco Bay), and gravel embeddedness (Figure 17 and Table 4). Indicators associated with hydrology (instantaneous conditions, number and magnitude of diversions), passage/migration (passage at mouth or confluence, physical barriers), and viability (spatial structure) were rated more favorably throughout the DPS (Table 4).

Winter Rearing Juvenile Viability Results: Winter rearing juveniles, the most impaired life stage in the DPS, are largely impacted by poor over-wintering habitat quality (*i.e.*, lack of habitat complexity) (Figure 18). As with summer rearing juveniles, shelter rating was the most impacted attribute indicator with all populations rated Poor or Fair, of which 82% were rated Poor. Riparian tree diameter was rated Poor for all populations north of San Francisco Bay and 63% of populations overall (Figure 18 and Table 4). The decline of large diameter trees within the riparian zone has, in part, contributed to the impaired quality of in-stream habitat complexity throughout the DPS, particularly north of San Francisco Bay.

Smolt Attribute Results: As with winter and summer rearing juveniles, shelter rating was rated Poor or Fair for the smolt life stage in all populations of which 82% were rated Poor (Figure 19 and Table 4). The quality and extent of estuary/lagoon habitat was also identified as a serious impairment for the smolt life stage with all populations rated Poor or Fair except for San Gregorio Creek (Good). Other impaired indicators for the smolt life stage included viability

(low abundance), water quality (toxicity, turbidity), and hydrology (the number and magnitude of diversions).

Watershed Processes: Across the DPS, 49% of watershed processes were rated Poor or Fair, of which 36% were rated Poor. The most impacted was streamside road density which was rated Poor for all but one population (Upper Russian River, Good) (Figure 20). Roads density and urbanization were rated Poor or Fair in many populations throughout the DPS particularly in the diversity strata surrounding San Francisco Bay. The only watershed process that did not receive a Poor rating was timber harvest and only one population was rated Fair, Austin Creek (Table 4).

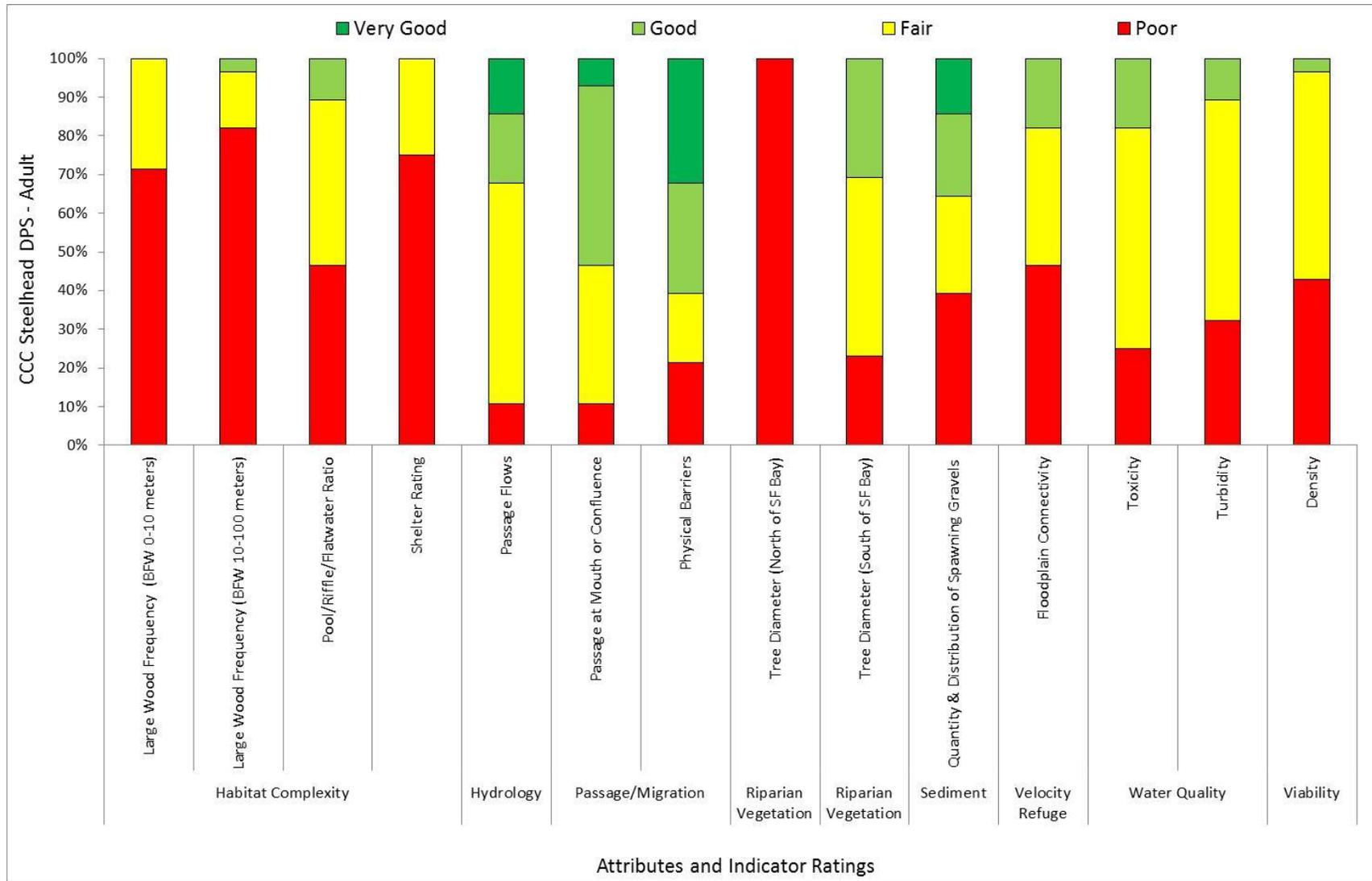


Figure 15: Attribute Indicator ratings for the Adult life stage.

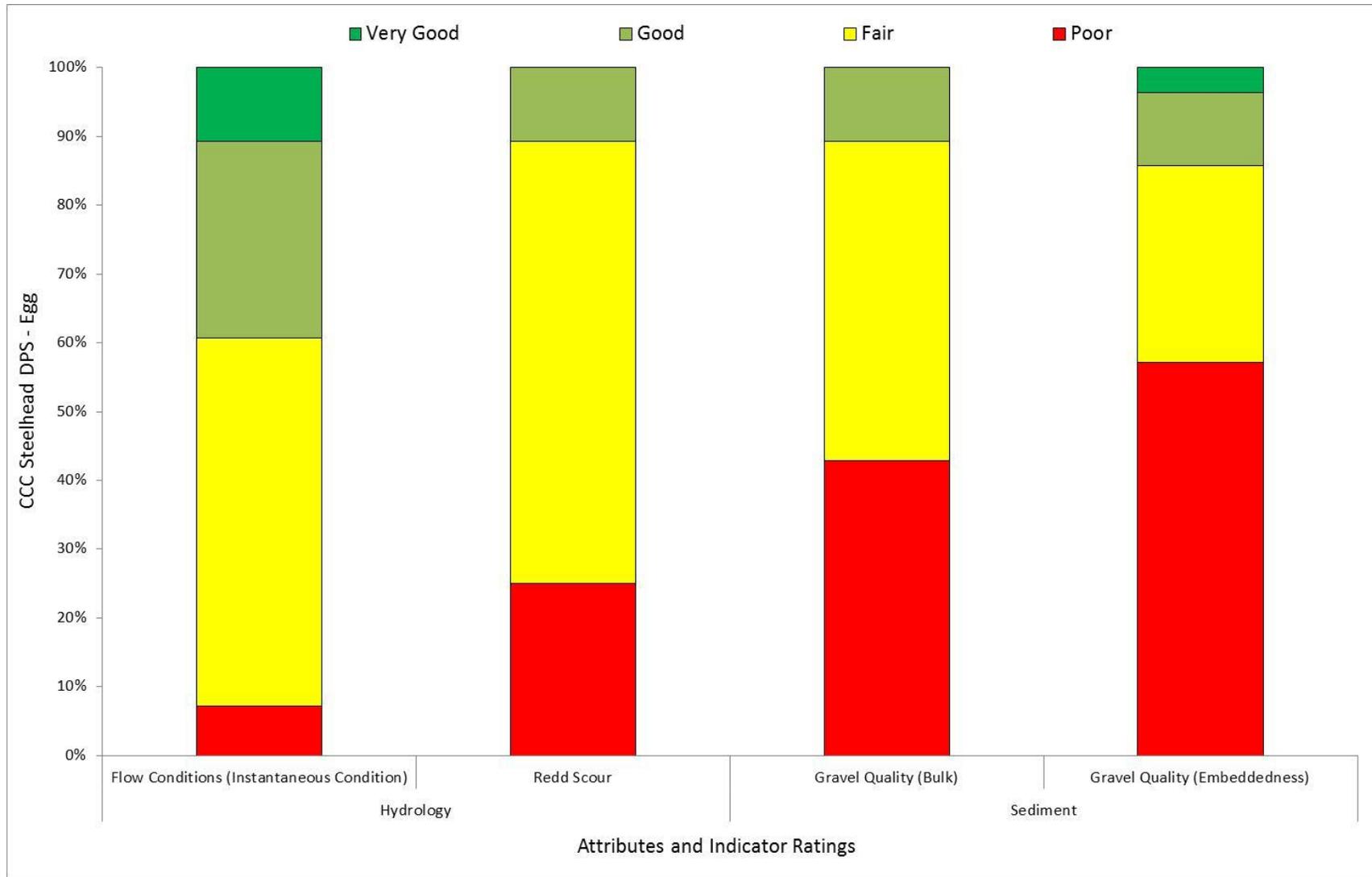


Figure 16: Attribute Indicator ratings for the Egg life stage.

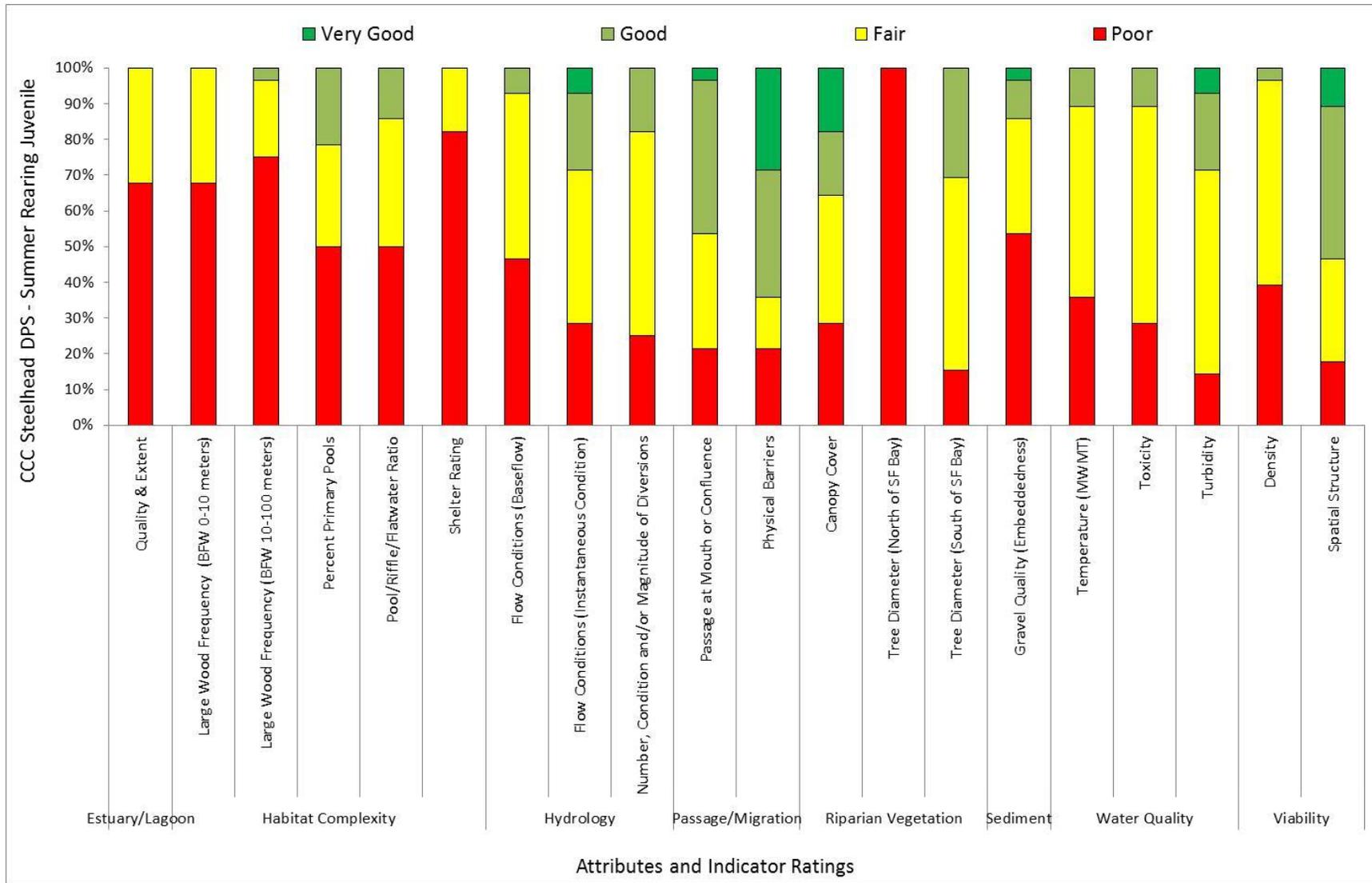


Figure 17: Attribute Indicator ratings for the Summer Rearing Juvenile life stage.

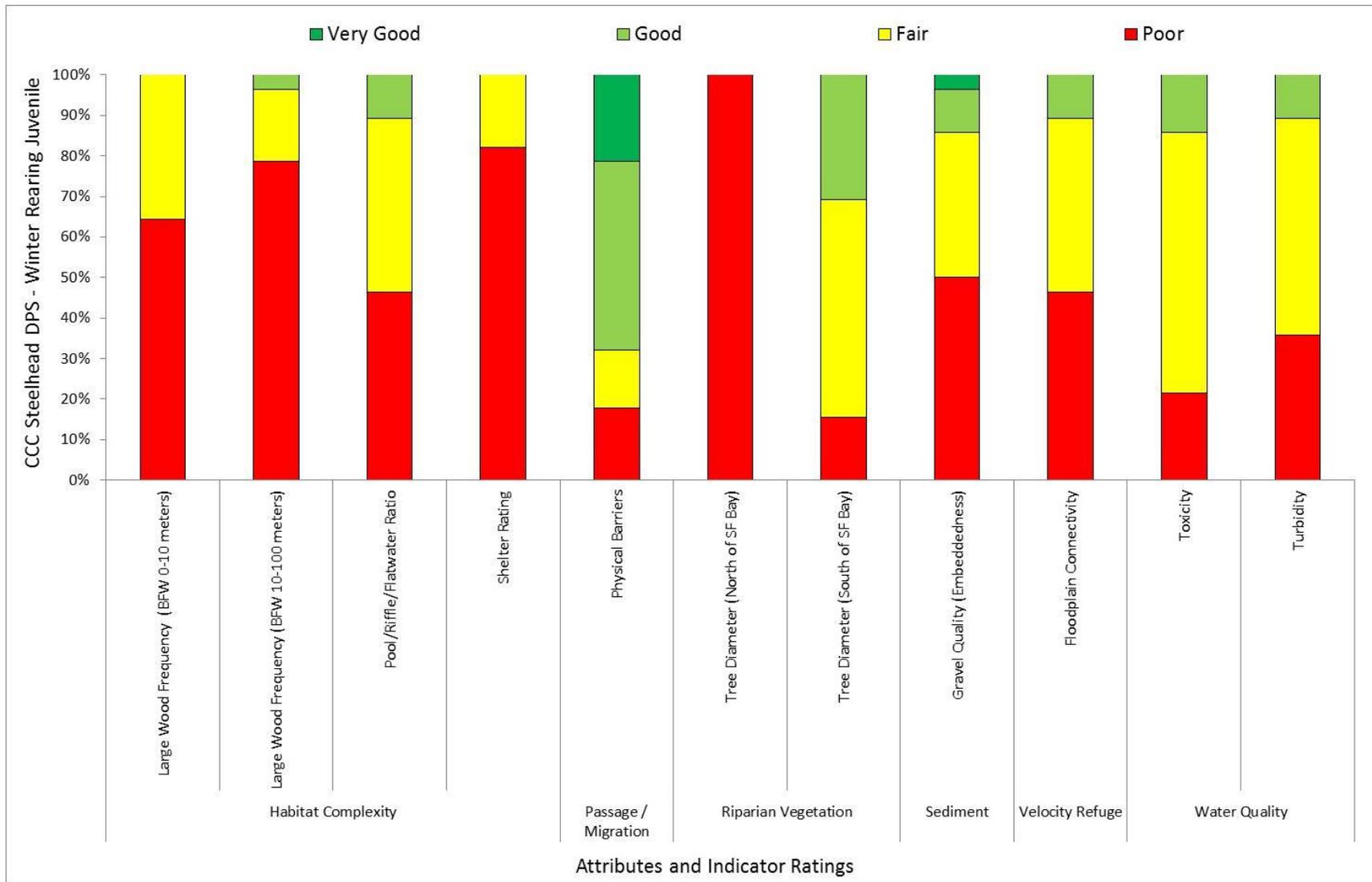


Figure 18: Attribute Indicator ratings for the Winter Rearing Juvenile life stage.

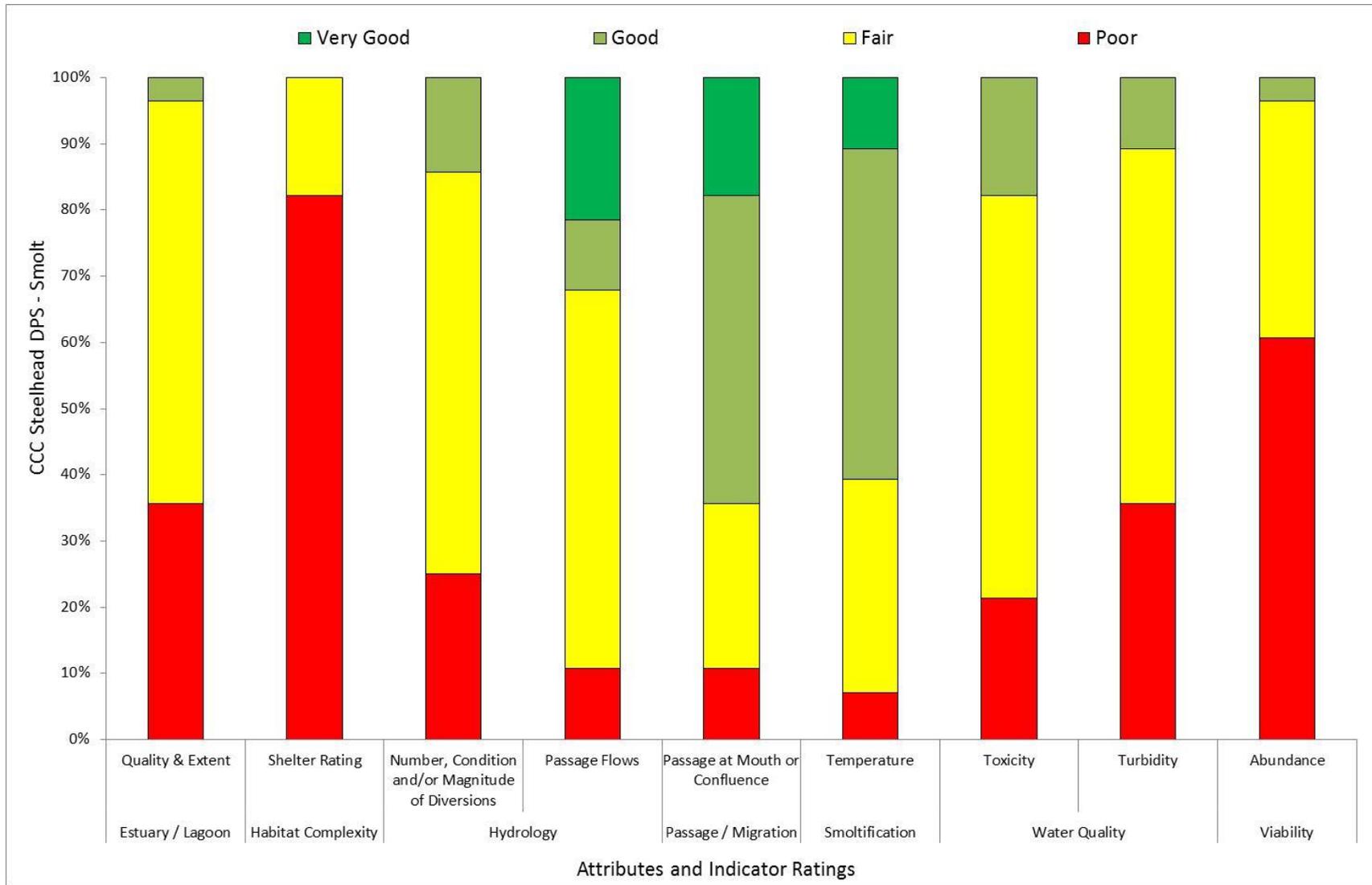


Figure 19: Attribute Indicator ratings for Smolt life stage.

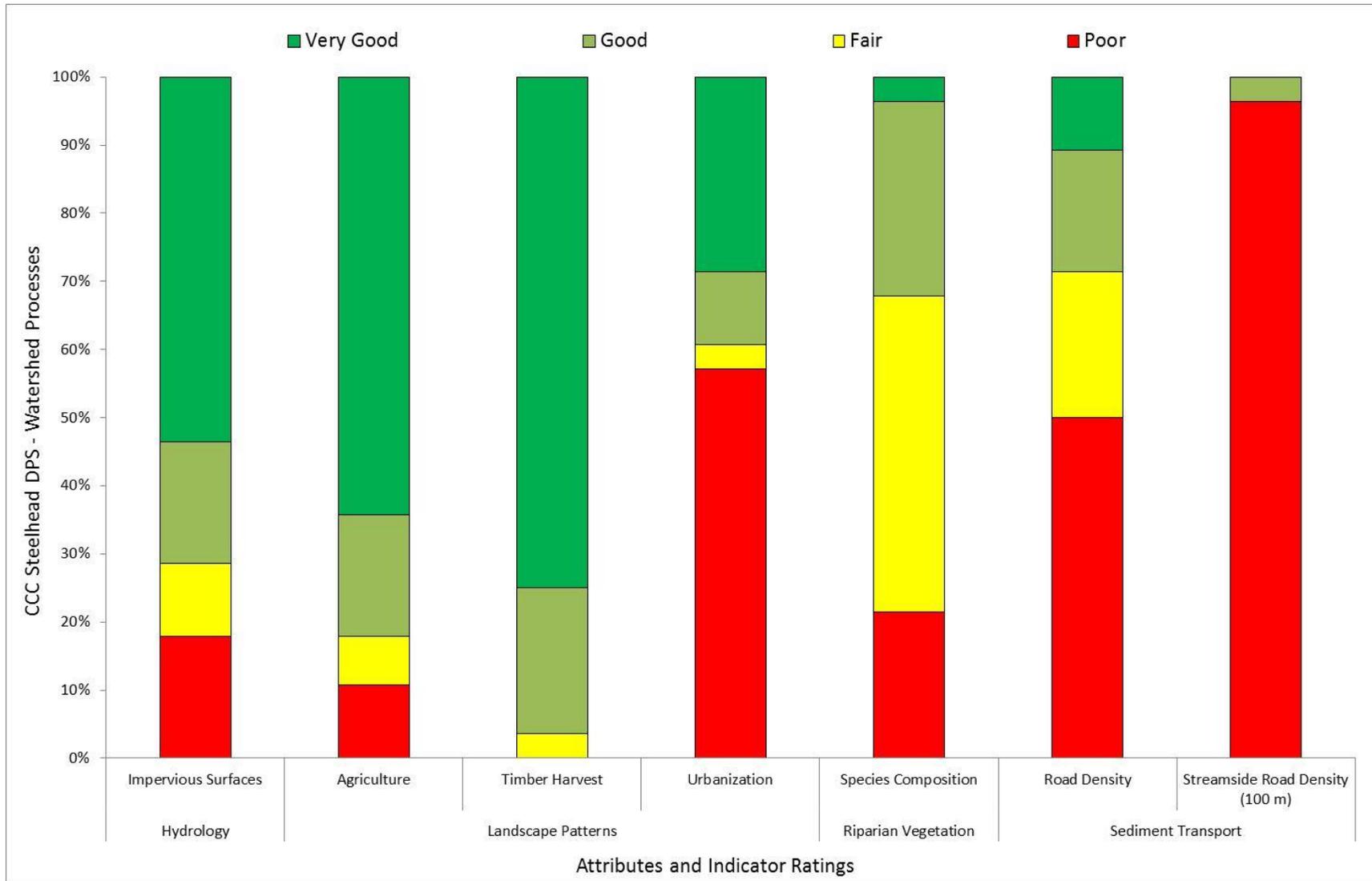


Figure 20: Attribute Indicator ratings for Watershed Processes.

DPS CAP THREAT RESULTS

Table 5 summarizes the CAP threat results across the DPS. Based on the combined percentage of Very High or High ratings the most significant threats to steelhead populations in the CCC DPS are channel modification, residential and commercial development, roads and railroads, and water diversions and impoundments (Figure 21). Of these, water diversions and impoundments received the greatest number of Very High ratings, all of which were in populations south of the Golden Gate where annual precipitation is generally less (Table 5). Threats of low concern throughout the DPS were fishing and collecting as well as hatcheries and aquaculture, which were consistently rated Low, Medium, or Not Applicable.

Table 5: CCC steelhead DPS Threat Summary Table, where L=low, M=medium, H=high, and VH=very high threat. Cells with [-] were not rated or not applicable.

Diversity Strata	Northern Coastal					Interior				Santa Cruz Mountains							Coastal S.F. Bay					Interior S.F. Bay							
CCC Steelhead Threat/Population	Austin Creek	Green Valley Creek	Salmon Creek	Walker Creek	Lagunitas Creek	Mark West Creek	Dry Creek	Maacama Creek	Upper Russian River	Pilarcitos Creek	San Gregorio Creek	Pescadero Creek	Waddell Creek	Scott Creek	San Lorenzo River	Soquel Creek	Aptos Creek	Corte Madera Creek	Novato Creek	Guadalupe River	Stevens Creek	San Francisco Creek	Petaluma River	Sonoma Creek	Napa River	Green Valley/Suisun Creek	Alameda Creek	Coyote Creek	
Agriculture	M	H	M	H	M	H	H	H	H	VH	M	M	M	M	M	M	M	M	H	L	L	L	L	M	VH	VH	VH	M	L
Channel Modification	M	H	M	H	M	H	H	M	H	VH	M	H	M	M	H	M	H	VH	VH	VH	VH	VH	VH	H	VH	VH	M	VH	VH
Disease, Predation and Competition	L	L	L	L	L	M	L	M	M	M	M	M	M	L	M	M	L	M	M	L	L	L	M	L	M	M	VH	M	M
Fire, Fuel Management and Fire Suppression	M	L	L	L	L	L	L	M	M	M	H	H	H	M	H	M	H	M	M	-	-	L	L	L	M	M	L	M	L
Fishing and Collecting	L	L	M	M	L	L	L	L	L	L	L	M	L	L	M	L	M	M	L	L	L	L	L	L	M	M	M	M	M
Hatcheries and Aquaculture	L	L	L	L	L	L	L	L	L	-	-	-	-	L	L	-	-	M	L	-	-	-	L	-	-	M	L	M	
Livestock Farming and Ranching	L	M	M	H	M	L	L	M	M	M	L	M	L	L	M	L	L	M	M	L	L	L	L	H	M	M	H	VH	L
Logging and Wood Harvesting	H	M	M	L	M	M	L	M	M	L	M	M	M	M	H	M	M	M	M	-	-	-	L	L	L	M	L	-	-
Mining	M	M	L	L	L	L	L	L	M	M	-	L	-	-	M	M	-	M	M	H	M	-	L	L	L	M	L	H	VH
Recreational Areas and Activities	L	-	L	L	L	M	L	L	L	H	H	M	M	L	H	M	M	M	M	M	H	M	L	L	L	M	L	L	H
Residential and Commercial Development	M	H	H	M	H	H	M	M	H	VH	VH	H	L	M	VH	VH	H	VH	VH	VH	VH	H	H	H	H	H	M	VH	VH
Roads and Railroads	H	H	H	M	H	H	M	H	H	H	VH	H	H	H	VH	H	VH	VH	VH	VH	VH	H	H	H	H	H	M	H	VH
Severe Weather Patterns	L	H	M	M	M	M	M	M	M	VH	H	H	H	M	VH	H	H	H	M	M	M	L	M	H	VH	M	H	M	
Water Diversion and Impoundments	M	H	M	M	M	M	H	M	H	VH	VH	H	M	M	VH	H	H	M	VH	VH	VH	M	M	VH	VH	VH	VH	VH	
Threat Status for Targets and Project	H	VH	H	H	H	VH	H	H	H	VH	VH	VH	H	H	VH	VH	VH	VH	VH	VH	VH	H	H	VH	VH	VH	VH	VH	VH

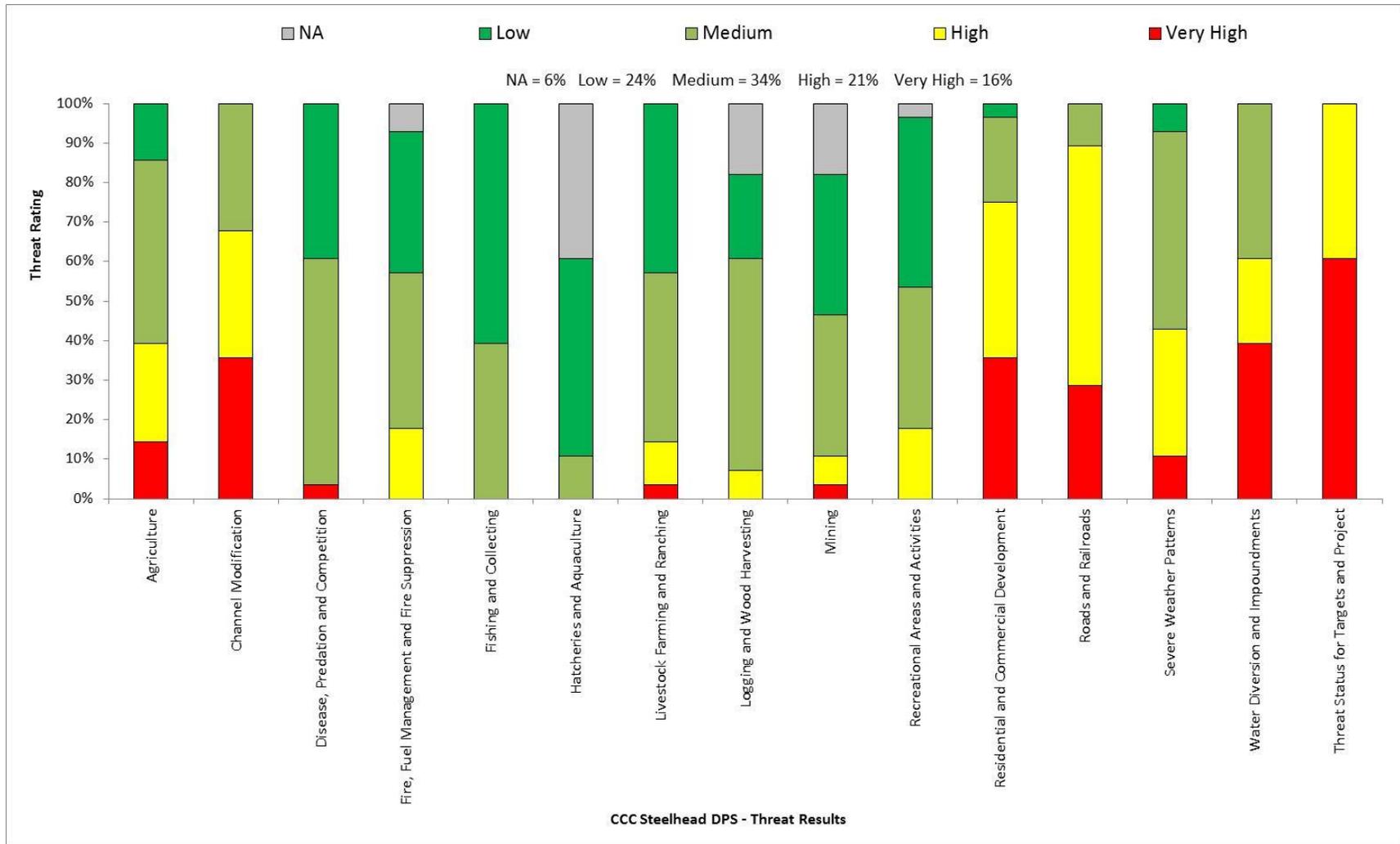


Figure 21: Threat ratings for the CCC steelhead DPS

DPS LEVEL RECOVERY ACTIONS

The following recovery actions are DPS-wide recovery actions. DPS-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.

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-1.1	Estuary	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-1.1.1	Estuary	Recovery Action	Increase quality and extent of estuarine habitat.										
DPS-CCCS-1.1.1.1	Estuary	Action Step	In estuary/lagoons when applicable, remove problematic infrastructure and fill material to promote the historical seasonal formation and timing of an estuary/lagoon barrier breach	3	20	County, State, NMFS						TBD	Cost is dependent on the infrastructure of fill to be removed
DPS-CCCS-1.1.1.2	Estuary	Action Step	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,						0	Action is considered In-Kind
DPS-CCCS-1.2	Estuary	Objective	Address the inadequacy of existing regulatory mechanisms.										
DPS-CCCS-1.2.1	Estuary	Recovery Action	Increase quality and extent of estuarine habitat.										
DPS-CCCS-1.2.1.1	Estuary	Action Step	Develop and implement Estuary Inflow Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.	2	20	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
DPS-CCCS-1.2.1.2	Estuary	Action Step	Work with local county/city and state organizations to develop alternative methods of flood control to reduce artificial breaching frequency.	2	10	City, County, NMFS, State						0	Action is considered In-Kind
DPS-CCCS-2.1	Floodplain Connectivity	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
DPS-CCCS-2.1.1	Floodplain Connectivity	Recovery Action	Rehabilitate and enhance floodplain connectivity										
DPS-CCCS-2.1.1.1	Floodplain Connectivity	Action Step	Evaluate opportunities and implement actions for planned retreat of urban development or other incompatible land uses from floodplains (similar to the City of Napa, CA) and alluvial valley streams to recreate natural floodplain processes and complex off-channel habitat and implement such opportunities where appropriate.	2	50	City, County						TBD	In-Kind for the evaluation, TBD for the implementation of the plan
DPS-CCCS-2.2	Floodplain Connectivity	Objective	Address the inadequacy of existing regulatory mechanisms										
DPS-CCCS-2.2.1	Floodplain Connectivity	Recovery Action	Rehabilitate and enhance floodplain connectivity										
DPS-CCCS-2.2.1.1	Floodplain Connectivity	Action Step	County zoning should consider the 20-year and 100-year floodprone areas and design protective ordinances and compatible land use designations in these locations.	2	50	County						0	Action is considered In-Kind
DPS-CCCS-3.1	Hydrology	Objective	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
DPS-CCCS-3.1.1	Hydrology	Recovery Action	Improve flow conditions										
DPS-CCCS-3.1.1.1	Hydrology	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-3.1.1.2	Hydrology	Action Step	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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-3.1.1.3	Hydrology	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-3.1.1.4	Hydrology	Action Step	Work with the RWQCBs 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						0	Action is considered In-Kind
DPS-CCCS-3.1.1.5	Hydrology	Action Step	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						TBD	Costs for implementing this action will depend on the number, location and duration of gages across the ESU and DPS. See also Monitoring Chapter.
DPS-CCCS-3.1.1.6	Hydrology	Action Step	Meter water diversions for the purposes of measuring instantaneous demand.	2	5	CDFW, City, County, NMFS, Private Landowners, State, SWRCB						0	Implementation costs should be covered under existing laws or should be the responsibility of the entity that owns the diversion.
DPS-CCCS-3.1.1.7	Hydrology	Action Step	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						TBD	Some of this would be In-Kind
DPS-CCCS-3.1.1.8	Hydrology	Action Step	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						0	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. Action is considered In-Kind
DPS-CCCS-3.1.1.9	Hydrology	Action Step	Evaluate geological patterns in the ESU to identify areas with karst formations or similar geology. These sites may 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						TBD	
DPS-CCCS-3.2	Hydrology	Objective	Address the inadequacy of existing regulatory mechanisms										
DPS-CCCS-3.2.1	Hydrology	Recovery Action	Improve flow conditions										
DPS-CCCS-3.2.1.1	Hydrology	Action Step	Encourage local governments to condition new development to reduce or eliminate human water demand by integrating hydro-modification concerns into development planning.	2	50	City, County						0	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 have no adverse impacts of fisheries resources. Action is In-Kind
DPS-CCCS-3.2.1.2	Hydrology	Action Step	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						0	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. Action is In-Kind
DPS-CCCS-3.2.1.3	Hydrology	Action Step	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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-3.2.1.4	Hydrology	Action Step	Collaborate with and support the SWRCB and local agencies to increase oversight and responsibility for regulating groundwater extraction from aquifers hydrologically connected to surface flows.	1	5	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB						0	Action is considered In-Kind
DPS-CCCS-3.2.1.5	Hydrology	Action Step	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	City, County, CDFW, NMFS, SWRCB						0	Action is considered In-Kind
DPS-CCCS-3.2.1.6	Hydrology	Action Step	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, NMFS, Private Landowners, RWQCB, SWRCB						0	Action is considered In-Kind
DPS-CCCS-3.2.1.7	Hydrology	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-3.2.1.8	Hydrology	Action Step	Water conservation projects should be focused on shifting reliance from on-stream storage to offstream storage, resolve frost protection issues, and ensure necessary flows for all freshwater lifestyles in all water years.	2	10	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB						TBD	
DPS-CCCS-5.1	Passage	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
DPS-CCCS-5.1.1	Passage	Recovery Action	Modify or remove physical passage barriers.										
DPS-CCCS-5.1.1.1	Passage	Action Step	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						TBD	
DPS-CCCS-5.1.1.2	Passage	Action Step	Monitor and update barriers in the Passage Assessment Database (PAD) (https://nm.dfg.ca.gov/PAD/)	3	50	City, County, NGO, RCD, State						0	The data that is collected is often part of another survey and is forwarded to CDFW. CDFW maintenance of the database is considered In-Kind
DPS-CCCS-6.2	Habitat Complexity	Objective	Address the inadequacy of existing regulatory conditions										
DPS-CCCS-6.2.1	Habitat Complexity	Recovery Action	Improve shelter										
DPS-CCCS-6.2.1.1	Habitat Complexity	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-6.2.1.2	Habitat Complexity	Action Step	Work with California BOF, 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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-6.2.1.3	Habitat Complexity	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-6.2.1.4	Habitat Complexity	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-6.2.1.5	Habitat Complexity	Action Step	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						TBD	
DPS-CCCS-6.2.1.6	Habitat Complexity	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-6.2.1.7	Habitat Complexity	Action Step	Develop and update a Beaver Management Plan for California to benefit salmonids.	3	10	CDFW, California Fish and Game Commission, NMFS						0	Action is considered In-Kind
DPS-CCCS-7.1	Riparian	Objective	Address the inadequacy of existing regulatory conditions										
DPS-CCCS-7.1.1	Riparian	Recovery Action	Improve riparian conditions										
DPS-CCCS-7.1.1.1	Riparian	Action Step	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.	2	10	County						0	Action is considered In-Kind
DPS-CCCS-7.1.1.2	Riparian	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-8.1	Sediment	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-8.1.1	Sediment	Recovery Action	Improve instream gravel quality										
DPS-CCCS-8.1.1.1	Sediment	Action Step	Fund and implement sediment TMDLs within the range of listed salmonids.	2	10	EPA, RWQCB						TBD	
DPS-CCCS-8.1.1.2	Sediment	Action Step	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	Caltrans, County, CDFW, NMFS						TBD	
DPS-CCCS-10.1	Water Quality	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-10.1.1	Water Quality	Recovery Action	Reduce toxicity and pollutants.										

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-10.1.1.1	Water Quality	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-10.1.1.2	Water Quality	Action Step	Conduct outreach to increase awareness of the effects of pesticides and contaminants that impact the continued existence and habitat of listed salmonids.	2	5	EPA, CDFW, NGO, NMFS, RWQCB						0	Action is considered In-Kind
DPS-CCCS-10.1.1.3	Water Quality	Action Step	Support the development and implementation of stormwater BMPs in cities, towns and rural areas.	2	5	City, County, Local, Private Landowners, State, RWQCB						0	Action is considered In-Kind
DPS-CCCS-10.1.1.4	Water Quality	Action Step	Implement performance standards in Stormwater Management Plans.	2	5	City, County, Private Landowners, State, RWQCB						0	Action is considered In-Kind
DPS-CCCS-10.1.1.5	Water Quality	Action Step	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						0	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. Action is considered In-Kind
DPS-CCCS-10.1.1.6	Water Quality	Action Step	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						0	For example: change building infrastructure applications of pyrethroids on monthly schedules throughout the entire year including the rainy season to seasons of interest. Action is considered In-Kind
DPS-CCCS-10.1.1.7	Water Quality	Action Step	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						0	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. Action is considered In-Kind
DPS-CCCS-10.1.1.8	Water Quality	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-10.2	Water Quality	Objective	Address Inadequacy of existing regulatory conditions										
DPS-CCCS-10.2.1	Water Quality	Recovery Action	Reduce toxicity and pollutants.										
DPS-CCCS-10.2.1.1	Water Quality	Action Step	Work with the RWQCB to support and fast track promulgation of methods to detect impacts from 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						0	Action is considered In-Kind
DPS-CCCS-11.1	Viability	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-11.1.1	Viability	Recovery Action	Increase abundance, spatial structure and diversity										
DPS-CCCS-11.1.1.1	Viability	Action Step	Finalize and implement the California Coastal Salmonid Monitoring Plan.	1	50	CDFW, County, NGO, RCD, Watershed Partners, Water Agencies						TBD	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.
DPS-CCCS-11.1.1.2	Viability	Action Step	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.	2	50	CDFW, NMFS						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-11.1.1.3	Viability	Action Step	Work with the SWFSC to revise the "Intrinsic Potential" model in areas where the model predictions has a severe or high bias.	2	5	NMFS, SWFSC						0	Action is considered In-Kind
DPS-CCCS-11.1.1.4	Viability	Action Step	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, CDFW, NGO, NMFS, SWFSC						TBD	
DPS-CCCS-11.1.1.5	Viability	Action Step	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, CDFW, NGO, NMFS, SWFSC						TBD	
DPS-CCCS-12.1	Agriculture	Objective	Address the present of threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-12.1.1	Agriculture	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-12.1.1.1	Agriculture	Action Step	Continue existing cooperative conservation programs (such as Fish Friendly Farming or Fish Friendly Ranching) in order to minimize the impacts of agricultural operations on habitat quality.	2	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State						TBD	
DPS-CCCS-12.1.1.2	Agriculture	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-12.1.1.3	Agriculture	Action Step	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						0	In-Kind to develop the program, TBD depending on what incentives are provided
DPS-CCCS-12.1.1.4	Agriculture	Action Step	Continue and expand the use of cover crops in agriculture fields to reduce sediment runoff.	3	10	Private Landowners						0	In-Kind, should be considered standard practice, but implementation is ultimately up to the landowner.
DPS-CCCS-12.1.2	Agriculture	Recovery Action	Prevent or minimize impairment to watershed hydrology										
DPS-CCCS-12.1.2.1	Agriculture	Action Step	Support projects that build agricultural ponds as an alternative to summer riparian diversions.	2	15	NMFS, NRCS, Private Landowners, RCD, RWQCB, State, SWRCB						0	Action is considered In-Kind
DPS-CCCS-12.1.2.2	Agriculture	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-12.1.2.3	Agriculture	Action Step	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						TBD	
DPS-CCCS-12.1.2.4	Agriculture	Action Step	Re-design levee systems to back-flood alluvial basin recharge zones in flood tolerant agricultural areas.	3	20	Corps, County, NMFS						0	Action is considered In-Kind
DPS-CCCS-12.2	Agriculture	Objective	Address the inadequacies of existing regulatory mechanisms.										
DPS-CCCS-12.2.1	Agriculture	Recovery Action	Prevent or minimize impairment to watershed hydrology										

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-12.2.1.1	Agriculture	Action Step	NMFS and CDFW should request to be included as technical experts in ongoing legislative efforts to craft marijuana cultivation regulations.	2	5	CDFW, NMFS						0	Action is considered In-Kind
DPS-CCCS-12.2.1.2	Agriculture	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-12.2.1.3	Agriculture	Action Step	Promote the use of reclaimed waste water for agricultural, landscape and other appropriate applications.	2	10	City, County, Private, NMFS, State, RWQCB, SWRCB						0	Action is considered In-Kind
DPS-CCCS-12.2.1.4	Agriculture	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-12.2.1.5	Agriculture	Action Step	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.	1	5	CDFW, County, NMFS, State						0	Action is considered In-Kind
DPS-CCCS-12.2.2	Agriculture	Recovery Action	Prevent or minimize impairment to watershed hydrology										
DPS-CCCS-12.2.2.1	Agriculture	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-13.1	Channel Modification	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-13.1.1	Channel Modification	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-13.1.1.1	Channel Modification	Action Step	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						TBD	
DPS-CCCS-13.1.1.2	Channel Modification	Action Step	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						TBD	
DPS-CCCS-13.1.1.3	Channel Modification	Action Step	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						TBD	
DPS-CCCS-13.2	Channel Modification	Objective	Address the inadequacy of existing regulatory mechanisms.										
DPS-CCCS-13.2.1	Channel Modification	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-13.2.1.1	Channel Modification	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-13.2.1.2	Channel Modification	Action Step	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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-14.1	Disease/Predation/Competition	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-14.1.1	Disease/Predation/Competition	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
DPS-CCCS-14.1.1.1	Disease/Predation/Competition	Action Step	Provide funding to investigate and remediate impacts of disease and predation to overall viability.	3	20	Academic, CDFW, NMFS, SWFSC						TBD	
DPS-CCCS-14.1.1.2	Disease/Predation/Competition	Action Step	Evaluate impacts of striped bass predation in coastal estuaries to juvenile and smolt salmonids and implement abatement strategies where appropriate.	2	10	CDFW, NMFS						TBD	See Monitoring Chapter
DPS-CCCS-14.1.1.3	Disease/Predation/Competition	Action Step	Support CDFW, and other resource agencies to control and contain invasive species in California.	2	10	CDFW, NMFS						0	Action is considered In-Kind
DPS-CCCS-14.1.1.4	Disease/Predation/Competition	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-14.1.1.5	Disease/Predation/Competition	Action Step	Work with Counties to modify existing tree ordinances (e.g., Heritage Tree Ordinance) to exclude protection of non-native trees (e.g., <i>Eucalyptus</i> sp.) and waive any associated fees for non-native tree removal, particularly when part of a restoration project or on public lands.	3	10	County, NMFS, CDFW						0	Action is considered In-Kind
DPS-CCCS-14.1.1.6	Disease/Predation/Competition	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-15.1	Fire/Fuel Management	Objective	Address the inadequacy of existing regulatory mechanisms.										
DPS-CCCS-15.1.1	Fire/Fuel Management	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-15.1.1.1	Fire/Fuel Management	Action Step	Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.	2	10	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind
DPS-CCCS-15.1.1.2	Fire/Fuel Management	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-15.1.1.3	Fire/Fuel Management	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-15.1.1.4	Fire/Fuel Management	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-15.1.2	Fire/Fuel Management	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
DPS-CCCS-15.1.2.1	Fire/Fuel Management	Action Step	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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-15.1.2.2	Fire/Fuel Management	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-15.1.3	Fire/Fuel Management	Recovery Action	Prevent or minimize impairment to watershed hydrology										
DPS-CCCS-15.1.3.1	Fire/Fuel Management	Action Step	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						TBD	NMFS anticipates that it will take up to 5 years for this to be implemented but should continue in perpetuity
DPS-CCCS-16.1	Fishing/Collecting	Objective	Address the overutilization for commercial, recreational, scientific or educational purposes.										
DPS-CCCS-16.1.1	Fishing/Collecting	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
DPS-CCCS-16.1.1.1	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-16.1.1.2	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-16.1.1.3	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-16.1.1.4	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-16.1.1.5	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-16.1.1.6	Fishing/Collecting	Action Step	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						TBD	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.
DPS-CCCS-16.1.1.7	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-16.1.1.8	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-16.1.1.9	Fishing/Collecting	Action Step	Consider other incentives for greater angler participation in fisheries restoration efforts.	2	10	CDFW, CA Fish and Game Commission, NMFS						TBD	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.
DPS-CCCS-16.1.1.10	Fishing/Collecting	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-17.1	Hatcheries	Objective	Address other natural or manmade factors affecting the species' continued existence.										
DPS-CCCS-17.1.1	Hatcheries	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
DPS-CCCS-17.1.1.1	Hatcheries	Action Step	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						0	Ensure the threat of hatcheries remains low for listed salmonids for current, and all future, hatchery programs. Action is considered In-Kind
DPS-CCCS-17.1.1.2	Hatcheries	Action Step	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						TBD	
DPS-CCCS-17.1.1.3	Hatcheries	Action Step	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						TBD	
DPS-CCCS-18.1	Livestock	Objective	Address the present or threatened destruction, modification or curtailment of the species habitat or range.										
DPS-CCCS-18.1.1	Livestock	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-18.1.1.1	Livestock	Action Step	Aid and encourage willing landowners to fence livestock from the stream channel and riparian zones and develop offstream alternative water sources.	2	15	NRCS, RCD, Private Landowners						TBD	
DPS-CCCS-18.1.1.2	Livestock	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-18.1.1.3	Livestock	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-18.1.1.4	Livestock	Action Step	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						0	
DPS-CCCS-18.1.1.5	Livestock	Action Step	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						TBD	
DPS-CCCS-18.1.2	Livestock	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-18.1.2.1	Livestock	Action Step	Implement practices as outlined in the University of California guidelines for water quality protection (Ristow 2006).	2	10	NRCS, RCD, Private Landowners						TBD	
DPS-CCCS-18.1.2.2	Livestock	Action Step	Implement recommendations of the California Rangeland Water Quality Management Program.	2	10	NRCS, RCD, Private Landowners						TBD	
DPS-CCCS-19.1	Logging	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
DPS-CCCS-19.1.1	Logging	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-19.1.1.1	Logging	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-19.1.1.2	Logging	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-19.1.1.3	Logging	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-19.1.1.4	Logging	Action Step	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						TBD	
DPS-CCCS-19.2	Logging	Objective	Address the inadequacy of existing regulatory mechanisms.										
DPS-CCCS-19.2.1	Logging	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-19.2.1.1	Logging	Action Step	Discourage Counties from rezoning forestlands or identified TPZ areas to rural residential or other land uses (e.g., vineyards).	3	50	County, NMFS						0	Action is considered In-Kind
DPS-CCCS-19.2.1.2	Logging	Action Step	Increase THP inspections by CalFire especially during winter months.	3	50	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners						0	Action is considered In-Kind
DPS-CCCS-19.2.1.3	Logging	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-19.2.1.4	Logging	Action Step	Work with the BOF, 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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-19.2.1.5	Logging	Action Step	California BOF could 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						TBD	
DPS-CCCS-20.1	Mining	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
DPS-CCCS-20.1.1	Mining	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-20.1.1.1	Mining	Action Step	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, Federal, NMFS, Private, State						TBD	
DPS-CCCS-20.2	Mining	Objective	Address the inadequacy of existing regulations										
DPS-CCCS-20.2.1	Mining	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-20.2.1.1	Mining	Action Step	NMFS National Gravel Extraction Guidance (2005, 2014) should be followed for all existing and proposed projects.	2	20	County, EPA, Federal, NMFS, Private, State						0	Action is considered In-Kind
DPS-CCCS-20.2.1.2	Mining	Action Step	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, Federal, NMFS, Private, State						0	Action is considered In-Kind
DPS-CCCS-20.2.1.3	Mining	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-22.1	Residential/Commercial Development	Objective	Address the present or threatened destruction, modification or curtailment of the species habitat or range.										
DPS-CCCS-22.1.1	Residential/Commercial Development	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
DPS-CCCS-22.1.1.1	Residential/Commercial Development	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-22.1.2	Residential/Commercial Development	Recovery Action	Prevent or minimize impairment to watershed hydrology										
DPS-CCCS-22.1.2.1	Residential/Commercial Development	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-22.1.2.2	Residential/Commercial Development	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-22.2	Residential/Commercial Development	Objective	Address the inadequacy of existing regulatory mechanisms.										

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-22.2.1	Residential/Commercial Development	Recovery Action	Prevent or minimize impairment to stream hydrology (impaired water flow).										
DPS-CCCS-22.2.1.1	Residential/Commercial Development	Action Step	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, SRWCB						0	Action is considered In-Kind
DPS-CCCS-22.2.1.2	Residential/Commercial Development	Action Step	Develop and implement regulations for activities that intercept groundwater recharge.	2	10	CDFW, County, NMFS, SRWCB						0	Action is considered In-Kind
DPS-CCCS-22.2.1.4	Residential/Commercial Development	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-22.2.2	Residential/Commercial Development	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-22.2.2.1	Residential/Commercial Development	Action Step	Enforce existing building permit programs to minimize unpermitted construction.	3	50	City, County, County Planner						0	Action is considered In-Kind
DPS-CCCS-22.2.2.2	Residential/Commercial Development	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-22.2.2.3	Residential/Commercial Development	Action Step	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						TBD	Price depends on the type of incentive provided
DPS-CCCS-22.2.2.4	Residential/Commercial Development	Action Step	Encourage infill and high density developments over dispersal of low density rural residential development.	2	50	City, County, County Planner, NMFS, State						0	Action is considered In-Kind
DPS-CCCS-22.2.2.5	Residential/Commercial Development	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-23.1	Roads/Railroads	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
DPS-CCCS-23.1.1	Roads/Railroads	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
DPS-CCCS-23.1.1.1	Roads/Railroads	Action Step	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 Landowner						TBD	
DPS-CCCS-23.1.1.2	Roads/Railroads	Action Step	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 Landowner						TBD	
DPS-CCCS-23.1.1.3	Roads/Railroads	Action Step	Conduct annual inspections of roads prior to winter. Correct conditions that are likely to deliver sediment to streams.	2	50	BOF, Local, RWQCB, Timber Landowner						0	Inspections should be standard practice in timber operations

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-23.1.1.4	Roads/Railroads	Action Step	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).	1	50	CDFW, NMFS, Timber Landowner						0	In-Kind to consider the projects, cost of upgrading/decommissioning roads is at the population level when recommended.
DPS-CCCS-23.1.1.5	Roads/Railroads	Action Step	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	CalTrans, CDFW, NMFS, Timber Landowner						0	Action is considered In-Kind
DPS-CCCS-23.1.1.6	Roads/Railroads	Action Step	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 Landowner						TBD	
DPS-CCCS-23.1.2	Roads/Railroads	Recovery Action	Prevent or minimize impairment to passage and migration.										
DPS-CCCS-23.1.2.1	Roads/Railroads	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-23.1.2.2	Roads/Railroads	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-23.1.2.3	Roads/Railroads	Action Step	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						TBD	
DPS-CCCS-23.1.3	Roads/Railroads	Recovery Action	Prevent or minimize increased landscape disturbance.										
DPS-CCCS-23.1.3.1	Roads/Railroads	Action Step	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						TBD	
DPS-CCCS-23.2	Roads/Railroads	Objective	Address the inadequacy of existing regulatory mechanisms.										
DPS-CCCS-23.2.1	Roads/Railroads	Recovery Action	Prevent or minimize impairment to watershed hydrology.										
DPS-CCCS-23.2.1.1	Roads/Railroads	Action Step	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						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment	
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25			
DPS-CCCS-23.2.1.2	Roads/Railroads	Action Step	Encourage enforcement of existing regulations regarding grading, riparian and building violations and sediment release from county roads.	2	50	CalTrans, County, NMFS, RWQCB						0	Action is considered In-Kind	
DPS-CCCS-24.1	Severe Weather Patterns	Objective	Address other natural or manmade factors affecting the species continued existence.											
DPS-CCCS-24.1.1	Severe Weather Patterns	Recovery Action	Prevent or minimize impairment to watershed hydrology											
DPS-CCCS-24.1.1.1	Severe Weather Patterns	Action Step	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						0	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. Action is considered In-Kind	
DPS-CCCS-24.1.1.2	Severe Weather Patterns	Action Step	Develop a climate strategy that addresses simultaneously the reduction of fossil fuels and the protection of forestlands.	3	15	Academic, NWFS, State, SWFSC,							TBD	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.
DPS-CCCS-24.1.1.3	Severe Weather Patterns	Action Step	Expand research and monitoring to improve predictions of climate change and its effects on salmon recovery.	2	15	Academic, NWFS, State, SWFSC,							TBD	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.
DPS-CCCS-24.1.1.4	Severe Weather Patterns	Action Step	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						0	Action is considered In-Kind	
DPS-CCCS-24.1.1.5	Severe Weather Patterns	Action Step	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						0	Action is considered In-Kind	
DPS-CCCS-24.1.1.6	Severe Weather Patterns	Action Step	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							TBD	
DPS-CCCS-24.1.1.7	Severe Weather Patterns	Action Step	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						0	Action is considered In-Kind	
DPS-CCCS-24.1.1.8	Severe Weather Patterns	Action Step	Institute water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	1	50	CDFW, Local Government, Private Landowners, NMFS, SWRCB							TBD	

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-24.1.1.9	Severe Weather Patterns	Action Step	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	Local Government, Private Landowners, NMFS, SWRCB, USGS						TBD	
DPS-CCCS-24.1.2	Severe Weather Patterns	Recovery Action	Prevent or minimize impairment to estuarine quality and extent										
DPS-CCCS-24.1.2.1	Severe Weather Patterns	Action Step	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,						TBD	
DPS-CCCS-25.1	Water Diversion/Impoundments	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
DPS-CCCS-25.1.1	Water Diversion/Impoundments	Recovery Action	Prevent or minimize impairment to watershed hydrology										
DPS-CCCS-25.1.1.1	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.1.1.2	Water Diversion/Impoundments	Action Step	Work with partners to promote water storage as an alternative to direct diversion during periods of low stream flow.	2	50	Private Landowners, NGO, NMFS, SWRCB						0	In-Kind. See also Hydrology
DPS-CCCS-25.1.1.3	Water Diversion/Impoundments	Action Step	Support projects that provide rainwater catchment systems to rural residential as an alternative to summer riparian diversions.	3	50	Private Landowners, NGO, NMFS						0	Action is considered In-Kind
DPS-CCCS-25.1.1.4	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.1.1.5	Water Diversion/Impoundments	Action Step	Explore the possibility of using other easement mechanisms to dedicate water to instream uses.	2	50	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
DPS-CCCS-25.1.1.6	Water Diversion/Impoundments	Action Step	Support temporary urgency change petitions by appropriate water right holders during critically dry periods if it will provide a benefit to salmonids.	2	50	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
DPS-CCCS-25.1.1.7	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.1.1.8	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.1.1.9	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2	Water Diversion/Impoundments	Objective	Address the inadequacy of existing regulatory mechanisms										
DPS-CCCS-25.2.1	Water Diversion/Impoundments	Recovery Action	Prevent or minimize impairment to watershed hydrology										
DPS-CCCS-25.2.1.1	Water Diversion/Impoundments	Action Step	Encourage the SWRCB to exercise greater regulatory authority over summer water diversions. Water rights held under a claim of pre-1914 rights, riparian rights or older appropriative rights could be regulated to protect instream uses.	2	50	CDFW, NMFS, SWRCB						0	Action is considered In-Kind

Central California Coast Steelhead DPS Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs (\$K)					Entire Duration	Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
DPS-CCCS-25.2.1.2	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2.1.3	Water Diversion/Impoundments	Action Step	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.	1	10	County, NMFS, Private Landowners, Public Works, Water Agencies, SWRCB						0	Action is considered In-Kind
DPS-CCCS-25.2.1.4	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2.1.5	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2.1.6	Water Diversion/Impoundments	Action Step	Provide technical assistance to the SWRCB in its implementation of the frost protection regulation.	2	10	Agriculture Owners, County, NMFS, Private Landowners, SWRCB						0	Action is considered In-Kind
DPS-CCCS-25.2.1.7	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2.1.8	Water Diversion/Impoundments	Action Step	Counties should consider forbearance agreements that eliminate withdrawals during low-flow conditions.	2	5	CDFW, County, NMFS, Private Landowners, SWRCB						0	Action is considered In-Kind
DPS-CCCS-25.2.1.9	Hydrology	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2.1.10	Water Diversion/Impoundments	Action Step	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						0	Action is considered In-Kind
DPS-CCCS-25.2.2	Water Diversion/Impoundments	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria.										
DPS-CCCS-25.2.2.1	Water Diversion/Impoundments	Action Step	Adequately screen water diversions to prevent juvenile salmonid mortalities.	1	50	CDFW, County, NMFS, Private Landowners						TBD	

LITERATURE CITED

- 55 FR 24296. 1990. Endangered and threatened species; listing and recovery priority guidelines. Federal Register 55:24296-24298.
- 61 FR 56138. 1996. Endangered and threatened species: threatened status for central California coho salmon evolutionarily significant unit (ESU). Federal Register 61:56138-56149.
- 62 FR 43937. 1997. Endangered and threatened species: listing of several evolutionarily significant units (ESUs) of west coast steelhead. Federal Register 62:43937-43954.
- 65 FR 36074. 2000. Endangered and threatened species: threatened status for one steelhead evolutionarily significant unit (ESU) in California. Federal Register 65:36074-36094.
- 71 FR 834. 2006. Endangered and threatened species: final listing determinations for 10 distinct population segments of West coast steelhead. Federal Register 71:834-862.
- Bjorkstedt, E. P., B. C. Spence, J. C. Garza, D. G. Hankin, D. Fuller, W. E. Jones, J. J. Smith, and R. Macedo. 2005. An analysis of historical population structure for evolutionarily significant units of Chinook salmon, coho salmon, and steelhead in the north-central California coast recovery domain. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-SWFSC-382.
- Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Largomarsino. 1996. Status review of West Coast steelhead from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center and Southwest Region Protected Resources Division, NOAA Technical Memorandum, NMFS-NWFSC-27.
- Good, T. P., R. S. Waples, and P. B. Adams. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-NWFSC-66.
- Grantham, T. E., and J. H. Viers. 2014. 100 years of California's water rights system: patterns, trends and uncertainty. Environmental Research Letters 9: 084012, 10pp.
- Hanson, L. C. 1993. The foraging ecology of harbor seals, *Phoca vitulina*, and California sea lions, *Zalophus californianus*, at the mouth of the Russian River, California. Sonoma State University, Sonoma, CA.
- NMFS (National Marine Fisheries Service). 2012. National Marine Fisheries Service's annual approval of a 4(d) research limit (salmonids) and 4(d) research exemption (green sturgeon) to the Endangered Species Act (ESA) take prohibitions for California

Department of Fish and Game's Research Program for the next five years (2012-2016), under the authority of section 4(d) of the ESA. National Marine Fisheries Service, Southwest Region, Santa Rosa, CA.

SSHG (Salmon and Steelhead Hatchery Assessment Group). 2003. Hatchery Broodstock Summaries and Assessments for Chum, Coho, and Chinook Salmon and Steelhead stocks within Evolutionarily Significant Units listed under the Endangered Species Act. National Marine Fisheries Service, Seattle, WA.

Spence, B., E. P. Bjorkstedt, J. C. Garza, D. Hankin, D. Fuller, W. Jones, J. Smith, and R. Macedo. 2006. Preliminary biological viability criteria for salmonid ESUs in the North-Central California Coast recovery domain. North-Central California Coast Recovery Team.

Spence, B. C., E. P. Bjorkstedt, J. C. Garza, J. J. Smith, D. G. Hankin, D. Fuller, W. E. Jones, R. Macedo, T. H. Williams, and E. Mora. 2008. A Framework for Assessing the Viability of Threatened and Endangered Salmon and Steelhead in the North-Central California Coast Recovery Domain. U.S. Department of Commerce. NOAA Technical Memorandum. NOAA-TM-NMFS-SWFSC-423.

Spence, B. C., E. P. Bjorkstedt, S. Paddock, and L. Nanus. 2012. Updates to biological viability criteria for threatened steelhead populations in the North-Central California Coast Recovery Domain. National Marine Fisheries Service, Southwest Fisheries Science Center, Fisheries Ecology Division, Santa Cruz, CA.