NOAA FISHERIES

COASTAL MULTISPECIES PLAN

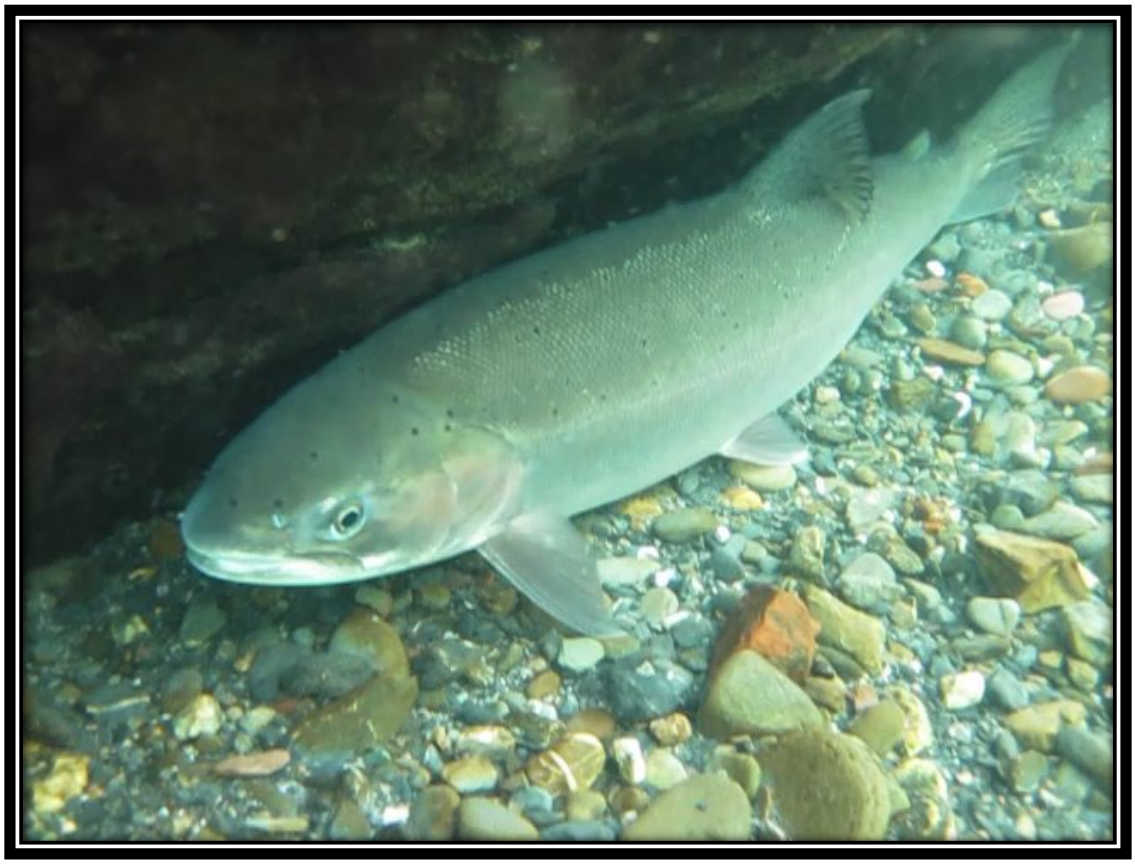

Photo Courtesy: Scott Harris, CDFW, Northern California Steelhead Summer-Run Adult, Middle Fork Eel River, CA

VOLUME III

NORTHERN CALIFORNIA STEELHEAD

FINAL

2016

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LITERATURE CITATION SHOULD READ AS FOLLOWS:

National Marine Fisheries Service. 2016. Final 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
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404

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

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INTRODUCTION TO NC STEELHEAD DPS RECOVERY

The Northern California (NC) steelhead Distinct Population Segment (DPS) historically consisted of five Diversity Strata with 41 independent populations of winter-run steelhead (19 functionally independent and 22 potentially independent) and 10 populations of summer steelhead (all functionally independent) (Spence *et al.* 2008; Spence *et al.* 2012). The delineation of the NC steelhead DPS Diversity Strata was based on environmental and ecological similarities and life history differences between winter run and summer run steelhead. Five strata were identified by Bjorkstedt *et al.* (2005): Northern Coastal, Lower Interior, North Mountain Interior, North Central Coastal, and Central Coastal. We have selected 51 winter-run populations across the five Diversity Strata and 10 summer-run populations across two Diversity strata to represent the recovery scenario for the NC steelhead DPS (Figure 1).

The biological recovery criteria for these populations are (See also Biological Recovery Criteria):

- 27 essential independent populations attaining low extinction risk criteria (*i.e.*, Garcia River, Gualala River, Navarro River, Chamise Creek, Outlet Creek, Tomki Creek, Woodman Creek, Larabee Creek, Middle Fork Eel River, North Fork Eel River, Upper Mainstem Eel River, Van Duzen River, Big River, Noyo River, Ten Mile River, Usal Creek, Wages Creek, Maple Creek/Big Lagoon, Bear River, Humboldt Bay Tributaries, Little River (Humboldt County), Mattole River, South Fork Eel River, Mad River (Upper), Mad River (Lower), and Redwood Creek (Upper) and Redwood (Lower) (Humboldt County));
- Ten supporting independent populations attaining moderate extinction risk criteria (*i.e.*, Brush Creek, Elk Creek, Bell Springs, Bucknell Creek, Dobbyn Creek, Garcia Creek, Jewett River, Albion River, Cottaneva Creek and Pudding Creek); and
- 14 dependent populations contributing to redundancy and occupancy (*i.e.*, Schooner Gulch, Soda Creek, Caspar Creek, Guthrie Creek, Oil Creek, Big Creek, Big Flat Creek, Howe Creek, Jackass Creek, Lower Mainstem Eel River, McNutt Gulch, Shipman Creek, Spanish Creek, and Telegraph Creek).

- Ten independent summer-run steelhead populations expected to meet effective population size criteria (Table 1) (*i.e.,* Redwood Creek, Mad River, South Fork Eel River, Mattole River, Van Duzen River, Larabee Creek, North Fork Eel River, Upper Middle Mainstem Eel River, Middle Fork Eel River, and Upper Mainstem Eel River).

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

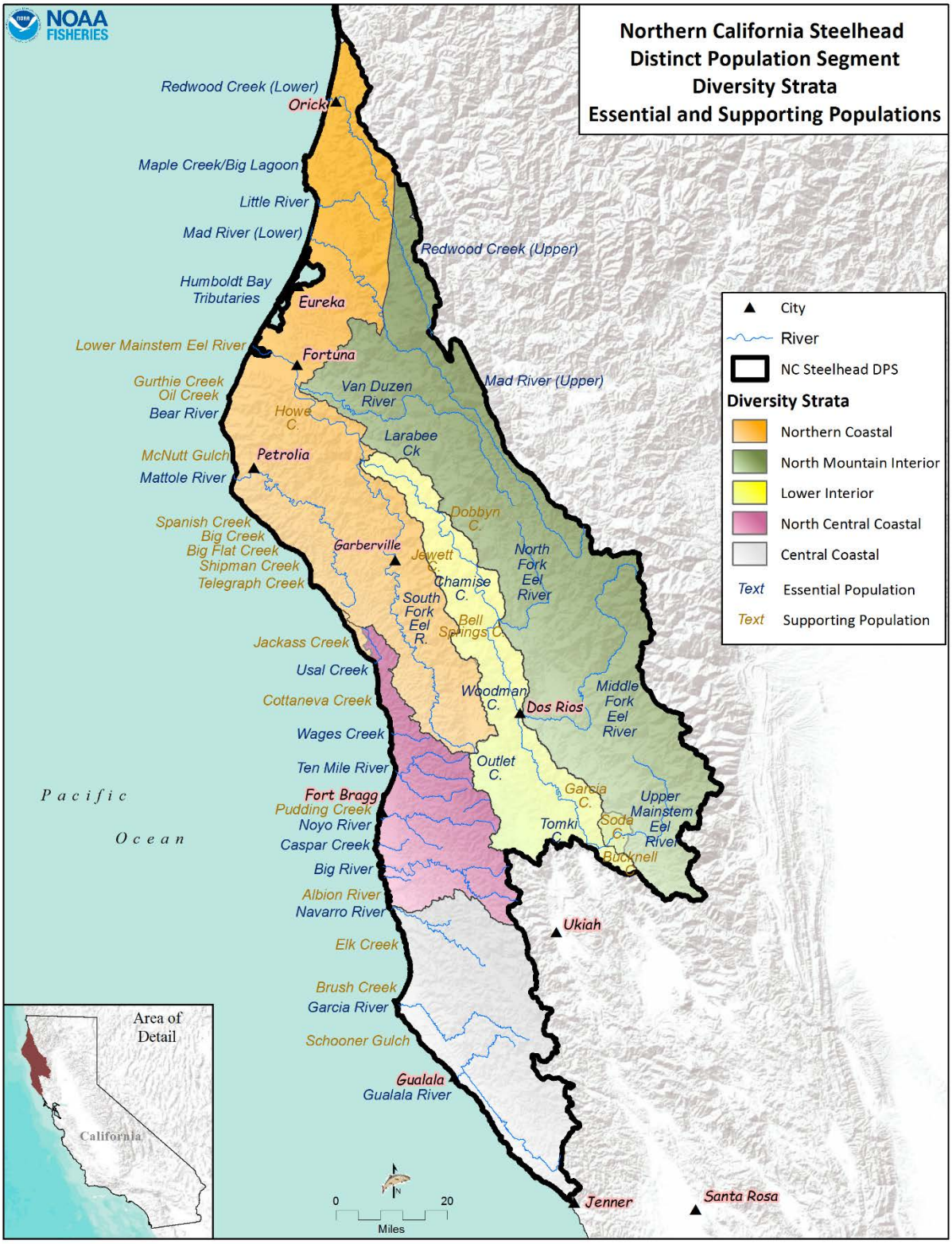

Figure 1: NC Steelhead Winter-Run Essential and Supporting Populations

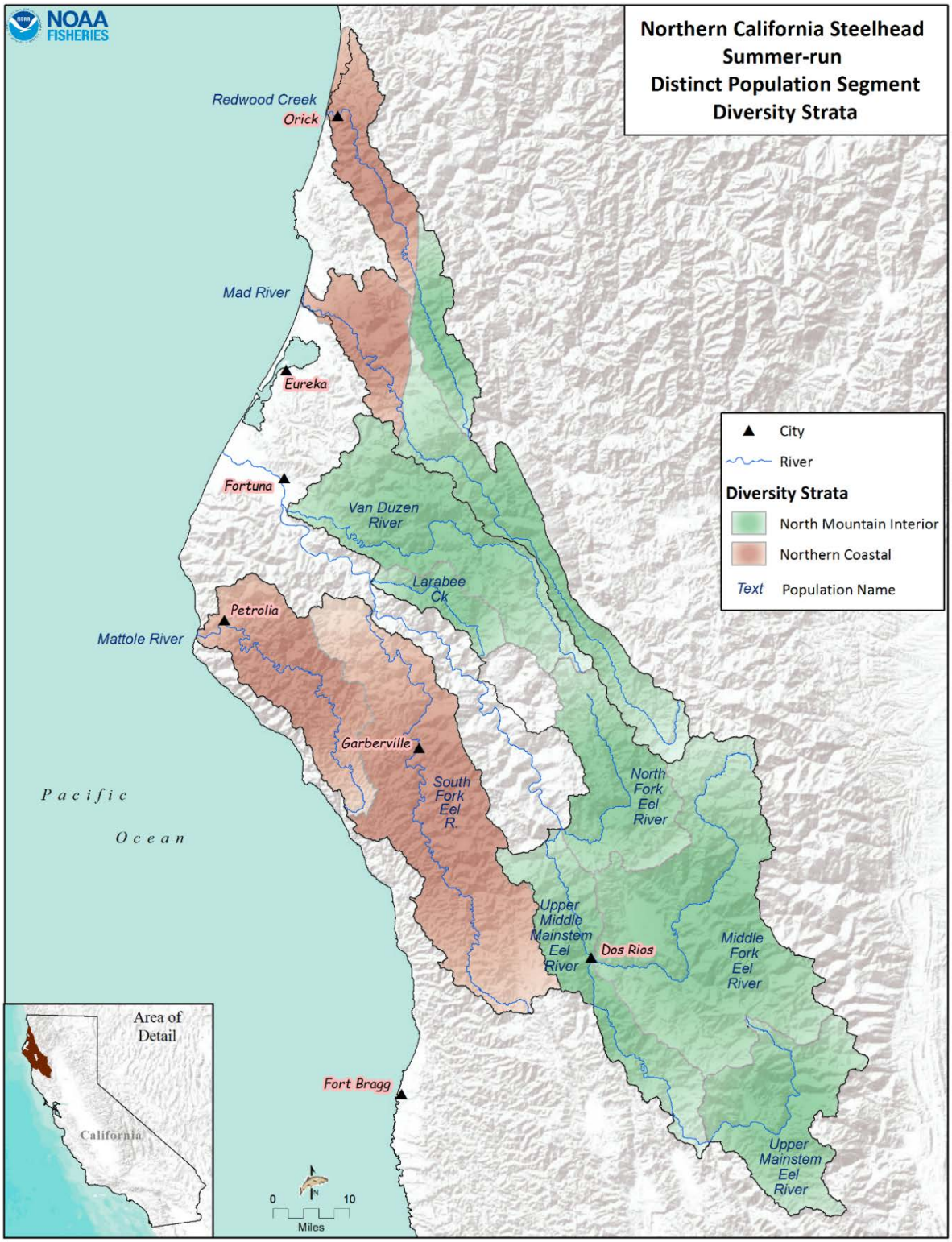

Figure 2: NC Steelhead Summer-Run Populations and Diversity Strata boundaries.

NC STEELHEAD DPS LISTING, REVIEWS & RECOVERY CRITERIA

The NC 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 III includes a description of the listing decision for the NC 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 NC steelhead recovery criteria.

NC 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 NC steelhead ESU was proposed for listing as threatened under the ESA on August 9, 1996 (61 FR 56138). On August 18, 1997, the final listing determination for the NC steelhead ESU was extended for 6 months due to substantial scientific disagreement about the sufficiency and accuracy of data relevant to the determination (62 FR 43974). On March 19, 1998, NMFS determined the NC steelhead ESU did not warrant listing as a threatened species under the ESA at that time, but concluded that the ESU warranted classification as a candidate species under the ESA and noted the intent to review the determination no later than four years from the date of the Federal Register notice (63 FR 13347). Because the State of California did not implement conservation measures that NMFS considered critically important in its decision not to list the NC steelhead ESU, NMFS completed an updated status review and reconsidered the status of the ESU under the ESA. NMFS proposed the NC steelhead ESU for listing as threatened under the ESA on February 11, 2000 (65 FR 6960). On June 7, 2000, the NC steelhead ESU was listed as threatened under the ESA (65 FR 36074). On January 5, 2006, after an updated status review on a number of West Coast salmonid ESUs, NMFS reaffirmed the threatened status of NC 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 coastal river basins from Redwood Creek southward to, but not including, the Russian River, as well as two artificial propagation programs that are no longer active: the Yager Creek hatchery and North Fork Gualala River Hatchery (Gualala River Steelhead Project) steelhead hatchery programs. The inadequacy of regulatory mechanisms, destruction and modification of habitat, and natural and man-made factors were identified as the primary causes for the decline of NC steelhead DPS (NMFS 1996).

NC 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 NC steelhead DPS was a threatened species based on their status and threats associated with the five section 4(a)(1) factors. NMFS concluded that habitat degradation associated with forest practices was a significant contributor to the reduction in abundance and distribution of NC steelhead (65 FR 6960). 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, habitat blockages, water diversions, artificial propagation, estuarine destructions or modification, flooding, hydropower development, instream habitat problems, lack of data, general land use activities, poaching, predation, recreational angling, urbanization, and water management.

Two habitat blockages were documented that reduced historical spawning and rearing access: Mathews Dam on the Mad River and Scott Dam on the Eel River. Matthews dam was found to block an estimated 36% of historical habitat. Scott Dam was found to block access to an estimated 99% of historical spawning and rearing habitat upstream of Soda Creek.

Factor A Since Listing:

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. Unregulated pesticides use, habitat destruction, and illegal damming and diversion of rural streams and rivers for the purpose of irrigating illegal marijuana growing operations is likely now the paramount threat to salmonid survival and habitat function in many first and second-order streams located in remote, rural areas.

The restoration of salmon and steelhead habitats has been a primary focus of Federal, State and local entities. The State of California Fisheries Restoration Grant Program (FRGP) alone has invested over $250 million dollars and supported approximately 3,500 salmonid restoration projects. These projects include fish passage, water conservation, improving instream habitats, watershed monitoring, education and organizational support to watershed groups. Many other entities have made investments to improve the range and habitat of steelhead. Roni *et al.*(2010) indicated the percentage of floodplain and in-channel habitat that would need to be restored to detect a 25% increase in salmon and steelhead production was 20%. There has been far more than 20% of floodplain and in-channel habitat restored due to FRGP. Extensive restoration in NC steelhead populations has improved conditions; however, the activities that led to habitat degradation continue.

Although Matthews Dam on the Mad River was identified as a substantial habitat blockage at the time of listing (McEwan and Jackson 1996), the dam is now believed to block only 2 miles of historical spawning and rearing habitat. The 2 miles are believed to be of low value habitat and a portion of the river which naturally went intermittent and dry during the summer/fall months. The flows coming from Matthews Dam have improved in-river flows for summer steelhead and juvenile steelhead rearing year-round. Many of the physical effects to habitat normally associated with dams are less severe with this blockage than other dams.

All threats identified at listing continue to impair NC steelhead and their habitats. We have identified a number of threats originally discussed under Factor A that should be evaluated under a different ESA section 4(a)(1) factor. Thus, threats associated with a specific land use practice are discussed under Factor D (inadequacy of regulatory mechanisms), fishing under Factor B (overutilization), predation under Factor C (disease and predation) and flooding under Factor E (other natural or manmade factors).

Please see the NC steelhead 2016 ESA 5-Year Status Review for a more details on the current status of Listing Factor A (NMFS 2016).

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

Factor B At Listing:

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. Steelhead have been an important freshwater recreational and tribal fishery. Over-fishing in the early days of European settlement led to the depletion of many stocks of steelhead even before extensive habitat degradation. Anglers have been allowed to retain only hatchery fish. The mortality rates from incidental catch and release were unknown as was the level of illegal retention. 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 especially in the tributaries of the Middle Fork Eel River and Redwood Creek. Utilization for scientific research and education programs was identified as having little impact on NC steelhead populations (NMFS 1996) since take of this nature is via the issuances and conditioning of scientific permits. However, no comprehensive total or estimate of steelhead mortalities related to scientific sampling is kept for any watershed or steelhead stock in the state.

Factor B Since Listing:

The impacts of commercial or recreational ocean harvest are relatively unknown. . The impact of freshwater recreational angling is thought to be low for steelhead in this DPS; however, the actual level of impact cannot be estimated with existing data. Recreational steelhead fishing is popular within this DPS and on the Mad River there is a bag limit of two hatchery steelhead. In streams where only catch and release fishing is allowed, all wild steelhead must be released without further harm. There are also significant restrictions on gear used for angling. During periods of

decreased habitat availability (drought or low flow conditions), recreational fisheries have a greater impact on wild steelhead. However, in 2015 the California Fish and Game Commission adopted regulations that prohibit fishing for NC steelhead during low flow conditions. CDFW has the authority under Title 14, California Code of Regulations, Section 8.00 to close select streams to fishing during specific months (depending on the area) when it determines that stream flows are below specific minimum flows or inadequate to provide fish passage for migrating steelhead trout and salmon (depending on the area). These new regulations only apply to twelve watersheds in Mendocino County. The regulations are intended to provide fishing opportunity when conditions allow for ample upstream and downstream movement by adult steelhead. These regulations will likely reduce the threat of recreational angling to NC steelhead during low flow periods.

Poaching and illegal retention is likely a threat in some populations. CDFW and the California Fish and Game Commission have made an effort to lessen this threat by implementing the low flow fishing closures. The problem with poaching continues to plague summer steelhead due to the absence of adequate law enforcement (Moyle *et al.* 2008). Although fishing is prohibited in many areas and fines for violations are high, protection of summer steelhead populations requires special enforcement efforts (Moyle *et al.* 2008). Species identification and proper handling and release techniques, when incidental capture of NC steelhead occurs is critical to reduce the likelihood of mortality and ensure NC steelhead adults survive to reproduce. Releasing NC steelhead unharmed requires specific handling, hook removal, revival efforts and minimal air exposure time (*i.e.,* time out of the water).

Since the listing of this DPS, the take of NC 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 NMFS' approval of the CDFW Research Program under 50 CFR 223.203 (promulgated by NMFS under ESA section 4(d), this regulation includes an exception to take prohibitions for a state research program approved by

NMFS). Tracking of authorized take began in 2004. Beginning in 2009, project applications were submitted online at the NMFS online application website Authorizations and Permits for Protected Species (APPS). APPS has allowed for improved annual tracking of lethal and non-lethal take requested, approved and reported for natural and listed hatchery-origin adults, smolts and juveniles. APPS data are analyzed annually to determine level of take for the DPS. Between 2004 and 2010, the actual reported percent mortality of NC 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 Research Program is not likely to jeopardize the continued existence of NC steelhead.

Please see the NC steelhead 2016 ESA 5-Year Status Review for a more details on the current status of Listing Factor B (NMFS 2016).

Factor C: Disease or Predation

Factor C At Listing:

At listing, avian, marine mammal, pikeminnow, freshwater predation and disease were identified as threats for Factor C. Predation was considered a threat mostly in circumstances with introduced non-natives, low steelhead populations, habitat conditions leading to concentrations of steelhead in small areas or where avoidance habitats such as deep pools, undercut banks, or quality estuarine areas were compromised or lost. Marine predation was not well understood, but most investigators believed it to be a minor factor in steelhead declines. Pikeminnow predation in the Eel River and striped bass were considered major problems. No reliable data were available regarding the predation rates of striped bass, sea lions and harbor seals.

Diseases were attributed to hatchery-related activities, injury during passage through man-made impediments and habitat conditions leading to low water flows and high temperatures. However, very little historical information existed to quantify changes in infection levels and

mortality rates attributable to disease. The listing indicated there was insufficient available information to suggest that the DPS was in danger of extinction because of disease or predation.

Factor C Since Listing:

Disease and predation were not considered major factors causing the decline of the NC steelhead DPS. Many common disease pathogens exist in wild populations, but increased individual resistance and natural ecological dynamics limit disease outbreaks and any resulting population-level impacts. Production hatcheries (i.e., those producing fish intended for angling opportunities) can have increased incidences of disease and related mortality, likely due to overcrowding and sub-optimal habitat conditions that can lower the natural immunity of individual fish. However, there are few hatcheries that exist within the NC steelhead DPS that would be a source for an outbreak of disease. 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 state of the NC steelhead DPS.

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

Factor D: Inadequacy of Existing Regulatory Mechanisms

Factor D At Listing:

At the time of listing, a variety of state and Federal regulatory mechanisms were in place to protect 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 NC 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 In-water Construction Programs
    - Section 404 of the Clean Water Act
- USDA Forest Service: Northwest Forest Plan and PACFISH

Factor D Since Listing:

For regulatory mechanisms to be deemed adequate they must be regulatory, not voluntary, enforced and found to effectively address threats to steelhead. Since listing, a number of factors outlined in the Federal Register listing NC steelhead persist, have improved or have been identified as not relevant. The primary regulatory mechanisms that protect NC 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.

<u>Federal and State Land Management</u>

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). 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 NC steelhead DPS. Aside from updates to the California Forest Practice Rules, few changes to state land management programs have occurred since the last status review in 2016 (NMFS 2016; Williams *et al.* 2016).

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

The North Coast Regional Water Quality Control Board (NCRWQCB) currently has implemented a waste discharge waiver for state-legal medicinal marijuana cultivation[1]. The waiver program attempts to regulate and manage waste discharge into surface water bodies in a manner similar to other agricultural industries in the state, such as vineyards and grazing, with a tiered approach that places prospective operations into one of four different levels based largely on the areal size of the operation. All growers regulated under the waiver program will be required to implement specific Best Management Practices identified by the NCRWQCB, with program compliance verified either through self-reporting (for the smaller farms) to inspection

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

by state agency personnel for larger operations. While the marijuana cultivation waste discharge waiver shows promise toward minimizing water quality-related impacts resulting from marijuana cultivation, the realized benefit may be smaller than anticipated due to the suspected large number of illegal grows (*i.e.*, not for medicinal uses, but for black market sales) and the low likelihood that criminal operators will voluntarily register with a state agency.

Federal and State Water Management:

Groundwater regulation and management should improve in the coming decades following the 2014 passage of the Groundwater Sustainability Management Act; however, surface water throughout the state is heavily over-allocated (Grantham and Viers 2014), and little change to the regulatory status quo concerning surface water rights and permitting is expected in the near future. As the state adapts to future climate variability combined with a period of accelerated population growth, the demands placed upon streams and rivers for surface water supplies will likely grow. Many large rivers and stream in the NC 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 Act[2]). 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, regulate dredge and fill within the ordinary high water mark of streams, rivers, wetlands, and other waterbodies. Anyone proposing to conduct a project that requires a federal permit or involves dredge or fill activities that may result in a discharge to U.S. surface waters and/or "Waters of the State" is required to obtain a Clean Water Act Section 401 Water Quality Certification and/or

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

Waste Discharge Requirements (Dredge/Fill Projects) from the Regional Water Quality Control Board, verifying that the project activities will comply with state water quality standards. These Water Quality Certifications establish enforceable conditions necessary for compliance with California State water quality standards. In addition, the RWQCBs issue permits for dredge and fill activities outside of the U.S. Army Corps of Engineers' jurisdiction. These permits include the Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction (Order No. 2004-0004-DWQ), and in the North Coast Region the Categorical Waiver for Minor Dredging and Fill Operations, adopted through Resolution No. R1-2012-0099. CDFW performs a similar role through their Streambed Alteration Agreement program (Fish and Game Code section 1602).

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

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

Factor E At Listing:

The manmade factors of artificial propagation and hatchery programs and the natural factors (*i.e.*, severe weather patterns), 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. The propagation programs identified were

Yager Creek/Van Duzen, Van Arsdale Fish Station, Mad River, Noyo River and the North Fork Gualala hatchery.

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:

Yager Creek/Van Duzen, Van Arsdale Fish Station, Noyo and the North Fork Gualala hatchery programs have been terminated. The Mad River Hatchery continues to be operational. CDFW is currently working with NMFS in the development of a Hatchery and Genetic Management Plan for the Mad River Hatchery (steelhead produced in this hatchery are not considered part of this DPS but its operation may impact the NC steelhead DPS).

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

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. See Volume 5, Climate Change for more information on how the changing climate may affect NC steelhead.

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

Protective Efforts for NC Steelhead

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

DPS RECOVERY GOALS, OBJECTIVES AND CRITERIA

Recovery goals, objectives and criteria provide a means by which the public can measure progress in the efforts at recovery and are used to link listing with status reviews and reclassification determinations. We developed eight categories of recovery criteria for the NC 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 NC 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 NC steelhead now and into the future (*i.e.,* post-delisting);
5. Address other natural or manmade factors affecting the continued existence of NC steelhead; and
6. Ensure NC 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. See Volume 1, Chapter 4 and 5 for more information.

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

AND

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

AND

Redundancy and Occupancy Criteria: Spawner density and abundance targets for dependent populations, which are the occupancy goals for each of those

populations, have been achieved (See the discussion of Spence *et al*. (2008) in Vol. I, Chapter 3).

AND

NC steelhead summer-run populations must meet effective population size criteria outlined by Spence *et al*. (2008) (Table 1)

The selected populations and associated recovery criteria for NC Steelhead DPS (Also see Table 2 and Table 3):

a. Selected populations in all five Diversity Strata achieving biological recovery criteria;

b. **NC-BR1:** 27 essential independent populations attaining low extinction risk criteria (*i.e.*, Garcia River, Gualala River, Navarro River, Chamise Creek, Outlet Creek, Tomki Creek, Woodman Creek, Larabee Creek, Middle Fork Eel River, North Fork Eel River, Upper Mainstem Eel River, Van Duzen River, Big River, Noyo River, Ten Mile River, Usal Creek, Wages Creek, Maple Creek/Big Lagoon, Bear River, Humboldt Bay Tributaries, Little River (Humboldt County), Mattole River, South Fork Eel River, Mad River (Upper), Mad River (Lower), and Redwood Creek (Upper) and Redwood (Lower) (Humboldt County));

c. **NC-BR2:** Eight supporting independent populations attaining moderate extinction risk criteria (*i.e.*, Brush Creek, Elk Creek, Bell Springs, Bucknell Creek, Dobbyn Creek, Albion River, Cottaneva Creek and Pudding Creek); and

d. **NC-BR3:** 14 dependent populations contributing to redundancy and occupancy criteria (*i.e.*, Schooner Gulch, Soda Creek, Caspar Creek, Guthrie Creek, Oil Creek, Big Creek, Big Flat Creek, Howe Creek, Jackass Creek, Lower Mainstem Eel River, McNutt Gulch, Shipman Creek, Spanish Creek, and Telegraph Creek).

e. **NC-BR4:** 10 independent summer-run steelhead populations expected to meet effective population size criteria (*i.e.*, Redwood Creek, Mad River, South Fork Eel River, Mattole River, Van Duzen River, Larabee Creek, North Fork Eel River, Upper Middle Mainstem Eel River, Middle Fork Eel River, and Upper Mainstem Eel River.)

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

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

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

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

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

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

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

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

Table 2: NC winter-run steelhead: Diversity Strata, Populations, Historical Status, Population's Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting. Redwood Creek and Mad River cross two diversity strata and were broken into an upper and lower to reflect this.

Diversity Strata	NC winter-run steelhead populations	Historical Population Status	Population's Role In Recovery	Current Weighted IP-km	Spawner Density	Spawner Abundance
Northern Coastal	Bear River	I	Essential	107.8	27.2	2,900
	Big Creek	D	Supporting	3.8	6-12	21-44
	Big Flat Creek	D	Supporting	5.9	6-12	33-69
	Guthrie Creek	D	Supporting	9.2	6-12	53-108
	Howe Creek	D	Supporting	13.9	6-12	81-165
	Humboldt Bay Tributaries	I	Essential	203.4	20.0	4,100
	Jackass Creek	D	Supporting	6.9	6-12	39-81
	Little River (Humboldt Co.)	I	Essential	50.0	35.3	1,800
	Lower Mainstem Eel River Tributaries	D	Supporting	166.4	6-12	996-1,995
	Mad River (Lower)*	I	Essential	146.3	21.9	3,200
	Maple Creek/Big Lagoon	I	Essential	71.7	32.3	2,300
	Mattole River	I	Essential	534.4	20.0	10,700
	McNutt Gulch	D	Supporting	11.3	6-12	66-134
	Oil Creek	D	Supporting	10.6	6-12	62-125
	Redwood Creek (Humboldt Co) (Lower)*	I	Essential	161.1	20.0	3,200
	Shipman Creek	D	Supporting	2.3	6-12	12-26
	South Fork Eel River	I	Essential	951.8	20.0	19,000
	Spanish Creek	D	Supporting	1.9	6-12	9-21
	Telegraph Creek	D	Supporting	5.3	6-12	30-62
	Northern Coastal Diversity Stratum Recovery Target					**47,200**
North Mountain Interior	Dobbyn Creek	I	Supporting	47.0	6-12	280-562

	Larabee Creek	I	Essential	86.4	30.2	2,600
	Mad River (Upper)*	I	Essential	289.6	20.0	5,800
	Middle Fork Eel River	I	Essential	472.4	20.0	9,400
	North Fork Eel River	I	Essential	315.7	20.0	6,300
	Redwood Creek (Humboldt Co) (Upper)*	I	Essential	86.2	30.2	2,600
	Upper Mainstem Eel River	I	Essential	317.5	20.0	6,400
	Van Duzen River	I	Essential	312.2	20.0	6,200
	North Mountain Interior Diversity Stratum Recovery Target					**39,300**
Lower Interior	Bell Springs Creek	I	Supporting	18.1	6-12	107-215
	Bucknell Creek	I	Supporting	9.0	6-12	52-106
	Chamise Creek	I	Essential	36.2	37.2	1,300
	Jewett Creek	I	Supporting	16.8	6-12	99-200
	Garcia Creek	D	Supporting	14.1	6-12	83-167
	Outlet Creek	I	Essential	176.0	20.0	3,500
	Soda Creek	D	Supporting	15.7	6-12	92-186
	Tomki Creek	I	Essential	89.5	29.8	2,700
	Woodman Creek	I	Essential	35.0	37.4	1,300
	Lower Interior Diversity Stratum Recovery Target					**9,100**
North-Central Coastal	Albion River	I	Supporting	48.6	6-12	290-581
	Big River	I	Essential	255	20	5,100
	Caspar Creek	D	Essential	12.9	40.4	500
	Cottaneva Creek	I	Supporting	21.9	6-12	129-261
	Noyo River	I	Essential	152.8	21.0	3,200
	Pudding Creek	I	Supporting	23.9	6-12	141-285
	Ten Mile River	I	Essential	171.1	20	3,400
	Usal Creek	I	Essential	27.5	38.4	1,100

	Wages Creek	I	Essential	17.4	39.8	700
North-Central Coastal Diversity Stratum Recovery Target						**14,000**
Central Coastal	Brush Creek	I	Supporting	21.4	6-12	126-255
	Elk Creek	I	Supporting	34.5	6-12	205-412
	Garcia River	I	Essential	135.4	23.4	3,200
	Gualala River	I	Essential	396.7	20.0	7,900
	Navarro River	I	Essential	387.6	20.0	7,800
	Schooner Gulch	D	Supporting	7.7	6-12	44-90
Central Coastal Diversity Stratum Recovery Target						**18,900**
NC Steelhead DPS Recovery Target						**128,200**

Table 3: NC summer-run steelhead: Diversity Strata, Populations, Historical Population Status, and Effective Population Size (N_e). *The Redwood Creek and Mad River populations each occur in two diversity strata (Spence *et al.* 2008). In both watersheds, the location of actual spawning grounds is poorly understood and therefore each will be treated as one population until more information is obtained from monitoring.

Diversity Strata	NC summer-run steelhead populations	Historical Population Status	Effective Population Size
Northern Coastal/ North Mountain Interior	Redwood Creek*	I	$N_e \geq 500$
Northern Coastal/ North Mountain Interior	Mad River*	I	$N_e \geq 500$
Northern Coastal	South Fork Eel River	I	$N_e \geq 500$
Northern Coastal	Mattole River	I	$N_e \geq 500$
North Mountain Interior	Van Duzen River	I	$N_e \geq 500$
North Mountain Interior	Larabee Creek	I	$N_e \geq 500$
North Mountain Interior	North Fork Eel River	I	$N_e \geq 500$
North Mountain Interior	Upper Middle Mainstem	I	$N_e \geq 500$
North Mountain Interior	Middle Fork Eel River	I	$N_e \geq 500$
North Mountain Interior	Upper Mainstem Eel River	I	$N_e \geq 500$

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

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

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

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

A1 CAP/Rapid Assessment attribute ratings for:

- **a. Essential Populations** found Good or better for all attributes in each Stratum.
- **b. Supporting Populations** found Good or better for 50 percent[3] 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.

[3] 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.

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

Listing Factor C: Disease, Predation and Competition

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

a. Essential and Supporting Populations found Medium or Low.

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

Listing Factor D: The Inadequacy of Existing Regulatory Mechanisms

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

a. Essential and Supporting Populations found Medium or Low.

Listing Factor D Threats

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

PRIORITIZING POPULATIONS FOR RESTORATION AND FOCUS

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

NOAA Fisheries evaluated all the essential (i.e. must meet low viability criteria) CCC and NC steelhead and CC Chinook salmon populations within the recovery plans using a prioritization framework based on Bradbury et al. (1995). Oregon State Senate President, Bill Bradbury, asked the Pacific Rivers Council for help in assembling a diverse group to create a prioritization process for effective and scientifically-sound watershed protection and restoration. The framework developed provides a common basis from which diverse groups can develop mutually agreed-upon restoration priorities reflecting a strong scientific basis (Bradbury et al. 1995).

The prioritization framework uses three criteria groupings for ranking populations:

1. biological and ecological resources (Biological Importance);
2. watershed integrity and risk (Integrity and Risk); and

3. potential for restoration (Optimism and Potential).

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

Table 4: NC steelhead Restoration and Focus Prioritization Results

Diversity Strata	Northern California Steelhead Populations	Biological & Ecological			Integrity & Risk		Optimism & Potential						
		CAP Biological Viability (Weighted)	Number of Listed Species	High IP-km	CAP Watershed Characterization	CAP Threats	Public Lands	CCC Coho Focus Population	SONCC Core 1 Population	Monitoring (LCM) Priority	Total	Extant Summer Steelhead (+)	Priority #
Northern Coastal	Redwood Creek	4	3	3	2	1	3	0	1	1	18	+	A
	Maple Creek/Big Lagoon	6	2	1	1	2	1	0	0	0	13		B
	Little River	2	3	1	1	2	1	0	0	0	10		B
	Mad River	2	3	3	2	1	3	0	0	1	15	+	A
	Humboldt Bay Tributaries	4	3	2	1	1	2	0	1	1	15		A
	Lower Mainstem Eel River												C
	Howe Creek												C
	Guthrie Creek												C
	Oil Creek												C
	South Fork Eel River	6	3	3	2	1	3	0	1	1	20		A
	Bear River	6	3	2	1	1	1	0	0	0	14		B
	McNutt Gulch												C
	Mattole River	6	3	3	2	1	2	0	0	1	18	+	A
	Spanish Creek												C
	Big Creek												C
	Big Flat Creek												C
	Shipman Creek												C
	Telegraph Creek												C
	Jackass Creek												C
Lower Interior	Jewett Creek												C
	Chamise Creek	2	3	1	3	2	2	0	1	0	14		A
	Bell Springs Creek												C

	Woodman Creek	2	3	1	3	2	3	0	1	0	15		A
	Outlet Creek	2	3	2	1	2	1	0	1	1	13		B
	Garcia Creek												C
	Tomki Creek	2	3	1	2	2	2	0	1	0	13		B
	Soda Creek												C
	Bucknell Creek												C
North Mountain Interior	Van Duzen River	6	3	3	1	1	2	0	1	1	18	+	A
	Larabee Creek	4	3	1	1	2	1	0	1	0	13		B
	Dobbyn Creek												C
	North Fork Eel River	6	3	3	2	2	3	0	0	0	19		A
	Middle Fork Eel River	4	3	3	3	1	3	0	0	1	18	+	A
	Upper Mainstem Eel River	2	3	2	2	1	3	0	0	0	13		B
North Central Coastal	Usal Creek	6	2	1	2	2	1	1	0	0	15		B
	Cottaneva Creek												C
	Wages Creek	2	2	1	2	2	1	1	0	0	11		B
	Pudding Creek												C
	Ten Mile River	4	3	2	1	1	1	1	0	1	14		A
	Noyo River	4	3	2	2	3	2	1	0	1	18		A
	Caspar Creek	4	2	1	2	2	3	1	0	0	15		B
	Big River	2	3	2	1	3	3	1	0	0	15		A
	Albion River												C
Central Coastal	Navarro River	2	3	3	1	2	2	1	0	1	15		A
	Elk Creek												C
	Brush Creek												C
	Garcia River	4	3	2	2	1	1	1	0	1	15		A
	Schooner Gulch												C
	Gualala River	2	3	3	3	1	1	1	0	0	14		B

DPS AND DIVERSITY STRATA RESULTS

All CAP viability and threat tables were assembled for the NC steelhead DPS to evaluate patterns in the ESU across Diversity Strata and populations. Attribute and threat results are discussed first for Diversity Strata followed by results across lifestages for the 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 NC steelhead DPS Diversity Strata was based on environmental and ecological similarities and life history differences between winter run and summer run adult populations. Five strata were identified by Bjorkstedt *et al*. (2005): Northern Coastal, Lower Interior, North Mountain Interior, North-Central Coastal and Central Coastal.

Attribute Results

Across strata, the Lower Interior Diversity Stratum had the highest percentage of Poor or Fair attribute indicator ratings (76%), followed by the North Mountain Interior stratum (72%) (Figure 3). The North-Central Coastal Diversity Stratum received the lowest percentage of Poor or Fair indicator ratings (50%) overall and the Central Coastal stratum had the lowest percentage of Poor indicator ratings (19%). Figure 3 shows the percentage of ratings for Very Good, Good, Fair and Poor for each Stratum in the DPS.

Threat Results

The Northern Coastal Diversity Stratum received the highest percentage of Very High and High threat ratings (31%) followed by the Central Coastal Diversity Stratum (29%) (Figure 4).

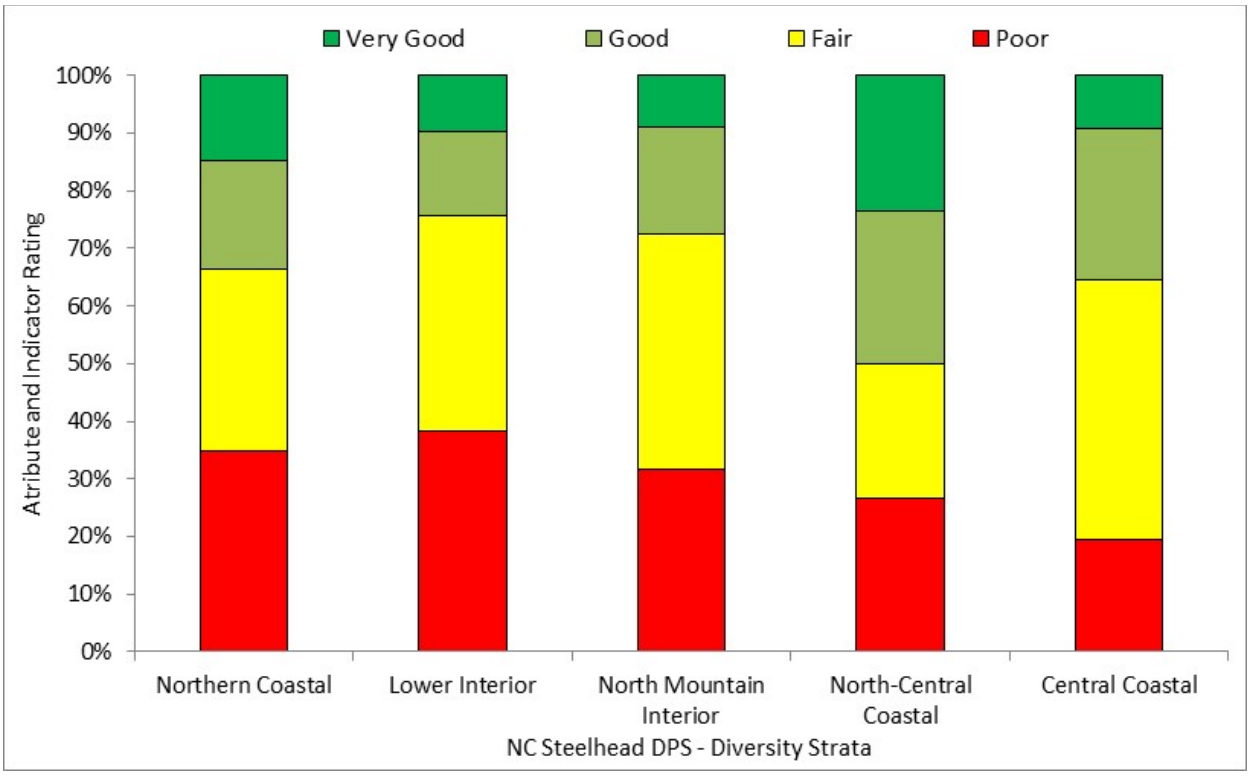

Figure 3: Attribute Indicator ratings for the NC steelhead DPS by Diversity Strata.

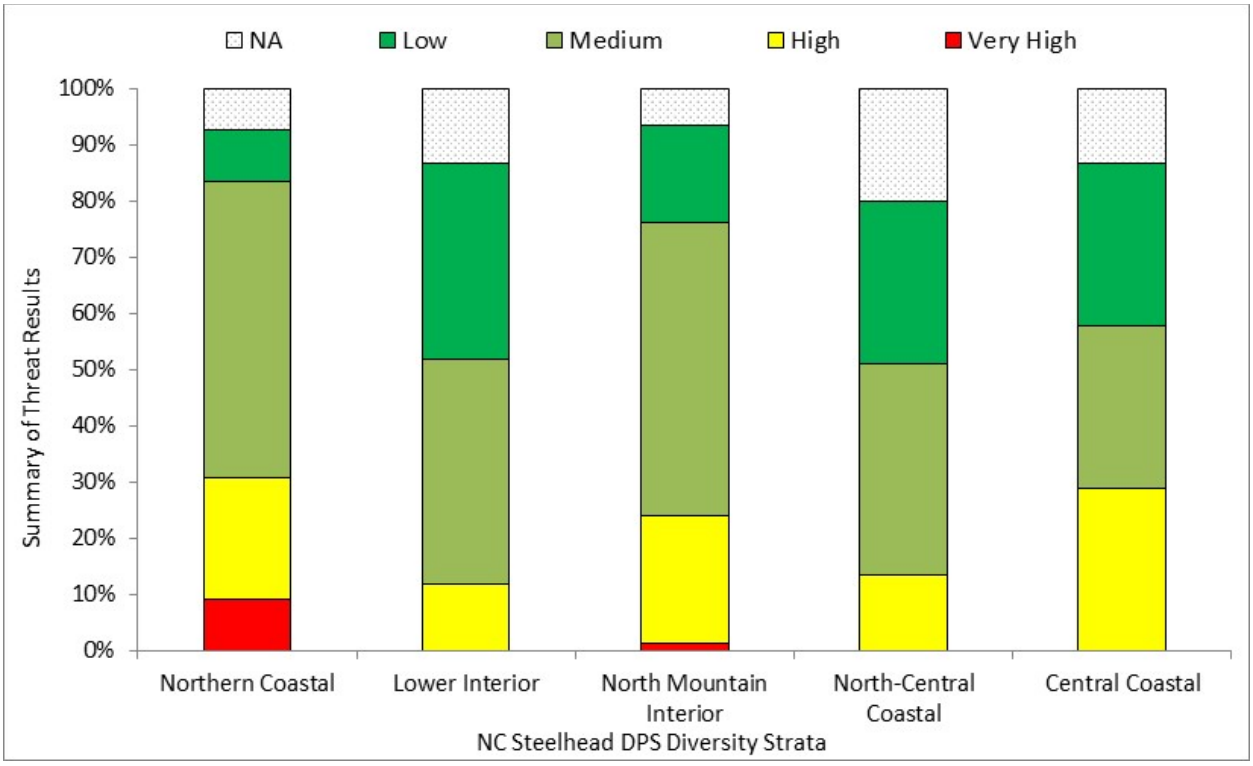

Figure 4: NC steelhead DPS Diversity Strata Threat ratings.

NORTHERN COASTAL DIVERSITY STRATUM RESULTS

The Northern Coastal Diversity Stratum is influenced by the coastal climate conditions of northern California. CAP populations in the Northern Coastal stratum include: Redwood Creek, Maple Creek/Big Lagoon, Little River, Mad River, Humboldt Bay, South Fork Eel River, Bear River, and the Mattole River. Of the five Strata in the DPS, the Northern Coastal has the most extensive urban centers (*i.e.,* Eureka and Arcata), however logging remains the most common and widespread land use.

Attribute Results

The Northern Coastal Diversity Stratum received the second highest percentage of Poor indicator ratings (35%) and a total of 66% of indicators rated as Poor or Fair (Figure 3, Figure 6 and Table 5). In general, attribute indicators of greatest concern for all life stages included estuary/lagoon (quality and extent), indicators related to in-stream habitat complexity (LWD, shelter, pool/riffle/flatwater ratio, percent primary pools), hydrology (number, condition, and/or magnitude of diversions), riparian vegetation (tree diameter), sediment (gravel quality – bulk, spawning gravels), sediment transport (road density and streamside road density), and water quality (turbidity). Indicators of least concern included those associated with hydrology, landscape patterns, passage/migration, and water toxicity (Table 5).

Life Stage Results

In the Northern Coastal stratum, more than 50% of indicator ratings for each life stage were rated as Poor or Fair and more than 60% for five of the six life stages (Figure 5). Winter rearing juveniles were the most impaired life stage with 78% of indicators rated as Poor or Fair followed closely by summer adults with 73%. Half of the indicators for watershed process were rated as either Poor or Fair, of which 34% were rated Poor. Across the stratum, indicators of concern for the winter adult life stage were those associated with a lack of habitat complexity, small riparian tree diameter, sediment (embeddedness), and high turbidity (Table 6). Impaired gravel quantity and quality necessary for successful spawning and egg incubation were the indicators identified as

most limiting for the egg life stage. For summer rearing juveniles, winter rearing juveniles, and smolts, impacted estuary/lagoon conditions (summer rearing juveniles and smolts only), and reduced in-stream habitat complexity were common impairments. For summer and winter rearing jueniles, all populations were rated Poor or Fair for riparian vegetation (tree diameter), and in all but one population (Bear River, Fair) winter rearing juveniles were rated Poor for turbidity. Three of four populations with summer adults in the stratum were rated Poor for viability (abundance) with the exception being Mad River (Fair), and habitat complexity (shelter rating) was rated poor in all four populations. All populations were rated Poor or Fair for mainstem water temprature, precent staging pools, and hydrology (baseflow extent) (Table 6).

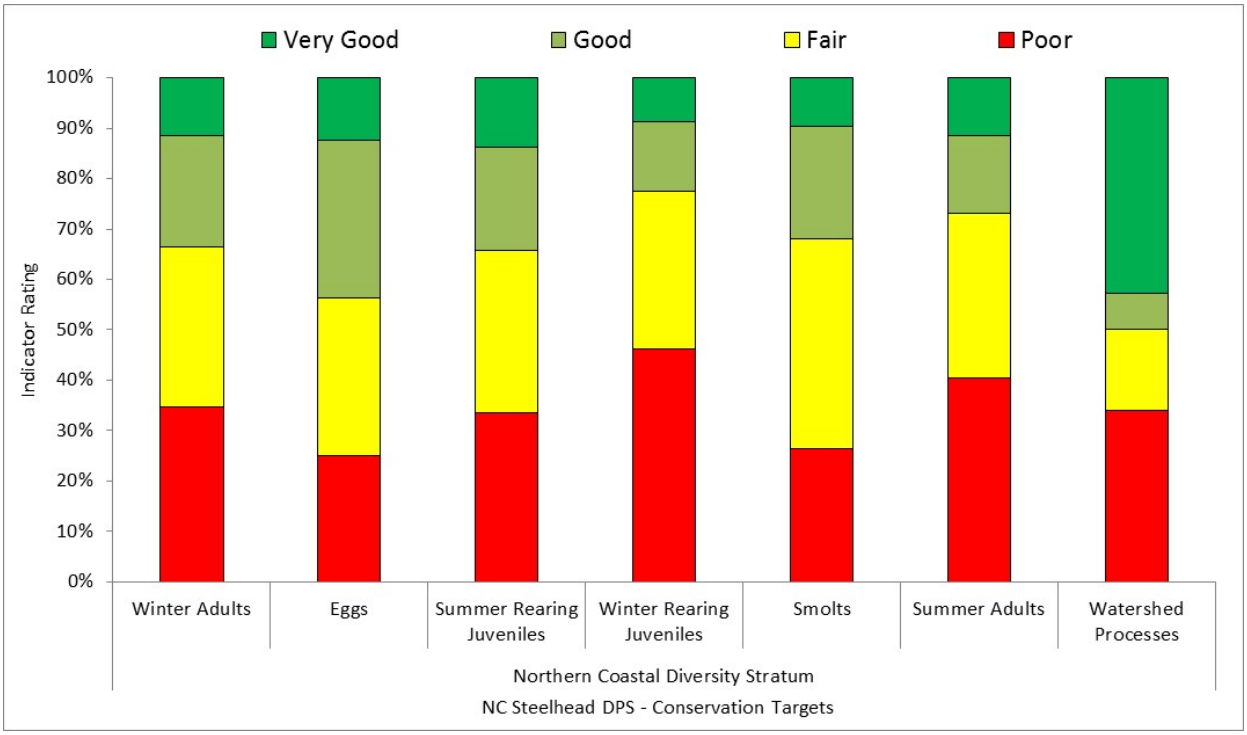

Figure 5: Attribute Indicator Ratings for the Northern Coastal Diversity Stratum Conservation Targets.

Threat Results

Within the stratum, 26% of the threats were rated Very High or High and only 10% were rated Low. Threats of greatest concern were roads and railroads, logging and wood harvesting,

channel modification, and water diversions and impoundments (Figure 6 and Table 7). The Mattole River and South Fork Eel River were rated Very High and High respectively for severe weather patterns and for all other populations in the stratum this threat was rated Medium (Table 7). Redwood Creek has the highest amount of Very High and High ratings with 7 out 13 threats assessed rated as Very High or High. The steelhead hatchery on the Mad River is the only extant hatchery operation in the stratum. The remaining populations were not rated for hatcheries and aquaculture.

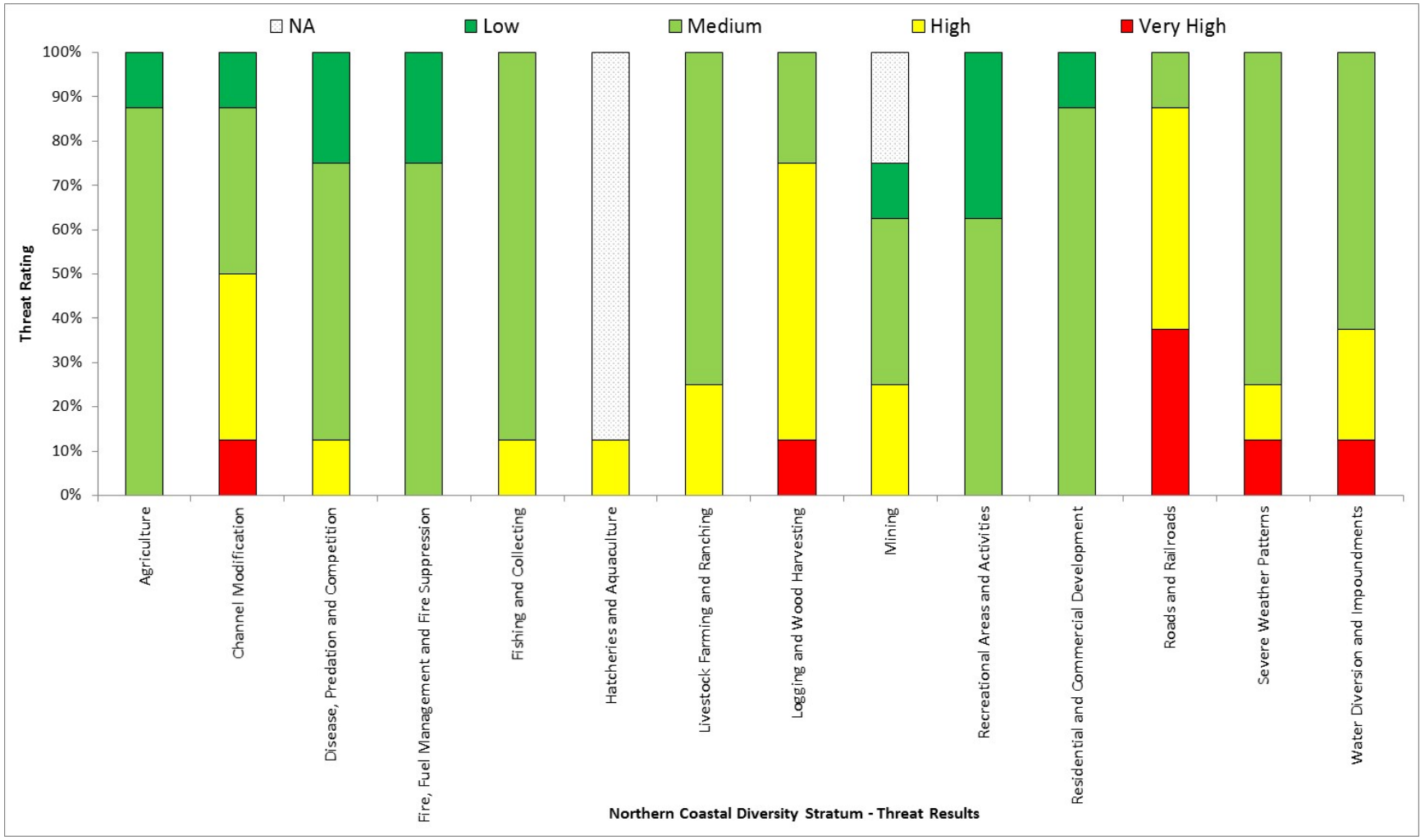

Figure 6: Threat ratings for the Northern Coastal Diversity Stratum.

LOWER INTERIOR DIVERSITY STRATUM RESULTS

The Lower Interior Diversity Stratum consists of four CAP steelhead populations: Chamise, Woodman, Outlet, and Tomki creeks, which drain the interior, mainstem valley of the Eel River Watershed.

Attribute Results

Of the five Diversity Strata, the Lower Interior had the highest percentage (76%) of Poor or Fair indicator ratings and the highest percentage (38%) of Poor ratings alone (Figure 3). Steelhead from each of the four populations in the stratum utilize the same estuary which was rated Poor. Other attribute indicators that were rated Poor or Fair consistently throughout the stratum and across life stages were habitat complexity (large wood frequency, percent primary pools, shelter rating), hydrology (baseflow conditions, instantaneous conditions), riparian vegetation (species composition, tree diameter), gravel quality (embeddedness), sediment transport (streamside road density), and water quality (water temperature, turbidity). Indicators that were less impaired were similar with other strata and included hydrology (impervious surfaces), landscape patterns (agriculture, timber, and urbanization), passage/migration (physical barriers), and water quality (toxicity) (Table 5).

Life Stage Results

The results from the CAP viability analysis indicate each of the target life stages across the stratum are significantly impaired with more than 70% of all attribute indicators rated as Poor or Fair for each life stage (Figure 7 and Table 6). Summer rearing juveniles were the most impacted life stage with 87% of attribute indicators rated as Poor or Fair, followed closely by eggs (81%) and winter rearing juveniles (80%) (Figure 7). Watershed processes overall had 43% of attribute indicators rated as Poor or Fair, and sediment transport (streamside road density) was rated Poor throughout the stratum (Table 6). Attribute indicators of greatest concern for the winter adult life stage are habitat complexity (large wood frequency, pool/riffle/flatwater ratio, shelter rating), riparian vegetation (tree diameter), water quality (turbidity), and viability (density). For eggs,

gravel quality (embeddedness) was rated Poor for all populations except Tomki Creek (Fair). In addition to the above indicators for winter adult and egg life stages, estuary/lagoon (quality and extent), hydrology (baseflow and instantaneous flow), water quality (water temperature), and viability (density) were also rated poorly for summer rearing juveniles. Meanwhile, habitat complexity (large wood frequency, shelter), riparian tree diameter, and turbidity appear to be of most concern for the winter rearing juveniles. For smolts, estuary/lagoon, habitat complexity (shelter rating) and viability (low abundance) are most limiting.

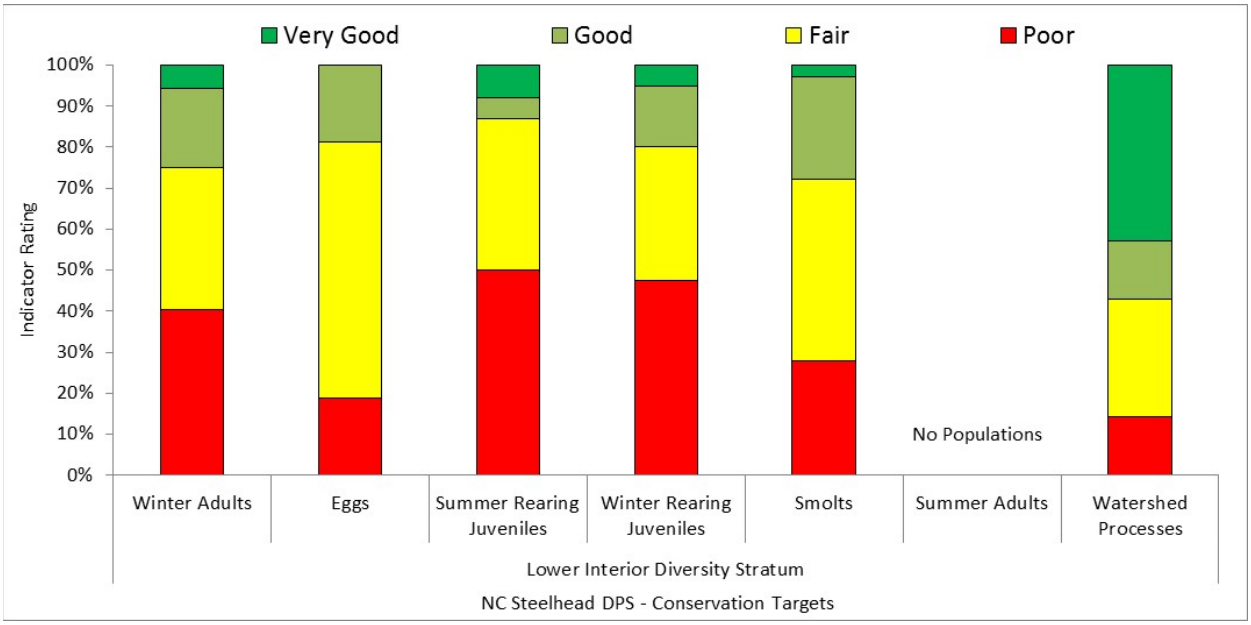

Figure 7: Attribute Indicator Ratings for the Lower Interior Diversity Stratum Conservation Targets.

Threat Results

Despite the degraded conditions for all life stages throughout the stratum (see Figure 7), the threat ratings for the stratum were fairly positive with 79% of the threats rated as Low (38%) or Medium (Figure 8 and Table 7). Some threats were deemed not applicable in certain populations in the stratum and therefore were not rated. There are no hatchery or aquaculture programs operating in the stratum and therefore this threat was not rated for all populations in the stratum. None of the threats were rated Very High and those that received a High rating (7%) were roads and

railroads and water diversions and impoundments; these are the greatest threat to steelhead within the stratum.

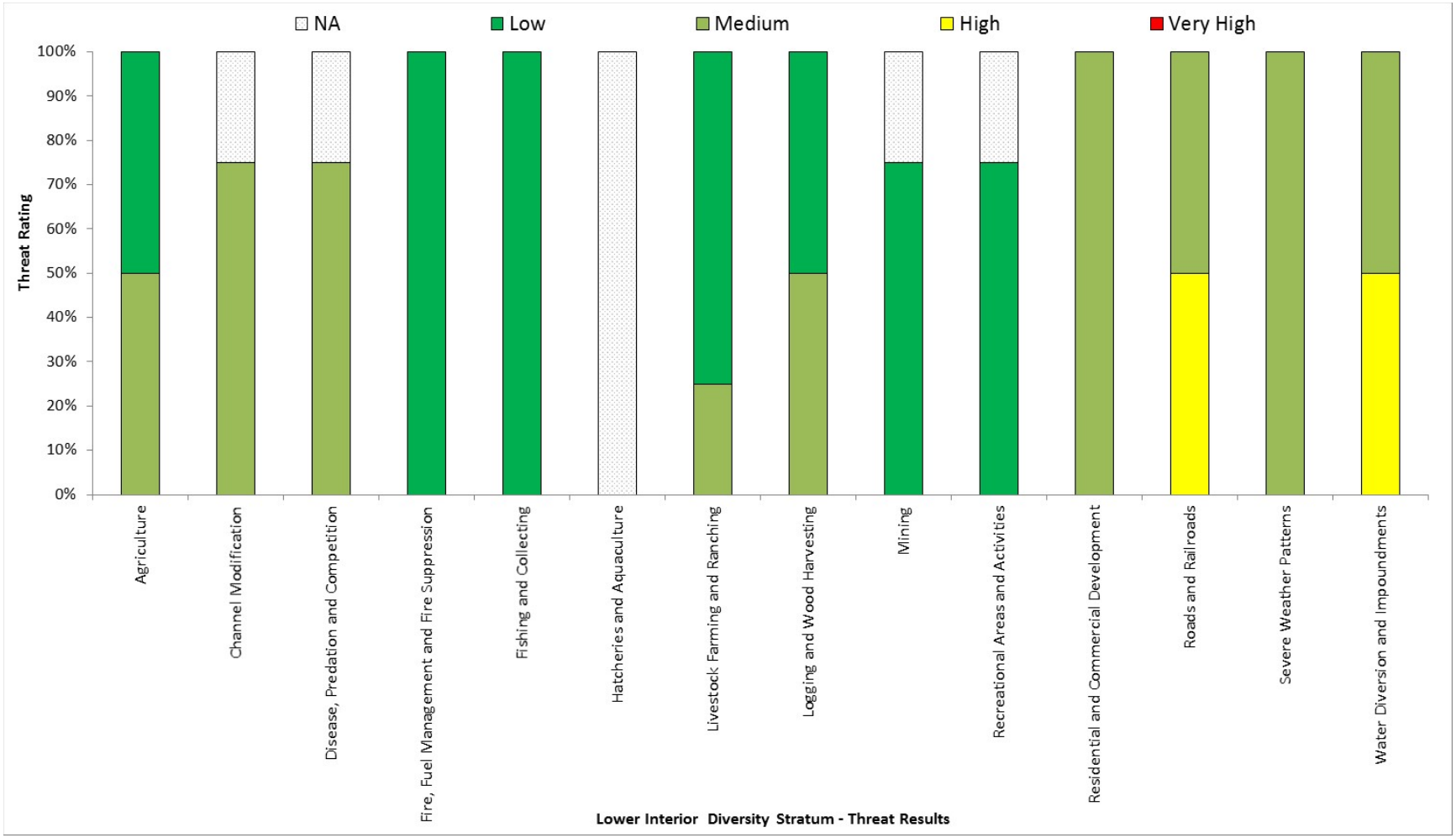

Figure 8: Threat ratings for the Lower Interior Diversity Stratum.

NORTH MOUNTAIN INTERIOR DIVERSITY STRATUM RESULTS

The North Mountain Interior Diversity Stratum includes populations or parts of populations that occupy areas influenced by likely snowmelt events in the Eel River Watershed. These include the Van Duzen River, Larabee Creek, North Fork Eel River, Middle Fork Eel River, and Upper Mainstem Eel River populations.

Attribute Results

Across strata, the North Mountain Interior had the second highest percentage (72%) of Poor or Fair indicator ratings, of which 32% were rated Poor (Figure 3). Like the other Eel River Watershed populations in the Lower Interior Diversity Stratum, the estuary was rated Poor for all applicable life stages and populations (Table 5). Other attributes with a High percentage of Poor or Fair ratings across the stratum were habitat complexity, riparian vegetation (canopy cover and tree diameter), gravel quality (embeddedness), streamside road density, and water temperatures for summer rearing juveniles (Table 5). Like other strata, most populations and life stages in the North Mountain Interior were rated Fair or better for attribute indicators related to hydrology, landscape patterns, passage/migration, and toxicity (Table 5). The few exceptions were timber harvest (Poor) for the Van Duzen River and Larabee Creek populations, baseflow conditions for summer rearing juveniles and summer adults in the Van Duzen River and North Fork Eel River populations, and passage at mouth or confluence for smolts and summer rearing juveniles in the Upper Mainstem Eel River. Passage (physical barriers) for winter adults and summer adults in the Upper Mainstem Eel River was also rated Poor due to Scott Dam.

Life Stage Results

Across the North Mountain Interior Diversity Stratum, all life stages of steelhead are impaired with more than 60% of attribute indicators rated as Poor or Fair (Figure 9). Based on the percentage of indicators rated as Poor or Fair, summer rearing juveniles (83%) were the most impaired life stage, followed closely by winter rearing juveniles (82%). Summer rearing juveniles received the most Poor ratings overall (40%). As with other strata in the DPS, streamside road

density was rated Poor and is the most concerning watershed process in the North Mountain Interior populations. Individual life stage results were similar for other strata. Winter adults are most limited by habitat complexity, riparian vegetation, and to a lesser extent turbidity, and eggs are most limited by gravel embeddedness (Table 6). Estuary/lagoon, habitat complexity, riparian vegetation, sediment, and water temperature are of greatest concern for summer rearing juveniles. Winter rearing juveniles are most limited by reduced habitat complexity, riparian tree diameter, and high gravel embeddedness, and smolts are most impacted by poor estuary/lagoon and in-stream shelter conditions. For summer adults, indicators of greatest concern include percent staging pools, shelter rating, gravel quantity and quality, and high mainstem water temperatures.

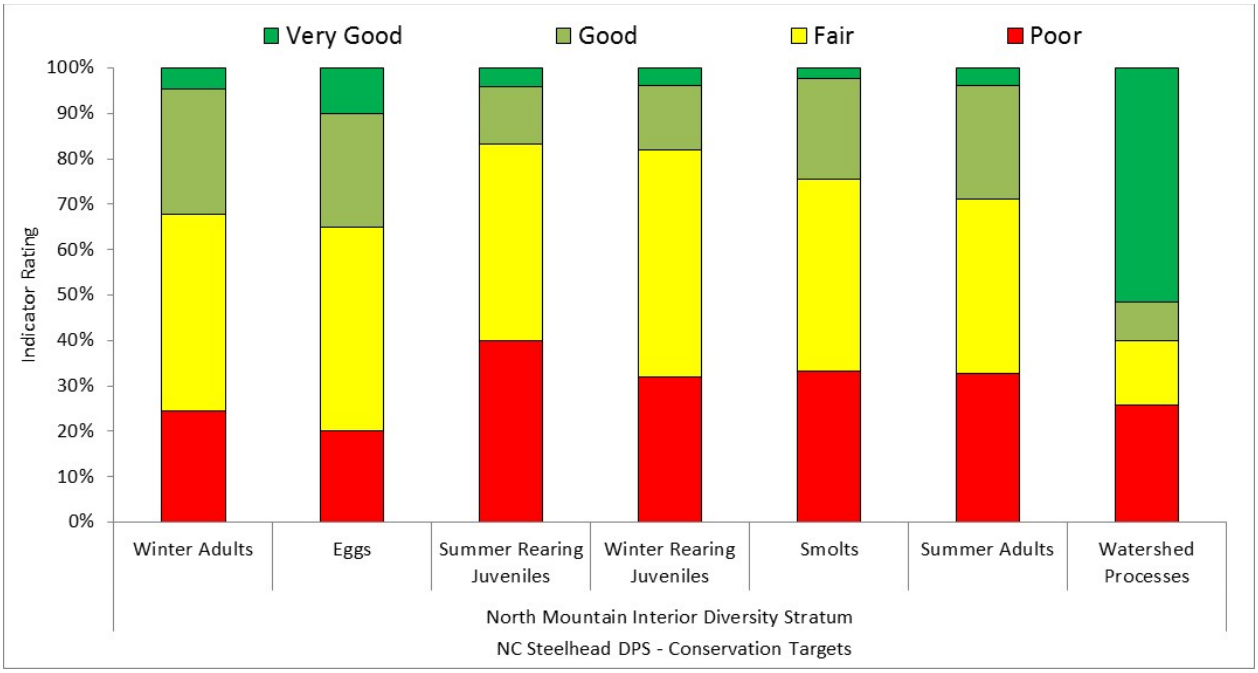

Figure 9: Attribute Indicator Ratings for the North Mountain Interior Diversity Stratum Conservation Targets.

Threat Results

Similar to the Lower Interior stratum, the North Mountain Interior had an overall Low percentage (18%) of High or Very High threats (Figure 10). The only Very High rating for the stratum was

water diversion and impoundments in the Upper Mainstem Eel River population (Table 7). Roads and railroads were rated a High threat for all populations in the stratum while hatcheries and aquaculture were rated Low in all populations. There are no steelhead hatcheries in operation within the stratum and therefore these threats were not rated.

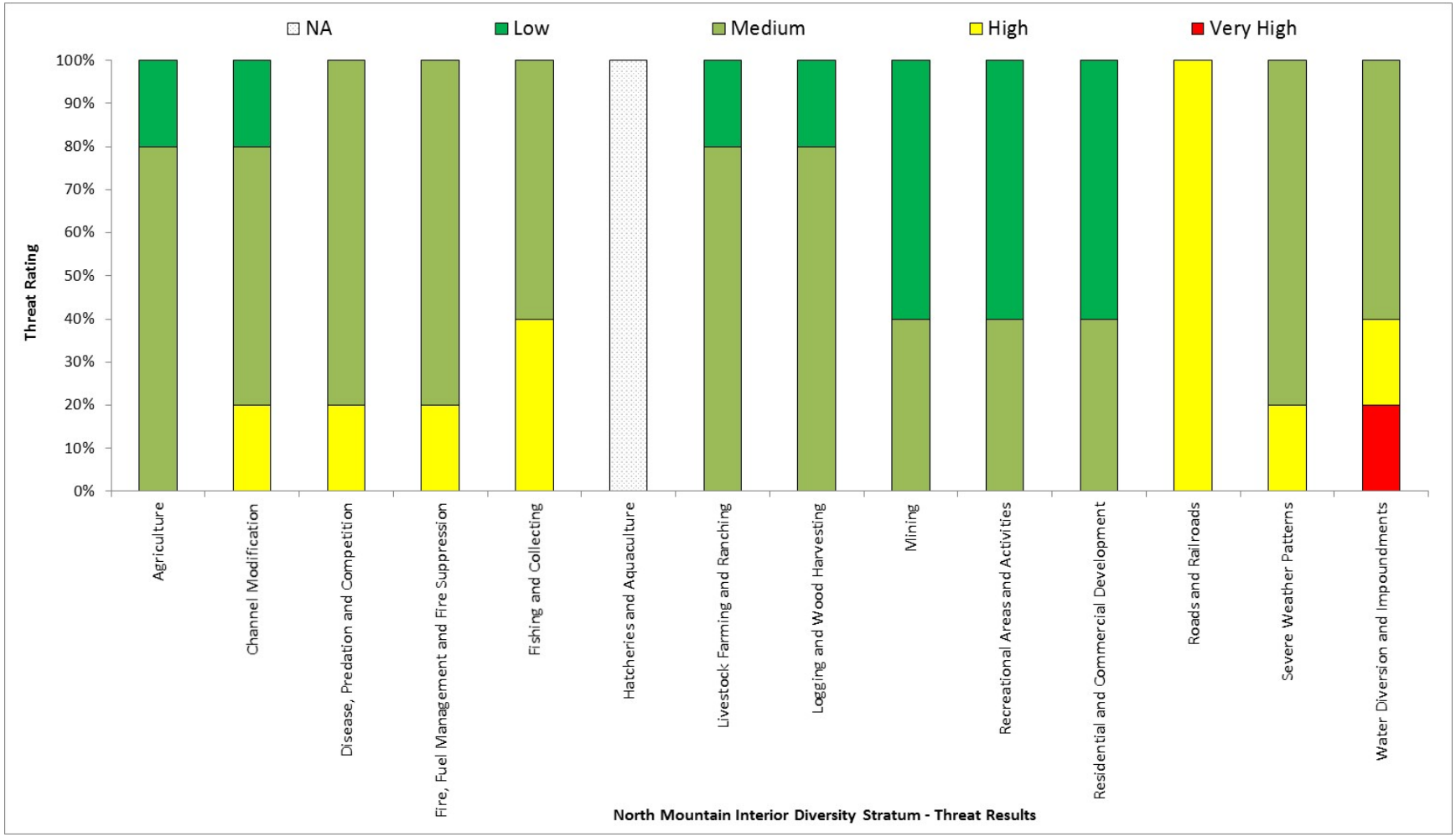

Figure 10: Threat ratings for the North Mountain Interior Diversity Stratum.

NORTH-CENTRAL COASTAL DIVERSITY STRATUM RESULTS

The North-Central Coastal Diversity Stratum CAP populations occur along the Mendocino County coastline and include Usal Creek, Wages Creek, Ten Mile River, Noyo River, Caspar Creek, and Big River. This stratum is comprised almost entirely of a forested landscape, and timber harvest is the dominant land use. Small coastal and rural developments also exist.

Attribute Results

Based on the CAP viability results, the North-Central Coastal Diversity Stratum was the least impaired in the DPS (Figure 3); however 50% of indicator ratings for the stratum were reported as Poor or Fair. With the exception of Usal Creek, indicator ratings for estuary/lagoon quality and extent were better than the Eel River populations to the north, and two of six of the populations were rated Good for summer rearing juveniles (Table 5). As in other strata, habitat complexity was identified as a serious impairment for steelhead viability with the exception of Caspar Creek which was rated Good or Very Good for large wood frequency and pool/riffle/flatwater ratio. Road density, including streamside roads, was rated Poor for all populations. With very few exceptions, all attribute indicators related to hydrology, landscape patterns, passage/migration, and water quality (toxicity) were rated Good or Very Good for all life stages and populations in the stratum.

Life Stage Results

In the North-Central Coastal Diversity Stratum, winter rearing juveniles are the most impacted life stage with 67% of indicators rated as Poor or Fair (Figure 11). This result is consistent with the relatively poor habitat complexity (*i.e.*, poor overwintering habitat quality) reported for most of the stratum. For winter adults, large wood frequency was rated Poor or Fair in all populations except for Caspar Creek (Very Good and Good), and shelter rating was Poor or Fair for all populations in the stratum (Table 6). Most indicators were rated Fair or better for the egg life stage with the few exceptions related to gravel quantity (Usal and Wages Creeks) and quality (Ten Mile and Big Rivers) (Table 6). Like winter rearing juveniles and winter adults, indicators

of most concern for the summer rearing juvenile life stage were those associated with habitat complexity as well as sediment quality and water temperature. For smolts, all populations in the stratum were rated Poor for habitat complexity (shelter rating) except one (Wages Creek, Fair). Viability (low abundance) was also a concern for the smolt life stage throughout in the stratum. With the exception of road density throughout and timber harvest in the Ten Mile River, all other indicators for watershed processes were rated Fair or better with a majority rated as Very Good.

Figure 11: Attribute Indicator Ratings for the North-Central Coastal Diversity Stratum conservation targets.

Threat Results

As in other strata, roads and railroads represent the greatest threat to steelhead and their designated critical habitat in the North-Central Diversity Stratum (Figure 12). There were no threats rated Very High and only 10% of threats were rated High. Severe weather patterns was rated High in two populations (Usal and Ten Mile) (Table 7).

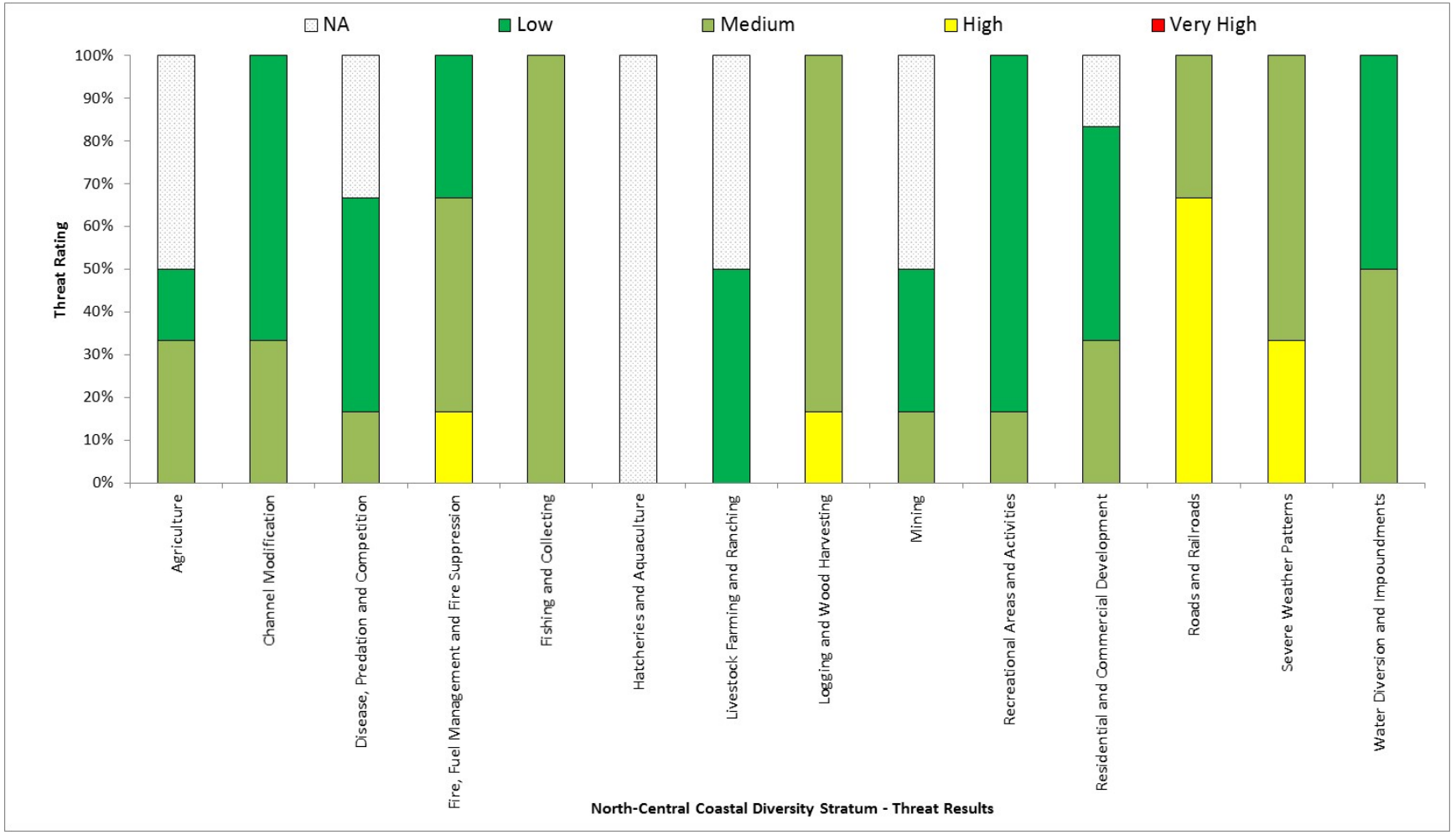

Figure 12: Threat ratings for the North-Central Coastal Diversity Stratum.

CENTRAL COASTAL DIVERSITY STRATUM RESULTS

The Central Coastal Diversity Stratum CAP populations are Navarro River, Garcia River, and the Gualala River, located in northern Sonoma and southern Mendocino counties. These populations are largely covered by a forested landscape where logging is a common land use. Agriculture and small rural developments also exist and are becoming more common.

Attribute Results

The Central Coastal Diversity Stratum had the fewest indicators rated Poor overall (19%), however 65% of indicators were rated Poor or Fair (Figure 3). Estuary conditions were rated Fair or better for all life stages and populations (Table 5). Shelter rating was rated Poor across all three populations, while percent primary pools, and pool/riffle/flatwater ratio were rated Poor for all lifestages in two of three populations (Navarro and Gualala). Large wood frequency in the channel was generally rated Good for two of the three populations (Garcia and Gualala rivers) and Poor in the Navarro River. Like other strata, streamside road density was rated Poor or Fair for all populations and flow conditions, and viability (density) and water temperature were rated Poor or Fair for summer rearing juveniles.

Life Stage Results

Based on the combined percentage of Poor and Fair indicator ratings, smolts (78%, 7% as Poor) are the most impaired life stage in the Central Coastal Diversity Stratum; although winter rearing juveniles (27%), summer rearing juveniles (25%), and winter adults (19%) received a higher percentage of Poor ratings overall (Figure 13). The high percentage of Poor ratings for the summer rearing and winter rearing juveniles were largely due to impaired habitat complexity (Table 6). A majority of the indicator ratings for the egg life stage were rated Fair which indicates gravel quality and quantity throughout the stratum are not primary limiting factors. Winter adults and smolts are most impaired by Poor shelter, particularly in the Garcia and Gualala river populations and large wood frequency was rated Poor for winter adults in the Navarro River population.

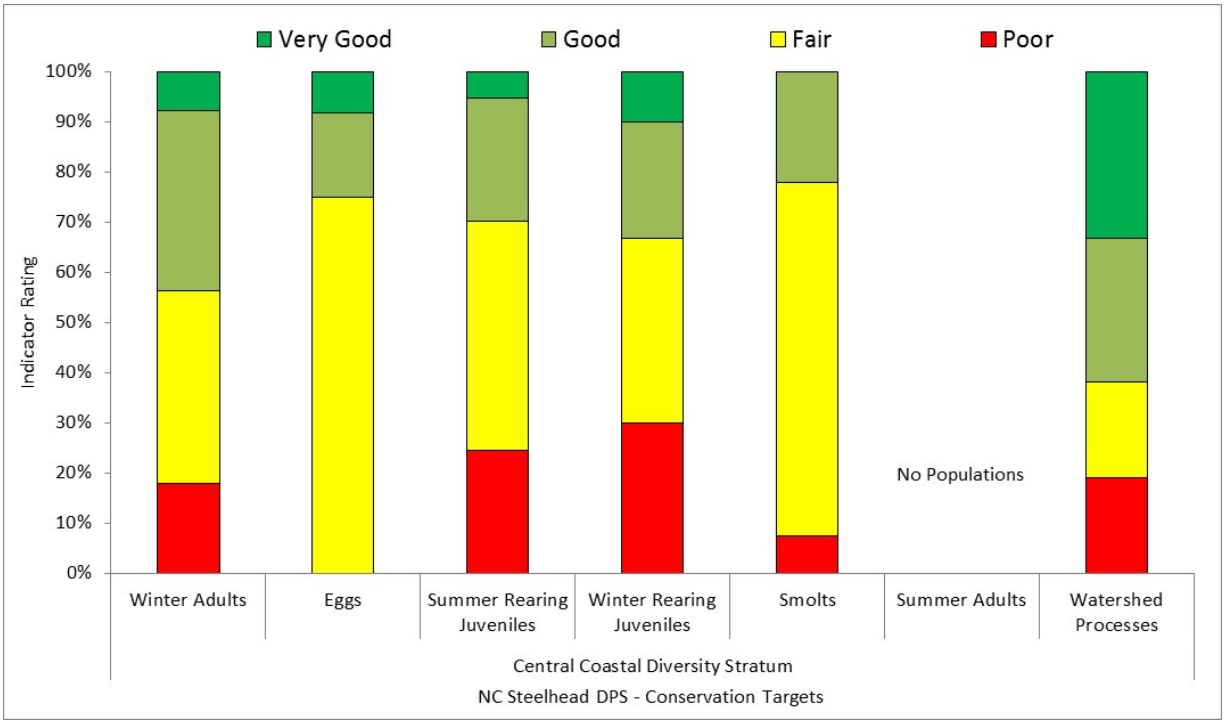

Figure 13: Attribute Indicator Ratings for the Central Coastal Diversity Stratum Conservation Targets.

Threat Results

Water diversions or impoundments for all three populations were rated High and were identified as the most significant threat to steelhead in the stratum (Figure 14 and Table 7). Roads and railroads as well as logging and wood harvesting were also rated as High threats for the Garcia and Gualala populations and Medium threats for the Navarro population.

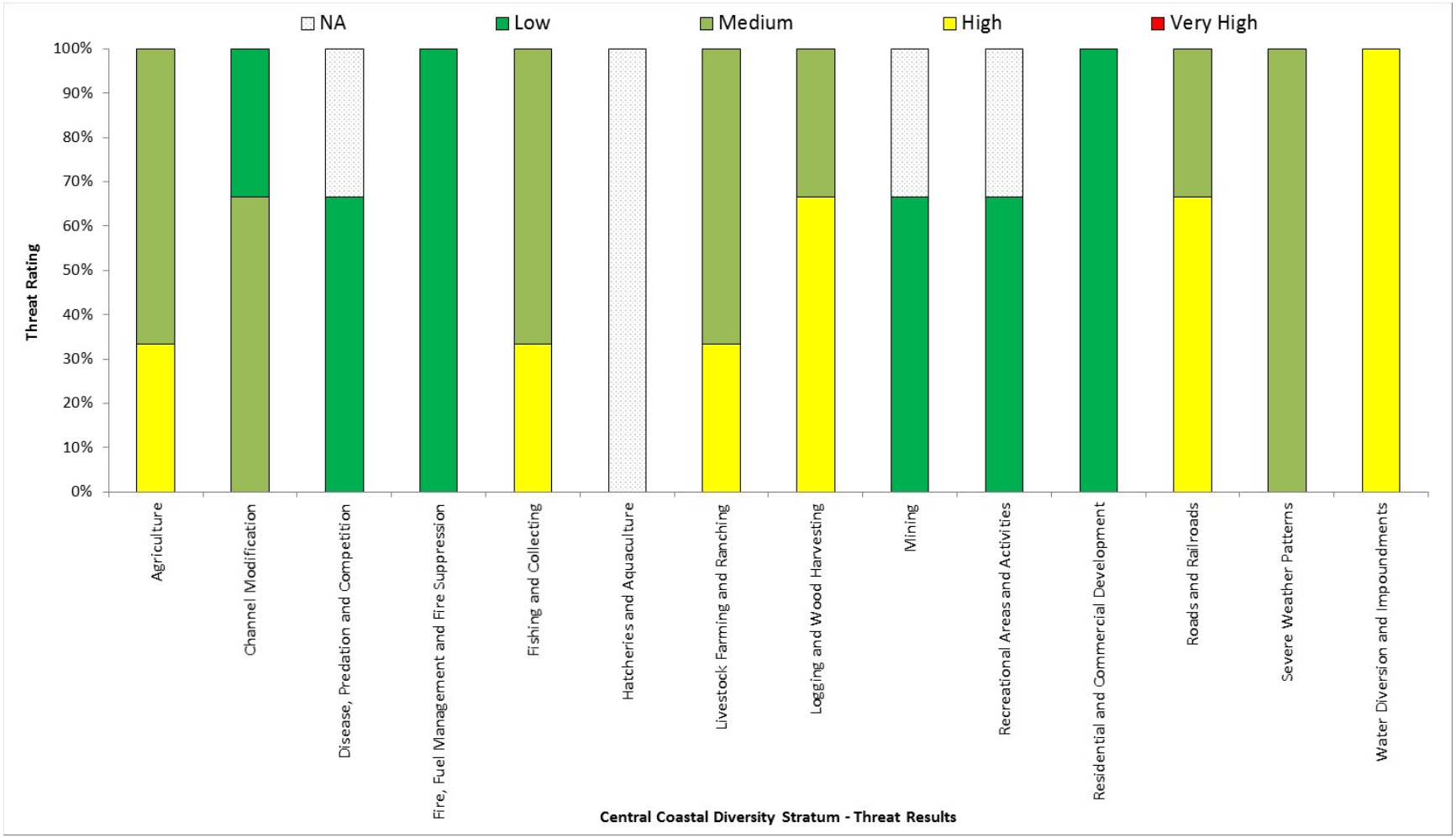

Figure 14: Threat ratings for the Central Coastal Diversity Stratum.

DPS CAP VIABILITY RESULTS

Attributes

Throughout the DPS and across life stages, attribute indicators most impacted are those associated with habitat complexity (large wood frequency, percent primary pools, pool/riffle/flatwater ratio, and shelter), riparian vegetation (tree diameter), and sediment transport (road density, streamside road density) (Table 5). The quality and extent of estuarine habitat for summer rearing juvenile and smolt life stages were rated Poor for all ten steelhead populations within the Eel River Watershed, and was rated Poor or Fair for most other populations throughout the DPS. Hydrology (flow conditions, impervious surfaces, number and magnitude of diversion, and passage flows), passage/migration (passage at mouth or confluence, physical barriers), landscape patterns (agriculture and urbanization), and water quality (toxicity) are the least impacted attribute indicators across the DPS and life stages (Table 5).

Table 5: NC steelhead DPS CAP Viability Summary by Attribute.

NC Steelhead Population Conditions By Habitat Attribute			Northern Coastal								Lower Interior				North Mountain Interior					North-Central Coastal						Central Coastal		
Target	Attribute	Indicator	Redwood	Maple Creek/Big Lagoon	Little River	Mad River	Humboldt Bay	South Fork Eel River	Bear River	Mattole River	Chamise Creek	Woodman Creek	Outlet Creek	Tomki Creek	Van Duzen River	Larabee Creek	North Fork Eel River	Middle Fork Eel River	Upper Mainstem Eel River	Usal Creek	Wages Creek	Ten Mile River	Noyo River	Caspar Creek	Big River	Navarro River	Garcia River	Gualala River
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	P	P	F	F	F	P	F	F	P	P	P	P	P	P	P	P	P	P	F	G	F	G	F	F	G	F
Smolts	Estuary/Lagoon	Quality & Extent	P	P	F	F	F	P	F	F	P	P	P	P	P	P	P	P	P	P	F	G	F	F	F	F	F	F
Winter Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	F	P	F	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	V	P	P	G	G
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	F	P	F	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	V	P	P	G	G
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	F	P	F	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	V	P	P	G	G
Winter Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	F	P	F	F	P	P	P	P	P	P	P	F	F	F	P	P	P	F	P	P	G	P	P	F	G
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	F	P	F	F	P	P	P	P	P	P	P	F	F	F	P	P	P	F	P	P	G	P	P	F	G
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	F	P	F	P	P	P	P	P	P	P	P	F	F	F	P	P	P	F	P	P	G	P	P	F	G
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	F	P	F	P	P	F	G	F	F	P	P	P	P	F	P	P	P	P	P	P	F	P	P	P	G	P
Summer Adults	Habitat Complexity	Percent Staging Pools	P	NA	NA	F	NA	F	NA	P	NA	NA	NA	NA	P	NA	P	G	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	V	P	F	F	P	F	F	V	F	P	F	F	P	P	F	F	F	G	F	V	P	F	G	P
Summer Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	P	P	F	F	P	F	F	V	F	P	F	F	P	P	P	F	P	G	F	V	P	P	G	P
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	P	P	F	F	P	F	F	V	F	P	F	F	P	P	F	F	F	G	F	V	P	P	G	P
Winter Adults	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	F	P	P	F	P	F	P	P	P	P	F	P	P
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	P	P	P	F	P	F	P	P	P	P	P	P	P
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	F	P	P	F	P	F	P	P	P	P	P	P	P
Smolts	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	F	P	P	P	P	F	P	P	P	P	F	P	P
Summer Adults	Habitat Complexity	Shelter Rating	P	NA	NA	P	NA	P	NA	P	NA	NA	NA	NA	P	NA	P	P	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	P	G	G	F	F	P	G	P	F	F	P	P	P	F	P	F	G	G	G	V	G	G	F	F	F	P
Summer Adults	Hydrology	Flow Conditions (Baseflow)	F	NA	NA	F	NA	P	NA	F	NA	NA	NA	NA	P	NA	P	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	G	G	V	G	G	G	F	F	G	G	G	V	V	G	G	V	G	V	G	V	G	F	F	F
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	G	G	V	F	F	P	F	F	P	F	F	F	F	F	F	G	G	V	G	V	G	F	F	P
Watershed Processes	Hydrology	Impervious Surfaces	V	V	V	V	F	V	V	V	V	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	P	V	G	F	P	P	G	P	V	G	P	F	P	F	G	F	F	V	F	F	V	V	G	F	G	G
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	P	V	G	F	P	F	G	F	V	G	F	F	P	F	G	G	G	V	F	G	V	V	G	F	G	G
Winter Adults	Hydrology	Passage Flows	G	V	V	G	V	G	G	F	F	F	F	G	G	G	G	G	G	V	G	V	V	V	G	F	F	G
Smolts	Hydrology	Passage Flows	F	V	V	G	V	F	G	F	F	G	F	G	F	F	P	G	G	V	G	G	G	V	G	F	F	F
Summer Adults	Hydrology	Passage Flows	F	NA	NA	G	NA	F	NA	F	NA	NA	NA	NA	P	NA	G	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eggs	Hydrology	Redd Scour	F	V	V	G	P	F	G	F	F	F	G	F	F	F	G	F	F	F	G	G	F	V	F	F	F	G
Watershed Processes	Landscape Patterns	Agriculture	V	V	V	V	V	V	V	V	V	V	F	V	F	G	V	V	V	V	V	V	V	V	V	F	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	V	F	P	G	P	G	G	V	V	V	G	V	P	P	V	V	V	G	F	P	F	V	F	G	G	F
Watershed Processes	Landscape Patterns	Urbanization	V	V	V	V	P	V	V	V	V	V	F	F	V	V	V	V	V	V	V	V	V	V	V	G	V	V
Winter Adults	Passage/Migration	Passage at Mouth or Confluence	G	V	G	G	G	G	V	G	G	G	F	G	G	G	G	G	G	G	V	V	V	V	V	G	F	G
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	G	V	G	G	G	P	V	P	F	G	F	F	F	G	F	F	P	G	V	V	G	V	G	F	F	F
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	V	G	G	G	F	V	F	G	G	G	F	F	G	F	G	P	P	G	V	V	V	G	G	F	F
Summer Adults	Passage/Migration	Passage at Mouth or Confluence	F	NA	NA	G	NA	P	NA	F	NA	NA	NA	NA	F	NA	G	G	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Adults	Passage/Migration	Physical Barriers	V	V	G	V	G	V	V	V	V	P	F	V	V	V	V	G	P	V	V	V	V	V	G	G	V	V
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	V	V	G	V	G	V	V	V	V	F	P	V	G	V	V	G	F	V	V	V	V	V	G	F	V	V
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	V	V	G	V	G	V	V	V	G	G	F	V	G	V	V	G	F	V	V	V	G	V	V	F	V	V
Summer Adults	Passage/Migration	Physical Barriers	V	NA	NA	V	NA	V	NA	V	NA	NA	NA	NA	V	NA	F	F	P	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	F	F	G	V	V	F	P	F	P	V	F	P	P	P	P	F	F	G	F	F	V	V	P	F	F	F
Watershed Processes	Riparian Vegetation	Species Composition	F	F	F	F	G	F	P	F	F	F	F	F	V	G	F	G	F	V	V	G	G	G	F	P	F	G
Winter Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	F	P	P	F	F	P	P	P	F	P	P	P	F	F	P	P	F	G	F	P	F	F
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	F	P	P	F	F	P	P	P	F	P	P	P	F	F	P	P	F	G	F	P	F	F
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	F	P	P	F	F	P	P	P	F	P	P	P	F	F	P	P	F	G	F	P	F	F
Eggs	Sediment	Gravel Quality (Bulk)	F	P	F	V	P	P	F	P	F	F	F	F	P	G	F	P	F	P	P	F	F	F	F	F	F	G
Summer Adults	Sediment	Gravel Quality (Bulk)	F	NA	NA	V	NA	P	NA	P	NA	NA	NA	NA	P	NA	F	P	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	P	F	F	F	G	P	P	P	F	F	P	F	F	P	F	P	F	G	F	F	P	F	V	F
Summer Adults	Sediment	Gravel Quality (Embeddedness)	G	NA	NA	V	NA	F	NA	P	NA	NA	NA	NA	P	NA	F	P	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Adults	Sediment	Quantity & Distribution of Spawning Gravels	P	P	F	G	F	G	P	P	F	P	G	G	P	F	F	G	G	V	G	G	G	V	G	G	F	V
Summer Adults	Sediment	Quantity & Distribution of Spawning Gravels	P	NA	NA	G	NA	G	NA	P	NA	NA	NA	NA	P	NA	F	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	P	V	F	F	G	P	P	P	F	F	P	F	F	P	P	F	G	P	F	F	P	F	V	F
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	P	V	F	F	G	P	P	P	F	F	P	F	F	P	P	F	P	P	F	F	P	F	V	F
Watershed Processes	Sediment Transport	Road Density	P	P	P	P	P	P	P	F	G	G	F	G	P	P	F	V	F	P	P	P	P	P	P	P	G	G
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	F
Smolts	Smoltification	Temperature	P	F	V	F	G	P	F	P	F	G	F	F	F	G	P	F	F	V	V	V	G	V	G	F	G	F
Winter Adults	Velocity Refuge	Floodplain Connectivity	P	F	G	G	F	F	F	P	F	G	P	G	F	G	G	F	F	G	G	F	F	F	F	G	P	F
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	P	F	G	G	F	F	F	P	G	G	P	F	F	G	G	F	G	G	G	F	F	P	F	F	P	F
Summer Adults	Velocity Refuge	Floodplain Connectivity	P	NA	NA	G	NA	F	NA	P	NA	NA	NA	NA	F	NA	G	F	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Smolts	Viability	Abundance	F	G	P	F	F	G	F	F	F	P	F	P	F	F	F	F	P	F	P	F	F	P	F	F	F	F
Summer Adults	Viability	Abundance	P	NA	NA	F	NA	P	NA	P	NA	NA	NA	NA	F	NA	P	F	P	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Adults	Viability	Density	F	G	P	F	F	F	G	F	P	F	F	P	F	F	G	F	P	F	P	F	F	F	P	F	F	F
Summer Rearing Juveniles	Viability	Density	F	G	P	F	F	F	G	P	P	P	F	P	F	F	F	F	G	F	F	F	G	F	F	F	P	P
Summer Rearing Juveniles	Viability	Spatial Structure	G	V	F	F	G	V	V	V	V	G	F	P	G	V	G	F	P	V	G	V	G	G	G	F	G	G
Summer Adults	Water Quality	Mainstem Temperature (MWMT)	P	NA	NA	F	NA	P	NA	P	NA	NA	NA	NA	F	NA	P	F	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Rearing Juveniles	Water Quality	Temperature (MWMT)	P	V	V	V	V	P	P	F	P	F	P	P	F	P	P	F	P	G	V	F	P	F	P	P	F	F
Winter Adults	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	G	F	G	G	F	F	V	G	G	G	G	G	F	G	F
Summer Rearing Juveniles	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	F	F	G	G	F	V	G	G	G	G	G	G	F	G	F
Winter Rearing Juveniles	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	G	F	G	G	F	F	V	G	G	G	G	G	F	G	F
Smolts	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	G	F	G	G	F	V	V	G	G	G	G	G	F	G	F
Summer Adults	Water Quality	Toxicity	F	NA	NA	G	NA	F	NA	G	NA	NA	NA	NA	F	NA	G	G	V	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter Adults	Water Quality	Turbidity	P	P	P	F	P	P	F	P	P	F	F	F	P	F	F	F	F	F	G	P	G	F	F	G	G	G
Summer Rearing Juveniles	Water Quality	Turbidity	G	P	P	G	G	P	G	F	F	F	F	F	P	G	G	G	F	G	G	G	G	G	V	G	G	G
Winter Rearing Juveniles	Water Quality	Turbidity	P	P	P	P	P	P	F	P	P	F	F	F	P	F	F	F	F	F	G	P	F	P	F	G	G	F
Smolts	Water Quality	Turbidity	P	P	P	F	P	F	F	F	F	F	F	F	P	F	F	F	F	F	G	P	F	F	F	F	G	F

Table 6: NC steelhead DPS CAP Viability Summary by Conservation Target.

NC Steelhead Population Conditions By Target Life Stage			Northern Coastal									Lower Interior				North Mountain Interior					North-Central Coastal					Central Coastal		
Target	Attribute	Indicator	Redwood	Maple Creek/Big Lagoon	Little River	Mad River	Humboldt Bay	South Fork Eel River	Bear River	Mattole River	Chamise Creek	Woodman Creek	Outlet Creek	Tomki Creek	Van Duzen River	Larabee Creek	North Fork Eel River	Middle Fork Eel River	Upper Mainstem Eel River	Usal Creek	Wages Creek	Ten Mile River	Noyo River	Caspar Creek	Big River	Navarro River	Garcia River	Gualala River
Winter Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	F	P	F	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	V	P	P	G	G
Winter Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	F	P	F	F	P	P	P	P	P	P	P	F	F	F	P	P	P	F	P	P	G	P	P	F	G
Winter Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	V	P	F	F	P	F	F	V	F	P	F	F	P	P	F	F	F	G	F	V	P	F	G	P
Winter Adults	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	F	P	P	F	P	F	P	P	P	P	F	P	P
Winter Adults	Hydrology	Passage Flows	G	V	V	G	V	G	G	F	F	F	F	G	G	G	G	G	G	V	G	V	V	V	G	F	F	G
Winter Adults	Passage/Migration	Passage at Mouth or Confluence	G	V	G	G	G	G	V	G	G	G	F	G	G	G	G	G	G	G	V	V	V	V	V	G	F	G
Winter Adults	Passage/Migration	Physical Barriers	V	V	G	V	G	V	V	V	V	P	F	V	V	V	V	G	P	V	V	V	V	V	G	G	V	V
Winter Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	F	P	P	F	F	P	P	P	F	P	P	P	F	F	P	P	F	G	F	P	F	F
Winter Adults	Sediment	Quantity & Distribution of Spawning Gravels	P	P	F	G	F	G	P	P	F	P	G	G	P	F	F	G	G	V	G	G	G	V	G	G	F	V
Winter Adults	Velocity Refuge	Floodplain Connectivity	P	F	G	G	F	F	F	P	F	G	P	G	F	G	G	F	F	G	G	F	F	F	F	G	P	F
Winter Adults	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	G	F	G	G	F	F	V	G	G	G	G	G	F	G	F
Winter Adults	Water Quality	Turbidity	P	P	P	F	P	P	F	P	P	F	F	F	P	F	F	F	F	F	G	P	G	F	F	G	G	G
Winter Adults	Viability	Density	F	G	P	F	F	F	G	F	P	F	F	P	F	F	G	F	P	F	P	F	F	F	P	F	F	F
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	G	G	V	G	G	G	F	F	G	G	G	V	V	G	G	V	G	V	G	V	G	F	F	F
Eggs	Hydrology	Redd Scour	F	V	V	G	P	F	G	F	F	F	G	F	F	F	G	F	F	F	G	G	F	V	F	F	F	G
Eggs	Sediment	Gravel Quality (Bulk)	F	P	F	V	P	P	F	P	F	F	F	F	P	G	F	P	F	P	P	F	F	F	F	F	F	G
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	P	F	F	F	G	P	P	P	P	F	P	F	F	P	F	F	G	P	F	G	P	F	V	F
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	P	P	F	F	F	P	F	F	P	P	P	P	P	P	P	P	P	P	F	G	F	G	F	F	G	F
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	F	P	F	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	V	P	P	G	G
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	F	P	F	F	P	P	P	P	P	P	P	F	F	F	P	P	P	F	P	P	G	P	P	F	G
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	F	P	F	P	P	F	G	F	F	P	P	P	P	F	P	P	P	P	P	P	F	P	P	P	G	P
Summer Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	P	P	F	F	P	F	F	V	F	P	F	F	P	P	P	F	P	G	F	V	P	P	G	P
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	P	P	P	F	P	F	P	P	P	P	P	P	P
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	P	G	G	F	F	P	G	P	P	F	F	P	P	F	P	F	G	G	G	V	G	G	F	F	F	P
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	G	G	V	F	F	P	F	F	P	F	F	F	F	F	F	G	G	V	G	V	G	F	F	P
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	P	V	G	F	P	P	G	P	V	G	P	F	P	F	G	F	F	V	F	F	V	V	G	F	G	G
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	G	V	G	G	G	P	V	P	F	G	F	F	F	G	F	F	P	G	V	V	G	V	G	F	F	F
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	V	V	G	V	G	V	V	V	V	F	P	V	G	V	V	G	F	V	V	V	V	V	G	F	V	V
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	F	F	G	V	V	F	P	F	P	V	F	P	P	P	P	F	F	G	V	F	V	V	P	F	F	F
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	F	P	P	F	F	P	P	P	F	P	P	P	F	F	P	P	F	G	F	P	F	F
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	P	V	F	F	G	P	P	P	F	F	P	F	F	P	P	F	G	P	F	F	P	F	V	F
Summer Rearing Juveniles	Water Quality	Temperature (MWMT)	P	V	V	V	V	P	P	F	P	F	P	P	F	P	P	F	P	G	V	F	P	F	P	P	P	F
Summer Rearing Juveniles	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	F	F	G	G	F	V	G	G	G	G	G	G	F	G	F
Summer Rearing Juveniles	Water Quality	Turbidity	G	P	P	G	G	P	G	F	F	F	F	F	P	G	G	G	F	G	G	G	G	G	V	G	G	G
Summer Rearing Juveniles	Viability	Density	F	G	P	F	F	F	G	P	P	P	F	P	F	F	F	F	G	F	F	F	G	F	F	P	F	P
Summer Rearing Juveniles	Viability	Spatial Structure	G	V	F	F	G	V	V	V	V	G	F	P	G	V	G	F	P	V	G	V	G	G	C	F	G	G
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	F	P	F	P	F	P	P	F	P	P	P	F	F	F	P	P	P	P	P	P	V	P	P	G	G
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	F	P	F	P	P	P	P	P	P	P	P	F	F	F	P	P	P	F	P	P	G	P	P	F	G
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	P	P	F	F	P	F	F	V	F	P	F	F	P	P	F	F	F	G	F	V	P	P	G	P
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	F	P	P	F	P	F	P	P	P	P	P	P	P
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	V	V	G	V	G	V	V	V	G	G	F	V	G	V	V	G	F	V	V	V	G	V	V	F	V	V
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	F	P	P	F	F	P	P	P	F	P	P	P	F	F	P	P	F	G	F	P	F	F
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	P	V	F	F	G	P	P	P	F	F	P	F	F	P	P	F	P	P	F	F	P	F	V	F
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	P	F	G	G	F	F	F	P	G	G	P	F	F	G	G	F	G	G	G	F	F	P	F	P	F	F
Winter Rearing Juveniles	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	G	F	G	G	F	F	V	G	G	G	G	G	F	G	F
Winter Rearing Juveniles	Water Quality	Turbidity	P	P	P	P	P	P	F	P	P	F	F	F	P	F	F	F	F	F	G	P	F	P	F	G	G	F
Smolts	Estuary/Lagoon	Quality & Extent	P	P	F	F	F	P	F	F	P	P	P	P	P	P	P	P	P	P	F	G	F	F	F	F	F	F
Smolts	Habitat Complexity	Shelter Rating	P	P	F	P	F	P	P	P	P	P	P	P	P	F	P	P	P	P	F	P	P	P	P	F	P	P
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	P	V	G	F	P	F	G	F	V	G	F	F	P	F	G	G	G	V	F	G	V	V	G	F	G	G
Smolts	Hydrology	Passage Flows	F	V	V	G	V	F	G	F	F	G	F	G	F	F	P	G	G	V	G	G	G	V	G	F	F	F
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	V	G	G	G	F	V	F	G	G	G	F	F	G	F	G	P	P	G	V	V	V	G	G	F	F
Smolts	Smoltification	Temperature	P	F	V	F	G	P	F	P	F	G	F	F	F	G	P	F	F	V	V	V	G	V	G	F	G	F
Smolts	Water Quality	Toxicity	F	G	G	G	F	F	G	G	G	F	F	G	F	G	G	F	V	V	G	G	G	G	G	F	G	F
Smolts	Water Quality	Turbidity	P	P	P	F	P	F	F	F	F	F	F	F	P	F	F	F	F	F	G	P	F	F	F	F	G	F
Smolts	Viability	Abundance	F	G	P	F	F	G	F	F	F	P	F	P	F	F	F	F	P	F	P	F	F	P	F	F	F	F
Watershed Processes	Hydrology	Impervious Surfaces	V	V	V	V	F	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Agriculture	V	V	V	V	V	V	V	V	V	V	F	V	F	G	V	V	V	V	V	V	V	V	V	F	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	V	F	P	G	P	G	G	V	V	V	G	V	P	P	V	V	V	G	F	P	F	V	F	G	G	F
Watershed Processes	Landscape Patterns	Urbanization	V	V	V	V	P	V	V	V	V	V	F	F	V	V	V	V	V	V	V	V	V	V	V	G	V	V
Watershed Processes	Riparian Vegetation	Species Composition	F	F	F	F	G	F	P	F	F	F	F	F	V	G	F	G	F	V	V	G	G	G	F	P	F	G
Watershed Processes	Sediment Transport	Road Density	P	P	P	P	P	P	P	F	G	G	F	G	P	P	F	V	F	P	P	P	P	P	P	P	G	G
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	F
Summer Adults	Habitat Complexity	Percent Staging Pools	P	NA	NA	F	NA	F	NA	P	NA	NA	NA	NA	P	NA	P	G	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Habitat Complexity	Shelter Rating	P	NA	NA	P	NA	P	NA	P	NA	NA	NA	NA	P	NA	P	P	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Hydrology	Flow Conditions (Baseflow)	F	NA	NA	F	NA	P	NA	F	NA	NA	NA	NA	P	NA	P	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Hydrology	Passage Flows	F	NA	NA	G	NA	F	NA	F	NA	NA	NA	NA	P	NA	G	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Passage/Migration	Passage at Mouth or Confluence	F	NA	NA	G	NA	P	NA	F	NA	NA	NA	NA	F	NA	G	G	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Passage/Migration	Physical Barriers	V	NA	NA	V	NA	V	NA	V	NA	NA	NA	NA	V	NA	F	F	P	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Sediment	Gravel Quality (Bulk)	F	NA	NA	V	NA	P	NA	P	NA	NA	NA	NA	P	NA	F	P	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Sediment	Gravel Quality (Embeddedness)	G	NA	NA	V	NA	F	NA	P	NA	NA	NA	NA	P	NA	F	P	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Sediment	Quantity & Distribution of Spawning Gravels	P	NA	NA	G	NA	G	NA	P	NA	NA	NA	NA	P	NA	F	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Velocity Refuge	Floodplain Connectivity	P	NA	NA	G	NA	F	NA	P	NA	NA	NA	NA	F	NA	G	F	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Water Quality	Mainstem Temperature (MWMT)	P	NA	NA	F	NA	P	NA	P	NA	NA	NA	NA	F	NA	P	F	F	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Water Quality	Toxicity	F	NA	NA	G	NA	F	NA	G	NA	NA	NA	NA	F	NA	G	G	V	NA	NA	NA	NA	NA	NA	NA	NA	NA
Summer Adults	Viability	Abundance	P	NA	NA	F	NA	P	NA	P	NA	NA	NA	NA	F	NA	P	F	P	NA	NA	NA	NA	NA	NA	NA	NA	NA

Life Stages

Based on the viability attribute results, all life stages of NC steelhead were found to be impaired (Table 6 and Figure 15). Winter rearing juveniles were the most impaired life stage across the DPS with 75% of all indicator ratings reported as Poor or Fair (40% as Poor alone), followed closely by the summer adult (72%) and summer rearing juvenile (68%) (Figure 15). Watershed processes, on a DPS level, had a combined 43% of attribute indicators reported as Poor or Fair (Figure 15), of which 31% were rated as Poor.

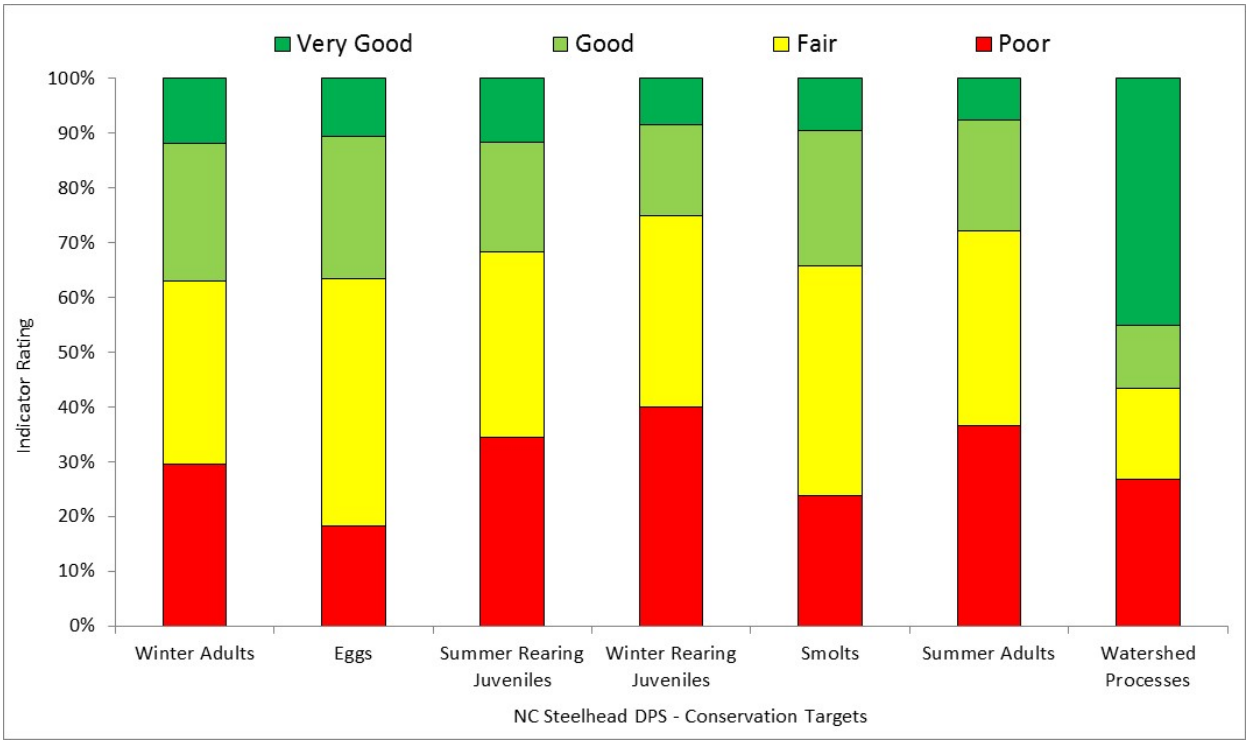

Figure 15: Attribute Indicator ratings for the NC steelhead DPS by life stage.

Winter Adult Attribute Results: Across the DPS, the winter adult life stage had a high percentage (> 60%) of Poor or Fair ratings; exceptions were passage flows, passage at mouth or confluence, physical barriers, the quality and distribution of spawning gravels, and toxicity (Figure 16 and Table 6). The indicators of greatest concern, based on the percentage of Poor ratings alone were large wood frequency, shelter rating, and tree diameter (Table 6). Shelter was rated Poor or Fair in all populations with nearly 80% of populations rated as Poor. Population viability (*i.e.*, low abundance) was also rated as Poor or Fair for winter adults in many populations.

Eggs Attribute Results: Of the four indicators assessed for the egg life stage, the most concerning were those related to gravel quantity (bulk), followed by gravel quality (embeddedness), and the potential for redd scour (Figure 17).

Summer Rearing Juvenile Attribute Results: Attribute indicators most impaired for summer rearing juveniles were estuary/lagoon (quality and extent), habitat complexity (large wood frequency, percent primary pools, pool/riffle/flatwater ratio, and shelter rating), riparian vegetation (tree diameter), sediment (embeddedness), and water temperature (Figure 18 and Table 6). Shelter rating was rated Poor or Fair for all populations within the DPS with 85% of populations rated as Poor. Indicators associated with hydrology (number and magnitude of diversions), passage/migration (passage at mouth or confluence, physical barriers), and water quality (toxicity, turbidity) were rated favorably throughout the DPS with few exceptions (Table 6). Summer rearing juvenile passage was rated Good or Very Good in approximately 70% of the populations within the DPS.

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 19). As with summer rearing juveniles, shelter rating was the most impacted attribute indicator with all populations rated as Poor or Fair, of which 81% of populations were rated Poor. Riparian tree diameter was rated Poor or Fair in all but one population in the DPS (Caspar Creek, Table 6). 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. Physical barriers, floodplain connectivity, and stream toxicity indicators were largely rated as Fair or better (Figure 19).

Smolt Attribute Results: As with both winter and summer rearing juveniles, shelter rating was rated Poor (81%) or Fair (19%) for all populations (Figure 20 and Table 6). The quality and extent of estuary/lagoon habitats was also identified as a serious impairment for smolts with nearly all

populations (except Ten Mile River) rated as Poor or Fair. Other impaired indicators for the smolt life stage included viability (low abundance) and water quality (turbidity).

Summer Adult Attribute Results: The summer adult life history strategy persists in eight populations within the NC steelhead DPS. These are Redwood Creek, Mad River, Mattole River, South Fork Eel River, Van Duzen River, North Fork Eel River, Middle Fork Eel River, and Upper Eel River Mainstem (Table 6). Across these populations, 73% of all attribute indicator ratings were reported as Poor or Fair (Figure 21) and attribute indicators identified as most impaired for summer adults were shelter rating, viability (low abundance), percent staging pools, gravel quality (bulk), and mainstem water temperature. Reduced floodplain connectivity, low passage flows at a mouth or confluence, poor upstream passage due to physical barriers, and gravel quantity and quality were also rated Poor or Fair for some populations (Table 6).

Watershed Processes: Streamside road density was rated Poor for all but one population in the DPS (Gualala River, Fair) (Figure 22). Roads in general were identified as the most significant impact to current riparian and in-stream habitat quality. Riparian species composition and timber harvest were also rated as moderately impaired with 62% and 38% of populations in the stratum rated Poor or Fair respectively. Relative to more urbanized southern DPS's, the extent of urbanization in the NC steelhead DPS is minimal with only 3 of 26 populations rated as Poor or Fair (Table 6).

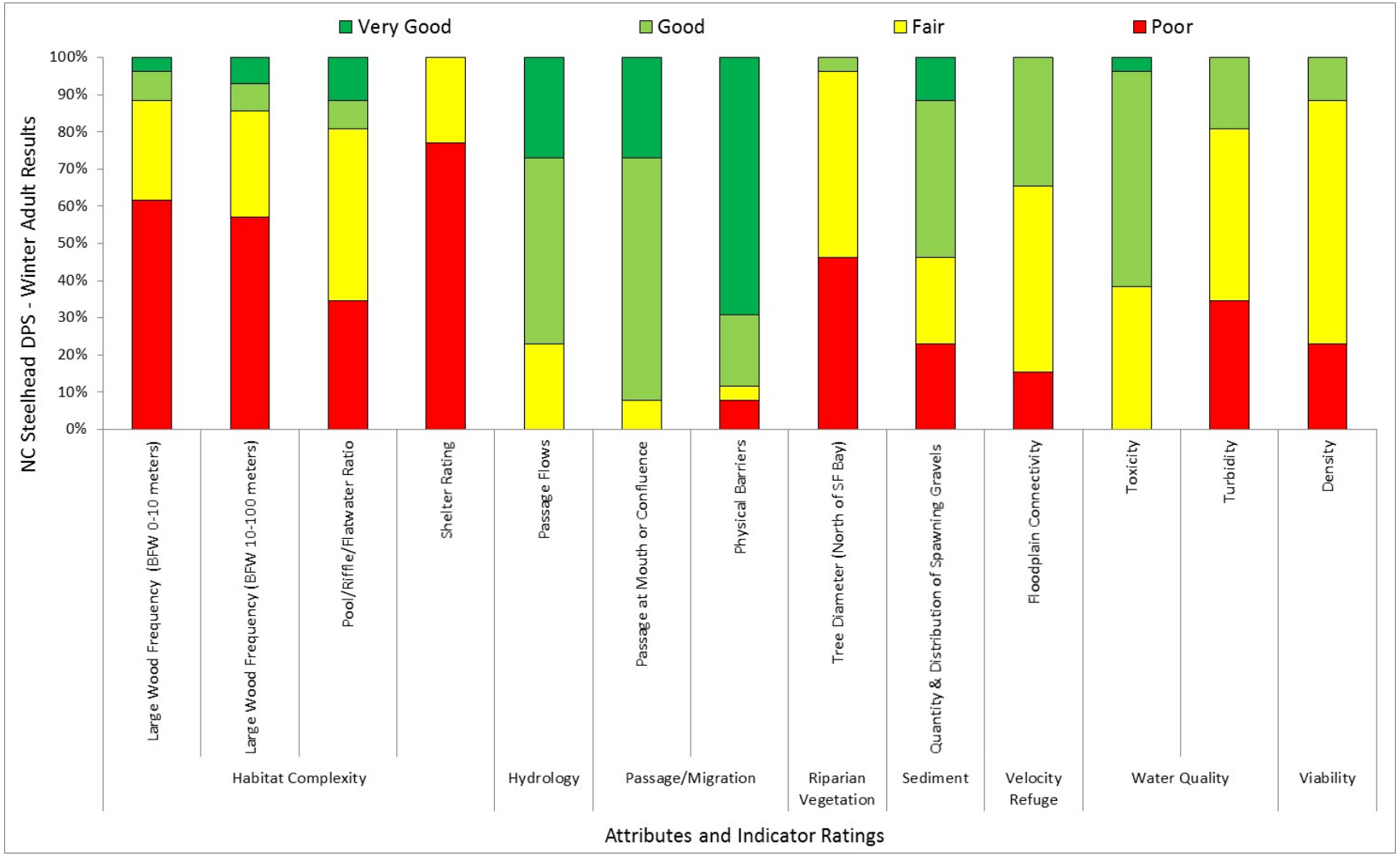

Figure 16: Attribute Indicator ratings for the Winter Adult life stage.

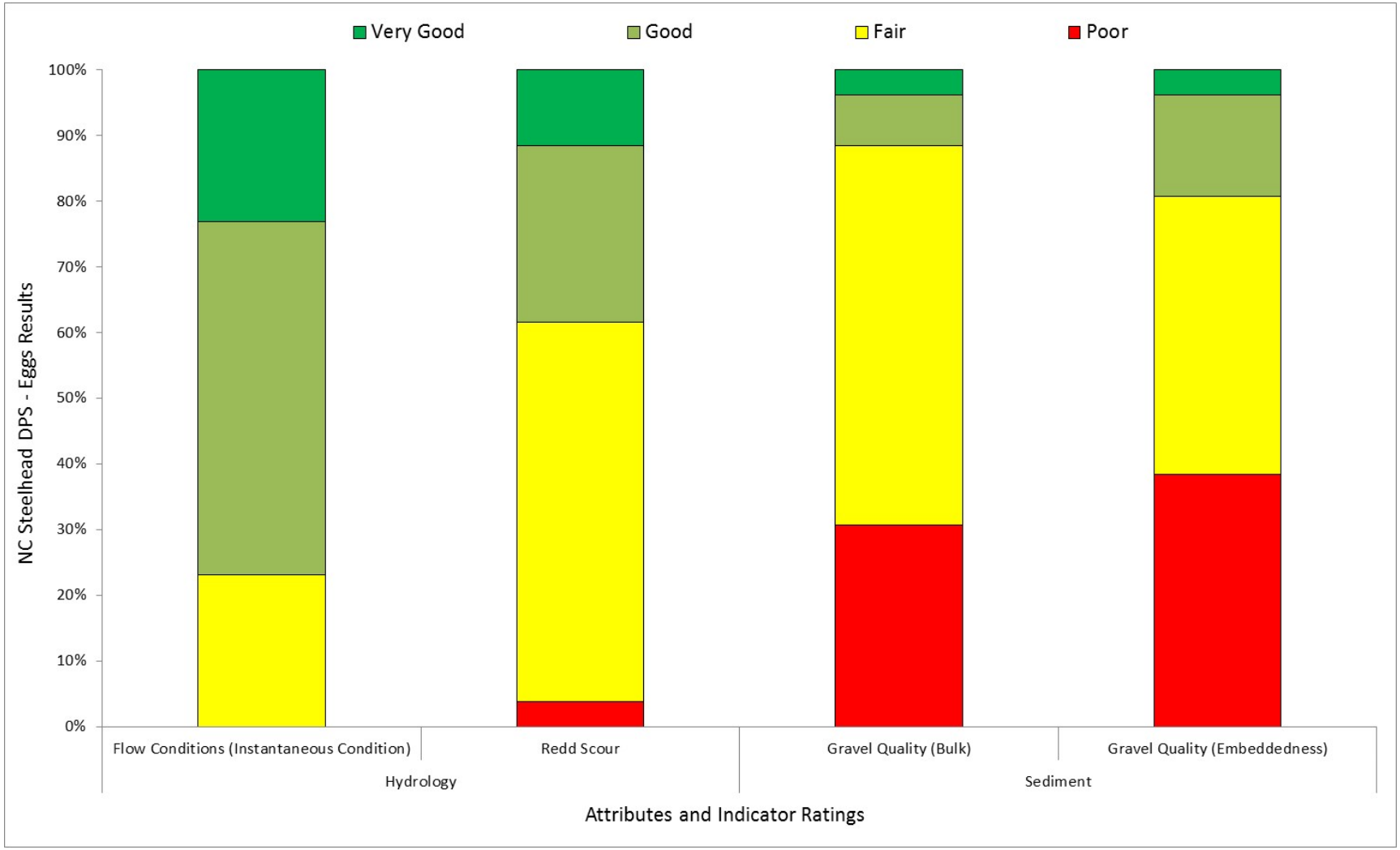

Figure 17: Attribute Indicator ratings for the Egg life stage.

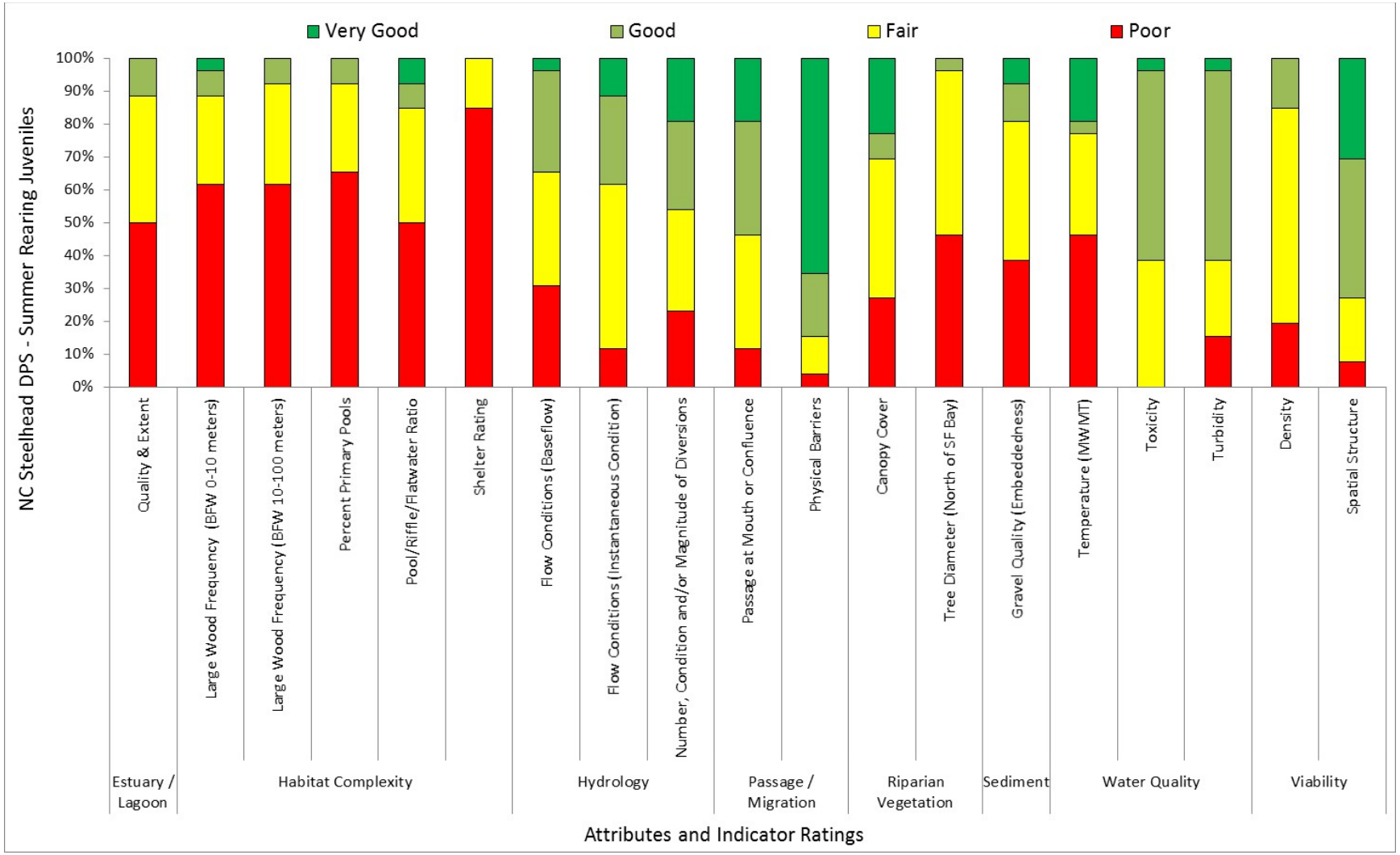

Figure 18: Attribute Indicator ratings for the Summer Rearing Juvenile life stage.

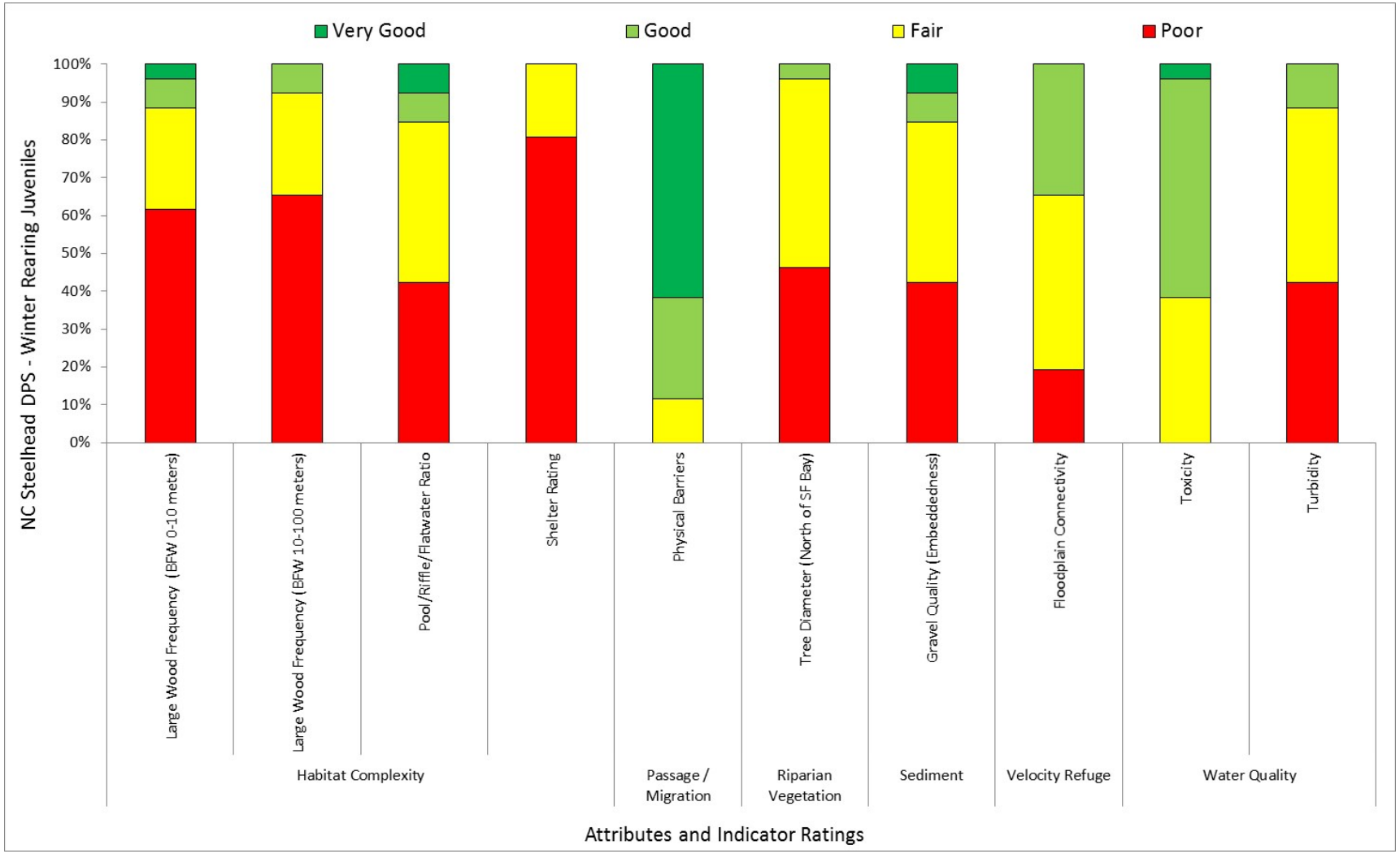

Figure 19: Attribute Indicator ratings for the Winter Rearing Juvenile life stage.

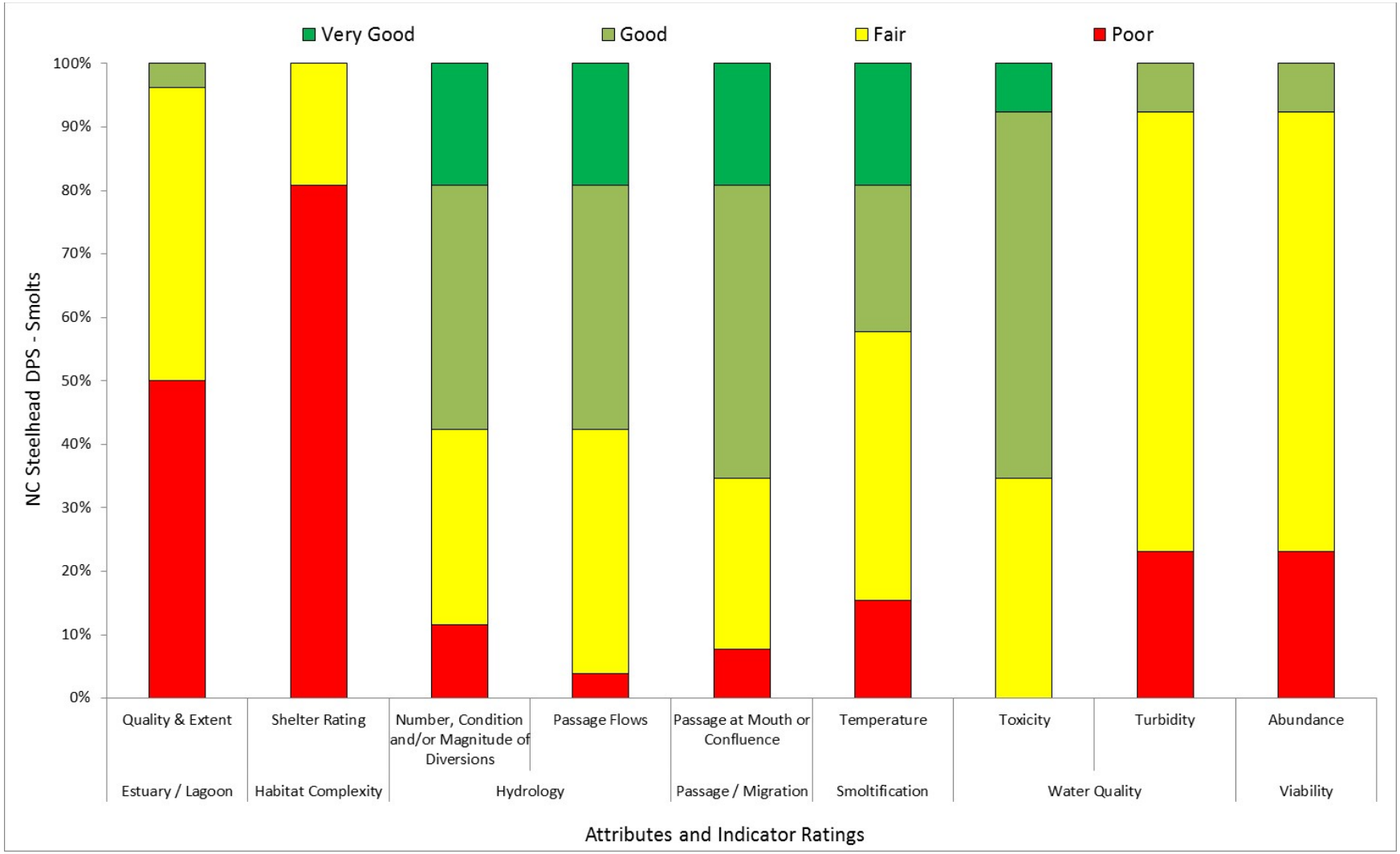

Figure 20: Attribute Indicator ratings for Smolt life stage.

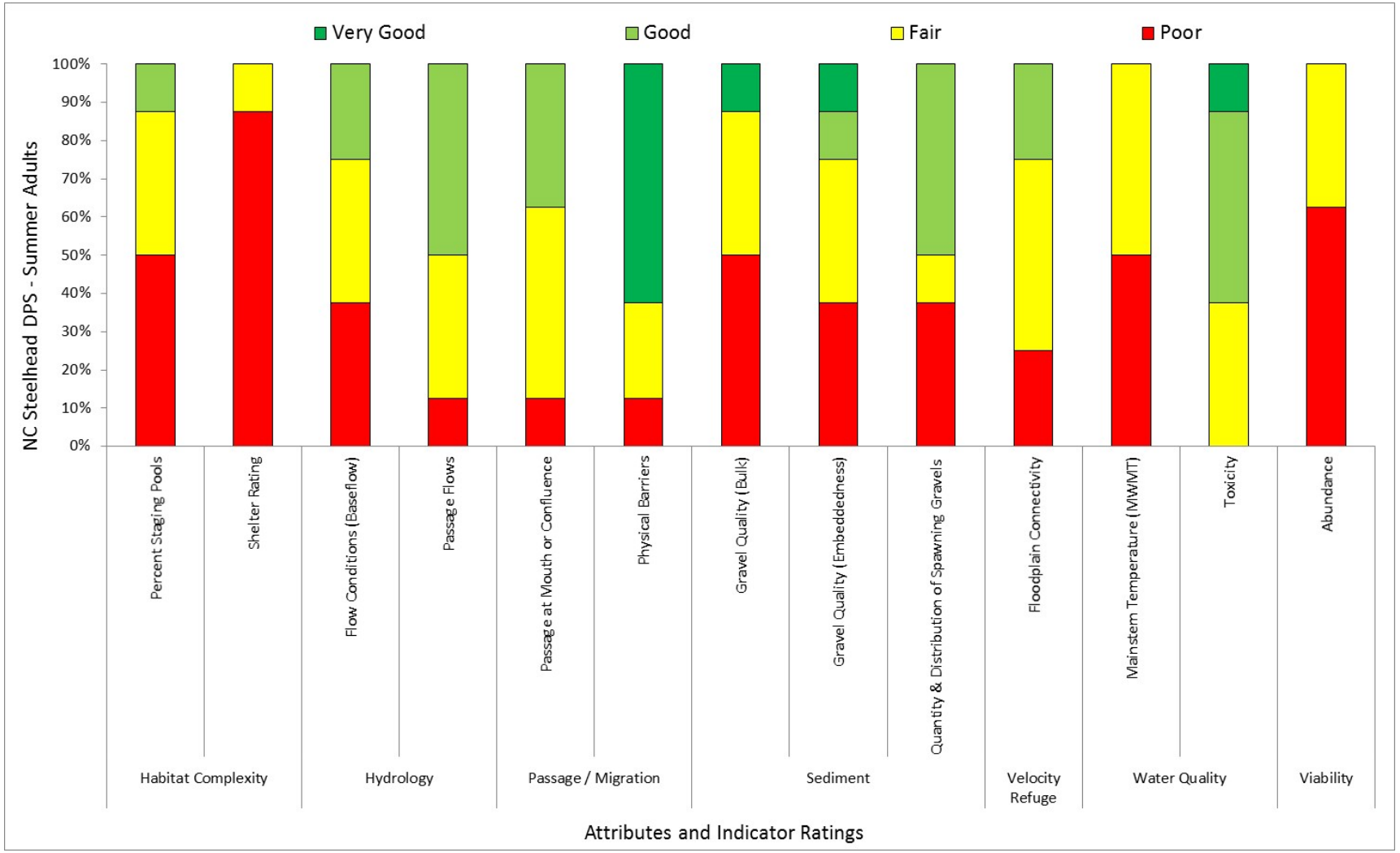

Figure 21: Attribute Indicator ratings for Summer Adult life stage.

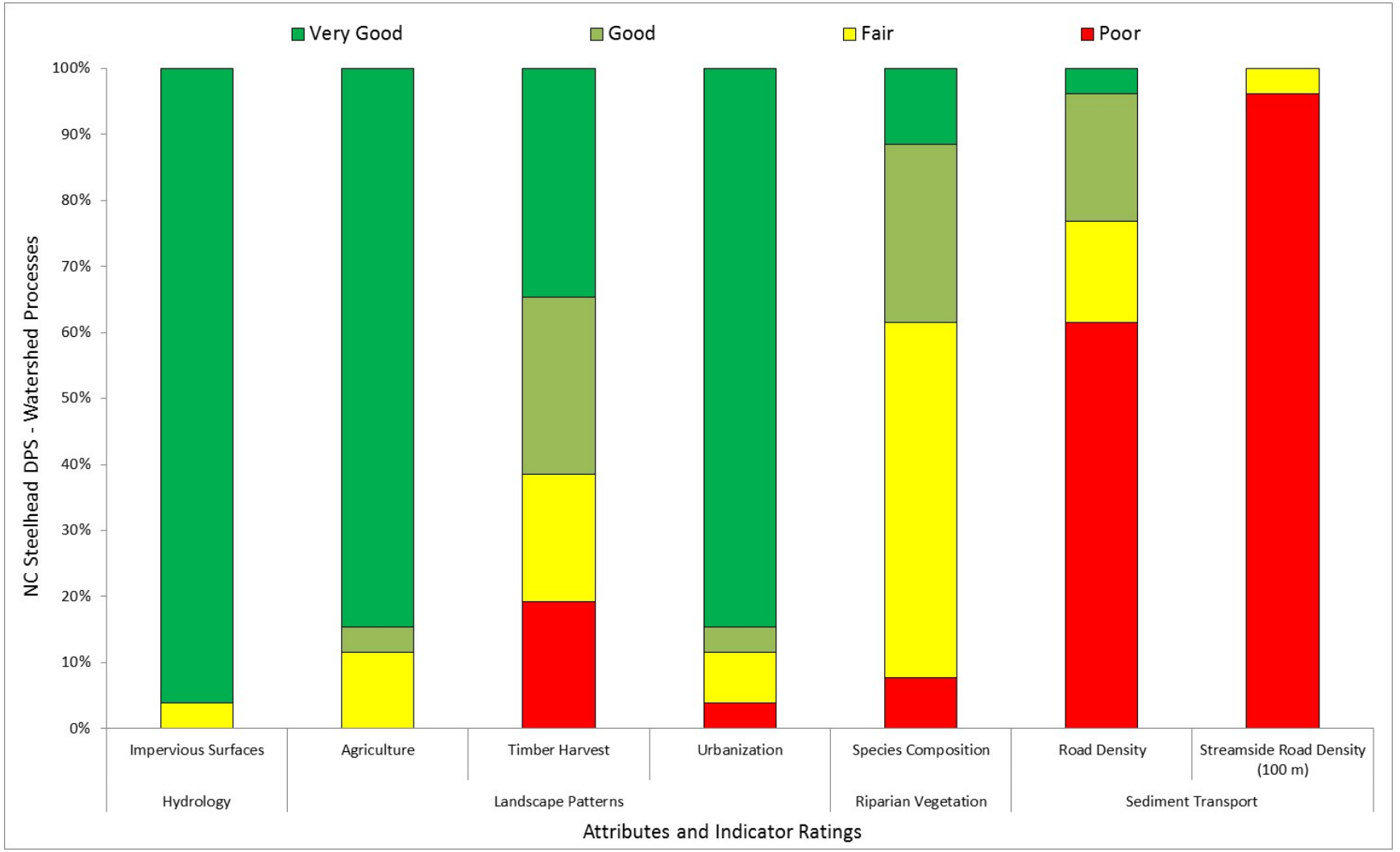

Figure 22: Attribute Indicator ratings for Watershed Processes.

DPS CAP THREAT RESULTS

Table 7 summarizes the CAP threat results across the DPS. Of the 14 identified threats, roads and railroads is the greatest threat with 77% rated Very High or High. This was followed by water diversions and impoundments (38%), logging and wood harvesting (35%), and channel modification (19%) (Table 7 and Figure 23).

Table 7: NC 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								Lower Interior				North Mountain Interior					North-Central Coastal						Central Coastal		
NC Steelhead Threat/Population	Redwood	Maple Creek/Big Lagoon	Little River	Mad River	Humbold Bay	South Fork Eel River	Bear River	Mattole River	Chamise Creek	Woodman Creek	Outlet Creek	Tomki Creek	Van Duzen River	Larabee Creek	North Fork Eel River	Middle Fork Eel River	Upper Mainstem Eel River	Usal Creek	Wages Creek	Ten Mile River	Noyo River	Caspar Creek	Big River	Navarro River	Garcia River	Gualala River
Agriculture	M	M	M	M	L	M	M	M	M	L	M	L	M	M	M	M	L	-	L	M	-	M	-	M	M	H
Channel Modification	VH	M	M	H	H	H	M	L	M	M	M	-	H	M	M	M	L	L	L	L	L	M	M	L	M	M
Disease, Predation and Competition	H	M	L	L	M	M	M	M	M	M	-	M	H	M	M	M	M	L	L	L	-	M	-	-	L	L
Fire, Fuel Management and Fire Suppression	M	M	L	M	M	M	M	L	L	L	L	L	M	M	M	H	M	M	M	H	L	M	L	L	L	L
Fishing and Collecting	H	M	M	M	M	M	M	M	L	L	L	L	H	M	M	H	M	M	M	M	M	M	M	M	H	M
Hatcheries and Aquaculture	-	-	-	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Livestock Farming and Ranching	M	M	M	M	H	M	H	M	L	L	M	L	M	M	M	M	L	-	L	L	-	L	-	M	H	M
Logging and Wood Harvesting	H	VH	H	H	M	M	H	H	L	L	M	M	M	M	M	M	L	M	M	H	M	M	M	M	H	H
Mining	H	M	-	H	-	M	M	L	L	L	L	-	M	L	M	L	L	L	L	M	-	-	-	-	L	L
Recreational Areas and Activities	M	M	L	M	L	M	M	L	L	L	-	L	M	L	M	L	L	L	L	L	L	M	L	-	L	L
Residential and Commercial Development	M	M	L	M	M	M	M	M	M	M	M	M	M	L	M	L	L	L	M	L	L	M	-	L	L	L
Roads and Railroads	H	VH	H	H	H	M	VH	VH	H	H	M	M	H	H	H	H	H	H	H	H	M	H	M	M	H	H
Severe Weather Patterns	M	M	M	M	M	H	M	VH	M	M	M	M	M	M	M	M	H	H	M	H	M	M	M	M	M	M
Water Diversion and Impoundments	H	M	M	M	M	H	M	VH	M	M	H	H	H	M	M	M	VH	L	M	M	L	M	L	H	H	H

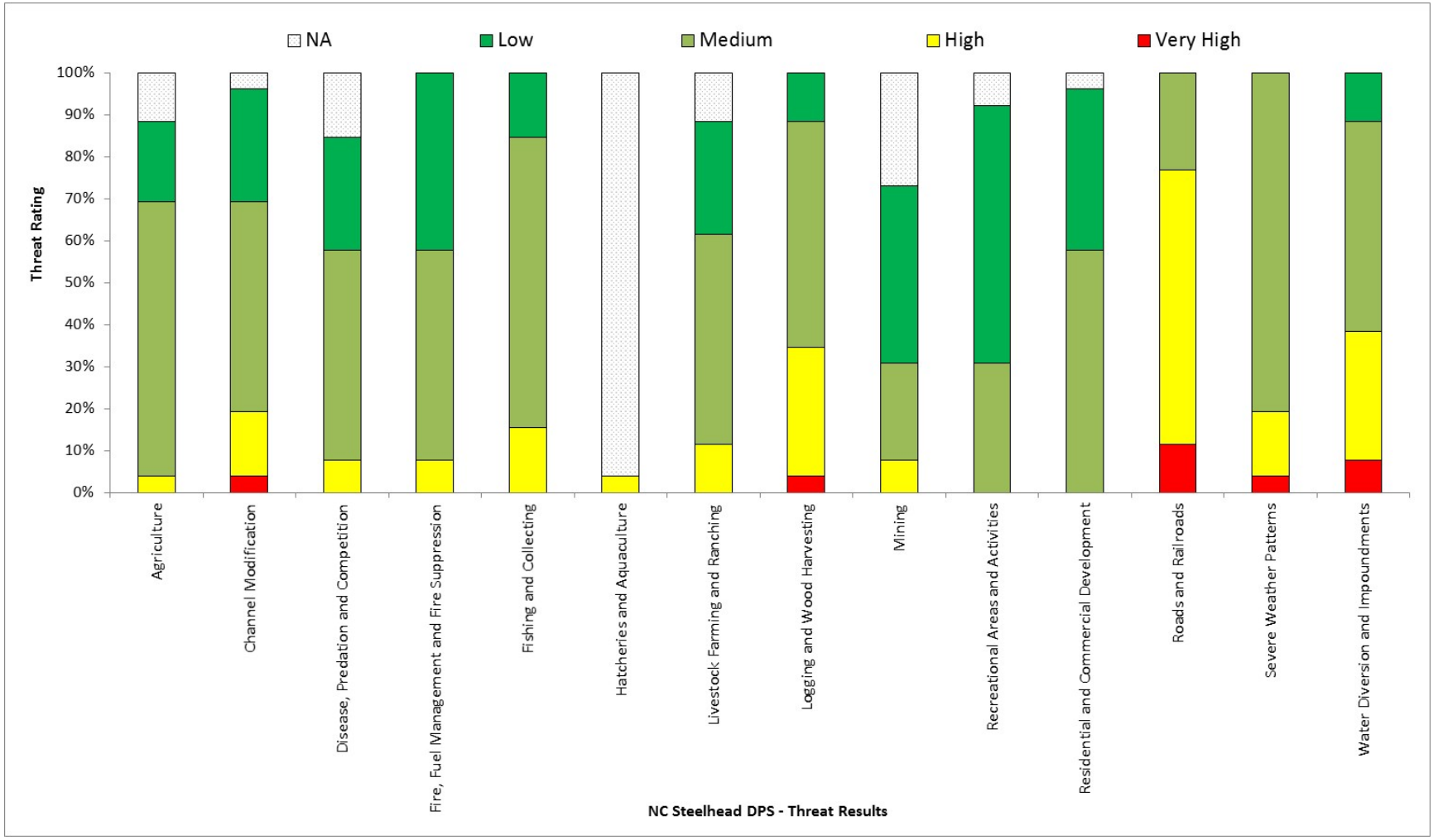

Figure 23: Threat ratings for the NC steelhead DPS

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.

Northern California Steelhead DPS Level Recovery Actions

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

Northern California Steelhead DPS Level Recovery Actions

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

Northern California Steelhead DPS Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers.				
DPS-NCSW-5.1.1.1	Action Step	Passage	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) need to accommodate 100-year flood flows and associated bedload and debris.	2	50	City, County, NMFS, State	
DPS-NCSW-5.1.1.2	Action Step	Passage	Monitor and update barriers in the Passage Assessment Database (PAD) (https://nrm.dfg.ca.gov/PAD/)	3	50	City, County, NGO, RCD, State	
DPS-NCSW-6.2	**Objective**	**Habitat Complexity**	**Address the inadequacy of existing regulatory conditions**				
DPS-NCSW-6.2.1	Recovery Action	Habitat Complexity	Improve habitat complexity				
DPS-NCSW-6.2.1.1	Action Step	Habitat Complexity	Work with Federal and State to develop an application of a programmatic permit for restoration work not funded by FRGP. The objectives of the programmatic should be to reduce costs and fast-track the implementation of high priority recovery actions.	2	5	City, County, CDFW, NGO, NMFS, NOAA RC, Private Landowners, RCD	
DPS-NCSW-6.2.1.2	Action Step	Habitat Complexity	Work with California BOF through implementation of California Forest Protection Rules, Section V, CDFW, RWQCB and others to modify the timber harvest permitting process (including CDFW Lake and Streambed Alteration Agreement process) and provide opportunities and incentives for the implementation of LWD placement and other restoration priorities during timber harvest operations.	3	5	BOF, CDFW, NMFS, RWQCB, Timber Landowners	
DPS-NCSW-6.2.1.3	Action Step	Habitat Complexity	Work with CDFW and the California Fish and Game Commission to remove beavers from California Fish and Game Code Section 4181 that provides any owner or tenant of land or property that is being damaged or destroyed or is in danger of being damaged or destroyed by certain mammals, including beaver, may apply to the department for a permit to kill the mammals.	3	10	CDFW, California Fish and Game Commission, NMFS	
DPS-NCSW-6.2.1.4	Action Step	Habitat Complexity	Work with CDFW and the California Fish and Game Commission to modify Title 14 of the California code of Regulations to prohibit recreational hunting/trapping of beavers within all counties within the NCCC Recovery Domain.	3	10	CDFW, California Fish and Game Commission, NMFS	
DPS-NCSW-6.2.1.5	Action Step	Habitat Complexity	Utilize non-lethal methods where feasible to manage beaver depredation issues (e.g. flooding, crop damage) such as flow devices, fencing, and beaver re-location and enhance habitat complexity.	3	10	CDFW, California Fish and Game Commission, NMFS, Private Landowners	
DPS-NCSW-6.2.1.6	Action Step	Habitat Complexity	Where non-lethal methods prove unfeasible to resolve depredation issues, relocate beaver populations to remote streams where habitat enhancement is needed and resource conflict is low.	3	10	CDFW, California Fish and Game Commission, NMFS, Private Landowners	
DPS-NCSW-6.2.1.7	Action Step	Habitat Complexity	Develop and update a Beaver Management Plan for California to benefit salmonids.	3	10	CDFW, California Fish and Game Commission, NMFS	
DPS-NCSW-6.2.1.8	Action Step	Habitat Complexity	Investigate the current conditon of the high IP reaches in each population and assess the status and develop a restoration plan for those areas.	2	10	City, County, CDFW, NGO, NMFS, NOAA RC, Private Landowners, RCD	
DPS-NCSW-7.1	**Objective**	**Riparian**	**Address the inadequacy of existing regulatory conditions**				
DPS-NCSW-7.1.1	Recovery Action	Riparian	Improve riparian conditions				
DPS-NCSW-7.1.1.1	Action Step	Riparian	Develop adequately sized riparian setbacks/buffers to protect salmonids habitat where they do not currently occur, and enforce requirements of local regulations where they do.	1	10	County	
DPS-NCSW-7.1.1.2	Action Step	Riparian	Counties should develop a riparian strategy to grow older larger diameter trees for improved canopy and appropriate natural recruitment to the stream. This could be achieved by creating ordinances (where currently non-existent) that limit or prevent the removal of mature trees during infrastructure upgrades or implementation of restoration projects.	3	10	County	
DPS-NCSW-7.1.1.3	Action Step	Riparian	Coordinate with RWQCB to promote policies and planning for adequate riparian area restoration, conservation and protection.	2	10	NMFS, RWQCB, State	
DPS-NCSW-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
DPS-NCSW-8.1.1	Recovery Action	Sediment	Improve instream gravel quality				
DPS-NCSW-8.1.1.1	Action Step	Sediment	Fund and implement sediment TMDLs within the range of listed salmonids.	2	10	EPA, RWQCB	

Northern California Steelhead DPS Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-8.1.1.2	Action Step	Sediment	Evaluate stream crossings for their potential to impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.	2	10	BOF, CalFire, Caltrans, County, CDFW, NMFS	
DPS-NCSW-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
DPS-NCSW-10.1.1	Recovery Action	Water Quality	Reduce toxicity and pollutants.				
DPS-NCSW-10.1.1.1	Action Step	Water Quality	Work with EPA, RWQCBs and CDFW to identify and prioritize potential contaminants of concern and develop protective standards and programs for issues that directly or indirectly adversely affect the continued existence of listed salmonids.	2	5	EPA, CDFW, RWQCB	
DPS-NCSW-10.1.1.2	Action Step	Water Quality	Conduct outreach to increase awareness of the effects of pharmaceuticals, pesticides and contaminants that impact the continued existence and habitat of listed salmonids.	2	5	EPA, CDFW, NGO, NMFS, RWQCB	
DPS-NCSW-10.1.1.3	Action Step	Water Quality	Support the development and implementation of stormwater BMPs in cities, towns and rural areas.	2	5	City, County, Local, Private Landowners, State, RWQCB	
DPS-NCSW-10.1.1.4	Action Step	Water Quality	Implement performance standards in Stormwater Management Plans.	2	5	City, County, Private Landowners, State, RWQCB	
DPS-NCSW-10.1.1.5	Action Step	Water Quality	Work with pesticide users to educate and advocate for an "integrative pest management framework (IPM)" for pesticide control.	2	5	City, County, NMFS, Private Landowners, State, RWQCB	Best management practices within the IPM include biological control, pesticide choices, removal of pest habitat and resources, barriers, optimal fertilization and irrigation, trap plants, intercropping, and cover crops, and synthetic mulches.
DPS-NCSW-10.1.1.6	Action Step	Water Quality	Work with the California Department of Pesticide Regulation (CDPR) to support changes to professional pesticide application methodologies and timing to limit the potential exposure of watercourses to pesticide runoff.	3	5	City, County, NMFS, Private Landowners, State, RWQCB	For example: change building infrastructure applications of pyrethorids on monthly schedules throughout the entire year including the rainy season to seasons of interest.
DPS-NCSW-10.1.1.7	Action Step	Water Quality	Work with the academic, local, government and non-profit entities (Natural Resource Conservation District, etc.) to support funding of research and use of pesticide alternatives.	3	15	Academic, Local, Government, NGO	These alternatives may include technologies that reduce the amount of pesticides that need to be applied or pest management strategies that require very little pesticide use.
DPS-NCSW-10.1.1.8	Action Step	Water Quality	Work with EPA, RWQCBs, and local stakeholders to implement actions under section 303(d)(1)(C) and (D) of the Clean Water Act requiring States to prepare TMDLs for all water bodies targeted in this recovery plan not currently meeting State of California water quality standards.	2	25	EPA, NMFS, RWQCB, State	
DPS-NCSW-10.1.1.9	Action Step	Water Quality	Install bollards at fire hydrants that are in proximity to streams inorder to prevent hydrants from being hit and discharging chlorinated water into thestreams.	3	10	CalFire, City, County, Local Fire Departments	Hit hydrants will discharge very high volumes of chlorinated water that has thepotential to wipe out a steelhead population in a stream. This action could preventcatastrophic loss of steelhead.
DPS-NCSW-10.1.1.10	Action Step	Water Quality	Research into the potential level of impacts from and solutions to environmental estrogens associated with wastewater discharge and domestic septic leakage are needed.	2	10	Cities, RWQCB, Water Agencies	
DPS-NCSW-10.1.2	Recovery Action	Water Quality	Reduce sedimentation				
DPS-NCSW-10.1.2.1	Action Step	Water Quality	Support actions and tasks identified in the Regional Water Board Staff Work Plan to Control Excess Sediment in Sediment-Impaired Watersheds.	2	10	NMFS, RWQCB	http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/sediment_workplan/
DPS-NCSW-10.2	**Objective**	**Water Quality**	**Address Inadequacy of existing regulatory conditions**				
DPS-NCSW-10.2.1	Recovery Action	Water Quality	Reduce toxicity and pollutants.				
DPS-NCSW-10.2.1.1	Action Step	Water Quality	Work with the RWQCB to support and fast track promulgation of methods to detect impacts from pharmaceuticals, 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	
DPS-NCSW-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				

Northern California Steelhead DPS Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-11.1.1	Recovery Action	Viability	Increase abundance, spatial structure and diversity				
DPS-NCSW-11.1.1.1	Action Step	Viability	Finalize and implement the California Coastal Salmonid Monitoring Plan.	1	50	CDFW, County, NGO, RCD, Watershed Partners, Water Agencies	Implementing the California Coastal Monitoring Plan is essential for evaluating the long-term viability of listed salmonids in California. For specific components of the Coastal Monitoring Plan see Vol.1 Chapter 6.
DPS-NCSW-11.1.1.2	Action Step	Viability	Prioritize restoration funds, notably the Pacific Coast Salmon Restoration Fund and California's Fisheries Restoration Grant Program (FRGP), to address issues in critical watersheds identified within this recovery plan.	1	50	CDFW, NMFS	
DPS-NCSW-11.1.1.3	Action Step	Viability	Work with the SWFSC to revise the "Intrinsic Potential" model in areas where the model predictions has a severe or high bias and evaluate current conditions where the model indicates the highest values, in order to direct the prioritization of restoration funds.	2	5	NMFS, SWFSC	
DPS-NCSW-11.1.1.4	Action Step	Viability	Support all educational and outreach conferences, events, workshops, etc. that advance the understanding of anadromous salmonid life history, ecology, history, biology, threats, habitat restoration, recovery, and species viability to include all those with a science, restoration, and policy focus.	2	50	Academic, BOF, CalFire, CDFW, NGO, NMFS, SWFSC	
DPS-NCSW-11.1.1.5	Action Step	Viability	Support studies, assessments, science, research, and monitoring (including associated modeling, data management, data analysis, and reporting) that will improve our understanding of species life history and genetic diversity, historical distribution, habitat relationships, status, trends, viability, and spatial structure including those for drought and climate change	2	50	Academic, BOF, CalFire, CDFW, NGO, NMFS, SWFSC	
DPS-NCSW-11.1.1.6	Action Step	Viability	Develop and implement watershed based restoration plans for essential and supporting populations.	1	100	CDFW, Cities, Counties, NGOs, NMFS, RCDs, Water Agencies	Watershed plans should focuses on restoring processes that form, connect, and sustain habitats and provide watershed-wide and reach-specific, detailed restoration actions. Such a plan should be based on geomorphic and ecosystem principles and scientific assessments that: 1) identify the types and natural rates of habitat-forming processes, 2) determine where processes are altered and the factors responsible, 3) decide how to restore the disrupted processes, and 4) provide watershed-wide and reach-specific restoration actions. Once developed, the watershed plans should fit into an adaptive management process and be used to refine actions described in the recovery plan.
DPS-NCSW-11.1.1.7	Action Step	Viability	Federal and State regulatory agencies should encourage city, county and water agencies to incorporate the Multispecies Recovery Plan into their watershed planning documents and Habitat Conservation Plans.	2	100	CDFW, Cities, Counties, NMFS, Water Agencies	
DPS-NCSW-11.2	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
DPS-NCSW-11.2.1	Recovery Action	Viability	Monitor habitat quality and extent and watershed land use change				
DPS-NCSW-11.2.1.1	Action Step	Viability	Establish at least one Intensively Monitored Watershed (IMW) within each diversity stratum (preferably a population with a LCM station) to assess the habitat conditions and the effectiveness of implemented restoration actions.	2	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, Water Agencies	IMWs are watersheds that are monitored to the extent that the limiting factors are followed and the impact of management actions on fish or habitat can be demonstrated (see ISEMP at http://www.isemp.org/). Conduct power analysis early in development to determine amount of watershed required to be treated necessary to detect 30-50 percent change in population response. Also, use salmonid response (i.e., presence, abundance, and fitness monitoring) at restoration sites to inform effectiveness over time

Northern California Steelhead DPS Level Recovery Actions

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

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-11.2.1.8	Action Step	Viability	As part of the Coastal Monitoring Plan, develop and implement a GRTS-based habitat status and trend monitoring program coordinated with the juvenile spatial structure evaluations	1	50	CDFW, Counties, NGO, SWFSC, Resource Conservation Districts, State Parks	The general methods for assessing habitat attributes will follow established programs such as the Columbia River Habitat Monitoring Program (CHaMP)
DPS-NCSW-11.3	**Objective**	**Viability**	**Address the overutilization for commercial, recreational, scientific or educational purposes**				
DPS-NCSW-11.3.1	Recovery Action	Viability	Monitor density, abundance, spatial structure and diversity				
DPS-NCSW-11.3.1.1	Action Step	Viability	In accordance with the Coastal Monitoring Plan, implement an unbiased GRTS-based monitoring program to assess NC steelhead adult spawner abundance estimates at the DPS, diversity stratum, and, population level.	1	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, Trout Unlimited, USACE, USGS, Water Agencies	See the Monitoring and Adaptive Management Chapter in Volume 1 for more information on adult spawner abundance cost estimates.
DPS-NCSW-11.3.1.2	Action Step	Viability	In accordance with the Coastal Monitoring Plan, establish a minimum of one (or preferably two) Life Cycle Monitoring stations within each diversity stratum to estimate spawner : redd ratios, conduct annual smolt abundance/trends, calibrate regional redd counts, and estimate smolt/adult ratios for marine/freshwater survival.	1	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, USACE, USGS, Water Agencies	Strive to have abundance estimates at the LCM stations with a CV on average of 15 percent or less.
DPS-NCSW-11.3.1.3	Action Step	Viability	In accordance with the Coastal Monitoring Plan, implement GRTS-based summer and fall sampling to assess the abundance, distribution and diversity of juvenile NC steelhead.	1	50	CDFW, Counties, NGO, NOAA SWFSC, NPS, Private Consultants, Private Landowners, Resource Conservation Districts, State Parks, Trout Unlimited, USACE, USGS, Water Agencies	Cost estimates are for 50 years of implementation. Annual cost estimate for juvenile spatial distribution, abundance and diversity would cost approximately $2,000 per reach. This estimate assumes a 10% sampling effort of the IP-km.
DPS-NCSW-11.3.1.4	Action Step	Viability	In accordance with the Coastal Monitoring Plan, develop a biological monitoring program for estuaries and seasonal, bar-built lagoons (particularly in LCM populations) that will track salmonid abundance and use of these habitats over time.	1	50	CDFW, Counties, NOAA SWFSC, NPS, Private Consultants, Resource Conservation Districts, State Parks, Trout Unlimited, USACE, USFWS, Water Agencies	These data can be used to document potential limiting factors (e.g., stresses) affecting salmonid rearing in these habitats and highlight emerging threats over time.ıThe estuary/lagoon monitoring protocol for the CMP has not been developed yet.
DPS-NCSW-11.3.1.5	Action Step	Viability	Monitor incidental capture and mortality rates of CC Chinook salmon, NC steelhead, and CCC steelhead in the recreational freshwater fisheries reported from Steelhead Fishing Report-Restoration Cards and creel surveys conducted by CDFW	2	50	CDFW	
DPS-NCSW-11.3.1.6	Action Step	Viability	Continue to annually monitor and assess intentional and incidental capture and mortality rates of CC Chinook salmon, NC steelhead, and CCC steelhead resulting from permitted research to ensure established take limits are adequate to protect these species.	2	50	CDFW, NMFS PRD	
DPS-NCSW-11.3.2	Recovery Action	Viability	Prevent reduced density, abundance, and diversity				
DPS-NCSW-11.3.2.1	Action Step	Viability	Develop Fisheries Monitoring and Evaluation Plans (FMEP) that incorporate delisting criteria, does not limit attainment of population-specific criteria and are specifically designed to monitor and track catch and mortality of wild and hatchery salmon and steelhead stemming from recreational fishing in freshwater and the marine habitats	2	20	CDFW, NMFS	
DPS-NCSW-11.3.2.2	Action Step	Viability	Develop and implement an expanded Genetic Stock Index (GSI) monitoring program for Pacific salmonids. This will help track ocean migrations of Chinook salmon, their origin, and an index of incidental capture and mortality rates in the commercial and recreational fisheries.	3	50	CDFW, NMFS, NOAA SWFSC	
DPS-NCSW-11.3.2.3	Action Step	Viability	Encourage continued scientific research on the effects of Chinook salmon and steelhead population declines on reduced marine-derived nutrients in freshwater habitats (Hill et al. 2010; Moore et al. 2011)	2	50	CDFW, NMFS, NOAA SWFSC	
DPS-NCSW-11.3.2.4	Action Step	Viability	Continue coordination between NMFS and CDFW on revisions to freshwater sport fishing regulations to ensure impacts do no preclude CC Chinook salmon, NC steelhead, and CCC steelhead recovery and impacts to their populations during migrations are minimized	2	50	CDFW, NMFS	
DPS-NCSW-11.4	**Objective**	**Viability**	**Address disease or predation**				
DPS-NCSW-11.4.1	Recovery Action	Viability	Increase density, abundance, spatial structure and diversity				

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

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

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-13.1.1	Recovery Action	Channel Modification	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-13.1.1.1	Action Step	Channel Modification	Collaborate with local, state, and federal agencies and non-governmental organizations to acquire fee-title to parcels or conservation easements over strategically-selected stream and riparian corridors to protect salmon and steelhead migratory, spawning, and rearing habitats.	3	50	City, County, Federal, Local, NGO, State	
DPS-NCSW-13.1.1.2	Action Step	Channel Modification	Eliminate the use of gabion baskets and undersized rock within the bankfull channel. Where riprap and other bank hardening is necessary, integrate other habitat-forming features – including large woody debris and riparian plantings and other methodologies to minimize habitat alteration effects.	2	10	City, County, Private Landowner, State, Water Agencies	
DPS-NCSW-13.1.1.3	Action Step	Channel Modification	When bank stabilization projects are required to protect existing infrastructure require bio-engineering methods including use of vegetated soil lifts, log crib walls, willow matresses and planted rock embankments where rip rap is required.	2	10	City, County, Private Landowner, State, Water Agencies	
DPS-NCSW-13.1.1.4	Action Step	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Focus on ensuring minimal disruption to watershed processes.	2	10	City, County, Private Landowner, State, Water Agencies	
DPS-NCSW-13.2	**Objective**	**Channel Modification**	**Address the inadequacy of existing regulatory mechanisms.**				
DPS-NCSW-13.2.1	Recovery Action	Channel Modification	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-13.2.1.1	Action Step	Channel Modification	Encourage Counties and municipalities to adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	15	County, County Municipalities, NMFS	
DPS-NCSW-13.2.1.2	Action Step	Channel Modification	Encourage FEMA to set regulatory standards in its Flood Insurance Program to explicitly address the protection of natural fluvial processes essential for the maintenance of naturally functioning riverine and riparian habitats.	2	15	FEMA, NMFS	
DPS-NCSW-14.1	**Objective**	**Disease/Predation/Competition**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
DPS-NCSW-14.1.1	Recovery Action	Disease/Predation/Competition	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
DPS-NCSW-14.1.1.1	Action Step	Disease/Predation/Competition	Provide funding to investigate and remediate impacts of disease and predation to overall viability.	3	20	Academic, CDFW, NMFS, SWFSC	
DPS-NCSW-14.1.1.2	Action Step	Disease/Predation/Competition	Evaluate impacts of striped bass predation in coastal estuaries to juvenile and smolt salmonids and implement abatement strategies where appropriate.	2	10	CDFW, NMFS	
DPS-NCSW-14.1.1.3	Action Step	Disease/Predation/Competition	Support CDFW, and other resource agencies to control and contain invasive species in California.	2	10	CDFW, NMFS	
DPS-NCSW-14.1.1.4	Action Step	Disease/Predation/Competition	Provide support to the Invasive Species Council of California (ISCC), and the California Invasive Species Advisory Committee (CISAC) in their efforts to effectively control invasive species.	2	10	CISAC, ISCC, NMFS	
DPS-NCSW-14.1.1.5	Action Step	Disease/Predation/Competition	Work with Counties to modify existing tree ordinances (e.g., Heritage Tree Ordinance) to exclude protection of non-native trees (e.g., *Eucalyptus* sp.) and waive any associated fees for non-native tree removal, particularly when part of a restoration project or on pubic lands.	3	10	County, NMFS, CDFW	
DPS-NCSW-14.1.1.6	Action Step	Disease/Predation/Competition	Promote the practice of Clean, Drain, and Dry for watercraft and equipment used in aquatic environments. Additional information can be found at https://www.wildlife.ca.gov/Conservation/Invasives	2	5	Citizens, CDFW, NMFS	
DPS-NCSW-14.1.1.7	Action Step	Disease/Predation/Competition	Minimize channel modifications that create bare rock walls along migration routes to avoid creating predation habitat for bass. Where feasible modify existing sites that currently act as predation habitat hotspots.	2	19	County, NMFS, CDFW	
DPS-NCSW-15.1	**Objective**	**Fire/Fuel Management**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
DPS-NCSW-15.1.1	Recovery Action	Fire/Fuel Management	Prevent or minimize increased landscape disturbance.				

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-15.1.1.1	Action Step	Fire/Fuel Management	Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.1.2	Action Step	Fire/Fuel Management	Identify historical fire frequency, intensities and durations and manage fuel loads in a manner consistent with historical parameters.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.1.3	Action Step	Fire/Fuel Management	Include CDFW and NMFS participation on rehabilitation planning teams. During rehabilitation, consider leaving felled trees in streams as LWD source. Re-contour massively modified areas. Storm-proof roads immediately after use. Dispose of suitable organic materials by dispersing them on disturbed soils on the contour. Where larger organic material is available, place in severely burned-out watercourses (assure CDFW/NMFS is a part of this design and decision). Seeding, preferably with local seed-stock, at high hazard/risk areas should be done whenever feasible.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.1.4	Action Step	Fire/Fuel Management	Establish fire contingency plans that involve CalFire, local fire districts and regulatory agencies with expertise in fisheries issues.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.1.5	Action Step	Fire/Fuel Management	Use controlled, low severity fire to dampen fuel loading and crowding of forest vegetation.	2	10	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.2	Recovery Action	Fire/Fuel Management	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
DPS-NCSW-15.1.2.1	Action Step	Fire/Fuel Management	Disseminate recommendations from NMFS' October 9, 2007, jeopardy biological opinion on the use of fire retardants and its impacts to salmonids, to local firefighting agencies and CalFire.	2	5	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.2.2	Action Step	Fire/Fuel Management	Locate chemicals, petroleum products, latrines, camp sites, etc., out of riparian buffer and place on flat ground.	2	5	CalFire, CDFW, Local Fire Districts, NMFS	
DPS-NCSW-15.1.3	Recovery Action	Fire/Fuel Management	Prevent or minimize impairment to watershed hydrology				
DPS-NCSW-15.1.3.1	Action Step	Fire/Fuel Management	Obtain water from lakes and reservoirs not occupied by listed salmonids when possible. Require all water trucks/tenders be fitted with CDFW and NMFS approved fish screens when water is acquired at fish bearing streams. Put up a silt fence or other erosion controls around the water extraction locations. Avoid significantly lower stream flows during water drafting.	2	100	CalFire, CDFW, Local Fire Districts, NMFS	NMFS anticipates that it will take up to 5 years for this to be implemented but should continue in perpetuity
DPS-NCSW-16.1	**Objective**	**Fishing/Collecting**	**Address the overutilization for commercial, recreational, scientific or educational purposes.**				
DPS-NCSW-16.1.1	Recovery Action	Fishing/Collecting	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
DPS-NCSW-16.1.1.1	Action Step	Fishing/Collecting	Fishery managers should work with NMFS to develop Fishery Management and Evaluation Plans to prevent extinction and ensure fishery management is consistent with recovery of the species, and cover incidental take of federally listed salmonids.	1	5	CDFW, CA Fish and Game Commission, NMFS SFD, SWFSC	
DPS-NCSW-16.1.1.2	Action Step	Fishing/Collecting	Collaborate with CDFW to develop appropriate fisheries data in select indicator watersheds that will support Fishery Management and Evaluation Plans (FMEPs).	1	5	CDFW, CA Fish and Game Commission, NMFS	
DPS-NCSW-16.1.1.3	Action Step	Fishing/Collecting	Work with CDFW and Fish and Game Commission to refine freshwater sport fishing regulations to minimize unintentional and unauthorized take, and incidental mortality, of listed species by anglers during the migration period. This effort could include development of specific emergency regulations during adult migration periods between September and January, low-flow closures (much like Washington State) and angler outreach programs.	1	5	CDFW, CA Fish and Game Commission, NMFS	
DPS-NCSW-16.1.1.4	Action Step	Fishing/Collecting	Work with CDFW to develop protective regulations and seek funds for additional Game Wardens to minimize impacts from fishing during the migratory period (e.g., until sandbars open naturally) within one mile of the river mouths of watersheds with essential or supporting populations.	1	5	CDFW, CA Fish and Game Commission, NMFS	
DPS-NCSW-16.1.1.5	Action Step	Fishing/Collecting	Improve CDFW's Freshwater Sport Fishing Regulations by considering prohibiting removal of wild salmonids from the water in catch-and-release fisheries.	2	5	CDFW, CA Fish and Game Commission, NMFS	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-16.1.1.6	Action Step	Fishing/Collecting	Utilizing the "reminder postcard" in efforts to increase Steelhead Report Card (SRC) return rates has worked well and is applauded by fisheries managers. Work with CDFW to consider providing, additional incentives to return SRCs by the January 31 deadline to save time and money while gaining more angler participation, which will provide more accurate information for agency evaluation.	2	5	CDFW, CA Fish and Game Commission, NMFS	
DPS-NCSW-16.1.1.7	Action Step	Fishing/Collecting	Work with CDFW to bring more awareness to special salmonid conservation propagation programs and improve salmonid identification outreach; especially in areas where a mixed stock fishery occurs (example: Russian River).	2	5	CDFW, CA Fish and Game Commission, NMFS	
DPS-NCSW-16.1.1.8	Action Step	Fishing/Collecting	Consider banning felt sole wading boots in California waters in efforts to minimize or eliminate the spread of aquatic diseases and invasive species (example: didymo, New Zealand mud snails, whirling disease, etc.).	2	5	CDFW, CA Fish and Game Commission, NMFS	
DPS-NCSW-16.1.1.9	Action Step	Fishing/Collecting	Consider other incentives for greater angler participation in fisheries restoration efforts.	2	10	CDFW, CA Fish and Game Commission, NMFS	For example, the Game Warden Stamp is an excellent way to gain more angler and hunter participation and support. Other stamp, sponsorships, and/or lottery fundraising programs that support recovery objectives should be discussed and developed.
DPS-NCSW-16.1.1.10	Action Step	Fishing/Collecting	Collaborate with NOAA OLE, CDFW, Tribes and stakeholders groups to enhance anti-poaching efforts in essential and supporting populations.	2	5	CDFW, Local Citizens, NOAA OLE, Tribes	
DPS-NCSW-17.1	**Objective**	**Hatcheries**	**Address other natural or manmade factors affecting the species' continued existence.**				
DPS-NCSW-17.1.1	Recovery Action	Hatcheries	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
DPS-NCSW-17.1.1.1	Action Step	Hatcheries	For all hatchery operations, develop and implement HGMPs consistent with 50 CFR 223.203(b)(5) and hatchery criteria identified in Spence et al. (2008).	1	10	CDFW, Hatchery Managers, NMFS	Ensure the threat of hatcheries remains low for listed salmonids for current, and all future, hatchery programs.
DPS-NCSW-17.1.1.2	Action Step	Hatcheries	Hatchery managers need to implement the recommendations in the California Hatchery Scientific Review Group report (California HSRG 2012), where appropriate.	2	10	CDFW, Hatchery Managers, NMFS	
DPS-NCSW-17.1.1.3	Action Step	Hatcheries	Where applicable, for severely depressed populations investigate the implementation of Conservation Hatchery programs that follow criteria outlined in Spence et al. (2008) and CDFG (2004).	2	20	CDFW, Hatchery Managers, NMFS, SWFSC	
DPS-NCSW-18.1	**Objective**	**Livestock**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**				
DPS-NCSW-18.1.1	Recovery Action	Livestock	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-18.1.1.1	Action Step	Livestock	Aid and encourage willing landowners to fence livestock from the stream channel, municipal water sources and riparian zones and develop offstream alternative water sources.	2	15	NRCS, RCD, Private Landowners	
DPS-NCSW-18.1.1.2	Action Step	Livestock	Encourage Livestock and Ranch Managers to utilize Groundwork: A Handbook for Small-Scale Erosion Control in Coastal California (MRCD, 2007), and Management Tips to Enhance Land & Water Quality for Small Acreage Properties (Sotoyome RCD, 2007), and The Grazing Handbook (Sotoyome RCD, 2007).	3	15	NRCS, RCD, Private Landowners	
DPS-NCSW-18.1.1.3	Action Step	Livestock	Establish conservative residual dry matter (RDM) targets per acre to ensure areas are not overgrazed at the end of grazing season. Remove cattle from pasture before soils dry out.	3	15	NRCS, RCD, Private Landowners	
DPS-NCSW-18.1.1.4	Action Step	Livestock	Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff, improve soil conditions, minimize noxious weeds, and encourage native revegetation.	3	15	NRCS, RCD, Private Landowners	
DPS-NCSW-18.1.1.5	Action Step	Livestock	Work with existing cooperative conservation programs (such as Fish Friendly Farming or Fish Friendly Ranching) in order to minimize the impacts of Livestock operations on habitat quality.	3	15	NRCS, NMFS, RCD, Private Landowners	
DPS-NCSW-18.1.2	Recovery Action	Livestock	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
DPS-NCSW-18.1.2.1	Action Step	Livestock	Implement practices as outlined in the University of California guidelines for water quality protection (Ristow 2006).	2	10	NRCS, RCD, Private Landowners	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-18.1.2.2	Action Step	Livestock	Implement recommendations of the California Rangeland Water Quality Management Program.	2	10	NRCS, RCD, Private Landowners	
DPS-NCSW-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of habitat or range.**				
DPS-NCSW-19.1.1	Recovery Action	Logging	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-19.1.1.1	Action Step	Logging	Encourage development of a GCP/HCP/Natural Community Conservation Plan (NCCP), conservation easements, conservation banks, or safe harbor agreements with industrial or non-industrial forestland owners.	2	50	County, Private Landowners, NMFS, State, Timber Landowners	
DPS-NCSW-19.1.1.2	Action Step	Logging	Investigate opportunities to programmatically permit the forest certification program to authorize incidental take for landowners through ESA Section 10(a)(1)(B).	3	15	NMFS, Private Landowners, Timber Landowners	
DPS-NCSW-19.1.1.3	Action Step	Logging	Consider assigning NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004) and work to implement recommendations as a result of these reviews	3	5	NMFS	
DPS-NCSW-19.1.1.4	Action Step	Logging	The State should consider a Salmonid Watershed Database (similar to the CDFW Northern Spotted Owl database) for RPFs to acquire standardized information on populations and habitat conditions in the watersheds associated with their harvest plan.	3	15	BOF, CDFW, Timber Landowners	
DPS-NCSW-19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms.**				
DPS-NCSW-19.2.1	Recovery Action	Logging	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-19.2.1.1	Action Step	Logging	Discourage Counties from rezoning forestlands or identified TPZ areas to rural residential or other land uses (e.g., vineyards).	3	50	County, NMFS	
DPS-NCSW-19.2.1.2	Action Step	Logging	Increase THP inspections by CalFire especially during winter months.	3	50	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners	
DPS-NCSW-19.2.1.3	Action Step	Logging	Encourage to CalFire and BOF to explore a statewide Forestry HCP (similar to that developed in Washington State), GCP, safe harbor agreements, and seek funding opportunities to support the effort.	2	20	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners	
DPS-NCSW-19.2.1.4	Action Step	Logging	Work with the BOF through implementation of California Forest Practice Rules, Section V, CalFire, CDFW, professional organizations and landowners to modify the timber harvest permitting process to provide opportunities and incentives for LWD recruitment during timber harvest operations.	1	25	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners	
DPS-NCSW-19.2.1.5	Action Step	Logging	California BOF should consider requiring (1) EIRs for all forestland conversions, (2) adopting a forestland Conversion THP, (3) elimination of the subdivision exemption, (4) raising forestland conversion permit fees, (5) developing requirements to offset loss of timberland, (6) incentivize restoration of unproductive timberlands, (7) investigate conservation banking programs and (8) coordinate with the other agencies involved for more CalFire oversight on forestland conversions.	1	10	BOF, CDFW, NMFS, Private Landowners, Timber Landowners	
DPS-NCSW-20.1	**Objective**	**Mining**	**Address the present or threatened destruction, modification, or curtailment of habitat or range.**				
DPS-NCSW-20.1.1	Recovery Action	Mining	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-20.1.1.1	Action Step	Mining	In sites with legacy terrace gravel mining pits, remove, setback, or breach levees and re-contour mining pits to an elevation inundated by frequent winter river/stream flows; Restore the inset floodplain at elevation appropriate for modern channel and regulated winter/spring base flows.	2	20	County, EPA, NMFS, Private, State	
DPS-NCSW-20.1.1.2	Action Step	Mining	Where economically and geomorphically feasible use gravel mining to create seasonal off-channel wetland, pond, alcove and secondary channel floodplain habuitats to increase winter refuge and rearing habitat.	2	10	County, EPA, NMFS, Private, State	
DPS-NCSW-20.2	**Objective**	**Mining**	**Address the inadequacy of existing regulations**				
DPS-NCSW-20.2.1	Recovery Action	Mining	Prevent or minimize increased landscape disturbance.				

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-20.2.1.1	Action Step	Mining	NMFS National Gravel Extraction Guidance (2005, 2014) and NMFS Southwest Region (2004) should be followed for all existing and proposed projects.	2	20	County, EPA, NMFS, Private, State	
DPS-NCSW-20.2.1.2	Action Step	Mining	Given the need for enormous amounts of water during fracking, oil companies and state/federal regulators should consult with NMFS/CDFW to ensure adequate water resources exist prior to developing the well. Avoid fracking operations that obtain water from underground aquifers hydrologically connected with surface streamflow.	2	10	County, EPA, NMFS, Private, State	
DPS-NCSW-20.2.1.3	Action Step	Mining	Evaluate the potential for fracking to impact surface water quality (and thus impact salmon and steelhead) where hydrologic connectivity between ground and surface water exists.	2	10	EPA, NMFS, RWQCB, State	
DPS-NCSW-21.1	**Objective**	**Recreation**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**				
DPS-NCSW-21.1.1	**Objective**	**Recreation**	**Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)**				
DPS-NCSW-21.1.1.1	**Objective**	**Recreation**	**Manage or limit mountain bike and equestrian activity on trails within state parks, state forests and on other publically-owned land that cause soil compaction, increased surface erosion, increased storm runoff and increased sediment input to stream channels**	3	10	City, County, Public, State	
DPS-NCSW-22.1	**Objective**	**Residential/Commercial Development**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**				
DPS-NCSW-22.1.1	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
DPS-NCSW-22.1.1.1	Action Step	Residential/Commercial Development	Design new developments to avoid or minimize impact to unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to the habitat of listed salmonids.	3	20	City, County, County Planners, Public Works, State	
DPS-NCSW-22.1.2	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to watershed hydrology				
DPS-NCSW-22.1.2.1	Action Step	Residential/Commercial Development	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining a mature and properly functioning riparian zone.	3	5	City, County, County Planners, Public Works, State	
DPS-NCSW-22.1.2.2	Action Step	Residential/Commercial Development	New development in all watersheds with essential and supporting populations should be designed to minimize storm-water runoff and changes in duration or magnitude of peak flow.	3	20	City, County, County Planners, RWQCB, State	
DPS-NCSW-22.2	**Objective**	**Residential/Commercial Development**	**Address the inadequacy of existing regulatory mechanisms.**				
DPS-NCSW-22.2.1	Recovery Action	Residential/Commercial Development	Prevent or minimize impairment to stream hydrology (impaired water flow).				
DPS-NCSW-22.2.1.1	Action Step	Residential/Commercial Development	As mitigation for potential adverse consequences to a watershed's hydrograph, municipalities and counties should develop and implement larger or more effective stormwater detention methods in key watersheds with ongoing channel degradation or in sub-watersheds where impervious surface area > 10 percent.	2	20	CDFW, County, Municipalities, NMFS, SWRCB	
DPS-NCSW-22.2.1.2	Action Step	Residential/Commercial Development	Develop and implement regulations for activities that intercept groundwater recharge.	2	10	CDFW, County, DWR, NMFS, SRWCB	
DPS-NCSW-22.2.1.3	Action Step	Residential/Commercial Development	Work with partners to develop legislation that will fund county planning for environmentally sound growth and water supply development and work in coordination with California Dept. of Housing, and other government associations (CDFG 2004).	2	30	County, NMFS, State	
DPS-NCSW-22.2.2	Recovery Action	Residential/Commercial Development	Prevent or minimize increased landscape disturbance.				
DPS-NCSW-22.2.2.1	Action Step	Residential/Commercial Development	Enforce existing building permit programs to minimize unpermitted construction.	3	50	City, County, County Planner	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-22.2.2.2	Action Step	Residential/Commercial Development	Modify Federal, State, city and county regulatory and planning processes to prevent or minimize new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all watersheds with essential and supporting populations.	2	15	City, County, Federal, NMFS, State	
DPS-NCSW-22.2.2.3	Action Step	Residential/Commercial Development	Identify forestlands or oak woodland areas at high risk of conversion, and develop incentives and alternatives for landowners to discourage conversion.	3	15	City, County, County Planner	
DPS-NCSW-22.2.2.4	Action Step	Residential/Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential development.	2	50	City, County, County Planner, NMFS, State	
DPS-NCSW-22.2.2.5	Action Step	Residential/Commercial Development	Develop legislation that will fund county planning for environmentally sound growth and water supply and work in coordination with California Dept. of Housing, Association of Bay Area Governments, and other government associations (CDFG 2004).	2	15	City, County, County Planner, NMFS, State	
DPS-NCSW-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
DPS-NCSW-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
DPS-NCSW-23.1.1.1	Action Step	Roads/Railroads	For all rural (unpaved) and seasonal dirt roads apply, at a minimum, the road standards outlined in the most recent version of the California Forest Practice Rules.	2	50	BOF, Local, RWQCB, Timber Landowners	For roads subject to the California Forest Practices Rules
DPS-NCSW-23.1.1.2	Action Step	Roads/Railroads	Design new roadways to avoid or minimize effects to unstable slopes, wetland, floodplains and other areas of high habitat value.	2	50	BOF, Local, RWQCB, Timber Landowners	This action is consistent with requirements in California Forest Practices Rules at 14 CCR §§ 923 - 923.9.1.
DPS-NCSW-23.1.1.3	Action Step	Roads/Railroads	Conduct annual inspections of roads prior to winter. Correct conditions that are likely to deliver sediment to streams.	2	50	BOF, Local, RWQCB, Timber Landowners	This action is consistent with requirements in California Forest Practices Rules at 14 CCR §§ 923 - 923.9.1.
DPS-NCSW-23.1.1.4	Action Step	Roads/Railroads	Restoration projects that upgrade or decommission high risk roads adjacent to streams supporting listed salmonids should be considered an extremely high priority for funding (e.g., PCSRF).	2	50	BOF, Local, RWQCB, Timber Landowners	
DPS-NCSW-23.1.1.5	Action Step	Roads/Railroads	Conduct outreach and continual education regarding the adverse effects of roads and the types of best management practices protective of salmonids. Education should address watershed process and the adverse effects of improper road construction and maintenance on salmonids and their habitats.	3	50	BOF, CalTrans, CDFW, NMFS, Timber Landowners	
DPS-NCSW-23.1.1.6	Action Step	Roads/Railroads	Evaluate and mitigate (where appropriate) the effects of transportation corridors and infrastructure on estuarine and stream fluvial processes. Mitigating measures may include, elevating existing approach, fill and maximizing clear spanning of upstream active channel(s), floodways, and floodplains to accommodate natural riverine and estuarine fluvial processes.	3	50	CDFW, NMFS, Timber Landowners	
DPS-NCSW-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration.				
DPS-NCSW-23.1.2.1	Action Step	Roads/Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and review appropriate barrier databases when developing new or retrofitting existing road crossings.	2	50	CalTrans, CDFW, City, County, County Planner, Engineers, NMFS, State	
DPS-NCSW-23.1.2.2	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents (i.e., pilings) feasible in order to minimize drift accumulation and facilitate fish passage.	2	50	CalTrans, CDFW, City, County, County Planner, Engineers, NMFS, State	
DPS-NCSW-23.1.2.3	Action Step	Roads/Railroads	For impact pile driving during construction, develop and implement sound attenuation methods that ensure sound levels are (1) below thresholds for onset of physical injury to fish (see NMFS' 2008 Interim Criteria for Injury to Fish from Pile Driving), (2) avoiding adverse behavioral effects (e.g., during adult migration, etc.), and (3) minimized by a reduction in the sound field (e.g., reduce the size of the area impacted). In situations where sound attenuation is not able to keep sound pressure at sub-injurious levels (i.e., sound levels that will not harm or injure fish), work should be conducted during seasonal work windows to avoid migrating salmonids.	2	50	CalTrans, CDFW, City, County, Engineers, NMFS, State	
DPS-NCSW-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance.				

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-23.1.3.1	Action Step	Roads/Railroads	Encourage implementation of Vegetation Management Plans for the roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.	3	50	CalTrans, CDFW, City, County, NMFS, State	
DPS-NCSW-23.2	**Objective**	**Roads/Railroads**	**Address the inadequacy of existing regulatory mechanisms.**				
DPS-NCSW-23.2.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to watershed hydrology				
DPS-NCSW-23.2.1.1	Action Step	Roads/Railroads	Support and engage CalTrans, counties and others with oversight on road practices to reduce sediment delivery to streams from road networks and channelization from poorly situated roads.	2	50	CalTrans, County, NMFS, RWQCB	
DPS-NCSW-23.2.1.2	Action Step	Roads/Railroads	Encourage enforcement of existing regulations regarding grading, riparian and building violations and sediment release from county roads.	2	50	CalTrans, County, NMFS, RWQCB	
DPS-NCSW-24.1	**Objective**	**Severe Weather Patterns**	**Address other natural or manmade factors affecting the species continued existence.**				
DPS-NCSW-24.1.1	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to watershed hydrology				
DPS-NCSW-24.1.1.1	Action Step	Severe Weather Patterns	Actively conduct outreach to stakeholders and the public regarding anticipated effects of climate change to salmonids and increase awareness that human actions can offset these effects. The public, local, state and federal agencies should become familiar with, and implement as necessary through lifestyle and policy changes, recommendations of the Intergovernmental Panel on Climate Change (IPCC).	3	5	Federal, Local, NMFS, Public, State	See the website http://www.ipcc.ch to view a summary of climate change issues for North America and the suite of actions from the IPCC to be considered for ecosystem (and human health) due to climate change.
DPS-NCSW-24.1.1.2	Action Step	Severe Weather Patterns	Develop a climate strategy that addresses simultaneously the reduction of fossil fuels and the protection of forestlands.	3	15	Academic, NWFSC, State, SWFSC,	For example, promote biological carbon sequestration best management practices (BMPs), where feasible, that are consistent with NMFS policies and guidelines. Develop incentives to maintain and rehabilitate forestlands, manage for older forests, discourage conversions or forest changes. Forestlands store carbon and reduce greenhouse gases.
DPS-NCSW-24.1.1.3	Action Step	Severe Weather Patterns	Expand research and monitoring to improve predictions of climate change and its effects on salmon recovery.	2	15	Academic, NWFSC, State, SWFSC,	Tools such as the Regional Climate System Model, Sea Level Rise and Coastal Flooding Impacts Viewer, etc. should be used to improve ecological forecasting of the threat of climate change, human population growth, and their impacts to salmonids and their habitats.
DPS-NCSW-24.1.1.4	Action Step	Severe Weather Patterns	Minimize anthropogenic increases in water temperatures by maintaining well-shaded riparian areas. Work to encourage and incorporate climate change vulnerability assessments and climate change scenarios in consultations, permitting, and restoration projects.	2	50	CDFW, Corps County, NMFS, NOAA RC, State	
DPS-NCSW-24.1.1.5	Action Step	Severe Weather Patterns	Maintain headwater areas in an undisturbed state to ensure a continuous source of cool water downstream.	1	50	CDFW, Corps, County, NMFS, NOAA RC, State	
DPS-NCSW-24.1.1.6	Action Step	Severe Weather Patterns	Maximize connectivity, and increase diversity, of instream habitats to allow a full range of opportunities for salmonids to exploit as environmental conditions shift.	2	100	CDFW, County, NMFS, State	
DPS-NCSW-24.1.1.7	Action Step	Severe Weather Patterns	Evaluate feasibility and benefits of establishing an Emergency Drought Operations Center (similar to the Emergency Drought Operations Center developed in Washington State), comprised of the SWRCB, CDFW, NMFS, and others to develop emergency rules for augmenting water supplies and mitigating the effects of drought and extreme climate listed salmonids and their habitats.	2	5	CDFW, NMFS, SWRCB	
DPS-NCSW-24.1.1.8	Action Step	Severe Weather Patterns	Institute water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	1	50	CDFW, DWR, Local Government, Private Landowners, NMFS, SWRCB	

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Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-24.1.1.9	Action Step	Severe Weather Patterns	Partner with land owners and local governments to explore the use of groundwater sources with high yield, such as Karst formations, and manage them as groundwater storage/banking, particularly during drought periods, or for adverse climate change conditions.	3	50	DWR, Local Government, Private Landowners, NMFS, USGS	
DPS-NCSW-24.1.2	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to estuarine quality and extent				
DPS-NCSW-24.1.2.1	Action Step	Severe Weather Patterns	Investigate the potential impact of sea level rise from climate change on the amount of salinity intrusion into fresh and brackish water habitats.	2	15	Academic, NWFSC, State, SWFSC,	
DPS-NCSW-25.1	**Objective**	**Water Diversion/Impoundments**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
DPS-NCSW-25.1.1	Recovery Action	Water Diversion/Impoundments	Prevent or minimize impairment to watershed hydrology				
DPS-NCSW-25.1.1.1	Action Step	Water Diversion/Impoundments	Encourage cooperation among water users and coordination of their diversions where they share a common water source to minimize adverse effects of diversions on the species' habitat.	2	50	Private Landowners, NGO, NMFS, SWRCB	
DPS-NCSW-25.1.1.2	Action Step	Water Diversion/Impoundments	Work with partners to promote and build water storage as an alternative to direct diversion during periods of low stream flow.	2	50	Private Landowners, NGO, NMFS, SWRCB	The off-stream storage can also be used to store water for fish and then release it in times of low-flow. See also Hydrology
DPS-NCSW-25.1.1.3	Action Step	Water Diversion/Impoundments	Support projects that provide rainwater catchment systems to rural residential as an alternative to summer riparian diversions.	2	50	Private Landowners, NGO, NMFS	
DPS-NCSW-25.1.1.4	Action Step	Water Diversion/Impoundments	Partner with water rights holders to dedicate water already claimed under existing appropriative right to be used instead for instream benefits under California Water Code Section 1707.	2	50	CDFW, Private Landowners, NMFS, SWRCB	
DPS-NCSW-25.1.1.5	Action Step	Water Diversion/Impoundments	Explore the possibility of using other easement mechanisms to dedicate water to instream uses.	2	50	CDFW, NMFS, SWRCB	
DPS-NCSW-25.1.1.6	Action Step	Water Diversion/Impoundments	Support temporary urgency change petitions by appropriative water right holders during critically dry periods if it will provide a benefit to salmonids.	2	50	CDFW, NMFS, SWRCB	
DPS-NCSW-25.1.1.7	Action Step	Water Diversion/Impoundments	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	3	50	CDFW, NMFS, Private Landowners, SWRCB	
DPS-NCSW-25.1.1.8	Action Step	Water Diversion/Impoundments	Support improvement of major dam/reservoir operations. Evaluate water release schedules and work with partners to modify as needed to improve conditions for salmonids downstream.	1	50	CDFW, NMFS, Public Works, Water Agencies, SWRCB	
DPS-NCSW-25.1.1.9	Action Step	Water Diversion/Impoundments	Support technical solutions to improved short-term precipitation forecasting where such information will facilitate more efficient management of reservoir storage.	3	50	NMFS, NOAA NWS	
DPS-NCSW-25.2	**Objective**	**Water Diversion/Impoundments**	**Address the inadequacy of existing regulatory mechanisms**				
DPS-NCSW-25.2.1	Recovery Action	Water Diversion/Impoundments	Prevent or minimize impairment to watershed hydrology				
DPS-NCSW-25.2.1.1	Action Step	Water Diversion/Impoundments	Encourage the SWRCB to exercise greater regulatory authority over summer water diversions.	2	50	CDFW, NMFS, SWRCB	
DPS-NCSW-25.2.1.2	Action Step	Water Diversion/Impoundments	Work with the SWRCB and explore the feasibility of upgrading bypass flow conditions for water rights developed prior to the establishment of AB 2121.	2	10	NMFS, Private Landowners, Public Works, Water Agencies, SWRCB	
DPS-NCSW-25.2.1.3	Action Step	Water Diversion/Impoundments	Support State agencies in implementing groundwater legislation (AB 1739, SB 1168, and SB 1319) where it may result in improved surface water conditions via groundwater/surface water interaction.	2	10	County, DWR, NMFS, Private Landowners, Public Works, Water Agencies	

Northern California Steelhead DPS Level Recovery Actions

Action ID	Targeted Attribute or Threat	Level	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
DPS-NCSW-25.2.1.4	Action Step	Water Diversion/Impoundments	Improve coordination between the agencies, particularly the SWRCB and county District Attorneys, to effectively identify and address illegal water diverters and out-of-compliance diverters, seasons of diversion, off-stream reservoirs, and bypass flows to protect listed salmonids.	1	5	County, NMFS, Private Landowners, Public Works, Water Agencies, SWRCB	
DPS-NCSW-25.2.1.5	Action Step	Water Diversion/Impoundments	Evaluate the recovery benefits of declaring some watersheds as fully appropriated and petition the SWRCB to formally declare it if appropriate.	2	10	NMFS, SWRCB	
DPS-NCSW-25.2.1.6	Action Step	Water Diversion/Impoundments	Provide technical assistance to the SWRCB in its implementation of the frost protection regulation.	2	10	Agriculture Owners, County, NMFS, Private Landowners, SWRCB	
DPS-NCSW-25.2.1.7	Action Step	Water Diversion/Impoundments	Encourage the SWRCB to conduct interagency consultation with CDFW, and seek technical assistance from NMFS on the issuance of water rights permits.	2	10	CDFW, NMFS, SWRCB	
DPS-NCSW-25.2.1.8	Action Step	Water Diversion/Impoundments	Counties should consider forbearance agreements that eliminate withdrawals during low-flow conditions.	2	5	CDFW, County, NMFS, Private Landowners, SWRCB	
DPS-NCSW-25.2.1.9	Action Step	Water Diversion/Impoundments	Coordinate with CDFW and the SWRCB to ensure the effective implementation of California Fish and Game Code Sections 5935-5937 regarding the provision of fishways and fish flows associated with dams and diversions.	2	5	CDFW, NMFS, SWRCB	
DPS-NCSW-25.2.1.10	Action Step	Water Diversion/Impoundments	Encourage development of a GCP/HCP/Natural Community Conservation Plan (NCCP), conservation banks, or safe harbor agreements for new water diversions in watersheds with essential and supporting populations.	3	5	CDFW, NMFS	
DPS-NCSW-25.2.2	Recovery Action	Water Diversion/Impoundments	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria				
DPS-NCSW-25.2.2.1	Action Step	Water Diversion/Impoundments	Adequately screen water diversions to prevent juvenile salmonid mortalities.	1	50	CDFW, County, NMFS, Private Landowners	
DPS-NCSW-25.2.2.2	Action Step	Water Diversion/Impoundments	Screen all off stream catchments, ponds, reservoirs with overflows and properly maintain them at all times especially before and after storm events to insure protection of listed species from escaped non-native fish.	2	50	CDFW, County, NMFS, Private Landowners	

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