

## Central Coastal Diversity Stratum

This stratum includes populations of steelhead that spawn in watersheds between the Navarro River and Gualala River, inclusive. These watersheds exhibit a narrower band of coastal influence than those to the north, and tend to be warmer and drier, particularly in the interior.

The populations that have been selected for recovery scenarios are listed in the table below and their profiles, maps, results, and recovery actions are in the pages following. Essential populations are listed by alphabetical order within the diversity stratum, followed by the Rapid Assessment of the Supporting populations:

- Garcia River
- Gualala River
- Navarro River
- Central Coastal Diversity Stratum Rapid Assessment
  - Brush Creek
  - Elk Creek
  - Schooner Gulch

NC steelhead Central Coastal Diversity Stratum, Populations, Historical Status, Population's Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting.

| Diversity Stratum      | NC winter-run steelhead populations                      | Historical Population Status | Population's Role In Recovery | Current Weighted IP-km | Spawner Density | Spawner Abundance |
|------------------------|--|------------------------------|-------------------------------|------------------------|-----------------|-------------------|
| <b>Central Coastal</b> | Brush Creek  | I                            | Supporting                    | 23.8                   | 6-12            | 141-284           |
|                        | Elk Creek  | I                            | Supporting                    | 21.5                   | 6-12            | 127-256           |
|                        | Garcia River   | I                            | Essential                     | 135.4                  | 23.4            | 3,200             |
|                        | Gualala River  | I                            | Essential                     | 397.1                  | 20.0            | 7,900             |
|                        | Navarro River  | I                            | Essential                     | 387.5                  | 20.0            | 7,800             |
|                        | Schooner Gulch   | D                            | Supporting                    | 7.7                    | 6-12            | 44-90             |
|                        | <b>Central Coastal Diversity Stratum Recovery Target</b> |                              |                               |                        |                 |                   |



**NC steelhead Central Coastal Diversity Stratum**

# Garcia River Population

## NC Steelhead Winter-Run

- Role within DPS: Functionally Independent Population
- Diversity Stratum: Central Coastal
- Spawner Abundance Target: 3,200 adults
- Current Intrinsic Potential: 135.4 IP-km

For information regarding CC Chinook salmon and CCC coho salmon for this watershed, please see the CC Chinook salmon volume of this recovery plan and the CCC coho salmon recovery plan (<http://www.westcoast.fisheries.noaa.gov/>).

## Steelhead Abundance and Distribution

Quantitative abundance and distribution estimates of winter-run steelhead within the Garcia River watershed are sparse or non-existent, although recent direct observations indicate they are well distributed and self-sustaining throughout the watershed (TCF 2006). It is currently unknown if this steelhead population is moving towards recovery or is in slow decline. Anecdotal accounts of steelhead from the early 1920s suggest abundant and sustainable runs within the Garcia River, with adult steelhead typically arriving in late November and spawning through April (Warmerdam, 2010).

Although degraded from pristine conditions, a substantial amount of high value habitat still exists within the Garcia watershed. The highest value habitat currently available for steelhead occurs within the upper sub-watershed areas where suitable water temperatures persist throughout the summer months.

## History of Land Use

The early period of logging and timber harvest in the Garcia River watershed began in the late 1860s and ended in 1915. In the 1950s, logging resumed in response to the post-World War II housing boom, with intense harvest rate and loggers utilizing more advanced technologies and heavy machinery. This period of intense logging ended in 1961 and left the watershed in a much degraded state. Large amounts of land were again harvested for timber more recently as 52-percent of the basin was harvested between 1987 and 1997 (NCRWQB 2005). Logging and wood harvest still occur within the watershed; however, timber harvest practices have improved as compared to previous logging areas, and, therefore, logging-related impacts to salmonid habitat may be less likely.

## **Current Resources and Land Management**

A large tract (24,000 acres) of the Garcia River was purchased in 2004 by the Conservation Fund, a group that has been in partnership with The Nature Conservancy, State Coastal Conservancy, Wildlife Conservation Board, and the California Department of Fish and Wildlife in developing and implementing an Integrated Resource Management Plan (2006) for the basin. The Conservation Fund is implementing sustainable management practices that include decreasing the intensity of timber harvests, decreasing timber harvest frequency, improving roads, and widening riparian buffers to improve water quality instreams degraded by past land uses. Other land uses occurring within the Garcia watershed include: agriculture, other timber companies, dairies, and cattle grazing and ranching. Conversion of hillside forest stands to vineyards is also occurring. The majority of the watershed is privately owned. Many government, public interest, and tribal groups and agencies are active or have jurisdiction within the watershed as well. The following pertinent documents are available for the Garcia River watershed:

- Garcia River Forest: Integrated Resource Management Plan (TCF 2006);
- Evaluation of the Garcia River Restoration with Recommendations for Future Projects (CDFG 2003);
- Action Plan for the Garcia River Watershed Sediment TMDL (NCRWQCB 2001);
- Garcia River Sediment Total Maximum Daily Load (EPA 1998);
- Garcia River Estuary Cross Sections (Jackson 1998);
- A Salmon Spawning Survey for Portions of Ten Mile River, Casper, and the Garcia River (MCRCD 1995-96);
- Fisheries Elements of the Garcia River Estuary Enhancement Feasibility Study (MCRCD 1995);
- Garcia River Drilling Mud Spill: Damage Assessment and Suggestions for Mitigation, Restoration, and Monitoring (FOGR 1992); and
- The Garcia River Watershed Enhancement Plan (MCRCD 1992).

## **Salmonid Viability and Watershed Conditions**

The following indicators were rated Poor through the CAP process for steelhead: LWD frequency, shelter rating, and streamside road density. Other indicators that are identified as impaired to the extent that rehabilitation work is needed include the following: physical barriers, estuary quality and extent, water temperature. Recovery strategies will focus on ameliorating these habitat indicators, although strategies that address other indicators may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed.

## **Current Conditions**

The following discussion focuses on those conditions that were rated Fair or Poor as a result of our CAP viability analysis. The Garcia River CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

## **Population and Habitat Conditions**

### **Estuary: Quality and Extent**

The river forms an estuary downstream of Hathaway Creek and maintains an open-sandbar during the dry season. Information provided by local residents suggests that the Garcia River estuary has aggraded over the years due to increased sediment loads as a result of past logging practices. Other investigations indicate that the estuary may be recovering and is getting deeper (Jackson 1998). It is still unclear to what extent the estuary is changing and at what rate. Other impacts that influence the quality and extent of the Garcia River estuary include current livestock activities around historic tidal sloughs, and potential reductions to freshwater inflow. The magnitude and duration of freshwater inflow is an essential component of a healthy estuary ecosystem and can dictate the quality and extent of rearing conditions for summer and smolt juvenile steelhead.

### **Sediment Transport: Road Density**

High road densities within the Garcia River watershed are primarily associated with past timber harvest. While road building standards have improved greatly in recent years, old road networks and landings still pose a high erosion risk (GRDMS 1992). Common problems with existing roads within the Garcia River include perched or raveling fills on the outside road edge; fill gullyng at watercourse crossings; shot-gunned culverts, or short culverts; inadequate or missing downspouts; and plugged ditches (TCF 2006). A major challenge for the future will be identifying and remediating these problem roads (TCF 2006). High sediment yields from failing roads have greatly affected watershed sediment transport processes and gravel quality in the past, and if continued, will impair habitat conditions for salmonids.

### **Sediment: Gravel Quality and Distribution of Spawning Gravels**

The Garcia River watershed is comprised of very unstable soil types and has a history of intensive logging and associated logging road networks (GRDMS 1992). The Garcia Watershed Enhancement Plan (1992) found that excessive fine sediment exists in the coarse spawning gravels within the lower river and tributaries. Other habitat inventories suggest that quality gravel exists within many watershed tributaries and can provide suitable spawning gravels for salmonids (CDFG 2002, 2004). Undoubtedly, suitable spawning gravel exists in some areas within the

watershed and other areas still are impaired from past land use. Steelhead are much less restricted than Chinook salmon to the mainstem for spawning and are more likely to find better spawning habitat in higher basin reaches and tributaries. However, impaired gravel quality in the mainstem or other areas may reduce macro-invertebrate production that supports summer and seasonal rearing salmonids.

#### **Passage/Migration: Mouth or Confluence and Physical Barriers**

A high percentage of the historic steelhead habitat within the Garcia River watershed is currently accessible, although some fish passage impairments do exist within the watershed (CALFISH 2011). Most identified passage impairments are partial barriers at stream crossings that may preclude steelhead reaching spawning destinations in the upper mainstem and adjacent tributaries under certain flow conditions. Some logjams from past logging have also been identified (Bell 2003, as cited by KrisWeb 2011). For steelhead, additional barriers exist in the South Fork Garcia, Hathaway Creek.

#### **Habitat Complexity: Large Wood and Shelter and Altered Pool Complexity and/or Pool/Riffle Ratios**

Extensive CDFW stream surveys (2002, 2004) indicate that many streams lack pool shelter complexity and desirable riffle/pool ratios. These habitat complexity features have been impaired primarily due to a large wood deficit within the stream channel. Past logging and degraded riparian zones have severely limited the natural recruitment of large wood in many historically productive streams within the watershed. The Conservation Fund and their partners have embarked on many instream large wood placement projects that have improved habitat complexity in some areas (GRF: IRMP 2006). However, many other stream reaches will require similar supplementation of LWD, boulders, and other channel forming features to encourage more desirable pool/riffle ratios (including primary pools) and increase mean shelter ratings. High priority steelhead streams in need of LWD placement include Blue Waterhole, North Fork, Inman Creek, Signal Creek, and Graphite Creek. Rehabilitating these streams will greatly improve the quality of available spawning and rearing habitat for steelhead.

#### **Riparian Vegetation: Composition, Cover & Tree Diameter and Water Quality: Temperature**

Portions of the Garcia River have been identified as having water temperatures unsuitable for summer rearing juvenile steelhead (KRIS 2011). Including some identified suitable streams for summer rearing; water temperatures have likely increased due to altered riparian structure, reduced canopy cover and lost old growth as a result of past logging practices. A shift to warmer water temperatures has limited the amount of preferable summer rearing habitat in some streams and has likely reduced juvenile steelhead growth and survival. Specific watersheds in need of riparian rehabilitation include: Blue Waterhole Creek, Inman Creek and the mainstem Garcia

River. Promoting long-standing tree growth and implementing planting programs over time will increase shade, which will contribute to cooling ambient temperatures during the summer months in stream corridors.

### **Habitat Complexity: Large Wood and Shelter**

The lower seven miles of the mainstem Garcia River flows through an alluvial valley where large amounts of sediment would naturally deposit. Following intensive timber harvest and poor land management, sediment deposition increased substantially during the previous several decades. Additionally, large wood recruitment was lost as riparian habitat was destroyed, limiting the amount of channel forming features (LWD) that encourage sediment sorting and scouring of large pools.

### **Threats**

The following discussion focuses on those threats that were rated as High or Very High (See Garcia River CAP Results). Recovery strategies will likely focus on ameliorating threats rated as High; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in the Garcia River CAP Results.

### **Logging and Wood Harvesting**

Logging and wood harvesting remains a threat to salmonid habitat quantity and quality within the Garcia River watershed. Timber harvest practices have improved greatly within the bounds of the Conservation Fund property and subsequent implementation of the Integrated Resource Management Plan (2006). However, other portions of the watershed still face accelerated timber harvest rates and high impact harvest techniques. Additionally, habitat degradation (gravel quality, water temperature, instream wood recruitment) associated with past timber harvest persists throughout the watershed, although some processes are currently in a state of recovery. Future management and recovery actions need to protect salmonid high value habitat from degraded water quality conditions (turbidity and increased temperature) associated with timber harvest, and ensure the continuation of watershed rehabilitation efforts.

### **Roads and Railroads**

Even with current logging road improvements and standards (rolling dips, rock surfaces, and road widths), legacy logging roads remain a threat to salmonid habitat quantity and quality throughout the Garcia River watershed. Impaired passage and migration at road crossings will continue to limit access to suitable habitat, and fine sediment inputs from poorly built, improperly maintained, and abandoned roads will continue. More efficient road networks, removal and

replacement of impassable and undersized culverts, and radical decommissioning efforts on problem roads will prevent further salmonid habitat degradation within the watershed.

### **Water Diversions and Impoundments**

Currently, there are no large long standing dams within the Garcia River watershed. Watershed hydrology is relatively unimpaired and free from major water diversions when compared to most watersheds within the NCCC Recovery Domain. However, concerns regarding future land uses, increasing agriculture, and increasing illegal marijuana cultivation pressure could increase water demand and further reduce spring and summer streamflows. Additionally, future streamflow alterations could alter the hydrodynamics of the estuary during the summer months. Provisions need to be made that ensure future residential and agricultural development do not adversely impact summer and spring baseflows or groundwater recharge.

### **Livestock Farming and Ranching**

Livestock farming and ranching have been reduced around the lower Garcia River/estuary, which has rehabilitated some stream riparian areas and significantly reduced erosion of adjoining properties (KRIS 2011). However, the historic quality and extent of the Garcia River estuary is still impaired, as some tidal sloughs continue to be disturbed by cattle activities.

### **Fishing and Collecting**

Poaching within the Garcia River continues to be a major concern within the Garcia River for fisheries managers and restoration practitioners (Bright 2014). In March 2012, law enforcement from CDFW and the Mendocino County Sheriff's Department seized 18 wild steelhead from a local resident. Congressional and law enforcement efforts are underway to solve this potential problem. Specifically Congressman Jared Huffman convened multiple meetings with multiple stakeholders to address poaching problems in the watershed. These meetings have been successful in minimizing poaching in the watershed, and continued Congressional involvement in facilitating is expected in the future. In 2013, Congressman Jared Huffman announced a "Historic Anti-Poaching Agreements Between Tribes, Federal and State Agencies". The agreement made combating poaching a shared responsibility, and outlined a common strategy to protect critically low populations of steelhead and coho salmon on the Garcia River. Informational signs to assist anglers in identifying threatened or endangered species have been posted (pers comm, March 2015, Josh Fuller, NMFS). According to Nancy Foley, CDFW's Chief of Enforcement, "Enforcement efforts are critical to ensuring the threatened wild steelhead stocks are able to rebuild..." (April 7, 2012).

## **Limiting Stresses, Lifestages, and Habitats**

The threat and stress analysis within the CAP workbook suggests that juvenile productivity is likely limiting adult steelhead abundance within the Garcia River watershed. Inadequate stream shading, higher water temperatures, impaired gravel quality (spawning and benthic food productivity), and reduced habitat complexity have reduced the quality and extent of rearing habitat.

## **General Recovery Strategy**

### **Improve Canopy Cover and Reduce Stream Water Temperature**

Stream canopy cover conditions have improved within many tributaries of the Garcia River watershed, and will continue to improve in areas protected from future logging. However, in many areas of Blue Waterhole, Inman Creek, and the mainstem Garcia River, riparian rehabilitation efforts will need to be implemented to improve the extent and quality of summer rearing conditions in these potentially productive subwatersheds.

### **Improve Habitat Complexity and LWD Recruitment**

Pool shelter ratings and primary pool frequencies are limited in most tributaries in the Garcia River watershed. Strategically placing channel forming features in high priority reaches of the Blue Waterhole, North Fork, Inman Creek, Signal Creek, and Graphite Creek sub-basins will increase surface water hydrologic connectivity in highly aggraded reaches and increase summer rearing production. Additionally, establishing appropriate size riparian buffer zones throughout the watershed will increase stream shading and promote natural LWD recruitment.

### **Protect Natural Hydrologic Conditions**

With physical habitat features improving and slowly recovering in many portions of the watershed, protecting spring and summer hydrologic conditions will be essential toward recovering all salmonids within the Garcia River watershed. Any alternatives to the natural watershed hydrology will present a future threat to the recovery of steelhead due to potential reductions in groundwater and consequently surface flows. Reducing suitable surface flows for summer rearing steelhead will not only limit the current extent of summer rearing within the basin, but may impair the quality of seasonal rearing conditions within the estuary.

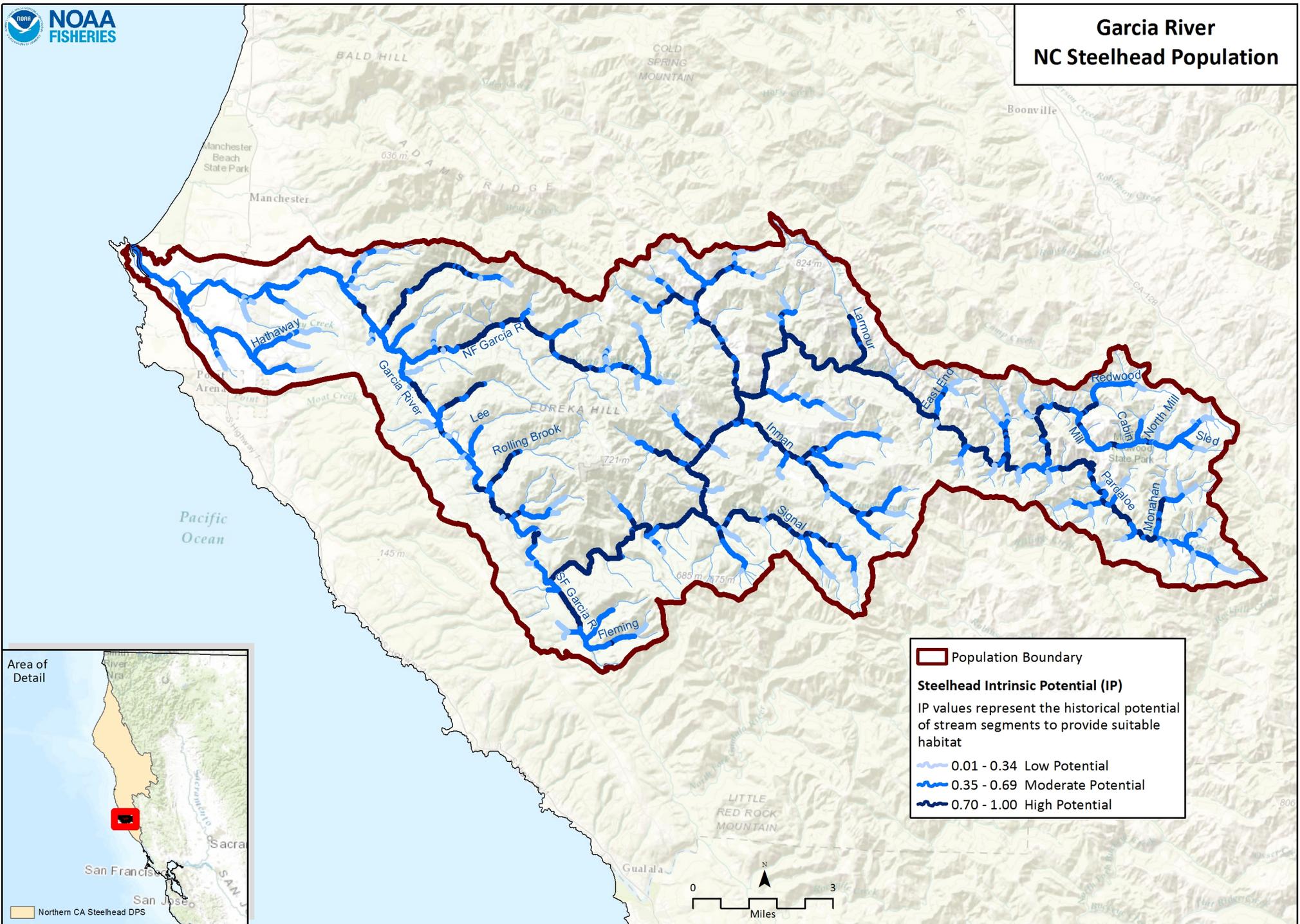
### **Protect, Enhance, and Rehabilitate the Quality and Extent of the Garcia River Estuary**

Efforts should be implemented to reclaim tidal sloughs from cattle grazing and agriculture within some areas of the Garcia River estuary. Integrating Hathaway Creek into future estuary rehabilitation efforts should be investigated.

## Literature Cited

- Bright, J. 2014. Loving the Garcia River (Don't Poach My Mistress). California Fly Fisher. Jan/Feb 2014.
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# Garcia River NC Steelhead Population



Garcia River CAP Viability Results

| # | Conservation Target | Category  | Key Attribute       | Indicator                                | Poor  | Fair  | Good  | Very Good   | Current Indicator Measurement                             | Current Rating |
|---|---------------------|-----------|---------------------|--|---|---|---|---|---|----------------|
| 1 | Adults              | Condition | Habitat Complexity  | Large Wood Frequency (BFW 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)   | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)   | Good           |
|   |                     |           | Habitat Complexity  | Large Wood Frequency (BFW 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 50% to 74% of streams/ IP-km (>1.3 Key Pieces/100 meters) | Fair           |
|   |                     |           | Habitat Complexity  | Pool/Riffle/Flatwater Ratio              | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)   | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 55% streams 79% IP-km (>40% Pools; >20% Riffles)          | Good           |
|   |                     |           | Habitat Complexity  | Shelter Rating                           | <50% of streams/ IP-Km (>80 stream average)         | 50% to 74% of streams/ IP-Km (>80 stream average)         | 75% to 90% of streams/ IP-Km (>80 stream average)         | >90% of streams/ IP-Km (>80 stream average)         | 18% streams/ 6% IP-km (>80 stream average)                | Poor           |
|   |                     |           | Hydrology           | Passage Flows                            | NMFS Flow Protocol: Risk Factor Score >75           | NMFS Flow Protocol: Risk Factor Score 51-75               | NMFS Flow Protocol: Risk Factor Score 35-50               | NMFS Flow Protocol: Risk Factor Score <35           | NMFS Flow Protocol: Risk Factor Score 51-75               | Fair           |
|   |                     |           | Passage/Migration   | Passage at Mouth or Confluence           | <50% of IP-Km or <16 IP-Km accessible*              | 50% of IP-Km to 74% of IP-km                              | 75% of IP-Km to 90% of IP-km                              | >90% of IP-km                                       | 50% of IP-km to 74% of IP-km                              | Fair           |
|   |                     |           | Passage/Migration   | Physical Barriers                        | <50% of IP-Km or <16 IP-Km accessible*              | 50% of IP-Km to 74% of IP-km                              | 75% of IP-Km to 90% of IP-km                              | >90% of IP-km                                       | 100% of IP-km   | Very Good      |
|   |                     |           | Riparian Vegetation | Tree Diameter (North of SF Bay)          | ≤39% Class 5 & 6 across IP-km                       | 40 - 54% Class 5 & 6 across IP-km                         | 55 - 69% Class 5 & 6 across IP-km                         | >69% Class 5 & 6 across IP-km                       | 39% Class 5 & 6 across IP-km                              | Fair           |
|   |                     |           | Riparian Vegetation | Tree Diameter (South of SF Bay)          | ≤69% Density rating "D" across IP-km                | 70-79% Density rating "D" across IP-km                    | ≥80% Density rating "D" across IP-km                      | Not Defined   |   |                |

|   |                          |           |                 |   |   |   |   |   |   |           |
|---|--------------------------|-----------|-----------------|---|---|---|---|---|---|-----------|
|   |                          |           | Sediment        | Quantity & Distribution of Spawning Gravels | <50% of IP-Km or <16 IP-Km accessible*                        | 50% of IP-Km to 74% of IP-km  | 75% of IP-Km to 90% of IP-km  | >90% of IP-km   | 50% of IP-km to 74% of IP-km  | Fair      |
|   |                          |           | Velocity Refuge | Floodplain Connectivity                     | <50% Response Reach Connectivity                              | 50-80% Response Reach Connectivity                                  | >80% Response Reach Connectivity                                    | Not Defined   | >80% Response Reach Connectivity                                    | Good      |
|   |                          |           | Water Quality   | Toxicity                                    | Acute   | Sublethal or Chronic  | No Acute or Chronic   | No Evidence of Toxins or Contaminants                         | No Acute or Chronic   | Good      |
|   |                          |           | Water Quality   | Turbidity                                   | <50% of streams/ IP-Km maintains severity score of 3 or lower | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower | >90% of streams/ IP-Km maintains severity score of 3 or lower | 75% to 90% of streams/ IP-km maintains severity score of 3 or lower | Good      |
|   |                          | Size      | Viability       | Density                                     | <1 spawners per IP-Km   | 1-20 spawners per IPKm  | 20-40 Spawners per IP-Km (e.g., Low Risk Extinction Criteria)       |   | 1-20 spawners per IPKm  | Fair      |
| 2 | Eggs                     | Condition | Hydrology       | Flow Conditions (Instantaneous Condition)   | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                         | NMFS Flow Protocol: Risk Factor Score 35-50                         | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                         | Fair      |
|   |                          |           | Hydrology       | Redd Scour                                  | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                         | NMFS Flow Protocol: Risk Factor Score 35-50                         | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                         | Fair      |
|   |                          |           | Sediment        | Gravel Quality (Bulk)                       | >17% (0.85mm) and >30% (6.4mm)                                | 15-17% (0.85mm) and <30% (6.4mm)                                    | 12-14% (0.85mm) and <30% (6.4mm)                                    | <12% (0.85mm) and <30% (6.4mm)                                | 15-17% (0.85mm) and <30% (6.4mm)                                    | Fair      |
|   |                          |           | Sediment        | Gravel Quality (Embeddedness)               | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 91% streams/ 98% IP-km (>50% stream average scores of 1 & 2)        | Very Good |
| 3 | Summer Rearing Juveniles | Condition | Estuary/Lagoon  | Quality & Extent                            | Impaired/non-functional                                       | Impaired but functioning  | Properly Functioning Condition                                      | Unimpaired Condition  | Properly Functioning Condition                                      | Good      |

|                    |   |  |  |  |  |  |           |
|--------------------|---|--|--|--|--|--|-----------|
| Habitat Complexity | Large Wood Frequency (Bankfull Width 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)      | Good      |
| Habitat Complexity | Large Wood Frequency (Bankfull Width 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-km (>1.3 Key Pieces/100 meters)    | Fair      |
| Habitat Complexity | Percent Primary Pools                               | <50% of streams/ IP-Km (>40% average primary pool frequency) | 50% to 74% of streams/ IP-Km (>40% average primary pool frequency) | 75% to 89% of streams/ IP-Km (>40% average primary pool frequency) | >90% of streams/ IP-Km (>40% average primary pool frequency) | 64% streams/ 83% IP-km (>40% average primary pool frequency) | Good      |
| Habitat Complexity | Pool/Riffle/Flatwater Ratio                         | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 55% streams 79% IP-km (>40% Pools; >20% Riffles)             | Good      |
| Habitat Complexity | Shelter Rating                                      | <50% of streams/ IP-Km (>80 stream average)                  | 50% to 74% of streams/ IP-Km (>80 stream average)                  | 75% to 90% of streams/ IP-Km (>80 stream average)                  | >90% of streams/ IP-Km (>80 stream average)                  | 18% streams/ 6% IP-km (>80 stream average)                   | Poor      |
| Hydrology          | Flow Conditions (Baseflow)                          | NMFS Flow Protocol: Risk Factor Score >75                    | NMFS Flow Protocol: Risk Factor Score 51-75                        | NMFS Flow Protocol: Risk Factor Score 35-50                        | NMFS Flow Protocol: Risk Factor Score <35                    | NMFS Flow Protocol: Risk Factor Score 51-75                  | Fair      |
| Hydrology          | Flow Conditions (Instantaneous Condition)           | NMFS Flow Protocol: Risk Factor Score >75                    | NMFS Flow Protocol: Risk Factor Score 51-75                        | NMFS Flow Protocol: Risk Factor Score 35-50                        | NMFS Flow Protocol: Risk Factor Score <35                    | NMFS Flow Protocol: Risk Factor Score 51-75                  | Fair      |
| Hydrology          | Number, Condition and/or Magnitude of Diversions    | >5 Diversions/10 IP km                                       | 1.1 - 5 Diversions/10 IP km  | 0.01 - 1 Diversions/10 IP km                                       | 0 Diversions   | 0.06 Diversions/10 IP km                                     | Good      |
| Passage/Migration  | Passage at Mouth or Confluence                      | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 50% of IP-km to 74% of IP-km                                 | Fair      |
| Passage/Migration  | Physical Barriers                                   | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 100% of IP-km  | Very Good |

|      |                              |                                 |  |  |  |  |  |           |
|------|------------------------------|---------------------------------|--|--|--|--|--|-----------|
|      | Riparian Vegetation          | Canopy Cover                    | <50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | >90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 91% streams/ 56% IP-km (>70% average stream canopy; >85% where coho IP overlaps) | Fair      |
|      | Riparian Vegetation          | Tree Diameter (North of SF Bay) | ≤39% Class 5 & 6 across IP-km  | 40 - 54% Class 5 & 6 across IP-km  | 55 - 69% Class 5 & 6 across IP-km  | >69% Class 5 & 6 across IP-km  | 39% Class 5 & 6 across IP-km   | Fair      |
|      | Riparian Vegetation          | Tree Diameter (South of SF Bay) | ≤69% Density rating "D" across IP-km   | 70-79% Density rating "D" across IP-km   | ≥80% Density rating "D" across IP-km   | Not Defined  |  |           |
|      | Sediment (Food Productivity) | Gravel Quality (Embeddedness)   | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 91% streams/ 98% IP-km (>50% stream average scores of 1 & 2)                     | Very Good |
|      | Water Quality                | Temperature (MWT)               | <50% IP km (<20 C MWT; <16 C MWT where coho IP overlaps)                         | 50 to 74% IP km (<20 C MWT; <16 C MWT where coho IP overlaps)                          | 75 to 89% IP km (<20 C MWT; <16 C MWT where coho IP overlaps)                          | >90% IP km (<20 C MWT; <16 C MWT where coho IP overlaps)                         | 50 to 74% IP-km (<20 C MWT; <16 C MWT where coho IP overlaps)                    | Fair      |
|      | Water Quality                | Toxicity                        | Acute  | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants  | No Acute or Chronic  | Good      |
|      | Water Quality                | Turbidity                       | <50% of streams/ IP-Km maintains severity score of 3 or lower                    | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower                    | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower                    | >90% of streams/ IP-Km maintains severity score of 3 or lower                    | 75% to 90% of streams/ IP-km maintains severity score of 3 or lower              | Good      |
| Size | Viability                    | Density                         | <0.2 Fish/m <sup>2</sup>   | 0.2 - 0.6 Fish/m <sup>2</sup>  | 0.7 - 1.5 Fish/m <sup>2</sup>  | >1.5 Fish/m <sup>2</sup>   | 0.2 - 0.6 Fish/m <sup>2</sup>  | Fair      |
|      | Viability                    | Spatial Structure               | <50% of Historical Range   | 50-74% of Historical Range   | 75-90% of Historical Range   | >90% of Historical Range   | 75-90% of Historical Range   | Good      |

|   |                          |           |                              |   |  |  |  |  |  |           |
|---|--------------------------|-----------|------------------------------|---|--|--|--|--|--|-----------|
| 4 | Winter Rearing Juveniles | Condition | Habitat Complexity           | Large Wood Frequency (Bankfull Width 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)      | Good      |
|   |                          |           | Habitat Complexity           | Large Wood Frequency (Bankfull Width 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-km (>1.3 Key Pieces/100 meters)    | Fair      |
|   |                          |           | Habitat Complexity           | Pool/Riffle/Flatwater Ratio                         | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 55% streams 79% IP-km (>40% Pools; >20% Riffles)             | Good      |
|   |                          |           | Habitat Complexity           | Shelter Rating                                      | <50% of streams/ IP-Km (>80 stream average)                  | 50% to 74% of streams/ IP-Km (>80 stream average)                  | 75% to 90% of streams/ IP-Km (>80 stream average)                  | >90% of streams/ IP-Km (>80 stream average)                  |  |           |
|   |                          |           | Passage/Migration            | Physical Barriers                                   | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 100% of IP-km  | Very Good |
|   |                          |           | Riparian Vegetation          | Tree Diameter (North of SF Bay)                     | ≤39% Class 5 & 6 across IP-km                                | 40 - 54% Class 5 & 6 across IP-km                                  | 55 - 69% Class 5 & 6 across IP-km                                  | >69% Class 5 & 6 across IP-km                                | 39% Class 5 & 6 across IP-km                                 | Fair      |
|   |                          |           | Riparian Vegetation          | Tree Diameter (South of SF Bay)                     | ≤69% Density rating "D" across IP-km                         | 70-79% Density rating "D" across IP-km                             | ≥80% Density rating "D" across IP-km                               | Not Defined  |  |           |
|   |                          |           | Sediment (Food Productivity) | Gravel Quality (Embeddedness)                       | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2) | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 91% streams/ 98% IP-km (>50% stream average scores of 1 & 2) | Very Good |
|   |                          |           | Velocity Refuge              | Floodplain Connectivity                             | <50% Response Reach Connectivity                             | 50-80% Response Reach Connectivity                                 | >80% Response Reach Connectivity                                   | Not Defined  | >80% Response Reach Connectivity                             | Good      |
|   |                          |           | Water Quality                | Toxicity  | Acute  | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants                        | No Acute or Chronic  | Good      |

|   |        |           |                    |  |  |  |   |   |  |      |
|---|--------|-----------|--------------------|--|--|--|---|---|--|------|
|   |        |           | Water Quality      | Turbidity  | <50% of streams/ IP-Km maintains severity score of 3 or lower              | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower            | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower   | >90% of streams/ IP-Km maintains severity score of 3 or lower |  |      |
| 5 | Smolts | Condition | Estuary/Lagoon     | Quality & Extent                                 | Impaired/non-functional  | Impaired but functioning   | Properly Functioning Condition  | Unimpaired Condition  | Impaired but functioning   | Fair |
|   |        |           | Habitat Complexity | Shelter Rating                                   | <50% of streams/ IP-Km (>80 stream average)                                | 50% to 74% of streams/ IP-Km (>80 stream average)                              | 75% to 90% of streams/ IP-Km (>80 stream average)                     | >90% of streams/ IP-Km (>80 stream average)                   | 18% streams/ 6% IP-km (>80 stream average)                                     | Poor |
|   |        |           | Hydrology          | Number, Condition and/or Magnitude of Diversions | >5 Diversions/10 IP km   | 1.1 - 5 Diversions/10 IP km  | 0.01 - 1 Diversions/10 IP km  | 0 Diversions  | 0.06 Diversions/10 IP km   | Good |
|   |        |           | Hydrology          | Passage Flows                                    | NMFS Flow Protocol: Risk Factor Score >75                                  | NMFS Flow Protocol: Risk Factor Score 51-75                                    | NMFS Flow Protocol: Risk Factor Score 35-50                           | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                                    | Fair |
|   |        |           | Passage/Migration  | Passage at Mouth or Confluence                   | <50% of IP-Km or <16 IP-Km accessible*                                     | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km  | >90% of IP-km   | 50% of IP-km to 74% of IP-km   | Fair |
|   |        |           | Smoltification     | Temperature                                      | <50% IP-Km (>6 and <14 C)  | 50-74% IP-Km (>6 and <14 C)  | 75-90% IP-Km (>6 and <14 C)   | >90% IP-Km (>6 and <14 C)                                     | 75-90% IP-km (>6 and <14 C)  | Good |
|   |        |           | Water Quality      | Toxicity   | Acute  | Sublethal or Chronic   | No Acute or Chronic   | No Evidence of Toxins or Contaminants                         | No Acute or Chronic  | Good |
|   |        |           | Water Quality      | Turbidity  | <50% of streams/ IP-Km maintains severity score of 3 or lower              | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower            | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower   | >90% of streams/ IP-Km maintains severity score of 3 or lower | 75% to 90% of streams/ IP-km maintains severity score of 3 or lower            | Good |
|   |        | Size      | Viability          | Abundance  | Smolt abundance which produces high risk spawner density per Spence (2008) | Smolt abundance which produces moderate risk spawner density per Spence (2008) | Smolt abundance to produce low risk spawner density per Spence (2008) |   | Smolt abundance which produces moderate risk spawner density per Spence (2008) | Fair |

| 6 | Watershed Processes | Landscape Context | Hydrology           | Impervious Surfaces             | >10% of Watershed in Impervious Surfaces   | 7-10% of Watershed in Impervious Surfaces    | 3-6% of Watershed in Impervious Surfaces     | <3% of Watershed in Impervious Surfaces    | 0.147% of Watershed in Impervious Surfaces   | Very Good |
|---|---------------------|-------------------|---------------------|---------------------------------|--|--|--|--|--|-----------|
|   |                     |                   | Landscape Patterns  | Agriculture                     | >30% of Watershed in Agriculture           | 20-30% of Watershed in Agriculture           | 10-19% of Watershed in Agriculture           | <10% of Watershed in Agriculture           | 1.134% of Watershed in Agriculture           | Very Good |
|   |                     |                   | Landscape Patterns  | Timber Harvest                  | >35% of Watershed in Timber Harvest        | 26-35% of Watershed in Timber Harvest        | 25-15% of Watershed in Timber Harvest        | <15% of Watershed in Timber Harvest        | 15% of Watershed in Timber Harvest           | Good      |
|   |                     |                   | Landscape Patterns  | Urbanization                    | >20% of watershed >1 unit/20 acres         | 12-20% of watershed >1 unit/20 acres         | 8-11% of watershed >1 unit/20 acres          | <8% of watershed >1 unit/20 acres          | 1% of watershed >1 unit/20 acres             | Very Good |
|   |                     |                   | Riparian Vegetation | Species Composition             | <25% Intact Historical Species Composition | 25-50% Intact Historical Species Composition | 51-74% Intact Historical Species Composition | >75% Intact Historical Species Composition | 25-50% Intact Historical Species Composition | Fair      |
|   |                     |                   | Sediment Transport  | Road Density                    | >3 Miles/Square Mile                       | 2.5 to 3 Miles/Square Mile                   | 1.6 to 2.4 Miles/Square Mile                 | <1.6 Miles/Square Mile                     | 2.2 Miles/Square Mile                        | Good      |
|   |                     |                   | Sediment Transport  | Streamside Road Density (100 m) | >1 Miles/Square Mile                       | 0.5 to 1 Miles/Square Mile                   | 0.1 to 0.4 Miles/Square Mile                 | <0.1 Miles/Square Mile                     | 2.8 Miles/Square Mile                        | Poor      |
|   |                     |                   |                     |                                 |  |  |  |  |  |           |

Garcia River CAP Threat Results

| Threats Across Targets                |  | Adults | Eggs | Summer Rearing Juveniles | Winter Rearing Juveniles | Smolts | Watershed Processes | Overall Threat Rank |
|---------------------------------------|--|--------|------|--------------------------|--------------------------|--------|---------------------|---------------------|
| Project-specific-threats              |  | 1      | 2    | 3                        | 4                        | 5      | 6                   |                     |
| 1                                     | Agriculture                                | Low    | Low  | Medium                   | Low                      | Low    | Medium              | Medium              |
| 2                                     | Channel Modification                       | Low    | Low  | Medium                   | Low                      | Medium | Medium              | Medium              |
| 3                                     | Disease, Predation and Competition         | Low    |      | Medium                   | Low                      | Low    | Low                 | Low                 |
| 4                                     | Hatcheries and Aquaculture                 |        |      |                          |                          |        |                     |                     |
| 5                                     | Fire, Fuel Management and Fire Suppression | Low    | Low  | Medium                   | Low                      | Low    | Low                 | Low                 |
| 6                                     | Fishing and Collecting                     | Medium |      | Medium                   |                          | Medium |                     | Medium              |
| 7                                     | Livestock Farming and Ranching             | Low    | Low  | Medium                   | Low                      | Medium | Medium              | Medium              |
| 8                                     | Logging and Wood Harvesting                | Medium | Low  | High                     | High                     | Medium | High                | High                |
| 9                                     | Mining                                     | Low    | Low  | Low                      | Low                      | Low    | Low                 | Low                 |
| 10                                    | Recreational Areas and Activities          | Low    | Low  | Low                      | Low                      | Low    | Low                 | Low                 |
| 11                                    | Residential and Commercial Development     | Low    | Low  | Low                      | Low                      | Low    | Low                 | Low                 |
| 12                                    | Roads and Railroads                        | Medium | Low  | Medium                   | High                     | Medium | High                | High                |
| 13                                    | Severe Weather Patterns                    | Medium | Low  | Medium                   | Medium                   | Medium | Medium              | Medium              |
| 14                                    | Water Diversion and Impoundments           | Low    | Low  | High                     | Low                      | High   | Low                 | High                |
| Threat Status for Targets and Project |  | Medium | Low  | High                     | High                     | High   | High                | High                |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| <b>GarcR-NCSW-1.1</b> | <b>Objective</b> | <b>Estuary</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-1.1.1      | Recovery Action  | Estuary                      | Rehabilitate natural river mouth dynamics  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-1.1.1.1    | Action Step      | Estuary                      | Investigate and determine if the river/estuary mouth dynamics have changed from historical conditions (i.e. opening/closing patterns). Evaluate passage conditions relative to adult salmonid run timing.  | 2               | 10                      | BLM, CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB  | 150.00      |         |          |          |          | 150             | Cost based estimate for investigations of river mouth dynamics.  |
| GarcR-NCSW-1.1.1.2    | Action Step      | Estuary                      | If determined necessary, develop and implement strategies that address adverse passage conditions for adult salmonids caused by altered river mouth dynamics.  | 3               | 20                      | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy                          |             |         |          |          |          | TBD             | TBD, the alternatives to address adverse passage conditions will be determined from the above action steps, if necessary.                                    |
| GarcR-NCSW-1.1.2      | Recovery Action  | Estuary                      | Rehabilitate inner estuarine hydrodynamics   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-1.1.2.1    | Action Step      | Estuary                      | Investigate the value of re-aligning the lower estuary channel from Minor Hole to the mouth in efforts to increase estuary depth and improve tidal wetlands.   | 2               | 10                      | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy                          |             |         |          |          |          | 0               | Cost accounted for above.  |
| GarcR-NCSW-1.1.2.2    | Action Step      | Estuary                      | If determined beneficial to estuary health and function, develop and implement a lower estuary channel re-alignment project.   | 2               | 10                      | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy                          |             |         |          |          |          | TBD             | Cost to re-align lower estuary channel is contingent upon necessity identified from above action step. Cost estimated at \$16,292/breach (NMFS 2008, pg. 20) |
| GarcR-NCSW-1.1.3      | Recovery Action  | Estuary                      | Increase the physical extent of estuarine habitat  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-1.1.3.1    | Action Step      | Estuary                      | Investigate the extent of sedimentation within the estuary associated watershed legacy impacts (e.g. logging). Evaluate sediment transport within the estuary and determine if the estuary is "filling" with sediment or "flushing" sediment (i.e., recovering). | 2               | 10                      | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy                          | 115.50      | 115.50  |          |          |          | 231             | Cost for sediment assessment is estimated at \$12.62/acre  |
| GarcR-NCSW-1.1.3.2    | Action Step      | Estuary                      | Investigate and determine the current vs. historical extent of the Garcia estuary. Include tracts of salt and freshwater marshes, sloughs, tidal channels, etc.  | 2               | 10                      | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy |             |         |          |          |          | 0               | Cost accounted for in above action steps.  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|--------------------|-----------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                    |                 |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GarcR-NCSW-1.1.3.3 | Action Step     | Estuary                      | Evaluate, design, and implement strategies to enhance habitat conditions within Hathaway Creek and near its confluence with the Garcia River main stem. Consider thinning vegetation within lower Hathaway to increase hydrologic circulation. Optimize winter rearing habitat/refuge while considering upstream migration to upper Hathaway Creek if determined beneficial. | 2               | 10                      | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy | 26.00       | 26.00   |          |          |          | 52              | Cost based on treating 1 mile of stream (assume 1 project/mile) at a rate of \$26,000/mile.    |
| GarcR-NCSW-1.1.3.4 | Action Step     | Estuary                      | Evaluate, design, and implement rehabilitation projects targeting tidal sloughs and off-channel habitats impaired by cattle located within the historical extent of the Garcia River estuary.  | 2               | 5                       | BLM, CDFW, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy                                    | 2,811       |         |          |          |          | 2,811           | Cost based on treating 10 acres (assume 10% of estuarine habitat) at a rate of \$281,100/acre. |
| GarcR-NCSW-1.1.3.5 | Action Step     | Estuary                      | Continue estuary rehabilitation efforts (public acquisition and easements, Bell 2003).   | 2               | 10                      | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy |             |         |          |          |          | TBD             | TBD, cost likely coincide with above action steps.   |
| GarcR-NCSW-1.1.4   | Recovery Action | Estuary                      | Increase and enhance estuarine habitat complexity features   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-1.1.4.1 | Action Step     | Estuary                      | Increase the percentage of area containing high value habitat complexity elements and features (SAV, LWD, boulders, marshes, vegetation, pools > 2 meters).  | 2               | 10                      | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy       |             |         |          |          |          | 0               | Cost accounted for in other action steps.  |
| GarcR-NCSW-1.1.4.2 | Action Step     | Estuary                      | Identify key locations to install LWD structures targeting increased pool depth and habitat conditions within the Garcia estuary.  | 2               | 10                      | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC   |             |         |          |          |          | 0               | Cost accounted for in other action steps.  |
| GarcR-NCSW-1.1.4.3 | Action Step     | Estuary                      | Continue working with landowners and rehabilitating riparian conditions within the Garcia estuary.   | 2               | 50                      | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-1.1.5   | Recovery Action | Estuary                      | Improve estuarine freshwater inflow  |                 |                         |   |             |         |          |          |          |                 |  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|--------------------|-----------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                    |                 |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-1.1.5.1 | Action Step     | Estuary                      | Install a stream gauge immediately upstream of the estuary to monitor inflow conditions during the dry season.  | 2               |                         | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, SWRCB, The Nature Conservancy                                    | 1           |         |          |          |          | 1               | Cost for stream flow gauges estimated at \$1000/gauge. Cost estimate does not account for maintenance or data management.   |
| GarcR-NCSW-1.1.5.2 | Action Step     | Estuary                      | Investigate the hydrodynamics of freshwater inflow and estuary water quality conditions relative to juvenile salmonid estuarine summer rearing (osmoregulating and non-osmoregulating). | 2               | 10                      | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy   |             |         |          |          |          | 0               | Cost accounted for in estuary use/residence timing monitoring.  |
| GarcR-NCSW-1.1.5.3 | Action Step     | Estuary                      | Develop a stream flow model to identify and implement a minimum freshwater inflow threshold to ensure optimal estuary health and function for rearing salmonids.                        | 2               | 10                      | CDFW, Friends of the Garcia River, NMFS, NRCS, RCD, RWQCB, SWRCB, The Nature Conservancy   | 32.50       | 32.50   |          |          |          | 65              | Cost for stream flow modeling estimated at \$65,084/project.  |
| GarcR-NCSW-1.1.6   | Recovery Action | Estuary                      | Improve estuarine water quality   |                 |                         |  |             |         |          |          |          |                 |   |
| GarcR-NCSW-1.1.6.1 | Action Step     | Estuary                      | Install continuous water quality monitoring stations throughout the Garcia estuary.   | 2               | 5                       | CDFW, CDFW Law Enforcement, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy | 35.00       |         |          |          |          | 35              | Cost for continuous water quality monitoring stations estimated at \$5,000/station with a total of 7 gauges. Cost does not account for maintenance and data management. |
| GarcR-NCSW-1.1.6.2 | Action Step     | Estuary                      | Identify and implement strategies to address point pollutant sources causing impairment to estuarine water quality conditions.  | 2               | 20                      | BLM, CDFW, Friends of the Garcia River, NMFS, NRCS, Private Landowners, RCD, The Nature Conservancy                                  |             |         |          |          |          | 0               | Cost accounted for in other action steps.   |
| GarcR-NCSW-1.1.7   | Recovery Action | Estuary                      | Enhance macro-invertebrate abundance and taxa richness  |                 |                         |  |             |         |          |          |          |                 |   |
| GarcR-NCSW-1.1.7.1 | Action Step     | Estuary                      | Investigate and identify prey items/availability for rearing salmonids and the associated water quality conditions they reside.   | 3               | 15                      | CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Consultants, RCD, RWQCB, The Nature Conservancy                      |             |         |          |          |          | 0               | Cost accounted for other action steps.  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat   | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|--------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                                |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| <b>GarcR-NCSW-2.1</b> | <b>Objective</b> | <b>Floodplain Connectivity</b> | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-2.1.1      | Recovery Action  | Floodplain Connectivity        | Rehabilitate and enhance floodplain connectivity  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-2.1.1.1    | Action Step      | Floodplain Connectivity        | Conduct a Lower Garcia River off-channel low gradient habitat assessment targeting juvenile salmonid rearing requirements (biological performance criteria, i.e. reduced velocity targets relative to juvenile salmonids). Identify potential off-channel rehabilitation sites. | 2               | 5                       | BLM, CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy  | 150.00      |         |          |          |          | 150             | Cost based on estimate for habitat assessment of a limited reach of the river.  |
| GarcR-NCSW-2.1.1.2    | Action Step      | Floodplain Connectivity        | Work with landowners and encourage rehabilitation activities within the lower Hathaway Creek area in efforts to enhance backwater/off-channel and floodplain habitat for winter rearing salmonids.  | 2               | 100                     | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-2.1.1.3    | Action Step      | Floodplain Connectivity        | Identify, design, and implement rehabilitation projects that target winter rearing floodplain habitat within the lower reaches of the Garcia River.   | 2               | 5                       | CDFW, Mendocino Redwood Company, The Nature Conservancy   | 261.00      |         |          |          |          | 261             | Cost based on treating 7 miles (assume 1 project/mile in 25% High IP) at a rate of \$37,200/mile.                             |
| <b>GarcR-NCSW-3.1</b> | <b>Objective</b> | <b>Hydrology</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-3.1.1      | Recovery Action  | Hydrology                      | Improve flow conditions (baseflow conditions)   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-3.1.1.1    | Action Step      | Hydrology                      | Map all water diversions (including illegal and legal) and upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.   | 2               | 10                      | CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, Private Landowners, SWRCB, The Nature Conservancy                       |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-3.1.1.2    | Action Step      | Hydrology                      | Install and maintain stream gauges within the following tributaries that provide cold water to the Garcia River mainstem: Hathaway, North Fork, Rolling Brook, Mill Creek (lower Garcia River), South Fork, Signal, Mill Creek (upper Garcia River).                            | 2               | 10                      | CDFW, NMFS, Private Landowners, SWRCB, The Nature Conservancy   | 3.50        | 3.50    |          |          |          | 7               | Cost for 7 stream flow gauges estimated at \$1000/gauge. Cost does not account for maintenance or data management.            |
| GarcR-NCSW-3.1.1.3    | Action Step      | Hydrology                      | Identify strategic locations to install off-channel storage facilities to reduce impacts associated with water diversions (e.g. storage tanks for rural residential users).   | 2               | 30                      | CDFW, NMFS, NRCS, Private Landowners, RCD, SWRCB  |             |         |          |          |          | TBD             | Cost are difficult to determine because based on landowner participation and extent of off-channel storage facilities needed. |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GarcR-NCSW-3.1.1.4    | Action Step      | Hydrology                    | CDFW, SWRCB, RWQCB, CalFire, Caltrans, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact salmonids. These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality (CDFG 2004). | 2               | 60                      | CalFire, CalTrans, CDFW, Mendocino County Department of Public Works, Private Landowners, RWQCB                     |             |         |          |          |          | 0               | Most diversions in the Garcia for dust control are for timber management actions. Most of these diversion have a Lake and Streambed Alteration Agreement with the Department of Fish and Wildlife and are likely incorporated into existing operations. Action is considered In-Kind |
| <b>GarcR-NCSW-4.1</b> | <b>Objective</b> | <b>Landscape Patterns</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-4.1.1      | Recovery Action  | Landscape Patterns           | Prevent or minimize increased landscape disturbance   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-4.1.1.1    | Action Step      | Landscape Patterns           | Work with CDFW and TNC to designate the Garcia River as a protected "salmonid preserve".  | 2               | 100                     | CDFW, Conservation Fund, NMFS, NOAA RC, Private Landowners, State Parks, The Nature Conservancy, Trout Unlimited    |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-4.1.1.2    | Action Step      | Landscape Patterns           | Should large tracts of forestlands within the Garcia River watershed become available for purchase, the State of California and/or the Federal Government should consider purchasing the area as a Demonstration Forest, State Park, or protected "salmonid preserve".  | 2               | 100                     | CDFW, Conservation Fund, NMFS, NOAA RC, Private Landowners, State Parks, The Nature Conservancy, Trout Unlimited    |             |         |          |          |          | TBD             | Cost are difficult to determine because of fair market value and land use turnover.  |
| GarcR-NCSW-4.1.1.3    | Action Step      | Landscape Patterns           | Discourage counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).  | 2               | 100                     | CDFW, Mendocino County, NMFS, Sonoma County   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>GarcR-NCSW-5.1</b> | <b>Objective</b> | <b>Passage</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-5.1.1      | Recovery Action  | Passage                      | Modify or remove physical passage barriers  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-5.1.1.1    | Action Step      | Passage                      | Evaluate, design, and implement strategies to address potential impairment to passage due to vegetation encroachment or "choking" in Hathaway Creek. Ensure that winter rearing refuge for juvenile salmonids is optimized. Investigate habitat quality in upper Hathaway Creek.  | 2               | 5                       | BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy | 52.00       |         |          |          |          | 52              | Cost based on treating 8 acres at a rate of \$6,400/acre.  |
| GarcR-NCSW-5.1.1.2    | Action Step      | Passage                      | Evaluate, design, and implement appropriate fish passage at Bridge at Highway 1 on Hathaway Creek (Gasker Slough) (See CALFISH: PAD_ID 716762; Passage ID 26883).   | 3               | 5                       | CalTrans, CDFW, NMFS, USACE   | 660.00      |         |          |          |          | 660             | Cost based on treating passage for major 2 lane road at a rate of \$653,406/unit.  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level       | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|---------------------|-------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                     |             |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-5.1.1.3  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Mill Creek (See CALFISH: PAD_ID 705892; Passage ID 7210)                            | 3               | 5                       | CDFW, Mendocino County, NMFS, NOAA RC, Private Landowners, USACE | 660         |         |          |          |          | 660             | Cost based on providing passage for a small waterway at a rate of \$653,406/unit. |
| GarcR-NCSW-5.1.1.4  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Mill Creek (See CALFISH: PAD_ID 705893; Passage ID 7211).                           | 3               | 5                       | CDFW, Mendocino County, NMFS, USACE                              | 660         |         |          |          |          | 660             | Cost based on providing passage for a small waterway at a rate of \$653,406/unit. |
| GarcR-NCSW-5.1.1.5  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at private road crossing on Mill Creek (See CALFISH: PAD_ID 713212; Passage ID 16600).                   | 3               | 5                       | CDFW, Mendocino County, NMFS, Private Landowners, USACE          | 260.00      |         |          |          |          | 260             | Cost based on treating a minor 2 lane road at a rate of \$254,065/unit.           |
| GarcR-NCSW-5.1.1.6  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at private road crossing on Mill Creek (See CALFISH: PAD_ID 713213; Passage ID 16601).                   | 3               | 5                       | CDFW, Mendocino County, NMFS, Private Landowners, USACE          | 260.00      |         |          |          |          | 260             | Cost based on treating a minor 2 lane road at a rate of \$254,065/unit.           |
| GarcR-NCSW-5.1.1.7  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Sled Creek (See CALFISH: PAD_ID 713211; Passage ID 16599)                           | 3               | 5                       | CDFW, Mendocino County, USACE                                    | 660         |         |          |          |          | 660             | Cost based on providing passage on a small waterway at a rate of \$653,406/unit.  |
| GarcR-NCSW-5.1.1.8  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at private road crossing on Hathaway Creek (See CALFISH: PAD_ID 716763; Passage ID 26884).               | 2               | 5                       | CDFW, Mendocino County, NMFS, Private Landowners, USACE          | 260.00      |         |          |          |          | 260             | Cost based on treating minor 2 lane road at a rate of \$254,065/unit.             |
| GarcR-NCSW-5.1.1.9  | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at culvert at mouth on SF Garcia River (See CALFISH: PAD_ID 712859; Passage ID 16063).                   | 3               | 5                       | CalTrans, CDFW, Mendocino County, NMFS, NOAA RC, USACE           | 470.00      |         |          |          |          | 470             | Cost based on treating major 2 lane road at a rate of \$468,022/unit.             |
| GarcR-NCSW-5.1.1.10 | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at culvert on Flemming Creek (See CALFISH: PAD_ID 723443; Passage ID 9525)                               | 3               | 5                       | CDFW, Mendocino County, NMFS, Private Landowners, USACE          | 255.00      |         |          |          |          | 255             | Cost based on treating minor 2 lane road at a rate of \$254,065/unit.             |
| GarcR-NCSW-5.1.1.11 | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at unnamed tributary to SF Garcia River (See CALFISH: PAD_ID 723441; Passage ID 9523).                   | 3               | 5                       | CDFW, Mendocino County, NMFS, Private Landowners, USACE          | 255.00      |         |          |          |          | 255             | Cost base on treating minor 2 lane road at a rate of \$254,065/unit.              |
| GarcR-NCSW-5.1.1.12 | Action Step | Passage                      | Evaluate, design, and implement appropriate fish passage at culvert on unnamed tributary to main stem Garcia River (See CALFISH: PAD_ID 723440; Passage ID 9522). | 3               | 5                       | CDFW, Mendocino County, Private Landowners, USACE                | 255.00      |         |          |          |          | 255             | Cost based on treating minor 2 lane road at a rate of \$254,065/unit.             |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-5.1.1.13   | Action Step      | Passage                      | Evaluate, design, and implement appropriate fish passage at identified logjams throughout the Garcia watershed (only if necessary).                                     | 3               | 20                      | CDFW, Mendocino County, Mendocino County Fish and Wildlife Advisory Board, Mendocino Redwood Company, NMFS, Private Landowners, USACE                        |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-5.1.1.14   | Action Step      | Passage                      | Identify and prioritize all logjams that are complete or partial barriers and indicate passage impairment to specific life stage (Bell 2006, as cited by KrisWeb 2011). | 3               | 20                      | CDFW, TNC, NOAA RC, RCD, Private Landowners  |             |         |          |          |          | 0               | Action is considered standard practice and is In-Kind   |
| GarcR-NCSW-5.1.1.15   | Action Step      | Passage                      | Ensure that all logjams are carefully modified and that all LWD remains in the active stream channel (Monschke and Caldon 1992).  | 3               | 30                      | NOAA RC, RCD, Private Landowners   |             |         |          |          |          | 0               | Action is considered standard practice and is In-Kind   |
| <b>GarcR-NCSW-6.1</b> | <b>Objective</b> | <b>Habitat Complexity</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| GarcR-NCSW-6.1.1      | Recovery Action  | Habitat Complexity           | Increase large wood frequency (BFW 0-10 meters)   |                 |                         |  |             |         |          |          |          |                 |   |
| GarcR-NCSW-6.1.1.1    | Action Step      | Habitat Complexity           | Increase wood frequency in spawning and rearing areas to the extent that a minimum of six key LWD pieces exists every 100 meters in 0-10 meters BFW streams.            | 2               | 10                      | CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy | 130.00      | 130.00  |          |          |          | 260             | Cost based on treating 10 miles of stream at a rate of \$26,000/mile. If ELJ projects implemented, cost could be \$1,040,000. |
| GarcR-NCSW-6.1.1.2    | Action Step      | Habitat Complexity           | Identify and install key LWD pieces in Rolling Brook to the extent that LWD frequency is optimized.   | 3               | 10                      | CDFW, NMFS, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy   |             |         |          |          |          | 0               | Cost accounted for in increase wood frequency in spawning in rearing habitat.   |
| GarcR-NCSW-6.1.2      | Recovery Action  | Habitat Complexity           | Increase large wood frequency (BFW 10-100 meters)   |                 |                         |  |             |         |          |          |          |                 |   |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level       | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|--------------------|-------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                    |             |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-6.1.2.1 | Action Step | Habitat Complexity           | Increase wood frequency in seasonal habitat and migratory reaches to the extent that a minimum of 1.3 to 4 key LWD pieces exists every 100 meters in 10-100 meter BFW streams.                            | 2               | 10                      | Board of Forestry, CalFire, CDFW, Conservation Fund, Friends of the Gualala River Watershed, Mendocino Redwood Company, NMFS, NOAA RC, Private Landowners, Public, RCD, RWQCB, The Nature Conservancy | 169.00      | 169.00  |          |          |          | 338             | Cost based on treating 13 miles of stream at a rate of \$26,000/mile. Cost to treat 13 miles of stream with ELJ would be \$1,352,000. |
| GarcR-NCSW-6.1.2.2 | Action Step | Habitat Complexity           | Target Signal Creek, North Fork Garcia, Rolling Brook, lower Mill Creek, Pardaloe, Blue Waterhole, Lanmour, and upper Mill Creek sub-basins as high priorities for LWD placement and rehabilitation work. | 2               | 20                      | CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy  |             |         |          |          |          | 0               | Cost accounted for in increase wood frequency in seasonal habitat.  |
| GarcR-NCSW-6.1.2.3 | Action Step | Habitat Complexity           | Evaluate and implement strategies to rehabilitate LWD frequency and natural recruitment within the Garcia River main stem.  | 2               | 20                      | CDFW, Conservation Fund, Friends of the Garcia River, NMFS, NOAA RC, Private Landowners, Public, RCD, RWQCB, The Nature Conservancy   |             |         |          |          |          |                 | Cost likely to be included as part of the restoration action and or required as part of the permitting process.                       |
| GarcR-NCSW-6.1.2.4 | Action Step | Habitat Complexity           | Identify strategic locations to install key LWD features in the SF Garcia mainstem to the extent that habitat complexity is optimized.  | 2               | 20                      | CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, Public, Railroad, RWQCB, The Nature Conservancy                             |             |         |          |          |          | 0               | Cost accounted for in increase wood frequency in seasonal habitat.  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|--------------------|-----------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                    |                 |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-6.1.2.5 | Action Step     | Habitat Complexity           | Encourage coordination of LWD placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort (CDFG 2004).  | 2               | 100                     | CalFire, CDFW, Private Landowners   |             |         |          |          |          | 0               | Action is considered standard practice and is In-Kind   |
| GarcR-NCSW-6.1.3   | Recovery Action | Habitat Complexity           | Increase primary pools frequency   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-6.1.3.1 | Action Step     | Habitat Complexity           | Increase the number of primary pools to the extent that more than 40% of summer rearing pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams.)                        | 2               | 10                      | CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy   | 169.00      | 169.00  |          |          |          | 338             | Cost based on treating 13 miles (50% of High IP) at a rate of \$26,000/mile. This may be combined with increasing LWD, reducing overall cost.                       |
| GarcR-NCSW-6.1.3.2 | Action Step     | Habitat Complexity           | Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches within the following tributaries: Fleming Creek, Little SF Garcia, Signal Creek (and tribs).                                     | 2               | 20                      | CDFW, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, RWQCB, The Nature Conservancy  |             |         |          |          |          | TBD             | Cost accounted for in increase the number of primary pools.   |
| GarcR-NCSW-6.1.4   | Recovery Action | Habitat Complexity           | Improve shelter  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-6.1.4.1 | Action Step     | Habitat Complexity           | Increase the number of pools that have a minimum shelter of 80 (See NMFS/CDFG criteria).   | 2               | 10                      | CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, The Nature Conservancy |             |         |          |          |          | 0               | Cost are associated with other recovery actions such as increase LWD and increasing primary pools.  |
| GarcR-NCSW-6.1.4.2 | Action Step     | Habitat Complexity           | Evaluate, identify, and improve shelters in pools within the mainstem Garcia River and the following tributaries: Blue Waterhole, Fleming Creek, Graphite Creek, Inman Creek, Little SF Garcia, NF Garcia, and Signal Creek (and tribs). | 2               | 10                      | CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy                      |             |         |          |          |          |                 | Cost based on treating 13 miles (50% of High IP), assuming this recovery action is separate from increase large wood and primary pools, at a rate of \$26,000/mile. |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| <b>GarcR-NCSW-7.1</b> | <b>Objective</b> | <b>Riparian</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-7.1.1      | Recovery Action  | Riparian                     | Improve canopy cover   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-7.1.1.1    | Action Step      | Riparian                     | Increase the average stream canopy cover within all current and potential salmonid spawning and rearing reaches to a minimum of 80%.   | 2               | 20                      | Board of Forestry, CalFire, Conservation Fund, Mendocino Redwood Company, NMFS, RWQCB, The Nature Conservancy | 101         | 101     | 101      | 101      |          | 404             | Cost based on treating 2 miles (assume 10 acres/mile treated in 5% High IP) at a rate of \$20,719/acre. |
| GarcR-NCSW-7.1.1.2    | Action Step      | Riparian                     | Plant and protect riparian vegetation, including redwood, on the lower 7 mile reach (Eureka Hill Road Bridge and Windy Hollow Road) or where necessary to provide the following: shade and lower water temperatures, cover, protection for fish, bank protection from erosion, and large organic debris in the future for habitat (Bell 2003). | 2               | 10                      | Board of Forestry, CalFire, CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy |             |         |          |          |          | 0               | Cost accounted for in increase average stream canopy.   |
| GarcR-NCSW-7.1.1.3    | Action Step      | Riparian                     | Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy within the Blue Waterhole sub-basin.          | 2               | 20                      | Board of Forestry, CalFire, Conservation Fund, Mendocino Redwood Company, NMFS, RWQCB, The Nature Conservancy |             |         |          |          |          | 0               | Cost accounted for in increase average stream canopy.   |
| GarcR-NCSW-7.1.1.4    | Action Step      | Riparian                     | Minimize effects to existing native riparian vegetation where stream cover is provided.  | 2               | 20                      | Board of Forestry, CalFire, CDFW, Conservation Fund, NMFS, RWQCB, The Nature Conservancy                      |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-7.1.2      | Recovery Action  | Riparian                     | Improve tree diameter  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-7.1.2.1    | Action Step      | Riparian                     | Increase tree diameter to a minimum of 80% CWHR density rating "D" across all current and potential spawning and juvenile rearing areas.   | 2               | 20                      | Board of Forestry, CalFire, Conservation Fund, NMFS, RWQCB, The Nature Conservancy                            |             |         |          |          |          | 0               | Cost accounted for in increase canopy cover.  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-7.1.2.2    | Action Step      | Riparian                     | Conduct conifer release to promote growth of larger diameter trees where appropriate.   | 2               | 10                      | Board of Forestry, CDFW, Conservation Fund, NMFS, Private Landowners, RCD, RWQCB, The Nature Conservancy                                      | 235.00      | 235.00  |          |          |          | 470             | Cost based on treating 4 miles (assume 80 acres/mile in 15% High IP) at a rate of \$1,468/acre.   |
| GarcR-NCSW-7.1.2.3    | Action Step      | Riparian                     | Develop a Large Wood Recruitment Plan that assesses instream wood needs, and sites potentially responsive to wood recruitment or placement, and develop a riparian strategy to ensure long term natural recruitment of wood via large tree retention.   | 3               | 2                       | AC Alliance, Board of Forestry, Napa CFCWCD, NOAA RC, NOAA/NMFS, NRCS, The Nature Conservancy   | 80.00       |         |          |          |          | 80              | Cost based on \$20K in each high priority subbasin over a two year period.  |
| GarcR-NCSW-7.1.2.4    | Action Step      | Riparian                     | Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (CDFG 2004). Focus on partnerships with railroad and timber industry, as well as large private landowners.   | 3               | 20                      | CA Coastal Commission, California Coastal Conservancy, CDFW, Mendocino County, NMFS, NRCS, Private Landowners, RCD, Redwood Forest Foundation |             |         |          |          |          | TBD             | Costs can not be determined without additional information on the potential projects within this basin.   |
| <b>GarcR-NCSW-8.1</b> | <b>Objective</b> | <b>Sediment</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-8.1.1      | Recovery Action  | Sediment                     | Improve and expand instream gravel quantity   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-8.1.1.1    | Action Step      | Sediment                     | Conduct a habitat survey assessment to determine extent of embeddedness.  |                 |                         |   |             |         |          |          |          |                 | Cost for habitat survey estimated at \$353/IP km. Assume survey High IP, cost estimated at \$15,000. This action step could be incorporated in other monitoring and assessment actions. |
| GarcR-NCSW-8.1.1.2    | Action Step      | Sediment                     | Use the results of the habitat survey to identify areas with high embeddedness and implement gravel enhancement and sediment controls in those areas. Increase the percentage of gravel quality embeddedness to values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) in all current and potential juvenile salmonid summer and seasonal (fall/winter/spring) rearing areas. | 2               | 20                      | CDFW, Conservation Fund, Friends of the Garcia River, NMFS, NOAA RC, RWQCB, The Nature Conservancy  |             |         |          |          |          | TBD             | Costs will vary with methods and extent of gravel enhancement and sediment control projects.  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GarcR-NCSW-8.1.1.3     | Action Step      | Sediment                     | Identify and implement strategies to treat landslides and remediate historic features such as stream side landings and log landings (Bell 2003).   | 3               | 10                      | CDFW, Conservation Fund, Friends of the Garcia River, NMFS, NOAA RC, Private Landowners, RWQCB, The Nature Conservancy |             |         |          |          |          | TBD             | Cost will vary with methods and extent of treatments.  |
| GarcR-NCSW-8.1.1.4     | Action Step      | Sediment                     | Complete the remaining 25% of erosion control sites identified in the South Fork Garcia River by the Trout Unlimited North Coast Coho Project.   | 2               | 5                       | CDFW, Mendocino Redwood Company, Trout Unlimited   |             |         |          |          |          | TBD             | Need cost estimates from project proponents.   |
| GarcR-NCSW-8.1.1.5     | Action Step      | Sediment                     | Treat high and medium priority sites that are identified in the MRC Garcia River Watershed Analysis, Garcia River Forest Integrated Resource Management Plan and other credible landowner assessments.     | 1               | 10                      | CDFW, NOAA RC, Private Consultants, Private Landowners, SWRCB  | 500         | 500     |          |          |          | 1,000           | Based on \$1 million estimate for Garcia river forest sites.   |
| GarcR-NCSW-8.1.1.6     | Action Step      | Sediment                     | Acquire funding for assessment and implementation of sediment reduction measures associated with the 2008 Jacks Fire which occurred in the North Fork Garcia River subbasin.                               | 2               | 2                       | CalFire, NRCS, Private Landowners, RCD   | 200         |         |          |          |          | 200             | Rough estimate for erosion control in affected area.   |
| GarcR-NCSW-8.1.1.7     | Action Step      | Sediment                     | Continue the implementation of the Garcia River TMDL and associated sediment reduction efforts.  | 1               | 20                      | Board of Forestry, CalFire, CDFW, NMFS, NOAA RC, RWQCB, The Nature Conservancy   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-8.1.1.8     | Action Step      | Sediment                     | Develop and implement bank erosion prevention and riparian planting in Pardaloe Creek (Monschke and Caldon 1992).  | 2               | 10                      | CDFW, Conservation Fund, NMFS, NOAA RC, RCD, RWQCB, The Nature Conservancy   | 11.50       | 11.50   |          |          |          | 23              | Cost based on treating 0.5 mile of bank at a rate of \$25,000/mile for bank erosion and \$20,719/mile for riparian planting. |
| <b>GarcR-NCSW-10.1</b> | <b>Objective</b> | <b>Water Quality</b>         | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |  |
| GarcR-NCSW-10.1.1      | Recovery Action  | Water Quality                | Improve stream temperature conditions  |                 |                         |  |             |         |          |          |          |                 |  |
| GarcR-NCSW-10.1.1.1    | Action Step      | Water Quality                | Work with TNC and Stillwater Sciences to develop a "Basin Temp" model to aid in efforts to reduce stream temperatures between Signal and the Pardaloe/Mill creeks confluence.                              | 2               | 10                      | CDFW, Conservation Fund, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy                         |             |         |          |          |          | 0               | Cost accounted for in development of stream flow model.  |
| GarcR-NCSW-10.1.1.2    | Action Step      | Water Quality                | Work with landowners to plant riparian zones of Blue Waterhole, Inman Creek, and Pardaloe Creek with the goal of reducing instream water temperatures of the Garcia River main stem during the dry season. | 2               | 10                      | CDFW, NOAA RC, Private Landowners  |             |         |          |          |          | TBD             | Cost will depend on the length of reaches identified for planting.   |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-10.1.1.3    | Action Step      | Water Quality                | Identify and Implement actions to maintain and restore water temperatures to meet habitat requirements for salmonids in specific streams (CDFG 2004).  | 2               | 10                      | CDFW, CDFW Law Enforcement, NMFS OLE, NOAA RC, NOAA/NMFS, Private Landowners, RCD |             |         |          |          |          | TBD             | Costs will vary with methods and extent of actions taken. |
| <b>GarcR-NCSW-16.1</b> | <b>Objective</b> | <b>Fishing/Collecting</b>    | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-16.1.1      | Recovery Action  | Fishing/Collecting           | Prevent or minimize reduced density, abundance, and diversity based on the biological recovery criteria  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-16.1.1.1    | Action Step      | Fishing/Collecting           | Work with CDFW to modify California code of Regulations Section 8.00(b)(1) low flow minimum flow closure for Mendocino, Sonoma, and Marin counties. Discontinue using the Russian River at Guerneville gauging station for angling closures and use the Navarro River USGS gauging station (11468000) which better reflects hydrologic conditions in smaller unregulated coastal Sonoma/Mendocino streams. | 2               | 30                      | CDFW, NMFS  |             |         |          |          |          | 0               | Action is considered In-Kind                              |
| GarcR-NCSW-16.1.1.2    | Action Step      | Fishing/Collecting           | Reduce poaching of adult salmonids by increasing law enforcement.  | 1               | 100                     | CDFW, NOAA/NMFS   |             |         |          |          |          | 0               | Action is considered In-Kind                              |
| GarcR-NCSW-16.1.1.3    | Action Step      | Fishing/Collecting           | Promote CalTip to discourage poaching (CDFG 2004).   | 2               | 100                     | CDFW, DFG, NOAA/NMFS  |             |         |          |          |          | 0               | Action is considered In-Kind                              |
| <b>GarcR-NCSW-16.2</b> | <b>Objective</b> | <b>Fishing/Collecting</b>    | <b>Address other natural or manmade factors affecting the species' continued existence</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-16.2.1      | Recovery Action  | Fishing/Collecting           | Prevent or minimize reduced density, abundance, and diversity based on the biological recovery criteria  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-16.2.1.1    | Action Step      | Fishing/Collecting           | Investigate and consult with local tribal officials in efforts to stop or minimize tribal gill-netting in the Garcia River watershed.  | 1               | 30                      | CDFW, CDFW Law Enforcement, NMFS OLE, NOAA/NMFS, Pomo Tribe                       |             |         |          |          |          | 0               | Action is considered In-Kind                              |
| <b>GarcR-NCSW-18.1</b> | <b>Objective</b> | <b>Livestock</b>             | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-18.1.1      | Recovery Action  | Livestock                    | Prevent or minimize impairment to estuary quality and extent   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-18.1.1.1    | Action Step      | Livestock                    | Work with BLM to ensure that future cattle leasing agreements do not reduce potential rehabilitation of high value summer and winter juvenile salmonid rearing habitat within the lower Garcia River and estuary.  | 2               | 20                      | BLM, CDFW, NOAA RC, NOAA/NMFS   |             |         |          |          |          | 0               | Action is considered In-Kind                              |
| <b>GarcR-NCSW-19.1</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-19.1.1      | Recovery Action  | Logging                      | Prevent or minimize impairment to water quality (instream water temperature)   |                 |                         |   |             |         |          |          |          |                 |   |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level           | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|---------------------|-----------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                     |                 |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GarcR-NCSW-19.1.1.1 | Action Step     | Logging                      | Protect current riparian zones in all summer salmonid rearing areas to the extent that they are able to mature, provide, and maintain a minimum of 80% canopy cover.  | 2               | 50                      | Board of Forestry, CalFire, CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, NOAA RC, Private Landowners, RWQCB, The Nature Conservancy |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-19.1.2   | Recovery Action | Logging                      | Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)   |                 |                         |  |             |         |          |          |          |                 |  |
| GarcR-NCSW-19.1.2.1 | Action Step     | Logging                      | Ensure future forest management allows for optimal levels of natural LWD recruitment of larger older trees into stream channels   | 2               | 100                     | CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, RWQCB, The Nature Conservancy  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-19.1.3   | Recovery Action | Logging                      | Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)  |                 |                         |  |             |         |          |          |          |                 |  |
| GarcR-NCSW-19.1.3.1 | Action Step     | Logging                      | Develop and implement low impact timber and wood harvest techniques (e.g., full-suspension cable yarding) in efforts to reduce turbidity impacts in streams. Example: Parker Ranch in the Ten Mile River Basin (Bell 2003). | 2               | 100                     | Board of Forestry, CDFW, Conservation Fund, Mendocino Redwood Company, Private Landowners, RWQCB, The Nature Conservancy                         |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind |
| GarcR-NCSW-19.1.3.2 | Action Step     | Logging                      | Extend the monitoring period and upgrade THP road maintenance after harvest.  | 2               | 60                      | CalFire  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-19.1.3.3 | Action Step     | Logging                      | New THPs should identify problematic legacy roads within WLPZ's, decommission them, and revegetate the area with appropriate native species.  | 2               | 20                      | CalFire, Mendocino Redwood Company, NOAA RC, Private Landowners  |             |         |          |          |          | TBD             | Cost will vary with THP development near streams with legacy roads.                      |
| GarcR-NCSW-19.1.4   | Recovery Action | Logging                      | Prevent or minimize increased landscape disturbance   |                 |                         |  |             |         |          |          |          |                 |  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-19.1.4.1    | Action Step      | Logging                      | Areas adjacent to currently owned State parks or forestlands supporting essential or supporting populations should be considered for purchase (if feasible within the next 5 years).   | 2               | 50                      | CDFW, NMFS, Private Landowners, Redwood Forest Foundation, The Nature Conservancy, Trout Unlimited       |             |         |          |          |          | TBD             | Cost estimates are difficult to determine as this action step is driven by current market value and rate of turnover. |
| GarcR-NCSW-19.1.4.2    | Action Step      | Logging                      | Should large tracts of forestlands within the Garcia River watershed become available for purchase, the State of California and/or the Federal Government should consider purchasing the area as a Demonstration Forest, State Park, or protected "salmonid preserve". | 2               | 50                      | CDFW, NMFS, Redwood Forest Foundation, RWQCB, The Nature Conservancy                                     |             |         |          |          |          | TBD             |   |
| GarcR-NCSW-19.1.4.3    | Action Step      | Logging                      | Continue the activities of the North Coast Watershed Assessment / Coastal Watershed Program.   | 2               | 20                      | CDFW, NMFS, Private Landowners   |             |         |          |          |          | TBD             | NCWP/Coastal Watershed Program needs to implement assessment in the Garcia River basin.                               |
| GarcR-NCSW-19.1.4.4    | Action Step      | Logging                      | Maintain and expand California's working forestlands and forestlands held by the State, and minimize future conversion of forestlands to agriculture or other land uses.   | 2               | 20                      | Board of Forestry, CalFire, CDFW, NMFS, RWQCB  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>GarcR-NCSW-19.2</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| GarcR-NCSW-19.2.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |  |             |         |          |          |          |                 |   |
| GarcR-NCSW-19.2.1.1    | Action Step      | Logging                      | Discourage Counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).   | 1               | 20                      | Board of Forestry, CA Coastal Commission, CDFW, NMFS   |             |         |          |          |          | 0               | Cost expected to be minimal to improve coordination with Mendocino County. Action is considered In-Kind               |
| GarcR-NCSW-19.2.1.2    | Action Step      | Logging                      | Work with the California Board of Forestry to design and implement a program of BMPs for logging areas that meets the approval of NMFS and CDFW.   | 3               | 20                      | Board of Forestry, CDFW, NMFS, RWQCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-19.2.1.3    | Action Step      | Logging                      | Conduct an assessment of the mechanisms driving forestland conversion and develop strategies to protect forestlands.   | 3               | 10                      | Board of Forestry, Mendocino County, NMFS  |             |         |          |          |          | TBD             |   |
| GarcR-NCSW-19.2.1.4    | Action Step      | Logging                      | Consider the development of a Watershed Database (similar to the CDFW Northern Spotted Owl database) for salmonids that provides watershed data and information in a consistent fashion to all foresters for consideration in their harvest plans.                     | 2               | 20                      | Board of Forestry, CDFW, NMFS  | 25.00       | 25.00   | 25.00    | 25.00    |          | 100             | Assumes data for the Garcia River portion of the database can be maintained for \$5k per year.                        |
| GarcR-NCSW-19.2.1.5    | Action Step      | Logging                      | Establish a scientific framework for monitoring the effectiveness of practices in meeting watershed process goals and a decision-making process that is adaptive to the new information.   | 1               | 30                      | Board of Forestry, CalFire, CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-19.2.1.6    | Action Step      | Logging                      | Provide information to BOF regarding salmonid recovery priorities identified in the Plan, and recommend upgrading relevant forest practices to minimize adverse effects of timber harvest.   | 1               | 2                       | CDFW, NMFS   |             |         |          |          |          | 0               | This is underway. Action is considered In-Kind  |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GarcR-NCSW-19.2.1.7    | Action Step      | Logging                      | Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).   | 1               | 100                     | CA Coastal Commission, CDFW, Mendocino County, NMFS                                       |             |         |          |          |          | 0               | Need to determine the number of regulatory staff to control rural development in Mendocino County. Action is considered In-Kind                            |
| GarcR-NCSW-19.2.1.8    | Action Step      | Logging                      | Assign 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).                              | 1               | 5                       | Board of Forestry, CalFire, CDFW, NMFS  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-19.2.1.9    | Action Step      | Logging                      | Develop a California Forest Practice monitoring protocol to determine whether specific practices are effectively meeting intended objectives and are providing for the protection of salmonids.   | 3               | 20                      | Board of Forestry, CalFire, NMFS, NRCS, RCD, RWQCB, The Nature Conservancy                |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>GarcR-NCSW-23.1</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-23.1.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-23.1.1.1    | Action Step      | Roads/Railroads              | Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in historical habitats.  | 2               | 10                      | Board of Forestry, CalFire, Mendocino County, NMFS, NOAA RC, RWQCB                        | 495.00      | 495.00  |          |          |          | 990             | Cost based on treating 82 miles of road network at a rate of \$12,000/mile.  |
| GarcR-NCSW-23.1.1.2    | Action Step      | Roads/Railroads              | Map and identify stream crossings with the intention of replacement or removal if they cannot pass the 100 year flow. Designs should include fail safe measures to accommodate culvert overflow without causing massive road fill failures. | 2               | 10                      | CDFW, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners, RCD | 39.50       | 39.50   |          |          |          | 79              | Number of culverts and specific details to upgrade are needed to estimate cost. Cost based on road inventory of 82 miles at a rate of \$957/mile.          |
| GarcR-NCSW-23.1.1.3    | Action Step      | Roads/Railroads              | Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).                             | 3               | 10                      | CalFire, CDFW, Mendocino County Department of Public Works, NRCS, Private Landowners      |             |         |          |          |          | 0               | Ten year duration to accommodate changes in BMPs. Action is considered In-Kind   |
| GarcR-NCSW-23.1.1.4    | Action Step      | Roads/Railroads              | Restoration projects that upgrade or decommission high risk roads should be considered an extremely high priority for funding (e.g., PCSRF).  | 2               | 20                      | CDFW, NOAA RC, NRCS   |             |         |          |          |          | 0               | Costs considered In-Kind to prioritize projects.   |
| GarcR-NCSW-23.1.1.5    | Action Step      | Roads/Railroads              | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).  | 2               | 20                      | CalFire, CDFW, NOAA RC, NRCS, Private Landowners, RCD                                     | 19.00       | 19.00   | 19.00    | 19.00    |          | 76              | Cost based on decommissioning 6.2 miles of riparian roads at a rate of \$12,000/mile. Cost may be less than other basins due to TMDLs in place since 1997. |
| GarcR-NCSW-23.1.1.6    | Action Step      | Roads/Railroads              | Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.  | 2               | 20                      | CalFire, CDFW, NOAA RC, NRCS, Private Landowners, RCD                                     |             |         |          |          |          | 0               | Costs are related to maintenance and enforcement of gates and other closure techniques. Action is considered In-Kind                                       |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat   | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|--------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                                |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GarcR-NCSW-23.1.2      | Recovery Action  | Roads/Railroads                | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-23.1.2.1    | Action Step      | Roads/Railroads                | Develop a private road database using standardized methods. The methods should document all road features, apply erosion rates, and compile information into a GIS database.  | 3               | 5                       | CalFire, Mendocino County Department of Public Works, NMFS, Private Consultants, Private Landowners                       | 50.00       |         |          |          |          | 50              | Cost estimate for entire basin.   |
| GarcR-NCSW-23.1.2.2    | Action Step      | Roads/Railroads                | Develop a Salmon Certification Program for road maintenance staff.  | 2               | 10                      | CDFW, Mendocino County, NOAA RC, NRCS, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-23.1.2.3    | Action Step      | Roads/Railroads                | All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) should accommodate 100-year flood flows and associated bedload and debris.   | 3               | 20                      | Mendocino County, NMFS, NRCS, Private Landowners, RCD   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-23.1.2.4    | Action Step      | Roads/Railroads                | Evaluate existing and future stream crossings that impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.  | 3               | 10                      | Board of Forestry, CalFire, CDFW, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, RCD, RWQCB | 335.00      | 335.00  |          |          |          | 670             | Cost based on replacing 3 stream crossings at a rate of \$223,051/unit. |
| GarcR-NCSW-23.1.2.5    | Action Step      | Roads/Railroads                | Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.  | 2               | 5                       | CalFire, CalTrans, CDFW, NMFS, NRCS, Private Landowners   | 250.00      |         |          |          |          | 250             | Based on approximately \$50k to do inspections for a five year period.  |
| GarcR-NCSW-23.1.3      | Recovery Action  | Roads/Railroads                | Prevent or minimize impairment to passage and migration   |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-23.1.3.1    | 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 feasible in order to minimize drift accumulation and facilitate fish passage. | 2               | 100                     | CalTrans, Mendocino County Department of Public Works   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GarcR-NCSW-23.1.3.2    | Action Step      | Roads/Railroads                | Ensure that all future road or bridge repairs at stream crossing provide unimpaired fish passage for all salmonid life stages.  | 2               | 20                      | Mendocino County  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>GarcR-NCSW-24.1</b> | <b>Objective</b> | <b>Severe Weather Patterns</b> | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |   |
| GarcR-NCSW-24.1.1      | Recovery Action  | Severe Weather Patterns        | Prevent or minimize impairment to stream hydrology (stream flow)  |                 |                         |   |             |         |          |          |          |                 |   |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat        | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|-------------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                                     |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GarcR-NCSW-24.1.1.1    | Action Step      | Severe Weather Patterns             | Implement water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.  | 2               | 20                      | CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, RWQCB, SWRCB                                    |             |         |          |          |          | TBD             | Costs will vary based on methods and extent of conservation strategies.        |
| <b>GarcR-NCSW-25.1</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.1.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.1.1.1    | Action Step      | Water Diversion/ Impoundment        | Minimize impacts to flow either directly or indirectly through groundwater withdrawals and aquifer depletion.  | 2               | 20                      | CDFW, NMFS, SWRCB   |             |         |          |          |          | TBD             | Costs will vary based on methods and extent of remediation actions.            |
| GarcR-NCSW-25.1.1.2    | Action Step      | Water Diversion/ Impoundment        | Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and California Water Code §1707 (CDFG 2004).   | 2               | 20                      | CDFW, NOAA RC, Private Landowners, SWRCB  |             |         |          |          |          | TBD             | Cost will vary with the number of water rights holders willing to participate. |
| GarcR-NCSW-25.1.2      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to passage and migration  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.1.2.1    | Action Step      | Water Diversion/ Impoundment        | Establish flow related adult and smolt migration thresholds to consider in authorizing future water diversions.  | 2               | 20                      | CDFW, CDFW Law Enforcement, NMFS OLE, NMFS, SWRCB   |             |         |          |          |          | TBD             | Cost will depend on the optimum flows for adult and smolt migration.           |
| GarcR-NCSW-25.1.3      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to the estuary (quality and extent)   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.1.3.1    | Action Step      | Water Diversion/ Impoundment        | Discourage the development of any surface water diversions in the watershed that independently or cumulatively have significant impact on reducing inflow to the estuary during spring/summer/fall months (ECORP and Kamman Hydrology & Engineering 2005). | 2               | 20                      | CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GarcR-NCSW-25.1.4      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to water quality (instream temperature)   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.1.4.1    | Action Step      | Water Diversion/ Impoundment        | Minimize impairment of instream water temperatures resulting from diversions during the summer and fall dry seasons.   | 2               | 50                      | CA Coastal Commission, CWQCB, NMFS OLE, NOAA/NMFS, Pomo Tribe, Private Landowners, RCD, WCB |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>GarcR-NCSW-25.2</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.2.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| GarcR-NCSW-25.2.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams.                                     | 1               | 10                      | CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB   |             |         |          |          |          | 0               | Action is considered In-Kind   |

Garcia River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level       | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner                                  | Costs (\$K) |         |          |          |          | Entire Duration | Comment                      |
|---------------------|-------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|------------------------------|
|                     |             |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |                              |
| GarcR-NCSW-25.2.1.2 | Action Step | Water Diversion/ Impoundment | Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.                                   | 2               | 100                     | CDFW, NMFS, NRCS, SWRCB                           |             |         |          |          |          | 0               | Action is considered In-Kind |
| GarcR-NCSW-25.2.1.3 | Action Step | Water Diversion/ Impoundment | Ensure all water diversions and impoundments are compliant with AB2121 or other appropriate protective measures.        | 2               | 50                      | CDFW, NMFS, SWRCB                                 |             |         |          |          |          | 0               | Action is considered In-Kind |
| GarcR-NCSW-25.2.1.4 | Action Step | Water Diversion/ Impoundment | Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.  | 3               | 30                      | SWRCB   |             |         |          |          |          | 0               | Action is considered In-Kind |
| GarcR-NCSW-25.2.1.5 | Action Step | Water Diversion/ Impoundment | Improve compliance with existing water resource regulations via monitoring and enforcement.                             | 2               | 20                      | CDFW, CDFW Law Enforcement, NMFS OLE, NMFS, SWRCB |             |         |          |          |          | 0               | Action is considered In-Kind |
| GarcR-NCSW-25.2.1.6 | Action Step | Water Diversion/ Impoundment | Support the SWRCB in regulating groundwater.  | 3               | 20                      | CDFW, NMFS, RWQCB                                 |             |         |          |          |          | 0               | Action is considered In-Kind |
| GarcR-NCSW-25.2.1.7 | Action Step | Water Diversion/ Impoundment | Request that SWRCB review and/or modify water use based on the needs of salmonids and authorized diverters (CDFG 2004). | 2               | 20                      | CDFW, NMFS, SWRCB                                 |             |         |          |          |          | 0               | Action is considered In-Kind |

# Gualala River Population

## NC Steelhead Winter-Run

- Role within DPS: Functionally Independent Population
- Diversity Stratum: Central Coastal
- Spawner Abundance Target: 7,900 adults
- Current Intrinsic Potential: 397.1 IP-km

For information regarding CC Chinook salmon and CCC coho salmon for this watershed, please see the CC Chinook Salmon volume of this recovery plan and the CCC coho salmon recovery plan (<http://www.westcoast.fisheries.noaa.gov/>).

## Steelhead Abundance and Distribution

Insufficient information exists from which to determine quantitatively the current abundance and distribution of steelhead within the Gualala River watershed (CRWQCB 2001). Past and recent accounts of steelhead within the watershed do suggest the population is currently self-sustaining, but numbers of returning adult steelhead are highly variable and possibly declining. Estimates from 1970s CDFW creel and mark-and-recapture surveys conducted in the lower river reported a wide range of returning adult steelhead among years (571 to 10,379), a substantial decline from the reported CDFW mid-1960s estimates of 16,000 returning adult steelhead (CRWQCB 2001). Recent annual spawning surveys conducted in the 2000s (2002-2010) within the Wheatfield Fork counted a low of 126 adult steelhead in 2010, and a high of 1,402 in 2008 (DeHaven, 2010). A recorded low of 31 adult steelhead were counted by DeHaven during multiple spawning surveys conducted within a shortened survey reach of Wheatfield Fork in 2010.

Steelhead remain well distributed throughout the watershed, as current reports of juvenile steelhead distribution are consistent with historical accounts (CRWQCB 2001). However, juvenile steelhead densities, and the extent in which they inhabit tributaries during the dry months, vary. Juvenile steelhead electro-fishing surveys conducted by CDFW from 1988 to 1998 within the lower and upper Little North Fork Gualala River reported a range of 0.19 to 1.49 steelhead/m<sup>2</sup>. DeHaven (2008) reported high densities (3.7 steelhead/linear ft.) of juvenile steelhead during snorkel surveys in selected reaches of the Wheatfield Fork in June of 2008, however, due to lower than normal summer flows, densities had decreased to 0.6 steelhead/ft) by late August.

## History of Land Use

The first documented accounts of logging of old growth redwoods date back to 1862 in lower portions of the watershed (NCWAP 2003). By 1965, aerial photos of the watershed show large areas denuded of trees and scarred by roads and skid trails. Logging and clearing of dense conifer and woodland areas was frequently followed by prolonged cattle grazing. Following slowed periods of logging in the 1970s and 1980s, timber harvest activity again increased in the 1990s. During the 1990s, smaller but numerous clear-cut blocks appeared in the redwood lowland areas under Gualala Redwoods, Inc. ownership (NCWAP 2003). There is also a history of instream gravel mining that has been conducted in the South and Wheatfield Forks of the Gualala River.

## Current Resources and Land Management

Currently, greater than 99 percent of the Gualala River watershed is privately owned. Of that, approximately 34 percent is owned by four timber companies: The Conservation Fund, Gualala Redwoods, Soper Wheeler Company, and Mendocino Redwood Company. Over the past 20 years, 54 percent of the watershed has been under a Timber Harvest Plan. As such timber production remains the primary land use in the Gualala River watershed today, along with grazing and rural residential development (USEPA 2001). Vineyards are also present within the watershed, and more recently, large forestland-to-vineyard land conversions have been proposed. Instream gravel mining is also conducted in the watershed.

A TMDL aimed at addressing sediment impairments, water temperatures, and water quality was developed by the USEPA in 2001 and adopted by the North Coast Regional Water Quality Control Board in 2004. Other stakeholders within the watershed include the Gualala River Watershed Council and Friends of the Gualala River, who are both very active in grassroots watershed protection. These grass-root groups are successful in working with landowners in reducing excessive fine sediment into adjacent waterways, placing LWD in streams, and conducting natural resource-type research in many areas of the Gualala River watershed. In 2003, the North Coast Watershed Assessment Program completed the Gualala River Watershed Assessment. The following pertinent documents are available for the Gualala River watershed:

- Draft North Fork Gualala River Reconnaissance Assessment and Study Plan (NGWC, 2011);
- Gualala Estuary and Lower River Enhancement Plan: Results of 2002 and 2003 Physical and Biological Surveys (SRCD & CCC, 2005);
- North Coast Watershed Assessment Program (CDFG, 2003);
- Gualala River Watershed Technical Support Document For Sediment (RWQCB, 2001);
- Gualala River Total Maximum Daily Load (USEPA, 2001);

- Adult and Juvenile Steelhead Population Surveys, Gualala River, CA (DeHaven, 2002-2010); and
- Preservation Ranch Limiting Factors Analysis. Final Report. Prepared for Buckeye Ranch, LLC, 5 Financial Plaza Napa, CA 94558. Prepared by Stillwater Sciences 2855, Telegraph Avenue, Suite 400, Berkeley, CA 94705. January 2008.

## **Salmonid Viability and Watershed Conditions**

The following indicators are rated Poor through the Conservation Action Planning (CAP) process (see Gualala River CAP results) for steelhead: pool shelter, primary pools, pool/riffle/run ratio, impaired hydrology (passage flow for smolts), stream side road density, water temperature, and summer juvenile steelhead reduced density and abundance. Recovery strategies will focus on improving these poor conditions as well as those needed to ensure population viability and functioning watershed processes.

## **Current Conditions**

The following discussion focuses on those conditions that are rated Fair or Poor as a result of our CAP viability analysis. The Gualala River CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

## **Population and Habitat Conditions**

### **Riparian Vegetation: Composition, Cover and Tree Diameter**

Current riparian canopy generally consists of mid-sized 40-year-old second growth coniferous or mixed conifer/hardwood stands in the middle to upper reaches of the Gualala River watershed (NCWAP 2003). Riparian oak savanna reaches have not re-established since initial logging, most likely due to over grazing, slop instability, and high air temperatures (NCWAP 2003). Overall, watershed-wide riparian canopy cover has improved since the 1960s, but has not recovered to levels observed in 1942 when canopy cover was complete and had recovered from early 1900s logging in most areas. Canopy cover is a significant factor influencing stream water temperatures.

### **Water Quality: Temperature**

Water temperature information provided by the Gualala River Watershed Council and Gualala Redwoods, Inc., as reported in the NCWAP (2003), indicated a linear relationship between higher temperatures and lower canopy values. Water temperatures are considered suitable for summer rearing steelhead in smaller tributaries where data was available (NCWAP 2003). However, temperatures were considered unsuitable in the mainstem and most sub-basins overall (NCWAP

2003, DeHaven 2011. Furthermore, high stream temperatures in low gradient reaches that flow through oak woodland forests may be limiting juvenile steelhead production with the Buckeye creek watershed (Stillwater Sciences 2008).

### **Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios and Habitat Complexity: Large Wood and Shelter**

CDFW habitat surveys conducted in 2002 and 2004 indicated lacking pool shelter, habitat complexity, and less than desirable riffle/pool/flatwater ratios in many tributaries. Habitat complexity has been lost in many streams due to poor abundance of channel forming features (*e.g.*, LWD, boulders, *etc.*), channel simplification, and sediment aggradation, which are all associated with past logging and wood harvest activities. In addition, riparian zones degraded by past logging have severely limited the natural recruitment of LWD in many historically productive streams within the Gualala River watershed, limiting the quality of juvenile rearing habitat in many areas of the watershed. Gualala Redwoods, Inc. and their partners have embarked on many instream large wood placement projects, which have improved habitat complexity in some areas. However, many other stream reaches will require similar supplementation of LWD, boulders and other channel forming features to encourage more desirable pool/riffle ratios (including primary pools) and increase pool shelter ratings. High priority sub-basins within the Gualala River watershed in need of LWD placement include: NF Gualala River, Rockpile, Buckeye, Wheatfield Fork, and SF Gualala River. Rehabilitating these streams will greatly improve the quality of available spawning and seasonal rearing habitat potential for steelhead.

### **Hydrology: Baseflow and Passage Flows**

Seasonal impairments in water flow have been noted in the Gualala River specifically during the spring and summer months (Dehaven 2004, FOGR 2013). As streamflow recedes during these months, the quality and extent of fry and juvenile rearing habitat diminishes particularly in areas that lack significant instream cover (Stillwater Sciences 2012). The interface of reduced spring and summer streamflow with reduced instream cover has been observed throughout the Gualala River watershed. Dehaven (2004) observed 4<sup>th</sup> and 5<sup>th</sup> order sections of the Wheatfield Fork becoming dry or intermittent during a year with average rainfall, which is a rare occurrence based on his observations. In the North Fork Gualala, Stillwater Sciences (2012) found that where instream habitat was lacking, summer rearing for juvenile steelhead decreased substantially relative to more complex habitats as streamflow declined from 9.4 cfs to 3.0 cfs.

### **Estuary: Quality and Extent**

Under existing conditions, steelhead rearing capacity in the coastal Gualala estuary is generally good for pre-smolts and smolt steelhead (SRCD and CCC 2005). However, how much of the

historic extent of the estuary has been lost or filled due to excessive sediments loads resulting from past and current logging and agricultural activities is unclear. Investigations should be conducted to assess if the estuary is “filling” or “recovering” from these past impacts. Designing and implementing habitat complexity features (*e.g.*, LWD, boulder, *etc.*) that encourage deeper pools and provide shelter may significantly improve the rearing capacity of the estuary regardless of its historic depth and condition. Furthermore, the current quality and extent of the estuary for seasonal (March 15 to November 15) juvenile steelhead rearing is controlled by hydrologic and water quality characteristics. Therefore, any change to timing or magnitude of any given characteristic (*e.g.*, summer inflow) or physical process brought about by human activities within the estuary or upstream may significantly impact estuary health and ecology (SRCD and CCC, 2005). Specific physical parameters (water quality, sediment transport, *etc.*) that influence the quality of rearing conditions for salmonids within the estuary should be continuously monitored.

## **Threats**

The following discussion focuses on those threats that were rated as High or Very High. Recovery strategies will likely focus on ameliorating threats rated as High; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in Gualala River CAP results.

### **Logging and Wood Harvesting**

Early logging activities left a legacy of impacts, some of which persist today (NCWAP 2003). Splash dams and log drives tended to flatten and simplify stream channels. Watercourses were frequently used as skid paths to move logs downslope including the use of splash dams (NCWAP, 2003). More recent data reported by KRIS Gualala (2011) showed that timber harvest rates between 1991 and 2001 were Very High (>30-percent of a watershed area in less than 10-years) in some areas of the Gualala River watershed. Other reports indicate that 50 percent of the combined area of Annapolis, Little and Grasshopper creeks was disturbed by timber harvest between 1991 and 2008 (Higgins 2009). Past and present impacts associated with logging include: reduced canopy cover resulting in increased stream water temperatures, increased sediment load into adjacent waterways impairing gravel quality in downstream reaches, and significant loss of LWD recruitment, which is an essential component of habitat complexity, form and function. Although logging has improved compared to historical practices, habitat degradation from past logging and potential impacts associated with future logging will continue to threaten the recovery of steelhead and their habitat.

### **Water Diversions and Impoundments**

Currently, there are no large long standing dams within the Gualala River watershed. Based on existing water rights, land use data, and observations reported by CDFW during instream field surveys conducted in 2001, water diversions within the watershed do not appear to significantly affect streamflows. However, most active diversions within the watershed are not monitored and the resulting impacts on streamflow have not been evaluated or recorded (NCWAP 2003). DeHaven (2008, 2010) reported severe dewatering in some years within the Wheatfield Fork sub-basin and near its confluence with the SF Gualala River. In light of the paucity of information of streamflow impacts of current active diversions in the watershed and the expected higher use of current water rights allocated to Sea Ranch and the North Gualala Water Company (NCWAP 2003), it is likely that future low-flow constraints in the Gualala River will prohibit future California State Water Resources Control Board appropriative water allocations. The North Fork Gualala River has been identified as an important source of baseflow to the lower Gualala River and estuary during late season periods (SRCD and CCC 2005).

The current quality and extent of the estuary for seasonal (March 15 to November 15) juvenile steelhead rearing is controlled by hydrologic and water quality characteristics. Increases in water diversions have the potential to not only adversely affect the timing, but also reduce the magnitude of freshwater flow entering the estuary and thus result in a significant impact on the health and ecology in the estuary. Therefore, further reductions in flow during the spring and summer, caused by water diversions and impoundments, pose a significant threat for not only salmonids rearing in sub-basins within the watershed (NCWAP 2003), but also for juvenile rearing within the estuary (SRCD and CCC 2005).

### **Agriculture**

Vineyards pose one of the most serious threats to the Gualala River's steelhead and ecosystem (DeHaven 2011). Vineyards are becoming more widespread throughout the watershed, and larger forestland-to-vineyard conversions are being proposed. Large portions of the Wheatfield Fork near Annapolis have already been converted or are proposed for conversion to vineyards, and other proposals to convert portions of Grasshopper, Buckeye, and Patchett creeks are underway (FGR 2011). The heaviest vineyard water usage is during the spring and summer months when young steelhead are emerging from the gravel, smolts are emigrating to the ocean, and steelhead parr are rearing within available summer habitat. Reduced surface and groundwater from these sub-basins could not only impair summer baseflows in these tributaries, but also could impair inflow and water quality conditions within the Gualala estuary. Forestland-to-vineyard conversions are also noted as being potentially more severe to the landscape than past logging practices. The forestland-to-vineyard conversion process includes clear cutting of

forestlands, deep ripping of the soil, and increase ground and surface water use, all which result in the permanent conversion of complex forest ecosystems (FGR, 2011).

### **Roads and Railroads**

Roads and railroads associated with past logging included massive cut and fill excavation along stream banks and within the active stream channel. Many of these roads had and still have steep gradients designed to access all positions of the side slope. Skid trails frequently followed or crossed ephemeral stream channels (NCWAP 2001). Roads and landings adjacent to watercourses were constructed by pushing woody debris into the channel and overtopping with dirt and fill. These road-associated impacts contributed to massive instream aggradation, and degraded spawning gravel quality in many streams. Further, annual blading or maintenance of dirt roads in the watershed provided a chronic source of fine sediment to tributaries in the Gualala. On December 20, 2001, the USEPA established a sediment TMDL for the Gualala River based on the information provided in the Gualala Technical Support Document (TSD, 2001). The TSD listed eight current sediment sources with the basin, six of which are associated with roads: road mass wasting, bank erosion, surficial road erosion, road gullies, road-stream crossing failures, and skid trails. Additionally, some roads impair upstream steelhead passage at stream crossings (Fuller Creek PAD\_ID 736904) (Franchini Creek), and many still need to be remedied. Although current road standards have improved, the many remaining legacy roads, the associated road maintenance of existing roads, and the expected construction of new roads near watercourses will remain a current and future threat to the recovery of steelhead and their habitat within the Gualala river watershed.

### **Fishing and Collecting**

Current low flow regulations on the Gualala River are based on the Russian River Hacienda stream gage. Unlike the Gualala River and other adjacent coastal watersheds, the Russian River has two large reservoirs that regulate streamflows, and is operated for flood control during the wet months. These regulated operations often slow descending hydrologic conditions, resulting in higher prolonged and sustained streamflows. These conditions do not accurately reflect unregulated hydrologic conditions of the Gualala River and other adjacent coastal streams. Adopting a more appropriate low flow fishing closure that protects all salmonids and better reflects hydrologic conditions in the Gualala River watershed is needed.

### **Limiting Stresses, Lifestages, and Habitats**

The summer juvenile steelhead lifestage is the most limited in the Gualala River watershed. Impaired canopy cover, reduced habitat complexity, and increased water temperatures coupled

with reduced surface flow, are the stresses most limiting summer juvenile survival and ultimately recovery of steelhead within the Gualala River watershed.

## **General Recovery Strategy**

### **Improve Canopy Cover and Reduce Stream Water Temperature**

Stream canopy conditions have improved within many small streams of the Gualala River watershed and will continue to improve in areas that are protected from future logging and forestland-to-vineyard conversions. However, in many low-gradient areas riparian rehabilitation efforts need to be implemented to improve the extent and quality of summer rearing conditions within the watershed.

### **Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios and Habitat Complexity: Large Wood and Shelter**

Pool shelter levels and primary pool frequency are poor in most every tributary in the Gualala River watershed. Strategically placing channel forming features in high priority reaches of the NF Gualala, Rockpile, Buckeye, Wheatfield Fork, and SF Gualala sub-basins will increase surface water hydrologic connectivity in highly aggraded reaches and consequently increase summer rearing habitat capacity. Additionally, establishing appropriate size riparian buffer zones or improving management within those buffers throughout the watershed will increase stream shading and promote natural LWD recruitment.

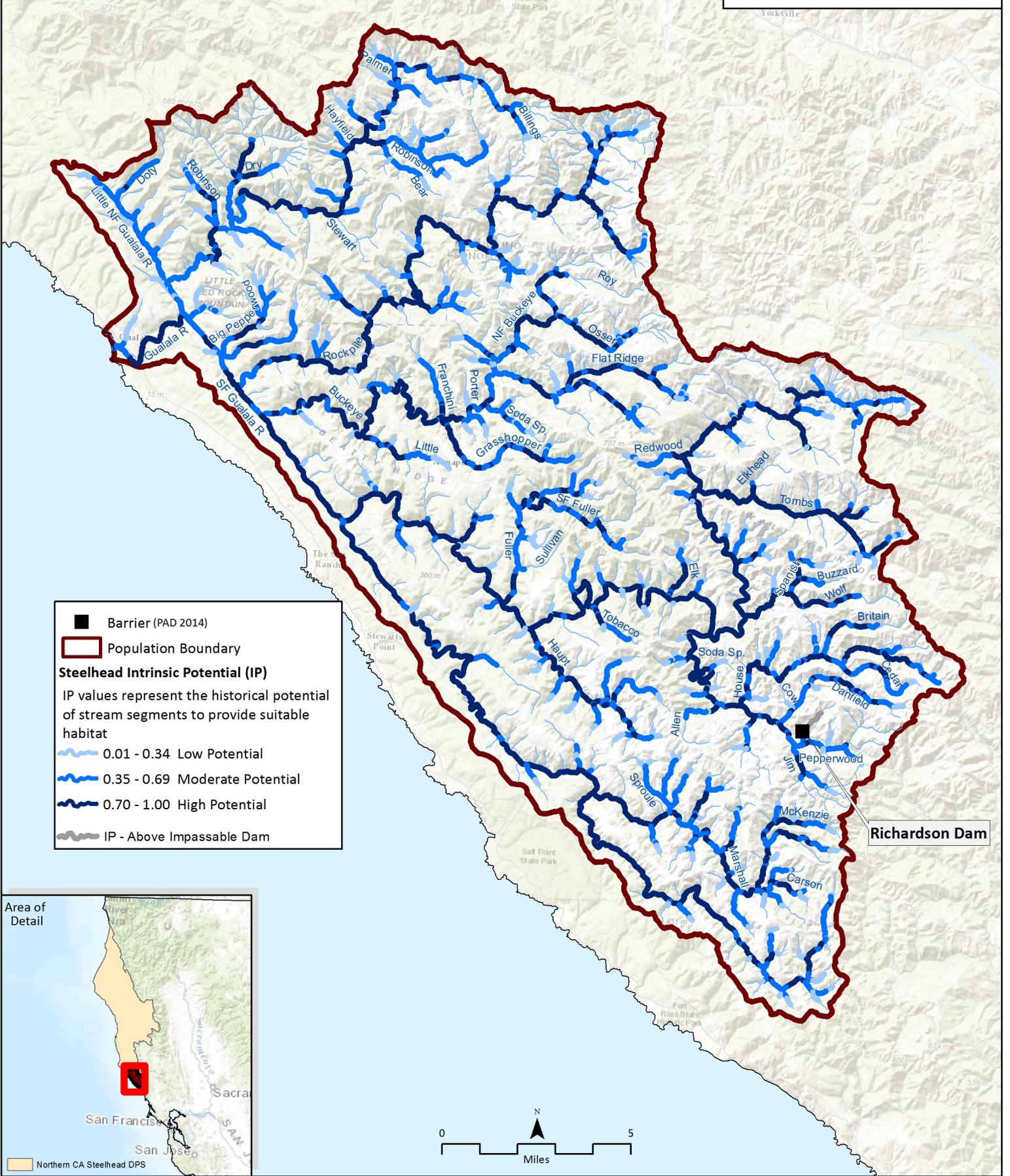
### **Protect Seasonal and Summer Hydrologic Conditions**

With physical habitat features improving and slowly recovering in many portions of the watershed, protecting spring and summer hydrologic conditions will be essential for the recovery of all salmonids in the Gualala River. The proposed establishment of large vineyards is an exceptionally high threat due to potential reductions in the groundwater table and surface flow. Lower surface flows will not only limit the current extent of summer steelhead rearing within the basin, but may seriously impair the quality of seasonal rearing conditions in the estuary.

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Gualala River CAP Viability Results

| # | Conservation Target | Category  | Key Attribute       | Indicator                                | Poor  | Fair  | Good  | Very Good   | Current Indicator Measurement                             | Current Rating |
|---|---------------------|-----------|---------------------|--|---|---|---|---|---|----------------|
| 1 | Adults              | Condition | Habitat Complexity  | Large Wood Frequency (BFW 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)   | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)   | Good           |
|   |                     |           | Habitat Complexity  | Large Wood Frequency (BFW 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 75% to 90% of streams/ IP-km (>1.3 Key Pieces/100 meters) | Good           |
|   |                     |           | Habitat Complexity  | Pool/Riffle/Flatwater Ratio              | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)   | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 48% streams/ 37% IP-km (>40% Pools; >20% Riffles)         | Poor           |
|   |                     |           | Habitat Complexity  | Shelter Rating                           | <50% of streams/ IP-Km (>80 stream average)         | 50% to 74% of streams/ IP-Km (>80 stream average)         | 75% to 90% of streams/ IP-Km (>80 stream average)         | >90% of streams/ IP-Km (>80 stream average)         | 8% streams/ 2% IP-km (>80 stream average)                 | Poor           |
|   |                     |           | Hydrology           | Passage Flows                            | NMFS Flow Protocol: Risk Factor Score >75           | NMFS Flow Protocol: Risk Factor Score 51-75               | NMFS Flow Protocol: Risk Factor Score 35-50               | NMFS Flow Protocol: Risk Factor Score <35           | NMFS Flow Protocol: Risk Factor Score 35-50               | Good           |
|   |                     |           | Passage/Migration   | Passage at Mouth or Confluence           | <50% of IP-Km or <16 IP-Km accessible*              | 50% of IP-Km to 74% of IP-km                              | 75% of IP-Km to 90% of IP-km                              | >90% of IP-km                                       | 75% of IP-km to 90% of IP-km                              | Good           |
|   |                     |           | Passage/Migration   | Physical Barriers                        | <50% of IP-Km or <16 IP-Km accessible*              | 50% of IP-Km to 74% of IP-km                              | 75% of IP-Km to 90% of IP-km                              | >90% of IP-km                                       | 100% of IP-km   | Very Good      |
|   |                     |           | Riparian Vegetation | Tree Diameter (North of SF Bay)          | ≤39% Class 5 & 6 across IP-km                       | 40 - 54% Class 5 & 6 across IP-km                         | 55 - 69% Class 5 & 6 across IP-km                         | >69% Class 5 & 6 across IP-km                       | 39% Class 5 & 6 across IP-km                              | Fair           |
|   |                     |           | Riparian Vegetation | Tree Diameter (South of SF Bay)          | ≤69% Density rating "D" across IP-km                | 70-79% Density rating "D" across IP-km                    | ≥80% Density rating "D" across IP-km                      | Not Defined   |   |                |

|   |      |           |                 |   |   |  |   |   |  |           |
|---|------|-----------|-----------------|---|---|--|---|---|--|-----------|
|   |      |           | Sediment        | Quantity & Distribution of Spawning Gravels | <50% of IP-Km or <16 IP-Km accessible*                        | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km  | >90% of IP-km   | >90% of IP-km  | Very Good |
|   |      |           | Velocity Refuge | Floodplain Connectivity                     | <50% Response Reach Connectivity                              | 50-80% Response Reach Connectivity   | >80% Response Reach Connectivity                                    | Not Defined   | 50-80% Response Reach Connectivity   | Fair      |
|   |      |           | Water Quality   | Toxicity                                    | Acute   | Sublethal or Chronic   | No Acute or Chronic   | No Evidence of Toxins or Contaminants                         | Sublethal or Chronic   | Fair      |
|   |      |           | Water Quality   | Turbidity                                   | <50% of streams/ IP-Km maintains severity score of 3 or lower | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower        | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower | >90% of streams/ IP-Km maintains severity score of 3 or lower | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower        | Good      |
|   |      | Size      | Viability       | Density                                     | <1 Spawner per IP-km (Spence et al 2012)                      | >1 spawner per IP-km to < low risk spawner density per Spence et al (2012) | low risk spawner density per Spence et al (2012)                    |   | >1 spawner per IP-km to < low risk spawner density per Spence et al (2012) | Fair      |
| 2 | Eggs | Condition | Hydrology       | Flow Conditions (Instantaneous Condition)   | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | NMFS Flow Protocol: Risk Factor Score 35-50                         | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | Fair      |
|   |      |           | Hydrology       | Redd Scour                                  | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | NMFS Flow Protocol: Risk Factor Score 35-50                         | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 35-50                                | Good      |
|   |      |           | Sediment        | Gravel Quality (Bulk)                       | >17% (0.85mm) and >30% (6.4mm)                                | 15-17% (0.85mm) and <30% (6.4mm)   | 12-14% (0.85mm) and <30% (6.4mm)                                    | <12% (0.85mm) and <30% (6.4mm)                                | 12-14% (0.85mm) and <30% (6.4mm)   | Good      |
|   |      |           | Sediment        | Gravel Quality (Embeddedness)               | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)         | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 63% streams 70% IP-km (>50% stream average scores of 1 & 2)                | Fair      |

| 3 | Summer Rearing Juveniles | Condition | Estuary/Lagoon     | Quality & Extent                                    | Impaired/non-functional                                      | Impaired but functioning   | Properly Functioning Condition                                     | Unimpaired Condition   | Impaired but functioning                                    | Fair |
|---|--------------------------|-----------|--------------------|---|--|--|--|--|---|------|
|   |                          |           | Habitat Complexity | Large Wood Frequency (Bankfull Width 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)     | Good |
|   |                          |           | Habitat Complexity | Large Wood Frequency (Bankfull Width 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-km (>1.3 Key Pieces/100 meters)   | Good |
|   |                          |           | Habitat Complexity | Percent Primary Pools                               | <50% of streams/ IP-Km (>40% average primary pool frequency) | 50% to 74% of streams/ IP-Km (>40% average primary pool frequency) | 75% to 89% of streams/ IP-Km (>40% average primary pool frequency) | >90% of streams/ IP-Km (>40% average primary pool frequency) | 23% streams 25% IP-km (>40% average primary pool frequency) | Poor |
|   |                          |           | Habitat Complexity | Pool/Riffle/Flatwater Ratio                         | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 48% streams/ 37% IP-km (>40% Pools; >20% Riffles)           | Poor |
|   |                          |           | Habitat Complexity | Shelter Rating                                      | <50% of streams/ IP-Km (>80 stream average)                  | 50% to 74% of streams/ IP-Km (>80 stream average)                  | 75% to 90% of streams/ IP-Km (>80 stream average)                  | >90% of streams/ IP-Km (>80 stream average)                  | 8% streams/ 2% IP-km (>80 stream average)                   | Poor |
|   |                          |           | Hydrology          | Flow Conditions (Baseflow)                          | NMFS Flow Protocol: Risk Factor Score >75                    | NMFS Flow Protocol: Risk Factor Score 51-75                        | NMFS Flow Protocol: Risk Factor Score 35-50                        | NMFS Flow Protocol: Risk Factor Score <35                    | NMFS Flow Protocol: Risk Factor Score >75                   | Poor |
|   |                          |           | Hydrology          | Flow Conditions (Instantaneous Condition)           | NMFS Flow Protocol: Risk Factor Score >75                    | NMFS Flow Protocol: Risk Factor Score 51-75                        | NMFS Flow Protocol: Risk Factor Score 35-50                        | NMFS Flow Protocol: Risk Factor Score <35                    | NMFS Flow Protocol: Risk Factor Score >75                   | Poor |
|   |                          |           | Hydrology          | Number, Condition and/or Magnitude of Diversions    | >5 Diversions/10 IP km                                       | 1.1 - 5 Diversions/10 IP km  | 0.01 - 1 Diversions/10 IP km                                       | 0 Diversions   | 0.15 Diversions/10 IP-km                                    | Good |
|   |                          |           | Passage/Migration  | Passage at Mouth or Confluence                      | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 50% of IP-km to 74% of IP-km                                | Fair |

|      |                              |                                 |  |  |  |  |  |           |
|------|------------------------------|---------------------------------|--|--|--|--|--|-----------|
|      | Passage/Migration            | Physical Barriers               | <50% of IP-Km or <16 IP-Km accessible*   | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km   | >90% of IP-km  | 100% of IP-km  | Very Good |
|      | Riparian Vegetation          | Canopy Cover                    | <50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | >90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 50% streams/ 14% IP-km (>70% average stream canopy; >85% where coho IP overlaps) | Fair      |
|      | Riparian Vegetation          | Tree Diameter (North of SF Bay) | ≤39% Class 5 & 6 across IP-km  | 40 - 54% Class 5 & 6 across IP-km  | 55 - 69% Class 5 & 6 across IP-km  | >69% Class 5 & 6 across IP-km  | 39% Class 5 & 6 across IP-km   | Fair      |
|      | Riparian Vegetation          | Tree Diameter (South of SF Bay) | ≤69% Density rating "D" across IP-km   | 70-79% Density rating "D" across IP-km   | ≥80% Density rating "D" across IP-km   | Not Defined  |  |           |
|      | Sediment (Food Productivity) | Gravel Quality (Embeddedness)   | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 63% streams 70% IP-km (>50% stream average scores of 1 & 2)                      | Fair      |
|      | Water Quality                | Temperature (MWT)               | <50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                       | 50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                        | 75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                        | >90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                       | 50 to 74% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                  | Fair      |
|      | Water Quality                | Toxicity                        | Acute  | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants  | Sublethal or Chronic   | Fair      |
|      | Water Quality                | Turbidity                       | <50% of streams/ IP-Km maintains severity score of 3 or lower                    | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower                    | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower                    | >90% of streams/ IP-Km maintains severity score of 3 or lower                    | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower              | Good      |
| Size | Viability                    | Density                         | <0.2 Fish/m <sup>2</sup>   | 0.2 - 0.6 Fish/m <sup>2</sup>  | 0.7 - 1.5 Fish/m <sup>2</sup>  | >1.5 Fish/m <sup>2</sup>   | <0.2 Fish/m <sup>2</sup>   | Poor      |
|      | Viability                    | Spatial Structure               | <50% of Historical Range   | 50-74% of Historical Range   | 75-90% of Historical Range   | >90% of Historical Range   | 75-90% of Historical Range   | Good      |

|   |                          |           |                              |   |  |  |  |  |   |           |
|---|--------------------------|-----------|------------------------------|---|--|--|--|--|---|-----------|
| 4 | Winter Rearing Juveniles | Condition | Habitat Complexity           | Large Wood Frequency (Bankfull Width 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)     | Good      |
|   |                          |           | Habitat Complexity           | Large Wood Frequency (Bankfull Width 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-km (>1.3 Key Pieces/100 meters)   | Good      |
|   |                          |           | Habitat Complexity           | Pool/Riffle/Flatwater Ratio                         | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 48% streams/ 37% IP-km (>40% Pools; >20% Riffles)           | Poor      |
|   |                          |           | Habitat Complexity           | Shelter Rating                                      | <50% of streams/ IP-Km (>80 stream average)                  | 50% to 74% of streams/ IP-Km (>80 stream average)                  | 75% to 90% of streams/ IP-Km (>80 stream average)                  | >90% of streams/ IP-Km (>80 stream average)                  |   |           |
|   |                          |           | Passage/Migration            | Physical Barriers                                   | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 100% of IP-km   | Very Good |
|   |                          |           | Riparian Vegetation          | Tree Diameter (North of SF Bay)                     | ≤39% Class 5 & 6 across IP-km                                | 40 - 54% Class 5 & 6 across IP-km                                  | 55 - 69% Class 5 & 6 across IP-km                                  | >69% Class 5 & 6 across IP-km                                | 39% Class 5 & 6 across IP-km                                | Fair      |
|   |                          |           | Riparian Vegetation          | Tree Diameter (South of SF Bay)                     | ≤69% Density rating "D" across IP-km                         | 70-79% Density rating "D" across IP-km                             | ≥80% Density rating "D" across IP-km                               | Not Defined  |   |           |
|   |                          |           | Sediment (Food Productivity) | Gravel Quality (Embeddedness)                       | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2) | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 63% streams 70% IP-km (>50% stream average scores of 1 & 2) | Fair      |
|   |                          |           | Velocity Refuge              | Floodplain Connectivity                             | <50% Response Reach Connectivity                             | 50-80% Response Reach Connectivity                                 | >80% Response Reach Connectivity                                   | Not Defined  | 50-80% Response Reach Connectivity                          | Fair      |
|   |                          |           | Water Quality                | Toxicity  | Acute  | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants                        | Sublethal or Chronic  | Fair      |

|   |        |           |                    |  |  |  |   |   |  |      |
|---|--------|-----------|--------------------|--|--|--|---|---|--|------|
|   |        |           | Water Quality      | Turbidity  | <50% of streams/ IP-Km maintains severity score of 3 or lower              | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower            | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower   | >90% of streams/ IP-Km maintains severity score of 3 or lower |  |      |
| 5 | Smolts | Condition | Estuary/Lagoon     | Quality & Extent                                 | Impaired/non-functional  | Impaired but functioning   | Properly Functioning Condition  | Unimpaired Condition  | Impaired but functioning   | Fair |
|   |        |           | Habitat Complexity | Shelter Rating                                   | <50% of streams/ IP-Km (>80 stream average)                                | 50% to 74% of streams/ IP-Km (>80 stream average)                              | 75% to 90% of streams/ IP-Km (>80 stream average)                     | >90% of streams/ IP-Km (>80 stream average)                   | 8% streams/ 2% IP-km (>80 stream average)                                      | Poor |
|   |        |           | Hydrology          | Number, Condition and/or Magnitude of Diversions | >5 Diversions/10 IP km   | 1.1 - 5 Diversions/10 IP km  | 0.01 - 1 Diversions/10 IP km  | 0 Diversions  | 0.15 Diversions/10 IP-km   | Good |
|   |        |           | Hydrology          | Passage Flows                                    | NMFS Flow Protocol: Risk Factor Score >75                                  | NMFS Flow Protocol: Risk Factor Score 51-75                                    | NMFS Flow Protocol: Risk Factor Score 35-50                           | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                                    | Fair |
|   |        |           | Passage/Migration  | Passage at Mouth or Confluence                   | <50% of IP-Km or <16 IP-Km accessible*                                     | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km  | >90% of IP-km   | 50% of IP-km to 74% of IP-km   | Fair |
|   |        |           | Smoltification     | Temperature                                      | <50% IP-Km (>6 and <14 C)  | 50-74% IP-Km (>6 and <14 C)  | 75-90% IP-Km (>6 and <14 C)   | >90% IP-Km (>6 and <14 C)                                     | 50-74% IP-km (>6 and <14 C)  | Fair |
|   |        |           | Water Quality      | Toxicity   | Acute  | Sublethal or Chronic   | No Acute or Chronic   | No Evidence of Toxins or Contaminants                         | Sublethal or Chronic   | Fair |
|   |        |           | Water Quality      | Turbidity  | <50% of streams/ IP-Km maintains severity score of 3 or lower              | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower            | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower   | >90% of streams/ IP-Km maintains severity score of 3 or lower | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower            | Fair |
|   |        | Size      | Viability          | Abundance  | Smolt abundance which produces high risk spawner density per Spence (2008) | Smolt abundance which produces moderate risk spawner density per Spence (2008) | Smolt abundance to produce low risk spawner density per Spence (2008) |   | Smolt abundance which produces moderate risk spawner density per Spence (2008) | Fair |

| 6 | Watershed Processes | Landscape Context | Hydrology           | Impervious Surfaces             | >10% of Watershed in Impervious Surfaces   | 7-10% of Watershed in Impervious Surfaces    | 3-6% of Watershed in Impervious Surfaces     | <3% of Watershed in Impervious Surfaces    | 0.101% of Watershed in Impervious Surfaces   | Very Good |
|---|---------------------|-------------------|---------------------|---------------------------------|--|--|--|--|--|-----------|
|   |                     |                   | Landscape Patterns  | Agriculture                     | >30% of Watershed in Agriculture           | 20-30% of Watershed in Agriculture           | 10-19% of Watershed in Agriculture           | <10% of Watershed in Agriculture           | 0.548% % of Watershed in Agriculture         | Very Good |
|   |                     |                   | Landscape Patterns  | Timber Harvest                  | >35% of Watershed in Timber Harvest        | 26-35% of Watershed in Timber Harvest        | 25-15% of Watershed in Timber Harvest        | <15% of Watershed in Timber Harvest        | 26-35% of Watershed in Timber Harvest        | Fair      |
|   |                     |                   | Landscape Patterns  | Urbanization                    | >20% of watershed >1 unit/20 acres         | 12-20% of watershed >1 unit/20 acres         | 8-11% of watershed >1 unit/20 acres          | <8% of watershed >1 unit/20 acres          | 2% of watershed >1 unit/20 acres             | Very Good |
|   |                     |                   | Riparian Vegetation | Species Composition             | <25% Intact Historical Species Composition | 25-50% Intact Historical Species Composition | 51-74% Intact Historical Species Composition | >75% Intact Historical Species Composition | 51-74% Intact Historical Species Composition | Good      |
|   |                     |                   | Sediment Transport  | Road Density                    | >3 Miles/Square Mile                       | 2.5 to 3 Miles/Square Mile                   | 1.6 to 2.4 Miles/Square Mile                 | <1.6 Miles/Square Mile                     | 1.9 Miles/Square Mile                        | Good      |
|   |                     |                   | Sediment Transport  | Streamside Road Density (100 m) | >1 Miles/Square Mile                       | 0.5 to 1 Miles/Square Mile                   | 0.1 to 0.4 Miles/Square Mile                 | <0.1 Miles/Square Mile                     | 2.0 Miles/Square Mile                        | Fair      |
|   |                     |                   |                     |                                 |  |  |  |  |  |           |

Gualala River CAP Threat Results

| Threats Across Targets                |  | Adults | Eggs   | Summer Rearing Juveniles | Winter Rearing Juveniles | Smolts | Watershed Processes | Overall Threat Rank |
|---------------------------------------|--|--------|--------|--------------------------|--------------------------|--------|---------------------|---------------------|
| Project-specific-threats              |  | 1      | 2      | 3                        | 4                        | 5      | 6                   |                     |
| 1                                     | Agriculture                                | Medium | Medium | Medium                   | Medium                   | Medium | Medium              | Medium              |
| 2                                     | Channel Modification                       | Low    | Low    | Medium                   | Low                      | Low    | Medium              | Medium              |
| 3                                     | Disease, Predation and Competition         | Low    | Low    | Low                      | Low                      | Low    | Low                 | Low                 |
| 4                                     | Hatcheries and Aquaculture                 |        |        |                          |                          |        |                     |                     |
| 5                                     | Fire, Fuel Management and Fire Suppression | Low    | Low    | Low                      | Low                      | Low    | Low                 | Low                 |
| 6                                     | Fishing and Collecting                     | Medium |        | Low                      |                          | Low    |                     | Low                 |
| 7                                     | Livestock Farming and Ranching             | Medium | Medium | Medium                   | Medium                   | Low    | Medium              | Medium              |
| 8                                     | Logging and Wood Harvesting                | High   | Medium | High                     | High                     | High   | High                | High                |
| 9                                     | Mining                                     | Low    | Low    | Low                      | Low                      | Low    | Low                 | Low                 |
| 10                                    | Recreational Areas and Activities          | Low    | Low    | Medium                   | Low                      | Low    | Low                 | Low                 |
| 11                                    | Residential and Commercial Development     | Low    | Low    | Low                      | Low                      | Low    | Low                 | Low                 |
| 12                                    | Roads and Railroads                        | Medium | Medium | Medium                   | Medium                   | Medium | High                | High                |
| 13                                    | Severe Weather Patterns                    | Medium | Medium | Medium                   | Low                      | Medium | Low                 | Medium              |
| 14                                    | Water Diversion and Impoundments           | Medium | Low    | Medium                   | Medium                   | Medium | High                | Medium              |
| Threat Status for Targets and Project |  | High   | Medium | High                     | High                     | High   | High                | High                |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| <b>GualR-NCSW-1.1</b> | <b>Objective</b> | <b>Estuary</b>               | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-1.1.1      | Recovery Action  | Estuary                      | Increase the physical extent of estuarine habitat   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-1.1.1.1    | Action Step      | Estuary                      | Investigate the extent of sedimentation within the estuary/lagoon associated with watershed legacy impacts (logging). Evaluate sediment transport within the estuary and determine if the estuary is "filling" with sediment or "flushing" sediment (recovering). | 3               | 10                      | CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB   | 117.00      | 117.00  |          |          |          | 234             | Cost based on sediment assessment estimated at \$12.22/acre. Assume 10% of total watershed acres.   |
| GualR-NCSW-1.1.1.2    | Action Step      | Estuary                      | Identify past mechanical fill sites (inside of Mill Bend) and develop strategies targeting the re-establishment of wetland marsh habitat (if feasible).   | 3               | 10                      | CDFW, NMFS, NOAA RC, NRCS, RCD  |             |         |          |          |          | 0               | Cost accounted for in other action steps. Feasibility of re-establishing wetland marsh habitat should be identified in estuary monitoring.                        |
| GualR-NCSW-1.1.1.3    | Action Step      | Estuary                      | Develop and implement rehabilitation projects designed to increase the physical extent of high quality habitat for rearing juvenile salmonids within the Gualala River estuary.   | 3               | 10                      | CDFW, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners  | 680         | 680     |          |          |          | 1,360           | Cost based on treating 5 acres (assume 5% of total estuarine habitat) at a rate of \$272,120/acre.  |
| GualR-NCSW-1.1.1.4    | Action Step      | Estuary                      | Investigate the historical functions and ecology of the estuary   | 3               | 10                      | CDFW, Gualala Watershed Council   | 141.50      | 141.50  |          |          |          | 283             | Cost based on estuary use/residence monitoring at a rate of \$282,233/project.  |
| GualR-NCSW-1.1.2      | Recovery Action  | Estuary                      | Increase and enhance estuarine habitat complexity features  |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-1.1.2.1    | Action Step      | Estuary                      | Increase the percentage of area containing high value habitat complexity elements and features (SAV, LWD, boulders, marshes, vegetation, pools > 2 meters).   | 2               |                         |   |             |         |          |          |          | 126             | Cost based on stream complexity recovery action at \$101,120/mile from estuary mouth to Highway 1 bridge (approximately 1.25 miles)                               |
| GualR-NCSW-1.1.2.2    | Action Step      | Estuary                      | Identify strategic locations to install LWD structures designed to increased pool depth and habitat conditions within the Gualala River estuary.  | 2               | 10                      |   |             |         |          |          |          | 0               | Costs associated with installation of LWD would be encompassed by increasing the percentage of area high value habitat.   |
| GualR-NCSW-1.1.3      | Recovery Action  | Estuary                      | Improve the quality of freshwater lagoon habitat  |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-1.1.3.1    | Action Step      | Estuary                      | Install continuous water quality monitoring stations in the Gualala estuary during the summer months. Monitor at a minimum temperature, dissolved oxygen, and salinity.   | 2               | 5                       | CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, RCD, RWQCB | 15.00       |         |          |          |          | 15              | Cost based on continuous monitoring gauges estimated at \$5,000/unit. Assume a minimum of 3 for lagoon. Cost does not account for maintenance or data management. |
| GualR-NCSW-1.1.4      | Recovery Action  | Estuary                      | Improve freshwater inflow   |                 |                         |   |             |         |          |          |          |                 |   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-1.1.4.1    | Action Step      | Estuary                      | Install a stream gauge immediately upstream of the estuary/lagoon to monitor inflow conditions during the dry season.   | 2               | 5                       | CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RWQCB  | 1.00        |         |          |          |          | 1               | Cost based on stream gauges estimated at \$1,000/gauge. Cost does not account for maintenance or data management. |
| GualR-NCSW-1.1.4.2    | Action Step      | Estuary                      | Investigate the hydrodynamics of freshwater inflow and estuary water quality conditions relative to juvenile salmonid estuarine summer rearing (osmoregulating and non-osmoregulating).   | 2               | 10                      | CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Consultants, Private Landowners, RCD, RWQCB, SWRCB | 136.61      | 136.61  |          |          |          | 273             | Cost based estuary use estimated at \$273,217/project.  |
| GualR-NCSW-1.1.4.3    | Action Step      | Estuary                      | Develop a stream flow model to identify and implement a minimum freshwater inflow threshold to ensure optimal estuary health and function for rearing salmonids.  | 2               | 5                       | CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Consultants, RWQCB, SWRCB  | 63.01       |         |          |          |          | 63              | Cost based on stream flow model estimated at \$63,005/project.  |
| <b>GualR-NCSW-3.1</b> | <b>Objective</b> | <b>Hydrology</b>             | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-3.1.1      | Recovery Action  | Hydrology                    | Improve flow conditions (baseflow conditions)   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-3.1.1.1    | Action Step      | Hydrology                    | Continue to work with the North Gualala Water Company on water right Permit 14853. Ensure that the Site-specific Study Plan prepared for the NGWC by Stillwater Sciences (11 October 2011) is completed within the next 3-yrs. Implement recommendations within the next 5-years. Ensure salmonid life history requirements targeted in the proposal are evaluated under a range of water year types (dry - wet). Evaluate potential impacts to dry season estuary water quality conditions associated with Permit 14853. | 2               | 20                      | CDFW, CDFW Law Enforcement, Gualala Watershed Council, NMFS, NMFS OLE, North Gualala Water Company, SWRCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level       | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|--------------------|-------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                    |             |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-3.1.1.2 | Action Step | Hydrology                    | Map all water diversions and upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.  | 2               | 60                      | CDFW, NMFS, North Gualala Water Company, Private Landowners, Sea Ranch, SWRCB   |             |         |          |          |          | TBD             | Costs may be minimal due to the low number of diverters in this basin.   |
| GualR-NCSW-3.1.1.3 | Action Step | Hydrology                    | Monitor, identify problems, and prioritize needed changes to permitted water diversions on current or potential steelhead streams.   | 2               | 10                      | BLM, CDFW, NMFS, North Gualala Water Company, Private Landowners, Sea Ranch, SWRCB  |             |         |          |          |          | TBD             | Problems should be identified through mapping diversion and developing stream flow model.  |
| GualR-NCSW-3.1.1.4 | Action Step | Hydrology                    | Install and maintain a gauging station immediately upstream of the estuary to monitor freshwater inflow during the dry season.   | 2               | 10                      | CDFW, NMFS, USGS  | 0.50        | 0.50    |          |          |          | 1               | Provide consistent funding for the North Fork Gualala River and possible funding for the Wheatfield Forks of the Gualala River. Cost of installing stream gage is \$1000/unit. Cost does not account for maintenance or data management. |
| GualR-NCSW-3.1.1.5 | Action Step | Hydrology                    | Develop critical flow values that are the basis for minimum bypass flow requirements to support juvenile rearing habitat conditions during the dry season.   | 1               | 5                       | CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, RCD, RWQCB, Sea Ranch, SWRCB |             |         |          |          |          | 0               | Cost accounted for in stream flow model.   |
| GualR-NCSW-3.1.1.6 | Action Step | Hydrology                    | Install and maintain a stream gauge at an appropriate location near the base of Rockpile Creek.  | 3               | 10                      | CDFW, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RWQCB, SWRCB  | 0.50        | 0.50    |          |          |          | 1               | Cost based on stream gauge estimated at \$1,000/gauge. Cost does not account for maintenance or data management.   |
| GualR-NCSW-3.1.1.7 | Action Step | Hydrology                    | Install and maintain a stream gauge at an appropriate location near the base of Buckeye Creek.   | 3               | 5                       | CDFW, NMFS, NRCS, Private Landowners, RCD, SWRCB  | 1.00        |         |          |          |          | 1               | Cost based on installing a stream flow gauge at a rate of \$1,000/station. Cost does not account for data management or maintenance.   |
| GualR-NCSW-3.1.1.8 | Action Step | Hydrology                    | Install and maintain a stream gauge at an appropriate location immediately downstream of the SF Gualala and Wheatfield Fork confluence.  | 3               | 10                      | CDFW, Gualala Watershed Council, NMFS, NRCS, Private Landowners, RCD, Sea Ranch, SWRCB  | 0.50        | 0.50    |          |          |          | 1               | Cost based on stream flow gauge estimated at \$1,000/gauge. Cost does not account for maintenance or data management.  |
| GualR-NCSW-3.1.1.9 | Action Step | Hydrology                    | Evaluate and implement off-channel storage facilities to reduce impacts of water diversion (storage tanks for rural residential users). Focus efforts in the NF Gualala and Wheatfield sub-watersheds. | 2               | 20                      | CDFW, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, SWRCB   |             |         |          |          |          | TBD             | Cost difficult to estimated because of participation of landowners and feasibility of off-channel storage facilities.  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| <b>GualR-NCSW-4.1</b> | <b>Objective</b> | <b>Landscape Patterns</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-4.1.1      | Recovery Action  | Landscape Patterns           | Prevent or minimize increased landscape disturbance   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-4.1.1.1    | Action Step      | Landscape Patterns           | Consider developing and/or identifying a protected "salmonid preserve" in the Gualala River watershed.  | 2               | 100                     | CDFW, NMFS, NOAA RC   |             |         |          |          |          | TBD             | Cost difficult to estimate because of fair market value and land use turnover. |
| GualR-NCSW-4.1.1.2    | Action Step      | Landscape Patterns           | Should large tracts of forestlands within the Gualala River watershed become available for purchase, the State of California and/or the Federal Government should consider purchasing the area as a Demonstration Forest, State Park, or protected "salmonid preserve". | 2               | 50                      | CDFW, Gualala Redwood Company, NMFS, NOAA RC  |             |         |          |          |          | TBD             | Cost difficult to estimate because of fair market value and land use turnover. |
| <b>GualR-NCSW-4.2</b> | <b>Objective</b> | <b>Landscape Patterns</b>    | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-4.2.1      | Recovery Action  | Landscape Patterns           | Prevent or minimize increased landscape disturbance   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-4.2.1.1    | Action Step      | Landscape Patterns           | Discourage counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).  | 1               | 100                     | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, RCD, Sea Ranch, Sonoma County, SWRCB                             |             |         |          |          |          | 0               | Action is considered In-Kind   |
| GualR-NCSW-4.2.1.2    | Action Step      | Landscape Patterns           | Discourage any forestland to agricultural and/or rural/urban development.   | 1               | 100                     | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, Private Landowners, Public, RCD, Sea Ranch, Sonoma County, SWRCB |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>GualR-NCSW-5.1</b> | <b>Objective</b> | <b>Passage</b>               | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-5.1.1      | Recovery Action  | Passage                      | Modify or remove physical passage barriers  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-5.1.1.1    | Action Step      | Passage                      | Evaluate, design, and implement appropriate fish passage at South Beach Road Crossing on Fuller Creek (Wheatfield Fork sub-basin; See CALFISH: PAD_ID 736904; Passage ID 13268) | 2               | 10                      | CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD   | 31.50       | 31.50   |          |          |          | 63              | Cost based on stream crossing at \$63,000/unit.  |
| GualR-NCSW-5.1.1.2    | Action Step      | Passage                      | Evaluate, design, and implement appropriate fish passage designs in Palmer Canyon and McKenzie creeks (Wheatfield Fork sub-basin; Klamt et al. 2003).                           | 2               | 10                      | CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD   | 950         | 950     |          |          |          | 1,900           | Cost based on implementing two fish passage facilities at a rate of \$961,000/unit.                |
| <b>GualR-NCSW-6.1</b> | <b>Objective</b> | <b>Habitat Complexity</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range.</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-6.1.1      | Recovery Action  | Habitat Complexity           | Increase large wood frequency (BFW 0-10 meters)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-6.1.1.1    | Action Step      | Habitat Complexity           | Increase wood frequency in salmonid spawning and rearing areas to the extent that a minimum of 6 key LWD pieces exists every 100 meters in 0-10 meter BFW streams.              | 2               | 10                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RCD | 350.00      | 350.00  |          |          |          | 700             | Cost based on treating 28 miles (assume 1 project/mile in 50% High IP) at a rate of \$25,000/mile. |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|--------------------|-----------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                    |                 |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-6.1.1.2 | Action Step     | Habitat Complexity           | Design and install LWD structures in McKenzie and Wild Hog creeks, and the SF sub-basin to the extent that optimal LWD frequency is achieved at strategic locations.              | 2               | 20                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RWQCB |             |         |          |          |          | TBD             | Cost accounted for in above.   |
| GualR-NCSW-6.1.2   | Recovery Action | Habitat Complexity           | Increase large wood frequency (BFW 10-100 meters)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-6.1.2.1 | Action Step     | Habitat Complexity           | Increase wood frequency in seasonal habitat and migratory reaches to the extent that a minimum of 1.3 to 4 key LWD pieces exists every 100 meters in 10-100 meter BFW streams.    | 2               | 10                      | CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, RWQCB   | 130.00      | 130.00  |          |          |          | 260             | Cost based on treating 10 miles (assume 1 project/mile in 50% High IP) at a rate of \$26,000/mile. |
| GualR-NCSW-6.1.2.2 | Action Step     | Habitat Complexity           | Design and implement a SF Gualala mainstem migration project. Focus should include a higher frequency of significantly large wood structures to enhance staging pool development. | 2               | 10                      | CDFW, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD  |             |         |          |          |          | 0               | Cost accounted for in above action step.   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|--------------------|-----------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                    |                 |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-6.1.2.3 | Action Step     | Habitat Complexity           | Evaluate, design, and implement salmonid habitat improvement structures as appropriate to the stream channel type and hydrologic conditions within the Rockpile Sub-basin  | 2               | 10                      | Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RCD, The Nature Conservancy | 130.00      |         |          |          |          | 130             | Cost based on treating 5 miles (assume 1 project/mile in 50% high IP) at a rate of \$26,000/mile. Cost for fish/habitat restoration model accounted for in other action steps.                            |
| GualR-NCSW-6.1.2.4 | Action Step     | Habitat Complexity           | Evaluate, design, and implement salmonid habitat improvement structures as appropriate to the stream channel type and hydrologic conditions within the Buckeye Sub-basin.  | 2               | 5                       | CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, Private Landowners, Public, RCD, RWQCB  | 115.00      |         |          |          |          | 115             | Cost based on fish/habitat restoration model at a rate of \$114,861/project.  |
| GualR-NCSW-6.1.3   | Recovery Action | Habitat Complexity           | Improve pool shelter   |                 |                         |  |             |         |          |          |          |                 |   |
| GualR-NCSW-6.1.3.1 | Action Step     | Habitat Complexity           | Evaluate, design, and implement strategies to improve shelter pools ratings within the Rockpile and Buckeye sub-basins and the following tributaries: Boyd, Buckeye, Camper, Carson, Danfield, Doty, Dry, Franchini, Fuller, Grasshopper, Groshong Gulch, House, Little NF GR, Log Cabin, Marshall, McGann, McKenzie, NF Fuller, Lower NF GR, Palmer Canyon, Pepperwood, Rockpile, SF Fuller, Sullivan, Tombs, Wheatfield Fork, and Wild Hog creeks. | 2               | 20                      | CDFW, Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, The Nature Conservancy                        | 175.00      | 175.00  | 175.00   | 175.00   |          | 700             | Cost based on treating 28 miles (assume 1 project/mile in 50% High IP) at a rate of \$25,000/mile. This action step should be in concert with increasing LWD frequency and therefore cost could be lower. |
| GualR-NCSW-6.1.4   | Recovery Action | Habitat Complexity           | Increase primary pools frequency   |                 |                         |  |             |         |          |          |          |                 |   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-6.1.4.1    | Action Step      | Habitat Complexity           | Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches within the following tributaries: Boyd, Doty, Dry, Fuller, Little NF GR, Log Cabin, Marshall, McGann, McKenzie, Palmer, Robinson, Tombs, and West Fork Fuller. | 2               | 20                      | CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD |             |         |          |          |          | 0               | Cost accounted for in other action steps.   |
| GualR-NCSW-6.1.4.2    | Action Step      | Habitat Complexity           | Identify historic salmonid habitats lacking in channel complexity and implement restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover.   | 2               | 20                      | CDFW, NOAA RC, Private Landowners  |             |         |          |          |          | TBD             | Continue current restoration projects in progress.  |
| GualR-NCSW-6.1.4.3    | Action Step      | Habitat Complexity           | Encourage coordination of LWD placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort (CDFG 2004).  | 2               | 20                      | CalFire, CDFW, NOAA RC, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GualR-NCSW-6.1.4.4    | Action Step      | Habitat Complexity           | Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.  | 2               | 60                      | CDFW, NOAA RC, Private Landowners  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| GualR-NCSW-6.1.4.5    | Action Step      | Habitat Complexity           | Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004).   | 2               | 60                      | CDFW, NMFS, NRCS, Private Landowners   |             |         |          |          |          | In-Kind         | Cost to maintain LWD is expected to be minimal. Action is considered In-Kind                    |
| GualR-NCSW-6.1.5      | Recovery Action  | Habitat Complexity           | Improve pool/riffle/flatwater ratios (hydraulic diversity)   |                 |                         |  |             |         |          |          |          |                 |   |
| GualR-NCSW-6.1.5.1    | Action Step      | Habitat Complexity           | Increase the frequency of LWD to rate as Good (over 75% of IP-km within the watershed).  | 2               | 20                      |  |             |         |          |          |          | 0               | Cost should be accounted for in increase LWD frequency and primary pools.                       |
| <b>GualR-NCSW-7.1</b> | <b>Objective</b> | <b>Riparian</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| GualR-NCSW-7.1.1      | Recovery Action  | Riparian                     | Improve tree diameter  |                 |                         |  |             |         |          |          |          |                 |   |
| GualR-NCSW-7.1.1.1    | Action Step      | Riparian                     | Increase tree diameter to a minimum of 80% CWHR density rating "D" across all current and potential spawning and juvenile rearing areas.   | 2               | 20                      | Board of Forestry, CalFire, CDFW, Conservation Fund, Gualala Redwood Company, NMFS, The Nature Conservancy   | 1,205       | 1,205   | 1,205    | 1,205    |          | 4,820           | Cost based on treating 3 miles (assume 80 acres/mile in 5% High IP) at a rate of \$20,057/acre. |
| GualR-NCSW-7.1.1.2    | Action Step      | Riparian                     | Prioritize large tree retention along the SF Gualala River.  | 2               | 50                      | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS  |             |         |          |          |          | In-Kind         | Action is considered In-Kind  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|--------------------|-----------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                    |                 |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-7.1.1.3 | Action Step     | Riparian                     | Conduct conifer release to promote growth of larger diameter trees where appropriate.  | 2               | 10                      | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, NRCS, RCD   | 550         | 550     |          |          |          | 1,100           | Cost based on treating 9 miles (assume 80 acres/mile in 15% High IP) at a rate of \$1,422/acre.   |
| GualR-NCSW-7.1.2   | Recovery Action | Riparian                     | Improve canopy cover   |                 |                         |  |             |         |          |          |          |                 |   |
| GualR-NCSW-7.1.2.1 | Action Step     | Riparian                     | Increase the average stream canopy cover within potential spawning and rearing reaches to a minimum of 80%.  | 2               | 20                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, The Nature Conservancy  | 301         | 301     | 301      | 301      |          | 1,203           | Cost based on treating 3 miles (assume 20 acres/mile treated in 5% High IP) at a rate of \$20,057/acre. This action step should be in concert with increasing tree diameter to a minimum of 80% CWHR. |
| GualR-NCSW-7.1.2.2 | Action Step     | Riparian                     | Evaluate buffers width and/or timber harvest in terms of light penetration and potential changes to micro-climate conditions along the SF Gualala River.   | 2               | 50                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS   |             |         |          |          |          | In-Kind         | Action is considered In-Kind  |
| GualR-NCSW-7.1.2.3 | Action Step     | Riparian                     | Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the NF Gualala sub-basin: upper reaches of Dry Creek, Robinson Creek, the central and higher reaches of the mainstem, and the lower reaches of Bear and Stewart Creeks (Klamt et al. 2003). | 2               | 20                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RCD |             |         |          |          |          | 0               | Cost accounted for in above action steps.   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-7.1.2.4     | Action Step      | Riparian                     | Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the Rockpile sub-basin: mainstem Rockpile Creek, Red Rock Creek, and Horsetheif (Klamt et al. 2003).                        | 2               | 20                      | Board of Forestry, CalFire, CDFW, Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RCD, The Nature Conservancy |             |         |          |          |          | 0               | Cost accounted for in above action steps.   |
| GualR-NCSW-7.1.2.5     | Action Step      | Riparian                     | Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the Buckeye sub-basin: upper reaches of Buckeye Creek, Franchini, Grasshopper, and Soda Springs creeks (Klamt et al. 2003). | 2               | 20                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RCD  |             |         |          |          |          | 0               | Cost accounted for in above action steps.   |
| <b>GualR-NCSW-8.1</b>  | <b>Objective</b> | <b>Sediment</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-8.1.1       | Recovery Action  | Sediment                     | Improve instream gravel quality  |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-8.1.1.1     | Action Step      | Sediment                     | Treat high priority slides and landings identified in credible landowner assessments.  | 1               | 20                      | CDFW, NOAA RC, Private Landowners   |             |         |          |          |          | TBD             | Site specific information needed for a accurate cost estimate.                    |
| GualR-NCSW-8.1.1.2     | Action Step      | Sediment                     | Continue efforts such as erosion proofing, improvements, and decommissioning, through the Rockpile sub-basin to reduce sediment delivery to central Rockpile Creeks and Rockpile tributaries.  | 2               | 10                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD  | 30.00       | 30.00   |          |          |          | 60              | Cost based on decommissioning 5 miles of road network at a rate of \$12,000/mile. |
| <b>GualR-NCSW-10.1</b> | <b>Objective</b> | <b>Water Quality</b>         | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-10.1.1      | Recovery Action  | Water Quality                | Improve stream temperature conditions  |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-10.1.1.1    | Action Step      | Water Quality                | Expand continuous temperature monitoring efforts into the upper sub-basins and tributaries that provide summer rearing for salmonids. Investigate canopy composition and monitoring air temperature to examine the relationship between canopy, temperature, and other micro-climate effects on water temperature (Klamt et al. 2003). | 2               | 5                       | CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC   | 1.50        |         |          |          |          | 2               | Cost based on installing a minimum of 3 continuous stream temperature gauges at a rate of \$500/station |
| GualR-NCSW-10.1.1.2    | Action Step      | Water Quality                | Evaluate the current adequacy of buffer zones in recently logged areas and ensure stream temperatures have not increased due to these activities.  | 2               | 20                      | Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, Private Landowners, RCD |             |         |          |          |          | 0               | Cost accounted for through implementation of other action steps.  |
| GualR-NCSW-10.1.1.3    | Action Step      | Water Quality                | Implement actions to maintain and restore water temperatures to meet habitat requirements for steelhead in specific streams (CDFG 2004).   | 2               | 20                      | CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NRCS, Private Landowners                            |             |         |          |          |          | 0               | Cost accounted for in above action steps.   |
| <b>GualR-NCSW-12.1</b> | <b>Objective</b> | <b>Agriculture</b>           | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-12.1.1      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to instream habitat complexity (altered pool complexity and/or pool riffle ratio)   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-12.1.1.1    | Action Step      | Agriculture                  | Discourage forest-to-vineyard land conversions or other agricultural activities that may impact natural stream channel morphology.   | 1               | 30                      | Board of Forestry, CalFire, CDFW, NMFS, Sonoma County   |             |         |          |          |          | In-Kind         |   |
| GualR-NCSW-12.1.2      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)   |                 |                         |   |             |         |          |          |          |                 |   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-12.1.2.1    | Action Step      | Agriculture                  | Assess and address sources from agricultural activities that deliver sediment and runoff to stream channels.   | 3               | 10                      | CA Coastal Commission, CDFW, DWR, NOAA RC, NRCS, Private Landowners, RCD | 60.50       | 60.50   |          |          |          | 121             | Cost based on sediment assessment for 9,550 acres (assume 5% of total watershed acres) at a rate of \$12.62/mile. Additional costs of addressing sources will vary depending on methods and extent of actions. |
| GualR-NCSW-12.1.2.2    | Action Step      | Agriculture                  | Work with vineyard owners to assess the effectiveness of erosion control measures throughout the winter period.  | 3               | 5                       | CalFire, CDFW, NMFS, RWQCB, Sonoma County                                | 50.00       |         |          |          |          | 50              | Cost estimate for field work by agency or other staff.   |
| GualR-NCSW-12.1.2.3    | Action Step      | Agriculture                  | Encourage and assist the NRCS and RCD to increase the number of landowners participating in sediment reduction planning and implementation.  | 3               | 25                      | CDFW, NMFS, NOAA RC, Private Landowners                                  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-12.1.2.4    | Action Step      | Agriculture                  | Work with agencies and landowners to establish appropriately sized and properly functioning riparian buffers adjacent to watercourses that have a potential to deliver sediment to spawning and rearing habitat. | 3               | 50                      | NRCS, Private Landowners, RCD, NOAA RC                                   |             |         |          |          |          | TBD             | Costs will vary depending on extent of buffers.  |
| GualR-NCSW-12.1.3      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to water quality (instream water temperature)   |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-12.1.3.1    | Action Step      | Agriculture                  | Maintain functional riparian stream buffers that provide desirable stream canopy cover adjacent to agricultural land activities.   | 2               | 20                      | FishNet 4C, NOAA RC, Private Landowners, Sonoma County                   |             |         |          |          |          | TBD             | Additional information needed on the size and scope of projects in order to estimate cost.   |
| GualR-NCSW-12.1.4      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to watershed hydrology  |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-12.1.4.1    | Action Step      | Agriculture                  | Promote and implement off-channel storage facilities (e.g. winter diversion ponds, tanks, etc.) in efforts to reduce in-stream flow impacts associated with agricultural water use.                              | 2               | 10                      | CalFire, CDFW, NMFS, NMFS OLE, Private Landowners, Sonoma County, SWRCB  |             |         |          |          |          | TBD             | Low cost to promote. Implementation likely 1-2 million based on recent Russian River costs to develop off-channel storage.   |
| GualR-NCSW-12.1.5      | Recovery Action  | Agriculture                  | Prevent or minimize increased landscape disturbance  |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-12.1.5.1    | Action Step      | Agriculture                  | Work within the agricultural community to educate landowners and enhance practices that provide for functional watershed processes.  | 3               | 20                      | Farm Bureau, FishNet 4C, Private Landowners, Sonoma County               |             |         |          |          |          | In-Kind         | Relatively low cost is expected to work with agricultural community. Action is considered In-Kind  |
| GualR-NCSW-12.1.5.2    | Action Step      | Agriculture                  | Improve education and awareness to agencies, landowners, and the general public regarding salmonid recovery and habitat requirements.  | 3               | 30                      | NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD                     |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-12.2</b> | <b>Objective</b> | <b>Agriculture</b>           | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-12.2.1      | Recovery Action  | Agriculture                  | Prevent or minimize increased landscape disturbance  |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-12.2.1.1    | Action Step      | Agriculture                  | Coordinate with regulatory agencies authorizing/permitting forestland-to-agriculture conversions to ensure consistency with salmonid recovery goals.   | 1               | 5                       | CalFire, CDFW, NMFS, Sonoma County                                       |             |         |          |          |          | In-Kind         |  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-12.2.1.2    | Action Step      | Agriculture                  | Streamline permit processing where landowners are conducting actions aligned with recovery priorities.   | 2               | 5                       | CDFW, NMFS, NOAA RC, Private Landowners, RCD  |             |         |          |          |          | In-Kind         |  |
| GualR-NCSW-12.2.1.3    | Action Step      | Agriculture                  | Technical support to counties by NMFS staff should be conducted to encourage county general plan updates that include measures to conserve and protect salmonids and their habitats.   | 3               | 10                      | NMFS, NOAA RC, NRCS, Private Landowners, Public Works, RCD, Sonoma County                         |             |         |          |          |          | In-Kind         |  |
| GualR-NCSW-12.2.2      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to watershed hydrology  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-12.2.2.1    | Action Step      | Agriculture                  | Identify and eliminate depletion of summer base flows from unauthorized water users.   | 2               | 20                      | CDFW, NMFS, NMFS OLE, NOAA RC, North Gualala Water Company, SWRCB                                 | 32.50       | 32.50   |          |          |          | 65              | Development of stream flow model will identify summer base flow levels. Cost based on stream flow/precipitation model at a rate of \$65,084/project. |
| GualR-NCSW-12.2.2.2    | Action Step      | Agriculture                  | Develop legislation to fund county planning for environmentally sound agricultural growth and water supply.  | 2               | 30                      | CDFW, NMFS, Sonoma County, SWRCB  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-16.1</b> | <b>Objective</b> | <b>Fishing/Collecting</b>    | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-16.1.1      | Recovery Action  | Fishing/Collecting           | Prevent or minimize reduced density, abundance, and diversity based on the biological recovery criteria  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-16.1.1.1    | Action Step      | Fishing/Collecting           | Work with CDFW to modify Section California Code of Regulations 8.00(b)(1) low flow minimum flow closure for Mendocino, Sonoma, and Marin counties. Discontinue using the Russian River at Guerneville gauging station for angling closures and use the Navarro River USGS gauging station (11468000) which better reflects hydrologic conditions in smaller unregulated coastal Sonoma/Mendocino streams. | 2               | 100                     | CDFW, NMFS  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-18.1</b> | <b>Objective</b> | <b>Livestock</b>             | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-18.1.1      | Recovery Action  | Livestock                    | Prevent or minimize adverse alterations to riparian species composition and structure  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-18.1.1.1    | Action Step      | Livestock                    | Work with agencies and landowners to reduce livestock and feral pig access to the riparian zone to encourage bank stabilization and re-vegetation of riparian areas within the following sub-basins: Gualala Main stem/ SF Garcia, Wheatfield Fork, Rockpile (Klamt et al. 2003).  | 3               | 20                      | CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD |             |         |          |          |          | TBD             | Costs will vary with methods and extent of actions.  |
| <b>GualR-NCSW-19.1</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-19.1.1      | Recovery Action  | Logging                      | Prevent or minimize impairment to floodplain connectivity (quality & extent)   |                 |                         |   |             |         |          |          |          |                 |  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level           | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|---------------------|-----------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                     |                 |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-19.1.1.1 | Action Step     | Logging                      | Timber harvest planning should evaluate and minimize impacts to off channel habitat, floodplains, ponds, and oxbows.  | 2               | 50                      | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, NRCS, RCD            |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-19.1.2   | Recovery Action | Logging                      | Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-19.1.2.1 | Action Step     | Logging                      | Encourage coordination of LWD placement projects in streams (as necessary) as part of logging operations.   | 3               | 30                      | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, NOAA RC, RCD         |             |         |          |          |          | In-Kind         | This recommendation should be considered standard practice. Action is considered In-Kind |
| GualR-NCSW-19.1.2.2 | Action Step     | Logging                      | Work with CalFire and others during the timber harvest permitting process to retain the largest trees in all riparian zones (including intermittent and ephemeral streams) for bank stability and long-term wood recruitment. | 2               | 100                     | Board of Forestry, CalFire, Gualala Redwood Company, NMFS, NRCS, RCD, CDFW            |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-19.1.3   | Recovery Action | Logging                      | Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-19.1.3.1 | Action Step     | Logging                      | Encourage all permanent and year-round access roads beyond the THP parcel be surfaced after harvest completion with base rock and road gravel, asphalt, or chipseal, as appropriate.  | 3               | 60                      | CalFire, Private Landowners   |             |         |          |          |          | TBD             | Costs will vary with extent and methods of treatments.                                   |
| GualR-NCSW-19.1.3.2 | Action Step     | Logging                      | Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities that can promote erosion.  | 3               | 20                      | CalFire, California Geological Survey, Private Consultants, Private Landowners, RWQCB |             |         |          |          |          | TBD             | Cost expected to be low because much of this mapping has been completed.                 |
| GualR-NCSW-19.1.3.3 | Action Step     | Logging                      | Establish equipment limitation zones on headwater streams and swales.   | 3               | 50                      | Board of Forestry, CalFire, CDFW, NMFS, NRCS, RCD                                     |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level           | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|---------------------|-----------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                     |                 |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| GualR-NCSW-19.1.3.4 | Action Step     | Logging                      | Decommissioning legacy roads, upgrading road networks, and other rehabilitation work targeting reductions in fine sediment inputs to stream networks.                | 2               | 20                      | Board of Forestry, CalFire, CDFW, Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, Private Landowners, RCD | 137.50      | 137.50  | 137.50   | 137.50   |          | 550             | Cost to decommission 40 miles (assume 10% of road network) at a rate of \$12,000/mile. Costs to upgrade and rehabilitate are likely to be less, but will depend on methods and extent of actions. |
| GualR-NCSW-19.1.4   | Recovery Action | Logging                      | Prevent or minimize impairment to water quality (instream water temperature)   |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-19.1.4.1 | Action Step     | Logging                      | Encourage wider riparian buffer zones in areas where stream temperatures or riparian canopy are found limiting.  | 2               | 30                      | Board of Forestry, CalFire, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD  |             |         |          |          |          | In-Kind         | Action is considered In-Kind  |
| GualR-NCSW-19.1.4.2 | Action Step     | Logging                      | Protect current riparian zones in all summer salmonid rearing areas to the extent that they are able to mature, provide, and maintain a minimum of 80% canopy cover. | 2               | 100                     | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, Private Landowners, RCD  |             |         |          |          |          | In-Kind         | Action is considered In-Kind  |
| GualR-NCSW-19.1.5   | Recovery Action | Logging                      | Prevent or minimize adverse alterations to riparian species composition and structure  |                 |                         |   |             |         |          |          |          |                 |   |
| GualR-NCSW-19.1.5.1 | Action Step     | Logging                      | Work with CalFire and others through the timber harvest permitting process to conserve and manage forestlands for older forest stages.                               | 2               | 100                     | Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS   |             |         |          |          |          | In-Kind         | Action is considered In-Kind  |
| GualR-NCSW-19.1.5.2 | Action Step     | Logging                      | Manage riparian areas for their site potential composition and structure.  | 2               | 60                      | Board of Forestry, CalFire, CDFW, NMFS  |             |         |          |          |          | TBD             | Cost of reducing timber available in riparian areas needs to be calculated for estimating cost of this action.  |
| GualR-NCSW-19.1.6   | Recovery Action | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-19.1.6.1    | Action Step      | Logging                      | Consider the development of a Watershed Database (similar to the CDFG Northern Spotted Owl database) for salmonids that provides watershed data and information in a consistent fashion to all foresters for consideration in their harvest plans. | 3               | 20                      | Board of Forestry, CDFW, NMFS   |             |         |          |          |          | TBD             | A database is currently in development and being performed in-house. Outsourcing may be needed at future developmental stages. |
| GualR-NCSW-19.1.6.2    | Action Step      | Logging                      | Acquire key large tracts of forestlands identified as a priority by Federal, State, local government, and non-governmental organizations   | 2               | 30                      | CDFW, NMFS, NOAA RC   |             |         |          |          |          | TBD             | Cost are difficult to estimate because of fair market value and rate of turnover.  |
| GualR-NCSW-19.1.6.3    | Action Step      | Logging                      | Provide for properly functioning watershed processes (e.g., cycles of wood, water and sediment) by promoting long term sustainable forestry practices that support salmonid habitats.  | 2               | 100                     | Board of Forestry, CalFire, CDFW, NMFS, RWQCB   |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-19.1.6.4    | Action Step      | Logging                      | Should large tracts of forestlands within the Gualala River watershed become available for purchase, the State of California or other entities should consider purchasing the area as a Demonstration Forest or State Park.                        | 2               | 20                      | BLM, CalFire, California Coastal Conservancy, CDFW, Conservation Fund, NMFS, Private Landowners, Sonoma County, State Parks, The Nature Conservancy |             |         |          |          |          | TBD             | Not able to estimate cost at this time.  |
| GualR-NCSW-19.1.6.5    | Action Step      | Logging                      | Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).  | 3               | 60                      | CalFire, CDFW, NMFS, Private Landowners, Sonoma County  |             |         |          |          |          | TBD             | Costs may be low if conducted with existing federal, state and county staff.   |
| GualR-NCSW-19.1.6.6    | Action Step      | Logging                      | Work with state and local agencies and landowners to maintain and expand California's working forestlands and forestlands held by the State, and prevent future conversion of forestlands to agriculture or other land uses.                       | 2               | 50                      | Board of Forestry, CalFire, CDFW, NMFS, County  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-19.2</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-19.2.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-19.2.1.1    | Action Step      | Logging                      | Work with Sonoma county planning staff to minimize rezoning forestlands to rural residential or other land uses (e.g., vineyards).   | 1               | 60                      | CalFire, NMFS, Sonoma County  |             |         |          |          |          | In-Kind         | Cost low if conducted with current regulatory and County staff. Action is considered In-Kind                                   |
| GualR-NCSW-19.2.1.2    | Action Step      | Logging                      | Coordinate with regulatory agencies to minimize conversions in key watersheds and discourage forestland conversions.   | 1               | 5                       | Board of Forestry, CalFire, CDFW, NMFS  |             |         |          |          |          | In-Kind         | Cost low if conducted with current regulatory and County staff. Action is considered In-Kind                                   |
| GualR-NCSW-19.2.1.3    | Action Step      | Logging                      | Work with CalFire and others to establish greater oversight and post-harvest monitoring by the permitting agency for operations.   | 2               | 5                       | Board of Forestry, CalFire, CDFW, NMFS, RWQCB   |             |         |          |          |          | In-Kind         | Cost low if conducted with current regulatory and County staff. Action is considered In-Kind                                   |
| GualR-NCSW-19.2.1.4    | Action Step      | Logging                      | Assign 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).                                     | 1               | 10                      | CalFire, NMFS   |             |         |          |          |          | In-Kind         | The recovery action is considered In-Kind.   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-19.2.1.5    | Action Step      | Logging                      | Require tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.  | 2               | 60                      | CalFire, California Geological Survey, CDFW, NMFS, Private Consultants, Private Landowners, RWQCB |             |         |          |          |          | TBD             | Cost can not be determined without information on the number of acres and cost of merchantable timber retention.   |
| GualR-NCSW-19.2.1.6    | Action Step      | Logging                      | Extend the post harvest monitoring period to a minimum of 5 years to ensure adverse effects are minimized, including THP road maintenance after harvest.  | 2               | 10                      | CalFire, CDFW, NMFS, Private Landowners, RWQCB  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-19.2.1.7    | 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               | 5                       | Board of Forestry, CalFire, CDFW, NMFS  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-23.1</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-23.1.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-23.1.1.1    | Action Step      | Roads/Railroads              | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).  | 1               | 10                      | CDFW, NOAA RC, Private Landowners, RCD, Sonoma County   | 300.00      | 300.00  |          |          |          | 600             | Based on remaining number of miles of roads that have not been upgraded (500 miles) in high priority areas. Cost to decommission roads based on \$12,000/mile for 500 miles. If roads were upgraded, costs would be \$21,000/mile for an estimated total of \$1,050,000. |
| GualR-NCSW-23.1.1.2    | Action Step      | Roads/Railroads              | Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).   | 1               | 60                      | Private Landowners, RCD, Sonoma County  |             |         |          |          |          | TBD             | Cost of maintaining upgraded roads will depend on severity of previous winter.   |
| GualR-NCSW-23.1.1.3    | Action Step      | Roads/Railroads              | Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity.  | 2               | 5                       | NRCS, Private Consultants, Private Landowners, RCD  |             |         |          |          |          | TBD             | Cost expected to be low because most areas have been surveyed.   |
| GualR-NCSW-23.1.1.4    | Action Step      | Roads/Railroads              | Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.  | 2               | 5                       | CDFW, Private Consultants, Private Landowners, RWQCB  |             |         |          |          |          | TBD             | Five years may be sufficient to determine problem segments that would be stormproofed.   |
| GualR-NCSW-23.1.1.5    | Action Step      | Roads/Railroads              | Encourage, when necessary and appropriate, restricted access to unpaved roads in winter to reduce road degradation and sediment release. Where restricted access is not feasible, encourage measures such as rocking to prevent sediment from reaching streams with steelhead (CDFG 2004).                        | 2               | 20                      | Private Landowners  |             |         |          |          |          | TBD             | Twenty years is suggested to institutionalize these practices.   |
| GualR-NCSW-23.1.1.6    | Action Step      | Roads/Railroads              | Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following Gualala mainstem/ SF Gualala Subbasin tributaries: McKenzie Creek, Marchall Creek, Palmer Canyon Creek, Wild Hog Creek, South Fork, and Marshall Creek. | 2               | 20                      | CDFW, Gualala Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB                |             |         |          |          |          | 0               | Cost accounted for in other action steps.  |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID            | Level           | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|----------------------|-----------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                      |                 |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-23.1.1.7  | Action Step     | Roads/Railroads              | Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following Wheatfield Fork sub-basin tributary reaches: Lower reaches of Haupt and Tabacco Creeks; Lower to middle reaches of Tombs, Wolf, and Elk creeks, and unnamed trib to the mainstem Wheatfield Fork upstream from Tombs Creek, to Elk Creek, and flanked by Bear and Gibson ridges; larger watercourses to the lower reaches of House Creek; middle to higher reaches of House, Pepperwood, Danfield, and Cedar creeks (Klamt et al. 2003). | 2               | 20                      | CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB  |             |         |          |          |          | 0               | Cost likely accounted for in other action steps.   |
| GualR-NCSW-23.1.1.8  | Action Step     | Roads/Railroads              | Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following North Fork sub-basin tributaries: Stewart, Dry, Upper Billings, upper Robinson, Doty, Log Cabin creeks, and McGann Gulch (Klamt et al. 2003).  | 2               | 20                      | CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD, RWQCB |             |         |          |          |          | 0               | Cost accounted for in other action steps.  |
| GualR-NCSW-23.1.1.9  | Action Step     | Roads/Railroads              | Use appropriately sized culverts in steep terrain to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure in the Buckeye sub-basin (GRWA 2003).   | 2               | 50                      | CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD, RWQCB |             |         |          |          |          | In-Kind         | This recommendation should be considered standard practice. Action is considered In-Kind |
| GualR-NCSW-23.1.1.10 | Action Step     | Roads/Railroads              | Install locked gates at river access points to prevent 4wd vehicles from driving in the river.   | 2               | 10                      | CDFW, FOGualalaR, Gualala Redwood Company, Gualala Watershed Council                                     |             |         |          |          |          | TBD             | TBD, cost based on number and type of locked gates to prevent 4wd vehicles.              |
| GualR-NCSW-23.1.2    | Recovery Action | Roads/Railroads              | Prevent or minimize impairment to passage and migration  |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-23.1.2.1  | Action Step     | Roads/Railroads              | Minimize future passage barriers on newly constructed roads utilizing NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a)  | 2               | 20                      | CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-23.1.2.2  | Action Step     | Roads/Railroads              | Ensure that all future road or bridge repairs at stream crossing minimize impairment to fish passage for all salmonid life stages.   | 2               | 20                      | CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-23.1.3    | Recovery Action | Roads/Railroads              | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)   |                 |                         |  |             |         |          |          |          |                 |  |
| GualR-NCSW-23.1.3.1  | Action Step     | Roads/Railroads              | Design new roads that avoid (to the maximum extent practicable) riparian areas and are hydrologically disconnected from the stream network.  | 2               | 60                      | Private Consultants, Private Landowners, Sonoma County   |             |         |          |          |          | In-Kind         | This recommendation should be considered standard practice. Action is considered In-Kind |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat        | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|-------------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                                     |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-23.1.4      | Recovery Action  | Roads/Railroads                     | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-23.1.4.1    | Action Step      | Roads/Railroads                     | Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in historical habitats or steelhead watersheds.                                     | 1               | 10                      | FishNet 4C, Private Landowners, RCD   | 1,100       | 1,100   |          |          |          | 2,200           | Cost based on decommissioning 176 miles of road at a cost of \$12,000/mile. Recovery action related to prevent impairment to instream substrate by decommissioning riparian roads. |
| GualR-NCSW-23.1.4.2    | Action Step      | Roads/Railroads                     | Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions.   | 3               | 5                       | Board of Forestry, CDFW, NMFS, NRCS, RCD, RWQCB   | 1,538       |         |          |          |          | 1,538           | Cost based on road inventory of 1,607 miles of road at a rate of \$957/mile.   |
| GualR-NCSW-23.1.4.3    | Action Step      | Roads/Railroads                     | Conduct outreach and education regarding the adverse effects of roads, and the types of best management practices protective of salmonids.                                   | 3               | 30                      | Board of Forestry, CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-23.1.4.4    | Action Step      | Roads/Railroads                     | Develop a Salmon Certification Program for road maintenance staff.   | 2               | 10                      | NMFS, Caltrans, County  |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-24.1</b> | <b>Objective</b> | <b>Severe Weather Patterns</b>      | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-24.1.1      | Recovery Action  | Severe Weather Patterns             | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-24.1.1.1    | Action Step      | Severe Weather Patterns             | Use the emergency drought operations center (EDOC) or other similar group to oversee implementation of water conservation measures and alternatives.                         | 2               | 60                      | CDFW, CDFW Law Enforcement, NMFS OLE, North Gualala Water Company, Private Landowners, Public, Sea Ranch, Sonoma County       |             |         |          |          |          | TBD             | Need additional analysis to estimate cost which will vary with drought frequency.  |
| GualR-NCSW-24.1.1.2    | Action Step      | Severe Weather Patterns             | Prioritize water conservation measures to maintain instream flow needs of salmonids.   | 3               | 10                      | CDFW, NMFS, RCD   |             |         |          |          |          | 0               | Prioritizing existing funding mechanisms is not expected to add additional cost to the process.  |
| <b>GualR-NCSW-25.1</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.1.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.1.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with the SWRCB and others to ensure that current and future water diversions (surface or groundwater) do not impair water quality conditions in summer rearing reaches. | 1               | 42134                   | CDFW, CDFW Law Enforcement, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NMFS OLE, NOAA RC, SWRCB |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat        | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|-------------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                                     |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| GualR-NCSW-25.1.1.2    | Action Step      | Water Diversion/ Impoundment        | Develop a stream flow model and apply it to ensure water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.   | 1               | 5                       | CDFW, CDFW Law Enforcement, NMFS, SWRCB   | 65.00       |         |          |          |          | 65              | Cost based on stream flow/precipitation model at a rate of \$65,084/project.   |
| GualR-NCSW-25.1.1.3    | Action Step      | Water Diversion/ Impoundment        | Provide incentives to water rights holders willing to convert some or all of their water rights to instream use via petition change of use and California Water Code §1707 (CDFG 2004).  | 2               | 20                      | CDFW, NMFS, SWRCB   |             |         |          |          |          | TBD             | Cost based on amount and type of incentives to provide to water diverters. Currently, existing programs exist and should be explored and expanded. |
| GualR-NCSW-25.1.2      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to passage and migration  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.1.2.1    | Action Step      | Water Diversion/ Impoundment        | Establish flow related adult and smolt migration thresholds for consideration in authorizing future water diversions.  | 1               | 5                       | CDFW, NMFS, North Gualala Water Company, SWRCB  |             |         |          |          |          | 0               | Cost accounted for in above action step for stream flow model.   |
| GualR-NCSW-25.1.3      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to the estuary (quality and extent)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.1.3.1    | Action Step      | Water Diversion/ Impoundment        | Discourage the development of any surface water diversions in the watershed that independently or cumulatively have significant impact on reducing inflow to the estuary during spring/summer/fall months (ECORP and Kamman Hydrology & Engineering 2005). | 1               | 5                       | CDFW, Gualala Watershed Council, NMFS, North Gualala Water Company, SWRCB                       |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-25.1.3.2    | Action Step      | Water Diversion/ Impoundment        | Develop and implement Estuary Inflow Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.   | 1               | 5                       | CDFW, NMFS, SWRCB   |             |         |          |          |          | 0               | Cost accounted for in above action step for stream flow model.   |
| GualR-NCSW-25.1.4      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to water quality (instream temperature)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.1.4.1    | Action Step      | Water Diversion/ Impoundment        | Work with agencies and landowners to ensure future water diversions do not impair instream water temperatures during the summer and fall dry seasons.  | 1               | 10                      | CDFW, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, RCD, Sea Ranch, SWRCB |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| <b>GualR-NCSW-25.2</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.2.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| GualR-NCSW-25.2.1.1    | Action Step      | Water Diversion/ Impoundment        | Ensure all water diversions and impoundments are compliant with AB2121 or other appropriate protective measures.   | 1               | 10                      | CDFW, CDFW Law Enforcement, NMFS OLE, NMFS, SWRCB   |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |
| GualR-NCSW-25.2.1.2    | Action Step      | Water Diversion/ Impoundment        | Identify and work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinate efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams.                         | 1               | 20                      | CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB   |             |         |          |          |          | In-Kind         | Action is considered In-Kind   |

Gualala River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level       | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner                                  | Costs (\$K) |         |          |          |          | Entire Duration | Comment                      |
|---------------------|-------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|------------------------------|
|                     |             |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |                              |
| GualR-NCSW-25.2.1.3 | Action Step | Water Diversion/ Impoundment | Improve coordination between agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of steelhead and their habitats, and avoidance of adverse impacts caused by water diversion (CDFG 2004). | 2               | 10                      | CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB |             |         |          |          |          | In-Kind         | Action is considered In-Kind |

# Navarro River Population

## NC Steelhead Winter-Run

- Role within DPS: Functionally Independent Population
- Diversity Stratum: Central Coastal
- Spawner Abundance Target: 7,800 adults
- Current Intrinsic Potential: 387.5 IP-km

For information regarding CC Chinook salmon and CCC coho salmon for this watershed, please see the CC Chinook Salmon volume of this recovery plan and the CCC coho salmon recovery plan ().

## Steelhead Abundance and Distribution

In 1965, CDFW estimated abundance of 16,000 adult winter steelhead for the Navarro River watershed (Busby *et al.* 1996). Based on the current potential habitat capacity of the Navarro River watershed, Spence *et al.* (2012) estimates a population abundance target of 7,900 adult steelhead. Few actual spawning escapement estimates exist for this population, but recent spawning surveys conducted by CDFW estimate the abundance for the 2009/10 spawning population at 102 adult fish (D. Wright, personal communication 2010).

According to various sources, juvenile steelhead are distributed throughout much of the Navarro River basin (Entrix 1998). Juvenile steelhead distribution data collected by CDFW was reviewed by Entrix (1998), reporting the presence of steelhead in 33 of 35 sampled streams. Limited outmigrant monitoring on the North Fork Navarro was conducted by CDFW from 1995 to 1997 with young-of-the-year (YOY) steelhead and smolts found each year. The outmigrant sampling represents smolt production from 21 percent of the potential habitat in the Navarro River watershed. High numbers of YOY steelhead (9,015 – 60,479) were observed during these trapping efforts, and smolt numbers of 384 to 2,186 fish were also reported (KRIS Navarro website).

Areas of high quality habitat exist within the North Fork Navarro subbasin, Upper Rancheria, and Indian Creek subbasins. Tributaries in these subbasins maintain suitable stream temperatures and flow, and provide the highest quality salmonid habitat in the basin (Entrix 1998). In addition to the high quality tributary reaches, the estuary is a key habitat area that juvenile steelhead utilize for a significant part of their life history (Cannata 1998).

## **History of Land Use**

The present-day Navarro River watershed is in multiple land use with timber harvest, agriculture (largely vineyards), and grazing as the principal uses. Historically, timber harvest was the primary land use, with harvest activities beginning in the mid-1800s and a second logging boom occurring from the 1930s to the early 1950s. Industrial and private timberlands have been harvested consistently since the 1950s, with a spike from the late 1980s to about 1998. Agricultural and grazing development began as early as the 1850s in Anderson Valley, with apple production and sheep grazing in the watershed. Italian immigrants built the first commercial winery in the valley during the early 1910s, but viticulture did not expand until the late 1970s. Current wine grape production in the Anderson Valley has increased to approximately 3,000 acres, or about 2 percent of the watershed area (NMFS GIS, CDFG FRAP GIS). The current population is approximately 3,500 people, centered largely around the town of Boonville in Anderson Valley. Highway 128 spans the length of the watershed, eventually meeting Highway 1 at the Navarro River estuary.

Past timber harvest, agricultural, and grazing impacts have resulted in the establishment of a TMDL for impaired temperature and sediment conditions by the EPA in 2000. Water diversion is an issue in this basin due to agricultural diversions; the SWRCB (1998) concluded the Navarro should be listed as fully appropriated between April 1 and December 14. The SWRCB Division of Water Rights subsequently formally recognized the Navarro as fully allocated during the summer.

## **Current Resources and Land Management**

The Navarro River watershed is predominately in private ownership, with forestland as the major land use (70 percent of watershed area). Rangeland makes up 25 percent of the current land use, agriculture about 2 percent, and a small percentage in rural residential development. There are also state parks, which include Hendy Woods, Paul M. Demmick, and Navarro River Redwoods State Park. The Navarro River Redwoods State Park stretches along an 11-mile corridor of the mainstem Navarro River from the North Fork to the estuary.

The Anderson Valley Land Trust, Mendocino County Water Agency, and the California State Coastal Conservancy jointly sponsored a Navarro Watershed Restoration Plan, focusing on restoration opportunities related to sediment and temperature, and their impacts on salmonid species in the watershed.

## **Salmonid Viability and Watershed Conditions**

The following habitat indicators are rated Poor through the CAP process: LWD frequency, riparian tree diameter, shelter rating, primary pools, pool/riffle ratio for both juvenile rearing and adult salmonid lifestages. Stream temperature is also rated as Poor for juvenile summer rearing. Indicators for watershed processes that are rated as Poor through the CAP analysis include riparian species composition, road density across the watershed and within riparian areas. Recovery strategies will focus on improving these poor conditions as well as those needed to ensure population viability and functioning watershed processes. Indicators that are rated as Fair through the CAP process, but are considered important within specific areas of the watershed include gravel quality for eggs, baseflow conditions for summer rearing and the estuary, and physical barriers for juvenile steelhead.

## **Current Conditions**

The following discussion focuses on those conditions that are rated Fair or Poor as a result of our CAP viability analysis. The Navarro River CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

## **Population and Habitat Conditions**

### **Habitat Complexity: Large Wood and Shelter**

Suitable shelter ratings are required for juvenile salmonids as well as spawning adults for protection from predators, partitioning of habitat from other fish, and providing areas of reduced velocity for energy conservation. Data from CDFW habitat inventories indicate shelter ratings throughout the Navarro River watershed are poor within 90 percent of all sampled reaches. Poor to Fair LWD ratings were also documented during habitat surveys, which are due largely to a lack of functional riparian corridors and poor recruitment of large conifer species from adjacent upslope areas. The general lack of wood within the Navarro River watershed is from timber harvesting, and stream cleaning efforts that occurred in the 1970s through the 1980s. The multiple timber harvesting regimes since the 1850s have shifted forest size, and to some extent the composition, of riparian forest from historical conifer/redwood stands characteristic of late seral forests to smaller conifer and hardwood dominated stands that have been maintained due to the Forest Practices Act of 1973. This shift in forest-type has resulted in lower wood volumes available for recruitment into the streams. Reduced shelter ratings across the basin reduce habitat suitability for juvenile rearing during critical low-flow summer periods and high-flow conditions in the winter.

### **Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios**

Primary pool abundance was suitable (40 percent by length) in only 37 percent of the streams that were habitat typed in the Navarro River watershed. Therefore, these Habitat Complexity conditions have an overall rating of Poor for both winter and summer rearing juvenile steelhead. Most sampled streams have a high percentage of flatwater or run habitat that is not preferred by rearing lifestages of salmonids due to a general lack of depth, habitat complexity and flow velocity refuge. The lack of pools in this basin likely limits the space available for juvenile fish attempting to maintain territory for feeding and protection from predators. The general lack of pool habitat within this basin stems from increased sediment production from upslope sources (causing pool filling), and loss of LWD recruitment from past anthropogenic practices.

### **Water Quality: Temperature**

Summer water temperatures limit steelhead habitat suitability throughout many stream reaches of the Navarro River watershed. The few remaining tributaries with cool water temperatures include several coastal tributaries that still retain a relatively good conifer/redwood-dominated riparian corridor, such as Flynn Creek and Marsh Creek. Most of the streams in the south eastern part of the watershed, such as the mainstem Navarro River, Rancheria Creek, and Indian Creek, currently have marginal to unsuitable summer stream temperatures. The University of California, Davis conducted a stream temperature study in the Navarro River watershed and concluded that juvenile steelhead sampled in lower, middle and upper Anderson Creek, lower and upper Indian Creek, and middle and upper Rancheria Creek were experiencing temperature stress (Johnson 2002). The study showed that temperature stress by testing for heat shock proteins produced when temperature is the dominant stress (Johnson 2002). Juvenile fish under high-stress conditions have a decreased chance of survival, and are unlikely to maintain normal growth rates required to reach a size to successfully transition to the smolt lifestage and the marine environment.

### **Estuary: Quality and Extent**

Estuary conditions have an overall rating of Fair for summer rearing juveniles due to poor water quality when the lagoon forms at the end of the summer months. The reduction in water quality is likely caused from reduced freshwater inflow to the estuary/lagoon in the summer and fall months. Cannata (1998) reports that maintaining adequate freshwater inflow to the lagoon is a critical component in maintaining water quality suitable for juvenile steelhead rearing within the Navarro River estuary. The EPA (1999) reports data records from the Division of Water Rights (DWR) that show permitted summer diversions from the Navarro mainstem are approximately 9 cubic feet per second. Given the analysis of Jackson (1991) illustrating a trend of lower summer flows on the mainstem just above the estuary, it appears that water diversions occurring throughout the basin are reducing the quality of steelhead habitat in the estuary. During drier water years this impact is much more evident than in water years with higher runoff.

### **Riparian Vegetation: Composition, Cover & Tree Diameter**

Although riparian canopy conditions are improving in areas of the watershed, such as the North Fork Navarro, many streams continue to exhibit poor riparian canopy condition. Poor riparian conditions are common throughout much of the Anderson Valley and Rancheria Creek subbasins. Historical land clearing for agriculture and logging effectively removed many of the larger redwoods/conifers that shaded headwater streams throughout the basin. Currently, much of the basin has second or third growth conifer and hardwood riparian areas that are in the process of recovery. Agriculture has removed or greatly reduced available riparian habitat by planting vineyards along many tributaries of the Anderson Valley along the mainstem Navarro. Also, years of grazing activity in the southern subbasins of Anderson and Rancheria creek have reduced and impeded riparian recovery along stream channels, increasing water temperatures, reducing LWD recruitment, and ultimately reducing the overall carrying capacity for juvenile salmonids.

### **Other Current Conditions**

Flow levels in some subbasins, such as the North Fork Navarro, are not significantly impacted by water diversion at this time, and, therefore, the entire basin did not receive a Poor condition rate because water diversions impair only a portion of the potential habitat. Impaired summer flow is an issue in the areas that drain from the mainstem above the North Fork Navarro (Anderson Valley). Spawning habitat quality is poor in parts of the basin due to road related sediment delivery and is a stress in many streams, but is not rated overall as a Poor condition. In addition, many fish passage barriers associated with Highway 128 need to be assessed for steelhead migration.

### **Threats**

The following discussion focuses on those threats that are rated as High or Very High (see Navarro River CAP Results). Recovery strategies will likely focus on ameliorating threats rated as High; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in Navarro River CAP Results.

### **Roads and Railroads**

Legacy roads from past logging and grazing activity continue to impact the Navarro River watershed. Road-related sediment yields in the Navarro River watershed account for 80 percent of the anthropogenic sediment yield in the basin (USEPA 2000). Since the late 1990s the Navarro Restoration Plan implementation has resulted in many road improvements to minimize sediment

delivery to streams. The Resource Conservation District (RCD) and Natural Resources Conservation Service (NRCS) continue to work with private landowners to upgrade roads. The major industrial timber landowner in the watershed, MRC, has also completed some road upgrades to minimize sediment erosion into streams within subbasins located in the northern portion of the watershed. Although many roads have been upgraded, there are many existing roads that need to be decommissioned or upgraded to reduce sediment yields from potential road crossing failures, surface erosion, and road related mass wasting and gullying.

### **Severe Weather Patterns**

Future impacts of severe weather patterns pose a High threat to watershed processes within the Navarro River watershed. Climate change in this region will have the greatest impact on watershed processes affecting all lifestages, impacting habitat parameters such as pool frequency and fine sediment in spawning areas. Overall, the range and degree of temperature and precipitation variability is likely to increase in this watershed (Hayhoe *et al.* 2004). As a result, spawning and juvenile rearing will be impacted through larger and more frequent flood and mass wasting events, which is especially troublesome in this area due to the inherent steep terrain and unstable geology.

More frequent drought episodes may further impact the already stressful instream conditions that exist throughout much of the Navarro River watershed. For instance, given that summer streamflows are already stressed by diversions, long-lasting drought patterns will likely pose a significant threat to maintaining adequate streamflows and aquatic habitat.

### **Water Diversion and Impoundments**

The vast majority of water diversions and impoundments in this basin are associated with the relatively (1980s) recent increase in viticulture in the Anderson Valley and other non-timber areas of the basin. Agriculture is focused mainly within the southern portion of the basin, affecting the mainstem Navarro River and smaller mainstem tributaries, as well as Indian, Anderson, and Rancheria creeks. Water diversions supporting viticulture, and rural residential homes in these areas reduce summer baseflows, disconnecting aquatic habitat and elevating instream temperatures (EPA 2000). Many stream reaches in the Anderson Valley have reportedly gone dry with increasing frequency. As stated earlier, the Navarro River watershed has been listed as fully appropriated during the summer months. Therefore, any additional future diversions will likely be illegal if conducted in the summer months, and, as a result, any additional water diversions are expected to be sought during the winter and spring months. However, uncoordinated diversion practices designed to limit frost damage may increase stranding potential in some tributaries. In addition, rearing habitat in the estuary/lagoon will likely be

further impaired, as rural residential and illegal summer diversions withdraw in excess of the estimated 9 cfs currently diverted.

### **Other Threats**

In addition to the water withdrawal impacts, agriculture operations typically encroach into adjacent riparian areas, which can increase sediment delivery to the stream as well as decrease riparian shading and wood recruitment. Timber harvest, sheep and cattle grazing occurs throughout the Anderson and Rancheria creek subbasins. Additional timber harvesting is expected to disturb landscape processes across the northern subbasins, but NMFS expects timber harvesting improvements are likely to occur in much of this basin when the Habitat Conservation Plan (HCP) is implemented for the industrial timberlands currently managed by the Mendocino Redwood Company (MRC). Also, overgrazing has resulted in erosion and riparian deforestation throughout the Navarro River watershed, especially where riparian fencing is inadequate (Entrix 1998). Some streams have been channelized as part of agricultural or urban development (*e.g.*, Anderson Creek), but the incidence of channelization is comparatively low given the small percentage of developed land within the basin versus other more developed watersheds (*e.g.*, Russian River).

### **Limiting Stresses, Lifestages, and Habitats**

Threat and stress analysis within the CAP workbook suggests juvenile survival is likely limiting steelhead recovery in the Navarro River watershed. Inadequate stream shelter and pool habitat levels, largely resulting from the lack of structure formed by LWD, is evident across the basin. Although canopy cover is rated as Fair for most surveyed reaches in the watershed, stream temperatures across much of the basin remain stressful during summer months and likely limit juvenile production. Because impacts to baseflow during the summer from agriculture and associated water diversions do not impact salmonid habitat suitability across the basin, they are rated as Fair. Depleted baseflow and elevated stream temperature are believed to impact the portion of the population inhabiting Indian, Anderson, and Rancheria creeks. Diversions also likely degrade estuary function when the lagoon forms. In addition, there are tributaries across the basin that continue to be affected by high sediment yields that fill pools and reduce spawning habitat quality. Restoration actions should address these issues within specific subbasins to increase juvenile steelhead survival and carrying capacity in tributaries.

## **General Recovery Strategy**

### **Improve Canopy Cover and LWD Volume**

Much of the Navarro River watershed would benefit from improved riparian composition and structure, which would increase stream shading, improve LWD recruitment, and increase instream shelter for juvenile fish. General practices to improve riparian condition include increasing the number of riparian conservation easements, reducing timber harvest in riparian areas, increasing riparian planting, and installing livestock exclusion fencing where appropriate.

### **Address Upslope Sediment Sources**

Roads supporting timber harvest, ranching, and to a lesser extent agriculture, exist throughout the basin. Many of these roads need to be upgraded to reduce fine sediment delivery into streams. Problem roads and active erosion sites should be prioritized and addressed as part of comprehensive sediment reduction plans at the subbasin level. Agricultural operations need to practice BMPs that minimize soil disturbance and sediment delivery to stream channels.

### **Increase Instream Shelter Ratings and Pool Volume**

Shelter ratings are Low within many (90 percent) of the surveyed stream reaches of the Navarro River watershed. Where applicable, restoration efforts should incorporate instream wood/boulder structures, and/or implement large conifer recruitment (fall trees) into degraded reaches to improve shelter and overall habitat complexity.

### **Address Water Diversion and Groundwater Extraction**

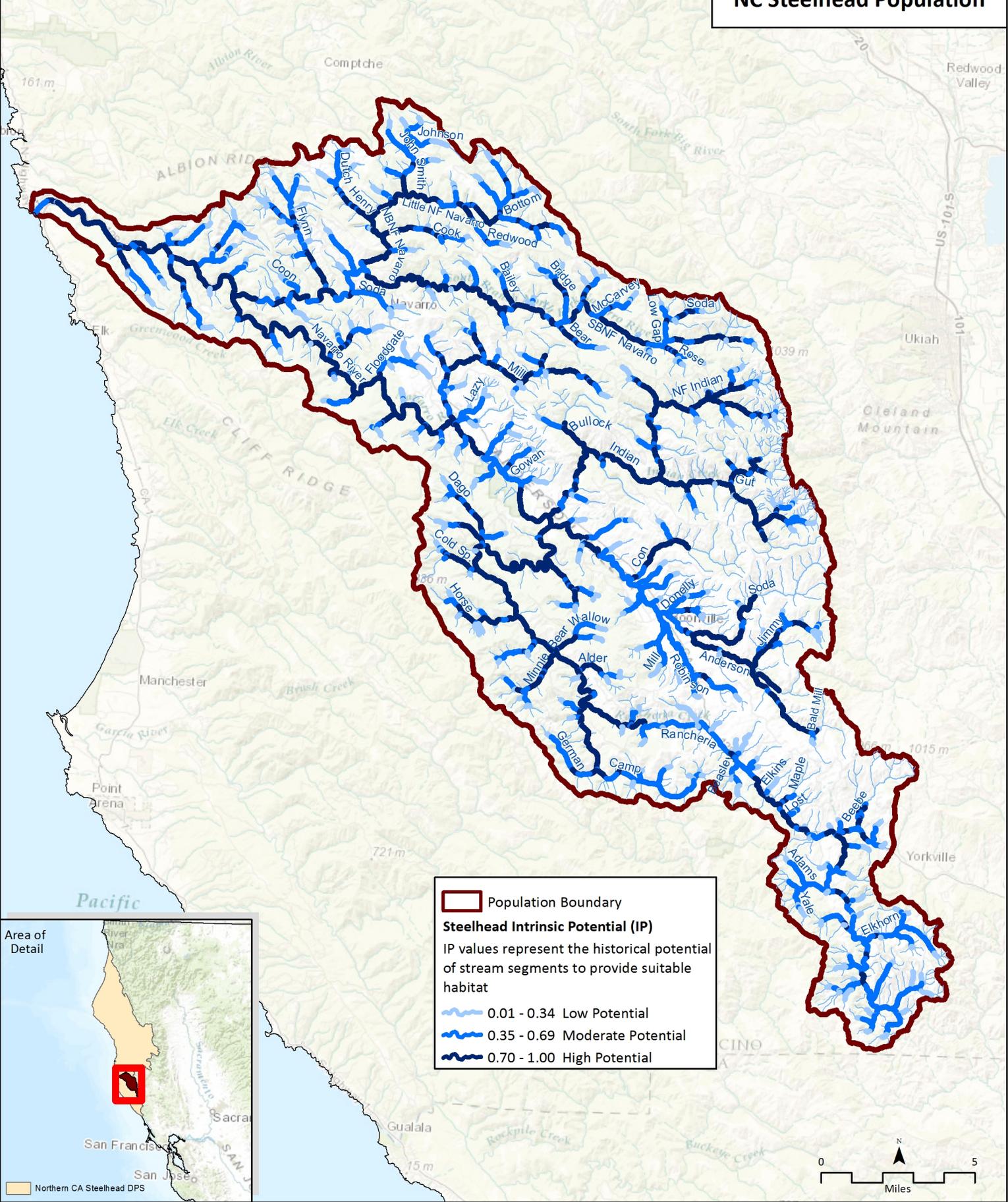
Low summer streamflow has been observed within tributaries of the mainstem Navarro River, Indian Creek, Anderson Creek, Rancheria Creek and the estuary. Reduced flow conditions, and resulting disconnected flow conditions (dry stream channels), appear to be the result of water diversions and groundwater pumping, and must be minimized to protect and increase juvenile steelhead survival. Federal, state and local government representatives should work with landowners to implement creative solutions that minimize these effects; these solutions should examine conservation methods, water management planning, and water storage and recharge solutions.

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**Navarro River  
NC Steelhead Population**



Navarro River CAP Viability Results

| # | Conservation Target | Category  | Key Attribute       | Indicator                                | Poor  | Fair  | Good  | Very Good   | Current Indicator Measurement                       | Current Rating |
|---|---------------------|-----------|---------------------|--|---|---|---|---|---|----------------|
| 1 | Adults              | Condition | Habitat Complexity  | Large Wood Frequency (BFW 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)   | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)   | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)   | Poor           |
|   |                     |           | Habitat Complexity  | Large Wood Frequency (BFW 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters) | <50% of streams/ IP-km (>1.3 Key Pieces/100 meters) | Poor           |
|   |                     |           | Habitat Complexity  | Pool/Riffle/Flatwater Ratio              | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)   | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)   | 53% of streams/ IP-km (>40% Pools; >20% Riffles)    | Fair           |
|   |                     |           | Habitat Complexity  | Shelter Rating                           | <50% of streams/ IP-Km (>80 stream average)         | 50% to 74% of streams/ IP-Km (>80 stream average)         | 75% to 90% of streams/ IP-Km (>80 stream average)         | >90% of streams/ IP-Km (>80 stream average)         | 17% of streams/ IP-km (>80 stream average)          | Fair           |
|   |                     |           | Hydrology           | Passage Flows                            | NMFS Flow Protocol: Risk Factor Score >75           | NMFS Flow Protocol: Risk Factor Score 51-75               | NMFS Flow Protocol: Risk Factor Score 35-50               | NMFS Flow Protocol: Risk Factor Score <35           | NMFS Flow Protocol: Risk Factor Score 51-75         | Fair           |
|   |                     |           | Passage/Migration   | Passage at Mouth or Confluence           | <50% of IP-Km or <16 IP-Km accessible*              | 50% of IP-Km to 74% of IP-km                              | 75% of IP-Km to 90% of IP-km                              | >90% of IP-km                                       | 75% of IP-km to 90% of IP-km                        | Good           |
|   |                     |           | Passage/Migration   | Physical Barriers                        | <50% of IP-Km or <16 IP-Km accessible*              | 50% of IP-Km to 74% of IP-km                              | 75% of IP-Km to 90% of IP-km                              | >90% of IP-km                                       | 75% of IP-km to 90% of IP-km                        | Good           |
|   |                     |           | Riparian Vegetation | Tree Diameter (North of SF Bay)          | ≤39% Class 5 & 6 across IP-km                       | 40 - 54% Class 5 & 6 across IP-km                         | 55 - 69% Class 5 & 6 across IP-km                         | >69% Class 5 & 6 across IP-km                       | ?39% Class 5 & 6 across IP-km                       | Poor           |
|   |                     |           | Riparian Vegetation | Tree Diameter (South of SF Bay)          | ≤69% Density rating "D" across IP-km                | 70-79% Density rating "D" across IP-km                    | ≥80% Density rating "D" across IP-km                      | Not Defined   |   |                |

|   |      |           |                 |   |   |  |   |   |  |      |
|---|------|-----------|-----------------|---|---|--|---|---|--|------|
| 2 | Eggs |           | Sediment        | Quantity & Distribution of Spawning Gravels | <50% of IP-Km or <16 IP-Km accessible*                        | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km  | >90% of IP-km   | 75% of IP-km to 90% of IP-km   | Good |
|   |      |           | Velocity Refuge | Floodplain Connectivity                     | <50% Response Reach Connectivity                              | 50-80% Response Reach Connectivity   | >80% Response Reach Connectivity                                    | Not Defined   | >80% Response Reach Connectivity   | Good |
|   |      |           | Water Quality   | Toxicity                                    | Acute   | Sublethal or Chronic   | No Acute or Chronic   | No Evidence of Toxins or Contaminants                         | Sublethal or Chronic   | Fair |
|   |      |           | Water Quality   | Turbidity                                   | <50% of streams/ IP-Km maintains severity score of 3 or lower | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower        | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower | >90% of streams/ IP-Km maintains severity score of 3 or lower | 75% to 90% of streams/ IP-km maintains severity score of 3 or lower        | Good |
|   |      | Size      | Viability       | Density                                     | <1 Spawner per IP-km (Spence et al 2012)                      | >1 spawner per IP-km to < low risk spawner density per Spence et al (2012) | low risk spawner density per Spence et al (2012)                    |   | >1 spawner per IP-km to < low risk spawner density per Spence et al (2012) | Fair |
|   |      | Condition | Hydrology       | Flow Conditions (Instantaneous Condition)   | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | NMFS Flow Protocol: Risk Factor Score 35-50                         | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | Fair |
|   |      |           | Hydrology       | Redd Scour                                  | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | NMFS Flow Protocol: Risk Factor Score 35-50                         | NMFS Flow Protocol: Risk Factor Score <35                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | Fair |
|   |      |           | Sediment        | Gravel Quality (Bulk)                       | >17% (0.85mm) and >30% (6.4mm)                                | 15-17% (0.85mm) and <30% (6.4mm)   | 12-14% (0.85mm) and <30% (6.4mm)                                    | <12% (0.85mm) and <30% (6.4mm)                                | 15-17% (0.85mm) and <30% (6.4mm)   | Fair |
|   |      |           | Sediment        | Gravel Quality (Embeddedness)               | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)         | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2)  | 50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)         | Fair |

| 3 | Summer Rearing Juveniles | Condition | Estuary/Lagoon     | Quality & Extent                                    | Impaired/non-functional                                      | Impaired but functioning   | Properly Functioning Condition                                     | Unimpaired Condition   | Impaired but functioning   | Fair |
|---|--------------------------|-----------|--------------------|---|--|--|--|--|--|------|
|   |                          |           | Habitat Complexity | Large Wood Frequency (Bankfull Width 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | <50% of streams/ IP-km (>6 Key Pieces/100 meters)                    | Poor |
|   |                          |           | Habitat Complexity | Large Wood Frequency (Bankfull Width 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | <50% of streams/ IP-km (>1.3 Key Pieces/100 meters)                  | Poor |
|   |                          |           | Habitat Complexity | Percent Primary Pools                               | <50% of streams/ IP-Km (>40% average primary pool frequency) | 51% to 74% of streams/ IP-Km (>40% average primary pool frequency) | 75% to 89% of streams/ IP-Km (>40% average primary pool frequency) | >90% of streams/ IP-Km (>40% average primary pool frequency) | 11% of IP-km of streams/ IP-km (>40% average primary pool frequency) | Poor |
|   |                          |           | Habitat Complexity | Pool/Riffle/Flatwater Ratio                         | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 21% of streams/ IP-km (>40% Pools; >20% Riffles)                     | Poor |
|   |                          |           | Habitat Complexity | Shelter Rating                                      | <50% of streams/ IP-Km (>80 stream average)                  | 50% to 74% of streams/ IP-Km (>80 stream average)                  | 75% to 90% of streams/ IP-Km (>80 stream average)                  | >90% of streams/ IP-Km (>80 stream average)                  | 16% of streams/ IP-km (>80 stream average)                           | Poor |
|   |                          |           | Hydrology          | Flow Conditions (Baseflow)                          | NMFS Flow Protocol: Risk Factor Score >75                    | NMFS Flow Protocol: Risk Factor Score 51-75                        | NMFS Flow Protocol: Risk Factor Score 35-50                        | NMFS Flow Protocol: Risk Factor Score <35                    | NMFS Flow Protocol: Risk Factor Score 51-75                          | Fair |
|   |                          |           | Hydrology          | Flow Conditions (Instantaneous Condition)           | NMFS Flow Protocol: Risk Factor Score >75                    | NMFS Flow Protocol: Risk Factor Score 51-75                        | NMFS Flow Protocol: Risk Factor Score 35-50                        | NMFS Flow Protocol: Risk Factor Score <35                    | NMFS Flow Protocol: Risk Factor Score 51-75                          | Fair |
|   |                          |           | Hydrology          | Number, Condition and/or Magnitude of Diversions    | >5 Diversions/10 IP km                                       | 1.1 - 5 Diversions/10 IP km  | 0.01 - 1 Diversions/10 IP km                                       | 0 Diversions   | 1.59 Diversions/10 IP-km   | Fair |
|   |                          |           | Passage/Migration  | Passage at Mouth or Confluence                      | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 50% of IP-km to 74% of IP-km   | Fair |

|  |      |                              |                                 |  |  |  |  |  |      |
|--|------|------------------------------|---------------------------------|--|--|--|--|--|------|
|  |      | Passage/Migration            | Physical Barriers               | <50% of IP-Km or <16 IP-Km accessible*   | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km   | >90% of IP-km  | 50% of IP-km to 74% of IP-km   | Fair |
|  |      | Riparian Vegetation          | Canopy Cover                    | <50% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 50% to 74% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 75% to 90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | >90% of streams/ IP-Km (>70% average stream canopy; >85% where coho IP overlaps) | 50% to 74% of streams/ IP-km (>70% average stream canopy; >85% where coho IP overlaps) | Fair |
|  |      | Riparian Vegetation          | Tree Diameter (North of SF Bay) | ≤39% Class 5 & 6 across IP-km  | 40 - 54% Class 5 & 6 across IP-km  | 55 - 69% Class 5 & 6 across IP-km  | >69% Class 5 & 6 across IP-km  | ?39% Class 5 & 6 across IP-km  | Poor |
|  |      | Riparian Vegetation          | Tree Diameter (South of SF Bay) | ≤69% Density rating "D" across IP-km   | 70-79% Density rating "D" across IP-km   | ≥80% Density rating "D" across IP-km   | Not Defined  |  |      |
|  |      | Sediment (Food Productivity) | Gravel Quality (Embeddedness)   | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2)                     | 50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)                     | Fair |
|  |      | Water Quality                | Temperature (MWMT)              | <50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                       | 50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                        | 75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                        | >90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                       | <50% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)                             | Poor |
|  |      | Water Quality                | Toxicity                        | Acute  | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants  | Sublethal or Chronic   | Fair |
|  |      | Water Quality                | Turbidity                       | <50% of streams/ IP-Km maintains severity score of 3 or lower                    | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower                    | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower                    | >90% of streams/ IP-Km maintains severity score of 3 or lower                    | 50% to 74% of streams/ IP-km maintains severity score of 3 or lower                    | Good |
|  | Size | Viability                    | Density                         | <0.2 Fish/m <sup>2</sup>   | 0.2 - 0.6 Fish/m <sup>2</sup>  | 0.7 - 1.5 Fish/m <sup>2</sup>  | >1.5 Fish/m <sup>2</sup>   | 0.2 - 0.6 Fish/m <sup>2</sup>  | Fair |
|  |      | Viability                    | Spatial Structure               | <50% of Historical Range   | 50-74% of Historical Range   | 75-90% of Historical Range   | >90% of Historical Range   | 50-74% of Historical Range   | Fair |

|   |                          |           |                              |   |  |  |  |  |  |      |
|---|--------------------------|-----------|------------------------------|---|--|--|--|--|--|------|
| 4 | Winter Rearing Juveniles | Condition | Habitat Complexity           | Large Wood Frequency (Bankfull Width 0-10 meters)   | <50% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)            | 75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | >90% of streams/ IP-Km (>6 Key Pieces/100 meters)            | <50% of streams/ IP-km (>6 Key Pieces/100 meters)                  | Poor |
|   |                          |           | Habitat Complexity           | Large Wood Frequency (Bankfull Width 10-100 meters) | <50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | 75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | >90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)          | <50% of streams/ IP-km (>1.3 Key Pieces/100 meters)                | Poor |
|   |                          |           | Habitat Complexity           | Pool/Riffle/Flatwater Ratio                         | <50% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 50% to 74% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 75% to 90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | >90% of streams/ IP-Km (>40% Pools; >20% Riffles)            | 21% of streams/ IP-km (>40% Pools; >20% Riffles)                   | Poor |
|   |                          |           | Habitat Complexity           | Shelter Rating                                      | <50% of streams/ IP-Km (>80 stream average)                  | 50% to 74% of streams/ IP-Km (>80 stream average)                  | 75% to 90% of streams/ IP-Km (>80 stream average)                  | >90% of streams/ IP-Km (>80 stream average)                  |  |      |
|   |                          |           | Passage/Migration            | Physical Barriers                                   | <50% of IP-Km or <16 IP-Km accessible*                       | 50% of IP-Km to 74% of IP-km                                       | 75% of IP-Km to 90% of IP-km                                       | >90% of IP-km  | 50% of IP-km to 74% of IP-km                                       | Fair |
|   |                          |           | Riparian Vegetation          | Tree Diameter (North of SF Bay)                     | ≤39% Class 5 & 6 across IP-km                                | 40 - 54% Class 5 & 6 across IP-km                                  | 55 - 69% Class 5 & 6 across IP-km                                  | >69% Class 5 & 6 across IP-km                                | ?39% Class 5 & 6 across IP-km                                      | Poor |
|   |                          |           | Riparian Vegetation          | Tree Diameter (South of SF Bay)                     | ≤69% Density rating "D" across IP-km                         | 70-79% Density rating "D" across IP-km                             | ≥80% Density rating "D" across IP-km                               | Not Defined  |  |      |
|   |                          |           | Sediment (Food Productivity) | Gravel Quality (Embeddedness)                       | <50% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2) | >90% of streams/ IP-Km (>50% stream average scores of 1 & 2) | 50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2) | Fair |
|   |                          |           | Velocity Refuge              | Floodplain Connectivity                             | <50% Response Reach Connectivity                             | 50-80% Response Reach Connectivity                                 | >80% Response Reach Connectivity                                   | Not Defined  | 50-80% Response Reach Connectivity                                 | Fair |
|   |                          |           | Water Quality                | Toxicity  | Acute  | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants                        | Sublethal or Chronic   | Fair |

|   |        |           |                    |  |   |  |  |   |   |   |
|---|--------|-----------|--------------------|--|---|--|--|---|---|---|
| 5 | Smolts | Condition | Water Quality      | Turbidity  | <50% of streams/ IP-Km maintains severity score of 3 or lower | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower        | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower            | >90% of streams/ IP-Km maintains severity score of 3 or lower         |   |   |
|   |        |           | Estuary/Lagoon     | Quality & Extent                                 | Impaired/non-functional                                       | Impaired but functioning   | Properly Functioning Condition   | Unimpaired Condition  | Impaired but functioning  | Fair  |
|   |        |           | Habitat Complexity | Shelter Rating                                   | <50% of streams/ IP-Km (>80 stream average)                   | 50% to 74% of streams/ IP-Km (>80 stream average)                          | 75% to 90% of streams/ IP-Km (>80 stream average)                              | >90% of streams/ IP-Km (>80 stream average)                           | 50% to 74% of streams/ IP-km (>80 stream average)                   | Fair  |
|   |        |           | Hydrology          | Number, Condition and/or Magnitude of Diversions | >5 Diversions/10 IP km  | 1.1 - 5 Diversions/10 IP km  | 0.01 - 1 Diversions/10 IP km   | 0 Diversions  | 1.59 Diversions/10 IP-km  | Fair  |
|   |        |           | Hydrology          | Passage Flows                                    | NMFS Flow Protocol: Risk Factor Score >75                     | NMFS Flow Protocol: Risk Factor Score 51-75                                | NMFS Flow Protocol: Risk Factor Score 35-50                                    | NMFS Flow Protocol: Risk Factor Score <35                             | NMFS Flow Protocol: Risk Factor Score 51-75                         | Fair  |
|   |        |           | Passage/Migration  | Passage at Mouth or Confluence                   | <50% of IP-Km or <16 IP-Km accessible*                        | 50% of IP-Km to 74% of IP-km   | 75% of IP-Km to 90% of IP-km   | >90% of IP-km   | 75% of IP-km to 90% of IP-km  | Good  |
|   |        |           | Smoltification     | Temperature                                      | <50% IP-Km (>6 and <14 C)                                     | 50-74% IP-Km (>6 and <14 C)  | 75-90% IP-Km (>6 and <14 C)  | >90% IP-Km (>6 and <14 C)   | 50-74% IP-km (>6 and <14 C)   | Fair  |
|   |        |           | Water Quality      | Toxicity   | Acute   | Sublethal or Chronic   | No Acute or Chronic  | No Evidence of Toxins or Contaminants                                 | Sublethal or Chronic  | Fair  |
|   |        |           | Water Quality      | Turbidity  | <50% of streams/ IP-Km maintains severity score of 3 or lower | 50% to 74% of streams/ IP-Km maintains severity score of 3 or lower        | 75% to 90% of streams/ IP-Km maintains severity score of 3 or lower            | >90% of streams/ IP-Km maintains severity score of 3 or lower         | 50% to 74% of streams/ IP-km maintains severity score of 3 or lower | Fair  |
|   |        |           | Size               | Viability  | Abundance   | Smolt abundance which produces high risk spawner density per Spence (2008) | Smolt abundance which produces moderate risk spawner density per Spence (2008) | Smolt abundance to produce low risk spawner density per Spence (2008) |   | 44,100-880,000 = Smolt abundance which produces moderate risk spawner density per Spence (2008) |

| 6 | Watershed Processes | Landscape Context | Hydrology           | Impervious Surfaces             | >10% of Watershed in Impervious Surfaces   | 7-10% of Watershed in Impervious Surfaces    | 3-6% of Watershed in Impervious Surfaces     | <3% of Watershed in Impervious Surfaces    | 3-6% of Watershed in Impervious Surfaces   | Very Good |
|---|---------------------|-------------------|---------------------|---------------------------------|--|--|--|--|--|-----------|
|   |                     |                   | Landscape Patterns  | Agriculture                     | >30% of Watershed in Agriculture           | 20-30% of Watershed in Agriculture           | 10-19% of Watershed in Agriculture           | <10% of Watershed in Agriculture           | 20-30% of Watershed in Agriculture         | Fair      |
|   |                     |                   | Landscape Patterns  | Timber Harvest                  | >35% of Watershed in Timber Harvest        | 26-35% of Watershed in Timber Harvest        | 25-15% of Watershed in Timber Harvest        | <15% of Watershed in Timber Harvest        | 25-15% of Watershed in Timber Harvest      | Good      |
|   |                     |                   | Landscape Patterns  | Urbanization                    | >20% of watershed >1 unit/20 acres         | 12-20% of watershed >1 unit/20 acres         | 8-11% of watershed >1 unit/20 acres          | <8% of watershed >1 unit/20 acres          | 8-11% of watershed >1 unit/20 acres        | Good      |
|   |                     |                   | Riparian Vegetation | Species Composition             | <25% Intact Historical Species Composition | 25-50% Intact Historical Species Composition | 51-74% Intact Historical Species Composition | >75% Intact Historical Species Composition | <25% Intact Historical Species Composition | Poor      |
|   |                     |                   | Sediment Transport  | Road Density                    | >3 Miles/Square Mile                       | 2.5 to 3 Miles/Square Mile                   | 1.6 to 2.4 Miles/Square Mile                 | <1.6 Miles/Square Mile                     | >3 Miles/Square Mile                       | Poor      |
|   |                     |                   | Sediment Transport  | Streamside Road Density (100 m) | >1 Miles/Square Mile                       | 0.5 to 1 Miles/Square Mile                   | 0.1 to 0.4 Miles/Square Mile                 | <0.1 Miles/Square Mile                     | >1 Miles/Square Mile                       | Poor      |
|   |                     |                   |                     |                                 |  |  |  |  |  |           |

Navarro River CAP Threats Results

| Threats Across Targets                |  | Adults | Eggs   | Summer Rearing Juveniles | Winter Rearing Juveniles | Smolts | Watershed Processes | Overall Threat Rank |
|---------------------------------------|--|--------|--------|--------------------------|--------------------------|--------|---------------------|---------------------|
| Project-specific-threats              |  | 1      | 2      | 3                        | 4                        | 5      | 6                   |                     |
| 1                                     | Agriculture                                | Low    | Low    | Medium                   | Medium                   | Low    | Medium              | Medium              |
| 2                                     | Channel Modification                       | Low    |        | Medium                   | Low                      | Low    | Low                 | Low                 |
| 3                                     | Disease, Predation and Competition         |        |        |                          |                          |        |                     |                     |
| 4                                     | Hatcheries and Aquaculture                 |        |        |                          |                          |        |                     |                     |
| 5                                     | Fire, Fuel Management and Fire Suppression | Low    | Low    | Low                      | Low                      | Low    | Low                 | Low                 |
| 6                                     | Fishing and Collecting                     | Medium |        | Low                      |                          | Low    |                     | Low                 |
| 7                                     | Livestock Farming and Ranching             | Low    | Low    | Medium                   | Low                      | Low    | Medium              | Medium              |
| 8                                     | Logging and Wood Harvesting                | Medium | Medium | Medium                   | Medium                   | Low    | Medium              | Medium              |
| 9                                     | Mining                                     |        |        |                          |                          |        |                     |                     |
| 10                                    | Recreational Areas and Activities          |        |        |                          |                          |        |                     |                     |
| 11                                    | Residential and Commercial Development     | Low    | Low    | Low                      | Low                      | Low    | Medium              | Low                 |
| 12                                    | Roads and Railroads                        | Medium | Medium | Medium                   | Medium                   | Low    | High                | Medium              |
| 13                                    | Severe Weather Patterns                    | Low    | Medium | Medium                   | Medium                   | Low    | High                | Medium              |
| 14                                    | Water Diversion and Impoundments           | Medium | Low    | High                     | High                     | Low    | Medium              | High                |
| Threat Status for Targets and Project |  | Medium | Medium | High                     | Medium                   | Low    | High                | High                |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat   | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|--------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                                |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| <b>NvroR-NCSW-2.1</b> | <b>Objective</b> | <b>Floodplain Connectivity</b> | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-2.1.1      | Recovery Action  | Floodplain Connectivity        | Rehabilitate and enhance floodplain connectivity  |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-2.1.1.1    | Action Step      | Floodplain Connectivity        | Delineate reaches possessing both potential winter rearing habitat and floodplain areas, and develop restoration action plans.  | 3               | 5                       | CDFW, County, Private Landowners  | 253.00      |         |          |          |          | 253             | Cost based on treating 7 miles of High IP (assume 1 project per mile in 25% high IP) at a rate of \$36,046/mile.   |
| NvroR-NCSW-2.1.1.2    | Action Step      | Floodplain Connectivity        | Evaluate Highway 128 and associated crossings with focus on the segment from the North Fork Navarro Bridge to Barton Gulch. Modify crossings based on the evaluation to provide access to historical floodplain habitats.   | 1               | 1                       | CalTrans, CDFW, NOAA RC   | 1,587       |         |          |          |          | 1,587           | Cost to evaluate existing passage database and plan restoration of culvert crossings on Hwy128. Cost to treat 8 crossings at a rate of \$198,400/crossing would total \$1,587,200. Costs should be lower if minor modifications are needed at each crossing. |
| <b>NvroR-NCSW-3.1</b> | <b>Objective</b> | <b>Hydrology</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-3.1.1      | Recovery Action  | Hydrology                      | Improve flow conditions   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-3.1.1.1    | Action Step      | Hydrology                      | Monitor, identify problems, and prioritize need for changes to water diversion on current or potential steelhead streams.   | 3               | 10                      | CDFW, SWRCB   | 32.50       | 32.50   |          |          |          | 65              | Cost based on hydrologic model at a rate of \$65,084/project.  |
| NvroR-NCSW-3.1.1.2    | Action Step      | Hydrology                      | Assess and map water diversions (CDFG 2004). Focus initial efforts in high priority watersheds.   | 2               | 5                       | Private Consultants, Private Landowners, SWRCB  |             |         |          |          |          | TBD             | Estimate based on landowner cooperation to assess diversion sites.   |
| NvroR-NCSW-3.1.1.3    | Action Step      | Hydrology                      | Implement Best Management Practices (BMP's) for agriculture land use within Mendocino County (CDFG 2004).   | 3               | 100                     | County, CDFW  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-3.1.1.4    | Action Step      | Hydrology                      | Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).  | 2               | 20                      | CDFW, Mendocino County, NMFS, NOAA RC, Private Consultants, Private Landowners, SWRCB |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-3.1.1.5    | Action Step      | Hydrology                      | Install streamflow gauging devices to determine the level of impairment to natural flow. Focus initial efforts on Mill Creek, Flynn Creek, and North Fork Navarro.  | 3               | 5                       | Private Landowners, SWRCB, USGS   | 3.00        |         |          |          |          | 3               | Cost for stream flow gauges estimated at \$1,000/gauge. Cost does not account for maintenance or data management.  |
| NvroR-NCSW-3.1.1.6    | Action Step      | Hydrology                      | Identify and eliminate depletion of summer base flows from unauthorized water uses. Focus efforts along Rancharia Creek, Mill Creek, and tributaries along the mainstem Navarro River above the North Fork. Tributaries such as Floodgate Creek and Perry Gulch and other small tributaries need water use evaluated. | 1               | 5                       | CDFW, CDFW Law Enforcement, NMFS OLE, SWRCB   | 65.00       |         |          |          |          | 65              | Cost for stream flow model estimated at \$65,084/project.  |
| NvroR-NCSW-3.1.1.7    | Action Step      | Hydrology                      | Work with SWRCB and landowners to purchase water rights that would improve and protect over summer survival of juveniles by re-establishing summer baseflows (from July 1 to October 1) in rearing reaches that are currently or have potential to be impacted by water use.  | 1               | 20                      | CDFW, FishNet 4C, NOAA RC, Private Landowners, SWRCB                                  |             |         |          |          |          | TBD             | Costs for acquisition of water rights and developing alternatives will need to be developed. Cost of water is reported to average 500 dollars or more per acre foot (Sunding and Zwane 2004).  |
| NvroR-NCSW-3.1.1.8    | Action Step      | Hydrology                      | Work with SWRCB and landowners to restore and maintain the natural hydrograph between March 1 and May 15 to minimize impacts to steelhead fry due to stranding by implementing alternative frost protection strategies.   | 1               | 5                       | Farm Bureau, NMFS, NMFS OLE, Private Landowners                                       |             |         |          |          |          | TBD             | 5 year period to get methods and actions in place to minimize stranding. Costs may be high in Anderson Valley.   |
| NvroR-NCSW-3.1.1.9    | Action Step      | Hydrology                      | Support SWRCB in regulating the use of streamside wells and groundwater.  | 2               | 5                       | CDFW, FishNet 4C, NOAA RC, Private Landowners, RCD, SWRCB                             |             |         |          |          |          | 0               | Additional regulatory staff to support improved regulation of groundwater. Action is considered In-Kind  |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| NvroR-NCSW-3.1.1.10   | Action Step      | Hydrology                    | Request that SWRCB review and/or modify water use based on the minimum flow needs for summer rearing for salmonids.  | 2               | 5                       | SWRCB   |             |         |          |          |          | TBD             | Need additional info from SWRCB to develop cost estimate for this action. Action is considered In-Kind  |
| NvroR-NCSW-3.1.1.11   | Action Step      | Hydrology                    | Provide incentives to water rights holders willing to convert some or all of their water rights to instream use via petition change of use and California Water Code §1707 (CDFG 2004).  | 2               | 20                      | CDFW, FishNet 4C, NOAA RC, Private Landowners, RCD, SWRCB |             |         |          |          |          | TBD             | Number of water rights holders willing to participate is unknown at this time.  |
| NvroR-NCSW-3.1.1.12   | Action Step      | Hydrology                    | Support a water conservation program for rural residential water users within the Navarro River watershed.   | 3               | 50                      | RCD, County, RWQCB  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-3.1.1.13   | Action Step      | Hydrology                    | Improve compliance with existing water resource regulations via monitoring and enforcement.  | 3               | 25                      | RCD, county, SWRCB, RWQCB                                 |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-3.1.1.14   | Action Step      | Hydrology                    | Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed managers.  | 3               | 60                      | CDFW, NMFS, SWRCB   |             |         |          |          |          | 0               | Need additional analysis to determine costs of upgrading and maintaining system. Action is considered In-Kind                                     |
| NvroR-NCSW-3.1.2      | Recovery Action  | Hydrology                    | Improve passage flows  |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-3.1.2.1    | Action Step      | Hydrology                    | Develop BMP's (such as off-channel storage) for landowners conducting water diversion actions.   | 2               | 20                      | NMFS, NRCS, Private Landowners, SWRCB                     |             |         |          |          |          | TBD             | Total cost for basin will need additional analysis. Cost per landowner is estimated to be 10-50k.   |
| NvroR-NCSW-3.1.2.2    | Action Step      | Hydrology                    | Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.  | 2               | 10                      | CDFW, NMFS, Private Landowners, SWRCB                     |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>NvroR-NCSW-5.1</b> | <b>Objective</b> | <b>Passage</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-5.1.1      | Recovery Action  | Passage                      | Modify or remove physical passage barriers   |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-5.1.1.1    | Action Step      | Passage                      | Restore passage in high priority areas of the Navarro watershed as identified by the Mendocino RCD, MRC, the County of Mendocino, Caltrans (HWY 128), and existing fish passage databases.   | 1               | 10                      | RCD, CDFW, County, Private Landowners                     | 820         | 820     |          |          |          | 1,640           | Cost based on treating 8 barriers in high IP at a rate of \$204,947/barrier. Cost may be less depending on updated database.                      |
| <b>NvroR-NCSW-6.1</b> | <b>Objective</b> | <b>Habitat Complexity</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-6.1.1      | Recovery Action  | Habitat Complexity           | Increase large wood frequency  |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-6.1.1.1    | Action Step      | Habitat Complexity           | Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (CDFG 2004). Focus on tributaries of Flynn Creek, North Fork Navarro, South Branch Navarro, and Mill Creek. | 1               | 10                      | CDFW, NOAA RC, NRCS, Private Landowners                   | 625         | 625     |          |          |          | 1,250           | Cost based on treating 50 miles at a rate of \$25,000/mile. Based on an estimate of 50 miles in the next 10 years at 20k for high priority areas. |
| NvroR-NCSW-6.1.1.2    | Action Step      | Habitat Complexity           | Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.  | 3               | 20                      | County, CDFW  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-6.1.1.3    | Action Step      | Habitat Complexity           | Maintain current LWD, boulders, and other structure providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004). Maintain large debris accumulations along Highway 128 on the North Fork Navarro.                  | 2               | 50                      | CDFW, County, RCD   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-6.1.2      | Recovery Action  | Habitat Complexity           | Improve frequency of primary pools, LWD and shelters   |                 |                         |   |             |         |          |          |          |                 |   |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| NvroR-NCSW-6.1.2.1    | Action Step      | Habitat Complexity           | Identify historic steelhead habitats lacking in channel complexity, and promote restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover.   | 2               | 10                      | Campbell Timberland Management, CDFW, Private Landowners  |             |         |          |          |          | 0               | Cost accounted for in above action step.  |
| NvroR-NCSW-6.1.3      | Recovery Action  | Habitat Complexity           | Improve pool/riffle/flatwater ratios (hydraulic diversity)   |                 |                         | Campbell Timberland Management, CDFW, Private Landowners  |             |         |          |          |          |                 |   |
| NvroR-NCSW-6.1.3.1    | Action Step      | Habitat Complexity           | Increase the frequency of LWD to rate as Good (over 75% of IP-km within the watershed).  | 2               | 20                      | Campbell Timberland Management, CDFW, NMFS, NOAA RC, Private Landowners                                     |             |         |          |          |          | 0               | Cost should be accounted for in increase LWD frequency and primary pools.               |
| <b>NvroR-NCSW-7.1</b> | <b>Objective</b> | <b>Riparian</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-7.1.1      | Recovery Action  | Riparian                     | Improve canopy cover   |                 |                         |   |             |         |          |          |          |                 |   |
| NvroR-NCSW-7.1.1.1    | Action Step      | Riparian                     | Assess riparian canopy and impacts of exotic vegetation (e.g., Arundo donax, etc.), prioritize and develop riparian habitat reclamation and enhancement programs (CDFG 2004).  | 2               | 5                       | CDFW, RCD, Private Landowners   | 74.00       |         |          |          |          | 74              | Cost based on riparian restoration monitoring/assessment at a rate of \$73,793/project. |
| NvroR-NCSW-7.1.1.2    | Action Step      | Riparian                     | Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream). Focus efforts along Anderson Creek and its tributaries, and affected areas of the Indian and Rancheria creek watersheds.   | 2               | 10                      | CDFW, NOAA RC, Private Landowners, RCD  | 47.00       | 47.00   |          |          |          | 94              | Cost based on treating 5 miles at a rate of \$18,760/mile.                              |
| NvroR-NCSW-7.1.1.3    | Action Step      | Riparian                     | Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (CDFG 2004). Work cooperatively with land trusts, and Mendocino RCD to establish conservation easements, setbacks, and riparian buffers on industrial timberland, agricultural, and rangeland within high priority subbasins. | 3               | 20                      | CA Coastal Commission, California Coastal Conservancy, CDFW, NOAA RC, NRCS, Private Landowners, State Parks |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-7.1.1.4    | Action Step      | Riparian                     | Focus removal activities on existing areas of Arundo located in the upper reaches of Rancheria Creek to stop seeding and growth in downstream areas.   | 2               | 2                       | CDFW, NOAA RC, NRCS, Private Landowners, RCD  | 50.00       |         |          |          |          | 50              | Cost based on estimate of 5 projects at 10k per project.                                |
| NvroR-NCSW-7.1.1.5    | Action Step      | Riparian                     | Continue removal of Arundo located in the upper reaches of Rancheria Creek to stop infestation of downstream areas.  | 2               | 10                      | CDFW, NOAA RC, Private Landowners, RCD  | 40.00       | 40.00   |          |          |          | 80              | Cost based on treating 2 acres at a rate of \$40,245/acre.                              |
| NvroR-NCSW-7.1.1.6    | Action Step      | Riparian                     | Improve riparian and instream conditions in rearing habitats by establishing riparian protection zones that extend the distance of a site potential tree height from the outer edge of a channel.  | 2               | 20                      | CalFire, Mendocino County, Mendocino Redwood Company, NRCS, Private Landowners, RCD                         |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-7.1.1.7    | Action Step      | Riparian                     | Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to ameliorate instream temperature and provide a source of future large woody debris recruitment.   | 3               | 20                      |   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-7.1.2      | Recovery Action  | Riparian                     | Improve tree diameter  |                 |                         |   |             |         |          |          |          |                 |   |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| NvroR-NCSW-7.1.2.1     | Action Step      | Riparian                     | Work with CalFire and CDFW to increase the harvest intervals to increase tree diameter within 55% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 trees)        | 2               | 30                      | CDFW, NMFS, NOAA RC, RCD, Private Landowners                    |             |         |          |          |          | 0               | Cost likely accounted for in above action steps.   |
| NvroR-NCSW-7.1.2.2     | Action Step      | Riparian                     | Work with CalFire and CDFW to improve the structure and composition of riparian areas to provide shade, large woody debris input, nutrient input, bank stabilization, and other steelhead needs. | 2               | 20                      | CDFW, NMFS, NOAA RC, Private Landowners, RCD                    |             |         |          |          |          | 0               | Cost accounted for in above action steps.  |
| <b>NvroR-NCSW-8.1</b>  | <b>Objective</b> | <b>Sediment</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-8.1.1       | Recovery Action  | Sediment                     | Improve instream gravel quality  |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-8.1.1.1     | Action Step      | Sediment                     | Address high and medium priority sediment delivery sites as identified by the Mendocino RCD, Mendocino Redwoods Company, or other credible assessments.  | 1               | 20                      | CDFW, Mendocino Redwood Company, Private Landowners, RCD        |             |         |          |          |          | TBD             | More information is needed for large projects such as large slides and landings. Cost estimated at \$3,068/acre. |
| <b>NvroR-NCSW-10.1</b> | <b>Objective</b> | <b>Water Quality</b>         | <b>Address the present or threatened destruction, modification, or curtailment of the species range or habitat</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-10.1.1      | Recovery Action  | Water Quality                | Improve stream temperature conditions  |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-10.1.1.1    | Action Step      | Water Quality                | Work with local RCD and NRCS representatives to determine stream reaches appropriate for riparian planting projects.   | 2               | 30                      | RCD, CDFW, County   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-10.1.1.2    | Action Step      | Water Quality                | Determine site-specific recommendations for improving riparian habitat to remedy high stream temperatures and implement accordingly (CDFG 2004).   | 2               | 2                       | CDFW, NMFS, NRCS, Private Consultants, RCD                      | 20.00       |         |          |          |          | 20              | Cost is only to determine site specific recommendations using existing data.                                     |
| NvroR-NCSW-10.1.1.3    | Action Step      | Water Quality                | Plant native vegetation to promote streamside shade. Focus efforts in stream reaches of Indian, Anderson and the Rancheria creeks and their tributaries.   | 2               | 35                      | CDFW, NOAA RC, NRCS, Private Landowners, RCD                    |             |         |          |          |          | TBD             | Cost will vary with extent and type of plantings.  |
| NvroR-NCSW-10.1.1.4    | Action Step      | Water Quality                | Implement actions from Riparian action steps section.  |                 |                         |   |             |         |          |          |          |                 |  |
| <b>NvroR-NCSW-11.1</b> | <b>Objective</b> | <b>Viability</b>             | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-11.1.1      | Recovery Action  | Viability                    | Increase density, abundance, spatial structure, and diversity  |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-11.1.1.1    | Action Step      | Viability                    | Develop and implement a monitoring program to evaluate the performance of recovery efforts.  | 2               | 20                      | CDFW, NMFS, RCD, Private Landowners                             |             |         |          |          |          | 0               | Efforts are currently underway and may be expanded in the future. Action is considered In-Kind                   |
| NvroR-NCSW-11.1.1.2    | Action Step      | Viability                    | Measure or estimate the condition of key habitat attributes across the watershed.  | 2               | 60                      | CDFW  |             |         |          |          |          | 0               | Cost accounted for in the monitoring chapter.  |
| NvroR-NCSW-11.1.1.3    | Action Step      | Viability                    | Monitor population status for response to recovery actions.  | 2               | 20                      | CDFW, NMFS  |             |         |          |          |          | 0               | Cost accounted for in the monitoring chapter.  |
| NvroR-NCSW-11.1.1.4    | Action Step      | Viability                    | Conduct monitoring activities to determine the population status of adult and smolt salmonids in major subbasins of the Navarro River.   | 2               | 60                      | CDFW, Mendocino Redwood Company, NOAA SWFSC, Private Landowners |             |         |          |          |          | 0               | Type and effort of future population monitoring is not known. Cost likely accounted for in above action step.    |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| NvroR-NCSW-11.1.1.5    | Action Step      | Viability                    | Evaluate feasibility of installing a lifecycle station in an appropriate location within the watershed. If found feasible, establish a lifecycle station.                 | 3               | 2                       | CDFW, Mendocino Redwood Company, NOAA SWFSC, Private Landowners                   |             |         |          |          |          | 0               | Minimal cost to determine feasibility of a lifecycle station. Action is considered In-Kind   |
| <b>NvroR-NCSW-12.1</b> | <b>Objective</b> | <b>Agriculture</b>           | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-12.1.1      | Recovery Action  | Agriculture                  | Work with CalFire and CDFW in the timber harvest permitting process to minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity) | 2               | 40                      | CDFW, Farm Bureau, NMFS, Private Landowners                                       |             |         |          |          |          | TBD             | Cost of implementing BMPs to agriculture producers is not known at this time. The cost BMPs for reducing sediment production, riparian protection, and water use will need to be determined. |
| NvroR-NCSW-12.1.1.1    | Action Step      | Agriculture                  | Develop a Road Sediment Reduction Plan for agricultural lands that prioritizes problem sites and outlines implementation and a timeline of necessary actions.             | 2               | 10                      | Private Consultants, Private Landowners   |             |         |          |          |          | TBD             |  |
| NvroR-NCSW-12.1.1.2    | Action Step      | Agriculture                  | Assess sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.  | 2               | 10                      | Board of Forestry, CDFW, Farm Bureau, NMFS, Private Landowners                    | 394.00      | 394.00  |          |          |          | 788             | Cost base on road inventory of 550 miles (assume 25% of road network) estimated at \$927/mile and sediment assessment (assume 10% of road network) estimated at \$1,385/mile.                |
| NvroR-NCSW-12.1.1.3    | Action Step      | Agriculture                  | Work with landowners to assess the effectiveness of erosion control measures throughout the winter period.  | 2               | 10                      | Farm Bureau, NMFS, Private Consultants, Private Landowners                        |             |         |          |          |          | 0               | Cost accounted for in above action step.   |
| NvroR-NCSW-12.1.1.4    | Action Step      | Agriculture                  | Continue implementation of the NRCS/RCD coordinated permit program for fishery restoration practices.   | 2               | 30                      | RCD, NMFS, CDFW   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-12.1.2      | Recovery Action  | Agriculture                  | Prevent or minimize increased landscape disturbance   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-12.1.2.1    | Action Step      | Agriculture                  | Improve education and awareness of agencies, landowners and the public regarding salmonid protection and habitat requirements.  | 3               | 25                      | NMFS, CDFW  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-12.1.2.2    | Action Step      | Agriculture                  | Work within the agricultural community to educate landowners and enhance practices that provide for functional watershed processes.                                       | 3               | 3                       | Farm Bureau, NRCS, RCD  | 60.00       |         |          |          |          | 60              | Additional staff time for RCDs and NRCS to conduct education programs for landowners.  |
| NvroR-NCSW-12.1.2.3    | Action Step      | Agriculture                  | Provide technical and staff support to counties to encourage general plan updates that include measures to protect salmonids.   | 3               | 40                      | County, NMFS, NOAA RC, CDFW, RCD  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-12.1.3      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-12.1.3.1    | Action Step      | Agriculture                  | Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.                         | 3               | 20                      | CDFW, FishNet 4C, Mendocino County, NMFS, NOAA RC, NRCS, Private Consultants, RCD |             |         |          |          |          | 0               | Cost is expected to minimal for agency staff to encourage restoration projects. Action is considered In-Kind   |
| NvroR-NCSW-12.1.4      | Recovery Action  | Agriculture                  | Prevent or minimize alterations to riparian species composition and structure   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-12.1.4.1    | Action Step      | Agriculture                  | Maintain and enhance existing natural vegetation types within the Navarro watershed.  | 3               | 25                      | CDFW, RCD, County, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>NvroR-NCSW-12.2</b> | <b>Objective</b> | <b>Agriculture</b>           | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-12.2.1      | Recovery Action  | Agriculture                  | Prevent or minimize impairment to stream hydrology (impaired water flow)  |                 |                         |   |             |         |          |          |          |                 |  |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| NvroR-NCSW-12.2.1.1    | Action Step      | Agriculture                  | Promote off-channel storage to reduce impacts of water diversion during the spring and summer (e.g. diversion during winter high flow).   | 2               | 10                      | CDFW, NMFS, Private Landowners, SWRCB                      |             |         |          |          |          | TBD             | Cost of implementing is unknown at this time. An analysis focusing on the amount of off-channel storage to provide improved spring and summer flows needs to be conducted prior to implementing. Participating landowners and water users could initiate prior to analysis being completed. |
| NvroR-NCSW-12.2.1.2    | Action Step      | Agriculture                  | Investigate the potential to provide bypass flow from agricultural storage during critical low flow period of August through October.   | 2               | 20                      |  |             |         |          |          |          | TBD             | Cost based on amount of critical low flow to restore for salmonids. Suggest conducting a hydrologic model at a rate of \$65,084/project.  |
| NvroR-NCSW-12.2.2      | Recovery Action  | Agriculture                  | Prevent or minimize increased landscape disturbance   |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-12.2.2.1    | Action Step      | Agriculture                  | Coordinate with the agencies to minimize conversion of range and forestland in key watersheds.  | 2               | 50                      | NMFS, CalFire, CDFW, RCD, County                           |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-12.2.2.2    | Action Step      | Agriculture                  | The State and Mendocino County should minimize conversion of open space, rangeland, or TPZ to vineyards or other agricultural uses that impact salmonids until a grading ordinance and land conversion ordinance are in place. The ordinance should minimize runoff, erosion, sediment delivery to streams, and provide riparian protection.      | 1               | 60                      | Farm Bureau, County, RCD, Private Landowners               |             |         |          |          |          | 0               | Cost to develop ordinance is considered cost of doing business. Action is considered In-Kind  |
| NvroR-NCSW-12.2.2.3    | Action Step      | Agriculture                  | Implement the NRCS/RCD coordinated permit program for fishery restoration practices.  | 2               | 40                      | CDFW, Farm Bureau, NMFS, Private Landowners                |             |         |          |          |          | TBD             | Cost of implementing BMPs to agriculture producers is not known at this time. The cost BMPs for reducing sediment production, riparian protection, and water use will need to be determined. Action is considered In-Kind   |
| <b>NvroR-NCSW-16.1</b> | <b>Objective</b> | <b>Fishing/Collecting</b>    | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-16.1.1      | Recovery Action  | Fishing/Collecting           | Prevent or minimize reduced density, abundance, and diversity based on the biological recovery criteria   |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-16.1.1.1    | Action Step      | Fishing/Collecting           | NMFS and CDFW will work to improve the California Freshwater Sport Fishing Regulations to minimize take of adult salmonids.   | 2               | 30                      | CDFW, NMFS, Public   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-16.1.1.2    | Action Step      | Fishing/Collecting           | Work with CDFW to modify California Code of Regulations Section 8.00 (b) (1) low flow minimum flow closure for Mendocino, Sonoma, and Marin counties. Discontinue using the Russian River at Guerneville gauging station and replace with the Navarro River USGS gauging station (11468000) to reflect hydrologic conditions for coastal streams. | 2               | 20                      | CDFW, NMFS   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-16.1.1.3    | Action Step      | Fishing/Collecting           | Reduce poaching of adult steelhead by increasing law enforcement.   | 2               | 20                      | CDFW, NMFS OLE   |             |         |          |          |          | TBD             | Cost are difficult to determine because of availability of increased law enforcement.   |
| <b>NvroR-NCSW-19.1</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-19.1.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance   |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-19.1.1.1    | Action Step      | Logging                      | Should large tracts of forestlands within any essential or supporting watershed in this recovery plan become available for purchase, the Federal Government, State of California, or other entities should consider purchasing the area as a conservation area.   | 3               |                         | BLM, CDFW, Redwood Forest Foundation                       |             |         |          |          |          | TBD             | Will vary with specific tract and current market value.   |
| NvroR-NCSW-19.1.1.2    | Action Step      | Logging                      | Increase size of Navarro River Redwoods State Park if opportunities arise. At the minimum purchase or develop conservation easement on lower tributaries and associated riparian areas, including important steelhead tributaries such as Flynn Creek.  | 2               | 20                      | Mendocino Redwood Company, Private Landowners, State Parks |             |         |          |          |          | TBD             | Cost to acquire parcels cannot be determined due to fluctuations in market value and rate of turnover.  |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| NvroR-NCSW-19.1.1.3    | Action Step      | Logging                      | Areas adjacent to currently owned State parks or forestlands supporting essential or supporting populations should be considered for purchase (if feasible within the next 5 years).            | 3               | 30                      | Mendocino Redwood Company, Private Landowners, State Parks                                  |             |         |          |          |          | TBD             | Cost to acquire parcels cannot be determined due to fluctuations in market value and rate of turnover.                       |
| NvroR-NCSW-19.1.2      | Recovery Action  | Logging                      | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-19.1.2.1    | Action Step      | Logging                      | Encourage all permanent and year-round access roads beyond the THP parcel be surfaced after harvest completion with base rock and road gravel, asphalt, or chipseal, as appropriate.            | 2               | 60                      | CalFire, CDFW, NMFS, Private Landowners, RWQCB  |             |         |          |          |          | 0               | Costs accounted for in roads and sediment actions.   |
| NvroR-NCSW-19.1.2.2    | Action Step      | Logging                      | Work with CalFire through the timber harvest permitting process to identify problematic legacy roads within WLPZ's, decommission them, and revegetate the area with appropriate native species. | 1               | 40                      | CalFire, CDFW, NRCS, Private Landowners   |             |         |          |          |          | 0               | Cost are accounted for in sediment reduction actions and roads actions.  |
| NvroR-NCSW-19.1.2.3    | Action Step      | Logging                      | Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities that can promote erosion.  | 2               | 60                      | CalFire, CDFW, Private Landowners, RWQCB  |             |         |          |          |          | 0               | These action occur now in CA THP process, therefore cost is expected to be minimal. Action is considered In-Kind             |
| NvroR-NCSW-19.1.2.4    | Action Step      | Logging                      | Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.                                    | 3               | 60                      | Private Landowners  |             |         |          |          |          | TBD             | Additional cost of retaining trees is not known at this time. Landowners need to estimate timber volumes that would be lost. |
| NvroR-NCSW-19.1.3      | Recovery Action  | Logging                      | Prevent or minimize adverse alterations to riparian species composition and structure   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-19.1.3.1    | Action Step      | Logging                      | Explore acquisition or conservation easements from willing land-owners.   | 3               | 20                      | Private Consultants, Private Landowners   |             |         |          |          |          | TBD             | Cost difficult to determine because of fair market value and rate of turnover.   |
| NvroR-NCSW-19.1.3.2    | Action Step      | Logging                      | Allow trees in riparian areas to age, die, and recruit into the stream naturally.   | 2               | 60                      | Board of Forestry, CalFire, Mendocino County, Mendocino Redwood Company, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>NvroR-NCSW-19.2</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-19.2.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance   |                 |                         |   |             |         |          |          |          |                 |  |
| NvroR-NCSW-19.2.1.1    | Action Step      | Logging                      | Assign NMFS staff to conduct THP reviews in Navarro River watershed high priority areas.  | 2               | 50                      | NMFS, CalFire   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-19.2.1.2    | Action Step      | Logging                      | Work with the California Board of Forestry to design and implement a program of BMPs for logging areas that meets the approval of NMFS and CDFW.  | 2               | 3                       | CalFire, NMFS, NMFS OLE, Private Landowners, RWQCB  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-19.2.1.3    | Action Step      | Logging                      | Discourage Counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).  | 2               | 20                      | CDFW, Mendocino County, NMFS, RWQCB, State Parks  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-19.2.1.4    | Action Step      | Logging                      | Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).   | 2               | 60                      | CalFire, Mendocino County, NMFS, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind   |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| <b>NvroR-NCSW-23.1</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.1.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.1.1.1    | Action Step      | Roads/Railroads              | Restoration projects that upgrade or decommission high risk roads in areas with essential or supporting populations should be considered a high priority for funding (e.g., PCSRF).   | 1               | 10                      | CDFW, Mendocino County, Mendocino Redwood Company, NOAA RC, Private Landowners   | 750         | 750     |          |          |          | 1,500           | Cost based on upgrading 150 miles of riparian road network at a rate of \$10,000/mile. |
| NvroR-NCSW-23.1.1.2    | Action Step      | Roads/Railroads              | For all rural (unpaved) and seasonal dirt roads apply best management practices for road construction maintenance management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999). | 2               | 10                      | CDFW, Mendocino County Department of Public Works, Mendocino Redwood Company, NOAA RC, NRCS, Private Landowners, Public, RCD               | 1,000       | 1,000   |          |          |          | 2,000           | Cost based on treating 200 miles of road at a rate of \$10,000/mile.                   |
| NvroR-NCSW-23.1.1.3    | Action Step      | Roads/Railroads              | Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams.   | 2               | 5                       | CDFW, NOAA RC, Private Landowners, RCD   |             |         |          |          |          | 0               | Cost accounted for in road and sediment assessment.                                    |
| NvroR-NCSW-23.1.1.4    | Action Step      | Roads/Railroads              | Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).                                       | 2               | 20                      | CDFW, NOAA RC, Private Landowners, RCD   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-23.1.1.5    | Action Step      | Roads/Railroads              | Minimize new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.                                 | 2               | 30                      | CalFire, County, RCD, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-23.1.1.6    | Action Step      | Roads/Railroads              | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).  | 2               | 20                      | CalFire, County, RCD, Private Landowners   | 75.00       | 75.00   | 75.00    | 75.00    |          | 300             | Cost based on decommissioning riparian road network at a rate of \$12,000/mile.        |
| NvroR-NCSW-23.1.2      | Recovery Action  | Roads/Railroads              | Prevent or minimize increased landscape disturbance   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.1.2.1    | Action Step      | Roads/Railroads              | Continue education of Caltrans, County road engineers, and County maintenance staff regarding watershed processes and the adverse effects of improper road construction and maintenance on salmonids and their habitats.                              | 3               | 60                      | CalFire, CDFW, Mendocino County, Private Landowners  |             |         |          |          |          | TBD             | Cost of additional staff time is unknown at this time, but could be considerable.      |
| NvroR-NCSW-23.1.2.2    | Action Step      | Roads/Railroads              | Develop a Salmon Certification Program for road maintenance staff.  | 2               | 5                       | CDFW, FishNet 4C, Mendocino County Department of Public Works, Mendocino Redwood Company, NOAA RC, Private Consultants, Private Landowners | 50.00       |         |          |          |          | 50              | Cost based on annual training for certification of entities in Navarro watershed.      |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat   | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|------------------------|------------------|--------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                        |                  |                                |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| NvroR-NCSW-23.1.3      | Recovery Action  | Roads/Railroads                | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)  |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.1.3.1    | Action Step      | Roads/Railroads                | Develop a road database using standardized methods. The methods should document all roads features, apply erosion rates, and compile information into a GIS database.   | 3               | 5                       | NRCS, Private Landowners, Public, RCD  | 50.00       |         |          |          |          | 50              | Rough estimate to develop database for Navarro watershed.  |
| NvroR-NCSW-23.1.3.2    | Action Step      | Roads/Railroads                | Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners                                   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| NvroR-NCSW-23.1.4      | Recovery Action  | Roads/Railroads                | Prevent or minimize impairment to passage and migration   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.1.4.1    | Action Step      | Roads/Railroads                | Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and appropriate barrier databases when developing new or retrofitting existing road crossings.  | 2               | 10                      | CalTrans, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners | 150.00      | 150.00  |          |          |          | 300             | Based on estimate for 3 projects per year and each would have an additional 10k in cost.   |
| NvroR-NCSW-23.1.4.2    | Action Step      | Roads/Railroads                | Continue to refine, update, and maintain the California Fish Passage Assessment Database of barriers to fish passage.   | 2               | 10                      | California Coastal Conservancy, CDFW, Pacific States Marine Fisheries Commission, USFWS  | 25.00       | 25.00   |          |          |          | 50              | Cost estimate for maintaining database for the Navarro watershed for 10 years.   |
| <b>NvroR-NCSW-23.2</b> | <b>Objective</b> | <b>Roads/Railroads</b>         | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.2.1      | Recovery Action  | Roads/Railroads                | Prevent or minimize increased landscape disturbance   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.2.1.1    | Action Step      | Roads/Railroads                | Expand the NRCS/RCD coordinated permit program to a statewide programmatic ESA consultation that allows funding and technical expertise to small land owners and rural residential property owners.   | 2               | 20                      | CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, USACE                                |             |         |          |          |          | TBD             | Cost associated with additional staff time and consulting to expand program at this time unknown.  |
| NvroR-NCSW-23.2.2      | Recovery Action  | Roads/Railroads                | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)  |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-23.2.2.1    | Action Step      | Roads/Railroads                | Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a time line of necessary actions.   | 2               | 3                       | Mendocino Redwood Company, NRCS, Private Consultants, Private Landowners, RCD            | 100.00      |         |          |          |          | 100             | Estimate based on using existing data from various sources to develop road plan for the watershed.   |
| <b>NvroR-NCSW-24.1</b> | <b>Objective</b> | <b>Severe Weather Patterns</b> | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-24.1.1      | Recovery Action  | Severe Weather Patterns        | Prevent or minimize impairment to watershed hydrology   |                 |                         |  |             |         |          |          |          |                 |  |
| NvroR-NCSW-24.1.1.1    | Action Step      | Severe Weather Patterns        | Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.   | 2               | 25                      | NMFS, CDFW, RCD, Private Landowners  |             |         |          |          |          | TBD             | TBD, cost based on amount of acquired water needed, fair market value, and rate of turnover.   |
| NvroR-NCSW-24.1.1.2    | Action Step      | Severe Weather Patterns        | Conduct an analysis of critical flow levels. If predicted flows are below a level considered critical to maintain viable rearing habitat for salmonids, measures to reduce water consumption should be initiated by municipal water suppliers and other users in the watershed through conservation programs. | 2               | 60                      | Mendocino County, NOAA RC, Private Landowners, Public, SWRCB                             | 5.42        | 5.42    | 5.42     | 5.42     | 5.42     | 65              | An analysis of critical flow levels is needed to determine amount of water to determine extent of reduced in water consumption. Cost for hydrological model estimated at \$65,084/project. Reduction of consumptive uses of water will contribute to costs, but will vary with measure implemented and extent. |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID              | Level            | Targeted Attribute or Threat        | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|------------------------|------------------|-------------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                        |                  |                                     |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| NvroR-NCSW-24.1.1.4    | Action Step      | Severe Weather Patterns             | Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.  | 2               | 20                      | NOAA RC, Private Landowners, USACE                                     |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-24.1.1.5    | Action Step      | Severe Weather Patterns             | Identify and work with water users to minimize depletion of summer base flows from unauthorized water uses.   | 3               | 25                      |  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-24.1.1.6    | Action Step      | Severe Weather Patterns             | Implement mandatory water conservation measures during drought conditions to maintain viable conditions and migratory flows for adults and juveniles. Each watershed/city should have a plan that establishes drought conservation measures and circumstances for implementation. | 2               | 100                     | CDFW, NMFS, Private Landowners, SWRCB, County, cities                  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-24.1.1.7    | Action Step      | Severe Weather Patterns             | Pursue opportunities to acquire or lease water, or acquire water rights from willing sellers, for salmonid recovery purposes. Develop incentives for water right holders to dedicate instream flows for the protection salmonids (Water Code § 1707). □                           | 3               | 40                      | CDFW, NMFS, SWRCB  |             |         |          |          |          | TBD             | Cost is unknown. The main benefit of this action is to improve flow conditions in stream reaches where the majority of home owners and agricultural use occurs. |
| NvroR-NCSW-24.1.2      | Recovery Action  | Severe Weather Patterns             | Minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity) through effective erosion control measures.  | 3               | 20                      | CDFW, Mendocino County, NMFS, RWQCB, RCD                               |             |         |          |          |          | TBD             | Additional analysis needed to determine cost of modifying regulations at various levels.  |
| NvroR-NCSW-24.1.2.1    | Action Step      | Severe Weather Patterns             | Protect high-risk shallow-seeded landslide areas and surfaces prone to erosion from being mobilized by intense storm events.  | 2               | 60                      | Board of Forestry, CalFire, CDFW, Mendocino County, Private Landowners |             |         |          |          |          | TBD             | Cost of protecting high risk areas is unknown at this time. Cost estimated at a rate of \$3,068/acre.   |
| NvroR-NCSW-24.1.2.2    | Action Step      | Severe Weather Patterns             | Work with the County and other agencies to implement restrictions on new development in all historic steelhead watersheds to meet a zero net increase in storm-water runoff, changes in duration, or magnitude of peak flow.  | 2               | 60                      | Board of Forestry, CalFire, CDFW, Mendocino County, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-24.1.2.3    | Action Step      | Severe Weather Patterns             | Coordinate with county planners to minimize new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all historic NC steelhead watersheds.  | 2               | 50                      | Board of Forestry, CalFire, CDFW, Mendocino County, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-24.1.2.4    | Action Step      | Severe Weather Patterns             | Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.  | 2               | 50                      | Board of Forestry, CalFire, CDFW, Mendocino County, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-24.1.2.5    | Action Step      | Severe Weather Patterns             | See Roads actions for sediment reduction from severe winter storm events.   |                 |                         |  |             |         |          |          |          |                 |   |
| <b>NvroR-NCSW-25.1</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the inadequacy of existing regulatory mechanisms.</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-25.1.1      | Recovery Action  | Water Diversion/ Impoundment        | Improve flow conditions (instantaneous conditions)  |                 |                         |  |             |         |          |          |          |                 |   |
| NvroR-NCSW-25.1.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with SWRCB and landowners to restore and maintain the natural hydrograph between March 1 and May 15 to minimize impacts to steelhead fry due to stranding by implementing alternative frost protection strategies.   | 2               | 10                      | SWRCB, Private Landowners, County, NMFS, CDFW                          |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-25.1.1.2    | Action Step      | Water Diversion/ Impoundment        | Support SWRCB in regulating the use of streamside wells and groundwater.  | 2               | 20                      | SWRCB, NMFS, CDFW  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| NvroR-NCSW-25.1.1.3    | Action Step      | Water Diversion/ Impoundment        | Request that SWRCB review and/or modify water use based on the needs of steelhead and authorized diverters (CDFG 2004).   | 2               | 20                      | SWRCB, NMFS, CDFW  |             |         |          |          |          | 0               | Action is considered In-Kind  |

Navarro River, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID           | Level       | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner | Costs (\$K) |         |          |          |          | Entire Duration | Comment                      |
|---------------------|-------------|------------------------------|--|-----------------|-------------------------|------------------|-------------|---------|----------|----------|----------|-----------------|------------------------------|
|                     |             |                              |  |                 |                         |                  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |                              |
| NvroR-NCSW-25.1.1.4 | Action Step | Water Diversion/ Impoundment | Work with CDFW during the Lake and Strembed alteration Agreement process to re-establish natural flow regimes to improve adult migration to spawning habitats and smolt outmigration. Develop bypass flow plans for ponds and reservoirs to reduce the potential for impacts to fall flows that may inhibit adult steelhead passage. | 2               | 30                      | NMFS, CDFW       |             |         |          |          |          | 0               | Action is considered In-Kind |

## NC Steelhead DPS Rapid Assessment Profile: Central Coastal Diversity Stratum Populations

### Brush Creek

- Role within DPS: Independent Population
- Spawner Abundance Target: 141-284 adults
- Current Intrinsic Potential: 23.8 IP-km

### Elk Creek

- Role within DPS: Independent Population
- Spawner Abundance Target: 127-256 adults
- Current Intrinsic Potential: 21.5 IP-km

### Schooner Gulch

- Role within DPS: Dependent Population
- Spawner Abundance Target: 44-90 adults
- Current Intrinsic Potential: 7.7 IP-km

For information regarding CC Chinook salmon and CCC coho salmon for this watershed, please see the CC Chinook Salmon volume of this recovery plan and the CCC coho salmon recovery plan (<http://www.westcoast.fisheries.noaa.gov/>).

### Steelhead Abundance and Distribution

In these watersheds steelhead are present in variable numbers and widely distributed. The type of data and quality of data vary by watershed and by year. Aside from sporadic estimates of summer juvenile abundance, relatively little sampling has occurred in Brush Creek. Brush Creek is included in the overall suite of streams sampled in CDFW's coastal Mendocino County salmonid life cycle and regional status and trend monitoring effort but the sampling effort is part of a larger regional sampling program and estimates are, therefore, not specifically derived to estimate the greater Brush Creek steelhead population. In 2008/9, 2009/10, and 2010/11 one reach was sampled and no redds were detected and the adult population was estimated at zero (Gallagher and Wright, 2012). This does not necessarily mean no adults were present, rather the surveyors failed to detect adult steelhead in the survey reaches. Past juvenile sampling has documented presence of steelhead in all years surveyed.

Neither Schooner Gulch nor Elk Creek are monitored for adult abundance but both have been sporadically surveyed for juvenile presence. In both watersheds, juvenile steelhead have been

detected in the mainstem and tributaries. A barrier to steelhead migration occurs in the Elk Creek watershed and a resident trout population is present above the barrier.

## **History of Land Use, Land Management and Current Resources**

The historic land use in the three watersheds is largely defined by timber harvest, and to a lesser degree agriculture in lower Brush Creek. Rate of timber harvest varied between the watersheds but by the 1970s most of the original forest in all three watersheds had been harvested and the forests are in their second harvest rotation.

The human population in all three watersheds is low; 27 people live in Schooner Gulch, 11 people live in the Elk Creek watershed, and 195 live in the Brush Creek watershed (NMFS 2013). Most housing is located on the marine terrace near the confluence with the Pacific Ocean, including the town of Manchester in lower Brush Creek.

## **Diversity Stratum Population and Habitat Conditions**

The following discussion focuses on those conditions that are rated as Poor and Fair for steelhead life history stages (see “Central Coastal Diversity Stratum” Rapid Assessment). Conditions that are rated as Poor are associated with Habitat Complexity: Large Wood and Shelter. Recovery strategies will focus on improving these conditions as well as those needed to ensure population viability and properly functioning watershed processes.

The majority of conditions evaluated for the three watersheds are rated as Good for most lifestages. Overall, the Brush, Elk, and Schooner watersheds are subject to fewer stressful conditions than many other watersheds in the Diversity Stratum due to a general lack of urban or rural residential impacts except in the lower portions of the watersheds.

### **Estuary: Quality and Extent**

Estuary conditions are rated as Fair for the summer rearing lifestage, due in large part to the altered conditions associated with the stream diversion in lower Brush Creek. These diversions may lead to generally unsuitable summer rearing conditions due to poor water quality. The other two estuaries are less impacted than many other similar habitats in the DPS.

### **Hydrology: Baseflow and Passage Flows**

Hydrology: Baseflow and Passage Flows is rated as Fair for the summer rearing and smolt lifestages, primarily due to ongoing water diversions in the lower Brush Creek watershed.

### **Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios**

Habitat Complexity: Percent Primary Pools and Pool/Riffle/Flatwater Ratios is rated as Fair for the target lifestages, and may be limiting in select reaches in all three watersheds.

### **Habitat Complexity: Large Wood and Shelter**

Lack of habitat complexity in the form of wood and high levels of instream sediment is rated as Fair for the adult, summer, and winter rearing lifestages. Lack of instream complexity is likely the result of long term land uses related to timber harvest in the three watersheds, particularly impacts associated with mechanized logging practices prior to the California Forest Practice Rules and removal of wood during the 1960s-1980s. Of reaches sampled in the three watersheds, data from CDFW habitat inventories indicate large wood is lacking. Threats that have caused, are causing, or may cause this condition to continue to impair steelhead life history targets include Logging, Fire and Fuel Management, and Roads/Railroads.

### **Sediment: Gravel Quality and Distribution of Spawning Gravels**

Sediment: Gravel Quality and Distribution of Spawning Gravels is rated as Poor and has had a major adverse effect on the egg lifestage, and is potentially limited for those lifestages. This factor has also been rated as Fair and has had a moderate effect on the adult and summer and winter rearing lifestages. These ratings reflect the generally high sediment loads throughout the three watersheds in particular and the Diversity Stratum in general. Threats that have caused, are causing, or may cause this condition to continue to impair steelhead life history targets include Logging, Fire and Fuel Management, and Roads/Railroads.

### **Viability: Density, Abundance and Spatial Structure**

Viability: Density, Abundance and Spatial Structure had been rated as Fair for the target lifestages. Steelhead populations are depressed in the three watershed but all three populations maintain steelhead presence and distribution throughout the mainstems and tributaries.

### **Water Quality: Turbidity or Toxicity**

Increased turbidity has been rated as Fair and has had a moderate effect on adults, wintering juveniles, and smolts. Sources of increased turbidity are the result of high rates of fine sediment input from upslope areas throughout the three watersheds.

## **Threats**

The following discussion focuses on those threats that are rated as Poor and Fair (see “Central Coastal Diversity Stratum” Rapid Assessment). Recovery strategies focus on ameliorating primary threats; however, some strategies may address other threat categories when the strategy

is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in “Central Coastal Diversity Stratum” Rapid Assessment.

### **Agriculture**

This threat is rated as Fair and is considered a moderate contribution to the condition of Instream Substrate/Food Productivity: Impaired Gravel Quality & Quantity and Estuary: Impaired Quality & Extent. The primary location where agricultural practices are considered to have an impact on gravel quality is in lower Brush Creek. A significant proportion of the marine terrace in Brush Creek is devoted to agriculture and existing buffers may not be adequate to prevent increased rates of sediment input into the lower watershed.

### **Fire, Fuel Management and Fire Suppression**

This threat is rated as Fair and considered a moderate contributor to the condition of Habitat Complexity: Large Wood and Shelter; and Sediment: Gravel Quality and Distribution of Spawning Gravels, due to a fire reducing potential sources of future LWD recruitment and potentially increasing the rate of fine sediment input into spawning gravels following runoff in response to winter rainfall events. Increased rates of sedimentation are typical, and in combination with past and ongoing sources of sediment input, could adversely impact gravel quality and quantity necessary for successful spawning and food production. Furthermore, if existing riparian areas were lost to fire, increases in instream temperatures would likely result.

### **Logging and Wood Harvesting**

Timber harvest is rated as Poor and remains a major contributor to two conditions for steelhead in all three watersheds, but at diminished levels compared to historical practices. It is considered a major contributor to the conditions of Habitat Complexity: Large Wood and Shelter; and Sediment: Gravel Quality and Distribution of Spawning Gravels. Even with application of new California Forest Practice Rules and the MRC HCP, this threat is anticipated to continue into the foreseeable future. Rate of timber harvest over the past 15 years is particularly high for Elk Creek (9,337 acres or 53 percent of the watershed) and Schooner Gulch (1,117 acres or 39 percent of the watershed) (NMFS 2013).

### **Roads and Railroads**

Roads are rated as Good and a minor contributor to four conditions and rated as Fair and a moderate contributor to five others. Legacy roads from past logging activity continue to adversely impact habitat quality for salmonids in the three watersheds. Road densities are moderately high throughout the watersheds (2.0 miles/mile<sup>2</sup> in Brush; 2.4 miles/mile<sup>2</sup> in Elk; and

3.0 miles/mile<sup>2</sup> Schooner) and many of these roads were poorly situated and constructed<sup>1</sup>, improperly maintained, and many have been abandoned rather than properly decommissioned.

### **Severe Weather Patterns**

This threat is rated as a Good and Fair and considered a minor or moderate contributor to eleven conditions. The impacts of a severe drought (particularly in conjunction with ongoing diversions in Brush Creek) could adversely affect the summer rearing lifestage of steelhead in the watershed, and may increase the impact of the threat if water diversions increase during the summer months.

### **Water Diversion and Impoundments**

There are relatively few diversions in Elk or Schooner but major diversions exist in lower Brush Creek. The impact of the diversions, particularly in relation to impacts to estuarine rearing is a major concern to steelhead viability in the Brush Creek watershed. CDFW stated that “(a)dditional flow diversion could substantially reduce or even eliminate flow in portions of lower Brush Creek, where critical habitat exists. CDFW initiated an instream flow study of lower Brush Creek to identify the flow conditions required to optimize and protect the stream’s anadromous resources” (CDFG 2008).

### **Fishing and Collecting**

Fishing is rated as Fair and is a considered a moderate contributor to the condition of Viability: Density, Abundance and Spatial Structure primarily due to the ambiguity of the California Freshwater Sport Fishing Regulations. The regulations imply hatchery trout and hatchery steelhead are present in Brush Creek and Elk Creek when, in reality, they are not (resident rainbow trout are present above a natural barrier in Elk Creek). Concerns were raised over potential fishing impacts from uninformed fishers who presume hatchery fish may be present in areas where they do not occur. Furthermore, the regulations authorize summer fishing with a bag limit of zero. Fish that are caught during a summer fishery are almost certainly exclusively listed steelhead and/or coho salmon juveniles which could be injured by being caught and landed and then released.

### **Limiting Conditions, Lifestages, and Habitats**

The summer rearing and winter rearing lifestages are most limited by current conditions and future threats facing steelhead in Brush Creek, Elk Creek, and Schooner Gulch. The conditions most limiting include: Reduced LWD and Shelter. The greatest threats to recovery in these watersheds result from Logging, Severe Weather, Fire and Roads, and Fishing.

<sup>1</sup> The majority of these roads were constructed prior to the passing of the California Forest Practices Rules in 1973.

## **General Recovery Strategy**

In general, recovery strategies focus on improving conditions and ameliorating Fair and Poor conditions and threats, as discussed above, although strategies that address other factors may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed. The general recovery strategies for the populations in these watersheds are discussed below with more detailed and site-specific recovery actions provided in “Central Coastal Diversity Stratum” Rapid Assessment.

### **Habitat Complexity: Large Wood and Shelter**

Initiation of LWD enhancement efforts by the major landowners in these watersheds will likely be necessary due to the long period of time it may take for LWD to naturally recruit from existing riparian zones. In addition to directly contributing to habitat complexity, LWD and other habitat features such as boulders support development of complex pools, and improve pool/riffle ratios.

### **Address Upslope Sediment Sources to Improve Gravel Quality and Quantity**

Active and abandoned logging roads and skid trails are located throughout the three watersheds and likely contribute large volumes of sediment into the stream environment. Many logging roads have been upgraded to modern standards, but substantial work remains before this significant sediment source is thoroughly addressed. Ongoing road work should include a component that closes and decommissions unnecessary and abandoned roads and skid trails to effectuate lowering the overall road density in the watershed. Including road remediation within future timber harvest plans should be considered a top mitigation priority.

High priority sites identified as major sources of sediment contribution should be the initial focus of future restoration actions. Areas identified as shallow or deep seated landslides should be protected from future activities that could contribute to further instability. In particular, new roads should be carefully evaluated for their potential to contribute to further erosion as a result of major rainfall events, flooding, or earthquakes.

## **Fishing**

Modifications to the CDFW Freshwater fishing regulations would minimize the likelihood of impacts to adult and juvenile salmonids by fishers attempting to catch hatchery trout or steelhead. No hatchery plants have occurred in these watersheds in many years and by clarifying the fishing regulations to reflect this fact, potential impacts to the natural population can be avoided.

## **Ensure Protective Flows are Maintained**

Water diversions in Brush Creek may have a major impact to steelhead juveniles rearing in the lower portion of the watershed. Adoption, implementation, compliance monitoring and enforcement of standards set forth by CDFW (CDFG 2008) would ensure flows protective of all steelhead lifestages would be met.

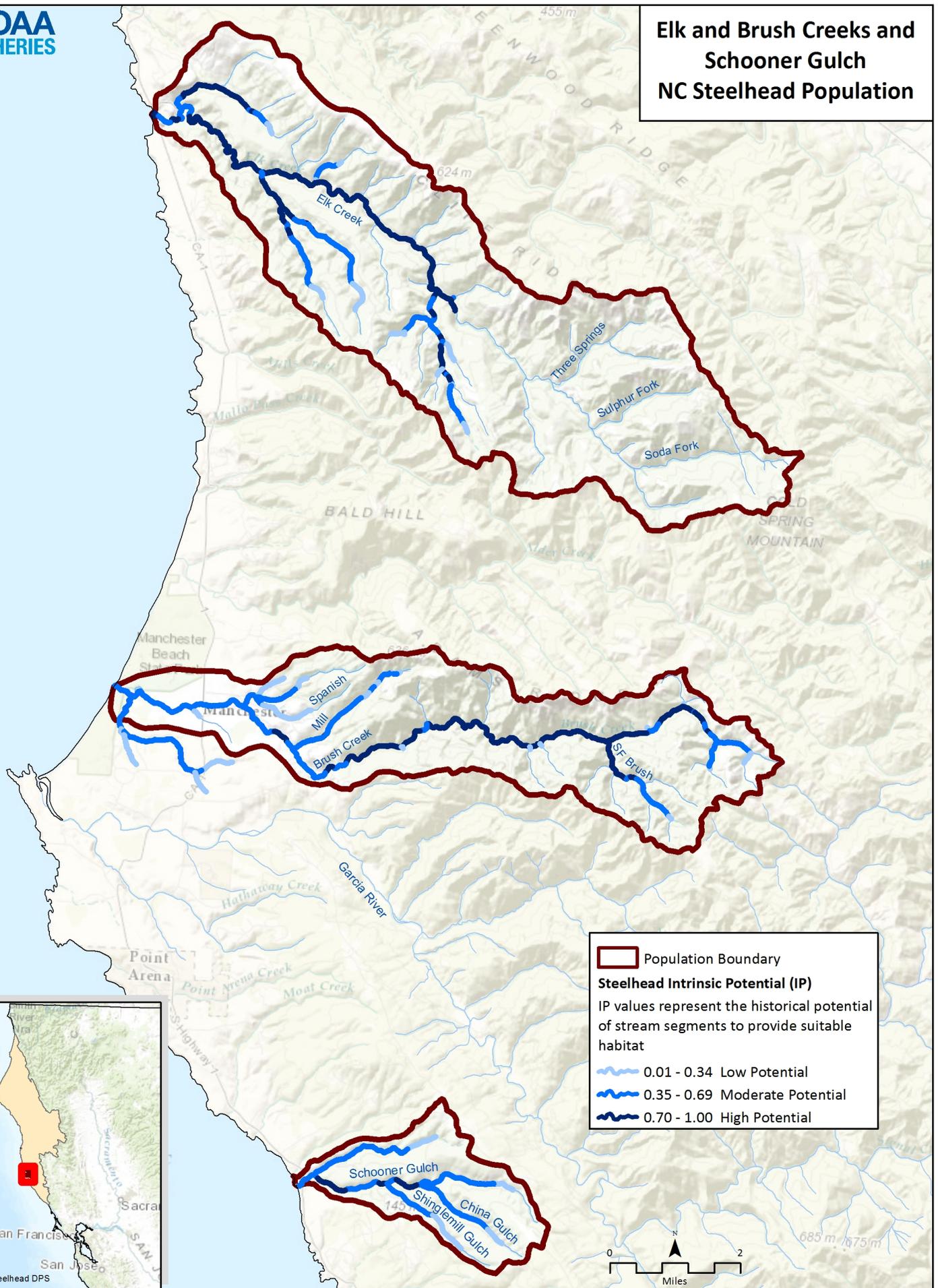
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**Elk and Brush Creeks and Schooner Gulch NC Steelhead Population**



**NC Steelhead DPS: Central Coastal Diversity Stratum (Brush/Elk/Schooner Gulch)**

| Habitat & Population Condition Scores By Life Stage:<br>VG = Very Good<br>G = Good<br>F = Fair<br>P = Poor |  | Steelhead Life History Stages |      |                          |                          |        |
|--|--|-------------------------------|------|--------------------------|--------------------------|--------|
|  |  | Adults                        | Eggs | Summer-Rearing Juveniles | Winter-Rearing Juveniles | Smolts |
| <b>Stresses: Key Attribute: Indicators</b>   | Riparian Vegetation: Composition, Cover & Tree Diameter                  |                               |      | G                        |                          |        |
|  | Estuary: Quality & Extent  | G                             |      | F                        | G                        | F      |
|  | Velocity Refuge: Floodplain Connectivity                                 | G                             |      |                          | G                        | G      |
|  | Hydrology: Redd Scour  |                               | G    |                          |                          |        |
|  | Hydrology: Baseflow & Passage Flows                                      | G                             | G    | F                        |                          | F      |
|  | Passage/Migration: Mouth or Confluence & Physical Barriers               | G                             |      | G                        | G                        | G      |
|  | Habitat Complexity: Percent Primary Pools & Pool/Riffle/Flatwater Ratios | F                             |      | F                        | F                        |        |
|  | Habitat Complexity: Large Wood & Shelter                                 | F                             |      | P                        | P                        | F      |
|  | Sediment: Gravel Quality & Distribution of Spawning Gravels              | F                             | F    | F                        | F                        |        |
|  | Viability: Density, Abundance & Spatial Structure                        | F                             |      | F                        |                          | F      |
|  | Water Quality: Temperature   |                               |      | G                        |                          | G      |
|  | Water Quality: Turbidity & Toxicity                                      | F                             |      | G                        | F                        | F      |

**NC Steelhead DPS: Central Coastal Diversity Stratum (Brush/Elk/Schooner Gulch)**

| Threat Scores<br>L: Low<br>M: Medium<br>H: High |   | Stresses   |                                       |   |                                      |                                |                              |   |  |  |   |  |   |
|---|---|--|---------------------------------------|---|--------------------------------------|--------------------------------|------------------------------|---|--|--|---|--|---|
|   |   | Altered Riparian Species:<br>Composition & Structure | Estuary: Impaired Quality &<br>Extent | Floodplain Connectivity:<br>Impaired Quality & Extent | Hydrology: Gravel Scouring<br>Events | Hydrology: Impaired Water Flow | Impaired Passage & Migration | Instream Habitat Complexity:<br>Altered Pool Complexity and/or<br>Pool/Riffle Ratio | Instream Habitat Complexity:<br>Reduced Large Wood and/or<br>Shelter | Instream Substrate/Food<br>Productivity: Impaired Gravel<br>Quality & Quantity | Reduced Density, Abundance &<br>Diversity | Water Quality: Impaired Instream<br>Temperatures | Water Quality: Increased<br>Turbidity or Toxicity |
| Threats - Sources of Stress                     | Agriculture                                 | L  | L                                     | L   | L                                    |                                | L                            | L   | M  | M  |   | L  | L   |
|   | Channel Modification                        | L  | L                                     | L   | L                                    | L                              | L                            | L   | M  | L  |   | L  | L   |
|   | Disease, Predation, and Competition         | L  | L                                     | L   |                                      |                                | L                            | L   | M  |  | L   | L  | L   |
|   | Fire, Fuel Management, and Fire Suppression | L  | L                                     | L   | L                                    |                                | L                            | L   | H  | M  |   | L  | M   |
|   | Livestock Farming and Ranching              | L  | L                                     | L   | L                                    |                                | L                            | L   | L  | L  |   | L  | L   |
|   | Logging and Wood Harvesting                 | L  | L                                     | L   | L                                    |                                | L                            | M   | H  | M  |   | L  | M   |
|   | Mining                                      | L  | L                                     | L   | L                                    |                                | L                            | L   | L  | L  |   | L  | L   |
|   | Recreational Areas and Activities           | L  | L                                     | L   | L                                    |                                | L                            | L   | M  | L  |   | L  | L   |
|   | Residential and Commercial Development      | L  | L                                     | L   | L                                    |                                | L                            | L   | M  | L  |   | L  | L   |
|   | Roads and Railroads                         | L  | L                                     | L   | L                                    |                                | L                            | L   | M  | M  |   | L  | M   |
|   | Severe Weather Patterns                     | L  | L                                     | L   | L                                    | M                              | L                            | L   | M  | M  |   | L  | M   |
|   | Water Diversions and Impoundments           | L  | H                                     | L   | L                                    | M                              | L                            | M   | M  | M  | M   | L  | L   |
|   | Fishing and Collecting                      |  |                                       |   |                                      |                                |                              |   |  |  | H   |  |   |
|   | Hatcheries and Aquaculture                  |  |                                       |   |                                      |                                |                              |   |  |  | L   | L  | L   |

Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID            | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|----------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                      |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| <b>BrC-NCSW-6.1</b>  | <b>Objective</b> | <b>Habitat Complexity</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-6.1.1       | Recovery Action  | Habitat Complexity           | Increase LWD, primary pools and shelter ratings  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-6.1.1.1     | Action Step      | Habitat Complexity           | Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth.   | 2               | 100                     | Mendocino County, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-6.1.1.2     | Action Step      | Habitat Complexity           | Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth.  | 3               | 20                      | CDFW, Private Landowners   | 22.75       | 22.75   | 22.75    | 22.75    |          | 91              | Cost based on treating 3.5 miles (assume 1 project/mile in 50% high IP) at a rate of \$26,000/mile.   |
| BrC-NCSW-6.1.1.3     | Action Step      | Habitat Complexity           | Allow native trees in riparian areas to age, die, and recruit into the stream naturally.   | 3               | 100                     | CDFW, County of Mendocino, Private Landowners                                      |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>BrC-NCSW-8.1</b>  | <b>Objective</b> | <b>Sediment</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-8.1.1       | Recovery Action  | Sediment                     | Improve instream gravel quality  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-8.1.1.1     | Action Step      | Sediment                     | Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.   | 3               | 20                      | CalFire, CalTrans, Mendocino County Department of Public Works, Private Landowners |             |         |          |          |          | TBD             | Costs will vary on landowner participation and year to year variation in rainfall patterns. This cost estimate does not include maintenance obligations.                    |
| BrC-NCSW-8.1.1.2     | Action Step      | Sediment                     | Permitting agencies (State, Federal, and local) should evaluate all authorized erosion control measures during the winter period.  | 3               | 100                     | CalFire, CDFW, NMFS, NRCS, RWQCB, USACE, USFWS                                     |             |         |          |          |          | 0               | This should be considered a standard business practice for all regulatory and oversight agencies. Action is considered In-Kind  |
| BrC-NCSW-8.1.1.3     | Action Step      | Sediment                     | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) and other infrastructure delivering sediment into watercourses (CDFG 2004).   | 3               | 30                      | CalFire, CDFW, County of Mendocino, NRCS, RWQCB                                    |             |         |          |          |          | 0               | Cost accounted for in other action steps requiring road decommissioning.  |
| <b>BrC-NCSW-15.1</b> | <b>Objective</b> | <b>Fire/Fuel Management</b>  | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-15.1.1      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-15.1.1.1    | Action Step      | Fire/Fuel Management         | Avoid use of aerial fire retardants and foams within 300 feet of riparian areas throughout the current range of NC steelhead.  | 1               | 100                     | CalFire  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-15.1.1.2    | Action Step      | Fire/Fuel Management         | Encourage CalFire to provide plans to minimize impacts from firefighting activities to all non-County firefighters when providing firefighting assistance in the Elk Creek watershed (and all other watersheds in the County). | 1               | 5                       | CalFire  |             |         |          |          |          | 0               | Cost of providing the plan is minimal. Action is considered In-Kind   |
| BrC-NCSW-15.1.1.3    | Action Step      | Fire/Fuel Management         | In the event of a wildfire, CalFire Resource Advisors should contact the resource agencies for ESA consultation (or technical assistance) about the incident.  | 3               | 100                     | CalFire  |             |         |          |          |          | 0               | The resource agencies can provide guidance regarding critical resources in the area that may be affected by the fire and firefighting actions. Action is considered In-Kind |
| BrC-NCSW-15.1.1.4    | Action Step      | Fire/Fuel Management         | Work with County planners to define future impacts of proposed urban and infrastructure development on fire suppression and fuel load buildup.   | 3               | 20                      | CalFire, CDFW, County of Mendocino   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-15.1.2      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to watershed hydrology  |                 |                         |  |             |         |          |          |          |                 |   |

Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID            | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner                 | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|----------------------|------------------|------------------------------|---|-----------------|-------------------------|----------------------------------|-------------|---------|----------|----------|----------|-----------------|--|
|                      |                  |                              |   |                 |                         |                                  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| BrC-NCSW-15.1.2.1    | Action Step      | Fire/Fuel Management         | Draft water from non-fish bearing waters if at all possible. In larger fish-bearing streams, excavate active channel areas outside of wetted width to create off-stream pools for water source.   | 2               | 100                     | CalFire                          |             |         |          |          |          | 0               | Require all water truck/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. Attempt to avoid significantly lowering stream flows during water drafting. Action is considered In-Kind   |
| BrC-NCSW-15.1.3      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize adverse alterations to riparian species composition and structure   |                 |                         |                                  |             |         |          |          |          |                 |  |
| BrC-NCSW-15.1.3.1    | Action Step      | Fire/Fuel Management         | Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.   | 2               | 5                       | CalFire, CDFW, NMFS, NRCS, USFWS |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>BrC-NCSW-15.2</b> | <b>Objective</b> | <b>Fire/Fuel Management</b>  | <b>Address other natural or manmade factors affecting the species continued existence</b>   |                 |                         |                                  |             |         |          |          |          |                 |  |
| BrC-NCSW-15.2.1      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |                                  |             |         |          |          |          |                 |  |
| BrC-NCSW-15.2.1.1    | Action Step      | Fire/Fuel Management         | Implement sedimentation reduction techniques in concert with prescribed fire techniques to minimize sediment impacts to various steelhead life stages.  | 2               | 100                     | CalFire                          |             |         |          |          |          | TBD             | This recommendation should be considered a standard practice. Implementing erosion control measures when constructing firebreaks (if possible) or shortly thereafter will likely result in a net cost savings. It is much more financially efficient to implement these measures while the fire crews are present rather than months later after the fire is out. Methods should include out-sloping, waterbars, breaks in fire lines (pick up blades on dozers occasionally, especially where fuels are sparse), minimize gradient of fire lines, change fire-line alignment onto occasional flats as often as possible (and especially near watercourses) to allow flows to dissipate and settle sediment. To the maximum extent possible, maintain natural topography - eliminate concentrating water velocities. |
| BrC-NCSW-15.2.1.2    | Action Step      | Fire/Fuel Management         | Re-contour any new facility sites as soon as possible after site cleanup and fire.  | 3               | 100                     | CalFire                          |             |         |          |          |          | 0               | This should be considered standard business practice. Action is considered In-Kind   |
| BrC-NCSW-15.2.1.3    | Action Step      | Fire/Fuel Management         | Immediately implement appropriate sediment control measures following completion of fire suppression while firefighters and equipment are on site.  | 2               | 100                     | CalFire                          |             |         |          |          |          | 0               | A major fire, particularly if located in areas with a high erosion hazard rating, could substantially increase fine sediment input and further compromise the altered rate of large wood recruitment into stream channels. Furthermore, if existing riparian areas were lost to fire, higher instream temperatures would likely result. Action is considered In-Kind   |
| BrC-NCSW-15.2.2      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)  |                 |                         |                                  |             |         |          |          |          |                 |  |
| BrC-NCSW-15.2.2.1    | Action Step      | Fire/Fuel Management         | Develop guidance that directs CalFire and other agencies and organizations using fire retardants to conduct an assessment of site conditions following wildfire where fire retardants have entered waterways, to evaluate the changes to on site water quality and the structure of the biological community. | 2               | 100                     | CalFire                          |             |         |          |          |          | 0               | Action is considered In-Kind   |
| BrC-NCSW-15.2.2.2    | Action Step      | Fire/Fuel Management         | Use non-toxic retardants. Avoid dropping fire retardant into streams. To the maximum extent feasible, orient air drops so that the drop goes perpendicular to streams as opposed to parallel.   | 2               | 100                     | CalFire                          |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>BrC-NCSW-16.1</b> | <b>Objective</b> | <b>Fishing/Collecting</b>    | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |                                  |             |         |          |          |          |                 |  |
| BrC-NCSW-16.1.1      | Recovery Action  | Fishing/Collecting           | Prevent or minimize reduced density, abundance, and diversity based on the biological recovery criteria   |                 |                         |                                  |             |         |          |          |          |                 |  |

Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID            | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner                        | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                      |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| BrC-NCSW-16.1.1.1    | Action Step      | Fishing/Collecting           | Improve CDFW fishing regulations to minimize incidental take of adult and juvenile steelhead.  | 2               | 2                       | CDFW                                    |             |         |          |          |          | 0               | Current fishing regulations for Brush Creek are vague and lack precision (e.g., location of Lawson bridge). Fishing regulation include a summer fishery without a bag limit which could likely harm listed steelhead juveniles. References to hatchery trout (which are not planted in the watershed) should be removed from regulations so as to not inadvertently encourage fishing for a resource which is not present in the watershed. Action is considered In-Kind |
| BrC-NCSW-16.1.1.2    | Action Step      | Fishing/Collecting           | Improve the low flow fishing closures.   | 2               | 5                       | CDFW, NMFS                              |             |         |          |          |          | 0               | Cost accounted for as part of conducting business with other regulatory resource agencies. Action is considered In-Kind  |
| <b>BrC-NCSW-19.1</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-19.1.1      | Recovery Action  | Logging                      | Prevent or minimize impairment to stream hydrology (impaired water flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-19.1.1.1    | Action Step      | Logging                      | Evaluate road surface treatment options to halt or minimize impacts from water drafting and diversion  | 3               | 100                     | CalFire, Private Landowners             |             |         |          |          |          | 0               | Road surface treatment options will vary widely on road use, availability of local rock sources and geology. Action is considered In-Kind  |
| BrC-NCSW-19.1.2      | Recovery Action  | Logging                      | Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)   |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-19.1.2.1    | Action Step      | Logging                      | Timber management should be designed to allow trees in riparian areas to age, die, and naturally recruit into the stream.                                    | 3               | 100                     | CalFire, Private Landowners             |             |         |          |          |          | 0               | The current Forest Practice Rules require retention of a proportion of the largest diameter trees adjacent to water courses. This practice should continue and potential expansion of the number left for future recruitment should be considered. Action is considered In-Kind  |
| BrC-NCSW-19.1.2.2    | Action Step      | Logging                      | Conduct conifer release to promote growth of larger diameter trees where appropriate.  | 3               | 100                     | CalFire, CDFW, Private Landowners, RPFs |             |         |          |          |          | TBD             | Costs will vary depending on landowner participation and site specific needs. This strategy can be implemented at relatively little costs in areas zoned for timber production as a component of future harvest plans. Estimate for riparian thinning is \$1,468/acre.   |
| BrC-NCSW-19.1.3      | Recovery Action  | Logging                      | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)  |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-19.1.3.1    | Action Step      | Logging                      | Protect headwater channels with larger buffers to minimize sediment delivery downstream.   | 3               | 100                     | CalFire                                 |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| BrC-NCSW-19.1.3.2    | Action Step      | Logging                      | Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist. | 3               | 100                     | CalFire, Private Landowners             |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| BrC-NCSW-19.1.3.3    | Action Step      | Logging                      | For areas with high or very high erosion hazard, extend the monitoring period and upgrade road maintenance for timber operations.                            | 3               | 100                     | CalFire, Private Landowners             |             |         |          |          |          | 0               | This recommendation applies to all THPs located in the mixed lithology geomorphic units with steep slopes, and all sandstone geomorphic units (steep and gentle slopes). Action is considered In-Kind  |
| BrC-NCSW-19.1.4      | Recovery Action  | Logging                      | Prevent or minimize adverse alterations to riparian species composition and structure  |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-19.1.4.1    | Action Step      | Logging                      | Manage riparian areas for their site potential composition and structure.  | 3               | 100                     | CalFire, Private Landowners             |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| BrC-NCSW-19.1.5      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-19.1.5.1    | Action Step      | Logging                      | Encourage low impact timber harvest techniques such as full-suspension cable yarding ( to improve canopy cover; reduce sediment input, etc.).                | 3               | 100                     | CalFire, Private Landowners             |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |

Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID            | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|----------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                      |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| BrC-NCSW-19.1.5.2    | Action Step      | Logging                      | Minimize use of winter operations for timber harvest activities.   | 3               | 100                     | CalFire, California Department of Mines and Geology, CDFW, Private Landowners, RWQCB |             |         |          |          |          | 0               | Particular emphasis should be placed on avoiding ground based winter operations during the rainy period. Aerial or skyline logging should be considered as preferred alternative to ground based logging, particularly in locations with high erosion hazard ratings or in watersheds of high IP value. Action is considered In-Kind  |
| BrC-NCSW-19.1.6      | Recovery Action  | Logging                      | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-19.1.6.1    | Action Step      | Logging                      | All roads, landings, and skid trails associated with timber operations should, to the maximum extent practicable, be hydrologically disconnected to prevent sediment runoff and delivery to streams. | 3               | 100                     | CalFire, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind  |
| BrC-NCSW-19.1.6.2    | Action Step      | Logging                      | Avoid new road construction in riparian zones  | 3               | 100                     | CalFire, Private Landowners  |             |         |          |          |          | 0               | Old roads should not be reopened unless for proper decommissioning purposes. Particular care should be directed at new road construction or reconstruction adjacent to Class 1 streams with high IP value habitat. Action is considered In-Kind   |
| BrC-NCSW-19.1.6.3    | Action Step      | Logging                      | See Roads and Railroads for additional recommendations.  |                 |                         |  |             |         |          |          |          |                 |   |
| <b>BrC-NCSW-19.2</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-19.2.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-19.2.1.1    | Action Step      | Logging                      | Establish greater oversight and post-harvest monitoring by the permitting agency for operations within salmonid areas.   | 3               | 20                      | CalFire, CDFW, Private Landowners, RWQCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-19.2.1.2    | Action Step      | Logging                      | Encourage timber landowners to implement restoration projects as part of their ongoing timber management practices in stream reaches where large woody material is deficient.                        | 3               | 100                     | CalFire, CDFW, Private Landowners, RWQCB   |             |         |          |          |          | 0               | Installing large woody material into stream deficient in large wood should be considered a top restoration priority. Restoration during harvest activities provides a unique opportunity to access key areas that are relatively undisturbed in comparison to areas of the watershed with a large rural residential footprint. Action is considered In-Kind                       |
| BrC-NCSW-19.2.1.3    | Action Step      | Logging                      | Discourage Mendocino County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).   | 2               | 100                     | CalFire, Mendocino County, Private Landowners, RWQCB                                 |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-19.2.1.4    | Action Step      | Logging                      | Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).  | 2               | 100                     | CalFire, County of Mendocino, Private Landowners, RWQCB                              |             |         |          |          |          | 0               | Illegal marijuana cultivation may occur in some areas and have the potential to severely degrade juvenile rearing conditions by diverting water and introducing toxic quantities of fertilizers and pesticides into the stream environment. Increased anthropogenic interface with forested lands will likely lead to increases in these activities. Action is considered In-Kind |
| <b>BrC-NCSW-23.1</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.1.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.1.1.1    | Action Step      | Roads/Railroads              | Maintain adequate energy dissipators for culverts and other drainage pipe outlets where needed.  | 3               | 100                     | CalFire, Private Landowners, RWQCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |

Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID         | Level           | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-------------------|-----------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                   |                 |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| BrC-NCSW-23.1.1.2 | Action Step     | Roads/Railroads              | Extend the monitoring period and upgrade THP road maintenance after harvest.  | 3               | 100                     | CalFire, CDFW, Private Landowners, RWQCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-23.1.1.3 | Action Step     | Roads/Railroads              | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).  | 3               | 25                      | CalFire, Private Landowners  | 4,104       | 4,104   | 4,104    | 4,104    | 4,104    | 20,520          | Primary emphasis should be placed on removing riparian roads with high sediment delivery potential adjacent to key spawning and rearing areas. Indiscriminate road density reduction should be avoided so as not to preclude inhibiting future road realignments that could also effectively reduce sediment delivery. Cost based on \$13,680/mile to decommission 1.5 miles of riparian roads. |
| BrC-NCSW-23.1.2   | Recovery Action | Roads/Railroads              | Prevent or minimize impairment to passage and migration   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.1.2.1 | Action Step     | Roads/Railroads              | Stream crossings should be identified and mapped with the intention of replacement or removal if they cannot pass 100 year flow. Design should include fail safe measures to accommodate culvert overflow without causing massive road fill failures. | 2               | 50                      | CalFire, CalTrans, Private Landowners, RWQCB, USACE  |             |         |          |          |          | TBD             | Cost will vary with number of crossings and methods of replacement or retrofit.   |
| BrC-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 feasible in order to minimize drift accumulation and facilitate fish passage.               | 3               | 100                     | CalFire, CalTrans, County of Mendocino, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-23.1.3   | Recovery Action | Roads/Railroads              | Prevent or minimize impairment to watershed hydrology   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.1.3.1 | Action Step     | Roads/Railroads              | Size culverts to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure.   | 3               | 100                     | CalFire, County of Mendocino, Private Landowners   |             |         |          |          |          | In-Kind         | This action should be considered standard business practice.  |
| BrC-NCSW-23.1.4   | Recovery Action | Roads/Railroads              | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.1.4.1 | Action Step     | Roads/Railroads              | Install sediment traps for pretreatment, and a modified culvert system that can act as an efficient detention system.   | 3               | 100                     | CalFire, CDFW, Private Landowners, RWQCB   |             |         |          |          |          | TBD             | Cost will vary depending on the number of culvert upgrades on the road network and the maintenance requirements and accessibility. An inventory of the culvert system is necessary before costs can be estimated.   |
| BrC-NCSW-23.1.4.2 | Action Step     | Roads/Railroads              | For all rural (unpaved) and seasonal dirt roads apply (at a minimum) the road standards outlined in the California Forest Practice Rules.   | 3               | 100                     | CalFire, County of Mendocino, Private Landowners, RWQCB                                      |             |         |          |          |          | In-Kind         | This action should be considered standard practice.   |
| BrC-NCSW-23.2     | Objective       | Roads/Railroads              | Address the inadequacy of existing regulatory mechanisms  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.2.1   | Recovery Action | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-23.2.1.1 | Action Step     | Roads/Railroads              | Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in current and historical habitats.  | 3               | 10                      | CalFire, CDFW, Mendocino County, Mendocino Redwood Company, Private Landowners               | 18.00       | 18.00   |          |          |          | 36              | Cost based on decommissioning 3 miles of road at a rate of \$12,000/mile.   |

Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID            | Level            | Targeted Attribute or Threat        | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|----------------------|------------------|-------------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                      |                  |                                     |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| BrC-NCSW-23.2.1.2    | Action Step      | Roads/Railroads                     | Minimize new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented. | 2               | 100                     | CalFire, CalTrans, County of Mendocino, Mendocino Redwood Company, RWQCB   |             |         |          |          |          | 0               | Some roads in the watershed are used for timber harvest and receive heightened levels of maintenance and review, as least for a short time (currently three years) following completion of a timber harvest plan. A well designed road management plan should result in overall cost savings due to reduced flood fighting actions, and stream bank and road stabilization projects. Action is considered In-Kind |
| BrC-NCSW-23.2.1.3    | Action Step      | Roads/Railroads                     | Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.  | 2               | 100                     | CalFire, CalTrans, County of Mendocino, Private Landowners, RWQCB  |             |         |          |          |          | 0               | This should be considered a standard road management practice for all landowners. Action is considered In-Kind  |
| BrC-NCSW-23.2.1.4    | Action Step      | Roads/Railroads                     | Licensed engineering geologists should review and approve grading on inner gorge slopes.  | 3               | 100                     | CalFire, California Geological Survey, Mendocino Redwood Company, Private Landowners, RWQCB  |             |         |          |          |          | 0               | This is a cost that is frequently absorbed into new road projects and should be considered a standard business practice. Action is considered In-Kind   |
| BrC-NCSW-23.2.1.5    | Action Step      | Roads/Railroads                     | Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).       | 2               | 100                     | CalFire, California Geological Survey, CDFW, Mendocino County Department of Public Works, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | TBD             | These practices should be adopted as part of future road actions and maintenance practices.   |
| BrC-NCSW-23.2.1.6    | Action Step      | Roads/Railroads                     | Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners   |             |         |          |          |          | TBD             | This recommendation may involve increased intra-watershed coordination among the landowners (locking and installing gates, etc.). Cost likely accounted for in road inventory.  |
| <b>BrC-NCSW-25.1</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-25.1.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to watershed hydrology   |                 |                         |  |             |         |          |          |          |                 |   |
| BrC-NCSW-25.1.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with the SWRCB and others to ensure water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.                                  | 2               | 100                     | CDFW, Private Landowners, SWRCB  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| BrC-NCSW-25.1.1.2    | Action Step      | Water Diversion/ Impoundment        | Provide incentives to water rights holders willing to convert some or all of their water rights to instream use via petition change of use and California Water code §1707 (CDFG 2004).                               | 2               | 20                      | CDFW, NMFS, SWRCB  |             |         |          |          |          | TBD             | Cost based on type and amount of incentives to provide. Currently, incentive programs exist and should be explored and expanded upon.   |
| BrC-NCSW-25.1.1.3    | Action Step      | Water Diversion/ Impoundment        | Promote conjunctive use of water with water projects whenever possible to maintain or restore salmonid habitat.   | 3               | 25                      | CDFW, NMFS, SWRCB, Trout Unlimited   |             |         |          |          |          | 0               | Action is considered In-Kind  |

**Brush Creek, Northern California Steelhead (Central Coastal) Recovery Actions**

| Action ID            | Level            | Targeted Attribute or Threat        | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|----------------------|------------------|-------------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                      |                  |                                     |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| BrC-NCSW-25.1.2      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to the estuary (quality and extent)   |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-25.1.2.1    | Action Step      | Water Diversion/ Impoundment        | Discourage the development of any surface water diversions in the watershed that independently or cumulatively have significant impact on reducing inflow to the estuary during spring/summer/fall months.             | 2               | 100                     | CDFW, NMFS, SWRCB                                       |             |         |          |          |          | 0               | Water diversions in the lower watershed likely have significant adverse effects to estuarine water quality, particularly during late summer in dry water years. Action is considered In-Kind |
| <b>BrC-NCSW-25.2</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-25.2.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| BrC-NCSW-25.2.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams. | 2               | 100                     | CDFW, County of Mendocino, NMFS OLE, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind   |
| BrC-NCSW-25.2.1.2    | Action Step      | Water Diversion/ Impoundment        | Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.  | 2               | 100                     | CDFW, Private Landowners, SWRCB                         |             |         |          |          |          | 0               | Action is considered In-Kind   |
| BrC-NCSW-25.2.1.3    | Action Step      | Water Diversion/ Impoundment        | Ensure all water diversions and impoundments are compliant with AB2121 or other appropriate protective measures.   | 2               | 100                     | CDFW, Private Landowners, SWRCB                         |             |         |          |          |          | 0               | Action is considered In-Kind   |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| <b>ElkC-NCSW-6.1</b>  | <b>Objective</b> | <b>Habitat Complexity</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-6.1.1       | Recovery Action  | Habitat Complexity           | Increase LWD, primary pools and shelters.  |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-6.1.1.1     | Action Step      | Habitat Complexity           | Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth.   | 2               | 100                     | Mendocino County, Private Landowners  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| ElkC-NCSW-6.1.1.2     | Action Step      | Habitat Complexity           | Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth.  | 3               | 20                      | CDFW, Private Landowners  | 29.25       | 29.25   | 29.25    | 29.25    |          | 117             | Cost based on treating 4.5 miles (assume 1 project/mile in 50% high IP) at a rate of \$26,000/mile.  |
| ElkC-NCSW-6.1.1.3     | Action Step      | Habitat Complexity           | Allow native trees in riparian areas to age, die, and recruit into the stream naturally.   | 3               | 100                     | CDFW, County of Mendocino, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>ElkC-NCSW-8.1</b>  | <b>Objective</b> | <b>Sediment</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-8.1.1       | Recovery Action  | Sediment                     | Improve instream gravel quality  |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-8.1.1.1     | Action Step      | Sediment                     | Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.   | 3               | 20                      | CalFire, CalTrans, Mendocino County Department of Public Works, Mendocino Redwood Company, Private Landowners |             |         |          |          |          | TBD             | Costs will vary on landowner participation and year to year variation in rainfall patterns. This cost estimate does not include maintenance obligations. |
| ElkC-NCSW-8.1.1.2     | Action Step      | Sediment                     | Permitting agencies (State, Federal, and local) should evaluate all authorized erosion control measures for effectiveness at controlling erosion during the winter period.   | 3               | 100                     | CalFire, CDFW, NMFS, NRCS, RWQCB, USACE, USFWS  |             |         |          |          |          | In-Kind         | This should be considered a standard practice for all regulatory and oversight agencies. Action is considered In-Kind                                    |
| ElkC-NCSW-8.1.1.3     | Action Step      | Sediment                     | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) and other infrastructure delivering sediment into watercourses (CDFG 2004).   | 3               | 10                      | CalFire, CDFW, County of Mendocino, Mendocino Redwood Company, NRCS, RWQCB                                    | 36.00       | 36.00   |          |          |          | 72              | Cost based on decommissioning 6 miles of riparian road network at a rate of \$12,000/mile.   |
| <b>ElkC-NCSW-15.1</b> | <b>Objective</b> | <b>Fire/Fuel Management</b>  | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-15.1.1      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)   |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-15.1.1.1    | Action Step      | Fire/Fuel Management         | Avoid use of aerial fire retardants and foams within 300 feet of riparian areas throughout the current range of NC steelhead.  | 2               | 100                     | CalFire   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| ElkC-NCSW-15.1.1.2    | Action Step      | Fire/Fuel Management         | Encourage CalFire to provide plans to minimize impacts from firefighting activities to all non-County firefighters when providing firefighting assistance in the Elk Creek watershed (and all other watersheds in the County). | 3               | 5                       | CalFire   |             |         |          |          |          | In-Kind         | Cost of providing the plan is minimal. Action is considered In-Kind  |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| ElkC-NCSW-15.1.1.3    | Action Step      | Fire/Fuel Management         | In the event of a wildfire, CalFire Resource Advisors should contact the resource agencies for ESA consultation (or technical assistance) about the incident.                                   | 3               | 100                     | CalFire, CDFW, NMFS, NRCS  |             |         |          |          |          | 0               | The resource agencies can provide guidance regarding critical resources in the area that may be affected by the fire and firefighting actions. Action is considered In-Kind   |
| ElkC-NCSW-15.1.1.4    | Action Step      | Fire/Fuel Management         | Work with County planners to define future impacts of proposed urban and infrastructure development on fire suppression and fuel load buildup.  | 3               | 20                      | CalFire, CDFW, County of Mendocino, Santa Cruz County                          |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-15.1.2      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to watershed hydrology   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-15.1.2.1    | Action Step      | Fire/Fuel Management         | Draft water from non-fish bearing waters if at all possible. In larger fish-bearing streams, excavate active channel areas outside of wetted width to create off-stream pools for water source. | 3               | 100                     | CalFire  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-15.1.3      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize adverse alterations to riparian species composition and structure   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-15.1.3.1    | Action Step      | Fire/Fuel Management         | Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.   | 2               | 50                      | CalFire, CDFW, Mendocino Redwood Company, NMFS, NRCS, Santa Cruz County, USFWS |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>ElkC-NCSW-15.2</b> | <b>Objective</b> | <b>Fire/Fuel Management</b>  | <b>Address other natural or manmade factors affecting the species continued existence</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-15.2.1      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-15.2.1.1    | Action Step      | Fire/Fuel Management         | Implement sedimentation reduction techniques in concert with prescribed fire techniques to minimize sediment impacts to various steelhead life stages.  | 2               | 100                     | CalFire, Mendocino Redwood Company   |             |         |          |          |          | 0               | This recommendation should be considered a standard practice. Implementing erosion control measures when constructing firebreaks (if possible) or shortly thereafter will likely result in a net cost savings. It is much more financially efficient to implement these measures while the fire crews are present rather than months later after the fire is out. Methods should include out-sloping, waterbars, breaks in fire lines (pick up blades on dozers occasionally, especially where fuels are sparse), minimize gradient of fire lines, change fire-line alignment onto occasional flats as often as possible (and especially near watercourses) to allow flows to dissipate and settle sediment. To the maximum extent possible, maintain natural topography - eliminate concentrating water velocities. Action is considered In-Kind |
| ElkC-NCSW-15.2.1.2    | Action Step      | Fire/Fuel Management         | Re-contour any new facility sites as soon as possible after site cleanup and fire.  | 3               | 100                     | CalFire, Mendocino County, Mendocino Redwood Company                           |             |         |          |          |          | 0               | This should be considered a standard practice. Action is considered In-Kind   |
| ElkC-NCSW-15.2.1.3    | Action Step      | Fire/Fuel Management         | Immediately implement appropriate sediment control measures following completion of fire suppression while firefighters and equipment are on site.  | 2               | 100                     | CalFire, Mendocino Redwood Company   |             |         |          |          |          | 0               | Action is considered In-Kind  |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| ElkC-NCSW-15.2.2      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)  |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-15.2.2.1    | Action Step      | Fire/Fuel Management         | Use non-toxic retardants. Avoid dropping fire retardant into streams. To the maximum extent feasible, orient air drops so that the drop goes perpendicular to streams as opposed to parallel. | 2               | 100                     | CalFire, Mendocino Redwood Company                                 |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>ElkC-NCSW-16.1</b> | <b>Objective</b> | <b>Fishing/Collecting</b>    | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-16.1.1      | Recovery Action  | Fishing/Collecting           | Prevent or minimize reduced density, abundance, and diversity based on the biological recovery criteria   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-16.1.1.1    | Action Step      | Fishing/Collecting           | Improve CDFW fishing regulations to minimize incidental take of adult and juvenile steelhead.   | 2               | 2                       | CDFW   |             |         |          |          |          | 0               | Fishing regulation include a summer fishery without a bag limit which could likely harm listed steelhead juveniles. References to hatchery trout (which are not planted in the watershed) should be removed from regulations so as to not inadvertently encourage fishing for a resource which is not present in the watershed. |
| <b>ElkC-NCSW-19.1</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-19.1.1      | Recovery Action  | Logging                      | Prevent or minimize impairment to stream hydrology (impaired water flow)  |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-19.1.1.1    | Action Step      | Logging                      | Evaluate road surface treatment options to halt or minimize impacts from water drafting and diversion   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners             |             |         |          |          |          | 0               | Road surface treatment options will vary widely on road use, availability of local rock sources and geology. Action is considered In-Kind   |
| ElkC-NCSW-19.1.2      | Recovery Action  | Logging                      | Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)  |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-19.1.2.1    | Action Step      | Logging                      | Timber management should be designed to allow trees in riparian areas to age, die, and naturally recruit into the stream.   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners             |             |         |          |          |          | 0               | The current Forest Practice Rules require retention of a proportion of the largest diameter trees adjacent to water courses. This practice should continue and potential expansion of the number left for future recruitment should be considered. Action is considered In-Kind   |
| ElkC-NCSW-19.1.2.2    | Action Step      | Logging                      | Conduct conifer release to promote growth of larger diameter trees where appropriate.   | 3               | 100                     | CalFire, CDFW, Mendocino Redwood Company, Private Landowners, RPFs |             |         |          |          |          | 0               | Costs will vary depending on landowner participation and site specific needs. This strategy can be implemented at relatively little costs in areas zoned for timber production as a component of future harvest plans. Action is considered In-Kind   |
| ElkC-NCSW-19.1.3      | Recovery Action  | Logging                      | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-19.1.3.1    | Action Step      | Logging                      | Protect headwater channels with larger buffers to minimize sediment delivery downstream.  | 3               | 100                     | CalFire, Mendocino Redwood Company                                 |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind  |
| ElkC-NCSW-19.1.3.2    | Action Step      | Logging                      | Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.                                  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners             |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind  |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| ElkC-NCSW-19.1.3.3    | Action Step      | Logging                      | For areas with high or very high erosion hazard, extend the monitoring period and upgrade road maintenance for timber operations.  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation applies to all THPs located in the mixed lithology geomorphic units with steep slopes, and all sandstone geomorphic units (steep and gentle slopes). Action is considered In-Kind  |
| ElkC-NCSW-19.1.4      | Recovery Action  | Logging                      | Prevent or minimize adverse alterations to riparian species composition and structure  |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-19.1.4.1    | Action Step      | Logging                      | Manage riparian areas for their site potential composition and structure.  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| ElkC-NCSW-19.1.5      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-19.1.5.1    | Action Step      | Logging                      | Encourage low impact timber harvest techniques such as full-suspension cable yarding ( to improve canopy cover; reduce sediment input, etc.).  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| ElkC-NCSW-19.1.5.2    | Action Step      | Logging                      | Minimize use of winter operations for timber harvest activities.   | 3               | 100                     | CalFire, California Department of Mines and Geology, CDFW, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | 0               | Particular emphasis should be placed on avoiding ground based winter operations during the rainy period. Aerial or skyline logging should be considered as preferred alternative to ground based logging, particularly in locations with high erosion hazard ratings or in watersheds of high IP value. Action is considered In-Kind |
| ElkC-NCSW-19.1.6      | Recovery Action  | Logging                      | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)   |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-19.1.6.1    | Action Step      | Logging                      | All roads, landings, and skid trails associated with timber operations should, to the maximum extent practicable, be hydrologically disconnected to prevent sediment runoff and delivery to streams. | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| ElkC-NCSW-19.1.6.2    | Action Step      | Logging                      | Avoid new road construction in riparian zones  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | Old roads should not be reopened unless for proper decommissioning purposes. Particular care should be directed at new road construction or reconstruction adjacent to Class 1 streams with high IP value habitat. Action is considered In-Kind  |
| ElkC-NCSW-19.1.6.3    | Action Step      | Logging                      | See Roads and Railroads for additional recommendations.  |                 |                         |   |             |         |          |          |          |                 |  |
| <b>ElkC-NCSW-19.2</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| ElkC-NCSW-19.2.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| ElkC-NCSW-19.2.1.1    | Action Step      | Logging                      | Establish greater oversight and post-harvest monitoring by the permitting agency for operations within salmonid areas.  | 3               | 20                      | CalFire, CDFW, Private Landowners, RWQCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-19.2.1.2    | Action Step      | Logging                      | Encourage timber landowners to implement restoration projects as part of their ongoing timber management practices in stream reaches where large woody material is deficient. | 3               | 100                     | CalFire, CDFW, Mendocino Redwood Company, Private Landowners, RWQCB                |             |         |          |          |          | 0               | Installing large woody material into stream deficient in large wood should be considered a top restoration priority. Restoration during harvest activities provides a unique opportunity to access key areas that are relatively undisturbed in comparison to areas of the watershed with a large rural residential footprint. Action is considered In-Kind                       |
| ElkC-NCSW-19.2.1.3    | Action Step      | Logging                      | Discourage Mendocino County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).  | 2               | 100                     | CalFire, Mendocino County, Private Landowners, RWQCB                               |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-19.2.1.4    | Action Step      | Logging                      | Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).   | 2               | 100                     | CalFire, County of Mendocino, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | 0               | Illegal marijuana cultivation may occur in some areas and have the potential to severely degrade juvenile rearing conditions by diverting water and introducing toxic quantities of fertilizers and pesticides into the stream environment. Increased anthropogenic interface with forested lands will likely lead to increases in these activities. Action is considered In-Kind |
| <b>ElkC-NCSW-23.1</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-23.1.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-23.1.1.1    | Action Step      | Roads/Railroads              | Maintain adequate energy dissipators for culverts and other drainage pipe outlets where needed.   | 3               | 10                      | CalFire, CDFW, Mendocino Redwood Company, RWQCB                                    |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-23.1.1.2    | Action Step      | Roads/Railroads              | Extend the monitoring period and upgrade THP road maintenance after harvest.  | 3               | 100                     | CalFire, CDFW, Mendocino Redwood Company, Private Landowners, RWQCB                |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-23.1.1.3    | Action Step      | Roads/Railroads              | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).                        | 3               | 15                      | CalFire, CDFW, Mendocino Redwood Company, RWQCB                                    | 24.00       | 24.00   | 24.00    |          |          | 72              | Cost based on decommissioning 6 miles of riparian road network at a rate of \$12,000/mile.  |
| ElkC-NCSW-23.1.2      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to passage and migration   |                 |                         |  |             |         |          |          |          |                 |   |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| ElkC-NCSW-23.1.2.1    | 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 feasible in order to minimize drift accumulation and facilitate fish passage.               | 3               | 100                     | CalFire, CalTrans, County of Mendocino, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | 0               | Action is considered In-Kind  |
| ElkC-NCSW-23.1.2.2    | Action Step      | Roads/Railroads              | Stream crossings should be identified and mapped with the intention of replacement or removal if they cannot pass 100 year flow. Design should include fail safe measures to accommodate culvert overflow without causing massive road fill failures. | 2               | 30                      | CalFire, CalTrans, Mendocino County, Mendocino Redwood Company, RWQCB, USACE                 |             |         |          |          |          | TBD             | Cost will vary with number of crossings and methods of replacement or retrofit.   |
| <b>ElkC-NCSW-23.2</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-23.2.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| ElkC-NCSW-23.2.1.1    | Action Step      | Roads/Railroads              | Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in current and historical habitats.  | 3               | 100                     | CalFire, CDFW, Mendocino County, Mendocino Redwood Company, Private Landowners               | 3.60        | 3.60    | 3.60     | 3.60     | 3.60     | 72              | Cost based on decommissioning 6 miles of road network at a rate of \$12,000/mile.   |
| ElkC-NCSW-23.2.1.2    | Action Step      | Roads/Railroads              | Minimize new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.                                 | 2               | 100                     | CalFire, CalTrans, County of Mendocino, Mendocino Redwood Company, RWQCB                     |             |         |          |          |          | 0               | Some roads in the watershed are used for timber harvest and receive heightened levels of maintenance and review, as least for a short time (currently three years) following completion of a timber harvest plan. A well designed road management plan should result in overall cost savings due to reduced flood fighting actions, and stream bank and road stabilization projects. Action is considered In-Kind |
| ElkC-NCSW-23.2.1.3    | Action Step      | Roads/Railroads              | Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.  | 2               | 100                     | CalFire, CalTrans, County of Mendocino, Private Landowners, RWQCB                            |             |         |          |          |          | 0               | This should be considered a standard road management practice for all landowners. Action is considered In-Kind  |
| ElkC-NCSW-23.2.1.4    | Action Step      | Roads/Railroads              | Licensed engineering geologists should review and approve grading on inner gorge slopes.  | 3               | 100                     | CalFire, California Geological Survey, Mendocino Redwood Company, Private Landowners, RWQCB  |             |         |          |          |          | 0               | This is a cost that is frequently absorbed into new road projects and should be considered a standard business practice. Action is considered In-Kind   |

Elk Creek, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat        | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|-------------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                                     |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| ElkC-NCSW-23.2.1.5    | Action Step      | Roads/Railroads                     | Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).        | 2               | 100                     | CalFire, California Geological Survey, CDFW, Mendocino County Department of Public Works, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | TBD             | These practices should be adopted as part of future road actions and maintenance practices.  |
| ElkC-NCSW-23.2.1.6    | Action Step      | Roads/Railroads                     | Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners   |             |         |          |          |          | 0               | This recommendation may involve increased intra-watershed coordination among the landowners (locking and installing gates, etc.). Cost likely accounted for in road inventory. |
| <b>ElkC-NCSW-25.1</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the inadequacy of existing regulatory mechanisms.</b>   |                 |                         |  |             |         |          |          |          |                 |  |
| ElkC-NCSW-25.1.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |  |             |         |          |          |          |                 |  |
| ElkC-NCSW-25.1.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams. | 2               | 100                     | CDFW, County of Mendocino, NMFS OLE, Private Landowners  |             |         |          |          |          | 0               | Action is considered In-Kind   |
| ElkC-NCSW-25.1.1.2    | Action Step      | Water Diversion/ Impoundment        | Ensure all water diversions and impoundments are compliant with AB2121 or other appropriate protective measures.   | 2               | 100                     | CDFW, Private Landowners, SWRCB  |             |         |          |          |          | 0               | Action is considered In-Kind   |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |  |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| <b>SchG-NCSW-6.1</b>  | <b>Objective</b> | <b>Habitat Complexity</b>    | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |  |
| SchG-NCSW-6.1.1       | Recovery Action  | Habitat Complexity           | Increase LWD, primary pools and shelters   |                 |                         |  |             |         |          |          |          |                 |  |
| SchG-NCSW-6.1.1.1     | Action Step      | Habitat Complexity           | Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth.                             | 2               | 100                     | Mendocino County, Private Landowners   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| SchG-NCSW-6.1.1.2     | Action Step      | Habitat Complexity           | Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth.                          | 3               | 10                      | CDFW, Private Landowners   | 13.00       | 13.00   |          |          |          | 26              | Cost based on treating 0.8 miles (assume 1 project /mile in 25% high IP) at a rate of \$26,000/mile.   |
| SchG-NCSW-6.1.1.3     | Action Step      | Habitat Complexity           | Allow native trees in riparian areas to age, die, and recruit into the stream naturally.   | 3               | 100                     | CDFW, County of Mendocino, Private Landowners                                      |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>SchG-NCSW-8.1</b>  | <b>Objective</b> | <b>Sediment</b>              | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>   |                 |                         |  |             |         |          |          |          |                 |  |
| SchG-NCSW-8.1.1       | Recovery Action  | Sediment                     | Improve instream gravel quality  |                 |                         |  |             |         |          |          |          |                 |  |
| SchG-NCSW-8.1.1.1     | Action Step      | Sediment                     | Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.   | 3               | 20                      | CalFire, CalTrans, Mendocino County Department of Public Works, Private Landowners |             |         |          |          |          | TBD             | Costs will vary on landowner participation and year to year variation in rainfall patterns. This cost estimate does not include maintenance obligations. |
| SchG-NCSW-8.1.1.2     | Action Step      | Sediment                     | Permitting agencies (State, Federal, and local) should evaluate all authorized erosion control measures during the winter period.                                    | 3               | 100                     | CalFire, CDFW, NMFS, NRCS, RWQCB, USACE, USFWS                                     |             |         |          |          |          | 0               | This should be considered a standard practice for all regulatory and oversight agencies. Action is considered In-Kind                                    |
| SchG-NCSW-8.1.1.3     | Action Step      | Sediment                     | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) and other infrastructure delivering sediment into watercourses (CDFG 2004). | 3               | 30                      | CalFire, CDFW, County of Mendocino, NRCS, RWQCB                                    |             |         |          |          |          | 0               | Cost accounted for in ROADS/RAILROADS  |
| <b>SchG-NCSW-15.1</b> | <b>Objective</b> | <b>Fire/Fuel Management</b>  | <b>Address other natural or manmade factors affecting the species continued existence</b>  |                 |                         |  |             |         |          |          |          |                 |  |
| SchG-NCSW-15.1.1      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)  |                 |                         |  |             |         |          |          |          |                 |  |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner                                      | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |   |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| SchG-NCSW-15.1.1.1    | Action Step      | Fire/Fuel Management         | Implement sedimentation reduction techniques in concert with prescribed fire techniques to minimize sediment impacts to various steelhead life stages.  | 2               | 100                     | CalFire, Mendocino Redwood Company                    |             |         |          |          |          | TBD             | This recommendation should be considered a standard practice. Implementing erosion control measures when constructing firebreaks (if possible) or shortly thereafter will likely result in a net cost savings. It is much more financially efficient to implement these measures while the fire crews are present rather than months later after the fire is out. Methods should include out-sloping, waterbars, breaks in fire lines (pick up blades on dozers occasionally, especially where fuels are sparse), minimize gradient of fire lines, change fire-line alignment onto occasional flats as often as possible (and especially near watercourses) to allow flows to dissipate and settle sediment. To the maximum extent possible, maintain natural topography - eliminate concentrating water velocities. |
| SchG-NCSW-15.1.1.2    | Action Step      | Fire/Fuel Management         | Re-contour any new facility sites as soon as possible after site cleanup and fire.  | 3               | 100                     | CalFire, Mendocino County, Mendocino Redwood Company  |             |         |          |          |          | 0               | Standard business practice. Action is considered In-Kind   |
| SchG-NCSW-15.1.1.3    | Action Step      | Fire/Fuel Management         | Immediately implement appropriate sediment control measures following completion of fire suppression while firefighters and equipment are on site.  | 2               | 100                     | CalFire, Mendocino Redwood Company                    |             |         |          |          |          | 0               | Action is considered In-Kind   |
| SchG-NCSW-15.1.2      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)  |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-15.1.2.1    | Action Step      | Fire/Fuel Management         | Use non-toxic retardants. Avoid dropping fire retardant into streams. To the maximum extent feasible, orient air drops so that the drop goes perpendicular to streams as opposed to parallel.                             | 2               | 100                     | CalFire, Mendocino Redwood Company                    |             |         |          |          |          | 0               | Action is considered In-Kind   |
| <b>SchG-NCSW-15.2</b> | <b>Objective</b> | <b>Fire/Fuel Management</b>  | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-15.2.1      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)  |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-15.2.1.1    | Action Step      | Fire/Fuel Management         | Avoid use of aerial fire retardants and foams within 300 feet of riparian areas throughout the current range of NC steelhead.   | 2               | 100                     | CalFire   |             |         |          |          |          | 0               | Action is considered In-Kind   |
| SchG-NCSW-15.2.1.2    | Action Step      | Fire/Fuel Management         | Encourage CalFire to provide a plan to minimize adverse effect of firefighting to all non-County firefighters when providing firefighting assistance in the Elk Creek watershed (and all other watersheds in the County). | 3               | 5                       | CalFire   |             |         |          |          |          | 0               | Cost of providing the plan is minimal. Action is considered In-Kind  |
| SchG-NCSW-15.2.1.3    | Action Step      | Fire/Fuel Management         | In the event of a wildfire, CalFire Resource Advisors should contact the resource agencies for ESA consultation (or technical assistance) about the incident.   | 3               | 100                     | CalFire, CDFW, NMFS, NRCS                             |             |         |          |          |          | 0               | The resource agencies can provide guidance regarding critical resources in the area that may be affected by the fire and firefighting actions. Action is considered In-Kind  |
| SchG-NCSW-15.2.1.4    | Action Step      | Fire/Fuel Management         | Work with County planners to define future impacts of proposed urban and infrastructure development on fire suppression and fuel load buildup.  | 3               | 20                      | CalFire, CDFW, County of Mendocino, Santa Cruz County |             |         |          |          |          | 0               | Action is considered In-Kind   |
| SchG-NCSW-15.2.2      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize impairment to watershed hydrology   |                 |                         |   |             |         |          |          |          |                 |  |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| SchG-NCSW-15.2.2.1    | Action Step      | Fire/Fuel Management         | Draft water from non-fish bearing waters if at all possible. In larger fish-bearing streams, excavate active channel areas outside of wetted width to create off-stream pools for water source. | 3               | 100                     | CalFire  |             |         |          |          |          | 0               | Action is considered In-Kind  |
| SchG-NCSW-15.2.3      | Recovery Action  | Fire/Fuel Management         | Prevent or minimize adverse alterations to riparian species composition and structure   |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-15.2.3.1    | Action Step      | Fire/Fuel Management         | Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.   | 2               | 5                       | CalFire, CDFW, Mendocino Redwood Company, NMFS, NRCS, Santa Cruz County, USFWS |             |         |          |          |          | 0               | Action is considered In-Kind  |
| <b>SchG-NCSW-19.1</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-19.1.1      | Recovery Action  | Logging                      | Prevent or minimize impairment to stream hydrology (impaired water flow)  |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-19.1.1.1    | Action Step      | Logging                      | Evaluate road surface treatment options to halt or minimize impacts from water drafting and diversion   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners                         |             |         |          |          |          | 0               | Road surface treatment options will vary widely on road use, availability of local rock sources and geology. Action is considered In-Kind   |
| SchG-NCSW-19.1.2      | Recovery Action  | Logging                      | Prevent or minimize impairment to habitat complexity (reduced large wood and/or shelter)  |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-19.1.2.1    | Action Step      | Logging                      | Timber management should be designed to allow trees in riparian areas to age, die, and naturally recruit into the stream.   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners                         |             |         |          |          |          | 0               | The current Forest Practice Rules require retention of a proportion of the largest diameter trees adjacent to water courses. This practice should continue and potential expansion of the number left for future recruitment should be considered. Action is considered In-Kind |
| SchG-NCSW-19.1.2.2    | Action Step      | Logging                      | Conduct conifer release to promote growth of larger diameter trees where appropriate.   | 3               | 100                     | CalFire, CDFW, Mendocino Redwood Company, Private Landowners, RPFs             |             |         |          |          |          | TBD             | Costs will vary depending on methods implemented and extent of rehabilitation.  |
| SchG-NCSW-19.1.3      | Recovery Action  | Logging                      | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-19.1.3.1    | Action Step      | Logging                      | Protect headwater channels with larger buffers to minimize sediment delivery downstream.  | 3               | 100                     | CalFire, Mendocino Redwood Company   |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind  |
| SchG-NCSW-19.1.3.2    | Action Step      | Logging                      | Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.                                    | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners                         |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind  |
| SchG-NCSW-19.1.3.3    | Action Step      | Logging                      | For areas with high or very high erosion hazard, extend the monitoring period and upgrade road maintenance for timber operations.   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners                         |             |         |          |          |          | 0               | This recommendation applies to all THPs located in the mixed lithology geomorphic units with steep slopes, and all sandstone geomorphic units (steep and gentle slopes). Action is considered In-Kind   |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                              |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| SchG-NCSW-19.1.4      | Recovery Action  | Logging                      | Prevent or minimize adverse alterations to riparian species composition and structure  |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-19.1.4.1    | Action Step      | Logging                      | Manage riparian areas for their site potential composition and structure.  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| SchG-NCSW-19.1.5      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-19.1.5.1    | Action Step      | Logging                      | Encourage low impact timber harvest techniques such as full-suspension cable yarding ( to improve canopy cover; reduce sediment input, etc.).  | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| SchG-NCSW-19.1.5.2    | Action Step      | Logging                      | Minimize use of winter operations for timber harvest activities.   | 3               | 100                     | CalFire, California Department of Mines and Geology, CDFW, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | 0               | Particular emphasis should be placed on avoiding ground based winter operations during the rainy period. Aerial or skyline logging should be considered as preferred alternative to ground based logging, particularly in locations with high erosion hazard ratings or in watersheds of high IP value. Action is considered In-Kind |
| SchG-NCSW-19.1.6      | Recovery Action  | Logging                      | Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)   |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-19.1.6.1    | Action Step      | Logging                      | All roads, landings, and skid trails associated with timber operations should, to the maximum extent practicable, be hydrologically disconnected to prevent sediment runoff and delivery to streams. | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | This recommendation should be considered standard practice. Action is considered In-Kind   |
| SchG-NCSW-19.1.6.2    | Action Step      | Logging                      | Minimize new road construction in riparian zones   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | 0               | Old roads should not be reopened unless for proper decommissioning purposes. Particular care should be directed at new road construction or reconstruction adjacent to Class 1 streams with high IP value habitat. Action is considered In-Kind  |
| SchG-NCSW-19.1.6.3    | Action Step      | Logging                      | See Roads and Railroads for additional recommendations.  |                 |                         |   |             |         |          |          |          |                 |  |
| <b>SchG-NCSW-19.2</b> | <b>Objective</b> | <b>Logging</b>               | <b>Address the inadequacy of existing regulatory mechanisms</b>  |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-19.2.1      | Recovery Action  | Logging                      | Prevent or minimize increased landscape disturbance  |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-19.2.1.1    | Action Step      | Logging                      | Establish greater oversight and post-harvest monitoring by the permitting agency for operations within salmonid areas.   | 3               | 20                      | CalFire, CDFW, Private Landowners, RWQCB  |             |         |          |          |          | 0               | Action is considered In-Kind   |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|-----------------------|------------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                       |                  |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| SchG-NCSW-19.2.1.2    | Action Step      | Logging                      | Encourage timber landowners to implement restoration projects as part of their ongoing timber management practices in stream reaches where large woody material is deficient.   | 3               | 100                     | CalFire, CDFW, Mendocino Redwood Company, Private Landowners, RWQCB                          |             |         |          |          |          | 0               | Installing large woody material into stream deficient in large wood should be considered a top restoration priority. Restoration during harvest activities provides a unique opportunity to access key areas that are relatively undisturbed in comparison to areas of the watershed with a large rural residential footprint. Action is considered In-Kind                       |
| SchG-NCSW-19.2.1.3    | Action Step      | Logging                      | Discourage Mendocino County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).  | 2               | 100                     | CalFire, Mendocino County, Private Landowners, RWQCB   |             |         |          |          |          | 0               | Action is considered In-Kind  |
| SchG-NCSW-19.2.1.4    | Action Step      | Logging                      | Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).   | 2               | 100                     | CalFire, County of Mendocino, Mendocino Redwood Company, Private Landowners, RWQCB           |             |         |          |          |          | 0               | Illegal marijuana cultivation may occur in some areas and have the potential to severely degrade juvenile rearing conditions by diverting water and introducing toxic quantities of fertilizers and pesticides into the stream environment. Increased anthropogenic interface with forested lands will likely lead to increases in these activities. Action is considered In-Kind |
| <b>SchG-NCSW-23.1</b> | <b>Objective</b> | <b>Roads/Railroads</b>       | <b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>  |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-23.1.1      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-23.1.1.1    | Action Step      | Roads/Railroads              | Maintain adequate energy dissipators for culverts and other drainage pipe outlets where needed.   | 3               | 10                      | CalFire, CDFW, Mendocino Redwood Company, RWQCB  |             |         |          |          |          | TBD             | Cost are likely to be minimal part of road maintenance.   |
| SchG-NCSW-23.1.1.2    | Action Step      | Roads/Railroads              | Extend the monitoring period and upgrade THP road maintenance after harvest.  | 3               | 100                     | CalFire, CDFW, Mendocino Redwood Company, Private Landowners, RWQCB                          |             |         |          |          |          | 0               | Action is considered In-Kind  |
| SchG-NCSW-23.1.1.3    | Action Step      | Roads/Railroads              | Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).  | 3               | 50                      | CalFire, CDFW, Mendocino Redwood Company, RWQCB  | 1.70        | 1.70    | 1.70     | 1.70     | 1.70     | 17              | Cot based on decommissioning 1.4 miles of riparian road at a rate of \$12,000/mile.   |
| SchG-NCSW-23.1.2      | Recovery Action  | Roads/Railroads              | Prevent or minimize impairment to passage and migration   |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-23.1.2.1    | 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 feasible in order to minimize drift accumulation and facilitate fish passage. | 3               | 100                     | CalFire, CalTrans, County of Mendocino, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | 0               | Action is considered In-Kind  |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID          | Level           | Targeted Attribute or Threat | Action Description  | Priority Number | Action Duration (Years) | Recovery Partner   | Costs (\$K) |         |          |          |          | Entire Duration | Comment   |
|--------------------|-----------------|------------------------------|---|-----------------|-------------------------|--|-------------|---------|----------|----------|----------|-----------------|---|
|                    |                 |                              |   |                 |                         |  | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |   |
| SchG-NCSW-23.1.2.2 | Action Step     | Roads/Railroads              | Stream crossings should be identified and mapped with the intention of replacement or removal if they cannot pass 100 year flow. Design should include fail safe measures to accommodate culvert overflow without causing massive road fill failures. | 2               | 5                       | CalFire, CalTrans, Mendocino County, Mendocino Redwood Company, RWQCB, USACE   |             |         |          |          |          | TBD             | Cost will vary with number of crossings and methods of replacement or retrofit.   |
| SchG-NCSW-23.2     | Objective       | Roads/Railroads              | <b>Address the inadequacy of existing regulatory mechanisms</b>   |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-23.2.1   | Recovery Action | Roads/Railroads              | Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)   |                 |                         |  |             |         |          |          |          |                 |   |
| SchG-NCSW-23.2.1.1 | Action Step     | Roads/Railroads              | Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in current and historical habitats.  | 3               | 10                      | CalFire, CDFW, Mendocino County, Mendocino Redwood Company, Private Landowners   | 8.50        | 8.50    |          |          |          | 17              | Cost based on decommissioning 1.4 miles of road at a rate of \$12,000/mile.   |
| SchG-NCSW-23.2.1.2 | Action Step     | Roads/Railroads              | Minimize new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.                                 | 2               | 100                     | CalFire, CalTrans, County of Mendocino, Mendocino Redwood Company, RWQCB   |             |         |          |          |          | 0               | Some roads in the watershed are used for timber harvest and receive heightened levels of maintenance and review, at least for a short time (currently three years) following completion of a timber harvest plan. A well designed road management plan should result in overall cost savings due to reduced flood fighting actions, and stream bank and road stabilization projects. Action is considered In-Kind |
| SchG-NCSW-23.2.1.3 | Action Step     | Roads/Railroads              | Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.  | 2               | 100                     | CalFire, CalTrans, County of Mendocino, Private Landowners, RWQCB  |             |         |          |          |          | 0               | This should be considered a standard road management practice for all landowners. Action is considered In-Kind  |
| SchG-NCSW-23.2.1.4 | Action Step     | Roads/Railroads              | Licensed engineering geologists should review and approve grading on inner gorge slopes.  | 3               | 100                     | CalFire, California Geological Survey, Mendocino Redwood Company, Private Landowners, RWQCB  |             |         |          |          |          | 0               | This is a cost that is frequently absorbed into new road projects and should be considered a standard business practice. Action is considered In-Kind   |
| SchG-NCSW-23.2.1.5 | Action Step     | Roads/Railroads              | Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).                                       | 2               | 100                     | CalFire, California Geological Survey, CDFW, Mendocino County Department of Public Works, Mendocino Redwood Company, Private Landowners, RWQCB |             |         |          |          |          | TBD             | These practices should be adopted as part of future road actions and maintenance practices.   |

Schooner Gulch, Northern California Steelhead (Central Coastal) Recovery Actions

| Action ID             | Level            | Targeted Attribute or Threat        | Action Description   | Priority Number | Action Duration (Years) | Recovery Partner  | Costs (\$K) |         |          |          |          | Entire Duration | Comment  |
|-----------------------|------------------|-------------------------------------|--|-----------------|-------------------------|---|-------------|---------|----------|----------|----------|-----------------|--|
|                       |                  |                                     |  |                 |                         |   | FY 1-5      | FY 6-10 | FY 11-15 | FY 16-20 | FY 21-25 |                 |  |
| SchG-NCSW-23.2.1.6    | Action Step      | Roads/Railroads                     | Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.   | 3               | 100                     | CalFire, Mendocino Redwood Company, Private Landowners  |             |         |          |          |          | TBD             | This recommendation may involve increased intra-watershed coordination among the landowners (locking and installing gates, etc.). Cost likely accounted for in road inventory. |
| <b>SchG-NCSW-25.1</b> | <b>Objective</b> | <b>Water Diversion/ Impoundment</b> | <b>Address the inadequacy of existing regulatory mechanisms.</b>   |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-25.1.1      | Recovery Action  | Water Diversion/ Impoundment        | Prevent or minimize impairment to stream hydrology (stream flow)   |                 |                         |   |             |         |          |          |          |                 |  |
| SchG-NCSW-25.1.1.1    | Action Step      | Water Diversion/ Impoundment        | Work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams. | 2               | 100                     | CDFW, County of Mendocino, NMFS OLE, Private Landowners |             |         |          |          |          | 0               | Action is considered In-Kind   |
| SchG-NCSW-25.1.1.2    | Action Step      | Water Diversion/ Impoundment        | Ensure all water diversions and impoundments are compliant with AB2121 or other appropriate protective measures.   | 2               | 100                     | CDFW, Private Landowners, SWRCB                         |             |         |          |          |          | 0               | Action is considered In-Kind   |