Eel River Watershed Overview for NC Steelhead

The following functionally independent and potentially independent populations of the Eel River (Spence *et al*. 2012), selected to achieve a low extinction risk for recovery scenarios, were assessed using the CAP protocols:

Essential Populations

- South Fork Eel River (Functionally Independent)
- Van Duzen River (Functionally Independent)
- Middle Fork Eel River (Functionally Independent)
- North Fork Eel River (Functionally Independent)
- Upper Mainstem Eel River (Functionally Independent)
- Tomki Creek (Functionally Independent)
- Larabee Creek (Potentially Independent)
- Chamise Creek (Potentially Independent)
- Woodman Creek (Potentially Independent)
- Outlet Creek (Functionally Independent)

In addition, a number of potentially independent populations of the Eel River were selected for recovery scenarios to attain moderate extinction risk criteria and the dependent populations were selected for recovery scenarios to meet redundancy and occupancy criteria; these populations were assessed using the Rapid Assessment protocols:

Supporting Populations

- Lower Interior/North Mountain Interior Rapid Assessment
    - Bell Springs Creek (Potentially Independent)
    - Bucknell Creek (Potentially Independent)
    - Dobbyn Creek (Potentially Independent)
    - Garcia Creek (Dependent)
    - Jewett Creek (Potentially Independent)
    - Soda Creek (Dependent)

- North Coastal Diversity Stratum: Eel River Rapid Assessment
    - Lower Mainstem Eel River Tributaries[1] (Dependent)
    - Howe Creek (Dependent)

The following sections provide a general overview of the abundance and distribution of NC steelhead, history of land use, current resources and land management, and a brief summary of the CAP viability, stresses, and threats results for the Eel River Watershed.

NC Steelhead Abundance and Distribution

Information on the historic abundance and distribution of adult steelhead in the Eel River watershed are limited and poorly understood. Historically, winter-run (winter) steelhead are thought to have spawned and reared in the mainstem and tributary streams of all major subbasins in the Eel River Watershed. The distribution of summer-run (summer) steelhead was less extensive with populations primarily located in the Middle Fork, Van Duzen, and North Fork subbasins (Moyle *et al.* 2008). Like other coastal populations throughout California, steelhead use of the Eel River estuary was undoubtedly extensive with multiple life stages utilizing the estuary throughout the year. The construction of Scott Dam (1922) eliminated significant portions of historic spawning habitat for steelhead in the Upper Mainstem Eel River including "*some of the best spawning grounds in the entire watershed (Gravelly Valley)* (Shapovalov 1939)." Aside from the loss of habitat upstream of Scott Dam and within reaches flooded by both Van Arsdale Reservoir and Lake Pillsbury, steelhead remain widely distributed throughout the Eel River Watershed.

Based on amount of historic habitat available in the watershed, Yoshiyama and Moyle (2010) estimate the historic run size ranged between 100,000 and 150,000 adults per year for both the winter and summer populations. There are two long-term data series of adult returns to the Eel

[1] The Lower Mainstem Eel River includes a set of small tributaries to the lower mainstem of the Eel River.

River Watershed—ladder counts at the Van Arsdale Fisheries Station (VAFS) located at Cape Horn Dam on the Upper Mainstem Eel River (Figure 1), and counts at Benbow Dam on the South Fork Eel River (Figure 2). Based on these records, and assuming the historic run size estimates above, steelhead runs in the Eel River watershed have declined substantially with a precipitous decline since the 1950s. Annual counts at VAFS averaged 4,394 in the 1930's, which declined to 731 during the 1970's (Figure 1). Similarly, on the South Fork Eel River, adult returns at Benbow Dam in the 1940s averaged 18,800 fish, which declined to an average of 3,400 fish during the 1970s (Figure 2). For summer steelhead, the decline in abundance is equally as significant. CDFG (1997) noted that recent counts were approximately 80 to 90 percent lower than counts made in the 1930s and 1940s.

Recent data of steelhead adult returns to the Eel River Watershed are limited primarily to counts at the VAFS on the Upper Mainstem and dive counts of summer steelhead adults in the Middle Fork Eel River. Overall, the trend of adult returns at VAFS is negative with recent counts well below the peak counts from the 1930s and 1940s. There is a strong hatchery influence as well. Between 1997 and 2007, more than 90% of adult steelhead returns at VAFS were of hatchery origin, although the trend in wild fish has been positive over the past 14 years (Williams *et al.* 2011). Nevertheless, the Upper Mainstem Eel River population remains highly impacted and the overall population is at high risk of extinction (Williams *et al.* 2011). Based on recent counts of summer adults in the Middle Fork Eel River, Williams *et al.* (2011) concluded this population remains at moderate risk of extinction despite recent counts being slightly above low extinction thresholds.

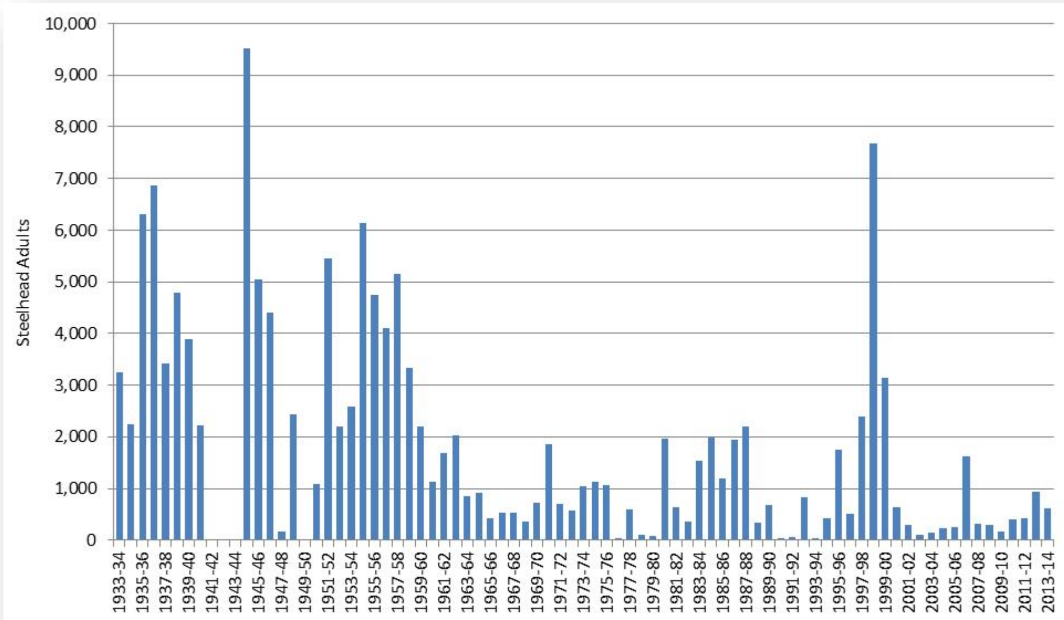

Figure 1: Adult steelhead returns counted at the Van Arsdale Fisheries Station on the Upper Mainstem Eel River, 1933-34 through 2013-2014.

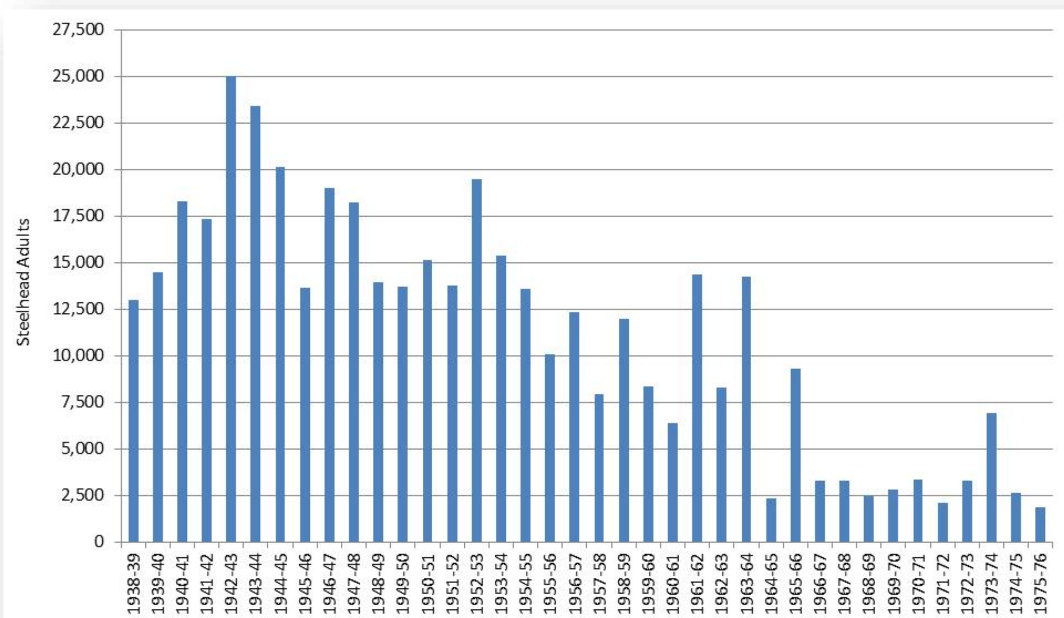

Figure 2: Adult steelhead returns counted at the Benbow Dam Fish Ladder on the South Fork Eel River, 1938-39 through 1975-76. Note all 1964-65 data are estimates due to incomplete

records caused the 1964 floods. Counts in 1963-64, 1966-67, and 1969-70 through 1973-74 are estimates as the station was closed before the end of the run.

History of Land Use

The Eel River Watershed is the third largest watershed within California with a drainage area of approximately 3,684 square miles covering four major subbasins (Van Duzen River, South Fork Eel River, North Fork Eel River, and Middle Fork Eel River) and portions of five counties (Figure 3). Due to its size, the topography and climate within the watershed varies. Overall, the climate follows a Mediterranean pattern with cool wet winters, followed by dry and relatively warm summers. In summer, the coastal areas of the watershed typically experience fog while inland areas are dry and much warmer. The watershed is located in a geologically active area and is underlain by Franciscan Formation which is highly erodible, particularly in steep terrain (Kubicek 1977; Yoshiyama and Moyle 2010).

Figure 3: Eel River watershed overview map

Prior to Euro-American settlement, the Eel River Watershed was inhabited by several native groups including the Wiyot, Sinkyone, Lassik, Nongatl, Yuki and Wailaki peoples. While these groups utilized the natural resources of the Eel River Watershed, it is likely their collective impact on the resources or landscape was relatively minor. Euro-American settlement and exploitation of the watershed's natural resources began in the second half of the 19^{th} Century. During this period, most of the low-elevation forested areas were logged and converted to other uses such as dairies and agriculture. The abundant fish populations in the watershed (primarily Chinook salmon), supported a commercial fishery including cannery operations. The canneries operated until 1912 and the commercial fishery was closed by 1926 as salmon numbers declined despite substantial artificial propagation (Yoshiyama and Moyle 2010).

Although logging and fishing continued through the early 20^{th} Century, two of the more significant anthropogenic changes to the watershed during this period were the construction of Cape Horn (1908) and Scott (1922) dams on the Upper Mainstem Eel River (SEC 1998). Unlike Cape Horn, Scott Dam (farther upstream) was constructed without fish passage facilities and therefore blocks a significant amount of potential anadromous salmonid habitat. The dams and impounded reservoirs were built to generate hydro-electric power and provide water south to the Russian River Watershed (NMFS 2002).

Following World War II, much of the remaining virgin forest as well as substantial areas of second-growth forest were logged at a rapid pace throughout the watershed. Logging spread to steeper slopes and remote areas which required development of a vast network of mostly poorly constructed roads. The removal of vegetation and road construction increased sediment erosion on an unprecedented scale. The large floods in 1955 and 1964 exacerbated the erosion and caused significant sedimentation within the Eel River, its tributaries, and the estuary. Deep pools that were common in the river channels were mostly filled in and most of the riparian vegetation was eliminated. While some areas have improved since the floods, legacy effects of the logging and floods remains in many areas of the watershed, which contribute to the poor habitat quality evident throughout much of the watershed today.

Throughout the 20th Century, both Chinook salmon and steelhead were propagated and released into the Eel River. For Chinook salmon, most of the eggs and fry were harvested from out-of-basin stocks (Sacramento and Trinity basins) (Yoshiyama and Moyle 2010). Prior to 1920, all steelhead released in the Eel River were of native stock (SEC 1998). After 1981, all Chinook salmon planted in the Eel River Watershed were of native origin. The impacts of the hatchery practices on the genetic integrity and population status are unknown or poorly understood due to insufficient information (SEC 1998; Yoshiyama and Moyle 2010).

In 1980, predatory Sacramento pikeminnow were introduced into Lake Pillsbury (CDFG 1997), and are now found throughout the Eel River watershed. Based on recent surveys by the California Department of Fish and Wildlife (CDFW), Sacramento pikeminnow are present in large numbers in Lake Pillsbury, and many of the larger tributaries that drain into the lake such as the mainstem Eel River, and much of the Rice Fork system (S. Harris, personal communication, 2013).

Current Resources and Land Management

Approximately 67% of the Eel River Watershed is privately owned, 30% managed as federal lands, and 3% managed as state lands. A majority of the federally managed lands are within the Six Rivers National Forest and the Yolla Bolly-Middle Eel Wilderness Area. Approximately 60,000 acres of the watershed is managed under the State of California Department of Parks and Recreation, much of which is within Humboldt Redwoods State Park. In 1981, portions of the Eel River and its major tributaries (a total 398 miles) were designated under the National Wild and Scenic River system.

Nearly 75% of the watershed is forested with Douglas fir (27%), montane hardwood (26%), and Coast redwood (10%) being the most common forest communities. Urban areas represent less than 1% of the watershed area with the largest developments located near the coast and extreme headwaters. In addition to parks and other recreational areas, logging, grazing, and agriculture are the primary land uses in the watershed.

The Eel River Estuary

The Eel River estuary was once a highly complex and extensive habitat area that played a vital role in the health and productivity of all Eel River salmonid populations. Currently, the Eel River estuary is severely impaired due to past diking and filling of tidal wetlands for agriculture and flood protection. Approximately 60 percent of the estuary has been lost through the construction of levees and dikes, and CDFG (2010) estimated only 10 percent of historic salt marsh habitat remains today. The function of the estuary (*e.g.*, rearing, refugia, ocean transition) for Eel River salmonids is particularly important given the degraded habitat conditions and predation and competition from non-native Sacramento pikeminnow in the mainstem Eel River. Juveniles and smolts suffer from the lost opportunity for increased growth, which affects their survival at ocean entry. The quantity and quality of estuary habitat available to salmonids in the Eel River is expected to expand in the near future due to the Salt River Ecosystem Restoration Project and restoration efforts on the The Wildland Conservancy's Eel River Estuary Preserve and CDFW's Ocean Ranch Unit of the Eel River Wildlife Area.

Salmonid Viability and Habitat Conditions

A summary of attributes and indicator ratings for Eel River populations of NC steelhead are presented in Table 1 and Table 2. Across the Eel River Watershed, attribute indicators frequently rated Poor for multiple populations and life stages were:

- Estuary: Quality and Extent;
- Habitat Complexity: Percent Primary Pools & Pool/Riffle/Flatwater Ratios;
- Habitat Complexity: Large Wood & Shelter;
- Hydrology: Baseflow & Passage Flows;
- Riparian Vegetation: Composition, Cover & Tree Diameter;
- Sediment: Gravel Quality & Distribution of Spawning Gravels;
- Sediment Transport: Road Density;
- Viability: Density, Abundance & Spatial Structure; and
- Water Quality: Temperature

Across all populations in the Eel River Watershed, summer rearing juveniles are the most impaired life stage with 85% of attribute indicators rated Poor or Fair and 45% rated as Poor alone (Figure 3). Winter rearing juveniles are a close second with 82% of attribute indicators rated Poor or Fair, of which 39% were rated Poor. Of the Watershed Processes, streamside road density was identified as the most significant impact to instream and riparian habitat quality with all populations rated Poor (Table 2). Timber harvest was also rated Poor for the Larabee Creek and Van Duzen River populations. The extent and impact of impervious surfaces, urban development, and agriculture are minimal as all populations were rated Fair or better with most rated Very Good.

With the exception of the South Fork Eel River (North Coastal Diversity Stratum), all other populations represent the entirety of the Lower Interior and North Mountain Interior Diversity Strata, which includes the upper portions of the Mad River and Redwood Creek watersheds (Bjorkstedt *et al.* 2005). The DPS and Diversity Strata results from the CAP viability analysis are described in greater detail in the section above, NC steelhead CAP results. Population-specific results are described below in the population profiles and rapid assessments.

Table 1: NC steelhead DPS CAP Viability Summary by Attribute for Eel River populations.

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

Table 2: NC steelhead DPS CAP Viability Summary by Life Stage for Eel River populations.

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

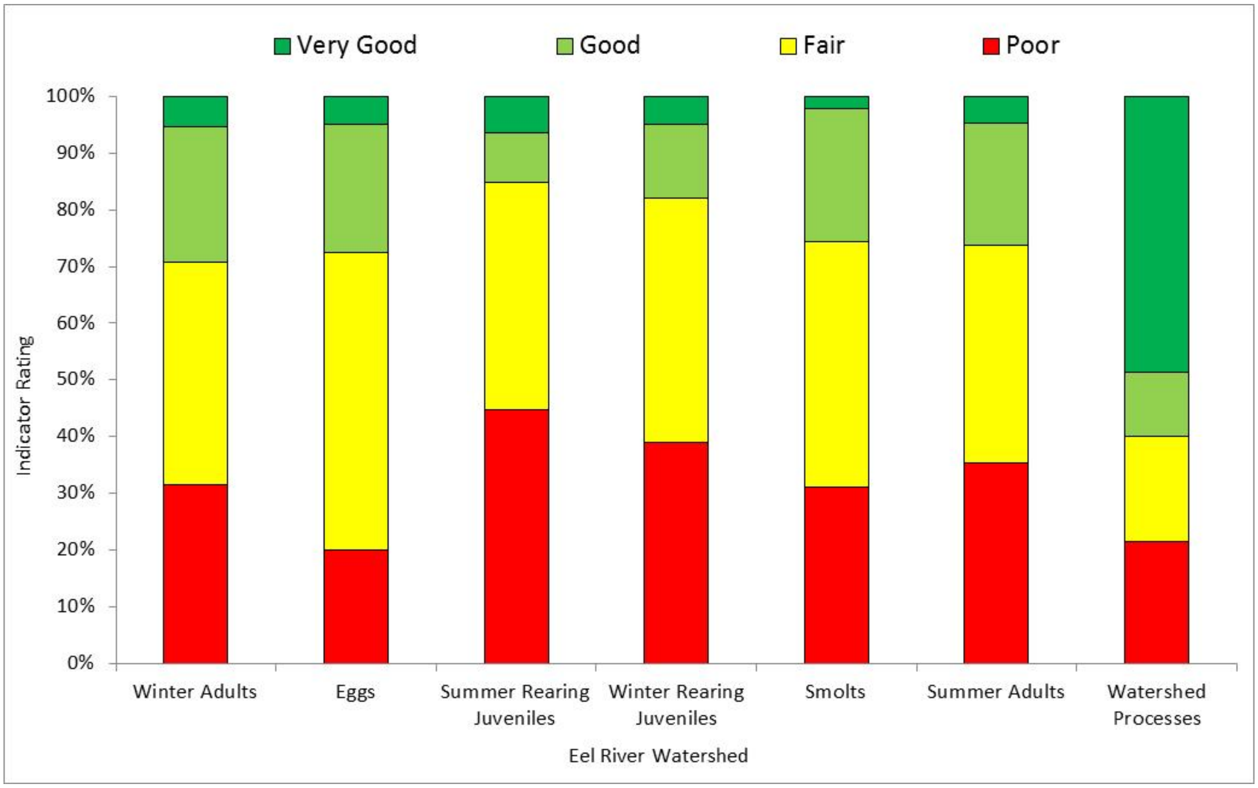

Figure 4: CAP Attribute Indicator ratings for the NC steelhead life stages in the Eel River Watershed.

Current Conditions

Current Conditions were rated for each life stage within ten essential populations of the Eel River Watershed. The three current conditions most frequently rated as Poor/Fair (in order) were Habitat Complexity: Large Wood and/or Shelter (9 populations), Viability: Density, Abundance & Spatial Structure (8 populations), and Sediment: Gravel Quality & Quantity (6 populations). Other current conditions rated poorly in the top three for each population were, Habitat Complexity: Percent Primary Pools & Pool/Riffle/Flatwater Ratios (3 populations), Hydrology: Baseflow & Passage Flows (2 populations), Passage/Migration: Mouth or Confluence & Physical Barriers (1 population, Upper Mainstem Eel), and Water Quality: Temperature (1 population, South Fork Eel River). Overall, the current condition rated as Poor/Fair in these populations were consistent with the CAP viability results with one notable exception, Estuary: Quality and Extent, which was rated Poor for all populations and life stages in the CAP viability results due to the substantial loss of habitat and impaired quality (See Table 1 and Table 2). Population-specific results for current conditions are described in greater detail in each population.

Threats

Table 3 summarizes the CAP threat results across the Eel River populations. The threat of greatest concern throughout the Eel River Watershed is Roads and Railroads, with 7 of 10 populations rated High and the 3 remaining populations rated Medium. This was followed by Water Diversions and Impoundments which was the only threat with a Very High rating (Upper Mainstem Eel River) in addition to three populations with High ratings (South Fork Eel River, Outlet Creek, and Van Duzen River). Other threats rated High were Channel Modification (South Fork Eel River and Van Duzen River), Disease, Predation, and Competition (Van Duzen River), and Fire, Fuel Management and Fire Suppression (Middle Fork Eel River). Population-specific results of threats and actions to ameliorate them are described in greater detail below under each population profile.

Table 3: NC steelhead Threat Summary Table for Eel River Populations, where L=Low, M=Medium, H=High, and VH=Very High threat. Cells with [-] were not rated or not applicable.

Diversity Strata	N.C	Lower Interior				North Mountain Interior				
NC Steelhead Threat/Population	South Fork Eel River	Chamise Creek	Woodman Creek	Outlet Creek	Tomki Creek	Van Duzen River	Larabee Creek	North Fork Eel River	Middle Fork Eel River	Upper Mainstem Eel River
Agriculture	M	M	L	M	L	M	M	M	M	L
Channel Modification	H	M	M	M	-	H	M	M	M	L
Disease, Predation and Competition	M	L	M	-	M	H	M	M	M	M
Fire, Fuel Management and Fire Suppression	M	L	L	L	L	M	M	M	H	M
Fishing and Collecting	M	L	L	L	L	M	L	L	M	L
Hatcheries and Aquaculture	L	L	L	-	-	L	L	L	L	L
Livestock Farming and Ranching	M	L	L	M	L	M	M	M	M	L
Logging and Wood Harvesting	M	L	L	M	M	M	M	M	M	L
Mining	M	L	L	L	-	M	L	M	L	L
Recreational Areas and Activities	M	L	L	-	L	M	L	M	L	L
Residential and Commercial Development	M	M	M	M	M	M	L	M	L	L
Roads and Railroads	M	H	H	M	M	H	H	H	H	H
Severe Weather Patterns	M	M	M	M	M	M	M	M	M	H
Water Diversion and Impoundments	H	M	M	H	M	H	M	M	M	VH
Threat Status for Targets and Project	H	H	H	H	M	H	H	H	H	H

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