California Fish and Game Commission
P.O. Box 944209
Sacramento, Ca 94244-2090

June 7, 2021

Notice of Petition: Southern California Steelhead (*Oncorhynchus mykiss*)

Commissioners,

California Trout ("CalTrout") is pleased to submit the following petition to list the Southern California steelhead (*Oncorhynchus mykiss*) as an Endangered Species under the California Endangered Species Act (CESA, FGC § 2050 et seq). This petition demonstrates warranted listing under CESA based on the factors specified in the statute.

CalTrout has been a statewide leader on trout, salmon, and steelhead conservation since its founding 50 years ago. It is CalTrout's belief that abundant wild fish indicate healthy waters and that healthy waters benefit all Californians. With more than sixty large-scale, "boots on-the-ground" conservation projects underway, in tandem with public policy efforts in Sacramento, CalTrout's six regional offices work tirelessly to advance our cause through a three-pillared approach to conservation.

Southern California steelhead ("Southern steelhead") is an iconic species on the South Coast of California. Southern steelhead are culturally important and serve as an indicator species to gauge the broader health of the entire watershed. The species is currently experiencing an alarming rate of habitat loss, compounded by climate crisis impacts. According to the California Department of Fish and Wildlife's Steelhead Restoration and Management Plan for California (1996), "southern steelhead are the most jeopardized of all of California's steelhead populations." This petition utilizes the best available science to fully establish that Southern California steelhead face the threat of certain extinction.

Twenty-five years ago, CalTrout was recognized in the forward of the state's Steelhead Restoration and Management Plan as being a leader in this cause. Today we again see a clear need for action by the Fish and Game Commission, and we request that the Fish and Game Commission list Southern California Steelhead as endangered.

We appreciate your consideration and look forward to working with the Commission on this critical listing. Please do not hesitate to reach out if you have any questions or would like to further discuss the petition.

Sincerely,

Curtis Knight
Executive Director
California Trout

CALIFORNIA TROUT
FISH · WATER · PEOPLE

California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

June 7th, 2021

The California Department of Fish and Wildlife (CDFW) published their Steelhead Restoration and Management Plan for California twenty-five years ago (McEwan and Jackson, 1996). This plan laid out the blueprint for restoring this important and valued state resource by restoring degraded habitat and re-establishing access to historic habitat that is currently blocked. This plan reaffirmed the state's mandate framed in The Salmon, Steelhead Trout, and Anadromous Fisheries Act of 1988 (SB 2261) to significantly increase natural production of salmon and steelhead by the year 2000. As stated in the Plan, severe anadromous fish population declines, the potential for species listings under the Endangered Species Act (ESA), fulfillment of legislative mandates, and the state's Public Trust obligations called for immediate implementation of CDFW's Steelhead Management Plan.

Since its publication in 1996, agencies and concerned organizations have made consistent efforts to reverse the course of population decline for Southern California Steelhead (*Oncorhynchus mykiss*). It is now 2021, and Southern steelhead have seen little demonstrable improvement in population numbers and long-term persistence (National Marine Fisheries Services (NMFS) 5-Year Update, 2016) since the species' federal ESA listing in 1997. We respectfully submit this petition to list Southern California Steelhead as an endangered species under the California Endangered Species Act (CESA F&GC § 2050 et seq.).

Southern steelhead is an iconic species on the South Coast of California. Southern steelhead are culturally important and serve as an indicator species to gauge the broader health of the entire watershed. The species is experiencing an alarming rate of habitat loss, compounded by climate crisis impacts. Yet it is still not listed as endangered by the State of California.

The State of the Salmonids: Status of California's Emblematic Fishes (2017) used an exhaustive literature review and a standardized protocol (Moyle et al. 2015) to determine that Southern steelhead are of "Critical Concern," with the population in danger of extinction with the next 25–50 years due to anthropogenic and environmental conditions. Going further, it states, "Since their listing as an Endangered Species in 1997, Southern steelhead abundance remains precariously low." This statement only reinforces how dire the situation has become. CDFW, in their own management plan, stated that "Southern steelhead are the most jeopardized of all of California's steelhead populations."

Preventing the extinction of Southern steelhead will have long-term implications for all steelhead populations on the West Coast (Boughton et al. 2007b, 2006, NMFS 2016). Over millennia, steelhead have evolved an ability to use a variety of shifting habitats. Southern steelhead took advantage of this plasticity and honed it in the naturally dynamic environment of Southern California and Northern Mexico (NMFS 2016). The mechanisms underlying anadromy for Southern steelhead, which is an important component of their life history variation, are not completely understood. However, research and *in situ* studies point to both environmental and genetic components having significant influence on their life-history pathway.

Extirpation of Southern steelhead would initiate a process of irreversible, cumulative extinctions of other native *O. mykiss* populations through three main pathways. First, irreversible loss of heritable genetic loci responsible for anadromy will prevent their transmission to future progeny. Second, *O. mykiss* in Southern California tolerate higher water temperatures and more variable dissolved oxygen levels, and can therefore contribute these adaptive traits to steelhead in northern regions as they experience warming of coastal waters. Third, fish passage barriers that completely block access to freshwater spawning grounds prevents genetic mixing on a regional scale, and thus the few remaining Southern steelhead or the freshwater resident native rainbow trout that maintain anadromous genetic characteristics, are substantially reproductively isolated (Hoelzer et al. 2008). This isolation by habitat fragmentation represents an important uncoupling in the evolutionary legacy of the species and a direct threat to its continued existence.

Paraphrasing Fish and Game Code 2062, an endangered species under CESA is a native species or subspecies which is in serious danger of becoming extinct throughout all, or at least a significant portion of its range due to one or more causes—including loss of habitat, change in habitat, overexploitation, predation, competition, or disease. Southern steelhead are in danger of becoming extinct throughout their entire range primarily through modification, degradation, and simplification of required habitat for full life-history, and loss of access to historical habitat to maintain genetic diversity. Southern steelhead's continued existence is threatened by predation and competition from non-native aquatic species in their currently accessible habitat and in historical habitat once access is restored. The requirements to list Southern California steelhead as endangered under CESA F&GC § 2050 et seq. are met and exceed over its entire range and distribution.

This petition utilizes the best available science to fully establish that Southern steelhead face the immediate threat of certain extinction due to the loss, fragmentation, and simplification of their habitat and provides clear evidence that the State of California must exercise its mandate to protect native salmonids and steelhead by listing Southern steelhead as endangered.

California Trout, Inc was recognized in the foreword of the state's Steelhead management plan as being a leader in this cause. Today we again see a clear need for leadership and action by the Fish and Game Commission. We request that the Fish and Game Commission list Southern California Steelhead as endangered.

Scientific Information Required for Listing Petition:

Population trend (A)

The Southern steelhead population has decreased substantially from the estimated historic population size (Boughton et al. 2005, Boughton and Goslin 2006, Boughton et al. 2006). The Southern California Coast Steelhead distinct population segment (DPS) has been estimated to have annual runs of between 32,000 and 46,000 returning adults. Today, the annual run is estimated to be less than 500 total returning adults in any given year (Busby et al. 1996, Williams et al. 2011, Good et al. 2005, Helmbrecht and Boughton 2005, Boughton and Fish 2003). The four watersheds historically exhibiting the largest annual anadromous runs—Santa Ynez River, Ventura River, Santa Clara River, and Malibu Creek—have experienced declines in run size of greater than 90 percent (Boughton et al. 2005, Good et al. 2005, Helmbrecht and Boughton 2005, Busby et al. 1996). Simply put, Southern steelhead remain in danger of extinction (Williams et al. 2011, Moyle 2017).

A comprehensive status review of steelhead was conducted by Busby et al. (1996), who characterized Evolutionarily Significant Units (ESUs) using the conceptual framework of Waples (1991), and then assessed extinction risk of each ESU. The Southern California Coast Steelhead DPS, based on the ESU definition, was subsequently listed as endangered by NMFS under the U.S. Endangered Species Act in 1997. The original listing characterized the southern range limit as the eastern end of the Santa Monica Mountains. In 2002, the ESA listing area was extended further south to the Tijuana River system at the U.S. border with Mexico. The listing was further modified in 2006 to include only the anadromous component of the ESU, which is composed of both anadromous and freshwater-resident forms of O. mykiss which can co-exist within watersheds. Good et al. (2005) updated the status of Pacific coast steelhead populations and another update was conducted in 2010 (Williams et al. 2011). None of these updates or reviews led to changes in the status of the species' listing. It has remained endangered under ESA.

Following the significant rise in Southern California's human population after World War II and the associated land and water development within coastal drainages, the Southern steelhead's population rapidly declined. This led eventually to the extirpation of populations in many watersheds, leaving only remnant or sporadic populations (Boughton et al. 2005, Good et al. 2005, Helmbrecht and Boughton 2005, Busby et al. 1996). A central tenet of the NMFS Recovery Plan (2012) is that a viable DPS will consist of a sufficient number of viable discrete populations that may be spatially dispersed but nevertheless adequately connected to achieve the long-term persistence and evolutionary potential of the species. The goal of status-review updates is to assess whether viability metrics for the DPS are moving toward or away from the viability criteria. The consensus of publications is that the status of the Southern California Coast steelhead DPS has not changed appreciably since the federal listing in 1997 (NMFS 1996, Busby et al. 1996, NMFS 2016). The most recent publication which compiled adult steelhead abundance through existing monitoring programs of various types and anecdotal observations within this DPS documented only 177 adult steelhead observations in the past 25 years (Dagit et al. 2020).

Range (B) and Detailed Distribution Map (L)

NMFS identifies the Southern California steelhead DPS as being comprised of the coastal watersheds extending from the Santa Maria River system south to the U.S. border with Mexico (Titus et al. 2010, NMFS 2012). Historically, *O. mykiss* occurred at least as far south as Rio del Presidio in Mexico (Behnke 1992, Burgner et al. 1992).

The range of watersheds within the DPS are generally classified in two basic types depending on their geomorphology; short coastal streams that are part of the coastal ranges, and larger river systems that extend inland through the coastal ranges. The smaller coastal systems are typified by the character of the Santa Monica and Santa Ana Mountain watersheds. The larger watershed class includes the Santa Maria, Santa Ynez, Ventura, Santa Clara, San Gabriel, Santa Ana, Santa Margarita, San Luis Rey, and San Diego

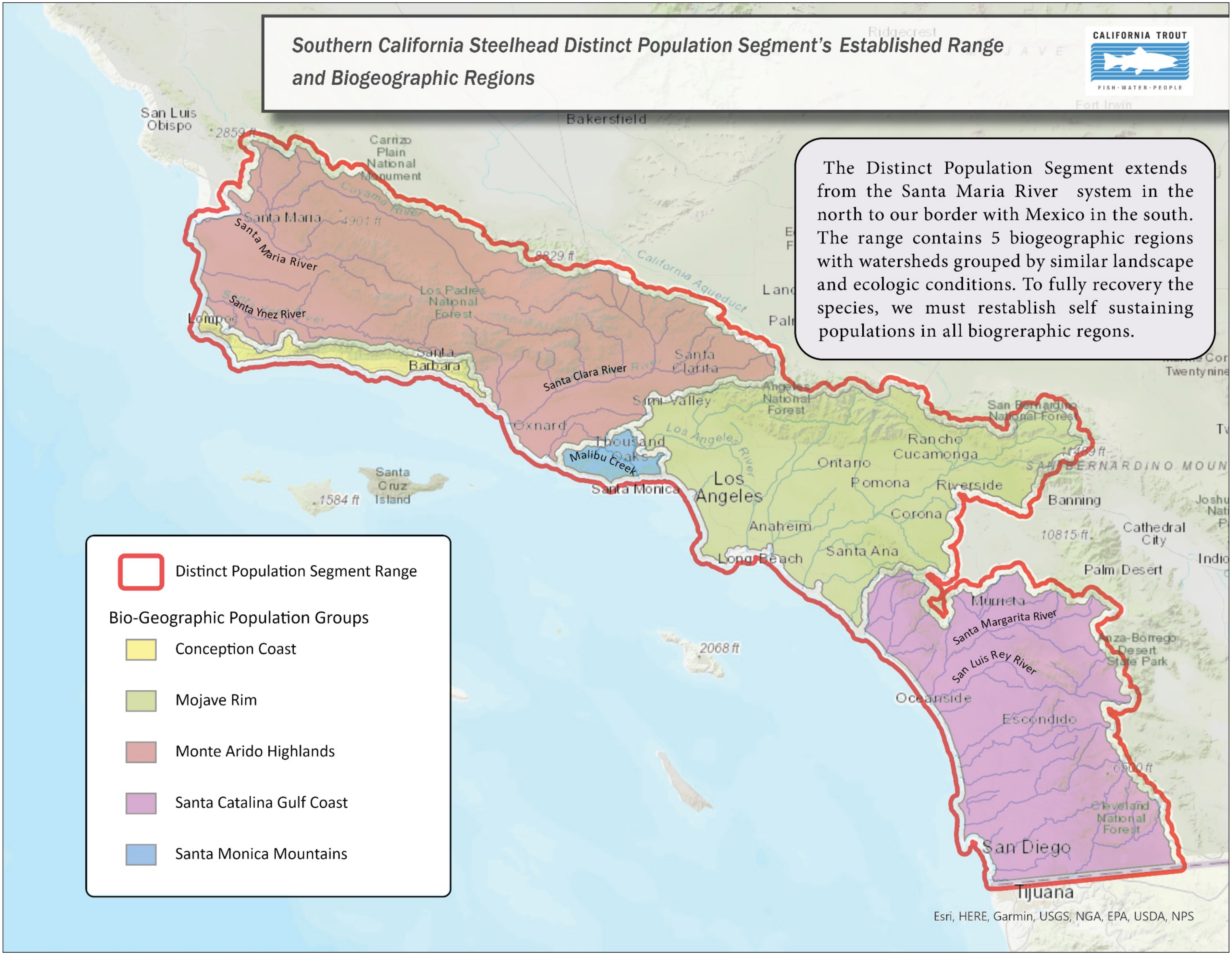
Rivers. These systems were further classified by predominate environmental and climate processes into five biogeographic population groups (BPGs). The entire range covers approximately 12,700 mi^2 with 25,700 mi. of streams (NMFS 2012). The established range of Southern steelhead contains several large human population centers with almost 22 million people. This figure, and level of landscape development and resource use implicit in it, is central to the current degraded condition of Southern steelhead

The range of the Southern steelhead is generally accepted as stated above, but not all stream miles within this range are equally habitable. NMFS used an Intrinsic Potential model to characterize and prioritize habitat suitability for species recovery. These models used an established set of factors to predict the potential for unimpaired over-summering habitat to be present at any given location in the DPS (Boughton 2006, NMFS 2012).

In general, Intrinsic Potential modeling is based on the idea that natural processes will tend to generate suitable habitat in reaches where discharge, gradient and topography meet certain criteria (Burnett et al. 2003). The parameters to model potential over-summering habitat for Southern steelhead included mean annual air temperature, mean discharge of streams during August and September, mean August air temperature and limiting access gradient in addition to stream gradient, discharge, and topography (Boughton et al 2006).

This work developed the ranked prioritization of watersheds within the DPS based on their environmental capacity to support a Southern steelhead population. This led to the designation of Category 1, identified to have the highest priority for recovery, followed by Category 2 then Category 3 populations within each of the five BPGs. This works assists in prioritizing restoration activities for target watersheds. However, the NMFS Recovery Plan describes the scientific basis for population-level and DPS-level recovery criteria whereby multiple populations within each BPG must have self-sustaining populations (NMFS 2012, NMFS 2016)

The delineation of the physical boundaries of Southern steelhead's range has been supported by genetic analysis and the observed variances among different *O. mykiss* populations. Early allozyme analysis of mitochondrial DNA performed before the ESA listing demonstrated a high degree of interpopulation differentiation within California (Nielsen 1994). Comparison of DNA samples among watersheds within the DPS to populations north of the DPS showed large differences in genetic markers. Samples collected from river system between the Santa Ynez River and Malibu Creek indicate the presence of mitochondrial DNA that is rare in steelhead populations north of the Southern steelhead DPS. (Busby et al. 1996). More recent genetic analyses of *O. mykiss* populations at the southern end of their range, using high-resolution genotyping of microsatellite loci and single nucleotide polymorphism (SNP) loci, indicate that the southern boundary of Southern steelhead range extends to northern Baja California, south of the U.S. border with Mexico (Abadia-Cardoso et al, 2015; Abadia-Cardoso et al, 2016).


Southern California Steelhead Distinct Population Segment's Established Range and Biogeographic Regions
CALIFORNIA TROUT
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The Distinct Population Segment extends from the Santa Maria River system in the north to our border with Mexico in the south. The range contains 5 biogeographic regions with watersheds grouped by similar landscape and ecologic conditions. To fully recovery the species, we must restablish self sustaining populations in all biogreraphic regons.
Distinct Population Segment Range
Bio-Geographic Population Groups
Conception Coast
Mojave Rim
Monte Arido Highlands
Santa Catalina Gulf Coast
Santa Monica Mountains
Santa Maria River
Santa Ynez River
Santa Clara River
Malibu Creek
Santa Margarita River
San Luis Rey River
San Luis Obispo
Bakersfield
Carrizo Plain National Monument
Santa Maria
Lompoc
Los Padres National Forest
Santa Barbara
Santa Clarita
Simi Valley
Oxnard
Thousand Oaks
Santa Monica
Los Angeles
Angeles National Forest
San Bernardino National Forest
Rancho Cucamonga
Ontario
Pomona
Riverside
Corona
Anaheim
Santa Ana
Long Beach
Banning
Cathedral City
Palm Desert
Murrieta
Anza-Borrego Desert State Park
Oceanside
Escondido
Cleveland National Forest
San Diego
Tijuana
Santa Cruz Island
1584 ft
2068 ft
10815 ft
6500 ft
California Aqueduct
Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

Distribution (C)

The spatial structure of Southern steelhead is influenced by fish passage barriers. The majority of watersheds historically occupied by Southern steelhead experienced extirpation due to anthropogenic barriers (Boughton et al 2005). The current distribution of Southern steelhead is defined as all anadromous waters below total natural barriers or man-made structural barriers (NMFS 1997). Anadromous adult Southern steelhead have been extirpated from approximately 60% of their historical range due to habitat fragmentation (NMFS 2012).

Southern steelhead have a complex life history that is central to their historical and current distribution. As covered in more detail in the Life History and Required Habitat sections, Southern steelhead predominantly express two forms: full anadromy and resident-freshwater. The anadromous and the resident-freshwater form co-exist throughout the DPS (Boughton et al 2006, Pearse et al. 2014).

The interplay of their life-history, their required habitat types, and distribution --both historical and current -- is complex (Boughton 2006). The freshwater resident form, or rainbow trout, are an integral part of the steelhead population, because anadromous adults can be the offspring of freshwater resident parents (Courter et al. 2013, Kendall et al. 2015, Abadia-Cardoso et al. 2016). It is likely that a combination of environmental and genetic factors determines anadromous or resident phenotype, which may be regulated by epigenetic factors (Baerwald et al, 2016). Genetic sampling above and below impassable dams within the established DPS for Southern steelhead indicates that they tend to be each other's closest relative (Clemento et al 2009.)

A number of barrier removal and habitat restoration projects have been implemented over two decades to address threats throughout the DPS (NMFS 2016). However, a number of large, complex fish passage barriers remain in place or not fully functional, even though significant investment over the years has supported advanced engineering design. The state ESA listing is anticipated to help move these projects forward into construction to realize their potential in species recovery. Environmental impacts from high intensity wildfires, floods, and extended drought have further reduced the number of small, isolated, remnant freshwater resident populations found in the upper tributaries (NMFS 2012). The Thomas Fire (2017) impacted many drainages throughout Santa Barbara and Ventura Counties; the Whittier Fire (2017) impacted the Santa Ynez watershed in Santa Barbara County, the Woolsey Fire (2018) impacted all creeks in the Santa Monica Mountains except Topanga Creek. The Holy Fire (2018) burned through Coldwater Canyon Creek in Riverside County which contains one of two known native rainbow trout populations descended from steelhead at the most southern extent of their range in California. Subsequent fire related floods and debris flows following these catastrophic events can cause local extirpation if emergency translocations are not performed in time.

Abundance (D)

Steelhead abundance numbers are naturally subject to high variability. Due to the character of the river systems in the DPS, monitoring of run sizes is difficult to quantify. Estimates of the historical (pre-1960s) abundance are available for several rivers in the DPS. The Santa Ynez River before 1950 is estimated to have had an annual run of 20,000-30,000 adult Southern steelhead. The Ventura River, pre-1960, had estimated annual runs of 4,000-6,000 returning adults. The Santa Clara River, pre-1960, was 7,000-9,000 returning adults and Malibu Creek, pre-1960, 1,000 adult returns. (NMFS 2012).

A review of the data from life-cycle monitoring stations at Vern Freeman Diversion Fish Ladder, Robles Diversion Fish Passage Facility, from migrant trapping by Cachuma Operation and Maintenance Board and the CDFW's Coastal Monitoring Program (CMP) support the finding that little to no change has been observed in total abundance or spatial structure of Southern steelhead since the initial federal listing (Williams et al 2011, NMFS 2012, NMFS 2016). The most productive systems support single digit runs of returning adults on any given year (Busby 1996, Williams et al. 2011, Dagit et al. 2020). Contemporary literature reviews of monitoring data support the conclusion that the total population estimate is dangerously low. This is further illustrated by the recent compilation of all monitoring program data and independent observations within the federal ESA listing area between 1998-2018. This work documented only 177 positive identifications of returning adult Southern steelhead in the past 25 years (Dagit et al. 2020).

Fish that express the resident freshwater life-history strategy play a central role to the continued existence of Southern steelhead. If the current course of modification and loss of available habitat for anadromous Southern steelhead is not corrected, there will be a greater need for resident freshwater rainbow trout to produce the vast majority of smolts that express anadromy and enter the Pacific Ocean. Smolt production is the product of both resident freshwater and anadromous life-history strategies (NMFS 2012). Due to shrinking suitable habitat below natural or man-made barriers to migration; rainbow trout will be a key component to ensure we maintain and re-establish the expression of anadromy and that any smolts produced by freshwater residents have access to required habitat over the entire course of their journey to the ocean and upon their return.

Recent studies have shown the resident freshwater populations still possess the alleles associated with anadromy (Pearse et al. 2009; Abadia-Cardosa et al. 2016). These results indicate that adoption of the freshwater resident life-history pattern does not necessarily result in the loss of the genetic potential for anadromy. The genetic potential of resident *O. mykiss* to express anadromy remains (Nielsen 1999; Courter et al. 2013; Phillis et al. 2016; Apgar et al. 2017) and, given the opportunity through restoration activity, could support re-establishing viable anadromous populations.

It is important to note that these freshwater resident populations are at risk from watershed-scale adverse anthropogenic impacts, quickening climate stress and other population level threats to their continued success. Catastrophic wildland fire, long term drought and continued human alteration of headwater habitat all put additional pressure on resident freshwater rainbow trout populations (NMFS 2012). Excessive loss of local freshwater resident populations can lead to lower genetic variability and fitness (Pearse et al. 2014; Abadia-Cardoso et al. 2016; Leitwein et al. 2017). Indeed, genetic analysis of rainbow trout at the southernmost extent of their range in the United States indicate that these populations have low allelic diversity (Clemento et al. 2009; Pearse et al. 2009; Jacobson et al. 2014; Abadia-Cardosa et al. 2016; Apgar et al. 2017), potentially leading to decreased retention of the genetic markers that support anadromy and overall fitness

The movement of adult steelhead between watersheds is an important factor as well. Anadromous adults are known to stray from their natal systems and could be important for re-establishing viable populations in formerly occupied watersheds (Bell et al. 2011). This could serve as a pathway to re-introduce genetic material across separate sub-populations (Garza et al. 2014). The inter-play of resident freshwater and anadromous life-histories is a critical component of Southern steelhead's current and future abundance and must be considered for recovery of the species.

Life history (E)

Steelhead are a highly migratory and adaptive species utilizing multiple habitat types over their complete life-history. The life cycle of Southern steelhead generally includes a freshwater period in coastal river systems followed by a migration to a marine environment to reach sexual maturity. Southern steelhead can express a great amount of variation in the timing and duration of each life-history stage in comparison to other species within the genus (Hayes et al. 2011, Quinn 2005, Hendry et al. 2004) This flexibility and malleability of life-history trajectories unique to Southern steelhead (Sloat and Reeves 2014, Kendall et al. 2015) is the evolutionary manifestation of the variability in environmental conditions that is characteristic of Southern California. This is particularly evident in the high number of sand-berm built estuaries in the DPS that must breach due to sufficient streamflow following winter rains to allow steelhead migratory access to a particular watershed.

Southern steelhead will spend one to four years maturing in the Pacific Ocean (Jacobs et al. 2011, Borg 2010, Haro et al. 2009, Leder et al. 2006, Quinn 2005, Davies 1991, Groot and Margolis 1995, Northcote 1958). Anadromous adults grow substantially larger than freshwater residents, leading to higher fecundity of returning anadromous females (NOAA 2012). After reaching maturity, Southern steelhead typically return to their natal river system to spawn, although strays do occur and may be an important vector to maintain genetic variability and connection across basins (Garza et al. 2014) Spawners typically return between January and May, but year-to-year variation in environmental conditions across diverse geographic settings have allowed Southern steelhead variability in spawning period. Variability in access to any river system is compounded by the sporadic nature of hydrologic connectivity common to river systems in Southern California.

Following sand-berm breaching, whereby a lagoon becomes an estuary that connects a freshwater stream to the ocean, steelhead will move into coastal river systems. Upon entering the river system, Southern steelhead can migrate several to hundreds of miles to reach suitable spawning habitat. Upon finding suitable gravel, females excavate a redd and deposit their eggs. Males then fertilize the eggs, after which the eggs are covered with gravel by the female. The embryos' incubation time may vary from three weeks to two months depending on environmental conditions. Newly hatched *O. mykiss* or alevins will then remain in the gravel for an additional two to six weeks. Unlike salmon, adult steelhead do not typically die following their spawning trip, and have been observed to return to the ocean and then come back to freshwater to spawn again. The frequency and nature of repeat spawning by Southern steelhead as a species, is poorly understood, but this iteroparous life-history strategy can occur (Moyle et al 2008, Moyle 2002).

Juvenile Southern steelhead or parr will rear and forage in a variety of freshwater habitat types depending on their maturation rate before beginning their migration to the ocean. Southern steelhead parr will spend between one to three years in freshwater before migrating to the ocean (Shapovalov and Taft 1954, Moore 1980, Quinn 2005). The timing of out-migration is influenced by a variety of environmental cues including streamflow, temperature, and breaching of the sand berm at the river's mouth. Out-migration to the ocean usually occurs in the late winter and spring . Smolts will spend a short time in the estuary. Here the mixing of fresh and saltwater habitats allows for the morphological changes that smolts need to undergo to prepare themselves for the ocean environment. In some watersheds, smolts may rear in a lagoon or estuary for several weeks or months prior to entering the ocean.

In contrast to Central California lagoons where juveniles grow substantially faster and larger than their riverine reared counterparts (Smith 1990, Bond et al. 2008, Hayes et al. 2008, Atkinson 2010), Southern steelhead are less frequently observed in estuaries. This may be attributed to low population numbers, adaptation for rapid outmigration, and/or poor lagoon habitat. Studies from more northern estuaries support the idea that larger juveniles have a higher survival advantage after outmigration into coastal marine waters and, as a result, have a greater opportunity to return to their natal streams as adults for spawning (Bond et al. 2008, Hayes et al. 2008, and Atkinson 2010). Therefore, if conditions permit, increased juvenile steelhead estuarine rearing prior to emigration could be a critical contributor to enhance the viability of steelhead populations.

The cycle described above is referred to as their fluvial-anadromous life-history strategy. Southern steelhead can also express two additional life-history trajectories: a freshwater-resident pathway and a lagoon-anadromous pathway. The freshwater-resident pathway describes *O. mykiss* that complete their entire life cycle in freshwater. Fish that follow this life-history trajectory are commonly known as rainbow trout. Rainbow trout will incubate, hatch, rear, mature, reproduce, and die in freshwater. A lagoon-anadromous pathway describes a hybrid option. Southern steelhead smolts out-migrate, but can remain in the lagoon or estuary for a year before returning upstream to freshwater habitat to spawn.

These descriptions only cover the predominant life-history pathways for *O. mykiss*. It does not, however, capture the full complexity of the life-history permutations that can be exhibited by *O. mykiss*. Plasticity of life-history should be considered the central characteristic for Southern steelhead in understanding their life cycle (Kendall et al. 2015). An interplay between environmental conditions and adaptive behavior likely causes shifts between resident and migratory life-history behavior expressed by a Southern steelhead (Kendall et al. 2015, Pearse et al. 2014, Pearse 2016, Satterthwaite 2012; Beakes 2010). The seasonality of the hydrologic cycle impacts the predominant life-history trajectory expressed in particular watersheds. Southern steelhead's long-term viability is dependent on this life-history plasticity, and on their ability to migrate to new habitat.

Kind of habitat necessary for survival (F)

Habitat characteristics at any one location may change significantly from year to year in the Southern California Mediterranean climate. A Mediterranean climate is distinguished by warm, wet winters under prevailing westerly winds and calm, hot, dry summers, as is characteristic of the Mediterranean region and parts of California, Chile, South Africa, and southwestern Australia. As water warms and preferred habitat alters seasonally, hydrological connectivity between habitat types becomes important, and influences the ability of *O. mykiss* to move throughout the river system to seek refuge areas if needed. Their multiple life-history trajectories rely on a network of habitat types to build in the critical redundancy. This allows any individual to complete their life cycle by exploiting the best available habitat for that stage of development at any given time. A simple example is that juvenile Southern steelhead can find the necessary thermal refugia to over-summer in a tributary that flows year-round or in the river's estuary. The interplay of habitat type, habitat condition, and the connectivity between habitats over time is paramount in their development and survival.

Southern steelhead require cool, clean water, and complex, connected habitat. Each habitat type must provide sufficient nutrients and foraging opportunities to allow for the growth and development required for their current life-history stage (NMFS 2012). Ocean-going adult steelhead require sufficient water quality, depth, cover, and marine vegetation. Estuary and lagoon habitats must provide uncontaminated water and substrates with connected wetlands for juveniles. Effective mobility for juvenile and adult Southern steelhead requires mainstem river migration corridors that are free of obstruction. They must also minimize excessive risk of predation and provide enough water quantity to allow for cover, shelter, and holding areas.

The geological character of their geographic range is young, highly erodible sedimentary rock. Excessive sedimentation and turbidity are critical water quality components in all habitat types and impacts how Southern steelhead utilize each habitat type. Freshwater spawning sites must provide sufficient water quantity as well as good water quality. Southern steelhead gravel sizes must fall within a range that supports spawning and incubation. Freshwater rearing habitat must provide sufficient water quantity and quality with lateral connectivity to the floodplain. These characteristics are essential for rearing and foraging as it provides refugia and habitat complexity.

Within each of these habitat types, Southern steelhead realize changes in their availability depending on the habitat conditions or quality. The preferred biotic conditions of any habitat type are subject to the immense variability common in Southern California. Documented habitat tolerances and ranges are important, but Southern steelhead's ability to move into microenvironments in response to changing conditions is a critical component of their required habitat types and conditions (Moyle et al. 2017). Their required habitat conditions align with habitat types suited to their life-history development stage.

The primary habitat conditions that influence Southern steelhead development are temperature, dissolved oxygen, water depth, and velocity. Of these, water temperature is the best studied and can change significantly diurnally and seasonally. Southern steelhead tolerate warmer water temperatures than more northern salmonids, as they have adapted to a wider range of environmental conditions characteristic of a highly variable climate. The upper temperature threshold of 25°C has been observed to coincide with cessation of feeding and retreat to thermal refugia in Southern steelhead (Boughton et al. 2015, Sloat and Osterback 2013, Spina 2007).

Juvenile Southern steelhead regularly persist in conditions outside of the ideal range. Juvenile steelhead prefer water temperature in the range of 10–17 ° C, but have been observed in the Ventura River with water temperature that peaked at 28°C (Carpanzano 1996). The relatively warm water of the Ventura River has been observed to result in more rapid growth of juvenile steelhead than has been observed in more northerly populations (Moore 1980, McEwan and Jackson 1996).

While temperature is a principle biotic condition impacting overall survival of Southern steelhead, dissolved oxygen, water depth, and water velocity during their freshwater development stages are important factors as well. Dissolved oxygen levels, as influenced by water temperature, above 5mg/L is considered adequate for survival. In contrast, 3 mg/L is considered to be the lethal lower limit for unimpaired growth (EPA 1986) , but is dependent on duration, magnitude, frequency, and accessibility of refugia (McLaughlin et al. 2009, Matsubu et al. 2017, Huber and Carlson 2020).

For returning adult Southern steelhead, 7 inches is considered the minimal water depth needed for successful migration. Water velocities over 10 ft/sec are considered sub-optimal for migration upstream (Bovee 1978, Thompson 1972, Barnhartt 1986). Water velocities that hinder the swimming of adult returners have a greater impact on effective migration than depth (Barnhartt 1986). Southern steelhead fry prefers water depths that are from 2–14 inches with juveniles occupying similar depths with observed preference for 10–20 inches (Bovee 1978).

Factors affecting the ability to survive and reproduce (G)

Destruction, modification, and fragmentation of native habitat are recognized as the primary causes for the decline of the Southern steelhead (NMFS 2012). This has occurred due to the development of water infrastructure, agriculture, urbanization, and climate change-induced events including catastrophic wildland fire and drought. Water storage, withdrawal, diversions, flood control, and hydropower have greatly reduced, disconnected, simplified, or eliminated Southern steelhead habitat. These actions have modified natural flow and sediment regimes, which in turn have resulted in degraded water quality, changes in aquatic species communities, depletion of necessary flows for life-history development, and disrupted habitat maintenance processes (NMFS 2012). The Conservation Action Planning (CAP) Workbooks (Hunt, 2008) prepared for NMFS informed the federal recovery plan and hold true today. The CAP Workbooks resulted from reviewing existing information on steelhead habitat conditions and assessing the magnitude and extent of threats to steelhead and their habitats. These workbooks were used to develop recovery planning actions across the DPS.

Large dams in the Ventura River, Santa Clara River, Santa Ynez River, Malibu Creek, and other impassable barriers created by water diversions, flood control channels and certain bridges have had the most profound effect on blocking Southern steelhead migration between the ocean and upstream freshwater spawning, rearing, and foraging areas. These barriers disconnect the longitudinal and lateral ecosystem processes of the headwaters from lower sections and restrict floodplain access. This not only blocks migration to upstream spawning, rearing and foraging habitat but also restricts and impedes the effective out-migration of smolts (Stoecker and Kelley 2005). In some cases, migration through and access to critical habitat is blocked as is the case for 100-ft tall Rindge Dam in the lower three miles of Malibu Creek in the Santa Monica Mountains BPG (U.S. Army Corps of Engineers, 2020). Land development, whether for agriculture or urban development, leads to reduction in habitat complexity, alteration of flow and sediment transport, and degrades water quality (Moyle et al. 2017). Both agriculture and urbanization increase water demand. Even though almost 80% of water in Southern California is imported, over-reliance on surface diversion and groundwater pumping has resulted in depletion of instream flows and groundwater aquifers.

The rate of change in climate conditions brought on by climate crisis is a significant challenge to the continued existence of Southern steelhead. Climate change models for Southern California that evaluate conservative atmospheric forcing projections predict warmer atmospheric temperatures, sea level rise, ocean acidification, increased surface water temperatures, and changes in frequency, severity, duration, and intensity of drought and precipitation (Wade et al. 2013). Climate crises will exacerbate the problems associated with anthropogenic degradation of riverine, estuarine, and marine habitats already present (Williams et al. 2015). Floods and persistent drought conditions have periodically reduced already limited spawning, rearing, foraging habitats, and migration corridors.

Impacts to Southern steelhead from climate crisis impacts include direct effects from temperature such as mortality from heat stress, changes in growth and development rates, expanded parasite range and disease susceptibility. Changes in the flow regime also affect survival and behavior. Southern steelhead mortality and growth rates are also expected to suffer from the indirect effects that result from changes in the freshwater habitat structure and the invertebrate and vertebrate community, which govern food supply and predation risk (Crozier et al. 2008, Petersen and Kitchell 2001). Expected behavioral responses include shifts in seasonal timing of important life-history events, such as adult migration, spawning, fry emergence, and juvenile migration (Hayes et al. 2011, Boughton et al. 2009).

Direct threats to survival and reproduction include the presence of non-native vegetation and aquatic species that outcompete Southern steelhead for limited resources. Poor water quality and inconsistent water flow are hallmarks of unsuitable habitat for Southern steelhead, which can be exacerbated by competition or predation from non-native species.

As the impacts of climate change become more pervasive, catastrophic events such as fire and extended drought will lead to sudden extirpation of already fragmented populations. These reproductively isolated populations become more inbred through time, and as their genetic diversity decreases, their resilience to environmental threats may also decrease. All of these interactingand negative feedback loops have earned Southern steelhead a rating of “critically vulnerable” to the impacts of climate change, with a forecast of being likely to go extinct by 2100 without strong conservation measures (Moyle et al 2013).

Degree and immediacy of threat (H)

Southern steelhead are facing the highest degree of concern and an immediacy of threat to the continued persistence of this species over the next 50 years. Anadromous *O. mykiss* in southern California face significant threats from water and land management practices that have degraded or curtailed freshwater and estuarine habitats. This has severely reduced the capability of the species to sustain viable populations within most watersheds (Moyle et al. 2011, 2008). Given the current status of the species and the degraded condition of many freshwater and estuarine ecosystems, the continued existence of the species may be further threatened by shifts in climatic and oceanographic conditions (NMFS 2012).

Recent assessments of Southern steelhead forecast that they are in danger of extinction within the next 25–50 years due to the degradation of habitat associated with human development and the widespread impacts of climate crisis (Moyle et al 2017). This assessment is the result of a standardized protocol scoring for seven metrics: area occupied (anadromous and resident freshwater), estimated adult abundance, dependence on human intervention for persistence, environmental tolerance under natural conditions, genetic risks, vulnerability to climate change and anthropogenic threats. Scoring of the metrics was based on literature reviews, expert knowledge, and interviews with species experts (Moyle et al 2017).

Impact of existing management efforts (I)

Federal

The principal management strategy for Southern steelhead lies at the federal level for regulatory and recovery planning within the DPS boundaries. The listing of the Southern steelhead in 1997 under the Endangered Species Act (62 FR 43937) covered steelhead in anadromous water below natural and man-made fish passage barriers within the Southern California Coastal Steelhead DPS, which followed the geographic boundaries of the Southern steelhead ESU. The original listing was bounded by the Santa Maria River at the northern end, to Malibu Creek in the Santa Monica Mountains at the southern end. After documentation of steelhead in San Mateo Creek in San Diego County by CDFW biologists in 1999-2001, and genetic analysis by NOAA showing native steelhead ancestry, the ESA listing was extended south to the U.S.-Mexico border in 2002 (67 FR 21586). As such, the federal ESA listing established requirements for steelhead consultation under NMFS jurisdiction for this amended area, and the Southern California Steelhead Recovery Plan was produced by NMFS pursuant to that listing.

Four U.S. National Forests within the DPS (Angeles, Cleveland, Los Padres, San Bernardino) all have land management practices in place that require protection and conservation decisions to account for listed species. The federal government's oversight of the Clean Water Act (CWA) Section 404/401 Program requires that any project undergo consultation with NMFS when in the listing area for Southern steelhead. Additionally, the federal governments oversight and certification of the Flood Insurance Program through the Federal Emergency Management Agency (FEMA) strongly influences development of floodplains.

Even with these tools at the federal government's disposal, their impact on the long-term survivability of Southern steelhead has been challenging. No discernable change in total population size has been detected since the species was listed by the federal government in 1997. NMFS oversight and management of the species to date has been a key component directing the work of recovering the species. This has been supplemented by project funding from multiple federal agencies to implement NMFS Recovery Plan across the DPS. As stated above, many steelhead migration barriers have been remediated since the federal ESA listing. However, a number of large fish passage barriers remain in place or not fully functional. Significant investment over the years has supported advanced engineering design for remediation of these barriers, but implementation has been problematic.

The lack of legal basis to enforce recalcitrant landowners, entities, and agencies that are responsible for providing protections under ESA has presented problems. The rapid translation of scientific advances in understanding watershed and population dynamics, the ambiguity in the criteria established by NMFS during their oversight of passage barrier remediation has hindered implemented needed restoration actions. Without the species listed under CA Endangered Species Act, NMFS is, in most cases, the only government agency with direct oversight over the condition of the species and its required habitat. This has resulted in protracted legal battles and little option for enforcement.

The impact from the loss of habitat, exploitation of natural resources and the threat from aquatic invasive species has remained unchanged in successive status reviews by NMFS (Williams et al 2011, NMFS 2016). Major milestones of the federal recovery plan remain unachieved. Obsolete dams in the Ventura River and Malibu Creek system still stand. The Vern Freeman Diversion, long recognized as an ineffective partial passage barrier on the main stem of the Santa Clara River, a Core 1 population, has not been remediated over two decades and two lawsuits. Flow releases from Bradbury Dam to support Southern steelhead development in the Santa Ynez, a Bureau of Reclamation project, were secured after a lengthy regulatory process, but Bradbury Dam provides no opportunity for passage to two-thirds of Southern steelhead native headwater habitat in this system. Additional legal protection is imperative to move forward these projects essential to the species' survival.

Another impact of the federal listing is the ability to conduct scientific analysis on the species itself. It is not for lack of interest or want that the most fundamental research to establish the genetic uniqueness of the species pre-dates the federal listing. Federal guidelines and policies on the handling of the species for research purposes are a deterrent to continued research even though there has been significant innovation and advancement in DNA and gene sequencing technology.

State of California

The State of California has several published plans that provide for the management and conservation of Southern steelhead. The Steelhead Restoration and Management Plan for California (1996) written by California Department of Fish and Wildlife is foremost among these. This management plan identified the "impending extinction" of Southern steelhead within twenty-five years. Southern steelhead were given the highest priority for department management conservation action. The State of California's application of the Public Trust Doctrine is a second tool that provides the state a broad-based legal precedent to address threats to Southern steelhead survival. Fish and Game Code Sections 1600–1603 and 5935–5937 are additional mechanisms for State oversight in the management of Southern steelhead. The California State Water Resources Control Board (SWRCB) administers the water rights permitting system. They control utilization of waters for beneficial uses throughout the state (Grantham and Moyle 2014).

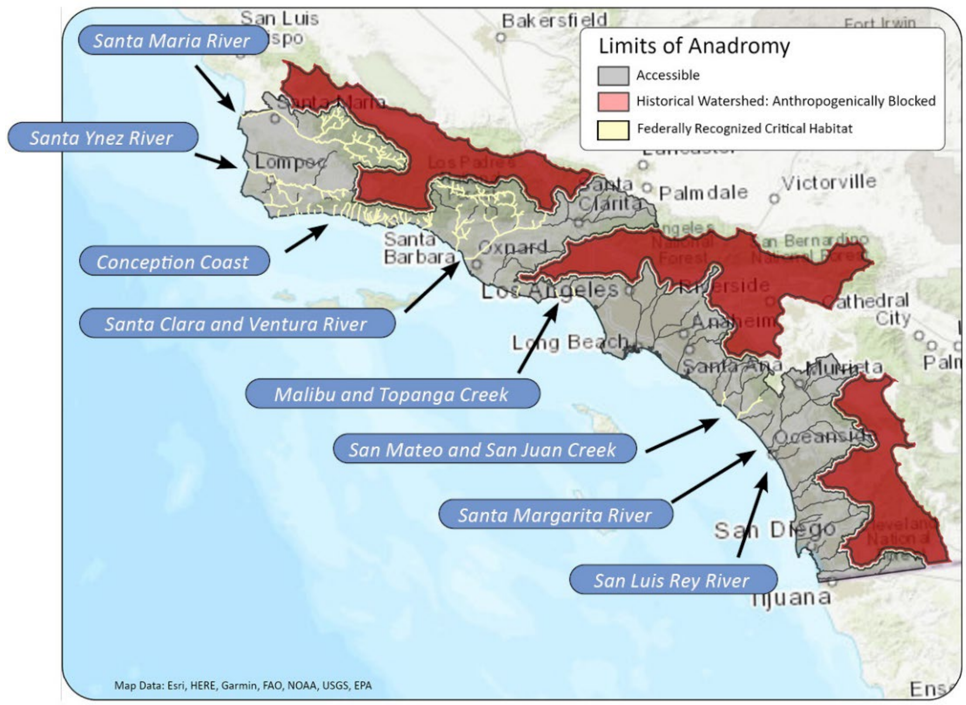
However, the system does not provide an adequate regulatory mechanism to implement the requirements of CDFG Code Sections 5935–5937 for the owner of any dam to protect fish populations below impoundments. Additionally, SWRCB generally lacks the effective oversight and regulatory authority over groundwater development comparable to surface water developments for out-of-stream beneficial uses.

Section 1600 Lake or Streambed Alteration Agreements program is the principal mechanism through which the CDFW provides protection of riparian and aquatic habitats. However, increased protection through this mechanism is needed to protect riparian and aquatic habitats important to migrating, spawning, and rearing steelhead.

Finally, monitoring of stocks (particularly annual run-sizes) is essential to assess the current and future status of individual populations and the DPS, as well as to develop basic ecological information on the Southern steelhead populations of the Recovery Planning Area. However, the Coastal Monitoring Plan remains unfinished for the Southern California region, and long-term funding for its implementation has not been identified and secured.

Suggestions for future management (J)

CalTrout recommends that the Fish and Game Commission list the species as endangered under CESA accepting the current limits of anadromy as established by the ESA listing for this species (NMFS 2002, 2012). The federal ESA listing covers *O. mykiss* downstream of total manmade or natural barriers in anadromous waters, and these fish are under jurisdiction of NMFS. O. mykiss upstream of total barriers are not covered under the federal ESA listing, and are under jurisdiction of the U.S. Fish & Wildlife Service.



We need to recognize Southern steelhead as endangered at the state level to augment the protection provided by the federal listing.

This recommendation is put forth because no demonstrable increase in Southern steelhead abundance has occurred since the initial ESA listing and the threat of extinction is immediate (NMFS 2011, NMFS 2016, Moyle et al. 2017).

CalTrout wants to ensure that all state agencies have the clear mandate to prioritize for Southern steelhead protection and conservation in strategic planning, funding appropriations, and resource management plans. The listing of Southern Steelhead as endangered will provide full acknowledgement to Californians of the fundamental importance this species has to the state and the ecosystem.

Listing of the species as endangered will allow the state and its citizens to realize the value of funds invested to date in Southern steelhead recovery. Many of these Southern steelhead conservation projects are large scale efforts with multiple stakeholders, and have required significant funds for planning, design, and implementation. As more projects are planned and move into construction, the state listing will be important for successful implementation and effectiveness monitoring of these projects.

Specifically, when the commission lists the Southern steelhead as endangered, CDFW will have direct authority to oversee projects proposed within the current limits of anadromy. This will provide CDFW the ability to establish species-specific mitigation measures that must be met for take coverage to be authorized.

CalTrout supports following the federal ESA listing coverage for below barrier steelhead, while keeping the above-barrier resident rainbow trout outside the ESA listing coverage. Above-barrier native rainbow trout are precious genetic resources for Southern steelhead recovery, but also are part of a robust sport fishery in the mountains of Southern California. Excluding these rainbow trout from CESA coverage also allows for emergency translocation after wildland fire without regulatory delays, and allows for conservation brood stock development and research to be performed to increase the genetic and geographic diversity of native rainbow trout of steelhead ancestry.

Our recommendation of adopting the federal ESA listing structure is intended to conserve key ecologic and evolutionary processes to preserve species diversity, while incorporating ESU-defining features of reproductive isolation and adaptation (Waples 1991). The anadromous component of the ESU covers a precariously small steelhead population expressing the anadromy trait in a discontinuous spatial context trending towards extinction. It therefore meets the four Viable Salmonid Population criteria (abundance, trends, spatial structure, diversity) used to guide ESA risk assessments (McElhany et al 2000), as well meeting the discrete and significant criteria for listing under CESA. The resident component of the ESU covers a large number of native rainbow trout that are geographically dispersed, but are genetically demonstrable remnant populations of Southern steelhead (Abadia-Cardoso et al 2016). These trout have been reproductively isolated behind barriers for decades, and have undergone localized adaptation.

Following the existing paradigm of quantitative genetics, most phenotypes are controlled by many genes of small effect (Waples, 2018). The interplay of neutral and adaptive loci enabling rainbow trout to survive in diverse above-barrier habitats, as well as the extent to which anadromy-associated genes are subject to selective pressure in resident trout, is not clearly understood. This is particularly evident in the case of chromosomal inversions (e.g., *Omy5* locus)(Pearse et al 2014) and transcriptional regulators (e.g., Greb1L)(Hess et al 2016, Prince et al 2017, Mohammed et al 2013). These have been shown to be important in triggering anadromy and/or run timing, in which a small number of genes produce a large impact on phenotypes. In this regulatory hierarchy, one or more master regulator proteins and/or epigenetic conditions can regulate hundreds of genes of varying penetrance, and thereby produce ecological/evolutionary diversity.

Native rainbow trout that have undergone adaptive evolution are still at risk from environmental threats such as drought, fire, flood in addition to anthropogenic threats. The proposed CESA management framework allows for emergency translocation of these above-barrier fish before sudden extirpation. It also allows for research to increase understanding of physiological tolerances unique to Southern steelhead and applicable to salmonids statewide. This ESA listing framework also provides for continued recreational fishing in the mountains of Southern California where native rainbow trout persist above major barriers. This in itself is a significant consideration for the state and its people. This is further impetus for the state, considering the diverse threats to steelhead and resident rainbow trout, to remove barriers and provide access to historical habitat in high priority watersheds, as identified through Intrinsic Potential modeling and designated in the NMFS Recovery Plan, to promote genetic interbreeding to the extent possible as soon as possible.

Additionally, CalTrout recommends that:

a) special restrictions of catch-and-release, barbless lures only regulations apply to native trout in areas demonstrated to have steelhead lineage (Abadia-Cardoso et al 2016),
b) signs be posted and fishing survey boxes be installed at key access points in the DPS for fishers that clearly state the role of these native rainbow trout in Southern steelhead recovery and what information is being collected,
c) only triploid (non-reproducing) rainbow trout be stocked in streams within the DPS, and
d) that stocked reservoirs and still-water bodies have adequate barriers to escape of hatchery trout into high priority Southern steelhead recovery rivers throughout the DPS.

CalTrout recommends the adopting of the current ESA listing area not only to preserve the organizing principles that currently directs recovery actions, but also to establish a state-level endangered species redundancy. For a species that is endemic and iconic to the coast of Southern California, redundancy in the species' protection at the state level will lay the groundwork for redundancy in Southern steelhead populations within the DPS.

Availability and sources of information (K)

The National Marine Fisheries Service as a part of the National Oceanic and Atmospheric Administration generated the majority of the information presented here through the NMFS Southern California steelhead Recovery Plan and 5-year status reviews, other technical documents, scientific publications, and biological opinions. CDFW and other state agencies have published Southern steelhead planning, recovery, and assessment documents which have also served to draft this petition. CDFW's Steelhead Restoration and Management Plan for California and NMFS's Southern California Steelhead Recovery Plan are cited throughout. Extensive research on *O. mykiss* physiological tolerances and behavior, particularly on resident rainbow trout, is provided by reference herein, as well as the most recent assessment of adult steelhead population abundance (Dagit et al. 2020).

The scoring of the potential for extinction of Southern steelhead is a product of the comprehensive overview of salmonid species in California conducted most recently by Moyle and co-authors in 2017.

CESA Listing Factors

CESA regulates that a species should be listed as endangered or threatened if the Fish and Game Commission determines that its continued existence is in serious danger by one or any combination of the following factors:

Present or Threatened Modification or destruction of habitat

Southern steelhead have declined in large part because of the degradation, simplification, fragmentation, and total loss of habitat (Hunt & Associates 2008). The destruction of habitat is the result of human land use, agriculture, and flood control management decisions. Water withdrawal, storage, conveyance, and diversions have greatly reduced or eliminated historically accessible Southern steelhead habitat.

Modification of natural flow regimes by water infrastructure development has resulted in increased water temperatures and depleted the flow necessary for migration, spawning, rearing, and forging. This has also resulted in the disruption of habitat forming and ecosystem maintenance processes. While previous loss of habitat was strictly the result of more tangible, direct anthropogenic activity, climate crisis is amplifying these impacts at an accelerating pace.

This assessment of the Present or Threatened Modification or Destruction of habitat is the result of a comprehensive analysis outlined in the Conservation Action Planning Workbooks. This process used available information in a consistent, transparent, and reproducible fashion to assess aquatic habitat quality and anthropogenic threats to that habitat (The Nature Conservancy 2010*,* Kier Associates and NMFS 2008, Hunt & Associates 2008). This process was applied to all 45 watersheds that comprise the Southern steelhead DPS. The assessment published in 2012 concluded that the general DPS-wide condition of all major watershed was “Fair” to “Poor” with only 4 of the 45 watersheds were assessed to score a ”Good” rating (NMFS 2012).

The DPS-wide threat of habitat modification and destruction remains a concern (NMFS 2011, NMFS 2016). While a number of smaller restoration actions have created landscape level habitat improvements, the practices over the past century including large dam construction, mainstem channel straightening and floodplain disconnection, remain in place and their legacy of alteration continues to ripple through time to this day.

Overexploitation

Southern steelhead populations historically supported an important recreational fishery throughout their range. Reporting on recreational angling for Southern steelhead on the Santa Ynez indicated a vibrant fishery with substantial angling opportunities prior to development of the Bradbury Dam/Lake Cachuma Facilities. Similar accounts are true for the Ventura, Santa Clara, and other river systems such as San Juan Creek and San Mateo Creek in the DPS (NMFS 2012). Recreational angling for Southern steelhead increased the mortality of returning and freshwater-resident adults, but is not considered the principal cause for the decline of the species (NMFS 2012).

Predation

Introductions of non-native aquatic invasive species (AIS) resulted in increased predator populations in numerous river systems in the DPS. Once established, these introduced species increase the level of predation experienced by native salmonids (NMFS 1996, Busby et al. 1996). AIS in the Southern steelhead DPS are pervasive and deleterious. These species are known to prey on rearing juvenile Southern steelhead (Cucherousset and Olden 2011).

NMFS concluded that the information available on these impacts to steelhead did not suggest that the DPS was in danger of extinction, or likely to become so in the foreseeable future because of predation. (NMFS 2012). It is recognized that small, isolated populations of Southern steelhead can be more vulnerable to extinction through the combination of multiple secondary threats, and the role predation plays may be heightened under the current degraded condition of their native habitat.

Competition

In addition to the increase of predation on Southern steelhead by AIS, Southern steelhead are also in direct competition for critical aquatic habitat and resources with AIS (Marks et al. 2010, Scott and Gill 2008, Fritts and Pearson 2006, Bonar et al. 2005, Dill and Cordone 1997) including fishes and amphibians such as largemouth bass, redeye bass, bullhead, sunfish species, and bullfrogs. All these species thrive in warmer slow-moving water. They can also withstand lower water quality conditions than Southern steelhead. The combination of a Mediterranean climate and decades of habitat loss led to habitat conditions suitable for uncontrolled AIS population growth. This uncontrolled population growth of AIS is evident in Sespe Creek, a tributary of the Santa Clara River. Designated as critical habitat by NMFS and a State identified Wild and Scenic River, it is teeming with AIS in the slow-moving pool habitat. However, in the smaller tributaries in this system with cool water temperatures and greater slope, there are healthy juvenile Southern steelhead population numbers (Stillwater 2019).

The presence of invasive species in San Mateo Creek in northern San Diego County is another example where invasive species threaten the recovery of Southern steelhead. In recent years, the San Diego Regional Water Quality Control Board has sought to combat this problem using a novel approach by preparing a 303d listing for invasive aquatic species in San Mateo Creek as a non-point source pollutant. This proposal has received preliminary approval by the Regional Water Board for incorporation into the San Diego Regional Basin Plan. A formal 303d listing would open up significant funding to remove invasive aquatic species from San Mateo Creek. The last purported Southern steelhead observed in 2017 in lower San Mateo Creek was likely lost due to predation by invasive species.

Disease

The combination of disease, AIS infestation and predation are likely to play a major role in the population size of Southern steelhead. Many diseases are known to influence the development and survival of steelhead (Noga 2000, Wood 1979, Rucker et al 1953), although limited data or information exists to explicitly link infection levels and rate of mortality (NMFS 2012). With the increased environmental stress on resident rainbow trout populations that are experiencing impacts due to climate crisis, they will likely encounter new parasites that have expanded range which may lead to sudden extirpations of the few remaining coastal steelhead populations.

Other Natural Occurrences or human related activities

Southern steelhead are on the front line for climate crisis impacts. The DPS covers the southern edge of the species' total range on the West Coast. The DPS is projected to experience the greatest overall increase of air and water temperatures. Persistent drought has increased surface air temperatures and altered natural precipitation patterns (Williams et al. 2015, NMFS 2016). This has accelerated the loss of habitat needed for all life-history stages for an already stressed population. Climate change will have a significant impact on their continued existence (Wade et al 2013). Climate crisis impacts on salmonid species are increasing over time. Building resiliency into the remaining populations of Southern steelhead is essential to their survival (Williams et al. 2016) and to the survival of salmonids further north along the coast. Even given their inherent plasticity, the impacts of climate crisis will outpace their ability to utilize this flexibility. The most recent NMFS 5-year status review completed in 2016 concluded that the ongoing drought and ocean conditions in the years preceding its publication likely reduced the survival of Southern steelhead across the DPS.

Conclusion

Southern steelhead are an iconic California species that deserve the highest level of state protection. State and federal entities have had decades to address the precipitous and continuing decline in Southern steelhead populations through all manner of guidance, policy, and mandate. Yet this species remains on the brink of extinction throughout its range. The principal condition for protection under CESA is met.

Southern steelhead have an irreplaceable impact on Southern California watersheds and communities. The total loss of this species will have irreversible consequences.

For this reason and all of those presented in this petition, CalTrout requests that the California Fish and Game Commission use the powers that it has vested to list this species as endangered under the California Endangered Species Act. We must ensure that future Californians have the ability to enjoy this amazing species.

Sincerely,

Curtis Knight
Executive Director
California Trout

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