

FGC – 670.1 (3/94)

**A PETITION TO THE STATE OF CALIFORNIA FISH AND GAME
COMMISSION**

For action pursuant to Section 670.1, Title 14, California Code of Regulations (CCR) and Sections 2071 and 2073 of the Fish and Game Code relating to listing and delisting endangered and threatened species of animals and plants.

I. SPECIES BEING PETITIONED:

Common Name: Northern California Summer Steelhead

Scientific Name: *Oncorhynchus mykiss irideus*

II. RECOMMENDED ACTION:

(Check appropriate categories)

a. List

b. Change Status

As endangered

From _____

As threatened _____

To _____

c. Or Delist

III. AUTHOR OF PETITION

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I hereby certify that, to the best of my knowledge, all statements made in this petition are true and complete.

Signature:



Date: September 27, 2018



FRIENDS OF THE EEL RIVER

Working for the recovery of our Wild & Scenic River, its fisheries and communities.

Friday, September 28, 2018

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

Dear Commissioners,

This is a petition to list Northern California summer steelhead under the California Endangered Species Act, (CESA, FGC § 2050 et seq.), as an endangered species.

Under CESA, “Endangered species” means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease. (F&GC § 2062)

Northern California summer steelhead (NC summer steelhead) are a native subspecies of fish in serious danger of becoming extinct throughout all of its range due to causes including loss of habitat and change in habitat.

These extraordinary fish are superlative in many ways. They include the largest adult steelhead, as well as fish capable of handling the highest water velocities and of jumping the highest barriers of any salmonids. NC summer steelhead include the southernmost summer steelhead. They are able to tolerate water temperatures higher than any other anadromous salmonids.

In their recent comprehensive review of the status and threats to salmonids in California, Moyle et al assessed the status of NC summer steelhead as being of Critical Concern, with a Status Score of 1.9 out of 5.0:

Northern California (NC) summer steelhead are in long-term decline and this trend will continue without substantial human intervention on a broad scale. Due to their reliance on cold water to over summer during the warmest months in freshwater and critical susceptibility to climate change, NC summer steelhead are vulnerable to extinction by 2050. (p. 276.)

Recent genetic research has demonstrated that a specific mutation gave rise to early-migrating life histories in both steelhead and chinook. These extremely rare evolutionary events are conserved in populations of summer steelhead and spring-run Chinook salmon today. However, if those premature-migrating populations are lost, the genetic diversity that makes the life history possible will itself be lost.

In its capacity as steward of the public trust in California’s fish and wildlife heritage, the Fish and Game Commission should recognize and protect NC summer steelhead under CESA. We encourage the Commission to work with the Department of Fish and Wildlife to

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further focus future conservation actions on NC summer steelhead, and to secure the resources necessary to protect these fish while we still have them.

In the following, the bracketed letters refer to the list of scientific information required of a petition to the Commission under 14 CCR § 670.1(d)(1).

(A) population trend and (D) abundance;

As noted, Moyle et al assess NC summer steelhead populations as being in long-term decline. They note that “Little historical abundance information exists for naturally spawning populations of NC summer steelhead, but current abundance of this species is likely much less than historical estimates.” (p. 277)

The species persists in only a handful of watersheds. In only a few of those do we have evidence of even a hundred fish in a year. Moyle et al estimate that there are likely “fewer than 1,000 adults across the DPS in a given year.” (p. 287)

In its most recent status review for the NC steelhead DPS, NMFS concluded that while winter-run steelhead populations are relatively healthy, and the DPS as a whole does not appear, in the agency’s opinion, to face an increased risk of extinction, “(s)ummer-run populations continue to be of significant concern. While one run is near the viability target, others are very small or there is a lack of data.” (NMFS 2016 Five Year Status Review, p. 41)

The one population “near the viability target” is the Middle Fork of the Eel River. It is also in long-term decline.

The Middle Fork Eel also had summer steelhead arriving as early as April 20th in some years and supported good numbers of fish (DFG 1959). It was once home to what was considered the largest run of summer steelhead left in the basin (DFG 1999). CDFW has conducted snorkel and electrofishing surveys on the Middle Fork since 1966, with survey data showing a downward trend in abundance and relatively low fluctuating numbers of fish over the last five decades (Figure 4). (Moyle p. 279)

NMFS note that “...the Van Duzen River appears to be supporting a population numbering in the low hundreds. However, the Redwood Creek and Mattole River populations appear small, and little is known about other populations including the Mad River and other tributaries of the Eel River (*i.e.*, Larabee Creek, North Fork Eel, and South Fork Eel). (NMFS 2016 Five Year Status Review p 41) Moyle et al present survey data from the Mad River that suggests that watershed could support several hundred fish. However, Moyle et al point out that “NOAA Fisheries forecast that NC summer steelhead populations in the Redwood Creek, Van Duzen River, North and South Fork Eel, and Mattole are all highly susceptible to climate change impacts in the near future.”

It may be possible to restore an additional population of NC summer steelhead to the Upper Mainstem Eel River, but only by restoring fish passage that has been blocked for a century by Scott Dam. NMFS’ MSRP states: “The Upper Mainstem Eel River steelhead population was once the longest-migrating population in the entire DPS. Restoring access to historical habitat above Scott Dam is essential to recovering this population.” (p. 466)

(B) range and (L) a detailed distribution map;

NOAA Fisheries (NMFS), in their 2016 Coastal Multispecies Recovery Plan (MSRP), outline the range of NC summer steelhead in Volume III. Figure 2 on p. 4 of that volume is reproduced below; it displays the NC summer steelhead range. It includes the larger coastal watersheds from Redwood Creek south to the Mattole River, including the Mad River and various tributaries of the Eel River. Please note that the MSRP includes highly detailed maps of all Northern California summer steelhead watersheds. We hereby incorporate those materials and the remainder of the MSRP by reference into this petition.

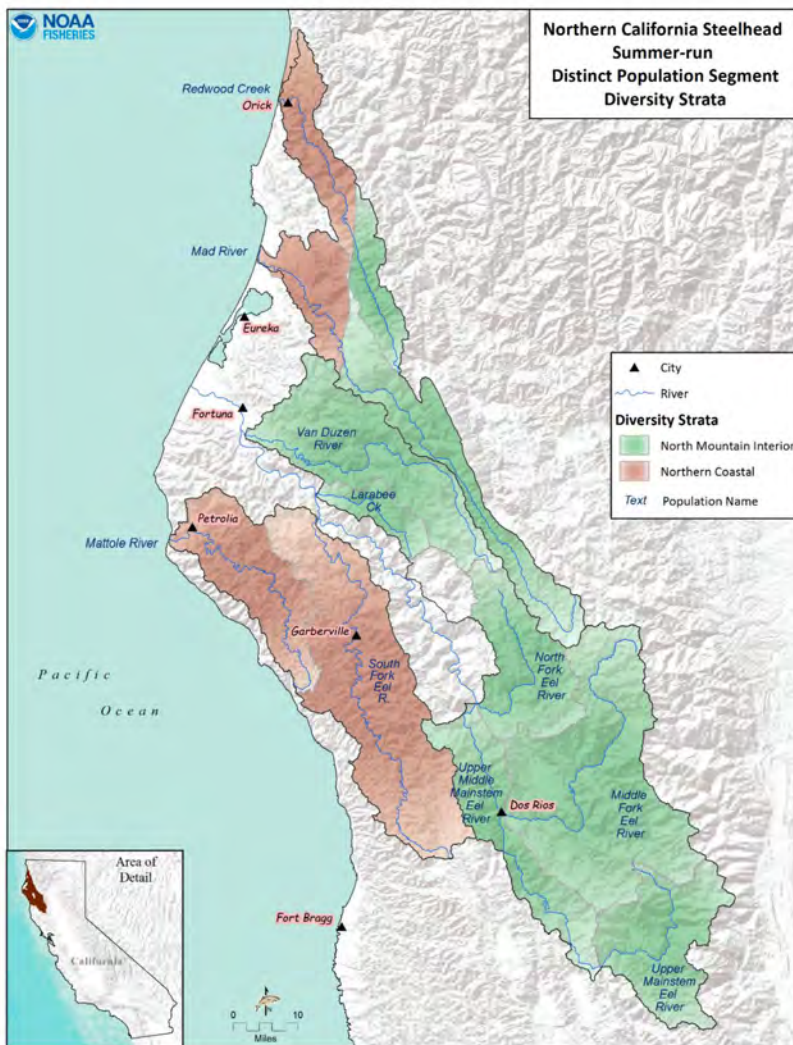


Figure 2: NC Steelhead Summer-Run Populations and Diversity Strata boundaries.

However, this classification leaves another group of native California summer steelhead, the Klamath Mountain Province summer steelhead, outside the boundaries of the populations proposed here for protection under CESA. While Klamath Mountain Province summer steelhead populations are not as low as Northern California summer steelhead

populations, Moyle et al assign the population precisely the same Status Score, 1.9 out of 5.0, as they do the Northern California summer steelhead. They note that “Klamath Mountain Province (KMP) summer steelhead are in a state of long-term decline in the basin. These stream-maturing fish face a high likelihood of extinction in California in the next fifty years.”

Thus, KMP summer steelhead, like Northern California summer steelhead, are “in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease,” and thus can and should be designated and protected as an endangered species under the California Endangered Species Act. (F&GC § 2062)

This presents the Commission and the Department with the question whether to protect only Northern California summer steelhead at this time, or to protect all summer steelhead in California together. We encourage the Department and the Commission to carefully consider all the relevant factors facing both KMP and Northern California summer steelhead in reaching a decision. It is clear that the scientific evidence would support a listing of “endangered” under CESA for either or both stocks.

(C) distribution;

NC summer steelhead are far from uniformly distributed even in their limited range.

NMFS’ 2016 MSRP lays out recovery objectives for the existing NC steelhead DPS:

Ten independent summer-run steelhead populations expected to meet effective population size criteria ... (i.e., Redwood Creek, Mad River, South Fork Eel River, Mattole River, Van Duzen River, Larabee Creek, North Fork Eel River, Upper Middle Mainstem Eel River, Middle Fork Eel River, and Upper Mainstem Eel River). (p. 2)

But only a few of watersheds have recent evidence of more than a dozen adult summer steelhead. The Middle Fork Eel, Van Duzen, and Mattole populations make this list; the Mad River probably does. The North Fork Eel and Upper Mainstem Eel almost certainly don’t have NC summer steelhead at all. The Upper Mainstem Eel might provide habitat for an additional vitally important population if access to the habitat above Scott Dam could be restored to Northern California summer steelhead. Of course, with very low numbers of fish in a given watershed, it becomes increasingly difficult for the remaining fish to spawn successfully.

(E) life history;

Moyle et al summarize the NC summer steelhead’s unique life history as follows:

Summer steelhead are stream-maturing ecotype fish that enter freshwater with undeveloped gonads, and then mature over several months in freshwater. This life history is uncommon compared to ocean-maturing or winter-run fish. These steelhead oversummer in typically deep, bedrock holding pools and remote canyon reaches of streams with some overhead cover and subsurface flow to keep cool until higher flows arrive in winter (Busby et al. 1996).

NC summer steelhead enter estuaries and rivers as immature fish between April and June in the northern portion of the DPS (Redwood National Park 2001). In the Mad River, summer steelhead enter the mouth in early April through July as flows allow (M. Sparkman, CDFW, pers. comm. 2016). Mattole summer steelhead enter the river between March and June (Mattole Salmon Group 2016), and further migrations upstream occur from June on, but timing depends upon rainfall and consequent suitable stream discharge for passage into upper sections of watersheds. Spawning happens primarily in the winter between December and early April in headwater reaches of streams not utilized by winter steelhead (Roelofs 1983, Busby et al. 1997), though favorably wet conditions may lengthen the spawning period into May. Infrequent observations of steelhead spawning in June have also been reported on the Mattole River (Mattole Salmon Group 2016).

The Northern California summer steelhead life history has important consequences for their conservation. As Moyle et al describe, NC summer steelhead are by definition unusual for the steelhead taxon. They occupy headwaters habitats right at the margin of salmonid tolerance in a range at the edge of salmonid tolerances. NC summer steelhead specialize in exploiting relatively limited dry-season holding habitats in order to make greater use of spawning and rearing habitats higher up in watersheds than winter-run steelhead. They play important ecological roles in areas no other anadromous salmonid reach. The summer steelhead life history makes these strategic choices to gain access to spawning habitats where it will not compete with winter run steelhead.

Northern California summer steelhead are inherently more subject to predation and disease in freshwater than their winter run counterparts. As adults and as juveniles, NC summer steelhead spend more time in freshwater. Both adults and juveniles face the poor water conditions, including low flow, high temperature, and high pollution levels, that summer and fall bring to the rivers they inhabit, limiting the mobility of over-summering fish within a watershed. Very low population numbers are especially vulnerable to predation impacts. Introduced pikeminnow are a major anthropogenic burden on juvenile steelhead, including summer steelhead, throughout much of the Eel River watershed. However, summer steelhead can easily pass barriers pikeminnow cannot, so they may be less subject to predation around spawning areas than winter run steelhead.

The NC summer steelhead life history also makes it more vulnerable to the impacts of climate change than winter run steelhead. NMFS acknowledges those stark differences in Appendix B of the MSRP, which analyzes the effects of climate change on Chinook salmon and steelhead recovery:

We did consider summer-run steelhead in the NC steelhead DPS somewhat separately. Because juvenile summer run steelhead emerge from redds in the winter, and then usually rear in streams for 1-3 years, they share similar vulnerabilities to climate change as juvenile winter-run steelhead (although in some cases they may be more susceptible to redd scour). However, because summer-run adults enter streams in late spring/early summer, and hold in mainstems until early fall to spawn, summer-run steelhead adults are likely more vulnerable to climate change impacts than winter-run adults in most (if not nearly all) cases. (NMFS 2016, Appendix B, pg. 19).

Finally, and critically, a recent paper has demonstrated that the premature migration observed in both summer steelhead and spring Chinook arises from a mutation at a specific area in the salmonid genome. (Prince et al 2017) The Prince et al analysis is critically relevant to the question of Northern California summer steelhead conservation policy for at least two reasons. It shows that summer steelhead are genetically distinct in profound ways from winter steelhead in the same watersheds.

As well, it shows that the assumption underlying the current combined listing of winter and summer steelhead as DPS under the federal Endangered Species Act – that if lost, summer steelhead can re-emerge from winter steelhead populations – is without foundation. Rather, the study shows that a unique evolutionary event was the cause for the spatial and temporal reproductive isolation that summer and winter-run steelhead exhibit in the coastal rivers of Northern California. Because summer steelhead arose from a unique evolutionary event, they are unlikely to re-evolve over ecological time scales. (Prince et al 2017).

This new genetic explanation adds to the existing evidence that NC summer steelhead are different from winter run steelhead in a number of ways that merit the close attention of the Commission in determining what level of protection Northern California summer steelhead should receive. Moyle et al explain that:

the two runs are distinctive in their genetic makeup, behavior, and reproductive biology... Genetic analyses support two discrete, separate monophyletic units of migrating populations based primarily on timing of freshwater entry and resulting maturation (Papa et al. 2007), correlating with run timing for the ocean-maturing (winter) and stream-maturing (summer, fall) ecotypes (Prince et al. 2015). (Moyle 2017, pp. 270-71)

(F) kind of habitat necessary for survival;

Moyle et al summarize NC summer steelhead habitat requirements by life stage, p. 273:

Steelhead require distinct habitats for each stage of life. The abundance of summer steelhead in a particular location is influenced by the quantity and quality of suitable coldwater habitat during low flow summer and fall months, food availability, and interactions with other species. Over-summering habitat for adult summer steelhead is critical for survival of this life history. In general, suitable habitats are often distributed farther inland than those for winter steelhead in the same watersheds (Moyle 2002).

Adult steelhead have a body form adapted for holding in faster water than most other salmonids with which they co-occur can tolerate. Within California, Bajjaliya et al. (2014) found important differences in steelhead morphology based on flow regimes and habitats occupied. Northern California steelhead had the largest individuals, on average, than populations of steelhead from elsewhere in the state. In general, coastal steelhead that occupied smaller, slower coastal rivers were deeper bodied, longer, and more robust than steelhead from larger inland rivers with higher velocities. Low flows associated with more inland rivers and tributaries do not facilitate passage of larger bodied adults, and therefore select for smaller, more streamlined fish. Adult summer

steelhead require water depths of at least 18 cm for passage (Bjorn and Reiser 1991), however, this may not take into account the deep-bodied, robust physiology of coastal steelhead in the NC steelhead DPS, which would require slightly more flow to allow passage (Bajjaliya et al. 2014). Reiser and Peacock (1985 in Spence et al. 1996) reported the maximum leaping ability of adult steelhead to be 3.4 m. Hawkins and Quinn (1996) found that the critical swimming velocity for juvenile steelhead was 7.7 body lengths/sec compared to juvenile cutthroat trout that moved between 5.6 and 6.7 body lengths/sec. Adult steelhead swimming ability is hindered at water velocities above 3 m/sec (Reiser and Bjornn 1979). Preferred holding velocities are much slower, and range from 0.19 m/sec for juveniles and 0.28 m/sec for adults (Moyle and Baltz 1985). Physical structures such as boulders, large woody debris, and undercut banks create hydraulic heterogeneity that increases availability of preferred habitat in the form of cover from predators, visual separation of juvenile territories, and refuge during high flows.

Steelhead require cool water and holding habitat to withstand the higher temperatures and lower flows of summer and fall while they mature. Important factors influencing summer steelhead habitat use are pool size, low substrate embeddedness (< 35%), presence of riparian habitat shading, and instream cover associated with increased velocity through the occupied pools (Nakamoto 1994, Baigun 2003). Temperatures of 23-24°C can be lethal for the adults (Moyle 2002), which can limit abundance and spatial distribution. Subsurface, or hyporheic, flows can be important to providing cool, flowing water in habitats separated by thermal or other barriers. In August 2015 on the upper Middle Fork Eel River, adult summer steelhead were observed in pools of varying depth, but only with maximum temperatures of less than 23°C.

For spawning, adult steelhead require loose gravels at pool tails for optimal conditions for redd construction. Redds are usually built in water depths of 0.1 to 1.5 m where velocities are between 0.2 and 1.6 m/sec. Steelhead use a smaller substrate size than most other coastal California salmonids (0.6 to 12.7 cm diameter). Spawning habitat for summer steelhead can be variable, but their temporal and spatial isolation from other steelhead runs maintain low levels of genetic differentiation from winter steelhead in the same watershed (Barnhart 1986, Papa 2007, Prince et al. 2015). Summer steelhead can spawn in intermittent streams, from which the juveniles emigrate into perennial streams soon after hatching (Everest 1973). Roelofs (1983) suggested that use of small streams for spawning may reduce egg and juvenile mortality because embryos may be less susceptible to scouring by high flows and predation on juveniles by adults.

After spawning, adult steelhead, called “kelts” at this life stage, are capable of rapidly making their way back out to sea; the entire migration and spawning cycle of an adult fish can be completed in less than ten days (J. Fuller, NMFS, pers. comm. 2016). In contrast, in Redwood Creek, relatively large numbers of kelts migrate downstream through the lower watershed in March (M. Sparkman, CDFW, pers. comm. 2016). Due to the relatively short distances these fish must travel in small coastal watersheds to

spawn, their survival rates and incidence of repeat spawning are higher than steelhead in the much larger Eel River, which reach dozens of kilometers inland.

Embryos incubate for 18 to 80 days, depending on water temperatures, which are optimal in the range of 5 to 13° C. Hatchery steelhead take 30 days to hatch at 11°C (Leitritz and Lewis, 1980 in McEwan and Jackson, 1996), and emergence from the gravel occurs after two to six weeks (Moyle 2002; McEwan and Jackson 1996). High levels of sedimentation (> 5% sand and silt) can reduce redd survival and emergence due to decreased permeability of the substrate and dissolved oxygen concentrations available for the incubating eggs (McEwan and Jackson 1996). When fine sediments (< 2.0 mm) compose > 26% of the total volume of substrate, poor embryo survival is observed (Barnhart 1986). Emerging fry can survive at a greater range of temperatures than embryos, but they have difficulty obtaining oxygen from the water at temperatures above 21.1°C (McEwan and Jackson 1996).

During the first couple years of freshwater residence, steelhead fry and parr require cool, clear, fast-flowing water (Moyle 2002). Exposure to higher temperatures increases the energetic costs of living for steelhead and can lead to reduced growth and increased mortality. As temperatures become stressful, juvenile steelhead will move into faster riffles to feed on more abundant prey (Moyle 2002 and bioenergetic box in SONCC coho account) and seek out cool- water refuges associated with cold-water tributary confluences and gravel seeps. In Redwood Creek, young-of-year (YOY) steelhead may travel 46 km downstream during summer months in search of rearing areas (M. Sparkman, CDFW, pers. comm. 2016). In the Mattole River, juvenile steelhead are found over-summering throughout the basin, although water temperatures often restrict their presence in the estuary. Cool water areas, including some restoration sites, provide refuge from temperatures that can rise above 19°C in the Mattole (Mattole Salmon Group 2005). However, juvenile steelhead can live in streams that regularly exceed 24°C for a few hours each day with high food availability and temperatures that drop to more favorable levels at night (Moyle 2002, M. Sparkman, CDFW, pers. comm. 2016).

Many of these habitats are vulnerable to a range of anthropogenic impacts. Such impacts have seriously degraded the capacity of the NC summer steelhead range to support the population over the last century and a half. This historic and continuing degradation of habitat is why many of the watersheds that did once support significant populations of Northern California summer steelhead now have only a few, or no, returning adults.

Moyle et al summarize 15 major anthropogenic factors limiting viability of Northern California summer steelhead populations, and rated them on their potential to impact the species. Three factors were ranked as “High,” meaning they could push a species to extinction in 10 generations or 50 years: Major dams, on the Eel and Mad Rivers¹; agriculture, including impacts from conventional agriculture in lower watersheds and diversions and pollution associated with unpermitted marijuana cultivation; and estuarine

¹ Note that NMFS disputes Moyle et al’s characterization of the impact of Ruth Dam on potential NC summer steelhead habitat in the Mad River.

alteration, again especially in the Eel and the Mad Rivers. (p. 285) An additional five factors were ranked as “Medium,” i.e., unlikely to drive a species to extinction by itself but contributing to increased extinction risk; they include grazing, rural/ residential development, transportation, logging, and hatcheries.

To these already severe threats, we now must add the very significant impacts of climate change on Northern California summer steelhead and the key habitats the species requires. Moyle et al emphasize the severity of these threats at pages 286-87:

Climate change is a major threat to the continued persistence of NC summer steelhead. In general, climate change will impact the freshwater habitat of steelhead in several important ways:

- 1. Increased runoff and flooding, scouring redds*
- 2. Higher stream temperatures reducing habitat quality and survival*
- 3. Lower stream flows reducing habitat quantity and accessibility*
- 4. Earlier spring snowmelt reducing juvenile outmigration success*
- 5. Altered ocean circulation and productivity reducing sub-adult growth and survival in the marine environment (decrease in smolt to adult survival)*
- 6. Higher stream temperatures and flows creating thermal and velocity migration barriers to juveniles and adults in both marine and freshwater*
- 7. Increased frequency and intensity of catastrophic wildfires, threatening salmonid survival with attendant erosion, mass wasting, etc.*
- 8. Altered woody debris availability and characteristics reducing holding areas for juvenile salmonids*
- 9. Higher temperatures shifting range of suitable habitat northward in ocean and freshwater habitats*
- 10. Increased eutrophication of estuaries that serve as important nurseries and foraging habitat for juvenile and sub-adult salmonids*

To summarize the recent NMFS findings on climate-related impacts to NC steelhead, the primary concerns focus on altered streamflows and warmer temperatures, which reduce survival and passage through reductions in suitable holding, spawning, and rearing habitat. These impacts can reduce life history diversity, further stressing low populations of summer steelhead (NMFS 2016). NMFS considered summer-run steelhead in the DPS separately from winter-run fish, due to their increased susceptibility to redd scour due to timing of spawning and necessary holding in mainstem rivers during the warmest months of the year (NMFS 2016). Summer steelhead were found to be more vulnerable to these impacts than winter fish in “most (if not nearly all) cases” (NMFS 2016, Appendix B, pg. 21). Using a threat vulnerability analysis, NOAA Fisheries forecast that NC summer steelhead populations in the Redwood Creek, Van Duzen River, North and South Fork Eel, and Mattole are all highly susceptible to climate change impacts in the near future (NMFS 2016). These impacts

are already being seen throughout the DPS range, and are limiting suitable upper watershed habitat for summer steelhead. Persistence of these populations is likely only with increased protection and restoration to improve stream flows, allow accessibility to prime holding and spawning habitat, and maintain cool temperatures in headwater tributaries for both spring Chinook salmon and summer steelhead.

Modeling of high greenhouse gas emissions scenarios have forecast increasing frequency and duration of critical drought, which exacerbates and compounds these impacts by reducing overall streamflow and increasing the variability in timing of precipitation events in California (NMFS 2016). As a result, Northern California summer steelhead may experience local extinctions and range contractions since higher gradient or elevation headwater streams are inaccessible behind falls, boulder fields, or dams in the DPS. Ongoing drought in California has likely contributed to a dip in populations of summer steelhead in the DPS, as lower flows and warmer summer water temperatures likely caused increased mortality before spawning. Persistent drought is likely to exacerbate already acute problems associated with depletion of summer baseflows, reduction of coldwater refugia, or even stream dewatering during the late summer and early fall months by reducing spawning, rearing, and migration habitat. More frequent and severe droughts are likely to contribute to higher occurrences of low summer baseflows that fuel toxic cyanobacteria blooms and degrade food webs that oversummering adult steelhead and juveniles depend on (Power et al. 2015). If summer temperatures increase during summer and early fall month and precipitation and prevalence of fog decrease, as has been observed in Northern California over the last fifty years, stream temperatures will rise and further stress summer-rearing salmonids and summer steelhead holding in pools (Madej 2011).

Drought and poor ocean conditions tied to climate change and El Nino conditions likely caused some decline in salmonid populations across the state by reducing coldwater upwelling and food availability (Daly et al. 2013, Williams et al. 2016). Changes in precipitation patterns could lead to flooding, contributing sediments from highly erodible terrain that smothers valuable gravel and fills in pool habitat. As populations continue to decline and become more fragmented, stochastic events such as increased catastrophic fire may change genetic structure, breeding, and population dynamics in ways that are unrecoverable.

Northern California summer steelhead are fantastically well-adapted to specific habitats that the coastal watersheds of Northern California have generally provided for millenia. Human activity has disrupted most of this habitat, even in the relatively undeveloped mountains of northwestern California. Anthropogenic climate change renders more habitat inhospitable. The combination of these impacts threatens Northern California summer steelhead with extinction in the near future.

(G) factors affecting the ability to survive and reproduce;

To a great extent, the critical factors affecting the ability of Northern California summer steelhead to survive and reproduce are the habitat issues discussed in section (F) immediately above. For adults, cool water and holding habitat; for reproduction, spawning

and rearing habitat are all essential to maintaining and recovering NC summer steelhead populations. Of course, as anadromous fish, the questions of ocean conditions present another complex of factors that will affect survival and successful reproduction.

(H) degree and immediacy of threat;

As noted, Moyle et al assess the status of Northern California summer steelhead as Critical, reflecting further decline from a 2008 review that found the species already at a High level of risk:

NC summer steelhead have a high risk of extinction in the next 50 years without significant restoration and intervention. ... This status could deteriorate rapidly if restoration and protection efforts are not put into effect. (Moyle 2017, pp. 287)

With only a relative few, relatively small populations remaining, NC summer steelhead are subject to rapid, likely irrecoverable loss from stochastic events or human action.

(I) impact of existing management efforts;

Despite the clear threats to NC summer steelhead, they are not listed under the California Endangered Species Act. Moyle et al explicitly argue that they should be so listed:

NC summer steelhead currently have no special conservation status within the state of California, but should be officially recognized as threatened under the California Endangered Species Act by the Fish and Game Commission or at least declared a state Species of Special Concern. (Moyle 2017, pp. 287)

The absence of state protections for NC summer steelhead reduces the ability of DFW to prioritize reducing impacts on key populations and promoting and coordinating actions necessary to recover the species.

Many state and federal agency efforts are devoted to protecting Northern California summer steelhead and NC steelhead generally. However, as Moyle et al summarize, existing state and federal programs have so far proved inadequate to protect Northern California summer steelhead and its habitat:

Northern California summer steelhead are trending downward over time, and require significant action to recover from legacy impacts of road building, logging, forest fires, poor water quality, and disjointed land use throughout their range. Increasing rural development and illegal diversions and withdrawals for illegal marijuana cultivation throughout the DPS range, coupled with five years of ongoing historic drought, have significantly stressed summer steelhead populations and have driven their decline. Other threats across diversity strata include dearth of large woody debris and cover for rearing fish, abundance of roads and railroads adjacent to sensitive watersheds and associated sedimentation/erosion, illegal diversion and degradation, presence of barriers to migration, and lack of sufficient high quality spawning and rearing habitat due to uncoordinated land use practices (NMFS 2016).

To ameliorate these threats, the NMFS Coastal Multispecies Recovery Plan for the NC steelhead DPS lays out a full suite of necessary recovery actions and essential partners (NMFS 2016). CDFW is currently revising a steelhead restoration and management

plan, which will help compile threats and identify specific actions to restore and manage steelhead in California (Nelson 2016). However, lack of coordination and prioritization of specific actions to protect summer-run life history steelhead in California represents a major challenge. Although designation of ESUs and DPSs are based upon distinctiveness of life-history traits and distinguishing genetic characteristics, such distinctions are not guiding conservation of steelhead life history diversity at the watershed scale, which is essential for maintaining populations of summer steelhead in the future.

As Moyle et al highlight in the above excerpt, the designation of Northern California summer steelhead as part of a NC steelhead DPS dominated by winter run steelhead has itself become an obstacle to effective conservation of Northern California summer steelhead. In view of the best available scientific information, this framework appears not only inadequate to insure the recovery of NC summer steelhead, but likely to lead to the extinction of summer steelhead in the region.

In its most recent status review for the NC steelhead DPS, NMFS concluded that while winter-run steelhead populations are relatively healthy, and the DPS as a whole does not appear, in the agency's opinion, to face an increased risk of extinction, "(s)ummer-run populations continue to be of significant concern. While one run is near the viability target, others are very small or there is a lack of data." (NMFS 2016 Five Year Status Review p. 41) Indeed, as Prince et al note, "despite the extirpation or substantial decline of premature migrating populations, the ESUs or DPSs to which they belong usually retain relatively healthy mature migrating populations and thus have low extinction risk overall." (p. 2)

As Prince et al imply, summer steelhead face extinction in part due to an error of classification that improved genetic analysis now allows us to correct. A conservation strategy that fails to effectively conserve summer steelhead – as the current strategy of considering them part of a larger DPS of *O. mykiss* dominated by winter-run steelhead in the same watersheds is failing – is likely actually to lead to the extinction of these unique forms of summer steelhead.

Northern California summer steelhead should be listed and protected under CESA separately from NC winter steelhead.

(J) suggestions for future management;

As Moyle et al note in the excerpt cited under (I) above, both NMFS and DFW have prepared or are in the process of preparing extensive and detailed prescriptions for management actions necessary to protect Northern California summer steelhead and its various habitats. Those menus of potential actions do little in the absence of the institutional resources and political will to actually undertake a comprehensive effort. As Moyle et al emphasize, "lack of coordination and prioritization of specific actions to protect summer-run life history steelhead in California represents a major challenge."

The most significant step the Commission can take to increase the prioritization and effective coordination of actions necessary to protect Northern California summer steelhead is to list the species as endangered under CESA.

(K) availability and sources of information

Of course, the California Department of Fish and Wildlife is the expert agency with responsibility for Northern California summer steelhead. DFW generated much of the information that is the subject of the studies and analyses discussed here.

The sources cited in this petition are likely to prove critical sources of information about Northern California summer steelhead, their habitat, threats to the species, and the best available science concerning the species and their conservation.

These include the comprehensive overview of salmonids in California, *State of the Salmonids: Status of California's Emblematic Fishes 2017*, which we have referred to as Moyle et al 2017. As well, NMFS has prepared status reviews for NC steelhead every five years since the DPS was listed as threatened. The MRPS noted above is essential. Finally, two papers, Prince et al 2017 and Thompson et al 2018, provide important perspective on the genetic basis of premature migration in salmonids and the need to protecting the genetic and behavioral diversity Northern California summer steelhead embody.

CESA Listing Factors

CESA commands that “(a) species shall be listed as endangered or threatened, as defined in sections 2062 and 2067 of the Fish and Game Code, if the Commission determines that its continued existence is in serious danger or is threatened by any one or any combination of the following factors.” CEQA specifically commands the Commission to consider five types of impacts on the species in deciding whether to list a species under CESA.

1. Present or threatened modification or destruction of its habitat

As noted above, habitat modification, destruction, and degradation from a range of human impacts is the key driver of Northern California summer steelhead decline across its range. Climate change is now amplifying the impacts of other anthropogenic factors, and threatens to render much of Northern California summer steelhead habitat unsuitable for the species in the relatively near future.

2. Overexploitation

Overfishing, both commercial and recreational, played important roles in the dramatic reduction of Northern California summer steelhead populations during the 20th Century, but there is little evidence that it is now a significant threat to Northern California summer steelhead. There are some continuing impacts associated with the recreational fishery, especially during the recent historic drought.

However, poaching remains a significant threat to Northern California summer steelhead today. The NMFS MSRP states:

The problem with poaching continues to plague summer steelhead due to the absence of adequate law enforcement (Moyle et al. 2008). Although fishing is prohibited in many areas and fines for violations are high, protection of summer steelhead populations requires special enforcement efforts (Moyle et al. 2008). p. 10

3. Predation

As noted above, the Northern California summer steelhead life history renders the species significantly more vulnerable to predation than winter run steelhead as both juveniles and as adults. With very small populations in some NC summer steelhead watersheds, there is an increased risk that predation could eliminate spawning opportunities.

The introduction of pikeminnow to Northern California summer steelhead habitat in the Eel River watershed has significantly increased the impact of predation on Northern California summer steelhead. While pikeminnow are native to California, and even to the Russian River immediately to the south, they are not native to the Eel River. NMFS acknowledge the threat in the most recent status review for Northern California summer steelhead: “Introduced Sacramento pikeminnow is a serious predator limiting salmonid recovery (Yoshiyama and Moyle, 2010). Their populations have flourished with warmer water conditions, and they consume juvenile salmonids throughout the Eel River Basin.” (NMFS 2016, p. 35.)

4. Competition

It is not clear that competition is a significant factor driving the decline of Northern California summer steelhead.

5. Disease

As noted above, both the Northern California summer steelhead life history and climate-change related impacts expose Northern California summer steelhead to additional disease threats beyond those faced by winter run steelhead. Disease threats can emerge very rapidly, confounding response efforts that have not been carefully pre-planned.

6. Other natural occurrences or human-related activities

As noted above, climate change presents an overarching and severe threat to Northern California summer steelhead across its remaining range.

As well, it is worth emphasizing that 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).” (MSRP p. 98) Cooper estimated more than two hundred miles of potential NC steelhead spawning and rearing habitat in the Upper Mainstem Eel River basin above the dam. (Cooper 2017) If passage past Scott Dam is not provided, it will not be even theoretically possible to achieve the recovery goals set by NMFS for Northern California summer steelhead recovery in its MSRP.

Conclusion

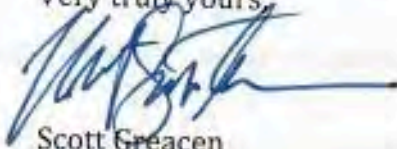
In summary, Northern California summer steelhead are a unique and extraordinary form of steelhead, whose exquisite adaptation to their extreme environmental niches is determined by a critical and highly specific genetic difference from winter run steelhead. Northern California summer steelhead are not being effectively conserved by being managed as part of a larger population of more numerous and less vulnerable winter run steelhead. In fact, Northern California summer steelhead face imminent extirpation in

many of the watersheds where they still survive. If NC summer steelhead are lost, the genetic basis of their remarkable life history is likely to be lost as well.

Given these facts, protection under CESA is both warranted and necessary to ensure that California's future citizens may continue to enjoy these irreplaceable fish and the contribution they make to our magnificent Northern California ecosystems.

Thank you for your kind attention to these important questions.

Very truly yours,

A handwritten signature in blue ink, appearing to read "Scott Greacen", with a long horizontal flourish extending to the right.

Scott Greacen
Conservation Director
Friends of the Eel River

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