12. NORTHERN CALIFORNIA SUMMER STEELHEAD

Consider whether listing northern California summer steelhead (*Oncorhynchus mykiss irideus*) as threatened or endangered under the California Endangered Species Act (CESA) may be warranted.

Summary of Previous/Future Actions

• Received petition	Sep 28, 2018
• FGC staff transmitted petition to DFW	Oct 8, 2018
• Published notice of receipt of petition	Oct 26, 2018
• Public receipt of petition and approval of DFW's request for a 30-day extension	Dec 12-13, 2018; Oceanside
• Received DFW 90-day evaluation	Feb 6, 2019; Sacramento
• **Today determine if petitioned action may be warranted**	**Jun 12-13, 2019; Redding**

Background

In Sep 2018, FGC received a petition (Exhibit 1) from Friends of the Eel River to list California summer steelhead as endangered under CESA. The petition was formally received by the public at the Dec 2018 FGC meeting.

California Fish and Game Code Section 2073.5 requires that DFW evaluate the petition and submit to FGC a written evaluation with a recommendation, which was received at FGC's Feb 6, 2019 meeting (Exhibit 3). The report delineates each of the categories of information required for a petition, evaluates the sufficiency of the available scientific information for each of the required components, and incorporates additional relevant information that DFW possessed or received during the review period.

Based upon the information contained in the petition and other relevant information, DFW has determined that there is sufficient scientific information available to indicate that the petitioned action may be warranted (Exhibit 2).

Today's agenda item follows the public release and review period of the evaluation report, as required in Fish and Game Code Section 2074 prior to FGC action. If FGC determines listing may be warranted pursuant to Section 2074.2 of the Fish and Game Code, a one-year status review will commence before a final decision on listing is made.

CESA and FGC's listing regulations require that the petition contain specific scientific information related to the status of the species. CESA, and case law interpreting it, make clear that FGC must accept a petition when the petition contains sufficient information to lead a reasonable person to conclude that there is a substantial possibility the requested listing could occur; the requested listing is tied to the species' status, that is, whether the species' continued existence is in serious danger or is threatened by a number of factors, and in no way relates to economic consequences that might result from listing.

Significant Public Comments (N/A)

Recommendation

FGC staff: Determine that listing may be warranted.

DFW: Accept and consider the petition for further evaluation.

Exhibits

1. Petition, received on Sep 28, 2018
2. DFW memo, received Jan 24, 2019
3. DFW 90-day evaluation report, dated Jan 2019

Motion/Direction

Moved by _____ and seconded by _____ that the Commission, pursuant to Section 2074.2 of the Fish and Game Code, finds that the petition to list northern California summer steelhead as endangered species **does** provide sufficient information to indicate that the petitioned action **may be** warranted based on the information in the record before the Commission, and directs staff to issue a notice reflecting this finding and that northern California summer steelhead is a candidate for threatened or endangered species status.

OR

Moved by _____ and seconded by _____ that the Commission, pursuant to Section 2074.2 of the Fish and Game Code, finds that the petition to list northern California summer steelhead as an endangered species **does not** provide sufficient information to indicate that the petitioned action may be warranted based on the information in the record before the Commission.

From: Scott Greacen <scott@eelriver.org>
Sent: Friday, September 28, 2018 3:40 PM
To: FGC
Subject: Petition to list Northern California summer steelhead under CESA
Attachments: FOER NC summer steelhead CESA petition.pdf

Dear Ms Miller-Henson

I am submitting the enclosed petition by regular mail as well this afternoon.

Thank you for your work to protect California's natural heritage.

Scott Greacen
Conservation Director
Friends of the Eel River

scott@eelriver.org
707/502.4555 mobile

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 **X**

As endangered __X__

As threatened _____

b. Change Status

From _____

To _____

c. Or Delist

III. AUTHOR OF PETITION

Name: Scott Greacen

Address: POB 4945
Arcata, CA 95518

Phone Number: (707) 798-6345

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

HUMBOLDT OFFICE
foer@eelriver.org
PO Box 4945, Arcata, CA 95518 • 707.798.6345

NORTH BAY OFFICE
David Keller, dkeller@eelriver.org
1327 I Street, Petaluma, CA 94952 • 707.763.9336

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)mmer-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.

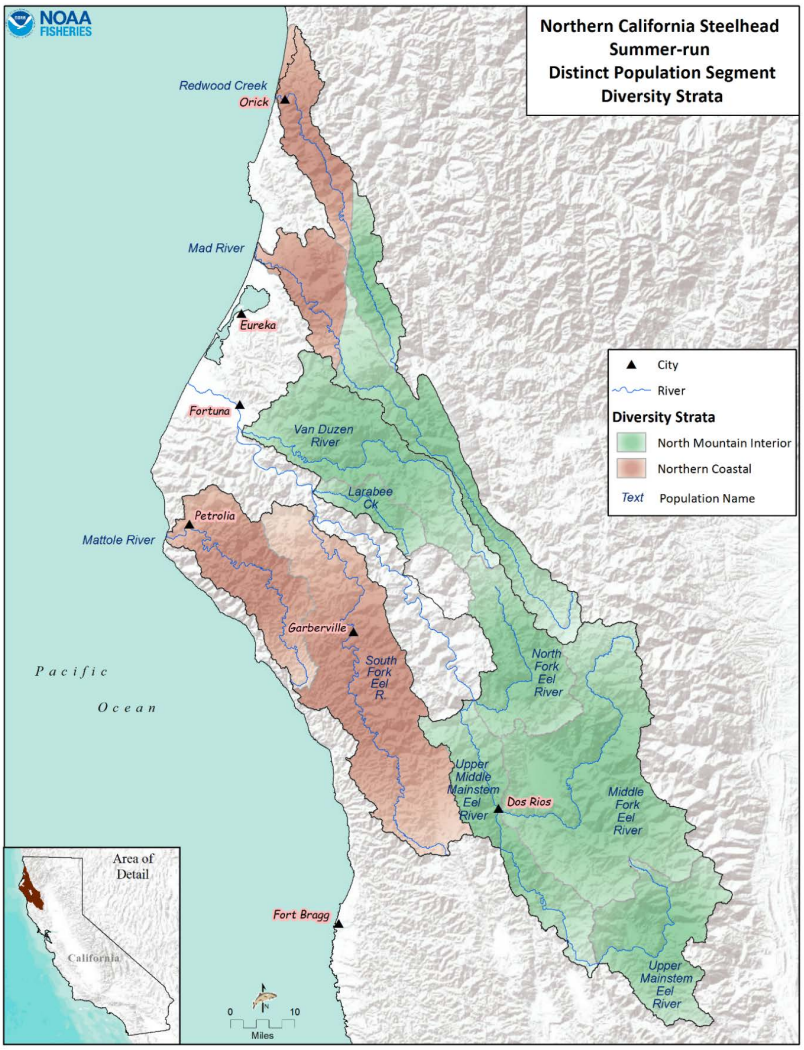

Figure 2: NC Steelhead Summer-Run Populations and Diversity Strata boundaries.

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 Rivers[1]; 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,

Scott Greacen
Conservation Director
Friends of the Eel River

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State of California
Department of Fish and Wildlife

Original on file. Received
January 24, 2019, 8:20 AM

Date: January 24, 2019

To: Melissa Miller-Henson
Acting Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: **Evaluation of the Petition to List Northern California summer steelhead (*Oncorhynchus Mykiss Irideus*) as Endangered under the California Endangered Species Act**

The California Department of Fish and Wildlife (Department) has completed its evaluation of the Petition to list Northern California summer steelhead as an endangered species (Petition) under the California Endangered Species Act, Fish and Game Code section 2050 et seq. The California Fish and Game Commission (Commission) received the Petition from the Friends of the Eel River on September 28, 2018. Pursuant to Fish and Game Code section 2073, the Commission referred the Petition to the Department on October 8, 2018. On November 5, 2018, in accordance with Fish and Game Code section 2073.5, subdivision (b), the Department requested a 30-day extension to further analyze the Petition and complete its evaluation report. The Commission approved this request, and the due date for the petition is February 5, 2019.

The Department completed the attached Petition evaluation report pursuant to Fish and Game Code section 2073.5. (See also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1).). The Department's evaluation report delineates the categories of information required in a petition and evaluates the sufficiency of the available scientific information regarding each of the Petition components. Based upon the information contained in the petition, the Department has determined that there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted. The Department recommends that the Petition be accepted and considered.

If you have any questions or need additional information, please contact Mr. Ryon Kurth, Senior Environmental Scientist (Supervisor), Fisheries Branch, at (916) 445-3181 or by email at Ryon.Kurth@wildlife.ca.gov or Mr. Kevin Shaffer, Branch Chief, Fisheries Branch, at (916) 327-8841 or by email at Kevin.Shaffer@wildlife.ca.gov.

Attachment

ec: California Department of Fish and Wildlife

Stafford Lehr, Deputy Director
Wildlife and Fisheries Division
Stafford.Lehr@wildlife.ca.gov

Chad Dibble, Deputy Director
Ecosystem Conservation Division
Chad.Dibble@wildlife.ca.gov

Wendy Bogdan, General Counsel
Office of the General Counsel
Wendy.Bogdan@wildlife.ca.gov

Tina Bartlett, Regional Manager
Northern Region
Tina.Bartlett@wildlife.ca.gov

Kevin Shaffer, Chief
Fisheries Branch
Kevin.Shaffer@wildlife.ca.gov

Rick Macedo, Chief
Habitat Conservation and Planning Branch
Richard.Macedo@wildlife.ca.gov

Lena Germinario
Office of the General Counsel
Lena.Germinario@wildlife.ca.gov

Michael Yaun, Attorney
Fish and Game Commission
Michael.Yaun@fgc.ca.gov

Tony LaBanca
Environmental Program Manager
Northern Region
Tony.LaBanca@wildlife.ca.gov

Jonathan Nelson
Environmental Program Manager
Fisheries Branch
Jonathan.Nelson@wildlife.ca.gov

Allan Renger
Senior Environmental Scientist, Supervisor
Klamath-Trinity Program, Northern Region
Allan.Renger@wildlife.ca.gov

Ryon Kurth
Senior Environmental Scientist, Supervisor
Fisheries Branch
Ryon.Kurth@wildlife.ca.gov

State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

EVALUATION OF THE PETITION FROM THE FRIENDS OF THE EEL RIVER TO LIST NORTHERN CALIFORNIA SUMMER STEELHEAD (*ONCORHYNCHUS MYKISS IRIDEUS*) AS ENDANGERED

Prepared by
California Department of Fish and Wildlife

JANUARY 2019

I. Executive Summary

The Friends of the Eel River (Petitioner) submitted a petition (Petition) to the California Fish and Game Commission (Commission) to list the Northern California summer steelhead (*Onchorhynchus mykiss irideus*) (NC summer steelhead) as endangered pursuant to the California Endangered Species Act (CESA), Fish and Game Code Section 2050 *et seq*.

The Commission referred the Petition to the California Department of Fish and Wildlife (Department) in accordance with Fish and Game Code Section 2073. (Cal. Reg. Notice Register 2017, No. 13-Z, 479.) Pursuant to Fish and Game Code Section 2073.5 and Section 670.1 of Title 14 of the California Code of Regulations, the Department has prepared this evaluation report for the Petition (Petition Evaluation). The Petition Evaluation is an evaluation of the scientific information discussed and cited in the Petition in relation to other relevant and available scientific information possessed by the Department during the evaluation period. The Department's recommendation as to whether to make NC summer steelhead a candidate for listing under CESA is based on an assessment of whether the scientific information in the Petition is sufficient under the criteria prescribed by CESA to consider listing NC summer steelhead as endangered.

After reviewing the Petition and other relevant information, the Department determined the following:

- Population Trend. The Petition contains sufficient information to indicate the overall trend for NC summer steelhead (which only occurs in California) is declining, with several populations believed to be extirpated.

- Range. The Petition contains a sufficient description of the NC summer steelhead range.

- Distribution. The Petition contains a sufficient description of the historical and recent distribution of NC summer steelhead populations, and demonstrates a reduction in their distribution due to dams and continued anthropogenic habitat degradation.

- Abundance. The Petition contains a sufficient description of what is known about historical and recent abundance of NC summer steelhead populations, indicating most populations appear to be depressed or extirpated.

- Life History. While the Petition only describes the life history characteristics of adult NC summer steelhead, it sufficiently describes the unique qualities of summer-run which render them particularly vulnerable to anthropogenic impacts and the anticipated effects of climate change.

- Kind of Habitat Necessary for Survival. The Petition contains a sufficient description of the types and conditions of habitats necessary for the survival of NC summer steelhead.

- Factors Affecting the Ability to Survive and Reproduce. The Petition contains sufficient information to suggest NC summer steelhead are adversely affected by historical habitat loss due to dams, continued anthropogenic habitat degradation, and the anticipated effects of climate change, that together threaten the species' continued survival.

- Degree and Immediacy of Threat. The Petition contains sufficient information to indicate threats to the long-term survival of NC summer steelhead will continue or potentially worsen in the future. If recent findings from Prince et al. (2017) are correct, NC summer steelhead result from a single, unique evolutionary event and it is unlikely they would re-evolve from the relatively more abundant NC winter steelhead population.

- Impacts of Existing Management. The Petition contains sufficient information to suggest that existing regulatory mechanisms and management efforts do not adequately protect NC summer steelhead from impacts that threaten their long-term survival.

- Suggestions for Future Management. The petition demonstrates there are known and developing management actions that could be beneficial to NC summer steelhead and may be implemented in the future, including NMFS's suggestion to restore access to historical habitat by removing Scott Dam, which currently blocks fish passage.

- Availability and Sources of Information. While the Petition primarily cites three citations, it contains a 30-page bibliography of available literature.

- A Detailed Distribution Map. The Petition contains a sufficiently detailed map of the historical distribution of NC summer steelhead.

The Petitioner is soliciting review for an endangered species determination of NC summer steelhead. The NC steelhead Distinct Population Segment (DPS), including NC summer steelhead is currently listed as threatened under the Federal Endangered Species Act (ESA) (65 FR 36074; 71 FR 834; 79 FR 20802). The listing includes only naturally spawned steelhead (anadromous form of *O. mykiss*) and their progeny residing below impassable barriers to migration for both summer and winter ecotypes. NMFS does not designate NC summer steelhead as a separate DPS largely because the genetic data NOAA considered in its review reinforced previous conclusions that, within a geographic area, summer and winter steelhead are more genetically similar to one another than either is to populations with similar run timing in different geographic areas (Busby et al. 1996).

However, new genetic evidence suggests that NC summer steelhead are profoundly different from NC winter steelhead and that, if lost, summer steelhead would not re-evolve from proximate winter steelhead populations. If correct, this interpretation of the genetic structure of the NC steelhead DPS could result in a new DPS determination for NC summer steelhead. The Department believes the petition may be warranted on the

basis that the summer steelhead life history ecotype is at low population abundance and has limited distribution within the Northern California DPS boundary.
The discussion below focuses on analyses of the scientific information provided in the Petition, as well as from scientific information the Department possesses, or has knowledge of, in regards to NC summer steelhead populations.
In completing its Petition Evaluation, the Department has determined the Petition provides sufficient scientific information to indicate that the petitioned action may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

II. Introduction

A. Candidacy Evaluation

CESA sets forth a two-step process for listing a species as threatened or endangered. First, the Commission determines whether to designate a species as a candidate for listing by determining whether the petition provides "sufficient information to indicate that the petitioned action may be warranted." (Fish & G. Code, § 2074.2, subd. (e)(2).) If the petition is accepted for consideration, the second step requires the Department to produce within 12 months of the Commission's acceptance of the petition a peer reviewed report based upon the best scientific information available that indicates whether the petitioned action is warranted. (Fish & G. Code, § 2074.6.) The Commission, based on that report and other information in the administrative record, then determines whether the petitioned action to list the species as threatened or endangered is warranted. (Fish & G. Code, § 2075.5.)

A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and other factors the petitioner deems relevant." (Fish & G. Code, § 2072.3; see also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1).) The range of a species for the Department's petition evaluation and recommendation is the species' California range. (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal. App. 4th 1535, 1551.)

Within 10 days of receipt of a petition, the Commission must refer the petition to the Department for evaluation. (Fish & G. Code, § 2073.) The Commission must also publish notice of receipt of the petition in the California Regulatory Notice Register. (Fish & G. Code, § 2073.3.) Within 90 days of receipt of the petition, the Department must evaluate the petition on its face and in relation to other relevant information and submit to the Commission a written evaluation report with one of the following recommendations:

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or

- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

(Fish & G. Code, § 2073.5, subds. (a)(1), (a)(2).) The Department's candidacy recommendation to the Commission is based on an evaluation of whether or not the petition provides sufficient scientific information relevant to the petition components set forth in Fish and Game Code Section 2072.3 and the California Code of Regulations, Title 14, Section 670.1, subdivision (d)(1).

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal. App. 4th 597, the California Court of Appeals addressed the parameters of the Commission's determination of whether a petitioned action should be accepted for consideration pursuant to Fish and Game Code Section 2074.2, subdivision (e), resulting in the species being listed as a candidate species. The court began its discussion by describing the standard for accepting a petition for consideration previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal. App. 4th 1104:

> As we explained in *Natural Resources Defense Council* [citation], "the term 'sufficient information' in section 2074.2 means that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" [Citation] "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report but does not require that listing be more likely than not. [Citation]

(*Center for Biological Diversity*, *supra*, 166 Cal. App. 4th at pp. 609-10.) The court acknowledged that "the Commission is the finder of fact in the first instance in evaluating the information in the record." (*Id.* at p. 611.) However, the court clarified:

> [T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after the requisite review of the status of the species by the Department under [Fish and Game Code] section 2074.6.

(ibid.)

CESA defines the “species” eligible for listing to include “species or subspecies” (Fish & G. Code, §§ 2062 and 2067), and courts have held that the term “species or subspecies” includes “evolutionarily significant units.” (*Central Coast Forest Assn. v. Fish & Game Com.* (2018) 18 Cal.App.5th 1191, 1236, citing *Cal. Forestry Assn.*, *supra*, 156 Cal. App. 4th at pp. 1542 and 1549.)

B. Petition History

The Northern California steelhead Evolutionarily Significant Unit (ESU) was originally proposed for listing as threatened under the federal ESA by NOAA Fisheries in 1996 (65 FR 36074). NMFS deferred the final determination for NC steelhead until March 1998, when NMFS stated that the NC steelhead ESU did not warrant listing under the Federal ESA. In 2000, NMFS proposed to list the NC steelhead ESU as a threatened species. The listing included only naturally spawned steelhead (anadromous form of *O. mykiss*) and their progeny residing below impassable barriers to migration for both summer and winter ecotypes. NOAA did not designate NC summer steelhead as a separate ESU largely due to the fact that the most recent genetic data reinforced previous conclusions that, within a geographic area, summer and winter steelhead typically are more genetically similar to one another than either is to populations with similar run timing in different geographic areas (Busby et al. 1996; 65 FR 36074). In 2006, NOAA Fisheries re-classified the listing of the NC steelhead ESU to a DPS and reaffirmed the listing status as threatened.

On September 28, 2018, the Friends of the Eel River submitted a Petition to the Commission to list NC summer steelhead as endangered under CESA. On October 8, 2018, the Commission referred the Petition to the Department for evaluation. This Petition Evaluation report was submitted to the Commission on February 5, 2019. The Commission has not previously received a petition to list NC steelhead (summer or winter) under CESA.

The Department evaluated the scientific information presented in the Petition as well as other relevant information the Department possessed at the time of review. The Department did not receive any information from the public during the Petition Evaluation period pursuant to Fish and Game Code Section 2073.4. Pursuant to Fish and Game Code Section 2072.3 and Section 670.1, subdivision (d)(1), of Title 14 of the California Code of Regulations, the Department evaluated whether the Petition includes sufficient scientific information regarding each of the following petition components to indicate that the petitioned action may be warranted:

- Population trend;
- Range;
- Distribution;
- Abundance;

- Life history;
- Kind of habitat necessary for survival;
- Factors affecting ability to survive and reproduce;
- Degree and immediacy of threat;
- Impacts of existing management;
- Suggestions for future management;
- Availability and sources of information; and
- A detailed distribution map.

C. Overview of NC summer steelhead

In the Northern California DPS, steelhead exhibit two distinct life history types. Stream-maturing steelhead enter freshwater primarily from April through June with immature gonads and require several months to mature and spawn. Ocean-maturing steelhead enter freshwater from September through March with mature gonads and spawn shortly after. NMFS classifies these two life-history variants as two distinct reproductive ecotypes—summer (stream-maturing) and winter steelhead (ocean-maturing) (Busby et al. 1996). While summer steelhead can be distinguished from winter steelhead by run timing, maturation while in fresh water, and their preferred spawning habitat in higher-gradient habitats and small tributaries, summer and winter steelhead are more genetically similar to one another than either is to populations with similar run timing in other rivers (Busby et al. 1996; Clemento 2006).

In NC summer steelhead DPS watersheds, migration typically begins during the final high flows in spring; sometimes as early as March but more frequently April through June. In the Mad River, summer steelhead enter the river mouth in early April through July as flows allow (M. Sparkman, CDFW, pers. comm. 2016). Summer steelhead continue migrating upstream into the upper reaches of the stream and oversummer. In the warm summer months, they seek out deep thermally stratified pools with overhead cover and subsurface flow to keep cool until winter (Busby et al. 1996). Summer steelhead spawn primarily in these headwater reaches from February through April, often overlapping the period that winter adults spawn.

Newly emerged fry move out of smaller natal streams into larger tributaries soon after emerging. Like winter steelhead, most juvenile steelhead migrate downstream as two-year-olds with a small portion migrating as yearlings and three-year-olds. The downstream migration period for juveniles extends from April into July with peaks in May and June. Prior to entering the ocean juvenile steelhead undergo a physiological change, known as smoltification, which enables them to survive in saline ocean

conditions. Juvenile fish from the Middle Fork Eel River generally smolt at two years old, but some NC summer steelhead enter the ocean as smolts in their third year of life after spending at least one year in the estuary (Cannata 1998). Smolts typically emigrate from the river to the estuary or ocean between March and June.

While in the ocean, NC steelhead are believed to stay near their natal streams (Harding 2015). In coastal California, steelhead usually spend one to two years in the ocean (Busby et al. 1996). The majority of returning steelhead in the Mad River are three years old (Zuspan and Sparkman 2002; Sparkman 2003). A portion of NC summer steelhead return to the river after only two to four months in the ocean as half-pounders, analogous to the grilse or jacks in Chinook salmon.

A central premise of the Petition is that NC summer steelhead are a distinct sub-species from NC winter steelhead. Currently, the Department considers the NOAA Fisheries designation of Evolutionarily Significant Unit (ESU) when evaluating petitions for listing under CESA, and the Commission has designated genetic groups of salmonids in California based on their status as ESUs. (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal. App. 4th 1535.) NOAA Fisheries considers the NC summer steelhead ecotype as a part of the greater NC steelhead DPS. However, the Petition presents new techniques in genetic analysis and subsequent findings that may indicate separation of the NC summer steelhead from NC winter steelhead. The new methods, and conclusions derived from them, are currently being debated within the scientific community, and therefore the central premise of the Petition requires evaluation beyond the scope of the Petition Evaluation.

III. Sufficiency of Scientific Information to Indicate the Petitioned Action May Be Warranted

a. Population Trend

i. Scientific information in the Petition

The information regarding both population trends and abundance are contained in the "Population Trend" section of the Petition (p. 2). The Petition primarily references two sources to characterize the population trend and abundance of NC summer steelhead, Moyle et al. 2017 (although the reference in the petition does not list the year of this publication) and the NMFS Five Year Status Review (2016).

The Petition states that NC summer steelhead populations are experiencing a long-term decline. The data for abundance and population trends of NC summer steelhead is sparse; however, the consensus from the referenced documents indicates that most NC summer steelhead populations are small, below viability targets, and in a long-term decline. Moyle et al. 2017, estimates that there are fewer than 1,000 adults across the DPS in a given year (p. 287).

ii. Conclusion

The NC summer steelhead ecotype has declined in abundance from historical times (pre-anthropogenic influences). Currently, only the Middle Fork Eel population (one of the ten identified populations within the DPS) appears stable and relatively close, though under, the NMFS viability target for abundance. The remaining populations look as though they may be extremely depressed or extirpated.

b. Range

i. Scientific information in the Petition

The information regarding range is described on pages 3-4 of the Petition. The Petition uses a map from the NMFS Coastal Multispecies Recovery Plan (2016) to display the range of NC summer steelhead (vol. III, p.4, fig.2).

The Petition refers to other summer-run steelhead populations outside the NC steelhead DPS in need of protection, namely, summer steelhead found in the Klamath Mountain Province (KMP) DPS. The KMP steelhead DPS is adjacent to the NC steelhead DPS and ranges from the Trinity River north to the Elk River in Oregon. Through email correspondence with the Department, the Petitioner stated that they intended for its petition to be limited to NC summer steelhead, however it supported including the KMP steelhead DPS in the Petition if the Department and the Commission so desired (pers. comm. S. Greacen, Friends of the Eel River).

ii. Conclusion

The information presented is an accurate account of the range of NC summer steelhead. The Petition does not provide any of the required information of CESA listing petitions for KMP summer steelhead, other than noting that KMP summer-run are also in a long-term decline and face a high likelihood of extinction in the next fifty years. Consistent with the Petitioner's instructions in its email correspondence referenced above, the Department recommends restricting the analysis of the Petition to only NC summer steelhead.

c. Distribution

i. Scientific information in the Petition

The information regarding Distribution is described on page 4 of the Petition. There is evidence the distribution of NC summer steelhead has contracted. For example, of the ten populations identified by NMFS, the North Fork and Upper Mainstem Eel are believed to no longer support summer run. Scott Dam, on the Upper Mainstem Eel River, and Mathews Dam, on the Mad River, blocks access to historically available habitat.

ii. Conclusion

The Petition contains a sufficient description of the historical and recent distribution of NC summer steelhead populations, and demonstrated a reduction in their current distribution due to dams and continued anthropogenic habitat degradation.

d. Abundance – See "Population Trend" section above

e. Life History

i. Scientific information in the Petition

The information regarding life history is listed in pages 4-6 of the Petition. The discussion of life history focuses on differences between summer and winter in adult run timing, spawning location, and a genotype. There is no discussion of juvenile rearing, smoltification, or age at maturity.

The Petition highlights a new genetic analysis that concluded a unique evolutionary event was the cause for the spatial and temporal reproductive isolation between summer and winter-run steelhead, and because summer steelhead arose from a unique evolutionary event, they are unlikely to re-evolve from proximate winter-run populations over ecological time scales. (Prince et al 2017).

The information provided does demonstrate that there is life history differentiation between summer and winter steelhead ecotypes within the NC steelhead range, including potentially important genetic differences. However, this new genetic information is being deliberated in the scientific community and has not been universally accepted. There is also uncertainty in the scientific literature regarding the use of trait-specific genomic data to define species (Waples 2018).

The Petition also emphasizes the unique life history of NC summer steelhead makes them more susceptible to climate change primarily due to higher summer water temperatures and lower discharge. The petition also contains some un-substantiated statements about an inherently greater vulnerability to predation and disease in freshwater compared to winter steelhead.

ii. Conclusion

The information provided does demonstrate that there is life history differentiation between summer and winter steelhead ecotypes within the NC steelhead range. The NC summer steelhead life history variant has declined in abundance from historical estimates.

f. Kind of Habitat Necessary for Survival

i. Scientific information in the petition

The information regarding necessary habitat is found in pages 6-10 of the Petition. The Petition presents the "Habitat Requirement" excerpt for NC summer steelhead (p. 273) found in Moyle et al (2017).

Summer steelhead require suitable coldwater habitat to over-summer while they mature. Streamflow must also be adequate for migrating steelhead to access holding habitat in the upper reaches of the watersheds they inhabit. Suitable gravel is necessary for spawning and incubation of embryos, and rearing juvenile steelhead require cool, clear, fast-flowing water.

Within this section, the Petitioner also describes the continuing degradation of habitat found within the range of NC summer steelhead. It provides a summary from Moyle et al (2017) of 15 major anthropogenic factors limiting population viability, and includes a discussion of the anticipated impacts on habitat due to climate change (NMFS 2016b). Anthropogenic effects include the following: major dams, agricultural practices, estuarine alteration, development, and hatcheries. The Petition also discusses the anticipated effects of climate change which threatens the quality and quantity NC summer steelhead habitat primarily through altered streamlflows and warmer temperatures.

ii. Conclusion

The information provided adequately describes the kind of habitat necessary for survival of all life stages of NC steelhead.

g. Factors Affecting the Ability to Survive and Reproduce

i. Scientific information in the Petition

The information regarding these factors is presented in pages 10-11 of the Petition. The Petitioner largely refers to its discussion of the impacts of habitat degradation and climate change, in the previous section, as the critical factors affecting the ability of NC summer steelhead to survive and reproduce. Specifically, it lists dams, agricultural practices, estuarine alteration, development, and hatcheries as existing, ongoing threats. Climate change is expected to further limit the range of suitable habitat for NC summer steelhead. The Petitioner concludes that the combination of habitat degradation and climate change will result in the extinction of NC summer steelhead in the near future.

ii. Conclusion

The information provided in the Petition adequately describes factors affecting the ability of NC summer steelhead to survive and reproduce. Available data for NC summer steelhead suggests that the availability of suitable habitat does limit their ability to survive and reproduce. The projected effects of climate change on critical habitat features such as streamflow and water temperature could further challenge the continued existence of NC summer steelhead.

h. Degree and Immediacy of Threat

i. Scientific information in the Petition

The Petitioner refers to Moyle et al (2017), which states that NC summer steelhead have a high risk of extinction in the next 50 years. The Petitioner concludes that NC summer steelhead are subject to rapid, likely irrecoverable loss from stochastic events or human action.

ii. Conclusion

The Petition demonstrates that there could be an immediate threat to the continued existence of NC summer steelhead. Most populations within the NC summer steelhead DPS are too data deficient to estimate their extinction risk, but overall the available data suggests that most populations are either depressed or extirpated. Only the Middle Fork Eel River summer steelhead population is near, though still below, NMFS abundance targets for viability.

i. Impact of Existing Management Efforts

i. Scientific information in the Petition

The Petition lists the impact of existing management efforts on pages 11-12. The Petition refers to Moyle et al. 2017, which states that that NC summer steelhead have no special conservation status within the state of California and recommends they should be declared as either a Species of Special Concern or listed as threatened under CESA (p. 287). The Petitioner contends that the inclusion of NC summer steelhead within the NC steelhead DPS is an obstacle to their recovery and will likely lead to the extinction of summer steelhead in the region. It refers to the most recent status review where NMFS concluded summer populations within the NC steelhead DPS continue to be of significant concern (NMFS 2016a).

ii. Conclusion

NC summer steelhead are included within the NC steelhead DPS which is listed as threatened under the federal ESA, and as such, afforded protection under ESA. There is also a federal recovery plan that has identified threats to NC summer steelhead and developed actions to hasten their recovery. The Petition contends that by including NC summer steelhead within the NC steelhead DPS management agencies fail to adequately prioritize and implement recovery actions specific to NC summer steelhead recovery.

j. Suggestions for Future Management

i. Scientific information in the Petition

The Petition presents suggestions for future management on page 12. Within this section, the Petitioner does not suggest specific actions, but refers generally to known

and developing management actions presented in Moyle et al. 2017 and the NMFS recovery plan (2016). In the “Population Trend” section on page 2, the Petitioner cites NMFS’s suggestion that removing Scott Dam may help restore an additional population of NC summer steelhead to the Upper Mainstem Eel River by restoring access to historical habitat.

The Petition does not provide independent suggestions for additional management actions, but instead highlights a lack of coordination and prioritization of known and developing actions to protect summer steelhead, and concludes that the most significant step the Commission can take to protect NC summer steelhead is to list them as endangered under CESA. Presumably, the Petitioner feels there are adequate recovery actions listed within Moyle et al. (2017) and the recovery plan (NMFS 2016b).

ii. Conclusion

The petition demonstrates there are known and developing management actions that could be beneficial to NC summer steelhead and may be implemented in the future, including NMFS’s suggestion to restore access to historical habitat by removing Scott Dam, which currently blocks fish passage.
would be placed on implementing those actions specific to conserving their life history.

k. Availability and sources of information

The Petition provides a 30 page bibliography of relevant literature. However, the Petition cites primarily 3 citations.

l. A detailed distribution map

A NC summer steelhead distribution map is located on page 3 of the Petition. The map displays what NMFS has determined are the historic distributional boundaries for the two diversity strata of NC summer steelhead, which includes 10 populations (NMFS 2016b).

IV. Recommendation to the Commission

Pursuant to Section 2073.5 of the Fish and Game Code, the Department has evaluated the Petition on its face and in relation to other relevant information the Department possesses or received. In completing its Petition Evaluation, the Department finds there is sufficient scientific information to indicate that the petitioned action may be warranted, and recommends the Commission accept and consider the Petition.

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