



# FRIENDS OF THE EEL RIVER

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

Thursday, November 15, 2018

Wilbur Ross  
Secretary of Commerce  
1401 Constitution Avenue  
Washington, DC 20230

Secretary Ross:

Please find attached Friends of the Eel River's petition to list Northern California summer steelhead as an Endangered Distinct Population Segment under the Endangered Species Act.

Pursuant to 50 CFR 424.14(b), FOER provided notice to the California Department of Fish and Wildlife of our intent to file this petition on October 2, 2018. Pursuant to 50 CFR 424.14(c)(9), FOER includes here copies of both our notice letter to the Department and the electronic mail transmitting that notice letter.

Thank you for your timely attention to this matter.

Sincerely yours,

Scott Greacen  
Conservation Director

**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



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Tuesday, October 2, 2018

## **Wildlife Branch - Nongame Wildlife**

1812 9th Street

Sacramento, CA 95811

via email to [wildlifemgt@wildlife.ca.gov](mailto:wildlifemgt@wildlife.ca.gov)

Dear DFW Wildlife Branch staff,

We at Friends of the Eel River intend to submit a petition to NOAA Fisheries to list Northern California summer steelhead as an endangered DPS under the federal ESA.

Under 50 CFR 424.14(b) and (c)(9), revised last year, we are now required to notify “the state agency responsible for the management and conservation of fish, plant or wildlife resources in each State where the species that is the subject of the petition occurs.” Northern California summer steelhead occur only in California. The Department of Fish and Wildlife is the agency responsible for the management and conservation of fish, plant or wildlife resources in California.

Thus, we are hereby notifying the California Department of Fish and Wildlife of our intent to submit the above-described petition. Our apologies if this is not the best office to which to provide this notice, but as you are charged with evaluating listing petitions, and did have an electronic address available, you won. Please feel free to share this notice with any and all appropriate entities.

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

Sincerely yours,

Scott Greacen  
Conservation Director

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**From:** Scott Greacen [scott@eelriver.org](mailto:scott@eelriver.org)  
**Subject:** Notice of Intent to Petition to List Northern California Summer Steelhead under the ESA  
**Date:** October 2, 2018 at 1:29 PM  
**To:** [wildlifemgt@wildlife.ca.gov](mailto:wildlifemgt@wildlife.ca.gov)  
**Bcc:** FOER Alicia Hamann [alicia@eelriver.org](mailto:alicia@eelriver.org)

RG

Greetings DFW Wildlife —

We at Friends of the Eel River intend to submit a petition to NOAA Fisheries to list NC summer steelhead as an endangered DPS under the federal ESA.

Please see the attached letter to that effect.

Thanks for all you do.

Scott Greacen  
[scott@eelriver.org](mailto:scott@eelriver.org)

707/502.4555 mobile



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Washington, DC 20230

## **Petition to List Northern California summer steelhead as an Endangered Distinct Population Segment under the Endangered Species Act**

This is a petition to list Northern California summer steelhead as an Endangered Distinct Population Segment (DPS) under the Endangered Species Act. (16 USC §1531 et seq) We seek to protect both this unique and important form of life, and the ecosystems on which it depends, as the landmark species conservation law was intended to do. “The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved ...” (16 USC § 1531(b))

Petitioners file this petition pursuant to § 553(e) of the Administrative Procedure Act (APA), 5 USC §§ 551-559 and §1533(b)(3) of the Endangered Species Act, and 50 CFR part 424.14, which recognize the right of any interested party to petition for issuance of a rule in such cases.

Northern California (NC) summer steelhead are summer-run, or premature migrating, anadromous *Oncorhynchus mykiss irideus* in California coastal river basins from Redwood Creek southward. Populations are known or may persist in Redwood Creek, the Mad River, several tributaries of the Eel River including the Van Duzen, and the Mattole River.

*Oncorhynchus mykiss* has both freshwater life histories (which we call rainbow trout), and anadromous life histories (which we call steelhead). The U.S. Fish and Wildlife Service (FWS), part of the Department of the Interior, has jurisdiction over rainbow trout, but it is the Department of Commerce’s NOAA Fisheries or National Marine Fisheries Service (NMFS) that has jurisdiction over steelhead. (16 USC § 1532(15))

In 1996, FWS and NMFS agreed that steelhead listings would be governed by a joint DPS policy (see 61 FR 4722) rather than the 1991 Evolutionarily Significant Unit (ESU) policy (see 56 FR 58612) NMFS applies to other threatened and endangered anadromous salmonids.

Under the DPS policy, the fundamental elements of the listing analysis remain the discreteness of the population in question and its significance to the taxon. (61 FR 4722) Northern California summer steelhead are currently listed as Threatened under the ESA, as part of a DPS that combines winter and summer steelhead across the region. (71 FR 833)

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As we discuss below, Northern California summer steelhead plainly meet the criteria to be considered a separate DPS, and the conservation status of that DPS is obviously endangered as the ESA defines the term: "... in danger of extinction throughout all or a significant portion of its range." (16 USC § 1532(6))

The Endangered Species Act requires that listing decisions be made "solely on the basis of the best scientific and commercial data available." (16 USC § 1533(b)(1)(A)) NMFS's 2016 Coastal Multispecies Recovery Plan (MSRP) details the current status of remaining summer steelhead populations across Northern California. (References to the MSRP here are generally to its Vol III unless otherwise noted.) As well, NMFS' April 2016 Status Review (5-Year Status Review California Coast Chinook Salmon and Northern California Steelhead) and previous status reviews provide important information.

Both these reports and a great deal of additional scientific and technical information relevant to the conservation of Northern California summer steelhead are reviewed and summarized in the most comprehensive recent analysis of salmonids across California, *State of the Salmonids: Status of California's Emblematic Fishes 2017*. (Moyle, et al 2017)

In its section on NC summer steelhead, *State of the Salmonids* assesses threats to NC summer steelhead, its conservation status, and the variations among the populations of summer steelhead in the DPS region. Standing alone, Moyle et al presents "substantial scientific or commercial information" indicating that listing NC summer steelhead as an endangered DPS may be warranted.

Notably, the *State of the Salmonids* report treats Northern California summer steelhead as a distinct population segment separate from Northern California winter steelhead.

*NC summer steelhead are treated separately in another account because the two runs are distinctive in their genetic makeup, behavior, and reproductive biology and require different conservation frameworks ... (Busby et al. 1996, Prince et al. 2015, Hodge et al. 2016). (Moyle 2017, pp. 270)*

This is a decision grounded in recent scientific discoveries which illuminate the evolutionary history of summer steelhead.

*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)*

The authors assess the status of Northern California summer steelhead as Critical, reflecting a 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)*

Moyle et al emphasize that "(c)limate change is a major threat to the continued persistence of NC summer steelhead," outlining impacts including increased runoff, higher stream

temperatures, and lower stream flows that can be anticipated – and indeed, are already being experienced in parts of the NC summer steelhead range:

*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. (Moyle et al, p. 286)*

The authors summarized 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; agriculture, including impacts from conventional agriculture in lower watersheds and diversions and pollution associated with unpermitted marijuana cultivation; and estuarine alteration, again especially in the Eel and the Mad Rivers. (p. 285)

Finally, a recent paper has demonstrated that the premature migration observed in both summer steelhead and spring chinook arises from a specific mutation. (Prince et al 2017, which Moyle 2017 cite above as Prince et al 2015) 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 – that if lost, the summer steelhead life history 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. Once summer steelhead are lost, their genetic heritage will be gone as well. (Prince et al 2017)

The long-term decline of Northern California summer steelhead across their range is clear. Moyle et al note that with some understatement that the “current abundance of this species is likely much less than historical estimates.” (p. 277) Though Moyle et al emphasize the uncertainty associated with limited surveys of surviving populations of Northern California summer steelhead, they estimate that there are “likely fewer than 1,000 adults across the DPS in a given year.” (p. 287)

Northern California summer steelhead meet the requirements to be considered a DPS under NMFS and USFWS policy. And as Moyle et al emphasize, NC summer steelhead “require different conservation frameworks than winter-run fish.”

When considered as such, the Northern California summer steelhead DPS is clearly endangered under the Endangered Species Act. (“in danger of extinction throughout all or a significant portion of its range.” 16 USC 1533(6))

## **1. Northern California Summer Steelhead Are A DPS Under Agency Policy**

### **A. The DPS policy**

*Oncorhynchus mykiss irideus*, or coastal steelhead, are a salmonid native to the Pacific Coast of North America. They have commonly been called steelhead trout in their anadromous form. In their freshwater life history, however, *O. mykiss* are known as rainbow trout. (The recognition that steelhead are salmon, reflected in their reclassification to the *Oncorhynchus* genus with other Pacific salmon, has yet to be reflected in general speech.)

The Endangered Species Act assigns anadromous salmonids – including steelhead – to the jurisdiction of the National Marine Fisheries Service (NMFS). Freshwater fish, including rainbow trout, are the responsibility of the US Fish and Wildlife Service. 16 USC § 1532(15) Listings of *O. mykiss* are governed by a joint NMFS-USFWS DPS policy.<sup>1</sup> (61 FR 4722)

Under the DPS policy, three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Endangered Species Act:

1. Discreteness of the population segment in relation to the remainder of the species to which it belongs.
2. The significance of the population segment to the species to which it belongs; and
3. The population segment's conservation status in relation to the Act's standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).

#### **i. Discreteness**

Under the DPS policy, “a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions:

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<sup>1</sup> We note here that NMFS and USFWS may want to reexamine this policy choice with respect to *O. mykiss* in light of the best available science. The effect of this policy is to exclude resident rainbow trout from listings that do protect their close, but anadromous, relatives, including potentially both their parents and their offspring.



*A. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.*

*B. It is delimited by international governmental boundaries ... (61 FR 4722)*

Northern California summer steelhead are indeed markedly separated from other populations of steelhead, including Northern California winter steelhead, as a consequence of physical, physiological, ecological, and behavioral factors. As Moyle et al state, “the two runs are distinctive in their genetic makeup, behavior, and reproductive biology.” We now know that a single mutation drives the notable physiological and behavioral differences that distinguish summer steelhead. The same research shows that:

*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)*

NC summer steelhead have a significantly higher fat content than mature migrating fish. Their gonads are not developed when they enter freshwater. In many respects, summer steelhead appear evolved to confront more extreme conditions – higher temperatures, higher flows, higher obstacles – than even winter-run steelhead. Summer steelhead use headwaters streams to spawn, generally in reproductive isolation from winter steelhead, and thus play an important ecological role in moving marine nutrients high into watersheds.

Moyle et al also highlight the extent to which Northern California summer steelhead are “markedly separated” from other populations of steelhead in their vulnerability to the impacts of climate change. This relatively greater vulnerability led NMFS to analyze summer steelhead separately in preparing the Coastal Multispecies Recovery Plan:

*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. (MSRP Vol V, Appendix B, pg. 19).*

As well, Northern California summer steelhead are physically separated from other populations of steelhead, as described in NMFS’ various listing decisions for the present Northern California steelhead DPS that combines winter and summer steelhead within overlapping ranges. (See, eg listings of Northern California as threatened; 61 FR 4722; 71 FR 834)

Thus, Northern California summer steelhead should be considered a **discrete population segment** under the DPS policy.

## ii. Significance

The DPS policy further explains:

*If a population segment is considered discrete under one or more of the above conditions, its biological and ecological significance will then be considered ... In carrying out this examination, the Services will consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs.*

*This consideration may include, but is not limited to, the following:*

- 1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon,*
- 2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon,*
- 3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range, or*
- 4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.*

Northern California summer steelhead appears to be biologically and ecologically significant under at least factors 1, 2, and 4.

### 1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon.

As Moyle et al describe, Northern California 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. Northern California summer steelhead specialize in exploiting limited dry-season holding habitats to use spawning and rearing habitats higher up in watersheds than winter-run steelhead. They play important ecological roles in areas no other anadromous salmonid reach.

NC summer steelhead include the southernmost populations of summer steelhead. The NC summer steelhead DPS we are asking NMFS to recognize includes coastal populations which can include the largest known adult summer steelhead, capable of breeding and returning to the Pacific in only weeks.

The NC summer steelhead DPS also includes fish that run up the Eel River to its Middle Fork, and could again include fish that would run up the upper mainstem Eel past 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) As Moyle et al note with respect to the watershed above Scott Dam,

*Blocked high gradient, small tributaries are important to summer steelhead, because these fish probably ascended higher in each watershed than any other salmonid based*

*on their morphological adaptations to hold in lower, faster water and leap higher than other steelhead or Chinook salmon (Hodge et al. 2011). (p. 281)*

2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon.

Given that Northern California summer steelhead are importantly distinct from winter-run steelhead in the same watersheds, it is clear that the loss of summer steelhead from the region would result in a significant gap in the range of summer steelhead. The nearest population of summer steelhead remaining would be in the Klamath Mountains province, in watersheds a long evolutionary distance from the upper Eel River and the lower Mattole River. Note, however, that Moyle et al tell us that Klamath Mountains Province summer steelhead are also facing extinction, at Critical Concern, with an identical 1.9 out of 5.0 score to NC summer steelhead.

4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Prince et al 2017 demonstrated that the key differences between Northern California summer and winter steelhead in run timing, behavior, and physiology can be attributed to genetic differences in the GREB1L gene. “We conclude that there is a nearly complete association between variation at this locus and migration category and that the premature migration alleles from all locations arose from a single evolutionary event.” (p. 3)

This is highly significant information, which must be evaluated in considering how to effectively implement the purposes of the Endangered Species Act in conserving truly unique forms of steelhead. It is “the best scientific and commercial data available,” which the ESA commands be the “sole” basis of decisions to list species under the Act. (1533(b)(1)(A))

Importantly, Prince et al’s results also support the present geographic extent of the NC steelhead DPS. “(M)easurements of overall genetic differentiation from genome-wide SNP data are consistent with current steelhead DPS delineations.” (p. 2.)

In sum, NC summer steelhead are highly significant to their taxon in several respects. If NC summer steelhead are not significant to their taxon, the word has no useful meaning in this context. Thus, NC summer steelhead is a distinct population segment under the DPS policy. It should be so designated.

**iii. Conservation Status: Endangered**

Finally, under the DPS policy, if a population segment is discrete and significant (i.e., it is a distinct population segment) its evaluation for endangered or threatened status will be based on the Act's definitions of those terms and a review of the familiar listing factors enumerated in section 4(a):

1. the present or threatened destruction, modification, or curtailment of its habitat or range;
2. overutilization for commercial, recreational, scientific, or educational purposes;
3. disease or predation;
4. the inadequacy of existing regulatory mechanisms; or

5. other natural or manmade factors affecting its survival.

Again, under the ESA, the status evaluation is to be made “solely on the basis of the best scientific and commercial data available.” (1533(b)(1)(A))

The NC steelhead DPS, which as noted combines winter and summer-run fish in a single DPS, is listed as Threatened under the ESA. (71 FR 833) The term “threatened species” means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. (16 USC § 1532(20)) The inadequacy of regulatory mechanisms, destruction and modification of habitat, and natural and man-made factors were identified as the primary causes for the decline of the NC steelhead DPS. (NMFS 1996)

NC summer steelhead populations have been impacted by the same factors, but to a greater extent than winter runs. Moyle et al summarize and assess the anthropogenic impacts that are and have been important factors affecting the viability of NC summer steelhead. (p. 285) Essentially all require focused action if NC summer steelhead are to survive:

*Over the recent, historic drought (2012-2016), increasingly severe anthropogenic pressures have compounded naturally stressful conditions for steelhead in California (floods, drought, fires, poor ocean conditions, etc.), causing depleted populations to decline further. The Northern Diversity Stratum of summer steelhead lack adequate shelter, staging pools, gravel quantity, and sufficiently cool mainstem water temperatures. Reduced floodplain connectivity, low passage flows, physical barriers to migration, and low abundance are limiting recovery of the DPS (NMFS 2016). Expression of the full suite of steelhead life history diversity is at risk due to low population abundance, fishing pressure during summer months, poor water quantity and quality, and lack of complex over summering pool habitat (NMFS 2016). (p. 281)*

The net result of these impacts is the situation we find today, with very few, very small populations of summer steelhead left. Small population sizes and relatively few populations both present important additional risks of extinction, as stochastic impacts – like this summer’s Ranch Fire – may result in the loss of irreplaceable components of these unique fish.

When properly considered as its own DPS, Northern California summer steelhead are clearly endangered as the ESA defines that status. “... (A)ny species which is in danger of extinction throughout all or a significant portion of its range” (16 USC § 1532(6))

### **1. habitat**

NC summer steelhead are at significant risk of extinction in the near future, in part as a consequence of the present and threatened destruction, modification, and curtailment of Northern California summer steelhead habitat and range. Moyle et al identify 3 High and 5 Medium anthropogenic threats as collectively representing a poor condition, noting that “Sufficient flows and temperatures are rapidly disappearing in the DPS.” Climate change also rated a poor condition because of its habitat impacts. They note that summer steelhead’s restrictive habitat requirements render them relatively vulnerable to

disturbance of their environment: “Adults require coldwater refuges and pool habitat with cover that is free from human intervention.” (p. 285)

Moyle et al summarize the specific kinds of habitat conditions confronting NC summer steelhead as follows:

*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). (p. 288)*

Another way to look at habitat condition and impacts is to consider where in its range NC summer steelhead still return to spawn in significant numbers. The answer is very few places. This reality contrasts badly with what a NC summer steelhead population that could sustain itself would look like. 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)*

Moyle et al present data suggesting the Mad River could still harbor summer steelhead returns in the hundreds. (p. 279) It would be very surprising to find nearly that many NC summer steelhead in watersheds where we don't have current survey data. Only one of the ten populations, on the Middle Fork Eel, approaches its viability target. And that population is itself 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) However, Moyle points 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.” (p. 288)

Re-establishing a population in the Upper Mainstem Eel River will probably require removing or very substantially modifying Scott Dam, which blocks essentially all of that watershed to steelhead passage. It is unlikely that effective adult and juvenile summer steelhead passage can be provided over the 130 foot Scott Dam and past the Lake Pillsbury reservoir while the dam remains in place.

With reference to the Upper Mainstem Eel River population, the MSRP states:

*Scott Dam currently blocks access to 99 percent of the potential habitat available to this steelhead population (Spence et al. 2012). Steelhead have not had access to this habitat since 1922. Lake Pillsbury currently maintains habitat for non-native species of Sacramento pikeminnow and largemouth bass (Micropterus salmoides). The reservoir provides habitat for these non-native species to survive and maintain high densities in the larger streams that drain into Lake Pillsbury. In addition, the hydrology, and sediment transport to the mainstem Eel River is disrupted by this facility. (p. 462)*

As well, a significant portion of the *O. mykiss* habitat above Scott Dam in the Upper Mainstem Eel River watershed burned in 2018’s Ranch Fire on the Mendocino National Forest. The fire underscores the increased threat that high-intensity wildfire may pose to water quality and temperature in a future where climate change is making such fires increasingly probable.

Habitat modification and curtailment clearly remains a significant limiting factor for NC summer steelhead. In the absence of effective, coordinated action, these factors are likely to add to pressures on remaining NC summer steelhead populations.

## **2. overutilization**

We wish to emphasize the absence of evidence that native peoples’ traditional fishing practices ever threatened the survival even of summer steelhead, fish which can be critically vulnerable to humans in the cold-water refugia they require.

Overutilization for commercial and recreational purposes played a role in sharply reducing the size of Northern California summer steelhead runs from the late nineteenth century to the second half of the twentieth century.

Take associated with recreational angling and poaching remains a threat to the viability of Northern California summer steelhead. The 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. disease or predation**

Northern California summer steelhead are more subject to predation and disease than their winter run counterparts. As adults, 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.

Climate change is expected to increase air temperatures and reduce precipitation, tending to further degrade late season water conditions across the range of Northern California summer steelhead. The recent drought has provided a stark example of how dramatically future conditions may depart from those of the last century. Low flows and high temperatures increase disease incidence in steelhead.

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.

Very low population numbers may be especially vulnerable to predation impacts. With individual tributary populations of Northern California summer steelhead numbering in the low three digits and below, the threat that predation and disease pose to the survival of the DPS becomes an urgent concern. Effective conservation of the DPS may require active intervention to protect one or more stocks. Recognition of the NC summer steelhead DPS as we request here will help to facilitate the planning and prioritization that may be necessary to such interventions.

### **4. inadequacy of existing regulatory mechanisms**

In view of the best available scientific information, NMFS' current listing of summer steelhead as part of a DPS dominated by winter steelhead appears not only inadequate to insure the recovery of NC summer steelhead, but is 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, so 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. That error – including summer and winter run steelhead in a single DPS – is what we are asking the

government to correct in light of the highly significant new understanding of the evolution of premature migration in salmonids revealed by Prince et al's work. In this light, the existing DPS is an inadequate existing regulatory mechanism. As Moyle et al observe,

*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. (p. 288)*

Thus, NC summer steelhead should be recognized as a DPS and protected as endangered under the ESA. If it is not, the premature migration gene in NC steelhead is likely to be lost.

Prince et al showed that the GREB1L gene is closely associated with premature migration in both steelhead and Chinook salmon. In a followup 2018 paper on the premature migration gene in chinook, Thompson et al extend our understanding of the selection mechanism by which the premature migration gene can be rapidly lost in populations where homozygous early-run fish are not conserved.

In their study, Thompson et al found that homozygous premature migrating fish, as expected, run early (ie are spring-run Chinook), and homozygous late-migrating fish run late (ie, in the fall, for chinook). But heterozygous fish – individuals with one parent from each line – return at an intermediate time, after the premature migrants but before the rest of the run. In most years and most rivers on the North Coast, environmental conditions are relatively unfavorable at those intermediate times. Thus, relatively few heterozygous fish are likely to spawn successfully. That means the early-return gene will only be conserved when there are populations of homozygous fish that actually realize the benefit of the premature migration strategy:

*... (B)oth theory and empirical evidence suggest heterozygotes are not a sustainable reservoir for spring-run alleles, and human factors can eliminate important adaptive variation regardless of total population size. ...*

*... (O)ur modeling demonstrates how such selection, if sustained, could rapidly result in complete loss of the spring-run allele. A main benefit of the spring-run phenotype is thought to be access to exclusive temporal and/or spatial habitat, while a major cost is reduced gametic investment (e.g., smaller egg size) because energy must be dedicated to maintenance and maturation while fasting in freshwater (23, 54). ...*

*... (O)ur modeling demonstrates that selection strong enough to explain these rapid phenotypic and genotypic shifts could lead to loss of the spring-run allele in a relatively short time. We conclude that, under continual selection against the spring-run phenotype, the spring-run allele cannot be expected to persist unless recessive with respect to fitness. ...*



*... We conclude that spring-run alleles are not being maintained in the Scott River and that diverse environments are susceptible to rapid loss of the spring-run allele upon extirpation of the spring-run phenotype. ...*

*... The combination of results from this study provides important insights into the mechanisms and consequences of phenotypic change induced by anthropogenic habitat alteration. First, our results demonstrate that complex phenotypic variation can have a simple genetic architecture and that anthropogenically-induced phenotypic change can be caused by rapid genetic evolution from strong selection at individual loci. Furthermore, our results (both modeled and empirical) demonstrate this situation can lead to the rapid loss of important adaptive alleles, including from populations that are healthy from a total population size perspective. In cases where adaptive alleles are the product of mutational events that are very rare from an evolutionary perspective (such as the spring-run allele in Chinook (30)), their loss will create a major challenge for future restoration as well as limit resilience and evolutionary potential. Taken together, our results highlight the need to conserve and restore critical adaptive variation before the potential for recovery is lost. (Thompson et al, pp 9-10)*

Of course, the same research group's earlier work in Prince et al showed that the genetic mechanisms of premature migration in summer steelhead and spring-run chinook are precisely parallel. NC summer steelhead's important adaptive alleles are at serious risk of being lost from a population that is "healthy from a total population size perspective." Those alleles are, likewise, "the product of mutational events that are very rare from an evolutionary perspective," and "their loss will create a major challenge for future restoration as well as limit resilience and evolutionary potential."

It is precisely because of the urgent "need to conserve and restore critical adaptive variation before the potential for recovery is lost" that we submit this petition to list NC summer steelhead as an endangered DPS. These unique and important fish have survived for tens of thousands of years, but we have placed them at risk of potentially very rapid extinction. If there were a status more urgent than endangered, we would be requesting that more urgent status.

As well, despite the clear threats to NC summer steelhead, they are not listed under the California Endangered Species Act. Moyle et al 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 the California Department of Fish and Wildlife to prioritize reducing impacts on key populations of NC summer steelhead and promoting and coordinating actions necessary to recover the species.

Another existing regulatory mechanism that has proven inadequate is the Federal Energy Regulatory Commission (FERC). If Northern California summer steelhead are not recognized and listed as separate DPS, FERC may fail to require fish passage adequate for summer steelhead over Scott Dam. As NMFS notes, “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.” (MSRP p. 466)

### **5. other natural or manmade factors affecting its survival**

The Mad River hatchery still produces steelhead for a recreational fishery. The hatchery plan should be carefully reviewed to insure as little impact as possible on wild fish, especially summer steelhead.

As noted, anthropogenic climate change presents a compounding set of threats that amplify the challenges Northern California summer steelhead face on all fronts. Climate change will bring more variable precipitation, but less overall. It will bring higher air temperatures, with unknown effects overall — but will certainly include higher average stream temperatures, lower flows, and longer dry seasons that will tend to make NC summer steelhead habitat incapable of supporting even these resilient fish.

In sum, although the history of Northern California summer steelhead’s endangerment is a long and tortured tale with many side-plots, the conclusion that it is now endangered is beyond plain.

As Moyle et al write, “NC summer steelhead have a high risk of extinction in the next 50 years without significant restoration and intervention.” (p. 287) The remaining populations are few and dwindling; they face rising threats; and we aren’t doing the things we need to be doing to recover existing populations or to reintroduce new ones where still possible.

Today, the most urgent priorities are to protect the remaining populations of Northern California summer steelhead and to secure opportunities where the fish can return to viable habitat not presently occupied.

In that respect, the great opportunity presently confronting Northern California summer steelhead is the possibility of returning to the Upper Mainstem Eel River. It is vitally important that Northern California summer steelhead be recognized as the unique and precious component of biological diversity they represent, by being recognized as a DPS, in order to insure that Northern California summer steelhead are considered in key decisions about the future of fish passage at Scott Dam and past the Lake Pillsbury reservoir.

### **Conclusion**

Northern California summer steelhead clearly meet the standards of discreteness and significance to be considered a DPS. Northern California summer steelhead are unique, extraordinary, and worthy of protection.

The range and seriousness of the threats confronting the Northern California summer steelhead DPS are daunting. Some threats are potentially catastrophic and could develop very quickly. Northern California summer steelhead are in a very perilous position, far

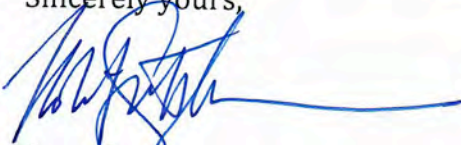
more serious than merely in danger of extinction over the next century. We therefore request NMFS move with all due haste to list NC summer steelhead as an endangered DPS.

While that listing is underway, we would also encourage NMFS to inform FERC and other agencies and stakeholders involved in the current process to relicense Scott and Cape Horn Dams as part of the Potter Valley Project that NMFS will be careful to secure the passage necessary to provide for NC summer steelhead recovery in the Upper Mainstem Eel River.

There are a number of additional measures that need to be undertaken to provide for the protection and recovery of NC summer steelhead. These include remediating illegal marijuana grows, especially on public lands, increased coordination, prioritization, and commitment of requisite resources to known restoration priorities from estuarine restoration to road maintenance and stream crossing rehabilitation. The menu of actions has largely been laid out by the MSRP and to a lesser extent the Eel River Action Plan. What is missing is the resources and the political will to take on the serious challenges necessary to protect NC summer steelhead while we still have them.

Thank you for your attention to the needless loss of our irreplaceable natural heritage.

Sincerely yours,



Scott Greacen  
Conservation Director  
Friends of the Eel River

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