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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