PETITION TO LIST THE
Black Salamander (*Aneides flavipunctatus*)
UNDER THE ENDANGERED SPECIES ACT

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Petition Submitted to the U.S. Secretary of Interior
Acting through the U.S. Fish and Wildlife Service

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Executive Summary

This petition to the United States Fish and Wildlife Services (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) requests that the black salamander (*Aneides flavipunctatus*) be listed as threatened under the United States Endangered Species Act (ESA). This petition originates from this species' endemism and habitat specialization in California and Southern Oregon being impacted by habitat fragmentation, climate change, disease, predation and anthropogenic activities. These factors in addition to population isolation and latitudinal habitat limits put this species at risk of decline.

Background Information

Natural History

The black salamander (*Aneides flavipunctatus*) has recently been suggested to be categorized into five to six subspecies or populations (Reilly and Wake 2019). All subspecies/populations inhabit a variety of locations in California (NatureServe 2022) and Southern Oregon (Reilly and Wake 2019) (Figures 1 and 2). Their habitat consists of forests and grasslands (Olson 2008). Within these habitats, the species can be found on talus slopes in seeps and under logs and rocks near streams in the wet soil (Sapp 2002).

Courtship occurs in this species with a male and female engaging in a tail-straddling walk (Sapp 2002). It is predicted that the black salamander can live up to 25-30 years with juveniles growing at the fastest rate and growth declining with age and body size (Staub 2016). This species is terrestrial and lays clutches of 5-25 eggs (Stebbins and McGinnis 2012). Females lay eggs from late spring to early summer in soil and near rocks (Marangio 2000). Due to frequent rates of scarring, which is higher in males, seen in the field, there is a chance that the black salamander is territorial in the wild (Staub 1993).

Invertebrates are a large portion of the black salamander's diet. Arthropods in the orders Diplopoda, Coleoptera, Hymenoptera, Isoptera, Diptera and Collembola were found to be 78% of the contents of their diet. Their diet contents fluctuate with the seasons. In autumn, millipedes were consumed in large quantities, winter meals consisted of dipteran larvae and during the spring, ants and beetles (Lynch 1985). Predation of this species has not been well documented

but it is likely to consist of garter snakes (Olson 2008; Marangio 2000) and the northern watersnake (California Department of Fish and Wildlife n.d.).

Population Trends

Historically black salamanders were common within their range (Petranka 1998) with coastal and inland populations estimated at 88,000 (Stebbins 2012). The current abundance is estimated to be between 10,000 and 100,000 individuals(NatureServe 2022). Research does not show accurate or exact population numbers for this species.

Distribution

As mentioned above, the black salamander has been suggested to be split into five or six subspecies or populations. Two of the populations (*Aneides flavipunctatus niger* and *Aneides iecanus*) are geographically isolated in two different locations within California (Figures 1 and 2). The other three to four populations are geographically close inhabiting Lake County, Mendocino County and Del Norte County California and Josephine County and Jackson County Oregon (Reilly and Wake 2019) (Figure 1). The black salamander's range crosses about 59,471km^2 . This is about fourteen percent of the total area of California. In Oregon, their range spans 1,874km^2 across two counties (Olson 2008). Reilly and Wake (2015) note the black salamander's estimated range limits with a dotted line in Figure 3. Research has shown that black salamanders do not go above 600 meters in elevation and dispersal estimates are based on other plethodontid salamanders who exhibit male-based dispersal patterns (Reilly and Wake 2015). High elevations within the species range (Figure 3) may cause an inability to disperse.

Figure 1
Population points of *Aneides flavipunctatus* subspecies (Reilly and Wake 2019)

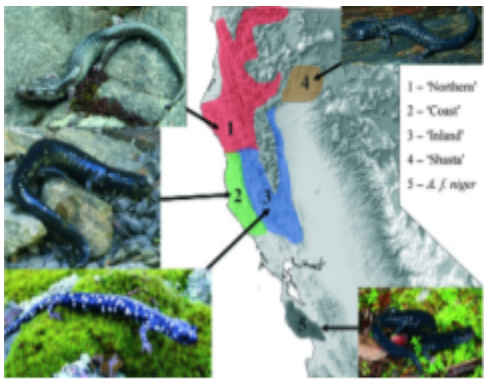

Figure 2
General ranges of *Aneides flavipunctatus* subspecies (Reilly et al. 2012)

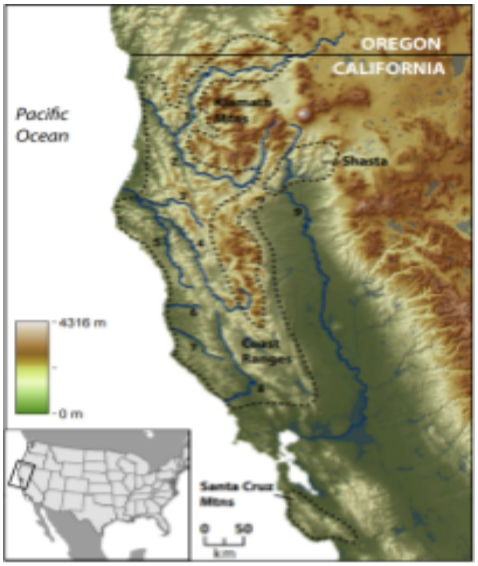

Figure 3
Estimated range limits (dotted line) of *Aneides flavipunctatus* (Reilly and Wake 2015)

Threats/Five Factors

I. Present or Threatened Destruction, Modification, or Curtailment of its Habitat Or Range

Personal observations have witnessed vineyards development in California that has ravaged large sections of the black salamander's habitat (Staub and Wake 1999). While 30% of California is covered in forests, the booming timber industry puts this habitat of the black salamander at risk. Timber and wood products are a crucial source of income for many economies in the state (UC Riverside n.d.). This is a threat as the black salamander's habitat consisted of forested areas.

Habitat fragmentation is not well documented for the black salamander but research has occurred for the two species of green salamander (*Aneides aeneus* and *Aneides caryaensis*). Similar to the black salamander, they live in forests and utilize rocks for habitats (Figures 5, 6, 7). *A. caryaensis* suffer habitat fragmentation due to anthropogenic activities (Patton et al. 2019). Figure 4 shows high levels of anthropogenic activity near *Aneides flavipunctatus*' range (shown in white). Habitat specialists like the black salamander are at higher risk of population declines from disturbances like habitat loss or climate change (Newman et al. 2018). The timber industry, wildfire increases and habitat specialization leave the black salamander at increased risk as a population.

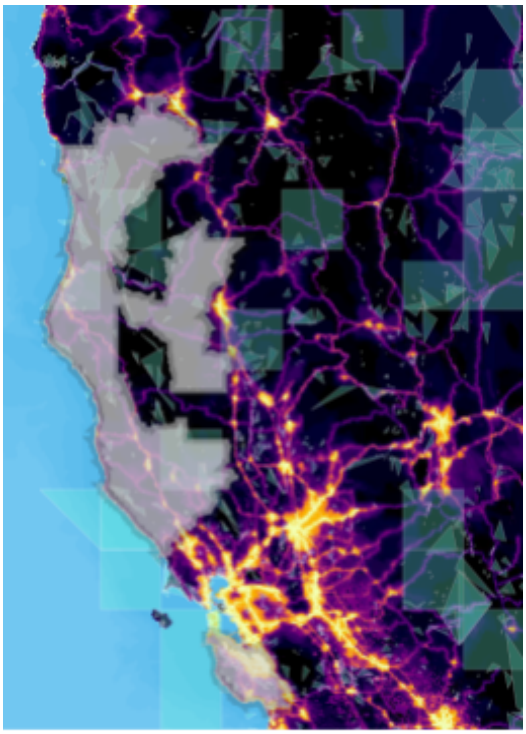

Figure 4
Anthropogenic activities near the black salamander's (*Aneides flavipunctatus*) range. Orange and yellow indicate a high human footprint

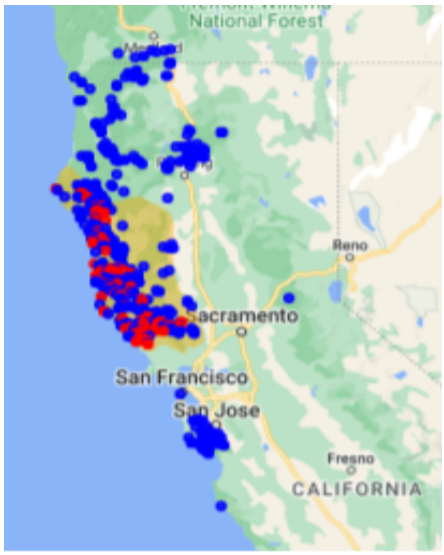

Figure 5
Aneides flavipunctatus' range including preserved specimens (blue) and human observations (red) (BerekeleyMapper 2022b)

Figure 6
Aneides lugubris' range including preserved specimens (blue) and human observations (red)
(BerkeleyMapper 2021)

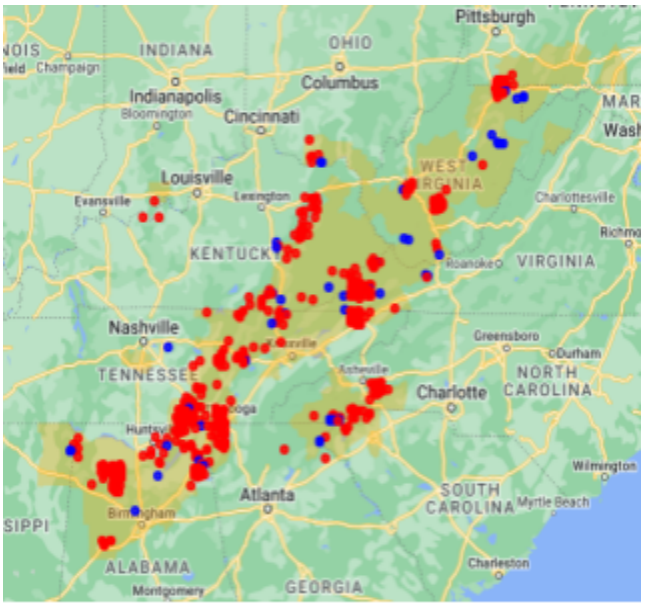

Figure 7
Aneides aeneus " range including preserved specimens (blue) and human observations (red)
(BerkeleyMapper 2022a)

II. Overutilization for commercial, recreational, scientific, or educational purposes

There is little to no evidence that the black salamander is overutilized for commercial, recreational, scientific, or educational purposes.

III. Disease or predation

Batrachochytrium dendrobatidis (*Bd*) causes chytridiomycosis which has been killing members of the *Aneides* genus. Bauer et al. (2018) found that *Anedides* may be more susceptible to chytridiomycosis than other salamander genera. *Aneides lugubris*, whose range overlaps with *Aneides flavipunctatus*, showed a seventy-one percent mortality rate from chytridiomycosis (Cowgill et al. 2021). Although *Bd* has affected the *Aneides* genus, *Batrachochytrium salamandrivorans* (*Bsal*) has had a greater impact on salamanders overall. As of 2021 *Bsal* has not been detected in the United States. Despite this, the Pacific Northwest, the black salamander's habitat, would be highly susceptible to *Bsal* due to the region's high salamander biodiversity (Thurman et al. 2021).

In 2007, the northern watersnake (*Nerodia sipedon*) became established in California and is now an invasive species. There is a concern for the black salamander to become prey to this species

due to the northern watersnake's diet consisting of amphibians (California Department of Fish and Wildlife n.d.a). Predators also include the western terrestrial garter snake (*Thamnophis elegans*) (Pauley and Watson 2005). Green salamanders (*Aneides aeneus*) had potential predators observed in one study which consisted of seven salamander species across three genera, the red-spotted newt (*Notophthalmus v. viridescens*), and the ringneck and eastern ratsnake (*Diadophis punctatus; Pantherophis alleghaniensis*) (Reed Rossell et al. 2019).

IV. The inadequacy of existing regulatory mechanisms

Monitoring, conservation and research efforts focused on the black salamander are sparse. Local and federal agencies' information is limited to natural history, photographs and range maps. Research rarely or ineffectively refers to or suggests monitoring and conservation efforts. Olson (2008), comments on information gaps stating they include topics such as habitat associations, suitable habitat in the species' range, threats, risk factors and detailing northern populations.

V. Other natural or manmade factors affecting its continued existence

Climate change is increasingly impacting California. According to Buechi et al. (n.d.), California's total fires were 13.88% higher from 2009 to 2018 with a 2.16% increase in acres burned. Compared to the 1979 to 1988 statistics, there was a 110% increase in acres burned from 2009 to 2018. Rising temperatures will also lead to forest desertification (Moroy-Gamboa et al. 2022). This will impact the species' need for wet soil in their habitat range. Forest habitats have historically been impacted by agriculture which has affected salamander abundance. Sites that were converted for agriculture show the lowest abundance of salamander due to a lack of access to forest materials (leaf litter and woody vegetation) and habitat fragmentation (Cosentino and Brubaker 2018). Manmade forest disturbances have and will continue to be a great risk to black salamander populations.

Critical Habitat and Suggested Management Actions

Critical Habitat Locations

Within the ranges of the black salamander, California has seven ecological reserves, 7.78% of the total ecological reserves in the state (California Department of Fish and Wildlife n.d.b). Oregon houses three wildlife reserves in the two counties where the black salamander is present (Oregon

Department of Fish and Wildlife n.d.) (Figure 8). Reserves or protected areas in Sonoma County, Mendocino County, Eastern Humboldt County, Western Shasta County and Santa Cruz County, California would help conserve current larger populations of the black salamander. A protected area in Jackson County, Oregon would be integral to maintaining the Oregon populations.

Forest and grasslands connecting Southern and Northeastern Humboldt County, Central Trinity County with Western Shasta County and Northern Siskiyou County, California with Southern Jackson County, Oregon would decrease population isolation leading to potential population increase and a decline in inbreeding and loss of genetic diversity due to the ability to outbreed with other populations. While connecting the subspecies *Aneides niger* with the other populations may not be possible due to distant isolation, a protected area is needed to maintain the population.

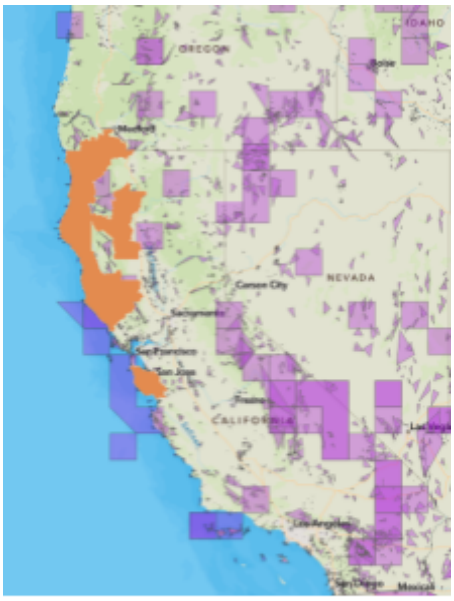

Figure 8
Aneides flavipunctatus populations (orange) and protected areas (purple) in California and Oregon

Suggested Management Actions

Continuing to protect the species under the Northwest Forest Plan is important. At the time the plan was created, the species was said to have a high chance of distributing well on federal lands. This Plan protects old-growth forests, established reserves to safeguard the ecosystem and

management for a sustainable timber industry (Meffe et al. 2006). The National Environmental Policy Act (NEPA) requires an assessment of proposed activities in relation to the species. These two policies will continue to conserve the Oregon populations. Suggested new management actions include assessing and prioritizing land based on the species' needs, evaluating activities on federal lands to ensure they contribute to species persistence and considering the microhabitat and microclimate associated with the black salamander (Olson 2008).

Conservation Approaches and Concerns

An ecosystem-based approach to conservation would be valuable for the black salamander. Their habitat provides for local economies and wildfires are increasing as climate change escalates. The degradation of this species' habitat will have economic, social and ecological impacts which the ecosystem-based approach targets (Meffe et al. 2006). Conserving the species through an ecosystem-based approach allows for species survival, trees for timber harvests, and mitigation of climate change impacts. Negatives of this approach include non-prioritization of threatened or endangered species and being time and monetarily intense. However, I believe the positives outweigh the negatives as an ecosystem-based approach can help address complex natural resource problems such as the black salamander's survival in an economically profitable location. This approach considers the long-term sustainability of both the ecosystem and human activities (Meffe et al. 2006) which is crucial to this species' survival.

Socioeconomic Concerns

Critical habitat designations of forested land could be detrimental to California's economy. This is a $39 billion industry that provides over 170,000 jobs. Forestry and logging yield $437 million per year and employes 5,700 workers who earn a total of $267 million combined (Standiford et al. 2020). Timber revenues in Oregon in 2011 amounted to $205 million dollars (State of Oregon 2012) and in 2019 the forest sector employed 61,556 individuals (Oregon Forest Resources Institute n.d.).

Conclusion

As with many species today, the black salamander faces threats such as destruction of habitat, predation and climate change. Their habitat is devastated by timber harvests, invasive species

like the northern watersnake that prey on amphibians and climate change which has increased forest fires in California by 110% in ten years. For these reasons, I am requesting that the black salamander (*Aneides flavipunctatus*) be listed under the Endangered Species Act (ESA) with the designation of threatened. Preserving this species and its habitat through ESA will allow the timber industry to continue sustainably and maintain biodiversity from the longevity of a species. There are so many ways species maintain and support ecosystems that we are yet to know. Losing species means doing more damage to this planet that may be irreversible.

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