BEFORE THE SECRETARY OF THE INTERIOR

PETITION TO PROTECT THE MONTANE PEACLAM (*PISIDIUM ULTRAMONTANUM*) UNDER THE ENDANGERED SPECIES ACT

Photo: Sheila Nadimi, FS/BLM, 2010

CENTER FOR BIOLOGICAL DIVERSITY

March 21, 2024

Notice of Petition

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Pursuant to Section 4(b) of the Endangered Species Act (ESA), 16 U.S.C. §1533(b); section 553(e) of the Administrative Procedure Act (APA), 5 U.S.C. §553(e); and 50 C.F.R. §424.14(a), the Center for Biological Diversity hereby petitions the Secretary of the Interior, through the U.S. Fish and Wildlife Service (USFWS), to protect the Montane peaclam (*Pisidium ultramontanum*) under the ESA.

The USFWS has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on USFWS. USFWS must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. §1533 (b)(3)(A). USFWS must make this initial finding "(t)o the maximum extent practicable, within 90 days after receiving the petition." Petitioner also requests that critical habitat be designated concurrently with the listing, pursuant to 16 U.S.C §1533(a)(3)(A) and 50 C.F.R. §424.12.

The Center for Biological Diversity ("Center") is a non-profit, public interest environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law, supported by more than 1.7 million members and online activists. The Center works to secure a future for all species, great or small, hovering on the brink of extinction. We submit this petition on behalf of our staff and members who hold an interest in protecting the Montane Peaclam.

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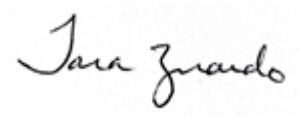
Submitted this 21 day of March, 2024.



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Executive Summary

The Montane Peaclam (*Pisidium ultramontanum*) ("peaclam") is a critically imperiled freshwater mollusk currently thought to only occur in south-central Oregon and California (NatureServe, 2024). It has undergone drastic range reduction and is considered to be the rarest and most endangered member of the peaclam family.

The peaclam is sensitive to water quality degradation and is primarily threatened by hydroelectric dams, lake eutrophication, sedimentation, and water diversions that lower the water table and reduce spring flows. The peaclam is also threatened by climate change, pollution, and potentially invasive species.

This petition seeks ESA protection for this critically imperiled species, based on the best scientific information and the five listing factors. It also seeks to have the areas where the species occurs, and which contain the physical or biological features essential to the conservation of the species, designated as critical habitat to address severe threats faced by the peaclam.

Introduction

Freshwater mollusks like the peaclam provide valuable ecosystem services by improving water quality, enhancing nutrient cycling, and playing critical roles in aquatic food webs (Atkinson et. al., 2023, p. 21). They are natural filters, feeding on algae, plankton, and silts, and help purify the aquatic system, as well as providing an important food source for many species of wildlife, such as other aquatic invertebrates, mammals, birds, and fish (USFWS, 2021).

The peaclam has a limited range and its current extent is uncertain and likely to have declined long-term due to multiple threats. While previously known from the states of Arizona, California, Oregon, and Washington, it is currently thought to only occur in south-Central Oregon and California (NatureServe, 2024). No living specimens have been found in recent surveys, indicating an urgent need to determine the number of viable occurrences and population trends (*Id.*). Because of this restricted range, they are especially vulnerable to extinction (*Id.*).

Biology

Taxonomy & Species Description

The Montane Peaclam (*Pisidium ultramontanum*) is a yellowish colored Pisidium with a well-rounded outline. It is a relatively large peaclam, measuring at least 4 mm in diameter. It features a slightly inflated beak with a heavy growth ridge, with distinct additional ridges on the shell (FS/BLM, 2010, p.1). No other species in the Sphaeriidae family resembles this striking species (*Id.*).

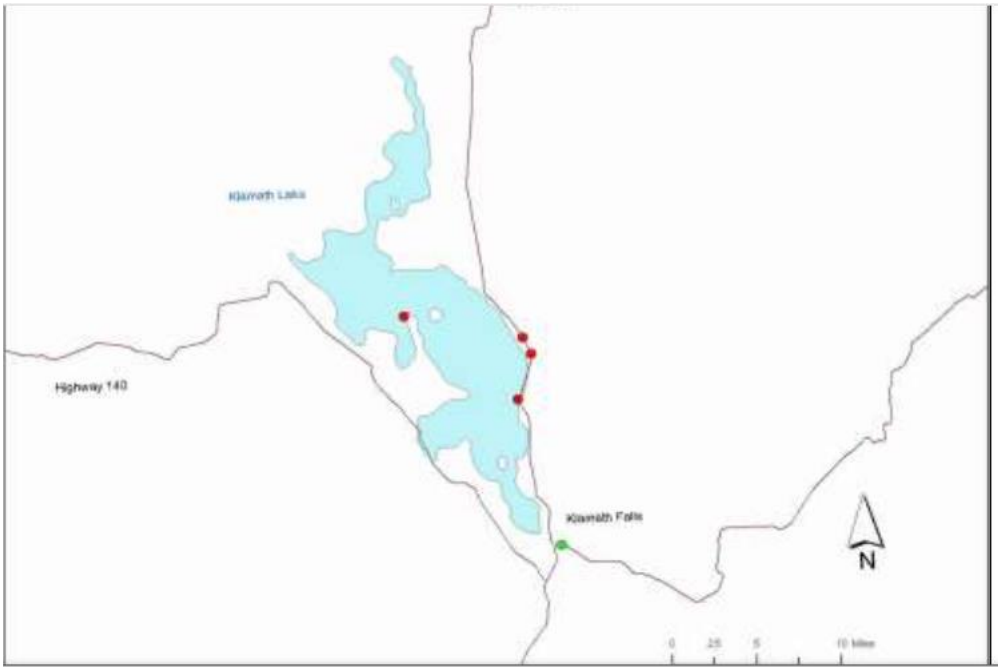
Life History

As freshwater bivalves, adult peaclams are filter feeders, collecting nutrients and detritus from the water column as they breathe (NatureServe, 2024).

Mollusks reproduce sexually and most are separately sexed, where gametes are released into the mantle cavity and fertilized eggs develop into larvae. Members of the class Bivalvia are mostly gonochoric; some are protandric hermaphrodites. Embryos develop into free-swimming trocophore larvae, succeeded by the bivalve veliger, resembling a miniature clam (Sealifebase, 2005). Fertilized eggs grow into veliger larvae (mollusk larvae with swimming flaps) within 48 hours and float in open water until they settle on the seafloor. Juvenile clams bury themselves under the seafloor to grow into adults. Only about 1% of clams that survive to the juvenile stage will make it to full adulthood. Most *Pisidium* species release up to 20 young and reach their final size in about a year, with life spans up to 5 years (Sturm et al., 2006, p. 331).

Habitat Requirements

The peaclam is currently thought to only occur in south-central Oregon and California (NatureServe, 2024). Surviving populations are in the Upper Klamath Lake area, the middle Pit River, and possibly at Eagle Lake in the Lassen National Forest (FS/BLM, 2010, p. 2). Within the Lassen, they are thought to occur at Hat Creek (USDA, 2007, p. 17). Sites are also suspected in the Shasta National Forest, although populations at historical sites appear to have been extirpated (*Id.*).



Site locations of the Montane peaclam from surveys by Frest and Johannes (1996)

The species is found in spring-fed streams, lakes, and pools with sand-gravel substrates (NatureServe, 2024). These sites are characterized by a high diversity of aquatic mollusks, some

of which are restricted to the same types of habitats, such as the Great basin Ramshorn (*Helisoma newberryi*) (FS/BLM, 2010, p. 4).

Freshwater mollusks, including the peaclam, have low tolerance to certain anthropogenic stressors, such as dams, urbanization, and degraded water quality (Atkinson, 2023, p. 21). Even in the best remaining spring pools and spring-fed creeks feeding into the Upper Klamath Lake, the peaclam seems to be confined to limited areas with the best water quality (FS/BML, 2010, p. 5).

Mollusks like the peaclam play important roles in the environment. They provide and stabilize habitat for algae, macrophytes, macroinvertebrates, and fish, as well as playing important roles in nutrient recycling, translocation, and storage, and may influence nutrient abatement (Atkinson, 2023, p. 22 -25). By enhancing denitrification rates, mussels contribute to the permanent removal of nutrients from aquatic ecosystems and improve and create habitat by enhancing hydrodynamic habitat complexity and decreasing shear stresses (*Id.*). Mollusk shells themselves also provide habitat for algae, macrophytes, macroinvertebrates, and fish (*Id.*).

Range & Population Status

The historical range of this species is estimated to run from Arizona to Washington (NatureServe, 2024). Original distribution included the periphery of the Great Basin in Oregon, the Klamath and Pit Rivers in Oregon and California, and some of the larger lakes in Oregon and California, such as the Upper Klamath, Tule, Eagle, and possibly lower Klamath Lakes (FS/BLM, 2010, p. 2).

However, the species is now extinct in the Tule and Lower Klamath Lakes. Surviving and best remaining populations have been found in the Upper Klamath Lake area (where five sites were confirmed in 1996), middle Pit River, and possibly at Eagle Lake in the Lassen National Forest (*Id.*). Sites are also suspected in the Shasta National Forest, although populations at known historical sites appear to have been extirpated (*Id.*). Remaining populations in the Upper Klamath Lake area have been found in only one spring complex flowing into the lake (*Id.*). Experts have determined that the species is declining in range (*Id.*).

Biodiversity is declining at a greater rate in freshwaters than in terrestrial systems. For example, of the species comprising perhaps the most diverse freshwater mollusk assemblage in the world, an estimated one-third are now extinct due to flow regulation and habitat alteration (Atkinson, 2023, p. 21). Globally, 40% of freshwater bivalves are considered threatened, including an estimated 72% of freshwater mussels in North America (*Id.*).

The montane peaclam has been described as the rarest and most endangered of all sphaeriid species (NatureServe, 2024). It is currently ranked as a G1 Critically Imperiled species with long-term declines due to pollution and hydrological developments (*Id.*). Threats include lake eutrophication, water diversions that lower the water table and reduce spring flows, and hydroelectric impoundments, especially where there are sedimentation problems downstream (*Id.*). Because no living specimens have been found in the most recent surveys, further research

and surveys are needed to determine the number of viable occurrences and population trends (*Id.*).

In addition, because of the current, limited range of the peaclam, a single disturbance – such as stream drying, excessive temperatures, and/or significant habitat degradation – could ultimately result in the extinction of the species.

Listing Factors

The Montane peaclam faces threats to its continued existence under three of the five factors and warrants protection under the ESA as an endangered or threatened species. Specifically, the peaclam is threatened by habitat loss, lake eutrophication, water diversions that lower the water table and reduce spring flows, and hydroelectric impoundments; the retirement of which could cause short-term sedimentation problems downstream if not properly mitigated (NatureServe, 2024). Remaining sites where the peaclams are located are also threatened by pollution from agricultural, industrial, and urban use (FS/BLM, 2010, p. 4).

Present or threatened destruction, curtailment, or modification of habitat or range:

The peaclam has a limited range and its current extent is uncertain and likely to have declined long-term due to aforementioned threats. While previously known from the states of Arizona, California, Oregon, and Washington, it is currently thought to only occur in south-Central Oregon and northeastern California (NatureServe, 2024). No living specimens have been found in recent surveys, indicating an urgent need to determine the number of viable occurrences and population trends (*Id.*). Because of this restricted range, they are especially vulnerable to extinction (*Id.*). Habitat modification serves as a major threat to the peaclam (FS/BLM, 2010, p. 3).

Lake Eutrophication

The peaclam has lost much of its habitat in Upper Klamath Lake to eutrophication, particularly in the vicinity of the Klamath Hydroelectric Project, where the peaclam has been found (*Id.*). The effect of the Project on nutrient loads are known to be very large, including phosphorus (*Id.* at 5). High algal productivity in the Upper Klamath Lake has been accompanied by violations of Oregon's water quality standards for free ammonia, dissolved oxygen, and pH (PacifiCorp, 2006, p. 1). Ammonia in particular is highly toxic to freshwater mollusks, especially juveniles (Salerno et al. 2020). Interactions between multiple contaminants can also magnify toxic impacts (*Id.*)

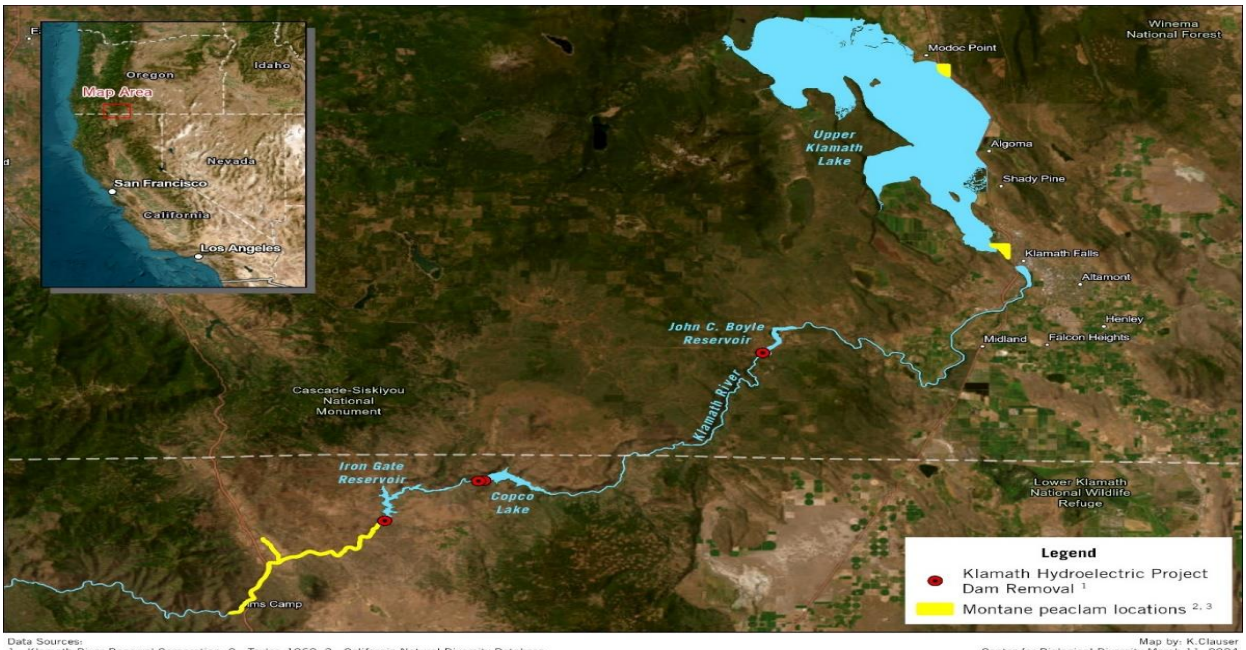
To address this issue, the Environmental Protection agency adjusted the total maximum daily load (TMDL) and called for a 40 percent reduction of total phosphorus loading to the Upper Klamath (*Id.*). Still, in 2004, the National Research Council's Committee on Endangered and Threatened Fishes in the Upper Klamath River Basin concluded that, even if the TMDL's targeted 40 percent reduction in external phosphorus loading could be achieved, it would likely be ineffectual without the suppression of internal phosphorus loadings, given the current levels of phosphorus loadings for Upper Klamath Lake (*Id.*).

Studies have shown that areas that typically contain high concentrations of nutrients, such as nitrogen and phosphorus – as the Upper Klamath does – are plagued by recurring cyanobacterial blooms and hypoxia, which negatively affects organisms like the peaclam (Chislock et. al., 2013, p. 2/8). The most conspicuous effect of cultural eutrophication is the creation of dense blooms of noxious, foul-smelling phytoplankton that reduce water clarity and harm water quality (*Id.* at 3/8). Algal blooms limit light penetration, reducing growth and causing die-offs of plants in littoral zones, while also lowering the success of animals that need light to pursue and catch prey (*Id.*). Furthermore, high rates of photosynthesis associated with eutrophication can deplete dissolved inorganic carbon and raise pH to extreme levels during the day. Elevated pH can in turn 'blind' organisms that rely on perception of dissolved chemical cues for their survival by impairing their chemosensory abilities (*Id.*). When these dense algal blooms eventually die, microbial decomposition severely depletes dissolved oxygen, creating a hypoxic or anoxic 'dead zone' lacking sufficient oxygen to support most organisms like the peaclam (*Id.*).

Eutrophication is also associated with major changes in aquatic community structure (*Id.* at 4/8). During cyanobacterial blooms, small-bodied zooplankton tend to dominate plankton communities, and past observational studies have attributed this pattern to anti-herbivore traits of cyanobacteria (e.g., toxicity, morphology, and poor food quality) (*Id.*). Given the widespread extent of water quality degradation associated with nutrient enrichment, eutrophication has and continues to pose a serious threat to potable drinking water sources, fisheries, recreational water bodies, and sensitive species like the peaclam.

Modification of Hydroelectric Impoundments & Water Diversions

While highly beneficial in the long run for the health of the ecosystem, the retirement of some of the Klamath Hydroelectric Project dams could lead to short-term sedimentation problems downstream, including directly below Iron Gate Dam, where bivalves like the peaclam live (NatureServe, 2024).



Iron Gate, the lowest of the three remaining dams, was first breached on Jan. 9, followed by J.C. Boyle on Jan. 16. On Jan. 23, a concrete plug in the tunnel at the base of Copco 1 was also blasted away (OPB, March 6, 2024). This is inevitably having an effect on wildlife, and dead fish have been reported stranded in the mud as a result (*Id.*). While CDFW reportedly has emergency response plans for wildlife in place, these plans focus more on specific species, including western pond turtles, listed as "species of special concern" in California, as well as golden and bald eagles (*Id.*). In addition, while NOAA Fisheries and the Bureau of Reclamation are in the process of removing decades worth of sediment accumulated behind the dams, there are no indications that any measures will be implemented to protect the peaclams and other sensitive species (NOAA, 2024). It's unclear that the peaclam will survive this perturbation in the lower Klamath—only time will tell.

The Upper Klamath has for years also been used to support the federal Klamath Project for irrigation by local farmers. However, federal officials have paused releases from the lake into the irrigation water project when there are extremely low water levels, as in 2021 (OPB, 2021). Between 2001 and 2022, due to dry springs experienced in the Upper Klamath Lake Basin, an executive order was issued declaring a state of drought emergency in Klamath County in part due to low snowpack, low reservoir levels, and low streamflow (USGS, 2014; Oregon.gov, 2022). Still, emergency groundwater use drought permits are continually approved in the basin (*Id.*).

The Pit River is also used extensively for irrigation and hydroelectric purposes; specifically, the lower course of the Pit River marks one of California's most significant hydroelectric rivers. As of 2004, the annual generation from main stem powerhouses provided approximately 13 percent of California's total hydropower (CA Energyalmanac, 2015) and, at one time, diversions took up to 95 percent of Pit River summer flows (California Trout, 2011). In 2011, the relicensing of several PG&E hydroelectric facilities on the river required the power company to increase minimum flow on the river reaches below Dams 3, 4, and 5.

Land Use Practices & Recreation

There is a long history of intensive habitat modification in the peaclam's range. Many of the changes have rendered large portions of its former habitat unsuitable. Most of the large springs along the periphery of Upper Klamath Lake were historically modified for log transport, which physically impacted the peaclam's habitat, even if water quality remains unharmed (USGS, 2017). Additionally, other land use practices, such as dredging, mining, road construction, and others, can cause sedimentation and nutrient inputs that may smother substrates or reduce egg survival (ODFW, 2019).

Recreational impacts could also harm the peaclam's waterways. The Pit River is a well-known trout stream in California and a popular destination for fishing, hiking, and sightseeing (Danielsson, 2006). In addition, the BLM operates the following recreation sites on the Upper Klamath River: Spring Island Day Use Site, Klamath River Campground, Turtle Primitive Camp, and Stateline Campground (Recreation.gov, 2024).

There are numerous ways recreationists can cause physical and chemical damage to these areas, including by trampling, degrading water quality by introducing sunscreen, insect repellent,

personal care products and detergents, and human waste. Recreation threatens these species because it can cause trampling, soil erosion, disturbance to vegetation, water pollution, and other disturbances (Monz et al., 2021, p.631-643). Habitat conditions can also be harmed when dogs enter the river and by introducing flea and tick treatment residues and animal waste. People cleaning fish also sometimes dispose of unused bait and fish residues in water sources near these areas. Visitors also frequently move rocks and debris in water sources in recreational areas, which impacts flow and substrate.

Grazing & Pollution

Extensive human modification to rather specialized habitat is an ongoing threat to montane peaclams. Water quality, nutrient concentration, sedimentation, eutrophication, grazing, and habitat loss by conversion of springs for livestock and domestic usage are all threats to this species (ISSSP, 2019, p. 6). Grazing and habitat loss by conversion of springs for livestock and domestic usage in particular are especially problematic for the peaclams because cattle grazing near water sources may pollute sites with feces and urine (*Id.*).

Uplands grazing can cause harm and trespassing livestock is a constant problem wherever there is water in the arid west. Land use activities that involve ground disturbance near riparian areas negatively impact water quality through sediment disturbance and transport (Mebane, 2001, p. 293-322). Grazing specifically can have significant detrimental effects on riparian ecosystems. Grazing impacts water quality and quantity, soil health, instream and streambank vegetation, and aquatic wildlife (Belsky et al., 1999, p. 1). Because grazing compacts soil, it can reduce groundwater infiltration rates and contribute to increased runoff and erosion (Teague, 2020, p. 1). Species richness of native plant types has been documented as lower at springs in proximity of high grazing intensity, as compared to springs with limited or no grazing (Nielson, 2019, p. 1).

Inadequacy of existing regulatory mechanisms

State

The peaclam is considered as threatened or endangered throughout its range by the Oregon Natural Heritage Program (G1/S1 species). The California State Wildlife Action Plan has also classified the peaclam as an S1 Species of Greatest Conservation Need. Still, there are currently no regulations protecting the peaclam from threats to its habitat.

As has also been discussed above, although there are efforts to remove hydroelectric dams near the peaclam, there are currently no efforts in place to provide protective measures to sensitive species like the peaclam; as a result, the removal of these dams could actually cause sedimentation problems downstream, especially to a potential occurrence directly below Iron Gate Dam (NatureServe, 2024).

Federal

There are no documented conservation efforts aimed at protecting this species. Although the Forest Service and BLM have listed the Montane peaclam as a Sensitive Species in Oregon

(FS/BLM, 2010, p. 1) and the US Fish and Wildlife Service has federally listed the species as a species of concern (USFWS, 1994), there are currently no regulations protecting the species from threats driving its extinction. As previously discussed, the petitioned species is especially vulnerable to habitat modification. The species does not receive direct management attention by the BLM; if the BLM is also unable to adequately manage cattle in the area where the peaclam occurs, it could have detrimental effects on the habitat of the petitioned species that could lead to extirpation and extinction.

Because existing regulatory mechanisms do not adequately address threats to the habitat of the petitioned species and there are no conservation efforts targeting this species, protection under the ESA is necessary. Listing under the ESA would provide the peaclam with a recovery plan and the long-term funding of conservation efforts called for by scientists and necessary for the species to have any chance of survival. Conservation measures needed include research (to survey and determine the species' occurrences, life history, genetic health, habitat requirements, sensitivity to pollutants, sedimentation, and altered flow regimes) (NatureServe, 2024). Monitoring protocols are also needed to determine abundance and population structure of extant populations and to locate and monitor additional populations to better understand the species' distribution (habitat suitability models could be used to locate additional populations) (*Id.*). This also includes developing a propagation and reintroduction protocol to augment and expand the ranges of extant populations and reestablish viable populations in streams within the historical range that have suitable habitat and water quality (*Id.*). In addition, educational programs to engage local landowners, communities, and others to assist in recovery of the species are also needed (*Id.*).

Additional conservation measure needs for the peaclam include protecting and restoring their habitat to prevent further destruction, limiting agricultural, herbicide, and insecticide runoff into rivers which may and nutrients and other pollutants to water, protecting sites from runoff that may contain residue from insecticide or herbicide applications, monitoring the species and the effects of habitat change on the species, and assessing activities on the peaclam and associated effects on its habitat, as well as the effects of minimizing or eliminating conversion of their habitat for other uses, including minimizing grazing access at known sites to protect from potential habitat (FS/BLM, 2010, p. 4).

Other natural or manmade factors affecting the continued existence of the species:

The peaclam faces threats from multiple other factors, including climate change and pollution.

Climate change and severe droughts are increasingly threatening freshwater mollusks. As previously discussed, water diversions and use and drought also have significant impacts in the last few areas where the peaclam remains. According to the Oregon Water Resources Department, Oregon is currently in the "worst megadrought on the record." Between 2001 and 2022, due to dry springs experienced in the Upper Klamath Lake Basin, an executive order was issued declaring a state of drought emergency in Klamath County in part due to low snowpack, low reservoir levels, and low streamflow (USGS, 2014; Oregon.gov, 2022). The Pit River is also used extensively for irrigation and hydroelectric purposes.

Drought conditions then increase the danger of wildfires (Oregon Water Resources Department, 2023). A severe wildfire in the petitioned species' range could catastrophically impact the population due to its small size and limited range. Anthropogenically-induced climate change exacerbates the previously discussed threats to groundwater availability by increasing the likelihood and severity of drought.

Freshwater mollusks in general are also negatively impacted by water pollution, erosion, excessive sedimentation, groundwater withdrawal, associated impacts on surface streams, and invasive species (Bohm et. al., 2021, p. 5). Freshwater mollusks are highly sensitive to contaminants, and the impacts of certain metals, fertilizers, and pesticides are well-documented, and can be lethal to them in even small amounts (Xerces Society, 2024). Toxic compounds are often transported into species' habitats via soil sediments washed into streams during storm events, or otherwise brought by human use of the area (*Id.*). This is especially true for and agricultural runoff (*Id.*).

In addition, the Pit River Watershed is infested with invasive plants and noxious weeds, such as Scotch thistle (*Onopordum acanthiumi)* and Perennial Pepperweed (*Lepidium latifolium L*), which are negatively affecting the watershed condition of the area (Pit River Alliance, 2024).

As discussed above, the range of the peaclam is extremely limited, and there are limited data on population size for the species. Because of their small population size, they are also vulnerable to stochastic and catastrophic events including fire, drought, and contamination.

Request for Critical Habitat

We request and strongly recommend that the Upper Klamath Lake and Pit River drainages be designated as critical habitat concurrent with the peaclam's listing. As required by the Endangered Species Act, the Secretary shall designate critical habitat concurrent with determination that a species is endangered or threatened (16 U.S.C. §1533(a)(3A)). Critical habitat is defined by Section 3 of the ESA as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species.

16 U.S.C. §1532(5).

As part of designating critical habitat, suggested conservation measures for the peaclam include fencing off habitat areas, installing water monitors, surveys, maintaining appropriate water flow and quality, preventing and mitigating for water diversions, dredging, and other activities that

could increase sediment or nutrient levels, protecting and restoring their habitat to prevent further destruction, monitoring the species and the effects of habitat change on the species, and assessing activities on the peaclam and associated effects on its habitat, as well as the effects of minimizing or eliminating conversion of their habitat for other uses. Mitigation measures such as relocation must be pursued in order to ensure that the clams are not destroyed while certain projects, such as dam removal, are occurring.

Conclusion

The Montane Peaclam is a unique and critically imperiled freshwater mollusk, likely only surviving only in the Upper Klamath Lake and Pit River drainages in south central Oregon and northeastern California. In the context of the five listing factors, the peaclam warrants ESA protection because it is at risk of extinction due to the threats it faces and due to its small population size and restricted range. There are currently no existing regulatory mechanisms that alleviate the threats facing the peaclam, and without ESA protection, it remains vulnerable to extinction. We urge the Service to propose the peaclam for listing and to designate critical habitat to ensure that it survives for future generations.

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