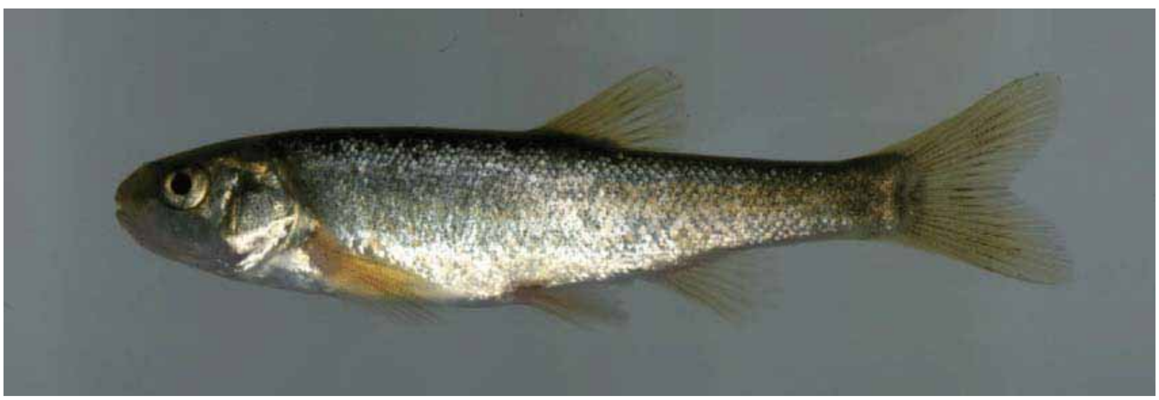
Before the Secretary of the Interior

Petition to List the Northern Roach (*Hesperoleucus mitrulus*) as a Threatened or Endangered Species under the Endangered Species Act



Center for Biological Diversity

October 16, 2025

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 herby petitions the Secretary of the Interior, through the U.S. Fish and Wildlife Service (USFWS), to protect the Northern roach (*Hesperoleucus mitrulus*) as an endangered or threatened or species under the ESA.

This petition requests listing of the Northern roach based on threats from agriculture, livestock grazing, logging, transportation infrastructure, fire, climate change, and invasive species. 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 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."

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 1.8 million members and supporters. 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 Northern roach.

Submitted this 16th day of October, 2025

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Executive Summary

The Northern roach is a small minnow that occurs only in the upper Pit River basin upstream of the Pit River Falls in northeastern California, and a few northern tributaries of Goose Lake in southern Oregon.

Preferred habitat for Northern roach is spring pools, margins of streams, and swampy stream reaches. Adults reach only two to four inches in length. Roach feed on algae, crustaceans and aquatic insects.

Northern roach have disappeared from stream reaches in the North Fork Pit River, South Fork Pit River, and Mainstem Pit River from Alturas downstream to Pit River Falls. In California, they may remain only in Ash Creek and Rush Creek, Lassen and Modoc counties; the Bear Creek tributary to the Fall River, Shasta County; and Beaver Creek in Lassen County.

In Oregon, Northern roach were formerly widespread and common in northern tributaries of Goose Lake such as Dry Creek, Drews Creek, Hay Creek, Dent Creek, Muddy Creek and Augur Creek. Resurvey efforts in 2022 and 2023 documented widespread declines in native fish abundance in these tributaries and disappearance of formerly numerous populations of Northern roach.

Northern roach are threatened by habitat loss and alteration from agriculture, livestock grazing, logging, transportation infrastructure. They are also jeopardized by climate change, altered fire regimes, and invasive species.

Agricultural impacts include water withdrawal for irrigation, channelization of streams, and impaired water quality. Livestock grazing damages riparian vegetation, collapses stream banks, adds sediment to pools, impairs water quality from sedimentation and animal waste input, and reduces the amount of cover and shading. Logging and ranch roads contribute to siltation, channelization, and habitat loss.

Northern roach are eliminated by non-native predatory fishes that have escaped from stock ponds, such as green sunfish, largemouth bass, and bluegill.

Increasing aridity associated with climate change and increasing local surface water diversions and ground water withdrawal are decreasing the base flows in streams that Northern roach depend on. Coupled with predicted climate change effects, more severe wildfires may eliminate roach habitats or extirpate small populations from tributary streams.

The species is now restricted to a few isolated populations which could decline rapidly and face extirpation as result of alterations to streams, invasion of non-native fishes, water withdrawal for agriculture, and predicted impacts from climate change. Endangered Species Act protections are critical to the continued existence of the Northern roach.

Biology

a. Species Description

Roach are small, stout-bodied minnows (cyprinids) with a narrow caudal peduncle and a deeply forked tail. Northern roach are small (adult size typically 50-100 mm) and bronzy. They have a robust body, deep caudal peduncle, short snout and short rounded fins. The head is large and conical, eyes are large, and the mouth is subterminal and slants at a downward angle. They are dark on the upper half of the body, light below, and very similar in appearance to Central California roach. Northern roach differ from Central California roach in having short, rounded fins and "cup-like" scales (see Snyder 1913 for more detail on scale morphology). Snyder (1908a) published morphometric data on 20 fish from Drews Creek (Lake County, Oregon), among them the type specimen of the species; all individuals had 8 dorsal rays and 7 fin rays. Roach exhibit general (non-nuptial) sexual dimorphism (Snyder 1908a; Murphy 1943). Both sexes exhibit bright orange and red breeding coloration on the operculum, chin and the base of the paired fins. Males may also develop numerous small breeding tubercles (pearl organs) on the head (Murphy 1943). Snyder (1908a) found that male Northern roach had longer, larger fins than did females, especially pectoral fins; he also found that the sexes could be differentiated by the ratio of pectoral fin length to body length. These differences in the relative fin length between the sexes led Snyder to publish one of the first accounts of general sexual dimorphism in cyprinid fishes.

b. Taxonomy

Northern roach were first collected in 1898 by C. Rutter (1908), who recognized them as *Rutilus symmetricus* (Baird et al. 1854). Speaking of the specimens collected on this trip, Rutter (1908 p. 139) said "We have but few small specimens of this form, the longest being but 3 inches long. They were taken in North Fork Pitt (sic) River near Alturas and at the mouth of Joseph Creek, several hundred miles from where any other specimens of *symmetricus* have been taken. The form may prove to not to be *symmetricus*, but we cannot identify it otherwise with the material at hand."

In 1904, John O. Snyder surveyed broadly in northeastern California and southeastern Oregon, collecting in the upper Pit River, along with the Goose Lake, Summer, Abert, Harney and Warner basins of Oregon but found roach only in the tributaries to Goose Lake, Lake County, Oregon (Snyder 1908a). Snyder (1913) erected a new genus, *Hesperoluecus*, and described six new species based on locality, isolation and morphological differences. Among the new species was the northern roach, *Hesperoleucus mitrulus*, from Drews, Muddy, and Cottonwood creeks, Lake County, Oregon. Snyder also reported that the species had not been recorded from Goose Lake itself or from the high-gradient Californian streams that flow into the lake from the Warner Mountains to the east. There is no indication that he was aware of the previous collection of roach in the Pit River by Rutter.

Northern roach were classified as a distinct species of *Hesperoleucus* by subsequent workers (Evermann and Clark 1931; Shapovalov and Dill 1950; Shapovalov et al. 1959), but Miller (1945a, p. 197) suggested the "preliminary analysis of the forms of *Hesperoleucus* shows that many if not all, of those described as species are geographic subspecies of *H. symmetricus*." Murphy (1948c), in an unpublished master's thesis, proposed that all coastal forms be demoted to subspecific status and submerged into *H. symmetricus*. Murphy (1948c) did not study samples of the northern roach, nor did he suggest that his subspecific diagnosis should be applied to *H. mitrulus*. However, it appears that when Murphy's (1948c) subspecific diagnosis for *H. parvipinnis*, *H. navarroensis*, *H. venustus* and *H. subtitus* was adopted by subsequent workers (Hopkirk 1973; Moyle 1976; Hubbs et al. 1979), subspecies status was erroneously applied to *H. mitrulus* as well.

The first inclusion of roach from the Pit River in *mitrulus* was by Hubbs et al. (1979 p. 11), who used the common name "upper Pit roach" when referring to *H. mitrulus*. While no mention is made of a range extension for the taxon, it is assumed that this change was precipitated by the 1934 collection of 19 roach in the North Fork Pit River near Alturas, Modoc County (unpublished field notes and collections of Carl Hubbs at the University of Michigan, as reported in Reid et al. 2003). The California Department of Fish and Wildlife (Shapovalov et al. 1981) subsequently applied the common name "upper Pit" roach to *H. symmetricus* but, like Hubbs et al. (1979), did not publish distributional information.

Genetically, Aguilar and Jones (2009) found that individuals from these Goose Lake and Pit River locations were distinct from all other California roach. Northern roach were reciprocally monophyletic for mtDNA haplotypes and showed strong differentiation from all other roach populations based on nuclear microsatellites (Aguilar et al. 2009). Based on mtDNA sequence diversion, Aguilar et al. (2009) estimated that the northern populations of roach have been isolated for 8 million years.

Moyle et al. (1995) and Moyle (2002) listed the "Pit" roach (i.e. *mitrulus*) as being native to the upper Pit River system, as well as to Oregon tributaries of Goose Lake. In light of: the 2009 genetic analysis (nuclear and mtDNA) that corroborated the distinctiveness of northern roach as described by Snyder (1913); and the fact that Snyder's original species were never properly submerged (i.e. through formal publication of an analysis in the peer-reviewed literature), Moyle et al. (2015) considered the northern roach a valid full species. The subspecies name, *Lavinia s. mitrulus* (Hopkirk 1973) is pre-occupied by *Lavinia mitrulus* (Snyder 1913). Many variations of the common name "upper Pit" or "Pit River" have been applied to *mitrulus*; however, because the range consists of multiple isolated basins and because the type locality is in Lake County, Oregon, Snyder's original name for the taxon, "northern roach," seemed most fitting (Moyle et al. 2015). The species is also referred to as "Pit roach" (Nelson 2023).

Baumsteiger and Moyle (2019) used previous studies of the Hesperoleucus/Lavinia species complex along with a recent comprehensive genomic analysis to reorganize the California Roach/Hitch species complex. Baumsteiger and Moyle (2019) found that the genera *Lavinia* and *Hesperoleucus* are supported as representing distinct lineages, despite occasional hybridization between them. Baumsteiger and Moyle (2019) divided *Hesperoleucus symmetricus* into four species, including the Northern roach, *H. mitrulus*. Their genomic study (Baumsteiger et al. 2017) also found all individuals collected from Goose Lake and Pit River locations to be distinct at the species-level in every analysis.

c. Reproduction, Behavior, and Diet

Northern roach presumably share much of their life history with Central California roach but the specific life history attributes of Northern roach have not been studied so cannot be verified (Moyle et al. 2015).

Roach are opportunistic omnivores whose diet varies greatly across watershed, habitat type and season. In small, warm, streams they primarily graze on filamentous algae, which is seasonally abundant, although they also ingest crustaceans and aquatic insects, which can account for nearly a third of stomach contents by volume (Fry 1936; Fite 1973; Greenfield and Deckert 1973). In larger streams, such as the North Fork Stanislaus River, roach have been observed to feed on drift and aquatic insects may dominate their diet year-round (Roscoe 1993). Juvenile roach consume large quantities of crustaceans and small chironomid midge larvae, while adult roach are more opportunistic feeders, feeding both off the substrate and from drifting insects in the water column. Although roach are primarily benthic feeders, Moyle (2002) observed roach feeding in the Tuolumne River in swift current on drift organisms, including terrestrial insects. Adult roach show little preference for food type and small midge, mayfly, caddisfly and stonefly larvae, along with elmid beetles, aquatic bugs and amphipods, are taken roughly in proportion to their availability in the benthos and drift (Fite 1973; Roscoe 1993; Feliciano 2004). Adult roach have also been observed to consume larger prey and one individual in the Navarro River contained three larval lampreys (Moyle 2002). As a result of their benthic feeding habits, stomach contents of adult roach are often found to contain considerable amounts of detritus and fine debris. It is thought that roach extract some nutritional value from this material because its retention is facilitated by the gill rakers and mucus secretions from epithelial cells (Cech et al. 1991).

Growth is highly seasonal, with most rapid growth typically occurring in early summer (Fry 1936; Barnes 1957). In perennial streams, roach frequently exceed 40 mm SL in their first summer, reach 50-75 mm by their second year and 80-95 mm SL by their third summer (Fry 1936; Roscoe 1993). Few individuals exceed 120 mm SL or live beyond 3 years, although a 6-year-old specimen was recorded in San Anselmo Creek, Marin County (Fry 1936).

Roach typically mature at 45-60 mm SL in their second or sometimes third year (Fry 1936). Fecundity is dependent on size and ranges from 250 – 2,000 eggs per female (Fry 1936, Roscoe 1993). Spawning activity is largely dependent on temperature and typically occurs in March through early July, when water temperatures exceed 16˚C. Spawning occurs in riffles over small rock substrates, 3-5 cm in diameter. Roach spawn in large groups over coarse substrates where each female repeatedly deposits eggs, a few at a time, into the interstices between rocks which are immediately fertilized by one or more attendant males. Spawning aggregations can be quite conspicuous and spawning fish can splash so vigorously that, at times, the splashing can be heard at some distance (Moyle 2002). This activity clears silt and sand from interstices of the gravel which improves adhesion for sticky fertilized eggs. Eggs hatch after 2-3 days, and larvae remain in the gravel until large enough to actively swim. Larval development is described by Fry (1936). The population studied in Bear Creek, Colusa County, apparently spawned in emergent vegetation and newly hatched larvae remained among the plants for some time (Barnes 1957). Once the yolk is absorbed, larval roach feed primarily on diatoms and small crustaceans (Fry 1936).

Larval drift may be a significant form of dispersal for roach during some years. Roach embryos and larvae in Eel River tributaries (introduced population) made up a significant portion of the nighttime planktonic drift from May through July (Harvey et al. 2002; White and Harvey 2003). White and Harvey (2003) suggest that the timing of roach spawn (in late spring as flows recede) and apparent short period of drift for individual larvae are adaptations that may reduce the risk of roach drifting downstream into unsuitable habitat types.

d. Habitat Requirements

Northern roach tend to be associated with spring pools and swampy stream reaches, habitats dissimilar from those occupied by roach in the rest of California (S. Reid, pers. comm. 2009, as cited in Moyle et al. 2015). Thus, in Ash and Rush creeks, Lassen and Modoc counties, roach are found in small numbers inhabiting the weedy margins of streams and, in one case, an isolated spring pond (Moyle and Daniels 1982; S. Reid, pers. comm. 2009, as cited in Moyle et al. 2015). They do not often occupy intermittent streams in the Pit system, as is usual with roach in the rest of their range. Instead, speckled dace (*Rhinichthys osculus*) dominate these habitats.

Moyle and Daniels (1982) found that 94% of the fish species that co-occurred with northern roach were also native. The most common associates were speckled dace, Sacramento sucker (*Catostomus occidentalis*) and Pit sculpin (*Cottus pitensis*). The fact that roach occur as part of a predominately native fish assemblage has been observed elsewhere (Moyle and Nichols 1973; Leidy 1984; Brown and Moyle 1993; Leidy 2007). Moyle (2002) attributes the uncommon co-occurrence of roach with alien species to the tendency for roach to be easily displaced by invasive fish species, especially centrarchids.

e. Current and Historic Range

In California, northern roach are restricted to several tributaries of the upper Pit River (Moyle et al. 2015). It is likely that they once inhabited the meandering valley floor reaches of the Pit River in Big Valley, Modoc County, but this area is now completely dominated by invasive species (Moyle and Daniels 1982). Roach have not been recorded from Goose Lake itself or from the high-gradient Californian streams that flow into the lake from the Warner Mountains to the east (Moyle et al. 2015). However, roach found in the northern tributaries of Goose Lake in Lake County, Oregon are also included in *H. mitrulus* (Moyle et al. 2015). In a comprehensive sampling of the Oregon portion of the Goose Lake watershed, the Oregon Department of Fish and Wildlife found northern roach to be widespread and relatively abundant (>80 fish/km) in Dry, Drews, Hay, Dent, Muddy and Augur creeks (Heck et al. 2008).

Roach populations in the terminal lake basins adjacent to Goose Lake, in the high desert of eastern Oregon, may also belong to this species but distributional records are spotty and taxonomic relationships among these populations remain uncertain (Moyle et al. 2015). Nelson (2023) calculated an estimated range of 522 km^2, using NatureServe RARECAT tool and 17 mapped EO records in Biotics. See Figure 1 for a range map.

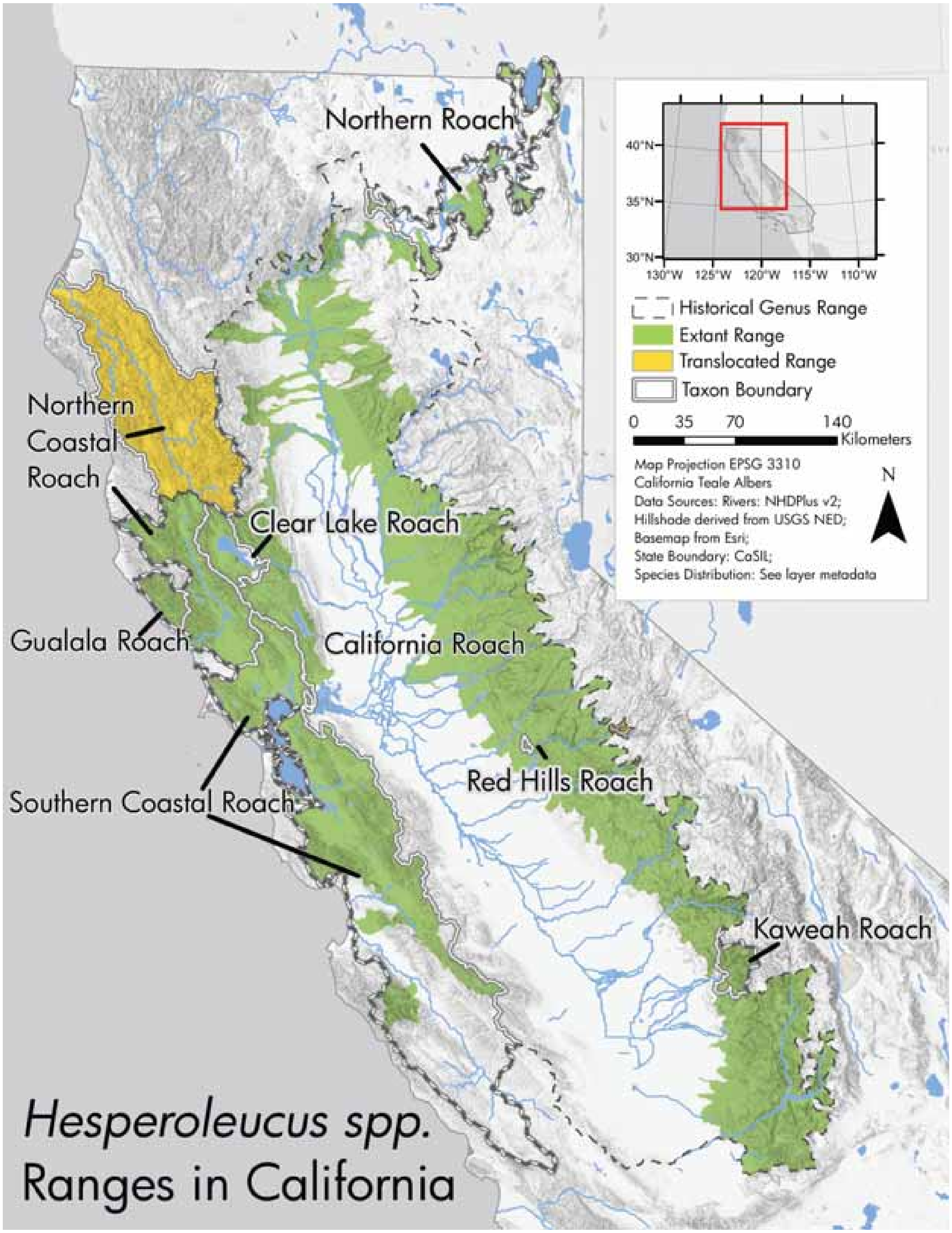

Figure 1. Northern roach range map from Baumsteiger and Moyle 2019

Pit River Falls is located five miles downstream of the town of Fall River Mills, Shasta County, dividing the Pit River basin into upper and lower drainages. The falls are at least partially a barrier to fish movement (Moyle et al. 2015). Historically, they represented the northern range limit for some Sacramento River basin fishes, such as tule perch, *Hysterocarpus traski* (Moyle 2002). Only roach found above Pit River Falls are considered northern roach, *L. mitrulus*. Roach found below the falls would have historically had unimpeded access to the Sacramento River system and are assumed to be *L. s. symmetricus*. However, genetic studies have not been conducted and relationships remain uncertain (Moyle et al. 2015).

Historical collecting trips to the upper Pit River system captured only a few roach specimens (Rutter 1908; Hubbs et al. 1934, from field notes and collections at the University of Michigan, as reported in Reid et al. 2003) or none at all (Snyder 1908a). In a comprehensive sampling of the Pit system, Moyle and Daniels (1982) found roach at only 8% of 261 collection sites. Above Pit River Falls, roach were found in three drainages: (1) Ash–Rush–Willow Creek drainage, Lassen and Modoc counties, (2) Bear Creek, tributary to the Fall River, Shasta County and (3) Beaver Creek, Lassen County.

Population Status

<u>Oregon Surveys</u>

Comprehensive 2007 sampling of the Oregon portion of the Goose Lake watershed by the Oregon Department of Fish and Wildlife found Northern roach to be widespread and relatively abundant (>80 fish/km) in reaches of six small tributary creeks (Heck et al. 2008; Scheerer et al. 2010). Scheerer et al. (2010) collected roach from 40 locations, which represented 20% of all sites sampled and 25% of the nongame fishes sample frame. Roach were found in Dry, Drews, Hay, Dent, Muddy and Augur creeks. Roach were widespread in the lower gradient, lower elevation, non-forested stream channels of the basin with no major change in distribution compared to previous sampling efforts. Sites (n=11) where relatively large numbers of Pit Roach (≥80 fish) were collected were widely distributed throughout the basin.

In 2009 roach were found in several Oregon tributaries to Goose Lake, including Hay Creek, Dent Creek, Muddy Creek, Camp Creek, and Cox Creek (ODFW 2009).

In 2016, ODFW found roach in Drews Creek below Highway 140 (email from Justin Miles, ODFW Assistant District Fish Biologist).

During 2016 ODFW surveys for pit sculpin in Drews and Camp creeks, native roach were collected in the lower agricultural section of Drews Creek (sites 1-9); but were not found in Camp Creek (Scheerer et al. 2017).

Comprehensive fish sampling efforts were not conducted in the Oregon tributaries of Goose Lake from 2007 until 2022, when ODFW sampled 36 sites (all previously sampled by ODFW in 2007) using electrofishing and collection of triplicate eDNA samples; 16 sites in Thomas-Bauers, 10 sites in Drews, 5 sites in Dry, and 5 sites in Eastside watersheds (Davis et al. 2022; ODFW 2022). Northern (Pit) roach were detected in 2022 using eDNA in one reach of lower Thomas Creek, one reach of upper Thomas Creek, and one reach of Dry Creek (Davis et al. 2022). The Drews Creek watershed was punctuated by widespread declines in fish abundances comparted to 2007. At lower elevation sites (1541 ± 46 m) in Dent Creek and Dog Creek where roach had been highly abundant in 2007, roach were completely absent in 2022 (Davis et al. 2022). Dry Creek also appeared to experience widespread fish declines, with previously robust populations of roach absent in 2022 (Davis et al. 2022).

Resurveys were done in Oregon tributaries of Goose Lake by ODFW (2023), with 33 comprehensively sampled sites, all of which were previously sampled by ODFW in 2007 and most of which were sampled in 2022, and an additional 56 sites using eDNA. Ongoing drought conditions appear to have been slightly alleviated during the 2023 field season but fish abundance trends, including for roach, appeared to be similar to 2022. In 2023 a newly sampled site on Hay Creek had "very high numbers of native and non-native minnows" but they were apparently not identified to species (ODFW 2023).

California Surveys

Historically, roach were probably much more widely distributed in the upper Pit River drainage (e.g., Big Valley) but modern surveys have found that they have disappeared from reaches in which they previously occurred (reviewed in Reid et al. 2003). Reid et al. (2003), in the only known survey of the Upper Pit drainage since 1978, surveyed 12 sites in the North Fork, South Fork and upper mainstem Pit River (between Alturas and Rose Canyon) without collecting roach.

The following is a history of roach occurrence in the upper Pit River basin from Moyle et al. (2015):

North Fork Pit River. Rutter (1908), collecting in 1898, captured “a few small specimens” of roach. Snyder (1908), collecting in 1904 near the same location, did not capture any roach, while Hubbs and others collecting in the North Fork near Alturas in 1934 captured only 19 (from field notes and collections at the University of Michigan, as reported in Reid et al. 2003). Subsequent collectors have found green sunfish but not roach (Moyle and Daniels 1982; Reid et al. 2003).

South Fork Pit River. Three historic sampling trips found roach in the South Fork. Modern collecting trips have failed to document roach in the South Fork (from information in Reid et al. 2003).

Mainstem Pit River, Alturas to Pit River Falls. The only known record of capture is a single specimen taken by R.R. Miller in 1961 (from University of Michigan field notes and collections, as reported in Reid et al. 2003). This is the reach flowing through Big Valley which has been highly altered and contains mainly alien species (Moyle and Daniels 1982). However, roach remain common in the Ash Creek drainage (S. Reid. pers. com. 2009, as cited in Moyle et al. 2015).

Moyle and Daniels (1982) found roach at only 8% of 261 collection sites. Above Pit River Falls, roach were found in three drainages: (1) Ash–Rush–Willow Creek drainage, Lassen and Modoc counties, (2) Bear Creek, tributary to the Fall River, Shasta County and (3) Beaver Creek, Lassen County.

Petitioner sent a public records request in 2025 to the California Department of Fish and Wildlife, which did not have any additional survey or population information for the Northern roach.

Threats

The main factors which limit the abundance and distribution of northern roach are agriculture, livestock grazing, logging, transportation infrastructure, fire, and invasive species (Moyle et al. 2015).

Present or Threatened Destruction, Curtailment, or Modification of Habitat or Range

Agriculture

Moyle et al. (2015) rate agriculture as a medium threat to the Northern roach. Agricultural alteration of the Pit River basin has a long history. The earliest fish survey of the region (1898) already described the South Fork Pit as being "almost drained by irrigation ditches" (Rutter 1908, p. 110). The low gradient areas favored by roach are also areas in which extensive pasture, hay, and other types of farming occur, for example much of Big Valley, through which the Pit River flows, is devoted to growing alfalfa, pasture, and potatoes (Moyle et al. 2015). It is likely that the river in this region was once habitat for roach but agricultural alteration, combined with abundant invasive species, has made it unsuitable habitat (Moyle et al. 2015). Many tributary streams in this region are channelized to reduce spring flooding of pasture and agricultural lands, a practice which eliminates roach habitat (Moyle 1976). The relationship between water withdrawal for irrigation and stream flow is not documented in the region (Moyle et al. 2015), but Pit River flows are low and polluted with agricultural return water between Alturas and Fall River Mills, as evidenced by the Pit River being listed as impaired by high temperature, nutrients and low dissolved oxygen content under The Clean Water Act section 303(d) (USEPA 2006).

The water quality standards recommended by state and federal agencies need to be adopted and vigorously enforced, including finding ways to reduce sediment loads (Moyle et al. 2015). Water rights in the entire Pit River watershed need to be adjudicated and a minimum flow provided for all streams to provide suitable year-round habitat for native fishes (Moyle et al. 2015).

Livestock Grazing

Moyle et al. (2015) rate livestock grazing as a medium threat to the Northern roach. Livestock grazing is pervasive in the Pit River watershed and most streams have been heavily grazed (Moyle et al. 2015). Grazing impacts to streams can include: removal of riparian vegetation, stream bank collapse, sedimentation of pools, impaired water quality from sedimentation and animal waste input, and reduction in the amount of cover and shading (Moyle et al. 2015). If grazing impacts to streams are severe, roach tend to disappear despite their high tolerance of adverse conditions (Moyle et al. 2015). Stock ponds, which are created to provide water for cattle, can divert water from streams and support populations of non-native predatory fishes in the upper portions of watersheds (e.g. Ash Creek). These fish (e.g. green sunfish, largemouth bass) may colonize adjacent streams during wet periods when ponds spill and become hydrologically connected to streams, potentially eliminating roach populations (Moyle et al. 2015).

Logging

Moyle et al. (2015) rate logging as a medium threat to the Northern roach. Most of the Pit River watershed that is not devoted to agriculture is covered with dry forestland, and logging is a major land use in higher elevation parts of the watershed. Logging in the arid Pit drainage likely contributes sediments to streams, especially considering the nature of the volcanic soils across the region and wide use of highly friable crushed cinders for road base (Moyle et al. 2015).

Transportation Infrastructure

Moyle et al. (2015) rate transportation infrastructure as a medium threat to the Northern roach. Much of the Pit River is bordered by roads; logging and ranch roads contribute to siltation, channelization, and habitat loss (Moyle et al. 2015). Streambeds with adjacent roads and road crossings are subject to fragmentation (where road crossings create barriers to fish movement) and increased sediment and pollutant input, degrading aquatic habitat quality and quantity for roach and other fishes (Moyle et al. 2015). Roach populations decline when severe channelization of small streams occurs (Moyle et al. 2015).

Cumulative Threats

Although agriculture, livestock grazing, logging, and transportation infrastructure are considered medium threats to Northern roach, impacts from these activities operate in aggregate along with other less pressing threats, as cumulative and synergistic watershed impacts (Moyle et al. 2015). Taken cumulatively, impacts from agriculture, livestock grazing, logging, or transportation infrastructure that modify roach habitat or range pose a significant threat to the species, especially in conjunction with other significant threats from climate change, invasive species, and fire.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Harvest or collection is not known to be a threat for this species (Moyle et al. 2015).

Disease or Predation

There is no information about disease for the Northern roach. Predatory invasive fish species are a severe threat; see the section below on invasive species.

Inadequacy of Existing Regulatory Mechanisms

a. Federal Mechanisms

Although many of the extant Northern roach populations occur in stream reaches on federal public lands managed by the U.S. Forest Service and U.S. Bureau of Land Management, much of the extant range is on private lands that do not have adequate regulatory mechanism to protect Northern roach habitat. See Figure 2 for a map of land ownership within the Northern roach range.

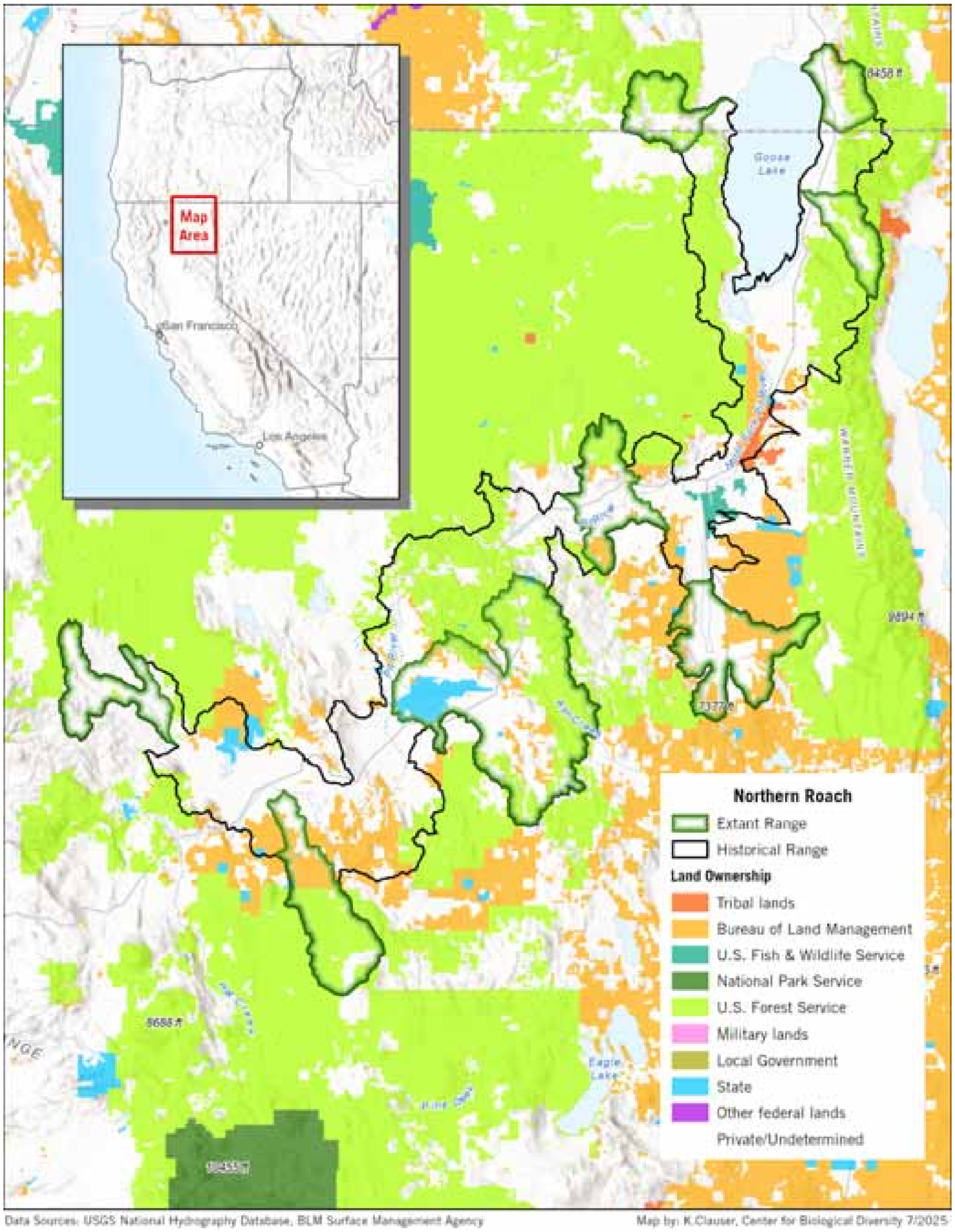

Figure 2. Land ownership map within the Northern roach range. Map by Center for Biological Diversity.

i. Federal Endangered Species Act

The Northern roach was formerly provided some protection due to its co-occurrence in a few streams with the Modoc sucker (*Catostomus microps*), which was listed as a federally endangered species in 1985 (USFWS 1985). However, the U.S. Fish and

Wildlife Service removed the Modoc sucker from the federal list of endangered and threatened wildlife in 2015 (USFWS 2015a). The Northern roach range overlaps with historic habitat for the Oregon spotted frog (federally listed as Threatened in 2014), but this frog is presumed extirpated from the Pit River basin of California (USFWS 2022). The Northern roach range overlaps with historic habitat for the bull trout (federally listed as Threatened in 1998), but bull trout no longer occurs in the Goose Lake or Pit River basins (USFWS 2015b). Thus, there is no overlap with or potential benefit from other ESA-listed species. There are no federal Habitat Conservation Plans that cover the Northern roach as a non-listed species (USFWS 2025).

ii. National Forest Management

The Northwest Forest Plan is a federal management policy with potential benefits for Northern roach. The Northwest Forest Plan does not adequately address impacts to freshwater fish habitat from roads, culverts, or grazing, but it contained an aquatic conservation strategy to limit timber harvest impacts, with buffers that could offer some protections for stream and riparian habitats for freshwater fish. However, in 2024 the U.S. Forest Service proposed amendments to the Northwest Forest Plan (USFS 2024b) that will dramatically increase logging throughout the Pacific Northwest and reduce stream and riparian habitat protections. Management by the U.S. Forest Service of streams and riparian areas on National Forest lands has the potential to protect and maintain habitat for Northern roach.

The Trump administration executive orders on accelerated logging on federal lands, attempts to sell off public lands, and rescinding of the roadless rule will lead to massive damage to national forests and wildlife habitat from increased logging and road building, including throughout Oregon and California and likely in the Goose Lake and Pit River basins. Nearly 2.3 million acres of forest in the Fremont-Winema National Forest and 1.6 million acres in the Modoc National Forest are potentially at risk of accelerated logging. The Trump administration has directed the secretaries of Commerce, Interior and Agriculture to design plans that would “facilitate increased timber production,” expand their legal authority to extract timber, and eliminate protections that create an “undue burden” on cutting down trees. The Secretary of Agriculture issued a memorandum in 2025 declaring an "emergency" across 110 million acres of national forest, including tens of millions of acres of designated wilderness areas, wilderness study areas and inventoried roadless areas, as well as more than 300,000 acres of research natural areas, which the Forest Service typically manages to protect from all human activity. Most of these areas are critically important wildlife habitat. Logging projects proposed within “emergency” areas would receive reduced environmental review and limited opportunities for opponents of harmful projects to challenge them in court. The Secretary of Agriculture also announced in 2025 a repeal of the “roadless rule” to allow for timber harvest on more than 58 million acres of national forests; this could allow logging on more than 4 million acres of currently protected roadless forests in California and an estimated 2 million acres of roadless forests in Oregon. The Modoc National Forest has 201,000 acres of inventoried Roadless Areas that are at risk; and the Fremont National Forest has 86,000 acres of inventoried Roadless Areas that are at risk.

Fremont National Forest

Reaches of tributary streams to Goose Lake in Oregon that may support Northern roach are on U.S. Forest Service managed lands in the Fremont National Forest, including Dry, Drews, Hay, Dent, Muddy and Augur creeks (Heck et al. 2008). The Fremont National Forest management is guided by a 1989 management plan (USFS 1989). This management plan does not specifically mention Northern roach, nor explicitly manage to benefit this species or its habitat. It does outline goals for managing and protecting designated sensitive species, fisheries, and riparian areas. The USFS lands with streams supporting Northern roach are designated in this plan as management areas that prioritize timber harvest and livestock grazing. The plan acknowledges that improper grazing by domestic livestock has the largest adverse effect on the forest's riparian areas. The plan proposes to protect riparian areas by exclusion of livestock by fencing; removal when proper utilization is reached; changing the season of use; or the implementation of intensive (pasture management) grazing systems.

The Forest Service has completed watershed analyses for Oregon tributaries of Goose Lake that may support Northern roach: Dry Creek in 1995 and Drews Creek in 2006. The only nearby watershed analysis ne that is available online from the Forest Service is the 1996 Thomas Creek watershed analysis (USFS 1996). This analysis noted damage to fish habitat from 75 years of intense livestock grazing pressure in riparian areas, with cattle trampling riparian vegetation, compacting soil, and lowering the water table by causing bank erosion and channel downcutting. It also noted erosion and fine sediment impacts from logging and roads; and logging road densities that reduced base flows. It noted numerous unscreened diversions developed for agriculture, including several recognized as barriers to fish movement, and poorly designed culverts that are fish barriers.

Modoc National Forest

Reaches of the upper Pit River basin above Pit River Falls supporting Northern roach are on U.S. Forest Service managed lands in the Modoc National Forest, including the Ash–Rush–Willow Creek drainage, the Bear Creek tributary to the Fall River, and Beaver Creek (Moyle and Daniels 1982; Moyle et al. 2015). Modoc National Forest management is guided by a 1991 management plan (USFS 1991). This management plan does not specifically mention Northern roach, nor explicitly manage to benefit the species or its habitat. It does outline goals for managing and protecting designated sensitive species, fisheries, and riparian areas, specifically with regard to Goose Lake redband trout. The USFS lands with streams supporting Northern roach are designated in this plan as management areas that prioritize timber harvest and livestock grazing. The plan acknowledges that improper grazing by domestic livestock has had adverse effect on the forest's riparian areas. This plan is similar to the Fremont National Forest Plan in its aspirational goals for protecting riparian areas and fish habitat. Moyle et al. (2015) noted that the USFS has reversed some of the livestock grazing impacts in the Modoc National Forest through restoration actions, but that riparian protection measures such as exclusionary fencing need to be expanded.

Sensitive Species Designation

The Northern roach is not designated as a "sensitive species" by the USFS for either Region 5, which covers the Modoc National Forest (USDA 2013), nor for Region 6, which covers the Fremont National Forest (USDA 2021).

Aquatic Conservation Strategy

In 2018, the USFS implemented an Aquatic and Riparian Conservation Strategy for the Northwest Forest Plan Area, which comprises western Oregon, western Washington, and northwestern California, and lands in eastern Oregon and Washington that are implementing PACFISH and INFISH strategies; this does <u>not</u> include areas that support Northern roach (USFS 2018). Region 5 of the USFS adopted an Aquatic Conservation Strategy (ACS) for the Pacific Southwest Region (USFS 2013), which covers national forests within the state of California, including the Modoc National Forest.

Fundamental goals and essential components of the 2013 ACS include:

- Habitat connectivity within and among watersheds to support ecological integrity, biodiversity and resilience of aquatic resources
- Physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, to promote resilient aquatic habitats
- Water quality necessary to support healthy riparian, aquatic, and wetland ecosystems
- In-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to achieve desirable patterns of sediment, nutrient, and wood distribution
- Habitat to support well-distributed populations of native plant, invertebrate, and vertebrate aquatic and riparian-dependent species
- Sediment regime, including the timing, volume, rate, and character of sediment input, storage, and transport, that supports identified beneficial uses
- Timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands to provide groundwater recharge, stream flow, and maintenance of riparian areas
- Aquatic species composition and distribution in lentic and lotic habitats that reflect inherent biodiversity and productivity
- Species composition and structural diversity of plant communities in riparian areas to provide riparian functions and processes including shade, wood recruitment, and sediment capture.

In order to achieve these goals, the Region 5 Fisheries Program, in partnership with the Hydrology and Watershed Programs, implements the ACS by focusing on the following core elements:

- Development and implementation of species recovery plans, conservation assessments and strategies to conserve and recover TES aquatic species in collaboration with state and federal agencies and other organizations.
- Collaboration in the design and management of in-stream flows associated with hydropower, flood control, agricultural and municipal water operations that will maintain or restore aquatic resources (e.g. Federal Energy Regulatory Commission relicensing process).

- Assessment and restoration of aquatic organism passage at road-stream crossings to provide for unobstructed migration and dispersal, and reconnect habitats needed to fulfill the life-history requirements of aquatic species.
- Treatment of sediment delivery sources associated with roads, trails, and abandoned mines to reduce or eliminate sediment delivery where fine sediment is limiting the biological productivity of the water body
- Meadow restoration to re-establish or improve hydrologic processes and natural biotic communities
- Eradication or control of non-native aquatic species where they compromise the biological integrity of a water body and prevention of aquatic invasive species introductions through education, inspection and decontamination
- Silvicultural treatments in young riparian stands to accelerate the development of mature forest conditions and promote shade-producing canopy, vegetative diversity, wood recruitment, and a broader complex of habitats for aquatic and riparian species.
- Developing and sustaining partnerships to restore and enhance aquatic resources

There have been repeated agency (USFS and USBLM) and legislative proposals to substantially reduce protective provisions of the Northwest Forest Plan and specifically the Aquatic Conservation Strategy by increasing the extent of logging and other mechanized forest management, such as fuels treatments. Proposed changes, including reduced riparian reserve protections and a substantially lowered burden of proof for watershed-disturbing activities, are not scientifically justified (Frissell et al. 2014; CRA 2014). Observed and anticipated effects of climate change, and of cumulative anthropogenic stressors operating in the nonfederal lands surrounding federal lands strongly indicate the need to strengthen, not weaken key ACS protections. Roads and ground disturbance associated with mechanical thinning and fuels reduction activities, especially within Riparian Reserves, cause adverse environmental impacts that generally offset or exceed presumed restorative benefits. Headwater streams warrant wider riparian forest buffers than current ACS provisions to ensure effective retention of sediment and nutrients derived from upslope logging, fire, and landslides. Widespread and sustained ecological harm caused by roads is now widely recognized, and ACS measures should be strengthened to more effectively arrest and reduce road impacts in all catchments. Grazing, mining, post-disturbance logging (e.g., fire salvage), water withdrawal, and aerial application of toxic chemicals can cause both acute and chronic harm to aquatic ecosystems. Existing ACS standards and guidelines would need to be strengthened to more effectively control these impacts.

iii. National Environmental Policy Act

The National Environmental Policy Act (NEPA) was intended to require federal agencies to consider the effects of management actions on the environment. Only projects with a federal nexus (i.e. federal funding, authorization, or permitting) fall under NEPA, and therefore actions taken by private landowners generally are not required to comply with this law (USFWS 2009, p. 16). NEPA previously required federal agencies to fully and publicly disclose the potential environmental impacts of all proposed projects. Actions taken by federal agencies, such as the U.S. Forest Service or U.S. Bureau of Land Management, with the potential to impact the Northern roach and its habitat were subject to the NEPA process. The NEPA process required these agencies to describe a proposed action, consider alternatives, identify and disclose potential environmental impacts of each alternative, and involve the public in the decision-making process. The public could provide input on what issues should be addressed in an Environmental Impact Statement and comment on the findings in an agency's NEPA documents. Lead agencies were required to take into consideration all public comments received on NEPA documents during the comment period. However, NEPA still did not explicitly prohibit federal agencies from choosing alternatives that may negatively affect imperiled species. Even if the Northern roach or its habitat were present in a federal agency's project area, NEPA did not prohibit these agencies from choosing project alternatives that could negatively affect individual roach, roach populations, or roach habitat.

A recent recission of 40 CFR 1500-1508 (and thus all CEQ NEPA implementing regulations) no longer requires agencies to propose mitigation to offset significant environmental effects (CEQ 2025, p. 10611). In July 2025 the Trump administration revoked regulations governing environmental reviews under NEPA for numerous federal agencies, including the Department of Agriculture, Department of the Interior, Department of Energy, Department of Transportation and the Federal Energy Regulatory Commission. The decision will affect logging, mining and many other projects on federal lands.

iv. Clean Water Act

The Clean Water Act (CWA) exists to establish the basic structure for regulating the discharge of pollutants into U.S. waters, and for regulating quality standards of U.S. surface waters. Under the CWA, the U.S. Environmental Protection Agency (EPA) implements pollution control programs and sets wastewater standards for industry and water quality standards for all contaminants in surface waters. Theoretically the CWA should provide some protection for stream habitats used by the Northern roach. However, The CWA contains no specific provisions to address the conservation needs of rare species. Implementation of the CWA, and the Section 404 program in particular, has fallen far short of Congress's intent to protect water quality (e.g., see Morriss et al. 2001).

Under Section 404 of the CWA, discharge of pollutants into waters of the U.S. is prohibited absent a permit from the U.S. Army Corps of Engineers (Corps). The Corps is the federal agency with primary responsibility for administering the section 404 program. The Corps can issue nationwide permits for certain activities that are considered to have minimal impacts, including minor dredging and discharges of dredged material, some road crossings, and minor bank stabilization. The Corps seldom withholds authorization of an activity under nationwide permits unless the existence of a listed threatened or endangered species would be jeopardized. Activities that do not qualify for authorization under a nationwide permit, including projects that would result in more than minimal adverse environmental effects, either individually or cumulatively, may be authorized by an individual permit or regional general permit, which are typically subject to more extensive review. Regardless of the type of permit deemed necessary under section 404, rare species such as the Northern roach may receive no special consideration with regard to conservation or protection absent listing under the ESA.

Corps guidelines do not specify a methodology for assessing cumulative impacts or how much weight to assign them in decision-making. The Corps continues to lack a comprehensive and consistent process to address the cumulative effects of the continued development of waterfront, riverine, coastal, and wetland properties. The Corps authorizes certain floodplain fill and removal activities with nationwide permits (NWPs). In 2021, the Corps finalized the reissuance of existing nationwide permits with modifications (USOFR 2021c,d). The modifications are likely to increase the amount of fill and destruction of floodplain habitat allowed for nationwide permits. The NWP authorizations will disconnect off-channel stream and floodplain areas and result in simplification of stream habitats.

In 2023, the Supreme Court, ruling in Sackett v. Environmental Protection Agency, 598 U.S. 651 (2023), redefined the Clean Water Act's coverage of WOTUS. In its opinion, the Supreme Court ruled that the CWA extends protection only to those waters that are described "in ordinary parlance" as "streams, oceans, rivers, and lakes," and to wetlands only if those wetlands have a "continuous surface connection" to such waters "making it difficult to determine where the water ends and the wetland begins." One potential outcome would be a decline in water quality resulting from changes in regulation of activities in seasonally flooded floodplain wetlands and other areas outside of lake or stream habitats. The extent to which this affects Northern roach habitat will depend in large part on how EPA and the Corps choose to implement the Supreme Court's ruling.

b. State Mechanisms

i. Species of Special Concern/Sensitive Species

<u>California</u>

The state of California lists the Northern roach as a "Species of Special Concern." This is an administrative designation and carries no formal legal status or substantive protections.

<u>Oregon</u>

The Northern roach is not on the Oregon "Sensitive Species" list (ODFW 2021).

ii. State Conservation Plans

The Oregon Conservation Strategy has a goal to maintain healthy fish and wildlife populations by maintaining and restoring functioning habitats, preventing declines of at-risk species, and reversing declines in these resources where possible (ODFW 2024a). However, the Northern roach is not listed by ODFW as a Conservation Strategy Species. Even if the Northern roach occurred in habitats shared by other conservation strategy fish species, this would not afford any substantive protection—rather, ODFW has only identified "conservation goals" that include maintaining water quality and availability and reducing localized impacts where populations could become increasingly fragmented (ODFW 2024a). Conservation actions under the strategy are not binding or enforceable and are merely "priority actions recommended to conserve the species" (ODFW 2024a).

iii. Other State Policies

ODFW has a nongame fish policy that applies to the Northern roach. The policy requires that nongame fish be “managed to maintain self-sustaining populations,” OAR 635-500-1720(1). OAR 635-500-1700 provides “management objectives” for fish habitat that include influencing land management decisions to benefit fish habitat, improving quantity and quality of habitat, and “strongly advocat[ing] and support[ing] habitat protection and restoration on private and public land.” OAR 635-500-1700(1). Oregon Administrative Rules Division 7 contains regulations for the Native Fish Conservation Policy, which includes codified objectives such as “maintain[ing] and restor[ing] sustainable naturally produced native fish species living and reproducing successfully in their natural environments.” OAR 635-007-0504(3)(a). The Policy is to be implemented through Conservation Plans, but no Conservation Plan has been developed for the Northern roach.

iv. California Environmental Quality Act

The environmental review process under the California Environmental Quality Act (California Public Resources Code §§ 21000-21177) requires state agencies, local governments and special districts to evaluate and disclose impacts from "projects" in the state. CEQA declares that it is the policy of the state to prevent “the elimination of fish or wildlife species due to man’s activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities” (California Public Resources Code, section 21001(c)). The CEQA process is triggered when discretionary activities of state agencies may have a significant effect on the environment. When the CEQA process is triggered, it requires full disclosure of the potential environmental impacts of proposed projects. The operative document for major projects is usually the Environmental Impact Report.

Under CEQA, Species of Special Concern must be considered during the environmental review process, with an analysis of the project impacts on the species, only if they meet the criteria of sensitivity under Section 15380 of the CEQA Guidelines. However, project impacts to the Northern roach could remain unanalyzed if project proponents are able to claim insignificant impacts to non-listed species since the project does not have population-level or regional effects or impacts a small proportion of the species’ range.

Theoretically, besides ensuring environmental protection through procedural and informational means, CEQA also has substantive mandates for environmental protection. The most important of these is the provision requiring public agencies to deny approval of a project with significant adverse effects when feasible alternatives or feasible mitigation measures can substantially lessen such effects. In practice, however, this substantive mandate is rarely implemented, particularly with regard to instream projects, water diversions, grazing permits and projects causing pollution and sedimentation – the type of projects that could impact habitat for the Northern roach in Northern California. If significant impacts remain after all mitigation measures and alternatives deemed feasible by a lead agency have been adopted, a lead agency is allowed under CEQA to approve a project despite environmental impacts if it finds that social or economic factors outweigh the environmental costs. It is important to note that CEQA is not, nor was it ever intended to be, a habitat protection mechanism.

There are continuing state legislative attempts to undermine CEQA and make it easier for developers to avoid or narrow environmental review for a host of projects. For example, S.B. 607, authored by Sen. Scott Wiener (D-San Francisco), would allow more projects to bypass or limit environmental review even if there is evidence that the project would have serious consequences. In June 2025, the state legislature passed and Governor Newsom signed sweeping rollbacks to CEQA that will exempt certain projects from environmental review and restrict legal challenges.

c. Other Mechanisms

Goose Lake Fishes Conservation Strategy

During the 1987-1994 drought, a proposal was developed to list Goose Lake fish fauna under the federal ESA. In response, the Goose Lake Fishes Working Group was formed in 1991 (made up of representatives from both California and Oregon, and comprised of private landowners, state and federal agencies, nongovernmental organizations, and universities) to protect and, where needed, reestablish native fishes in the Goose Lake basin (Sato 1992a). In 1995, the Goose Lake Fishes Conservation Strategy was completed, with a goal of conserving all native fishes in Goose Lake by reducing threats, stabilizing population numbers, and maintaining the ecosystem (GLFWG 1996). The voluntary Conservation Strategy states that desired water quality and quantity, and physical attributes should provide safe and open passage for upstream and downstream migrants, clean spawning substrates, foraging habitats, hiding and thermal cover, and water temperatures to meet physiological requirements. The Conservation Strategy identified factors in each stream that were affecting fish and provided a list of actions since 1958 that were implemented to benefit potential problems.

Since publication of the conservation strategy in 1996, a number of additional projects have been completed or long-term projects begun. These include 2 culvert improvements, 11 diversion or passage projects, 10 fencing projects, 16 habitat improvement projects, 11 fish surveys, and a road improvement project to reduce sedimentation. In the lower reaches of most streams, restoration actions included making road under-crossings passable to trout, including a fish ladder installed over a major diversion dam on Thomas Creek in 1992 by ODFW. It is unclear if these projects provided passage for roach.

Restoring migratory connectivity between upstream and downstream habitats in the sub-basin would allow the full expression of life history potentials of the migratory fish species. Head cut control, bank stabilization, stream fencing, planting of riparian vegetation, modified grazing practices and other protective measures have also been undertaken on a number of streams in recent years. These measures have greatly improved habitat and water quality in Goose Lake tributaries, including the lower reaches that flow through agricultural land. Monitoring of water quality, insects, and fish demonstrate the improvements (Tate et al. 2005) however, continued effort is needed to maintain (and ideally increase) the populations of fishes, especially during periods of severe drought.

The Lake County Umbrella Watershed Council (LCUWC 2020, 2023), which is implementing the Goose Lake Fishes Conservation Strategy, lists half a dozen or more fish passage and habitat improvement projects in progress in the Goose Lake basin that have potential benefits for the Northern roach. Many of the Goose Lake basin fish passage and restoration projects, as well as fish monitoring, have been focused on and directed at Goose Lake redband trout (*Oncorhynchus mykiss newberrii*), Modoc sucker (*Catostomus microps*), and Warner sucker (*Catostomus warnerensis*), rather than the Northern roach.

The efforts under the Goose Lake Fishes Conservation Strategy, while potentially providing improvements to stream habitat for roach, are not eliminating the threats to the species. As discussed above, agricultural water diversions, roads, and livestock grazing impacts continue in most tributary basins. Legacy impacts of logging, mining, roads, and extensive stream channelization have altered natural flow and transport of sediments (California Trout 2017). These impacts combined with drought event are a major threat, particularly considering concurrent water usage for agricultural purposes (Moyle et al. 2015).

The Goose Lake Fishes Conservation Strategy does not establish specific conservation objectives for the Northern roach. It does not identify the appropriate steps needed to reduce threats to the roach, nor does it contain a schedule for completing necessary conservation and habitat restoration measures, nor does it have a mechanism for evaluating the effectiveness of restoration efforts.

Despite the existence of the Goose Lake Fishes Conservation Strategy for 20 years, Moyle et al. (2015) noted that impacts from agricultural irrigation, grazing, roads (especially culverts) and invasive species continued to threaten Northern roach persistence in California. Additionally, impacts from climate change are predicted to lower base flows, thereby reducing the amount of perennial habitat and increasing summer water temperatures in tributary streams and Goose Lake.

Recognizing that persistence of the Northern roach depends on management actions in both California and Oregon, Moyle et al. (2015) had specific management recommendations that have not yet been completed under the Goose Lake Fishes Conservation Strategy. The involvement of private landowners is particularly critical because many roach habitats occur on private land. See Figure 2 for a map of land ownership in the Northern roach range. The persistence of Northern roach in the Goose Lake Basin will require active cooperation between Oregon and California because it is likely that most (if not all) natural drought refuges for roach in the Goose Lake basin are in Oregon.

The management actions recommended by Moyle et al. (2015) for native fishes in the Goose Lake basin include:

- Determine the suitability of all reservoirs in the drainage as refuges for native fishes and negotiate, if necessary, for minimum pools during periods of drought. Special attention needs to be paid to potential refuges in California.
- Identify and implement restoration projects to benefit native fishes in the lower reaches of Goose Lake tributaries in both Oregon and California.

- Actively enforce the prohibition of use of live baitfish and introduction of nonnative fishes into Goose Lake basin, including Oregon. Where possible, eradicate existing populations of non-native fishes in ponds and streams.
- Establish instream flow protections for larger streams in the basin (Oregon: Thomas, Drews, and Dry creeks; California: Lassen and Willow creeks) to ensure adequate flows are present in lower stream reaches to maintain refuge areas and lake level during periods of drought.
- Conduct a thorough study of the Goose Lake ecosystem, including a study of the distribution and habitat requirements of roach and a systematic survey of the invertebrates present.
- Investigate life history and habitat requirements of Northern roach to determine what additional species-specific management measures are required.

The general recommendations by Moyle et al. (2015) for habitat improvements for all native fish in the Goose Lake basin include:

Dams. Small dams and diversions should be outfitted to allow fish passage at different life stages. Wherever possible, dams should be removed in a manner that will not expose aquatic habitats to increased sedimentation, scouring, etc.

Agriculture. Open diversions should be replaced by pipes in order to minimize streamflow diversion and water temperature gains. Improving spawning access and increasing flows in streams in California and Oregon, especially Lassen, Willow, and Thomas creeks, would benefit native fish species in the basin. Establishment of living buffers and wetlands may reduce the amount of nutrients delivered to Goose Lake and tributary streams, as well as moderate stream temperatures.

Grazing. Stream restoration projects should continue to be implemented, especially measures that create large pools and expand the amount and complexity of riparian vegetation. Cattle exclusion fencing should be maintained and, where appropriate, expanded. Water sources for cattle outside the riparian area should be developed. Maximum impact levels (vegetative height, minimum ground cover, etc.) should be identified, especially for meadow systems, and implemented. Areas where riparian vegetation has been removed, stream banks destabilized, and/or water quality degraded should be closed to grazing to allow ecosystem recovery.

Transportation. Seasonal roads should be storm-proofed (outsloped, inboard ditch removed) and/or decommissioned (outsloped, inboard ditch removed, access blocked, planted) in order to reduce the amount of sediment delivery to streams. Culverts should be replaced by open arches or bridges (minimum width of 1.5 bankfull width) to reduce the potential for blow outs in winter storms and improve fish passage.

Invasive species. Invasive fish species should be eradicated from streams and ponds where possible, with priority placed on the removal of predators (e.g., trout and bass species). Removal plans should be made on a site-by-site basis, using information gathered on the community assemblage and estimated abundances of species present in order to account for the potential incidental impacts to native fishes or other aquatic organisms from either chemical treatments or manual removal via electrofishing or netting.

Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Invasive Species

Moyle et al. (2015) rate invasive species as a high threat to the Northern roach. Roach cannot coexist with large populations of invasive fishes, especially predatory centrarchids such as green sunfish (*Lepomis cyanellus*) and largemouth bass (*Micropterus* spp.). Green sunfish, largemouth bass and bluegill are found together and often dominate the fish biomass in warm, slow, turbid reaches of the mainstem Pit River (Moyle and Daniels 1982). These stretches of river are now dispersal barriers to roach, further isolating small populations in tributary steams (Moyle et al. 2015). Roach populations in refuge tributary watersheds are also threatened by escape of invasive fishes from stock ponds, located higher in these watersheds (Moyle et al. 2015).

Climate Change

Northern roach are well adapted to the warm, arid conditions of northeastern California. However, their dependence upon spring pools in late summer and swampy headwaters suggests that they are also particularly susceptible to decreases in base flows (Moyle et al. 2015). While their ability to persist in small bodies of water bodes well for roach in a future of dwindling in-stream water supplies, it also suggests that they are likely to be extirpated from watersheds with streams that dry completely under the dual strains of increasing aridity associated with climate change and increasing local surface water diversions and ground water withdrawal for rural residential homes and agricultural irrigation (Moyle et al. 2015). Because of their dependence on small streams in an arid region and the isolation of populations from one another, Moyle et al. (2013) rated Northern roach as “critically vulnerable” to climate change.

The Earth’s climate is rapidly changing due to anthropogenic forces, causing widespread impacts, such as drought, that are projected to worsen exponentially in the coming decades. The speed at which the climate is changing means that many species will be unable to adapt quickly enough and will instead be lost. Across much of the West, heat waves are already occurring with increased frequency; for instance, the summer of 2021 was the warmest in Oregon’s recorded history, with heat indexes exceeding 90°F on many more days than the most recent 30-year average (Fleishman 2023, p. 45).

In some parts of Oregon, under the RCP 8.5 emissions scenario, “the heat index is projected to exceed 90°F on most summer days,” with eastern Oregon experiencing the most significant exceedances (Fleishman 2023, p. 48). Further, “projections suggest that if the concentration of greenhouse gases does not decrease, the frequency and magnitude of days with an extreme heat index will increase substantially throughout most of Oregon by the middle and late twenty-first century” (Fleishman 2023, p. 48).

Precipitation patterns will be greatly affected by climate change in the coming decades, and these changes are already being observed - droughts have been “persistent and severe” in Oregon since 2000, and in 17 of the last 23 water years, Oregon’s precipitation was below average (Fleishman 2023, pp. 53, 55). The average temperature in Oregon also was warmer than normal in 18 of the last 23 water years, which contributed to increases in evapotranspiration and drought frequency (Fleishman 2023,

p. 54). In the West's arid regions, decreased precipitation will likely cause some perennial streams to become increasingly intermittent, i.e., surface water will only be present for part of the year instead of year-round.

The Goose Lake basin in an arid portion of Oregon and California and this area has, in the recent past, suffered extended periods of drought. Climate change is likely to decrease summer stream flows in key streams, increasing competition for water and riparian habitats between humans (livestock, agriculture) and fishes (Moyle et al. 2015). Impacts from climate change are predicted to lower base flows, thereby reducing the amount of perennial habitat and increasing summer water temperatures in tributary streams and Goose Lake (Moyle et al. 2015). Goose Lake may dry more frequently and for longer periods of time due to increased frequency of drought (Moyle et al. 2015). These conditions may also favor invasive competitors and predators (Scheerer et al. 2010). An increase in fire frequency or intensity in this dry landscape may decrease riparian shading, add sediment, or otherwise make streams less suitable for roach and other native fishes (Moyle et al. 2015).

The most noticeable and widespread impacts of climate change on aquatic habitats in the Goose Lake basin will be continued increases in water temperatures and changes to the frequency and timing of drought and flooding events (Moyle et al. 2015). Water temperatures will likely increase by approximately 1 degree C or more, on average, by 2099, perhaps reducing the individual fitness of fishes already living in temperature impaired streams, such as those found in the Goose Lake basin (Moyle et al. 2015). Elevated air temperatures associated with climate change will change the periodicity and magnitude of peak and base flows in streams due to a reduction in snowpack levels and seasonal retention (Moyle et al. 2015). Stream flow in the basin is primarily fed by snowmelt from the Warner and Fremont mountains, with some baseflow provided by springs (GLFWG 1996). Streams in the Goose Lake basin may be significantly impacted due to the relatively low elevations (< 3000 m) of the Fremont and Warner mountains (Hayhoe et al. 2004). Peak flow currently takes place in the spring, from April to May, but may shift earlier by as much as one month (Moyle et al. 2015). The lake itself is also fed by a few small springs (Phillips and van Denburgh 1971, in GLFWG 1996). Predictions are that stream flow will increase in the winter and early spring and decrease in the fall and summer (Knox and Scheuring 1991; Field et al. 1999; CDWR 2006), resulting in potential changes to the spawning ecology of fishes (Moyle et al. 2015). Fish distribution in the basin is already impacted by decreases in streamflow (Moyle et al. 2015). During dry years (as in 2007 and 2010-12), the distribution of fishes in the basin can be affected by reduction in wetted channel availability. In 2007, 21% of the habitats sampled by ODFW (2008) and Scheerer et al. (2010) had gone dry.

The Goose Lake Basin is highly susceptible to climate-induced disturbance. Dew (2024) evaluated post-2007 disturbance events in the Goose Lake basin including drought, temperature changes, and wildfires. A suite of climate-mediated disturbances occurred in the Goose Lake Basin between 2007 and 2022, including a prolonged drought event and complete dewatering of the lake for half of those years, a major wildfire event, warmer than average temperatures, and lower water availability. These disturbances impacted the distribution, relative abundance, and habitat utilization of native and non-native fish species. Dew (2024) saw widespread declines in fish species abundances throughout the entire Goose Lake Basin; at some sites species declined by up to 90% in abundance, while species disappeared completely from other sites.

Fire

Moyle et al. (2015) rate fire as a medium threat to the Northern roach. Fires may cause local extirpation, especially in upper watersheds occupied by isolated populations. Fire is a natural part of the high desert landscape in the Pit River watershed. However, fires are likely more frequent and severe than they were historically because of human land management practices and associated changes to the landscape, especially fire prevention and consequent shifts in forest vegetation composition and density (Moyle et al. 2015). Coupled with predicted climate change effects, more severe wildfires may eliminate roach habitats or possibly extirpate small populations from tributary streams (Moyle et al. 2015).

Insufficient Information and Surveys

The specific life history attributes of Northern roach have not been well studied (Moyle et al. 2015), which contributes to an increased likelihood of extinction, since land and water management decisions are being made without certainty as to impacts on its life cycle and essential habitat. A thorough fish population and habitat survey of the Pit River watershed is needed in order to determine abundance and distribution of native fish populations, including roach, and habitat attributes of both occupied and unoccupied streams (Moyle et al. 2015). Once baseline data are collected, basin-wide monitoring every five years needs to be established to determine status and trends of native fish populations and their habitats, as well as to detect invasive fish invasions (Moyle et al. 2015).

Request for Critical Habitat

Petitioners urge the Service to designate critical habitat for the Northern roach concurrent with listing the species as threatened or endangered under the ESA. Critical habitat as defined by Section 3 of the ESA is: (i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the provisions of section 1533 of the ESA, 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) the 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 the ESA, upon a determination by the Secretary that such areas are essential for the conservation of the species.16 U.S.C. § 1532(5).

Congress recognized that the designation and protection of habitat is essential to the recovery and/or survival of listed species, stating that: "classifying a species as endangered or threatened is only the first step in ensuring its survival. Of equal or more importance is the determination of the habitat necessary for that species' continued existence…If the protection of endangered and threatened species depends in large measure on the preservation of the species' habitat, then the ultimate effectiveness of the Endangered Species Act will depend on the designation of critical habitat." H. Rep. No. 94-887 at 3 (1976).

Critical habitat is an extremely effective and important component of the ESA, without which the Northern roach's chance for survival significantly diminishes. Petitioners request that the Service propose critical habitat for the Northern roach concurrently with its listing, consisting of the upper Pit River basin (North Fork Pit River, South Fork Pit River, mainstem Pit River from Alturas downstream to Pit River Falls, Ash Creek, Rush Creek, Bear Creek tributary to Fall River, and Beaver Creek), and northern tributaries to Goose Lake in Oregon (Dry Creek, Drews Creek, Hay Creek, Dent Creek, Muddy Creek and Augur Creek). Critical habitat should include riparian habitat and buffers sufficient to maintain the ecological function of stream habitats for the Northern roach. Both occupied and unoccupied habitat should be included in the designation.

Conclusion

The Northern roach has been confirmed recently only in Ash Creek in California, and previously robust populations of roach documented in Oregon tributaries of Goose Lake in 2007 had dramatically declined or disappeared by 2022-2023 surveys.

Northern roach face ongoing severe threats, including water diversions for agriculture and grazing, combined with severe, extended drought; damage to instream and riparian habitats by livestock grazing and logging; sediment from roads; predation from invasive fish species; and climate change.

Existing regulatory mechanism are inadequate to reduce the risk of extinction for the Northern roach. Most of the stream reaches for roach flow through private lands, where agricultural and cattle grazing uses divert water and impact stream and riparian habitat. National Forest management on public lands has not adequately addressed the impacts to Northern roach from livestock grazing, water diversions, or roads.

The Northern roach is threatened by four of the five Endangered Species Act listing factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. With climate change decreasing stream flows in key roach streams and increasing competition for water and riparian habitats between native fishes and human uses such as livestock and agriculture, Endangered Species Act protections are critical to the continued existence of the Northern roach.

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