BEFORE THE SECRETARY OF THE INTERIOR

PETITION TO PROTECT THE ROUGHHEAD SHINER (*Notropis semperasper*) UNDER THE ENDANGERED SPECIES ACT with CRITICAL HABITAT

Photo Courtesy of Derek Wheaton, Enchanting Ectotherms

MARCH 25, 2022

CENTER FOR BIOLOGICAL DIVERSITY

NOTICE OF PETITION

March 25, 2022

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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, 5 U.S.C. § 553(e); and 50 C.F.R. § 424.14(a), the Center for Biological Diversity and Tierra Curry hereby petition the Secretary of the Interior, through the United States Fish and Wildlife Service ("FWS," "Service"), to protect the roughhead shiner (*Notropis semperasper*) as an endangered or threatened species.

The U.S. Fish and Wildlife Service has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on the Service. Specifically, the Service must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." FWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition" (16 U.S.C. § 1533(b)(3)(A)).

We also request that critical habitat be designated for the roughhead shiner concurrently with 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 nonprofit, public interest environmental organization dedicated to the protection of imperiled species and the habitat and climate they need to survive through science, policy, law, and creative media. The Center is supported by more than 1.7 million members and supporters throughout the country. The Center works to secure a future for all species, great or small, hovering on the brink of extinction. The Center

submits this petition on its own behalf and on behalf of its members and staff with an interest in protecting the roughhead shiner and its habitat.

Sincerely,

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Executive Summary

The roughhead shiner is a small olive minnow named for the distinctive bumps on its head that lives only in the James River watershed in Virginia and nowhere else on Earth. It is threatened with extinction primarily due to displacement by a non-native shiner species. Scientists have been aware of the roughhead shiner's vulnerability to extinction for half a century, but it has never risen to the top of a priority list for protection, and it is quietly slipping towards extinction. The roughhead shiner is on track to become a tragic "don't know what you've got 'til it's gone" story unless measures are taken to safeguard its future. This petition outlines what little is known of the biology of this fish, details the threats it is facing, and demonstrates that the roughhead shiner warrants protection under the Endangered Species Act, the most effective regulatory tool available to save species from extinction.

Introduction

Freshwater habitats harbor an astounding variety of plants, animals, fungi and other organisms. Freshwater makes up less than one-tenth of one percent of non-frozen water on Earth but is home to around 12 percent of all known species including one-third of vertebrates (Balian et al. 2008). The importance of rivers and lakes to biodiversity is magnified even further by the fact that these habitats, which are home to one in ten described animals, cover only around two percent of total global land surface area. Just in terms of fish species, there are more than 18,000 described freshwater fishes, which is more kinds of fish than are found in all the world's oceans (Manel et al. 2020).

The proportion of life on Earth found in freshwater habitats is even more astounding in that freshwater wetlands, which cover five to seven percent of global land surface area and are known to be highly biodiverse habitats, were not included in the global freshwater biodiversity assessment (Balian et al. 2008) so freshwaters are actually home to an even higher proportion of species than has been quantified.

North America harbors a globally significant diversity of freshwater fishes with species richness in the Tennessee, Cumberland, Mobile Bay, Apalachicola, and Ozark Highlands river systems supporting a particularly high diversity of temperate fish species per ecoregion area (Abell et al. 2008). The southern United States is approaching nearly 700 species of freshwater fishes as new species are uncovered regularly.

Southern Appalachia in particular hosts a high number of endemic fish species. The higher elevation drainages have had stable geologic and physiographic conditions over time that served as refugia for fishes during glaciation and provided ample time for speciation since the shallow marine seas of the pre-Cambrian. Around one-third of the region's fishes are restricted to a single drainage unit, a narrow endemicity which makes them highly vulnerable to extinction when faced with habitat degradation, invasion of non-native species, or other threats from which they cannot relocate (Butler 2002).

In addition to their importance in supporting biological diversity, rivers and other freshwater habitats have incalculable importance for humanity in terms of health, educational, cultural, and

economic value (Albert et al. 2020). Yet because of humanity's dependence on freshwater and the essential values it provides, freshwater habitats are highly endangered and freshwater organisms face heightened extinction risk.

Nearly one-third of freshwater species are facing extinction globally, primarily due to habitat loss, invasive species, pollution, and exploitation (IUCN 2022). Freshwater vertebrate populations have declined in abundance by an average of 84 percent since 1970 (World Wide Fund for Nature Living Planet Index (WWF) 2020. This is twice the rate of decline as populations in terrestrial or marine ecosystems, indicating that freshwater vertebrates are the most threatened group of vertebrates. If the WWF population decline data is indexed to an annual rate, then monitored freshwater populations are declining four times faster (3.9%) than terrestrial populations (1.1%) (Reid et al. 2019).

In North America, at least 57 taxa of freshwater fishes were lost to extinction from 1898-2006 (Burkhead 2012). Nearly 40 percent of freshwater fishes in North America are in an extinction risk category with 230 vulnerable, 190 threatened, and 280 endangered extant taxa, and 61 taxa that are either presumed extinct or extirpated from the wild (Jelks et al. 2008).

The current extinction rate for North American freshwater fishes is estimated conservatively to be 877 times greater than the background extinction rate with the rate of loss continuing to accelerate (Burkhead 2012). Status assessments of southeastern fishes show rising levels of imperilment over time with increasing numbers of species moving from vulnerable to threatened categories (Deacon et al. 1979, Williams et al.1989, Warren et al. 2000, Butler 2002, Jelks et al. 2007).

The variety of fish in an area and their imperilment level provide useful information for human communities on the overall health of a watershed. Because of their specific habitat requirements and life histories, fish can serve both as indicator species to assess watershed health and anthropogenic impacts, and as surrogates for overall biodiversity levels (Karr 1981, Abell et al. 2008, Angermeier and Pinder 2015).

Charismatic species of fish, such as salmon, trout, sturgeon, and other species that people prefer to fish for, receive far more attention and funding than the numerous little species that most people will never encounter. Even among small species, there is a hierarchy of appreciation with colorful species like darters garnering more appreciation than minnows in general (for example see @150Fishes; #DarterMadness). The roughhead shiner (*Notropis semperasper*) is one such tiny fish that has slipped through the cracks of conservation for half a century.

The story of the roughhead shiner is not a dramatic tale of habitat destruction like the explosive mountaintop removal coal mining that permanently destroyed most of the range of the Kentucky arrow darter (*Etheostoma spilotum*) or the sucking dry of the Owens River Valley to supply water for Los Angeles at the expense of native species like the Owens pupfish (*Cyprinodon radiosus*) the last wild individuals of which biologists rescued in buckets. The streams where the roughhead shiner still survives are in relatively good condition, which ironically has contributed to a lack of protective status for the fish because there are no clear steps managers could take to improve its habitat.

The primary threat to the roughhead shiner's survival has been the invasion of its habitat by the telescope shiner (*Notropis telescopus*) which has pushed the roughhead shiner to the brink of extinction over the past several decades. The state of Virginia is aware of the imperiled status of the fish but has lacked the funding to research or improve its situation.

This petition seeks Endangered Species Act protection for the roughhead shiner so that it does not quietly slip into extinction alongside the Scioto madtom (*Noturus trautmani*), San Marcos gambusia (*Gambusia georgei*), Maryland darter (*Etheostoma sellare),* harelip sucker (*Moxostoma lacerum*), whiteline topminnow (*Fundulus albolineatus*), and other fish species the United States has already lost to extinction.

The Endangered Species Act (ESA) specifies that a species warrants listing if it is threatened by any one of five listing factors including modification or curtailment of habitat or range; disease or predation; overutilization; the inadequacy of existing regulatory mechanisms; or other factors threatening it existence such as invasive species or climate change. The roughhead shiner is threatened by invasive species, habitat loss, and the inadequacy of existing regulatory mechanisms and thus qualifies for protection as a threatened or endangered species under the ESA.

Federal protection for the roughhead shiner will bring not only habitat protection from projects that could degrade its habitat like the Mountain Valley Pipeline but will also bring a recovery plan and federal funding to restore roughhead shiner populations.

Biological Information

Taxonomy and Description

The roughhead shiner (*Notropis semperasper* Gilbert, 1961) is in class Actinopterygii (ray-finned fishes), order Cypriniformes, family Leuciscidae (true minnows), subfamily Pogonichthyinae (North American minnows).

The Latin *semperasper* means ‘always rough’ referring to the small tubercles that are present in males, females, and juveniles nearly year-round except for winter. The bumps are most pronounced during the breeding season. Nuptial males and females differ in that the female tubercles are smaller and rarely occur on the fins. Juveniles has less dense tuberculation (Jenkins and Burkhead 1994).

Photo of head tubercles provided courtesy of Derek Wheaton, Enchanting Ectotherms

Head tubercles on roughhead shiner © ihunta on iNaturalistUK CC BY-NC

The roughhead shiner has an olive green back, silver sides, and grows to be 2 to 3.5 inches long.

Jenkins and Burkhead (1994) provide the following description in *Freshwater Fishes of Virginia*:

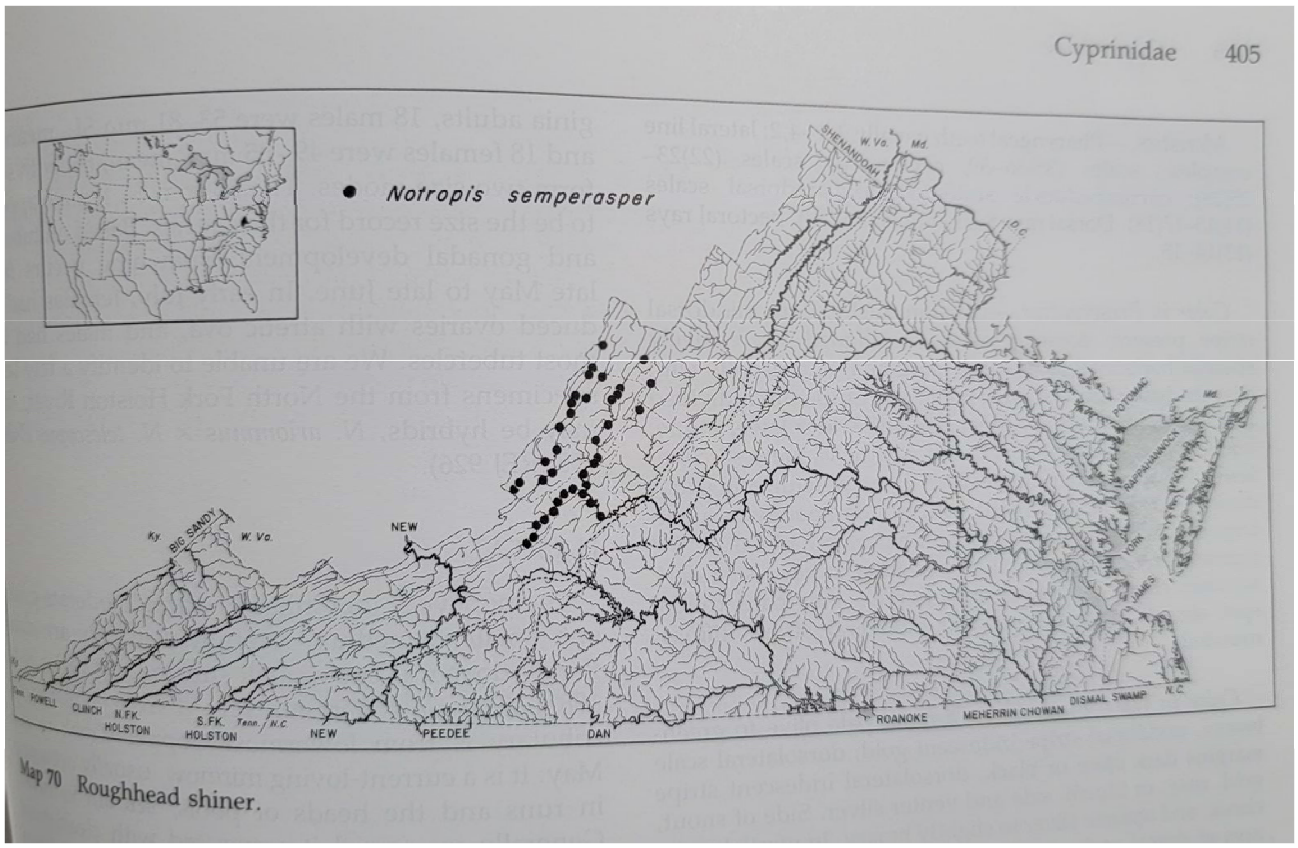
> "A shiner with a somewhat rounded snout, large eye, and much pigment below the lateral line anteriorly; adults are 45-65 mm SL. Body moderately elongate, somewhat compressed; dorsal fin origin usually slightly posterior to pelvic fin base, occasionally above or moderately posterior to the posterior insertion of pelvic fin. Head moderate; eye large, essentially lateral; snout slightly acute to, more often, laterally rounded; mouth large, terminal, oblique. Anal fin margin concave. Breast nearly naked; belly fully or almost fully scaled" (p. 403).

Roughhead shiner observation © ihunta on iNaturalistUK CC BY-NC

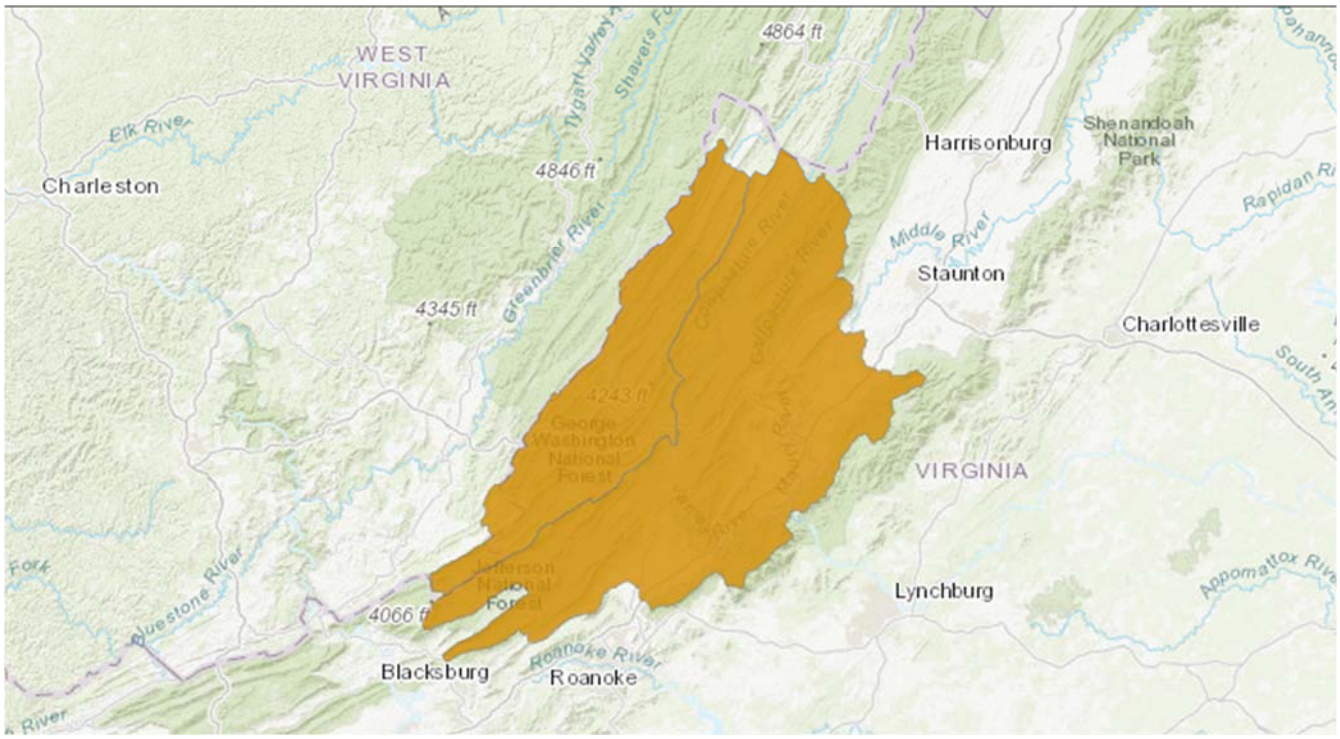
Range

The roughhead shiner is endemic to the Ridge and Valley Province of the upper James River drainage in western Virginia near the border with West Virginia in the Alleghany Highlands of the Southern Appalachian Mountains. It was described in 1961 from tributaries of the Jackson River, Potts and Dunlap creeks. Jenkins (1979) described its range as the upper James River and all eight of its largest tributaries from the Maury River upstream.

Jenkins and Burkhead (1994) mapped 38 collection sites, which may represent several distinct occurrences (subpopulations) with an estimated total of ten locations.



Map of roughhead shiner distribution from Jenkins and Burkhead (1994) Freshwater Fishes of Virginia



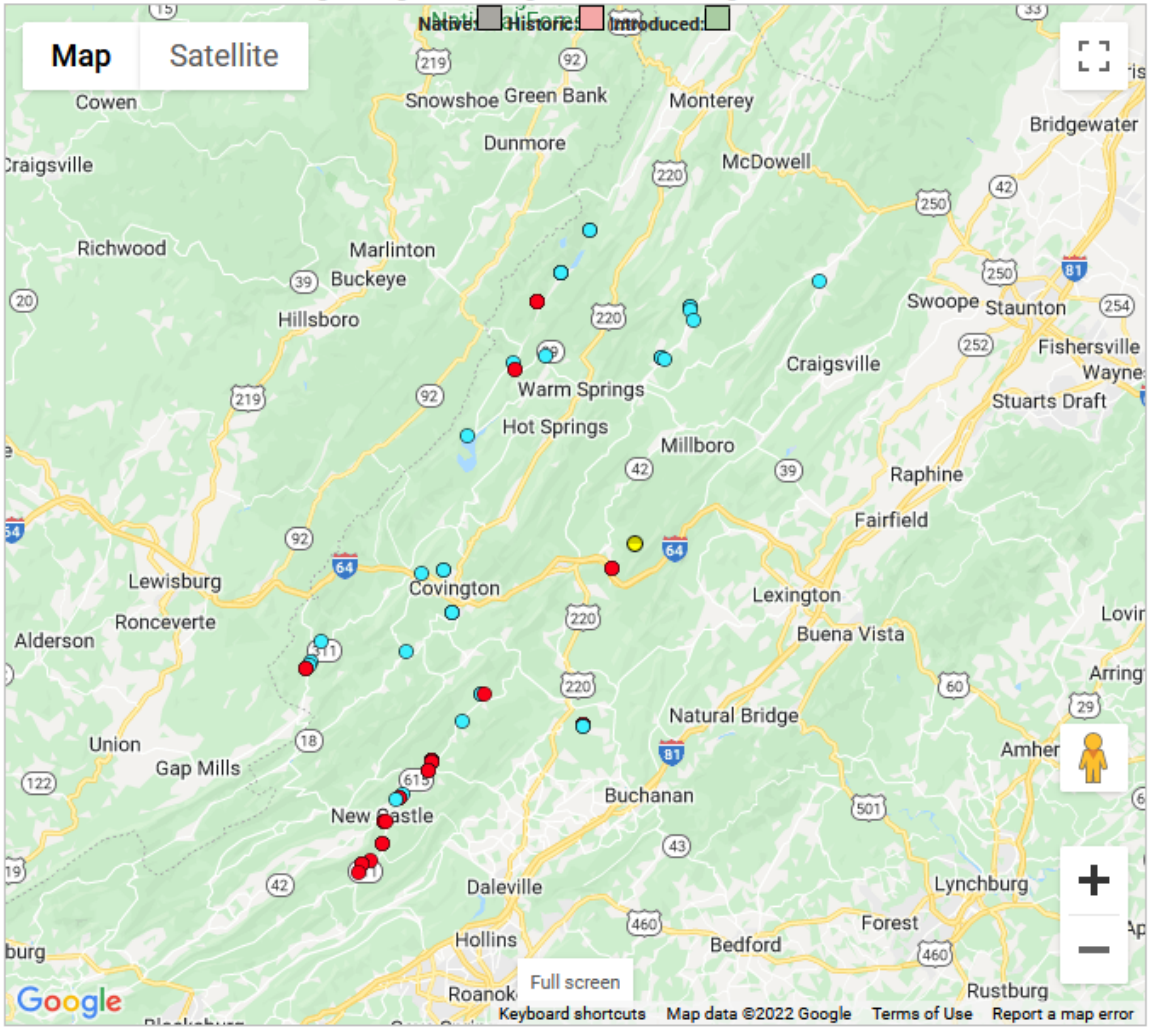
Map of roughhead shiner range from IUCN RedList species account

The FishBase database has 11 occurrences for the species including the Cowpasture River, Back Creek, Big Back Creek, Craig Creek, and Dunlap Creek dating back to 1962. Only one of the records is post-2000.

Roughhead Shiner - *Notropis semperasper* Native Fish

Roughfish ITIS NatureServe FishBase Wikipedia Google Images iNaturalist.org

iDigBio.org GBIF.org iNaturalist.org NANFA FishNet 2 USGS NAS



Toggle GBIF Data Toggle iDigBio Data Toggle FishNet 2 Data Toggle iNaturalist Data Toggle Watersheds

HUC Code	Watershed Name	Occurrence	Source
02080201	Upper James	Current	NatureServe
02080202	Maury	**Historic**	NatureServe

Map of roughhead shiner point observations from FishBase 2022

Habitat and Life History

The roughhead shiner lives in small to large creeks and rivers in clear rocky pools near flowing water, moderate currents of runs, and backwaters, occasionally being found in swifter water. It appears limited to usually clear, relatively pristine waters with moderate gradient, hard bottoms, and little to no siltation. It may be found in both cool and warm water (Jenkins and Burkhead 1994, Page and Burr 2011).

The roughhead shiner may spawn over chub (*Nocomis)* nests. Numerous species of shiners spawn over the nests of species that build nests, likely to take advantage of the clean substrate (Johnston and Birkhead 1988).

Roughhead shiner spawning likely takes place from early or mid-May to early June but may extend into July or even August. Both sexes reach maturity in two years, but most individuals live no longer than three years, though a few survive to reach age four (Jenkins and Burkhead 1994). The short life span makes the species vulnerable to habitat disturbance or pollution events that could disrupt a breeding season.

Adult roughhead shiners primarily consume aquatic insect larvae (Jenkins and Burkhead 1994). Because most aquatic insect larvae need clean substrate, their reliance on them as a food source heightens their vulnerability to siltation.

Status

The roughhead shiner was first flagged for conservation attention 50 years ago when it was classified as threatened/rare in 1972 in the first list of threatened freshwater fishes of the United States compiled by the conservation committee of the American Society of Ichthyologists and Herpetologists and the endangered species committee of the American Fisheries Society (Miller 1972).

Jenkins (1979) assigned it a status of Special Concern because of its restricted total geographic range, confinement to main channels, and drainage modifications.

The roughhead shiner is a federal Species of Concern having been placed on the candidate list for ESA protection in 1991 (56 FR 58804) carried over into 1994 (59 FR 58982) but then dropped when the list was re-organized in 1996.

In 2000 the Southeastern Fishes Council technical advisory committee ranked the roughhead shiner as Vulnerable (Warren et al. 2000).

It was ranked as Threatened in a 2002 review of imperiled fishes of the Southern Appalachian Ecosystem (Butler 2002).

Jelks et al. (2008) ranked it as Vulnerable in a comprehensive American Fisheries Society review.

NatureServe (2012) assigns it a status of Imperiled (G2G3 S2S3). It is ranked by the International Union for Conservation of Nature RedList as Vulnerable (2013).

The Virginia Department of Wildlife Resources (2022) identifies the roughhead shiner as a Special Status Species. The state's 2015 Wildlife Action Plan which identified Virginia Species of Greatest Conservation Need assigned the roughhead shiner a ranking of Tier 1 Critical Conservation Need, defined as "Faces an extremely high risk of extinction or extirpation. Populations of these species are at critically low levels, facing immediate threat(s), or occur within an extremely limited range. Intense and immediate management action is needed," and placed it in Category B defined as "Managers have only identified research needs for the species or managers have only identified "on the ground" conservation actions that cannot be implemented due to lack of personnel, funding, or other circumstance" (VDWR 2015).

The Southeastern Association of Fish and Wildlife Agencies wildlife diversity committee identified the roughhead shiner as a Species of High Concern on the Regional Species of Greatest Conservation Need inventory (2022).

The population size of roughhead shiner is unknown. In 1994 Jenkins and Burkhead described it as generally uncommon overall but rare to common in different parts of its range. NatureServe (2012) reports that its distribution and abundance are probably slowly declining. The paucity of post-2000 records in the FishBase database may also reflect population decline.

Jenkins and Burkhead (1994) expressed concern for the conservation status of the roughhead shiner nearly 30 years ago due to concerns about siltation, damming, and invasive species:

> "The roughhead shiner warrants special concern status. It is limited to relatively pristine Valley and Ridge streams. It may have occupied streams near the lower boundary of the Valley and Ridge, but may have been extirpated by the increase of sediment during historical time. Jenkins and Burkheard (1975a) estimated that 432 rkm of streams were occupied in the upper James, about 35 rkm of which were lost recently by the creation of Lake Moomaw. We are apprehensive that the apparently introduced rapidly spreading telescope shiner *N. telescopus* may competitively jeopardize the roughhead shiner" (p. 404).

Inquiries to several field biologists in early 2022 on the status of the shiner reported that they are "definitely uncommon," and "likely slipping through the cracks." Because they are considered uncommon, few red flags were raised when surveys didn't encounter them. The biologists expressed concern that the roughhead shiner "is going to wink out before anyone ever takes notice" and is "really struggling behind the scenes" (personal communications between Tierra Curry, Derek Wheaton, and Zach Alley, February 2022).

The predicament with the roughhead shiner may well be analogous to that of the potentially extinct slender chub (*Erimystax cahni*) which was in decline for several decades before anyone grew alarmed at the lack of detections.

As noted in the Strategy for the Conservation of Southeastern Imperiled Fishes, “Without systematic, intensive surveys and monitoring needed to detect small population changes, the gradual disappearance of uncommon or rare fishes, particularly localized species, may occur with little notice” (Bibb et al. 2000).

Threats

Overview

Freshwater fishes are sensitive to water quality parameters and each species has a range of chemical, thermal and physical conditions that limits its range and viability. Threats to fishes include any activities that render their environment less suitable by degrading water quality, flow regime, trophic interactions, habitat structure, or biotic interactions (Karr 1981). Many activities that degrade habitat for fish take place in uplands where their effects on aquatic communities are not taken into consideration.

Nationwide habitat degradation and invasive species are the main threats to at-risk fishes, and these factors are exacerbated in species that have small ranges like the roughhead shiner (Jelks et al. 2008). Because of its status as a geographically restricted and isolated endemic, the roughhead shiner is vulnerable to extirpation from even very localized habitat degradation (Warren et al. 2000).

In Virginia, some of the factors degrading freshwater fish habitats include agriculture, urban suburban, and exurban sprawl, mining, logging, power generation, nonnative species and climate change (Angermeier and Pinder 2015). One of the most ubiquitous results of these activities is the introduction of silt and sediment which settles onto stream bottoms and fills in the interstitial spaces both fish and their insect food sources need to carry out their life cycles. Fishes are also threatened by nutrification, pollutants including pesticides and toxins, and direct structural changes to streams from dams, channelization, or water removal. Angermeier and Pinder (2015) report that these threats “have been common in Virginia for decades and instrumental in causing fish imperilment” (p. 158).

Modification or Curtailment of Habitat or Range

Although habitat loss and degradation is not the primary threat to the roughhead shiner, its habitat is threatened by multiple activities.

In 1979 the completion of the Gathright Dam on the Jackson River to create Lake Moomaw rendered at least 22 river miles of its habitat unsuitable (Jenkins and Burkhead 1994). Dams degrade habitat for fish both upstream and downstream in multiple ways including changing water flow and temperature and disrupting trophic interactions and physical structure.

Siltation has long been identified as a threat to the roughhead shiner and Jenkins and Burkhead (1994) indicate that the species may have been extirpated from some parts of its historical range as a result of increased siltation near the lower boundary of the Valley and Ridge. Angermeier and Pinder (2015) include siltation as a factor that is harming aquatic habitats across the state.

NatureServe lists pulp mill effluents as a threat to the species (2012).

The Virginia Department of Wildlife Resources Wildlife Action Plan (2015) states that aquatic habitats within the roughhead shiner's planning region (Central Shenandoah) face multiple threats including water quality degradation, runoff from impervious surfaces, habitat conversion and alteration, invasive species, altered stream pH, and climate change:

> "1. Water Quality Degradation: Pollution is the most significant threat to aquatic species and riparian habitats within the Central Shenandoah Planning Region. Polluting materials include fertilizers, eroded sediment, and human and animal waste flowing into the region's creeks and rivers from storm water runoff, failing septic systems, and agricultural practices that do not conform to standard best management practices (DEQ 2014). In many cases, watersheds have insufficient riparian buffers and vegetative areas to stop these materials from flowing into the creek or stream (ACJV 2005). Once present in aquatic systems, these materials may concentrate in sediment and bottom-dwelling organisms where they can result in reduced levels of dissolved oxygen and altered pH levels (Chesapeake Bay Foundation 2014). In addition to the impacts on aquatic life, many of these substances pose a risk to human health and local economies (Chesapeake Bay Foundation 2014).
>
> 2. Impervious Surface: Impervious surfaces (i.e., land covers that do not permit water to permeate the ground) give a useful measure of the environmental condition of an area. In a developed watershed there is often significant impervious surface cover; thus, a greater amount of surface water, often laden with pollutants, arrives into a stream at a faster rate than in less developed watersheds, increasing the likelihood of more frequent and severe flooding. Substantial amounts of impervious surface area can also lead to degradation of water quality, changes in hydrology, habitat structure, and aquatic biodiversity. Additionally, impervious surfaces often run along areas that directly interact with the stream or river through flooding, geomorphology, or material inputs. Although much of the Central Shenandoah Planning Region has a low percentage of impervious surface cover, there is a larger percentage of impervious surface cover around population centers (Figure 8).
>
> 3. Habitat Conversion and Alteration: Rivers are fragmented by dams, culverts, and other impediments that limit the connectivity of these aquatic habitats. This fragmentation can prevent aquatic species from accessing important aquatic habitats crucial to various life stages. Channelization, shoreline alteration, and extractive land use practices can alter aquatic habitats in terms of changes to hydrology, chemistry, and water temperature. These practices may also directly alter habitats through loss of vegetative riparian cover, filling of streams, or hardening of stream banks.
>
> 4. Invasive Species: Invasive species such as white perch threaten western warm water streams and rivers. Invasive species are less of a direct threat to fish within cold water systems, but invasive species cause significant impacts to the forests surrounding these systems. Defoliation by the emerald ash borer, gypsy moth, hemlock woody adelgid, and southern pine beetle can alter river and stream hydrology and temperature, especially important to cold water streams.
>
> 5. Stream pH: Fish species are sensitive to water pH, and pH can play a role in species richness. Waters flowing through non-karst areas in this planning region have experienced acid deposition over decades, making the waters more acidic and potentially harming or extirpating aquatic species, such as brook trout (Webb 2014).

> 6. Climate Change: Climate change will also affect both warm and cold water streams. Changes to precipitation regimes and air temperatures will result in changes to flow patterns, erosion rates, and water temperatures" (p. 6-27 – 6-29).

Because the roughhead shiner is not a federally protected species, its habitat is vulnerable to disturbance by activities on the Jefferson National Forest. As a federal species of concern, the shiner is on the forest's sensitive species list, but this classification does not provide on-the-ground protection from habitat disturbing activities on the forest. In 2016, for example, the conservation group Wild Virginia submitted comments to the Forest Service on the Wallace and Marshall Prescribed Burn Proposal because of concerns about impacts on the roughhead shiner's habitat in the Cowpasture River:

> "The land management activities proposed in this notice are located in the riparian areas along the Cowpasture River and the choices made for management in these areas will have direct impacts on the floodplain areas and to water quality in the stream. Therefore, the cause-effect connections between this proposed project and both of these resource conditions are clearly present. The overall management of these two tracts, which comprise about 332 acres and stretch along well over one mile of stream's length, also could definitely have substantial effects on both resource conditions. In a rural area, such as that represented by the project areas, nonpoint sources of pollution produced by land management activities are the primary concern in relation to stream health" (Wild Virginia 2016).

The roughhead shiner is also threatened by construction and operation of the Mountain Valley Pipeline which would cross its habitat in Craig Creek. Impacts to the shiner include sedimentation during construction, ongoing sedimentation from landslides following project completion, ongoing contamination from herbicides sprayed in the pipeline maintenance corridor, spills during eventual operation should the pipeline be completed, and multiple other impacts to fish that have been identified elsewhere (see Appalachian Voices vs. U.S. Department of Interior 2022).

Because of the narrow range of the roughhead shiner, its vulnerability to extirpation from habitat disturbing activities is magnified. The stress on remaining populations from invasive species, discussed below under Other Factors, synergistically exacerbates other threats such as habitat disturbance.

Inadequacy of Existing Regulatory Mechanisms

The roughhead shiner is not protected under any regulatory mechanisms that are sufficient to safeguard its continued existence.

At the federal level, it's status as a species of concern brings no actual protections. Similarly, being categorized as a sensitive species by the U.S. Forest Service brings consideration during project analysis but does not translate to habitat protection.

Similarly, recognition by the state of Virginia as a special status species does not bring about habitat protection. An example of the lack of tangible protections is apparent in the planning

documents for the Mountain Valley Pipeline. In a project review email concerning the roughhead shiner, the Department of Game and Inland Fisheries concluded "DGIF has no protective recommendation for non-listed species" (Mountain Valley Pipeline Project 2017).

The roughhead shiner needs federal protection under the Endangered Species Act to fund recovery for the fish because without the prioritization listing would bring, the state of Virginia does not have the resources to prioritize the shiner. Its rank in the state Wildlife Action Plan recognizes this gap. As a Tier 1 species of critical conservation need, by definition the shiner faces an extremely high risk of extinction or extirpation: "populations of these species are at critically low levels, facing immediate threat(s), or occur within an extremely limited range. Intense and immediate management action is needed" (2015). Its assignment to category b means that conservation actions "cannot be implemented due to lack of personnel, funding, or other circumstance" (2015).

Federal listing would bring about a recovery team and recovery funding to implement surveys and on the ground improvements for the shiner including research into controlling the telescope shiner.

Other Factors Imperiling Continued Existence

The roughhead shiner is threatened by other factors including invasives species, climate change, and intrinsic vulnerability due to narrow range.

Invasive Species

The primary threat to the continued existence of the roughhead shiner is displacement by the telescope shiner which has a 10-state range and has been introduced outside its native range in Virginia as well as into the state of West Virginia.

As early as the 1970s fish biologists cautioned that telescope shiners could displace roughhead shiners (Southeast Fishes Council 1998).

Jenkins and Burkhead (1994) were apprehensive that the telescope shiner would "competitively jeopardize" the roughhead shiner. Indeed, surveys in 1997 by Mike Pinder and Paul Bugas noted that "of the four historical sites known for roughheads, telescope shiners have taken over" (Southeast Fishes Council 1998).

Endemicity and Imperilment

Range size is a primary predictor of imperilment for fishes, with the level of imperilment growing with diminishing range size (Butler 2002). Smaller range size predicts extinction risk and makes species more vulnerable to habitat degradation and to catastrophic events such as spills, severe weather events, etc. (Purvis et al. 2000, Staude et al. 2020). The roughhead shiner's small range also magnifies the threat posed by the telescope shiner (Jelks et al. 2008).

Climate Change

Climate change represents a stark threat to the future of biodiversity within the United States. The Fourth National Climate Assessment warns that extinctions and transformative impacts on

ecosystems will occur without significant reductions in global greenhouse gas emissions (U.S. Global Change Research Program 2018). Anthropogenic climate change is causing widespread harm to life across the planet, disrupting species' distribution, physiology, and genetics, in addition to increasing species extinction risk (Warren et al. 2011). Climate change is already affecting key ecological processes that underpin ecosystem function (Scheffers 2016).

Species extinction risk will accelerate with continued greenhouse gas pollution. One million animal and plant species are now threatened with extinction, with climate change as a primary driver (IPBES 2019). At 2°C compared with 1.5°C of temperature rise, species' extinction risk will increase dramatically, leading to a doubling of the number of vertebrate and plant species losing more than half their range, and a tripling for invertebrate species (IPCC 2021).

Numerous studies have projected catastrophic species losses during this century if climate change continues unabated: 15 to 37 percent of the world's plants and animals committed to extinction by 2050 under a mid-level emissions scenario (Thomas et al. 2004); the potential extinction of 10 to 14 percent of species by 2100 (Maclean and Wilson 2011); global extinction of 5 percent of species with 2°C of warming and 16 percent of species with business-as-usual warming (Urban 2015); the loss of more than half of the present climatic range for 58 percent of plants and 35 percent of animals by the 2080s under the current emissions pathway (Warren et al. 2013); and the loss of a third or more of animals and plant species in the next 50 years (Roman-Palacios and Wiens 2020).

In Virginia, climate change is expected to bring more hot days, more heavy rainfall events and more inland flooding and these effects are already being seen (Climate Central 2022). As extreme events become more prevalent, the rates of change and unpredictability can outpace the ability of freshwater species to adapt (Reid et al. 2019). The Virginia Wildlife Action Plan notes that in the roughhead shiner's ecoregion, climate change is expected to alter precipitation regimes and air temperatures which will result in changes to flow patterns, erosion rates, and water temperatures (2015, p. 6-27 – 6-29).

Request for Critical Habitat Designation

Petitioners urge the Service to designate critical habitat for the roughhead shiner concurrently with listing. 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 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) 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 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).

Congress recognized that the 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 insuring 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 effective and important component of the ESA, without which the roughhead shiner's long-term chance for survival diminishes. Petitioners thus request that the Service propose critical habitat for this rare fish concurrently with its proposed listing.

Conclusion

The Endangered Species Act specifies that species warrant protection if they are threatened by any one of five listing factors. The roughhead shiner is threatened by at least three listing factors including habitat loss, invasive species, and the inadequacy of existing mechanisms to safeguard it from these threats. Petitioners urge the U.S. Fish and Wildlife Service to promptly propose the roughhead shiner for listing so that a recovery plan can be developed and funds designated to implement conservation measures for this species before it slips into extinction.

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Appendix: Notice to State

CENTER *for* BIOLOGICAL DIVERSITY *Because life is good.*

February 7, 2022

To: Ryan Brown, Executive Director
Virginia Department of Wildlife Resources
P.O. Box 90778
Henrico, VA 23228

CC: Gray Anderson
Chief of Wildlife
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Leo Miranda
Region 4 Director
leopoldo_miranda@fws.gov

Dear Director Brown and Director Miranda:

Pursuant to 50 C.F.R. § 424.14(b), we hereby provide notice that the Center for Biological Diversity intends to file a petition under the federal Endangered Species Act to list and designate critical habitat for the Roughhead Shiner (*Notropis semperasper*) no sooner than 30 days from the date that this notice is provided.

The Roughhead Shiner has a small range in the upper James River drainage where it is increasingly rare. It is threatened by habitat degradation from siltation, impoundment and pulp mill effluents, and is also threatened by competition with the introduced Telescope Shiner (*Notropis telescopus)*.Recent efforts to detect the species have produced very few individuals and scientists have expressed concern that the species is on the brink of extinction.

We encourage the Service to proactively list this species because it needs conservation intervention faster than the normal listing process timeline.

Please feel free to contact me for more information.

Sincerely,

Tierra Curry
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