

Cylindrical Lioplax (*Lioplax cyclostomaformis*)
Flat Pebblesnail (*Lepyrium showalteri*)
Plicate Rocksnailed (*Leptoxis plicata*)
Painted Rocksnailed (*Leptoxis taeniata*)
Round Rocksnailed (*Leptoxis ampla*)
Lacy Elimia (*Elimia crenatella*)

**Status Review:
 Summary and Evaluation**



Photos of museum specimens of aquatic snails. Top row from left: cylindrical lioplax (*Lioplax cyclostomaformis*), flat pebblesnail (*Lepyrium showalteri*), and plicate rocksnailed (*Leptoxis plicata*). Bottom row from left: painted rocksnailed (*Leptoxis taeniata*), round rocksnailed (*Leptoxis ampla*), and lacy elimia (*Elimia crenatella*). Photo credit: Alabama Aquatic Biodiversity Center.

U.S. Fish and Wildlife Service
Southeast Region
Alabama Ecological Services Field Office
Daphne, Alabama

October 2022

STATUS REVIEW
Cylindrical Lioplax (*Lioplax cyclostomaformis*)
Flat Pebblesnail (*Lepyrium showalteri*)
Plicate Rocksnail (*Leptoxis plicata*)
Painted Rocksnail (*Leptoxis taeniata*)
Round Rocksnail (*Leptoxis ampla*)
Lacy Elimia (*Elimia crenatella*)

GENERAL INFORMATION

Current Classification:

Endangered: cylindrical lioplax, flat pebblesnail, plicate rocksnail

Threatened: painted rocksnail, round rocksnail, lacy elimia

Lead Field Office: Alabama ES Field Office, Morgan Brizendine, 251-441-5839

Reviewers:

Lead Regional Office: Atlanta Regional Office, Carrie Straight, (404) 679-7226

Date of original listing: October 28, 1998 (63 FR 208)

Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the cylindrical lioplax, flat pebblesnail, plicate rocksnail, painted rocksnail, round rocksnail, and lacy elimia to inform this status review.

We announced initiation of the review for these species in the Federal Register on June 23, 2021 (86 FR 32965) with a 60-day comment period and received two comments. One comment provided by the Southern Environmental Law Center on behalf of Black Warrior Riverkeeper emphasized threats to water quality in the Black Warrior River drainage, and the other comment by the National Council for Air and Stream Improvement, Inc. highlighted the importance of best management practices for protecting water quality and aquatic habitat. The primary sources of information used in this analysis were the 1998 final listing rule (Service 1998), the 2005 recovery plan (Service 2005), peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Alabama Ecological Services Field Office, Daphne, Alabama. All literature and documents used for this review are on file at this office. All recommendations from this review are the result of thoroughly reviewing the best available information.

Federal Register Notice citation announcing the species is under active review:
June 23, 2021 (86 FR 32965)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):

8. Cylindrical lioplax, painted rocksnail, round rocksnail, and lacy elimia are all species with a moderate degree of threat and high recovery potential.
5. Flat pebblesnail is a species with a high degree of threat and a low recovery potential.
- 5C. Plicate rocksnail is a species with a high degree of threat and a low recovery potential that may be in conflict with construction or other development projects or other forms of economic activity.

Review History:

Previous 5-year reviews recommending no change in status were published on August 29, 2006 (Service 2006), and on July 8, 2016 (Service 2016).

REVIEW ANALYSIS

Listed Entities

Taxonomy and nomenclature

Cylindrical lioplax. Since the previous status review, a global genetics review of the family Viviparidae used both nuclear and mitochondrial markers to confirm that cylindrical lioplax is a unique species (Stelbrink et al. 2020). In addition, Bieler (2021) reviewed many of Isaac Lea's original conchological descriptions and publications and evaluated them under the 4th edition of the International Commission on Zoological Nomenclature. The scientific community and the Service have used the original species spelling of *cyclostomaformis*. However, Bieler (2021) identified a name change that was made by Lea to avoid homonymy with another species and listed *Lioplax cyclostomatiformis* as the correct nomenclature of this species. This change is not yet reflected by the Integrated Taxonomic Information System (2022f). This update does not impact our assessment of the listed entity, and it is still considered a valid entity by the Service. Until we finalize a technical correction of the name, we will continue to reference the species using the name as it was listed.

Flat pebblesnail. We are not aware of any changes to the taxonomy of this entity (ITIS 2022e), and it is still considered valid by the Service.

Plicate rocksnail. We are not aware of any changes to the taxonomy of this entity (ITIS 2022d), and it is still considered valid by the Service.

Painted rocksnail. Painted rocksnail has been known as *Leptoxis taeniata* until experts re-evaluated historical collections and determined that this name was erroneously applied (Whelan et al. 2017). The painted rocksnail was originally described by Conrad in 1834 from specimens collected from the Alabama River at Claiborne. However, his description was vague and could apply to multiple species of rocksnails (Whelan et al. 2017), especially since shell morphology varies and can overlap between closely related species (Goodrich 1922; Whelan et al. 2015; Whelan et al. 2017). The spotted rocksnail (*Leptoxis picta*) was also described by Conrad from

this Alabama River location approximately four months before the painted rocksnail. After re-examination of possible type and historical material of painted rocksnail, re-examination of pleurocerid collections from the Alabama River, and re-consideration of the historical range of the painted rocksnail, experts concluded that the original type material represented a single taxon that is synonymously referred to as *Leptoxis taeniata* and *Leptoxis picta* (Whelan et al. 2017).

Further phylogenetic analyses indicate that painted rocksnail is a unique species (Whelan et al. 2017). It exhibits different shell morphology and body color patterns as adults from spotted rocksnail and lays its eggs in concentric rings instead of spirals (Whelan et al. 2015; Whelan et al. 2017; Garner et al. 2022). Furthermore, an anchored hybrid enrichment probe set has shown that both painted rocksnail and spotted rocksnail occur within the same genetic clade but are supported as different branches or species (Whelan et al. 2022). Based on these analyses, painted rocksnail is now recognized as *Leptoxis coosaensis* (Lea, 1861) and is considered endemic to the Coosa River drainage (Whelan et al. 2017). This change is reflected by the Integrated Taxonomic Information System (2022c), and the painted rocksnail is still considered a valid entity by the Service. Until we finalize a technical correction of the name, we will continue to reference the species using the name as it was listed.

Round rocksnail. We are not aware of any changes to the taxonomy of this entity (ITIS 2022b), and it is still considered valid by the Service.

Lacy elimia. We are not aware of any changes to the taxonomy of this entity (ITIS 2022a), and it is still considered valid by the Service.

Distinct Population Segment (DPS) (61 FR 4722)

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing of a DPS to only vertebrate species. Because the six species under review in this document are not vertebrates, the DPS policy does not apply.

Recovery Criteria

Recovery Plan or Outline

Recovery Plan for Six Mobile River Basin Aquatic Snails: cylindrical lioplax (*Lioplax cyclostomaformis*), flat pebblesnail (*Lepyrium showalteri*), plicate rocksnail (*Leptoxis plicata*), painted rocksnail (*Leptoxis taeniata*), round rocksnail (*Leptoxis ampla*), and lacy elimia (*Elimia crenatella*), December 2, 2005.

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protection under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020). The Service believes these recovery criteria are appropriate and relevant. The following paragraphs discuss which criteria have or have not been met for each species.

A population is defined as all snails occurring within a contiguous river or stream reach extending a minimum of 30 km (18 mi). Snails in a recovered population should be easily found in appropriate habitat throughout the occupied reach.

Criteria for reclassification to threatened status (cylindrical lioplax, flat pebblesnail, plicate rocks nail)

The cylindrical lioplax, flat pebblesnail, and plicate rocks nail will be considered for reclassification to threatened status when the following criteria are met:

- 1. The existing population has been shown to be stable or increasing over a period of 10 years (2 to 5 generations). This may be measured by numbers/area, catch per unit/effort, or other methods developed through population monitoring, and must be demonstrated through annual monitoring.*

Although the Service, the Alabama Department of Conservation and Natural Resources, the Geological Survey of Alabama, the Alabama Natural Heritage Program, universities, and other agencies and programs periodically survey freshwater mollusks in the Mobile River Basin, no standardized annual monitoring plans have been established or implemented for cylindrical lioplax, flat pebblesnail, or plicate rocks nail. **This recovery criterion has not been met for these species.**

- 2. There are no apparent or immediate threats to the listed population (see Listing/Recovery Criteria, below).*

This criterion has not been met for cylindrical lioplax, flat pebblesnail, or plicate rocks nail. See the threats summary below.

- 3. A captive population has been established at an appropriate facility, and the species has been successfully propagated.*

The cylindrical lioplax, flat pebblesnail, and plicate rocks nail have been successfully propagated at the Alabama Aquatic Biodiversity Center (Service 2016). **This criterion has been met for these three species.**

- 4. A minimum of two additional populations have been established (or discovered) within historic range.*

Cylindrical lioplax has four known populations (Table 1), and three of those populations were discovered after the listing rule (Service 1998; Service 2016). However, these populations do not meet the population recovery criteria (above). **This criterion has not been met for cylindrical lioplax.**

Flat pebblesnail has two known populations (Table 2), which were identified in the listing rule (Service 1998). These populations do not meet the population recovery criteria (above), and an additional two populations have not been established or discovered. **This criterion has not been met for flat pebblesnail.**

Plicate rocks nail has one known population (Table 3), which was identified in the listing rule (Service 1998). An additional two populations have not been established or discovered; therefore, **this criterion has not been met for plicate rocks nail.**

Criteria for delisting (recovery) of all species:

The lacy elimia, round rocksnail, painted rocksnail, cylindrical lioplax, flat pebblesnail, and plicate rocksnail will be considered for delisting when:

1. *A minimum of 3 natural or re-established populations have been shown to be persistent (i.e., stable or increasing) for a period of 10 years (2 to 5 generations).*

See above for discussion of populations of cylindrical lioplax, flat pebblesnail, and plicate rocksnail.

The painted rocksnail has four known populations (Table 4), and the Coosa River population below Logan Martin Dam was discovered after the listing rule (Service 1998; Service 2016). These populations do not meet the population recovery criteria (above).

This criterion has not been met for painted rocksnail.

The round rocksnail has five known populations (Table 5), and the Schultz Creek population was discovered after the listing rule (Service 1998; Whelan et al. 2019). However, the status of the Six-mile Creek population is currently unknown (Table 5). The Cahaba River population is likely recovered, but more extensive surveys are needed to confirm its status throughout this reach. No other populations meet the population recovery criteria (above). **This criterion has not been met for round rocksnail.**

The lacy elimia has one known population in lower Cheaha Creek (Table 6), and two populations have been extirpated since its listing (Service 1998). **This criterion has not been met for lacy elimia.**

Although the Service, the Alabama Department of Conservation and Natural Resources, the Geological Survey of Alabama, the Alabama Natural Heritage Program, universities, and other agencies and programs periodically survey freshwater mollusks in the Mobile River Basin, no standardized annual monitoring plans have been established or implemented. **This recovery criterion has not been met for any of these species.**

2. *There are no apparent or immediate threats to the population (see Listing/Recovery Factor Criteria, below).*

This criterion has not been met for cylindrical lioplax, flat pebblesnail, plicate rocksnail., painted rocksnail, round rocksnail, or lacy elimia. See the threats summary below.

Biology and Habitat Summary

Additional information about the biology and life history of these species can be found in the recovery plan (Service 2005) and in the previous 5-year status reviews (Service 2006, 2016). A brief summary of this information followed by any significant new information is discussed for each species in the following paragraphs.

Cylindrical lioplax

The cylindrical lioplax is a gill-breathing snail in the family Viviparidae with a shell that reaches about 28 mm (1.1 in) in length and is light to dark olivaceous green outside and bluish inside of the shell opening (Service 2005). Viviparid snail eggs hatch inside of the female and the young are born live, and they have a life span that ranges from 3 to 11 years (Service 2005). Unlike its

close relatives, which are usually found in exposed soft substrates along the margins of streams, cylindrical lioplax are found in mud under large flat rocks in swift flow (Clench and Turner 1955; Service 2005).

There are currently four known populations of cylindrical lioplax (Table 1; Figure 1). Its current distribution has not changed since the previous status review (Service 2016). We are not aware of any additional new biology or habitat information since the most recent species review that impacts the status of the species, and the information provided in the last 5-year review remains valid (Service 2016).

Table 1. Populations of cylindrical lioplax (*Lioplax cyclostomaformis*).

Population	Stream Reach Length	1998 Listing Rule Status	Most Recent Observation (Year)	2022 Status
Cahaba River	24 km (15 mi) ¹	Current	2020 ²	Current
Little Cahaba River	< 1 km (< 1 mi) ³	Historical	2013 ³	Current
Coosa River	-	Historical	1957 ⁴	Extirpated
Yellowleaf Creek	< 1 km (< 1 mi) ⁵	Historical	2006 ⁵	Current
Choccolocco Creek	< 1 km (< 1 mi) ³	Historical	2011 ³	Current
Oothcalooga Creek	-	Historical	Pre-1955 ⁶	Extirpated
Coahulla Creek	-	Historical	Pre-1955 ⁶	Extirpated
Armuchee Creek	-	Historical	Pre-1955 ⁶	Extirpated
Little Wills Creek	-	Historical	Pre-1955 ⁶	Extirpated
Alabama River	-	Historical	Pre-1955 ⁶	Extirpated
Black Warrior River	-	Historical	Pre-1955 ⁶	Extirpated
Big Prairie Creek	-	Historical	Pre-1955 ⁶	Extirpated
Valley Creek	-	Historical	Pre-1955 ⁶	Extirpated

¹Bogan and Pierson 1993a; Service 1998, ²Garner et al. 2022, ³Johnson et al. 2021, ⁴MCZ 2022, ⁵Johnson 2006, ⁶Clench and Turner 1955

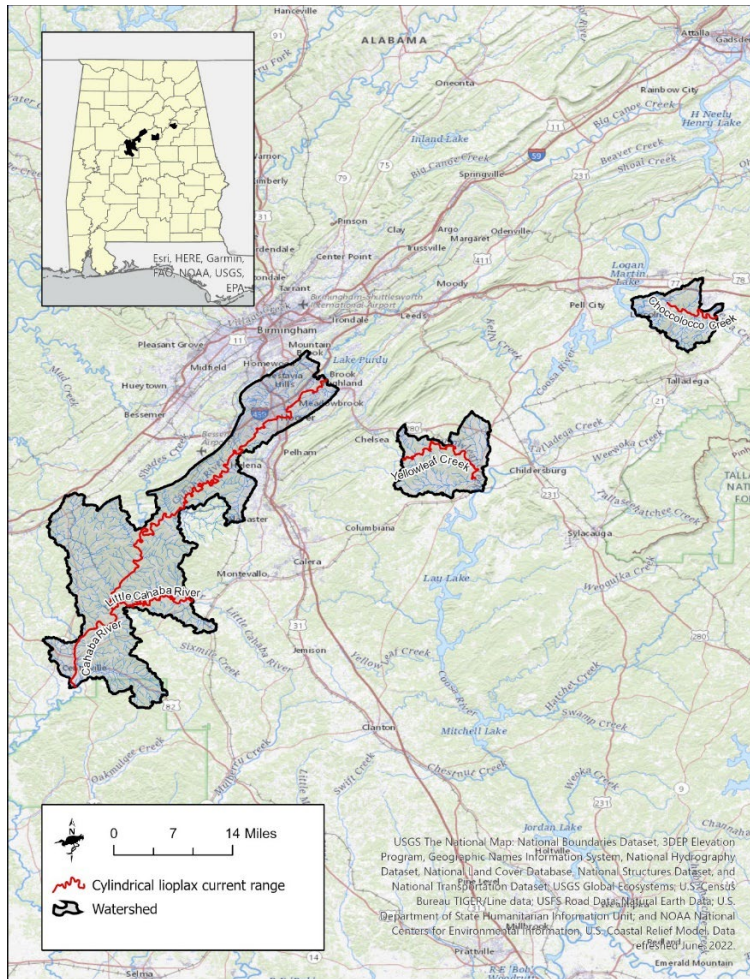


Figure 1. The current known range of the cylindrical lioplax (*Lioplax cyclostomaformis*) includes the Cahaba River and its tributary the Little Cahaba River and the Yellowleaf Creek and Choccolocco Creek watersheds of the Coosa River Basin in Alabama. Created by the Alabama Ecological Services Field Office.

Flat pebblesnail

The flat pebblesnail is a relatively large hydrobiid with a shell that is 3.5 to 4.4 mm (0.1 to 0.2 in) high and 4 to 5 mm (0.2 in) wide and has a depressed spire and expanded, flattened body whorl (Service 2005). Females lay their eggs in capsules on rocks in rapid currents of river shoals, and adults live for one year (Service 2005).

There are currently two known populations of flat pebblesnail (Table 2; Figure 2), and the distribution of this species has not changed since the previous status review (Service 2016). Although the listing rule identified the Coosa River as part of the historical range of this species, we did not include it in Table 2 because the collection location of these records may have been mislabeled (Garner et al. 2022).

Table 2. Populations of flat pebblesnail (*Lepyrium showalteri*).

Population	Stream Reach Length	1998 Listing Rule Status	Most Recent Observation (Year)	2022 Status
Cahaba River	22 km (13.7 mi) ¹	Current	2013 ³	Current
Little Cahaba River	< 1 km (< 1 mi) ²	Current	2013 ³	Current

¹Johnson et al. 2006, ²Johnson et al. 2021, ³Garner et al. 2022

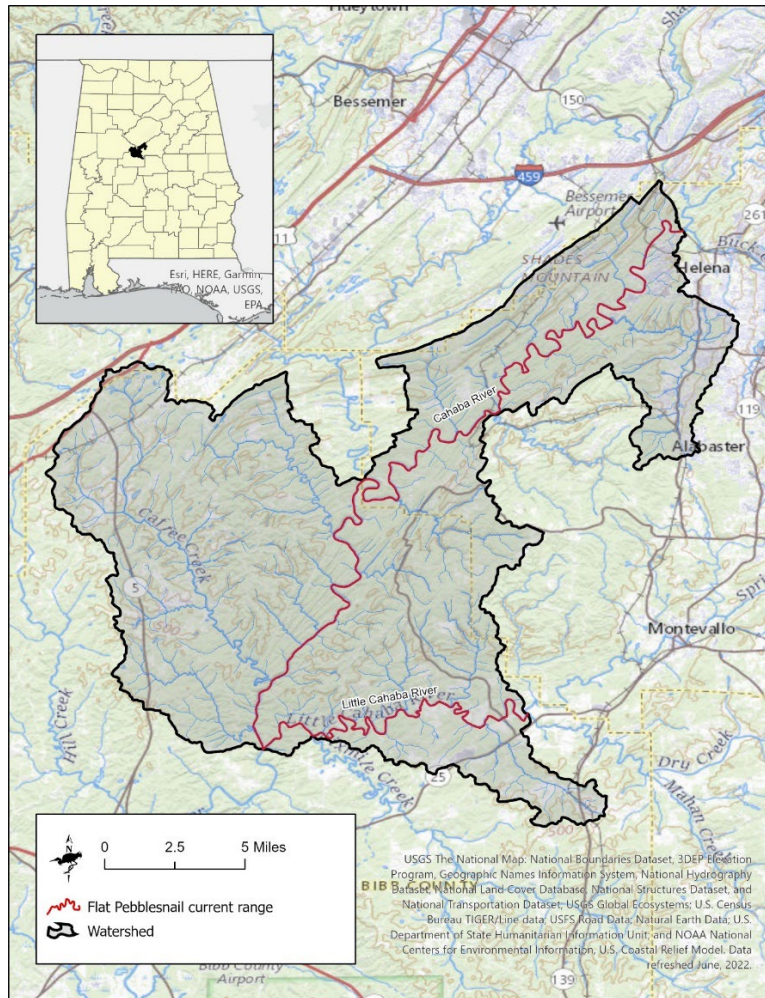


Figure 2. The current known range of the flat pebblesnail (*Lepyrium showalteri*) includes the Cahaba River and its tributary the Little Cahaba River in Alabama. Created by the Alabama Ecological Services Field Office.

Plicate rocksnail

The plicate rocksnail has a subglobose shell that grows to about 20 mm (0.8 in) in length and has a broadly rounded aperture and an ornamented body whorl with strong folds or plicae (Service 2005). This species can be found in shallow gravel and cobble shoals, and adults live for up to two years in captivity (Service 2005). Females lay single eggs in random patterns on hard substrates (Whelan et al. 2015).

In 1998, the plicate rocksnail was known from a 32 km (20 mi) reach of the Locust Fork, and that range was extended downstream by 5.2 km (3.2 mi) in 2009 (Service 1998; Richardson and Selby 2009; Service 2016). In 2020, biologists extended the range upstream and downstream and documented the plicate rocksnail at 12 sites that extended the range to 60.5 km (37.6 mi) (Buntin et al. 2021). Biologists also noted two populations within the range that were separated by a 23 km (14.3 mi) unoccupied section (Buntin et al. 2021). There are no other known populations of plicate rocksnail outside of the Locust Fork (Table 3; Figure 3).

Table 3. Populations of plicate rocksnail (*Leptoxis plicata*).

Population	Stream Reach Length	1998 Listing Status	Most Recent Observation (Year)	2022 Status
Locust Fork	60.5 km (37.6 mi) ¹	Current	2020 ¹	Current
Black Warrior River	-	Historical	Early 1900s ²	Extirpated
Little Warrior River	-	Historical	Early 1900s ²	Extirpated
Tombigbee River	-	Historical	Early 1900s ²	Extirpated

¹Buntin et al. 2021, ²Goodrich 1922

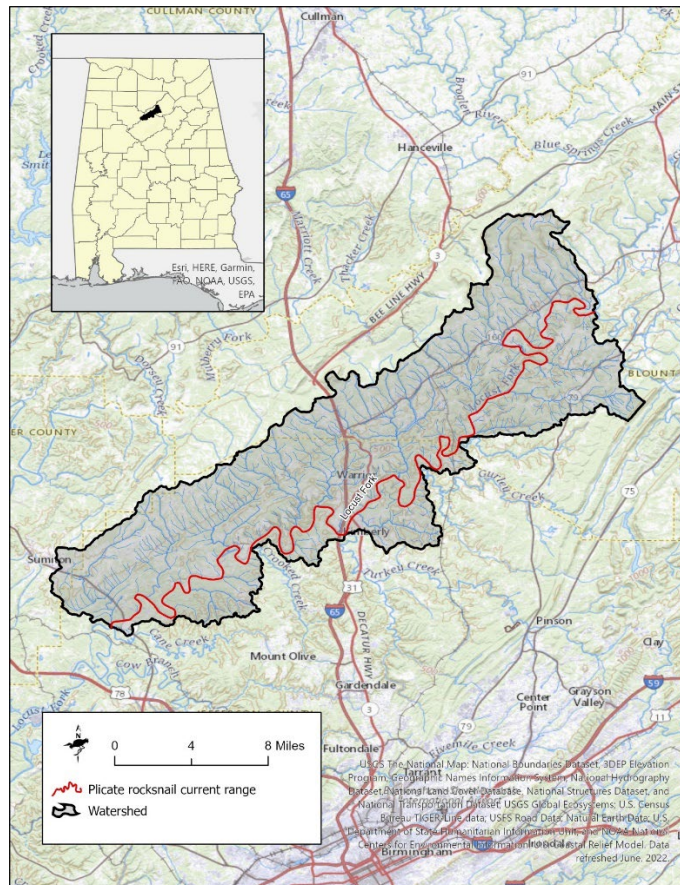


Figure 3. The current known range of the plicate rocksnail (*Leptoxis plicata*) includes the Locust Fork watershed of Black Warrior River in Alabama. Created by the Alabama Ecological Services Field Office.

Painted rocksnail

The painted rocksnail has a shell that is subglobose to oval in shape and is about 19 mm (0.8 in) long with a broadly ovate, anteriorly rounded aperture or shell opening (Service 2005). These snails likely have a life span of less than two years and are found on hard substrates in riffles and shoals (Service 2005). Females lay their eggs in clutches in concentric rings with mucus around each egg (Whelan et al. 2015).

Although the painted rocksnail was thought to have the largest range of any rocksnail in the Mobile River Basin (Goodrich 1922; Service 2005), recent analyses have determined that this species is endemic to the Coosa River Basin (Whelan et al. 2017). A genetic assessment of the current painted rocksnail populations indicates that these populations have not experienced a significant genetic bottleneck or inbreeding depression (Gladstone and Whelan 2021). The Coosa River population exhibited the highest diversity, and it was most genetically similar to the other populations; therefore, it is recommended that broodstock be collected from the Coosa River population for future propagation and reintroduction efforts (Gladstone and Whelan 2021).

Painted rocksnail is currently known from four populations (Table 4; Figure 4). The current distribution of painted rocksnail has not changed since the previous status review, except for the confirmation of the persistence of the Ohatchee Creek population (Gladstone and Whelan 2021).

Table 4. Populations of painted rocksnail (*Leptoxis taeniata*).

Population	Stream Reach Length	1998 Listing Rule Status	Most Recent Observation (Year)	2022 Status
Chocolocco Creek	16.7 km (10.4 mi) ¹	Current	2019 ³	Current
Buxahatchee Creek	< 1 km (<1 mi) ²	Current	2019 ⁴	Current
Ohatchee Creek	< 1 km (<1 mi) ²	Current	2019 ⁴	Current
Coosa River	< 1 km (<1 mi) ²	Historical	2019 ⁴	Current

¹Johnson et al. 2021, ²Whelan et al. 2017, ³Garner et al. 2022, ⁴Gladstone and Whelan 2021

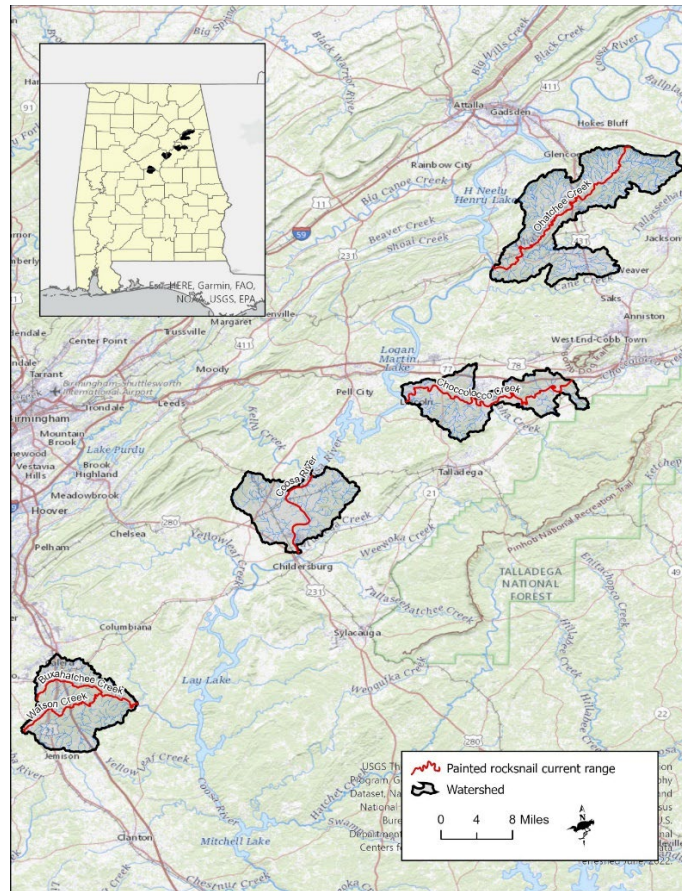


Figure 4. The current known range of the painted rocksnail (*Leptoxis taeniata*) includes the main stem Coosa River below Logan Martin Dam and its tributaries Choccolocco Creek and Buxahatchee Creek in Alabama. Created by the Alabama Ecological Services Field Office.

Round rocksnail

The round rocksnail is a gill-breathing snail that has a subglobose shell with an ovately round aperture that grows to about 20 mm (0.8 in) in length (Service 2005). These snails likely have a life span of less than two years and are found on hard substrates in riffles and shoals (Service 2005). Females lay their eggs clutches in concentric rings with mucus and algae or detritus surrounding each egg (Whelan et al. 2015).

A genetic assessment of the round rocksnail populations, which did not include samples from Six-mile Creek but did include samples from a new population in Schultz Creek, found that main stem populations are more diverse than those in tributaries and that downstream populations are more diverse than upstream populations (Whelan et al. 2019). This study also found that gene exchange between populations is low, especially between those in tributaries, and that slight genetic differences in populations can influence subtle differences in shell shape variation (Whelan et al. 2019). Based on these findings, conserving each population will be necessary to preserve diversity, and managers can use reintroductions at sites within historic range where round rocksnails are extirpated to facilitate recovery; however, augmenting populations by

translocating individuals or stocking captively bred individuals is not currently recommended because of the increased risk of outbreeding depression (Whelan et al. 2019).

The listing rule included the Cahaba River, Little Cahaba River and the Coosa River and its tributaries, including Canoe Creek, Kelley Creek (St. Clair County), Ohatchee Creek, Yellowleaf Creek, and Waxahatchee Creek as part of the species' historical range (Service 1998). However, the round rocksnail is now considered endemic to the Cahaba River drainage and past records outside of this drainage are misidentifications (Whelan et al. 2019; Garner et al. 2022). There are currently four or five known populations of round rocksnail (Table 5). The distribution of the species has not changed since the previous status review, except for the addition of the Schultz Creek population discovered in October 2016 (Figure 5; Whelan et al. 2019).

Table 5. Populations of round rocksnail (*Leptoxis ampla*).

Population	Stream Reach Length	1998 Listing Rule Status	Most Recent Observation (Year)	2022 Status
Cahaba River	44 km (27.4 mi) ¹	Current	2020 ⁴	Current
Little Cahaba River	8.2 km (5.1 mi) ²	Current	2019 ⁴	Current
Shades Creek	< 1 km (<1 mi) ¹	Current	2016 ⁵	Current
Six-mile Creek	< 1 km (<1 mi) ³	Current	1992 ³	Unknown
Schultz Creek	< 1 km (<1 mi) ⁴	Unknown	2019 ⁴	Current

¹Johnson et al. 2006, ²Johnson et al. 2021, ³Bogan and Pierson 1993a, ⁴Garner et al. 2022, ⁵Whelan et al. 2019

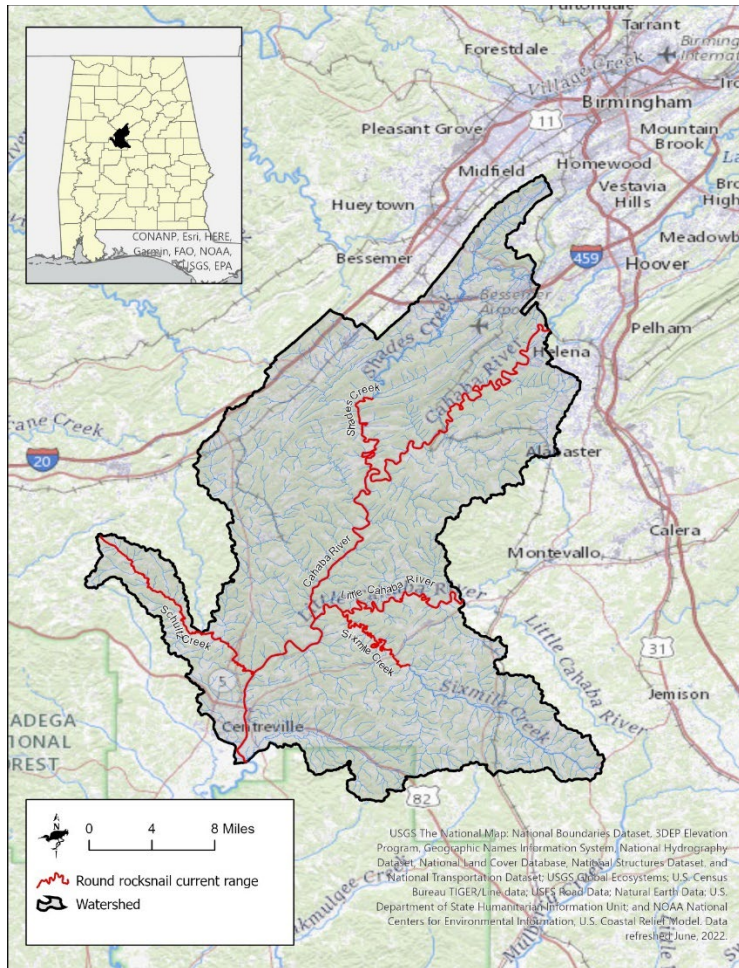


Figure 5. The current known range of the round rocksnail (*Leptoxis ampla*) includes the main stem Cahaba River and its tributaries the Little Cahaba River, Shades Creek, Six-mile Creek, and Shultz Creek in Alabama. Created by the Alabama Ecological Services Field Office.

Lacy elimia

The lacy elimia is a small pleurocerid snail with a dark brown to black, conic shaped shell that is striate with folded upper whorls and is about 1.1 cm (0.4 in) in length (Service 2005). Little is known about the life history of this species; however, other elimia snails are found on rock shoals and gravel bars, lay their eggs in early spring, and have a life span up to five years (Service 2005).

Two of the three extant populations of lacy elimia identified in the listing rule (Service 1998) are extirpated (Table 6; Figure 6). From 2010 to 2014, biologists surveyed 36 sites within the Choccolocco Creek watershed, which included sites in 13 tributaries, and found lacy elimia at one site in Cheaha Creek (Johnson et al. 2021). Biologists have also surveyed Emauhee Creek and Weewoka Creek multiple times since listing but have not observed lacy elimia (Pierson and Pursifull 2006; Johnson pers. comm. 2021).

Although specimens first collected in 2011 from upper Cheaha Creek and its tributary Kelly Creek (Talladega County) were similar in appearance to lacy elimia (Garner et al. 2022), genetic

testing of individuals collected in 2019 determined that these snails are a different species (Gladstone and Whelan 2021). Lacy elimia are now limited to a reach of <1 km length in Cheaha Creek, and the remaining population exhibits low genetic diversity relative to other freshwater snails and a high inbreeding coefficient, which could indicate a genetic bottleneck or inbreeding depression (Gladstone and Whelan 2021). Lacy elimia have been propagated in captivity; however, reintroductions have not been attempted because of limited habitat availability (Service 2016).

Table 6. Populations of lacy elimia (*Elimia crenatella*).

Population	Stream Reach Length	1998 Listing Rule Status	Most Recent Observation (Year)	2022 Status
Cheaha Creek	< 1km (< 1 mi) ¹	Current	2019 ²	Current
Emauhee Creek	-	Current	1992 ³	Extirpated
Weewoka Creek	-	Current	1992 ³	Extirpated
Coosa River	-	Historical	Early 1900s ⁴	Extirpated
Big Will's Creek	-	Historical	Early 1900s ⁴	Extirpated
Kelley Creek	-	Historical	Early 1900s ⁴	Extirpated
Chocolocco Creek	-	Historical	1955 ⁵	Extirpated
Tallaseehatchee Creek	-	Historical	Early 1900s ⁴	Extirpated

¹Johnson et al. 2021, ²Gladstone and Whelan 2021, ³Bogan and Pierson 1993b, ⁴Goodrich 1936, ⁵Garner et al. 2022

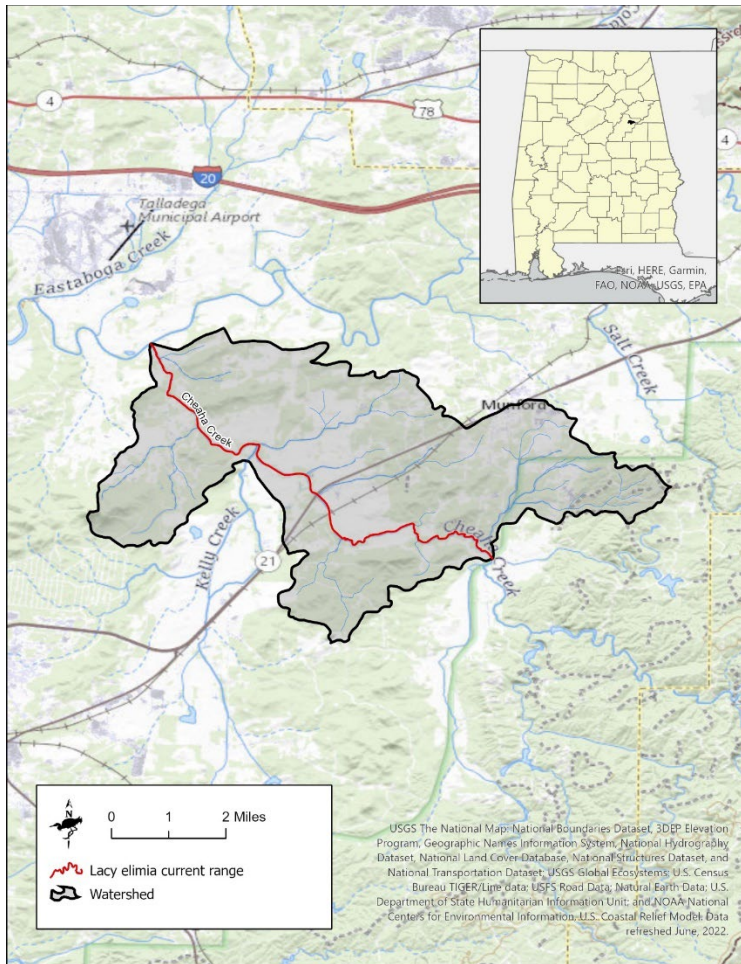


Figure 6. The current known range of the lacy elimia (*Elimia crenatella*) includes the Cheaha Creek watershed of the Coosa River Basin in Alabama. Created by the Alabama Ecological Services Field Office.

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4(a)(1) of the Act. A summary of this assessment for all species is detailed below.

Factor A: The present or threatened destruction, modification, or curtailment of its habitat or range.

The final listing rule described several threats to the habitats of these six snails, including impoundments, point and nonpoint source pollution, sedimentation, and eutrophication (Service 1998). Recent information shows that these threats remain ongoing and occur throughout the species range, and we expect this threat to continue in the future. The following paragraphs further discuss these threats.

The Alabama Department of Environmental Management is required to establish water quality standards for streams in Alabama, identify impaired waters, and develop total maximum daily loads (TMDLs) for impaired waters. A TMDL is the maximum amount of a

pollutant that can be in a stream before it is considered impaired. The Alabama Department of Environmental Management is required by the Clean Water Act to maintain a list of impaired waters and to update that list with the Environmental Protection Agency every two years (EPA 2022). The following paragraphs summarize impaired streams that are occupied by listed snails by river basin.

Black Warrior River Basin (plicate rocksnail). The remaining population of plicate rocksnail is found in the Locust Fork, a large tributary of the Black Warrior River. The Locust Fork had four segments that were impaired by siltation from 1998 until 2016; however, improvements in macroinvertebrate and habitat assessments as well as a decrease in total suspended solids and turbidity supported its removal from the impaired waters list for siltation in 2018 (ADEM 2018). Segments of numerous other tributaries to the Black Warrior River that were historically occupied by plicate rocksnail, including the Sipsey Fork and Mulberry Fork, continue to be listed as impaired for various causes, including siltation, nutrients, total dissolved solids, pathogens (*E. coli*), metals (mercury), pesticides, and organic enrichment (ADEM 2022). Continued impairment of these streams will limit reintroductions and recovery of plicate rocksnail (Service 2016).

Cahaba River Basin (cylindrical lioplax, flat pebblesnail, and round rocksnail). The Cahaba River was removed from the 303(d) list in 2022 for pathogens (*E. coli*), but it continues to be listed for the metals (mercury) impairment (ADEM 2022). The Little Cahaba River was listed as impaired for metals (mercury) throughout Lake Purdy reservoir and for total dissolved solids upstream of Lake Purdy (ADEM 2022). Although TMDLs for siltation, turbidity, and habitat alteration were prepared for Shades Creek in 2004 (EPA 2004; Service 2016), this stream was not listed as impaired in 2022. Continued maintenance and improvement of water quality in the Cahaba River Basin will be critical for the recovery of cylindrical lioplax, flat pebblesnail, and round rocksnail.

Coosa River Basin (cylindrical lioplax, painted rocksnail, and lacy elimia). The Coosa River and many of its tributaries continue to be listed as impaired for a variety of causes. The Coosa River is listed for impairments of contaminated sediments (PCBs) and metals (mercury) below Logan Martin Dam, which could negatively impact painted rocksnail (ADEM 2022). Buxahatchee Creek was removed from the 2022 303(d) list as impaired for pathogens (*E. coli*), and a TMDL has been developed for this stream, which will benefit painted rocksnail (ADEM 2020; ADEM 2022). Ohatchee Creek, which supports one population of painted rocksnail, is listed as impaired for pathogens (*E. coli*), while Choccolocco Creek, which has one population of cylindrical lioplax and painted rocksnail, continues to be listed for contaminated sediments (PCBs), metals (mercury), and pathogens (*E. coli*) (ADEM 2022).

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes.

We have no indication that overutilization for commercial, recreational, scientific, or educational purposes poses a significant threat for cylindrical lioplax, flat pebblesnail, plicate rocksnail, painted rocksnail, round rocksnail, or lacy elimia.

Factor C: Disease or predation.

We have no indication that disease or predation poses a significant threat for cylindrical lioplax, flat pebblesnail, plicate rocksnail, painted rocksnail, round rocksnail, or lacy elimia. Although biologists have documented viral infection as a factor in a freshwater mussel mortality event (Richard et al. 2020), these infections have not been documented in gastropods. The drainages these six snails occupy do not currently have introduced black carp, an invasive species known to forage on mussels and snails, which could be a future threat to the species if found in these waters (Service 1998). The Alabama Division of Wildlife and Freshwater Fisheries Regulation 220-2-.26 restricts the possession, sale, import, bring, or release of any black carp into the state, which may reduce this risk.

Factor D: The inadequacy of existing regulatory mechanisms.

In addition to protections provided by the Act, cylindrical lioplax, flat pebblesnail, plicate rocksnail, painted rocksnail, round rocksnail, and lacy elimia are protected under the State of Alabama's Invertebrate Species Regulation (220-2-.98); the Federal Power Act (16 U.S.C. §791 et seq. 1920, as amended); the Clean Water Act (33 U.S.C. §1251 et seq. 1972); and the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. §136 et seq. 1996).

The State of Alabama Invertebrate Species Regulation (220-2-.98) prohibits the take, possession, or trade of state or federally protected invertebrates without a scientific collection permit. Even with state and federal species protections, many of the public are not educated about the status of these snails and their habitats and are not aware of how they can help conserve them.

The Federal Power Act (16 U.S.C. §791 et seq. 1920, as amended) requires cooperation between the Federal Energy Regulatory Commission and the Service in order to protect, mitigate, and enhance fish and wildlife resources that are affected by the licensing or relicensing of dams. The Federal Power Act provides some protections for one population of painted rocksnail in the Coosa River and for populations of cylindrical lioplax and painted rocksnail in Choccolocco Creek.

The Clean Water Act (33 U.S.C. §1251 et seq. 1972) regulates the point source discharges of pollutants into and the water quality standards for surface waters in the United States. The Environmental Protection Agency has authorized the Alabama Department of Environmental Management to issue permits from the National Pollutant Discharge Elimination System in Alabama, which allows for lawful, regulated discharges into waters within the state. Section 303(d) of the Clean Water Act also requires each state to maintain a list of polluted waterbodies and to establish TMDLs for each impaired waterbody (see Factor A, Criteria 3). Section 404 authorizes the U.S. Army Corps of Engineers to regulate the discharge of dredged or fill material into waters of the U.S., which includes wetlands. These permits are usually issued individually and do not consider the potentially harmful cumulative effects of discharges across watersheds or drainages; in addition, inadequate budgets and staff may limit enforcement of permit conditions.

The Federal Insecticide, Fungicide, and Rodenticide Act regulates the use of registered pesticides in the U.S. and is intended to protect against "unreasonable adverse effects on the environment." Sediment-bound pollutants or toxicants can be introduced into streams along with extrinsic sediments (Niraula et al. 2016). Toxicants, which include pesticides, ammonia, metals, and ions such as potassium, chloride, and sulfate, can disrupt growth, feeding, and

reproduction in freshwater mussels, and prolonged exposure to toxicants can lead to death (Naimo 1995; Newton et al. 2003; Bringolf et al. 2007; Wang et al. 2016; Ciparis et al. 2019). Wang et al. (2016) also found that freshwater mussels are underrepresented in toxicity databases that are used to determine water quality criteria; furthermore, the few species that have been tested in studies are often common species that may be less sensitive to toxicants than species with a narrow endemic range. Freshwater gastropods, especially listed species, are more underrepresented in these studies even though they may be more sensitive to some toxicants than freshwater mussels (Gibson et al. 2016). Toxicity tests are needed for all life stages of listed freshwater gastropods to determine if current water quality criteria and pollutant and pesticide regulations adequately protect these gastropods.

Factor E: Other natural or manmade factors affecting its continued existence.

All populations of cylindrical lioplax, flat pebblesnail, plicate rocksnail, painted rocksnail, round rocksnail, and lacy elimia remain vulnerable to natural and anthropogenic threats, including droughts and toxic spills. Droughts can reduce both the amount of habitat available to these species and the water quality of that habitat, which can lead to mortality events and further fragmentation of populations. Temperatures in Alabama have been very warm during the most recent 5-year increment analyzed, and weather and climate models suggest that warming trends will continue (Runkle et al. 2022). Increasing temperatures will increase the rate of soil moisture loss, and areas that contain soil with poor water-holding capacity could experience an increase in drought conditions (Runkle et al. 2022). Toxic spills could have devastating impacts on the survival of these snails, especially if they occur upstream of known populations. Many of the occupied streams have road, railroad, and pipeline crossings that increase the risk of toxic spills.

Synthesis

Cylindrical lioplax. The cylindrical lioplax is a gill-breathing snail in the family Viviparidae with a shell that reaches about 28 mm (1.1 in) in length and is found in mud under large flat rocks in swift flow in the Cahaba River and Coosa River drainages. Although three populations in addition to the Cahaba River population have been discovered since the species' listing, individuals of all populations are only found at localized sites. Additional surveys and monitoring are needed to determine the extent and viability of these populations. Water quality and habitat degradation, inadequate regulatory protections, and anthropogenic threats, including drought and toxic spills, continue to threaten this species throughout its range. Because of ongoing threats and the current condition of the species, **cylindrical lioplax continues to meet the definition of an endangered species.**

Flat pebblesnail. The flat pebblesnail is a relatively large hydrobiid with a shell that is 3.5 to 4.4 mm (0.1 to 0.2 in) high and 4 to 5 mm (0.2 in) wide that is found on rocks in rapid currents of river shoals in the Cahaba River drainage. No new populations have been discovered in addition to the Cahaba River and Little Cahaba River populations since the species' listing. Additional surveys and monitoring are needed to determine the extent and viability of these populations. Water quality and habitat degradation, inadequate regulatory protections, and anthropogenic threats, including drought and toxic spills, continue to threaten this species throughout its range. Because of ongoing threats and the current condition of the species, **flat pebblesnail continues to meet the definition of an endangered species.**

Plicate rocksnail. The plicate rocksnail has a subglobose shell that grows to about 20 mm (0.8 in) in length and is found in shallow gravel and cobble shoals in the Locust Fork of the Black Warrior River drainage. Although this species' range has been extended in the Locust Fork since its listing, no new populations have been discovered in other streams. Additional monitoring is needed to determine the viability of this population. Water quality and habitat degradation, inadequate regulatory protections, and anthropogenic threats, including drought and toxic spills, continue to threaten this species throughout its range. Because of ongoing threats and the current condition of the species, **plicate rocksnail continues to meet the definition of an endangered species**.

Painted rocksnail. The painted rocksnail has a shell that is subglobose to oval in shape that is about 19 mm (0.8 in) long and is found on hard substrates in riffles and shoals in the Coosa River drainage. Although one new population in the Coosa River below Logan Martin Dam has been discovered since the species' listing, individuals of all populations are only found at localized sites. Additional surveys and monitoring are needed to determine the extent and viability of these populations. Water quality and habitat degradation, inadequate regulatory protections, and anthropogenic threats, including drought and toxic spills, continue to threaten this species throughout its range. Because of ongoing threats and the current condition of the species, **painted rocksnail continues to meet the definition of a threatened species**.

Round rocksnail. The round rocksnail is a gill-breathing snail that has a subglobose shell with an ovately round aperture that grows to about 20 mm (0.8 in) in length and is found on hard substrates in riffles and shoals in the Cahaba River drainage. Since the species' listing, one new population in Schultz Creek has been discovered, and the Cahaba River population may be recovered; however, the status of the Six-mile Creek population is currently unknown. Additional surveys and monitoring are needed to determine the extent and viability of these populations. Water quality and habitat degradation, inadequate regulatory protections, and anthropogenic threats, including drought and toxic spills, continue to threaten this species throughout its range. Because of ongoing threats and the current condition of the species, **round rocksnail continues to meet the definition of a threatened species**.

Lacy elimia. The lacy elimia is a small pleurocerid snail with a conic shaped shell that is about 1.1 cm (0.4 in) in length and is found on rock shoals and gravel bars in the lower reach of Cheaha Creek in the Coosa River drainage. Since the species' listing, it has not been collected in Emahee Creek and Weewoka Creek, and these populations are considered extirpated. Although snails similar to lacy elimia were discovered in 2012 in the upper reach of Cheaha Creek and in its tributary Kelly Creek, genetic analyses determined that they were a different species. The species is now limited to a reach of Cheaha Creek that is less than 1 km in length. Further genetic analyses of individuals of lacy elimia from lower Cheaha Creek determined that this population has likely experienced a genetic bottleneck and/or inbreeding depression (Gladstone and Whelan 2021). Water quality and habitat degradation, inadequate regulatory protections, and anthropogenic threats, including drought and toxic spills, continue to threaten this species throughout its range. The limited distribution of lacy elimia puts the species at risk from a single toxic spill or other event, which could result in a catastrophic decline. Because of ongoing threats and the current condition of the species, lacy elimia no longer meets the definition of a threatened species. **We recommend that the lacy elimia be uplisted to endangered status and**

undergo a detailed species status assessment to quantify the risk of extinction and assess future scenarios to inform future rulemaking.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 2005). During this status review, targeted potential recovery activities were identified and are included below.

- Develop standardized monitoring plans for each species, which should include evaluation of habitat conditions and potential threats for each population.
- Develop survey plans for each species throughout their historic ranges.
- Develop and implement habitat restoration plans for currently occupied streams or streams where these species can be reintroduced.
- Continue to collaborate with agencies and other partners to support life history studies, propagation efforts, and water quality monitoring and improvements.
- Collaborate with regulatory and science-based agencies to conduct formal toxicity testing to better understand sensitivity of listed gastropods to pollution threats in these systems.
- Correct the nomenclature for cylindrical lioplax and painted rocksnail.

RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of
Cylindrical Lioplax (*Lioplax cyclostomaformis*)
Flat Pebblesnail (*Lepyrium showalteri*)
Plicate Rocksnail (*Leptoxis plicata*)
Painted Rocksnail (*Leptoxis taeniata*)
Round Rocksnail (*Leptoxis ampla*)
Lacy Elimia (*Elimia crenatella*)

Status Recommendation:

Based on this review, we recommend the following status for these species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

- Downlist to Threatened
 Uplist to Endangered (lacy elimia)
 Delist:
 The species is extinct
 The species does not meet the definition of an endangered or threatened species
 The listed entity does not meet the statutory definition of a species
 No change needed (cylindrical lioplax, flat pebblesnail, plicate rocksnail, painted rocksnail, and round rocksnail)

New Recovery Priority Number (48 FR 43098):

Based on the information analyzed in this review, we recommend changing the recovery priority number for lacy elimia from 8, which indicates a species with a moderate degree of threat and high recovery potential, to 5, which indicates a species with a high degree of threat and low recovery potential. The extirpation of two populations since listing leaves one extant population in a reach of Cheaha Creek that is less than 1 km in length. This limited distribution puts the species at risk from a single toxic spill or other event that could result in a catastrophic decline. The recovery potential is considered low for lacy elimia because of continuing threats from water quality and habitat degradation. In addition, recent genetic testing of specimens that appear similar to lacy elimia collected in Kelly Creek, a tributary to Cheaha Creek, determined these specimens are a different species. Further analysis of the remaining population of lacy elimia determined it exhibits low genetic diversity. Although the species has been successfully propagated in captivity, reintroductions have not been attempted because of limited habitat availability, which also limits recovery potential of the species.

FIELD OFFICE APPROVAL:

Field Supervisor, Alabama Ecological Services Field Office, Fish and Wildlife Service

Approve _____

LEAD REGIONAL OFFICE APPROVAL:

Assistant Regional Director – Ecological Services, Fish and Wildlife Service

Approve _____

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