

**Snuffbox**  
*(Epioblasma triquetra)*

**Status Review:  
Summary and Evaluation**



Photo Credit: G. Thomas Watters, Ohio State University

**U.S. Fish and Wildlife Service  
Ohio Ecological Services Field Office  
Columbus, Ohio  
March 19, 2024**

**STATUS REVIEW**  
**Snuffbox (*Epioblasma triquetra*)**

**GENERAL INFORMATION**

**Species:** Snuffbox

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**Cooperating Regional Office(s):** Carrie Straight, Region 4, (404) 679-7226; Sarah Furtak, Region 5, (413) 326-4687.

**Date of listing publication:** February 14, 2012

**FR citation(s):** 77 FR 8632

**Classification:** Endangered

**Critical habitat/4(d) rule/Experimental population designation/Similarity of appearance listing:** None

**Methodology used to complete the review:** Public notice was given in the *Federal Register* (88 FR 2368) requesting new scientific or commercial data and information that may have a bearing on the snuffbox (*Epioblasma triquetra*) classification of endangered status. Pertinent data were obtained from the final listing rule (77 FR 8632), the species status assessment (SSA, USFWS 2022a), 2019 5-year review (USFWS 2019), recent reports of freshwater mussel surveys, and data submitted by U.S. Fish and Wildlife Service Field Offices and state and provincial natural resource agencies within the range of the species. This 5-year review was completed by Angela Boyer, Fish and Wildlife Biologist with the Ohio Ecological Services Field Office.

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (ESA), 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. The U.S. Fish and Wildlife Service (Service) evaluated the biology and status of the snuffbox to inform this status review.

A Service team developed the SSA (USFWS 2022a). The SSA represents our evaluation of the best available scientific information, including the resource needs and the current and future condition of the species. We developed two future scenarios of environmental and management conditions to discuss the viability of the species in the future. Independent peer reviewers and partner representatives reviewed the SSA before we used it as the scientific basis to support our status review.

**FR Notice citation announcing the species is under active review:** January 13, 2023 (88 FR 2368).

**Review History:** The first 5-year review for this species was completed in 2019 resulting in no recommended change in the species' listing status. An SSA was completed in 2022 to assist in the development of this 5-year review and an upcoming recovery plan and critical habitat designation.

## **REVIEW ANALYSIS**

### **Recovery Criteria**

Recovery Plan or Outline: A recovery plan is currently being developed.

### **Updated Information Relevant to the Current Species' Status**

An SSA was completed for the snuffbox in May 2022 (USFWS 2022a). New information has been obtained since the completion of the SSA that documents a small range expansion in two populations.

### **Biology and Habitat:**

The biology of the snuffbox is similar to other bivalve mollusks belonging to the family Unionidae. They are sexually dimorphic, and the age of sexual maturity can occur as early as age three (McGregor 2023, pers. comm.). The verified snuffbox host fish are the logperch (*Percina caprodes*), blackside darter (*P. maculata*), rainbow darter (*Etheostoma caeruleum*), Iowa darter (*E. exile*), blackspotted topminnow (*Fundulus olivaceus*), mottled sculpin (*Cottus bairdii*), banded sculpin (*C. carolinae*), Ozark sculpin (*C. hypselurus*), largemouth bass (*Micropterus salmoides*), and brook stickleback (*Culaea inconstans*).

There is no new information on the species biology and habitat since the completion of the 2022 SSA.

### **Range and distribution:**

The snuffbox was historically distributed in at least 211 streams and lakes in the Great Lakes (~21% of streams), Ohio River (~50%), Tennessee River (~25%), Upper Mississippi River (~10%), Lower Mississippi River (<1%), Arkansas-White-Red (~6%), and Lower Missouri

River Basins (~4%) in 18 states: Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Mississippi, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin; and Ontario, Canada. At the time of the previous 5-year review in 2019, the species was known to be extant in 82 streams in 14 states: Alabama, Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin, and Ontario, Canada.

Currently the snuffbox occurs in 14 states, as well as the Canadian province of Ontario. For the 2022 SSA, we described and analyzed the distribution of the snuffbox in terms of watersheds occupied, delineated by the U.S. Geological Survey (USGS) based on surface hydrological features. These hydrological areas are identified as hydrological units at various geographic scales (referred to as HUC). In the 2022 SSA, we used the HUC2 scale to delineate our representation units for the snuffbox: Great Lakes, Ohio, Tennessee, Upper Mississippi, Lower Mississippi, and Arkansas-White-Red Basins. The species currently ranges across all six representation units.

In the SSA, we used the HUC8 at the subbasin scale to define a population of the snuffbox and conduct our current condition analysis. Defining a population at the HUC8 scale resulted in 55 extant populations range wide. The range data used in the SSA remains current at this time. Based on this analysis, the snuffbox has 55 extant HUC8 populations, which includes a total of 85 occupied streams.

While the snuffbox SSA defined the populations of the species using HUC8 units for the purpose of analysis, the species current OneRange<sup>1</sup> has been developed at a more refined level, using HUC12 units rather than HUC8 units (Figure 1). This does not change the number of populations since the purpose of mapping HUC12 units was only for refining the distribution for consultation purposes.

In 2023, a new location for snuffbox was found in a small section of the Thornapple River in Michigan near the confluence with the Grand River (Johnson 2023, pers. comm.). This is a small range expansion in the Lower Grand population. A live female snuffbox was found in Spring Creek, a tributary to the Little Kanawha River in West Virginia in 2018 (USFWS 2018). Prior to this record, the species was not known from Spring Creek. This is a small range expansion in the Little Kanawha population.

#### **Taxonomic and nomenclature:**

There have been no changes in the taxonomic classification or nomenclature of this species since it was originally listed on February 14, 2012.

#### **Additional information:**

#### **Five-Factor Analysis**

#### **Factor A. Present or threatened destruction, modification or curtailment of its habitat or**

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<sup>1</sup> OneRange is the geographic area where we know or suspect that a species currently occurs modeled at a resolution unit for aquatic species using the line segment catchment polygons associated with the National Hydrography Dataset (NHD)-plus dataset from the United States Geological Survey.

**range:**

Current or potential future threats to snuffbox habitat include contaminants, reduced water quality, sedimentation, inadequate hydrological regime, landscape alteration, and lack of connectivity, and invasive species are the primary risk factors influencing the resources upon which the snuffbox relies, either directly or indirectly (USFWS 2022a). There is substantial uncertainty regarding the magnitude, duration, and location of the risk factors now and into the future. However, it is anticipated that the risk level these threats pose will fluctuate over time, with some increasing (e.g., stochastic events, urban development, new invasive species), some staying at or near the same level (e.g., dams remaining operational), and some threats may decrease into the future (e.g., dam removals may increase connectivity for some populations).

Several projects have adversely affected some snuffbox populations since the last 5-year review. Two bridge projects that affected snuffbox occurred in the Grand and Huron Rivers River (MI) (USFWS 2021, 2022b). A bank stabilization project also affected snuffbox on the Paint Rock River (AL) (USFWS 2020).

A planned 2023 removal of the Harms Mill Dam on the Elk River in Tennessee was postponed until late summer/fall of 2024 (Ford 2024, pers. comm.; USFWS 2023). Currently the snuffbox occurs in the Elk River only downstream of Harms Mill Dam. While the dam removal activities will cause some adverse effects to the snuffbox, the long-term effects should be beneficial due to the restored habitat connection (Ford 2024, pers. comm.)

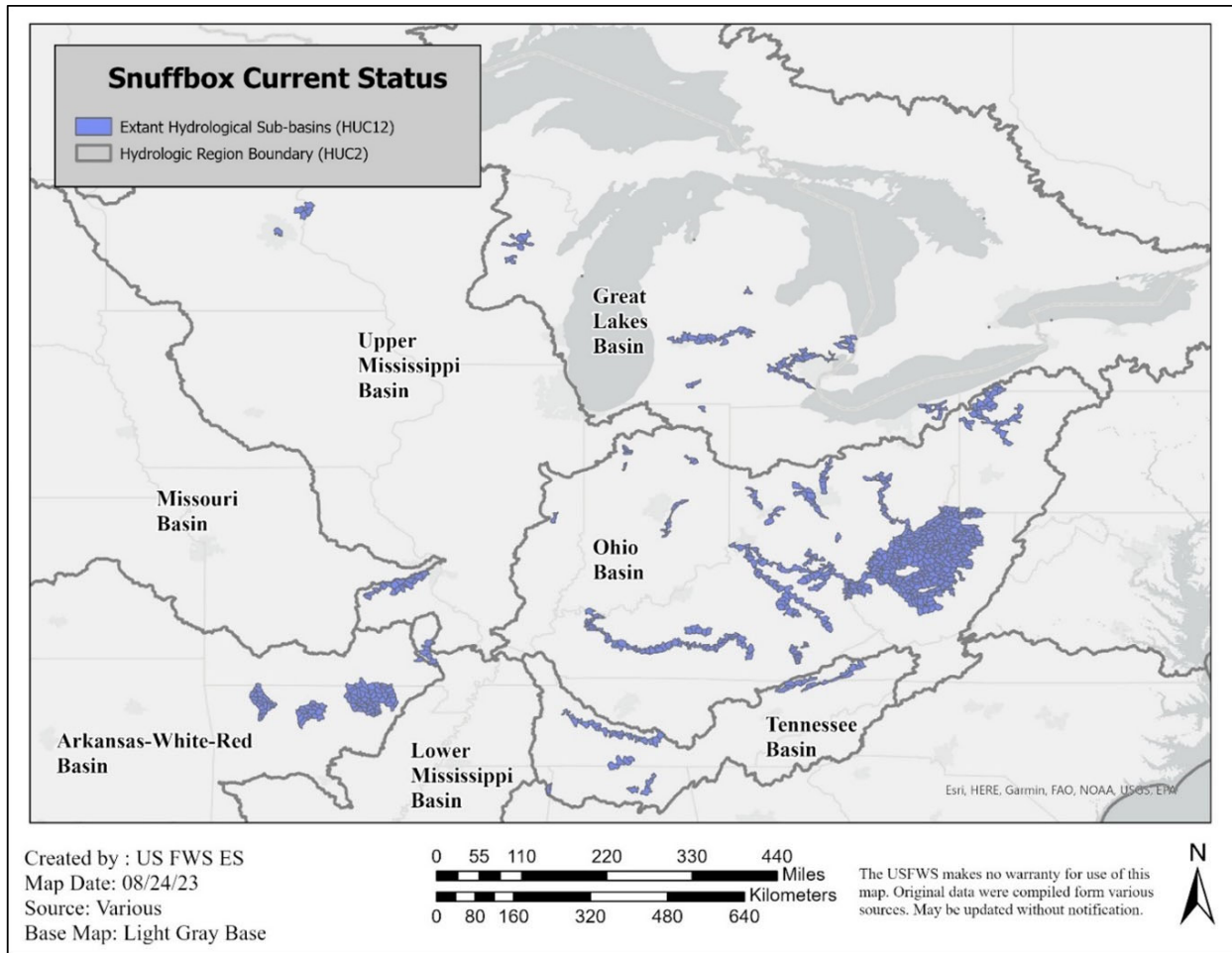


Figure 1. Current Range of the Snuffbox

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

We have no new information regarding overutilization for the snuffbox since the last 5-year review and overutilization is not considered to be a threat to the snuffbox.

**Factor C. Disease or predation:**

We have no new information regarding disease or predation for the snuffbox since the last 5-year review and disease and predation are not considered to be threats to the species.

**Factor D. Inadequacy of existing regulatory mechanisms:**

Existing regulatory mechanisms have not been sufficient to significantly reduce or remove the threats to the snuffbox. Inconsistent enforcement of current Federal and state laws to prevent sediment entering waterways causes risk to the snuffbox. Best management practices for sediment and erosion control are often recommended or required by local ordinances for construction projects; however, compliance, monitoring, and enforcement of these recommendations are often poorly implemented. Furthermore, prior to listing, there were no requirements within the scope of Federal environmental laws to specifically consider the

snuffbox during Federal activities, or to ensure that Federal projects would not jeopardize their continued existence.

Since the previous 5-year review, there have been at least three projects that have had the potential to impact snuffbox populations. Instream effects could not be avoided for these projects due to the required instream work. Through consultation with the local Service Field Offices, snuffbox were relocated out of harm’s way for all three projects. This information indicates that were the species not listed, these projects would have had greater effects on the species, further demonstrating the inadequacy of existing non-ESA regulatory mechanisms.

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

Invasive species are one of the primary risk factors influencing the species' viability (USFWS 2022a, p. 11). Various exotic species are well established within the range of the snuffbox. Exotic species, including the zebra mussel (*Dreissena polymorpha*), quagga Mussel (*Dreissena rostriformis bugensis*), Asian clam (*Corbicula fluminea*), rusty crayfish (*Faxonius rusticus*), round goby (*Neogobius melanostomus*), spiny waterflea (*Bythotrephes longimanus*), brown trout (*Salmo trutta*), and black carp (*Mylopharyngodon piceus*), negatively impact the snuffbox, or its host fish, or both, through mechanisms such as habitat modification, competition, and predation. We are not aware of any new information about other natural or manmade factors since the last 5-year review.

**Current Population Demographic and Risk Conditions**

The current demographic and risk conditions of the 55 snuffbox HUC8 unit populations were assessed in the 2022 SSA (USFWS 2022a). Based on the demographic and risk criteria used, 17 populations (31 %) currently have a high or moderate demographic condition and only four populations are at low risk (7 %) (Table 1; Table 2). Only one population is currently in moderate condition with low risk and there are no populations with both high demographic condition and low risk (Table 3). See the 2022 SSA for a description of the demographic and risk condition categories (USFWS 2022a, pp. 14-17).

*Table 1. Summary of demographic condition for snuffbox HUC8 populations across the range (USFWS 2022a).*

<b>Demographic Condition</b>	<b>Number of Populations</b>
<b>High</b>	8
<b>Moderate</b>	9
<b>Low</b>	32
<b>Functionally Extirpated</b>	6
<b>Total</b>	55

Table 2. Summary of risk factor condition for snuffbox HUC8 populations across the range (USFWS 2022a).

Risk Factor Condition	Number of Populations
High Risk	27
Moderate Risk	23
Low Risk	4
Unknown	1
<b>Total</b>	<b>55</b>

Table 3. Summary of snuffbox demographic condition and risk category for the HUC8 representation units. (U = Unknown, FX = Functionally Extirpated, L = Low, M = Moderate, H = High) USFWS 2022a).

Demographic Condition	FX	FX	FX	H	H	H	H	M	M	M	L	L	L	Total
Risk Condition	H	M	L	H	M	L	U	H	M	L	H	M	L	
Great Lakes	0	0	0	1	2	0	1	2	1	0	1	1	2	11
Ohio	3	1	1	1	0	0	0	1	1	1	8	10	3	30
Tennessee	0	0	0	0	0	0	0	1	2	0	2	0	0	5
Upper Mississippi	0	0	0	2	0	0	0	0	0	0	2	0	0	4
Lower Mississippi	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Arkansas-White-Red	0	1	0	1	0	0	0	0	0	0	1	0	1	4
<b>Total</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>1</b>	<b>15</b>	<b>11</b>	<b>6</b>	<b>55</b>

Conservation Measures: Augmentation of snuffbox from cultured propagation efforts has occurred at several sites in the Clinch and Powell Rivers in Virginia and Tennessee, the Duck River in Tennessee, and the Spring River in Arkansas (Lane 2023, pers. comm.; Ford 2023, pers. comm.). These mussels were produced by Virginia Department of Wildlife Resources at the Aquatic Wildlife Conservation Center (AWCC), Virginia Tech’s Freshwater Mollusk Conservation Center from Clinch River broodstock, and Norfolk National Fish Hatchery (NNFH) from Spring River broodstock (Lane 2023, pers. comm.; Moles 2023, pers. comm.). Success of these efforts has not yet been documented. The AWCC plans to continue their snuffbox propagation efforts for the next several years (Agbalog 2017, pers. comm.).



Augmentation of snuffbox in the Tippecanoe River in Indiana has been ongoing for about a decade (Fisher 2023, pers. comm.). Each year, a few gravid females are collected from the Salamonie River in Indiana. The glochidia from these females are used to inoculate logperch. The inoculated logperch are then held in cages in Lake Shafer (along the Tippecanoe River) for around 18 months so the juvenile snuffbox can grow to a stockable size. The juvenile snuffbox are then released into the Tippecanoe River (Fisher 2023, pers. comm.).

Propagation and augmentation in Kentucky by the Center for Mollusk Conservation has released 1,239 juvenile snuffbox at three locations along the Licking River in Kentucky. Ongoing propagation and augmentation efforts will continue for 2024 with anticipated releases in the Green River (Ohio tributary) and Red Bird River (South Fork Kentucky River tributary).

Snuffbox augmentation is also ongoing in Wisconsin. Since 2020, the Wisconsin Department of Natural Resources and Genoa National Fish Hatchery have released 11,710 juvenile snuffbox into three areas of the Wolf River (Weinzinger 2023, pers. comm.).

### **Synthesis**

The snuffbox is a federally listed endangered species that is known to be extant in 85 streams in Alabama, Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin, and Ontario, Canada. At the HUC8 unit level, these 85 occupied streams are considered to be 55 populations.

Successful propagation techniques for the snuffbox are well established. Propagation and augmentation and/or reintroduction of snuffbox are ongoing in Indiana, Tennessee, Wisconsin, and Virginia. The methods being used include host fish inoculation and in vitro culture of glochidia without utilizing host fish. Where host fish are being utilized, the fish are inoculated with larvae then either released into a stream or kept in cages or tanks to grow juvenile mussels to a stockable size. Streams with ongoing efforts include the Wolf River (WI), Tippecanoe River (IN), Clinch River (TN, VA), Powell River (TN, VA), and Duck River (TN).

There has been no change in the species' historical range and only a minor expansion of the occupied streams in 2 of the 55 HUC8 populations range since the last 5-year review. Range expansion has been documented in the Lower Grand population in Michigan and the Little Kanawha population in West Virginia.

The status of the snuffbox remained relatively constant since listing and the previous 5-year review. Additionally, threats persist for the remaining snuffbox populations, including habitat degradation and climate change effects. Many of the remaining populations are small and restricted to short river reaches making them vulnerable to stochastic events such as spills and drought. The 2022 SSA found that of the 55 extant populations, 32 (57%) have a low demographic condition and 6 (11%) have a very low/functionally extirpated demographic condition. Only 8 (14%) have a high current demographic condition while 9 (16%) have a moderate demographic condition (USFWS 2022a). Although there are ongoing attempts to alleviate some threats, there appear to be no populations without current significant threats and many threats are without obvious or readily available solutions. Therefore, we are not recommending a change in status at this time.

After reviewing the best available scientific information, we conclude that the snuffbox remains an endangered species. The evaluation of threats affecting the species under the factors in section 4(a)(1) of the ESA and analysis of the status of the species at the time of listing remains an accurate reflection of the species current status.

**RESULTS**

**U.S. FISH AND WILDLIFE SERVICE  
STATUS REVIEW OF THE SNUFFBOX**

**Current Classification:** Endangered

**Status Recommendation resulting from Status Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist (Indicate reasons for delisting per 50 CFR 424.11):
  - 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

**Lead Field Office Supervisor, U.S. Fish and Wildlife Service**

Approve \_\_\_\_\_ Date \_\_\_\_\_

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