

5-Year Review
Short Form Summary
Species Reviewed: Snake River Physa (*Physella natricina*)
Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

May 10, 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 167 Species in Oregon, Washington, Idaho, Montana, California, Hawaii, Guam, and the Northern Mariana Islands. 87 FR 28031.

Lead Region/Field Office:

Region 1/Idaho Fish and Wildlife Office, Boise, Idaho

Name of Reviewer(s):

Alyssa Bangs, Idaho Fish and Wildlife Office, Fish and Wildlife Biologist
Greg Burak, Idaho Fish and Wildlife Office, Fish and Wildlife Biologist
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Methodology used to complete the 5-year review:

This review was conducted by staff of the Idaho Fish and Wildlife Office (IFWO) of the U.S. Fish and Wildlife Service (Service or USFWS), beginning on May 10, 2022. The review was based on a synthesis of current, available information since the last 5-year review for the Snake River Physa in 2018 (USFWS 2018, entire). Information considered includes: Endangered Species Act (ESA) Section 10(a)(1)(A) annual reports submitted by the Idaho Power Company (IPC) and U.S. Bureau of Reclamation (BOR); ESA Section 7(a)(1) consultation documents, such as biological opinions, assessments, and letters of concurrence; comments submitted in response to the 2022 Federal Register notice of initiation of 5-year status reviews (87 FR 28031-28034), and annual monitoring reports and other data collected by the IFWO. The evaluation conducted by IFWO biologists was reviewed by the Assistant State Supervisor and Deputy State Supervisor before submission to the Idaho State Supervisor for approval.

Background:

For information regarding the species listing history and other facts, please refer to the Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (<https://ecos.fws.gov/ecp/>).

Review Analysis:

This 2023 5-year review considers new information and data collected after completion of the 2018 5-year review and focuses on pertinent updates that reflect the status of the species starting in 2018.

New Taxonomic Information:

The Snake River physa was listed as *Physa natricina* in 1992 (57 FR 59242-59257). Between 2003 and 2013, taxonomic revisions and genetic analyses verified the validity of Snake River physa as a species (reviewed in 88 FR 7134-7177). More recently, Young et al. (2021, entire) used an array of species delineation analyses based on mitochondrial and nuclear gene sequences to re-evaluate species designations among Physidae in North America. Their analyses strongly supported the Snake River physa snail as a distinct taxon in the Physella clade (Young et al. 2021, pp. 7–8). The Service revised the species name to *Physella natricina* in 2023 (88 FR 7134-7177).

New Status Information:

Surveys for Snake River physa have occurred annually in the Minidoka Reach of the Snake River in south-central Idaho since the previous 5-year review in 2018 (Figure 1). In this reach, the Service has typically recovered Snake River physa snails from 50-55 percent of survey samples since 2018, with transect densities ranging from 1-58 individuals per square meter; overall average density in 2022 was four individuals per square meter (USFWS in litt. 2022, p. 6; USFWS in litt. 2023, p. 7-8). Service sampling efforts focus on known higher-density/abundance sections of the river, whereas samples taken by Gates and Kerans (2010, p. 14; 2014, p. 978) were distributed throughout the Minidoka Reach to include a variety of river widths and habitat types. In general, Snake River physa are more commonly found in the upstream portion of the Minidoka Reach (the first six miles downstream of Minidoka Dam). Clear patterns in the distribution and abundance of Snake River physa remain indiscernible; snail density is variable within transects, between transects along the river corridor, and between years. However, mean transect density for the seven permanent Service transects has decreased from 17.33 snails per square meter in 2019 to 5.375 snails per square meter in 2022 (USFWS, unpublished data). It is difficult to compare current densities to those prior to 2019; previous transect locations and sampling effort was highly variable due to changes in funding and conflicting research needs, with as many as 128 benthic samples collected in 2007 and as few as 20 samples collected in 2015 (USFWS in litt. 2019, p. 3). These sampling limitations, as well as inter-annual variation in river discharge and management, have resulted in a limited understanding of the species' status and distribution in this reach. Similarly, due to the variability of Snake River physa presence and abundance between and among transects and surveys, we are unable to produce a reliable estimate of overall Snake River physa population size.

Since the last 5-year review, few Snake River physa surveys have been conducted in the Snake River outside of the Minidoka Reach. In 2018, IPC collected 55 Hester-Dendy benthic samples in the Swan Falls Reach (RM 436-449), collecting 344 live physid snails, none of which were Snake River physa (Stephenson et al. 2019, p. 4, 6). Upstream of the Minidoka Reach, IPC conducted surveys immediately below American Falls Dam, with an estimated 30 minutes of suction dredge effort at the facility's retaining wall (Stephenson et al. 2019, p. 5) and an additional 30 samples (totaling approximately 7.5 m²) within two miles of the dam (River Kilometers 1145.8-1148.8; River Miles 712-713.8) (USFWS in litt. 2022, p. 6). No living Snake River physa nor shells of the species were recovered from these surveys.

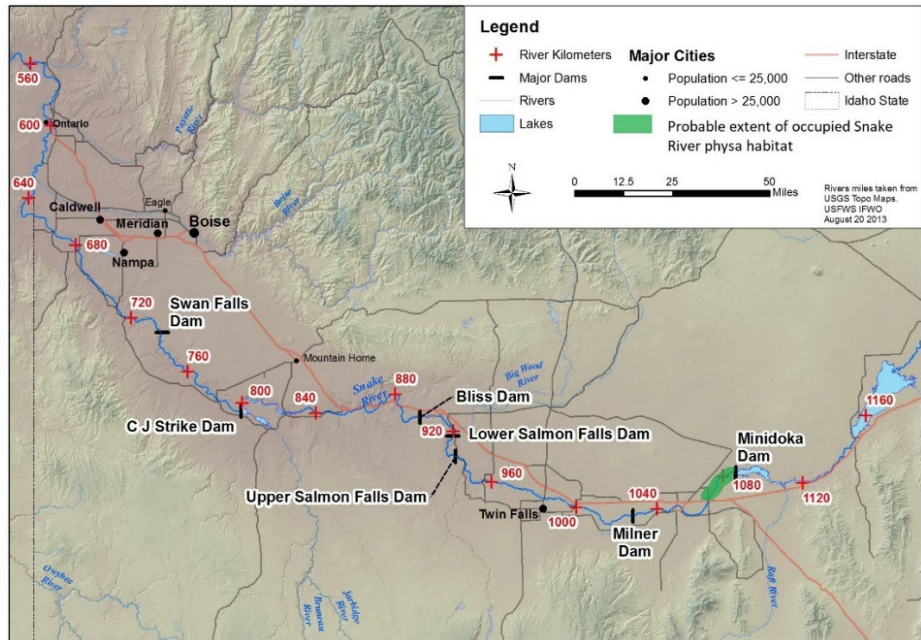


Figure 1. The Snake River, encompassing the historic range of the Snake River physa. The species is thought to occur from approximately Minidoka Dam, Idaho, downstream to Ontario, Oregon. Numerous recent search efforts in the historic range and from locations upstream of Minidoka Dam have failed to record the species, except in the river reach immediately below Minidoka Dam (highlighted in green), where a persistent population has been detected since 2005 (see text).

In the fall of 2022, the Service surveyed Bear Lake, which straddles the Idaho-Utah border in the southeastern corner of Idaho. Bear Lake was historically a tributary of the Snake River, and Snake River physa shells appear in the late Pliocene fossil record in this area (Taylor 1988, p. 69). Non-fossilized shells appearing to be those of Snake River physa were collected from the shores of Bear Lake in the spring of 2021; no surveys for Snake River physa specifically had previously occurred in Bear Lake. Although fossilized shells appearing to be Snake River physa were found during the Service’s surveys, no live or recent shells of the species were identified (USFWS in litt. 2022, p.8).

These most recent survey efforts outside of the Minidoka Reach support the 2018 5-year status review’s conclusion that the species continues to be largely or entirely restricted to the Minidoka Reach of the Snake River (Figure 1).

New and/or Updated Threats:

The existing threats affecting the Snake River physa include small population size and limited/fragmented available habitat, water management and operation of existing dams, water quality degradation, climate change, inadequate pollution control regulations, and lack of state (Idaho) invertebrate protections (Table 1). These threats are ongoing, but most have not changed significantly since the 2018 5-year status review for the species. Information that has become available since the previous 5-year status review is provided below. In addition, Table 1 provides an updated overview of all threats and summarized threat information.

Population Size and Restricted Range:

Surveys over the past 20 years have failed to recover live individuals or shells of the Snake River physa outside of the Minidoka Reach. Therefore, it appears that the species continues to be restricted to an 11-mile reach of river in south-central Idaho. The current range of the Snake River physa represents an estimated 4 percent of its historical range. While actual population numbers could be large within this reach, confinement of this population to a relatively small river area make it vulnerable to actions that degrade water quality or alter river discharge (water quantity). The Minidoka population continues to be isolated from any potentially suitable habitat downstream by Milner Dam, as described in the previous 5-year status review (USFWS 2018, pp. 4-5).

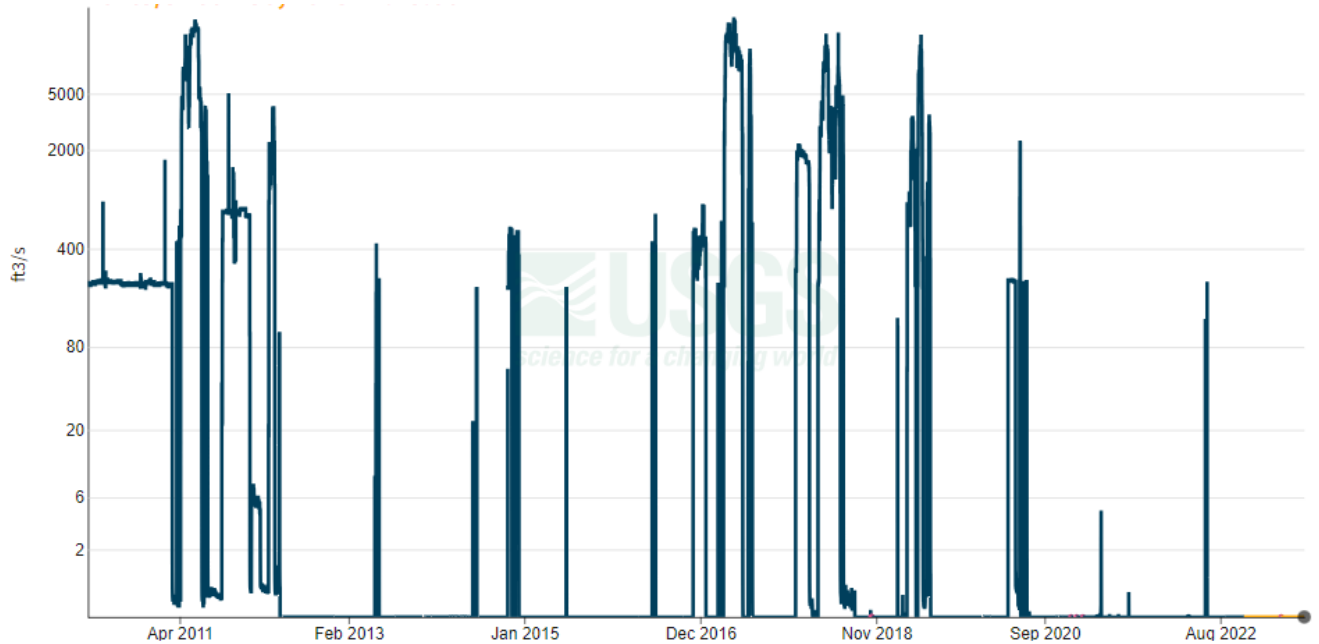


Figure 2. Snake River flows (cubic feet per second ([cfs]) below Milner Dam (USGS gage 13087995) from April 2010 through June 2023. The river is seasonally dry in the winter months (est. October through March) and may remain below 1,000-2,000 cfs through the summer during drought conditions.

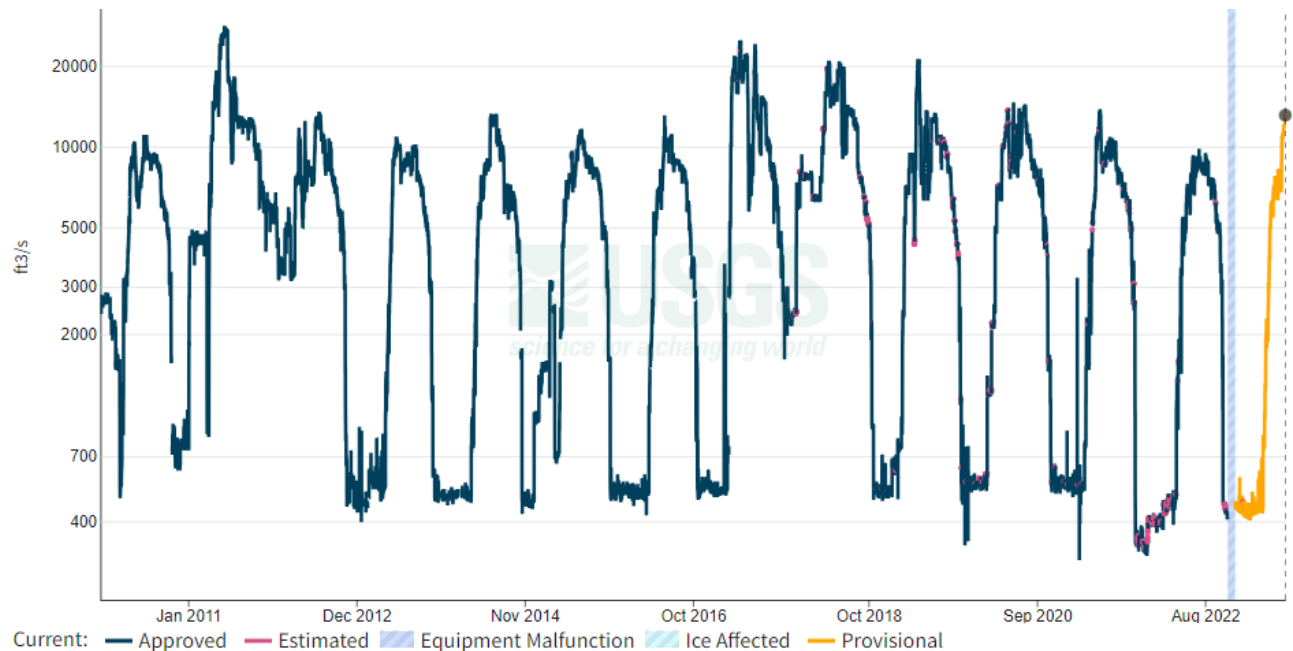


Figure 3. Snake River flows (cubic feet per second ([cfs]) below Minidoka Dam (USGS gage 13081500) from January 2010 to June 2023. Except during high-water years, winter minimum flows range from 400-600 cfs. Although the flows during the winters of 2021 and 2022 appear to have been below BOR’s 400 cfs minimum winter flow, discussions between the Service and BOR determined that these were gage errors rather than true measurements.

Water Quality Degradation:

While water quality has been noted as a persistent concern in all previous reviews of the Snake River physya, the sources and/or components of this threat may be changing over time. Since the previous 5-year status review, increased urban development in shoreline properties within the Minidoka Reach has been observed by Service personnel during species monitoring surveys; the area has historically been dominated by irrigated agriculture (D. Hopper, pers. comm). These changes may reduce contaminant inputs from agrochemicals and suspended sediments from adjacent farmed properties. Additionally, homeowners often install shoreline breakwaters and extensive lawns/landscaping that may reduce sediment runoff into the river. However, urban development may produce water-borne contaminants from other sources such as lawn-care pesticides/fertilizers and septic systems or increase threats from domestic-related contaminant sources such as dumping of paints or other household wastes. The increase in urban development may trade one set of contaminants (agricultural) for another (domestic), or urban contributions may be additive to agricultural contaminants. Urban development along the shoreline of the Minidoka Reach has also increased the level of in-water construction in the form of docks for recreational use; increased recreational use of the area associated with increased urban development may also increase disturbance to benthic habitats. In the future, increasing development and disturbance of benthic habitat in the Minidoka Reach may become a threat of concern but at present is regarded as a minor threat.

Climate Change:

Changes in water management within the Minidoka Reach that negatively affect Snake

River physa likely pose the most tangible and direct threat to the species, given its extremely limited distribution. Future climate conditions and human response to those conditions could directly impact the species and its habitat. The 2018 5-year review for the Snake River physa states that while climate change poses a threat, there had been no significant change in the impacts to Snake River physa since 2014 (USFWS 2018, Table 1, p. 6). However, recent weather events and supporting climate models indicate the rate of anticipated climate change is accelerating such that we are observing future outcomes considerably sooner than initially projected (International Panel on Climate Change 2021, pp. 4-10). A plausible outcome of this acceleration is that summer drought conditions and winter/spring high-flow conditions will occur sooner in the Snake River plain, placing pressures on water managers (e.g., BOR, U.S. Army Corps of Engineers, private) to modify how water is managed in the Minidoka Reach.

River management within the Minidoka Reach is highly regimented for flood control, irrigation storage (winter), and aquifer recharge, as well as serving as a conduit for irrigation distributions in the summer (irrigation season). During the transition to summer flows, discharge from Minidoka Dam increases from a low of 400-600 cubic feet per second (cfs) in February and March to irrigation discharge ranging from 9,000 to 11,000 cfs to fulfill agricultural water rights in April and May (Figure 3).

While reduction of winter minimum flows is not currently under consideration by water managers, projected drought conditions could require water managers to consider various water-saving measures, such as reducing winter flows in the Minidoka Reach. For the Snake River physa, this could reduce important and seemingly limited over-wintering habitat with uncertain, but potentially devastating, impacts to the species. The low winter discharges through the Minidoka Reach likely serve as a limiting factor in population size of Snake River physa (Gates and Kerans 2010, pp. 20-23; 2014, pp. 979-981). Although some level of benthic dewatering occurs naturally in most unregulated western rivers and creeks as snowpack and creek/river flows decline throughout the summer and fall months, the changes that occur in the Minidoka Reach due to irrigation regulation are far more abrupt and likely result in lower high and low flows than would occur in an unregulated system. Gates and Kerans (2014, pp. 979-981) estimated 33% of the benthic habitat that exists during irrigation flows is dewatered during winter minimum flows. These numbers indicate that water management plays an important, limiting role for the species, suggesting that elevated minimum winter flows could increase usable benthic habitat and by extension population size. Winter flows below the currently required 400 cfs would further reduce the amount of productive habitat and corresponding population size.

Similarly, higher snowfall years or periods of intense rainfall may require additional spill to create storage availability in reservoirs upstream; spring-summer flows in the Minidoka Reach in high snowfall years have reached highs in excess of 20,000 cfs, with winter carryover discharge greater than 2,000 cfs. Elevated flows in the above-mentioned ranges likely produce scouring effects on benthic habitats used by Snake River physa, removing fine sediments, shifting and redepositing gravels and cobbles, and transporting snails and/or eggs downstream and outside of preferred habitat. While Snake River physa

have evolved with natural flow changes in the Snake River, regulated water management in response to climate change could further stress Snake River physa and its habitat.

New Management Actions:

Prior to the 2018 5-year review, the Service and partners had collaborated to develop environmental DNA (eDNA) materials and methods with the hopes of creating an inexpensive and rapid method of detecting Snake River physa. Efficacy of eDNA detection was tested in the Minidoka Reach at and around the Jackson Bridge site. Water samples were taken from both the river surface as well as from directly above the substrate at most sample sites and triplicate samples were then tested from each sample. Detection of Snake River physa DNA was largely successful, with detections at occupied sites of 100 percent, but lost effectiveness over relatively short distances. Samples collected one kilometer below known occupied sites did not contain detectable Snake River physa eDNA (BOR 2018, unpub. data). Samples taken from the downstream end of the “snail pool” below Minidoka Dam in February of 2020 did not detect Snake River physa DNA. Whether this is because snails were not present in the pool or because the winter conditions were not conducive to eDNA detection is unknown. The developed eDNA tools do not provide quantification of the number of snails, nor can we determine a function that characterizes the decay or dilution of eDNA with distance from the source, since we could not establish set distances from the DNA sources to point of water collection. These results illustrate that this sampling may result in false negatives and have a level of uncertainty associated with it. It should be noted that all control samples (n=6 sites) collected where the species is not expected to occur (Jackson Lake, Malheur River and Boise River) were all negative, hence no false positives have been documented. Therefore, while eDNA may be a useful rapid assessment tool, it should be used with the caveat that we have little understanding regarding snail or genetic material densities needed for a positive detection.

Table 1. Threats to Snake River physa (*Physella natricina*) at the time of listing (1993), 2014 and 2018 5-year status reviews, and this review. X denotes a threat.

Threats	Listing Factor ¹	1993 (Time of Listing)	2014 5-Year Status Review	2018 5-Year Status Review	2023 5-Year Status Review	Summary
Construction of new hydropower dams	A	X				Determined not a current threat in 2014, 2018, or 2023 Snake River physa (SRP) 5-year status reviews - no significant change in information.
Operation of existing dams (Water management)	A	X	X	X	X	Continued threat – while gage readings below minimum flow requirements in recent years appeared to have been gage errors, this factor could become more pronounced with climate change and resulting changes in water management.
Water quality degradation	A	X	X	X	X	Continued threat – no significant change in water quality degradation information since 2014 SRP 5-year status review.
Water diversions and groundwater withdrawal for agriculture and aquaculture	A	X				Determined not a current threat in 2014, 2018, and 2023 5-year status reviews - no significant change in information, but see Operations and Climate Change.
Small hydropower development	A	X				Determined not a current threat in 2014, 2018, and 2023 5-year status review – no significant change in information.
Climate change	A		X	X	X	Continued threat – accelerating climate change observed since 2014 and 2018 SRP 5-year status reviews suggest water-shortage impacts could occur sooner and with greater frequency than anticipated in last 5-year review.
Inadequate pollution control regulations	D	X	X	X	X	Continued threat – no significant change to pollution control regulations since 2018 SRP 5-year status review.
Lack of State invertebrate species protections	D	X	X	X	X	Continued threat – no significant change in state of Idaho regulations for the protection of invertebrate species since 2018 SRP 5-year status review.
Competition with New Zealand mudsnails	E	X				Determined not a current threat in 2014, 2018, and 2023 5-year status reviews – no significant change in information.
Small population size, habitat fragmentation, and loss of connectivity	E			X	X	Analyzed in 2014 SRP 5-year status review but determined not a threat at that time. Data since then indicates it is an increasing threat in 2018 and 2023 5-year status reviews.

¹ The listing agencies consider the following factors, as set forth in the ESA, in deciding whether to list a species:

- A. the present or threatened destruction of habitat;
- B. overutilization of the species for commercial, recreational or other purposes;
- C. disease or predation;
- D. inadequacy of existing regulatory mechanisms; and
- E. other natural or manmade factors affecting the continued existence of the species.

Synthesis:

As found in the 2018 5-year status review, the Snake River physa does not appear as widespread or abundant outside of the Minidoka Reach in the Snake River as previously thought in 2014. Even though data indicates the species was historically found in 494 River Kilometers (307 River Miles) of the Snake River in southern Idaho, surveys outside of the Minidoka reach, many targeting suitable habitat in locations previously occupied (between 1998 and 2002), have continually failed to record the species alive or collect shells confirmed to belong to the species. The additional sampling that has occurred since the 2018 5-year status review has not detected Snake River physa in areas outside of the Minidoka Reach. While it is possible that the species may occur in appropriate downstream habitats, there have been no live snails or shells found downstream of Minidoka since 2002, indicating the species is either absent or extremely rare.

The information we have gathered over the last 5 years further supports our hypothesis that the Snake River physa is largely or entirely restricted to the Minidoka Reach of the Snake River. The population that occurs below Minidoka Dam appears to be variable in size, but persistent since monitoring began in 2006. The Minidoka population is largely isolated from areas both downstream and upstream due to the operation of Milner Dam, other hydroelectric dams or diversions, and poor water quality. Additional surveys conducted upstream of Lake Walcott since the 2018 5-year review support prior observations that the species does not occur upstream of Minidoka Dam. Therefore, the single known population of this species is isolated in the Minidoka Reach and lacks the redundancy or representation needed to withstand catastrophic and stochastic events it may encounter. On-going threats identified in the 2018 5-year review remain persistent in this area.

The existing Snake River Aquatic Species Recovery Plan does not contain recovery criteria specific to the Snake River physa beyond that recovery will be based on detection of increasing, self-reproducing colonies for a five-year period. Since 2019, the Service's surveys in the Minidoka Reach have found declining mean densities of Snake River physa in the most upstream transects, which does not meet stated recovery criteria. Based on the information included in this 5-year review, we recommend that the Snake River physa remain classified as endangered.

Recommendations for Future Actions:

1. Continue monitoring Snake River physa within the Minidoka Reach to further track population trends of this important population, including surveys in the "snail pool".
2. Continue targeted and opportunistic surveys outside of the Minidoka Reach to further inform our understanding of the species' current range.
3. Finalize development of the eDNA marker for the Snake River physa and implement further refining of detection parameters.

4. Apply eDNA survey method outside the Minidoka Reach, where it has been difficult to confirm species presence, to enhance current distribution information.
5. Investigate possible habitat conditions, or other factors, limiting Snake River physa occupancy outside of the Minidoka Reach. Based on those results, reevaluate recovery actions to address those threats.
6. Increase surveillance and monitoring of threats to the species within the Minidoka Reach (e.g., water quantity, water quality, human-related habitat disturbance).
7. Develop greater communication with water managers around the Minidoka Reach to safeguard or mitigate against potential new or worsening threats.

References:

Gates, K.K., and B.L. Kerans. 2010. Snake River physa, *Physa (Haitia) natricina*, survey and study: Final Report. Department of Ecology, Montana State University, Reclamation Agreement 1425-06FC1S202, Bozeman, Montana.

Gates, K.K. and B.L. Kerans. 2014. Habitat use of an endemic mollusk assemblage in a hydrologically altered reach of the Snake River, Idaho, USA. *River Research and Applications* 30: 976-986.

International Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis Summary for Policymakers. Sixth Assessment Report.* IPCC, Switzerland. 40 pp.

Stephenson, M., B. Bean, and D. Bates. 2019. 2018 Endangered Species Act Section 10 Report, Annual Report, Section 10 Permit #799558-9. Idaho Power Company, Boise, ID. 9 pp. and 14 appendices.

Young, M.K., R. Smith, K.L. Pilgrim, and M.K. Schwartz. 2021. Molecular species delimitation refines the taxonomy of native and nonnative physine snails in North America. *Science Reports* 11: 21739

[USFWS] U.S. Fish and Wildlife Service. 2014. 5-Year Status Review for Snake River physa (*Physa (Haitia) natricina*). U.S. Fish and Wildlife Service, Region 1, Idaho Fish and Wildlife Office, Boise, ID. 45 pp.

USFWS. 2018. 5-Year Status Review for Snake River physa (*Physa (Haitia) natricina*). U.S. Fish and Wildlife Service, Region 1, Idaho Fish and Wildlife Office, Boise, ID. 13 pp.

In litteris:

[BOR] Bureau of Reclamation. 2018. eDNA data from 2017 and 2018 from Minidoka Reach and Control locations. Unpublished Data. Michael Young, USFS Rocky Mountain Research Station, Missoula, Montana.

[USFWS] U.S. Fish and Wildlife Service. 2022. 2021 Snake River Physa Monitoring. Idaho Fish & Wildlife Office, Boise, ID. 10 pp.

USFWS. 2023. 2022 Snake River Physa Monitoring. Idaho Fish & Wildlife Office, Boise, ID. 11 pp.

Personal Communication:

Interview with Dr. David Hopper, Biologist, U.S. Fish and Wildlife Service, in Burley, Idaho (August 17, 2021).

U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of Snake River Physa (*Physella natricina*)

Current Classification: Endangered

Pre-1996 DPS listing still considered a listable entity? N/A

Recovery Priority Number (no change needed): 8C

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

FIELD OFFICE APPROVAL:

State Supervisor, Idaho Fish and Wildlife Office

Approve _____ Date 8/17/2023