Species Planning Document Template

Detailed instructions and examples can be found in the Species Planning Document Standards and Guidelines on the Recovery Guidance website

SCIENTIFIC NAME: PLETHOBASUS COOPERIANUS

COMMON NAME: ORANGEFOOT PIMPLEBACK

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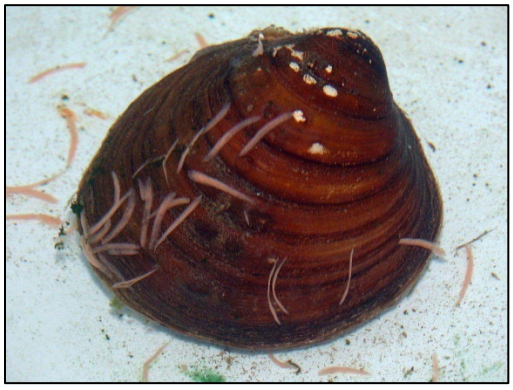
SPECIES PHOTO:



Species Planning Document Goal

The Species Planning Document identifies conservation objectives and inventories and prioritizes actions to achieve the objectives.

1. Need for Conservation

A. Brief synthesis of the species' status. Broad assessments of the species' status and trends as described in the SSA are provided. Trends (or contemporary status, at a minimum) for each of the three SSA components (distribution, abundance, population viability) should be addressed, with spatial and temporal scale identified.

In Illinois the Orangefoot Pimpleback is restricted to the Ohio River. It is state and Federally-endangered and its global and subnational conservation ranks are G1 and S1, respectively. Two extant element occurrences (EOs) are recorded in the Natural Heritage Database, and both are ranked D (poor viability). Source features record only one or two individuals. Distribution and abundance information is rarely collected and so no trends can be identified.

B. Identify the stressors and threats **currently acting upon the species**. Characterize each item by providing the spatial extent, frequency, and intensity of each stressor or threat.

i. Stressors: factors that constrain productivity, development, or reproductive success (e.g., predation, disease, lack of mates, salinization, unsuitable temperature, or moisture conditions)

Low dissolved oxygen concentrations. Dissolved oxygen concentration requirements for Orangefoot Pimpleback are unknown, but temperature, mussel size, and exposure period influence minimum dissolved oxygen concentrations that mussels can endure. Intolerable dissolved oxygen concentrations, even for short periods of time, may reduce distribution and abundance of Orangefoot Pimpleback. High temporal resolution dissolved oxygen records for the Ohio River are not available, and so the extent of this stressor in Illinois is unknown.

Sedimentation. High suspended sediments decrease light penetration and inhibit planktonic algae production, which limits food availability for mussels. Sediments deposited onto stream beds may smother mussels and create an unstable substrate. Sedimentation likely creates areas of unsuitable habitat in the Ohio River and limits Orangefoot Pimpleback distribution.

Pollutants (not otherwise mentioned). Many pollutants observed in streams have been shown to reduce survival and growth of mussels under acute and chronic exposure. The Ohio River in Illinois is categorized as "impaired" by the US EPA due to high concentrations of iron, PCBs, dioxins, and mercury. Each pollutant, and possibly some not identified by the EPA, may individually or cumulatively impact Orangefoot Pimpleback distribution, abundance, and population viability.

Depredation. Mussels are prey for some mammals and fishes. River Otter, several species of suckers (Catostomidae), Freshwater Drum (*Aplodinotus grunniens*) and Black Carp (*Mylopharyngodon piceus*) occur in the Ohio River and may consume Orangefoot Pimpleback. It is unclear how, if at all, depredation impacts the status of the species in Illinois.

Disease and parasites. Enigmatic mussel declines have been observed in recent decades, and viral, bacterial, and fungal diseases have been linked to some of these declines (e.g., Richard et al. 2020). Ciliates, oligochaetes, leeches, mites, copepods, and insect larvae have been observed attached to the mantel and soft tissues of mussels, and some of these colonizing organisms have been shown to have negative impacts on mussels (McElwain 2019). No information was uncovered regarding the prevalence of disease or parasites in Ohio River mussels.

Competition. Mussels and other benthic and filter feeding organisms may compete with one another for food and space. It is likely that some, very limited, locales in the Ohio River have mussel densities high enough to restrict further occupancy; however, available mussel density information is insufficient to determine the frequency at which this occurs. Presence of Zebra mussels has been directly linked to native mussel declines through the mechanism of reduced food availability (Strayer 2008). Native mussels may also compete with one another by reducing food availability by one-third at densities observed in the Ohio River (Strayer 2008). Areas of high mussel density where Orangefoot Pimpleback occurs may reduce abundance or population viability.

Low population density. Orangefoot Pimpleback Element Occurrences (EOs) record just one or two individuals per record. At this density it may be unlikely females will encounter conspecific sperm and successfully reproduce. Low density likely decreases viability of populations in Illinois.

ii. Threats: processes or events that cause harm to the species, typically by producing stressors (e.g., harvest, invasive species, land development, climate change, habitat loss or fragmentation)

Flow modification/impoundment. Flow in the Illinois portion of the Ohio River is intensely regulated by five lock and dam facilities that create impounded reaches and may limit downstream discharge. Impounded reaches likely have increased sedimentation rates and periodic lower dissolved oxygen concentrations. The dams may limit gamete or fish host dispersal. Dams may also exacerbate low flow periods and downstream reaches. The modified flow regime of the Ohio River likely limits habitat suitability and therefore distribution of Orangefoot Pimpleback.

Dredging. The US Army Corps of Engineers dredges the Ohio River to maintain navigability. Mussels occupying dredged areas are destroyed and dredging temporarily increased turbidity and sedimentation. Dredging may reduce distribution of Orangefoot Pimpleback.

Invasive species. Zebra mussel is prevalent throughout the Illinois portion of the Ohio River. Quagga mussel (*Dreissena bugensis*) has been detected, but only at one locale. Black Carp occurs in the Ohio River, but abundance is unknown. Invasive species may reduce abundance and population viability of Orangefoot Pimpleback.

Point-source discharges. Hundreds of municipal, industrial, mine and energy production discharges to the Ohio River and its tributaries occur within Illinois and thousands more occur upstream. The total load of potential pollutants that these discharges contribute is difficult to determine and water quality evaluations occur at a spatiotemporal resolution that is too coarse to adequately estimate the intensity of stressors that may be associated with this threat.

Landscape alteration. The Ohio River basin encompasses approximately 530,000 km^2 in eleven states. Landcover is approximately 35% agriculture, 9% urban, and the remaining area is comprised of less disturbed cover categories. Approximately 25 million people reside in the basin. Agricultural and urban areas contribute sediment and other pollutants and alter surface and subsurface flow regimes. Landscape alteration may reduce abundance, distribution, and population viability of Orangefoot Pimpleback.

Harvest. Illinois regulations (17 IL Admin Code 830) allow commercial harvest of mussels in the Ohio River. Although harvest of Orangefoot Pimpleback is prohibited, some gear used to harvest mussels is indiscriminate and take of the species may occur. Records of commercial mussel harvest are incomplete and so it is unclear if harvest occurs in the Ohio River.

Climate Change. Increased precipitation extremes and higher temperatures are likely to result in higher water temperature and more extreme droughts and floods. Climate change may reduce population viability of Orangefoot Pimpleback.

B. Identify information needs. A list of data inadequacies that will hinder the management of the species.

Status assessment. Distribution, abundance, and demographic information for Orangefoot Pimpleback is insufficient for accurate assessment of the species' status in Illinois.

Prevalence/frequency of stressors and threats. Presence of stressors and threats to Orangefoot Pimpleback in the Ohio River has been documented, but intensity and frequency of those stressors and threats is unknown in many cases.

Viable hosts. No hosts have been identified for Orangefoot Pimpleback (Douglass and Stodola 2014).

Habitat associations. Limited information regarding physicochemical characteristics associated with micro- and macro-scale distribution of Orangefoot Pimpleback is available. Accurate distribution information at multiple scales would aid identification of these associations.

2. Conservation Objectives

A. Conservation objectives. A description of desired conservation outcomes written as objectives (i.e., measurable). Objectives shall be ordered according to priority (highest priority first).

Conservation objectives shall focus on improving accuracy and resolution of status assessment information and refining life history information.

1. Improve resolution of distribution, abundance, and demographic information.
2. Refine life history information.
3. Refine habitat association information at multiple spatial resolutions.

3. Conservation Actions

A. Conservation actions. Each action is described along with the associated conservation objective(s) and the stressors/threats/information needs addressed. Resource requirements and years to expected completion are estimated for each action (include funding, staff time, and/or contractual expenses that could be expected to complete the action). Actions shall be ordered according to priority (highest priority first).

1. *Identify reaches of the Ohio River that may be occupied by Orangefoot Pimpleback*. Few EOs have been recorded for Orangefoot Pimpleback and recent surveys have failed to detect the species. The species' rarity and size of the Ohio River confound efforts to identify reaches of the Ohio River that may be occupied by Orangefoot Pimpleback. Improving occupancy information will require two steps: gathering records from agencies and institutions that are not currently incorporated into the IDNR Natural Heritage Database and conducting a survey to determine the status of EOs and identify additional EOs. This action will require approximately $100,000 and 37.5 hours of Heritage staff time.
2. *Identify fish hosts*. Reported host fishes for Orangefoot Pimpleback are based on knowledge of viable hosts for other species in the same genus. Successful conservation management of Orangefoot Pimpleback will require accurate host identification to estimate the species'

population viability and likelihood of distribution expansion. This action will require approximately $50,000 and 7.5 Heritage staff hours.

3. *Improve habitat association information at multiple spatial resolutions*. General information regarding habitat associations for Orangefoot Pimpleback are available, but information specific to the Ohio River may improve management strategies. Local habitat characteristics (e.g., substrate, depth) and reach characteristics (e.g., flow, presence of surrogate species) associated with Orangefoot Pimpleback occurrence will be used to refine habitat associations. In addition to resources required for proposed action #1, this action will require 37.5 staff hours or $20,000.
4. *Review mussel harvest records and recommend conservation actions to reduce take associated with harvest*. Commercial mussel harvest is permittable in the Ohio River, and some harvest techniques are indiscriminate. This action would first review harvest records to identify intensity of this threat in the Ohio River, and then would recommend regulatory methods (e.g., fishing regulation restrictions) to reduce take associated with harvest. This action will require 15 hours of Heritage and Fisheries staff time.
5. *Inventory threats in occupied reaches of the Ohio River*. An attributed inventory of threats would be compiled to identify locales and stressors associated with threats and identify conservation actions to alleviate those threats. This action will require 15-30 Heritage staff hours or $5,000.

B. Synthesis table of conservation actions. Table columns include: Action, Objective Addressed, Purpose of Action (what associated stressor, threat, and/or information need is addressed), Estimated Resources Required (staff hours, dollars, and/or contractual), and Years to Complete.

Action	**Objective(s)**	**Purpose**	**Resources Required**	**Years to Complete**
1. Identify occupied reaches.	1	Information need: Status assessment.	$100,000 and 37.5 staff hours	2
2. Identify fish hosts	1, 2	Information need: Viable hosts.	$50,000 and 7.5 staff hours	3
3. Habitat associations	1, 3	Information need: Habitat associations.	$20,000 or 37.5 staff hours (in addition to resources for action 1)	1
4. Harvest threat	1	Threat: Harvest	15 staff hours	1
5. Inventory threats	1	Threat: Point-source discharges, dredging, dams.	15-30 staff hours or $5,000.	1

4. Citations

Douglass, S.A. and A.P. Stodola. 2014. Status revision and update for Illinois' freshwater mussel species in greatest need of conservation. Illinois Natural History Survey report 2014(47).

McElwain, A. 2019. Are parasites and diseases contributing to the decline of freshwater mussels (Bivalvia, Unionida)? Freshwater Mollusk Biology and Conservation, 22(2)85-89.

Richard, J.C., E. Leis, C.D. Dunn, R. Agbalog, D. Waller, S. Knowles, J. Putnam, and T.L. Goldberg. 2020.

Strayer, D.L. 2008. Freshwater Mussel Ecology. University of California Press, Berkeley, CA, 197 pp.