FNR-536-W

HELP THE HELLBENDER

North America's Giant Salamander

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PURDUE EXTENSION

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WHAT IS A HELLBENDER?

The eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) is a large, fully aquatic salamander that requires cool, well-oxygenated rivers and streams. Because they require high-quality water and habitat, they are thought to be indicators of healthy stream ecosystems. While individuals may live up to 29 years, possibly longer, many populations of this unique salamander are in decline across their geographic range.

Common Nicknames

- Snot otter
- Water dog
- Devil dog
- Allegheny alligator
- Water eel
- Grampus
- Old lasagna sides

Cover photo by T. Travis Brown
Photos by the authors, unless otherwise noted.

What's in a Name?

Hidden below (hidden much like our shy hellbender friends) are some of the different names used to refer to hellbenders. Whatever you call them, one fact rings true, they are one spectacular salamander!

B S G M U D D O G A B S Z S Q
X H A O T W N T L E U J U T V
T T E J D V A L U P K H C W P
S K D L R L I W M N C D Q E A
U G K R L G I A A N R P P E L
O W Y J A B R V A Y S N L G L
H S E T T G E R E B U F C W E
S H O F H C B N P D L J Z T G
N R T G R O U N D P U P P Y H
A L U I T I X C U E Z E X N A
S O J P E C K F N N R B L B N
O H Y R E T T O T O N S Y M Y
I R V Q A H H F F X W F F D W
C M C Y K J E T G L J B V E X
L R W K O X A W N Z V I T B Y

ALLEGHANY
ALLIGATOR
CRYPTOBRANCHUS
DEVILDOG
GRAMPUS
GROUNDPUPPY
HELLBENDER
MUDDOG
OSANSHOU*
SNOTOTTER
TWEEG**
WAWAYU***

*Japanese Giant Salamander
**Native American term for "Hellbender"
***Chinese Giant Salamander

Quick Facts

The hellbender is one of the largest North American salamanders (up to 29 inches) and is the sixth-largest salamander in the world.

Identification

The eastern hellbender is one of the largest salamanders in North America. Adults are capable of reaching 29 inches in length; however, most individuals are 11–24 inches long. This North American giant salamander has short limbs and a wide, flattened head and body. A fleshy fold of skin extends along each side of the body between the front and hind limbs, giving it an overall wrinkly appearance (Figure 1). Body color often is variable, ranging from a greenish to yellowish brown. Dark spotting typically is present along the back and tail. Larval hellbenders are 1–2 inches long. Larvae differ from adults in several ways: they possess external gills, have visible yolk sacs for around two months, and lack functioning limbs at hatching. They typically are uniform in color, with dark backs and light bellies (Figure 2). Dorsal spotting begins to form at 6 months when larvae reach 2.0–2.5 inches. The spotting becomes more prominent at 1–2 years of age when larvae reach 4–5 inches and lose their external gills (Figure 3).

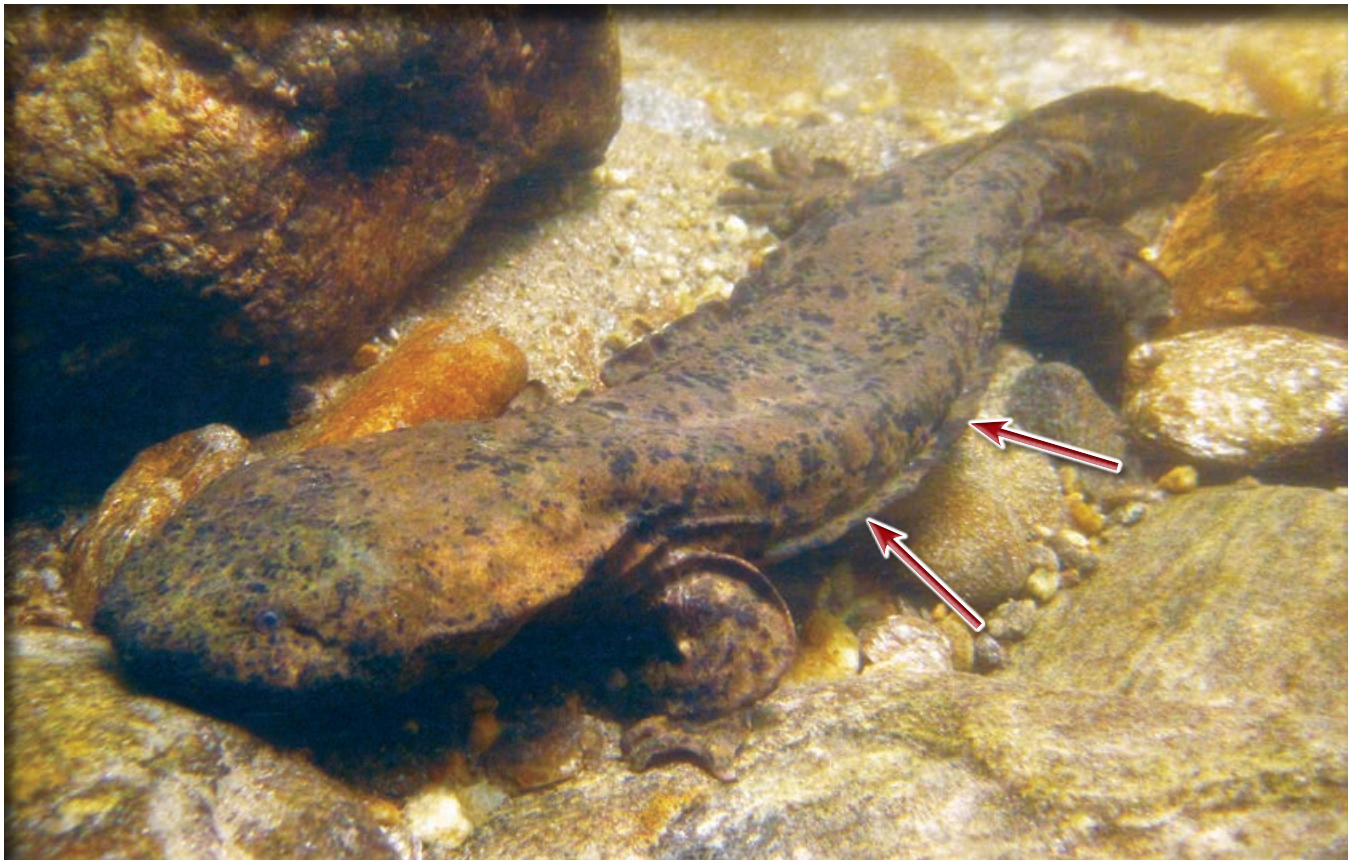


Figure 1. Hellbenders are easily identified by the conspicuous fleshy folds of skin that extend along the sides of the body, as indicated by the arrows above.

Quick Facts

Cryptobranchus is Greek for "hidden gill," while *alleganiensis* is Latin for "belonging to the Allegheny Mountains."

Figure 2. Larval hellbenders have large, plume-like external gills.

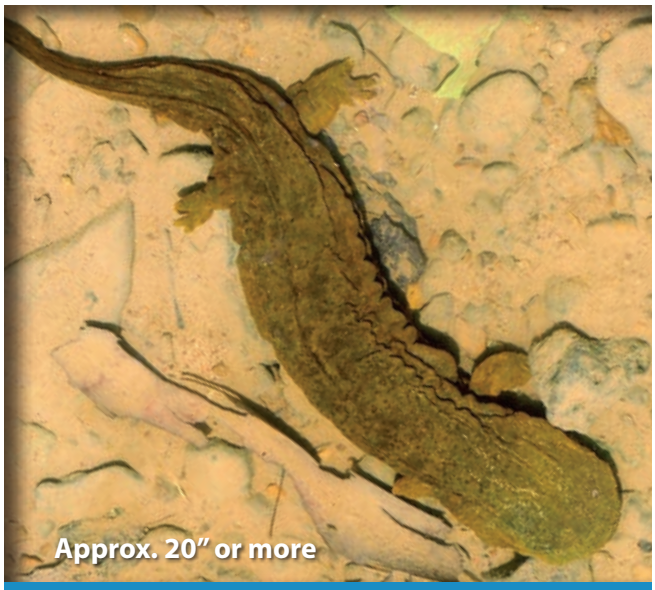
Figure 3. Juvenile hellbenders begin to resemble adults once they reach 2 years of age.

Quick Facts

Male hellbenders have been known to cannibalize their own eggs to help keep themselves fed while guarding their nest.

Hellbender or Mudpuppy?

These two species of aquatic salamanders are often misidentified.



HELLBENDER

- Lacks gills as adult
- Large, flat head
- Wrinkled appearance
- Five toes on hind feet
- Larger (more than 20 in.)

MUDPUPPY

- Large external gills throughout life
- Triangular head
- Smooth appearance
- Four toes on hind feet
- Smaller (up to 12 in.)

Quick Facts

Hellbenders are declining in numbers throughout their geographic range and are extirpated, or nearly extirpated, in several states.

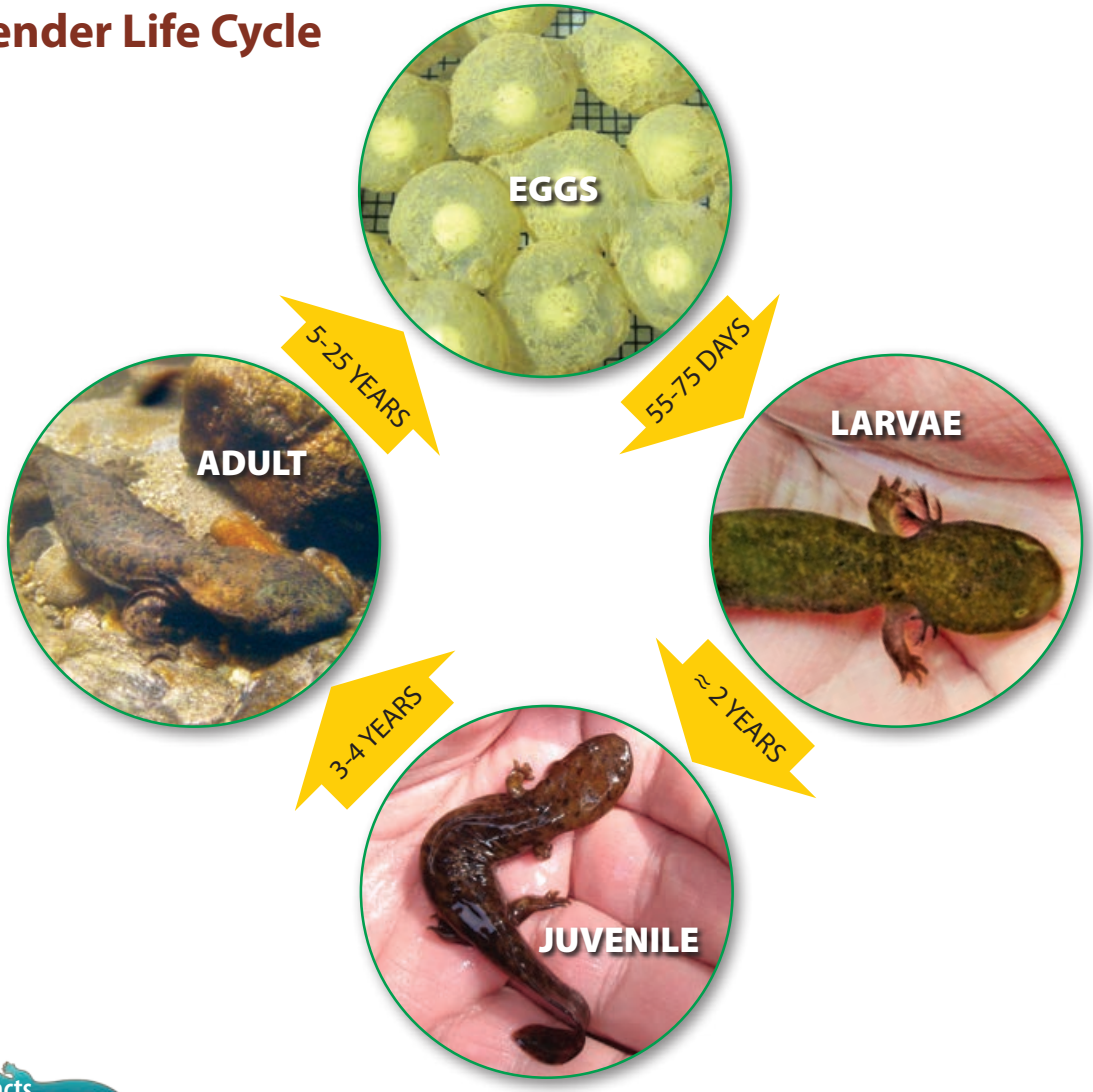
Ecology and Behavior

Eastern hellbenders are salamanders belonging to the ancestral family Cryptobranchidae. Eastern hellbenders are fully aquatic and inhabit cool, fast flowing, rocky streams and rivers. They prefer areas where rocks are not embedded or heavily silted. A hellbender absorbs most of its oxygen from the water through its skin. Adults typically are nocturnal, and otherwise remain hidden under rocks and other cover. Their diet consists almost entirely of crayfish.

Eastern hellbenders are one of the few salamanders to externally fertilize eggs. As the female begins to deposit eggs, the male simultaneously releases sperm to fertilize her eggs. Females lay between 100 and 300 eggs under a male's nest rock. Individual eggs are attached to each other and together resemble a pearl necklace. After egg laying is complete, the male drives off the female and defends the eggs from predators, including other hellbenders.

Little is known about the larval life cycle, but larvae are thought to feed on a variety of aquatic insects and live under gravel and cobble to avoid predators. It is during this stage that they are the most vulnerable to predation by fish, crayfish, and other aquatic organisms. The larval stage lasts for approximately two years, at which point the young undergo a partial transformation. During this life stage young hellbenders absorb their gills and begin breathing through their skin. After transformation, juveniles require another 3–4 years to reach sexual maturity.

Hellbender Life Cycle



Quick Facts

Hellbenders are one of few species of salamander that fertilize their eggs externally.

Distribution and Status

Eastern hellbenders currently are found across Appalachia, parts of the Midwest, and across the northern tips of several southern states (Figure 4). The eastern hellbender has experienced significant decline throughout its geographic range because of sedimentation, poor water quality, and persecution. This has resulted in various levels of protection among state agencies (Table 1). If you see or catch a hellbender in your state, please take a photograph, release it immediately, and contact your local state agency or www.helpthehellbender.org.

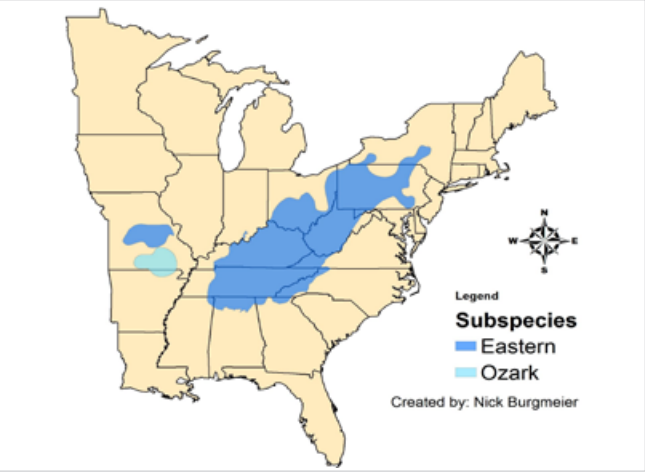


Figure 4. Current distribution of hellbender subspecies.

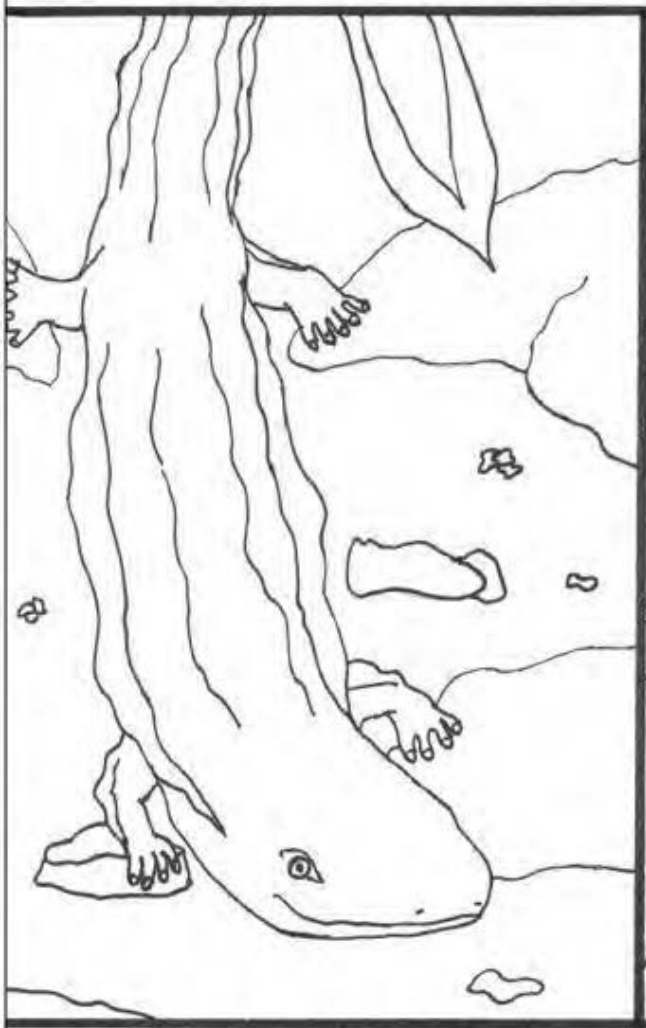
Table 1. Region-wide state agencies and conservation status of eastern hellbenders. Contact information is listed for each state to report hellbender sightings.

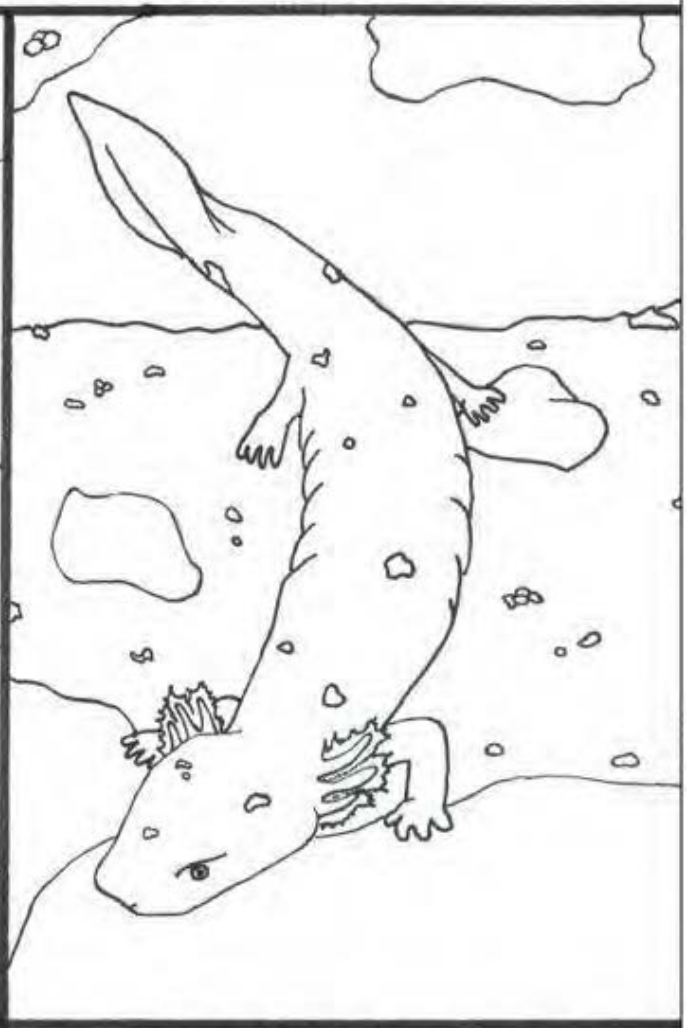
State	Agency	Listing	Status	Contact
Indiana	Department of Natural Resources www.in.gov/dnr/	Endangered	Declining	(812) 334-1137
North Carolina	North Carolina Wildlife Resources Commission www.ncwildlife.org/	Special Concern	Stable in Some Locations	(919) 707-1050
Tennessee	Tennessee Wildlife Resources Agency www.tn.gov/twra/	Nongame	In need of management	(615) 781-6610
Pennsylvania	Pennsylvania Fish and Boat Commission www.fish.state.pa.us/	State Protected	Stable in Some Locations	(814) 359-5113
Ohio	Ohio Department of Natural Resources www.ohiodnr.com/	Endangered	Declining	(800) 945-3543
West Virginia	West Virginia Department of Natural Resources www.wvdnr.gov/	No Take	Declining	(304) 637-0245
Virginia	Virginia Department of Game and Inland Fisheries www.dgif.virginia.gov/	Special Concern	Unknown	(804) 367-1000
New York	New York Department of Environmental Conservation www.dec.ny.gov/	Special Concern	Declining	(518) 402-8920
Missouri	Missouri Department of Conservation http://mdc.mo.gov/	Endangered	Declining	(573) 522-4115 ext 3201
Kentucky	Kentucky Division of Fish and Wildlife Resources www.kdfwr.state.ky.us/	Special Concern	Unknown	(800) 858-1549
Georgia	Georgia Wildlife Resources Division www.georgiawildlife.com/	Nongame (rare)	Stable in some locations	(478) 994-1438
Illinois	Illinois Department of Natural Resources www.dnr.illinois.gov/	Endangered	Likely extirpated	(217) 782-6302
Maryland	Maryland Department of Natural Resources www.dnr.state.md.us/	Endangered	Declining	(410) 260-8572

Quick Facts

A guarding male uses his body and tail to stir the eggs to ensure they stay clean and have access to dissolved oxygen.

What Differences Do You See?





HELLBENDERS	MUDPUPPIES
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Quick Facts

Hellbenders are indicators of good ecosystem health and are found in streams with high-quality water.

Research

The reasons for the range-wide hellbender decline are unclear. To better understand the causes and develop appropriate conservation strategies, it is important to gather as much information as possible. Researchers around the country have implemented research programs to study hellbenders and the environments in which they live. Researchers are studying all aspects of hellbender biology: population demography, spatial ecology, health and genetics, water quality, captive breeding, and reintroduction and head-starting methods. For more information on hellbender research, please visit www.helpthehellbender.org.

Figure 6. Purdue biologist Nick Burgmeier uses radio-telemetry to locate hellbenders. Radio-telemetry allows biologists to track the movements of tagged individuals so they can learn what types of habitats are being used, how much space they need, and how they behave throughout the year.

Figure 5. Orianne Society scientist Dr. Stephen Spear filters water for environmental DNA analysis (eDNA). eDNA has allowed biologists to detect the presence of hellbender populations by sampling water and testing for DNA shed by hellbenders. This method saves time and doesn't disturb habitat like traditional surveys.

Figure 7. University of Kentucky graduate student, Paul Hime, works with hellbender DNA. Genetic analyses have revealed a method for determining the sex of hellbenders using non-invasive techniques. Analysis of hellbender genetics will also be used to study the genetic health of hellbender populations across their range.

Quick Facts

The hellbender has remained relatively unchanged from its ancestors of 160 million years ago.

Zoos and Captive Breeding

Zoos play an integral role in conservation. In addition to giving the public a place to learn about animals that people otherwise would never experience, they also contribute important research, conservation programs, and outreach. Zoos and universities across the country have started projects designed to strengthen hellbender conservation throughout the hellbender's range. They are establishing captive breeding programs to ensure the survival of the species and have expanded the audience for hellbender outreach through extensive education campaigns.

Figure 9. Purdue post-doctoral researcher Dr. Steven Kimble and Purdue graduate student Obed Hernandez-Gomez are working to understand the microbial communities living on hellbenders. They are investigating the utility of introducing captive juveniles to natural river water to improve their immune systems and increase survival upon release.

Figure 8. Purdue graduate student Erin Kenison tends to head-starting tanks. Head-starting allows biologists to raise young hellbenders in captivity so that they can grow to a larger size before being released. This will increase their chances of survival in the wild and their potential to reproduce.

Figure 10. The St. Louis Zoo has had tremendous success breeding the Ozark Hellbender subspecies (*Cryptobranchus alleganiensis bishopi*). They have constructed two outdoor breeding streams designed to replicate natural environmental conditions.

Quick Facts

The fleshy folds along the sides of a hellbender's body increase its surface area. This helps it absorb more oxygen from the water.

Outreach and Education

One of the most important parts of any successful conservation program is gaining public support. For a relatively unknown species like the hellbender, public outreach is crucial. Numerous presentations, educational programs, video games, publications, lesson plans, and websites have been developed to help teach the public about hellbender biology and natural resources. Many of these educational resources can be found online, at zoos, or at local state parks. If you would like to access these resources, please visit www.helpthehellbender.org.

Figure 11. Purdue University has developed a traveling hellbender exhibit. It is easily transported between educational events, includes information on biology and conservation, and has slots for educational materials.

Figure 12. Snotty the Snot Otter, North Carolina Zoo Society's Hellbender ambassador, travels throughout North Carolina, Pennsylvania, Ohio, and Virginia. Along the way he spreads the word about the problems facing hellbenders in the wild and educates people about the importance of good water quality.

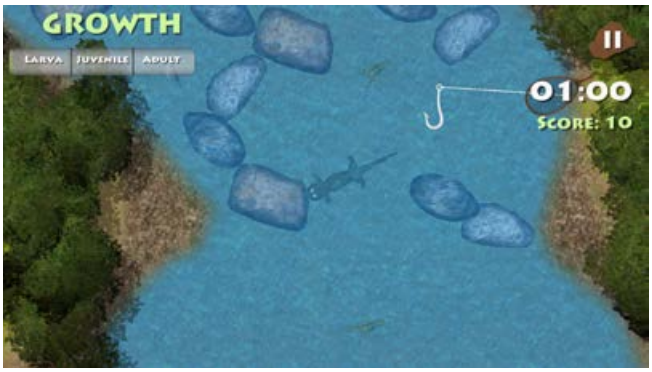

Figure 13. A new video game, Hellbender Havoc!, has been developed for both Android and Apple platforms. It allows players to explore the life cycle of the hellbender while searching for food and avoiding threats.

Quick Facts

By absorbing nutrients stored in their yolk sacs, newly hatched larvae can survive for several months without eating.

Conservation Practices

Captive breeding projects and outreach efforts are important, but the only way to permanently help the hellbender is by enhancing its habitat. Most of the threats to hellbenders are a direct result of common human activities. Farming, livestock operations, dam construction, and deforestation can all be detrimental to aquatic ecosystems without the proper conservation practices. Even small-scale activities like recreational boating and fishing, neglecting your septic system, and homestead runoff can all negatively affect hellbenders. However, there are many things that landowners can do to minimize the impacts of these activities on aquatic systems and reduce their effects on hellbenders. For more information, please visit www.helpthehellbender.org.

Figure 15. Homeowners can use rain barrels to collect rainwater. This helps reduce surface runoff after rain events and allows homeowners to store water for use around their homes. This saves water and money by avoiding using water from the tap.

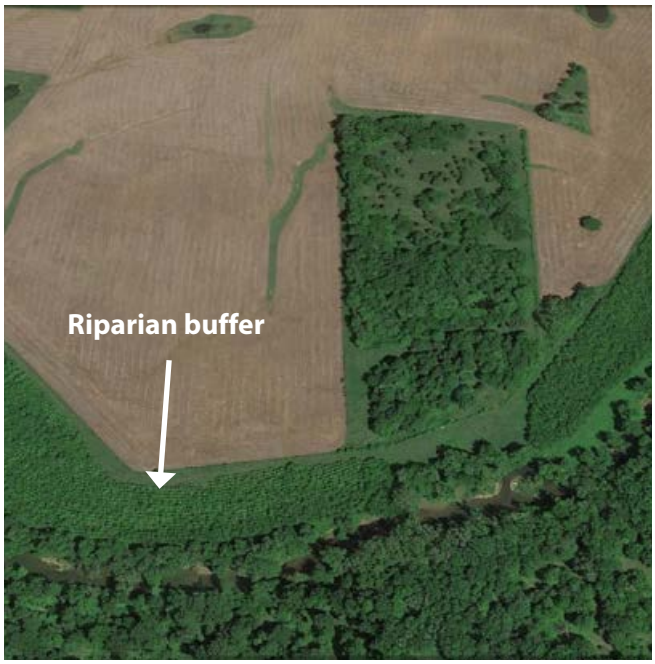

Figure 14. Many farmers and livestock operators leave vegetated buffers between their properties and rivers. These *riparian* buffers help to remove nutrients and filter sediment from runoff that flows into the river. They help stabilize stream banks and keep rivers clean.

Figure 16. Septic systems are often forgotten until they have failed. A failing septic system (above) can leach toxic sewage into bodies of water, increase nutrient loads, make people and wildlife sick, become unsightly, and smell bad. It is much cheaper to maintain a septic system than pay for costly repairs. Photo by: Alamance County Environmental Health

Quick Facts

A hellbender has very small eyes and relies almost entirely on its sense of smell to locate prey.

What to Do if You Find a Hellbender

If you see a hellbender in your area, please report it to your local state natural resources agency (Table 1) or http://www.helpthehellbender.org/. If a hellbender is caught on a fishing line, cut the line as close as possible to the lead and release the individual back into the water. The hook will dissolve naturally. Removing the hook might injure the animal. These measures will help to ensure that hellbenders stay where they belong: in the wild.

Ways You Can Help

- Use practices promoted by your local watershed group or Soil and Water Conservation District.
- Properly use lawn-care products, herbicides, and pesticides.
- Fence cattle from streams and rivers.
- Do not dispose of oil, antifreeze, or paint thinner down drains.
- Properly dispose of household chemicals
- Maintain septic systems
- Become involved in a local stream team and cleanup in your area

Quick Facts

Hellbenders are neither venomous nor poisonous. They produce a slimy skin secretion that might be noxious to some predators, but they are harmless to humans.

Web Sources

www.helpthehellbender.org

www.hellbenders.org/The_Hellbender_Homepage/Hoe.html

www.dgif.virginia.gov/hellbender

www.stlzoo.org/animals/abouttheanimals/amphibians/salamandersandnewts/hellbender

www.fws.gov/midwest/endangered/esday/MOOZHE.html

www.dec.ny.gov/animals/7160.html

www.facebook.com/pages/Help-the-Hellbender/369598889735989

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Acknowledgments

We would like to thank M. Titchenell, J. Groves, and S. Spear for reviewing this publication. We would also like to thank K. Smith, A. Pursell, L. Prokopy and members of Williams' lab group for reviewing prior versions of this publication.

We would like to thank J. Groves, L. Williams, P. Hime, and S. Spear for their contribution of materials for inclusion in this publication. We would like to thank T. Travis Brown for his excellent cover photo. Research and publication costs were partially supported by Purdue University, and Duke Energy.

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