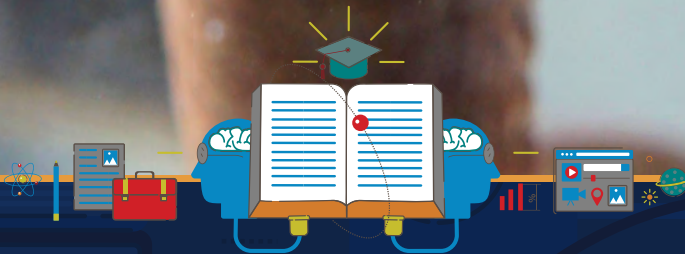


HELLBENDERS: SAVING THE SNOT OTTER

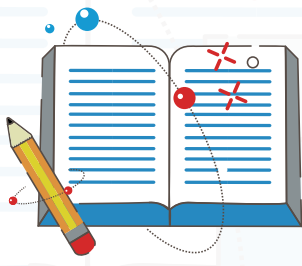
A SCIENCE 3D ADVENTURE

GRADE 4



By MIKE HEITHAUS Ph.D

symbioeducation™



KEY WORDS

Look for these words and see if you can figure out their meaning.

CANNIBALISM

DEPOSITION

EROSION

EXTERNAL FERTILIZATION

METAMORPHOSIS

NICHE

SOLITARY

SPECIALIST

TERRITORIAL



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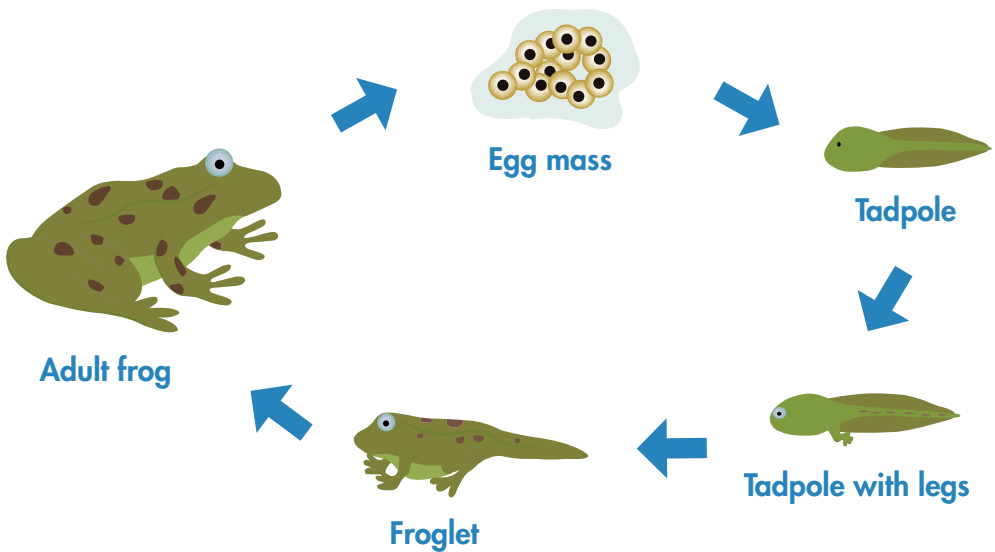
Hellbender
Lasagna lizard
Snot otter
Allegheny alligator
Mud dog

A CREATURE OF MANY NAMES

What on earth is a lasagna lizard? It's actually not a lizard at all! Lasagna lizard is another name for a giant salamander that lives in rivers. The most common name for this amphibian is hellbender. People have given them other crazy nicknames, like Allegheny alligators, water dogs, old lasagna sides, and snot otters.

Hellbenders share many traits with other amphibians, including frogs, toads, and newts. They have thin skin that needs to stay moist. They lay eggs that do not have a shell. That means the eggs need to be laid in water or somewhere they will not dry out. Their life cycles are similar to other amphibians as well.

Life cycle of a frog



Amphibians lay eggs in water or wet areas. The young that hatch may not look like their parents. As they grow, the young change to look like their parents. This is called **metamorphosis**.

THE BIGGEST OF THEM ALL?

Hellbenders are the largest amphibian in North America. For salamanders, they are huge! They grow to 74 cm, which is more than two feet long. They can weigh up to 2.5 kg or 5.5 lbs. That's heavier than some cats!

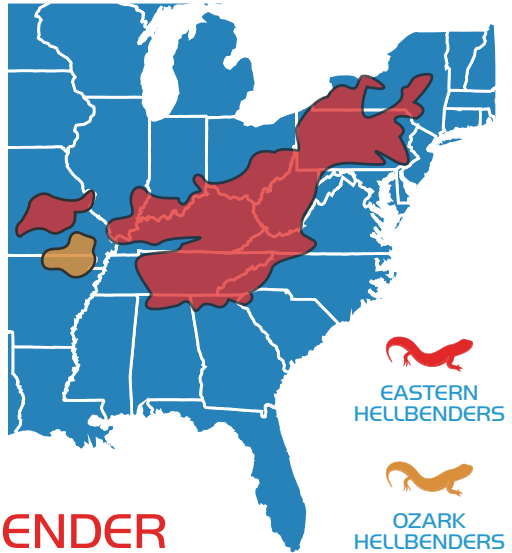
Hellbenders can live a long time. In captivity one lived 30 years. Scientists think they may be able to live for 50 years.

Hellbenders may seem huge, but they are tiny compared to the giant salamanders in Japan and China. The Chinese giant salamander can weigh over 45 kg (100 lbs) and grow to more than 1.5 m (5 ft) long. It is the largest amphibian in the world today. But they are small compared to the largest amphibians to ever live. Some extinct amphibians grew to more than 3 m (10 ft) long.



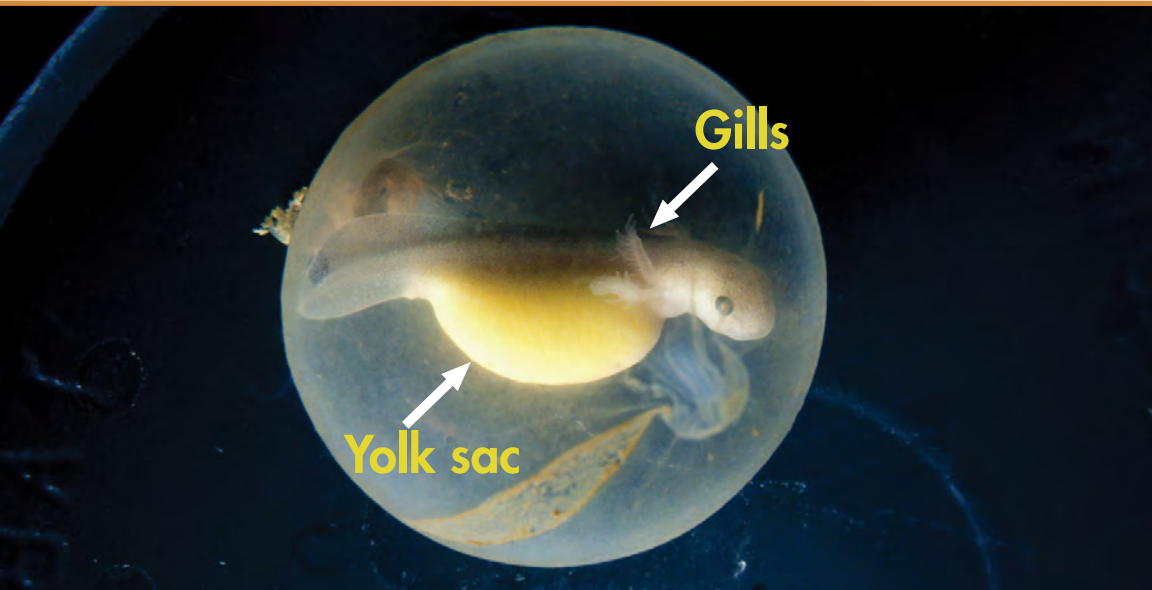
WHERE DO HELLBENDERS LIVE?

Hellbenders live in the streams of eastern North America. There are two types of hellbenders, the Ozark hellbender and the Eastern hellbender. The Ozark hellbender is found mainly in Missouri and Oklahoma. The Eastern hellbender is found in places like New York, Pennsylvania, Ohio, Kentucky, Tennessee, and Georgia.



THE LIFE OF A HELLBENDER

Hellbenders hatch from eggs that are laid underwater. When they are young, they have gills. They do not have working arms and legs. They get their energy from a yolk sac. After a year and a half, they undergo **metamorphosis**. The biggest change is the loss of their gills.



Baby hellbenders have small gills. As they get bigger, they lose their gills.

Hellbenders spend a large part of their days living under rocks. They are mostly nocturnal. That means they are mainly active at night. At night they look for prey or sit under rocks and wait for prey to come to them. Their favorite food is crayfish. They also eat small fish. Sometimes they eat the eggs of other hellbenders! Some scientists think that hellbender **cannibalism**, eating members of your own species, may prevent their populations from growing very large.



Hellbenders need to hide under rocks to stay safe from their predators. Raccoons, mink, otters, fish, turtles, and snakes all eat hellbenders.



**Raccoons
are a major
predator to
hellbenders.**

Hellbenders make slimy mucus that can cover their bodies. This mucus gives them one of their nicknames, the snot otter! Scientists still don't know the purpose of this snot. It may prevent them from getting scratched by rocks. It may help kill bacteria that could make them sick. It probably tastes bad to predators. Can you think of experiments you might do to figure out why snot otters are so snotty?



Check out the slimy skin on this snot otter. Scientists still don't know how the slime helps hellbenders survive.

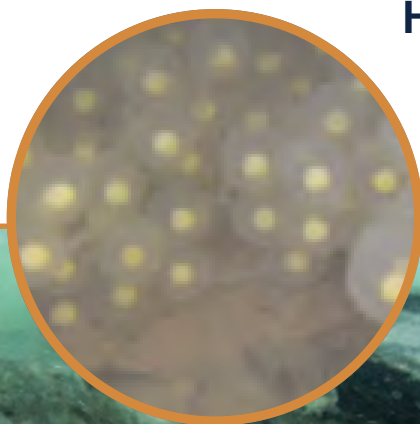
Hellbenders are **solitary**. They live alone most of the time. Usually only one hellbender lives under a particular rock. Hellbenders are also **territorial**. They defend their rocks from other hellbenders.

Each male hellbender makes a nest under a rock. He then waits for a female to come lay eggs in the nest. The female lays between 150 and 200 eggs over several days.



After a female hellbender lays her eggs, the male fertilizes the eggs. This is **external fertilization**. Most amphibians and fish have external fertilization. After the female lays eggs, the male chases her away and waits for another female to add eggs to the nest. More than 1,000 eggs have been found in some nests! The male guards the eggs to keep them safe from predators, like fish. He also fans the water to get more oxygen to the eggs.

Hellbender eggs



FRESHWATER ECOSYSTEMS

Hellbenders and other amphibians live in freshwater ecosystems. Some of them like water that flows quickly. Others like still water. There are several types of freshwater habitats. Ponds are small with calm, still water. Like ponds, lakes have water that doesn't flow. But lakes are big. Some are so big they can seem like an ocean. Wind can make the water very rough. Some lakes are shallow. Others are very deep. Lake Superior, near Michigan, gets to more than 400 m (1,300 ft) deep.

Wetlands are freshwater habitats that have shallow water and a lot of vegetation. Water levels of wetlands go up and down during the year. That means that some areas are wet for part of the year and dry for other parts of the year. Some animals, like frogs and other amphibians, have to make sure they lay their eggs at the right time. If they don't, the places they lay their eggs could dry up.

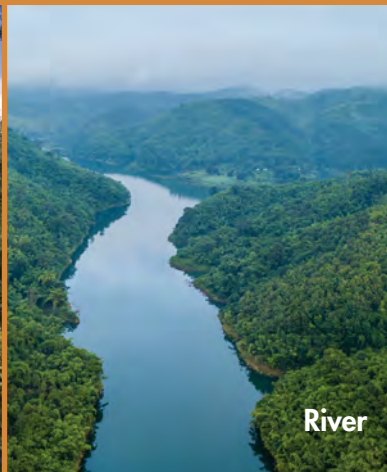
Streams and rivers have flowing water. Streams are smaller than rivers. Streams flow into each other to create bigger streams and rivers. Rivers come together to form larger rivers. The Amazon River is the widest river in the world. In the dry season it is more than 10 km (6 mi) wide. When it rains a lot, it can grow to 40 km (25 mi) wide. The deepest river in the world is the Congo River. It can be deeper than 200 m (700 ft).



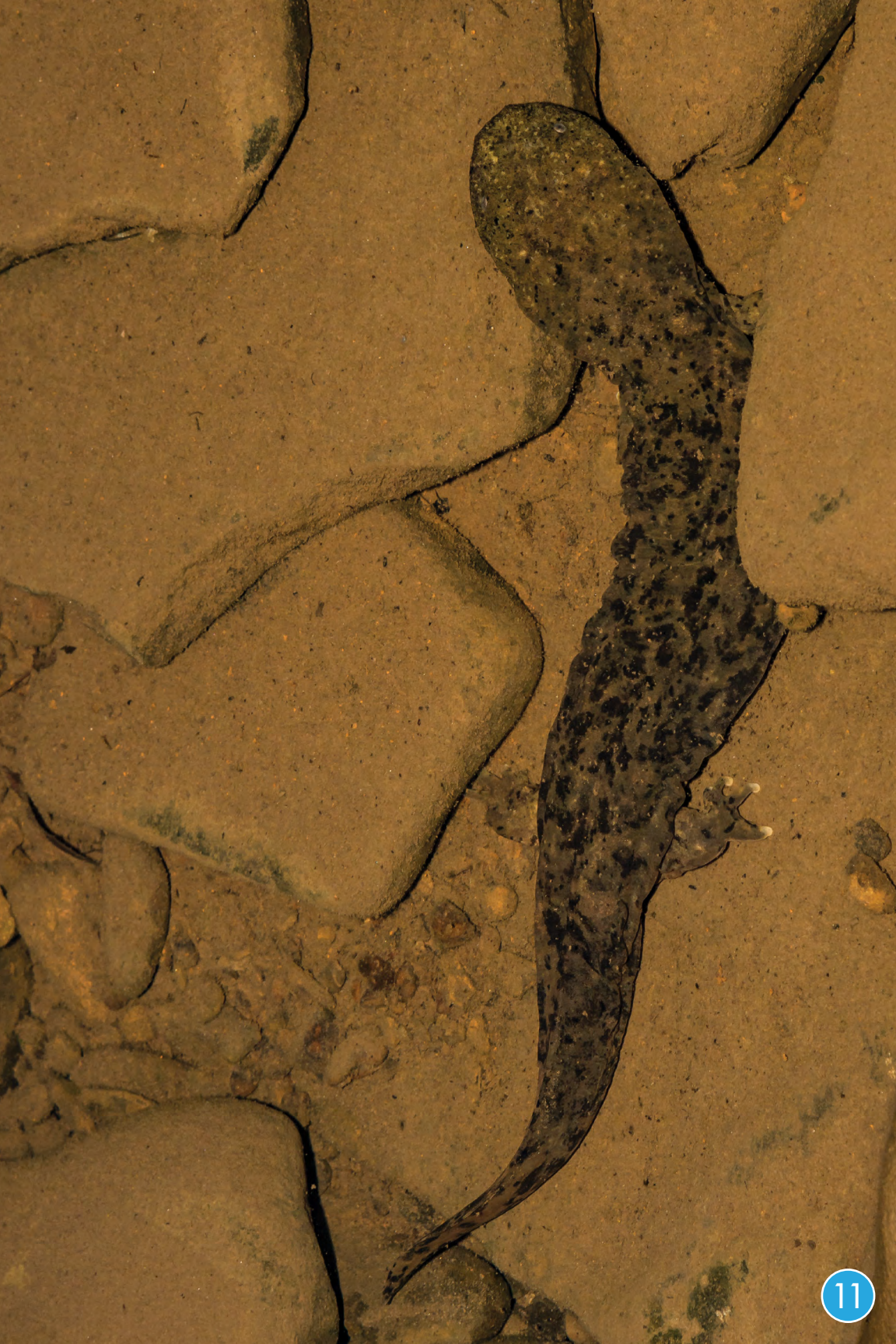
10 Wetland



Pond



River



FLOWING FRESH WATER

Streams and rivers are shaped by **erosion** and **deposition**. In places that water moves quickly or flows downhill, it can pick up sediment or soil and carry it away. This is erosion. When the water slows down, the soil or sediment falls and stays at the bottom. This is called deposition.

Streams and rivers have different habitats. Each habitat has different conditions. Not every habitat is fit for every type of amphibian or fish. Pools are areas where the water moves slowly. Pools are usually deeper and wider than other habitats. Because the water moves slowly, the bottom can be covered in mud. Sediment in the water sinks to the bottom and is not carried away by the current. Sometimes this deposition eventually causes a sandbar to form as a pool fills in with sediment. Oxygen levels in pools can be low. That means some animals can't live there. But because the water doesn't flow quickly, amphibians that are not great swimmers, like frog tadpoles, like these habitats.

Riffles and rapids are places where the water moves very fast. The surface of the water looks like it is bubbling. This helps a lot of oxygen get into the water. Riffles and rapids are usually more shallow and narrow than pools. The bottom is covered with a lot of rocks. Sometimes there are big boulders. Mud and small pebbles are swept away by the current. They are deposited in pools. Since riffles have a lot of oxygen, they are good places for salamanders, like hellbenders, to hide. Animals that live there have to be strong swimmers or be able to hold on to prevent them from being swept away.



12

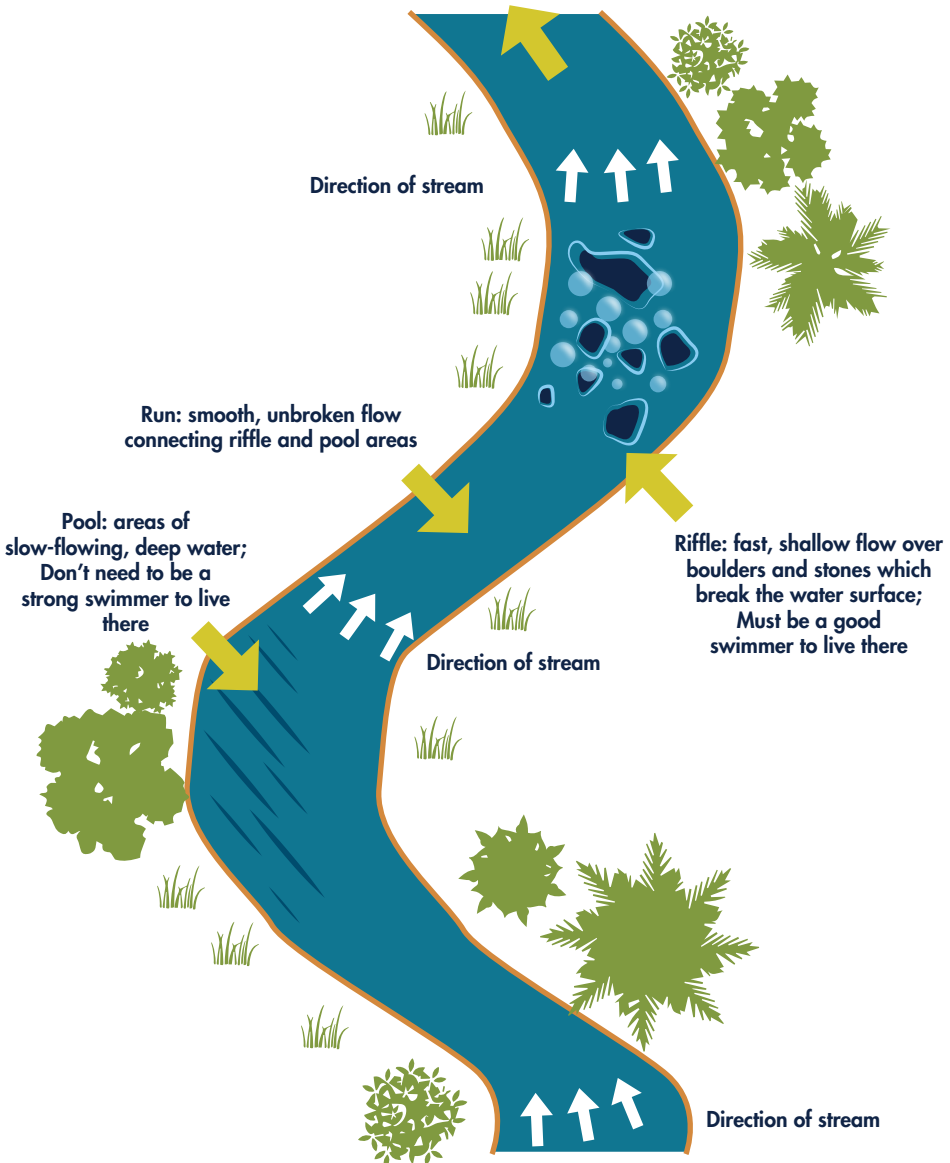
Riffle



Pool

Runs are areas where the water moves fast, but the surface doesn't bubble. The bottom usually is not muddy. The fast-moving water can erode the mud along the bank and carry it downstream.

Different current speeds and water depths create different habitats



WHO NEEDS LUNGS ANYWAY?

Most frogs and salamanders breathe through their lungs. Hellbenders barely use their lungs at all! They breathe through their skin. They have thin skin and small blood vessels called capillaries. Oxygen passes easily from the water through their skin and into their capillaries.

Hellbenders have thin, wavy folds of skin along their sides. These folds give them a couple of their nicknames – “old lasagna sides” and “lasagna lizard.” They also help them breathe. More skin means more area to get oxygen from the water. It is like a sailboat. A bigger sail helps catch more wind. Most of hellbenders’ oxygen is taken in by the skin folds.

Because they breathe through their skin, hellbenders need to live in water with a lot of oxygen. It also means they need clean water. Chemicals that could harm them would easily enter their body the same way oxygen from the water does.



Hellbenders breathe through their skin. Most of their oxygen enters their body through folds of skin along their sides. Breathing through skin may sound awesome, but it isn't always a good thing. If there is pollution in the water, it can enter a hellbender's body through its skin. That means hellbenders need clean water.

HELLBENDER HABITATS

Hellbenders are habitat **specialists**. That means they have a narrow **niche** with specific conditions. They need to have the right temperature. The water needs to have a lot of oxygen. The stream needs to have fast currents. They also need rocks that they can crawl under in their habitats. Under rocks, hellbenders can find calm waters to rest, find prey, hide from predators, and protect a nest of eggs.

Hellbenders have traits that help them live in their environment. Their bodies are flattened. This helps them move through the fast-moving current and prevents them from getting swept away. It also helps them move under rocks.

Hellbenders are adapted to their special environment. That means they can thrive when the conditions are right. But if conditions change, hellbenders can be in trouble. They may have to move in order to survive.



Hellbenders need just the right conditions to survive and reproduce. They need clean water with a lot of oxygen. They need big rocks they can live and hide under. They need enough prey, like crayfish.

HELLBENDERS IN TROUBLE

Hellbenders are very sensitive to the quality of the water in which they live. In many places, the quality of water in streams has been getting worse. There are many things that contribute to this decline in water quality. Farming practices that let a lot of dirt or sediment flow into the water cause streams to get clogged. Too much fertilizer on land flows into waters. This causes algae to bloom. The algae remove oxygen from the water. Chemicals and toxins from industry or cities can flow into rivers. Streams can be dredged or widened to change their flow. All of these can make a stream unlivable for hellbenders.



Too many hellbenders are being collected as pets in some areas. Another problem for wild hellbenders is disease. Skin diseases are common, but scientists still don't know what causes them.

Hellbenders are in trouble. They have disappeared from many streams where they used to be found. Remaining populations have gotten much smaller. Hellbenders are still doing well in areas with healthy forests. The forests prevent dirt from eroding and clogging streams. There are not many places where hellbender streams are near intact forests. If people don't do something, hellbenders could disappear forever. Thankfully, scientists are racing to save them.



SAVING SNOT OTTERS

Some people are working hard to save hellbenders. There are several things that need to happen to save them. Their habitats need to be protected. Many rivers need to be restored. This means they need to be fixed so they are like they were before they got polluted. People need to ensure that there are not too many hellbenders removed from streams. Scientists need to understand what may cause their diseases. Then they can help grow the wild populations.



Improving rivers for hellbenders also makes them better for other species and people. Farmers are finding ways to use less fertilizer or to apply it in ways so it doesn't run into streams.

People are replanting trees along the banks of rivers. This means that less dirt will run into the rivers. The forests also can help absorb many fertilizers and chemicals before they reach the streams. Better river conditions help hellbenders survive. Better rivers also provide better habitats for fish, some of which people like to catch. Clean rivers are also nicer for people to enjoy.



HELLBENDER HEAD START

In some places, healthy rivers are not the only thing that hellbenders need to survive. They have completely disappeared from some rivers. In others, there are not enough hellbenders to ensure the population will increase. How can people give hellbenders a helping hand? What do they need to do to be sure that they succeed? Now that you have learned about hellbenders, you are ready to join a team of scientists trying to save snot otters in Ohio!



Baby hellbenders are reared at The Wilds headstart program until they are big enough to be returned to their natural habitat.



GLOSSARY

CANNIBALISM

eating others of the same species

DEPOSITION

the settling of soil or rocks in an area after being moved by wind or water

EROSION

the gradual wearing away of soil, rock, or land by wind or water

EXTERNAL FERTILIZATION

eggs are fertilized outside of the female's body

METAMORPHOSIS

a change in an organism from one form to another

NICHE

the role and environmental needs of species

SOLITARY

living alone

SPECIALIST

an organism that is only found in a specific set of conditions

TERRITORIAL

defending an area from other individuals

PHOTO CREDITS

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SCIENCE 3D

Thanks for learning about hellbenders with us. Our science adventures take us to remote corners of the planet to uncover secrets of the most amazing animals and places. Our mission and passion is to share the excitement of scientific discoveries with you. There are so many cool things to see out there, even in your own backyard, so get outside and explore!

MIKE HEITHAUS, Ph.D.

Dr. Mike Heithaus is an explorer, author, educator, and television host. He is a professor of biology and Dean of the College of Arts, Sciences & Education at Florida International University. Mike and his students study sharks, whales, sea turtles, and other large marine animals around the world. They also work with people to help protect these species. Mike loves sharing his work with others. He has written textbooks and helped create programs for students in elementary, middle, and high school. He has been on television programs on PBS, National Geographic, and Discovery Channel's Shark Week.



PATRICK GREENE

As a wildlife filmmaker, Patrick has always had a passion for animals. He started to draw pictures of sharks and whales when he was just five years old. Later he went to college to become a marine biologist and learned a lot about science. Then he got a job in television and learned how to make videos too. Since then he's gone all over the world studying and filming wild animals. He's made shows for National Geographic, PBS, and ABC, and even won an Emmy Award. He loves making videos to teach students about science and about the many creatures that share our world.





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