

# Getting to Know Salamanders in Ohio

Life History and Management



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## Acknowledgements

The authors would especially like to thank the editors Brian MacGowan, Purdue University, and Rebecca Christoffel, D.J. Case and Associates, Inc., for their comments, recommendations, and time. Their kindly provided reviews greatly improved the publication.

Special thanks also to Andrew Hoffman, Brian MacGowan, Thomas P. LeBlanc, and J.P. Humphries for providing excellent images of Ohio's native salamander species.

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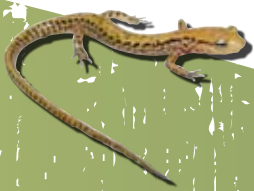
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TDD No. 800-589-8292 (Ohio only) or 614-292-1868

7/09 — 1200— XXXXXX







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*Figure 1. Legends and myths from long ago depicted salamanders sustaining life from fire.*

## The Myth of the Fire Lizard

Most people don't know it, but North America has more species of salamanders than anywhere else in the world! Ohio alone has 24 different species of salamanders, some of which can be very abundant. So why don't we see more salamanders crawling around? Salamanders are voiceless, very secretive, and take to hiding under rocks and logs during the daytime, so we are not likely to hear or stumble across them.

In fact, due to their elusive nature, many myths and legends have arisen about salamanders. During the Middle Ages, people believed salamanders were born from fire because they observed salamanders scurrying out of damp logs burned for fuel. Conse-

quently, in some languages, the word *salamander* means "fire lizard." Leonardo da Vinci (1880/1970) wrote that the salamander "has no digestive organs, and gets no food but from the fire, in which it constantly renews its scaly skin." Other early myths about salamanders claimed their saliva destroyed human hair. Fortunately for us, these beliefs are not true. While salamanders probably did scurry out of damp logs back in the day, they probably did so to escape the fire, not to be born from it. Further, salamanders do not lack digestive organs, do not have scales, and do not have saliva that ruins human hair. They are not even lizards, which are reptiles. Salamanders are amphibians, a group of animals that is often misunderstood and overlooked.



# Salamander Ecology

## Just What Are Salamanders?

Salamanders are amphibians, a group of animals characterized by smooth, naked skin with no scales, feathers, or hair. There are three major groups of amphibians, consisting of over 5,700 species total. The least familiar of these are the caecilians, a tropical group of long, worm-shaped animals with no limbs. Much more familiar to people are the anurans, or frogs and toads. These animals are often seen near ponds and marshes and may be heard during the spring when male frogs make their presence known with mating calls. Salamanders belong to the final group of amphibians, the caudates. Salamanders do not make mating calls or any other vocalizations. They are often overlooked because of their silent and secretive nature.

## What Do Salamanders Look Like?

At first glance, salamanders look a lot like lizards, which are reptiles rather than amphibians. A salamander is long, slender, and has a tail that is often just as long as its body. On closer inspection, however, you will notice that salamanders lack the

claws, scales, and dry skin that are characteristic of reptiles. Salamanders have very moist skin with mucous-secreting glands that prevent them from drying out. This is important because some species are capable of breathing through their skin and need a constant layer of moisture to do so. Salamanders are unique from frogs and toads because they retain their tail through adulthood. Most species also have two forelimbs and two hindlimbs that aid in swimming and walking on land.

When some people think of amphibians, it brings to mind images of slimy, warty animals that are definitely not the most attractive creatures on earth. While there are a few unfortunate species out there that are described well by these words, salamanders are a group of animals that, while slimy, are by no means ugly. Many of Ohio's salamanders are small, delicate, and brightly colored. They may be green, brown, red, orange, or yellow, and they often have spots, stripes, or dots of varying colors such as blue, white, or black.



Figure 2. Salamanders are the most quiet and secretive of all Ohio's amphibians. Photo courtesy of Brian MacGowan.





Figure 3. The cave salamander is one of Ohio's brightly colored salamanders. Photo courtesy of Andrew Hoffman.

Diversity is apparent not only in the color of these creatures; salamanders vary greatly in size as well. The largest Ohio species, an aquatic salamander called the hellbender, measures up to 24 inches in length, whereas the smallest Ohio species, the four-toed salamander, measures a mere 3 inches. With the exception of the hellbender, Ohio salamanders range in size from 2.5–8 inches, depending on the species. In their juvenile stage, however, many salamander species are small enough to easily perch on the tip of your pinky finger!

### What's on a Salamander's Lunch Menu?

Spiders, worms, grubs, and insects are on the preferred breakfast, lunch, and dinner menus of salamanders. Salamanders are nocturnal predators, meaning they wait until the sun has set before they head out to find some grub. Aquatic salamanders and larvae will capture prey by opening their mouth suddenly and with enough force to 'suck' the prey in. Terrestrial (land-dwelling) species will capture prey with a quick snap of the jaws and a sticky tongue. The food is not chewed, but is often shredded by the teeth from sudden, jerking movements of the head before swallowing.

### Salamander Behavior

Adult salamanders don't eat very often; most of their time during the day is spent resting under rocks, in logs, underground, or underwater. At night, they search for prey under these same rocks, logs, and aquatic vegetation. During dry weather, salamanders remain under cover at night to prevent their skin from losing moisture—a potential cause of death. Fortunately, salamanders can survive extended periods without food, remaining safe and sheltered during dry conditions.

One advantage to remaining under cover is that it decreases the chance of being found by predators. If a salamander is detected, it may employ several defensive strategies depending on the species. The juvenile red-spotted newt is protected by harmful compounds secreted from its skin. This substance will deter most predators and in humans, may cause slight skin irritation. The red-spotted newt also engages in a defensive reflex called *unken posture* in which it bends its head and tail upward and curls its tail. In this position, the brightly colored underside of the newt is exposed as a warning. Other species may show defensive behaviors such as lashing the tail, or casting-off the





tail and regenerating it later, which is a common strategy of the four-toed salamander. The tail will hold the attention of the predator by continuing to wriggle after it is detached, allowing the salamander to escape.

Perhaps due to these survival strategies, as well as their secretive nature, salamanders can be very long-lived. Many salamanders live more than ten years, and many require at least three to four years before they are old enough to breed. There are some species, such as the aquatic hellbender, that can live as long as 30 years!

## A Salamander Is Born

### Operation Migration

So how does the life of a salamander begin? It often begins with a journey. For many salamander species such as the eastern tiger, marbled, and spotted salamanders, spring means journeying to ponds or vernal pools, which are temporary pools of water, to mate. Migration usually begins after dark, approximately one hour after the first spring rain when the temperature is above 40° Fahrenheit. The Jefferson salamander starts this journey a bit earlier, in December or January, and courtship for this species often takes place beneath layers of ice in vernal pools. Salamanders may travel up to one-half of a mile or more to reach a vernal pool or pond, although typical distances are shorter. Migration can be a dangerous time for salamanders; they risk being eaten by predators or being hit by cars. They



Figure 4. Most of a salamander's life is spent hiding under a log or rock.

are also at risk of desiccation if they get stranded in a dry habitat.

### Courtship

Several aquatic-breeding salamanders, such as the spotted salamander, participate in a nuptial dance called *Liebesspiel*. In these “love games,” up to hundreds of salamanders gather in the breeding waters where they swim, dive, and nudge one another with their noses. In species that breed on land, such as the redback salamander, the male and female engage in what is known as a tail-straddling walk. For other species, courtship means fanning their tails, walking together in a pinwheel motion, or nudging each other's tails.



Figure 5. Spotted salamanders like the ones seen here travel great distances to reach breeding pools where they mate and lay their eggs. Photo courtesy of Thomas P. LeBlanc (<http://monarchbfly.com>).

### Mommy Dearest

Salamanders, like all amphibians, lay eggs enclosed in soft, gelatinous envelopes. Salamander species differ greatly in when and where they lay their eggs and how much care they give their developing young. Depending on the species, salamanders can produce several hundred or fewer than a dozen eggs in a breeding season. In a few species, such as the hellbender, fertilization is external (occurs outside the female's body), and eggs are deposited in “nests.” These “nests” are protected by a toxic, gel-like membrane and are sometimes hidden and guarded by one of the parents. In most species, however, fertilization is internal (occurs inside







*Figure 6. This northern dusky salamander mother is protecting her eggs by curling her body around them. Photo courtesy of Andrew Hoffman.*

the female's body), and eggs are deposited singly in long strings or small clusters either underwater on twigs and leaves, or on land beneath logs and rocks. Although most salamanders leave their eggs undefended, some species are devoted parents. The female redback salamander ferociously guards her eggs from potential predators. In addition, secretions from her skin are rubbed onto the eggs to retard bacterial and fungal development. By contrast, the female red-spotted newt provides no care to her eggs but does wrap each one (of up to 400) in a leaf as it is laid!

### **Metamorphosis Please!**

Like frogs and toads, salamanders undergo metamorphosis, a transformation that involves a change in almost every part of the body. Most salamanders emerge from their eggs as aquatic larvae with large, feathery gills, much like tadpoles. The larvae breathe through gills and eat the small invertebrates

and snails that live in their aquatic environment. After anywhere from two weeks to three years (but usually two to six months depending on the species), the larvae lose their gills and develop lungs that enable them to breathe air. In salamanders that breed in vernal pools, lung development often occurs at about the same time as the vernal pools dry up, which is middle to late summer. The young salamanders then emerge from the water to begin the terrestrial, or land-dwelling stage of their life. For most species, these juveniles are now smaller versions of their adult form. However, there are exceptions. The red-spotted newt will remain in this terrestrial form for several years before undergoing a second and final metamorphosis into an adult that returns to the water to live, whereas the hellbender and mudpuppy live in the water their entire lives. Other species, such as the redback and ravine salamanders, lack an aquatic stage in their lifestyle because their young complete metamorphosis before hatching from the egg.





Figure 7. Northern dusky salamander with newly hatched young. Photo courtesy of Andrew Hoffman.

## Ohio's Salamanders

### Do I Have Salamanders on My Land?

If you are wondering whether a certain species of wildlife is present on your land, look at the available habitat. For any animal, habitat is where food, water, and shelter can be found throughout the year in adequate supply. In the case of salamanders, habitat can be a stream, river, vernal pool, pond, rocky wooded hillside, or even a combination of some of these features. For example, the spotted salamander requires vernal pools for breeding and egg-laying, but it spends the remainder of its time under a log or rock in a forest. Conversely, the habitat of the blue-spotted salamander includes wet prairies, where it likes to breed.

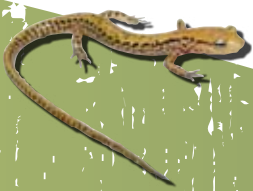
So if you are wondering whether you have salamanders on your land, maybe the better question to ask would be, "Do I have salamander habitat on my land?" Let's take a look at several different salamander habitats in Ohio and the species that can be found in them.

### Salamander Habitats

#### Flowing Water Habitats

Flowing water habitats include streams, creeks, springs, seeps, and rivers. Those that are spring-fed with a constant supply of cold water are preferred by salamanders. In these habitats, salamanders will often replace fish as the top predators. If predatory fish are present, however, salamanders will be preyed upon and out-competed for food.

There are 12 salamander species in Ohio that require flowing water habitat when young. Many of these species spend all or most of their adult life within or near water. In Ohio, the most common stream-dwelling salamanders are the northern dusky salamander, the northern and southern two-lined salamanders, and the longtail salamander. Other species that can be found in flowing water habitats are the streamside salamander, mountain dusky salamander, spring salamander, midland mud salamander, northern red salamander, cave salamander, eastern hellbender, and mudpuppy.





## ***Common Salamanders: Flowing Water***

### **Northern Dusky Salamander**

The northern dusky salamander varies in color and markings. Color ranges from yellowish brown to dark brown. Juveniles and young adults usually have a line running along the back from behind the head down to the tail and often have a line extending from each eye to the corner of the mouth. Their shape can also help to identify them; their hindlimbs are larger than their forelimbs. Northern dusky salamanders are found in the eastern and southern parts of Ohio, near wooded stream banks and underneath rocks, logs, and leaf litter. The female lays a cluster of 10 to 30 eggs under a rock or log near water in late July and stays with the eggs until they hatch in September.



*Figure 8. Northern dusky salamander. Photo courtesy of Brian MacGowan.*

### **Northern and Southern Two-lined Salamanders**

These two closely related species are small and range from bright yellow to yellow-orange to brownish yellow. They get their name from the two lines that extend from behind the eyes to the tip of the tail. The northern two-lined salamander is found in the northeast part of the state while the southern two-lined salamander is found in the southern part of the state. Northern and southern two-lined salamanders can be located on stream banks and in wet seeps, slumps, and wet woodlands where they will hide under rocks, logs, and leaves. Eggs are laid in May in a cluster submerged on the underside of a rock. Larvae hatch a month later and remain in the aquatic larval stage for two years.



*Figure 9. Northern two-lined salamander. Photo courtesy of Brian MacGowan.*

### **Longtail Salamander**

A slender species with long limbs and a long tail, the longtail salamander is light yellow to orange and adorned with dark brown or black spots. True to its name, the tail can comprise nearly two-thirds of this salamander's total length. Found in the eastern and southern parts of Ohio, the longtail salamander prefers wet, shaded streams with large, flat rocks. Breeding occurs in late autumn and early winter and the eggs are attached to the underside of a rock in the winter.



*Figure 10. Longtail salamander. Photo courtesy of Brian MacGowan.*



## Standing Water Habitats

Standing water habitats in Ohio include wetlands, vernal pools, bogs, swamp forests, oxbows, ponds, lakes, and wet prairies. A vernal pool located within or immediately adjacent to a forest is one of the best habitats for salamanders. A vernal pool is a body of water that will dry up at one point during the year. Typically, a vernal pool will hold water into July, which allows enough time for salamander larvae to complete metamorphosis. Many species that use these habitats also depend on the surrounding forest land to find food and shelter when they are not breeding. Terrestrial salamanders can also be found near vernal pools due to the moist conditions surrounding these areas.

Permanent ponds or lakes that hold water throughout the entire year can be suitable salamander habitat. However if predatory fish (bluegill or bass) are present, it is likely that salamander larvae will not survive. This is why, even in dry years, wetlands are preferred by most salamander species over permanent standing water sources. There are eight salamander species in Ohio that

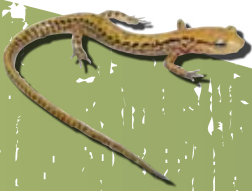
are dependent upon standing water habitats for breeding, egg-laying, and development of young. Common pond-breeding species in Ohio include the spotted salamander, smallmouth salamander, and red-spotted newt. Other species you might find in standing water habitats include the Jefferson salamander, blue-spotted salamander, marbled salamander, eastern tiger salamander, four-toed salamander, and mudpuppy.

### *Common Salamanders: Standing Water* Spotted Salamander

Up to eight inches long, the spotted salamander is distinctive. This salamander is thick-bodied and bluish-black to grayish brown in color with two rows of yellowish orange dots along the back. Found statewide in deciduous forests, the spotted salamander uses vernal pools for breeding in early spring, and it hides the rest of the year in underground burrows or rotten logs. Courtship, breeding, and egg-laying all occur underwater, where this species attaches its clusters of a hundred eggs or more to submerged twigs.



Figure 11. Spotted salamander. Photo courtesy of Andrew Hoffman.





### Smallmouth Salamander

Its short snout and lower jaw, which projects slightly beyond its upper jaw, distinguishes the smallmouth salamander from other species. This brown- to black-colored salamander is found mainly throughout the northern half of the state in deciduous and swamp forests. It breeds in vernal pools during the spring and spends the rest of the year hidden under logs, leaf litter, or in underground burrows. Like the spotted salamander, courtship, breeding, and egg-laying all occur underwater. Females attach small clusters of eggs onto twigs, leaves, or the pool bottom in early spring. After a few weeks—or longer following a cool spring—the eggs hatch, and the larvae complete metamorphosis by midsummer.



Figure 12. Smallmouth salamander. Photo courtesy of Andrew Hoffman.

### Red-spotted Newt

The red-spotted newt is found throughout Ohio but is more common in the South and the East. As this species matures, its appearance and habitat requirements change remarkably. The juvenile red-spotted newt, known as an *eft*, has bright red spots on a red-orange body, and it is terrestrial. The adult red-spotted newt is olive green with a row of red spots encircled in black along each side of its body, and it is mostly aquatic. The adults can be found in ponds, lakes, and slow-moving streams while efts are often found in forests surrounding these water sources. Females lay between 200 to 400 eggs in the spring, wrapping each egg in the leaf of an aquatic plant. The eggs hatch three to five weeks later, and the young newts spend the next three to four months in the water before emerging as efts. Newts remain

as efts for two to seven years before undergoing a second metamorphosis into their aquatic adult form. In some populations, no eft stage occurs. The red-spotted newt can live up to 15 years.



Figure 13. Red-spotted newt eft.



Figure 13.1. Red-spotted newt adult. Photo courtesy of Brian MacGowan.

### **Terrestrial Habitats**

Common terrestrial salamander species in Ohio include the ravine salamander, northern slimy salamander, and redback salamander. Species that are not as common are the green salamander and marbled salamander. Of these five salamander species, all can be found in forests. They often hide in the damp moss of rotting logs and stumps during the day, as well as under rocks. Rocky outcroppings and caves are also good habitats for terrestrial salamanders. These salamanders do not depend on a water source for breeding. The larval stage occurs



within the egg, and adults lack lungs. They breathe through their skin and the lining of their mouth. Eggs are laid underneath a stone or log, and the young hatch in adult form.

It is important to mention that many other species of salamanders also utilize forested habitats. Many species found in flowing water habitats and standing water habitats can also be found in the forested areas surrounding those water sources. They depend on the shelter and food resources the forest provides. In fact, the distribution of many Ohio salamanders coincides with the distribution of forest land in Ohio.

### ***Common Salamanders: Terrestrial*** **Ravine Salamander**

The ravine salamander is a slender salamander with one-half of its length consisting of its tail. This salamander is dark brown to black in color, with silver-white flecks. It is found in southern and eastern Ohio on forested hillsides and slopes where it hides beneath rocks and logs. Females lay eggs in the summer beneath rocks, where the larval stage is completed before hatching. Juvenile salamanders then remain hidden underground until the following spring.



*Figure 14. Ravine salamander. Photo courtesy of Brian MacGowan.*

### **Northern Slimy Salamander**

The northern slimy salamander is a large, black salamander that measures up to nine inches, with white spots covering its body. True to its name, this salamander will exude a white, gluey material from its skin glands, which is very difficult to remove when dry. The slimy salamander is found in the eastern and southern parts of Ohio on forested hillsides where it hides under logs and rocks. It is also found in rock crevices and in the openings of caves. Females lay eggs in the summer, attaching them to the underside of a rock. The larval stage is completed within the egg, and hatching occurs two to three months later.



*Figure 15. Northern slimy salamander. Photo courtesy of Andrew Hoffman.*





## Redback Salamander

This species may be confused with the ravine salamander in appearance, but the tail of the redback salamander is less than one-half of its body length. The redback salamander ranges in color from black to dark brown, and two color morphs are common. One morph has a broad, orange-red stripe extending down its back and onto its tail whereas the other morph lacks this stripe. It is this second color morph that closely resembles the ravine salamander. The redback salamander is found throughout the state in moist forests, especially on hillsides. It hides during the day beneath rocks, logs, fallen bark, and leaf litter. Eggs are laid in the summer within a rotting log, where the female will guard the 3 to 14 eggs until hatching. Like the ravine and northern slimy salamanders, the larval stage is completed within the egg.



Figure 16. Redback salamander. Photo courtesy of Brian MacGowan.

## How Can I See a Salamander?

The best time to see a salamander out and about is, unfortunately, when we are *not* out and about. Salamanders rarely venture out of their shelters during hot, dry weather, so we are not likely to run across them on a stroll through the woods on a sunny afternoon. Want to increase your odds of seeing a salamander? Aim to take those strolls through the woods on cool, rainy days with high cloud cover.

Along with the suitable weather conditions, timing is also very important when it comes to spotting salamanders. Early spring is an excellent time to catch large populations of spotted salamanders journeying to standing water habitats for courtship and mating. Likewise, it is also important to look for salamanders in the right locations. The habitats previously discussed are great places to search in spring and throughout the summer. Vernal pools are especially good in early spring. Don't forget also to search for egg masses and larvae of the species that breed in water. The size of egg masses will vary by species but for most, they will be fist-sized and oval-shaped. The eggs will be clear or opaque surrounded by a firm, gelatin-like membrane, and they are often attached to submerged vegetation. Salamanders are fascinating creatures to observe, and searching for them can be quite exciting. However, caution and care should be taken. Chemicals on our skin may irritate the absorptive skin of salamanders, so handling is discouraged. In addition, the skin secretions of some species—like the red-spotted newt—while not life threatening, can be irritating to our skin. Also, there are several species in Ohio that are endangered; handling these species is prohibited in order to protect them. When searching for salamanders in their habitats, be aware of your own personal safety as well as the protection of the habitat and the species dependent upon it.



# Management Options for Salamander Habitats

## Flowing Water Habitats

Flowing water habitats such as streams and rivers support a large number of salamander species in Ohio. Even some terrestrial salamanders depend on streams and the surrounding habitat to supply food and places to lay eggs. Several species, such as the hellbender and mudpuppy, spend their entire lives in streams or rivers. Perhaps the greatest threat to these habitats is degradation of the stream banks. This is often caused by the reduction of streamside vegetation, which serves to stabilize the bank and prevent erosion. Vegetation along stream banks also helps to reduce pollution runoff into the water. In short, a healthy stream bank will help protect water quality, which, in turn, will attract salamanders. To maintain healthy flowing water habitats, consider the following strategies.

### Management Strategies

- Avoid clearing natural vegetation along rivers and streams, as it prevents erosion, protects water quality, and provides habitat. A buffer of at least 50 to 100 feet is recommended; the wider the better.
- In order to protect water quality, try to avoid the use of chemicals such as herbicides within the vegetative buffer. When necessary, such as to control invasive plant species, always read and follow label instructions before applying any herbicide.
- Consider leaving woody debris—such as logs and branches—that falls into the stream. As long as the debris does not substantially decrease water flow, it can provide additional habitat for salamanders and the aquatic insects they prey on.
- To catch runoff, consider planting grass filter strips or creating a hold pond between agricultural fields and streams.



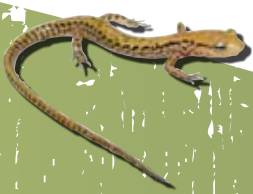
*Figure 17. Streams with rock bottoms like this one are excellent habitats for the eastern hellbender. Can you spot one in the picture? (Look toward bottom left.) Photo courtesy of J. Humphries.*

## Standing Water Habitats

Vernal pools are one of the most threatened yet important habitats for salamanders and other species of amphibians. Such wetlands once dotted much of the midwestern landscape. Over the years, many of these and other wetlands have been lost due to draining, ditching, and tilling the land for agricultural and urban development. Therefore, it is very important to protect and restore those wetlands that are remaining. If you are fortunate enough to have a vernal pool, marsh, or other type of wetland on your land, there are management strategies you can implement to enhance this habitat. Because certain activities pertaining to wetlands require a permit, contact the Army Corps of Engineers to make sure your plans do not require documentation.

### Management Strategies

- Resist the temptation to clean up around vernal pool habitats. Leave trees, bushes, and understory vegetation, as well as brush, logs, and dead trees as a buffer.





- Many salamander species require upland habitat beyond the wetland buffer. Plant or protect native plants and trees at least 500 feet around your pond to provide this habitat. Vegetation will also help protect water quality.
- In areas with more than one pool, try to maintain travel corridors of natural vegetation between them. If habitat alterations are necessary, conduct these activities between November and March when amphibians are less likely to be present.
- By restoring and maintaining your vernal pool, you are also providing habitat to many other species of wildlife such as frogs, turtles, snakes, birds, and dragonflies.



*Figure 18. A forest wetland such as this can be a great habitat for salamanders.*

## Terrestrial Habitats

Most of the terrestrial salamanders in Ohio can be found in forested habitats that contain features such as streams, vernal pools, rocky outcrops, and caves. In the Midwest, forestland was once continuous. After years of development, the forestland that remains is often highly fragmented. Making these areas suitable habitat for salamanders does not mean limiting use of these forests but suggests proactive steps when developing management plans. There are strategies that can provide habitat to forest salamanders while still achieving other forest management goals.

## Management Strategies

- Avoid fragmenting woods into smaller sections through careful placement of roads, barriers,

and crop fields. When splitting woods is unavoidable, maintain a connection to woodlots with fencerows or other uncultivated areas.

- Minimize disturbance to valuable habitat features such as vernal pools or stream banks within the forest.
- If you are harvesting timber, consider selective cutting rather than clearcutting. Selective cutting leaves a portion of the canopy and ground cover intact, which provides shade and cover to salamanders.
- Minimize disturbances to soil and vegetation by conducting your harvest when soil conditions are frozen or firm enough to support the equipment being used.
- Consider leaving fallen woody debris—such as logs—and other forest attributes—such as rocks. These features will provide shelter for many salamanders.
- If chemical treatments are unavoidable, consider methods such as banding or spot treatments rather than broadcasting, and use them outside of buffer areas around wetlands and streams.



*Figure 19. There are little things you can do within your forest, such as leaving woody debris on the forest floor, that make a big difference to salamanders.*



## Conservation of Salamanders

Salamanders are a valuable part of the food web, both as predators and as prey. As predators of insects and other small invertebrates, they influence ecosystem processes such as decomposition. As prey, they provide food for other animals such as birds, snakes, foxes, shrews, voles, frogs, and fish. From a human perspective, the presence of salamanders has no known negative impacts, but they can be used as indicators of ecosystem health and integrity. For example, having salamanders in your stream is an indicator of good water quality.

The main threats to salamanders are disease, pollution, habitat loss, and introduced species. Pollutants, including herbicides and pesticides, are easily absorbed into the delicate skin of salamanders. Carnivorous fish introduced into ponds pose another threat to salamanders; these fish can devour young and adult salamanders. Disease is also a potential killer; there has been an outbreak over the past decade of a waterborne fungus that causes a deadly disease (chytridiomycosis) in amphibians. Frogs are the main victims of this disease, but some species of salamanders have become infected as well. The biggest threat to salamanders, however, is habitat loss. Loss can occur through wetland filling and draining, destruction of forest habitat, or stream channelization and scouring. The removal of trees bordering streams can also harm salamanders. While it is sometimes necessary to remove trees in order to maintain a healthy stream bank, excess removal can result in an increased amount of silt in the water due to erosion, raised water temperatures caused by lack of shade, and limited foraging opportunities for salamanders.

### State Endangered Salamanders

There are four state endangered species of salamanders in Ohio: the eastern hellbender, the blue-spotted salamander, the green salamander, and the cave salamander. A species is endangered when the state population is in danger of extirpation. Extirpation occurs when a species that is native to

the state is no longer present due to one or more causes such as habitat loss, pollution, predation, competition, or disease. There is also one threatened salamander species in Ohio: the midland mud salamander. A species is listed as threatened when its population numbers are not in immediate jeopardy; however, it will become endangered if it faces continued or increased stress. The four-toed salamander is the only species listed as a “species of concern” in Ohio. This means that with increased stress, the species could be listed as threatened.

### Eastern Hellbender

The largest North American salamander, the eastern hellbender is known to reach over two feet in length. This species is fully aquatic and is usually brown in color but may be green, red, or yellow. Hellbenders live in medium to large, cool, swift-flowing streams with large, flat rocks. They breed in September when males build nests underneath rocks or logs. The males then lead the females to the nests for egg-laying. The males then guard the 300 to 400 eggs until they hatch two to three months later. Hellbenders feed mainly on crayfish but will also eat small fish, invertebrates, and other salamanders. They also prey on weak and diseased fish, allowing the strong and healthy fish to grow. Because hellbender populations need clean, oxygen-rich water, they can be a good indicator of water quality and overall stream health.



*Figure 20. Eastern hellbender. Photo courtesy of J. Humphries.*

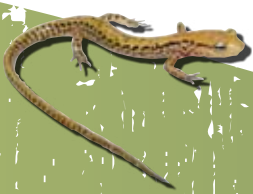






Figure 21. Green salamander. Photo courtesy of Andrew Hoffman.

### Green Salamander

The green salamander is perhaps the most habitat-specific salamander in Ohio. It requires limestone and sandstone rock outcroppings, preferably in forested areas where the trees protect the rocks from direct sunlight and rain. On occasion, one can be found on a tree near these rock formations. Green salamanders live within the rock crevices, coming out only at night to search for invertebrates crawling about the rock surfaces.

With distinctive green and black mottling on their backs and a brown to grey belly, these colorful salamanders are difficult to confuse with any other

species and are the only green salamander in Ohio. They have a flat head and body, which helps them squeeze between and move about in narrow rock crevices. Courtship, breeding, and egg-laying all occur on the surface of the rock outcroppings in June. The female first deposits the eggs in a moist crevice. She then attaches them to the roof of the crevice via a process that can last as long as thirty hours. During the next three months, the female will protect the eggs—at times, aggressively—until they hatch. Green salamander populations are threatened by tree removal around rock outcroppings, which can cause increased temperatures and evaporation within crevices and on rock surfaces.



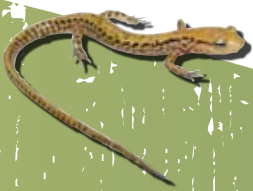


*Figure 22. The brightly colored midland mud salamander is threatened in Ohio. Photo courtesy of Andrew Hoffman.*

## **Now You Have Gotten to Know Salamanders**

Salamanders are a fascinating group of animals that can be quite abundant when habitat is suitable. They may even be one of the most common species in your woodlot! If you are fortunate enough to have suitable habitat for them on your land, enjoy knowing they are there; if you are ambitious, search for them. Remember, the best time to see salamanders is during breeding season in the spring.

Salamanders are becoming symbols of Ohio's best qualities. They provide us with unique educational opportunities as well as the need to protect the quality wetlands that are a part of Ohio's natural heritage. If you would like to take part in the conservation of salamanders, get involved with your local conservation organizations and other interested individuals.





# Ohio Salamander Sizes, Habitats, and Distribution

	Total Length (inches)	Flowing		Standing		Terrestrial		Ohio Distribution*										
		Water Habitat	Water Habitat	Water Habitat	Habitat	Habitat	N	E	S	W	C	NE	NW	SE	SW			
Blue-spotted Salamander	4-6		●	●		●										●		
Cave Salamander	4-6	●			●													●
Eastern Hellbender	11.5-24	●				●	●	●							●			●
Eastern Tiger Salamander	7-8.25		●		●											●		●
Four-toed Salamander	2-3		●		●											●		●
Green Salamander	3.25-5				●										●			
Jefferson Salamander	4.5-7		●		●											●		●
Longtail Salamander	4-6.5	●			●											●		●
Marbled Salamander	3.5-4.5		●		●											●		●
Midland Mud Salamander	3.5-6	●														●		
Mountain Dusky Salamander	2.75-4	●			●											●		
Mudpuppy	8-13	●			●											●		●
Northern Dusky Salamander	2.5-4.5	●			●											●		●
Northern Two-lined Salamander	2.5-3.75	●			●											●		
Northern Red Salamander	4.25-6	●														●		●
Northern Slimy Salamander	4.75-6.75		●															●
Ravine Salamander	3-4.5				●													●
Redback Salamander	2.25-3.5				●													●
Red-spotted Newt	3-4				●													●
Smallmouth Salamander	4.5-5.5		●		●													●
Southern Two-lined Salamander	2.5-3.75																	●
Spotted Salamander	6-7.75		●		●													●
Spring Salamander	4.75-7	●			●													●
Streamside Salamander	4.5-5.5	●			●													●

\* ● = state endangered ● = rare ● = common



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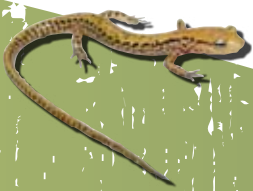
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# Notes



