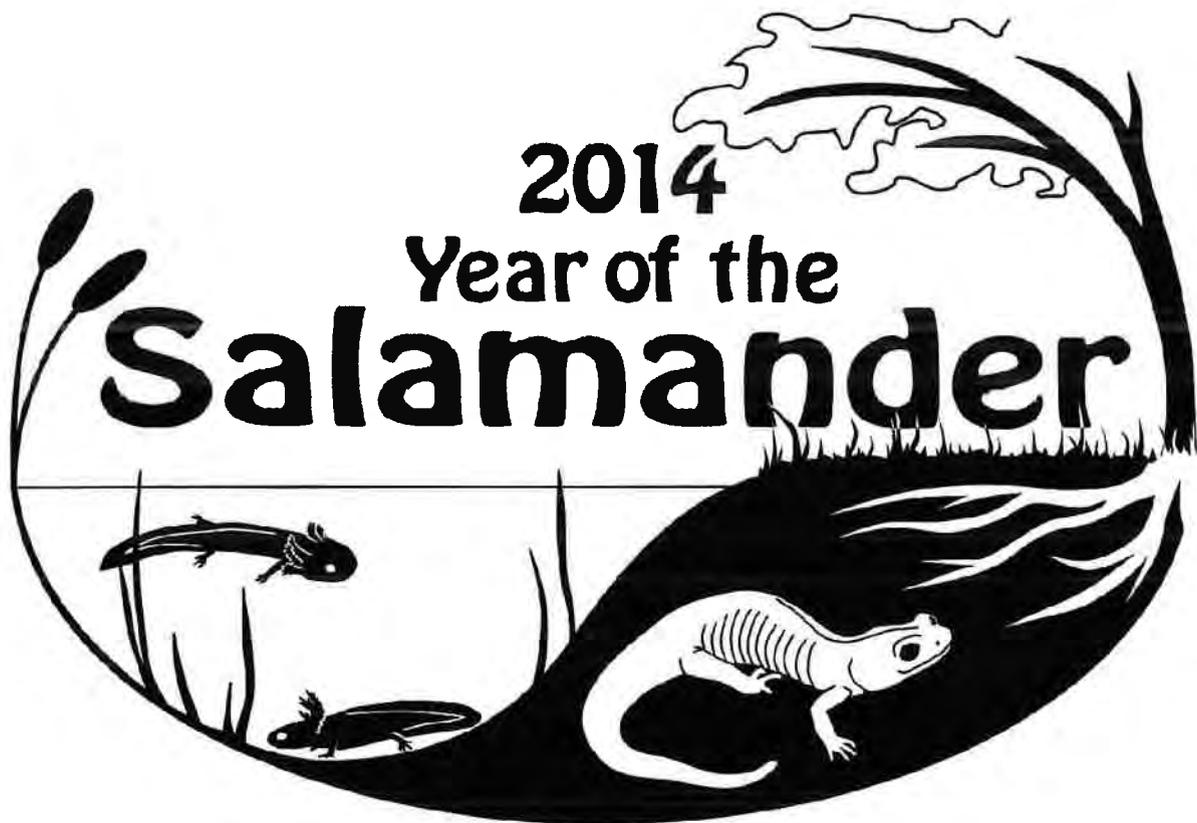


# Year of the Salamander Program Materials



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



Thank you for supporting PARC's Year of the Salamander campaign. In this booklet you will find a variety of ideas for hosting salamander programs throughout the year. Consider doing programs at your local library, senior center, scout group, school, or other organization. Combine the activities in this booklet to host a Salamander Day. Consider doing an education and craft component for younger students. Please don't hesitate to contact me if you have any questions or need help with ideas. If you do a program, please fill out a presentation report and return it to me – It will help us track how effective our programming is.

Thanks!

Carrie Elvey, Naturalist  
The Wilderness Center  
Wilmot, OH

[www.wildernesscenter.org](http://www.wildernesscenter.org)

330-359-5235

[carrie@wildernesscenter.org](mailto:carrie@wildernesscenter.org)



**THE WILDERNESS CENTER**  
*a non-profit nature center*

## Table of Contents



### Presentation Report Form

### Teacher Resources

Slide Show script – Year of the Salamander

Slide show slides – visit [www.yearofthesalamander.org](http://www.yearofthesalamander.org) to download the slide show

Jewels of Appalachia Poster

Salamander Fun Facts Poster - *COMING SOON (PLEASE CHECK BACK)!*

Saving Salamanders Poster - *COMING SOON (PLEASE CHECK BACK)!*

### Crafts

**Salamander Face Painting**

Craft Stick Salamanders

Salamander Armband – National Wildlife Federation

YoSal coloring pages

Salamander Paper Craft – Ducks Unlimited Canada

### Activities/Lesson Plans

Curriculum Enhancement Activities for [The Salamander Room](#) by Anne Mazer – Carrie Elvey

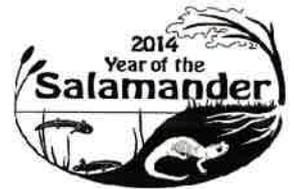
Soak it Up: Amphibian Skin – Association of Zoos and Aquariums

Back to the Pond: Habit Fragmentation – Amphibian Alert

Lost Your Marbled Salamanders Board Game - Amphibian Alert

Clay Salamanders Predation Study – Carrie Elvey

Be sure to check [www.yearofthesalamander.org](http://www.yearofthesalamander.org) for more lesson plans (especially for older students), videos, and other educational resources.



## Presentation Report Form

Name(s):

Affiliation:

Date of Program:

Program Location:

Number attending:

Age range of attendees:

Program Length:

Please describe program (slide show, crafts, touch table, etc):

Comments:

Thank you so much for being part of Year of the Salamander!

Please return this form to Carrie Elvey at The Wilderness Center, PO Box 202, Wilmot, OH 44689 or [carrie@wildernesscenter.org](mailto:carrie@wildernesscenter.org)



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



## Year of the Salamander Slide Show Script

1. **Welcome to the Year of the Salamander program.** Partners in Amphibian and Reptile Conservation (PARC) is working hard this year to raise awareness about salamanders and their important role in our world. (Introduce yourself and the host organization). Today we will talk about how salamanders live and interact with their environment, as well as some challenges and successes in salamander conservation.
2. **There are over 600 species of salamanders, all of which are carnivorous.** North America is home to over 150 of these species. With long bodies, tails, and front and rear limbs, salamanders look similar to lizards but are amphibians, not reptiles with claws and scales. They can regenerate limbs and some have tails that may fall off during attack, allowing them to escape. A few species, such as the Two-toed Amphiuma, have vestigial limbs and may be mistaken for eels.

(Images from upper right-hand corner going clockwise: Red-spotted Newt [*Notophthalmus viridescens viridescens*]; Two-toed Amphiuma [*Amphiuma means*]); Blue-spotted Salamander [*Ambystoma laterale*])

3. **Salamanders require a moist environment to survive and can be found in temperate climates.** Most are semi-aquatic or aquatic in nature. Their skin is permeable to water and gas exchange. Some adult salamanders have lungs, some have gills, while others have neither and breathe directly through their skin.

(Image: Northern Two-lined Salamander [*Eurycea bislineata*])

4. **The skin of a salamander is kept moist by a layer of mucus.** This important discharge aids in protecting them against infection while also reducing friction when in water. It also makes them difficult to grab. Special glands produce toxins of varying levels of toxicity in the skin. These are usually harmless to humans that pick them up but may cause skin irritation and can be lethal if ingested.

(Image: Top: Black-bellied Salamander [*Desmognathus quadramaculatus*]; Bottom: Alpine Newt [*Ichthyosaura alpestris*])

5. **How well a salamander sees varies among species.** Most salamanders have eyes adapted for night vision. Terrestrial salamanders may have flatter lens that allow for better peripheral vision while semi-aquatic species often have shorter ranges on land and

longer in water. Cave dwelling species may have no eyes or eyes that are underdeveloped and covered with a layer of skin. Salamander sight is trichromatic color vision, like humans, but extending into the ultraviolet range.

(Image: Eastern Tiger Salamander [*Ambystoma tigrinum*])

6. **Salamanders do not have external ear openings**, although they do have an opercularis system in the middle ear similar to that of frogs. This system is used to detect low frequency vibrations to warn the animal of an approaching predator.

(Images: Left: Mole Salamander [*Ambystoma talpoideum*]; Right: Fire Salamander [*Salamandra salamandra*])

7. **Salamanders lay shell-less eggs, lacking the hard shells of birds and reptiles that retain moisture.** To compensate, some species attach their eggs to plants under water while others lay their eggs in moist locations nearby, guarded by the mother. Like other amphibians, many salamander species, such as the southern two-lined salamander, hatch from eggs into larvae, with gills and initially no limbs. The limbs develop as the larvae grow. Several species, like the Green Salamander, do not have a larval stage and develop fully formed.

(Images from top left, clock-wise: Green Salamander [*Aneides aeneus*]; Jefferson Salamander Eggs [*Ambystoma jeffersonianum*]; Green Salamander [*Aneides aeneus*]; Southern Two-lined Salamander larvae [*Eurycea cirrigera*])

8. **What good are salamanders? Salamanders, like all other species, are an important part of their native ecosystems.** Salamanders are both predator and prey - thus an important part of food webs. They feed on insects, spiders, worms, snails, and in turn are prey for fish, reptiles, larger amphibians, birds, and some larger invertebrates like crayfish or giant water bugs. Removing salamanders from the food-web can lead to the changes in other animal populations which can often result in degraded or altered environments.

(Image: Eastern Long-tailed Salamander [*Eurycea longicauda longicauda*])

9. **The ability of salamanders to regenerate limbs has sparked the interest of scientists.** Scientists are trying to identify the conditions required for this ability. The goal is to develop a way to aid humans that have lost limbs or suffered spinal cord damage, or to speed the healing process.

(Image: Blue Ridge Two-lined Salamander [*Eurycea wilderae*])

10. **Salamanders are a great tool for teaching people the value of conservation.** Children are often curious about salamanders and can have great fun exploring their environment in search of them. Salamanders used in educational displays can give people an

opportunity to observe, touch, and interact with an animal they don't get to see every day. This creates a fantastic environment for people to learn more about and appreciate the value of these species.

(Images top left clock-wise: Hellbender [*Cryptobranchus alleganiensis*]; Spotted Salamander [*Ambystoma maculatum*]; Spotted Salamander [*Ambystoma maculatum*])

- 11. Salamanders are very aesthetically appealing, with a variety of patterns and colors.** Some display their toxicity with bright spots or stripes while others blend in perfectly with their environments, a beautiful display of camouflage.

(Images from top clock-wise: Alpine Newt [*Ichthyosaura alpestris*]; Four-toed Salamander [*Hemidactylium scutatum*]; Red-spotted Newt [*Notophthalmus viridescens viridescens*]; Jemez Mountains Salamander [*Plethodon neomexicanus*])

- 12. Salamanders have intrinsic value, meaning they are important just because they are,** because they belong here like all other species on our planet, and we, as fellow animals, do not have the right to be a part of their decline. Salamander species deserve to flourish just as all other species do, as part of their natural habitat.

(Image: Fire Salamander [*Salamandra salamandra*])

- 13. Salamanders make great indicators of the health of their environments.** Since their skin and eggs are so permeable, they are highly susceptible to pollution and often one of the first species to suffer from degrading habitat. If water quality is poor, you will not find salamanders there.

(Images: Top: Eastern Red-backed Salamander [*Plethodon cinereus*]; Bottom: Hellbender [*Cryptobranchus alleganiensis*])

- 14. Salamanders can also be indicators of global climate change.** A study in Yellowstone National Park has shown a drastic decline in salamanders. The culprit? Wetlands that are shrinking, some drying up completely due to changing precipitation patterns and temperatures. In 1992, 46 ponds were studied and 43 were found to have salamander populations. By 2006, only 38 of those same ponds even contained any water during the summer and only 21 were found to have salamanders. During the study, scientists witnessed firsthand four wetland communities dry up within days, too quickly for larvae to complete metamorphosis.

(Images from top left clock-wise: Southern Two-lined Salamander [*Eurycea cirrigera*]; Red-spotted Newt [*Notophthalmus viridescens viridescens*]; Eastern Long-tailed Salamander [*Eurycea longicauda longicauda*]; Sierra Newt [*Taricha torosa sierrae*])

- 15. What threatens salamanders?** Like most species, salamanders suffer from loss and fragmentation of habitat. Salamanders need wetlands to live and breed, but these areas are often filled in to build homes or businesses. Many salamanders also rely on upland forest habitats. Certain forest harvest practices use heavy equipment that can damage the

delicate forest floor ecosystems necessary to salamanders. Construction of roads, parking lots, and developments can result in a loss of cover and create physical barriers, making these animals susceptible to being stepped on or run over by vehicles. Road runoff such as road salts and oils pollute nearby wetland breeding sites.

(Both images: Spotted Salamander [*Ambystoma maculatum*])

- 16. There is a lack of public awareness.** In certain parts of the globe it is common for salamanders to be used for fishing bait for species such as bass, while other people intentionally hurt salamanders without regard for their intrinsic value as living beings. And in some cases, some people may not realize the harm they can cause. Picking up a salamander with chemicals on your skin, such as sun screen or bug spray, can cause great damage to these sensitive animals, while the movement of people from one wetland to another without taking strict precautions can transmit disease or deadly fungus from one area to another.

(Image: Spring Salamander [*Gyrinophilus porphyriticus*])

- 17. An example of a salamander conservation success story can be found at the Saint Louis Zoo in Missouri.** Only two months after the U.S. Fish and Wildlife Service granted the Ozark Hellbender salamander species protection under the Endangered Species Act, 185 juveniles were hatched in a first-ever successful attempt to breed the species in captivity. With less than 600 in the wild, an additional 185 individuals greatly increases their population while also giving hope to future accomplishment.

(Image: Top: Eastern Hellbender [*Cryptobranchus alleganiensis alleganiensis*]; Bottom: Hellbender [*Cryptobranchus alleganiensis*])

- 18. What can you do?** Join a salamander conservation group, don't collect salamanders from the wild, report your salamander sightings, create habitat, volunteer for amphibian "Big nights" when they migrate across roads to their breeding ponds, and most importantly, educate yourself and spread the word to friends, co-workers, and family.

(Image: Three-lined Salamander [*Eurycea guttolineata*])

- 19. Thank you for your interest in Year of the Salamander.** To learn more, follow YOS on Facebook, or log onto the website to get updates and download YOS monthly newsletter and calendar.

(Image: Marbled Salamander [*Ambystoma opacum*])



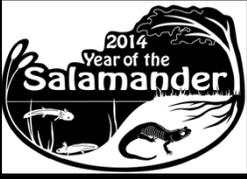




## What can you do?

-  Become a member of a salamander conservation group
-  Don't collect salamanders from the wild
-  Report your observations to a Natural Heritage Program
-  Work to create or protect salamander habitats in your neighborhood
-  Get involved in a local Big Night event
-  Educate yourself and spread the word!



[Yearofthesalamander@gmail.com](mailto:Yearofthesalamander@gmail.com)

# Jewels of Appalachia



The Appalachian region of the United States is home to 14% of the world's salamander species.

Of the over 70 species of salamanders in this region, nearly half are found nowhere else on earth.



The Appalachian Mountains provide essential habitat for salamanders, a group already facing threats such as climate change, pollution, and disease. Protecting the unique biodiversity hotspot of the Appalachians will be crucial to giving these creatures a fighting chance.



Visit [www.yearofthesalamander.org](http://www.yearofthesalamander.org) for more information

## Year of the Salamander Face Painting Activity

Examples of **5 northeastern salamander face painting designs** are included, along with a **fact card** for each that can be given to kids based on the species they choose. Fact cards could be strung on embroidery floss or other inexpensive string to wear around the kids' necks (better chance of being read and shared with people who ask what's on their faces!).

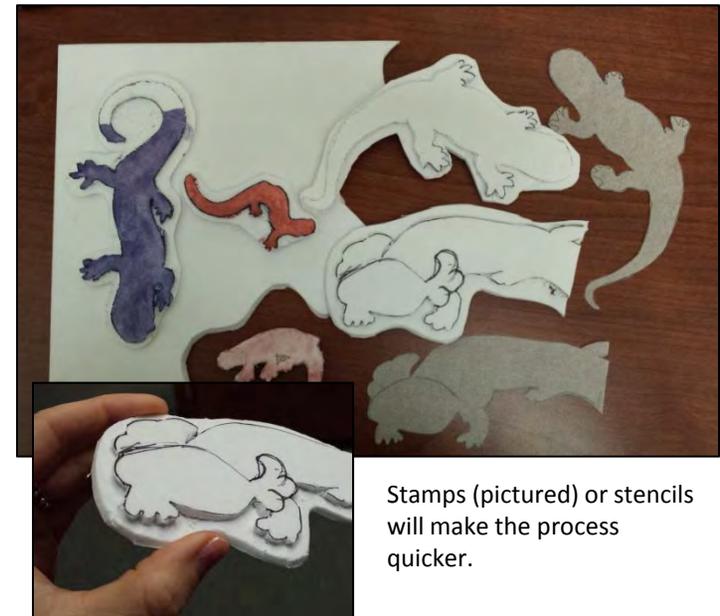
Print the sample faces and tack them to a display board at your event, for your little customers to choose from. Blank girl & boy face templates are included so you can create more choices if you want.

### Basic Supplies for Face Painting:

- Face paints (kits like these are good: <http://www.snazaroo.com/store/> - can be found at craft stores like Michael's)
- Fine paintbrushes
- Liner brushes or "script brush" for outlines and finer details – really gives a nice finishing touch
- Foam makeup wedges (sold by the bag) for filling in wider areas – optional
- Palette or plate for mixing paints
- Small cup or dish of water for rinsing paintbrushes, plus extra water for refreshing (depending on where your event is, you may also want to bring a disposal jug for the yucky water)

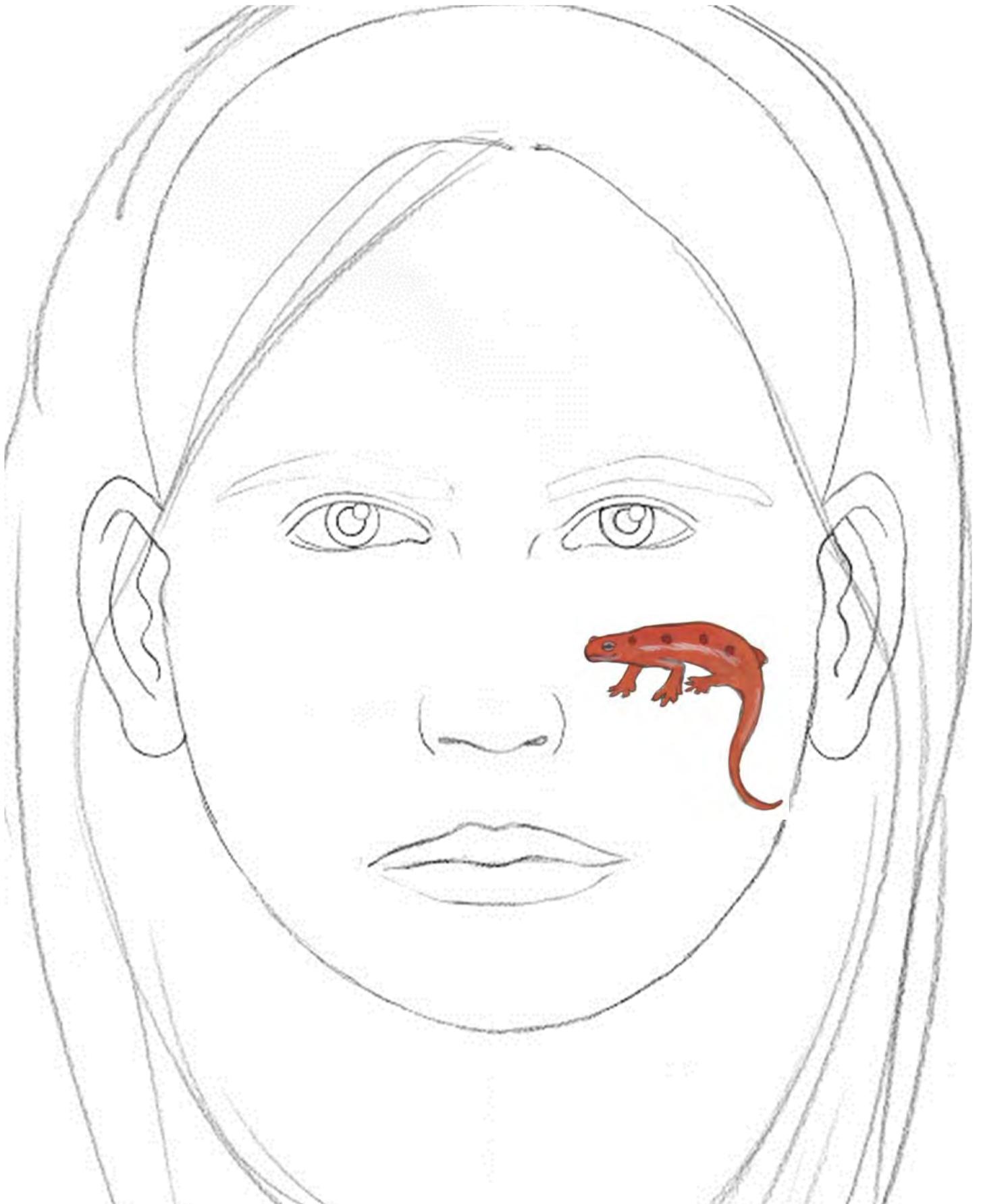
### Other Preparations & Notes:

- If you don't trust your speed or artistic skills, make stencils or stamps ahead of time to give you a quick outline of the animals. To make stamps (shown at right), cut out each salamander design, flip them upside-down\*\* and trace their outlines onto quarter-inch foam board (from arts/crafts store). On the foam board, cut about 1/4" wider than the shapes, leaving a border for handling them. Then use a knife or whittling tool to carve around the animals so that their shapes are raised above the border. Apply paint to the stamp and transfer to a child's face, then use paintbrushes to add finer details.
- \*\* Right-handed painters will find it easier for the design to go on the right side (i.e. kid's left cheek, as shown in the templates) for less nose & mouth interference! So flipping the design upside-down when tracing onto the foam board will produce a stamp for the right side, just like the template.
- Salamander paintings could also be done on the shoulder, arm, or hand.
- PRACTICE ahead of time so you know your supplies work and you can crank these paintings out in just a couple minutes.

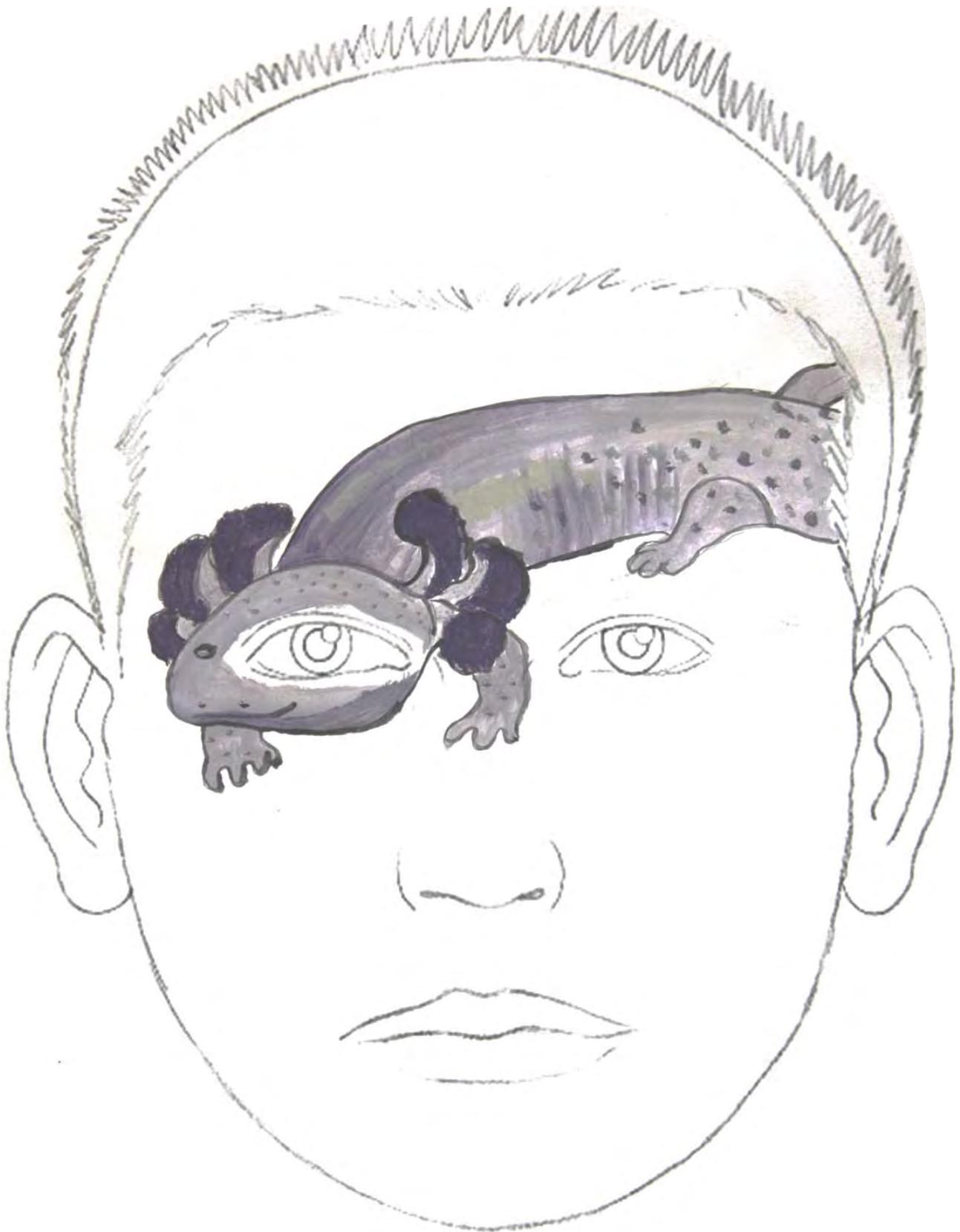


Stamps (pictured) or stencils will make the process quicker.

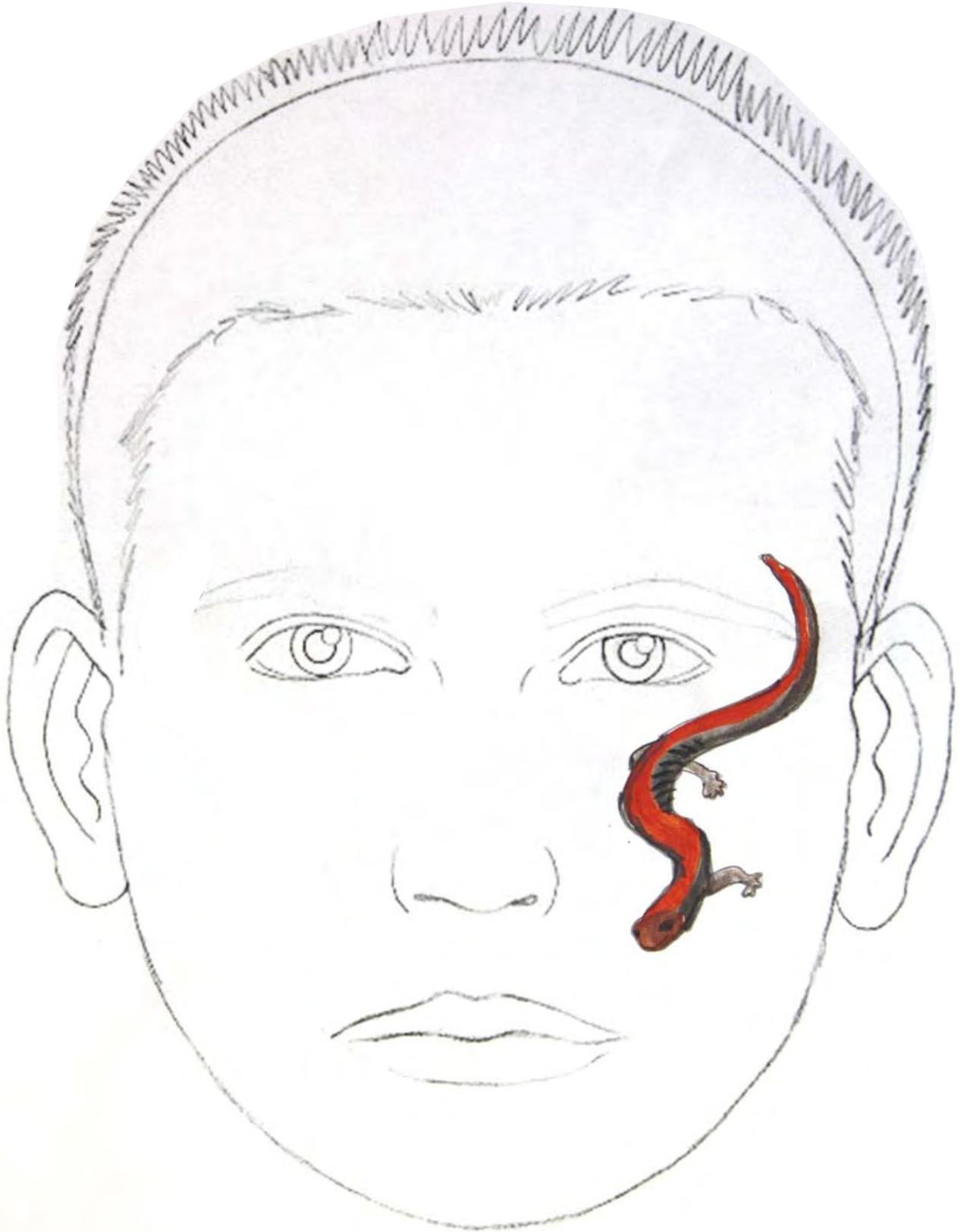
# Red-spotted Newt



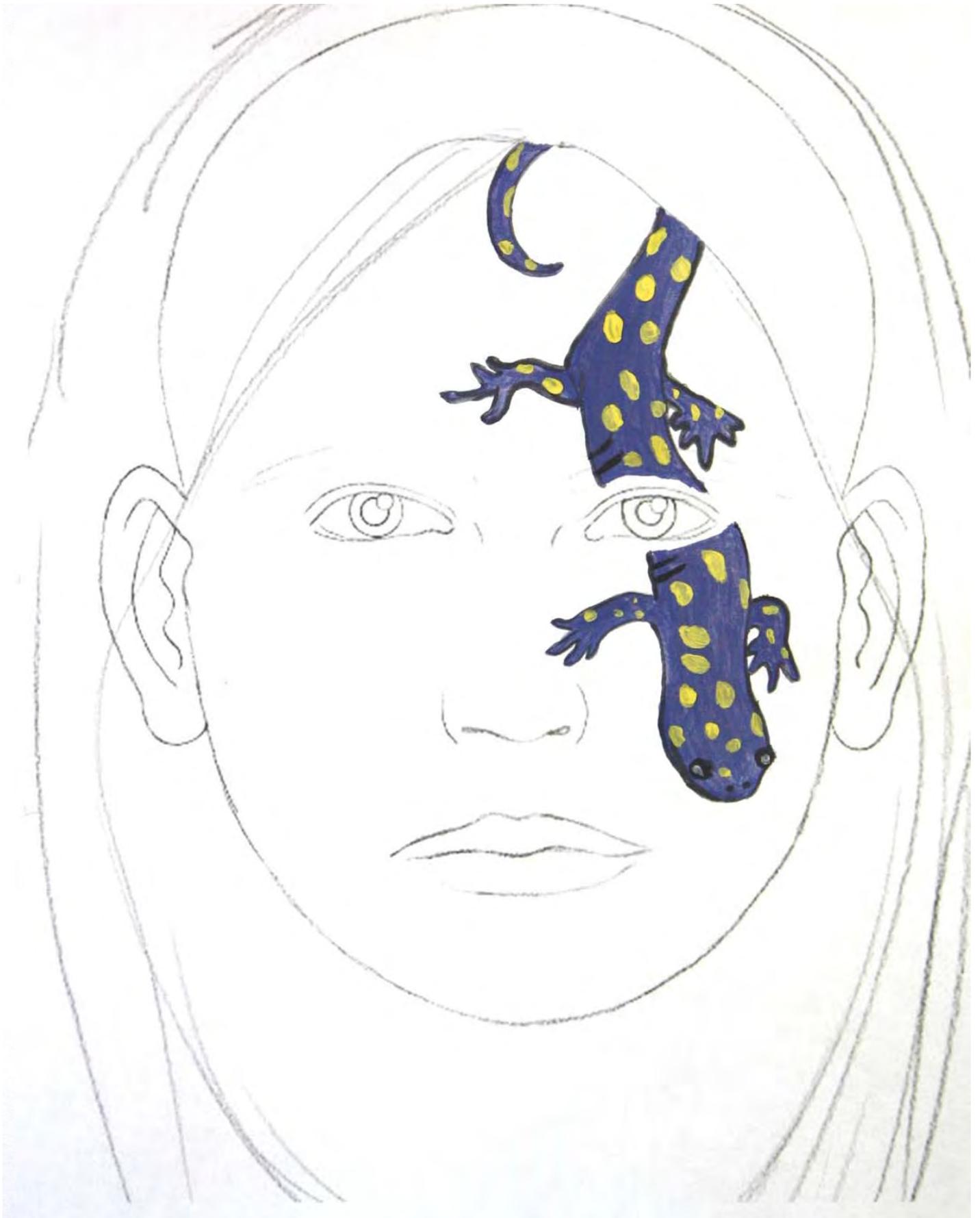
Mudpuppy



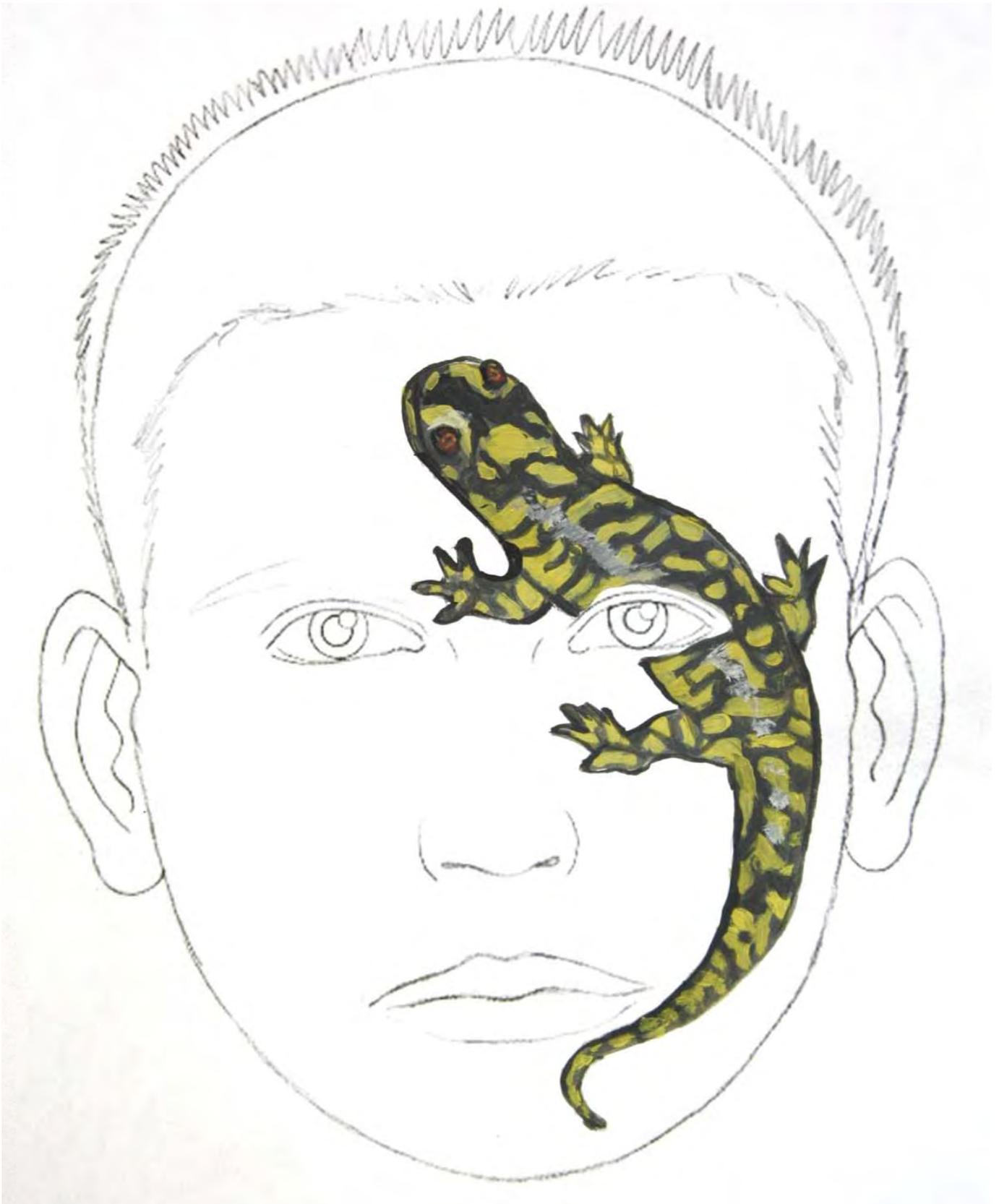
# Red-backed Salamander



Spotted Salamander



# Tiger Salamander





Salamanders are amphibians. They live in moist places and have smooth, damp skin that helps them to breathe. If you find a salamander, that's good news! It means *the environment is clean and healthy*. Salamanders also keep bugs like mosquitoes and beetles in check and in turn serve as food for animals like owls, turtles, songbirds, and bears. Not to mention, *they add more color and wonder to our world!*

Happy Year of the Salamander!

[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



Salamanders are amphibians. They live in moist places and have smooth, damp skin that helps them to breathe. If you find a salamander, that's good news! It means *the environment is clean and healthy*. Salamanders also keep bugs like mosquitoes and beetles in check and in turn serve as food for animals like owls, turtles, songbirds, and bears. Not to mention, *they add more color and wonder to our world!*

Happy Year of the Salamander!

[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



Salamanders are amphibians. They live in moist places and have smooth, damp skin that helps them to breathe. If you find a salamander, that's good news! It means *the environment is clean and healthy*. Salamanders also keep bugs like mosquitoes and beetles in check and in turn serve as food for animals like owls, turtles, songbirds, and bears. Not to mention, *they add more color and wonder to our world!*

Happy Year of the Salamander!

[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



Salamanders are amphibians. They live in moist places and have smooth, damp skin that helps them to breathe. If you find a salamander, that's good news! It means *the environment is clean and healthy*. Salamanders also keep bugs like mosquitoes and beetles in check and in turn serve as food for animals like owls, turtles, songbirds, and bears. Not to mention, *they add more color and wonder to our world!*

Happy Year of the Salamander!

[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



Salamanders are amphibians. They live in moist places and have smooth, damp skin that helps them to breathe. If you find a salamander, that's good news! It means *the environment is clean and healthy*. Salamanders also keep bugs like mosquitoes and beetles in check and in turn serve as food for animals like owls, turtles, songbirds, and bears. Not to mention, *they add more color and wonder to our world!*

Happy Year of the Salamander!

[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



Salamanders are amphibians. They live in moist places and have smooth, damp skin that helps them to breathe. If you find a salamander, that's good news! It means *the environment is clean and healthy*. Salamanders also keep bugs like mosquitoes and beetles in check and in turn serve as food for animals like owls, turtles, songbirds, and bears. Not to mention, *they add more color and wonder to our world!*

Happy Year of the Salamander!

[www.yearofthesalamander.org](http://www.yearofthesalamander.org)



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)

Prepared by MacKenzie Hall,  
Conserve Wildlife Foundation of NJ



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)

Prepared by MacKenzie Hall,  
Conserve Wildlife Foundation of NJ



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)

Prepared by MacKenzie Hall,  
Conserve Wildlife Foundation of NJ



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)

Prepared by MacKenzie Hall,  
Conserve Wildlife Foundation of NJ



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)

Prepared by MacKenzie Hall,  
Conserve Wildlife Foundation of NJ



[www.yearofthesalamander.org](http://www.yearofthesalamander.org)

Prepared by MacKenzie Hall,  
Conserve Wildlife Foundation of NJ



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

Ruff! Some people call me "waterdog" because of my squeaky bark. Did you know that most salamanders have no voice at all? That's ruff! I spend my whole life underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I'm one of the biggest salamanders in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Pierson Hill

Hello! I'm an: Eastern

Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

Have you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the most common animals in the forest. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...red backs. Want to know something else cool? We breathe through our skin; we have no lungs at all! Next time you're in the woods, send a friendly vibe. I'll be nearby!



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most abundant salamanders in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with thousands like me as we journey to small wooded pools to breed. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, please hit the brakes! I've got eggs to lay!



© Kevin Jamieson

Hello! I'm an: Eastern

Tiger Salamander

Scientific name:

*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

Tiger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm fossorial.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© stevendavidjohnson.com

Hello! I'm a:

Red-spotted Newt

Scientific name:

*Notophthalmus v. viridescens*

Size: up to 5" long

Lifespan: 12-15 years

Look closely (and step carefully!) on rainy days – that's when I like to crawl through the forest hunting for things to eat, like bugs, worms, and slugs. My bright orange skin isn't the greatest camouflage, but that's OK. It warns other animals that I'm no treat to eat. So while most salamanders prefer to hide, I'm out in the open and not very shy...and you get to say "hi!"

When you see a Newt like me on land, that means it's a youngster (called an "eft"). When I'm grown, my skin will turn olive-green in color, my tail will flatten like a fish's fin, and I'll move into the water to start the cycle of life all over again.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

**Ruff!** Some people call me “waterdog” because of my squeaky bark. Did you know that most salamanders have no voice at all? That’s *ruff!* I spend my *whole life* underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I’m one of the *biggest salamanders* in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

**Ruff!** Some people call me “waterdog” because of my squeaky bark. Did you know that most salamanders have no voice at all? That’s *ruff!* I spend my *whole life* underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I’m one of the *biggest salamanders* in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

**Ruff!** Some people call me “waterdog” because of my squeaky bark. Did you know that most salamanders have no voice at all? That’s *ruff!* I spend my *whole life* underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I’m one of the *biggest salamanders* in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

**Ruff!** Some people call me “waterdog” because of my squeaky bark. Did you know that most salamanders have no voice at all? That’s *ruff!* I spend my *whole life* underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I’m one of the *biggest salamanders* in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

**Ruff!** Some people call me “waterdog” because of my squeaky bark. Did you know that most salamanders have no voice at all? That’s *ruff!* I spend my *whole life* underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I’m one of the *biggest salamanders* in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Adrienne N. Lopez

Hello! I'm a:

Mudpuppy

Scientific name:

*Necturus maculosus*

Size: 8-13" long

Lifespan: 10+ years

**Ruff!** Some people call me “waterdog” because of my squeaky bark. Did you know that most salamanders have no voice at all? That’s *ruff!* I spend my *whole life* underwater in streams, lakes, and ponds. See those feathery gills behind my head? I breathe with them like fish do. Keep the water clean for us, ok?

Though I’m one of the *biggest salamanders* in the world, most people will never see a Mudpuppy like me. There are bigger animals on the prowl, you see. So I hide all day and come out at night to hunt for things to eat, like crayfish, snails, and other small water creatures.



© Pierson Hill

Hello! I'm an: Eastern  
Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...*red* backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all! Next time you're in the woods, send a friendly vibe. *I'll be nearby!*



© Pierson Hill

Hello! I'm an: Eastern  
Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...*red* backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all! Next time you're in the woods, send a friendly vibe. *I'll be nearby!*



© Pierson Hill

Hello! I'm an: Eastern  
Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...*red* backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all! Next time you're in the woods, send a friendly vibe. *I'll be nearby!*



© Pierson Hill

Hello! I'm an: Eastern  
Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...*red* backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all! Next time you're in the woods, send a friendly vibe. *I'll be nearby!*



© Pierson Hill

Hello! I'm an: Eastern  
Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...*red* backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all! Next time you're in the woods, send a friendly vibe. *I'll be nearby!*



© Pierson Hill

Hello! I'm an: Eastern  
Red-backed Salamander

Scientific name:

*Plethodon cinereus*

Size: up to 4" long

Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We "red-backs" are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole lives long, from the time we're tiny eggs. Some of us are born all gray (called "lead-backs") and some of us have...well...*red* backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all! Next time you're in the woods, send a friendly vibe. *I'll be nearby!*



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most *abundant salamanders* in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with *thousands like me as we journey to small wooded pools to breed*. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, *please hit the brakes!* I've got eggs to lay!



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most *abundant salamanders* in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with *thousands like me as we journey to small wooded pools to breed*. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, *please hit the brakes!* I've got eggs to lay!



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most *abundant salamanders* in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with *thousands like me as we journey to small wooded pools to breed*. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, *please hit the brakes!* I've got eggs to lay!



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most *abundant salamanders* in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with *thousands like me as we journey to small wooded pools to breed*. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, *please hit the brakes!* I've got eggs to lay!



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most *abundant salamanders* in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with *thousands like me as we journey to small wooded pools to breed*. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, *please hit the brakes!* I've got eggs to lay!



© George Cevera

Hello! I'm a:

Spotted Salamander

Scientific name:

*Ambystoma maculatum*

Size: 5-9" long

Lifespan: up to 30 years

We Spotted Salamanders are some of the biggest, flashiest, most *abundant salamanders* in the woods, but most people will never see one of us. Our lives are spent like moles, underground in small burrows or under the leaves and logs. But we come out at night to eat worms, slugs, millipedes, and bugs.

At the first hint of spring, during warm nighttime rains, we're ready to migrate! The ground erupts with *thousands like me as we journey to small wooded pools to breed*. But these days, many must cross roads to get there. Roads spell trouble for small, slow creatures. If you see me out there, *please hit the brakes!* I've got eggs to lay!



© Kevin Jamieson

Hello! I'm an: Eastern  
Tiger Salamander

Scientific name:  
*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

**T**iger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm *fossorial*.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



© Kevin Jamieson

Hello! I'm an: Eastern  
Tiger Salamander

Scientific name:  
*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

**T**iger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm *fossorial*.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



© Kevin Jamieson

Hello! I'm an: Eastern  
Tiger Salamander

Scientific name:  
*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

**T**iger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm *fossorial*.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



© Kevin Jamieson

Hello! I'm an: Eastern  
Tiger Salamander

Scientific name:  
*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

**T**iger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm *fossorial*.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



© Kevin Jamieson

Hello! I'm an: Eastern  
Tiger Salamander

Scientific name:  
*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

**T**iger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm *fossorial*.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



© Kevin Jamieson

Hello! I'm an: Eastern  
Tiger Salamander

Scientific name:  
*Ambystoma tigrinum*

Size: 6-12" long

Lifespan: up to 16 years

**T**iger is the perfect name for me, and not just because of my yellow & black stripes. I'm a big "cat" - the biggest salamander to walk the land! But in the animal kingdom, there's always somebody bigger around...so I live most of my life underground. I'm *fossorial*.

In the wintertime when you're bundled up at home, we Tigers roam. We slip beneath the ice to lay our eggs in shallow grassy waters called vernal pools. By spring, our youngsters are hatched, swimming, and breathing through feathery gills. We need clean water and healthy forests to survive (like all amphibians do). Will you do your best to protect the land & water...and us?



Photo © Pierson Hill

Hello! I'm a:  
Redback Salamander  
Scientific name:  
*Plethodon cinereus*  
Size: up to 4" long  
Lifespan: 10-25 years

**H**ave you ever been in the woods? Of course you have! Then you and I have definitely crossed paths. We Redbacks are one of the *most common animals in the forest*. But we don't sing like birds or scurry like squirrels. We live quietly under fallen leaves and logs, where it's damp and dark and safe from harm.

We live on land our whole long lives long, from the time we're tiny eggs. Some of us are born all gray (called "leadbacks") and some of us have...well...red backs. Want to know something else cool? *We breathe through our skin*; we have no lungs at all. Roll a log and Then be polite, and leave me on my way.



## Popsicle Stick Lizard Craft



Here's a cute lizard craft made from 2 Popsicle sticks or craft sticks and some pipe cleaners. You can change the color scheme as you like.

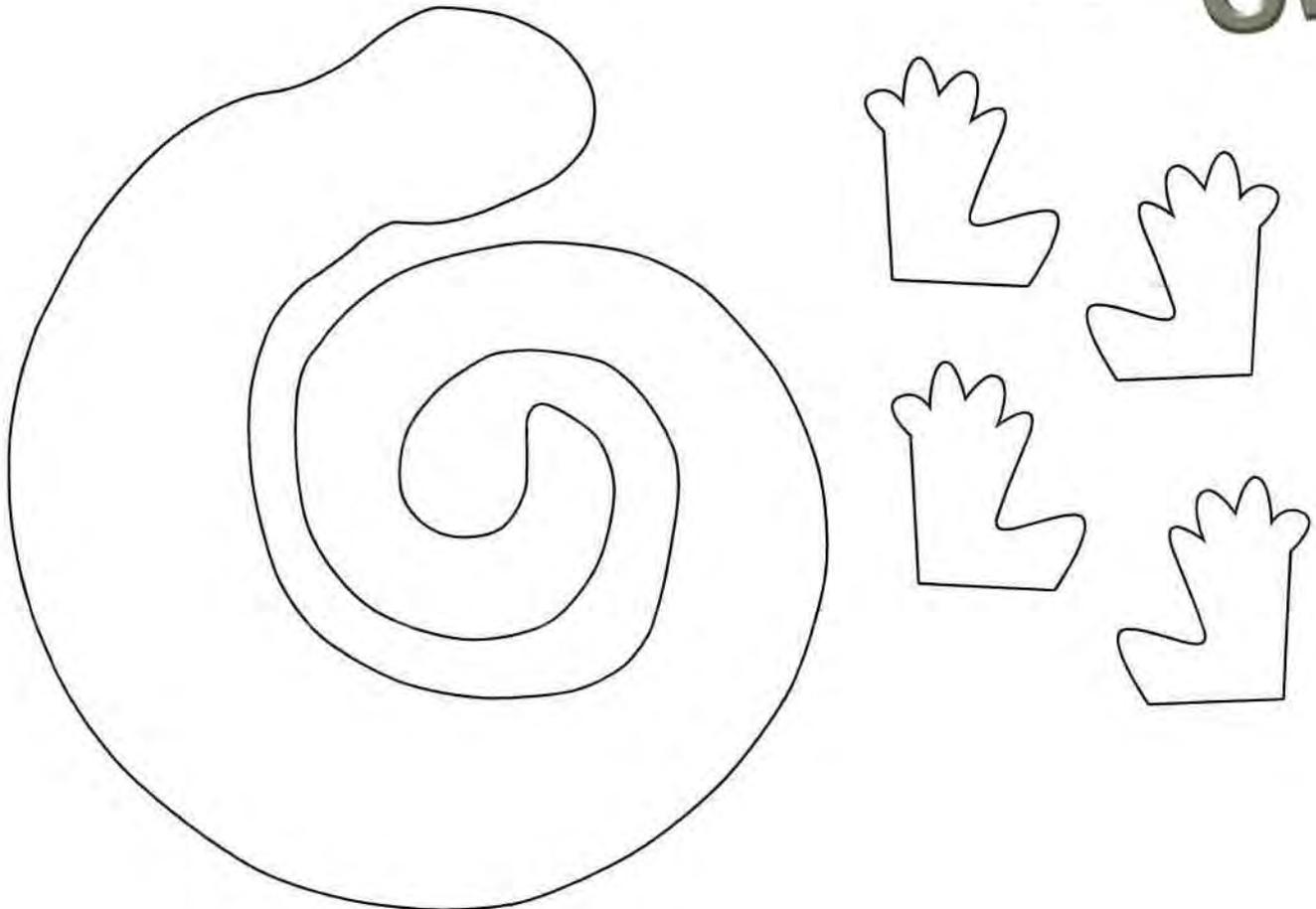
### Materials:

- Popsicle sticks or colored craft sticks(You can paint them yourself or buy colored ones)
- glue
- tape
- scissors
- pipe cleaners
- google eyes
- black marker

### Directions:

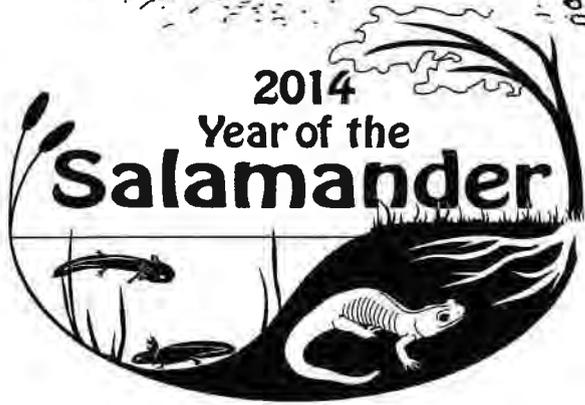
1. Cut two, 2 inch lengths of pipe cleaner to make the legs. Cut four, 1 inch lengths. Wrap the 1 inch piece around the end of the leg piece and twist once. Flatten out to make 3 toes. Repeat on the other end. It helps to make a lot of legs in advance before doing the craft in class.
2. Cut a 3-4 inch piece for the tail and add a curl.
3. Generously glue the leg and tail pieces to one of your colored craft sticks.
4. Sandwich another stick on top. Push down and allow to dry. You could also substitute tape to cut down on time.
5. Take a marker and decorate the top to look like scaly skin.
6. Glue on 2 google eyes.

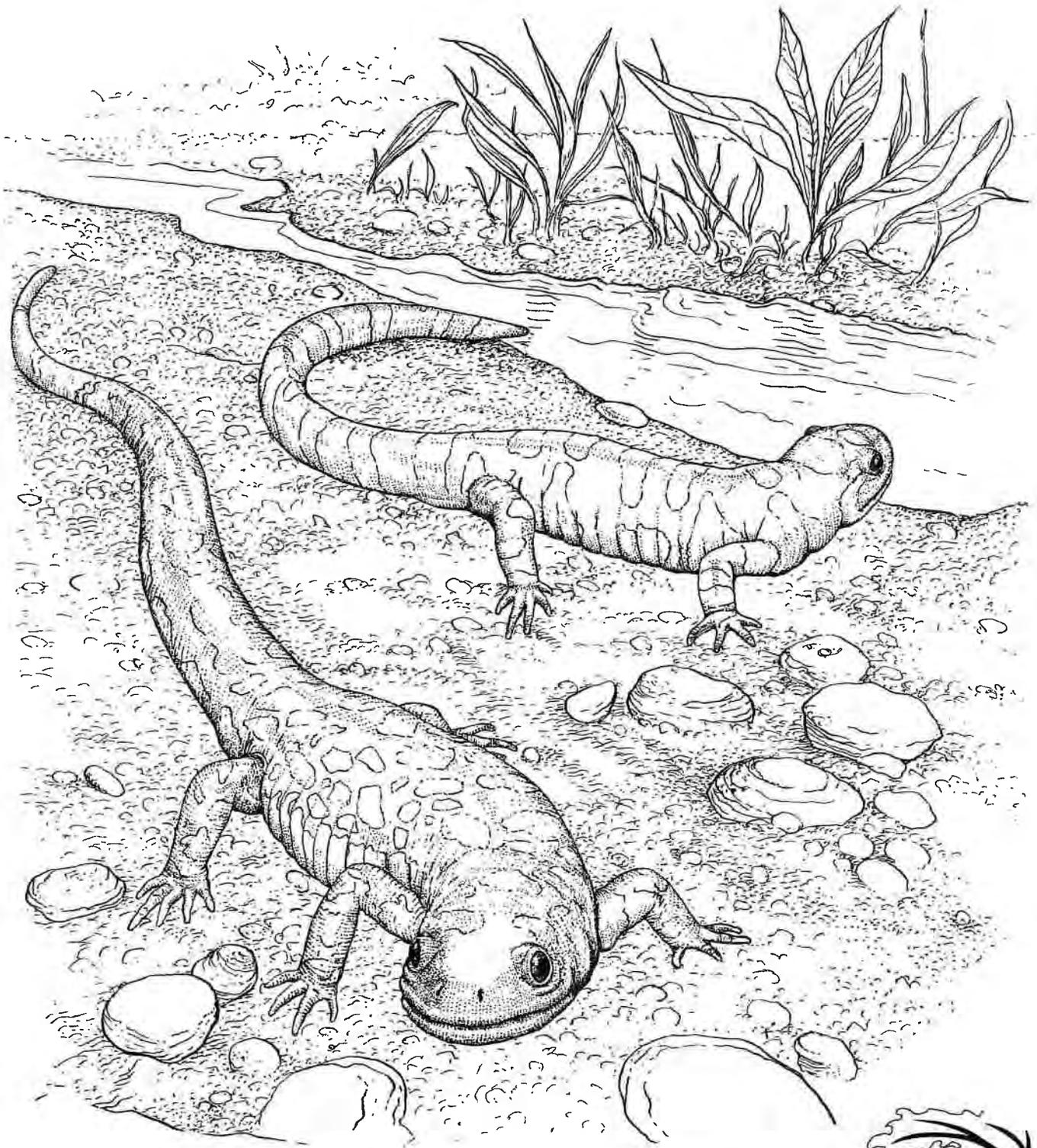
## Salamander Armband



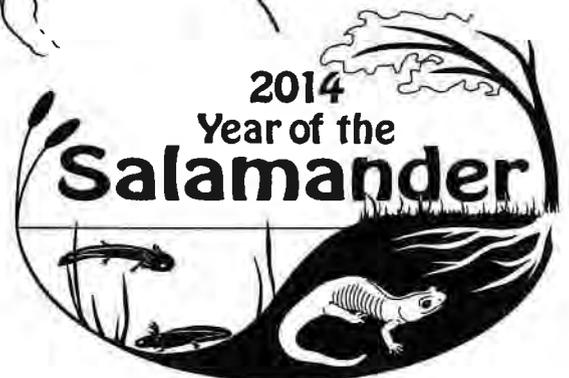
### Instructions:

1. Cut a ring about 1-1/2 inches wide from a cardboard tube or circular cardboard container. Some disposable containers you can use are a disposable cup, bread crumb container, frozen juice container, or potato chip tube. Choose one with the proper diameter for your child's upper arm. If desired, cover the ring with a piece of colorful poster board.
2. Use the pattern to trace the salamander body and four legs on a piece of poster board. Cut out the shapes and glue them onto the ring.
3. Let your child decorate the salamander with spots or stripes cut from sticky-back felt or other colors of poster board. Glue two eyes on the salamander's head.
4. Now the salamander is ready to accompany your child on some outdoor adventures.



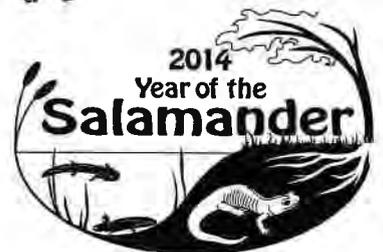


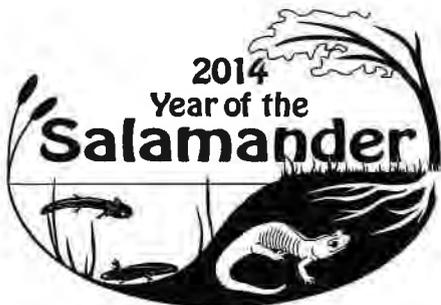
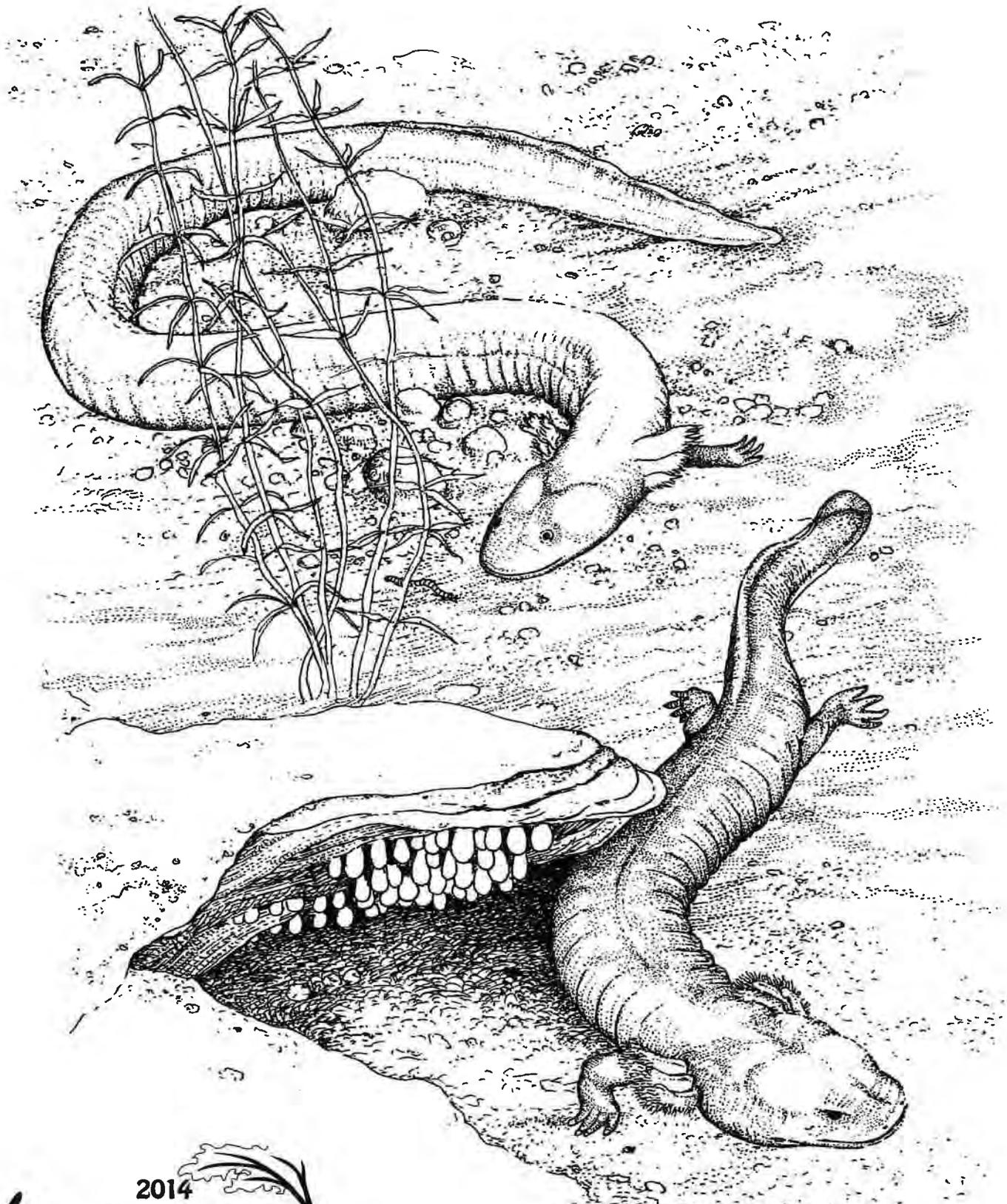
**Salamanders might look like lizard, but they are very different. Unlike lizards, they have smooth, slimy skin, no claws, and need to live in moist places.**



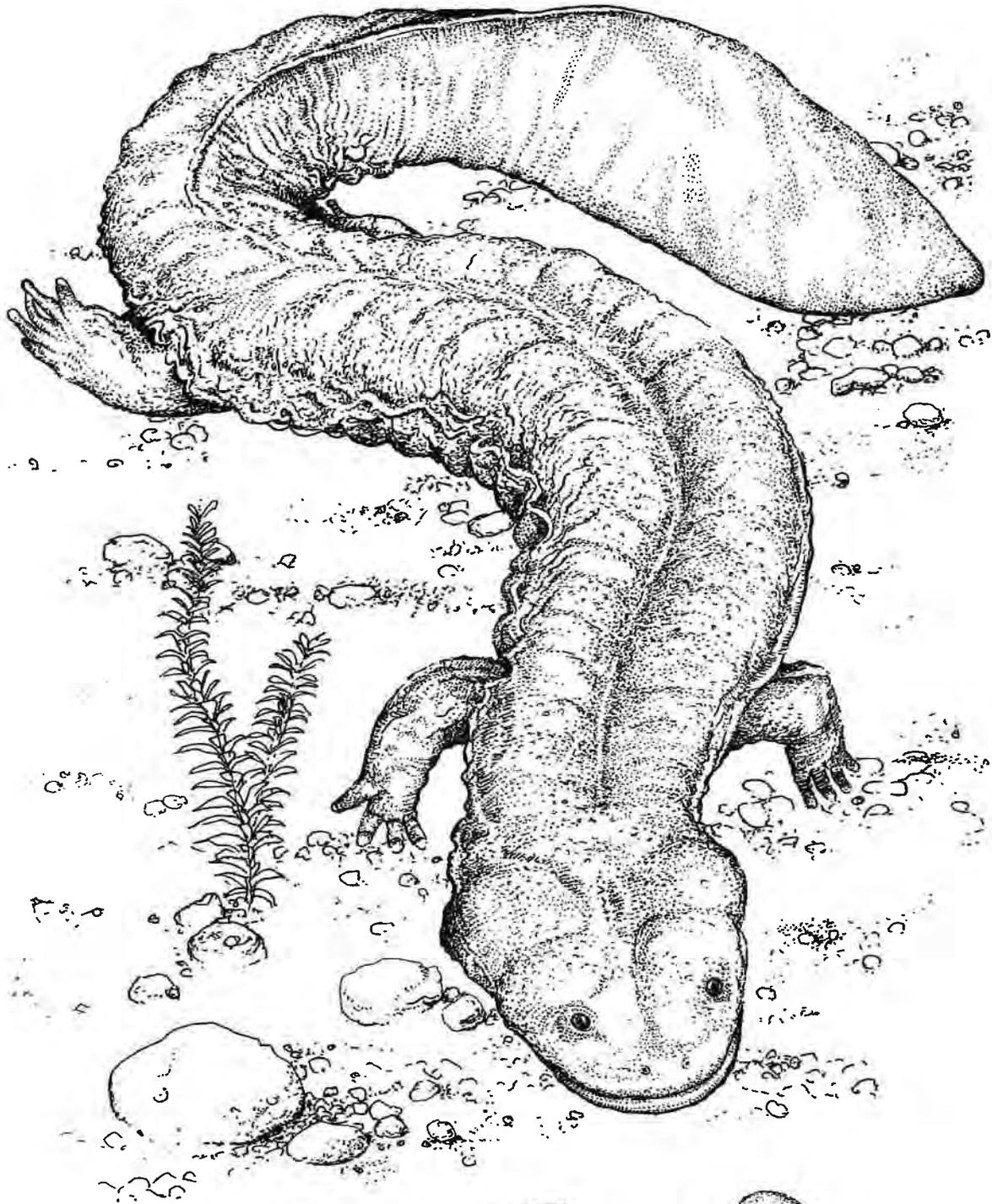


Many salamanders like this Spotted Salamander (top) and Northern Red (bottom) lay their eggs in ponds or springs.

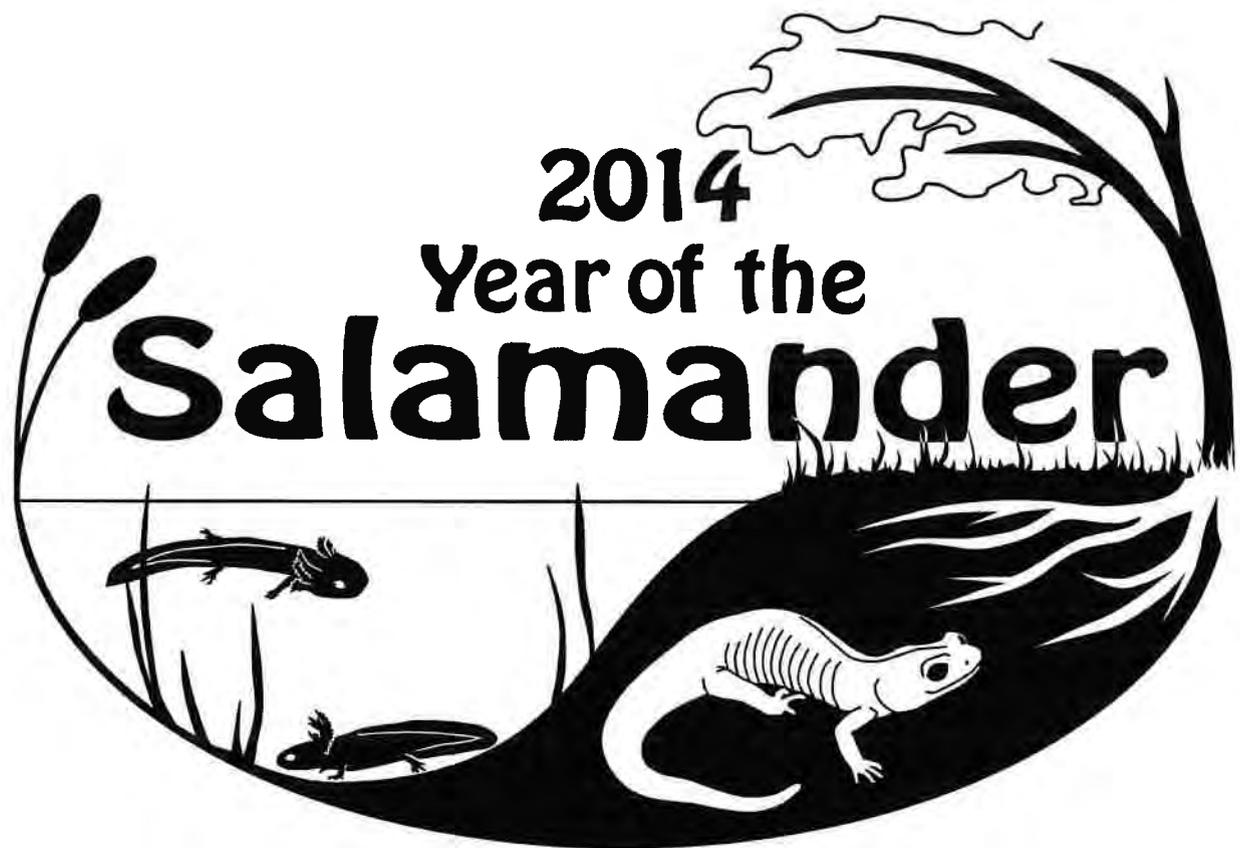
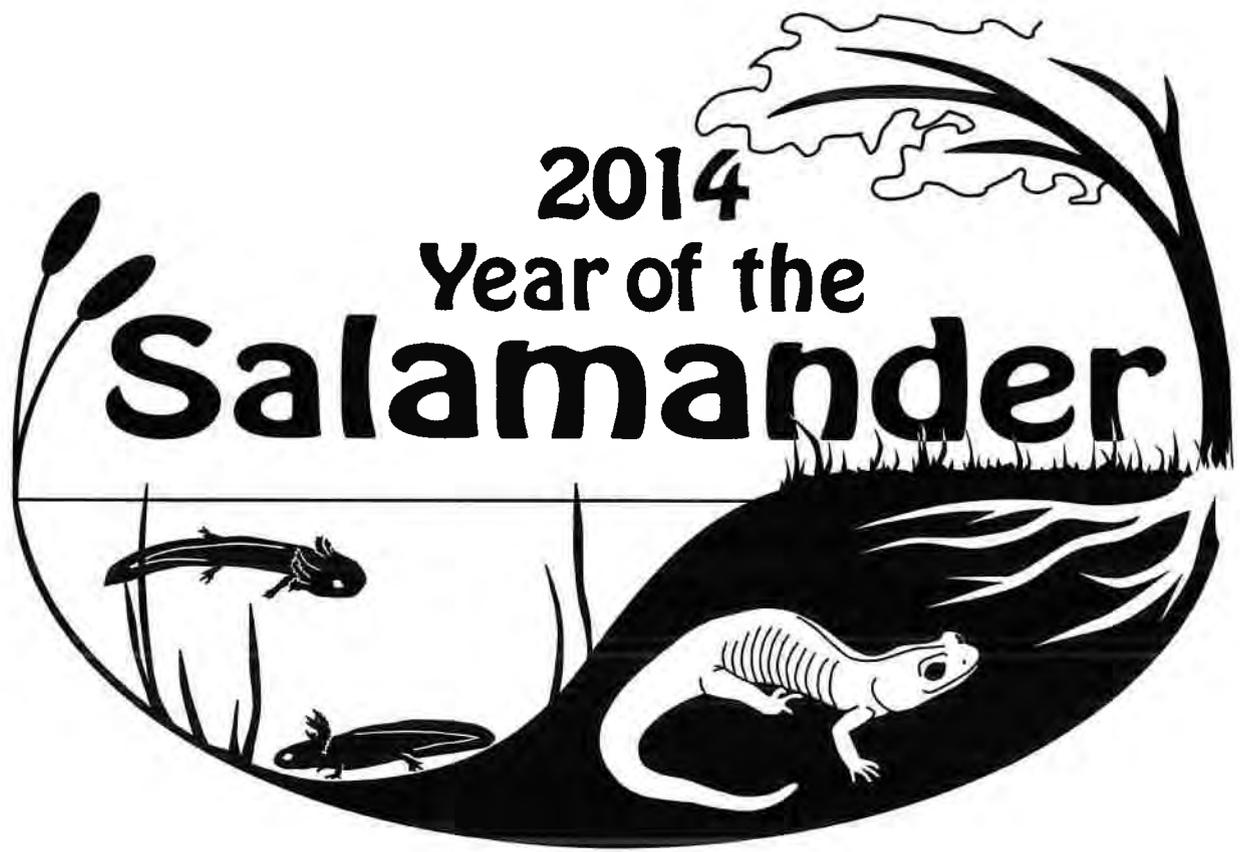




**Mudpuppies are aquatic salamanders that keep their feathery gills as adults.**



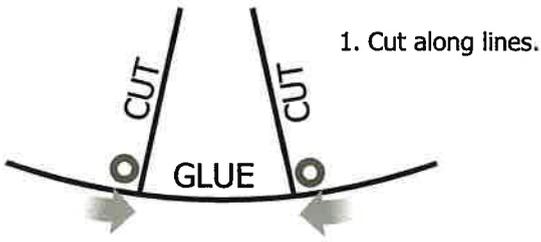
**Hellbenders are aquatic salamanders that live in clear, rocky streams. They are also called snot otters or devil dogs.**



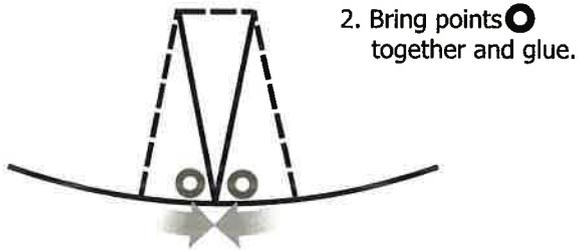
# To make your paper model

You will need: scissors, glue for paper (glue sticks work well)

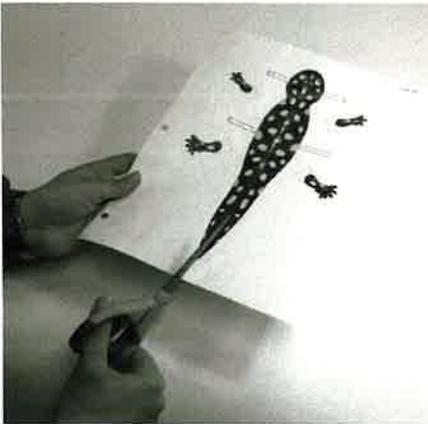
**Darts:** (shape your model)



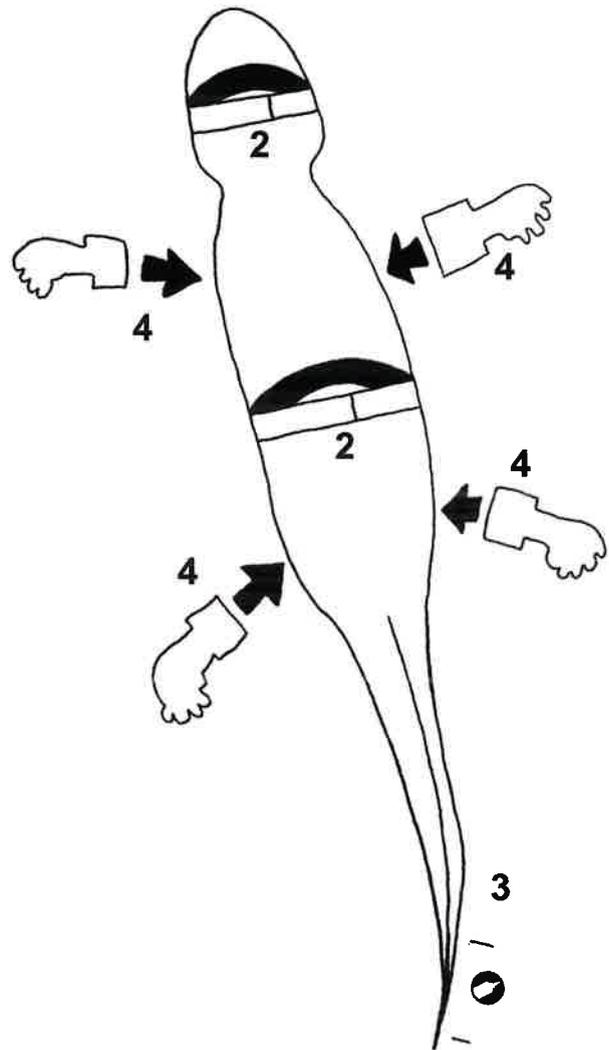
1. Cut along lines.



2. Bring points together and glue.



1. Cut out all pieces.



2. Overlap and glue tabs to shape body.

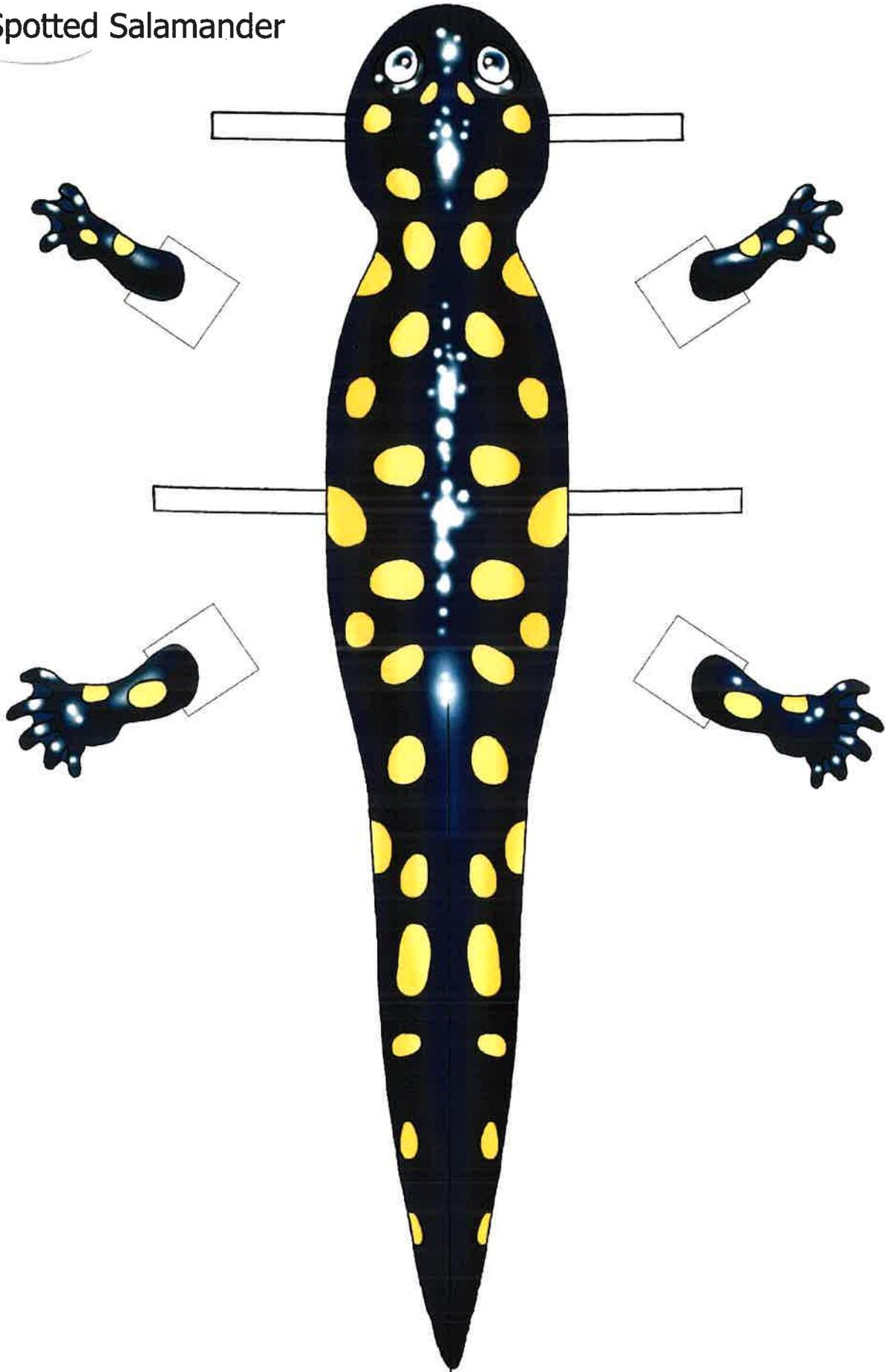


3. Fold tail along line. Glue tip together.



4. Glue legs to body.

# Yellow Spotted Salamander



ms-ed-2008

Graphics & Design: Maria Sewell

Animal Models: Robert Van Nood, based on an original concept by Monica Zavagli, Ramsar Convention Secretariat.

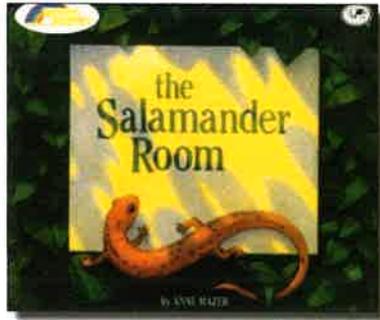


Ducks Unlimited Canada

[education.ducks.ca](http://education.ducks.ca)

## Curriculum Enhancement using The Salamander Room by Anne Mazer

Compiled by Carrie Elvey, The Wilderness Center



The Salamander Room by Anne Mazer is an excellent introduction to salamanders, habitat requirements, and the connectedness of nature. These curriculum ideas are a sampling only, many more can be found (and in more detail) by doing an internet search.

**Salamander Room diorama** – Have students create their own salamander room in shoe box. Stress the things that salamanders need – water, food, air, space, etc. Students may alternately be asked to create mural, diorama, etc. modeling the transformation the classroom would need to undergo to become salamander habitat.

**Scavenger hunt or bingo game** – Take a hike outside to look for things that salamanders would need. Consider creating bingo cards with pictures of salamander needs (rocks, water, insects) from the book. Use the bingo cards on the hike.

**Salamander camouflage** - Have students color salamander silhouettes. They can try to match a color or pattern in the classroom or in nature. When the salamanders are completed, place them in a land lab or in the classroom and discuss which ones are hard to see and which are easy to find. Discuss the question – “would there be good hiding places for a salamander in your bedroom?”

**Salt dough salamanders** - Create ‘clay’ salamanders – combine 2 cups flour, ½ cup salt, ¾ cup water, and 1 tablespoon vegetable oil. Mix until smooth. After salamanders are created, bake in a 300 °F oven for an hour. Let cool and paint. These can be added to dioramas or used in the camouflage salamander activity above.

**Lists and Venn Diagrams** – Have students list the things in the bedroom already, the things that salamanders need, and the things that were added to the bedroom to make it suitable habitat.

**Visit Reading Rainbow’s website** – This book was featured on Reading Rainbow (Reading Rainbow #909) and they offer a whole curriculum pack.

## **Soak It Up**

### **Audience/ Group Setting**

This activity works best for a classroom or camp setting, but can also be a simple demonstration that event visitors can view. For an event setting, it isn't necessarily a hands-on activity, but it does demonstrate how an amphibian's skin is very permeable. This activity's audience would generally be for visitors aged 7 and older.

### **Goal**

To understand the concept of permeability and how different body coverings can effect how much and how fast a chemical moves into an animal's body.

### **Objectives**

By the end of this activity, participants will be able to:

- View any differences in how far the dye permeates in an egg with and without its hard shell.
- Discuss and understand how this experiment relates to amphibians and pollution.

### **Big Idea/ Main Message**

Amphibians are more readily affected by pollution because of their permeable skin.

### **Conservation Action/ Behavior Addressed**

**Don't pollute.**

Do your part to keep garbage, chemicals, and non-native plants and animals out of the natural environment. Amphibians absorb chemicals through their skin easily. They also fall prey to non-native species.

### **Background Information**

Definition of permeable: having openings that liquids (or gasses) can pass through.

Amphibians have unique skin compared to that of many other vertebrate animals. An amphibian's skin is thinner, which allows for higher levels of oxygen to exchange with the blood vessels that are close to the surface of the skin. This permeable skin distinguishes them from birds, mammals or reptiles – and it is one of the characteristics that has contributed to their declining populations and extinctions.

Permeability relates to how easily a gas or liquid molecule can pass back and forth from the environment into the animal or from the animal into the environment. Typically, the larger a molecule is, the more difficult it is to enter the animal through its skin. Amphibian skin is much more permeable than other vertebrates. Many amphibians use this characteristic to their advantage, especially those animals that live in drier habitats. For example, some species of toads can absorb water from the soil around them by pressing their bellies against the moist ground.

Many amphibians also use their permeable skin to help them breathe. Oxygen is a small molecule that can easily pass through the skin of an amphibian. The oxygen first dissolves into

the liquid on the surface of the animal's skin, then it is picked up by blood that is in vessels close to the surface of the skin. An example of this would be a frog that hibernates at the bottom of a pond. During this hibernation, the frog's skin acts as a giant gill, passing oxygen from the water to the frog's blood. Also, some salamanders are so efficient at breathing through their skin that they do not have lungs!

This same characteristic that help amphibians survive in a variety of habitats also makes it very easy for harmful chemicals to pass into the animal's body. Toxic chemicals found in rainwater, ponds, rivers, and creeks may kill frogs by contaminating their bodies. Reptiles are not as susceptible to these chemicals because their scaly skin is less permeable.

For this activity, you will be using hard-boiled eggs to show how amphibians are susceptible to pollution because of their permeable skin, much like an egg without a shell. The shell of an egg acts like a mammal or reptiles' skin. It is less permeable and therefore acts as a barrier to the water and food coloring. The water will not penetrate into the shelled egg as far as it will for the unshelled or peeled egg.

The peeled egg, with only a thin membrane surrounding it, absorbed more water. The food coloring will travel further into this egg. The absorbed water will also make the egg swell, increasing its circumference.

## **Materials needed**

- Hard boiled eggs (prepared prior to the event/class)
- Food coloring (dark colors work best)
- Measuring tapes (or you can use string and rulers)
- Clear cups
- Water
- Knife

## **Staff**

This activity needs a volunteer or staff person to supervise.

## **Length of Activity**

Classroom setting: ~40 minutes over the course of 2 days

Event setting: ~5 minutes

## **Set up**

- Ahead of time: Hard-boil the eggs.
- Day of: Prepare other activity materials and or table setting (event).

## **Procedures**

### Day #1:

- Begin the activity by discussing the function of skin with the group. Why is skin important to mammals? Then discuss how an amphibian's skin is very different because it is more permeable to substances, which can be helpful and harmful at the same time.
- Divide the class into small groups. Each group should receive for the experiment:
  - 2 hard boiled eggs
  - 2 clear cups filled with water
  - Food coloring.
- Instruct the groups to peel one of the hard-boiled eggs (carefully).
- Each egg's circumference should be measured and noted (using either the measuring

tape or rulers and string).

- Put each egg in a cup and label each cup with "peeled" or "un-peeled."
- Add at least 20 drops of dye to each cup (again, dark colors work best).
- Let the eggs rest in the water for **AT LEAST** 24 hours.

Day #2:

- Have the groups return to their eggs and cups. Remove both eggs from the cups.
- Gently peel the egg that still has a shell.
- Gently cut each egg in half (from top to bottom, through the yolk).
- Using rulers or measuring tape, measure how far into the egg the food coloring has moved.
- Discussion points:
  - What animal do you think would be more affected by water pollution, a frog or lizard? Why?
  - What does this experiment tell you about the susceptibility of amphibians to water pollution? What types of pollution might affect amphibians? What is the source of the pollution?
- Wondering what to do with the left-over eggs? Although you probably don't want to use these eggs in egg salad (since they have been touched by visitors all day long) – use them for compost! By composting these used eggs instead of placing them in the trash bin, you are ensuring that the eggs don't end up in a landfill.

## **Activity Extensions/Modifications**

Event Use Modification:

For an event setting, this would mainly be used as a demonstration piece – the activity can be set-up at a staffed table. You can present both eggs that are still in the water, hard-boiled eggs that are still shelled and peeled for visitors to view/feel, and then the final product for visitors to view. Having a picture of amphibian's skin magnified for visitors to see would also be useful. By viewing these items, hopefully visitors will gain the idea of permeability and pollution.

## **National Science Education Standards**

This activity is aligned to the K-8 Life Science Content Standards.

- Structure & Function in living systems
- Regulations & Behavior
- Populations & Ecosystems
- Form & Function
- Population, Resources & Environment
- Natural Hazards

*Note: Activity materials adapted from and used with permission of Amphibian Alert!.*



## **Back to the Pond- Habitat Fragmentation**

*In this large-scale simulations game, your students will learn first-hand the challenges that amphibians face on a daily basis as their habitats are fragmented.*

**Objective:** Students will look at the challenges amphibians face when their habitat is fragmented, particularly the challenge of migration.

**Vocabulary:** habitat fragmentation, habitat degradation, migration



**Background:** All species need adequate space for day-to-day living, feeding, and migration. Most species are sensitive to changes in their habitat brought on by human activity. Habitat fragmentation occurs when large areas of woods, grasslands, riversides, or other habitats become separated into smaller pieces, usually from human activity such as building roads, cutting large blocks of trees, building homes, etc. Without corridors, these “islands” of animals become isolated from each other. This reduces their chances to choose mates and breed and can ultimately cause extinctions.

When you think of habitat destruction, you may picture mass extinction far away places. However, habitat fragmentation is occurring in our own backyard. Although scientists are researching causes of amphibian declines in seemingly undisturbed habitats, the cause for most amphibian (and other animals) declines is easily identified - habitat degradation and fragmentation.

**Related Subjects:** physical education, geography, math

**Materials:** newspaper, newsprint sheets, or construction paper, markers or crayons, large playground balls (soccer, volley, basketball, etc.)

**Procedures:** This game can be done outside in the schoolyard (if its not too breezy!) or inside in a large room.

1. Divide class into two teams and explain their roles: the “amphibians” and the “cars.” The goal of the game is for the “amphibians” to travel from water to land then back to water without being hit by a passing “car.” The “cars” are represented by a ball that is gently rolled down the roads at a safe speed. “Amphibians” have to walk heel-to-toe slowly across their habitat or the imaginary roads. “Cars” will roll a ball gently back and forth in straight lines down the road. “Amphibians” are not allowed to leap out of the way, but must keep going across. They can stop, or back up, but not leap.
2. Create the habitat using large pieces of newspaper, newsprint or construction paper. Half of the sheets will become “water”, half of which become “land.” You can mark them with blue for water and green for land. If your class is feeling extra creative, they



can draw these features on the paper. During the four rounds of the game various pieces of paper will be removed and replaced with roadways and stores.

3. The game will be played for 4 rounds, following the grids as outlined. Each round creates a more fragmented habitat in which the “amphibians” can live. The rounds should last about 3 minutes. Remember, the “amphibians” must move from water to land, then back to water without getting hit. The “cars” can only roll in a straight line once an area has been cleared. As the game begins, the “cars” can only roll on the outside of the habitat. The students on the cars team should pair up, so they are rolling the ball from one partner to the other. Review the rules:
  - ✓ Two “amphibians” cannot occupy the same space.
  - ✓ If an “amphibian” doesn’t move during the round, they are out.
  - ✓ “Cars” cannot aim for “amphibians” in their habitats. If they do, they are out.
  - ✓ The game is over at the end of the 4<sup>th</sup> round. How many “amphibians” are left?

**Opening set -up for game:**

W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W
W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W
W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W
W	L	W	L	W	L	W	L
L	W	L	W	L	W	L	W

**Round One - add a few roads:**

W		W	L	W		W	L
L		L	W	L		L	W
W		W	L	W		W	L
W		W	L	W		W	L
L		L	W	L		L	W
W		W	L	W		W	L
L		L	W	L		L	W

**Round Two - widen to split-lane highways:**

W			L			W	L
L			W			L	W
W			L			W	L
L			W			L	W
W			L			W	L
L			W			L	W

**Round Three - add a couple of stores:**

			L				
			W			L	W
			L			W	L
L			W			L	W
W			L				
L			W				



**Round Four - the stores need parking lots and off-ramps from the highway:**

			W			L	
			L			W	L
W			L				
L			W				

- At the end of the game, discuss the results with students. How many “amphibians” were left at the end of the game? How did they manage to survive? Can they think of ways to change the results? How could the roads, stores, and ramps have been built differently? How can scientists determine “how much habitat is enough?” for the amphibians and other animals? What problems might automobile noises pose for frogs that rely on calling to find mates?
- If your students find this a challenging problem and wish to pursue it further, they may wish to become involved in marking nearby roadways to let drivers know they are entering “amphibian habitat.”



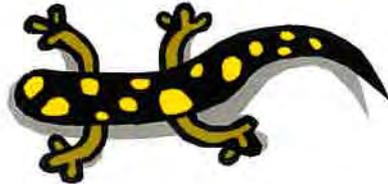


## Lost Your Marbled Salamanders Board Game

*Your students will experience the challenges faced by a North American amphibian species in this simple board game. The game can be adapted to other local amphibian species.*

**Objective:** Students will understand that amphibian populations are threatened by a number of different factors.

**Vocabulary:** habitat, disturbance, human impact



**Background:**

Marbled Salamanders are small salamanders that spend most of the year safely hidden in an underground burrow in the moist forests of the southeastern United States. Each year, before the onset of fall rains, these salamanders emerge from their burrows and travel to temporary pools to breed. A Fact Sheet is included with this lesson plan, which can be copied and shared with students. The Marbled Salamander Fact Sheet provides information on habitat preferences, diet, behaviors, and current scientific research on this species.

Amphibian populations may be in trouble because of one human activity or because of the additive effect of a number of different human-related activities. Playing this board game will allow students to explore this issue as they take on the challenges that a marbled salamander faces as it moves from its home in the woods to a breeding pool. This game can be used as a summary of other **Amphibian Alert!** activities or an introduction to amphibian declines.

**Related Subjects:** math, language arts

**Materials:** game board, game cards, game pieces



***Please note:*** This game is best played with 2-4 players, so this is not a whole class activity. The game should be explained to the entire class, then be available for small groups to play as the schedule allows.

Rules of the “Lost Your Marbled Salamanders” Board Game are similar to “Candy Land” - each player draws a card and moves forward as directed by the card. Play continues until one player reaches the finish line. Two to four players can play at once. If all the cards are used before there is a winner, shuffle the cards and continue play. Enjoy the game!

**Extension Activity:**

Once your students have become familiar with this game, challenge them to research and write a version based on a local amphibian. Are the problems different for other regions of the United States?

*\*Activity used with permission from the Education Department of the Tennessee Aquarium*



## Marbled Salamander Fact Sheet



The marbled salamander (*Ambystoma opacum*), also called the banded salamander, is a member of the mole salamander family. It gets its name from the white or silver bands that cover the black bodies of adult salamanders.

### Habitat

The marbled salamander is typically found in floodplains and low-lying fertile areas dominated by hardwood trees. The animal remains underground during dry weather. In the fall it leaves the woods and migrates to a nearby pond, where it mates, and females lay eggs.

### Range

Marbled salamanders occur from southern New England to northern Florida and west to southern Illinois, southeastern Oklahoma and eastern Texas. Disjunct populations are found near the southern perimeters of Lakes Erie and Michigan, as well as in southwestern Missouri and along the northern border between Ohio and Indiana.

### Breeding

Although other salamander species in the mole salamander family breed in water, the marbled salamander does not. It migrates to a pond before autumn rains begin. There, the animal begins to court and mate. Each female lays her clutch of 30 to 100 eggs in a dry depression, and the embryos begin to develop. A female usually stays with her eggs until autumn rains begin to fill the pond. When the nest sites become flooded, the eggs hatch within a few hours or days.

### Feeding

Aquatic salamander larvae feed almost continuously on zooplankton, tiny near-microscopic aquatic animals. They feed in the water at night and under leaf litter on the bottom of the pond during the day. As they grow, they eat larger prey, such as small insects, tadpoles, and the larvae of other kinds of salamanders. After four to six months, the larvae have grown enough to lose their gills (or metamorphose), and leave the pond to live on land.

Adults remain dormant underground during dry conditions, but they feed during opportune times and use much of their energy to grow and build up fat reserves. Adults usually reach a length of 3-1/2 to 4 inches and live an average of four years.

### Research

Scientists at the Savannah River Ecology Laboratory have studied marbled salamanders and other amphibian populations at the Savannah River Site continually since 1978. Because adult salamanders migrate at night, scientists encircle breeding sites with low fences that guide immigrating adults toward small buckets buried alongside the fences.

During the breeding season, thousands of salamanders fall into the open buckets, assuring scientists of capturing, counting and marking nearly all of the animals for future identification.



The scientists then release the salamanders. They often recapture the same salamanders leaving the bay as well.

This research allows scientists to learn more about amphibian populations and the importance of wetlands to their continued survival.

### **Did You Know?**

- The bands on female marbled salamanders are more silver than males' bands, which are generally white.
- When nesting, female marbled salamanders generally seek out and select nest sites between the deepest and shallowest portions of the bay or pond. This behavior helps prevent eggs from hatching too early after any unseasonal thunderstorms that temporarily flood the deeper areas of the pond. But the position of the nests ensures that they will be flooded by early winter.
- Scientists across the world have reported a decline in numbers of amphibians of many species, including salamanders. Some of the decline is attributed to habitat destruction and pollution, but the declines in other areas have no apparent cause. However, a long-term study by the Savannah River Ecology Laboratory shows that amphibian populations naturally fluctuate widely over a period of time, with breeding populations in the thousands in some years and near zero in others.
- Amphibians can be an important food source for other animals, from ducks and wading birds to raccoons, as well as reptiles and other amphibians. Also, larval salamanders probably help control mosquito populations in some habitats.

*\*\*This information is provided as a public service by the Savannah River Ecology Laboratory Outreach office.*

## Using Clay Salamander Models to Study the Effects of Coloration on Predation Rate

Carrie Elvey, Naturalist at The Wilderness Center

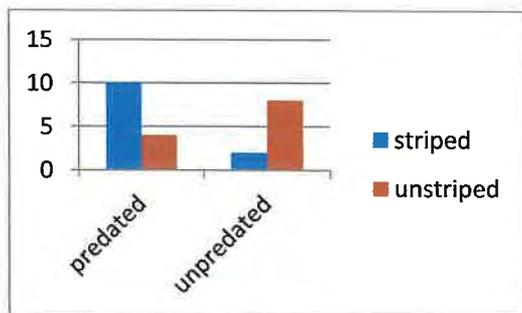
Using clay models is a standard research tool used to answer questions about color and pattern and the amount of protection different colors or patterns provide. This is a very simplified version of the methods used in these types of studies. It is suitable for older elementary students through adults groups. *Read the papers referenced below for a more in depth look at data analysis and research methods.* An excellent model using clay caterpillars can be found at: Curtis R, et al **Clay Caterpillar Whodunit: A Customizable Method for Studying Predator—Prey Interactions in the Field**, *The American Biology Teacher* **75**(1):47-51. 2013.

Create clay models using any soft sculpting clay (like Sculpey®). Students can create any color pattern they want, or you may wish to stick to two variations (one brown, one brown with yellow stripes) or use real species as models.

Place salamanders in the chosen study area – a land lab would work well for this.

Leave the salamanders overnight (or over a weekend). After this period, check the salamanders. Predation marks will show up as tooth marks, beak gouges, or missing salamanders.

Graph the results (simple example below)



### Extension Ideas

Allow the salamanders that “survive” to “reproduce” - For every two surviving salamanders, create one new salamander with the same pattern or color. Repeat the experiment through several “years” and discuss the changes in the population over time.

Examine the predation rates of similar looking salamanders in different habitats (in the leaf litter, on top of a log, in open lawn, along a creek).

### References

1. Bond AB, Kamil AC: **Visual predators select for crypticity and polymorphism in virtual prey.** *Nature* 2002, **415**:609-614.
2. Fiitzpatrick, BM, Shook K, Izally, R: **Frequency-dependent selection by wild birds promotes polymorphism in model salamanders,** *BMC Ecology* 2009, **9**:12.
3. Highton R: **The inheritance of the color phases of *Plethodon cinereus*.** *Copeia* 1959, **1**:33-37.
4. Raymond DL, Allen JA: **Wild birds prefer the familiar color pattern when feeding on similar artificial morphs.** *Oikos* 1990, **57**:175-179.