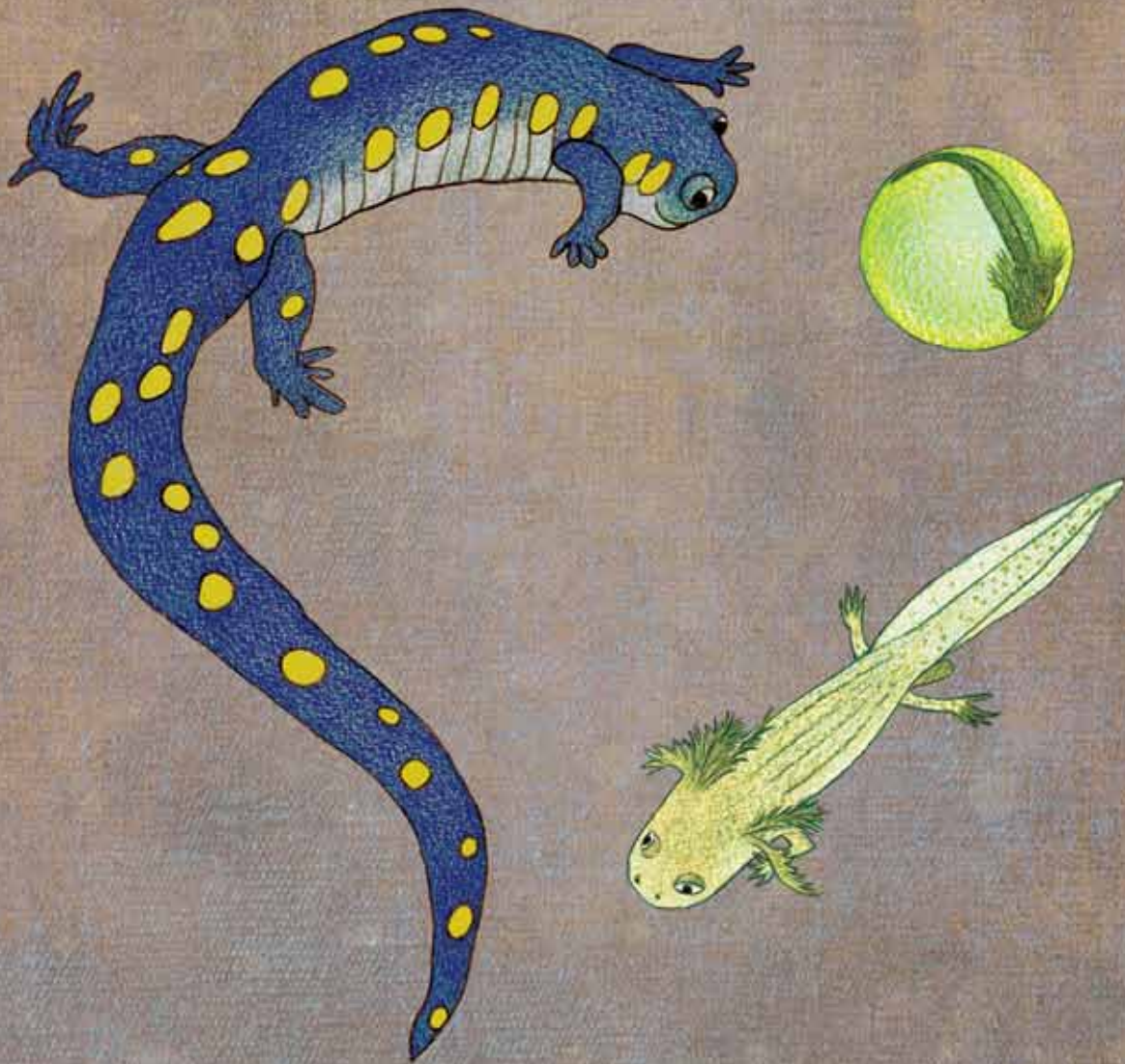


# SALAMANDER SEASON



BY JENNIFER KEATS CURTIS,  
J. ADAM FREDERICK, AND SHENNEN BERSANI

## SALAMANDER SEASON

One cold, rainy, spring night, a young girl and her scientist father participate in “Salamander Night” to follow hundreds of spotted salamanders as they venture into a vernal pool to breed and lay eggs. Together, the father-child team studies the salamanders through their complete amphibian metamorphosis, culminating in the adult salamanders’ disappearance into the woods in late summer. In easy-to-understand text, the girl relates the tale through her own illustrated, photographic journal.

It’s so much more than a picture book . . . this book is specifically designed to be both a fun-to-read story and a launch pad for discussions and learning. We encourage adults to do the activities with the young children in their lives both at home and in the classroom. Free online resources and support at [www.ArbordalePublishing.com](http://www.ArbordalePublishing.com) include:

- For Creative Minds as seen in the book (in English & Spanish):
  - Salamander Classification
  - Spotted Salamander Life Cycle Sequencing
  - Salamander Nights
  - An Environmental Biologist
- Teaching Activities (to do at home or school):
  - Reading Questions
  - Language Arts
  - Science
  - Math
  - Coloring Pages
- Interactive Quizzes: Reading Comprehension, For Creative Minds, and Math Word Problems
- English and Spanish Audiobooks
- Related Websites
- Aligned to State standards, Common Core & NGSS
- Accelerated Reader and Reading Counts! Quizzes
- Lexile and Fountas & Pinnell Reading Levels

eBooks with Auto-Flip, Auto-Read, and selectable English and Spanish text and audio are available for purchase online.

Thanks to the following experts for verifying the information in this book: J. Adam Frederick, Maryland Sea Grant, Asst. Director of Education at the Institute of Marine and Environmental Technology and Dr. Ryan Kerney, Assistant Professor of Biology at Gettysburg College. As an organismal biologist, Dr. Kerney specializes in the ecology, evolution and development of amphibians.

Award-winning author **Jennifer Keats Curtis** is frequently found among students and teachers, talking about literacy or conservation. In addition to *Primate School*, *Salamander Season*, the *Animal Helpers* series, *Baby Owl’s Rescue*, *Kali’s Story: An Orphaned Polar Bear Rescue*, and *Turtles In My Sandbox* for Arbordale, some of her other recent titles include *Osprey Adventure*, *Saving Squeak: A River Otter’s Tale*, and *Seahorses*. Visit her website at [jenniferkeatscurtis.com](http://jenniferkeatscurtis.com).



**J. Adam Frederick** is the Assistant Director of Education at Maryland Sea Grant and works in the University of Maryland Center for Environmental Sciences Institute of Marine and Environmental Technology in Baltimore, MD, and is a former high school biology teacher. As part of his job, he studies salamanders and other aquatic organisms and develops practical applications for classroom teachers. He has co-authored two curriculum-related books: *Inside-Out: Environmental Science in the Classroom and the Field* and *Saltwater Aquaria in the Classroom*. This is his first picture book.



Award-winning illustrator **Shennen Bersani** has illustrated *Salamander Season*; *Sea Slime: It’s Eeuwy, Goopy and Under the Sea*; *The Shape Family Babies*; *Animal Partners*; *Shark Baby*; *Home in the Cave*; *The Glaciers are Melting!*; and *Astro: The Steller Sea Lion* for Arbordale. Shennen has also illustrated a number of best-selling books, including *Snakes: Long, Longer, Longest*; *Sharks: Big, Bigger, Biggest*; and *Ocean Counting: Odd Numbers*. *Achoo! Why Pollen Counts* is her debut picture book as an author and illustrator. For more information, visit her website at [shennenbersani.com](http://shennenbersani.com).



# SALAMANDER SEASON

BY JENNIFER KEATS CURTIS AND  
J. ADAM FREDERICK  
ILLUSTRATED BY SHENNEN BERSANI

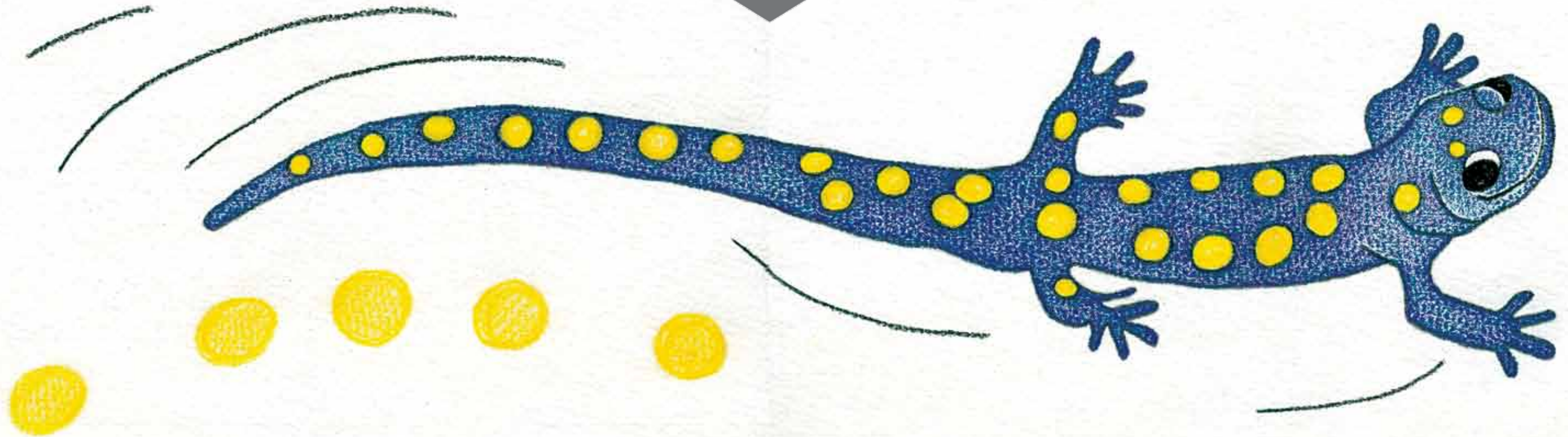


**March 21**

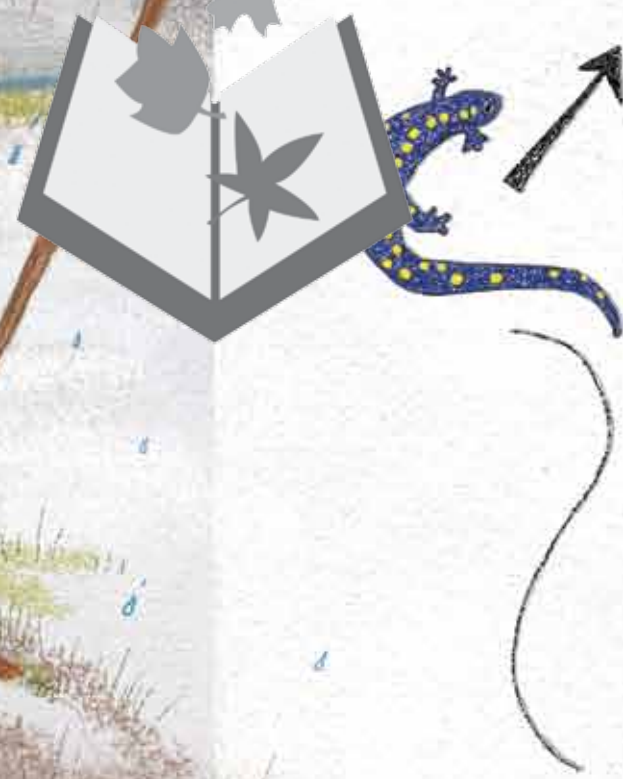
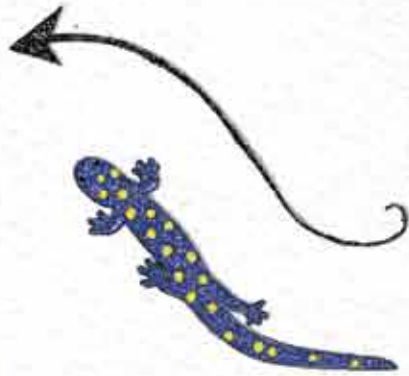
**Errr, screech the brakes.**

**There! In front of the car, little blue animals wriggle across the road. The creatures are almost invisible, except for bright yellow spots on their backs that glow like my flashlight.**

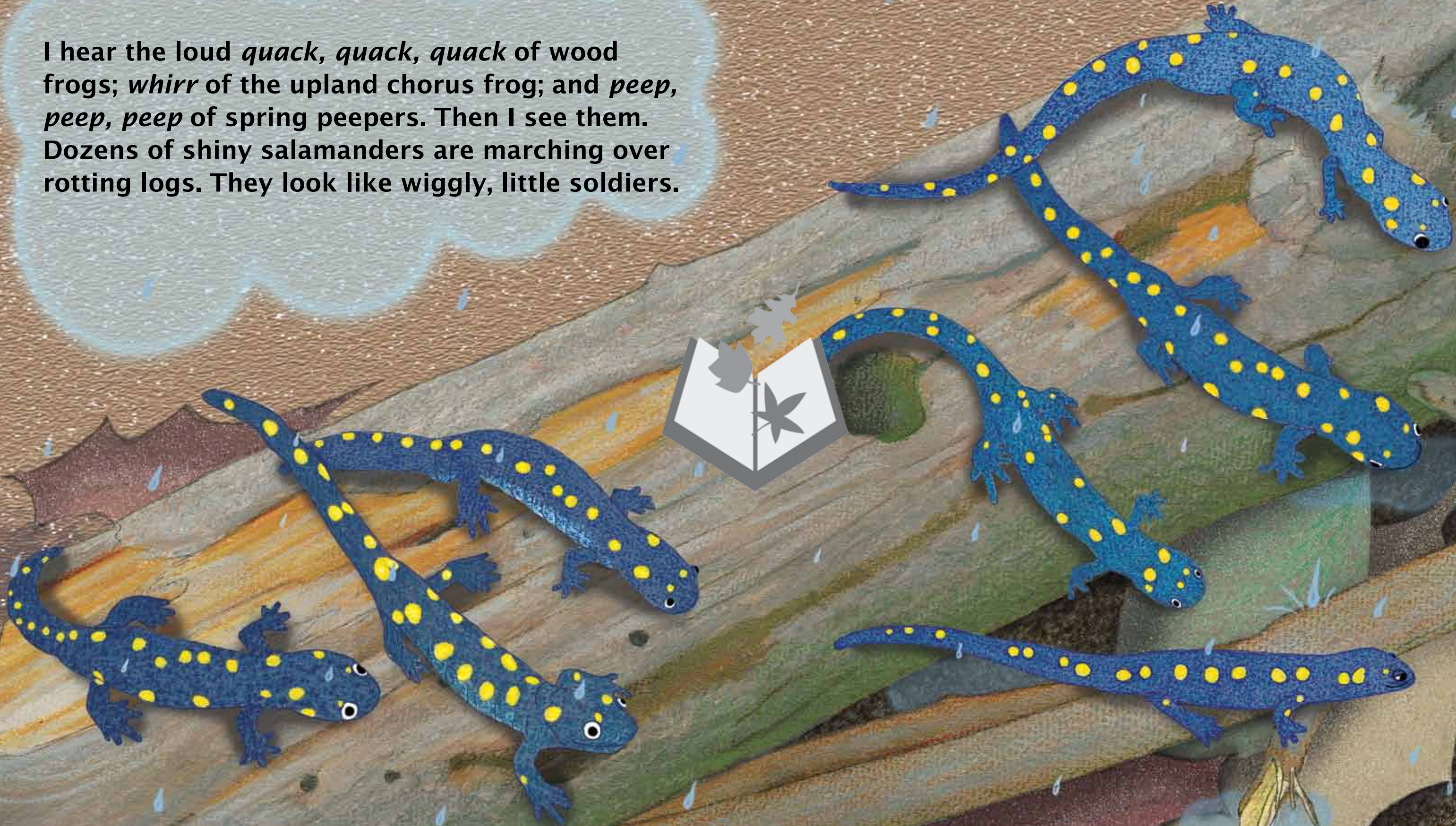
**Are they snakes? No! They are spotted salamanders just emerging from hibernation.**



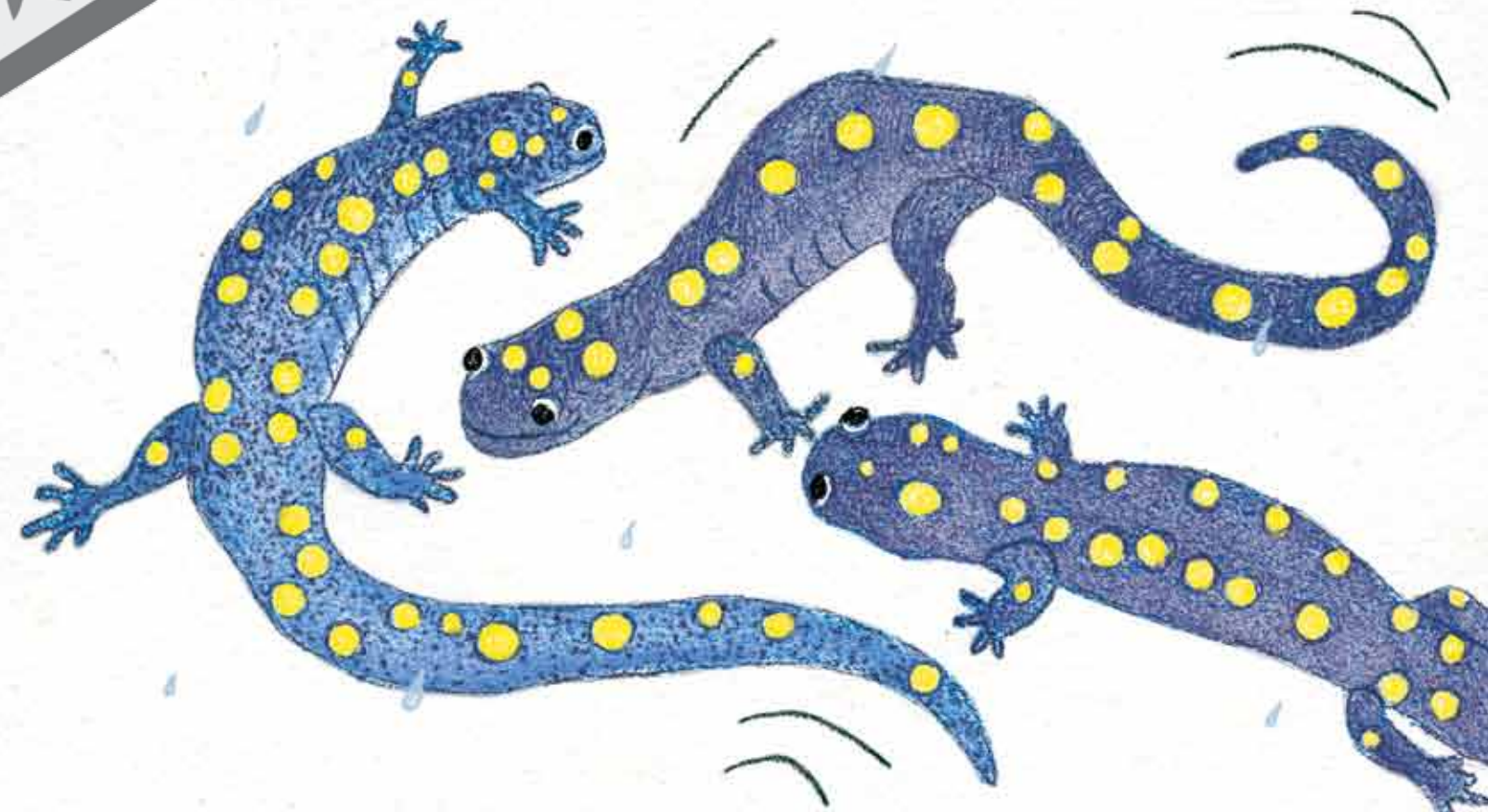
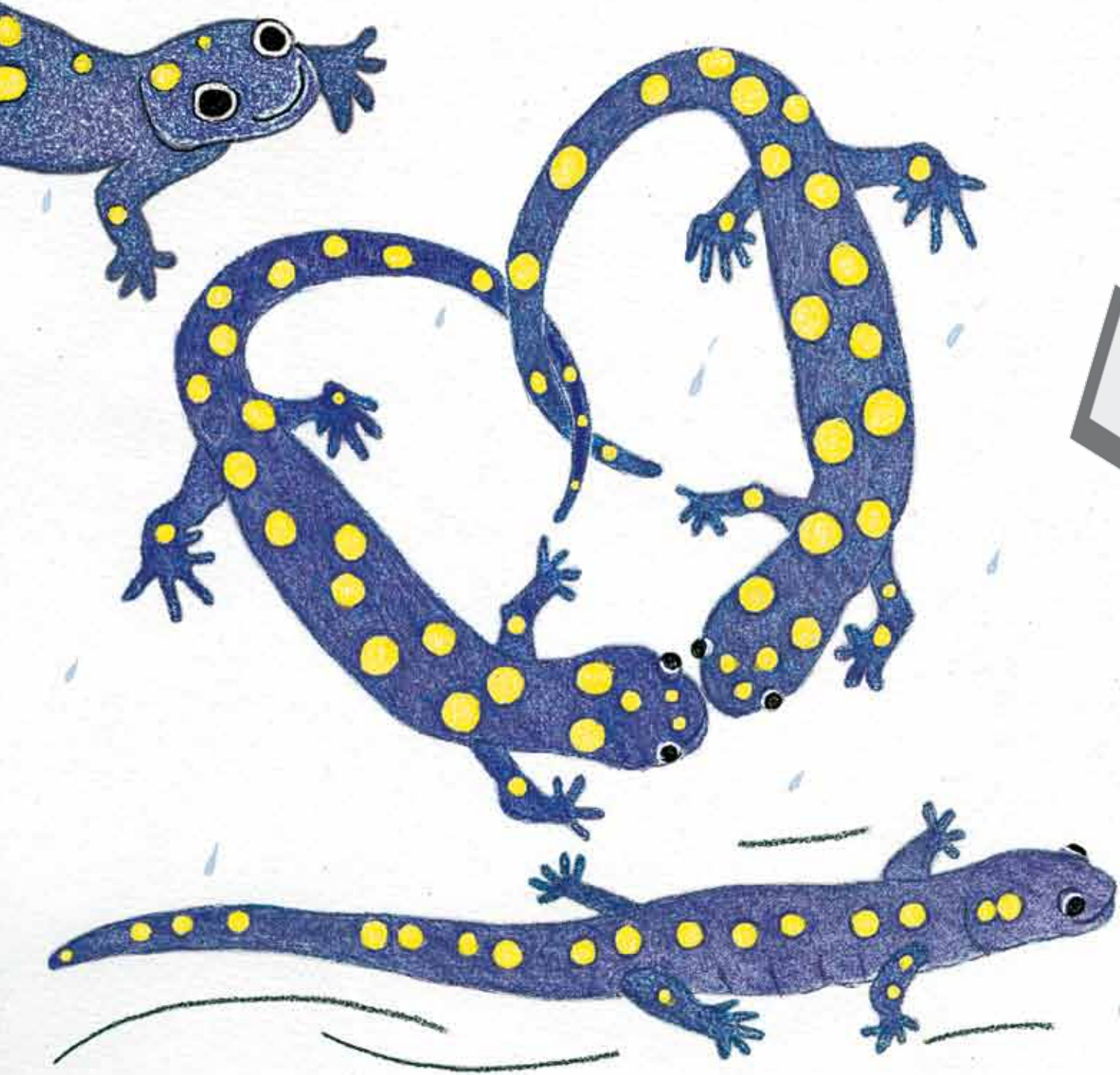
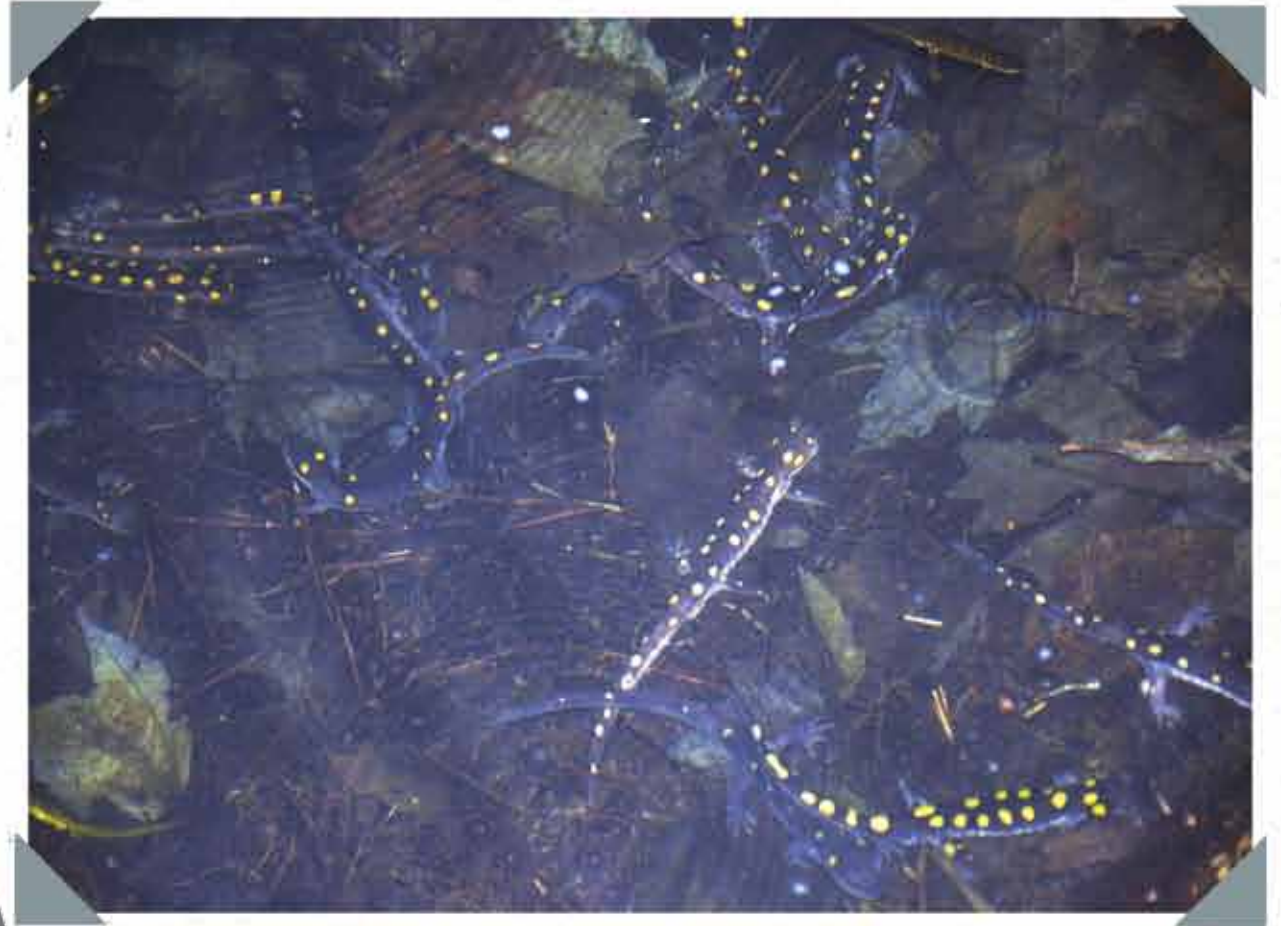
On this rainy, chilly night, Dad pulls the car over. We carefully step out. We follow the salamanders into the woods. Soggy sticks snap. Wet brown leaves cover my shoes. We reach the water. I call it a wicked big puddle. Dad says it's actually called a vernal pool.



I hear the loud *quack, quack, quack* of wood frogs; *whirr* of the upland chorus frog; and *peep, peep, peep* of spring peepers. Then I see them. Dozens of shiny salamanders are marching over rotting logs. They look like wiggly, little soldiers.



The boy salamanders try to get the girl salamanders' attention. They quickly twist their chunky bodies and turn their narrow heads. Some even rub noses.



## For Creative Minds

This For Creative Minds educational section contains activities to engage children in learning while making it fun at the same time. The activities build on the underlying subjects introduced in the story. While older children may be able to do these activities on their own, we encourage adults to work with the young children in their lives. Even if the adults have long forgotten or never learned this information, they can still work through the activities and be experts in their children's eyes! Exposure to these concepts at a young age helps to build a strong foundation for easier comprehension later in life. This section may be photocopied or printed from our website by the owner of this book for educational, non-commercial uses. Cross-curricular teaching activities for use at home or in the classroom, interactive quizzes, and more are available online. Go to [www.ArbordalePublishing.com](http://www.ArbordalePublishing.com) and click on the book's cover to explore all the links.

### Salamander Classification

Salamanders belong to one of the five classes of animals with backbones (vertebrates): amphibians, birds, fish, mammals or reptiles. Use the following information to determine where salamanders belong. The answer is below.

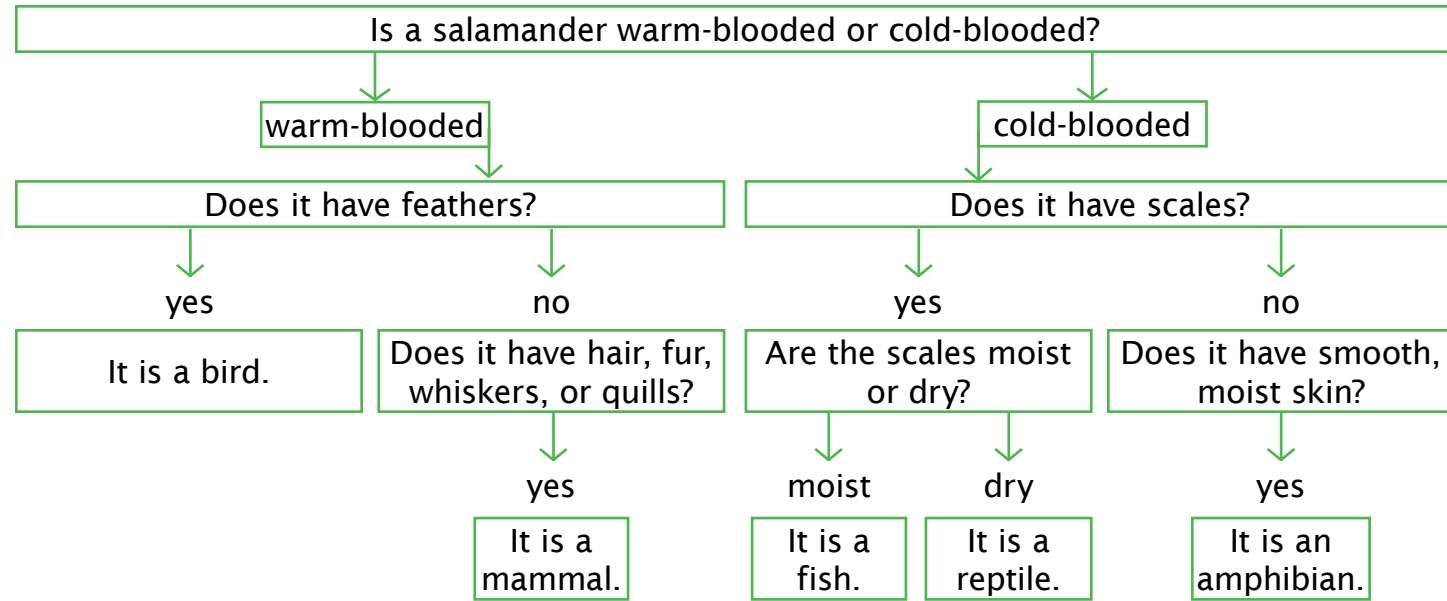
Salamanders hatch from eggs and spend the first part of their lives in water, breathing oxygen from the water through gills. They do not look like their parents when they hatch.

As they grow, their bodies change to look like their parents and they move onto land.

On land, they breathe oxygen through their lungs.

Salamanders are cold-blooded. That means that they use the heat of the sun or surrounding water to warm themselves.

They have smooth, moist skin without fur, feathers, or scales. To keep their skin from drying out, they live in or near water. On land, they live in burrows and rotten logs to keep their skin moist.



Answer: Salamanders are amphibians

### Spotted Salamander Life Cycle Sequencing

Put the spotted salamander life cycle events in order. The answer is below.

- Adult:** Adults are navy blue with yellow spots. Once the lungs and back legs are fully developed, the salamanders move onto land where they will live for the rest of their lives.
- Egg:** Adult female salamanders lay their eggs underwater in jiggly, jellybean-shaped masses. Each gooey egg container holds hundreds of eggs.
- Embryo:** The babies grow inside egg cases.
- Larva:** Larvae have front legs and breathe oxygen from the water through gills. They don't have hind legs yet.
- Juvenile:** As the salamanders grow, they change colors. First, they turn grey, then green like an olive. Their gills and short tail fins disappear and they grow back legs.



eggs



larva



juvenile



adult



embryo

Answers in order: egg, embryo, larva, juvenile, and adult

## Salamander Nights

At the end of winter, once the ground has no ice layers, some adult salamanders start to come out. The air temperature could be just above freezing and the water temperature is very cold, maybe in the high 30s F (0-5 C). Sometimes there is still ice on the water.

On the first few rainy nights in the spring, salamanders travel to “wicked big puddles” (vernal pools) to breed. They may head to the same pool where they were born. Up to hundreds of these amphibians gather to find mates. They will cross roads or crawl over anything in their way.

The mass migration occurs over several days.

Vernal pools are seasonal wetlands that fill with water for four to five months, depending on how early the snow melts. The area is dry for the rest of the year, which does not allow for fish and many other permanent water animals to live. These pools act as nurseries for many amphibians (frogs, toads, newts, and salamanders). There is enough food in these pools for the tadpoles to eat, but no fish to eat the tadpoles.

The new adults crawl out in August.

Many parks and nature centers have “Salamander Night” events to see the salamanders and to help them cross roads safely. Call local parks or nature centers to see what events they might have or if they can provide locations and estimated dates for your area. You can also call the state-level government agency responsible for protecting the wildlife in your state (Department of Natural Resources, Wildlife Resources, Fish and Game, etc.).

When you go, please remember that wildlife is to be observed. Do not handle animals unless you are under the guidance of licensed officials or wildlife biologists. Do not expose animals to bug spray, sunblock, or pesticides.



## An Environmental Biologist

Co-author J. Adam Frederick is a scientist and educator who studies salamanders and other aquatic organisms as part of his job. Because he works with living things found in the wild, he’s called an environmental biologist. He shares how and when he decided to become a scientist:

“When I was five years old, I was visiting the beach with my family and grandparents. I walked down to the water and was knee-deep in the surf when I stepped on something hard. I reached down to grab it. I was so excited. I thought it was a really big shell. But, I couldn’t move it. So, my dad and big brother helped me dig it up. Sand was stuck all over it but we could tell it was some kind of bone.

“When we got home, my dad and I took the bone to a biologist at the university where my dad worked. He told us it was part of the spine (vertebra) of a whale, probably a humpback.

“Finding that whalebone showed me that it’s really worth observing nature closely because, wow, you could find something incredible! I still look for things today. Sometimes I find things, but not always.



“I knew I wanted to be a scientist by the time I was eight years old. About that time, I was really into reptiles. Even though my mother didn’t like them, we had lots of pets: chameleons, geckos, armadillo lizards, and snakes—garter, rat, corn, and king. My oldest brother and I also had fish tanks with frogs and newts.

“Because I had all of these animals, I learned how to set up terrariums and what to put in there, and what not to put in there. I learned about life histories and read lots of books on the animals—about their anatomy, what to feed them, and what not to feed them. I started learning incredible amounts of biology on my own because of these animals.”

Just as you might keep a science journal in school, working scientists keep journals too! What kinds of things do you see in Adam’s journal?





To my dad—JKC

To my family—JAF

Special thanks to Rona Balco with the Bolton, Massachusetts, Conservation Commission for her help assisting me with my salamander research on Big Night 2014.—SB

Photo credits: J. Adam Frederick, David Frederick, Christopher England, and Shennen Bersani

Thanks to the following salamander experts for verifying the information in this book:

- J. Adam Frederick, Maryland Sea Grant, Asst. Director of Education at the Institute of Marine and Environmental Technology
- Dr. Ryan Kerney, Assistant Professor of Biology at Gettysburg College. As an organismal biologist, Dr. Kerney specializes in the ecology, evolution and development of amphibians.

Cataloging Information is available through the Library of Congress:

978-1-62855-5561 English hardcover ISBN  
978-1-62855-5653 English paperback ISBN  
978-1-62855-5745 Spanish paperback ISBN  
978-1-62855-5837 English eBook downloadable ISBN  
978-1-62855-5929 Spanish eBook downloadable ISBN

Interactive, read-aloud eBook featuring selectable English (978-1-62855-6018) and Spanish (978-1-62855-6100) text and audio (web and iPad/tablet based) ISBN

Translated into Spanish: *Temporada de salamandras*

key phrases for educators: amphibian, Environmental Education, life cycle, salamander, metamorphosis

#### Bibliography:

Graham, E. R., S. A. Fay, A. Davey, and R. W. Sanders. "Intracapsular Algae Provide Fixed Carbon to Developing Embryos of the Salamander *Ambystoma Maculatum*." National Center for Biotechnology Information. U.S. National Library of Medicine, 12 Oct. 2012. Web. <http://www.ncbi.nlm.nih.gov/pubmed/23038736>.

Indiviglio, Frank, and Michele Earle-Bridges. *Newts and Salamanders: Everything about Selection, Care, Nutrition, Diseases, Breeding, and Behavior*. Hauppauge, NY: Barron's Educational Series, 1997. Print.

"The Journal of Experimental Biology." Intracapsular Algae Provide Fixed Carbon to Developing Embryos of the Salamander *Ambystoma Maculatum*. Web. <http://jeb.biologists.org/content/216/3/452>.

Kerney, Ryan, Eunsoo Kim, Roger P. Hangarter, Aaron A. Heiss, Cory D. Bishop, and Brian K. Hall. "Intracellular Invasion of Green Algae in a Salamander Host." *Intracellular Invasion of Green Algae in a Salamander Host*. Ed. David B. Wake. Proceedings of the National Academy of Sciences of the United States of America, n.d. Web. <http://www.pnas.org/content/early/2011/03/29/1018259108>.

"Maryland Department of Natural Resources." *Salamanders & Newts*. Maryland Department of Natural Resources. Web. [http://dnr.maryland.gov/wildlife/Plants\\_Wildlife/herps/Caudata/fieldguide\\_OrderCaudata.asp](http://dnr.maryland.gov/wildlife/Plants_Wildlife/herps/Caudata/fieldguide_OrderCaudata.asp).

McDonald, Karen. "Spring Salamander Emergence and Herp Hunting Etiquette Tips - The Infinite Spider." *Spring Salamander Emergence and Herp Hunting Etiquette Tips*. The Infinite Spider. Web. <http://infinite-spider.com/spring-salamander-emergence-crossing-tunnels/>.

Newsletter, March 2012. *Maryland Amphibian & Reptile Atlas*. Web. <http://marylandnaturalist.org/wp-content/uploads/2012/07/2012%20MARA%20March%20Newsletter.pdf>.

Orr, Henry. "Memoirs: Note on the Development of Amphibians, Chiefly concerning the Central Nervous System; with Additional Observations on the Hypophysis, Mouth, and the Appendages and Skeleton of the Head." *Journal of Cell Science* (1888): 1-33. *Memoirs: Note on the Development of Amphibians, Chiefly concerning the Central Nervous System; with Additional Observations on the Hypophysis, Mouth, and the Appendages and Skeleton of the Head*. Web. <http://jcs.biologists.org/content/s2-29/115/295.short>.

"Sal Site." Welcome to Sal-Site. National Center of Research Resources at the National Institutes of Health. Web. 6 Aug. 2014. <http://www.ambystoma.org/education/embryo-staging-series>

United States. National Park Service. "Amphibians." National Parks Service. U.S. Department of the Interior, 04 Aug. 2014. Web. 06 Aug. 2014. <http://www.nps.gov/cato/naturescience/amphibians.htm>

"Vernal Pool Slides." Wicked Big Puddles. Vernal Pool Association. Web. 06 Aug. 2014. [http://www.vernalpool.org/sly\\_4.htm](http://www.vernalpool.org/sly_4.htm).

Manufactured in China, November, 2014

This product conforms to CPSIA 2008

First Printing

Text Copyright 2015 © by Jennifer Keats Curtis and J. Adam Frederick

Illustration Copyright 2015 © by Shennen Bersani

The "For Creative Minds" educational section may be copied by the owner for personal use or by educators using copies in classroom settings

Arbordale Publishing

Mt. Pleasant, SC 29464

[www.ArbordalePublishing.com](http://www.ArbordalePublishing.com)



If you enjoy this book,  
look for other Arbordale books that may be of interest:



Includes 4 pages of  
learning activities.

Look for more free activities  
online at

[ArbordalePublishing.com](http://ArbordalePublishing.com)