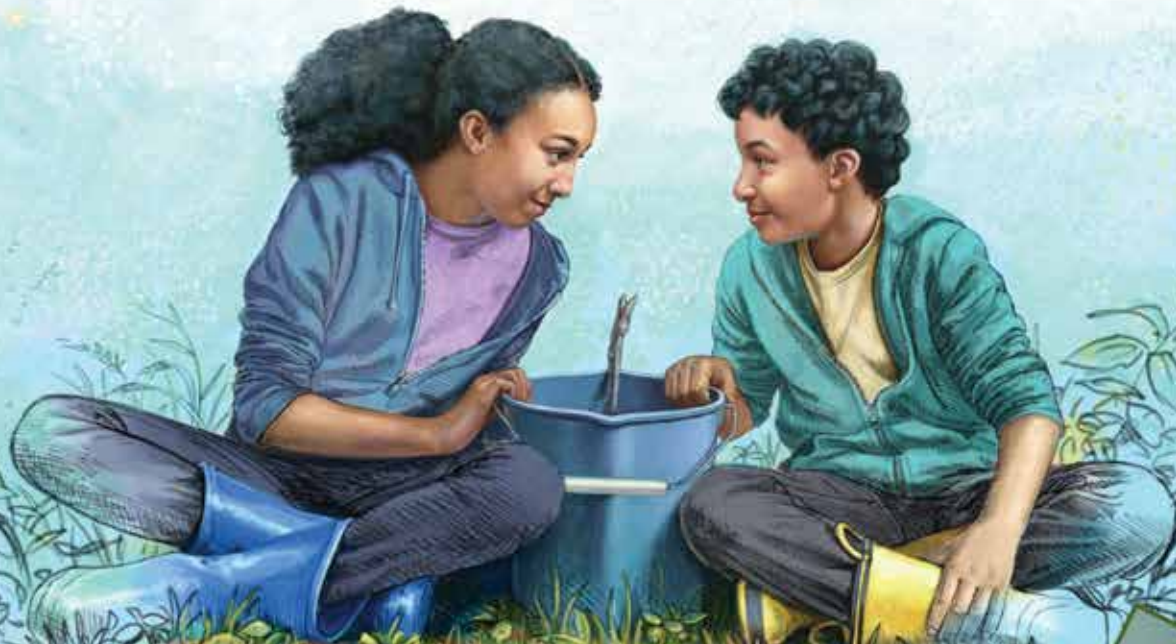


# CREEK CRITTERS



by Jennifer Keats Curtis with  
Stroud Water Research Center  
illustrated by Phyllis Saroff

Do you like scavenger hunts? How do you tell if creek water is clean and healthy? Join Lucas and his sister as they act like scientists looking for certain kinds of stream bugs (aquatic macroinvertebrates) that need clean, unpolluted water to survive. What will they find as they turn over rocks, pick up leaves and sort through the mud? Read along to find out if their creek gets a passing grade.

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- Scavenger Hunt: Identify the Bugs
- Matching Young to Adults
- Scientist's Field Notebook
- Is Your Creek Healthy? Ask the Critters!

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Thank you to Steve Kerlin, Mandy Nix, and Tara Muenz of the Stroud Water Research Center as partners in the creation of this book and verifying the scientific accuracy.

Arbordale's interactive ebooks read aloud in English and Spanish with word-highlighting and adjustable audio speed. Available for purchase online.

Award-winning **Jennifer Keats Curtis** has penned numerous stories about animals, including *Kali's Story: An Orphaned Polar Bear Rescue* (Children's Choice Book Award Winner) and *After A While Crocodile: Alexa's Diary* (NSTA/CBC Outstanding Science Trade Books for Children), with co-author Dr. Brady Barr of *Nat Geo Wild's Dangerous Encounter*, *Baby Bear's Adoption* with wildlife biologists at Michigan's DNR, *River Rescue* with Tri-State Bird Rescue & Research, Inc.; and *Moonlight Crab Count* with co-author Dr. Neeti Bathala. The long-time writer's other recent books include *The Lizard Lady*, with co-author Dr. Nicole Angeli, *Maggie: Alaska's Last Elephant* and the *Animal Helpers Series*. When not writing, Jennifer can be found among students and teachers, talking about literacy and conservation. Visit her website at [www.jenniferkeatscurtis.com](http://www.jenniferkeatscurtis.com).

Stroud Water Research Center is a research field station not a nature center. Visitors use the same tools as scientists to study and examine stream health. This story is based on bugs collected on the Stroud Center's property, along the East Branch of White Clay Creek, a tributary of the Delaware River. At the Stroud Water Center, environmental educators often pre-collect specimens because too many kids stomping through the creek has too much impact. The students have a chance to examine the bugs under a microscope and learn more about them. At the end of class, the educators return the bugs to the creek. The authors hope readers are inspired to go on an adventure of their own to local creeks, streams, and ponds to collect and learn more about the critters who live there.

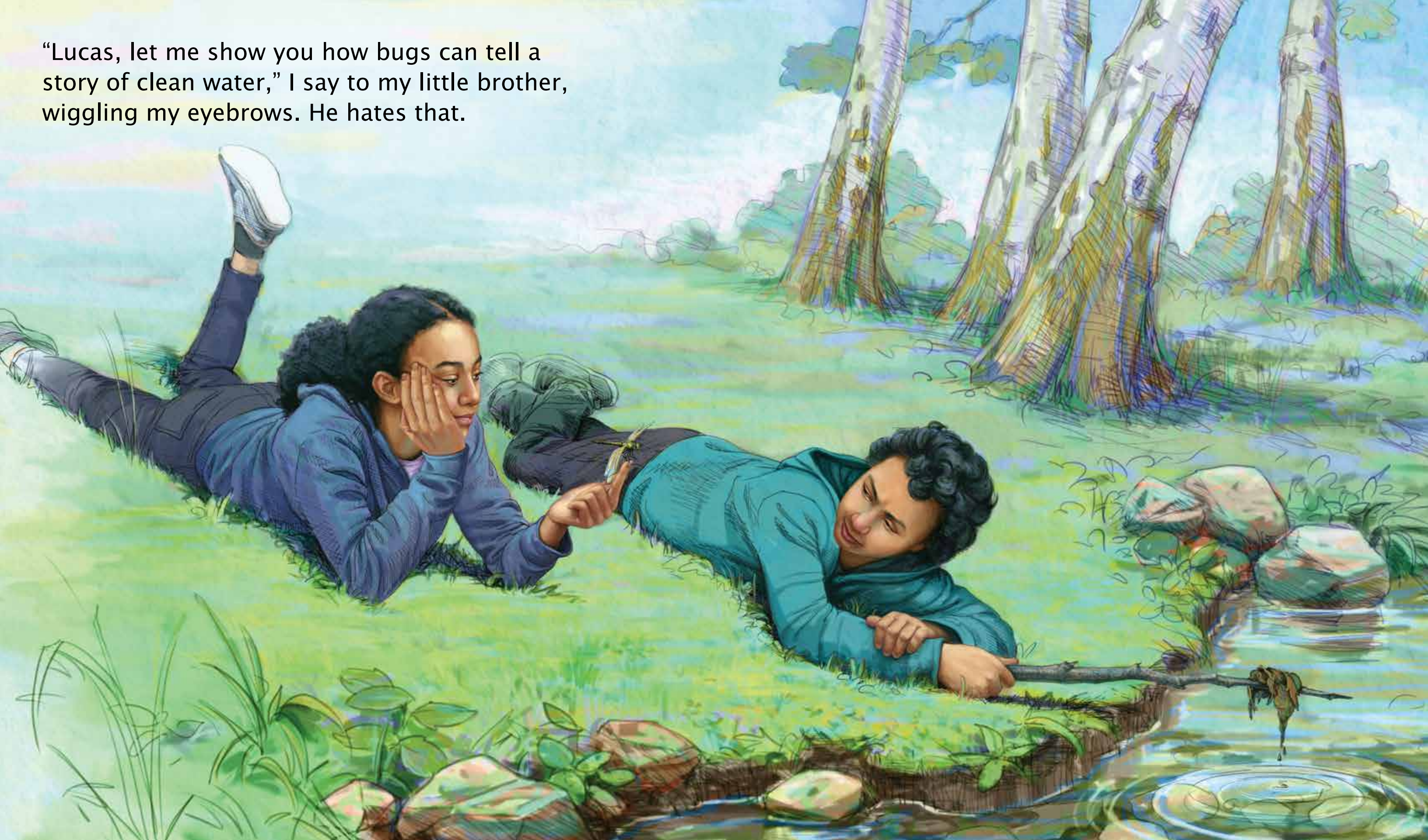
Since childhood, **Phyllis Saroff** has brought together her loves of science and art. In addition to *Creek Critters*, *Maggie: Alaska's Last Elephant*, *Vivian and the Legend of the Hoodoos*, *Tuktuk: Tundra Tale* and *Sounds of the Savanna* for Arbordale, Phyllis has illustrated nonfiction books about the natural world such as *Teeth* and *Mary Anning: Fossil Hunter*. She also illustrates for children's magazines, wayside signs and other educational material. Phyllis works digitally and with oil paint. Phyllis lives in Maryland with her husband, two sons, and two dogs. Visit her website at [saroffillustration.com](http://saroffillustration.com).



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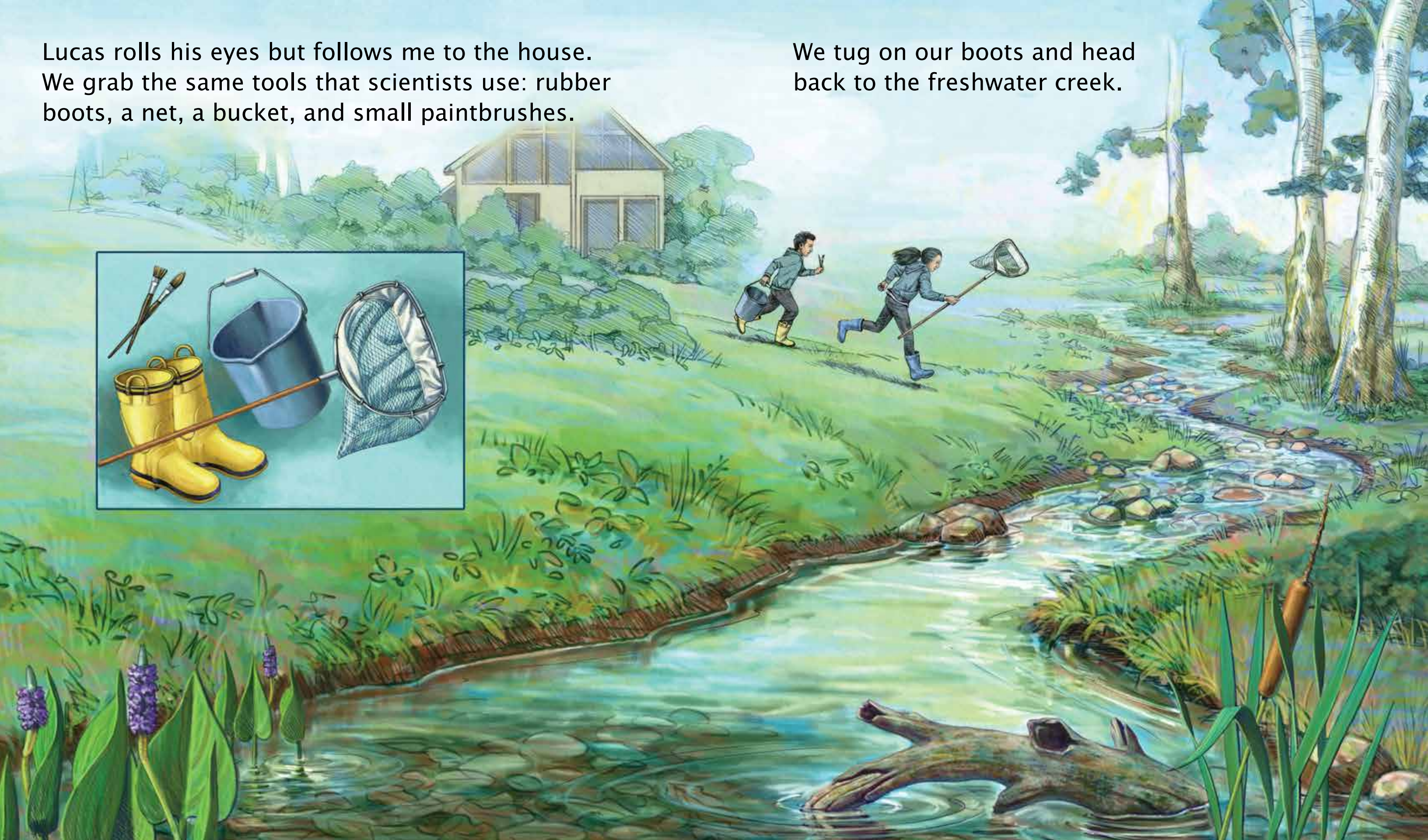


“Lucas, let me show you how bugs can tell a story of clean water,” I say to my little brother, wiggling my eyebrows. He hates that.



Lucas rolls his eyes but follows me to the house.  
We grab the same tools that scientists use: rubber boots, a net, a bucket, and small paintbrushes.

We tug on our boots and head  
back to the freshwater creek.





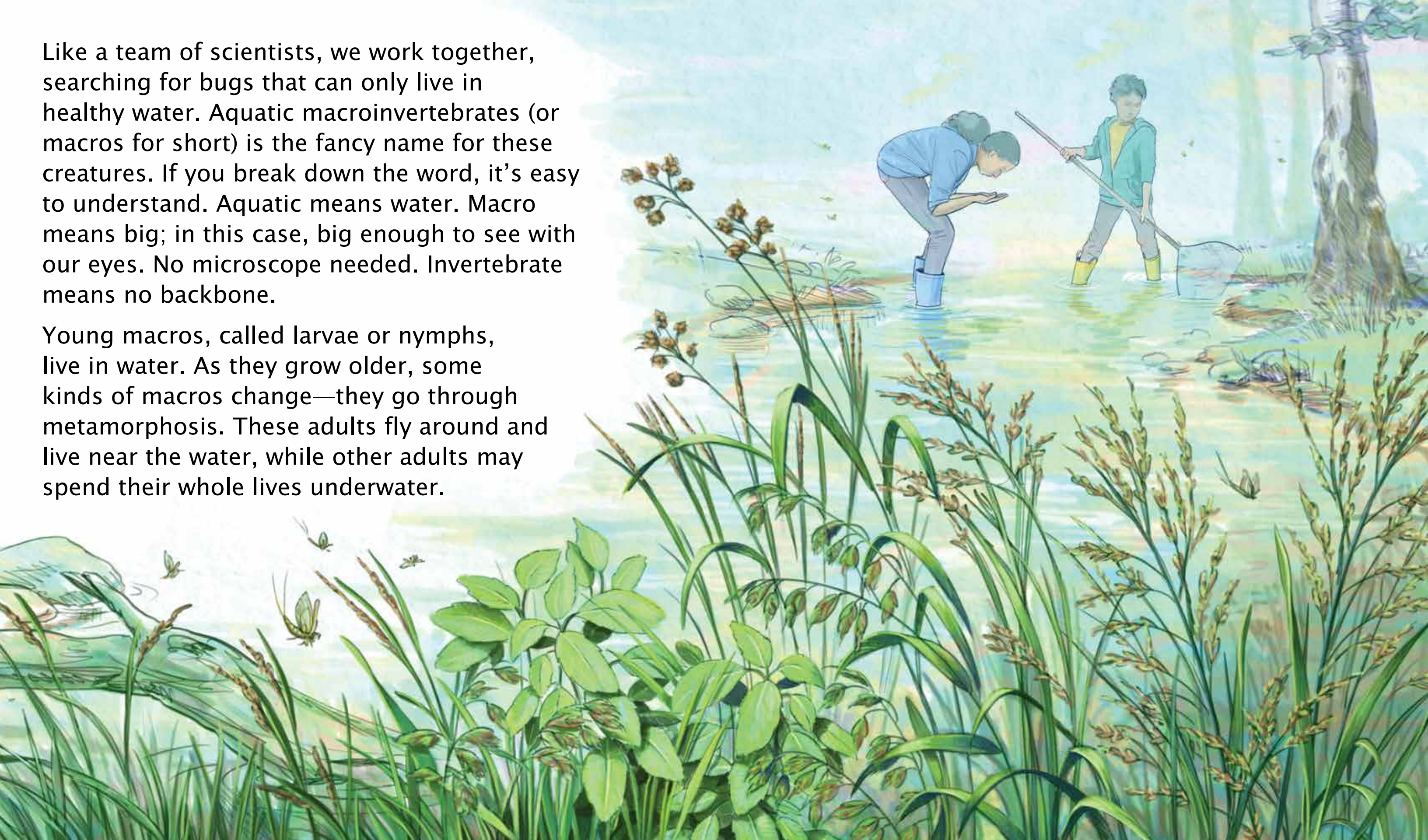
Galumph! We step right into the water. This part of the creek is called a riffle. It's shallow and the water runs fast enough over the rocks to make a bubbling noise. Downstream is a pool. It's deep and the water is calm.



I splash water into our bucket and plop it next to a tall sycamore tree. Quickly, I spin around before Lucas can push me in. That water is cold!

Like a team of scientists, we work together, searching for bugs that can only live in healthy water. Aquatic macroinvertebrates (or macros for short) is the fancy name for these creatures. If you break down the word, it's easy to understand. Aquatic means water. Macro means big; in this case, big enough to see with our eyes. No microscope needed. Invertebrate means no backbone.

Young macros, called larvae or nymphs, live in water. As they grow older, some kinds of macros change—they go through metamorphosis. These adults fly around and live near the water, while other adults may spend their whole lives underwater.



# For Creative Minds

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Visit [www.ArbordalePublishing.com](http://www.ArbordalePublishing.com) to explore additional resources.

## Scavenger Hunt: Identify the Bugs

water penny larva

stonefly nymph

dragonfly nymph

The answers are on the copyright page.

## Matching Young to Adults

Mayfly nymph



Caddisfly larva



Stonefly nymph



Dragonfly nymph



Can you match the young water bugs, called larvae or nymphs, to their adults?

Aquatic macroinvertebrates are “bugs” that spend some or all of their lives underwater, are big enough to see with the naked eye, and don’t have backbones.

These four kinds of macroinvertebrates are all insects that begin their lives underwater. After the larvae or nymphs change through metamorphosis, the adults fly around and live near the water.

Answers: mayfly-4, caddisfly-1, stonefly-2, dragonfly-3

# Scientist's Field Notebook

Explore a small section of your stream to see if it is a good place for creek critters to live! For each section below, check off the boxes of what you observe and find. Have fun!

Don't forget to bring: copy or download ([www.arbordalepublishing.com](http://www.arbordalepublishing.com)) this page to take with you, pencil, clear plastic cup (or mason jar) to take a sample of stream water, shoes for getting in the stream and exploring the nearby forest, and a buddy!

Your Name: \_\_\_\_\_ Date: \_\_\_\_\_

Stream/River Name: \_\_\_\_\_ Time: \_\_\_\_\_

### Current Weather

- Sunny 
- Cloudy 
- Partly Cloudy 
- Rain 
- No Rain

### Check the Stream Water Part 1

#### Water Color

- Clear
- Brown
- Green
- Orange
- Blue
- Other: \_\_\_\_\_

#### Smell

- Dead fish
- Rotten Eggs
- Chlorine
- Gas/Oil
- Nothing
- Other: \_\_\_\_\_

#### Clarity

- Clear
- Cloudy

Fill up a clear cup with stream water for these tests!



### I Also See:

- Fish
- Plastic
- Bridge
- Farm Animals
- Tires
- Buildings
- Birds
- Road
- Other: \_\_\_\_\_

### Check the Stream Water Part 2

#### Water Surface

- Nothing
- Algae
- Oil
- Foam
- Other: \_\_\_\_\_

#### Water Level

- Flood
- High
- Normal
- Low
- Dry

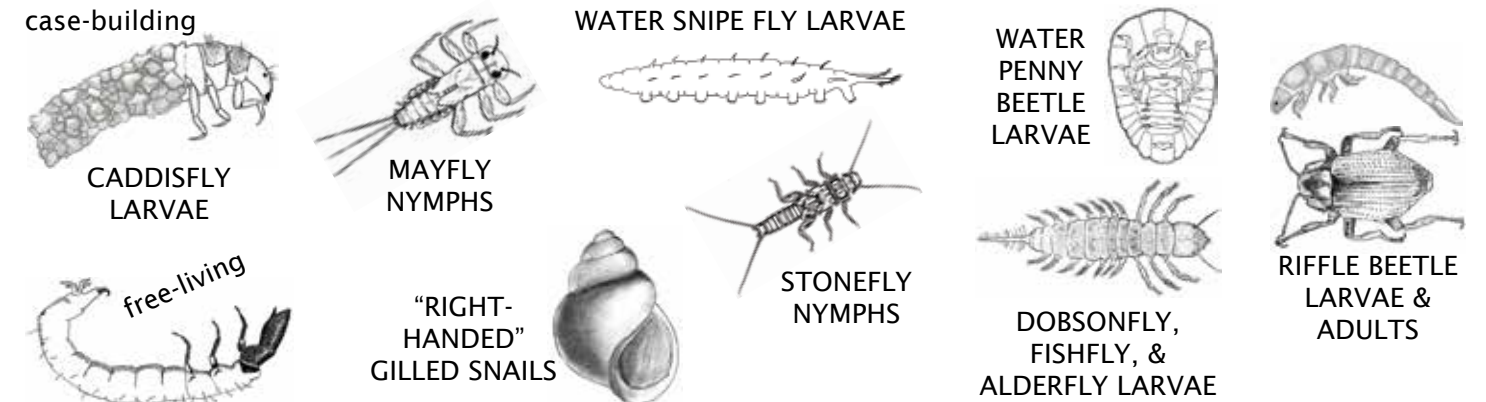
### Site Notes:

\_\_\_\_\_

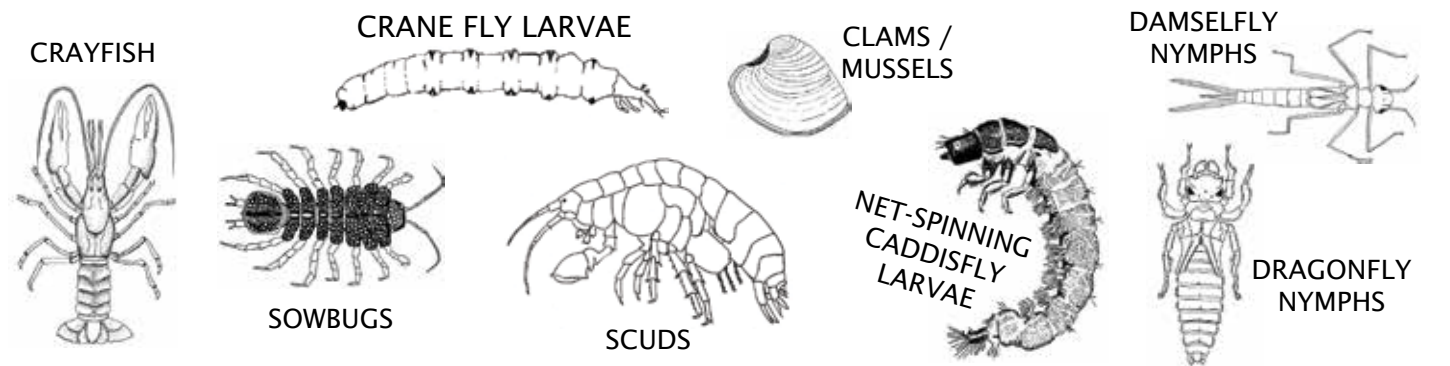
# Is Your Creek Healthy? Ask the Critters!

Aquatic macroinvertebrates (macros) can be grouped by how sensitive they are to pollution or dirty water. A healthy creek should support many sensitive macros. Macros in every group have special jobs in the creek. Scientists want to find many different kinds of macros and lots of each kind!

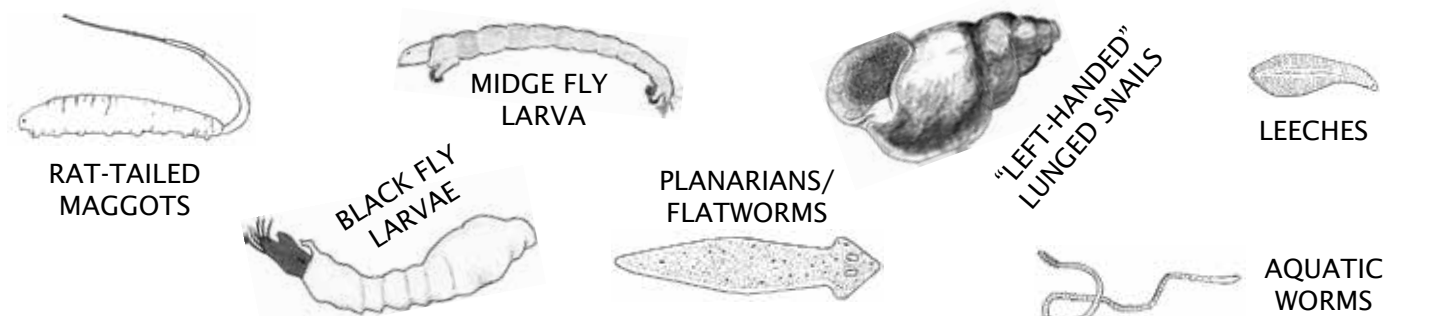
**Group 1: Sensitive — These aquatic macroinvertebrates need clean water to survive.**



**Group 2: Somewhat Sensitive — These aquatic macroinvertebrates can live in somewhat polluted water.**



**Group 3: Tolerant — These aquatic macroinvertebrates can live in very clean, somewhat clean, OR polluted water!**



Animals are not drawn to scale.



Thank you to Steve Kerlin, Mandy Nix, and Tara Muenz of Stroud Water Research Center as partners in the creation of this book and for verifying the scientific accuracy.

All photographs were provided by Stroud Water Research Center.

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