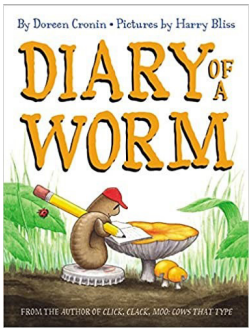
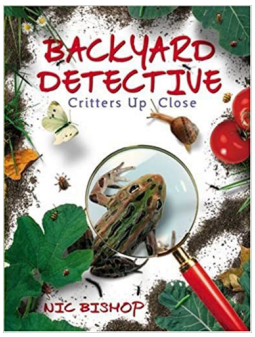
Roots

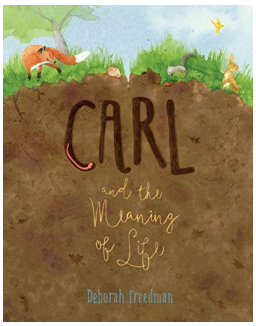
Digging Deeper into Soil & Water Resources

SOIL SUPERHEROES

LITERACY CONNECTIONS







Wiggling, slithering, creeping and crawling, lift a log or a rock and you are likely to find soil alive with creatures! Soil is a complete **habitat**, like a forest or stream, where organisms can find the resources they need including *food, water, cover (shelter), space* and *air*. In a typical forest or grassland the soil surface is covered with one or two inches of **organic matter** or **humus** in various stages of decay. Within the humus and the soil below, there are a multitude of tiny living **organisms** that play an important role in **nutrient cycling** and **soil fertility**. These organisms include *carnivorous* centipedes and spiders that feed on small insects, *herbivorous* grubs (beetle larvae) that feed on plant roots, *parasitic* mites that rely on larger animals for their food and the very important *scavengers*- worms, pillbugs (roly polys) and millipedes– that feed on dead plant material and incorporate important nutrients into the soil.

All of these organisms play an important role in the soil food web and in soil health. Their roles are so important we can think of them as *Soil Superheroes*! Pillbugs and millipedes breakdown organic compounds- manure, plant residue and pesticides- preventing them from entering the water system as pollutants. Bacteria and fungi hold nitrogen and other nutrients that might otherwise enter the groundwater. Tiny arthropods like insects and spiders produce fecal pellets that enhance soil clumping and reduce runoff and erosion. Earthworms, ants, termites and beetles create **macropores** that allow water to flow rapidly into and through the soil. Some soil organisms prey on crop pests and others are a source of food for above-ground animals.

Within healthy soils, you will find a diverse abundance of **soil organisms**. Soil temperature, moisture, pH and pore size will determine what species will be present as well as their level of activity. **Soil compaction**, a lack of vegetation and a lack of plant litter covering the soil surface, tends to reduce the number of arthropods in the soil. You can determine the relative health of your soil by searching for earthworms, pillbugs (roly polys), millipedes and other *Soil Superheroes*. The greater the number and diversity of organisms you discover, the healthier your soil is for both plants and animals.

Did You Know?

In most ecosystems, more life and diversity lives underground than above. A spade full of rich soil contains more species of organisms than can be found above ground in the entire Amazon rain forest. Similarly, one cup of soil may hold as many bacteria as there are people on Earth.

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SOIL SUPERHEROES

DISCOVERING SOIL IS ALIVE

It's time to get outside and explore! Let's look for soil organisms.

Supplies:

- Space Outside
- Tools for Digging: Spoons, small gardening spade, hands and fingers
- Collection Container: Small bucket, carryout container, bowl

Procedures:

- Find a safe place outside to dig and discover.
- Remember that when we dig in soil, we are digging into the habitat of many small plants and animals. Just as scientists do, we need to use gentle hands and make careful observations using our senses.
- Place a small amount of soil and leaf litter in the bottom of a collection container.
- Begin carefully digging, turning over rocks/logs and exploring the soil habitat. When soil organisms are discovered, gently place them into the collection container.
- Using the *Soil Superheroes Field Guide*, make observations and comparisons between the animals found and those in the field guide. We can also use the field guide to identify the organisms found.
- When we are done collecting and identifying the soil organisms, carefully release the animals found and return logs, rocks, leaf litter, etc. to the way it was before the exploration.
- Check out this **Soil is Alive Video**!

ADDITIONAL RESOURCES

Earthworm Facts

Yucky Worms Read Aloud

Millipedes of Ohio Field Guide

Decomposers

Soil is Alive!

The Soil Animal Handbook

Wiggling Worms at Work Read Aloud

I'VE GOT WORMS! Build a Worm Farm!

George McGavin Earthworms Eating Fallen Leaves

Worms are Wonderful

GIVE IT A TRY

Let the worms do the work! Give backyard composting a chance. Click on the following links to find out more about composting and our Community Backyards Rebate Program.

QUESTIONS TO EXTEND LEARNING:

1. Why is it important to have healthy soils?
2. Did the organisms you found have any special adaptations for living underground or for protection?
3. What are some ways we could make our soil healthier for these *Soil Superheroes*?

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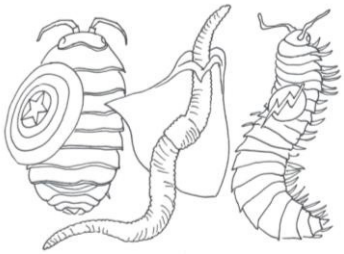
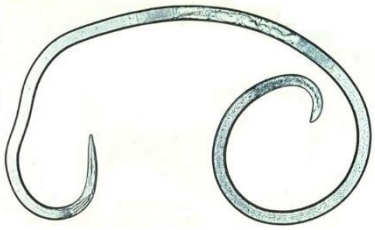


Soil Superheroes Field Guide

Earthworm



Nematode

Spider

Grub

Springtail

Ant

Millipede

Centipede

Salamander

Pillbug

Sowbug

Snail

Slug

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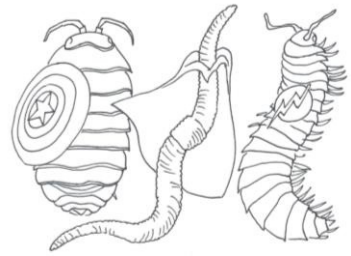

Soil Superheroes Field Guide

Spider Spiders are air breathing arachnids, with 8 legs, 2 body segments and no antennae or wings. Spiders have silk glands they use to spin webs or egg sacs. Most of these predators catch their prey in their webs and inject venom from their fangs to kill them.	**Nematode** Nematodes are tiny non-segmented roundworms that live in abundance in the soil. Though some are parasitic on plants, many species are free living, feeding on bacteria and fungus.	**Earthworm** The name earthworm covers a variety of segmented worms that burrow through the soil, breathe through their moist skin and eat decaying organic matter. They move through the soil by relaxing and contracting muscles along their bodies.
Ant Ants are insects, with 6 legs, 3 body segments (head, thorax, abdomen), and antennae. Ants are social animals, living in colonies in underground tunnels. Most ants are omnivores.	**Springtail** Springtails are tiny, wingless insects that live in moist soil and feed on decaying plant material, fungi and bacteria. They come in a variety of shapes and colors and are named for a tail that folds under the body and can extend to make them jump.	**Grub** Grubs can be the larvae of Japanese beetles, masked chafer, and June beetles. Grubs are typically white in color with a dark head and usually found in a "C shaped" position in the soil. They feed on grass roots.
Salamander Salamanders are amphibians that have a 'lizard-like' appearance. They have moist skin and live in wet environments. Many salamanders are feed on invertebrates.	**Centipede** Centipedes are fast moving, agile, nocturnal arthropods with one pair of legs per body segment. Centipedes are predators that use their antennae to detect prey and claws to grasp and inject venom into their prey.	**Millipede** Millipedes are arthropods that have 2 pairs of legs per segment. Millipedes have a hard outer shell which they shed as they grow, usually adding legs each time they molt. They eat decaying and dead plant matter.
Snail / Slug Land snails and slugs have two pairs of retractable tentacles on their heads. The upper pair has eye spots at the ends, while the lower pair provides the sense of smell. They have microscopic tooth-like structures that work like a file, ripping plants into pieces.	**Sowbug** Also called wood lice, sowbugs, feed on dead plant material. They are grey in color, relatively flat and have 14 legs. They are land crustaceans like pillbugs, but do not roll up. Sowbugs can be identified by two tails that stick out under the back of their shell.	**Pillbug** Also called roly polys, pillbugs are known for their ability to roll into a ball. Pillbugs and sowbugs are the only crustacean that can live on land their entire lives. Pillbugs live up to 2 years, molt their exoskeleton, have 14 legs and eat decaying plant material.

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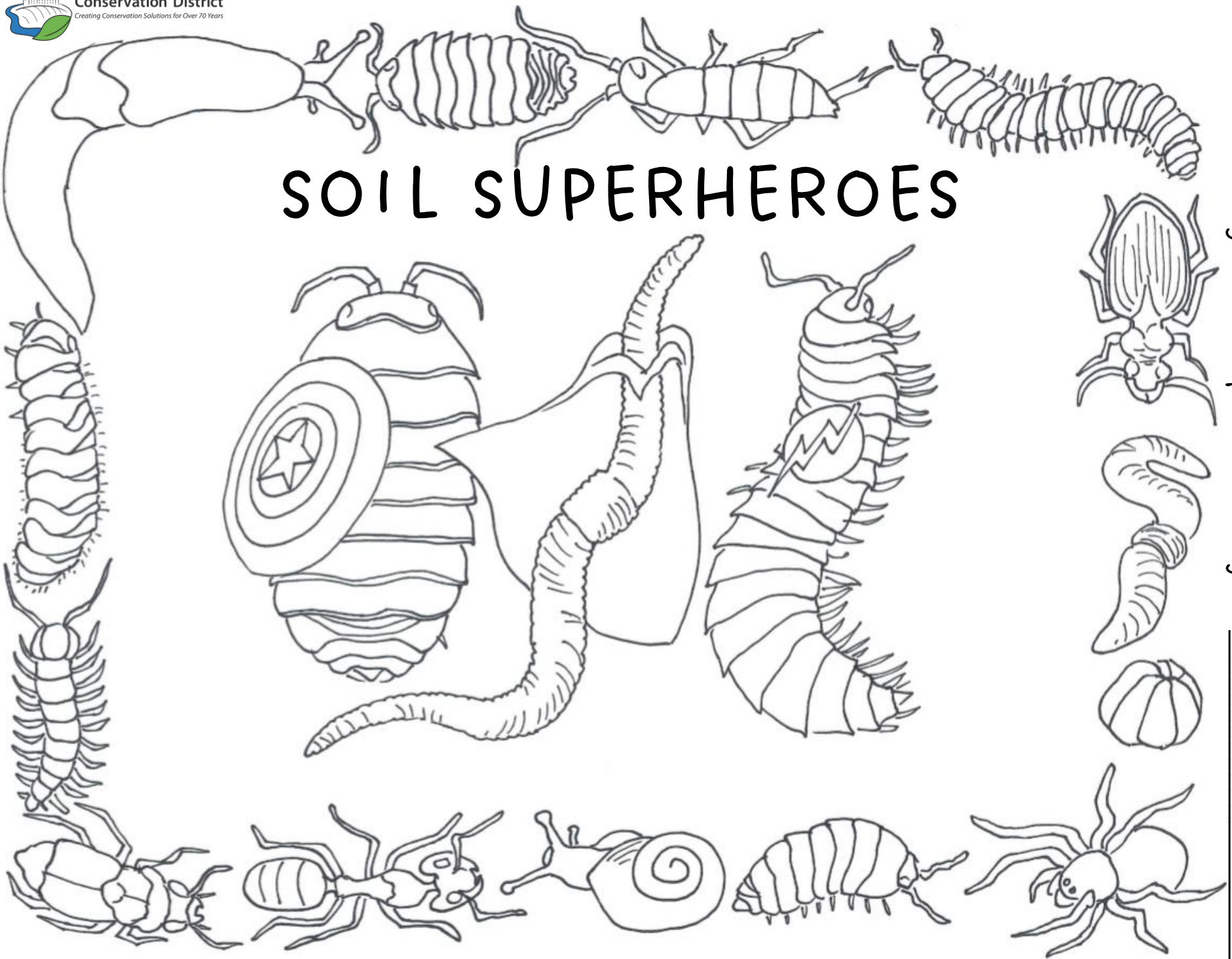

Which Soil Superhero would you like to be? _____

What would be your Soil Superhero strength? _____

Name: _____

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SOIL SUPERHERO KEY