

### Exploring Invertebrate Diversity and Soil Characteristics in an Iowa Prairie

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#### Introduction

##### Background<sup>1, 2</sup>

- Invertebrates influence soil characteristics, like aeration, moisture retention, and organic material (Fig. 1)
- Invertebrate biodiversity can impact soil function, plant growth, and overall and environmental health
- Outdoor learning helps elementary students develop greater independence, creativity, empathy, and problem-solving skills
- Activity adapted from findings of our related soil research project

##### Central Concept<sup>2</sup>

- Biodiversity is the variety of plants and animals we observe in different habitats.
- Different habitats contain different invertebrates that impact the look and feel of soil. In turn, soils vary across landscapes and support diverse plant life that humans depend on.

##### Learning Objectives

1. Compare soils from different habitats and describe their physical differences
2. Relate invertebrate diversity to soil characteristics
3. Use observations to conclude that different soil compositions support different forms of life

##### Lesson Characteristics

- Intended for early elementary school students (K-3)
- Lesson duration was 45 minutes
- Lesson was held in a grassy outdoor park in central Iowa
- Lesson was completed with 20-25 students; more students can be accommodated with additional materials

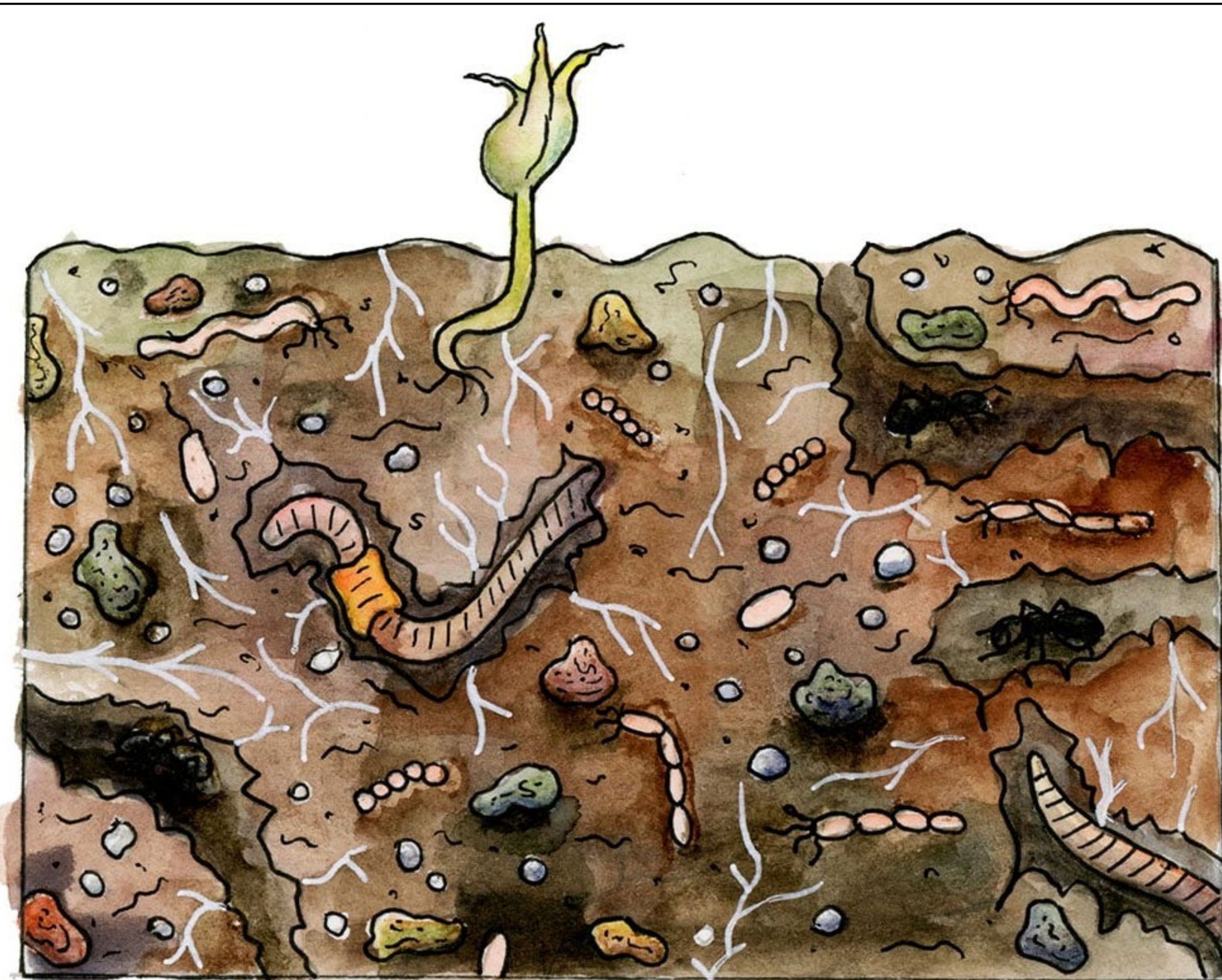


Illustration Credit: <https://www.sciencefriday.com/educational-resources/soil-texture/>

**Figure 1.** Cross-section image of soil used to spark the discussion of soil composition and subterranean invertebrates.

#### Teaching Methods

##### Preparation

- Prepared a board to publicly show student thinking
- Provided magnifying glasses, spoons, gloves, and small foil trays for collection
- Filled six pairs of two labeled sensory bins (e.g. prairie, wetland soil) (Fig. 2)
- Materials were added to the soil bins to represent field observations (Fig. 3)



##### Bin 1 Contents:

- Fine, dry soil
- 6+ worms
- 6 toy insects
- Grasses/ roots

##### Bin 2 Contents:

- Moist, compact soil
- Empty snail shells
- 2 worms
- 2 toy insects
- Sand
- Fallen plant material and other debris

**Figure 2.** Set-up of bin 1 and bin 2 with magnifying glass and collection tray for student use.

##### Engagement

- Greeted students and sparked curiosity about soil using a cross-section diagram (Fig. 1)
- Prompted students to notice and wonder about the image
- Developed an “Idea Map” to summarize student knowledge of soil
  - Examples of student responses: presence of worms, rocks, roots
- Generated more student ideas with questions:
  - *What is soil?*
  - *Where can we find soil?*
  - *Are there different kinds of soils?*
  - *How can we learn more about soil?*
- Arranged students into groups of four

##### Exploration

- Students searched through bin 1 (Fig. 4), then switched to bin 2
- Students collected items of interest from each bin
- Facilitated discussion about similarities and differences between the two bins

##### Concept Development and Application

- Used discussion to connect observed differences to the term *biodiversity*
  - Associated soil bin differences with different habitats: prairie and wetland
- Concluded with discussion of the importance of soil to food crops, asking:
  - *Do the things we eat grow in all the same soils?*
  - *What is Iowa known for growing?*
  - *If these plants like to grow in dry soil, what do you think would happen if they were planted in wet soil?*
  - *Could rice grow where corn does?*
  - *If the world only had one kind of soil, what would that mean for our food?*
- Supplement discussion with images of corn, grapes, and rice, and the crops’ preferred soil types: dry, rocky, and wet

##### Take Home Message

Students learned that soil is complex and found in terrestrial habitats all around the world. They discovered that different soil compositions support the growth of diverse forms of life, including plants and animals.



**Figure 3.** Collecting soil samples from a central Iowa prairie.

#### Connections to Next Generation Science Standards

##### Standards<sup>3</sup>

- **2-LS4.1.** Make observations of plants and animals to compare the diversity of life in different habitats.

##### Application

- **2-LS4.1.** In this activity, students explored two different soils and made observations of the presence of invertebrates, plants and plant parts, and the soil itself. They participated in discussion focused on identifying the similarities and differences between the two soils. Students explained the importance of biodiversity in different soil habitats.



**Figure 4.** Example of bin 1 containing prairie soil.

<sup>1</sup> Coyle, K. J. 2010. Back to school: Back outside. National Wildlife Federation. <https://www.nwf.org/Educational-Resources/Reports/2010/09-01-2010-Back-to-School-Back-Outside>.

<sup>2</sup> “The factory of life: Why soil biodiversity is so important.” 2010. European Commission. [https://ec.europa.eu/environment/archives/soil/pdf/soil\\_biodiversity\\_brochure\\_en.pdf](https://ec.europa.eu/environment/archives/soil/pdf/soil_biodiversity_brochure_en.pdf).

<sup>3</sup> NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.