



Nature Detectives

By Natalie Harr and Richard E. Lee Jr.

First graders study yearlong changes in nature as they create a school yard field guide.

With cutbacks on field trips and other school spending, teachers more than ever need practical ways to engage young learners in science at school. Richard Louv's *Last Child in the Woods* (2008) added to a growing consensus to get children outside and experiencing nature. Using ideas from place-based education, we present a simple year-long project that brings science, nature, and other curriculum standards to life right in your school yard. With a focus on journaling, this project is a novel way to promote nonfiction writing in your classroom. These first graders called themselves "nature detectives" because they used observation skills and simple tools to investigate a small natural area in their school yard. Students made predictions, recorded data, drew conclusions, and shared their findings about how their study site, including its plants, animals, and environment, transformed with each new season. The project culminated with students creating a school yard field guide, a unique science journal that showcased their ongoing work and discoveries. This investigation provided an ideal way to connect students with science and nature without ever leaving school!

Where in My School Yard?

In *Place-Based Education: Connecting Classroom and Communities*, David Sobel (2005) described place-based education as the process of using one's local environment as a foundation to teach concepts that span the curriculum, using hands-on learning and real-life experiences.

Whether you teach in an urban or rural area, just look beyond the school building and blacktop and you will find a small natural area nestled in your school yard where you can conduct a nature investigation. If you have difficulty locating a place to study, ask your school maintenance crew to avoid mowing a small section of the school yard. Studying a nonmowed area is better because it contains a greater diversity of plant and animal life.

The National Wildlife Federation created *Schoolyard Habitats: A How-to Guide for K-12 School Communities* (2001a) and *Schoolyard Habitats Site Planning Guide* (2001b) to help you locate, develop, or enhance existing habitats at your school. Keep in mind that your natural area should be located on school grounds but be a different habitat from the rest of your school yard. Familiarize yourself with the area prior to visiting with students. Check

the site for safety hazards such as broken glass, old fencing, harmful plants or animals, and holes or rocks that might cause students to trip. No matter how small or big, the natural area will bring the science curriculum to life and motivate students to intimately connect and write about nature. As one student said, "Let's miss recess so we can explore the school yard more!"

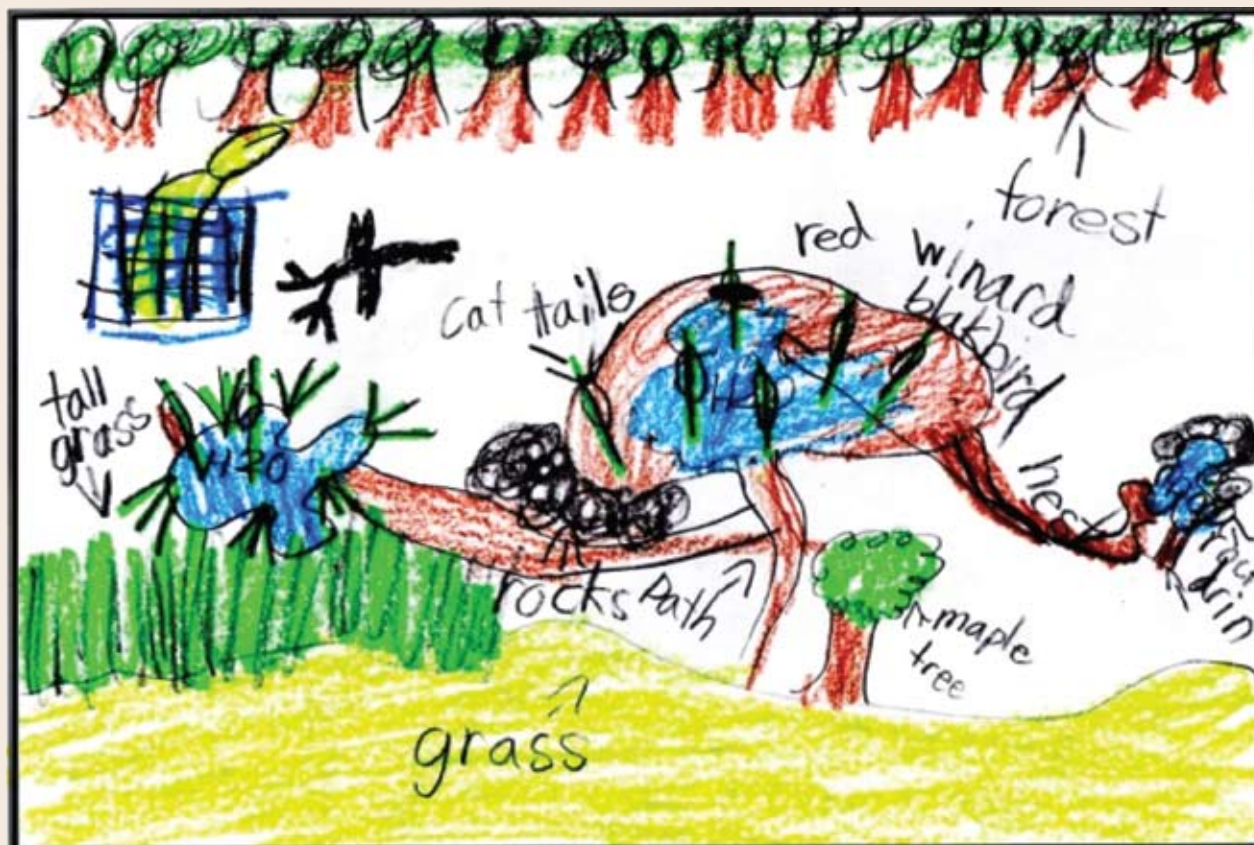


Meet Your Study Site

"Wow! The green grass is as tall as a first grader!" announced a student during our initial visit to our study site called the *bio-swales*. The bio-swales are located adjacent to the school's front parking lot and are about a five-minute walk from the classroom. The bio-swales were originally a cornfield until our new elementary school campus was constructed. To meet EPA requirements, a series of retention pools were created to control the runoff and pollution from our school's rooftops and parking lot areas. Therefore, this new undisturbed wetland habitat was not created for educational purposes, but it has served as an ideal setting for our ongoing nature investigation.

Figure 1.

A student's map.



A scavenger hunt is a great way to introduce your students to their new outdoor classroom (see NSTA Connection for handout). This activity encourages students to focus and explore their study site by using their senses (excluding taste). Before starting the hunt, be sure to cover safety rules with your students. Define the boundaries of your study site, point out hazards for students to avoid, and reinforce school rules (e.g., no running). The scavenger hunt can be conducted in pairs, small groups, or with the whole class. Throughout the activity be prepared for your students' questions and discoveries by packing a camera and notepad to record their responses. Also, it is important to model to your students how to respectfully interact with nature. This includes working quietly to avoid disturbing the wildlife and gently putting natural objects back where you find them.



As suggested in *Take a Tree Walk*, creating a map is an excellent way to familiarize students with nature and their surroundings (Kirkland 2006). At your study site, help your students locate special items and landmarks to include on their maps and discuss where they are in relationship to one another. These items include trees, bushes, flowers, bodies of water, rocks, paths, sidewalks, or buildings. Demonstrate how to draw shapes to represent these items and use simple words to label them. When working with younger students, it is helpful to create a class map together first. This activity integrates

fundamental writing and social studies standards and will eventually serve as a key component of your school yard field guide. Student-made maps can be revisited throughout the year and updated with your students' new insights during the investigation (Figure 1, p. 35). Signs of animals (e.g., tracks, rubbings, and burrows), wildlife sightings, and new plant growth are key items that can be added throughout the year.

Launching the Investigation

The purpose of the project is for students to become nature detectives and investigate a small natural area located at their school. Students make predictions, record data, draw conclusions, and share their findings about how their study site, including its plants, animals, and environment transforms each season. This project culminated with students creating a school yard field guide, a unique science journal that showcased their ongoing work and discoveries. *No Student Left Indoors: Creating a Field Guide to Your Schoolyard* (Kirkland 2007) is an excellent resource to keep handy throughout the course of the project.

Make Predictions

At least once each season, the nature detectives visited their study site to collect data for their investigation. Prior to each visit, students used their knowledge of the seasons to make thoughtful predictions as to how

Figure 2.

Assignments for nature detectives.

Group	Task	Scientific Tools
Plant Detectives	Search for changes in colors, shapes, sizes, and textures of various plants located at your study site. These include grasses, sedges, flowers, shrubs, and trees.	Magnifiers Optional: flower presses, field guides
Animal Detectives	Look for evidence of animals in your school yard. These include sightings, tracks, rubbings, fur, feathers, insect galls, etc.	Binoculars Optional: sweep nets, water nets, collection containers, field guides
Weather Detectives	Take measurements of current weather conditions in your school yard.	Thermometers Optional: other weather instruments
Soil Detectives	Examine soil for changes near the ground at your study site (e.g., leaf litter, mud, snow, ice, burrows, etc.). Measure soil temperature.	Soil thermometer with storage sleeve Optional: Berlese funnel North Carolina State University (www.cals.ncsu.edu/course/ent591k/berlese.html)

their site would change over time. Next, students discussed and recorded their predictions in science journals. These journals were created at school from mostly recycled items. Cardboard from cereal boxes were collected by students and cut to make a durable cover. The school's scrap paper, along with some teacher-made pages, was bound inside. Before our winter investigation, a student wrote in their journal, "I think the dying plants in the fall are now crushed under the snow. I bet they're turning into soil."

Establish Detective Groups

Assigning detective groups encourages students to work well together, experience different aspects of nature, and meet various math and science standards during the investigation (Figure 2). Students in each group used their observation skills and simple tools to collect data for the current season. The "plant detectives" searched for changes among the trees, bushes, grasses, and flowers using magnifiers to examine them closely. Binoculars, sweep and water nets, and collection containers helped the "animal detectives" search for evidence of wildlife. Any collected animals such as insects and tadpoles were examined and then carefully released back to their habitat. The "weather detectives" used thermometers to measure the air temperature and noted current weather conditions. The "soil detectives" measured soil tempera-

ture using soil thermometers. This group also searched for seasonal changes at ground level, noting evidence of dry, wet, or icy soil. The students rotated to a new detective group each season. The scientific tools are relatively inexpensive and can be purchased through a science distributor. Student learning was tracked by taking photographs and writing down their insights and discoveries.

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Record Data

After students investigated the school yard for that season, the data gathered by each detective group was discussed, synthesized, and recorded by the class onto a large chart paper. It is important to keep this seasonal data chart simple and concise for the students to reference (Figure 3; see NSTA Connection for blank copy). Students also checked their predictions and recorded their personal observations and discoveries in their science journals (Figure 4). This journaling is an open-ended activity, in which students are encouraged to draw pictures, create diagrams, or write sentences demonstrating what they learned about the current seasonal changes at their study site. While journaling, it is helpful to keep the seasonal data chart nearby to aid them with spelling and recording information. It is also a good time to share photographs that have been taken at the study site. Reviewing current and past photographs with the students will help them draw accurate conclusions about the seasonal changes they see. Interviewing students about their

Figure 3.

Sample data chart completed by the class.

Fall November 3, 2009
 The air temperature is 50° cool.
 The soil temperature is 40° cold.
 The animals are not very active.
 We see two birds, but we hear no crickets. We see an empty bird's nest and deer tracks by the water.
 The plants are very brown. Some are dry and falling over. Brown, yellow, orange, and red tree leaves are on the ground. Flowers, goldenrod, and cattails have seeds.
 We see colorful leaves and brown plants
 We hear the rustling of leaves in the wind
 We smell dry leaves and the crisp air.
 We touch squishy mud and prickly seeds

Figure 4.

Sample journal entry.

in fall time Animals
 are not active. the grass
 is brown and the water
 is gone the frogs are in
 the mud hibernating.
 The leaves on the trees
 are red and yellow we
 heard some crickets.

journal responses is a great way to assess their learning. Because your study site provides a great platform to teach other critical science concepts (e.g., living and nonliving things, life cycles, weather, food webs, plant and animal adaptations), the science journals are a valuable tool to document student learning across the entire science curriculum (Figure 5).

Share Discoveries

The charts and photographs are hung in the hallway throughout the school year to communicate students' discoveries with others. As each season is completed, these items eventually form a large circular shape that simulates the cyclical nature of the seasons. Adding student quotes and descriptions of their findings make this diagram even more meaningful for the students. By displaying a visual seasonal cycle (summer, fall, winter, and spring), students internalize this natural phenomenon and make astounding connections with nature, such as, "I think the school yard makes a cycle. Just like in our story about tadpoles turning into frogs. The circle never ends and will start all over again."

Creating a Field Guide

Students collaborate to create a school yard field guide to showcase their work and discoveries. This final step of

the project integrates several reading and writing standards and communicates learning. Provide a field guide from the library as a model for students as they work on their project. To begin, it is easiest to divide your field guide into three distinct sections:

Part I—an overview of the study site and a description of the project. Be sure to showcase your students' updated maps as well as photographs, drawings, or descriptive writing about your site's key features. These samples can be collected from your student's journal entries.

Part II—your study site through the seasons. Include seasonal data charts and the seasonal cycle diagram. Arranged by season, students create a collage of photographs, drawings, revised journal entries, flower pressings, and personal reflections about their discoveries.

Part III—description of the flora and fauna of the study site.

Students create their own pages for the field guide by researching a school yard plant or animal of particular interest to them (Figure 6). To start, your class can review the science journals and seasonal data charts to compile a list of all the plants and animals living at your study site. Once students make their selection, they can then use a KWL chart (see NSTA Connection) to organize their writing. Using the chart, students write facts that they already know and questions they wonder about their

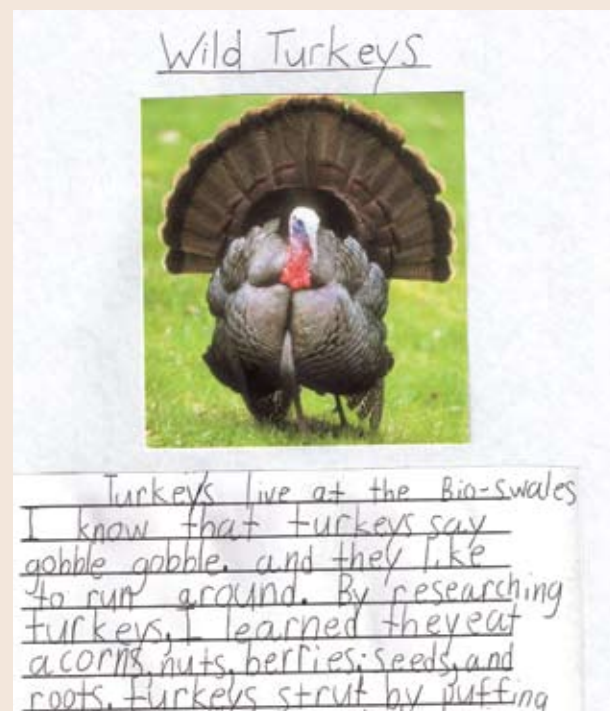
Figure 5.

Sample journal entry: What is a habitat?



Figure 6.

Sample field guide page.



topic. Using these “wonder questions” as a guide, students conduct research and write what they learned in the final column. Once the research is complete, students use the information from their chart to write their paragraph and perfect it using the writing process. Both students and teachers evaluate this page using a rubric (see NSTA Connection). Our first graders took great ownership for the project and were highly motivated to write about their nature experiences. Be sure to share the field guide with your school, families, and the community. We keep a copy in our school library.

School Yard Plans

One of the most significant outcomes of this project is the teachable moments that arise throughout the investigation. When students are immersed in nature, they naturally ask “why” questions that lead to meaningful inquiry. For example, when students were conducting the fall investigation, they became fascinated with insect galls forming on the goldenrod plants. The students were particularly curious as to how these ball-like structures came to be on these plants. These questions led the students to research insects and their winter adaptations (Sandro and Lee 2006). Because the small larvae within the gall survive freezing, this led to more investigations on states of matter as well as insect growth stages.

The implications of this project are endless and there are future plans to create a school yard science program at our school campus that spans K–3 grade levels. As students progress through the primary grades, this science program will expand from studying a small section of our school yard to comparing other habitats on school grounds to exploring local watersheds in the community. Just imagine the cohesiveness of science instruction within your school as students build this investigation year after year.

You’ll find that by extending your classroom investigations beyond school doors, children develop a strong connection with their natural world and community. Though there can be unexpected outcomes, such as poor weather or everyday curriculum demands, you’ll find that an outdoor investigation promotes meaningful learning that enriches elementary students’ school experiences. The creation of a field guide encourages students to write, document, and reflect on their learning and discoveries. By being a nature detective, students learn to work together as real scientists for a common purpose. It also gives you an innovative way to bring the entire curriculum together right in your school yard! ■

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References

- Kirkland, J. 2006. *Take a tree walk*. Lionville, PA: Stillwater Publishing.
- Kirkland, J. 2007. *No student left indoors: Creating a field guide to your schoolyard*. Lionville, PA: Stillwater Publishing.
- Louv, R. 2008. *Last child in the woods: Saving our children from nature-deficit disorder*. Chapel Hill, NC: Algonquin Books.
- National Wildlife Federation. 2001a. *Schoolyard habitats: A how-to guide for K–12 school communities*. Reston, VA: National Wildlife Federation.
- National Wildlife Federation. 2001b. *Schoolyard habitats site planning guide*. Reston, VA: National Wildlife Federation.
- Sandro, L.H., and R.E. Lee. 2006. Winter biology and freeze tolerance in the goldenrod gall fly. *The American Biology Teacher* 68 (1): 29–35.
- Sobel, D. 2005. *Place-based education: Connecting classrooms and communities*. Great Barrington, MA: The Orion Society.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Grade K–4

Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Standard C: Life Science

- The characteristics of organisms
- Life cycles of organisms
- Organisms and their environments

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.

NSTA Connection

For a project rubric, data chart, scavenger hunt worksheet, and additional samples of student work, visit www.nsta.org/SC1011.

