

ENVIRONMENTAL LITERACY CURRICULUM CONNECTIONS

The Next Generation Science Standards (NGSS) are based on the premise that the purpose of learning science is to help students understand the natural world, solve problems, improve their lives and communities, and make the world a better place. Environmental literacy is an essential part of science and is deeply embedded throughout NGSS. We think environmental literacy should be deeply embedded throughout your science curriculum, too! This resource will help you identify the units in your curriculum that emphasize environmental concepts and that provide opportunities where outdoor learning experiences are part of regular classroom routines.

What is environmental literacy and how is it connected to science teaching and learning?

In this document, environmental literacy is represented by three interconnected categories:

- 1) **Connection to nature:** having a sense of wonder and curiosity, enjoying the physical, social and emotional benefits of being outdoors, making observations and asking questions, building our relationship with the natural world;
- 2) **Understanding natural systems:** figuring out how nature works by carrying out investigations, collecting and analyzing data, constructing explanations, arguing based on evidence; and
- 3) **Community engagement:** communicating ideas, applying knowledge to positive community actions, understanding the socio-political and historical context for longstanding environmental inequities.

Within NGSS, Performance Expectations (PE) at every grade level ask students to **connect to nature**, **understand natural systems** and **apply** that knowledge. For example:

Kindergarten (K-ESS3-3) Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

5th Grade (5-ESS3-1) Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment.

Middle School (MS-LS2-4) Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Emphasizing environmental literacy supports students to develop skills that make them well-rounded, effective leaders in their human and ecological communities.

WHY DOES IT MATTER?

Environmental literacy leads to more equitable, inclusive, and culturally relevant learning experiences.

- Experiences in the local community with local partners are authentic, place-based and relevant to the lives of learners.
- Community leaders, community-based organizations, and environmental educators can help us understand environmental injustices and ensure that local issues and assets are part of student learning.
- Learning outdoors can be safer, healthier, more engaging than learning indoors.

How to use this tool

This teaching tool allows teachers, site leaders and instructional leaders, to complement their classroom instructional materials with local and easily accessible, real-world opportunities for their students to more fully understand the world around them.

Schoolyard Connection

Field Trip Connection

EP&C/Environmental Literacy Connections

- Select the appropriate curriculum document(s): FOSS Grades K-8; Amplify Science Grades K-8; SEPUP Grades 6-8; and, Ocean Sciences Sequence, Grades 6-8.
 - Read the environmental literacy curriculum connections (of select modules) organized by grade level and unit, describing meaningful outdoor learning activities for a schoolyard or local field trip destination
 - District office / school sites / or team of teachers may customize this tool, adding location ideas for outdoor learning when teaching the different units and lessons for each school, TK-8, in their district.

CONNECTING ENVIRONMENTAL LITERACY TO SCIENCE CURRICULUM

Districts don't always have the expertise to effectively, systematically use the outdoors as a classroom from Grades TK-12. We need partners who know the landscape, the natural and human history of the community, and know how to engage students in the world around them.

Environmental literacy curriculum connections in this document:

- support students to better understand natural systems,
- connect students to place, their schoolyard, their community, state and federal national parks; and
- encourage students to understand and create solutions to improve their communities.

Environmental Literacy Curriculum Connections funded by



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Ten Strands
Connecting Education, Environment, and Community

Schoolyard Connection <i>Embedded in Core Curriculum*</i>	Additional Schoolyard Extensions <i>Included with Core Curriculum</i>	Field Trip Connection <i>Extensions to FOSS Investigations**</i>	EP&C/Environmental Literacy Connections
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This course builds from basic understanding of what is a living thing and foundational biological concepts in order for students to navigate more complex environmental situations like salt-water tolerance of crops, the vital role of pollinators for our ecosystems and a more personal connection to local biodiversity in order to connect with the greater global issues. For more information about this and other Grade 6 courses, see [CA Environmental Principles and Concepts–Grade 6](#) and all the [Outdoor Experiences in FOSS K-8](#) on FOSSweb. For support taking students outdoors, explore the [Taking FOSS Outdoors resources](#) on FOSSweb, including the [Taking FOSS Middle School Outdoors Chapter](#).

<p>Investigation 1: What Is Life?</p> <p><i>Part 1: Living or Nonliving</i> Students collect natural materials and soil from the schoolyard to set up classroom mini-habitats.</p> <p>LOCATION IDEA:</p>	<p>After part 1, students can search for living/nonliving things in the schoolyard to add examples for class discussion. They can also explore a local water source for micro-organisms such as various plankton.</p> <p>Students can add to the collection throughout to address the driving question of the course: What are the characteristics that scientists use to define life?</p>	<p>Connect with a local microbiology research lab and learn how local researchers are studying various microorganisms and virus in your outdoor environment that are beneficial.</p> <p>LOCATION IDEA:</p>	<p>The classroom active investigations and extensions address EP&C Principles 1A and 3A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students go outdoors to collect a soil sample and dried leaves and grass to set up a mini habitat. • Students go outdoors to continue their search for living and nonliving materials.
<p>Investigation 5: The Vascular System</p> <p><i>Part 2: Looking at Plant Structures</i> <i>Part 3: Transpiration and Photosynthesis</i> Students go outdoors and isolate a sample of foliage outdoors in a plastic bag and return to check for water vapor released by plants.</p> <p>LOCATION IDEA:</p>	<p>Photo Challenges: How many different shapes, sizes, colors, and textures of leaves can you find? Students take pictures of different leaves in their local environment, and of leaves at different stages of development.</p>	<p>A field trip to a local farm, botanical garden or plant nursery would allow students to extend their understanding to concepts of food production and plant diversity.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principle 3A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students investigate water transport outdoors and discover the plant vascular system. • Students use a microscope to examine leaves and discover stomata. They go outdoors and plan an investigation to confirm that water exits plants through stomata.

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<p>Investigation 6: Plant Reproduction and Growth</p> <p><i>Part 1: Lima Bean Dissection</i></p> <p><i>Part 2: Environmental and Genetic Factors</i></p> <p><i>Part 3: Flowering-Plant Reproduction</i></p> <p><i>Part 4: Flowers and Pollinators</i></p> <p>LOCATION IDEA:</p>	<p>After part 1, students collect local seeds and identify their dispersal methods. They can plant seeds in their schoolyard.</p> <p>LOCATION IDEA:</p> <p>Photo challenges: After students dissect flowers, they collect or take pictures of local flowers. Once they investigate pollination syndrome, they find and photograph local pollinators in their local environment.</p> <p>LOCATION IDEA:</p> <p>Depending on schoolyard space and local climate during the school year, classes can plant an herb garden to help enhance student food literacy.</p> <p>LOCATION IDEA:</p> <p>See <i>Extending the Investigation</i>.</p>	<p>Students can research local honeybees, and invite local bee-keeper to speak, and/or plant bee-friendly garden. Request a Bee Ambassador from The Honeybee Conservancy</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 1A–C, 2A–D, 3A–B, and 5A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students determine the pollination syndromes and consider the importance of pollinators in ecosystems including the production of food for humans. They explore pollinators in their schoolyard. • Students can plant native plants in their schoolyard. • Students go outdoors to collect seeds and identify their dispersal methods. • Students research endangered insect species and the human impact on global insect diversity.

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<p>Investigation 9: Diversity of Life</p> <p><i>Part 1: Bioblitz</i></p> <p>As a course culminating project, students conduct a bioblitz in their schoolyard to learn about the biodiversity that exists in their area. Classes collect plant samples (leaves) and animals to discover the unexpected diversity of life right in front of them.</p> <p>LOCATION IDEA:</p>	<p>The FOSS bioblitz investigation focuses on variation of organisms collected, rather than specific identification. If students are inspired to identify some of their collection, we suggest iNaturalist. Students can create a schoolyard field guide of what they identify.</p>	<p>After participating in a schoolyard bioblitz, students can visit a local park, nature preserve to compare biodiversity with what they find in their schoolyard. Teachers can also coordinate participation in an official BioBlitz. See National Geographic’s BioBlitz resources for more information.</p> <p>LOCATION IDEA:</p> <p>In addition, visit a local zoo or wildlife sanctuary to observe more exotic species and learn about conservation efforts.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 1C, 2A, 4B, and 5A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students conduct a bioblitz in the schoolyard and discuss plant and animal biodiversity. They discuss human impact, including climate change, on biodiversity. • Students can conduct a neighborhood bioblitz or participate in an official BioBlitz to determine the health of their local ecosystems.

* These schoolyard connections are an integral part of the program investigations.

** These field trip connections are included as program extensions.

Schoolyard Connection
Embedded in Core Curriculum*

Additional Schoolyard Extensions
Included with Core Curriculum

Field Trip Connection
Extensions to FOSS Investigations**

EP&C/Environmental Literacy Connections

This course builds from foundational understanding of properties of water that cause weather patterns to navigate how changes in the atmosphere are causing global climate changes. In addition, to grasping the science, students also learn how to evaluate validity of news sources.

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Investigation 1: What Is Weather?

Part 1: Into the Weather

Take class outdoors to observe current weather throughout the course. For homework we suggest students also observe weather patterns at home.

LOCATION IDEA:

Students can collect continued data from a digital weather station or even better a weather station in the schoolyard. You can contribute data to The Community Collaborative Rain, Hail, and Snow Network ([CoCoRaHS Project](#)).

LOCATION IDEA:

Investigation 4: Radiation

Part 3: Heating Earth

Students investigate what happens to different earth materials when placed in sunshine and shade in the schoolyard. They set up an outdoor experiment and collect and analyze the data.

LOCATION IDEA:

Photo Challenges: Students take pictures of one place throughout the year to document the seasonal changes. Students explore how different earth materials might be impacting their schoolyard environment and consider proposals to improve their schoolyard.

LOCATION IDEA:

Invite urban planners to come talk with students about how earth materials are considered with urban development to minimize human impacts on their school environment.

LOCATION IDEA:

The classroom active investigations and extensions address EP&C Principles 1A–C and 3B–C. Outdoor connections include:

- Students go outdoors to create an ongoing weather data collection project. They determine what human activities are affected by weather conditions.
- Students explore how severe weather events impact humans and local ecosystems.

The classroom active investigations and extensions address EP&C Principle 2A, 2C, 3A, and 3B. Outdoor connections include:

- Students go outdoors and heat different earth materials to determine the effect of solar radiation. They can apply the results to the impact of human development changing the dominant surfaces.

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<p>Investigation 5: Conduction <i>Part 3: Home Design</i></p> <p>Students design a model home that most effectively reduces energy transfer. Students then go outdoors to test their home insulation and roof design.</p> <p>LOCATION IDEA:</p>	<p>Invite a local company that improves energy-efficiency of buildings to explain an energy audit of school and explain impact of surrounding schoolyard features.</p> <p>LOCATION IDEA:</p>	<p>Students create a service project to encourage local businesses to participate in an energy audits and improve their energy efficiency.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 4A and 5A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students experiment with different insulation materials to decrease energy transfer and increase energy efficiency in a model home and go outdoors to test their insulated house designs in the outdoor environment
<p>Investigation 8: The Water Planet</p>	<p>Explore your local watershed, starting with how your schoolyard connects to the greater watershed. Students can then examine how humans depend on the water as it cycles through the ecosystem.</p> <p>Photo challenge: Students take pictures of clouds and research and label them with the cloud type.</p>	<p>Visit a water treatment plant or work with a local water quality organization to participate in water testing project and get to know their watershed.</p> <p>LOCATION IDEA:</p> <p>Visit a local watershed restoration site.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 4A and 5A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students explore their local watershed and consider human impacts on their water systems.
<p>Investigation 9: Climate over Time <i>Part 1: Climate Change</i></p>	<p>Consider making time for short observational trips into the schoolyard throughout the year. Students benefit from regular observational exposure to the same place over time.</p> <p>If you are interested in setting up a year-long observational study, consider National Phenology Network Nature's Notebook resources.</p> <p>LOCATION IDEA:</p>		<p>The active investigations and extensions address EP&C Principles 1C, 3C, 4A–C, and 5B. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students observe changes to their schoolyard weather patterns throughout the year and can investigate how their climate has changed over time and human influences.

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Field Trip Connection
Extensions to FOSS Investigations**

EP&C/Environmental Literacy Connections

This course provides students with the first steps along the path of ecological understanding. Along the way students apply concepts to a specific ecosystem called an ecoscenario. The course culminates with students exploring an environmental problem impacting their ecoscenario and evaluating competing design solutions.

For more information about this and other Grade 7 courses, see [CA Environmental Principles and Concepts–Grade 7](#) and all the [Outdoor Experiences in FOSS K-8](#) on FOSSweb. For support taking students outdoors, explore the [Taking FOSS Outdoors resources](#) on FOSSweb, including the [Taking FOSS Middle School Outdoors Chapter](#).

Investigation 2: Sorting Out Life

Students can develop an ecoscenario for their local ecosystem. One option is to create a class project parallel to their ecoscenario studies. Include adding personal observations in local environment with research.

Begin by observing your biome and what abiotic factors define your local ecosystem.

LOCATION IDEA:

Give students the opportunity to research youth-led environmental projects and set up their own project to improve their local environment.

In Extending the Investigation, we recommend beginning with [Roots and Shoots](#).

The active investigations and extensions address EP&C Principles 1A–B and 2B. Outdoor connections include:

- Students explore ecosystem services and how humans rely on them. They begin the study of an ecosystem for one of ten sites in the United States and can create a story about a local ecosystem.
- Students discuss how biomes provide ecosystem services for humans and consider implicates for their local biome.

Investigation 4: Minihabitats

Part 1: The Physical Environment

Students collect natural materials from the schoolyard to add to classroom mini-habitats.

LOCATION IDEA:

Students can investigate their local watershed. Begin with direct observations of how their schoolyard connects to the greater watershed, then examine how humans depend on the water as it cycles through the ecosystem.

We suggest these [NOAA watershed resources](#).

LOCATION IDEA:

Visit a watershed restoration project with a local environmental scientist and learn how improving the abiotic factors benefit the organisms.

LOCATION IDEA:

The active investigations and extensions address EP&C Principles 1A, 1C and 3B.

- Students connect concepts of habitat to their local environment and schoolyard.

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<p>Investigation 5: Producers</p>	<p>Students survey local plants in the schoolyard. See <i>Extending the Investigation</i>.</p> <p>LOCATION IDEA:</p>	<p>Consider participating in Project BudBurst, a citizen science project where participants collect important data about plant phenophases (life cycle phases) throughout the year.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 1A–C and 3B. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students observe schoolyard plants, consider changes overtime and their importance as ecosystem services.
<p>Investigation 6: Following the Energy</p> <p><i>Part 2: Food-Chain Game</i></p> <p>Student go outdoors develop a model for a sustainable food chain and consider the concept of biomagnification.</p> <p>LOCATION IDEA:</p>	<p>Photo Challenges: Students take pictures of something decomposing in their environment. Students document evidence of feeding in their neighborhood.</p>	<p>Visit a local sustainable farm and learn about best practices for growing plants and animals for food.</p> <p>Students consider humans and their personal involvement in local food webs. See <i>Extending the Investigation</i>.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 1B, 1C, 3A–C, and 4B. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students collect organisms and materials from the schoolyard to set up and observe terrariums and worm jars, and discuss the importance of decomposers in ecosystems.

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<p>Investigation 8: Human Impact</p> <p><i>Part 1: Biodiversity</i></p> <p>Students conduct a biodiversity study of their schoolyard to determine the health of the schoolyard ecosystem.</p> <p>LOCATION IDEA:</p>	<p>Photo Challenges: Students document how humans impact different environments. Document evidence of changes because of human interactions.</p> <p>The FOSS bioblitz investigation focuses on variation of organisms collected, rather than specific identification. If students are inspired to identify some of their collection, we suggest iNaturalist. Students can create a schoolyard field guide of what they identify.</p>	<p>After participating in a schoolyard bioblitz, students can visit a local park, nature preserve to compare biodiversity with what they find in their schoolyard.</p> <p>Teachers can also coordinate participate in an official BioBlitz. See National Geographic’s BioBlitz resources for more information.</p> <p>LOCATION IDEA:</p> <p>In addition, visit a local zoo or wildlife sanctuary to observe more exotic species and learn about conservation efforts.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 2A, 2C, 3C, 4C, 5A–B. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students go outside and conduct a bioblitz. They discuss how the biodiversity index is a measure of the health of an ecosystem and its ability to recover from stress. They then discuss how humans can reduce their footprint on the environment.
<p>Investigation 9: Ecoscenarios</p>	<p>After the presentations, students can develop an ecoscenario focused on the local ecosystem. Begin with direct observations of the local environment.</p>	<p>If you have already been developing a local ecoscenario throughout the course, you could follow up now by investigating a local environmental issue and evaluating solution designs. Be sure to visit locations and people involved with the issue to gain personal observations of the issues. See <i>Extending the Investigation</i>.</p> <p>LOCATION IDEA:</p>	<p>The active investigations and extensions address EP&C Principles 1B, 2A–C, 3C, 4A–C, and 5A–B.</p>

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EP&C/Environmental Literacy Connections

The driving question for this course is: what do we need to know to tell the geologic story of a place? Building from the anchor phenomenon of the Grand Canyon, students investigate the history of Earth and culminate by applying their understanding to new phenomenon, represented in four Geoscenarios. In addition, they explore the implications of human impacts on Earth systems.

For more information about this and other Grade 7 courses, see [CA Environmental Principles and Concepts–Grade 7](#) and all the [Outdoor Experiences in FOSS K-8](#) on FOSSweb. For support taking students outdoors, explore the [Taking FOSS Outdoors resources](#) on FOSSweb, including the [Taking FOSS Middle School Outdoors Chapter](#).

Investigation 2:

Part 3: Soils

Students collect soil from their local environment and perform a simple test to determine which earth materials are found in the soil, answering questions about what happens to sediments that are not turned into sedimentary rocks.

LOCATION IDEA:

Photo Challenges: Students take pictures of rocks found in their local environment. Students take pictures of different local landforms. Students take pictures of evidence of weathering.

Students can continue their research into soils. They could focus their extended exploration of local soils on soil classification, agriculture, implications of soil permeability, soil pollution, soil erosion and sediment runoff, and soil ecology. See *Extending the Investigation*

Invite a researcher to explore your schoolgrounds or take a field trip to a research center or farm and learn firsthand about soil biology.

See more at “Resources by Investigation 2 Extensions” on FOSSweb.

LOCATION IDEA:

The active investigations and extensions address EP&C Principles 1B and 3A. Outdoor connections include:

- Students analyze soil samples from their schoolyard and can explore how the ecosystems services of soil are essential to human life.

Investigation 8: Geoscenarios

Students explore the geology of your schoolyard by mapping the area, identifying different surface earth materials, basic topography, evidence of erosion and deposition, and implications for local biology.

LOCATION IDEA:

After completing the Geoscenario Project, consider having students investigate their local geologic story and issues. Use the guiding questions from the notebook sheets to focus their exploration.

Take a field trip to define geological aspects of your area with a local geologist.

LOCATION IDEA:

The active investigations and extensions address EP&C Principles 2A–D, 3A–C, 4A–C, 5A–B.

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Investigation 9: What Is Earth's Story?		<p>Connect with your state geologic survey, local park department, or university geology department for assistance and support. See more information in <i>Extending the Investigation</i>.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> LOCATION IDEA: </div>	<ul style="list-style-type: none"> The active investigations and extensions address EP&C Principles 3A–C.

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The driving question for the course is: what is my cosmic address? To grapple with our place in the Universe, the course begins from Earth as a system, then extends to the Earth-Moon system, then the Earth-Moon-Sun system, and on to the Solar System and beyond.

For more information about this and other Grade 8 courses, see [CA Environmental Principles and Concepts–Grade 8](#) and all the [Outdoor Experiences in FOSS K-8](#) on FOSSweb. For support taking students outdoors, explore the [Taking FOSS Outdoors resources](#) on FOSSweb, including the [Taking FOSS Middle School Outdoors Chapter](#).

<p>Investigation 1: Earth as a System</p> <p><i>Part 2: Earth’s Systems</i> Students consider personal ways they are interacting with Earth’s subsystems.</p> <p><i>Part 3: Moon Watch</i> Students go outdoors to observe the Moon. They observe the Moon daily at home, recording their observations in a Moon log to chart changes in the Moon’s appearance.</p> <div style="background-color: white; padding: 5px; margin-top: 10px;">LOCATION IDEA:</div>	<p>For homework, students identify a natural system and a human-made system in their neighborhood. They should identify the parts and interactions of the parts.</p> <p>Students can also consider how Earth’s systems are interacting in their schoolyard. They can consider how they specifically are interacting with and influencing these systems.</p> <div style="background-color: white; padding: 5px; margin-top: 10px;">LOCATION IDEA:</div>	<p>Take a field trip with a local environmental scientist to explore the interacting subsystems of a dynamic place in your region (i.e. an interface between wild and urban space, a development next to a dynamic body of water, etc)</p> <div style="background-color: white; padding: 5px; margin-top: 10px;">LOCATION IDEA:</div>	<p>The active investigations and extensions address EP&C Principles 1A and 3A. Outdoor connections include:</p> <ul style="list-style-type: none"> • Students go outdoors and observe and record the lunar cycle over the course of four weeks.
<p>Investigation 7:</p> <p><i>Part 4: Changing Systems</i></p>	<p>Build on explorations of how students interact with Earth’s subsystems in the schoolyard and local environment from Investigation 1 by considering how their interactions compare to humans in the past and in other parts of the world.</p> <div style="background-color: white; padding: 5px; margin-top: 10px;">LOCATION IDEA:</div>	<p>Visit an archeological site in your area and learn how humans interacted with ancient climates.</p> <div style="background-color: white; padding: 5px; margin-top: 10px;">LOCATION IDEA:</div>	<p>The active investigations and extensions address EP&C Principles 1A, 2A–C, 3A–C, 4A–C, and 5A.</p>

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