

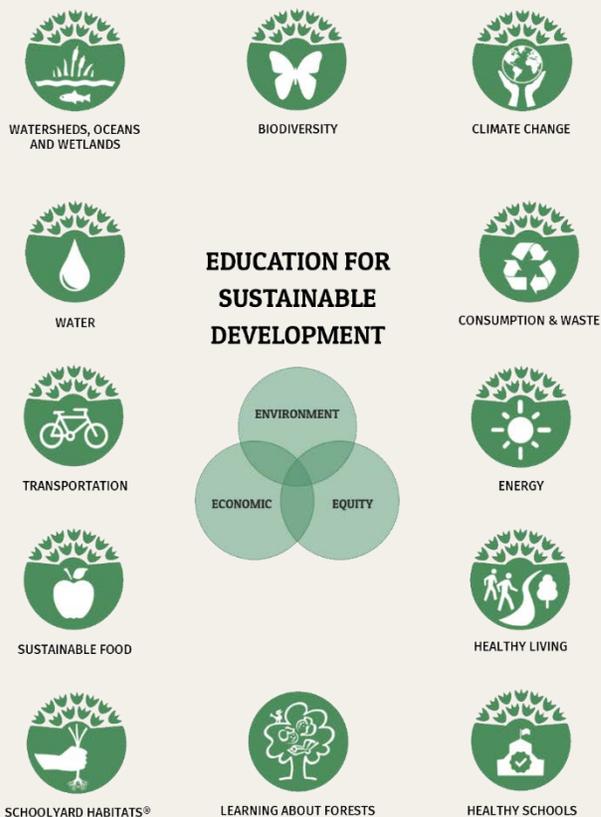


# Pathways to Sustainability

## Alignment to NGSS – Second Grade

The performance expectations in second grade help students formulate answers to questions such as: “How does land change and what are some things that cause it to change? What are the different kinds of land and bodies of water? How are materials similar and different from one another, and how do the properties of the materials relate to their use? What do plants need to grow? How many types of living things live in a place?” Second grade performance expectations include PS1, LS2, LS4, ESS1, ESS2, and ETS1 Disciplinary Core Ideas from the NRC Framework.

Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students are also expected to compare the diversity of life in different habitats. An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials. Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change. Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth. The crosscutting concepts of patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.



In the second grade performance expectations, students are expected to demonstrate grade- appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from



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evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

The National Wildlife Federation's Eco-Schools USA program has aligned their program Pathways of Sustainability to the Next Generation Science Standards, NGSS. As a part of the Eco-Schools Seven Step Framework, linking to the curriculum is a priority. This alignment is designed to highlight the natural connections between the NGSS and the Eco-Schools USA program.

Our program icons are used to denote pathway connections to the NGSS Performance Expectations and alignment to the Common Core State Standards, CCSS, English Language Arts, ELA and Mathematics.

**Green STEM is an initiative of NWF's Eco-Schools USA program** and is focused on identifying best practice in the STEM fields as it relates to environment-based learning. These elements include:

- Project, problem and place-based learning
- Utilizing the school, both inside and outside, as a learning laboratory
- Interdisciplinary approach
- Innovation space
- A commitment to stewardship
- An inclusive culture, where all students can learn, participate and take action



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## Alignment to NGSS

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### ECOSYSTEMS: INTERACTIONS, ENERGY AND DYNAMICS

#### Students who demonstrate understanding can:

**2-LS2-1.** Plan and conduct an investigation to determine if plants need sunlight and water to grow.

**2-LS2-2.** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.



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Both of the Performance Expectations lend themselves to high student engagement when performed outdoors, whether using the school's certified Schoolyard Habitat®, sustainable food garden, adjacent forested areas, watershed land or water bodies or wetlands to investigate plant needs for sunlight and water. Through this process students will also be caring for the natural areas, which includes learning about stewardship, conservation of resources and collecting and recording observable and measurable data related to growth and weather.

#### Driving Questions – Examples

- How can our class identify the needs of native plants in order to build a NWF certified Schoolyard Habitat®?
- How can our class teach others about how local wildlife help to disperse seeds and pollinate plants?



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## ECOSYSTEMS: INTERACTIONS, ENERGY AND DYNAMICS - CONTINUED

### SCIENCE AND ENGINEERING PRACTICES

- Developing and Using Models
- Planning and Carrying Out Investigations

### DISCIPLINARY CORE IDEAS

- LS2.A** Interdependent Relationships in Ecosystems
- ETS1.B** Developing Possible Solutions

### CROSCUTTING CONCEPTS

- Cause and Effort
- Structure and Function

Connections to other DCIs in this grade: N/A

Articulation of DCIs across grade-bands: **K.LS1.C** (2-LS2-1); **K-ESS3.A** (2-LS2-1); **K.ETS1.A** (2-LS2-2); **5.LS1.C** (2-LS2-1); **5.LS2.A** (2-LS2-2)

### Common Core State Standards Connections

#### ELA/Literacy

- W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1)
- W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1)
- SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)

#### Mathematics

- MP.2** Reason abstractly and quantitatively. (2-LS2-1)
- MP.4** Model with mathematics. (2-LS2-1),(2-LS2-2)
- MP.5** Use appropriate tools strategically. (2-LS2-1)
- 2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-2)



### 2-LS4 BIOLOGICAL EVOLUTIONS: UNITY AND DIVERSITY

#### Students who demonstrate understanding can:

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



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As students begin to grasp the similarities and differences between different plants and animals, use the school grounds to explore the concept of biodiversity. What level of biodiversity exists? Establishing certified Schoolyard Habitats® are one way to increase the biodiversity found on the school grounds. Students need multiple exposures to concepts in order for content to make its way into long term memory. Providing students opportunities to learn outdoors, on a regular basis, and experience the concept first-hand is an additional teaching strategy to access prior knowledge and engage students in the learning process.

#### Driving Questions – Examples

- What are the specific habitat needs of the monarch butterfly and how is it different from the other pollinators we observe?
- How can our class support the needs of our local wetland agency to increase the number of different types of birds that visit during the spring migration?



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## 2-LS4 BIOLOGICAL EVOLUTIONS: UNITY AND DIVERSITY - CONTINUED

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
<ul style="list-style-type: none"> <li>• Planning and Carrying Out Investigations</li> </ul> <p><b>CONNECTIONS TO NATURE OF SCIENCE</b></p> <ul style="list-style-type: none"> <li>• Scientific Knowledge is Based on Empirical Evidence</li> </ul>	<p><b>LS4.D</b> Biodiversity and Humans</p>	<p>NONE</p>

Connections to other DCIs in this grade: N/A

Articulation of DCIs across grade-bands: **3.LS4.C** (2-LS4-1); **3.LS4.D** (2-LS4-1); **5.LS2.A** (2-LS4-1)

### Common Core State Standards

#### ELA/Literacy

**W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS4-1)

**W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-LS4-1)

#### Mathematics

**MP.2** Reason abstractly and quantitatively. (2-LS4-1)

**MP.4** Model with mathematics. (2-LS4-1)

**2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS4-1)



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## Alignment to NGSS

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### 2-ESS2 EARTH'S SYSTEMS

#### Students who demonstrate understanding can:

**2-ESS2-1.** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

**2-ESS2-2.** Develop a model to represent the shapes and kinds of land and bodies of water in an area.

**2-ESS2-3.** Obtain information to identify where water is found on Earth and that it can be solid or liquid.



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Within every watershed the geography and topography are one of its key features. When students think about their watershed they should be taught that their watershed includes all the land features and water bodies within its boundaries. How can students protect delicate land areas or ecosystems within their watershed from the impacts associated with water and wind? By collecting and recording data about water levels at various points in the school yard or garden area(s) and observing the effects of strong winds on these same areas, students can work together to create a design solution to combat those impacts.

#### Driving Questions – Examples

- How can we protect our newly planted monarch butterfly garden from stormwater runoff from the parking lot?
- What would it take to protect our new nature murals from the spring storms and summer heat?



### 2-ESS2 EARTH'S SYSTEMS - CONTINUED

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
<ul style="list-style-type: none"> <li>Developing and Using Models</li> <li>Constructing Explanations and Designing Solutions</li> <li>Obtaining, Evaluating and Communicating Information</li> </ul>	<p><b>ESS2.A</b> Biodiversity and Humans</p> <p><b>ESS2.B</b> Plate Tectonics and Large-Scale System Interactions</p> <p><b>ESS2.C</b> The Roles of Water in Earth's Surface Processes</p> <p><b>ETS1.C</b> Optimizing the Design Solution</p>	<ul style="list-style-type: none"> <li>Patterns</li> <li>Stability and Change</li> </ul> <p><b>CONNECTIONS TO ENGINEERING, TECHNOLOGY AND SCIENCE ON SOCIETY AND THE NATURAL WORLD</b></p> <ul style="list-style-type: none"> <li>Influence of Engineering, Technology and Science on Society and the Natural World</li> </ul> <p><b>CONNECTIONS TO NATURE OF SCIENCE</b></p> <ul style="list-style-type: none"> <li>Science addresses Questions About the Natural and Material World</li> </ul>

Connections to other DCIs in this grade: **2.PS1.A** (2-ESS2-3)

Articulation of DCIs across grade-bands: **K.ETS1.A** (2-ESS2-1); **4.ESS2.A** (2-ESS2-1); **4.ESS2.B** (2-ESS2-2); **4.ETS1.A** (2-ESS2-1); **4.ETS1.B** (2-ESS2-1); **4.ETS1.C** (2-ESS2-1); **5.ESS2.A** (2-ESS2-1); **5.ESS2.C** (2-ESS2-2),(2-ESS2-3)

#### Common Core State Standards

##### ELA/Literacy

- RI.2.3** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS2-1)
- RI.2.9** Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)
- W.2.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS2-3)
- W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-ESS2-3)
- SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-ESS2-2)

##### Mathematics

- MP.2** Reason abstractly and quantitatively. (2-ESS2-1),(2-ESS2-2)
- MP.4** Model with mathematics. (2-ESS2-1),(2-ESS2-2)
- MP.5** Use appropriate tools strategically. (2-ESS2-1)
- 2.NBT.A.3** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2-ESS2-2)
- 2.MD.B.5** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2-ESS2-1)



### 2-PS1 MATTER AND ITS INTERACTIONS

#### Students who demonstrate understanding can:

**2-PS1-1.** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

**2-PS1-2.** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.



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While students are exploring solutions to reduce and improve their consumption and waste habits, use this opportunity to also investigate the various properties of matter of the reusable and recyclable items. While man-made items can give students a number of opportunities to explore this standard, don't forget about the natural world. Connect students to the properties of matter found in the natural world and explore how some of our most significant innovations have been inspired by the natural world.

#### Driving Questions – Examples

- What materials would be best to reduce evaporation from our sustainable food gardens?
- How can we teach other students about the properties of matter using matter found in nature?



### 2-PS1 MATTER AND ITS INTERACTIONS - CONTINUED

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
<ul style="list-style-type: none"> <li>• Planning and Carrying Out Investigations</li> <li>• Analyzing and Interpreting Data</li> </ul>	<p><b>PS1.A</b> Structure and Properties of Matter</p>	<ul style="list-style-type: none"> <li>• Patterns</li> <li>• Cause and Effect</li> </ul> <p><b>CONNECTIONS TO ENGINEERING, TECHNOLOGY AND APPLICATIONS OF SCIENCE</b></p> <ul style="list-style-type: none"> <li>• Influence of Engineering, Technology and Science on Society and the Natural World</li> </ul>

Connections to other DCIs in this grade: N/A

Articulation of DCIs across grade-bands: **4.ESS2.A** (2-PS1-3); **5.PS1.A** (2-PS1-1),(2-PS1-2),(2-PS1-3); **5.PS1.B** (2-PS1-4); **5.LS2.A** (2-PS1-3)

#### Common Core State Standards

##### ELA/Literacy

- RI.2.8** Describe how reasons support specific points the author makes in a text. (2-PS1-2)
- W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1) (2-PS1-2)
- W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1) (2-PS1-2)

##### Mathematics

- MP.2** Reason abstractly and quantitatively. (2-PS1-2)
- MP.4** Model with mathematics. (2-PS1-1) (2-PS1-2)
- MP.5** Use appropriate tools strategically. (2-PS1-2)
- 2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-PS1-1),(2-PS1-2)



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### K-2-ETS1 ENGINEERING DESIGN

#### Students who demonstrate understanding can:

- K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2.** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- K-2-ETS1-3.** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.



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While all the Eco-Schools USA pathways lend themselves to engineering design, these pathways have been chosen because they are found the second grade standards. To strengthen the concepts students have been learning, it is logical to integrate opportunities to design solutions to real world sustainability issues students have been working to address.

Design solutions could include:

- Methods of water distribution that conserve water for the school gardens
- Wind blocks
- Garden designs that reduce impacts on the land via weathering and erosion

Driving Questions – Examples

- What is the best garden design to ensure that our students with assistive technology can participate in gardening activities?
- How can our class use nature to solve a flooding problem near our outdoor learning area?



### ENGINEERING DESIGN - CONTINUED

#### SCIENCE AND ENGINEERING PRACTICES

- Asking Questions and Defining Problems
- Developing and Using Models
- Analyzing and Interpreting Data

#### DISCIPLINARY CORE IDEAS

- ETS1.A** Defining and Delimiting Engineering Problems
- ETS1.B** Developing Possible Solutions
- ETS1.C** Optimizing the Design Solution

#### CROSCUTTING CONCEPTS

- Structure and Function

Connections to other DCIs in this grade-band: Connections to K-2-ETS1.B: Developing Possible Solutions Problems include: **Kindergarten:** K ESS3-3, **First Grade:** 1-PS4-4, **Second Grade:** 2-LS2-2 Connections to K-2-ETS1.C: Optimizing the Design Solution include: **Second Grade:** 2-ESS2-1

Articulation of DCIs across grade-bands: **3-5.ETS1.A** (K-2-ETS1-1) (K-2-ETS1-2) (K-2-ETS1-3); **3-5.ETS1.B** (K-2-ETS1-2); **3-5.ETS1.C** (K-2-ETS1-1) (K-2-ETS1-2) (K-2-ETS1-3)

#### Common Core State Standards

##### ELA/Literacy

- RI.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1)
- W.2.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) (K-2-ETS1-3)
- W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) (K-2-ETS1-3)
- SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

##### Mathematics

- MP.2** Reason abstractly and quantitatively. (K-2-ETS1-1) (K-2-ETS1-3)
- MP.4** Model with mathematics. (K-2-ETS1-1) (K-2-ETS1-3)
- MP.5** Use appropriate tools strategically. (K-2-ETS1-1) (K-2-ETS1-3)
- 2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) (K-2-ETS1-3)