Unit Summary
How can humans reduce their impact on the land, water, air, and other living things in the local environment?
In this unit of study, students develop an understanding of what humans need to survive and the relationship between their needs and where they live. The crosscutting concept of *cause and effect* is called out as the organizing concept for the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *asking questions* and *defining problems,* and *in obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on K-ESS3-3 and K-2 ETS1-1.
Student Learning Objectives
Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* *[Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]* **(K-ESS3-3)**
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 ETS1-1)

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Unit Sequence	
Part A: *How can humans reduce their impact on the land, water, air, and other living things in the local environment?*	
Concepts	**Formative Assessment**
• Events have causes that generate observable patterns. • Things that people do to live comfortably can affect the world around them. • People can make choices that reduce their impacts on the land, water, air, and other living things. • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. • A situation that people want to change or create can be approached as a problem to be solved through engineering. • Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem.	*Students who understand the concepts are able to:* • Observe patterns in events generated due to cause-and-effect relationships. • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. • Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. • Ask questions based on observations to find more information about the natural and/or designed world. • Define a simple problem that can be solved through the development of a new or improved object or tool. • Ask questions, make observations, and gather information about a situation that people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.

What It Looks Like in the Classroom

In this unit of study, students will develop an understanding of the impact that humans have on the land, water, air, and other living things in the local environment and engage in a portion of the engineering design process in order to communicate solutions that can reduce these impacts.

To help students recognize the impact that humans have on the living and nonliving components of the local environment, they need opportunities to observe and think about the things that people do to live comfortably. Over a period of a few days, students can observe their families in their day-to-day lives, paying attention to what they eat, what they throw away, when and how they use water, how they warm or cool their home, what types of appliances and gadgets they use, how they maintain their home and yard, what resources are used to make the clothes they wear, how they travel from place to place, and how they communicate with others. During whole-group discussions, students can share their observations and then discuss the concept of comfortable lifestyle. This list could include:

- Plants and animals for food
- Trees, rocks, sand, and other materials for building homes and schools
- Local reserves of water for drinking, washing clothes, showering, washing dishes, watering lawns, and cooking
- Gas and oil for cars and buses
- Electricity to power the appliances in their homes

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- Land for homes, schools, parks, parking lots, and landfills

Then the class can discuss how obtaining and using these types of resources affects the local environment. To help with these discussions, teachers can use books, multimedia resources, field trips, or even invite guest speakers to the classroom. As students participate in discussions, they should be encouraged to ask questions, share observations, and describe cause-and-effect relationships between human use of resources and human impact on the environment.

As students come to understand that things people do to live comfortably can affect the world around them, they are ready to engage in the engineering design process. The process should include the following steps:

- ✓ As a class or in groups, students participate in shared research to find examples of ways that people solve some of the problems created by humans' use of resources from the environment. For example, people in the community might choose to:
  - Recycle plastic, glass, paper, and other materials in order to reduce the amount of trash in landfills;
  - Plant trees in areas where trees have been cut down for lumber to renew regional habitats for local wildlife; or
  - Set up rainwater collection systems so that rainwater can be used to maintain landscaping instead of using water from local reserves.
- ✓ Groups of students then develop a simple sketch, drawing, diagram, or physical model to illustrate how the solution reduces the impact of humans on land, water, air and/or other living things in the local environment.
- ✓ Groups need the opportunity to communicate their solutions with the class in oral and/or written form, using their sketches, drawings, diagrams, or models to help explain how the solution reduces the human impact on the environment.

While engaging in this process, students should learn that even though humans affect the environment in many ways, people can make choices that reduce their impacts on the land, water, air, and other living things in the environment.

Connecting with English Language Arts/literacy and Mathematics

English Language Arts

With adult support, students participate in shared research in order to find examples of ways that humans reduce their impact on the land, water, air, and other living things in the local environment. With prompting and support, students will ask and answer questions about key details in a text. Students, with adult support and/or peer collaboration, can also use simple books and media resources to gather information and then use drawings, simple informative writing (or dictation), and visual displays to represent some of the ways that people lessen their impact on the environment. With support from adults, students will recall information from experiences or gather information provided from sources to answer a question. Students can clarify their ideas, thoughts, and feelings using simple informative writing.

Mathematics

With adult support, students will classify data by one attribute, sort data into categories, and graph the data. For example, students can keep track of the amount of materials recycled over a period of time. They can classify recycled trash as paper, plastic, or glass, then count and graph these data, using bar graphs or picture graphs. Student should have opportunities to analyze and compare the data and then use the data to solve word problems. As students work with their data, they are learning to reason abstractly and quantitatively, model by diagramming the situation mathematically, and use appropriate tools strategically.

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Modifications

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Research on Student Learning
N/A

Future Learning

Grade 3 Unit 1: Weather and Climate

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(secondary)*

Grade 4 Unit 5: Transfer of Energy

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

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Grade 5 Unit 4: Water on Earth

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

Connections to Other Units

In **Unit 4, Basic Needs of Plants,** students learned that plants need sunlight and water in order to live and grow. In **Unit 5**, **Basic Needs of Animals**, student learned that all animals need food in order to live and grow. They obtain their food from plants or from other animals.

Sample of Open Education Resources

Humans on Earth: This is a 3.5 minute narrated video explaining the use of natural resources to supply the needs of humans, and solutions for preserving them.

The Clean Water Book: Choices for Resource Water Protection: This book is available from the New Jersey Department of Environmental Protection

Recycling Manual for New Jersey Schools: This manual will guide school personnel through a step-by-step process of setting up a recycling program in the school. It provides all the necessary tools for designing and implementing a viable and comprehensive program in private, public and parochial institutions.

Speakers Program: The New Jersey Department of Environmental Protection (DEP) fields requests for public speakers, classroom presentations and exhibitors regarding the various environmental topics, programs and services that are administered by the agency.

Practice the 5 R's – Poster

The USGS Water Science School: Welcome to the U.S. Geological Survey's (USGS) Water Science School. We offer information on many aspects of water, along with pictures, data, maps, and an interactive center where you can give opinions and test your water knowledge.

Teacher Professional Learning Resources

The New Jersey Department of Environmental Protection offers several **professional development opportunities** for classroom teachers as well as diverse enrichment programs for adults, students, environmental educators, families and other individuals. This section provides links to several training opportunities that are either administered by DEP or through one of DEP's formal partnerships or sponsorships.

Framework for K-12 Science Education, **Developing and Using Models**: This section of the Framework provides a deeper explanation of what it means for students to develop and use models. Modeling is especially important when concepts are too large or too small for students to have direct experience.

APPENDIX F: Science and Engineering Practices in the NGSS, The Framework uses the term "practices," rather than "science processes" or "inquiry" skills for a specific reason: We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. (NRC Framework, 2012, p. 30). Appendix F provides further clarification of each science and engineering practice as well as specific details about what each looks like in each grade band.

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***NGSS* Crosscutting Concepts: Stability and Change**

The presenter was Brett Moulding, director of the Partnership for Effective Science Teaching and Learning. Mr. Moulding began the web seminar by defining stability and change and discussing the inclusion of this concept in previous standards documents such as the National Science Education Standards (NSES). Participants brainstormed examples of science phenomena that can be explained by using the concept of stability and change. Some of their ideas included Earth's orbit around the Sun, carrying capacity of ecosystems, and replication of DNA. Mr. Moulding then discussed the role of stability and change within NGSS. Participants again shared their ideas in the chat, providing their thoughts about classroom implementation of this crosscutting concept.

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Appendix A: NGSS and Foundations for the Unit

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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 ETS1-1)

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Obtaining, Evaluating, and Communicating Information** • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3) **Asking Questions and Defining Problems** • Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)	**ESS3.C: Human Impacts on Earth Systems** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3) **ETS1.B: Developing Possible Solutions** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.*(secondary)* (K-ESS3-3) **ETS1.A: Defining and Delimiting Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)	**Cause and Effect** • Events have causes that generate observable patterns. (K-ESS3-3) **Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

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English Language Arts	Mathematics
Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3-3) **W.K.2** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) **RI.2.1** 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) **W.2.6** Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) **W.2.8**	Reason abstractly and quantitatively. (K-2-ETS1-1) **MP.2** Model with mathematics. (K-2-ETS1-1) **MP.4** Use appropriate tools strategically. (K-2-ETS1-1) **MP.5** 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) **2.MD.D.10**

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