Students should begin to group plants and animals together based upon their similar environmental needs (water, sunlight) and the availability of their preferred food sources. For example, students might read a story about the grasslands of Africa where a gazelle eats grass and then a lion eats the gazelle. Students should be able to **explain [SEP-6]** why each animal lives in that particular spot in Africa. Their answers should identify a specific need that is met by that location (either an environmental condition such as the grass lives there because it gets the sunlight and water that it needs, or a food source such as the lion lives there because it eats the gazelles there). Once students master the relationships of simple groups of organisms like the African grassland, teachers can focus on living things close to their school. What plants grow well in the weather in their city? What animals will eat those plants, and what animals will eat those animals? Teachers and students can decorate the four corners of their classrooms to look like the landscape of regional environments. They can read stories (fictional and informational) set in those environments. They can modify the decorations as the seasons change (connecting to IS3).

Students will build on their model of the relationship between the needs of organisms and their environmental conditions in grade three when they explore what happens when the environment changes (3-LS4-4) and in grade five when they examine the specific flow of energy and matter (5-LS2-1).



## Kindergarten Instructional Segment 2: Animals and Plants Can Change Their Environment

Even though all organisms rely on the environment to get the things they need, many organisms also have the power to change their environment to make it even better at meeting their needs. Since everything is connected in systems, changes by one organism affect all the others. The content in this segment flows from IS1, but is split apart as a separate segment partly to emphasize humans as an agent of change (ESS3.C).

#### KINDERGARTEN INSTRUCTIONAL SEGMENT 2: ANIMALS AND PLANTS CAN CHANGE THEIR ENVIRONMENT

#### **Guiding Questions**

- How do animals and plants change their environment to survive?
- What do we (humans) do that changes our environment?
- What can we do to modify our impact on the environment?

## Performance Expectations

Students who demonstrate understanding can do the following:

**K-ESS2-2.** Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]

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.\* [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–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.

\*The performance expectations marked with an asterisk integrate traditional science content with engineering through a practice or disciplinary core idea.

NRC document A Framework for K-12 Science Education:					
Highlighted Science and Engineering Practices	Highlighted Disciplinary Core Ideas	Highlighted Crosscutting Concepts			
[SEP-1] Asking Questions and Defining Problems [SEP-7] Engaging in Argument from Evidence	ESS2.E: Biogeology ESS3.C: Human Impacts on Earth Systems ETS1.A: Defining and Delimiting Engineering Problems ETS1.B: Developing Possible Solutions	[CCC-2] Cause and Effect: Mechanism and Explanation [CCC-4] Systems and System Models			

The bundle of performance expectations above focuses on the following elements from the

#### Highlighted California Environmental Principles and Concepts:

Principle I The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

<b>KINDERG</b>	ARTEN INS	RUCTIONA	L SEGMENT	2:
ANIMALS	AND PLANT	S CAN CHAI	NGE THEIR	ENVIRONMENT

**Principle II** The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies.

**Principle IV** The exchange of matter between natural systems and human societies affects the long-term functioning of both.

CA CCSS Math Connections: K.MD.3

CA CCSS for ELA/Literacy Connections: RI.K.1, 2, 10; SL.K. 2, 3, 5; W.K.2, 7, 8; L.K.1, 2

CA ELD Standards Connections: ELD.PI.K.2, 5, 6; ELD.PII.K.3

Students begin by walking around their schoolyard looking for ways in which plants and animals are changing the ecosystem. Students might notice a squirrel digging in the ground to hide a nut, ants piling up dirt outside a hole, a bird pulling a twig off a branch for its nest, a tree root pushing up a sidewalk, or a large bush blocking the sunlight of a smaller bush.

While animals are active and it is easier for students to think of them as making changes, students should also notice how plants change their environment. Some of the best evidence that plants make changes comes by comparing soil under plants to a patch of soil that does not have plants. Without plants, some soils can blow away in the wind. Plant roots change the environment and prevent soil from blowing or washing away. A patch of dirt might be dry because it lacks plants whose roots draw up moisture from deep below the surface and whose leaves shade the surface from the sunlight that dries it up. But bare dirt is not always loose—it can sometimes get hard and compacted. After a rainstorm, a patch of this hard dirt might be much muddier than soil near plants because it is hard for water to soak into soil that is hard and compacted. Students can notice these differences and ask questions [SEP-1] about why some bare dirt is loose and some is hard. A plant's roots sometimes act like a net to hold soft soil together, but other times they break hard soil apart, which allows water to soak in. A few pioneering weeds will be the first to send roots into that hard soil, slowly changing it. To draw attention to plant-related impacts, teachers can ask, Why do you think the sidewalk is raised or broken near the trees on the sidewalk? or After a rainstorm, why does mud run into the gutter from an empty lot, but not from a yard with lawn? Teachers scaffold student responses using simple sentence frames that emphasize the cause and effect relationships [CCC-2] (I think the \_\_\_\_ caused the \_\_\_\_). Students can represent the changes [CCC-7] by drawing two side-by-side pictures showing a before and after comparison of what the environment looked like before the change and what it looks like now.

Not every schoolyard has abundant nature visible, so teachers will have to do their best by finding short video clips and reading stories that illustrate ways in which animals and plants change their environment. For example, students can watch online videos of woodpeckers pecking holes in trees. Teachers encourage students to ask questions [SEP-1] about what they see, encouraging their natural curiosity. To address the question, Why is it pecking?, a teacher can ask students what ideas they have. After recording student responses, teachers emphasize that all of these possibilities relate to meeting the woodpecker's need for survival. It turns out that different woodpecker species peck for different reasons, but students can look for evidence in the videos for different species. A pileated woodpecker stops pecking periodically to eat bugs while an acorn woodpecker pecks a deep hole near several other holes that have acorns stuffed inside because it stores its food for the winter. With all those holes, students wonder, Does it hurt the trees? While some woodpeckers target trees that are already dead, others prefer live trees so that they can eat the sap and insects that feed on the sap. So the answer depends on how many woodpeckers there are and how many holes they drill. This idea allows teachers to transition into issues about human effects on the natural environment (ESS3.C).

## Kindergarten Snapshot 3.2: Resource Systems



Many changes that animals make to the environment benefit other organisms, but humans can modify the environment on such a large scale [CCC-3] that sometimes the changes affect other organisms including other people. Humans alter the environment when they extract natural resources

for making products and when they produce the energy needed to make those items (EP&C II). In this snapshot, students **obtain**, evaluate, and communicate information **[SEP-8]** about the relationship between everyday objects, the natural resources that are needed to produce them, and how using those resources can affect the natural systems where they are found (EP&Cs I and IV).

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Everyday phenomenon: Paper can be recycled.

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Ms. W walked over to the blue bin for recycled paper in her classroom and asked what could go in it. She then led a discussion about what students know about the questions: What is paper made of? and What does it mean to recycle it? Ms. W distributed three information cards to students with the labels Paper, Logs, and Trees. Ms. W led a class conversation about the photographs on the cards and students discussed how the objects relate to one another. Ms. W wanted to introduce the concept that paper is a resource that comes from trees that grow in forests. To scaffold this process, she had students arrange

the cards in a sequence of which came first and had students use verb phrases (CA ELD PII.K.3) to describe how trees became logs (cut) and how logs became paper (ground up in a factory). To reinforce both the concepts and the language development, she read a poem that used some of these verb phrases with vivid imagery. Students repeated the discussion for cards labeled "Bread-Wheat-Soil" and "School Building-Sand/Concrete-River." Ms. W emphasized that there is a pattern [CCC-1] by asking students to sort the cards into categories (CA CCSSM K.MD.3): "Object I use," "Material to make the object," and "Natural system." People use materials [CCC-5] from one category to make another, so each group of cards represents a separate system [CCC-4]. Ms. W had students complete a simple sentence describing a cause and effect relationship [CCC-2] within each system, such as When we use paper, we affect \_\_\_\_\_, or When we build \_\_\_\_\_, we take sand from rivers.

Ms. W asked the students to work in pairs to think about the question, What happens if we cut down too many trees in a forest? As they began to recognize that using things like paper in their daily lives affects the natural systems those resources come from, students started to develop an understanding of the essence of California EP&C IIpeople influence natural systems.

## **Resources:**

- California Education and the Environment Initiative. 2013. A Day in My Life. Sacramento: Office of Education and the Environment. http://www.cde.ca.gov/ci/sc/cf/ch3. asp#link3
- Wilson, Fred. 2013. "Sticks, Sticks, Pick up Sticks." In A Day in My Life, edited by California Education and the Environment Initiative. Sacramento: Office of Education and the Environment. http://www.cde.ca.gov/ci/sc/cf/ch3.asp#link4

## Engineering Connection — Reduce, Reuse, Recycle

Once students understand that producing everyday objects affects natural systems, they can begin to come up with solutions [SEP-6] that reduce the effects (K–2-ETS1-1). For example, students can brainstorm ways that they can save water or paper. Their solutions probably fall into the categories of reducing, reusing, or recycling, so teachers can introduce these terms and help students categorize their suggestions. Students might come up with systems for reusing materials in the classroom or design a way to capture wasted water in their classroom sink. To aedua communicate [SEP-8] their solutions (K-ESS3-3), students can draw a picture of one of their ideas and then choose the appropriate label

for their suggestion (reduce, reuse, or recycle). Students should be able to identify the natural system that benefits from the action and explain [SEP-6] how their solution will help).



## **Opportunities for ELA/ELD Connections**

Select four or five books about different ecosystems to read aloud to the class. For example, the series about living in a biome by Carol L. Linden has numerous topics such as *Life in a Forest*, *Life in an Ocean*, *Life in a Desert*, *Life in a Stream*, *Life in a Rain Forest*, and *Life in a Pond*. As each book is read, prompt student engagement using similar questions about the biome, for example: What does \_\_\_\_\_ (animal or plant) need to survive? Where does \_\_\_\_\_ live? How does \_\_\_\_\_ change their environment? Divide students into small groups, with each group assigned a different book, to compose (through dictation and/or pictures) an explanatory piece about their biome, including some text-based details.

CA CCSS for ELA/Literacy Standards: RI.K.1, 2, 10; SL.K. 2, 3, 5; W.K.2, 7, 8; L.K.1, 2 CA ELD Standards: ELD.PI.K.2, 5, 6

# Sample Integration of Science and ELD Standards in the Classroom

Students use pictures, drawings, and observations of natural events to construct an argument based on evidence about how plants and animals (including humans) can change the environment to meet their needs (K-ESS2-2). They sequence events and compare predictions (based on prior experiences, such as having picked fruit from a tree to eat or having collected and used water from different sources for different purposes) to what occurred (observable events), such as seeing birds gathering materials to build nests and drinking water from puddles, squirrels storing food, and tree roots breaking the concrete of sidewalks. As they work as a class and in small groups, they ask questions of one another and respond to others in order to identify details and patterns that support their claims.

**CA ELD Standards**: ELD.PI.K.5 *Source*: Lagunoff et al. 2015, 214–215