



HONORING OUR RIVERS

A Student Anthology

**Guide to Aligning Natural Science Illustration Activities
with Next Generation Science Standards and Common Core**

| Grade Level | NGSS Discipline Core Idea (DCI) | NGSS Performance Expectation | NGSS Clarification Statement | Examples Using Nature Illustration (option to include writing activity to align with Common Core) | Performance Expectations Related to Common Core Standards |
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| K | Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment | K-ESS2-2 Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. | <i>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.</i> | <i>An illustration of an egg or critter that can be found burrowed on the beach or a beaver that's made a dam can be evidence from the observations they made of the natural object and/or its environment to support an argument.</i> | W.K.1 - Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. W.K.2 - 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 | Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment | K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. | <i>Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.</i> | <i>An illustration of a leaf can be the model that represents the food that deer's eat, which is why they live in forests. An illustration of a periwinkle snail can be the model that represents rocky, intertidal areas along the coast, which it lives in so it can feed on algae and barnacle larvae.</i> | SL.K.5 - Add drawings or other visual displays to descriptions as desired to provide additional detail. |
| K | Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment | 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. | <i>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.</i> | <i>An illustration of an invasive or native plant/animal can be used in communicating either how humans have introduced invasive species or the important of planting/protecting native ones.</i> | W.K.2 - 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. |

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| K | Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment | K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive. | <i>Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.</i> | <i>An illustration of an object found in nature that needs water from a nearby source of water for survival, such as part of a plant or seashell.</i> | W.K.7 Participate in shared research and writing projects. |
| 1 | Structure, Function and Information Processing | 1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. | <i>Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.</i> | <i>An illustration of a nut shell or mollusk shell could mimic a bicyclist's helmet. An illustration of a plant's roots or an animal's tail could mimic stabilizing a building or airplane; a thorn or animal quill could mimic keeping out intruders, etc.</i> | W.1.7 Participate in shared research and writing projects. |
| 1 | Structure, Function and Information Processing | 1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. | <i>Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.</i> | <i>Examples of observations depicted in an illustration could include leaves from the same kind of river-related plant are the same shape but can differ in size.</i> | W.1.8 - With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. |

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| 2 | Interdependent Relationships in Ecosystems | 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats. | <i>Emphasis is on the diversity of living things in each of a variety of different habitats</i> | <i>Two illustrations of objects found in nature could reflect observations of river habitat's diversity of life.</i> | W.2.8 - Recall information from experiences or gather information from provided sources to answer a question. 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. |
| 3 | Interdependent Relationships in Ecosystems | 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. | <i>Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.</i> | <i>An illustration of a bird that depends on fish in the river or ocean.</i> | SL.3.4 - Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. W.3.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons. W.3.2 - Write informative/explanatory texts to examine a topic and convey ideas and information clearly. |
| 3 | Inheritance and Variation of Traits | 3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment. | <i>Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.</i> | <i>An illustration of a small adult fish can be evidence of a shallow river or creek.</i> | SL.3.4 - Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. W.3.2 - Write informative/explanatory texts to examine a topic and convey ideas and information clearly. |

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| 3 | Inheritance and Variation of Traits | 3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. | <i>Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.</i> | <i>An illustration of a crab's larger pincer may be more likely to outcompete other crabs for survival. An illustration of a tree leaning over the river may grow bigger than another because it has better access to sunlight.</i> | SL.3.4 - Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. W.3.2 - Write informative/explanatory texts to examine a topic and convey ideas and information clearly. |
| 4 | Structure, Function and Information Processing | 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. | <i>Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.</i> | <i>An illustration of a thorn, pincer, gills.</i> | W.4.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons and information. |
| 5 | Ecosystems: Interactions, Energy, and Dynamics | 5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment | <i>Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.</i> | <i>An illustration of two or more leaves showing the regular shape of the stomata and guard cells.</i> | SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. 5- LS2-1 Mathematics – MP.2 Reason abstractly and quantitatively. 5-LS2-1 MP.4 Model with mathematics. |

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| Middle School | Natural Selection and Adaptations | MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. | <i>Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.</i> | <i>Accompany explanation with a supporting illustration showing anatomical similarities and differences between a fossil and a similar modern organism.</i> | WHST.6-8.9 - Draw evidence from informational texts to support analysis reflection, and research |
| Middle School | Growth, Development, and Reproduction of Organisms | MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. | <i>Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.</i> | <i>An illustration based on the experience of observing of a natural object and its environment is empirical evidence. Illustration example: the hard shell on nuts that squirrels bury.</i> | <ul style="list-style-type: none"> • MS-LS1-4 (RST.6-8.1) - Cite specific textual evidence to support analysis of science and technical texts. |

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| High School | Ecosystems: Interactions, Energy, and Dynamics | HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. | <i>Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise</i> | <i>An illustration over time to demonstrate a plant life history. Illustration example: plants are starting to grow and bloom earlier in the spring and survive longer into the fall. Illustration example: Primary succession with the formation of lichens and moss covering a rock.</i> | WHST.11-12.9 - Draw evidence from informational texts to support analysis, reflection, and research. WHST.9-12.1 - Write arguments focused on discipline-specific content. |
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Extensions:

Engineering Design K-2, 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.

Engineering Design Elementary: Biomimicry - https://www.teachengineering.org/activities/view/cub_lifescience_lesson03_activity2

Additional Resources:

Fractals, Math, and Nature Educator Guide: <http://fractalfoundation.org/fractivities/FractalPacks-EducatorsGuide.pdf>

Fractals, Math, and Watersheds. Learn about the fractal nature of rivers, understand what a watershed is and create your own fractal design. <http://fractalfoundation.org/resources/fractivities/fractal-rivers/>

Math and Natural World: <https://www.neefusa.org/resource/rooted-math-educator-toolkit>