

## Sustainability Overlay of Maine Learning Standards

### Description:

This guide seeks to empower educators by suggesting pathways to expand upon Maine’s Learning Standards to promote environmental learning and action. Recommendations are categorized by “tags” to indicate the theme or learning goal that the recommendation seeks to meet. This resource is intended to be ever-evolving to best support educators and students in efforts to advance Maine’s Climate Literacy Plan. This list is not exhaustive; there are other classes that practice climate literacy, which can also be counted towards the Seal of Climate Literacy.

### Climate Literacy Tags:

- **Observation to Investigation:** empowers students to leverage observations to design and conduct an investigation that answers an environmental question.
- **Local lens:** applies a focus on the ecological, economic, and environmental characteristics and challenges at the state, county, or community/school level.
- **Data literacy:** promotes the ability to analyze, evaluate, and communicate data, with a focus on interpreting climate data, analyzing maps, identifying patterns of environmental change over time, and using findings to make informed real-world decisions.

### Additional tags:

- |                                          |                                   |
|------------------------------------------|-----------------------------------|
| - Citizen/Community Science              | Sense of place                    |
| - Local action                           | Developing community partnerships |
| - Ecological Modeling                    | Climate-ready schools             |
| - Developing solutions                   | Project-based learning            |
| - Understanding environmental challenges | Service learning                  |
| - Cultural competency                    |                                   |

9<sup>th</sup> - 12<sup>th</sup> grade

Geography 1

| Alphanumeric Code                               | Theme                                                                          |
|-------------------------------------------------|--------------------------------------------------------------------------------|
| <a href="#">Geography 1: F1, F2, D1, D2, D3</a> | Cultural competency, Understand Environmental Challenges, Developing Solutions |

| Learning Standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Recommendation                                                                                                                                    |
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| <p>Students understand the geography of the US and various regions of the world and the effect of geographic influences on decisions about the present and future by</p> <p>F1) Analyzing local, national, and global geographic data on physical, environmental, and cultural processes that shape and change places and regions.</p> <p>(F2) Evaluating and developing a well-supported position about the impact of change on the physical and cultural environment.</p> <p>(D1) Proposing a solution to a geographic issue that reflects physical, environmental, and cultural features at local, state, national, and global levels. (D2) Using inquiry to predict and evaluate consequences of geographic influences.</p> <p>(D3) Describing the major regions of the Earth and their major physical, environmental, and cultural features using a variety of <i>geographic tools</i> including digital tools and resources.</p> <p>Students understand geographic aspects of unity and diversity in Maine, the United States, and the world, including Maine Native American communities by: (F1) Analyzing geographic features that have impacted unity and diversity in the United States and other nations. (D1) Summarizing and interpreting the relationship between geographic features and cultures of Maine Native Americans, and</p> | <p><a href="#">Social Studies Lesson: Natural Resources in Conflict</a></p> <p><a href="#">Social Studies Lesson: Rivers and Water Rights</a></p> |

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| historical and recent immigrant groups in Maine, United States, and the world. |  |
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## Geography 2

| Alphanumeric Code                   | Theme                           |
|-------------------------------------|---------------------------------|
| <a href="#">Geography 2: F1, D1</a> | Cultural competency, Local lens |

| Learning Standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Recommendation                                                                    |
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| Students understand geographic aspects of unity and diversity in Maine, the United States, and the world, including Maine Native American communities by: (F1) Analyzing geographic features that have impacted unity and diversity in the United States and other nations. (D1) Summarizing and interpreting the relationship between geographic features and cultures of Maine Native Americans, and historical and recent immigrant groups in Maine, United States, and the world. | <a href="#">Wabanaki Connections to the Geography of What is Now called Maine</a> |

## History 2

| Alphanumeric Code             | Theme                                  |
|-------------------------------|----------------------------------------|
| <a href="#">History 2: D2</a> | Understanding environmental challenges |

| Learning Standard                                                                                                                                                                                                                                                                                                                              | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| Students understand historical aspects of unity and diversity in the United States, the world, and Native American communities by: D2) Making use of primary and secondary sources, identifying and analyzing major turning points and events in the history of world cultures as it pertains to various historical and recent migrant groups. | <p>Climate Migration-exploring global climate injustice and the disproportionate impacts of climate pollution.</p> <p>How do policies and practices promote environmental degradation in developing nations? Why are communities of color and communities impacted by poverty disproportionately impacted by environmental health hazards? How can human exposure to environmental health hazards be corrected or limited?</p> |

## Reading: Integration of Knowledge and Ideas

| Alphanumeric Code                                                             | Theme                                                   |
|-------------------------------------------------------------------------------|---------------------------------------------------------|
| <a href="#">Reading: Integration of Knowledge and Ideas Standard 11 (ELA)</a> | Observation to investigation, Environmental stewardship |

| Learning Standard                                                                                                                                                                              | Recommendation                                                                                                                                                                                          |
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| Evaluate and synthesize multiple sources of information and various texts (e.g., literary, visual, artistic, and quantitative) in order to achieve a specific purpose or to answer a question. | <p>Investigate local ecological challenges using data reports, first person accounts, etc.</p> <p>Analyze texts (poems, essays, books, movies, videos) that discuss humans' relationship to nature.</p> |

## Mathematics

| Alphanumeric Code                     | Theme                     |
|---------------------------------------|---------------------------|
| <a href="#">SR.EA.2 (Mathematics)</a> | Data literacy, local lens |

| Learning Standard                                                                                                                     | Recommendation                                                                                                                                                                                                                                                                                               |
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| Use random sampling, visual representations, and measures of center and variability to draw inferences about one or more populations. | <p>Evaluate and create graphs to analyze the relationship between species in the local ecosystem.</p> <p><b>Example Activity:</b><br/><a href="#">Monarch and Milkweed -- Looking at the Numbers - Signs of the Seasons: A New England Phenology Program - University of Maine Cooperative Extension</a></p> |

## Engineering Design

| Alphanumeric Code                            | Theme                                           |
|----------------------------------------------|-------------------------------------------------|
| <a href="#">HS-ETS1 (Engineering Design)</a> | Environmental Stewardship, Developing solutions |

| Learning Standard | Recommendation |
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| Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.                                                                                                      | Examples of challenges include local and global climate change issues, biodiversity loss or United Nations sustainable development goals.                                                                                                                    |
| Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.                                                                                                            | Examples could include transportation issues, dams, green energy and wind power in Maine.                                                                                                                                                                    |
| Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. | Examples could include lobstering and exports of lobster, dry wells and water conservation in Maine, or saltwater intrusion in coastal Maine wells.                                                                                                          |
| Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.                                                  | <a href="#">En-ROADS</a> climate solutions simulator. Have students try to determine the most equitable and effective climate solutions. Do a role-playing activity with different stakeholders and debate which actions to take to reduce carbon emissions. |

## Matter and Its Interactions

| Alphanumeric Code                                    | Theme                                  |
|------------------------------------------------------|----------------------------------------|
| <a href="#">HS-PS1 (Matter and Its Interactions)</a> | Understanding Environmental Challenges |

| Learning Standard                                                                                                                                                                                                      | Recommendation                                                                                                                                                                                                                                                         |
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| Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. | Examples of chemical reactions could include the reaction of sodium and chlorine, carbon and oxygen, or carbon and hydrogen. Examples could include ocean salt formation, combustion (as found in the burning of fuels in Maine homes, cars and the trucking industry) |

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| Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.                         | or the detection of carbon monoxide in a home (complete vs incomplete combustion).<br><br>Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension. Examples could consider why we salt roads in the winter, differences in melting points of water vs saltwater, the production of maple syrup or the strength of Maine minerals. |
| Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. | Examples could include the varied rates of oxidation of metals in winter vs in summer or the rate of dissolution of calcium shells in the ocean due to an increase in carbon dioxide an increase in temperature from global warming.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.                                                                     | Examples could include the proportion of ingredients combined in baked goods or the combustion of fuels.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.                      | Examples could include radon gas in basements, thorium in white gas mantles or, historically, Wiscasset's Maine Yankee nuclear power plant and Fukushima in Japan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### **Motion and Stability: Forces and Interactions**

| <b>Alphanumeric Code</b>                                               | <b>Theme</b>                                       |
|------------------------------------------------------------------------|----------------------------------------------------|
| <a href="#">HS-PS2 (Motion and Stability: Forces and Interactions)</a> | Understanding Environmental challenges, Local lens |

| Learning Standard                                                                                                                                                               | Recommendation                                                                                                                                     |
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| Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. | Examples could include wind turbines or generators along with any DC motorized toy. Also discuss wind turbines, their purpose, pros/cons in Maine. |
| Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.                                 | Examples could also include composite material substitutes for wood and the structure of solar cells along with how they work.                     |

## Energy

| Alphanumeric Code               | Theme                  |
|---------------------------------|------------------------|
| <a href="#">HS-PS3 (Energy)</a> | Project-based learning |

| Learning Standard                                                                                                                                                                                                                                                                           | Recommendation                                                                                                                                                                                                                                                                                                                                                       |
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| Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.                                                                                    | Examples could include wind turbines, hydroelectric or tidal power.                                                                                                                                                                                                                                                                                                  |
| Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.                                                                                                                                                           | Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency. Consider the <a href="#">Windstorm Challenge</a> or use of a solar oven when camping. |
| Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). | Examples can be found in heat pumps for radiant heat systems and insulation (to prevent heat transfer).                                                                                                                                                                                                                                                              |

## Waves and Their Application in Technologies for Information Transfer

| Alphanumeric Code                                                                             | Theme                                  |
|-----------------------------------------------------------------------------------------------|----------------------------------------|
| <a href="#">HS PS4 (Waves and Their Application in Technologies for Information Transfer)</a> | Understanding environmental challenges |

| Learning Standard                                                                                                                                                           | Recommendation                                                                                                                                                                                                                                    |
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| Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.                 | Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth. Examples include rainbows and how to aim when spearfishing. |
| Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. | Arguments around evidence could be made for dangers of cell phone usage or living near high voltage power lines.                                                                                                                                  |

## From Molecules to Organisms: Structures and Processes

| Alphanumeric Code                                                              | Theme                            |
|--------------------------------------------------------------------------------|----------------------------------|
| <a href="#">HS-LS1 (From Molecules to Organisms: Structures and Processes)</a> | Ecological Modeling. Local lens, |

| Learning Standard                                                                                                                                          | Recommendation                                                                                                 |
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| Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. | Example could be the water and nutrient intake in soft shell clams.                                            |
| Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.                                                          | Models may focus on Maine based economy of photosynthetic organisms such as seaweeds, potatoes and pine trees. |

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| Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy. | An example could be a moose eating a lily pad, the lily pad producing energy for the moose and the breathing of oxygen by the moose to enable the process of cellular respiration. |
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## Ecosystems: Interactions, Energy, and Dynamics

| Alphanumeric Code                                                                                                                                                                                                                                                                                                                                           | Theme                               |
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| <a href="https://www.nextgenscience.org/pe/hs-ls2-2-ecosystems-interactions-energy-and-dynamics">HS-LS2 (Ecosystems: Interactions, Energy, and Dynamics)</a><br><a href="https://www.nextgenscience.org/pe/hs-ls2-2-ecosystems-interactions-energy-and-dynamics">https://www.nextgenscience.org/pe/hs-ls2-2-ecosystems-interactions-energy-and-dynamics</a> | Understand environmental challenges |

| Learning Standard                                                                                                                                                             | Recommendation                                                                                                                                                                                                                                                                                                                                                                                       |
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| Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.                     | Examples could include a look at historical data of the population of a species that has moved north into Maine, such as opossum, and how it has changed as the climate in Maine has changed. Observe data of the populations of harbor seals and the effect that a hunting ban has had on their population and the resulting increase in the number of large predatory sharks in the Gulf of Maine. |
| Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. | Examples could include a graphical analysis of historical data on the population of trout and/or landlocked salmon before and after the introduction of bass into Moosehead Lake. Or data on a variety of populations (biodiversity) affected by dredging for sea scallops.                                                                                                                          |
| Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.                                       | An example could include a classroom lab activity around a Winogradsky Column with groups changing a variable such as                                                                                                                                                                                                                                                                                |

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| Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.                                                                                                    | temperature or light. Additional examples could look at the fermentation processes when blue-green algae is grown in aerobic and anaerobic environments.                                                                                                                                                                                |
| Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.                                                             | An example could include an illustration of a food pyramid students may find in Maine (e.g. seaweed → snail → fish → shark, or grass → insects → turkeys → foxes).                                                                                                                                                                      |
| 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. | Models may include multi-media illustration of the carbon cycle to include a Maine ecosystem they are familiar with such as pond, seaside, farm, forest, etc.                                                                                                                                                                           |
| Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.                                                                                                           | Examples could include how the number of moose hunting licenses impacts other populations or how fishing limits or shortened seasons decreases the catch of many fish species and the effects on ground fish or smaller fish.                                                                                                           |
| Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.                                                                                                                   | Potential Maine connections include the effects of: salting the roads in winter, introducing green crabs into coastal waters, introducing invasive species into Maine lakes, or examining historical data on water pollution in the Androscoggin during the height of mill activity, closing of mills and legislation on water quality. |
|                                                                                                                                                                                                                                     | Examples could include turkeys flocking to evade hunters or Canada geese migrating to and through Maine for breeding purposes.                                                                                                                                                                                                          |

## **Heredity: Inheritance and Variation of Traits**

| Alphanumeric Code                                                      | Theme                                  |
|------------------------------------------------------------------------|----------------------------------------|
| <a href="#">HS-LS3 (Heredity: Inheritance and Variation of Traits)</a> | Understanding Environmental Challenges |

| Learning Standard                                                                                                                                                                                                                                                                                                                                                                            | Recommendation                                                                                                                                                                                                                                                                                                                                                                    |
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| <p>Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</p> <p>Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> | <p>Emphasis is on using data to support arguments for the way variation occurs. Provide data on specific mutations caused by environmental factors.</p> <p>An example would be the population of red fox in Maine and the incidences of the red allele vs. the sable allele.</p> <p><b>Activity Idea:</b><br/> <a href="#">Ecosystem Lesson: Allele Frequency and Climate</a></p> |

### Biological Evolution: Unity and Diversity

| Alphanumeric Code                                                  | Theme                                                   |
|--------------------------------------------------------------------|---------------------------------------------------------|
| <a href="#">HS-LS4 (Biological Evolution: Unity and Diversity)</a> | Understanding Climate Change, Local lens, Data Literacy |

| Learning Standard                                                                                                                                                                                                                                                                                                                                                                                                                                         | Recommendation                                                                                                                                                                                                                                                                                                                                          |
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| <p>Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</p> <p>Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.</p> | <p>Emphasis is on using data to support arguments for the way variation occurs. Provide data on specific mutations caused by environmental factors.</p> <p>Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations. Observe historical data for the distribution of humpback</p> |

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| <p>Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.</p> <p>Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity</p> | <p>whales in the Gulf of Maine looking specifically at skin pigmentation.</p> <p>Further explanation: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.</p> <p>Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.</p> <p><b>Activity Ideas:</b><br/> <a href="#">Biology Lesson: Plastic and Ocean Life</a><br/><br/> <a href="#">Biology Lesson: Design Thinking Solutions for Birds</a></p> |
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## Earth's Place in the Universe

| Alphanumeric Code       | Theme      |
|-------------------------|------------|
| <a href="#">HS-ESS1</a> | Local lens |

| Learning Standard                                                                                                                                                                                   | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                  |
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| Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. | <p>Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth.</p> <p>Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11- year sunspot cycle, and non-cyclic variations over centuries.</p> |

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| Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. | Examples could also be found from looking at differences between coastal Maine and interior Maine rock types and their ages as evidence to explain the formation of land structures and plate boundaries that cause them. |
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## Earth's Systems

| Alphanumeric Code                         | Theme                                          |
|-------------------------------------------|------------------------------------------------|
| <a href="#">HS-ESS2 (Earth's Systems)</a> | Ecological Modeling, Local lens. Data literacy |

| Learning Standard                                                                                                                                                       | Recommendation                                                                                                                                                                                                                                                                    |
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| Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. | An example could be to utilize Maine Geologic maps, including tectonic maps, as data to create a model to illustrate how Maine's land features or oceanic features were formed. Consider looking to Maine's glacial history, features formed and materials deposited by glaciers. |
| Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.                            | An example could consider timber harvesting practices related to erosion and water runoff issues, river damming, or coastal erosion of Maine's beaches and dunes.                                                                                                                 |
| Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.                                              | Consider the climatic impacts of the Gulf stream and the Labrador currents on the Gulf of Maine, e.g. water temperature changes and fishing industry disruptions.                                                                                                                 |
| Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.                                                        | Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface.                                                           |

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|  | <p>Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; and how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.</p> <p><b>Activity Idea:</b><br/> <a href="#">Climate Change Lesson Plan: The Ocean</a></p> |
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## Earth and Human Activity

| Alphanumeric Code                                  | Theme                                                         |
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| <a href="#">HS-ESS3 (Earth and Human Activity)</a> | Local lens, Developing solutions, Local action, Data Literacy |

| Learning Standard                                                                                                                                                               | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. | Other examples include the impacts of climate change on Maine’s ski industry, fishing industry, maple sugar industry and on sea levels or droughts.                                                                                                                                                                                                                                                                                                                            |
| Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.                                          | Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use (for farming, timber industry, blueberry and potato crops), mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen. |

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| <p>Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.</p>                                              | <p>Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning. Consider the effects of urban sprawl and the loss of farmland.</p>                                                                                                                                                                                                                                           |
| <p>Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</p>                                                                                                         | <p>Examples of on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean). Other examples include the use of propane-powered buses in Acadia (evaluate pros and cons).</p> |
| <p>Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.</p> | <p>Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).</p>                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Use a computational representation to illustrate the relationships among Earth</p>                                                                                                                                   | <p>Use and interpret graphs and data of carbon dioxide levels in the Gulf of Maine for oysters</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| systems and how those relationships are being modified due to human activity. | and sea scallops. Consider the impacts of ocean acidification on shellfish. |
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