

Environmental Principles & Concepts (EP&C)/COSA Correlation of 4th - 7th Grade CA Science Standards

For ROSS Certifications at least nine of the 14 science standards are addressed during a 5-day program, and at least seven of the 14 science standards are addressed during a 4-day program. The following 4th - 7th grade science standards are part of ROSS certifications and correlated to the specific Environmental Principles and Concepts.

Academic Content Standards correlated to ROSS programs	EP&C See env. Princ & Concept Doc. For Key	Standards-based Learning Objectives in the Context of the EP&C Students will:
Life Sciences - 4th grade 2. All organisms need energy and matter to live and grow. As a basis for understanding this concept:		
a. Students know plants use carbon dioxide (CO ₂) and energy from sunlight to build molecules of sugar and release oxygen.	I a b	<ul style="list-style-type: none"> • Recognize that living things have needs that must be met for survival (including energy). • Recognize that plants are the primary source of energy for living things in an ecosystem. • Explain how living things meet their needs and survive by using resources (e.g., matter and energy) from their environment. • Identify that humans are living things and therefore have needs essential to their survival. • Identify that the needs of humans are met by using resources (goods and ecosystem services) from natural systems (e.g., matter and energy). • Recognize that everything humans need was originally derived from a natural system including the matter and energy that plants produce.
b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.	I b	<ul style="list-style-type: none"> • Recognize that plants and animals, including humans, can be classified by the sources of energy and matter (food) they consume. • Classify organisms from a terrestrial, freshwater, coastal or marine ecosystem as producers and consumers and explain their roles in that system. • Define ecosystems as interacting assemblages of organisms, non-living components that support those organisms and the interactions among them. • Recognize that some resources within an ecosystem, including those upon which humans depend, are readily available and others are limited in supply. • Describe how organisms compete for limited resources. • Explain potential consequences when a component of an ecosystem is changed or eliminated (e.g., when components of a food chain or food web are affected by competition for resources or other changes, whether natural or human-caused). • Describe factors that can adversely affect the health of an ecosystem (e.g., loss of organisms, disruption of food webs).
c. Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.	I b; III a c	<ul style="list-style-type: none"> • Give examples of organisms that are decomposers. • Explain the role of decomposers in an ecosystem. • Recognize that the cycles and processes involving

		<p>recycling of matter and transfer of energy among organisms are essential to the functioning of natural systems (ecosystem).</p> <ul style="list-style-type: none"> • Provide examples of human practices that directly depend on the cycles and processes involving decomposers in terrestrial, freshwater, coastal and marine ecosystems (e.g., their role in food production and waste management). • Describe the dependence of human practices on the cycles and processes that occur in terrestrial, freshwater, coastal and marine ecosystems (e.g., the role of decomposers in: food production through soil formation and fertility; waste management through the decay of waste products).
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<p>Life Sciences - 4th grade</p> <p>3. Living organisms depend on one another and on their environment for survival.</p>		
<p>d. Students know that most microorganisms do not cause disease and that many are beneficial.</p>	<p>I a b</p>	<ul style="list-style-type: none"> • Give examples of microorganisms. • Describe the roles of microorganisms in natural systems including the human body. • Recognize that microorganisms are involved in many natural system processes that are used by humans and human communities and that such processes are considered “ecosystem services” (e.g., processes involving microorganisms such as fermentation, decomposition, etc.). • Describe the role of ecosystem services involving microorganisms in human communities and societies (e.g., food production, waste treatment, production of pharmaceuticals). • Recognize that some microorganisms can cause changes to living things that may be harmful.

<p>Earth Sciences - 5th grade</p> <p>3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:</p>		
<p>a. Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.</p>	<p>I a c</p>	<ul style="list-style-type: none"> • Identify that humans are living things and clean fresh water is essential to their survival. • Recognize that because most of Earth's water is salt water located in the oceans, the vast majority of water is not available for human consumption. • Describe freshwater, coastal and marine ecosystems and compare the chemical characteristics of the water in these systems. • Provide examples of the goods that are produced by freshwater, coastal and marine ecosystems (e.g., clean fresh water, oxygen, food, energy resources). • Explain how humans and human communities can influence the quantity, distribution and chemical characteristics of the water in freshwater, coastal and marine
<p>b. Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.</p>	<p>I b c; III a</p>	<ul style="list-style-type: none"> • Describe the roles of evaporation, liquefaction and freezing in the water cycle. • Describe the role of the water cycle, evaporation, liquefaction and freezing in the functioning of natural systems. • Provide examples of the roles these cycles and processes play in human life and human communities.

<p>c. Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.</p>	<p>I a b c; III a</p>	<ul style="list-style-type: none"> • Identify the role of precipitation (rain, hail, sleet, or snow) in terrestrial, freshwater, coastal and marine ecosystems). • Provide examples of how humans and human communities directly and indirectly depend on precipitation (rain, hail, sleet, or snow) and the water cycle (e.g., agricultural systems, water delivery systems). • Provide examples of how human activities can influence the quantity, distribution and chemical characteristics of precipitation.
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<p>d. Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.</p>	<p>I a c; II a b c d; III a b c; IV a b c; V a</p>	<ul style="list-style-type: none"> • Identify sources of fresh water and describe the reservoirs of Earth's water. • Recognize that water moves from one reservoir to another over time. • Describe the ways in which humans, human communities and their practices use water. • Recognize that the supply of fresh water is limited at any given time and discuss how some resources within an ecosystem are finite in supply while others are less limited. • Describe the methods by which wastewater can be treated and cycled back into the environment. • Provide examples of how water use can be decreased by humans and human communities. • Explain potential consequences when the quantity, distribution or chemical characteristics of water are changed (e.g., contamination of an aquifer can compromise the use of the groundwater supply by humans and other organisms). • Describe how changes to the quantity, distribution and chemical characteristics of water in natural systems can influence the functioning of terrestrial, freshwater, coastal and marine ecosystems (e.g., acid precipitation affecting the growth of trees).
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<p>Earth Sciences - 6th grade 2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. As a basis for understanding this concept:</p>		
<p>b. Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.</p>	<p>I a b; III a b c</p>	<ul style="list-style-type: none"> • Identify how humans and human communities benefit from the dynamic nature of rivers and streams in ways that are essential to human life and to the functioning of our economies and cultures (e.g., deposition of fertile sediment). • Describe how humans and human communities are influenced by soil erosion, sediment transport, course changes and flooding of rivers and streams (e.g., food production, housing construction). • Provide examples of how human activities can influence the flow of rivers and streams. • Describe how changes to the flow of rivers and streams can influence the functioning of terrestrial, freshwater, coastal and marine ecosystems (e.g., spawning of salmon).

Life Science (Ecology) 6th Grade

5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:

<p>c Students know populations of organisms can be categorized by the functions they serve in an ecosystem.</p>	<p>I b</p>	<ul style="list-style-type: none"> Define a population. Give examples of the functions (producer, consumer, and decomposer) populations of organisms serve in an ecosystem. Explain how energy is transferred in an ecosystem and how the amount of available energy varies at the level of consumption (primary, secondary and tertiary consumers). Identify humans as consumers within ecosystems. Identify and describe byproducts generated by the human consumption of goods (matter) produced by natural systems (ecosystems). Describe the effects of human practices on the transfer of matter through natural systems. Provide examples of how the quantities of resources consumed, and the quantity and characteristics of the resulting byproducts can affect natural systems.
<p>d Students know different kinds of organisms may play similar ecological roles in similar biomes.</p>	<p>I a b</p>	<ul style="list-style-type: none"> Recognize different biomes. Identify the characteristics of various biomes. Provide examples of different organisms playing similar ecological roles (herbivores, carnivores, omnivores, and decomposers) in similar biomes. Explain how human practices make use of and/or have similar effects on organisms that play similar roles in different biomes. Describe the effects of human practices on the transfer of matter through natural systems (e.g., the effects of agriculture and forestry on organisms with similar ecological roles are comparable in similar biomes).

Earth Science (Resources) 6th Grade

6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept:

<p>a. Students know the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.</p>	<p>I a; II a b c; III a b c; IV a b c; V a</p>	<ul style="list-style-type: none"> Identify the various forms and uses of energy in students' communities. Describe different methods of producing energy (including using fuel, converting solar energy to electricity, using hydro or wind power). Recognize that when fuel is used (consumed) most of the energy released becomes heat, a byproduct that transfers to the surrounding environment. Describe other byproducts of energy production and consumption (e.g., liquids, gases and solids that may have varied effects). Provide examples of how the byproducts of converting energy sources into useful forms enter natural systems. Describe how the quantities of energy resources consumed, and the quantity and characteristics of the resulting byproducts, affect natural systems. Explain that the "usefulness" of energy sources is determined by weighing the benefits of their use against the costs of conversion and the generation and release of byproducts.
<p>b. Students know different natural energy and material</p>	<p>I a b;</p>	<ul style="list-style-type: none"> Identify different energy and material resources (e.g. air,

resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.	II a b c d; III b c; IV c; V a	<p>soil, rocks, minerals, petroleum, fresh water, wildlife, and forests) that are provided by natural systems.</p> <ul style="list-style-type: none"> • Explain that: renewable resources are replaced over a relatively short time period (e.g., fresh water, hydroelectric power, or living resources); non-renewable resources accumulate over such a long period of time that they must be considered as fixed (e.g., minerals or fossil fuels); and, inexhaustible resources have no practical limits (e.g., solar or hydrothermal energy). • Classify energy and material resources as renewable, non-renewable, or inexhaustible. • Identify energy and material resources that are essential to human life. • Provide examples of how human practices and rates of consumption can affect the availability (quality, quantity and reliability) of energy and material resources that are essential to human life.
c. Students know the natural origin of the materials used to make common objects.	I a; II a b	<ul style="list-style-type: none"> • Identify the natural origin of the materials used to make common objects. • Provide examples of the goods that are produced by natural systems that are used to make common objects used by humans. • Explain the methods used to make common objects (useable products) from natural resources. • Describe the methods used to extract, harvest and transport the materials used to make common objects from natural resources. • Provide examples of how the methods used to extract, harvest and transport natural resources, and consume them (or make useable products) affect natural systems.

Biology (Evolution) 7th Grade

3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:

a. Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.	I b c; II c	<ul style="list-style-type: none"> • Define evolution and identify its causes. • Describe the influence of genetic variation on the evolution and diversity of organisms. • Identify the role of environmental factors on the evolution and diversity of organisms, and the long-term functioning and health of natural systems. • Provide examples of how human population growth and human activities (e.g., expansion of communities, production and consumption of natural resources, the operation and expansion of human communities, and generation of byproducts) can affect both genetic variation and environmental factors). • Describe how human activities can affect reproductive cycles and genetic diversity, and thus, the evolution and diversity of species.
e. Students know that extinction of a species occurs when the environment changes and that the adaptive characteristics of a species are insufficient for its survival.	I b c; II a b c d	<ul style="list-style-type: none"> • Define and give examples of adaptation in living things. • Explain the effects of changing environmental factors in a natural system on species (e.g., changing biotic and abiotic factors including the availability of resources). • Identify factors that can cause extinction of a species and explain that some extinctions are natural while others are human-induced. • Recognize that throughout the history of life on Earth, some plants and animal species have died out completely in response to environmental changes. • Provide examples of how human population growth and expansion of communities, production and consumption of

		<p>natural resources, and the operation and expansion of human communities can influence rates of extinction.</p> <ul style="list-style-type: none"> • Describe how the capacity of natural systems to adjust to human-caused alterations depends on the scope, scale, and duration of the activity, and on the nature and health of the natural system. • Identify that in cases where species cannot respond to the degree of change, extinction may occur.
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Investigation and Experimentation
7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

The environmental principles and concepts provide fertile ground for the development of investigations and experiments that are directly related to achieving mastery of California’s science content standards. As stated by the California State Board of Education, such *“activities must be cohesive, connected and build on each other to lead students to a comprehensive understanding of the California Science Content Standards.”*

Environment-based investigations and experiments can also help teachers conform to recommendations of the California State Board of Education that *“hands-on activities compos(e) at least 20 to 25 percent of the science instructional program (as specified in the California Science Framework).”*