

BioTrek is an education-based project that reaches out to K-12 and college students, and other community members, emphasizing the need to share knowledge, values and behaviors that support biological sustainability on a finite Earth.



Summary of BioTrek Curriculum

During BioTrek field trips, we address the K-12 California Content Standards for science and history-social science where appropriate. A typical two-hour tour will have multiple stops that incorporate specific environmental themes.

Rainforest Learning Center

The Rainforest Learning Center is a greenhouse that maintains tropical conditions for our rainforest plants and animals. This stop emphasizes plant adaptations and plant-animal interactions that make the world's rainforests a valuable resource. The standards that may be covered include:

Grade	Subject	No.	Standard
Kindergarten	Life Sciences	2a	Students know how to observe and describe similarities and differences in the appearance and behavior of plants and animals (e.g., seed-bearing plants, birds, fish, insects).
	Earth Sciences	3b	Students know changes in weather occur from day to day and across seasons, affecting Earth and its inhabitants.
		3c	Students know how to identify resources from Earth that are used in everyday life and understand that many resources can be conserved.
	Physical Sciences	1a	Students know objects can be described in terms of the materials they are made of (e.g., clay, cloth, paper) and their physical properties (e.g., color, size, shape, weight, texture, flexibility, attraction to magnets, floating, sinking).
Grade 1	Life Sciences	2b	Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.
		2c	Students know animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.
	Earth Sciences	3b	Students know that the weather changes from day to day but that trends in temperature or of rain (or snow) tend to be predictable during a season.
		3c	Students know the sun warms the land, air, and water.
Grade 2	Life Sciences	2a	Students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and one another.
		2c	Students know many characteristics of an organism are inherited from the parents. Some characteristics are caused or influenced by the environment.
		2d	Students know there is variation among individuals of one kind within a population.
Grade 3	Physical Sciences	1c	Students know machines and living things convert stored energy to motion and heat.
Grade 4	Life Sciences	2b	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.
		2c	Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.
		3d	Students know that most microorganisms do not cause disease and that many are beneficial.
Grade 6	Life Sciences	5a	Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.

		5b	Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
		5c	Students know populations of organisms can be categorized by the functions they serve in an ecosystem.
		5d	Students know different kinds of organisms may play similar ecological roles in similar biomes.
		5e	Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.
	Earth Resources	6a	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.
		6b	Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.
		6c	Students know the natural origin of the materials used to make common objects.
Grade 7	Life Sciences	3a	Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.
		3e	Students know that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.
		4e	Students know fossils provide evidence of how life and environmental conditions have changed.
		4f	Students know how movements of Earth's continental and oceanic plates through time, with associated changes in climate and geographic connections, have affected the past and present distribution of organisms.
		5a	Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
		5b	Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.
		5f	Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.
Grades 9-12	Earth Sciences	5e	Students know charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.

Rainforest Animals Station

In our animal foyer, we house representative rainforest animals. This stop emphasizes animal adaptations. The standards that may be covered include:

Grade	Subject	No.	Standard
Kindergarten	Life Sciences	2a	Students know how to observe and describe similarities and differences in the appearance and behavior of plants and animals (e.g., seed-bearing plants, birds, fish, insects).
		2c	Students know how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, legs).
	Earth Sciences	3b	Students know changes in weather occur from day to day and across seasons, affecting Earth and its inhabitants.
Grade 1	Life Sciences	2a	Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.
		2b	Students know both plants and animals need water, animals need food, and plants need light.
		2c	Students know animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.
		2d	Students know how to infer what animals eat from the shapes of their teeth (e.g., sharp teeth: eats meat; flat teeth: eats plants).
	Earth Sciences	3b	Students know that the weather changes from day to day but that trends in temperature or of rain (or snow) tend to be predictable during a season.
		3c	Students know the sun warms the land, air, and water.
Grade 2	Life Sciences	2a	Students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and one another.
		2c	Students know many characteristics of an organism are inherited from the parents. Some characteristics are caused or influenced by the environment.
Grade 3	Life Sciences	3a	Students know plants and animals have structures that serve different functions in growth, survival, and reproduction.
		3b	Students know examples of diverse life forms in different environments, such as oceans, deserts, tundra, forests, grasslands, and wetlands.
		3c	Students know living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial.
	Physical Sciences	1c	Students know energy comes from the Sun to Earth in the form of light.
Grade 4	Life Sciences	3b	Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
		3d	Students know that most microorganisms do not cause disease and that many are beneficial.
Grade 6	Life Sciences	5a	Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
		5b	Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
		5e	Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.
	Resources	6b	Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.
Grade 7	Life Sciences	5c	Students know how bones and muscles work together to provide a structural framework for movement.

Grades 9-12	Biology/Life Sciences	8b	Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
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Ethnobotany Learning Center

The Ethnobotany Learning Center is a native California plant garden with over 300 species. This stop emphasizes the relationship between plants and people, featuring the Tongva-Gabrielino way of life. The standards that may be covered include:

Grade	Subject	No.	Standard
Kindergarten	Life Sciences	2c	Students know how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, legs).
	Earth Sciences	3c	Students know how to identify resources from Earth that are used in everyday life and understand that many resources can be conserved.
	History-Social Sciences	K.2	Students recognize national and state symbols and icons such as the national and state flags, the bald eagle, and the Statue of Liberty.
K.6.3		Students understand that history relates to events, people, and places of other times. Understand how people lived in earlier times and how their lives would be different today (e.g., getting water from a well, growing food, making clothing, having fun, forming organizations, living by rules and laws).	
Grade 1	Life Sciences	2a	Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.
		2d	Students know how to infer what animals eat from the shapes of their teeth (e.g., sharp teeth: eats meat; flat teeth: eats plants).
		2e	Students know roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.
	History-Social Sciences	1.2.4	Students compare and contrast the absolute and relative locations of places and people and describe the physical and/or human characteristics of places. Locate on maps and globes their local community, California, the United States, the seven continents, and the four oceans.
		1.4.1	Students compare and contrast everyday life in different times and places around the world and recognize that some aspects of people, places, and things change over time while others stay the same. Examine the structure of schools and communities in the past.
		1.4.3	...Recognize similarities and differences of earlier generations in such areas as work (inside and outside the home), dress, manners, stories, games, and festivals, drawing from biographies, oral histories, and folklore.
		1.5.3	Students describe the human characteristics of familiar places and the varied backgrounds of American citizens and residents in those places. Compare the beliefs, customs, ceremonies, traditions, and social practices of the varied cultures, drawing from folklore.
Grade 2	Life Sciences	2e	Students know light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants.
		2f	Students know flowers and fruits are associated with reproduction in plants.
	Earth Sciences	3b	Students know smaller rocks come from the breakage and weathering of larger rocks.
		3c	Students know that soil is made partly from weathered rock and partly from organic materials and that soils differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.
Grade 3	Life Sciences	3a	Students know plants and animals have structures that serve different functions in growth, survival, and reproduction.
		3c	Students know living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial.
		3d	Students know when the environment changes, some plants and animals survive and reproduce; others die or move to new locations.

	History-Social Sciences	3.2.1	Students describe the American Indian nations in their local region long ago and in the recent past. Describe national identities, religious beliefs, customs, and various folklore traditions.
		3.2.2	...Discuss the ways in which physical geography, including climate, influenced how the local Indian nations adapted to their natural environment (e.g., how they obtained food, clothing, tools).
Grade 6	Ecology/Life Sciences	5a	Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
		5b	Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
		5e	Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.
	Resources	6b	Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.
	Earth Sciences	2a	Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.
	World History/Geography	6.1.1	Students describe what is known through archaeological studies of the early physical and cultural development of humankind from the Paleolithic era to the agricultural revolution. Describe the hunter-gatherer societies, including the development of tools and the use of fire.
6.1.3		...Discuss the climatic changes and human modifications of the physical environment that gave rise to the domestication of plants and animals and new sources of clothing and shelter.	
Grade 7	Life Sciences	5f	Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.

Acorn Grinding Station

Within our native garden, large boulders mimic bedrock mortars where students learn to prepare food as the Tongva once did. This stops emphasizes native California history for the younger ages. The standards that may be covered include:

Grade	Subject	No.	Standard
Kindergarten	Earth Sciences	3c	Students know how to identify resources from Earth that are used in everyday life and understand that many resources can be conserved.
Grade 2	Earth Sciences	3e	Students know rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use.
	History-Social Sciences	2.4.3	Students understand basic economic concepts and their individual roles in the economy and demonstrate basic economic reasoning skills. Understand how limits on resources affect production and consumption (what to produce and what to consume).
Grade 3	Life Sciences	3a	Students know plants and animals have structures that serve different functions in growth, survival, and reproduction.
		3c	Students know living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial.
		3d	Students know when the environment changes, some plants and animals survive and reproduce; others die or move to new locations.
	Physical Sciences	1b	Students know sources of stored energy take many forms, such as food, fuel, and batteries.
		1c	Students know machines and living things convert stored energy to motion and heat.
		1d	Students know energy can be carried from one place to another by waves, such as water waves and sound waves, by electric current, and by moving objects.
	History-Social Sciences	3.2.1	Students describe the American Indian nations in their local region long ago and in the recent past. Describe national identities, religious beliefs, customs, and various folklore traditions.
		3.2.2	...Discuss the ways in which physical geography, including climate, influenced how the local Indian nations adapted to their natural environment (e.g., how they obtained food, clothing, tools).
Grade 4	Life Sciences	2b	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.
		2c	Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.
		3d	Students know that most microorganisms do not cause disease and that many are beneficial.

Biodiversity and Conservation Museum

From above the rainforest, museum exhibits tie the past with the present and link the far away with home. This stop emphasizes the importance of environmental conservation for the older ages. The standards that may be covered include:

Grade	Subject	No.	Standard
Grade 6	Earth Sciences	1f	Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.
		2a	Students know water running downhill is the dominant process in shaping the landscape, including California's landscape.
		2b	Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.
		2c	Students know beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.
		2d	Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.
	Life Sciences	5a	Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
		5b	Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
		5e	Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.
	Science/Energy in Earth System	4a	Students know the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.
	Resources	6a	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.
6b		Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.	
Grade 8	Life Sciences/ Chemistry	6a	Students know that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
		6b	Students know that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.
	Chemistry	5a	Students know reactant atoms and molecules interact to form products with different chemical properties.
Grades 9-12	Ecology	6a	Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
		6b	Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
		6d	Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
		6e	Students know a vital part of an ecosystem is the stability of its producers and decomposers.
		6f	Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.
		Earth Sciences/Energy in Earth System	4b
	5a		Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.

	5d	Students know properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms.
	5e	Students know rain forests and deserts on Earth are distributed in bands at specific latitudes.
	5f	Students know the interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts.
	6a	Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere.
	6b	Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents.
	6c	Students know how Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement.
Earth Sciences/ Biogeochemical Cycles	7a	Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle.
	7b	Students know the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs.
Earth Sciences/ Composition of Atmosphere	8c	Students know the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities.
California Geology	9a	Students know the resources of major economic importance in California and their relation to California's geology.
	9c	Students know the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.

Mesozoic Garden Learning Center

The Mesozoic Garden Learning Center features representatives of ancient flora. This stop emphasizes the link between the geologic past and pressing energy conservation issues today. The standards that may be covered include:

Tentative

Grade	Subject	No.	Standard
Kindergarten	Earth Sciences	3c	Students know how to identify resources from Earth that are used in everyday life and understand that many resources can be conserved.
Grade 2	Earth Sciences	3d	Students know that fossils provide evidence about the plants and animals that lived long ago and that scientists learn about the past history of Earth by studying fossils.
Grade 2	Earth Sciences	3e	Students know rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use.
Grade 3	Physical Sciences	1a	Students know energy comes from the Sun to Earth in the form of light.
Grade 6	Resources	6b	Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.
Grade 7	Earth Sciences	4a	Students know Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
Grade 7	Earth Sciences	4g	Students know how to explain significant developments and extinctions of plant and animal life on the geologic time scale.
Grade 7	Evolution	3e	Students know that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.
Grade 8	Earth Sciences	4c	Students know that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.
Grade 9	Earth Sciences	4d	Students know that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.
Grades 9-12	Biology/Life Sciences	1f	Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
Grades 9-12	Earth Sciences	1c	Students know the evidence from geological studies of Earth and other planets suggest that the early Earth was very different from Earth today.
Grades 9-12	Evolution	8e	Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.
Grades 9-13	Earth Sciences/ Energy in Earth System	4a	Students know the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society.