

**Geoscape Bay Area
Understandings and Essential Questions**

Big Idea for first two units

The Earth's outer surface is broken into moving plates which cause major geologic features and events described by the Plate Tectonics theory. We know by looking at current geological patterns which allow us to understand geologic history.

Tectonic Setting		
<p>Understandings</p> <ul style="list-style-type: none"> • Students will understand that the landforms that they see are due to tectonic forcings. • Students will understand that plate boundaries are determined by the distribution of volcanoes, earthquakes, topography and age of the seafloor. • Students will understand that the San Francisco Bay Area is geologically unique and complex. 	<p>Essential Questions</p> <ul style="list-style-type: none"> • Where are the Earth's tectonic plates and their boundaries in and around California? • What happens at plate boundaries? • How do Earth scientists classify plate boundaries? 	<p>Plate Tectonics and Earth's Structure</p> <p>1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> a. Students know evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and midocean ridges; and the distribution of fossils, rock types, and ancient climatic zones. d. Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface. e. Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions. f. Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics. <p>Shaping Earth's Surface</p> <p>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> <ul style="list-style-type: none"> a. Students know water running downhill is the dominant process in shaping the landscape, including California's landscape.

Earthquakes/Plate Tectonics		
<p>Understandings</p> <ul style="list-style-type: none"> • Students will understand why plate tectonics happens. • Students will understand that plate tectonics causes earthquakes. • Students will understand what it means to be living in an earthquake zone. • Students will understand that earthquakes are composed of waves. • Students will understand the time scales of earthquakes. 	<p>Essential Questions</p> <ul style="list-style-type: none"> • How do we know/What evidence do we have for the theory of plate tectonics? • What causes earthquakes in the bay area? Why is it important to know? 	<p>Plate Tectonics and Earth's Structure</p> <p>1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:</p> <ul style="list-style-type: none"> b. Students know Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core. c. Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle. d. Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface. g. Students know how to determine the epicenter of an earthquake and know that the effects of an earthquake on any region vary, depending on the size of the earthquake, the distance of the region from the epicenter, the local geology, and the type of construction in the region.
Water		
<p>Understandings</p> <ul style="list-style-type: none"> • Students will understand that freshwater is scarce and vulnerable. • Students will understand their "water footprint". • Students will understand that water cycles through both natural and human engineered systems. 	<p>Essential Questions</p> <ul style="list-style-type: none"> • Where are local sources of fresh water in the San Francisco Bay Area? • How much clean water is enough? • How can we balance economic progress with ecological needs of freshwater? • What factors are part of a water footprint? 	<p>Shaping Earth's Surface</p> <p>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> <ul style="list-style-type: none"> b. Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns. c. Students know beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.

Coastal Ocean		
<p>Understandings</p> <ul style="list-style-type: none"> Students will understand that coastal upwelling is a wind-driven process that is the basis for the biologically productive region along the coast of the San Francisco Bay Area Students will understand that the coastal food web is dependent on upwelling of nutrient-rich cold water. Students will understand that seasons that we experience on land are related to the 3 oceanographic seasons in the Bay Area. 	<p>Essential Questions</p> <ul style="list-style-type: none"> How do we know that coastal upwelling is occurring or not occurring? Why is coastal upwelling important? 	<p>Heat (Thermal Energy) (Physical Sciences)</p> <p>3. Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> Students know energy can be carried from one place to another by heat flow or by waves, including water, light and sound waves, or by moving objects. <p>Ecology (Life Sciences)</p> <p>5.Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> 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. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. Students know populations of organisms can be categorized by the functions they serve in an ecosystem. 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.
Ecosystem Services		
<p>Understandings</p> <ul style="list-style-type: none"> Students will understand that humans benefit from processes that are supplied by natural ecosystems. 	<p>Essential Questions</p> <ul style="list-style-type: none"> How do we categorize ecosystem services? Why is it important to think about the ecosystem in terms of human services? 	<p>Ecology (Life Sciences)</p> <p>5.Organisms in ecosystems exchange energy and nutrients among themselves and with the environment.</p> <p>Resources</p> <p>6.Sources of energy and materials differ in amounts, distribution,</p>

		<p>usefulness, and the time required for their formation. As a basis for understanding this concept:</p> <p>b. 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.</p>
Energy		
<p>Understandings</p> <ul style="list-style-type: none"> Students will understand that energy choices have to be balanced with other choices 	<p>Essential Questions</p> <ul style="list-style-type: none"> Where do we get electricity in the SF Bay area? What does a balanced portfolio mean? Why do we need to have a balanced energy portfolio? 	<p>Resources</p> <p>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> <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>b. 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.</p> <p>Energy in the Earth System</p> <p>4. Many phenomena on Earth’s surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept:</p> <p>a. 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.</p> <p>b. Students know solar energy reaches Earth through radiation, mostly in the form of visible light.</p>