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West Santa Monica Mts. - Cheesboro Canyon to Pt. Mugu - Field Trip

Field Sites

- [Photos](#) from field trips
- [Cheesboro Canyon](#) | [photos](#)
- [Rocky Oaks](#)
- [Backbone Trail](#)
- Escondido Canyon Overlook
- Zuma Bluffs
- El Pescador State Beach
- LaJolla Canyon
- Point Mugu



Standards Addressed

- [4](#) | [5](#) | [6](#) | [7](#) | [8](#)

Resources

- [Climate and weather](#)
- [Geological Maps, aerial images](#)
- [Geology information about the Santa Monicas](#)
- [Plants](#)
- [Fire](#)
- [Tides](#)
- [Handout \(pdf\)](#)

Mapping

- [GPS Activity](#) | [convert D/M/S to decimal degrees](#)
- [Google Earth](#)
- [Google Maps](#)
- [Picasa](#)



Science Teaching Series

[The Sourcebook for Teaching Science](#)
[Hands-On Physics Activities](#)
[Hands-On Chemistry Activities](#)

Internet Resources

I. Developing Scientific Literacy

- 1 - [Building a Scientific Vocabulary](#)
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II. Developing Scientific Reasoning

- 5 - [Employing Scientific Methods](#)
- 6 - [Developing Scientific Reasoning](#)
- 7 - [Thinking Critically & Misconceptions](#)

III. Developing Scientific Understanding

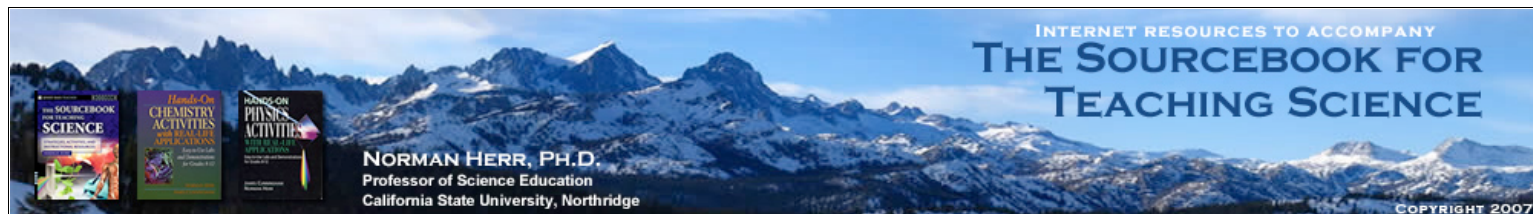
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4th Grade Standards addressed on field trip

Life Sciences

2.All organisms need energy and matter to live and grow. As a basis for understanding this concept:

- Students know plants are the primary source of matter and energy entering most food chains.
- 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.
- Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.

3.Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:

- Students know ecosystems can be characterized by their living and nonliving components.
- 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.
- Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter. d.Students know that most microorganisms do not cause disease and that many are beneficial.

Earth Sciences

4.The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:

- Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).
- Students know how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals by using a table of diagnostic properties.

5.Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:

- Students know some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
- Students know natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.
- Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

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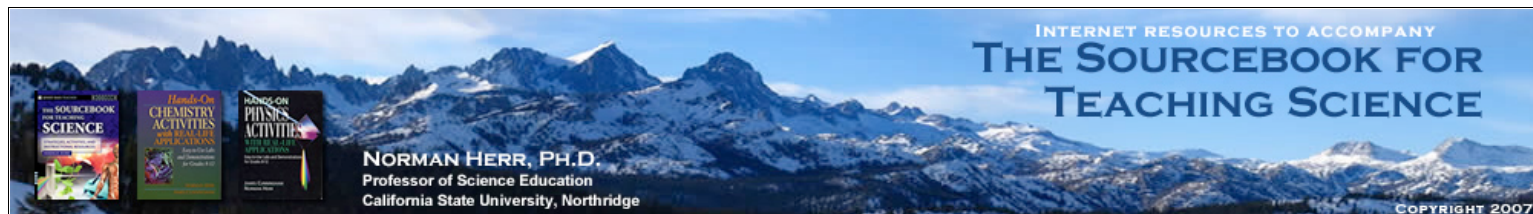
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5th Grade Standard Addressed on Field Trip

Earth Sciences

3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:

- Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.
- 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.
- 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.
- 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.
- Students know the origin of the water used by their local communities.

4. Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept:

- Students know uneven heating of Earth causes air movements (convection currents).
- Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
- Students know the causes and effects of different types of severe weather.
- Students know how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.
- Students know that the Earth's atmosphere exerts a pressure that decreases with distance above Earth's surface and that at any point it exerts this pressure equally in all directions.

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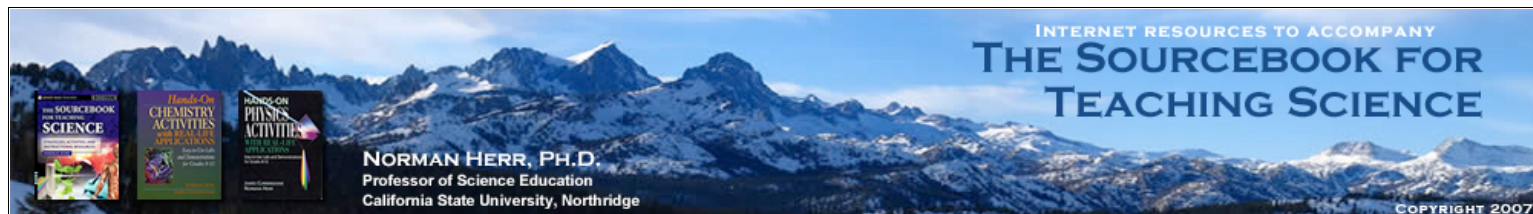
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6th Grade Standards Addressed on Field Trip

Plate Tectonics and Earth's Structure

1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:

- 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.
- Students know Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core.
- Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.
- 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.
- Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.
- Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.
- 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

Shaping Earth's Surface

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:

- Students know water running downhill is the dominant process in shaping the landscape, including California's landscape.
- Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.
- Students know beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.
- Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Energy in the Earth System

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:

- 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.
- Students know solar energy reaches Earth through radiation, mostly in the form of visible light.
- Students know heat from Earth's interior reaches the surface primarily through convection.
- Students know convection currents distribute heat in the atmosphere and oceans.
- Students know differences in pressure, heat, air movement, and humidity result in changes of weather.

Ecology (Life Sciences)

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

- 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.

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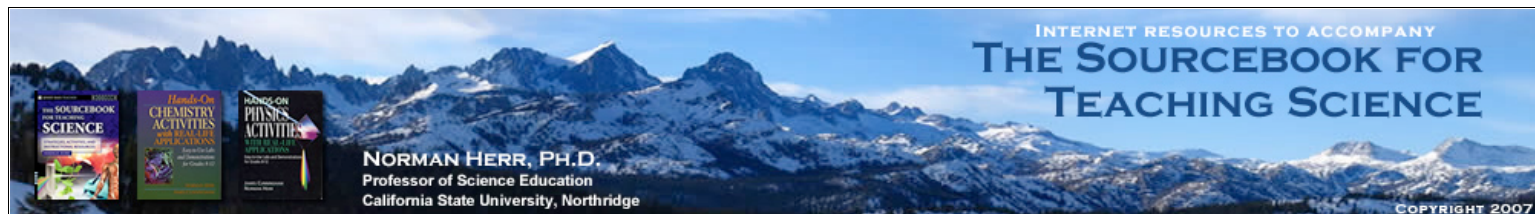
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7th & 8th Grade Standards addressed on Field Trip

7th Grade Standards

- 3a. Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms
- 7d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
- 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.
- 4b. Students know the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids.
- 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.
- 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.

8th Grade Standards

- 1b. Students know that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
- 1c. Students know how to solve problems involving distance, time, and average speed.
- 3b. Students know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements

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GPS Data

Travel

origin			
destination			
distance (trip odometer)			
moving time			
moving average			
maximum speed			
overall average speed			
travel time			
route			

Destination 1

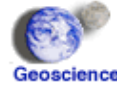
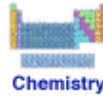
location			
elevation			
latitude			
longitude			
ecosystem			
aspect			
photograph			
yearly rainfall			

Destination 2

location			
elevation			
latitude			
longitude			
ecosystem			
aspect			
photograph			
yearly rainfall			

Destination 3

location			
elevation			
latitude			
longitude			
ecosystem			
aspect			
photograph			
yearly rainfall			

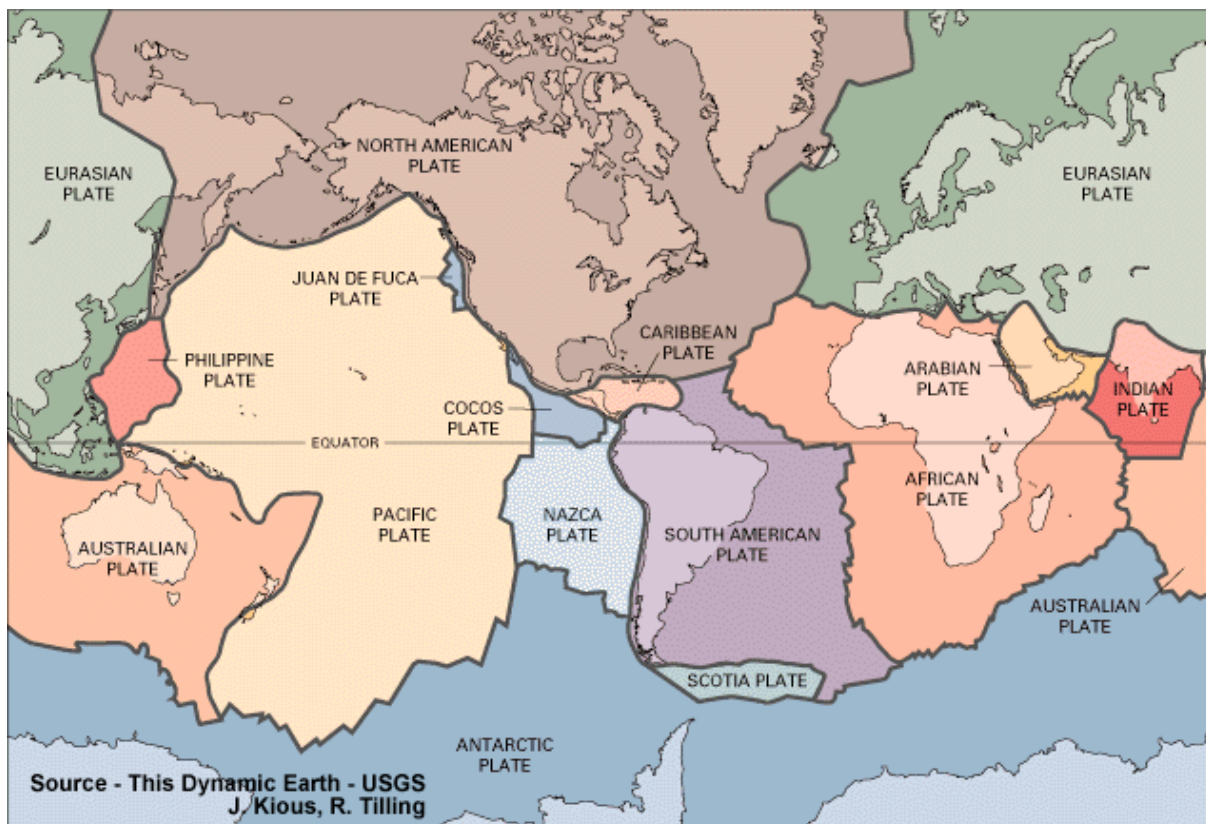


General Resources

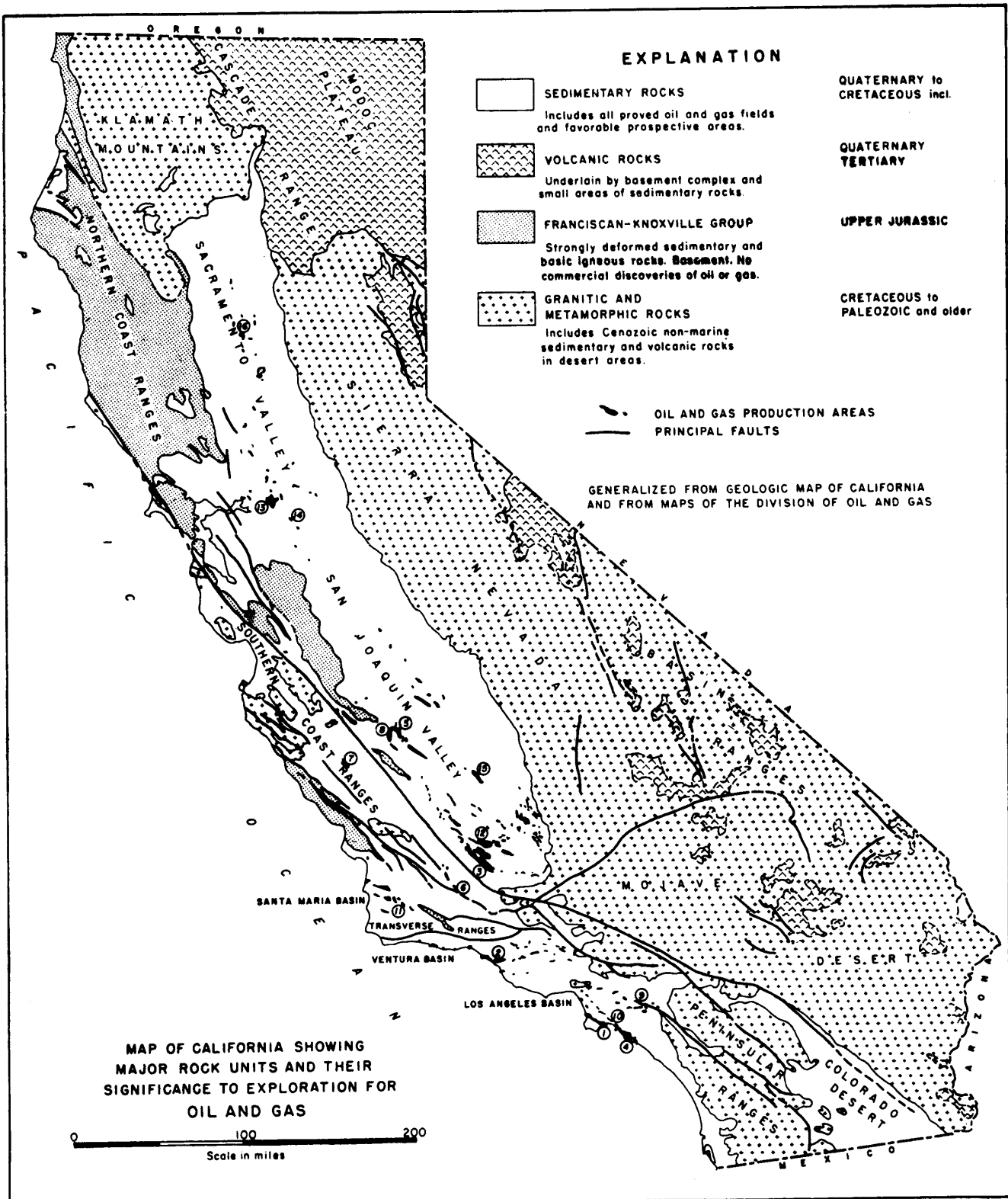
Subject-Specific Resources

Geology of the Santa Monica Mountains

- The Santa Monica Mountains are a geological unit of the **Transverse** Mountain Ranges of Southern California.
- The Santa Monica Mountains are a part of the only **east-west** belt of mountains in California and one of only two in North America so oriented.
- The Santa Monica Range is a broad **anticline** that has been severely ruptured by faulting and intruded by **sills and dikes**.
- The Santa Monica range is **bisected** by the flow of water that flows through Malibu Canyon.
- Malibu Creek is thought to have flowed in its present course **before the mountains** existed.
- The main fault of the Santa Monica Mountains is the Malibu Coast Fault.
- The Santa Monica Mountain Range is a result of the **interactions** between the Pacific Plate and the North American Plate.
- The Pacific Plate's crust is oceanic and composed of **basalt**, which is denser than continental crust.
- The Pacific Plate **subducts** under the North American Plate.
- The Pacific Plate moves north, and the North American Plate moves south; a **strike slip plate boundary**.
- The area where the two plates slip past each other is called the **San Andreas Fault**.
- **Geologic maps** help us understand the geology of the mountains.
- **Geologic profiles** provide a view at what might be beneath the ground.
- Other **geology resources**.





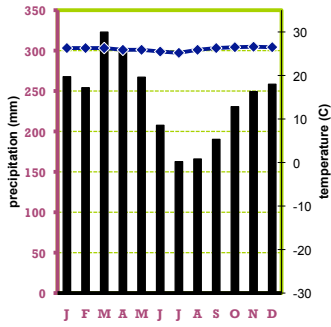


MOST IMPORTANT OIL AND GAS FIELDS

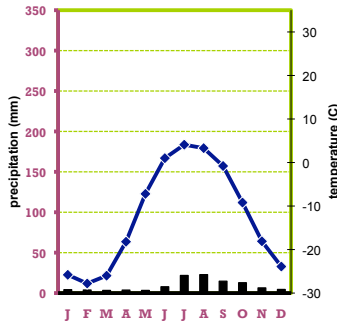
Oilfields: (1) Wilmington; (2) Ventura Avenue; (3) Midway-Sunset; (4) Huntington Beach; (5) Coalinga, East, Extension; (6) Cuyama, South; (7) San Ardo; (8) Coalinga; (9) Brea-Olinda; (10) Long Beach; (11) Cat Canyon; (12) Elk Hills. Dry gas fields: (13) Rio Vista; (14) McDonald Island; (15) Trico; (16) Beehive Bend.



Climograph for Iquitos, Peru



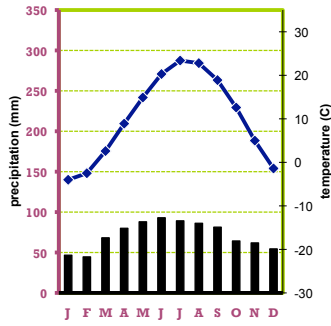
Climograph for Barrow, AK



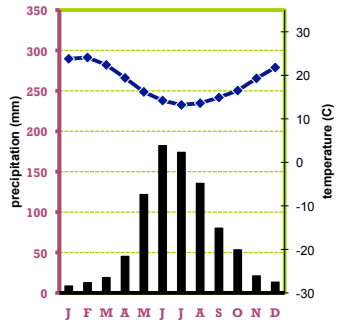
Climograph for Tindouf, Algeria



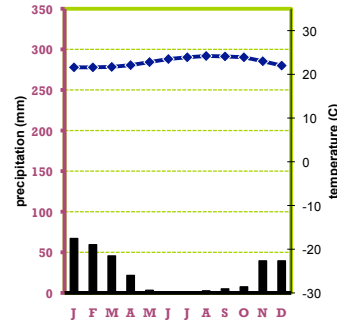
Climograph for Chicago, Illinois



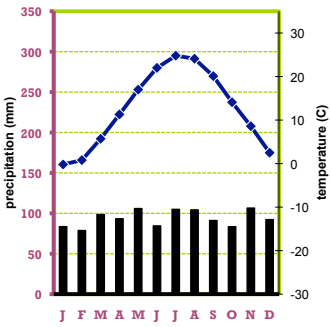
Climograph for Perth, Australia



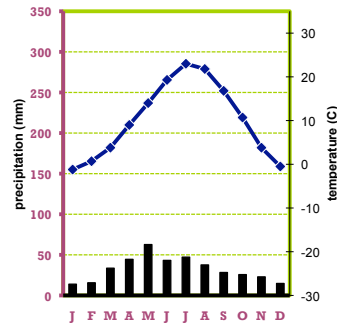
Climograph for Los Angeles, CA



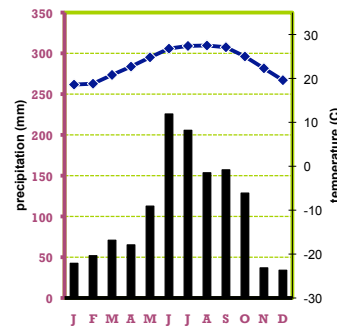
Climograph for New York, NY



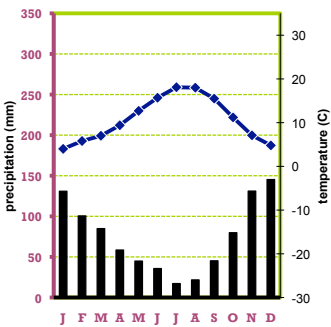
Climograph for Denver, CO



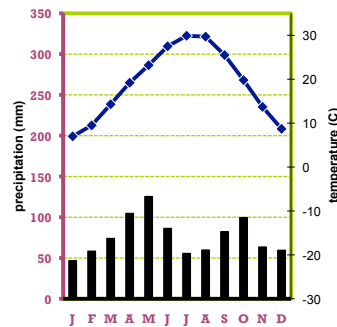
Climograph for Miami, FL



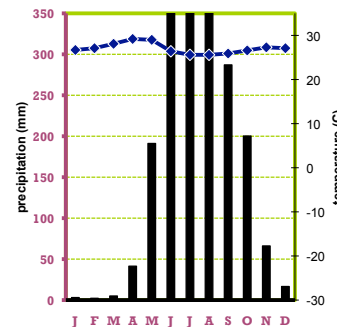
Climograph for Seattle, WA

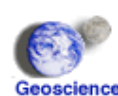
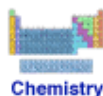
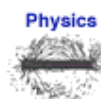


Climograph for Dallas, TX



Climograph for Mangalore, India



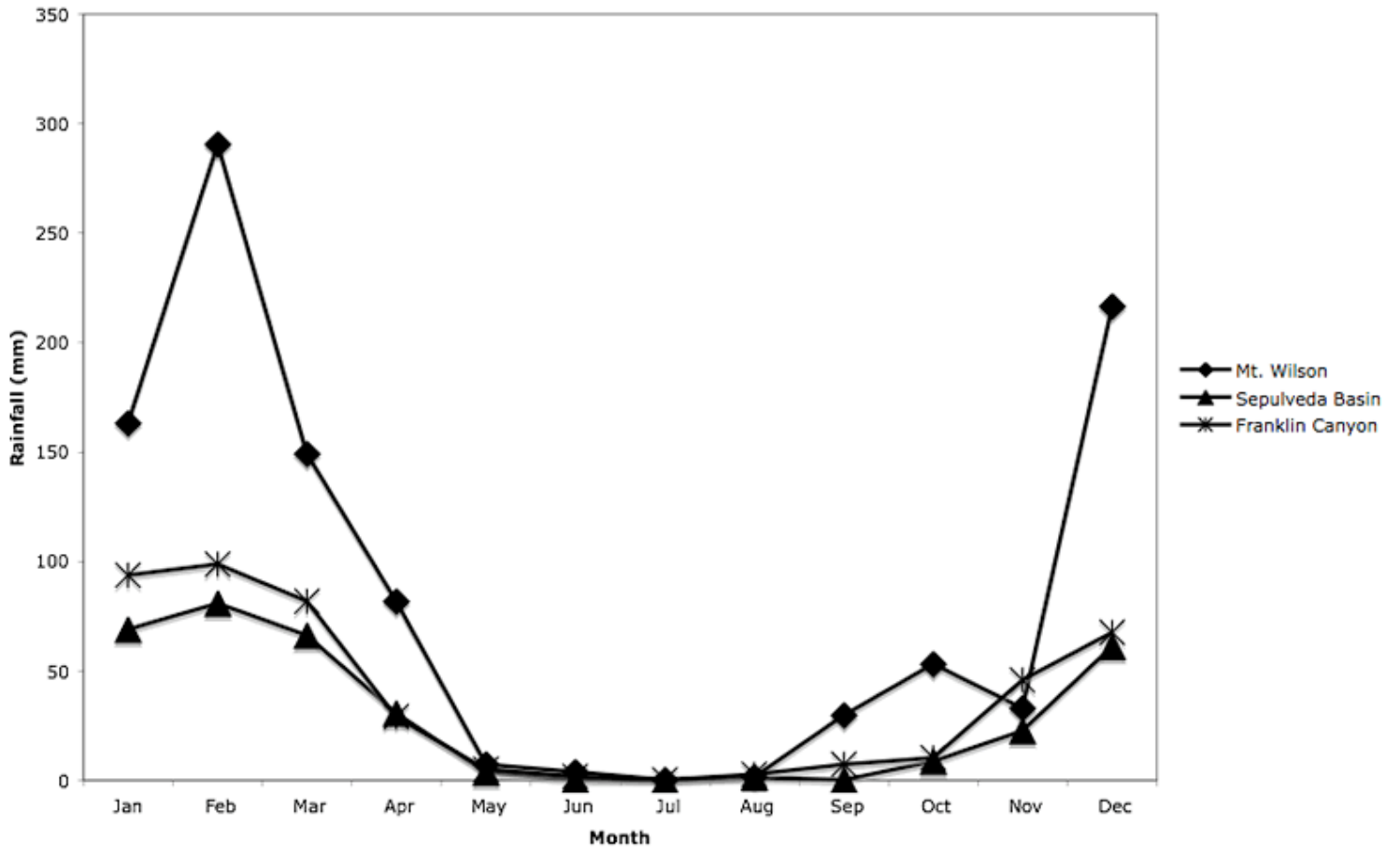


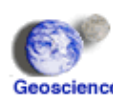
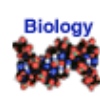
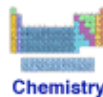
Climate data for Southern California

[more climate data](#)

Mount Wilson													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
rainfall-mm	163.1	290.6	149.2	81.9	7.3	3.8	0.2	1.5	29.8	53.1	32.9	216.5	1030.9
rainfall- in	6.4	11.4	5.9	3.2	0.3	0.1	0	0.1	1.2	2.1	1.3	8.5	40.6
Ave. Max °F	52.3	53.1	53.6	58.8	66.2	75.4	81	80.4	75.7	68.4	58.5	53.1	64.8
Ave. Min °F	36.5	36.9	36.3	39.7	46.9	55.9	62.6	61.5	56.8	50.5	41.9	37	46.9
Sepulveda Basin													
rainfall-mm	69	80.9	66.3	30.8	3.7	0.3	0	1.3	0.3	8.6	22.7	61.1	345.7
rainfall- in	2.7	3.2	2.6	1.2	0.1	0	0	0.1	0	0.3	0.9	2.4	13.6
Ave. Max °F	65.1	67.3	68.7	72.1	73.8	79.3	87.3	86.9	86.5	79.5	72.5	67.5	75.4
Ave. Min °F	41.4	43.3	45.7	50	53.1	56.8	60.8	61.2	59.2	53.6	47.1	43.2	51.3
Franklin Canyon													
rainfall-mm	93.8	98.7	81.8	29.2	5	1.8	0.2	2.7	7.3	10.2	45.9	67.6	445.1
rainfall- in	3.7	3.9	3.2	1.1	0.2	0.1	0	0.1	0.3	0.4	1.8	2.7	17.5
Ave. Max °F	66.2	66.7	66.4	68.4	69.1	72.1	76.6	77.7	77.4	75.2	70.2	66.2	71.1
Ave. Min °F	50.4	50.7	50.5	52.3	54.9	57.9	61	62.2	61.7	59	54.5	50.7	55.6

Rainfall Averages (mm)





Plant Species in the Santa Monica Mountains

The Mediterranean biome in the Santa Monica Mountains includes:

- Chaparral
- Oak savannah
- Grasslands
- Riparian
- Coastal sage
- Intertidal

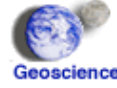
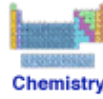
Over 1,000 plant species provide habitat for approximately 500 mammal, bird, reptile, and amphibian species. The Santa Monica Mountains have been heavily affected by grazing, logging, dams and water diversions, and intensive agriculture and urbanization, as well as competition by numerous introduced or exotic plant and animal species.

- Mediterranean-type [climate](#) occurs roughly between 30° and 40°
- Occurs on the west coasts, where there are cold ocean currents.
- It is characterized by wet winters, and long, dry summers.
- Total annual precipitation ranges between 15 and 40 inches per year.
- Temperatures are moderated by maritime influence and fogs.
- It has a very limited growing season.
- The Mediterranean biome is characterized by shrubs.
- These shrubs are evergreen and have small, leathery leaves.
- Sometimes the leaves are so reduced as to appear needle-like.

Tree species are in bold. Read about each plant at the [USDA Plant Database](#).

<i>Latin name</i>	Common name	Checklist
<i>Fraxinus velutina</i>	Arizona ash	
<i>Salix lasiolepis</i>	arroyo willow	
<i>Arctostaphylos glauca</i>	big berry manzanita	
<i>Acer macrophyllum</i>	big leaf maple	
<i>Ceanothus megacarpus</i>	big pod ceanothus	
<i>Convolvulus arvensis</i>	bindweed	
<i>Brassica nigra</i>	black mustard	
<i>Juglans californica</i>	black walnut	
<i>Rubus ursinus</i>	blackberry	
<i>Pteridium aquilinum</i>	bracken fern	
<i>Umbellularia californica</i>	California bay	
<i>Scirpus californicus</i>	California bulrush	
<i>Eschscholzia californica</i>	California poppy	
<i>Artemisia californica</i>	California sagebrush	

<i>Eriogonum fasciculatum</i>	California wild buckwheat	
<i>Ricinus communis</i>	castor bean	
<i>Typha latifolia</i>	cat tail	
<i>Adenostoma fasciculatum</i>	chamise	
<i>Yucca whipplei</i>	chaparral yucca	
<i>Quercus agrifolia</i>	Coast live oak	
<i>Rhamnus californica</i>	coffee berry	
<i>Cuscuta sp.</i>	dodder	
<i>Sambucus mexicana</i>	elderberry	
<i>Penstemon heterophyllus</i>	foothill penstemon	
<i>Vulpia myuros var. hirsute</i>	foxtail fescue	
<i>Populus fremontii</i>	Freemont cottonwood	
<i>Ribes californicum</i>	hillside gooseberry	
<i>Prunus ilicifoli</i>	holly leaf cherry	
<i>Marrubium vulgare</i>	horhound	
<i>Castilleja sp.</i>	Indian paintbrush	
<i>Malosma laurina</i>	laurel sumac	
<i>Lupinus sp.</i>	lupine	
<i>Cercocarpus betuloides</i>	mountain mahogany	
<i>Toxicodendron diversilobum</i>	poison oak	
<i>Opuntia littoralis</i>	prickly pear cactus	
<i>Solanum xanti</i>	purple nightshade	
<i>Quercus dumosa</i>	scrub oak	
<i>Foeniculum vulgare</i>	sweet fennel	
<i>Platanus racemosa</i>	sycamore	
<i>Heteromeles arbutifolia</i>	toyon	
<i>Nicotiana glauca</i>	tree tobacco	
<i>Quercus lobata</i>	valley oak	
<i>Salvia apiana</i>	white sage	
<i>Marah macrocarpus</i>	wild cucumber	
<i>Avena fatua</i>	wild oats	
<i>Rosa californica</i>	wild rose	
<i>Mimulus brevipes</i>	yellow monkeyflower	



Fire in the Mediterranean Biome

- Many species are aromatic and contain flammable oils.
- A twenty-year cycle of fire maintains a subclimax of chamise
- Ceonothus, sumac, toyon, and manzanita dominate w/o fires
- Dwarfed oaks and closed-cone pines may also occur w/o fire
- The flammable oils of chamise and other shrub species promote fire;
- Chamise sprouts from the roots after a burn
- The resin coating the cones of closed-cone pines melts in a hot fire
- Perennial forbs survive fires as underground bulbs
- The rosette shape of yuccas protects the inner growth bud
- An "elfin forest" of live oaks may develop in absence of fire.
- [Photographs following Malibu Bluffs fire](#)

