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Topography and Geology of California

Lecture 12

Slide 2

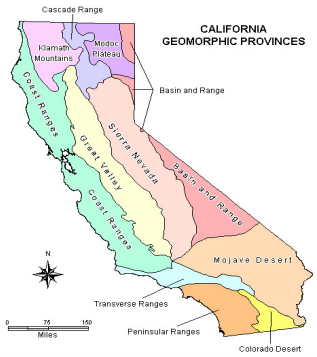
Learning Outcomes

- Geomorphic Provinces of California
- Different types of Rocks
- Weathering
- Erosion
- Topography

Slide 3

Geomorphic Provinces

- 11 Geomorphic Provinces in California
- Distinctive topography, geology, and origins



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Coast Ranges

- Extend 500 miles Oregon- Santa Barbara
- Old range of low (<6,000 ft) mountains
- Formerly seafloor sediments
- Valleys
  - Napa
  - Salinas

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Sierra Nevada

- Granite Batholith
- Magma cooled deep underground
- Slow cooling allow large crystals to develop
- Uplifted and exposed by erosion
- Glaciated

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Central Valley

- Formerly a tapestry of grasslands and marshlands
- Little natural vegetation remains

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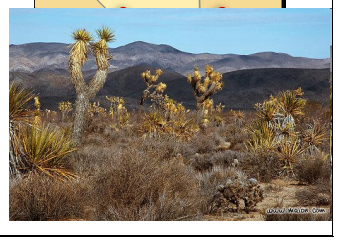
Mojave Desert

- Elevation 3-6,000 feet
- Winter rains
- Winter frosts common



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Colorado Desert

- Northern extension of Sonoran Desert
- 0-500 ft
- W of Colorado River
- Rainshadow of Peninsular Ranges
- 2 rainy seasons
- Winter and summer
- Frost never occurs

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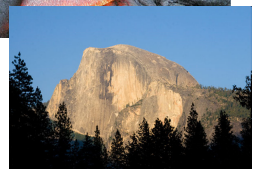
Igneous Rocks

- Formed from molten rock
- Basalt
  - Basic minerals
  - Iron and Magnesium
- Granite –
  - Acidic minerals
- Rate of cooling determines size of crystals



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Sedimentary Rocks

- Weathering and erosion of rocks produce sediments
- Compressed sediments form sedimentary rocks
  - Sandstone
  - Shale
- Previously weathered
  - Nutrient poor

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Metamorphic Rocks

- When rocks are buried and heated by magma
- Form different types of rock
- Sedimentary rock
- Igneous rock
- Granite → Gneiss

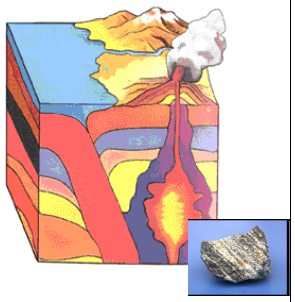

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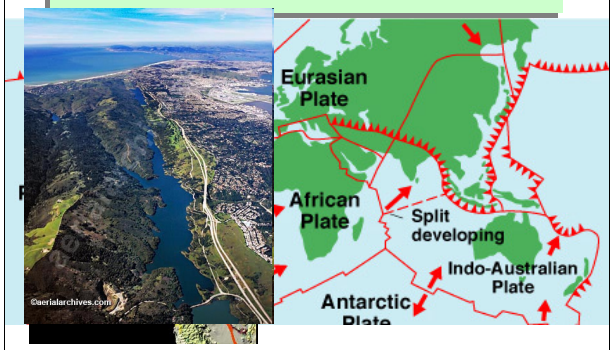
Plate Tectonics



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Rocks and Soils

- Rocks are the parent material of most soils
- The exception is when transported sediments like sand dunes develop into soils
- Soil pH, particle size, and fertility are directly related to rock type

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Physical Weathering

- Thermal expansion
- Ice expansion in cracks
- Pressure exerted by roots

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Chemical Weathering

- Rock minerals dissolved by weak acids
- Rain pH 5.6
- Acids secreted by organisms:
  - Lichens
  - Roots
  - decomposition

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Transport and Deposition

- Sediments are transported downhill by flowing water
- Deposition occurs when rate of flow drops below minimum rate to keep particle suspended
  - Alluvial fans
  - Estuaries

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Topography

- Abiotic factors vary with slope position
- Ridge
  - Greater wind exposure
  - Shallow, stony soils
- Valley floor
  - Deep soils
  - Greater soil water availability

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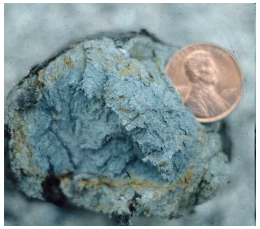
Drainage

- Soils on slopes tend to drain after rainfall
- Water drains downhill
- Footslope and valley floor soils may be poorly drained
- Low soil oxygen availability severe constraint
- Limits root growth
- Soluble metal ion toxicity



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Aspect

- In Northern Hemisphere
- Sun always to the south
- North facing slopes shadier, cooler and moister
- Mixed evergreen forest

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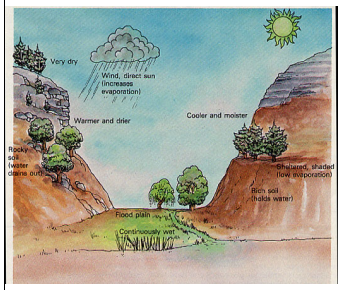
South Slope



South slope in northern hemisphere

- More solar radiation
- Higher temperatures
- Higher evaporation and transpiration rates
- Less soil water
- Vegetation sparser and more drought tolerant
- chaparral