Analysis

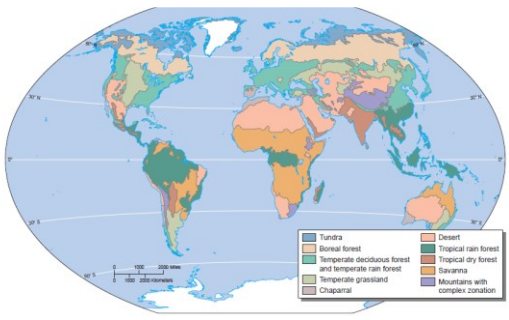
What is happening in this picture?

1. This picture shows expensive homes built in the chaparral of the Santa Monica Mountains. Based on what you have learned in this lesson, what environmental problem might threaten these homes?
2. Sometimes people have removed the chaparral vegetation to prevent fires from damaging their homes. Where that has occurred, the roots no longer hold the soil in place. What could happen when the winter rains come?

Abstraction

BIOME

- A large, relatively distinct terrestrial region with similar climate, soil, plants, and animals, regardless of where it occurs in the world.
- Encompasses many interacting ecosystems
- considered the next level of ecological organization above community, ecosystem, and landscape
- temperature and precipitation, have a predominant effect on biome distribution.



Tundra

Arctic tundra

- Treeless biome in the far north that consists of boggy plains covered by lichens and mosses; it has harsh, cold winters and extremely short summers.
- *alpine tundra*- similar ecosystem located in the higher elevations of mountains, above the tree line
- growing season is short, the days are long
- little precipitation, and most of the yearly 10 to 25 cm (4 to 10 in) of rain or snow falls during summer months
- Tundra soil is nutrient poor and have little *detritus*
- *Permafrost* beneath surface soil and impedes drainage
- Limited precipitation, combined with low temperatures, flat topography (or surface features), and the layer of permafrost, produces a landscape of broad, shallow lakes and ponds, sluggish streams, and bog
- recovers slowly from even small disturbances
- Oil and natural gas exploration and military use have caused damage to tundra likely to persist for hundreds of years

Flora

Cotton Plants | Lichen | Caribou Moss

Labrador Tea | Artic Willow | Bearberry

Fauna

Lemming   ptarmigan

- supports relatively few species compared to other biomes but the species exist in great numbers
- Dominant plants: Mosses, lichens, grasses, and grasslike sedges
- Tundra plants seldom grow taller than 30 cm (12 in)
- (year-round): lemmings, voles, weasels, arctic foxes, snowshoe hares, ptarmigan, snowy owls, and musk oxen

Boreal Forest

- region of coniferous forest (such as pine, spruce, and fir) in the Northern Hemisphere; located just south of the tundra. Also called *taiga*.
- Winters in the boreal forest are extremely cold and severe, although not as harsh as those in the tundra.
- receives little precipitation (50 cm (20 in) per year
- soil is typically acidic and mineral poor, with a thick surface layer of partly decomposed pine and spruce needles.
- permafrost deep under the surface
- has numerous ponds and lakes dug by ice sheets during the last ice age.
- world's top source of industrial wood and wood fiber

Flora

- Dominating: Black and white spruces, balsam fir, eastern larch, and other conifers (cone-bearing evergreens)
- Conifers have many drought-resistant adaptations, such as needle-like leaves whose minimal surface area prevents water loss by evaporation

Fauna

caribou

- Consists of some larger species such as caribou, which migrate from the tundra for winter; wolves; brown and black bears; and moose.
- most boreal mammals are medium sized to small, including rodents, rabbits, and smaller predators such as lynx, sable, and mink.
- Birds are abundant in the summer but migrate to warmer climates for winter.
- Insects are plentiful, but few amphibians and eptiles occur except in the southern boreal forest.

Temperate Rain Forest

- A coniferous biome with cool weather, dense fog, and high precipitation.
- Occurs on the northwest coast of North America, southeastern Australia and in southern South America
- Annual precipitation is high—more than 127 cm (50 in)—and is augmented by condensation of water from dense coastal fogs
- seasonal fl uctuation is narrow; winters are mild, and summers are cool.
- Relatively nutrient-poor soil, though its organic content may be high.
- Cool temperatures slow the activity of bacterial and fungal decomposers.
- rich wood producer, supplying lumber and pulpwood

Flora

- Dominant: large evergreen trees such as western hemlock, Douglas fir, western red cedar, Sitka spruce, and western arborvitae
- rich in epiphytes mainly mosses, club mosses, lichens, and ferns, all of which also carpet the ground

western hemlock

Fauna

Wood rat

- Squirrels, wood rats, mule deer, elk, numerous bird species, and several species of amphibians and reptiles

Temperate Deciduous Forest

- A forest biome that occurs in temperate areas where annual precipitation ranges from about 75 cm to 126 cm (30 to 50 in).
- Hot summers and cold winters
- Soil consists of a topsoil rich in organic material and a deep, clay-rich lower layer.
- among the first biomes converted to agricultural use

Flora

- Dominating in northeastern and mideastern United States: Broad-leaved hardwood trees (oak, hickory, and beech)
- Trees form a dense canopy that overlies saplings and shrubs

Oak

Fauna

- originally contained a variety of large mammals, such as puma, wolves, and bison, which are now absent.
- deer, bears, and many small mammals and birds

Bison

Tropical Rain forest

- A lush, species-rich forest biome that occurs where the climate is warm and moist throughout the year.
- are found in Central and South America, Africa, and Southeast Asia
- Annual precipitation is typically between 200 and 450 cm (80 to 180 in).
- commonly occurs in areas with ancient, highly weathered, mineral-poor soil.
- Little organic matter accumulates in such soils; because temperatures are high year-round, bacteria, fungi, and detritus-feeding ants and termites decompose organic litter quite rapidly.
- Roots quickly absorb nutrient minerals from the decomposing material.

- A fully developed tropical rain forest has at least three distinct stories, or layers, of vegetation (emergent story, canopy, understory)

Flora

Bromeliad

- No single species dominates
- trees are typically evergreen flowering plants.
- Emergent layer: very tall trees, some 50 m (164 ft)
- middle story, or canopy: trees 30 to 40 m (100 to 130 ft)
- smaller plants in the sparse understory
- communities of epiphytic plants such as ferns, mosses, orchids, and bromeliads

Fauna

Sloth

- about 90% of tropical rainforest organisms are adapted to live in the canopy
- abundant and varied insects, reptiles, and amphibians
- Mammals: sloths and monkeys

Chaparral

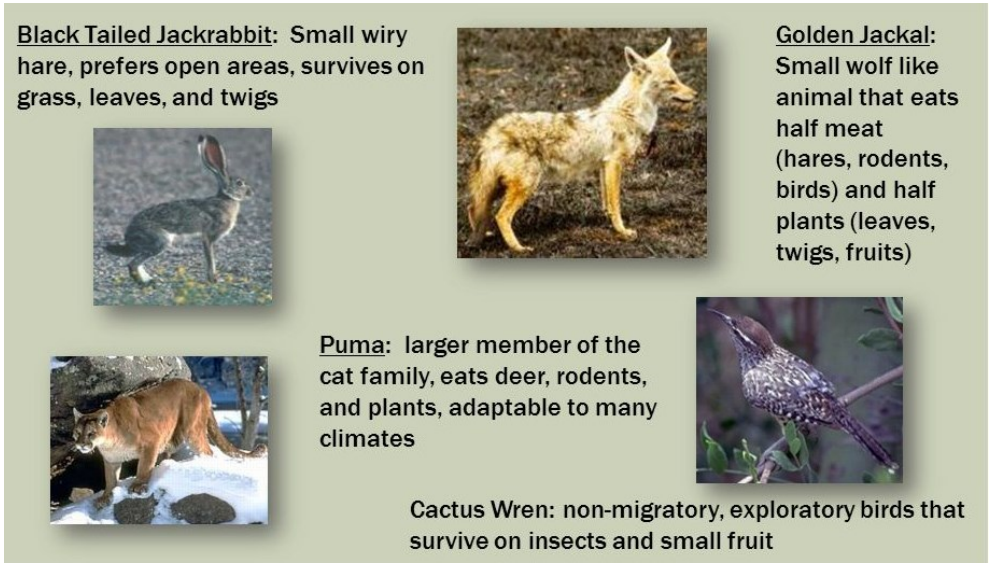
- A biome with mild, moist winters and hot, dry summers; vegetation is typically small-leaved evergreen shrubs and small trees.
- soil is thin and often not very fertile.
- Wildfires occur naturally and are particularly frequent in late summer and autumn

Flora

Scrub Oak

- Dominant: dense thicket of evergreen shrubs— often short, drought-resistant pine or scrub oak trees that grow 1 to 3 m (3 to 10 ft) tall

Fauna



- Mule deer, wood rats, chipmunks, lizards, and many species of birds

Temperate Grassland

- A grassland with hot summers, cold winters, and less rainfall than is found in the temperate deciduous forest biome.
- Average annual precipitation ranges from 25 -75 cm (10 to 30 in)
- Grassland soil has considerable organic material
- occur in the United States in parts of Illinois, Iowa, Minnesota, Nebraska, Kansas, and other Midwestern states
- Trees grow sparsely except near rivers and streams, but grasses taller than a person grow in great profusion in the deep, rich soil.
- Periodic wildfires help to maintain grasses as the dominant vegetation in grasslands.
- formerly supported large herds of grazing animals (bison and pronghorn elk)
- Principal predators: wolves, coyotes
- Smaller animals included prairie dogs and their predators (foxes, black-footed ferrets, and various birds of prey), grouse, reptiles such as snakes and lizards, and great numbers of insects.
- are temperate grasslands that receive less precipitation than moist temperate grasslands but more precipitation than deserts.
- occur in parts of Montana, Wyoming, South Dakota, and other midwestern states
- Grasses that grow knee high or lower dominate
- Plants grow less abundantly than in the moister grasslands, and bare soil is occasionally exposed.

Fauna

Pronghorn Elk

Savanna

- A tropical grassland with widely scattered trees or clumps of trees.
- found in areas of low rainfall or, more commonly, in areas of intense seasonal rainfall with prolonged dry periods.
- Temperatures vary little throughout the year.
- Precipitation is the overriding climate factor: Annual precipitation is 85 to 150 cm (34 to 60 in).
- soil is somewhat low in essential nutrient minerals, in part because it is heavily leached during
- rainy periods—that is, nutrient minerals filter out of the topsoil.
- Occur in Africa, also in in South America, western India, and northern Australia.
- converted into rangeland for cattle and other domesticated animals

Flora

Acacia

- has wide expanses of grasses interrupted by occasional trees like the acacia, which bristles with thorns to provide protection against herbivores.
- Both trees and grasses have fi re-adapted features, such as extensive underground root systems, that enable them to survive seasonal droughts as well as periodic fi res.

Fauna

- herbivores such as antelope, giraffe, elephants, wildebeest, and zebra
- Large predators, such as lions and hyenas, kill and scavenge the herds.

Wildebeest

Desert

- A biome in which the lack of precipitation limits plant growth; deserts are found in both temperate and tropical regions.
- consists of dry areas found in both temperate (cold deserts) and subtropical or tropical regions (warm deserts).
- Low water vapor content of the desert atmosphere → daily temperature extremes of heat and cold
- Desert environments vary greatly depending on the amount of precipitation they receive, which is generally less than 25 cm (10 in) per year.
- desert soil is low in organic material but is often high in mineral content, particularly salts

Flora

Sagebrush

- Plants in North American deserts include cacti, yuccas, Joshua trees, and sagebrush
- Desert plants are adapted to conserve water and as a result tend to have few, small, or no leaves.

- Cactus leaves are modified into spines
- Other desert plants shed their leaves for most of the year, growing only during the brief moist season.

Fauna

- typically small
- desert-adapted insects and arachnids (such as tarantulas and scorpions)few desert-adapted amphibians (frogs and toads) and many reptiles, such as the desert tortoise, Gila monster, and Mojave rattlesnake.
- Desert mammals in North America include rodents such as kangaroo rats, as well as mule deer and jackrabbits.
- Birds of prey, especially owls, live on the rodents and jackrabbits, and even the scorpions.
- During the driest months of the year, many desert animals tunnel underground, where they remain inactive.

AQUATIC ECOSYSTEMS

- The most fundamental division in aquatic ecology is probably between freshwater and saltwater environments.
- Factors affecting distribution of organisms
    - Salinity- the concentration of dissolved salts (such as sodium chloride) in a body of water
    - dissolved oxygen
    - nutrient minerals