



Topic/Objective CHAPTER:

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Essential Question

Cue: Review:
Thoughts: Main
Idea

NOTE Taking AREA:

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- also known as **boreal forest** or **snow forest**, is a biome characterized by coniferous forests consisting mostly of pines, spruces and larches.
- ***The taiga is the world's largest biome apart from the oceans.*** making up 29% of the world's forest cover
- In North America it covers most of inland Canada, Alaska, parts of the northern continental United States
- A different use of the term taiga is often encountered in the English language, with "boreal forest" used in the United States and Canada to refer to only the more southerly part of the biome, while "taiga" is used to describe the more barren areas of the northernmost part of the biome approaching the tree line and the tundra biome.
- Structurally, these forests are rather simple, generally consisting of two layers: an overstory and understory.
 - Some forests may support an intermediate layer of shrubs.
 - Pine forests support a herbaceous understory that is generally dominated by grasses and herbaceous perennials, and are often subject to ecologically important wildfires.
 - Many species of tree inhabit these forests including cedar, cypress, Douglas fir, fir, juniper, pine, podocarpus, spruce, redwood and yew. The understory also contains a wide variety of herbaceous and shrub species.
- Animals usually include wolves, bears, rabbits, deer, adapt for short summer.

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Taiga

- The taiga is the terrestrial biome with the lowest annual average temperatures after the tundra which has permanent ice caps.
 - Extreme winter minimums in the northern taiga are typically lower than those of the tundra.
 - Short summer in which snow may remain thru summer
 - The taiga or boreal forest has a subarctic climate with very large temperature range between seasons, but the long and cold winter is the dominant feature.
 - Meaning that the short summer (24 h average 50 °F or more) lasts 1–3 months and always less than 4 months.
 - Average temperature of the coldest month is between -6 °C (21 °F) and -50 °C (-58 °F).
 - According to some sources, the boreal forest grades into a temperate mixed forest when mean annual temperature reaches about 3 °C (37 °F).
 - Discontinuous permafrost is found in areas with mean annual temperature below 0 °C,
 - whilst in climate zones continuous permafrost may occurs and restricts growth to very shallow-rooted trees like Siberian larch.
 - The winters, with average temperatures below freezing, last five to seven months. Temperatures vary from -54 °C to 30 °C (-65 °F to 86 °F) throughout the whole year. The summers, while short, are generally warm and humid. In much of the taiga, -20 °C (-4 °F) would be a typical winter day temperature and 18 °C (64 °F) an average summer day.
- The growing season, when the vegetation in the taiga comes alive, is usually slightly longer than the climatic definition of summer as the plants of the boreal biome have a lower threshold to trigger growth

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Tundra

- In physical geography, **tundra** is a type of biome where the tree growth is hindered by low temperatures and short growing seasons.
- The term *tundra* comes through Russian meaning "uplands", "treeless mountain tract"
- Tundra vegetation is composed of
 - Dwarf shrubs, sedges and grasses, mosses, and lichens.
 - Scattered trees grow in some tundra regions.
 - The ecotone (or ecological boundary region) between the tundra and the forest is known as the tree line or timberline.
- There are three regions and associated types of tundra:
 - Arctic tundra,
 - Alpine tundra
 - Antarctic tundra.
- Local climate in which at least one month has an average temperature high enough to melt snow (0 °C (32 °F)), but no month with an average temperature in excess of 10 °C (50 °F).
- The cold limit generally meets the *EF* climates of permanent ice and snows; **Meaning permafrost in layers**
 - The warm-summer limit generally corresponds with the pole ward or altitudinal limit of trees, where they grade into
 - the subarctic climates (extreme winters as in parts of Siberia),
 - typical in Alaska, Canada, parts of Scandinavia,
 - cold winters with months of freezing,
 - no month colder than 27 °F as in parts of Iceland
- Tundra climates as a rule are hostile to woody vegetation even where the winters are comparatively mild by polar standards, as in Iceland.

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Tundra

NOTE Taking AREA:

- Despite the potential diversity of climates in the *ET* category involving
 - precipitation,
 - extreme temperatures,
 - and relative wet and dry seasons, this category is rarely subdivided.
- Rainfall and snowfall are generally slight due to the low vapor pressure of water in the chilly atmosphere, but as a rule potential evapotranspiration is extremely low, allowing soggy terrain of swamps and bogs even in places that get precipitation typical of deserts of lower and middle latitudes.
- The amount of native tundra biomass depends more on the local temperature than the amount of precipitation.
- Species as polar bears and white hairs.'
-

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Savanna

- Typical tropical savanna in Northern [Australia](#) demonstrating the high tree density and regular spacing characteristic of many savannas
- A savanna or savannah is
 - a mixed [woodland grassland ecosystem](#) characterized by the trees being sufficiently widely spaced so that the [canopy](#) does not close.
 - The open canopy allows sufficient light to reach the ground to support an unbroken [herbaceous](#) layer consisting primarily of grasses.
- Savannas maintain an open canopy despite a high tree density.
 - It is often believed that savannas feature widely spaced, scattered trees. However, in many savannas, tree densities are higher and trees are more regularly spaced than in forests.
- Savannas are also characterized by seasonal water availability, with the majority of rainfall confined to one season;
 - They are associated with several types of [biomes](#), and are frequently in a [transitional zone](#) between [forest](#) and [desert](#) or [grassland](#).
- Savanna covers approximately 20% of the [Earth's](#) land are
- Savannas are subject to regular [wildfires](#) and the ecosystem appears to be the result of human use of fire. Exist in habitats that are frequently disturbed by grazing or fire, as such disturbance prevents the encroachment of woody species.
- Human induced climate change resulting from the [greenhouse effect](#) may result in an alteration of the structure and function of savannas.
 - Savannas and Grasslands may become even more susceptible to woody plant encroachment as a result of [greenhouse induced climate change](#).
 - However, a recent case described a savanna increasing its range at the expense of forest in response to climate variation, and potential exists for similar rapid, dramatic shifts in vegetation distribution as a result of global climate change

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NOTE Taking AREA:

Grasslands

- Areas where the vegetation is dominated by grasses
 - However, sedge and rush families can also be found along with variable proportions of legumes, like clover, and other herbs.
 - Grassland vegetation can vary in height from very short, as in chalk grassland, to quite tall, as in the case of North American tallgrass prairie
- Grasslands occur naturally on all continents except Antarctica.
- Grasslands are found in most ecoregions of the Earth.
 - For example, there are five terrestrial ecoregion classifications (subdivisions) of the temperate grasslands, savannas, and shrublands biome(ecosystem), which is one of eight terrestrial ecozones of the Earth's surface.
- Grasslands often occur in areas with annual precipitation between 24 in & 59 in
- Average mean annual temperatures ranges from -5 and 20 °C (Woodward et al. 2004).
- However, some grasslands occur in colder (-20 °C) and hotter (30 °C) climatic conditions.
- Grassland can exist in habitats that are frequently disturbed by grazing or fire, as such disturbance prevents the encroachment of woody species.
- The closed forest types such as broadleaf forests and rainforests are usually not grazed owing to the closed structure precluding grass growth, and hence offering little opportunity for grazing.^[34] In contrast the open structure of savannas allows the growth of a herbaceous layer and are commonly used for grazing domestic livestock.^[35] As a result, much of the world's savannas have undergone change as a result of grazing by sheep, goats and cattle, ranging from changes in pasture composition to woody weed encroachment

SUMMARY:

- Human induced climate change resulting from the greenhouse effect may result in an alteration of the structure and function of savannas.
 - Savannas and Grasslands may become even more susceptible to woody plant encroachment as a result of greenhouse induced climate change.

However, a recent case described a savanna increasing its range at the expense of forest in response to climate variation, and potential exists for similar rapid, dramatic shifts in vegetation distribution as a result of global climate change



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Temperate

➤ **Temperate deciduous** or **temperate broad-leaf forests** are dominated by trees that lose their leaves each year.

coniferous forest

➤ They are found in areas with warm moist summers and cool winters.

This is where

➤ The six major areas of this forest type occur in the Northern Hemisphere:

We live at

- include oak, maple, beech and elm, dominate this type of forest, with loose leaves.
- The diversity of tree species is higher in regions where the winter is milder, and also in mountainous regions that provide an array of soil types and microclimates.
- The largest intact, temperate deciduous forest in the world is protected inside of the six-million-acre Adirondack Park in Upstate New York

➤ Animals such as Deer, rabbits, bears.

➤ Terrestrial biome found in temperate climate regions of the world with warm summers and cool winters and adequate rainfall to sustain a forest.

➤ In most temperate coniferous forests, evergreen conifers predominate, while some are a mix of conifers and broadleaf evergreen trees and/or broadleaf deciduous trees.

➤ Temperate evergreen forests are common in the United States of America, areas of regions that have mild winters and heavy rainfall, or inland in drier climates or mountain areas.

➤ Temperate coniferous forests are found mainly in the Northern Hemisphere in North America, Europe, and Asia,

- A separate ecoregion, the tropical coniferous forests, occurs in more tropical climates.



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NOTE Taking AREA:

Aquatic

Biomes

- Aquatic biomes house numerous species of plants and animals, both large and small. In fact, this is where life began billions of years ago when amino acids first started to come together.
- Without water, most life forms would be unable to sustain themselves and the Earth would be a barren, desert-like place. Although water temperatures can vary widely, aquatic areas tend to be more humid and the air temperature on the cooler side.
- The aquatic biome can be broken down into two basic regions,
 - freshwater (i.e, ponds and rivers)
 - marine (i.e, oceans and estuaries).

Freshwater

Regions

- Freshwater is defined as having a low salt concentration—usually less than 1%.
- Plants and animals in freshwater regions are adjusted to the low salt content and would not be able to survive in areas of high salt concentration (i.e, ocean).
- There are different types of freshwater regions:
 - ponds and lakes,
 - streams and rivers
 - wetlands which is swamps, marsh,
 - Ave temp 59°F - 95°F
 - Rain fall 68 inches – 78 inches

Marine

Regions

- Marine regions cover about three-fourths of the Earth’s surface and include
 - oceans, coral reefs, and estuaries.
- Marine algae supply much of the world’s oxygen supply and take in a huge amount of atmospheric carbon dioxide.
- The evaporation of the seawater provides rainwater for the land.

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Tropical
rainforests

- Tropical rainforests are rainforests that occur in areas of tropical rainforest climate in which there is no dry season – often found near the equator.
- Tropical rainforests can be characterized in two words: hot and wet.
 - Mean monthly temperatures exceed 64 °F during all months of the year.
 - Average annual rainfall is no less than 66 in and can exceed 390 in although it typically lies between 69 in and 120 in
 - This high level of precipitation often results in poor soils due to leaching of soluble nutrients in the ground.
- Tropical rainforests exhibit high levels of biodiversity.
 - Around 40% to 75% of all biotic species are indigenous to the rainforests.
 - Rainforests are home to half of all the living animal and plant species on the planet.
 - Two-thirds of all flowering plants can be found in rainforests.
 - A single hectare of rainforest may contain 42,000 different species of insect, up to 807 trees of 313 species and 1,500 species of higher plants.
- Tropical rainforests have been called the "world's largest pharmacy", because over one quarter of natural medicines have been discovered within them.
 - It is likely that there may be many millions of species of plants, insects and microorganisms still undiscovered in tropical rainforests.



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Tropical
rainforests

NOTE Taking AREA:

- Tropical rainforests are among the most threatened ecosystems globally due to large-scale fragmentation as a result of human activity.
 - Habitat fragmentation caused by geological processes such as volcanism and climate change occurred in the past, and have been identified as important drivers of speciation
 - However, fast human driven habitat destruction is suspected to be one of the major causes of species extinction. Tropical rain forests have been subjected to heavy logging and agricultural clearance (cutting down palms) throughout the 20th century, and the area covered by rainforests around the world is rapidly shrinking
- May also be referred to as lowland equatorial evergreen rainforest.
- Tropical rainforests are located around and near the equator, therefore having what is called an equatorial climate characterized by three major climatic parameters:
 - Temperature
 - Rainfall
 - and dry season intensity
 - Other parameters that affect tropical rainforests are carbon dioxide concentrations, solar radiation, and nitrogen availability.
- In general, climatic patterns consist of warm temperatures and high annual rainfall. However, the abundance of rainfall changes throughout the year creating distinct moist and dry seasons.
- Tropical forests are classified by the amount of rainfall received each year, which has allowed ecologists to define differences in these forests that look so similar in structure.
 - Tropical rainforests have an annual rainfall greater than 2 m and annual temperature greater than 24 degrees Celsius, with a potential evapotranspiration ratio (PET) value of <0.25.

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Tropical
rainforests

- **Other types of tropical forest**
 - **Moist seasonal tropical forest**
 - **Montane rainforests**
 - **Flooded rainforests**

- Rainforests are divided into different strata, or layers, with vegetation organized into a vertical pattern from the top of the soil to the canopy.
 - Each layer is a unique biotic community containing different plants and animals adapted for life in that particular strata.
 - Only the emergent layer is unique to tropical rainforests, while the others are also found in temperate rainforests.
 - The **forest floor**, the bottom-most layer, receives only 2% of the sunlight. Only plants **adapted** to low light can grow in this region. Away from riverbanks, swamps and clearings, where dense undergrowth is found, the forest floor is relatively clear of vegetation because of the low sunlight penetration. This more open quality permits the easy movement of larger animals
 - The **understory layer** lies between the canopy and the forest floor. The understory is home to a number of birds, small mammals, insects, reptiles, and predators.
 - e.i. **leopard**, **poison dart frogs**, **boa constrictor**, MaCaw, Capybara, Jaguar, Gibbon (monkey)
 - The vegetation at this layer generally consists of shade-tolerant shrubs, herbs, small trees, and large woody vines which climb into the trees to capture sunlight.
 - Only about 5% of sunlight breaches the canopy to arrive at the understory causing true understory plants to seldom grow to 10 feet
 - As an adaptation to these low light levels, understory plants have often evolved much larger leaves. Many seedlings that will grow to the canopy level are in the understory.



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rainforests

Deserts

Types of Deserts

- NOTE Taking AREA:**
- **Canopy layer** primary layer of the forest forming a roof over the two remaining layers.
 - It contains the majority of the largest trees, Tall, broad-leaved evergreen trees are the dominant plants. The densest areas of biodiversity are found in the forest canopy, as it often supports a rich flora
 - **Emergent layer** contains a small number of very large trees, called *emergents*, which grow above the general canopy, reaching heights of 45–55 m, although on occasion a few species will grow to 70–80 m tall. ^{[15][17]}
 - These trees need to be able to withstand the hot temperatures and strong winds that occur above the canopy in some areas.
 - A desert is a barren area of landscape where little precipitation occurs and consequently living conditions are hostile for plant and animal life.
 - The lack of vegetation exposes the unprotected surface of the ground to the processes of denudation.
 - **i.e. cactus is a water storage tissues, thick epidermal layers (often waxy surface), spines and thorns**
 - About one third of the land surface of the world is arid or semi-arid.
 - large diurnal and seasonal temperature range, with high daytime temperatures falling sharply at night.
 - The diurnal range may be as much as 36 to 54 °F (cold nights) and the rock surface experiences even greater temperature differentials
 - During the day the sky is usually clear and most of the sun's radiation reaches the ground, but as soon as the sun sets,
 - The desert cools quickly by radiating heat into space.
 - In hot deserts, the temperature during daytime can exceed 113 °F in summer and plunge below freezing point at night during winter
 - Sandy, Icy, Stony

SUMMARY:

diurnal temperature variation is the variation between a high temperature and a low temperature that occurs during the same day.