

1 ☐ :

Ecosystems: Biomes

EVPP 111

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2 ☐ Ecosystems & Biomes

✓ Ecosystem

- similar physical environments lead to
 - evolution of organisms similar in form and function
 - similar ecosystems
- known as “rule of climatic similarity”
 - leads to the concept of **biome**

3 ☐ Ecosystems & Biomes

✓ Biomes

- terrestrial climax communities with wide distribution
 - with similar ecosystem structure, niches, habitats, types of organisms
 - defined largely by regional variations in **climate**

4 ☐ Ecosystems & Biomes

✓ Biomes

- strong relationship between climate and life suggests that
 - if we know climate of an area
 - we can predict what **biome** will be found there
 - » approximate biomass
 - » approximate productivity
 - » dominant types of organisms

5 ☐ Ecosystems and biomes

✓ distribution of biomes results from interaction of

- physical features of the earth
- two key physical factors
 - amount of solar heat
 - global atmospheric circulation

✓ together these factors dictate local climate

- two most important climatic factors are
 - precipitation
 - temperature

6 ☐ Figure: Vegetation, Latitude, Altitude

7 ☐ Figure: Temperature and latitude

8  Fig. 6.8

9  Biomes

✓ **Biomes**

- terrestrial climax communities with wide geographic distribution
- concept is useful for describing in broad terms
 - general structure of the ecosystem
 - types of niches present
- of same type from different areas will exhibit variations in exact species present
- affected by two nonbiological factors
 - temperature
 - precipitation

10  Biomes

✓ **Biomes**

- major biomes of the world
 - **desert**
 - **grassland**
 - **savanna**
 - **Mediterranean shrublands (chaparral)**
 - **tropical dry forest**
 - **tropical rainforest**
 - **temperate deciduous forest**
 - **taiga or boreal forest**
 - **tundra**

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12  Biomes

✓ **deserts**

- dry
 - precipitation is <25 cm/yr
 - time and form of precipitation varies among deserts
- can be cool/cold during parts of year
- temperature can vary greatly during 24-hour period
- vegetation is sparse
 - survival depends on water conservation

13  Biomes

✓ **deserts**

- organisms have evolved adaptations to help them survive
 - restricting activity to times of year when water is present
 - avoiding high temperatures by living in deep, cool, & moist (sometimes) burrows
 - emerging only at night when temperatures are lower, especially if active year round
 - drinking large quantities of water when it is available (camels) & then survive long, dry periods

14 Biomes

✓ deserts

- world's great deserts are located in interiors of continents
 - Sahara in Africa
 - Gobi in Asia
 - Great Sandy Desert in Australia

15 Fig. 6.8

16

17 Figure 6.10a: Climagraph for Cairo

18 Figure: Desert biome and climagraphs

19 Figure 50.25c Deserts

20 Biomes

✓ Grasslands

- also known as **temperate grasslands, prairies, steppes**
- widely distributed throughout temperate regions
 - ~ halfway between equator & poles
- precipitation is ~ 25cm -75cm per year
- tend to be windy with hot summers, cold to mild winters
- grasses make up 60%-90% of vegetation
 - trees rare except along water courses due to need for greater amount of water

21 Biomes

✓ Grasslands

- in many grasslands, fire is important force in
 - preventing invasion of trees
 - releasing nutrients from dead plants into soil
 - contributing to high fertility of grassland soils

22 Biomes

✓ Grasslands

- once covered much of interior North America, widespread in Eurasia & South America
- often highly productive when converted to agricultural use
 - many agricultural lands of US & Canada were originally occupied by grasslands (prairies)
 - roots of perennial grasses characteristically penetrate far into soil
 - grassland soils, therefore, tend to be deep and fertile

23 Biomes

✓ Grasslands

- temperate grasslands often populated by herds of grazing mammals
 - in North America, huge herds of bison and pronghorns once inhabited prairies
 - herds are almost all gone now


- most of prairies have been converted into richest agricultural region on earth

24  Fig. 6.8

25 

26  Figure 6.11a: Climagraph for Tehran

27  Figure: Temperate grassland biome and climagraph

28  Figure 50.25e Temperate grassland

29  Biomes

✓ **Savanna**

- extensive grasslands spotted with occasional trees or patches of trees
- precipitation is 50cm-150cm /yr
 - occurs seasonally
 - period of heavy rainfall followed by prolonged drought
 - » results in seasonally structured ecosystem
- predominant plants are grasses
 - with widely spaced, drought resistant trees


30  Biomes


✓ **Savanna**

- many animals and plants are active only during rainy season
- fire is common
 - trees tend to be fire-resistant
- increasingly being converted to agricultural use
 - causing inhabitants of savannas to struggle to survive


31  Fig. 6.8


32 

33  Fig. 6.12a

34  Figure: Savanna biome and climagraph

35 

36  Figure 50.25b Savanna

37  Figure 50.25bx Savanna


38  Biomes

✓ **Mediterranean shrublands**


- also known as chaparral.
- precipitation is 40-100 cm/yr.


- wet, cool winters and hot, dry summers.
 - typical of Mediterranean coast and coastal southern California.
- vegetation dominated by woody shrubs adapted to hot, dry summers.
- fire is a common feature.

39  Fig. 6.8

40  Fig. 6.13a

41 

42  Figure 50.25d Chaparral


43  Figure 50.25dx Chaparral

44  Biomes

✓ **Tropical dry forest**

- precipitation range is 50-200 cm/yr
- many exhibit monsoon climate
 - several months of heavy rainfall followed by dry periods
 - ranging from a few to 8 months in length.
 - due to highly seasonal rainfall
 - plants must be drought resistant

45  Fig. 6.8

46  Fig. 6.14a

47  Biomes

✓ **Tropical rainforest**

- precipitation is >200cm/yr
- temperatures are warm and relatively constant, no frost
- located near the equator
 - South America, Africa, southeast Asia

48  Biomes

✓ **Tropical rainforest**

- most diverse ecosystems on earth
 - contain ~ half of all species of terrestrial plants and animals
 - in 1sq mi of tropical forest in Rondonia, Brazil there are 1200 species of butterflies
 - » 2X number found in U.S. & Canada combined

49  Biomes

✓ **Tropical rainforest**

- communities are diverse
 - each kind of organism is often represented in a given area by only a few individuals
 - typical to find that individuals of same species are separated by 1km or more

- most nutrients tied up in biomass, not the soil
 - they don't make good farmland

50 Biomes

✓ Tropical rainforest

- are being destroyed
 - under intense pressure from logging and agriculture
 - even though they don't make good farmland
 - many species in rainforests have never been seen by humans
 - during our lifetime, a quarter of world's species will disappear with rainforests

51 Fig. 6.8

52

53 Figure 6.13a: Climagraph for Singapore

54 Figure: Tropical rain forest biome and climagraphs

55 Fig. 6.15b

56 Figure 50.25a Tropical forests

57 Biomes

✓ temperate deciduous forests

- precipitation is 75cm-100cm/yr
 - evenly distributed
- warm summers, mild winters
 - plants grow actively for ~1/2 year
- northeastern US, eastern Canada, Eurasia
- often populated by deer, beaver, bear, raccoon
- generally have lower number of species but a higher number of individuals per species
- trees are major producers

58 Fig. 6.8

59

60 Figure 6.14: Climagraph for Chicago

61 Figure: Temperate deciduous forest

62 Figure 20.25f Temperate deciduous forest

63 Biomes

✓ Taiga

- also known as **northern coniferous forest**, or **boreal forest**
- precipitation is 25cm-100cm per year
 - climate is humid due to low evaporation resulting from generally low temperatures

- winters are long and cold
 - soil freezes in winter
- has very short growing season for farming so few people live there

64 Biomes

✓ Taiga

- most common trees are conifers such as spruce, fir, larch, etc/
 - needle-shaped leaves limit moisture loss
 - pyramid shape accommodates snow
- one of largest ecosystems on earth
 - located in a ring that extends across vast areas of Asia and North America

65 Biomes

✓ Taiga

- populated by many types of large mammals and carnivores such as moose, elf, deer, wolves, bear, lynx
- has been used for fur trapping and lumber production

66 Fig. 6.8

67

68 Figure 6.15a: Climagraph for Moscow

69 Figure: Taiga biome and climagraphs

70 Figure 20.25g Coniferous forests

71 Biomes

✓ tundra

- located north of taiga and south of polar ice
- precipitation is <25cm/yr
- subsurface soil layer is permanently frozen
 - known as **permafrost**
 - doesn't allow water to sink into soil
 - » resulting in waterlogged soil
 - » boggy
- extremely cold and windy
 - spring and summer temperatures usually less than 10°C (50°F)

72 Biomes

✓ tundra


- enormous ecosystem that covers 1/5th of earth's land area
- no trees
- plants are usually less than 20cm (8 in) tall
- populated by large grazing mammals such as musk-oxen, caribou, reindeer and carnivores such as wolves, foxes, lynx

73  Fig. 6.8

74 

75  Figure 6.16a: Climagraph for Fairbanks

76  Figure: Tundra biome and climagraphs

77  Figure 20.25h Tundra

78 

79  The End