

Chapter 2

LIFE ON LAND

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Chapter Concepts

- Uneven heating of the earth's surface by the sun and the tilt of the earth's axis, combine to produce predictable latitudinal variation in climate
- Geographic distribution of terrestrial biomes closely corresponds to variations in climate, especially temperature and precipitation

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Terrestrial Biomes

- Distinguished primarily by their predominant plants and are associated with particular climates
- Major divisions of terrestrial environment
 - ✓ Soil
 - ✓ Temperature, atmospheric circulation and precipitation

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Soil: Foundation of Terrestrial Biomes

- Soil: Complex mixture of living and non-living material.
 - ✓ Classification based on vertical layering (soil horizons)
 - O Horizon
 - A Horizon
 - B Horizon
 - C Horizon

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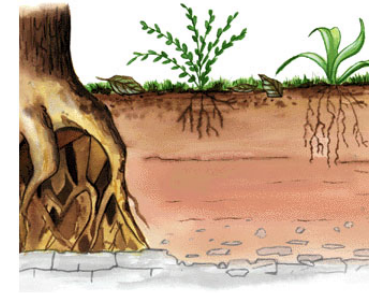
Soil Horizons

- O: Organic Layer freshly fallen organic material – most superficial layer
 - A: Mixture of minerals, clay, silt and sand
 - B: Clay, humus, and other materials leached from A horizon – often contains plant roots
 - C: Weathered parent material
- Soil profile provides a snapshot of soil structure in a constant state of flux

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Generalized soil profile, showing O, A, B, and C horizons.



Soil horizons

O Organic horizon. Upper layer contains loose, somewhat fragmented plant litter. Litter in lower layer is highly fragmented.

A Mineral soil mixed with some organic matter. Clay, iron, aluminum, silicates, and soluble organic matter are gradually leached from A horizon.

B Depositional horizon. Materials leached from A horizon are deposited in B horizon. Deposits may form distinct banding patterns.

C Weathered parent material. The C horizon may include many rock fragments. It often lies on bedrock.

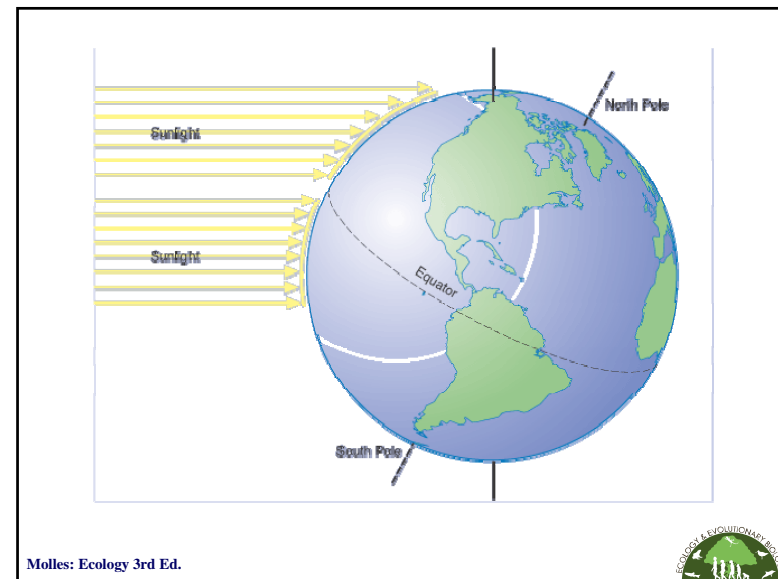
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Large Scale Patterns of Climatic Variation: Temp., Atmospheric Circulation, and Precip.

- Spherical shape and tilt of earth's axis cause uneven heating of earth's surface
 - ✓ Drives air circulation patterns and consequently precipitation patterns
 - Warm, moist air rises
 - Cools, Condenses, and falls as rain
 - Cooler, dry air falls back to surface
 - Rainforests at equator
 - Major Deserts at 30°N and S

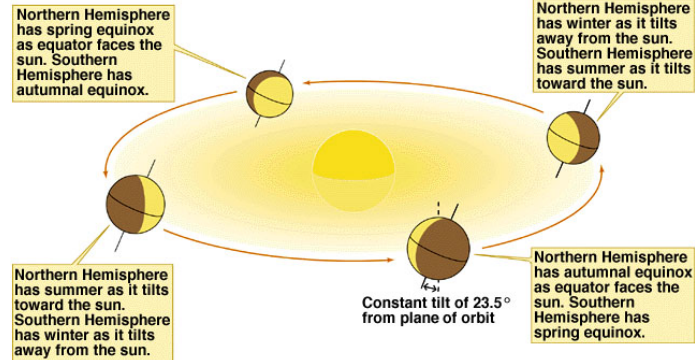
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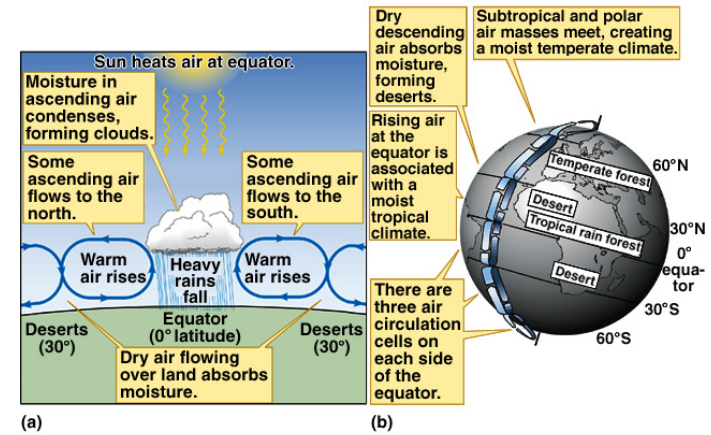
The seasons in the Northern and Southern Hemispheres.



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Air Circulation



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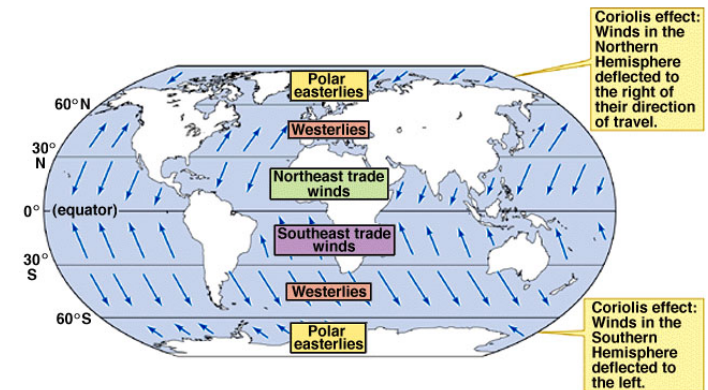
Temp., Atmospheric Circulation, and Precip.

- Coriolis Effect causes apparent deflection of winds clockwise in the N hemisphere and counterclockwise in the S hemisphere

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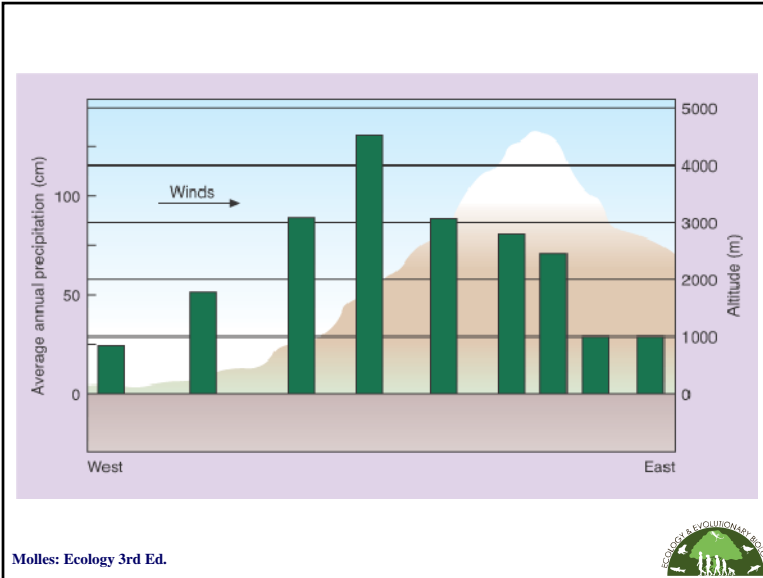


The Coriolis effect and wind direction.



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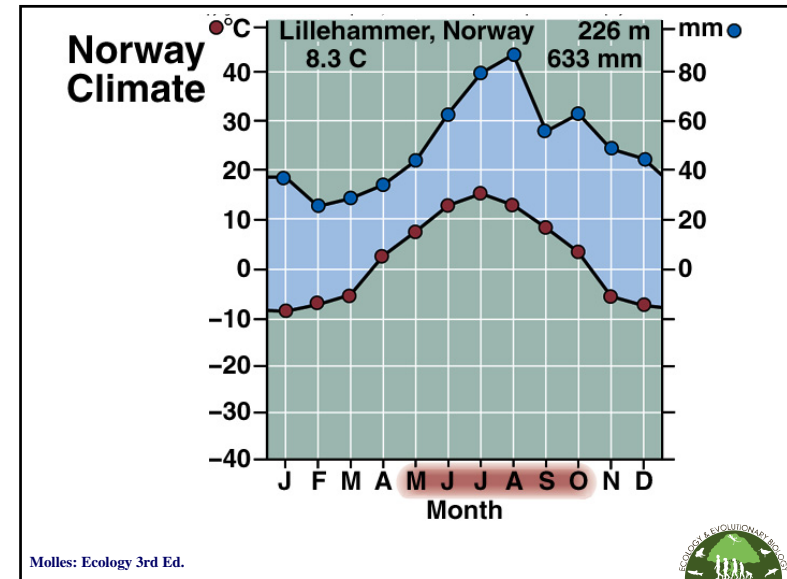
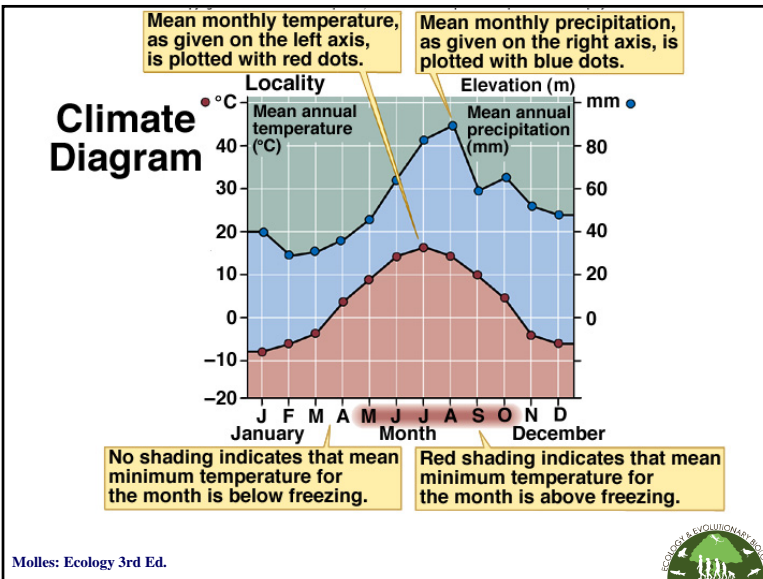


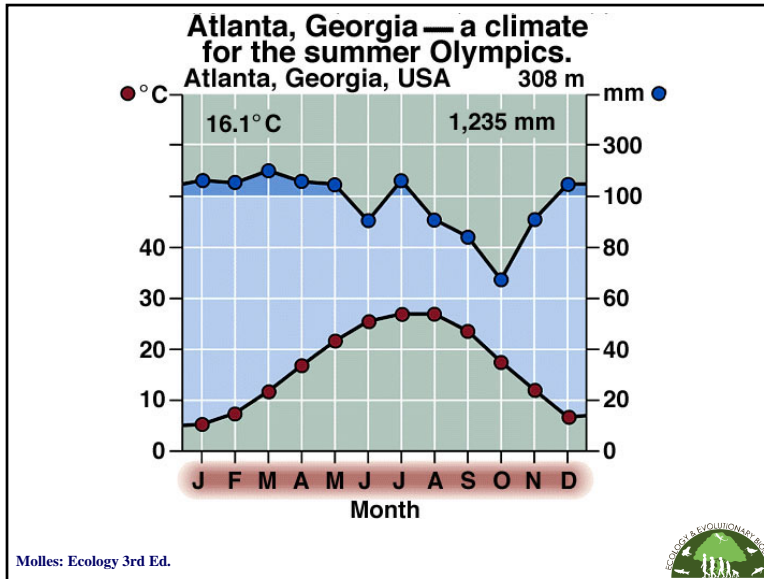


Climate Diagrams

- Effectively summarize input of various environmental variables for an area (temperature and precipitation)
 - ✓ Allows for quick comparison between areas for vegetative growth predications

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Natural History and Geography of Biomes

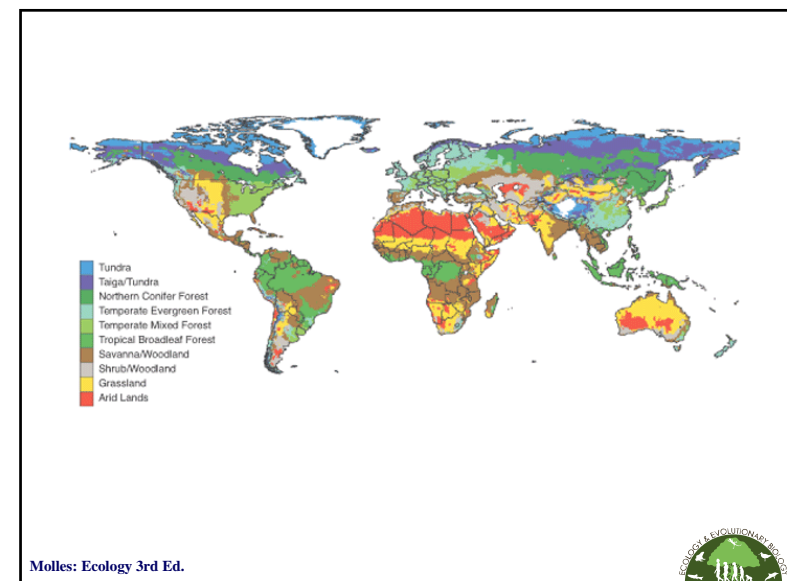
- Main factors determining biomes are:
 - ✓ Temperature
 - ✓ Precipitation

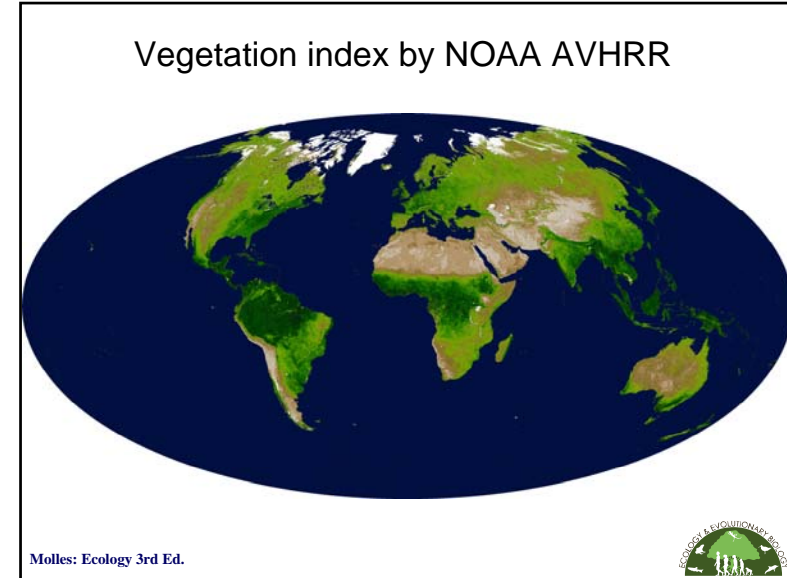
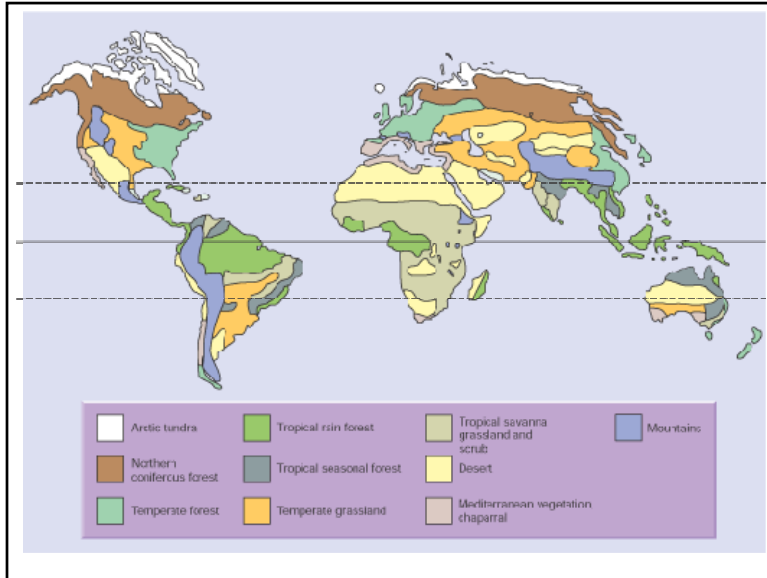
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Conditions, Resources and the World's Communities (Ecosystems)

- The *interplay* of conditions and resources profoundly influences the composition of the world's communities
- At the global scale, patterns of *climate circulation* are largely responsible for distinctive terrestrial biomes, such as deserts and rain forests, with their characteristic assemblages of plants and animals

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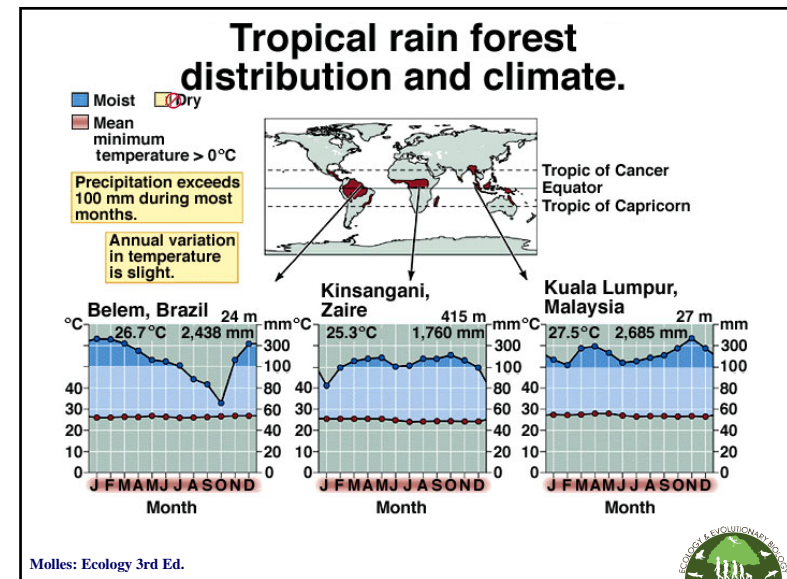




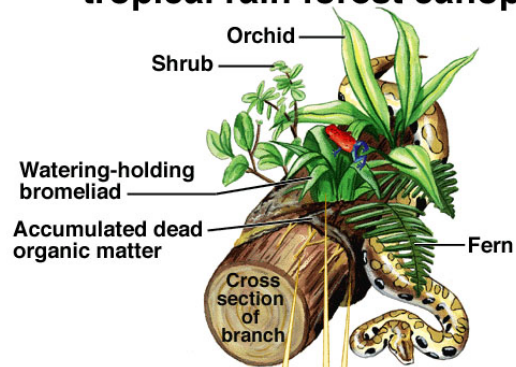
Tropical Rainforests

- Most occur within 10° lat. of equator
- Little temp variation between month
- Annual rainfall 2,000 – 4,000 mm relatively evenly distributed
 - ✓ Heavy rainfall quickly leaches soil nutrients
- Organisms add vertical dimension to ecology
- Harbor staple foods and medicines for world's human populations – increasingly exploited

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An epiphyte mat in the tropical rain forest canopy.



Roots from tree branches draw nutrients from epiphyte mat.

Nutrients are contained in living plants and dead organic matter.

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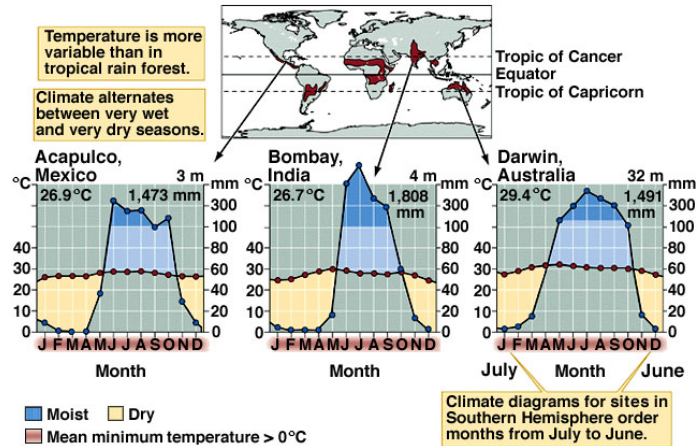
Tropical Dry Forest

- Most often located 10° – 25° latitude
- Climate more seasonal than tropical rainforest
- Soils generally richer in nutrients, but vulnerable to erosion
- Shares many animal and plant spp. with tropical rainforests
- Heavily settled by humans – extensive clearing for agriculture

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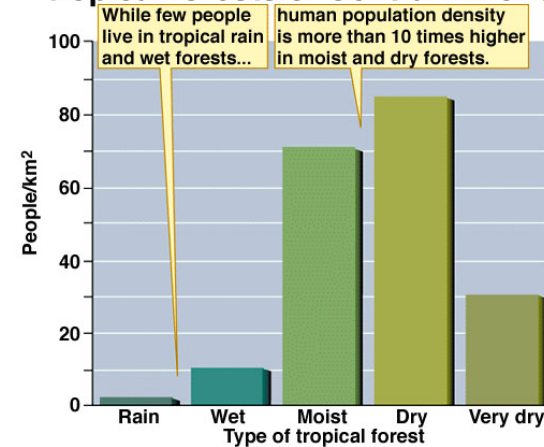
Tropical dry forest distribution and climate.



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Human population density in the tropical forests of Central America.



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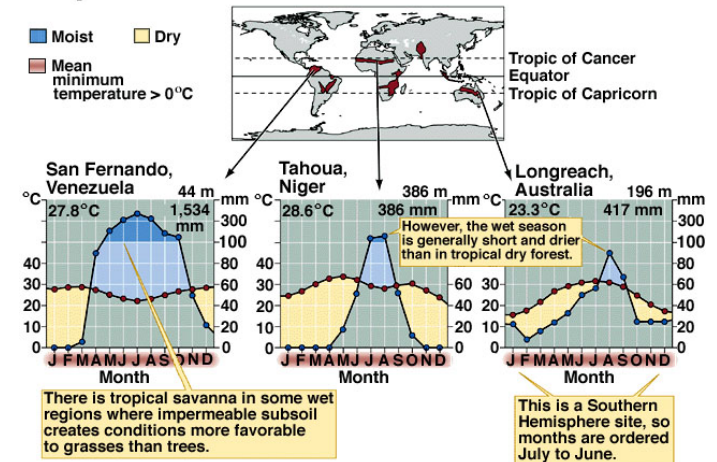
Tropical Savanna

- Often occur immediately N/S of Dry Forests
- Climate alternates between wet/dry seasons
 - ✓ Drought associated with dry season leads to dry conditions and subsequent lightning-caused wildfires
- Soils have low water permeability
 - ✓ Saturated soils keeps trees out
- Increasing pressure to produce livestock

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Tropical savanna distribution and climate.



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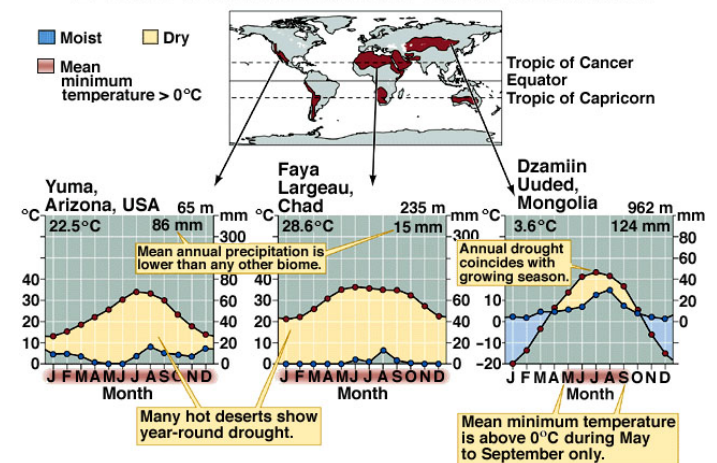
Desert

- Two major bands: 30°N and 30°S
- Occupy about 20% of earth's land surface
- Water loss exceeds precip. most of the year
- Soil usually extremely low in organic matter
- Plant cover ranges from sparse to absent
- Animal abundance low, but biodiversity may be relatively high
 - ✓ Strong behavioral adaptations
- Human intrusion increasing

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Desert distribution and climate.



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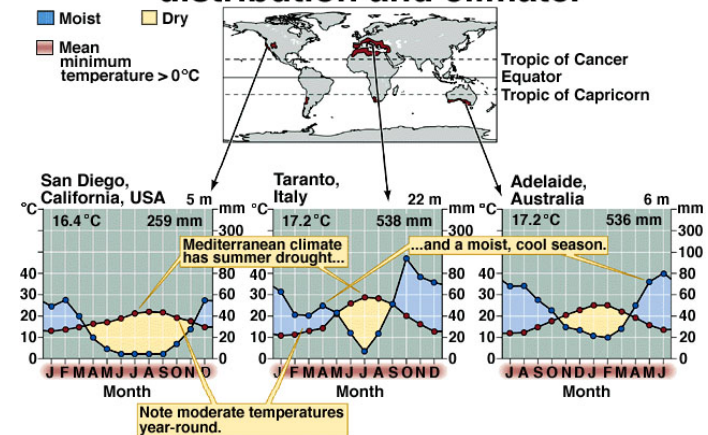
Temperate Woodland and Shrubland

- Occur in all continents except Antarctica
- Climate cool and moist in fall, winter, and spring, but can be hot and dry in summer
- Fragile soils with moderate fertility
- Trees and shrubs typically evergreen
- Fire-resistant plants due to fire regime
- Long history of human intrusion

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Temperate woodland and shrubland distribution and climate.



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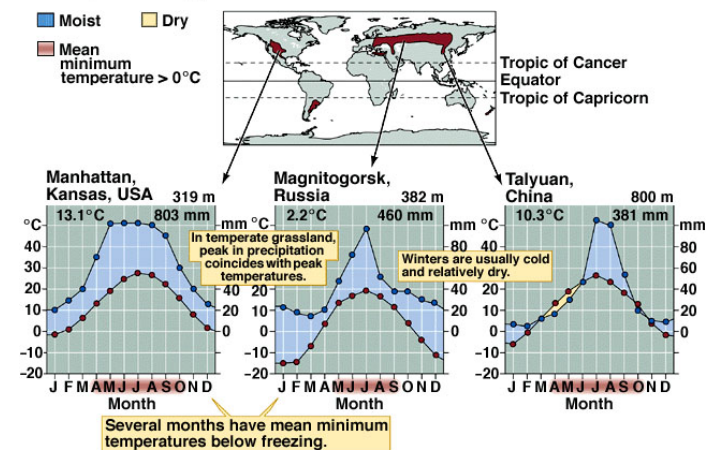
Temperate Grassland

- Extremely widespread distribution
- Annual rainfall 300 – 1,000 mm
- Experience periodic droughts
- Soils tend extremely nutrient rich and deep
- Thoroughly dominated by herbaceous vegetation
- Large roaming ungulates
 - ✓ Bison, pronghorn, wild horse, Saiga antelope

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Temperate grassland distribution and climate.



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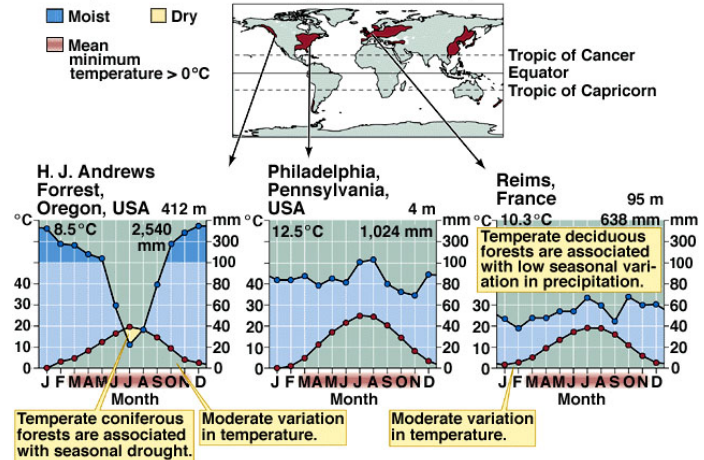
Temperate Forest

- Majority lie between 40° and 50°
- Rainfall averages 650 – 3,000 mm
- Fertile soils
 - ✓ Long growing seasons dominated by deciduous plants
 - ✓ Short growing seasons dominated by conifers
- Biomass production can be very high
- Many major human population centers

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Temperate forest geography and climate.



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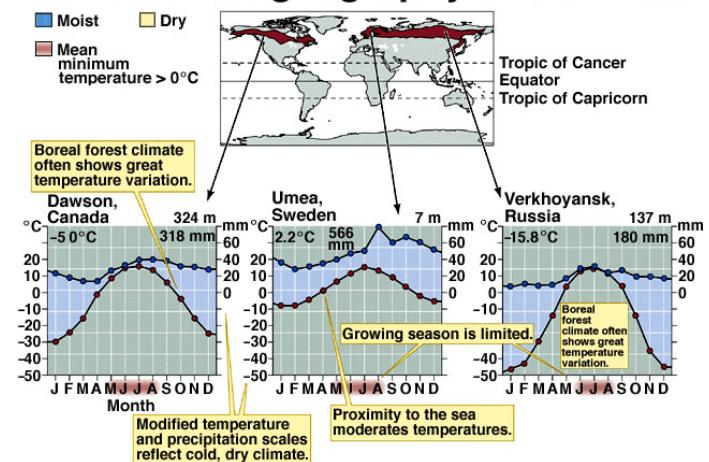
Boreal Forest (Taiga)

- Confined to N. hemisphere
 - ✓ Covers 11% of earth's land area
- Thin, acidic soils low in fertility
- Generally dominated by evergreen conifers
- Relatively high animal density
- Historically, low levels of human intrusion

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Boreal forest geography and climate.



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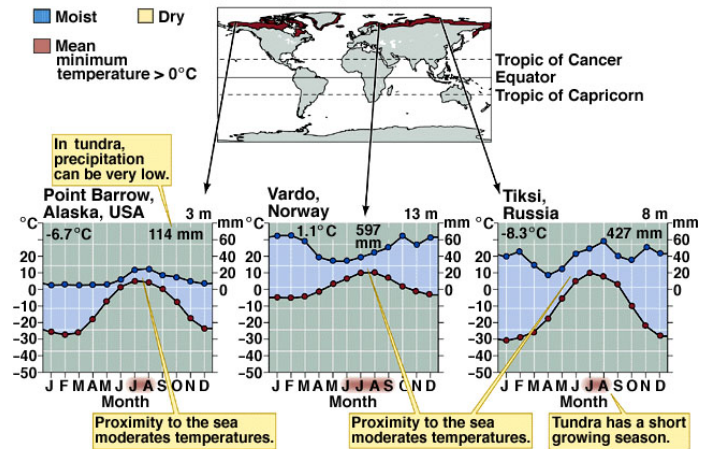
Tundra

- Covers most of lands N of Arctic Circle
 - ✓ Climate typically cool and dry with short summers
 - 200-600mm precip.
 - ✓ Low decomposition rates
 - ✓ Supports substantial numbers of native mammals
 - ✓ Human intrusion historically low, but increasing as resources become scarce

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Tundra geography and climate.



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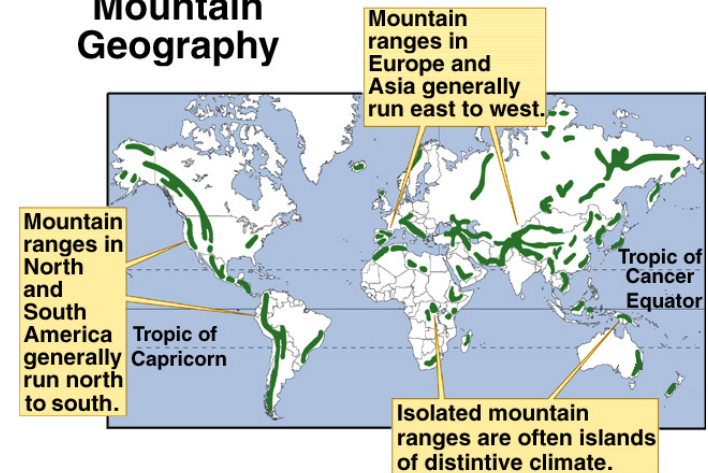
Mountains-Islands in the Sky

- Do not represent a specific biome
- Several biomes may be found
- Unique environmental conditions and organisms to regions

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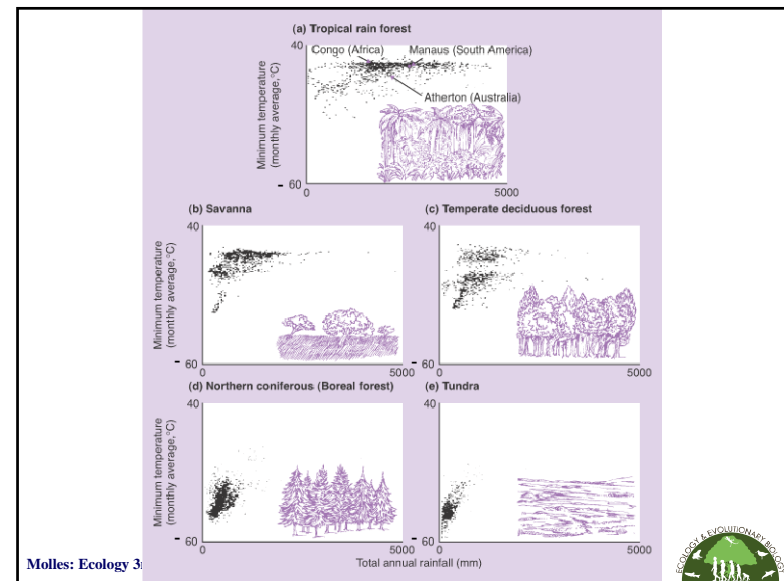
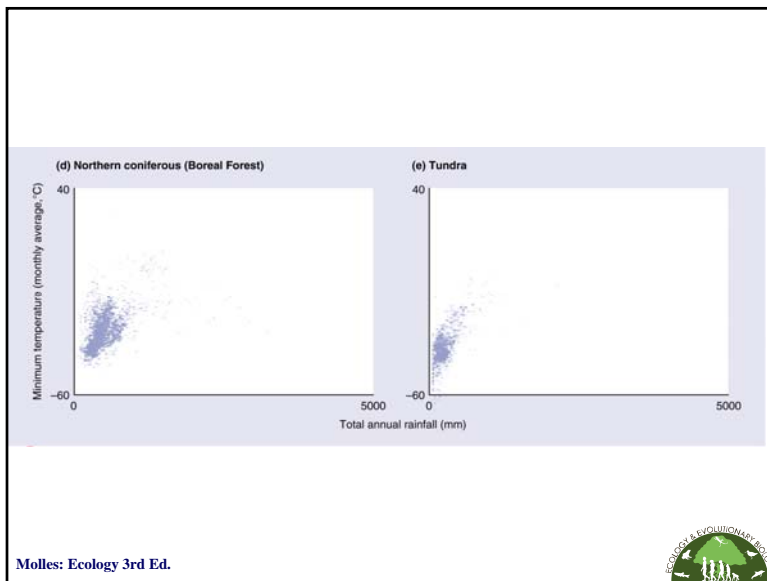
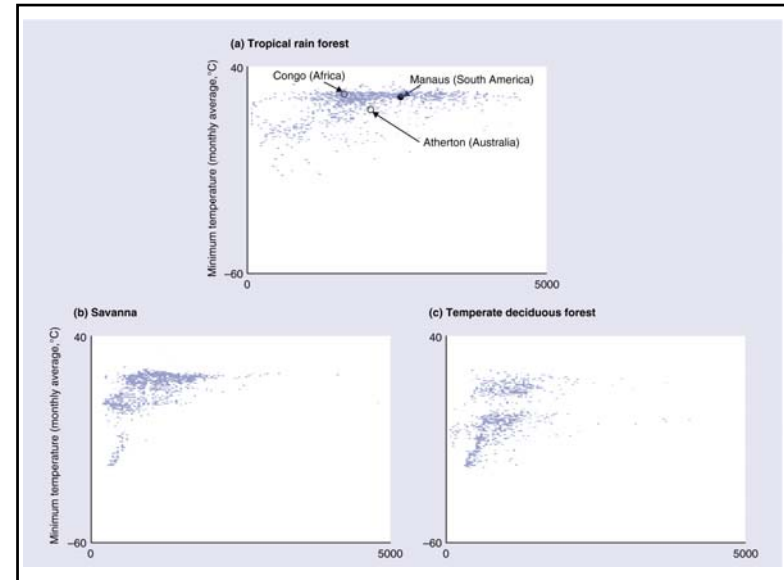
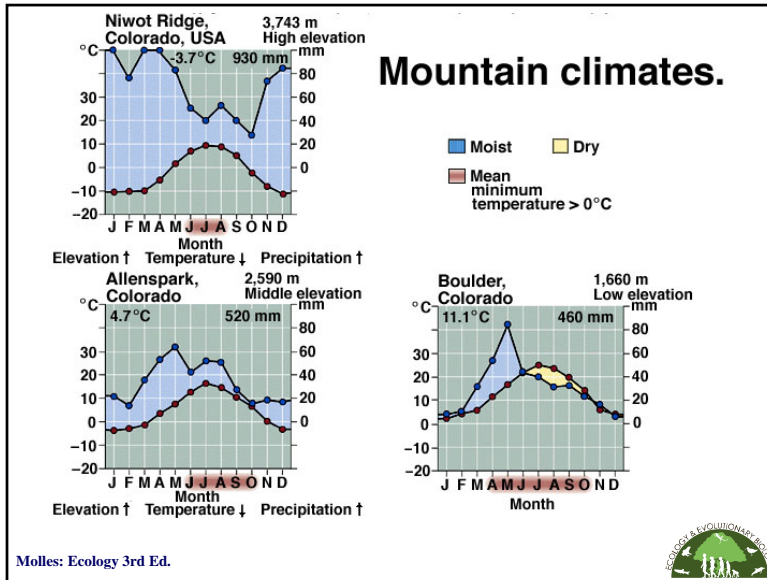


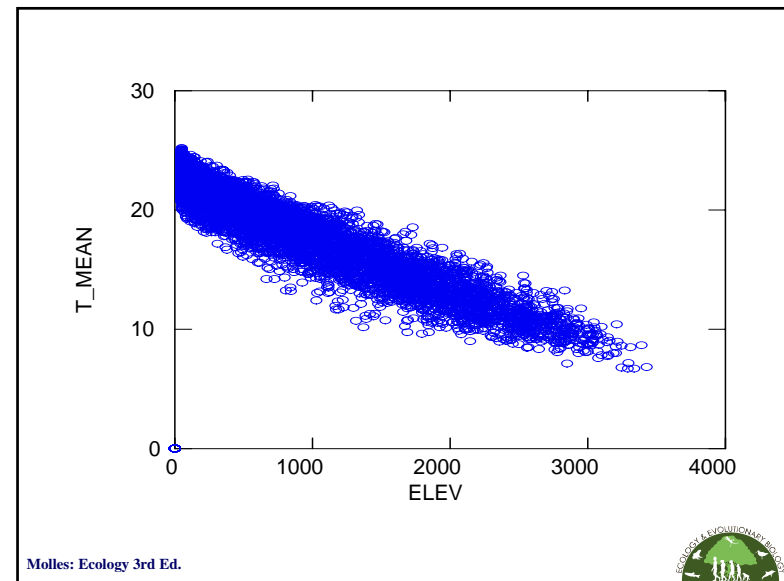
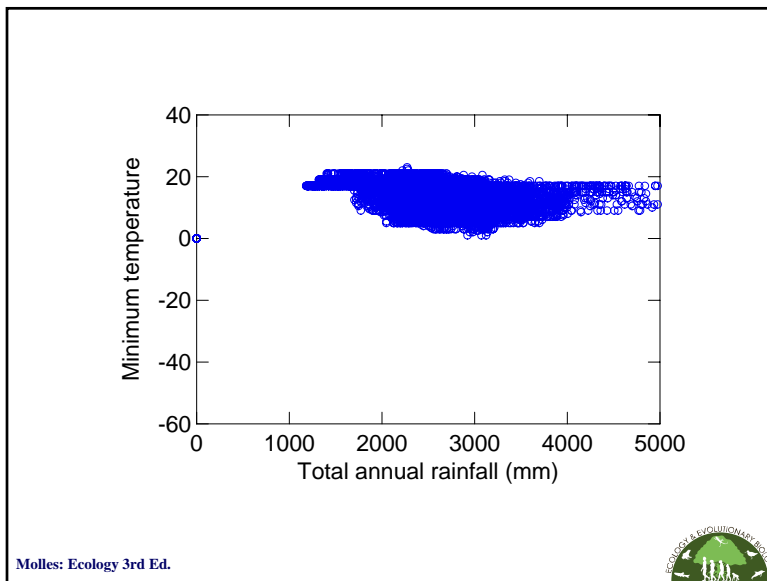
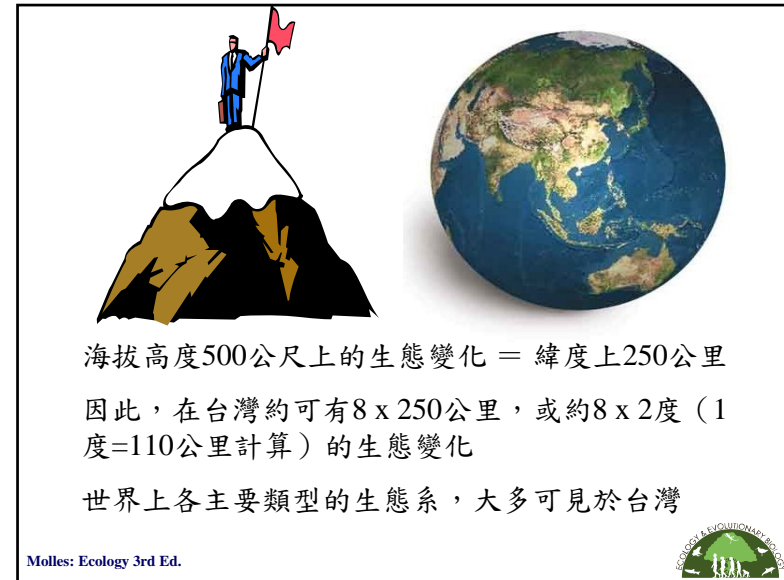
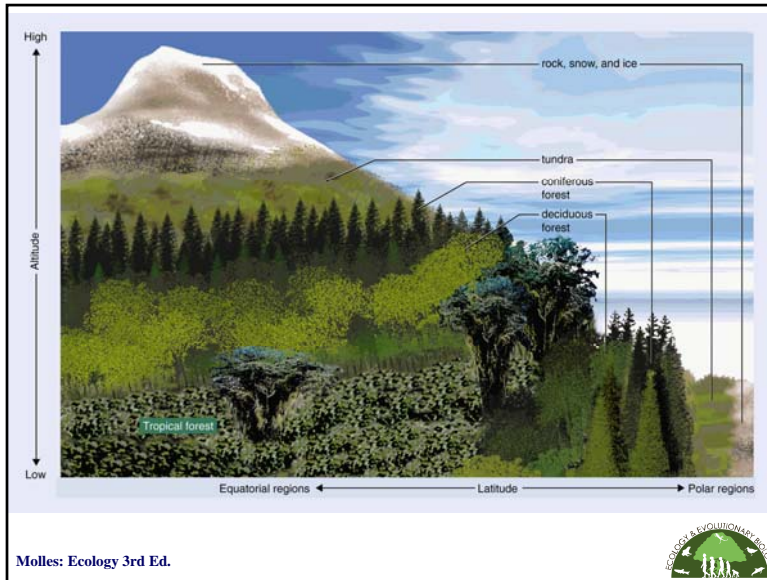
Mountain Geography

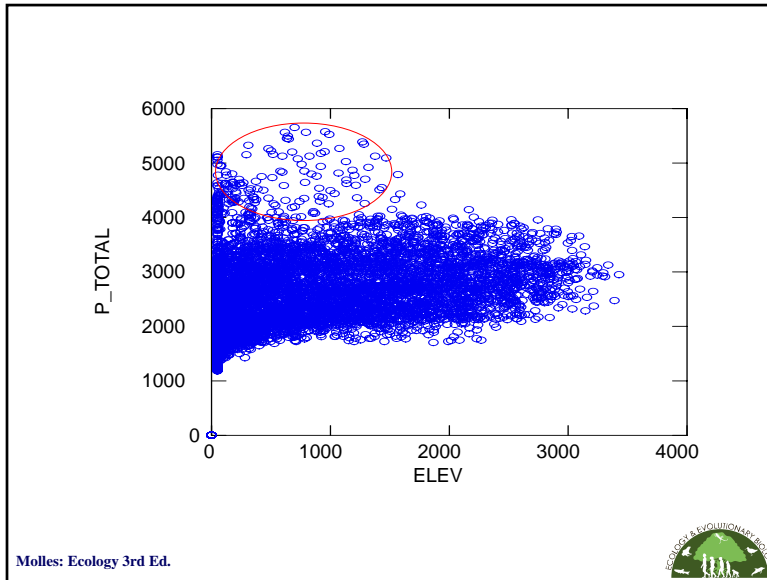


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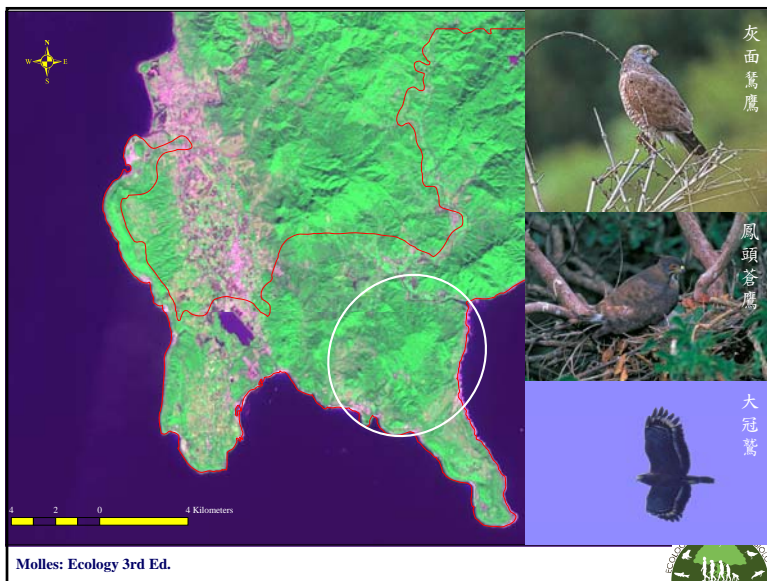




台灣的生態系類型

- 高山寒原
- 針葉林帶
 - ✓ 冷杉林帶
 - ✓ 鐵杉林帶
 - ✓ 檜木林帶
- 闊葉林帶
 - ✓ 亞熱帶
 - ✓ 熱帶
 - ✓ 海岸林

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Summary

- Uneven heating of the earth's surface drives global precipitation patterns
- Distribution of terrestrial biomes corresponds to variation in climate
 - ✓ Temperature
 - ✓ Precipitation

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