Jan 23   Terrestrial Forest Biomes of the World
Biome - large-scale unit of vegetation defined by the physiognomy of dominant, climax vegetation.

Elements of physiognomy:
• growth form (trees, shrubs, herbs);
• function (evergreen, deciduous);
• leaf morphology (needle-leaved, broad-leaved);
• plant spacing (forest, woodland, savanna).
World Wildlife Fund Terrestrial Biomes and Biogeographic Realms of the World

Olson et al. 2001
Climate Controls on Biomes

Chapin et al. 2011. Figs 2.22, 2.23
Is the relationship between biome type and climate correlational or causal?

Chapin et al. 2011. Figs 2.22, 2.23
Climate Controls on Biomes

Biomes are predictable across the globe because climate varies predictably and plant lifeform, leaf type and spacing are all adaptations for coping with climate and related constraints.

Chapin et al. 2011. Fig 2.23
What are the major factors that control global patterns of temperature and precipitation?
Climate is predictable across the globe because of:
• differential heating of the earth’s surface,
• the tilt of the earth,
• the direction of rotation of the earth.
Climate Controls on Biomes: Atmospheric Circulation

Climate is predictable across the globe because of:
• differential heating of the earth’s surface,
• the tilt of the earth,
• the direction of rotation of the earth.

Chapin et al. 2011. Fig 2.6 and 2.7
Climate Controls on Biomes: Atmospheric Circulation

Chapin et al. 2011. Fig 2.8
Climate Controls on Biomes: Landform Effects

Continental scale (Indian subcontinent)
- Summer monsoon rains
- Winter monsoon drought

Local scale (lakeshore or seacoast)
- Day sea breeze (afternoon thunderstorms)
- Night land breeze

Chapin et al. 2011.
Fig 2.13
Climate Controls on Biomes: Landform Effects

Chapin et al. 2011. Fig 2.9

Ascending air cools, releases moisture as rain

Rainshadow area

Descending air is dry and warm
Summary and Review:
What factors explain patterns of precipitation across North America?
Vegetation Effects on Climate

Albedo - (the fraction of the incident shortwave radiation reflected from a surface.

Albedo determines the quantity of solar energy absorbed by the surface, which is subsequently available for transfer to the atmosphere as longwave radiation and turbulent fluxes of sensible and latent heat.

Latent heat flux - heat that evaporates water at the surface is subsequently released to the atmosphere.

Sensible heat flux - an upward transfer of heat that is conducted from the warm surface to the air immediately above it and then moved upward by convection of the atmosphere as thermals.
Vegetation Effects on Climate

Chapin et al. 2011. Fig 2.14
Vegetation Effects on Climate

About 25–40% of the precipitation in the Amazon basin comes from water that is recycled from land by evapotranspiration. (Costa and Foley 1999).
Biomes are predictable across the globe because climate varies predictably and plant lifeform, leaf type and spacing are all adaptations for coping with climate and related constraints.

Chapin et al. 2011. Fig 2.23