FORESTS OF THE WORLD
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Forests of the World: Outcomes

- **Define and describe factors that influence the distribution of forests.**
- **List and describe major forest types of the world.**
  - Location
  - Principal environmental factors (biotic and abiotic)
  - Alternate names
  - Dominant life form and several principal genera
  - Principal strategies that plants use for survival
- **Discuss trends and issues of importance in world forests**

What is a Tree?

- **Woody plant (stems, branches, roots)**
- **Long lived (10's, 100's, even 1000's of years)**
- **Single main axis (stem, trunk, bole)**
- **At least 10-30' tall at maturity (note variability)**
- **Annual diameter growth (woody plants have 3 meristems)**
- **Ability to compartmentalize problems**
- **How many species?**
  - Perhaps 8000-10,000
  - Depends on definition used

How Do Trees Work?

- **Crown**
  - Leaves
  - Branches
  - Food production
- **Trunk**
  - Woody
  - Mostly dead tissue
  - Structure, transportation, storage of food and by-products
- **Roots**
  - Large woody structural
  - Fine, living, absorbing
  - Absorption and storage

How Do Trees Work?

- **Wood**
  - Sapwood (conductive)
    - Young xylem
  - Heartwood (non-conductive, structural)
    - Older xylem
- **Vascular Cambium**
  - Produces new wood and inner bark
- **Bark**
  - Inner bark (conductive)
    - Includes phloem
  - Outer bark (protective)

What is a Forest?

Forest is an ecosystem characterized by:
- **More or less dense and extensive tree cover**
- **Often consisting of multiple stands composed of:**
  - Different species
  - Structure
  - Age classes
  - Associated processes
- **Typically including:**
  - Meadows
  - Streams
  - Fish and wildlife
  - Etc.

Types of forests:
- **Industrial forests**
- **Non-industrial forests**
- **Public forests**
- **Private forests**
- **Protection forests**
- **Urban forests**
- **Parks and wilderness**

Woodlands: forests where trees are small and widely spaced
- **Short boles, small crowns (not touching)**
- **Interspersed with understory (often grass)**
- **Low in productivity**

How Are Forests Classified?

- Leafing Strategy:
  - Broadleaved vs. Needle-leaved
  - Broadleaved vs. Conifer
  - Hardwoods vs. Softwoods
- Seasonality:
  - Deciduous vs. Evergreen
- Climate:
  - Temperature (e.g. boreal, temperate, subtropical, tropical)
  - Moisture (rain forest, monsoon forests, dry forests)
- Geographically:
  - northern, southern, etc.
- Economically:
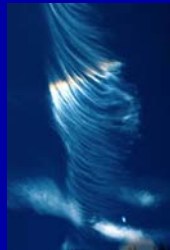 - Dominant species
  - Productivity (cubic feet/acre/year)

Factors that Influence Forests

- **Forests = *f* (climate, soil, topography, biota, time, disturbance)**

- **Forests = *f* (biotic communities and abiotic environment)**
  - **Biotic communities = plants, animals, microbial**
  - **Abiotic environments = atmosphere, soil**
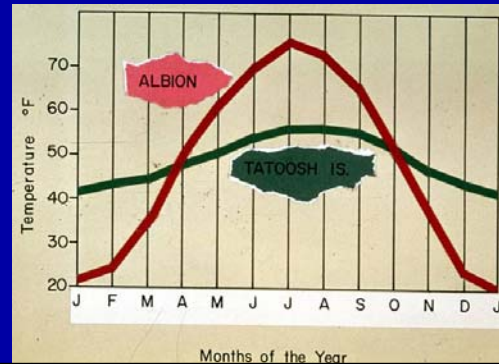
Factors That Influence Forests

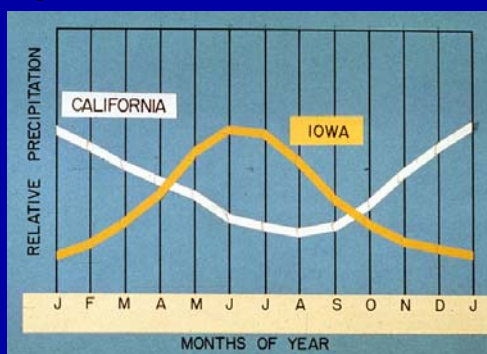**Vegetation = *f* (climate, soil, topography, biota, time, disturbance**

Climate: temperature & moisture
- **Extremes: highest & lowest**
- **Variability: annual, seasonal, daily**
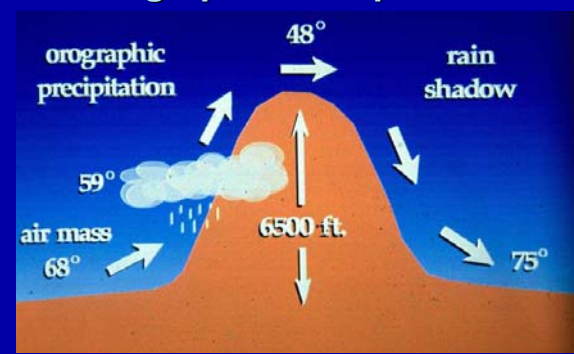- **Form (rain, snow, fog)**

Temperature: Ave. vs. Seasonal

Precipitation: Annual vs. Seasonal

Orographic Precipitation

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Orographic Precipitation

Factors That Influence Forests

Forests = f (climate, soil, topography, biota, time, disturbance)

Soil: (depth is critical)
- **Parent material (mineral, organic)**
- **Weathering agents**
- **Microbial activity**
- **Time**
- **Plant and animal communities**

Factors That Influence Forests

Forests = f (climate, soil, topography, biota, time, disturbance)
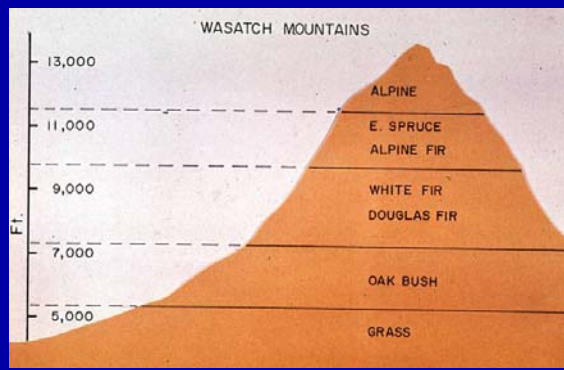
- **Topography (microclimate and soil)**
  - **Slope (steepness)**
  - **Aspect (N, S, E, W)**
  - **Uniformity vs. variability**

Macro-topography

Elevation and Climate

WASATCH MOUNTAINS

- 13,000
- ALPINE
- 11,000
- E. SPRUCE
- ALPINE FIR
- 9,000
- WHITE FIR
- DOUGLAS FIR
- 7,000
- OAK BUSH
- 5,000
- GRASS

Ft.

Elevation and latitude

SNOW & ICE
ALPINE MEADOW
CONIFEROUS FOREST
DECIDUOUS FOREST
TROPICAL FOREST
DECIDUOUS FOREST
CONIFEROUS FOREST
TUNDRA MEADOWS
NORTHERN LATITUDES →
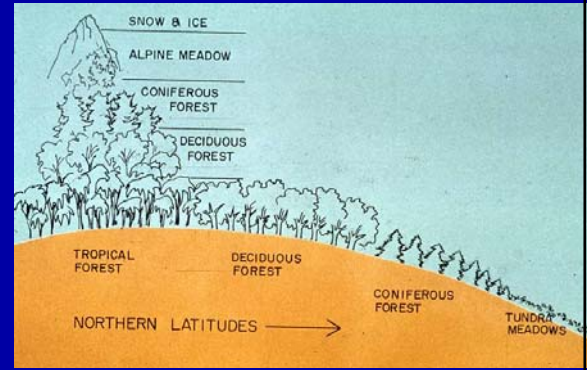
Micro-topography: Salt Flat

Slope, aspect, and soil

Factors That Influence Forests

Forests = *f* (climate, soil, topography, biota, time, disturbance)

- Biota
  - Plant Communities
    - overstory and understory
  - Animal Communities
    - large and small
    - above and below ground
  - Microbial Communities
    - Above and below ground

Factors That Influence Forests

Forests = *f* (climate, soil, topography, biota, time, disturbance)

- Time
  - Time since inception
  - Stability vs. disturbance

Factors That Influence Forests

Forests = *f* (climate, soil, biota topography, time, disturbance)

- Disturbance
  - Type (fire, wind, insects, diseases, flooding, glaciers, human activity, etc.)
  - Severity (stand replacement vs. stand altering)
  - Frequency

Trends in World Forests (2005 FAO)

- Forests occupy ~30% of the earth's land area (4 billion hectares)
  - ~ 5% are plantations; ~ 95% are "natural"
  - BUT "plantation" = planted with non-native species
  - ~35% are "primary" forests (but these are being lost most rapidly)
- ~ half (55%) of the world's forests occur in developed countries and ~ half (45%) in developing countries
- Almost evenly divided by area between tropical / subtropical forests and temperate / boreal forests
- 10 countries hold 2/3 of the world's forests (Australia, Brazil, Canada, China, Democratic Republic of the Congo, India, Indonesia, Peru, Russian Federation, US)

Trends in World Forests (2005 FAO)

- Rate of deforestation:
  - From 1980-1990: net loss of 11-13 million hectares/year
  - From 1990-2000: net loss of 9 million hectares/year
  - From 2000-2005: net loss of 7.5 million hectares per year (forest area the size of Panama—each year).
  - Rates seem to be slowing, but are currently increasing again

- Major areas of deforestation:
  - South America and Africa (~ 4 million hectares/year—each),
  - Oceania and North/Central America (~350,000 hectares/year—each)
  - Europe and Asia are gaining (as is US)

- Major causes of deforestation:
  - Subsistence agriculture in Africa and Asia (to feed their own)
  - Large scale agriculture (often for developed world)
  - Large economic development programs involving resettlement, agriculture, and infrastructure in Latin America and Asia
  - Wood for charcoal, cooking, and heating

- Major causes of increase in forested land area
  - Reforestation of abandoned agricultural lands.

Forests and Global Climate Change

Contribution of Forests
- Traditional values: wood, water, wildlife, recreation, aesthetics/spiritual
- Add to that: medicine, biodiversity, and influence on climate
  - Many of the world's medicines come from forests
  - Much of the world's biological diversity exists in forests
  - Forests store 50% more carbon than there is in the earth's atmosphere—so what happens to them has a great impact on global climate

Forests of the World

- Northern Coniferous Forest
- Temperate Deciduous Forest
- Pinyon-Juniper Forest
- Broad Sclerophyll "Forest"
- Moist Temperate Coniferous Forest
- Montane Forest
- Tropical Deciduous Forest
- Tropical Evergreen Forest
- Tropical Scrub "Forests"