

TEMPERATE FORESTS

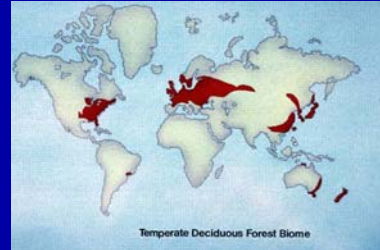
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- Temperate Deciduous Forests
- Moist Temperate Coniferous Forests



TEMPERATE DECIDUOUS FORESTS

- Primarily northern hemisphere (but not exclusively)
 - Bordered on the north by the boreal forest; in other areas by grasslands, semi-deserts, and subtropical forests
 - Profoundly influenced by human activity (farming, wars, anthropogenic fire, timber harvest, urbanization)



Temperate Deciduous Forest: Climate

- Precipitation
 - 30"-60"
 - Evenly distributed seasonally
- Temperature
 - 4 seasons
 - Hot, humid summers (90F) and cold winters (-22F) of reasonably similar lengths
- Growing Season
 - 140-300 days
 - Generally cold limited
- Climate in N. Amer. determined by movements of 3 major air masses



Temperate Deciduous Forests

- Dominated by winter-deciduous broadleaved trees
 - High diversity
 - Conifers often disturbance-related or niche specific (pines, hemlocks)
- Totally different genera in northern and southern hemispheres
 - N: maple, beech, basswood; oak, hickory; yellow-poplar; elm, magnolia, birch, cottonwood, ash, dogwood, locust, walnut
 - S: eucalypts, acacias, southern oaks, southern beeches



Temperate Deciduous Forests

Highly altered by humans—both past and present

- Cleared for:
 - Agriculture
 - Wars
 - Urbanization (and suburbanization)
- Wood for
 - Fuel
 - Construction
 - To fuel the industrial revolution



Temperate Deciduous Forests: Dominant Life Forms



Temperate Deciduous Forests: Productivity and Understories

Productivity high—dense forests and deep canopies
 Species richness high—many species per acre
 Lush understories dominated by spring ephemerals and perennials



Temperate Deciduous Forests: Soils and Nutrient Cycling

- Soils generally deep, dark, and rich
- Most nutrients abundant and held in loose cycles
- Replenished each year by leaf fall and weathering
- Suitable for sustainable forestry and agriculture



Temperate Deciduous Forests in North America

- Occupy the eastern half of the US
 - Prior to formation of Rocky Mountains, spanned N. America
- Account for ¼ of all the commercial forest land in US
 - But not ¼ of the timber volume!



Temperate Deciduous Forests of North America

- Most magnificent and least disturbed in the world (although still highly disturbed)



Temperate Deciduous Forests: Major Forest Regions in North America

- Large, diverse biome with many different forest types (15-20)
- Similar regions in North America, Europe, and Asia
- Australia and New Zealand very different



Temperate Deciduous Forest: Northern Region



- Transition zone between boreal forests to the north and broadleaf dominated forests to the south
- Conifers and broadleaved trees typically grow intermixed, or separately by environmental gradients like moisture or soil type

Temperate Deciduous Forests: Northern Region

- **Principal conifers:**
 - Hemlocks, pines, spruces, firs
- **Principal broadleaves:**
 - Maples, beeches, birches, poplars, cottonwoods, aspens, alders, oaks
- **Most stands mixed (not dominated by a single species)**



Temperate Deciduous Forests: Northern Region

- **From a productivity standpoint, conifers desired over hardwoods**
 - tend to be taller, straighter, and produce more wood per area
- **Heavily harvested in 1700s-1800s**
 - Vital to sailing and ship building industry



Temperate Deciduous Forests: Northern Region

- **Broadleaved stands**
 - typically mixed species
 - often poor growth form
 - modest volume/acre
 - (due in part to past harvesting practices)
- **But VERY aesthetically pleasing**
- **Some are very high value (e.g. black cherry and black walnut)**



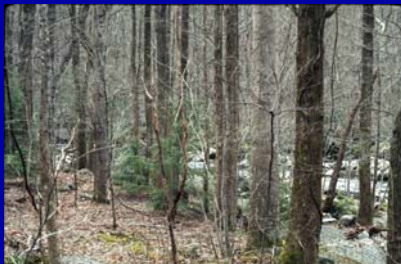
Temperate Deciduous Forests: Central Region

- **Dominated by oaks (50-60 species) and hickories (10-12 species)**
- **Many other species—mostly broadleaved**
- **Many stands mixed, but species differ along environmental gradients**



Temperate Deciduous Forests: Cove Forest

- **Cool moist valleys (coves) dominated by beech, maple, oaks, and yellow-poplar**



Temperate Deciduous Forests: Appalachian Hardwoods

- **Very diverse—often 30-40 species of trees per acre**
- **Commonly managed for high-value hardwoods (like cherry, walnut, yellow-poplar)**



Temperate Deciduous Forests: Yellow-Poplar

- Most (but not all) trees are small
 - due to harvesting practices over time (high grading)



Temperate Deciduous Forests: Riparian Forests

- Riparian = influenced by rivers and streams
- Typically have different species from upland forests
- Often subject to flooding (erosion, deposition)
- Growth rates often high due to constant source of water
- Examples: elms, cottonwoods, sycamores, hackberries, oaks
- Highly influenced by indigenous people



Temperate Deciduous Forests: Transition to Grasslands

- Dry, oak-dominated forests often transition into grasslands (oak savannas)
- Boundaries between forests and grasslands typically determined by climate, grazing, and fire history



Temperate Deciduous Forests: Southern Forests (N.Amer. only)

- Commonly called the "Southern Pine Region" because of commercial importance of pines
- Transition to sub-tropical vegetation
- Broadleaved trees are still generally the climax species—limited by soil, water, fire, and human activity



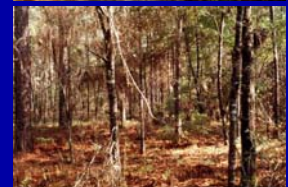
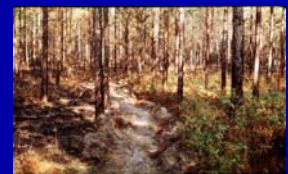
Primary Southern Pines

- 4 primary pines (but 8-10 others):
 - Loblolly
 - Shortleaf
 - Slash
 - Longleaf
- All early successional species maintained by human activity (but occur naturally)
- Many stands planted on abandoned cotton plantations and farm lands



Role of Prescribed Fire

- Integral to pine management
 - Without it, pines would be succeeded by broadleaved trees



Temperate Deciduous Forests: Southern Riparian (N. Amer. Only)

- River valleys, bottomlands, floodplains, and permanent swamps
- Oaks, gums, and baldcypress
- 6% of commercial forest land in US
- Rapidly being lost to agriculture and urbanization
- Baldcypress heavily harvested by Native Americans for canoes



Temperate Deciduous Forest in Europe

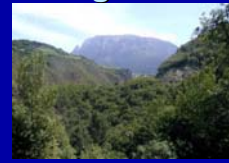
- Similar genera to North America, but different species
- **Highly** influenced by human habitation



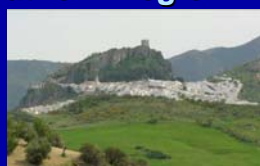
Temperate Deciduous Forests in Europe: Northern Region



Temperate Deciduous Forests of Europe: Central Region



Temperate Deciduous Forests of Europe: Southern Region



Moist Temperate Coniferous Forests

- W. North America, S. Chile, SW New Zealand, and SE Australia
- AKA: Temperate Rain Forest, Moist Temperate Evergreen Forest



Moist Temperate Coniferous Forests



Moist Temperate Coniferous Forests: Maritime Climate

- Cool and humid
 - Heavy maritime influence
- Temperatures
 - Moderate: Summer highs typically <90F; Winter lows typically >32F
 - Low seasonal fluctuation; low daily fluctuation
- Precipitation
 - Very high; typically 70-130" but as high as 400"
 - Mostly rain; often low intensity but long duration
 - Snow is uncommon
 - Summer fog often important, both for precipitation and to reduce losses from evaporation and transpiration
 - Short summer droughts occur in some places
- Growing Season
 - Very long—almost continuous

Moist Temperate Coniferous Forests



Moist Temperate Coniferous Forests: North America

- Total dominance by conifers
- High productivity and biomass accumulation
- Wet, mild winters, and warm, dry summers
- Strong climatic gradients with changes in elevation and longitude
- Disturbance regimes dominated by infrequent, catastrophic events (esp. fire and wind)
- Shaped by fire and ice



Moist Temperate Coniferous Forests

- Splendid for conifers
 - Well-adapted to taking advantage of long growing season
- Conifers dominate broadleaved trees
 - Ratio of 1000:1 (vol.)
 - Much taller and larger in diameter
 - Much longer-lived
 - Exact opposite of temperate deciduous forests



Moist Temperate Coniferous Forests: Advantages of Conifers

- Evergreen conifers
 - Can photosynthesize year-round
- Broadleaved deciduous trees
 - Have to grow during summer drought when moisture is limiting



Moist Temperate Coniferous Forests: Advantages of Conifers

- Massive size and high proportion of sapwood
 - Allows tree to store and re-circulate water
 - Helps sustain photosynthesis even when soil moisture is limiting



Moist Temperate Coniferous Forests: Dense Understories

- High precipitation, fertile soils, and tall open vertical structure foster dense understories



Epiphytes

- Epiphytes depend on trees for structure, but are not parasitic
 - Mosses
 - Lichens
 - Ferns
- Just as important in temperate coniferous forests as tropical rainforests
 - Just not as showy



Large Woody Debris

- Tremendously important to plant and animal communities, and to nutrient cycling
 - Standing, fallen
 - Fresh or hundreds of years old
 - Solid or rotten
 - Influence forests for 100s of years while standing and 100s of years when fallen



What makes these forests unique? Size and age of individual trees

Species	Age years	Diameter inches	Height feet
Sitka spruce	800+	90	250
Douglas-fir	750+	90	265
redwood	1000+	150	330
w. redcedar	1000+	120	200
w. hemlock	400+	50	215

What makes these forests unique? High productivity and volume/acre



Sources of Disturbance



Moist Temperate Coniferous Forests: Redwood Zone

- Unique to North America
- Low elevation and close to coast
 - Fog is critical environmental characteristic
- Very small area (0.2% of US forests by area)



Moist Temperate Coniferous Forests: Redwoods

- World's tallest tree
 - Among largest in dia.
 - Among the oldest
- Tremendous volumes per acre
- Actively logged (and regenerated) AND actively preserved
- Pure stands, but also mixed with tanoak and Douglas-fir



Moist Temperate Coniferous Forests: Mixed Evergreen

- Interior Valleys
- Mixed Conifer—Mixed Evergreen
- Western Hemlock
- Sitka Spruce
- Subalpine



Moist Temperate Coniferous Forest: Mixed Evergreen Forests—SW OR

- Mixed evergreen conifer and hardwood forests
- Highly variable topography, soils, climate, grazing, logging, and fire history
- Two-storied stands
 - Douglas-fir
 - tanoak, chinkapin, madrone, canyon live oak



Mixed Conifers & Mixed Evergreen Broadleaves



Moist Temperate Coniferous Forests: Sitka Spruce

Narrow band from Oregon-Alaska

Low elevation and hugs the coast (fog dependent)

Often mixed with western hemlock, western redcedar Douglas-fir



Moist Temperate Coniferous Forests Sitka Spruce-Western Hemlock

- Large trees in dense stands
- Very high volumes per acre
- Very dense understories
- Rapid recovery from disturbance



Moist Temperate Coniferous Forests: Western Hemlock—Douglas-fir

- Largest forest zone in Temperate Coniferous Forest (in N. America)
- Covers a wide range of environmental conditions
 - Greater temp. fluctuations and pronounced drought than coastal forests



Moist Temperate Coniferous Forests: Western Hemlock—Douglas-fir

- Dominated by pure stands of Douglas-fir or mixed stands of D-F/hemlock
- Hardwoods not common except of disturbed sites and riparian zones
- Understories variable but typically dense
 - Commonly survive disturbance



Moist Temperate Coniferous Forests: Douglas-fir

- Far and away the dominant tree in the Temperate Conifer Forest
- Tremendously important commercially and ecologically
- Widely planted in New Zealand, Europe, etc.
- Once formed vast old-growth systems in PNW
- Now heavily harvested and replanted



NOT Temperate Coniferous Forest

- With increasing elevation, dominant precipitation turns to snow
- Even though some species overlap, this is no longer Temperate Coniferous Forest
 - Dominant species now true firs, Engelmann spruce, and mountain hemlock



Moist Temperate Coniferous Forest: Wildlife



Issues

- Managing for wildlife and wildlife habitat
- Managing on urban fringe and under increasing social pressure
- Managing for timber production (clearcutting and fragmentation)
- Timber harvest on federal lands; increasing volumes
- Managing for late successional and old-growth forests
- Managing for fish and water quality
- Recovery following fire

