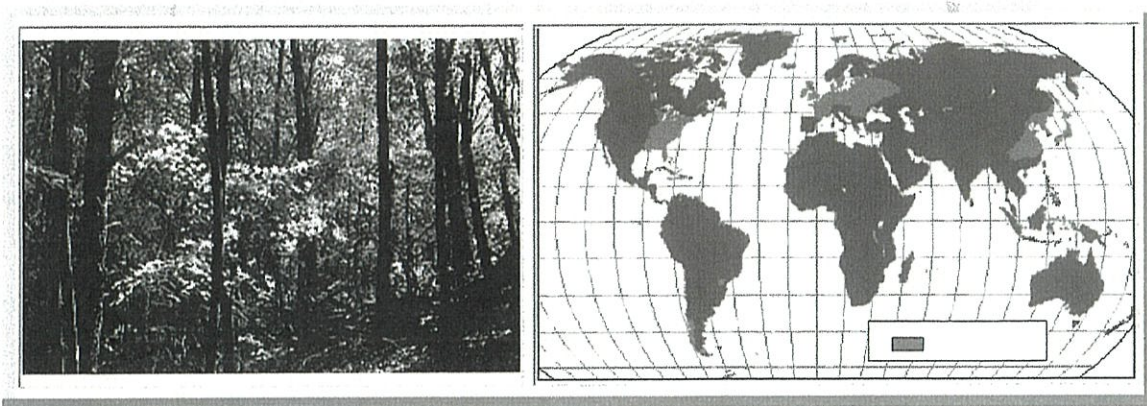


## Temperate Deciduous Forest Worksheet

1. What does deciduous mean? What does this adaptation help the trees do?
2. What is the average temperature of the forest?
3. Name four ways that deciduous trees and plants survive the changing seasons (adaptations).
4. What continents are forests primarily located on?
5. What is the Temperate Broadleaf Deciduous Forest (TBDF) known for?
6. What are the five recognized layers of the TBDF?
7. What develops under the TBDF?
8. Name four ways that bird of the rainforest can eat?
9. Describe the TBFD in Europe.
10. Describe the TBFD in China.
11. Describe the TBFD in North America.

## Temperate Broadleaf Deciduous Forest



**Introduction.** The Temperate Broadleaf Deciduous Forest (TBDF)--especially in eastern North America, where it remains most intact--is known for the turning of the colors of its leaves to brilliant reds, oranges, and golds in autumn. The shortening days of fall stimulate the plants to withdraw chlorophyll from their leaves, allowing a brief but beautiful display of other pigments before the leaves are shed completely and plants enter an extended period of dormancy.

**Climate:** Associated with warmer continental and humid subtropical climates (Dfa, Cfa, and--in Europe, Cfb). There is an approximately 6 month growing season. The 20 to 60 inches of precipitation is distributed evenly throughout the year. The non-growing season is due to temperature-induced drought during the cold winters.

**Vegetation:** Many of the same genera, previously part of an **Arcto-Tertiary Geoflora**, are common to all three of the disjunct northern hemisphere expressions of this biome. Included among these genera are *Quercus* (oak), *Acer* (maple), *Fagus* (beech), *Castanea* (chestnut), *Carya* (hickory), *Ulmus* (elm), *Tilia* (basswood or linden), *Juglans* (walnut), and Liquidamber (sweet gum). Different species of these genera occur on each continent.

**Structure and Growthforms:** Five layers are recognized:

1. a tree stratum, 60 -100 feet high, dominated regionally by various combinations of the genera listed above;
2. a small tree or sapling layer, with not only younger specimens of the tall trees with species limited to this layer such as (in Virginia) Allegheny serviceberry or shadbush, sourwood, dogwood, and redbud;
3. a shrub layer often with members of the heath family such as rhododendron, azaleas, mountain laurel, and huckleberries;
4. an herb layer of perennial forbs that bloom primarily in early spring; and
5. a ground layer of lichens, clubmosses, and true mosses. Lichens and mosses also grow on the trunks of trees.

Lianas such as wild grape, poison ivy, and Virginia creeper climb the trees to flower and fruit high in the forest canopy.

**Soil:** Brown forest soils (**alfisols**, in the American soil taxonomy) develop under the TBDF. Broadleaf trees tend to be nutrient-demanding and their leaves bind the major nutrient bases. Thus the litter under this forest is not as acidic as under needleleaf trees and aluminum and iron are not mobilized from the A horizon. The autumn leaf fall provides for an abundant and rich humus which begins to decay rapidly in spring just as the growing season begins. The humus content gives both A and B horizons a brown color. [Until John Deere's invention of the steel plow in the 1800s and the subsequent ability to break the prairie sod, the alfisols were considered the most fertile, most easily worked, and most easily cleared of northern hemisphere temperate zone soils. Many have been under continuous cultivation since the Neolithic.]

**Ultisols** replace alfisols in the southeastern US, where the older soils of unglaciated regions have been weathered to a much greater degree and are more completely leached than the younger soils to the north. Distinctive red or yellow subsoils have developed under the warmer climate. Ultisols are generally less fertile than alfisols and in the southeast were frequently further degraded under plantation and subsistence agriculture in both the colonial and post-colonial periods.

**Subclimaxes:** On sandy substrates, pines replace broadleaf species. Hence the New Jersey pine barrens, the pineywoods of the Deep South, and the tall (long-needled) pines of Georgia and other areas of the Atlantic Coastal Plain. On waterlogged sites in more northerly latitudes, bogs develop. In the south one finds instead pine savannas and bald cypress swamps.

**Fauna:** Characteristic members of the fauna are either mast-eaters (nut and acorn feeders) or omnivores. Mammals show adaptations to an arboreal life; a few hibernate during the winter months.

- North American herbivores include white-tail deer, gray squirrel, and chipmunk.
- Omnivores include raccoon, opossum, skunk, and black bear.
- Carnivores have been largely eliminated through the deliberate effort of humans but should include timber wolves, mountain lions, and bobcats. The coyote, native to the western grasslands and deserts, has recently dispersed east and taken over the niche of its departed cousin, the timber wolf.

Resident bird species also tend to be seed-eaters or omnivores. Many, like the several species of woodpeckers and the chickadees, are cavity-nesters. The loud, conspicuous blue jay is a major agent in the dispersal of oaks onto abandoned farmland and pastures. Migratory species tend to be insectivorous and include many so-called neotropical migrants, including warblers, wrens, thrushes, tanagers, and hummingbirds.

**Distribution:** The TBDF occurs in three major, disjunct expressions in western and central Europe; eastern Asia, including Korea and Japan; and eastern North America.

- In Europe, a species-poor forest reflects widespread extinctions during the Pleistocene. Oaks, beeches, and elms dominate. Most of the forest was cleared for agriculture, with remnants surviving only in some royal hunting preserves.
- The TBDF of China is known primarily from the fossil record; intensive agriculture has caused this region to be cleared of natural vegetation for at least 4,000 years. Japan has a largely artificial forest, but in the mountains of Korea the forest is more or less intact and fall foliage is reminiscent of New England's.
- Almost all the forests of eastern North America are second growth, but they preserve the world's greatest diversity of TBDF flora and fauna. This is especially true of the unglaciated Appalachian Plateau of eastern Kentucky and Tennessee and western North Carolina and Virginia. The Great Smoky Mountains have been designated a world biosphere reserve to help protect the rich assortment of species.

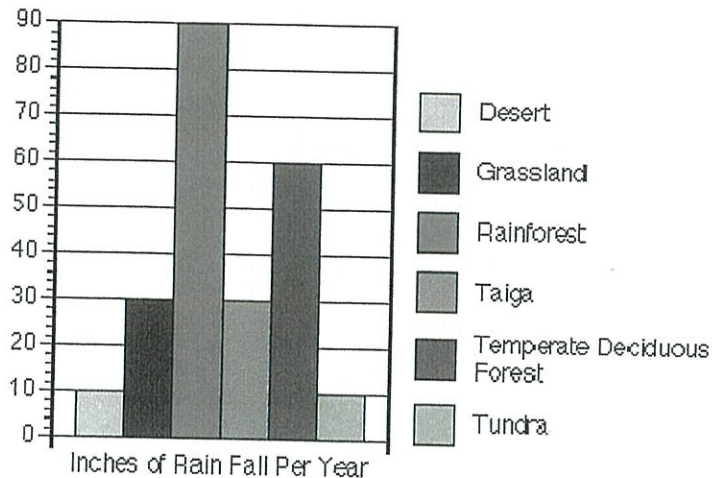
**Southern hemisphere expressions of the biome:** Regions of humid subtropical climate occur in the southern hemisphere, but their vegetation and flora differ from that of the northern hemisphere TBDF biome. An evergreen mixed (needleleaf-broadleaf) forest characterized, in part, by Gondwanan relict gymnosperms and angiosperms occurs instead.

# TEMPERATE DECIDUOUS FOREST

The Temperate Deciduous

Forest biome has four seasons of winter, spring, summer, and fall. Animals and plants have special adaptations to cope with these yearly changes.

## What's A Temperate Deciduous Forest Like?



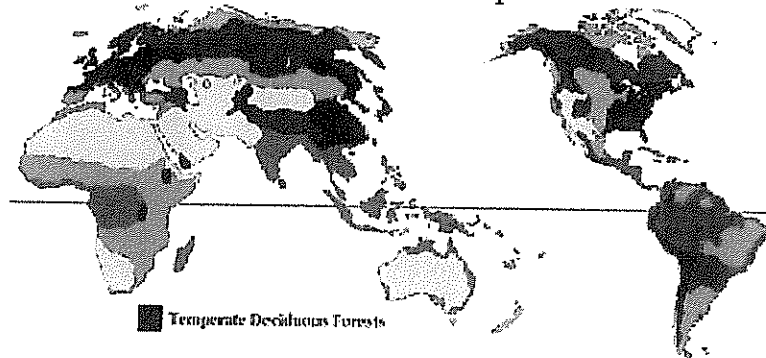
One of the most interesting features of the temperate deciduous forest is its changing seasons. The word "deciduous" means exactly what the leaves on these trees do: change color in autumn, fall off in the winter, and grow back again in the spring. This adaptation helps trees in the forest survive winter. If you look at the graph to the left, you'll see that next to the rainforest, the temperate deciduous gets the second-most amount of rainfall per year. In the winter, precipitation (rainfall) is in the form of sleet, snow, and hail. The average rainfall is 30 to 60 inches per year. The average temperature of the forest is about 50 degrees Fahrenheit.

### How do deciduous trees and plants survive the changing seasons?

Like all living things, deciduous trees and plants have special adaptations to stay alive. Summer is a busy time for deciduous trees. Their broad leaves capture energy from the sun and convert it to food by photosynthesis. Some of the food is used for growth and some is stored in the roots for next spring. During the shorter days and cooler weather of autumn, green chlorophyll in the leaves begins to decompose, revealing brilliant oranges, yellows, and reds. Actually, these colors were present in the leaves all year long, but had been hidden by the green pigment of the chlorophyll. To prepare for winter, deciduous trees and plants become dormant. They lose their leaves and seal the places where leaves were attached with a protective covering called a leaf scar. If they kept their leaves, the water in the leaves would freeze into ice, damaging the leaves and leaving the plant vulnerable to bacteria or fungi. Plants also make a concentrated sugar solution to stop water from freezing in their stems. The longer days and warmer weather of spring signal to the trees to grow new leaves and begin photosynthesis again.

## Where Are They Located?

Looking closely at the biome map below, you'll see that the temperate deciduous forests are located primarily in the eastern half of the United States, Canada, Europe, parts of Russia, China, and Japan.

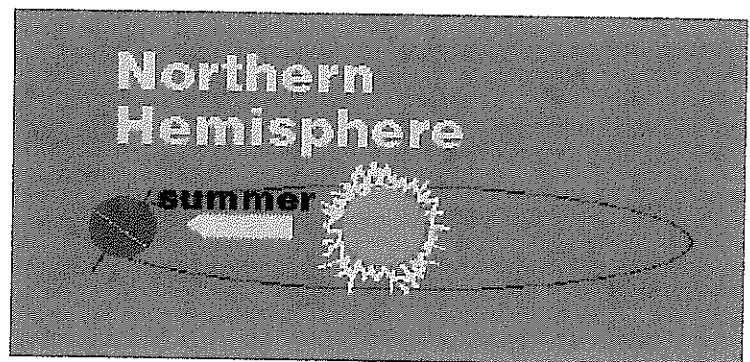
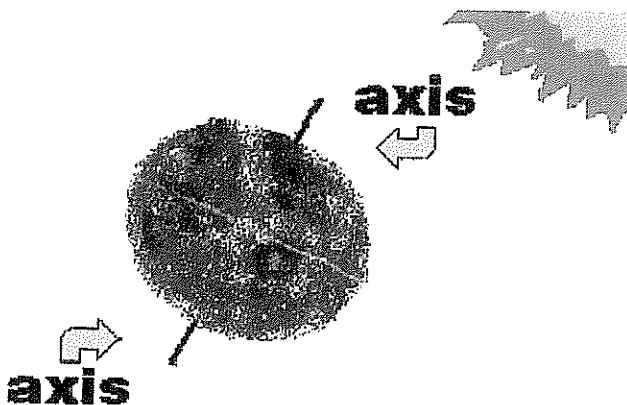


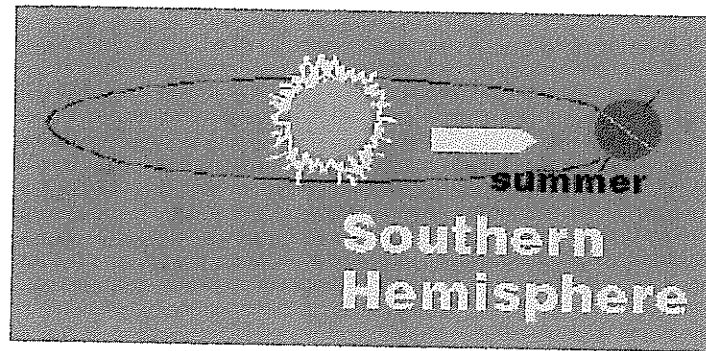
## What Causes the Four Seasons?

The temperate deciduous forest has four changing seasons. These forests have hot summers and cold winters. As the seasons change, so do the colors of the leaves of the deciduous trees. Deciduous means that these plants lose their leaves every year and grow them back.

### Reasons for Seasons

The four seasons happen because of the tilt of the Earth's axis. At different times of the year, the sun's rays hit different parts of the globe more directly. The angle of the Earth's axis tilts the Northern Hemisphere towards the sun during the summer.





Without the tilt of the earth's axis, we wouldn't have seasons. Instead, the areas around the equator would receive the most sun and the northern and southern hemispheres would be stuck in a gradual gradient of hot to cold. The seasons would not change, it would be about the same temperature year round and there would be no seasons.

**Is it true that the earth is closer to the sun in winter?**

Because of its elliptical orbit, the earth is closer to the sun during the northern hemisphere's winter. However, distance from the sun does **not** affect the seasons. The tilt of the earth's axis causes the seasons to change.

**What Color Are Leaves in The Fall?**

Black walnut and butternut	Drop leaves before they turn
Locust	Stays green until leaves drop
Ash	Plum purple
Red maple, dogwood, sassafras, and scarlet oak	Dark red
Sugar maple and sumac	Flame red and orange
Oak, beech, larch, elm, hickory, and sycamore	Tan or brown
Poplar, birch, tulip tree, willow	Yellow
See our <a href="#">leaf scrapbook</a> for real life examples.	

<http://www.mbgnet.net/sets/temp/index.htm>

