

TITLE: Trees of North America: The Gymnosperms--Part II
AUTHOR: Edward C. Jensen, Dendrologist, Dept. of Forest Management
PRODUCER: Forestry Media Center, Oregon State University, Corvallis, OR 97331
DATE: June 20, 1986
SLIDES: 79
TIME: 30 minutes

OPERATING INSTRUCTIONS: Begin this program with slide "1" on the screen and the tape advanced through the clear leader.

The following slides are in vertical format and should be checked to see that they're properly oriented in the tray: 6, 12, 15, 16, 19, 20, 27.

NOTE: Genera within the following families are included in this slide-tape: Redwood--Taxodiaceae; Cypress--Cupressaceae; and Yew--Taxaceae.

SLIDE 1: series title

This slide-tape continues our look at the principal or distinctive gymnosperms native to North America, focusing on the redwoods, cypresses, and yews. As in the first part of the program, we'll emphasize characteristics of each genus, but we'll illustrate these characteristics by showing individual species.

SLIDE 2: family title

The redwood family, Taxodiaceae was once widely distributed throughout the world, but now consists of approximately 10 genera, all limited to small, specific ranges. Only three of these genera--sequoia, giant sequoia, and baldcypress--are native to North America. Other genera include the Chinese firs, Japanese umbrella pines, Tasmanian cedars, Japanese red cedars, Chinese swamp cypresses, and the Taiwanias.

SLIDE 3: dead branchlets (*S. sempervirens*)

Although some members of this family are deciduous while others are evergreen, all shed their branchlets intact, with leaves still connected to the twigs--a fact that greatly aids in identification to the family level.

SLIDE 4: genus title

The first member of the redwood family we'll consider is sequoia, although many people refer to it as redwood, as well. Regardless of which common name is used, the scientific name is *Sequoia*--in commemoration of the American Indian who invented the Cherokee alphabet.

SLIDE 5: map--distribution of principal species in North America

Although once widely scattered throughout the forests of the Northern Hemisphere, the genus now consists of a single species--redwood, (*Sequoia sempervirens*)--that occupies the coastal fog belt from southern Oregon to central California.

SLIDE 6: tree (*S. sempervirens*)

Redwood is best known for its size--its massive trees often exceed 250 feet in height and 10 feet in diameter. In fact, the world-record holder is 370 feet tall and 21 feet in diameter. Redwoods are also capable of exceedingly old ages, often surpassing 1000 years.

Slide 7: grove of trees (*S. sempervirens*)

Redwoods grow in massive, tight-clustered groves that are the highest timber-producing stands in the world, often averaging yields of 150,000 board feet per acre. In fact, a single tree was reportedly once sawn into 480,000 board feet of lumber, enough to build 44 average American homes!

SLIDE 8: leaves (*S. sempervirens*)

Typical redwood leaves are single, linear, and spirally arranged, but they appear 2-ranked. They're about 1 inch long, and are stiff, pointed, and yellow-green on top with two bands of whitish bloom below. Besides these typical leaves, leaves on the tips of leaders and on fertile branchlets are more scale-like, and are only about 1/2 inch long--but you may have to look at a lot of redwoods before seeing this type.

SLIDE 9: cones (*S. sempervirens*)

Mature cones are egg shaped, and are composed of 15 to 20 reddish brown, thick, wrinkled scales. The seeds themselves are only about 1/8 inch long and have narrow lateral wings. Although redwood produces large numbers of seeds and cones each year, many of the seeds are unfilled or are defective, resulting in low germination rates.

SLIDE 10: bark (*S. sempervirens*)

The bark of mature redwoods is also distinctive. It's reddish brown to cinnamon in color, deeply furrowed, and 4-12 inches thick, which helps protect the trees from fire, their chief enemy.

SLIDE 11: tree (*S. sempervirens*)/list

The wood of redwood is soft, but it's extremely durable to the weather and resistant to attack from insects and decay, which makes it prized for such things as house siding and outdoor decking. The large burls that grow on the sides of many trees are converted to beautiful veneers and turned into novelties such as figurines, trays, and candle sticks.

SLIDE 12: stand of trees (*S. sempervirens*)

Because of their majesty and limited range, controversy has long surrounded the harvesting of coast redwoods. Despite, or perhaps because of the fact that redwood stands account for less than 1/500th of the commercial forest land in the United States, they've been a focus of the conservation movement throughout the world. Much of the land dominated by redwood groves is now protected by California State Parks and the United States National Park system.

SLIDE 13: genus title

The second member of the redwood family is giant sequoia, *Sequoiadendron*, which until a few years ago was grouped with coast redwood in the *Sequoia* genus.

SLIDE 14: map--distribution of principal species in North America

Giant sequoia, *Sequoiadendron giganteum*, is the only member of this genus, and has a very small range, limited to scattered groves in the Sierra Nevada mountains of central and southern California.

SLIDE 15: tree (*S. giganteum*)

Like the coast redwood, giant sequoia is noted for its immense size, although its girth is more astonishing than its height. It's not unusual for old-growth trees to be 250 to 275 feet tall and reach 25 to 30 feet in diameter at their base. Their branches are also immense, some reaching 6 to 7 feet in diameter.

SLIDE 16: tree (*S. giganteum*)

Individual members of the giant sequoias are extremely old, with ages of 2000-4000 years being common. In fact, among trees giant sequoias are exceeded in age only by bristlecone pines.

SLIDE 17: awl-like leaves (*S. giganteum*)

Giant sequoia leaves are single, spirally arranged and awl-like in shape. They vary in length from 1/4 to 1/2 inch, with the longer needles occurring on the most rapidly growing branches. On branches bearing cones, the needles may be shorter and more scale-like. All needles turn brown at the end of two or three growing seasons, but they persist on the tree for several years before dropping, an entire spray at a time.

SLIDE 18: cones with seeds (*S. giganteum*)

The cones of giant sequoia are similar to those of redwood--only larger. They're composed of 25 to 40 wedge-shaped scales with thick, wrinkled tips. The seeds are small and have narrow lateral wings, so they're poor flyers. As a result, squirrels and other seed gatherers are responsible for much of the sequoia reproduction that occurs any distance from the parent tree.

SLIDE 19: bark (*S. giganteum*)

The bark of giant sequoia is very thick--generally 1 to 2 feet--fibrous, and deeply fissured. Although it's soft enough to be easily indented by a human hand, it's tough and fire resistant, protecting the trees from their primary enemy.

SLIDE 20: tree (*S. giganteum*)/list

Although the wood of giant sequoia is extremely durable and would be useful for some lumber products, its limited range and vast aesthetic appeal combine to prohibit logging within its native range. In fact, the species has such a place in American history that many individual trees have their own names. In recognition of its growth rate and structural properties, however, giant sequoia is currently being tested throughout the world for commercial production.

SLIDE 21: genus title

The third, and final, North American member of the redwood family is bald cypress, *Taxodium*.

SLIDE 22: map--worldwide distribution of genus

Members of this genus were once widely distributed throughout the prehistoric forests of Europe and North America, but now only two or three species remain, all in Central America, Mexico, and the southern United States. Of these, the principal species is *Taxodium distichum*, which goes by the generic name bald cypress.

SLIDE 23: cypress swamp (*T. distichum*)

Perhaps the most distinguishing characteristic of bald cypress is where it grows. Although it does best on rich, moist, well-drained soils, it's most often found on flooded bottomlands and swamps, presumably forced there by an inability to compete for better sites. Regardless of the reasons, it's one of the few species able to tolerate and thrive in permanently wet conditions.

SLIDE 24: fluted trunk (*T. distichum*)

The swollen, fluted trunks of bald cypress are also good identifying characteristics. As well as contributing to windfirmness in permanently saturated soils, these flutes also contribute to the huge circumferences recorded for baldcypress--as much as 115 feet in some trees!

SLIDE 25: leaves (*T. distichum*)

Bald cypress leaves are primarily single, linear, and spirally arranged, although they appear 2-ranked. They're about 1/2 to 3/4 of an inch long, pointed, and yellow-green. Importantly, the small lateral branches, along with their entire complement of needles, are deciduous in winter.

SLIDE 26: cones (*T. distichum*)

Bald cypress cones are like small golf-balls, about 1 inch in diameter. Their scales are short, thick, tough, and have wrinkled surfaces. Usually they disintegrate at maturity. Their seeds are relatively large, unwinged, and irregularly shaped.

SLIDE 27: cypress with knees (*T. distichum*)

Although bald cypress wood is extremely durable in use, its limited range makes it relatively unimportant commercially. However the unique "knees" growing from the roots are often harvested and converted into novelties like lamp bases or candlesticks.

SLIDE 28: family title

The cypress family, Cupressaceae, consists of about 19 genera and 130 species scattered throughout the world. Five genera are native to North America: cypress, *Cupressus*; incense-cedar, *Calocedrus*; arborvitae, *Thuja*; white-cedar, *Chamaecyparis*; and juniper, *Juniperus*. Most members have short, scale-like or awl-like foliage that makes accurate identification a challenge.

SLIDE 29: genus title

Let's first consider the cypress genus, *Cupressus*, for which the family is named.

SLIDE 30: map--worldwide distribution of genus

Cupressus is a small genus of about 15 species of trees and shrubs growing in North America, the Mediterranean basin, and the Far East. Six are native to North America, but none are important commercially.

SLIDE 31: leaves (*Cupressus* spp.)

Cypress leaves are persistent, scale-like or awl-like, and occur in pairs. They have finely serrated margins and often have glands and resin-dots on their back sides, which help separate them from the false cedars.

SLIDE 32: cones (*Cupressus* spp.)

The cones are round with thickened scales, each with a pointed knob in the center. They take two years to develop but remain firmly attached to the tree for many years, another fact that helps distinguish them from the false cedars. The seeds are small, numerous, and have narrow, hard, irregularly shaped wings.

SLIDE 33: tree along beach (*C. macrocarpa*)

None of the North American cypresses are important for their wood, but some are important for watershed protection. One, Monterey cypress, is especially known for the beautiful, twisted shapes it assumes along the wind-swept California coast.

SLIDE 34: genus title

Incense-cedar, the next genus in Cupressaceae, is currently in flux, taxonomically speaking. For many years all incense-cedars were lumped together in the genus *Libocedrus*. However, recent evidence has caused many taxonomists to split the genus in two, with the incense-cedars of the Southern Hemisphere called *Libocedrus*, and those of the Northern Hemisphere called *Calocedrus*. Notice that the common name is hyphenated indicating that members of this genus are not closely related to the true cedars of the pine family.

SLIDE 35: map--distribution of principal species in North America

Only one member of the genus is native to North America--*Calocedrus decurrens*. It goes by the generic name, incense-cedar, and grows in the mountains of southern Oregon and California. The other two members of the genus are native to China.

SLIDE 36: closed cone on tree/open cone with seeds (both *C. decurrens*)

Cones are the distinctive feature of the incense-cedars. Mature cones are about 1 inch long, hang down, and are leathery. They're composed of 6 valve-like scales, but only three are easily seen. When open, they give the appearance of a duck's bill or a flying goose. The seeds are about 1/2 inch long and have a long, thin wing, well-adapted to long distance wind dispersal.

SLIDE 37: spray/close-up of leaves (both *C. decurrens*)

The leaves of incense-cedars are scale-like, held tightly to the twigs, occur in sets of four and are arranged in elongated sprays. They're yellow green, generally lack stomatal bloom, and are aromatic when crushed. Each leaf is much longer than it is wide, and sets of four leaves often take the shape of a wine goblet, making incense-cedars easy to distinguish from other false cedars.

SLIDE 38: young bark/old bark (both *C. decurrens*)

The bark of mature individuals is 3 to 8 inches thick, yellowish brown to cinnamon in color, fibrous, and deeply but irregularly furrowed. Young bark is often scaly.

SLIDE 39: tree (*C. decurrens*)/pencil

The most important product of incense-cedar is wooden pencil slats. Nearly three-fourths of the world's wooden pencils come from a few counties in southern Oregon and northern California. Because the wood is durable and easily worked it has a number of potential uses; unfortunately, a naturally occurring pocket rot limits its commercial value.

SLIDE 40: genus title

The next member of the cypress family is arborvitae or thuja, whose scientific name is also *Thuja*. Most members of the genus have the word "cedar" in their common names although they're not related to the true cedars of the pine family and, in fact, bear little resemblance to them.

SLIDE 41: map--worldwide distribution of genus

Thuja is a small genus of five or six species native to the Far East and both coasts of North America. Only two species are native to North America, one on each coast.

SLIDE 42: foliage (*Thuja* spp.)

The leaves of the various *thujas* are persistent and are borne in flattened sprays.

SLIDE 43: leaves--underside/topside (both *T. plicata*)

Individual leaves are small, scale-like, and occur in sets of four. They tend to be yellow-green and have distinctively shaped stomatal patterns on their lower surfaces, which can often be used to separate the genus into individual species.

SLIDE 44: cones (*T. plicata*)

The cones of *thujas* are small, erect, and cylindrical, with leathery, valve-like scales. The seeds are small and have narrow, gauzy wings, well adapted to wind dispersal.

SLIDE 45: bark (*T. plicata*)

Their bark is generally thin, reddish brown, and stringy--and on mature trees it forms a network of interlacing ridges and furrows. Native populations found many uses for the bark of *thujas*: from clothing, to woven ropes, to water-tight baskets.

SLIDE 46: map--distribution of principal species in North America

Two *thujas* are native to North America: northern white-cedar, *Thuja occidentalis*, which grows primarily in the northeastern United States and southeastern Canada, and western red cedar, *Thuja plicata*, which grows along the west coast and in the Inland Empire of the Rocky Mountains.

SLIDE 47: tree (*T. plicata*)/list

Western red cedar is the only *thuja* valued for lumber. Because its heartwood is so resistant to insects and decay, it's used primarily for house siding, shingles and shakes--and for posts and other outdoor lumber that will not be treated with preservatives. In addition, all *thujas* are cultivated for ornamentals, especially for hedges.

SLIDE 48: genus title

The next member of the cypress family is white-cedar or false-cypress, *Chamaecyparis*. Notice that both common names are hyphenated, indicating that members of *Chamaecyparis* are neither cedars nor cypresses, although some authorities do place them in *Cupressus*, the cypress genus.

SLIDE 49: map--worldwide distribution of genus

There are six species of *Chamaecyparis*, growing along both coasts of North America and in Japan and Taiwan.

SLIDE 50: spray of foliage (*C. lawsoniana*)

The leaves of the white-cedars resemble those of the *thujas*. They're persistent, scale-like, and arranged in flattened sprays.

SLIDE 51: leaves (top/bottom) (both *c. lawsoniana*)

They're also decussate (meaning arranged in alternating pairs), and often have characteristic patterns of stomatal bloom on their undersides.

SLIDE 52: cones (*C. lawsoniana*)

The cones more closely resemble those of the cypresses than the thujas, however. They're small, round, and leathery with thick, wrinkled scales. Their seeds are small and laterally winged, but are not particularly good flyers. As a result, most seedlings are found close to the parent tree.

SLIDE 53: tree (*C. lawsoniana*)/list

White-cedars are seldom numerous enough to be important commercially, but their wood is light-colored, straight grained, and easily worked, so that it's highly prized where it's available. Hundreds of cultivars of white-cedars grow in a wide variety of shapes and under a wide variety of conditions, making the genus very important for ornamental purposes.

SLIDE 54: map--distribution of principal species in North America

Two species are native to the west coast of North America and have some value commercially, Port-Orford-cedar (*Chamaecyparis lawsoniana*) whose range is limited to the coast of southern Oregon and northern California and Alaska-cedar (*Chamaecyparis nootkatensis*), which occupies cool, moist sites from Alaska to the mountains of central Oregon. A third species, Atlantic white-cedar (*Chamaecyparis thyoides*) inhabits swamps and bogs along the Atlantic and Gulf Coastal plains, but has little commercial value.

SLIDE 55: genus title

The final member of the cypress family native to North America is juniper, *Juniperus*.

SLIDE 56: map--worldwide distribution of genus

Juniperus is one of the most widely distributed genera in the world, with 50 to 70 species of trees and shrubs scattered throughout the Northern Hemisphere. They're capable of occupying nearly any site--from the steamy tropics, to parched deserts, to the freezing Arctic. About a dozen species are native to North America.

SLIDE 57: cones (*J. occidentalis*)

Small, round, berry-like cones are the most distinctive characteristic of junipers. Most often they're blue but they may also be red, copper, or brown; in all but a few species they're covered with a white, waxy bloom. Although they look more like berries than cones, if you look closely you can still see the cone scales, just like those of other members of the cypress family.

SLIDE 58: group of cones (*J. monosperma*)

Because they look so much like berries, the cones are readily eaten by birds, which then play a major role in distributing the seeds. Depending on species, the cones take from 1 to 3 years to mature. Since male and female flowers are borne on separate trees, it's not uncommon to find a plant covered with cones next to one that has none.

SLIDE 59: foliage (*J. communis*, *J. occidentalis*)

Juniper foliage is persistent, and occurs either in opposite pairs or in whorls of three. Young growth is commonly needle- or awl-like; mature foliage may be either of these, scale-like, or a combination of all three, depending on the species.

SLIDE 60: bark (*J. occidentalis*)

The bark of junipers is thin, stringy or flaky, fibrous, and reddish brown.

SLIDE 61: tree (*J. occidentalis*)/list

Because junipers are small, shrubby trees they often find use locally as fence posts and firewood. More importantly, however, they're invaluable for protecting watersheds in the harsh environments where they grow. Because of its colorful grain and distinctive aroma, the wood of many species is used for novelties and linings for chests and closets. In fact, most "cedar" chests are actually made of a juniper commonly called eastern red cedar. Oils from the wood, leaves and berries are used in perfumes, medicines, and for flavoring gin. The trees are used widely for landscaping, especially in droughty climates.

SLIDE 62: map--distribution of principal species in North America

Although it doesn't have the widest distribution, eastern red cedar, *Juniperus virginiana*, is far-and-away the most common juniper in North America, occurring abundantly throughout the eastern half of the United States. The shrub-like common juniper, *Juniperus communis*, is one of the world's most widely distributed woody plants, growing at high elevations and high latitudes throughout the continent and across the Northern Hemisphere. In the arid western half of the continent roughly 10 species of juniper combine with the pinyon pines to form the pinyon-juniper woodlands that dominate much of the landscape.

SLIDE 63: family title

The final gymnosperm family with members native to North America is yew, Taxaceae. Yew is a small family of 5 genera and 20 species scattered throughout the Northern Hemisphere. Only two genera, yew and torreyia, are native to North America.

SLIDE 64: genus title

First we'll look at yew, *Taxus*.

SLIDE 65: map--distribution of principal species in North America

Yew is a small, widely distributed genus of eight species of trees and shrubs that inhabit North America, Europe, the Middle East, and much of the Far East. None of the species are commercially important for timber, but several are widely planted as ornamentals.

SLIDE 66: aril (*T. baccata*)

The fruit of yew is unique. Although yews are commonly called conifers because of their foliage, their fruit isn't a cone at all, but a red, fleshy cherry-like body called an aril. It's important to note that the seed is highly poisonous to humans, but that birds are unaffected by it and play a major role in spreading the plant. Yews bear male and female flowers on separate plants, making wind pollination a chancy event.

SLIDE 67: leaves: upper and lower surfaces (*T. brevifolia*)

The leaves of yews are single, linear, and spirally arranged, although they often appear 2-ranked. They come to a distinct but soft point, and have tightly revolute margins. There is no stomatal bloom on either surface. Notice that the young twigs are bright green, a feature not common in other conifers.

SLIDE 68: tree (*T. brevifolia*)

Yews are generally small, shrubby trees with little commercial value. Their wood, however, is hard and elastic, making it suitable for specialized items like archery bows and canoe paddles. Yews also find great use ornamentally, especially in hedges.

SLIDE 69: map--distribution of principal species in North America

Only two yews are native to North America: Pacific yew, *Taxus brevifolia*, which grows along the Pacific Coast from San Francisco to the Alaska panhandle, and Florida yew, *Taxus floridana*, which occupies a limited range in the Florida panhandle.

SLIDE 70: genus title

The other member of the yew family native to North America is torreyia, sometimes referred to as nutmeg, stinking-cedar, or stinking yew. It's neither a nutmeg nor a cedar, but the adjective "stinking" is a good one because of the fetid odor of its crushed needles. The scientific name of the genus is *Torreya*.

SLIDE 71: map--worldwide distribution of genus

This is a small genus--six species of trees and shrubs in North America, China, and Japan. Only two species are found in North America, and neither is of commercial importance.

SLIDE 72: map--distribution of principal species in North America

California torreyia, *Torreya californica*, commonly called California nutmeg, is found in moist mountain canyons of central California. Florida torreyia, *Torreya taxifolia*, commonly called stinking-cedar, has a range limited to moist, wooded ravines in a small section of northwestern Florida and southwestern Georgia.

SLIDE 73: trees (*T. californica*)

Both North American species are small, seldom surpassing 50 feet tall. When grown in the open they have a wide pyramidal crown formed by slender, drooping branches.

SLIDE 74: needles (*T. californica*)

Torreya needles are similar to those of the yews. They're largely 2-ranked and are dark green on the upper surface...

SLIDE 75: needles close-up (*T. californica*)

...but torreya needles have two lines of stomatal bloom on their underside, while yews have none; and torreya needles are very sharply pointed.

SLIDE 76: fruit (*T. californica*)

Torreya fruits are similar to the arils of yews, but are much larger and are totally surrounded by a thin, fleshy covering, much like an olive, while yew fruits are open at the bottom. Also, torreya fruits are yellow-green at maturity while the arils of yews are bright red.

SLIDE 77: conifer forest (*Pseudotsuga menziesii*)

That completes our look at the principal gymnosperms native to North America. Keep in mind that although we've looked at many important genera, there are another 50 or so native to other continents that we haven't even considered--some of which are just as important locally as the pines or Douglas-firs are to us.

SLIDE 78: Production Team Credit (no narration)

Dendrologist: Edward C. Jensen

Media Specialist: Dale Conley

Artist: Don Poole

SLIDE 79: FMC Credit (no narration)

(c) 1986 by the Forestry Media Center, Oregon State University. All rights reserved.

i :

("""I'