



Common Gymnosperms on the Campus of Saint John's University

Introduction

The gymnosperms are a diverse assemblage of plants that are characterized by producing 'naked seeds' (*gymno* = naked, *sperm* = seed; Greek). In other words, the ovules are not produced inside an ovary or fruit as in the flowering plants, but rather, they are borne on the surface of a modified leaf or cone scale. Another feature common to the gymnosperms is that they lack vessels (water transport cell) in their wood. Tracheids are the only water-transporting cells in these plants. There are four families of gymnosperms represented in our flora – Pinaceae, Ginkgoaceae, Taxaceae, and Cupressaceae.

Ginkgoaceae – *Ginkgo* family

This family is represented by a single species, *Ginkgo biloba* (Maidenhair tree). The common name is derived from the fan-shaped leaves, which are reminiscent of those of the maidenhair fern (*Adiantum pedatum*). The leaves are dichotomously veined and borne in clusters on short spur shoots.

Ginkgo is commonly cultivated in many temperate areas; in fact, the tree is rare outside cultivation. Because only small, isolated populations exist in China, its ancestral home, ginkgo is mistakenly believed to be extinct in the wild. Ginkgo is tolerant of pollution, drought and cold temperatures (to -30 C) and hence, makes an excellent street tree in cities. Ginkgo is a good example of a "living fossil." Extant specimens are identical to fossils from the Jurassic period, which is probably when it was at its peak.

Ginkgo was long cultivated in Chinese temple gardens (at least as early as 1100) and was introduced to Europe in 1730 and then brought to this country in 1784. The actual name was a typographical error in translating the Chinese characters – it should actually be called the ginkyo. The error was initially made in 1712 by Kaempfer and then formalized by Linnaeus in 1771. The trees

are dioecious. The female produces seeds that are edible, though the coat has a terrible odor, like rancid butter (butyrate).

Taxaceae – *Yew* Family

This family is represented by only one native species in Minnesota, Canada yew (*Taxus canadensis*) that grows in cool, moist, wooded areas. However, other species are commonly cultivated. Yews are small trees and shrubs with evergreen leaves that are attached singly to the stem. The leaves are 2-ranked and have pale green bands or alternating bands of white and green on their underside. The plants are dioecious. The seeds are enveloped by a red fleshy aril (outgrowth of the seed coat). Most all parts of the plant are extremely poisonous! Yew is currently being evaluated as a potential source of chemicals to treat breast cancer. Taxol is isolated from the bark.

Pinaceae – *Pine* Family

The pines are shrubs or trees that produce leaves in groups or fascicles. The female reproductive structures are cones with numerous scales each bearing two ovules at the base. The ovules develop into winged seeds that are dispersed when the cone scales separate at maturity. Each scale is subtended by bracts that are normally shorter than the scales

Plants in this family exhibit a variety of adaptations for survival in cold, dry conditions including waxy leaves, sunken stomata, and evergreen leaves. These adaptations minimize water loss which is a problem during winter (or dry summer season). Also, evergreen leaves allow for ready photosynthesis whenever the weather becomes reasonable. These plants are primarily wind pollinated. Minnesota species include:

1. Pines (*Pinus*). The leaves (needles) are produced in groups (fascicles), the cones have woody scales that don't disintegrate (are persistent). The cones are usually not produced at the end of the branches, but rather are

sub-terminal. Common species include:

- *Pinus banksiana* (Jack pine) – needles two in a bundle, flared into a “V”, cones open when exposed to fire, point toward tip of shoot
- *Pinus strobus* (White pine) – soft pine, needles in bundles of five
- *Pinus resinosa* (Red or Norway pine) – needles in fascicles of two, bark reddish, needles long, break with a ‘snap,’ state tree of Minnesota
- *Pinus nigra* (Austrian pine) – this species is very similar to Red pine except that Austrian pine needles don't break with a snap, the buds are usually white, and the bark is darker-colored
- *Pinus sylvestris* (Scot's pine) – needles in bundles of two, bark orange, “Swayed Pines” in front of the St. John's football stadium. Most common pine used for Christmas trees.
- Mugho pine (*Pinus mugo*) – shrubby pine, native to mountains of Europe. Used as a landscape planting.

2. Spruces (*Picea*). The needles arise singly from the twig and are alternately arranged. The sessile needles leave a woody peg when they fall off, are four-angled and will roll between your fingers. Common species include:

- *Picea mariana* (Black spruce) – native to Minnesota, not common on campus
- *Picea glauca* (White spruce) – needles whitish to bluish; cone scales with a rounded margin; native to Minnesota
- *Picea abies* (Norway spruce) – branches ‘droop,’ twigs orange, often with cobwebby filaments; cones large, resinous; native to Europe
- *Picea pungens* (Colorado blue spruce) – needles sharp-pointed, bluish in color; cone scales ragged; common landscape tree, afflicted with a fungus which somewhat limits its utility; native to Rocky Mountains. Blue spruce can be difficult to distinguish from white spruce because white spruce can

have bluish needles and blue spruce can have whitish needles. But, if you find a cone, just look for the margin of the cone scales.

3. Firs (*Abies*). The needles are singly attached, alternate, sessile and leave a round depression when they are removed. The cone is upright, subterminal and disintegrates at maturity. Common species include:

- *Abies balsamifera* (Balsam fir) – native species; needles two-ranked (in one plane like a feather); stem with resin blisters; makes a fantastic Christmas tree
- *Abies concolor* (White fir) – larger and bluer needles than the other firs; native to Rocky Mountains, planted in our area as landscape tree
- *Abies fraseri* (Fraser fir) – not common on campus but is the ‘Cadillac’ of Christmas trees. The needles are usually darker green than those of balsam fir and spirally arranged around the stem

4. Larch or tamarack (*Larix*). Needles occur in clusters at the end of short spur shoots. The needles are deciduous. The cone is upright, subterminal and has persistent scales. *Larix laricina* is common in low wet areas. *L. decidua* is a common ornamental.

5. Douglas fir (*Pseudotsuga menziesii*). Needles have a short petiole. When removed, the needles leave a small, round, raised scar. The cone is pendant, subterminal and has two bracts that are exerted (looks like a snake tongue or mouse ears). Ornamental.

6. Hemlock (*Tsuga canadensis*). Evergreen, with alternate leaves that have a petiole that leaves a woody “cushion”. The cones are terminal (produced at the end of the branches). Tip of the tree waves in the breeze. Not common in our area, though occasionally planted.

Cupressaceae – Cypress (or Cedar) Family

These plants are shrubs or trees with leaves that can be either scale-like or awl-shaped or needle shaped. The bark is often fibrous and the wood aromatic. The plants are usually monoecious, and the cones are usually small and can be dry and woody or berry-like. Minnesota taxa include:

1. *Juniperus* (Junipers) – these plants are small trees and shrubs with leaves that are small and scale-like on young twigs, and sharp pointed on older twigs. They produce a bluish berry-like cone instead of the typical woody cone. Juniper

"berries" are used to flavor gin. Native species in our area include:

- Eastern red cedar (*Juniperus virginiana*) – small trees
 - Ground or creeping juniper (*Juniperus horizontalis*) – creeping shrubs
2. *Thuja occidentalis* (Northern white cedar) – small trees with flattened branches. There are many ornamental varieties of this species.

Checklist of Some Common Species**CUPRESSACEAE** – Cypress Family

- Juniperus virginiana* – Eastern red cedar
- Thuja occidentalis* – Northern white cedar, arborvitae

GINKGOACEAE – Ginkgo Family

- Ginkgo biloba* – Maidenhair tree, ginkgo

PINACEAE – Pine family

- Abies balsamea* – Balsam fir
- Abies concolor* – White fir
- Larix laricina* – Tamarack
- Picea abies* – Norway spruce
- Picea glauca* – White spruce
- Picea pungens* – Colorado blue spruce

- Pinus banksiana* – Jack pine
- Pinus mugo* – Swiss mountain pine, Mugho Pine
- Pinus nigra* – Austrian pine
- Pinus ponderosa* – Ponderosa pine
- Pinus resinosa* – Red pine, Norway pine
- Pinus sylvestris* – Scot's pine
- Pinus strobus* – White pine

- Pseudotsuga menziesii* – Douglas fir

- Tsuga canadensis* – Hemlock

TAXACEAE – Cypress or Yew Family

- Taxus* sp. – yew



**BAILEY
HERBARIUM**

College of Saint Benedict and Saint John's University