



CMG GardenNotes #172

Identifying Conifers: Arborvitae, Douglas Fir, Fir, Juniper, Pine, Spruce, and Yew

Outline: Characteristics of Conifers, page 1
Leaves, page 1
Seed Production, page 2
Key to Conifers, page 2
Key to *Abies*, (Fir), page 3
Key to *Picea*, (Spruce), page 3
Key to *Pinus*, (Pines), page 4
Key to *Thuja*, (Arborvitae), page 5

I. Characteristics of Conifers

a. Leaves

Most conifers (cone bearing plants) have characteristic leaf shape and arrangement that allow them to be quickly identified to the genus level.

- The *Pinaceae* family contains members such as pine, spruce, fir, and Douglas fir. This family has the classic needle-shaped leaves you think of when you think of Conifers (i.e., pine needles). The genera of the *Pinaceae* family are further sorted by how the needles are clustered on the stem. [Figure 1]

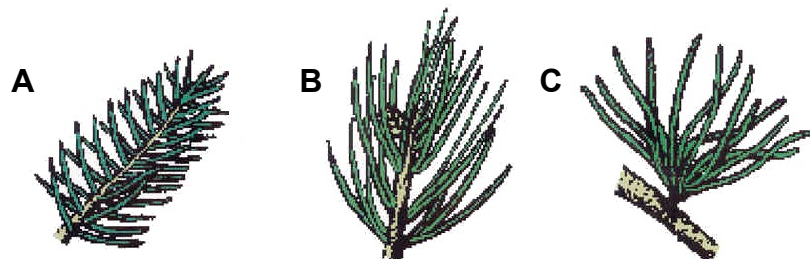


Figure 1: A) Single needles characteristic of the genera *Picea* and *Pseudotsuga*. B) Bundled needles characteristic of the genus *Pinus*. C) Clustered needles characteristic of the genus *Larix*.

- The *Cupressaceae* family includes members such as juniper and arborvitae. This family has leaves that are more scale-like or awl-like. [Figure 2A and 2B]

- The *Taxaceae* family is the Yew family. The leaves of these Conifers are flat and arranged along the stem in a manner that resembles a feather. [see **Figure 2C**]

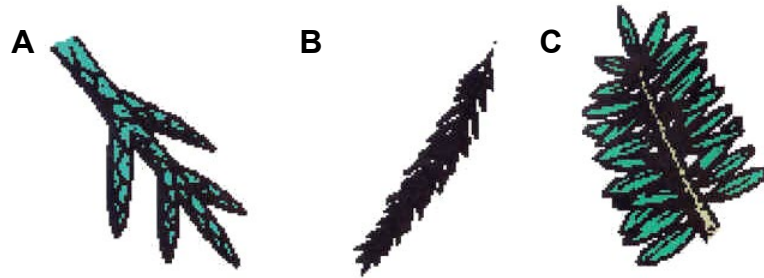


Figure 2: A) Scale-like leaves characteristic of *Juniperus* and *Thuja*. B) Awl-shaped leaves characteristic of *Juniperus*. C) Linear, feather-like leaves characteristic of *Taxus*.

b. Seed Production

Conifers are **Gymnosperms** (along with *Ginkgo biloba* and cycads), which are a group of plants that do not flower, but instead produce seed in a 'cone' structure made of modified leaves called scales. The term 'Gymnosperm' literally means "naked seed" and refers to the exposure of the female reproductive structure during pollination (instead of wrapped in an ovary as in flowering plants) rather than the actual seed being uncovered.

Members of the *Pinaceae* family and arborvitae are **monoecious** plants. These plants have separate male and female cones on the same plant (the term "monoecious" is Greek for 'one house'). Male cones produce pollen and are normally short lived. Female cones are generally larger and longer-lived, remaining on the tree until the seeds are mature and distributed. Junipers and Yews are **dioecious** plants, which have separate male and female plants ("dioecious" is Greek for 'two houses').

Cones of pines, spruce, and fir are made up of leathery or woody scales, which open to distribute the seed when the seed is mature. The cones of junipers have fused scales around the seed, resulting in a more berry-like appearance. [**Figure 3**]

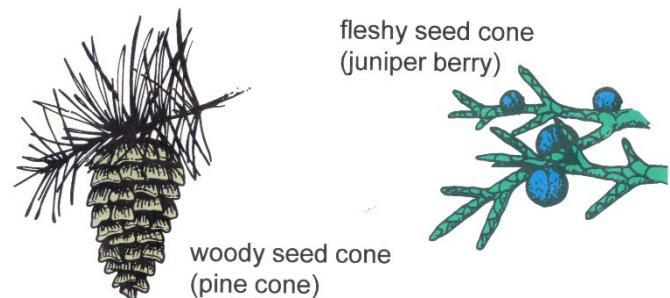


Figure 3: Woody cones of the *Pinaceae* family and fleshy cones of the *Juniperus* genus.

II. Key to Conifers

- Leaves scale-like or awl-like.** Fruit is a berry-like cone with scales fused together – *Cupressaceae* family (Junipers and Arborvitae).

- i. Leaves scale-like or awl-like, often closely pressed to the branches. Foliage arranged around the branch, rather than flattened. Cones are berry-like with scales pressed close together – ***Juniperus* (Junipers)**.
- ii. Leaves small, scale-like, hugging the stem. Foliage in flattened plate-like display. Cones are berry-like with thick scales – ***Thuja* (Arborvitae)** – visit the **Key to Thuja** on page 5.

b. Leaves needle-like. Pinaceae family (pine, spruce, fir, and Douglas fir).

- i. Needles single.

- 1. Needles flat in cross-section and flexible.

- a. Leaf scar oval, bud tips pointed. Cones have three-prong lobed tongue-like “bract” that extend out beyond the scales – ***Pseudotsuga menziesii* (Douglas Fir)**.
- b. Leaf scar round, bud tips roundish. Cones grow upright on the branch, usually disintegrating before falling to the ground – ***Abies* (Fir)** – visit the **Key to Abies** on page 3.

- 2. Needles square in cross-section and stiff. Older twigs studded with the persistent stumps of fallen needles – ***Picea* (Spruce)** – visit the **Key to Picea** on page 3.

- ii. Needles sheathed at the base in bundles of two to five. Cone scales thick and woody with swollen tips – ***Pinus* (Pine)** – visit the **Key to Pinus** on page 4.

- iii. Short needles in tufts of ten or more. May be deciduous – ***Larix* (Larch)**.

c. Leaves flat, linear-shaped in a feather-like arrangement. Shrubs with dark green leathery leaves. Red, berry-like fruit – ***Taxus* (Yew)**.

III. Key to ***Abies* (Fir)**

- a. **Young stems not hairy.** Needles usually longer than one inch (but can be misleading). Cones grayish green, 2½ to 5 inches long. Bracts of the cone scales with a short, triangular tip – ***Abies concolor* (White Fir)**.
- b. **Young stems hairy.** Needles usually shorter than one inch. Cones dark brown/purple, 2 to 4 inches long. Bracts of the cones scale are long with sublated tip. Native to higher elevations – ***Abies lasiocarpa* or *Abies bifolia* (Subalpine Fir)**.

IV. Key to ***Picea* (Spruce)**

- a. **Needles very stiff, sharp, ¾ to 1½ inch long, often bluish, pointing outwards from stem.** Stems not hairy. Cones 2½ to four inches long. Cone scales papery, furrowed, pointed/ragged. Bark black to dark grey furrowed. Native, generally below nine thousand feet elevation – ***Picea pungens* (Colorado Spruce)**.

- b. **Needles somewhat blunt, not as stiff, or sharp, pointed toward end of twig.** Young stems somewhat hairy. Cones less than 2½ inches long. Cone scales rounded. Bark smooth, with purplish brown to russet red scales on mature trees. Native. – ***Picea engelmannii* (Engelmann Spruce)**.
- c. **Needles ¼ to ½ inches long.** Each branch very short (2-4 inches long). Landscape shrub. – ***Picea glauca* ‘Conica’ (Dwarf Alberta Spruce)**.

V. Key to *Pinus* (Pine)

- a. Two needles per bundle.
 - i. Needles ½-1 ½ inches long, curved, medium green with white lines, some resin droplets. Cones small, rough, without prickles on scale. Seeds large (pine nuts). Shrubby tree. Native to the plateaus and mesas – ***Pinus edulis* (Pinon Pine)**.
 - ii. Needles 1-2 inches long, finely toothed, slightly twisted, curved, dark green, persisting five plus years. Branches out abruptly from trunk base, central leader not obvious, more shrub-like – ***Pinus mugo* (Mugo Pine)**.
 - iii. Needles 1-3 inches long, yellowish green, slightly twisted. Cones small, less than 2 inches long, hard, one-sided with prickled tips on scales. Branches slender, slightly flexible. Bark scaly, not becoming platy. Native in dense forest stands in higher elevations – ***Pinus contorta* (Lodgepole Pine)**.
 - iv. Needles 1½-3 inches long, twisted, persistent two to four years. Cones 1½ inches long, scattered throughout the tree, without prickles on the scales. Older bark orange – ***Pinus sylvestris* (Scotch Pine, Scots Pine)**.
 - v. Needles 3-6 inches long, stiff, dark green, dense on the branch, persisting four plus years. Cones 2-3 inches long with small prickles on scales. Buds whitish. Older bark dark gray furrowed – ***Pinus nigra* (Austrian Pine)**.
- b. Two and three needles per bundle, 3-10 inches long, medium green, crowded at end of branches on older trees, persisting three years. Cones 3-5 inches long, armed with sharp prickles on scales. Bark furrowed, eventually breaking into reddish plates. Native from outer foothills to subalpine regions – ***Pinus ponderosa* (Ponderosa Pine)**.
- c. Five needles per bundle – **White Pines** group.
 - i. White resin dots scattered on dark green needles, 1-1½ inches (25-38 mm) long. Cone scales long, sharp prickles. Native to higher elevations – ***Pinus aristata* (Bristlecone Pine)**.
 - ii. Needles 1-3 inches long, rigid, dark green, often clustered near branch ends, margins smooth, pointing forward, persist for five to six years. Cones 4-8 inches long on short stalk, with no prickles on scales. Branches very flexible. Bark silvery white to light gray. Small tree with irregular trunk and branching pattern. Native to higher elevation and high plains, often on open sites – ***Pinus flexilis* (Limber Pine)**.

iii. Needles 2-5 inches long, blue green, very soft, thin, margin toothed, persistent two years. The branches are green-brown. Cones 3-8 inches long with 1-inch-long stalk. Cone scales thin, don't bend back – ***Pinus strobus* (Eastern White Pine)**.

iv. Needles with a few small teeth near tip, not as soft as Eastern White Pine. Branchlets yellow-brown or red brown. Cones are short-stalked. Cone scales bend back. Tall tree with straight, unbranched trunks. Native to San Juan Mountains, Sangre de Cristo, and Rampart ranges – ***Pinus strobiformis* (Southwestern White Pine)**.

VI. Key to *Thuja* (Arborvitae)

a. Foliage in vertical plate-like displays – ***Thuja orientalis* (Oriental Arborvitae)**.

b. Foliage in horizontal plate-like displays – ***Thuja occidentalis* (American or Eastern Arborvitae)**.

Authors: David Whiting, CSU Extension, retired; Linda McMulkin, CSU Extension, retired; Joanne Jones, CSU Extension, retired; Alison O'Connor, CSU Extension; and Laurel Potts, CSU Extension, retired. Artwork by Scott Johnson and David Whiting. Used with permission. Revised October 2017. Reviewed October 2022 by Alison O'Connor, CSU Extension.

- Colorado Master Gardener GardenNotes are available online at <https://cmg.extension.colostate.edu/>.
- No endorsement is intended of products mentioned, nor is criticism implied of products not mentioned.
- Copyright Colorado State University Extension. All Rights Reserved. CMG GardenNotes may be reproduced, without change or additions, for nonprofit educational use with attribution.
- Colorado State University, U.S. Department of Agriculture, and cooperating Colorado counties.

Colorado State University Extension is an equal opportunity provider.

Colorado State University does not discriminate on the basis of disability and is committed to providing reasonable accommodations.

CSU's Office of Engagement and Extension ensures meaningful access and equal opportunities to participate to individuals whose first language is not English.

<https://col.st/OWMJA>

Colorado State University Extension es un proveedor que ofrece igualdad de oportunidades.

Colorado State University no discrimina por motivos de discapacidad y se compromete a proporcionar adaptaciones razonables.

Office of Engagement and Extension de CSU garantiza acceso significativo e igualdad de oportunidades para participar a las personas quienes su primer idioma no es el inglés.

Reviewed October 2022