

Conifers of Washington's east-side Cascade Mountains

Western larch



Subalpine fir



Conifers: trees without flowers

- Like all Gymnosperms, bear naked seeds
- Seeds born in **cones**, on **scales**
- Most are evergreen
- Have needle-like, linear, or scale-like foliage
- 3 Families native to Washington
 - Yew Family *yew*
 - Pine Family *pine, larch, spruce, hemlock, true firs, Douglas-fir*
 - Cypress Family *cedar, juniper*



A tree is a way of being a plant

- woody perennial
- single-stemmed: **trunk**
- has a **crown** of foliage and branches
- >20 ft. (5-6 m.) tall at maturity
- sometimes hard to distinguish between a “tall” shrub and a “low” tree



Conifers are king in Pacific NW forests!

- In the world's other temperate forests, broadleaf trees dominate due to climate.
- Pac. NW summers have low humidity & weeks of drought; moist cool winters
- Conifers conduct >50% of annual photosynthesis during fall, winter, & spring **whenever** water is available & temps. above freezing.



Conifers thrive in uncertain conditions

- Tolerate poor or badly drained soils
- Maximize nutrient & water absorption by forming mutually helpful association with soil fungi- called mycorrhize
- Many conifers adapted to wildfire
- Most are *sun-seekers*- rapid tall growth keeps them out of broadleaf tree shade.
- Tall and massive- buffer against stressors like drought and limited nutrients

Cones: either “his” or “hers”

- Most bear both male and female strobili on the same individual tree (monoecious) but on different parts of the crown.
- male strobili produces pollen
- Often hard to distinguish male from female strobili until mature



Whitebark pine male strobili

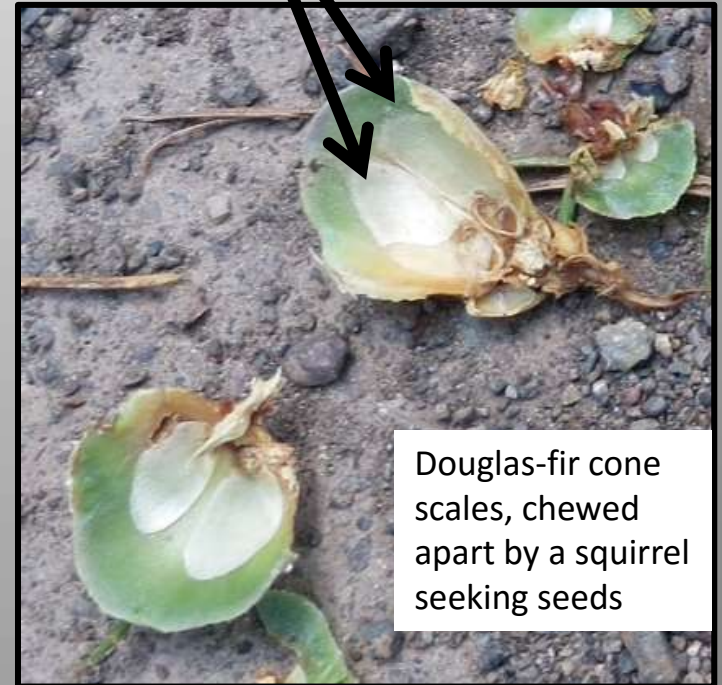
Cones: either “his” or “hers”

- Larger female strobili receives airborne pollen
- Sexual fertilization = seeds.
- Seeds born on a cone scale
- Seeds are slow growing: cones take 1+ yrs. to mature



Douglas-fir, fully ripened cone. Seeds have been dispersed by the wind.

Single scale from a still-ripening cone, with a pair of winged seeds



Douglas-fir cone scales, chewed apart by a squirrel seeking seeds

Washington: 19 native conifers

- PINE Family
 - 4 true fir (*Abies*)
 - 2 larch (*Larix*)
 - 2 spruce (*Picea*)- 1 only coastal
 - 4 pine (*Pinus*)
 - 1 false hemlock (*Psudotsuga*)
 - 2 hemlock (*Tsuga*)
- CYPRESS Family
 - 1 white-cedar (*Chamaecyparis*)
 - 1 juniper (*Juniperus*)
 - 1 cedar (*Thuja*)
- YEW Family- 1 yew (*Taxus*)

Eastside Low Montane Forest

- 1,8000 – 3,000 feet
- 15-30 inches of precipitation/year
- Main conifers- all adapted to
- frequent wildfire
 - ponderosa pine
 - Douglas-fir
 - grand fir
 - lodgepole pine
 - western larch



Near
Thompson
Road,
Winthrop

#2 Canyon,
Wenatchee,
post-fire

East-side High Montane forest

- 4,000-6,000 feet
- 35-50 inches of precipitation/year
- Main conifers:
 - subalpine fir
 - Englemann spruce
 - Western larch
 - mosaics of lodgepole pine



Mission Ridge ski area

Subalpine

- >6,000 ft., above the closed canopy of forest- elevation varies by aspect, amt. of snowfall, soil type, and exposure.

Main conifers:

subalpine fir

whitebark pine

subalpine larch

less common;

mountain hemlock,

yellow cedar



East side of Mt. Rainier,
Wonderland Trail

Pines

- Simple leaves- linear to needlelike
- Some groups have clustered needles
- Branches whorled or opposite
- Cones with spirally arranged flattened scales
- Cones mature in 1-2 years
- Most have a “wing” surrounding the seed for wind dispersal (Exception- Whitebark pine)

ponderosa pine

lodgepole pine



western white pine

whitebark pine

western white pine *Pinus monticola*

- **Needles:** In clusters of 5, whitish blue-green, slender & flexible, 2-1/2-4 inches. Lined with tiny teeth, so feel rough.
- **Tree shape:** Narrow open crowns with regularly spaced whorls of branches extending from main trunk



western white pine *Pinus monticola*



Cones: long, curved, slender, & pitchy scales; 6-11 inches.

Bark: Mature tree bark appears checkered. Younger trees have thin, gray bark. Sap weeps and orange needles indicate blister rust infection.



whitebark pine *Pinus albicaulis*

Needles: in clusters of 5; yellow-green, stiff, 2-3 inches.

Growth form: Confined to the timberline zone in Cascades. Takes on stunted growth forms on windy, snowbound sites.



whitebark pine *Pinus albicaulis*

Bark: gray and scaly

Mission Ridge, 6800 ft.



Confined to the timberline zone in Cascades. Takes on stunted growth forms on windy, snowbound sites. All seeds dispersed by Clark's nutcracker in caches, so many stems grow up from forgotten caches.

whitebark pine *Pinus albicaulis*



Cones: egg-shaped, remain closed on tree when ripe, 2-3 ½ inches. Depends upon Clark's nutcracker to disperse seeds.



ponderosa pine *Pinus ponderosa*

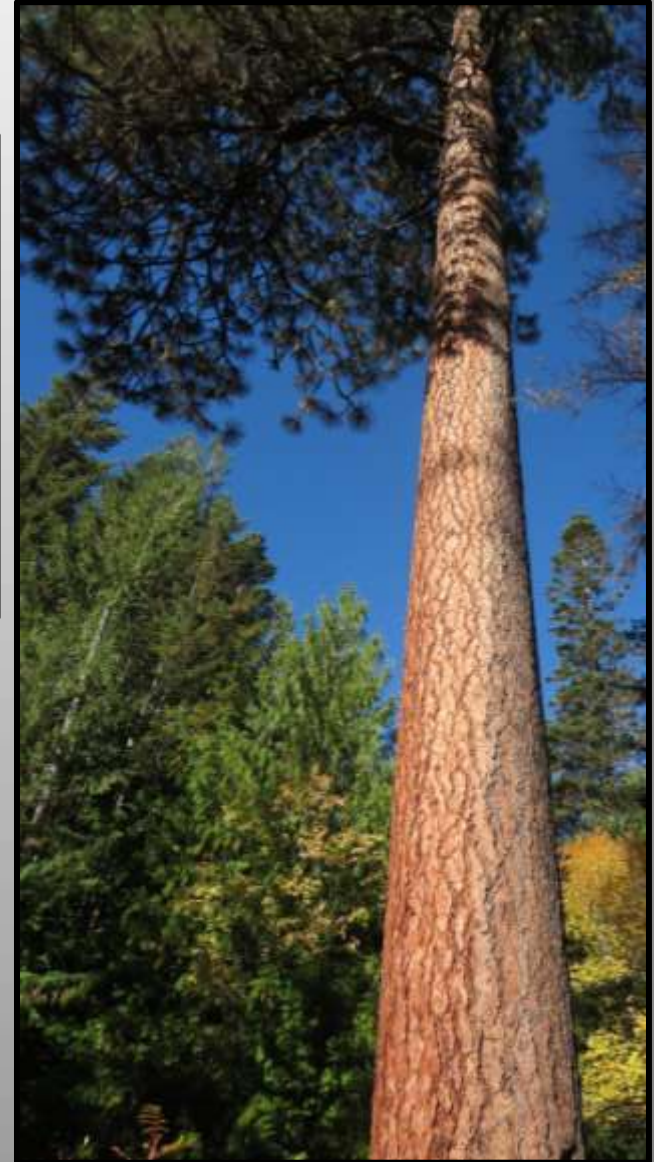


Needles: Clusters of 3 (sometimes 2), dark green, 5-10 in.



Mature trees have broad crowns of regular whorls of long limbs.

As a young tree grows, the lower branches are shed.



ponderosa pine *Pinus ponderosa*

Bark: gray-brown, becoming red-brown and deeply furrowed. Large trees shed jigsaw puzzle bark plates.



ponderosa pine *Pinus ponderosa*



Cones: egg-shaped and symmetrical, 3-5 inches. Prominent prickly armed scales



Male strobili in May- developing pollen will be wind dispersed

ponderosa pine *Pinus ponderosa*



Wildfire can burn through & kill part of a living tree. Sap then seals off the damage, creating a “cat-face” scar .



Thick corky bark serves as insulation against the heat of a low-intensity ground fire

This ponderosa forest has been thinned, then control burned to reduce ground fuels. The burn killed seedling conifers that would compete for limited water and nutrients. Water-stressed mature ponderosa pines are more susceptible to disease and less able to repel insect infestations.



As trees age, lower limbs drop off, reducing potential fuel & protecting the crown from fire

lodgepole pine *Pinus contorta*

Cones: usually bent and narrowly egg-shaped. 1-1/2-2 inches. Sharp prickle on back of cone scale. Can remain on tree unopened for several years.

Bark: thin, gray-red/brown, scaly and pitchy



lodgepole pine *Pinus contorta*

Needles: bundles of 2, yellow-green, 2 inches long.

Trees are relatively short-lived & have a small and slender form in forested habitats, rounded crown in open habitats.

Adapted to stand-replacement wildfires: some cones open only when heated by fire. Seeds then spread & grow in full sun



Western larch *Larix occidentalis*

- **Needles:** deciduous, soft, clusters of 25-40 on woody spurs, triangular, bright yellow-green, fine
- Tall, narrow pointed crown



western larch *Larix occidentalis*

Cones: long bracts extend beyond scales; 1- ½ inches; grow on all sides of branch

Bark: thick, deeply furrowed, flakes into orange-brown plates. At base, thick & corky
Rapidly grows tall into a high open canopy.



Compare these 2
trees, often seen
together

Ponderosa pine

Western larch

KEY ID TRAITS: No wooly cluster of hairs at base of new growth on branch; cones growing out of all sides of branch. Typically found at elevations below 5000' in Cascade eastside. Cones extend out in all directions from branch.



subalpine larch *Larix lyallii*

- **Needles:** deciduous, in clusters of 20-30 on woody spurs, 4-sided, blue-green, <math><1\frac{1}{2}</math> inch. White wooly hairs at base of new growth.
- Irregular canopy shape with open crowns



subalpine larch *Larix lyallii*

Cones: rounded, deep purple, covered in wooly hairs, bracts longer than scales, 1½-2 inches. Mostly grow upright on branch

Bark: yellow-brown, furrowed & thin.

Near the ground, bark on trunk is only 1 inch thick



KEY ID TRAIT: Differs from Western larch: new shoots covered with fine, white, wooly hairs.



Engelmann spruce *Picea engelmannii*

Needles: Think s's: sharp & square-can't roll between your fingers.

Blue-green with similar whitish bands on all 4 sides, extend from all sides of twig; 1 inch



Engelmann spruce *Picea engelmannii*

Cones: 1-2-1/2 inches scales diamond-shaped & ragged at tips

Bark: thin, dark purple/reddish tinge, loose scales flake off easily.



KEY ID TRAITS: Sharp (pointed tips), short, square, needles. Leave a woody base on the twig when fall off.



Douglas-fir *Pseudotsuga menziesii*

Needles: dark to pale green, spreading around the twig, pointed but not sharp. Length varies- about 1 inch.



KEY ID TRAITS: Look for the *hind feet and tail of a mouse*, ducking inside each cone scale.

Douglas-fir *Pseudotsuga menziesii*



Bark: dark brown to black, deeply furrowed & thick



Douglas-fir *Pseudotsuga menziesii*



Cones: cylindrical, 2-4 inches. 3-pointed bracts extend out from cone scales—looks like a mouse's tail.



KEY ID TRAIT: spear-like tip to every branch – touch the tip to feel a poke (true firs have rounded tip). Needles grow all around branch

western hemlock *Tsuga heterophylla*

Needles: dark green on top, whitish below; variable length up to 1 inch. Project outward on the sides of twigs, making branches look flattened & spraylike



western hemlock *Tsuga heterophylla*

Cones: small, up to 1 inch long, and almost as wide.

Bark: dark gray-brown & heavily furrowed, but only 1-inch thick. Inner layers dark red to purple

KEY ID TRAITS: bent-over leader, drooping branch tips, abundant small cones, and short delicate needles. Branches have a delicate, spray-like appearance.



mountain hemlock *Tsuga mertensiana*

Needles: pale green to whitish on both sides, more or less the same length, about $\frac{3}{4}$ inch. Project outward in all directions on twig.



mountain hemlock *Tsuga mertensiana*

Cones: broadly cylindrical, 1-2 inches.

Bark: dark purplish brown, with deep furrows & ridges, 1-1/4 inch thick.

At timberline, grows in a shrubby form.

KEY ID TRAITS: Branches have a brush-like appearance as needles radiate from little spurs on all sides of the branch. More blue-green colored needles.



True firs *Abies*

- Cylindrical cones stiffly erect on horizontal branches near the top.
- Different pattern of foliage on cone-bearing branches (denser)
- Thin bark with resin-filled blisters



All true firs have similar cone development patterns

Ripening cones covered in sticky resin.
Often purple.
Use binoculars to see these!



Cone scales begin to open & exposed winged seeds to wind for dispersal



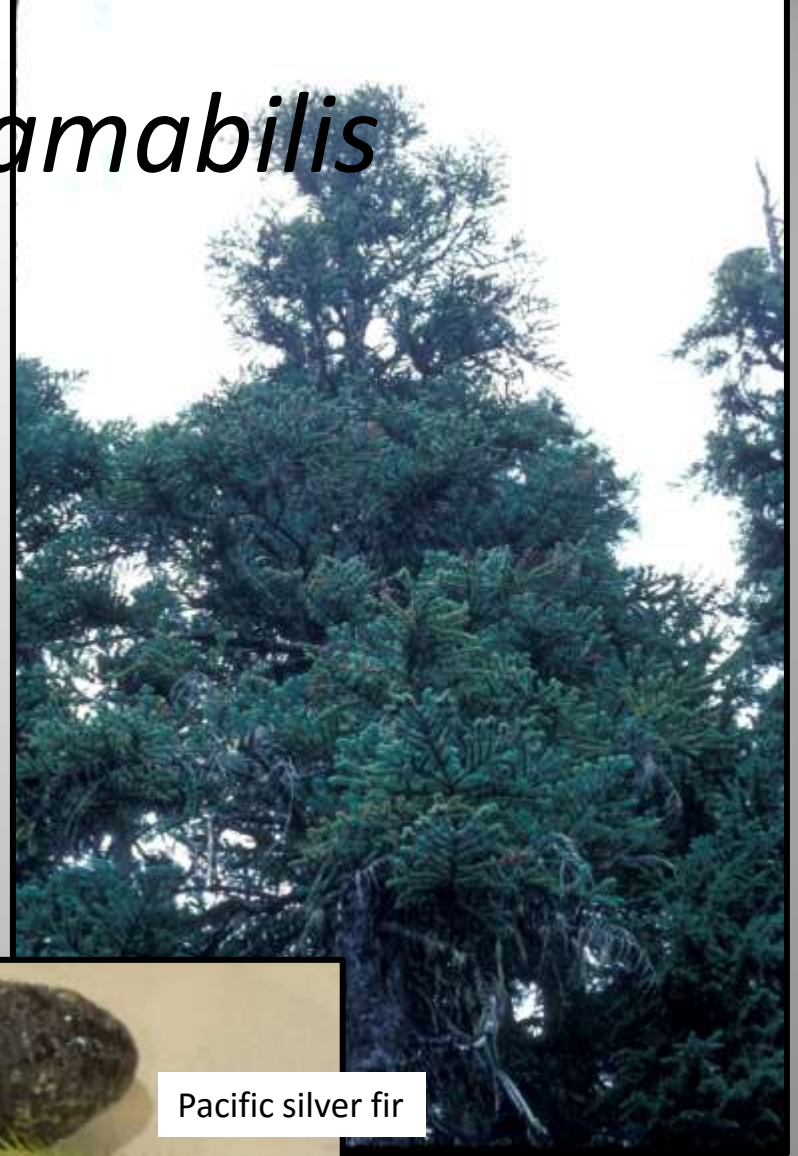
subalpine fir *Abies lasiocarpa*

Scales dry, spread out, and are eventually shed over time—ensuring seeds are wind dispersed. Upright center stalk remains on tree.



Pacific silver fir *Abies amabilis*

- **Cones:** Cylindrical, purple, smooth scales. 3--6 in.
- **Bark:** smooth, thin, ashy-gray with lichen blotches.
- Easily killed by fire-thin bark, shallow roots



Squirrel cut unripe cone, intended for underground caches as winter food



Pacific silver fir

7-inch long Noble fir

Pacific silver fir *Abies amabilis*

- **Needles:** flattened, blunt, 1-inch long, glossy green on top, silvery white on underside (2 bands). Neatly arranged, ruffled look: project horizontally from opposite sides of twig, bending forward along the top.



Key ID TRAITS: Looking down on branch, the stem is hidden from view; unlike grand fir with brown stem always visible. Needles glossy green above, silver below. 2 white bands on needle underside; none on top.

subalpine fir *Abies lasiocarpa*

Needles:

- tips rounded, whitish on both sides, <1 inch long
- One white band above, 2 white bands below.
- Growing on all sides of the twig-on short, stiff horizontal branches all the way to the ground.



subalpine fir *Abies lasiocarpa*

- **Cones:** 2-1/2-4 inches, deep purple, often covered with an “icing” of shiny resin
- **Bark:** thin, smooth, light grey.
- In rocks & on ridge tops, takes on shrubby form
- **Tree Growth form:** Slender cone-shape to shed snow.

KEY ID TRAITS: Grows above 5000' in subalpine and alpine forests at timberline. Stomatal bands of both sides of needle (1-top, 2-bottom). Needles grow all around the branch.



grand fir *Abies grandis*

- **Needles:** flat, blunt, dark shine green above & whitish (2 bands) on underside. >1 inch. Spread in two regular comb-like rows from opposite sides of twig
“two-ranked” array
- Seeds can sprout in shade, so will out-compete other conifers whose seeds require more sunlight to sprout (i.e. ponderosa pine, Douglas-fir)



Key field ID mark: looking down, brown stem shows – not hidden by needles



grand fir *Abies grandis*

- **Cones:** 3-5 inches, greenish. Sit upright, but sometimes tip sideways due to weight.
- **Bark:** thick, furrowed, divided into narrow flat plates. In young trees-dark, gray, & thin.
- Fire-ladder, due to low branches



KEY ID TRAITS: Needles with notched-tips, variable lengths, and flat-growing in two distinct rows. 2 stomatal bands on underside of needle; none on top.



Noble fir *Abies procera*

Needles: Scattered singly on branch, flattened but plump, with a groove on top and mostly pointed tips. White stomatal bands: 2 on upper & 2 on lower side. Distinctly blue-green needles attached to stem with a “hockey stick” shape.

KEY FIELD ID MARKS: Bluish-green needles are distinct from other native firs; needles have a slight groove on upper side and are plump, usually arranged on the top side of the twig with hockey stick attachment to twig. 2 white bands on top; 2 on bottom of needle.



When looking up at bottom of branch, has a “combed” look



When looking down on top of branch, has a “brushy” look



Underside of branch

Noble fir *Abies procera*

Trees in open stands are tall, symmetrical, and very straight, often clear of branches for 100 feet.

Trees in closed forest have done-shaped canopy.



Use binoculars to view cones- note regularly spaced whorls of branches

Cones: Tall, cylindrical, 6-10 inches long, standing upright, clustered near top of tree. Cone scales are covered with distinctive protruding pointed bracts, looking “shingled”.



western redcedar *Thuja plicata*

Needles: scale-like, lying flat against the twig, opposite in 4 rows, rounded on back & sharp pointed.

Branches are spray-like, spreading down & outward



Bark: thin, ridged, & fissured, grayish to reddish. Mature tree bark can be peeled off in long thin strips



western redcedar *Thuja plicata*

Cones: woody, egg-shaped, less than ½-inch thick. Scales are egg-shaped and attached at base.



Green cones, still ripening



Prior year's opened cone scales- seeds have dispersed.



KEY ID TRAITS: Stringy bark, clustered, upright cones, underside has a white butterfly-shaped stomatal bloom

Alaska-cedar *Chamaecyparis nootkatensis*

- **Needles:** scalelike, opposite in 4 rows. Prickly tip, Keeled ridge on back. Dark bluish-green. 1/8-inch. Branch in flat fern-like sprays. After 2 years, needles turn yellow-brown for 1 year before being shed



Alaska-cedar *Chamaecyparis nootkatensis*

- **Cones:** woody, rounded, <math><1/2</math> inch thick.
- **Bark:** shaggy & gray, hanging in loose rough pieces, but will not peel off into strips.
- Thrives in cold, wet, climate. Deep snowfall insulates tree from extreme cold.
- Slow-growing-often at upper limit of trees, avalanche chutes, bogs, or rocky crags.



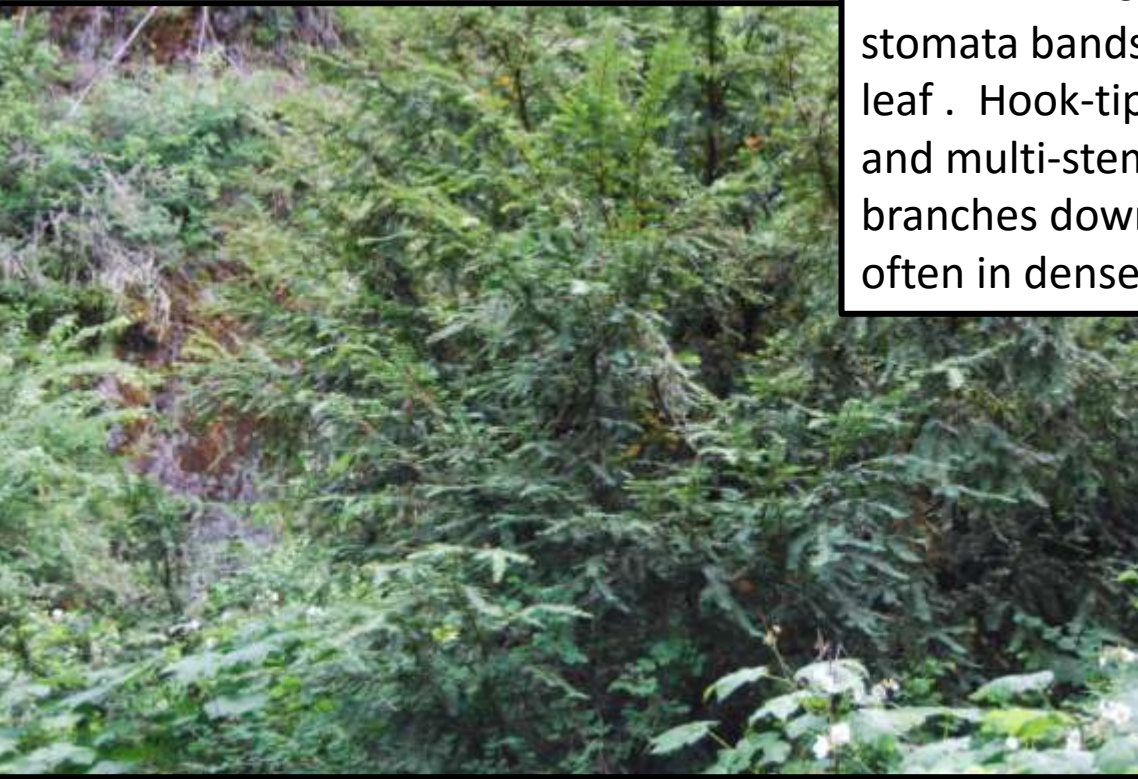
western yew *Taxus brevifolia*

habitat: In understory of moist, mature shady conifer forest and along streams at low to mid elevations.

fruits: scarlet, fleshy berry-like-cups surrounding a bony seed; open at one end.

bark: distinctive reddish brown, thin, with red to purplish scales

KEY ID TRAITS: Minimal white stomata bands on underside of leaf . Hook-tipped needle. Leggy and multi-stemmed with branches down to the ground, often in dense shade.



Leaves: flat needles with pointed tips; arranged in rows along each side of the twig; dark green above, paler below (no white bands)

Small low-spreading tree 20-50 feet tall with asymmetrical form, often branching to the ground.