



CONE RIPENESS & CUTTING GUIDE

V2 | JUNE 2023

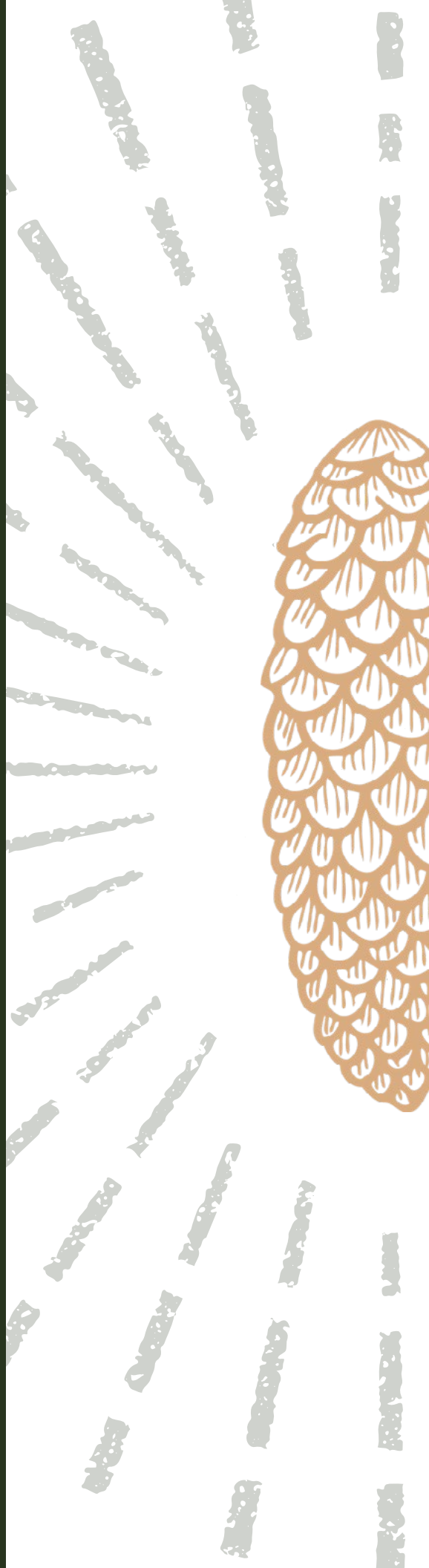


Table of Contents

CUTTING 101

<u>Seed Development</u>	3
<u>Cut Test</u>	3
<u>Cone Cutting Table</u>	4

RIPENESS 101

<u>Douglas fir (<i>Pseudotsuga menziesii</i>)</u>	8
<u>Grand fir (<i>Abies grandis</i>)</u>	9
<u>Incense cedar (<i>Calocedrus decurrens</i>)</u>	10
<u>Jeffrey pine (<i>Pinus jeffreyi</i>)</u>	11
<u>Lodgepole pine (<i>Pinus contorta</i>)</u>	12
<u>Noble fir (<i>Abies procera</i>)</u>	13
<u>Ponderosa pine (<i>Pinus ponderosa</i>)</u>	14
<u>Red fir (<i>Abies magnifica</i>)</u>	15
<u>Western hemlock (<i>Tsuga heterophylla</i>)</u>	16
<u>Western larch (<i>Larix occidentalis</i>)</u>	17
<u>Western red cedar (<i>Thuja plicata</i>)</u>	18
<u>Western white pine (<i>Pinus monticola</i>)</u>	19
<u>White fir (<i>Abies concolor</i>)</u>	20

APPENDIX

<u>Citations</u>	21
----------------------------------	----



Seed Development

Checking on the status of seed development is critical in determining whether and when to collect cones. Seed count is a component in monitoring seed development that determines how much seed output can be expected from a given collection.

By mid-July, seeds will have developed enough to provide accurate counts. Methods for getting cones down for cutting and counting include hand-picking or shooting down cones with a rifle.

Cones should be checked for the following:

seed count, insect activity, and embryo development. Insect activity can be identified on the exterior by curled, brown tipped or dead, dry cones, or on the cut interior of the cone by visible evidence of insect damage or predation. Cones are cut longitudinally down the center with a **sharp** knife, hatchet or cone cutter.

Cut Test

CUT TESTS ARE CONDUCTED AS FOLLOWS:

- ✓ Sample at least 5 cones from each of 4 to 5 trees selected at random throughout the collection area.
- ✓ Count all sound filled seeds on one face of the cut cone. Filled seeds have white centers (endosperm). Aborted seeds are darkened or shriveled (Figure 2). Look for insect activity inside the cone and seed (Figure 3).
- ✓ If more than half of the cones show insect damage then we may want to re-evaluate our collection.

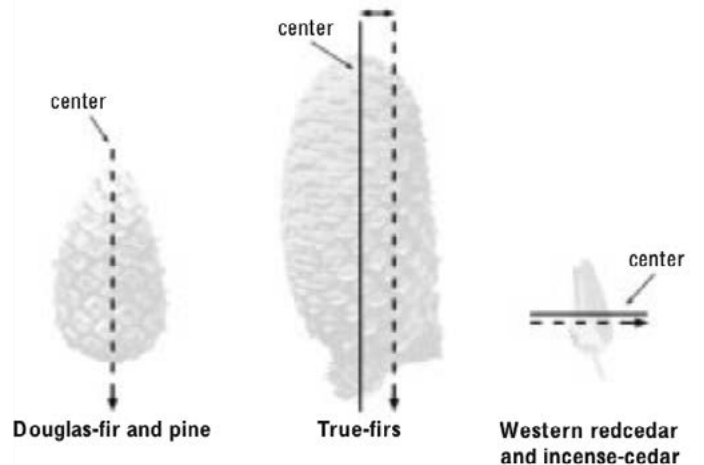


Figure 1. Different procedures for cutting cone based on species (Colorado State Raising Forest Tree Seedlings at Home)

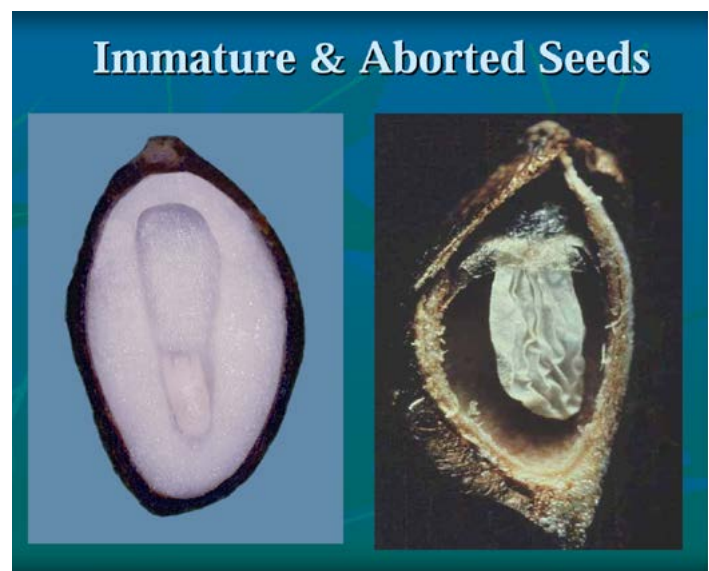


Figure 2. (Conifer Reproductive Biology)



Figure 3 Insect Damage (Schaefer)

Cone Cutting Table





SPECIES	DESCRIPTION	IDEAL FILLED SEED COUNT	PHOTO
Douglas fir <i>Cut lengthwise down the center</i>	Seed coat is golden brown to dark brown, shiny and darker on one side and light or variegated on the other, hardened. Wing is light brown to tan, detaches easily from the scale	5-7 per cut face	
Grand fir <i>Cut lengthwise ~1/2 inch off center</i>	Seed wing light brown or purple with brown margins seed coat turns tan with ripening seed detached from scale	12-14 seed per cut face	
Incense cedar <i>Instructions on how to cut here</i>	Description here	Seed fill here	
Jeffrey pine <i>Cut lengthwise down the center</i>	Seed coat brown color, hardened, smooth and evenly brown on top, coarser on scale side. Seed wing light tan to brown and brittle, adheres to seed coat	10 seeds per cut face	

Chart continued on next page...

Cone Cutting Table




SPECIES	DESCRIPTION	IDEAL FILLED SEED COUNT	PHOTO
Lodgepole pine <i>Cut lengthwise down the center</i>	Immature seed is white to cream colored, with clear to white wings. In ripe seed, the wing is light brown, seed coat is dark brown to black	Interior: 3-4 seeds per cut face Coastal: 6-7 seeds per cut face	
Noble fir <i>Cut lengthwise ~1/2 inch off center</i>	Seed wing uniform brown, detached from cone scale	50% seed fill	
Ponderosa pine <i>Cut lengthwise down the center</i>	Seed coat is pale brown to gray brown and usually mottled (freckled) on the scale side, hardened. Seed wing is gold to tan, brittle, adheres to seed coat. Wings and claws are brown on mature seed	7-10 per cut face	

Chart continued on next page...

Cone Cutting Table






SPECIES	DESCRIPTION	IDEAL FILLED SEED COUNT	PHOTO
Red fir <i>Cut lengthwise ~½ inch off center</i>	Seed coat reddish-brown, loosely attached to scale, wing reddish-brown with magenta margin, papery	50% seed fill	
Western hemlock <i>Cut lengthwise down the center</i>	Seed coat/wing clear to light green to gray-green, wing turns to tan as it ripens with dark edges, coat is brown to dark brown and soft when mature	20 seeds per cut face	
Western larch <i>Cut lengthwise down the center</i>	Seed wing develops red or purple streaks then turns light brown as it ripens. Mature seed has brown seed coat on the side away from the cone scale, the other side may be cream colored or light brown	2 per cut face	

Chart continued on next page...

Cone Cutting Table

SPECIES	DESCRIPTION	IDEAL FILLED SEED COUNT	PHOTO
Western red cedar <i>Cut widthwise just below center</i>	Seeds should be firm seed wing light brown, seed coat chestnut brown and soft	3-6 seeds per cut face	
Western white pine			<p>Work in progress.</p> <p>Have a photo? We'd love to see it.</p> <p>Submit photo with details to: seed@silvaseed.com</p>
White fir <i>Cut lengthwise ~½ inch off center</i>	Seed coat is cream or tan, soft with resin vesicles, loosely attached to scale. Wing is golden brown with magenta or golden margins and slightly translucent, wings feel papery	50% seed fill	

Douglas fir (*Pseudotsuga menziesii*)

Cone color and condition

Pale yellowish-green (unripe) to golden brown color¹ (ripe) cones puff up as they brown⁴

Scales/bracts

3-lobed bracts will turn golden brown first¹

Seed coat/wing color and condition

Seed coat is golden brown to dark brown, shiny and darker on one side and light or variegated² on the other, hardened. Wing is light brown to tan, detaches easily from the scale¹ (coastal seed = longer with pointed tips, interior = rounder tips, more triangle shaped¹)

Embryo color and condition

Embryo occupies 90-100% of cavity, pale yellow color. Embryo sac is whitish, opaque and firm¹

Collection period

Low elevation - July-August, higher elevation seed released by October¹

Minimum filled seed per cut face

5-6

- Seeds are ripe and ready for collection 3-4 weeks before cones begin to open and shed seed²
- If the brown lines of seed wings aren't visible when the cone is cut, it's not ripe⁴
- Bend the cone. If the scales start to separate they are ripe. You only have a few days to collect after the cones start to loosen⁴

Mature Cone



Immature Cone

Work in progress.

Have a photo? We'd love to see it.

Submit photo with details to:
seed@silvaseed.com

Cut Mature Cone

Work in progress.

Have a photo? We'd love to see it.

Submit photo with details to:
seed@silvaseed.com

Cut Immature Cone



Grand fir (*Abies grandis*)

Cone color and condition

light brown² (unripe) to gray brown (ripe)

Scales/bracts

scales beginning to flex³ and turn from green to yellow-tinged to brown⁴

Seed coat/wing color and condition

seed wing light brown or purple with brown margins³ seed coat turns tan with ripening seed detached from scale²

Embryo color and condition

embryo sac is opaque and firm, embryo is yellow/yellow green, 90% extended²

Collection period

early September²

Minimum filled seed per cut face

12-14 seeds²

- Germination continues right up to seed dispersal so seeds should not be removed from cones immediately after collection²

Mature Cone



Immature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo
with details to:

seed@silvaseed.com

Cut Mature Cone



Cut Immature Cone



Incense cedar (*Calocedrus decurrens*)

Cone color and condition

Yellowish-green to golden tinged with shades of brown. Cone tip will flex slightly¹

Seed coat/wing color and condition

Thin papery seed coat ripens to light tan color; has 2 persistent wings that must remain intact (to avert damage to embryo)¹

Collection period

Mid-August to October Very perishable
– be alert to overheating¹

Minimum filled seed per cut face

2

“The ideal time for collection is the short period when cleavages appear between the scales of many cones on a tree.”²

Mature Cone



Immature Cone



Mature Cone and Seeds



Cut Cone



Jeffrey pine (*Pinus Jeffreyi*)

Cone color and condition

Purple green (unripe) to yellow/brown²
(unripe) to, chocolate-reddish brown⁴ (ripe)

Scales/bracts

Scales begin to open when ready to pick

Seed coat/wing color and condition

Seed coat brown color, hardened, smooth and evenly brown on top, coarser on scale side. Seed wing is brown and brittle and adheres to seed coat¹

Embryo color and condition

Embryo creamy white and 90% length of cavity, embryo sac is whitish, firm and opaque¹

Collection period

Early September through October¹

Minimum filled seed per cut face

10 seeds¹

Mature Cone



Immature Cone



Cut Mature Cone



Cut Immature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:

seed@silvaseed.com

Lodgepole pine (*Pinus contorta*)

Cone color and condition

Greenish-purple (unripe) to yellowish-brown (unripe) to dark purple (unripe) to lighter purple-brown¹ (ripe)

Scales/bracts

scales begin to flex as cones open¹

Seed coat/wing color and condition

seed coat brown color, hardened, smooth and evenly brown on top, coarser on scale side. Seed wing is brown and brittle and adheres to seed coat¹

Embryo color and condition

embryo creamy white and 90% length of cavity, embryo sac is whitish, firm and opaque¹

Collection period

September - October²

Minimum filled seed per cut face

3-4

- Previous year's cones remain on the tree and may look weathered, grey or buckskin colored (do not collect)⁴
- If you can't see the brown lines of the seed wing when you cut the cone longitudinally, it's not mature⁴

Mature Cone



Immature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo
with details to:

seed@silvaseed.com

Cut Immature Cone



Lodgepole pine beetle



Lodgepole pine beetle can be found from British Columbia to California and in the South West

Noble fir (*Abies procera*)

Cone color and condition

Yellow-green (unripe) to light brown (ripe)

Scales/bracts

Highly conspicuous, nearly covering the entire surface of the cone at maturity²

Seed coat/wing color and condition

Wing uniform brown, detached from cone scale²

Embryo color and condition

Embryo 90% extended and firm²

Collection period

Early October²

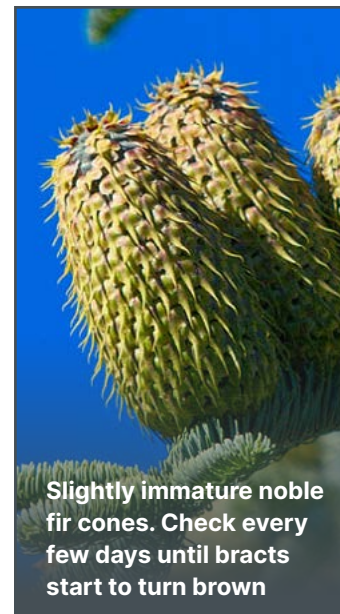
Minimum filled seed per cut face

10%⁵

Mature Cone



Immature Cone



Cut Cone



Ponderosa pine (*Pinus ponderosa*)

Cone color and condition

Pale yellow green (unripe) to light brown-green (unripe) to lustrous yellow-brown¹ (ripe)

Scales/bracts

Scales begin to flex¹ and open as they turn brown⁴

Seed coat/wing color and condition

Coat pale brown to gray brown and usually mottled (freckled) on scale side, hardened. Wing gold to tan, brittle, adheres to seed coat¹ wings and claws are brown on mature seed⁴

Embryo color and condition

Embryo is 90% length, pale yellow color, embryo sac is whitish color, opaque and firm¹

Collection period

Early August - September¹

Minimum filled seed per cut face

7-10 seeds^{1,3}

Mature Cone



Immature Cone



Cut Mature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:
seed@silvaseed.com

Cut Immature Cone



Red fir (*Abies magnifica*)

Cone color and condition

Greenish-brown (unripe) to russet brown (ripe) with reddish or grayish tinge¹

Scales/bracts

Scales will change from rigid to pliable before scales detach, visible exerted bracts on scale exterior^{1,2}

Seed coat/wing color and condition

Seed coat reddish-brown, loosely attached to scale, wing reddish-brown with magenta margin, papery¹

Embryo color and condition

Embryo is bright yellow (might have pinkish radicle end) and 90% extended, embryo sac is firm and oily in appearance¹

Collection period

Mid-August to October¹

Minimum filled seed per cut face

50%¹

- Collect as close as possible to seed fall²

Mature Cone



Almost Ripe Cut Cone



Almost ripe red fir cone with acceptable seed fill

Western hemlock (*Tsuga heterophylla*)

Cone color and condition

Green with purple tips (unripe) to brown with brown-red tips² (ripe) scales loosen, cones puff as they mature⁴

Scales/bracts

Scales greenish with brown margins³ scale edges turn brown and begin to dry⁴

Seed coat/wing color and condition

Seed coat/wing clear to light green to gray-green, wing turns to tan as it ripens with dark edges⁴, coat is brown to dark brown and soft when mature³

Embryo color and condition

Embryo has 3-6 cotyledons²

Collection period

September to October²

Minimum filled seed per cut face

Usually less than 40 seeds per cone, less than 20 are filled²

Mature Cone



Immature Cone



Cut Mature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:
seed@silvaseed.com

Cut Immature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:
seed@silvaseed.com

Western larch (*Larix occidentalis*)

Cone color and condition

Immature cones are light green or dark red to maroon⁴ ripe cone should be brown²

Scales/bracts

As cones ripen, bracts turn brown and bend back, away from the scales, scale tips will also begin to bend back⁴ bottom scales start to turn purple to brown as the cone nears maturity. When all scales are brown, pick immediately⁴

Seed coat/wing color and condition

Wing develops red or purple streaks then turns light brown as it ripens⁴ mature seed has brown seed coat on the side away from the cone scale, the other side may be cream colored or light brown⁴

Collection period

September-October²

Minimum filled seed per cut face

2 seeds

- Previous years' cone crop is not always easy to tell from the new cone crop due to the red color of cones

Mature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo
with details to:
seed@silvaseed.com

Immature Cone



Cut Mature Cone



Cut Immature Cone



Western red cedar (*Thuja plicata*)

Cone color and condition

Green (unripe) to banana yellow (unripe) to cinnamon brown (ripe)^{3,4}

Scales/bracts

Cones have 5 to 6 pairs of scales, the middle 3 pairs are fertile and contain 2 to 3 seeds²

Seed coat/wing color and condition

Seeds should be firm² seed wing light brown, seed coat chestnut brown and soft³

Embryo color and condition

Embryos have two cotyledons²

Collection period

August to September²

Minimum filled seed per cut face

3 to 6 seeds per cone⁵

Mature Cone



Immature Cone



Cut Mature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:

seed@silvaseed.com

Cut Immature Cone



Western white pine (*Pinus monticola*)

Cone color and condition

Yellowish beige-brown (unripe) to reddish, dark brown² (Ripe) (Cones can be red and green but on different trees)⁴

Scales/bracts

Seed wing will not stick to scale if it is mature

Seed coat/wing color and condition

Seed wing tan, and darker along straight edge³ seed coat medium to dark brown³

Collection period

August - September²

Minimum filled seed per cut face

10

- Bend the cone. If the scales start to separate they are ripe. You only have a few days to collect after the cones start to loosen⁴

Mature Cone



Immature Cone



Cut Mature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:

seed@silvaseed.com

Cut Immature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:

seed@silvaseed.com

White fir (*Abies concolor*)

Cone color and condition

Yellow-green (unripe) to golden (ripe), sometimes with purple/gray tips¹

Scales/bracts

Cone scales will become slightly pliable¹

Seed coat/wing color and condition

Cream or tan, soft with resin vesicles, loosely attached to scale. Wing is golden brown with magenta or golden margins and slightly translucent, wings feel papery^{1,2}

Embryo color and condition

Embryo is pale yellow-green², occupies 90-100% of cavity, and cotyledons are well developed. Embryo sac will appear whitish, fleshy and firm, may be somewhat oily in appearance¹

Collection period (highly variable depending on location)

Late August-October - must be collected slightly prematurely as true fir cones disintegrate upon maturation¹

Minimum filled seed per cut face

50%¹

Mature Cone



Immature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo
with details to:
seed@silvaseed.com

Cut Mature Cone

Work in progress.

Have a photo?
We'd love to see it.

Submit photo with details to:
seed@silvaseed.com

Cut Immature Cone



Citations

References

- [1] [Reforestation Practices for Conifers in CA](#)
- [2] [Woody Plant Seed Manual](#)
- [3] [A Field Guide to Collection Cones in British Columbia](#)
- [4] [Cone and Seed Maturity and Collection Guidelines for Northern Idaho](#)
- [5] [Special Forest Products Species Information Guide for the PNW \(USFS\)](#)
- [6] [Colorado State Raising Forest Tree Seedlings at Home](#)

Images

Conifer Reproductive Biology, 2007, retrieved from

<https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/tree-seed/tree-seed-centre/tsw07repbiol.pdf>

Oregon State, 2020, retrieved from

<https://landscapeplants.oregonstate.edu/plants/calocedrus-decurrens>

<https://landscapeplants.oregonstate.edu/plants/pinus-monticola>

Jim Peaco, US Park Service, retrieved from

<http://rockymountainbushcraft.blogspot.com/2012/12/rocky-mountain-tree-identification.html>