



CONE SCOUTING GUIDE

V2 | MARCH 2023

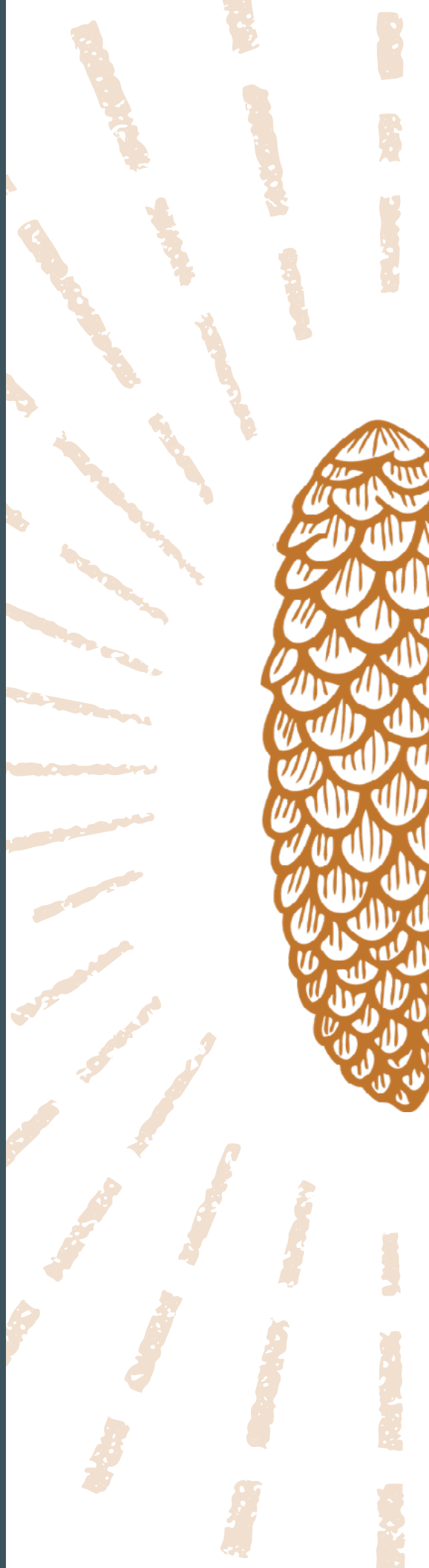


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Why Cone Scouting is Important

Seed supply for reforestation has not yet been scaled to meet the needs of our forests. A major component of knowing what to collect and where is dependent on identifying sufficient cone crops across species and regions. A mast event refers to a bountiful crop of seed-bearing cones produced by multiple trees across a given range simultaneously that only occurs once or twice a decade. Once a signal of fresh cone crop has been detected, a collection can be coordinated, along with tracking the ripeness of developing cones. The seed from those collections can be banked, sold and eventually used to grow seedlings.

Cone scouting typically begins in June and continues through the summer, with cone ripeness checks conducted periodically to assess seed production and confirm when cones are ripe and ready for collecting.

This version of the guide primarily focuses on species found in Washington, Oregon, California, and Idaho. Before heading out, we recommend downloading this PDF and saving it to your smartphone.

CONE SCOUTING TOOLS:



Binoculars

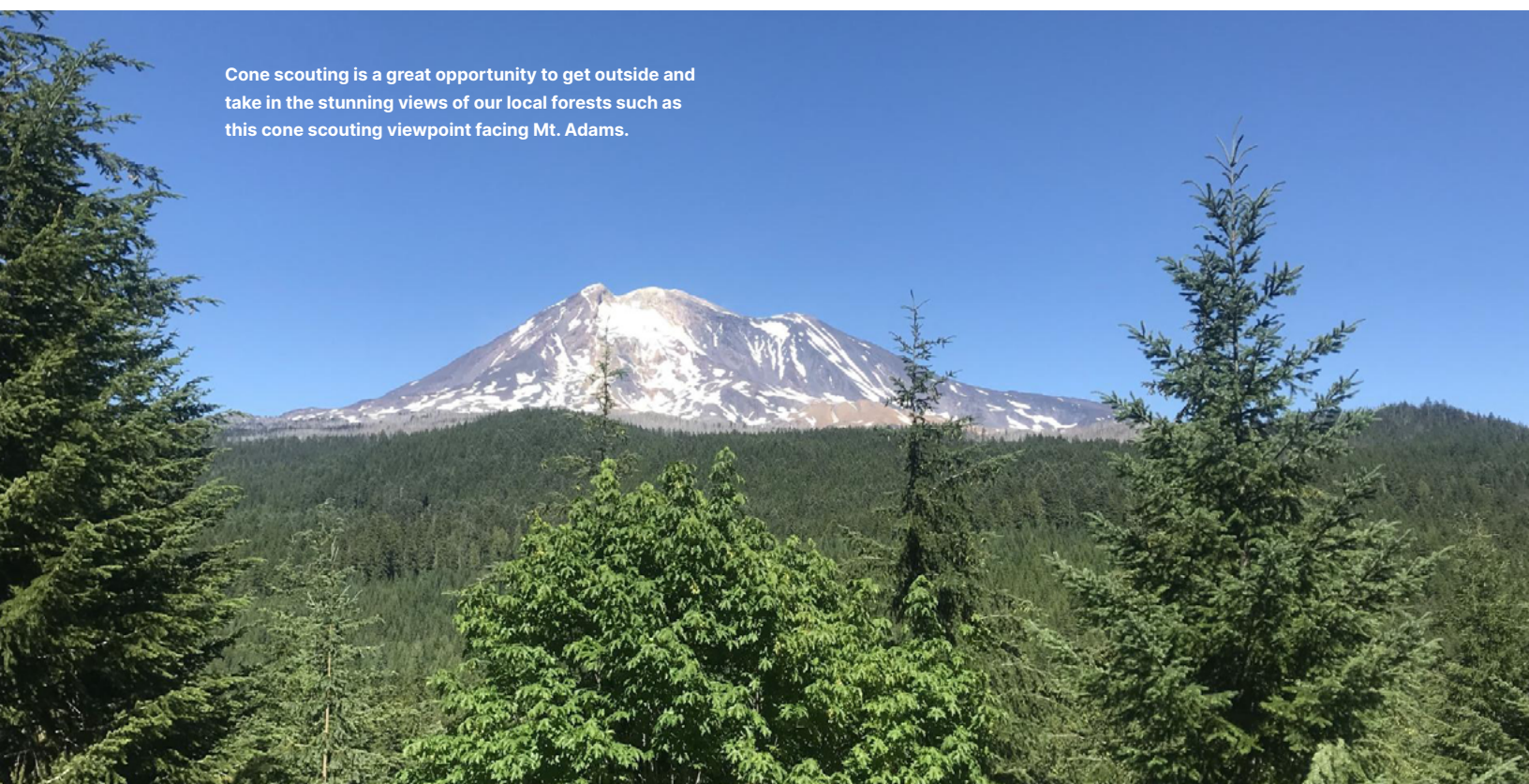


GPS



Camera
or smartphone

Cone scouting is a great opportunity to get outside and take in the stunning views of our local forests such as this cone scouting viewpoint facing Mt. Adams.



Cone Crop Reporting

Female seed cones vs male pollen cones

Female cones are the bulky, woody cones you probably think of when you imagine a conifer cone. But there are also male cones. Female cones bear seeds, so they are referred to as “seed cones”, whereas male cones bear pollen, so they are referred to as “pollen cones”. For seeds to develop, both types of cones are needed to allow pollination of female cones. Cone scouting requires us to know whether the cones we see in nature are seed cones or pollen cones. This guide prioritizes seed cone identification since our goal is to collect seeds, but we provide

some information here on pollen cones to help you differentiate between seed and pollen cones. Male pollen cones form primarily on the underside of lateral branches, and have a miniature red-brown berry like form until pollen is shed, at which time they become elongated and tassel-like [[Woody Plant Seed Manual, p. 162](#)]. Female seed cones can form in clusters on lateral branches or upright like candlesticks, as seen on many true firs. Early development of female seed cones can oftentimes be differentiated from male pollen cones by orientation on the branch.



Early development of a Douglas-fir seed cone (Oregon State, 2020)



Grand fir pollen (male) cones before release (Northwest Conifers, 2011)



Lodgepole pine pollen (male) cones and needles (Northwest Conifers, 2011)



Douglas-fir buds and pollen (male) cones (Northwest Conifers, 2011)

Cone Crop Reporting

Brief overview of cone production cycles in conifers

Cones grow primarily in either two-year or three-year cycles. Most species of conifers (particularly true firs) develop their cones in a two-year cycle. The reproductive buds form in the first year of the cone production cycle. Pollination occurs the following spring, followed by fertilization. Then cones expand and seeds mature through summer or early fall of the second year of the cone production cycle.

Three-year cone development cycles are common among pines. Reproductive buds form in the first year followed by pollination. Pollen tube development and growth toward the developing female gametophyte begins in the 2nd year, followed by fertilization, embryo development and enlargement, and final

seed maturation occurring during the 3rd year of reproductive tissue development. Seeds mature in the late summer and into fall of the 3rd year.

Old open cones versus new cone crop

Sometimes older cones will remain on trees for a couple years post development and ripening. These cones no longer carry viable seed and should not be included in your report. Old seed cones will be brown and open whereas fresh cone crops, as illustrated in this guide, often range from reddish-green prior to ripening. Once cones have reached peak ripeness, the seed quality decreases from that point forward unless collected, cleaned and stored properly.

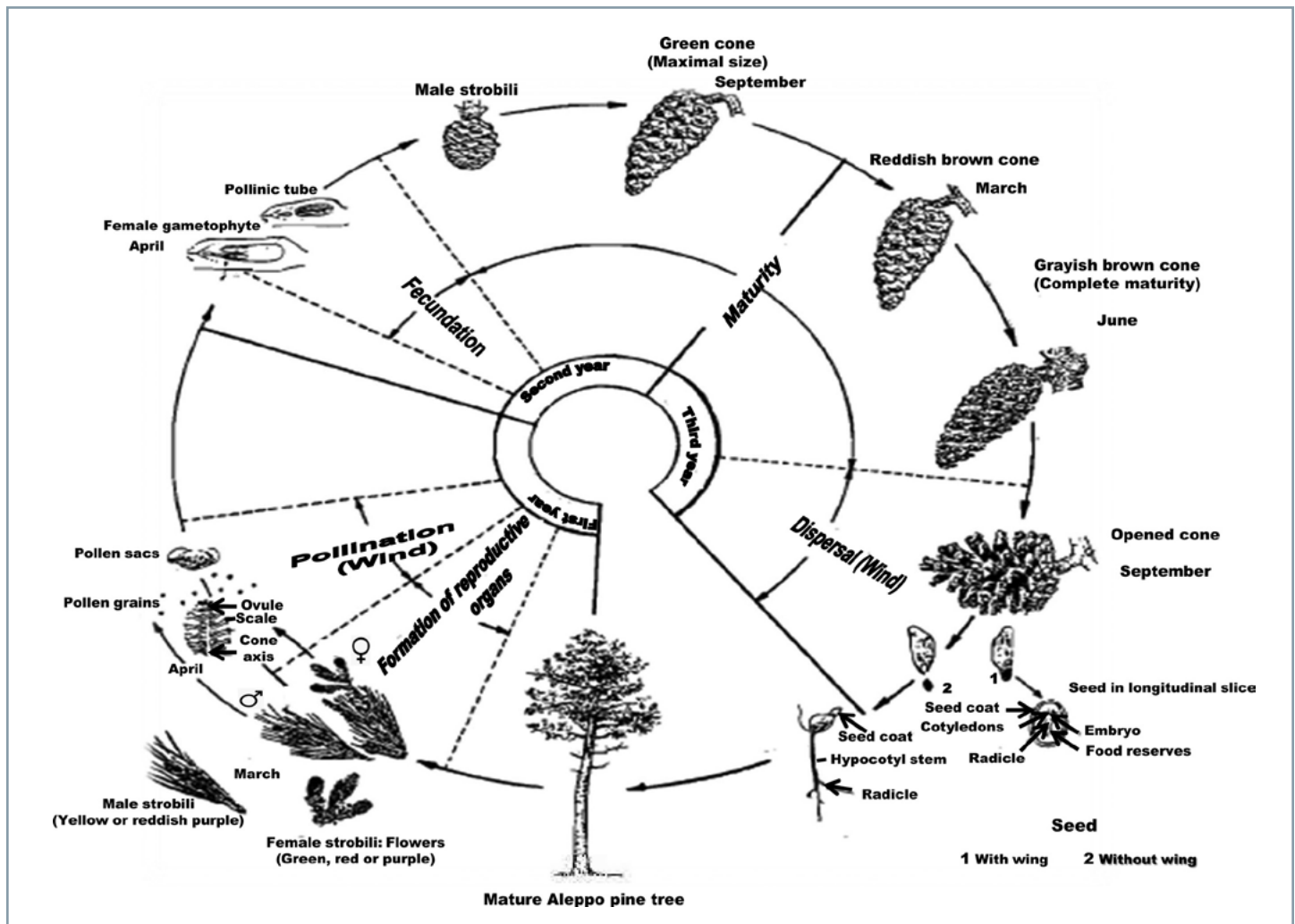


Illustration of three-year pine seed life cycle (Khouja, 1997)

Cone Crop Reporting

An at a glance guide to cone scouting and crop grading

Step 1: Identify the tree you are scouting

If you see a tree carrying cones, use this guide to help you with species identification. There are also 3rd party apps such as Google Lens and Seek by iNaturalist that use AI to identify species. If you are still struggling with identification then please email us at seed@silvaseed.com

Step 2: Grade the tree you are looking at

Once you have identified the tree with cones, select a single tree in the area that represents the average number of cones per tree. Do not look at the tree with the most or least cones. Look only at the top 1/3 of the tree. Use Table 1 (below) to grade the cone crop. Note that crop grade is species specific and report accordingly.

SPECIES	PAGE	LIGHT CROP	MODERATE CROP	HEAVY CROP
Douglas fir	6	Few scattered cones, usually near tree tops and on limb ends	Several cones per limb with cone bearing limbs extending down most of the crown	10 to 20 cones per limb with cone bearing limbs extending down most of the crown
Ponderosa pine	8	Few individual cones scattered over the crown	Cones more numerous and in clusters of 2-3	Cones in clusters of 3-5 and several clusters per limb
Grand fir	10	Less than 20 cones per tree	About 30 cones per tree	More than 40 cones per tree
Noble fir	12	Less than 20 cones per tree	About 30 cones per tree	More than 40 cones per tree
Lodgepole pine	14	Approximately 30 cones per tree	Approximately 60 cones per tree	In a mast year, there will be roughly 100 cones on each mature tree
White fir	16	50 cones	100 cones	200+ cones per year
Red fir	18	About 30 Cones per tree	About 50 cones per tree	80-100 cones on mature, healthy, dominant trees
Jeffrey pine	20	Few individual cones scattered over the crown	Cones more numerous and in clusters of 2-3	Cones in clusters of 3-5 and several clusters per limb
Western hemlock	22	Cones only at tips of branches		There will be hundreds of cones per mature tree in a mast year
Western redcedar	24	Light crops are rare, it's more likely that there would be no cones at all	A moderate crop will have a moderate concentration of cones in the upper third of the tree	A heavy crop will have a high concentration of cones throughout the whole tree
Western larch	26	Less than 3 cones per major branch of a dominant tree	3 - 10 cones per major branch of a dominant tree	Over 10 cones per major branch of a dominant tree Over 1,000 cones per tree
Engelmann spruce	28	A few scattered cones in the very top of the tree	Cones are not plentiful enough to weigh down branches	Cones are concentrated in the top of the tree on every branch, weighing them down
Incense cedar	30	Few scattered cones, likely hard to see	Cones are visible throughout the crown, roughly 20 per branch	Tree will have a yellow tint to it with 50+ cones per branch throughout the whole crown

Cone Crop Reporting

An at a glance guide to cone scouting and crop grading

Step 3: What proportion of trees near you look like your sample tree?

Is every tree in the direct area represented by the sample tree you graded or do only half of the trees look like that? Please report approximate percentages in intervals of 25%.


Step 4: What is the species composition of your area?

How many trees in your direct area are represented by your sample species? Is it the entire stand or is it only a couple trees in your area? Please report in approximate percentages in intervals of 25%

Examples:

- ✓ All trees around you are ponderosa pine, as is the sample tree you've selected = 100%
- ✓ Half of the trees around you are ponderosa pine, as is the sample tree you've selected = 50%

Sample Report

Location: National or State Forest, BLM, road name or number, GPS coordinates	<div style="background-color: #333; color: white; padding: 5px; text-align: center;">CONE CROP PHOTO DOCUMENTATION</div> 
Step 1: Douglas fir	
Step 2: Moderate Crop	
Step 3: in 50% of nearby Douglas fir	
Step 4: with 75% representation in stand	
Notes: This stand is mostly Douglas fir and most trees have approximately 10 cones on every branch in the upper third of the crown. 10% of trees have no cones or 10% of trees have 20+ cones per branch	
<p>Please include at least one photo. Do the best you can to capture the amount of crop on as many trees as possible. Try to get a photo of the upper half of the tree in good lighting.</p>	

Douglas-fir (*Pseudotsuga menziesii*)

Species ID

- ✓ Thin needles stick out in all directions forming a bottle brush and are soft to the touch.
- ✓ Bark is gray and brown with deep grooves.
- ✓ Cones have a three pointed bract that extends beyond each scale.
- ✓ New cone development can be identified as red shoots developing at the tips of branches.

LIGHT CROP

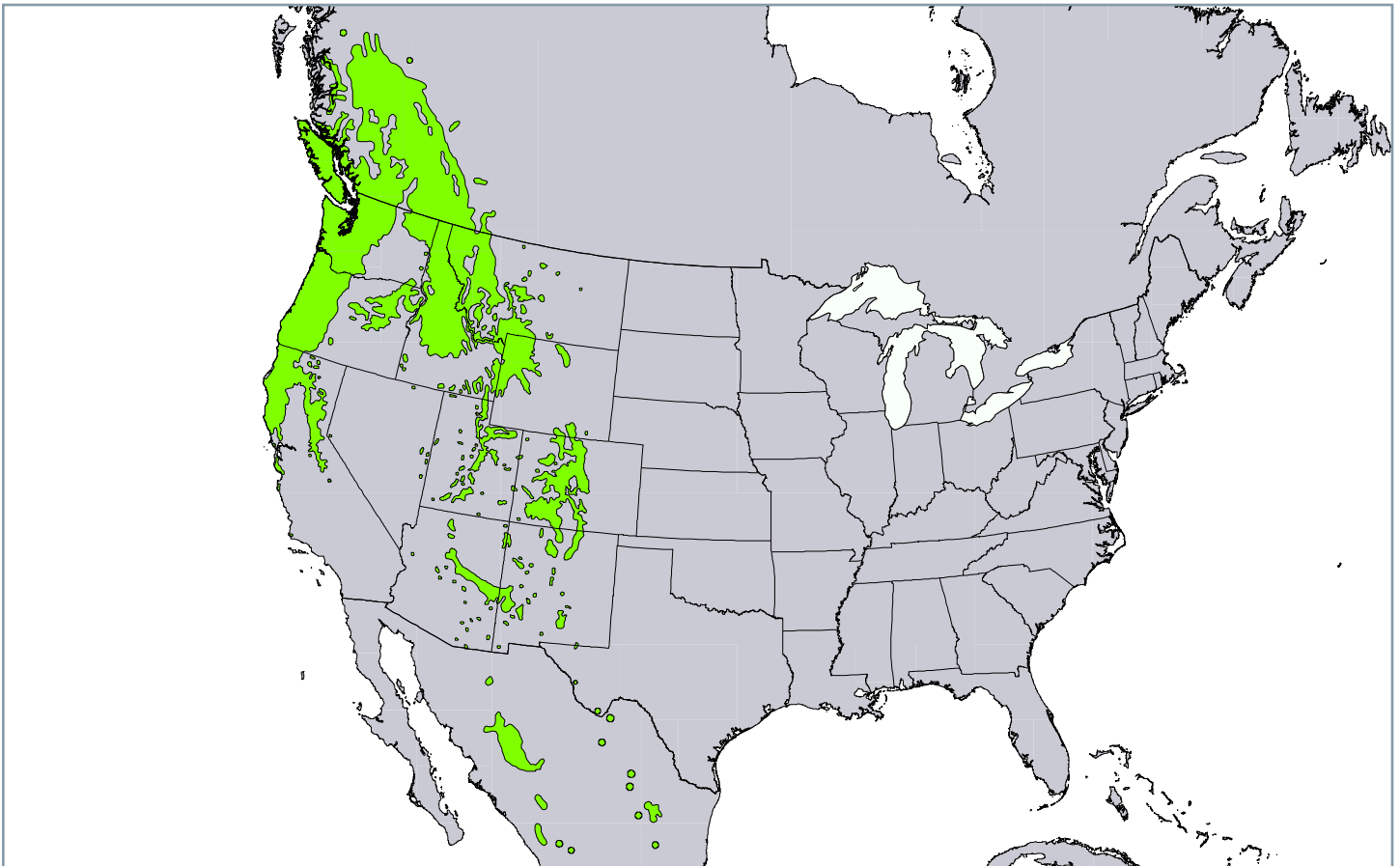
Few scattered cones, usually near tree tops and on limb ends

MODERATE CROP

Several cones per limb with cone bearing limbs extending down most of the crown

HEAVY CROP

10 to 20 cones per limb with cone bearing limbs extending down most of the crown



[USDA Douglas-fir distribution map](#)

Douglas-fir (*Pseudotsuga menziesii*)

Low crop



Light crop of Douglas fir (Silvaseed)

Medium crop



Medium Douglas fir crop (Silvaseed)

Heavy crop



Very heavy crop of Douglas fir (Silvaseed)

✗ Open (blown) cone



Open cone from last year, seed has already been released (Unknown)

✗ Male pollen cone



Douglas-fir buds and pollen (male) cones (Northwest Conifers, 2011)

✓ Immature cone



Immature Douglas fir cones look like small red buds in the spring (Blogspot, Unknown)

Ponderosa pine (*Pinus ponderosa*)

Species ID

- ✓ 3 needles per bundle, up to 10 inches long with sharp points.
- ✓ Flat yellow or red plated bark.
- ✓ Cones are 3 to 6 inches long and egg shaped with a sharp point on each scale.
- ✓ In abundant crop years, cones of Ponderosa pines will occur in clusters of 3 to 5, multiple clusters per branch.

LIGHT CROP

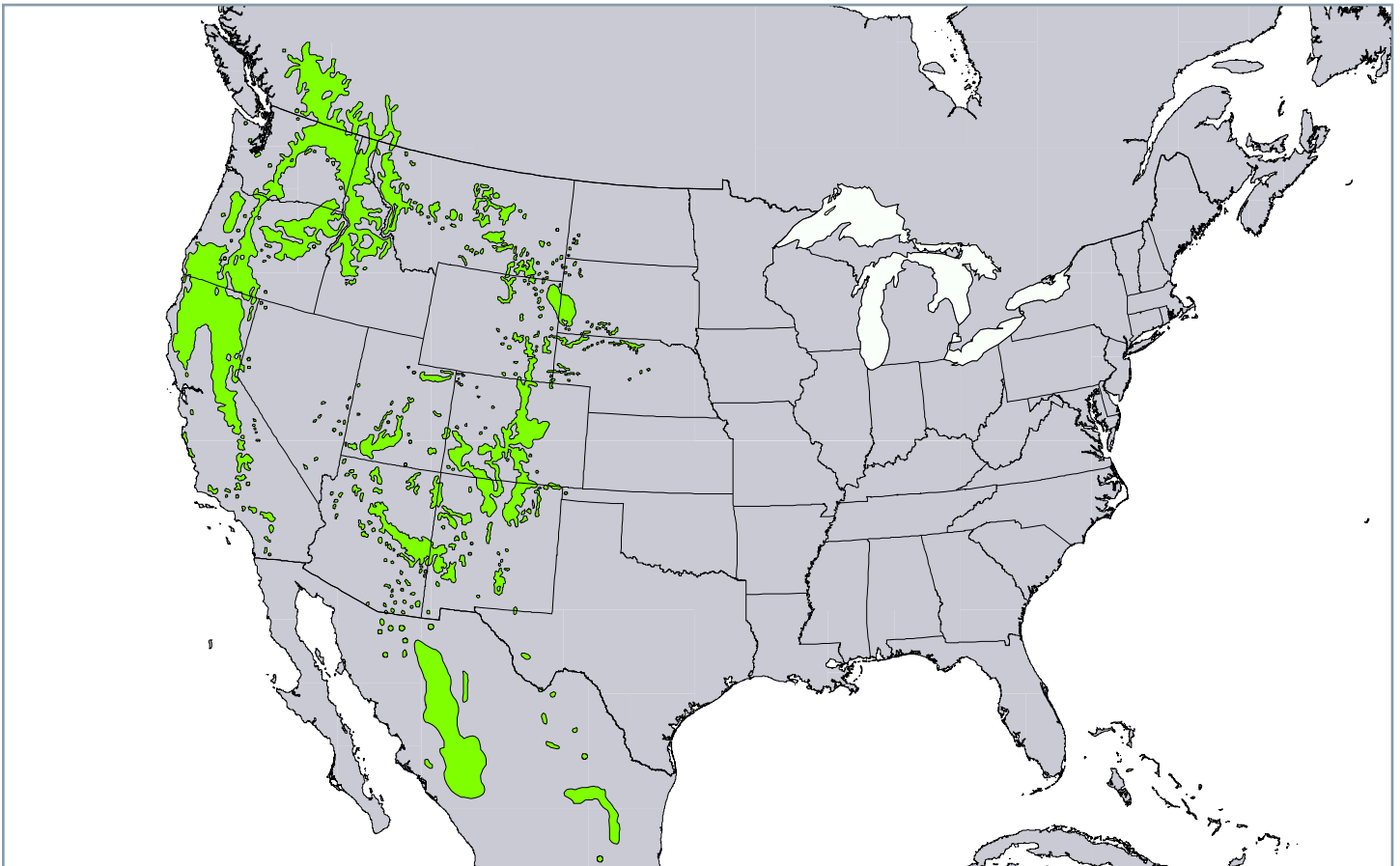
Few individual cones scattered over the crown

MODERATE CROP

Cones more numerous and in clusters of 2-3

HEAVY CROP

Cones in clusters of 3-5 and several clusters per limb



[USDA Ponderosa pine distribution map](#)

Ponderosa pine (*Pinus ponderosa*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Open (blown) cone



Ponderosa pine cones that have opened up and released their seed (iStock)

✗ Male pollen cone



Ponderosa pine pollen (male) cone, not to be reported as cone crop (Northwest Conifers, 2011)

Medium crop



PIPO with medium cone crop. Note the presence of previous years open cone also still on the tree. (Silvaseed)

Heavy crop



Heavier cone crop with multiple clusters per limb (Silvaseed)

✓ Immature cone



Slightly immature 2nd year cones and cluster of 1st year cones (Utah State University, Wildland Resources Department)

Grand fir (*Abies grandis*)

Species ID

- ✓ Needles spread out on opposite sides of the twig in flattened rows. They are dark shiny green on top with two white lines on the bottom.
- ✓ Bark is smooth gray with blisters on small branches, breaking into flat ridges and narrow furrows on large trees.
- ✓ Cones sit upright on the branches near the treetop and fall apart at maturity.

LIGHT CROP

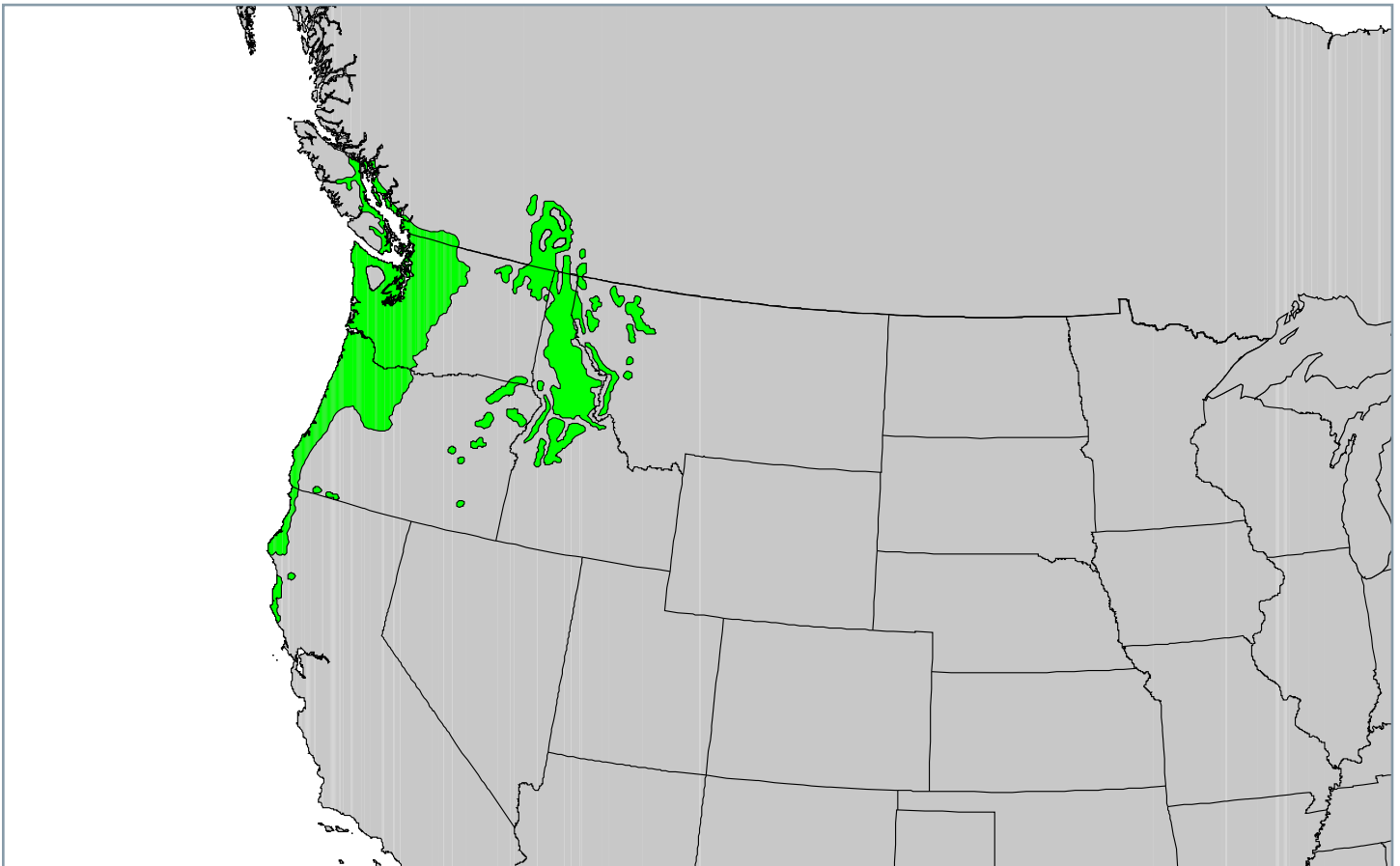
Less than 20 cones per tree

MODERATE CROP

About 30 cones per tree

HEAVY CROP

More than 40 cones per tree



[USDA Grand fir distribution map](#)

Grand fir (*Abies grandis*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Male pollen cone



(Oregon State, 2020)

Medium crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✓ Immature cone



Immature cones (Silvaseed)

Heavy crop



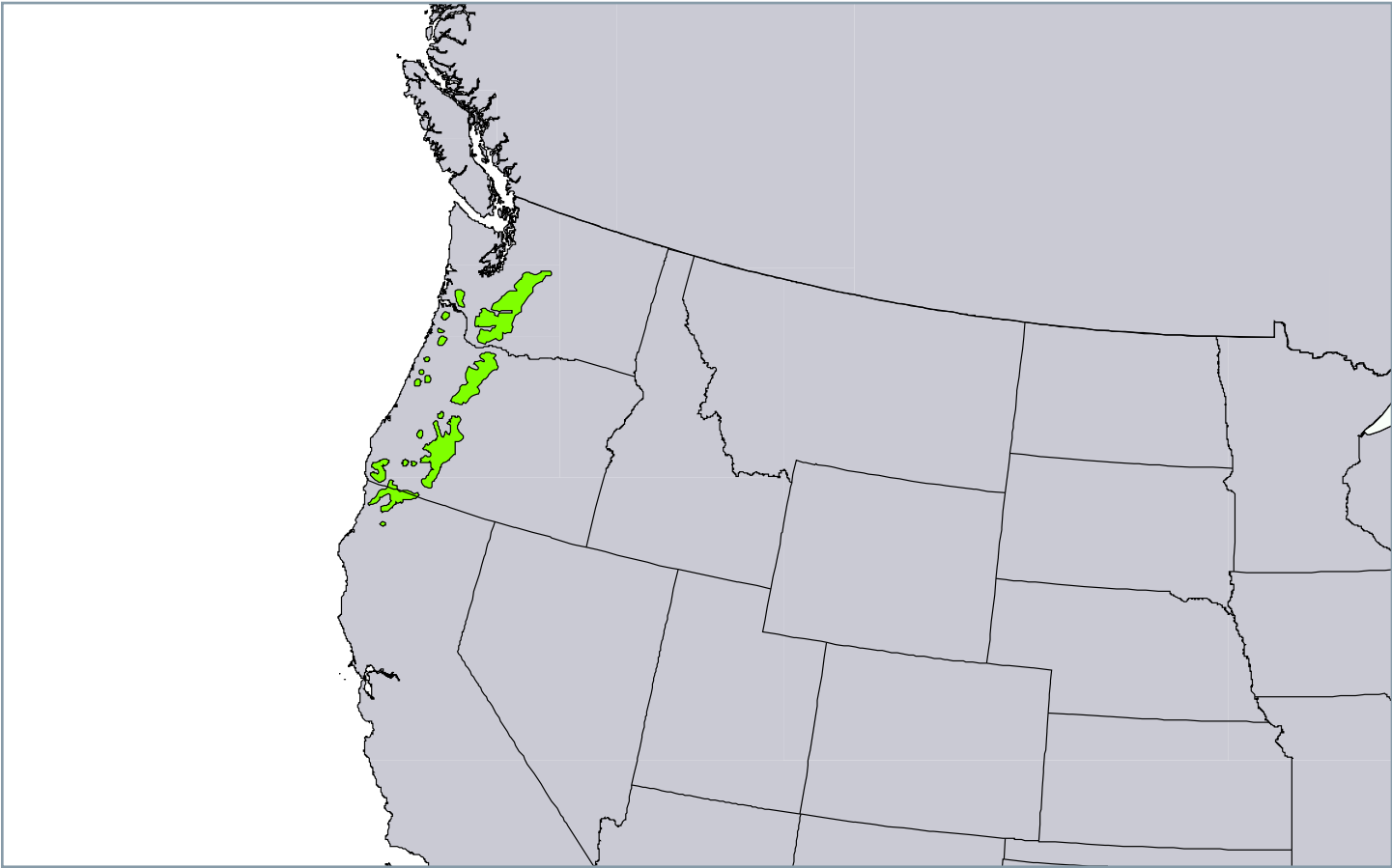
Heavy grand fir crop (Coniferous Forest)

Noble fir (*Abies procera*)

Species ID

- ✓ Needles are shaped like hockey sticks and sweep away from the twig. They are blue green with bands of white along the side.
- ✓ Young bark is gray and smooth with resin blisters. Older bark breaks into furrows with flat, narrow ridges.
- ✓ Cones sit upright on branches near the top of the tree and have distinctive whiskery bracts that protrude beyond the scales.

LIGHT CROP
Less than 20 cones per tree
MODERATE CROP
About 30 cones per tree
HEAVY CROP
More than 40 cones per tree



[USDA Noble fir distribution map](#)

Noble fir (*Abies procera*)

Low crop



Light crop for Noble fir (Native Plants PNW, 2014)

Medium crop



Medium crop for Noble fir (Silvaseed)

Heavy crop



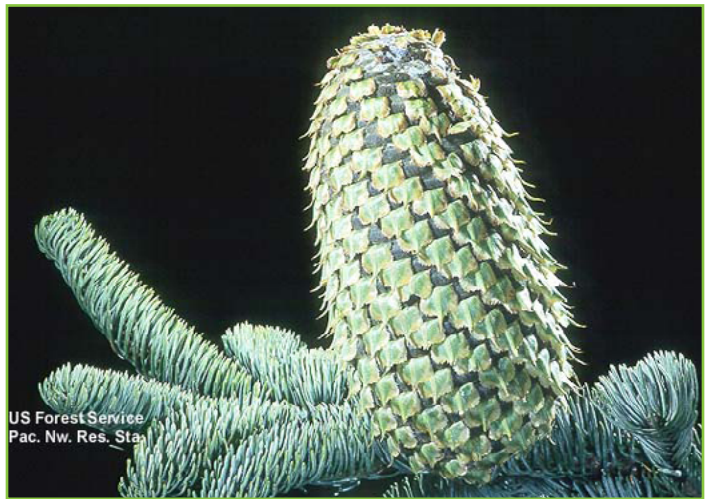
Heavy Noble fir crop (Gardening Know How, 2017)

✗ Male pollen cone



(Tree-guide, Unknown)

✓ Immature cone



(Oregon State, 2020)

Lodgepole pine (*Pinus contorta*)

Species ID

- ✓ Needles are about two inches long, and two to a fascicle
- ✓ Bark is dark gray and scaly with small furrows
- ✓ Cones are egg-shaped, about 2 inches long and have sharp points on the scales. Cones may not open until exposed to heat from fire (serotinous).
- ✓ Multiple year's cones may remain on the tree. Old cones will be open and may be light gray to tan colored. Older cones maybe entirely gray. We are not interested in old cones because we can't anticipate how well the old seed will germinate. [Schaefer, 2015]

LIGHT CROP

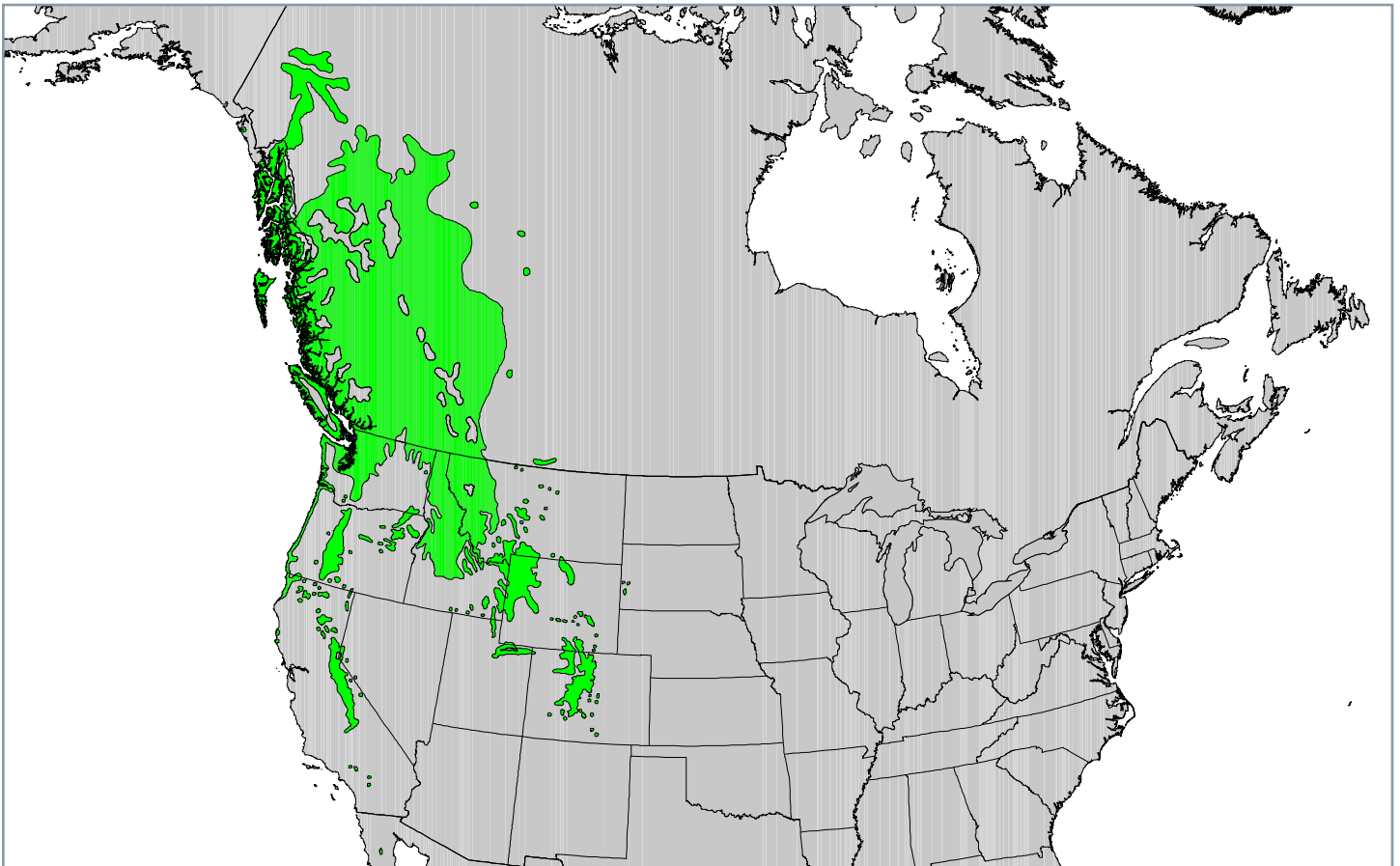
Approximately 30 cones per tree

MODERATE CROP

Approximately 60 cones per tree

HEAVY CROP

In a mast year, there will be roughly 100 cones on each mature tree



[USDA Lodgepole pine distribution map](#)

Lodgepole pine (*Pinus contorta*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

Medium crop



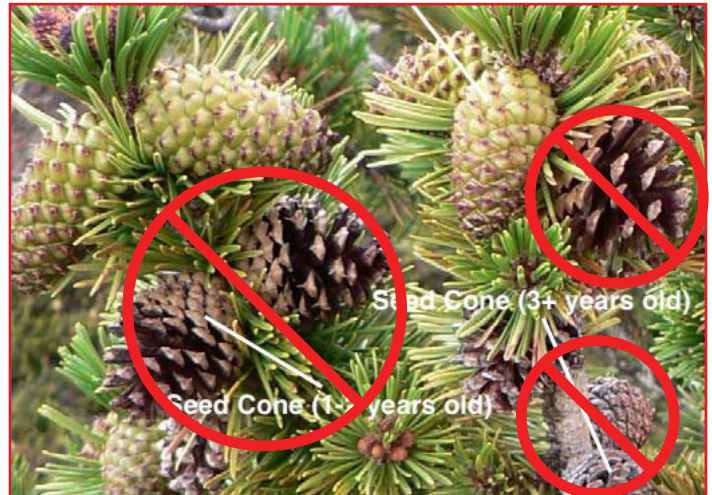
Medium cone crop (Silvaseed)

Heavy crop



Medium to heavy crop, 1 year old cone (Silvaseed)

✗ Open (blown) cone



Open and immature lodgepole cones. Seeing both old and new cones on the same tree is not uncommon. (Owens, J. N., 2006)

✗ Male pollen cone



Lodgepole pollen (male) cones and needles (Northwest Conifers, 2011)

✓ Immature cone



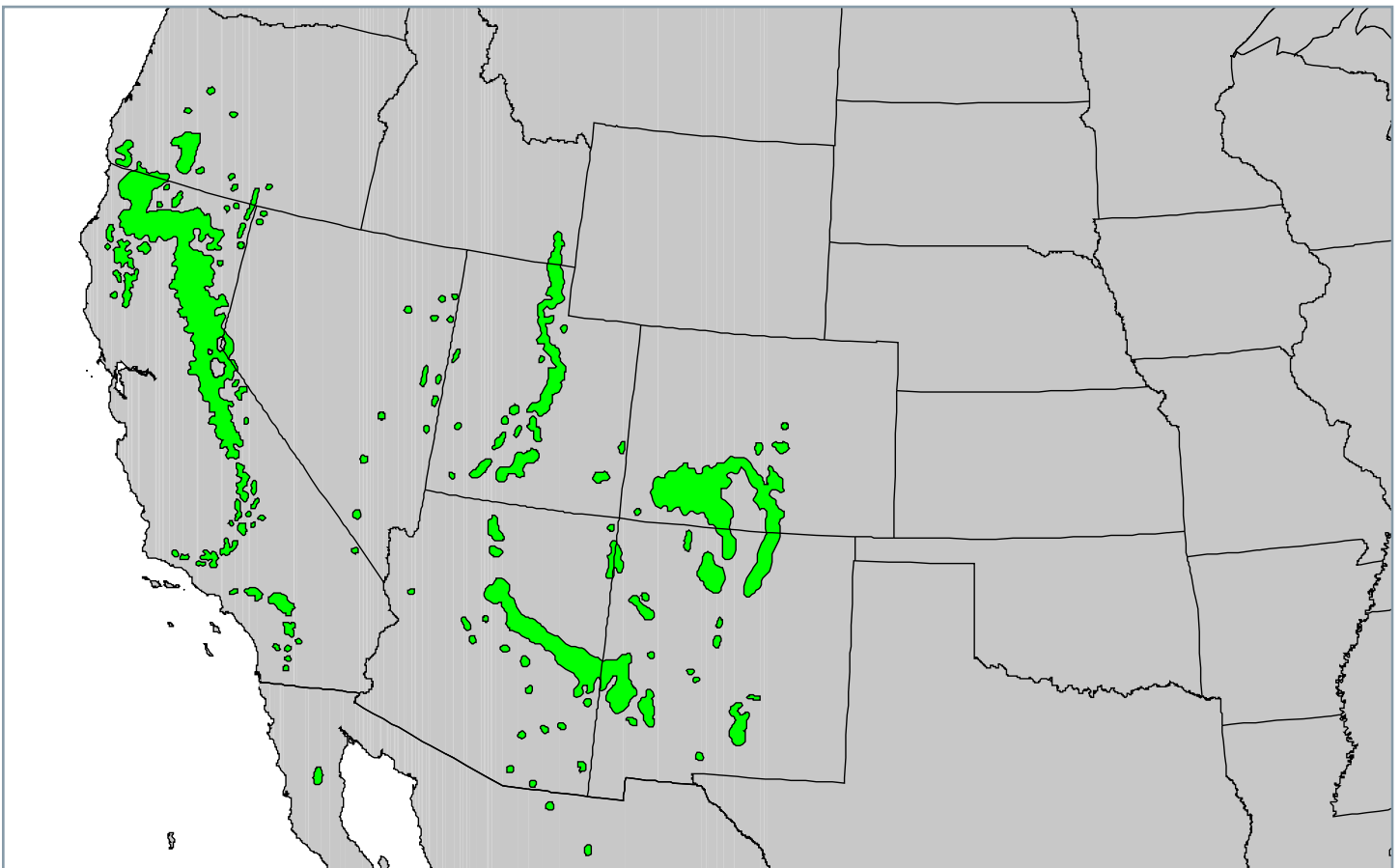
Open and immature lodgepole cones. Seeing both old and new cones on the same tree is not uncommon. (Owens, J. N., 2006)

White fir (*Abies concolor*)

Species ID

- ✓ Needles are about 2 inches long and curve upward in a V or U shape. They are blue gray with white lines on top and bottom.
- ✓ Smooth, gray bark breaks in deep furrows on large trees usually showing brown or yellowish inner bark.
- ✓ Cones sit upright and are brown in color with no whiskery bracts

LIGHT CROP
50 cones
MODERATE CROP
100 cones
HEAVY CROP
200+ cones per year



[USDA White fir distribution map](#)

White fir (*Abies concolor*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Male pollen cone



(University of Arizona)

Medium crop



Medium to heavy crop of White fir cones (Silvaseed)

✓ Immature cone



(The Gymnosperm Database, 2023)

Heavy crop



Heavy crop of white fir cones (Silvaseed)

Red fir (*Abies magnifica*)

Species ID

- ✓ Needles are shaped like hockey sticks but are square instead of flat. They are blue green with white lines on upper and lower surfaces.
- ✓ Bark is smooth and brown becoming gray and broken by narrow furrows on large trees.
- ✓ Cones sit upright on branches, have whiskery bracts (but are larger than Noble cones) and fall apart at maturity.

LIGHT CROP

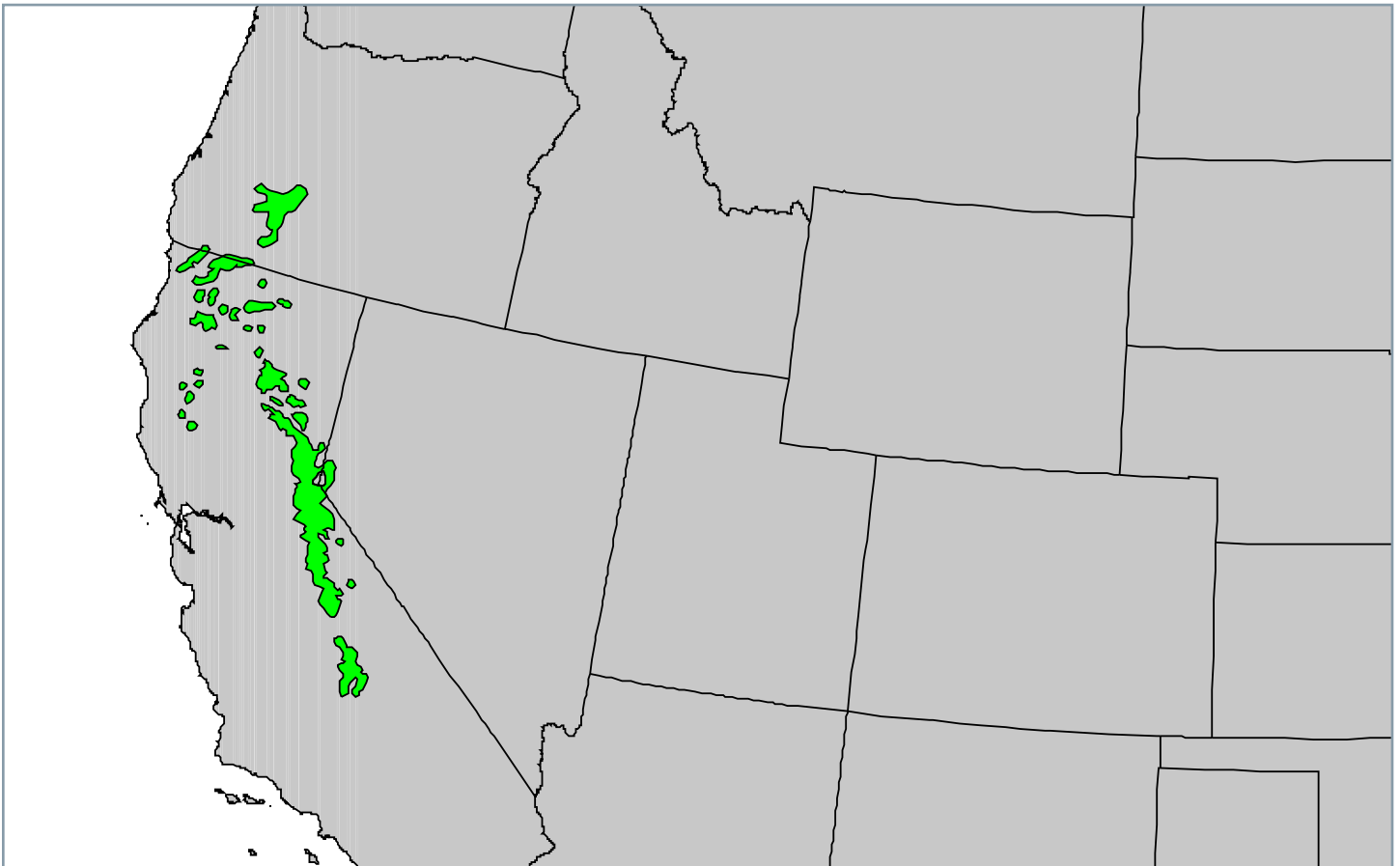
About 30 cones per tree

MODERATE CROP

About 50 cones per tree

HEAVY CROP

80-100 cones on mature, healthy, dominant trees



[USDA Red fir distribution map](#)

Red fir (*Abies magnifica*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Male pollen cone



(Washington State, Unknown)

✓ Immature cone

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

Medium crop



Medium crop of Red fir cones (Silvaseed)

Heavy crop



Heavy Red fir cone crop. The brown signals they are almost ready (Silvaseed)

Jeffrey pine (*Pinus jeffreyi*)

Species ID

- ✓ There are 3 needles per bundle. Jeffrey pine needles typically grow farther along the twig, while ponderosa pine needles tend to be bunched at the end.
- ✓ Bark is very similar to ponderosa with jigsaw puzzle piece shapes but brown instead of yellow or red and may smell like vanilla.
- ✓ Cones will develop into clusters at the ends of branches.

LIGHT CROP

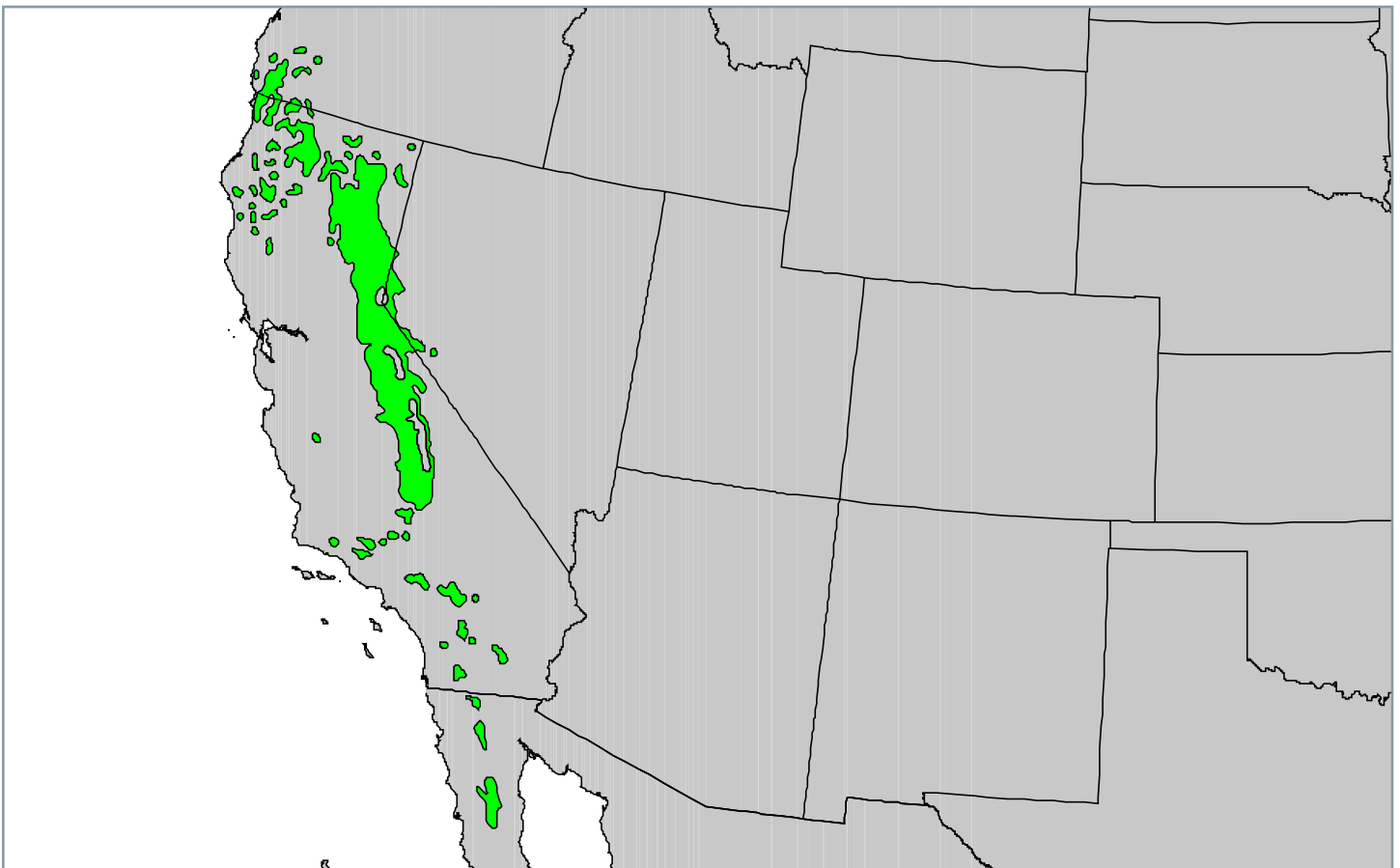
Few individual cones scattered over the crown

MODERATE CROP

Cones more numerous and in clusters of 2-3

HEAVY CROP

Cones in clusters of 3-5 and several clusters per limb



[USDA Jeffrey pine distribution map](#)

Jeffrey pine (*Pinus jeffreyi*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Open (blown) cone



(The Gymnosperm Database, 2023)

✗ Male pollen cone



(Steve K. Harpe, 2022r)

Medium crop



Medium Jeffrey pine cone crop (Silvaseed)

✓ Immature cone



(Paul Slichter, 2021)

Heavy crop



Jeffrey cones are 2 inches larger than ponderosa (Flickr)

Western hemlock (*Tsuga heterophylla*)

Species ID

- ✓ Needles are short and flat but irregular in length and usually flattened on the twig. White lines on the bottom of the needle
- ✓ Bark is gray and develops furrows on large trees
- ✓ Cones are less than an inch long, scales are thin and rounded. They are greenish in color and turn brown with age

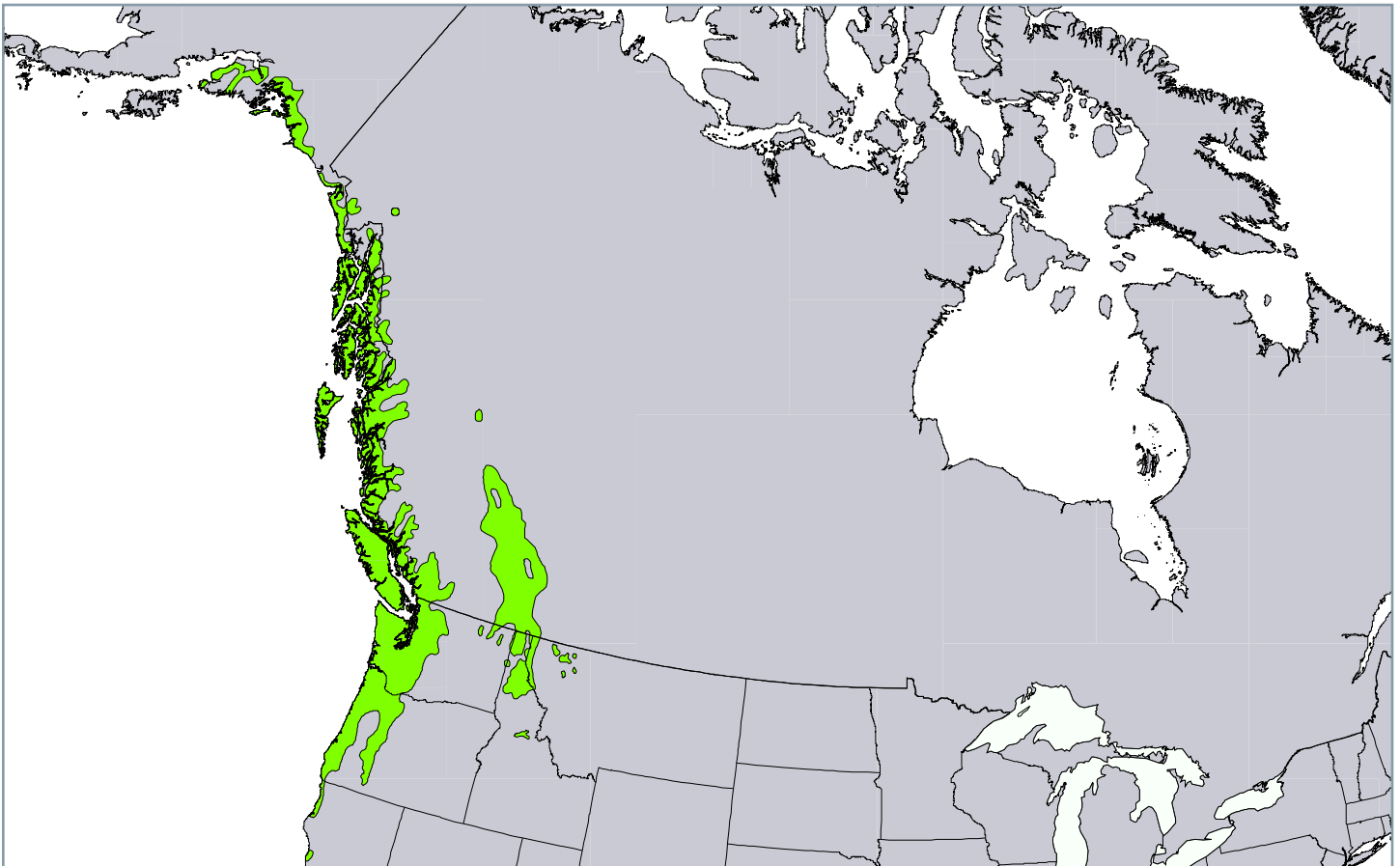
LIGHT CROP

Tips of branches

MODERATE CROP

HEAVY CROP

There will be hundreds of cones per mature tree in a mast year



[USDA Western hemlock distribution map](#)

Western hemlock (*Tsuga heterophylla*)

Low crop



(Oregon State, 2020)

Medium crop



Medium crop, cones have already opened (Oregon State, 2020)

Ripe Cone



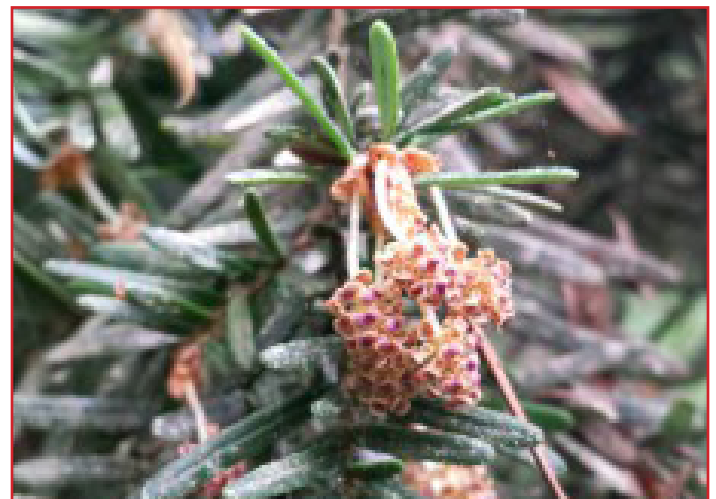
Hemlock cones turn brown and begin to open when ripe (Home Stratosphere, 2022)

Unripe to ripe to open cone



(Hemlock Restoration Initiative, 2021)

✗ Male Pollen Cone



(Seattle Arborist, 2014)

✓ Immature cone



An immature cone is light to dark green. (Miller, 2015)

Western redcedar (*Thuja plicata*)

Species ID

- ✓ Leaves are flat, wide and scale-like. They often have a white butterfly shaped pattern on the underside.
- ✓ Bark is reddish brown and stringy, and the base is buttressed.
- ✓ Cones are 1 cm long and sit on top of the branch. They look like little rose buds and average 3-6 seeds per cone [[USDA Database](#)].

LIGHT CROP

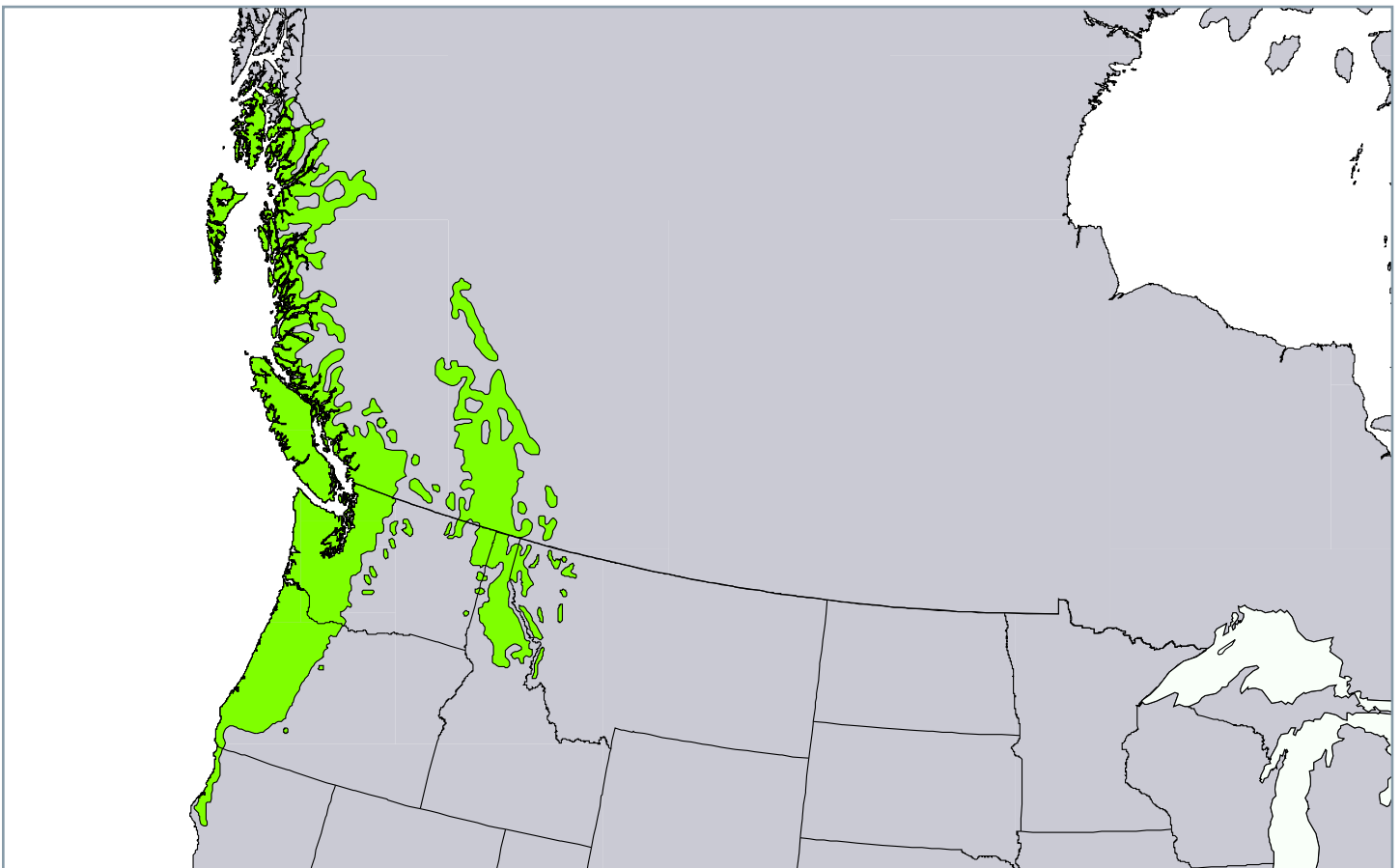
Light crops are rare, its more likely that there would be no cones at all

MODERATE CROP

A moderate crop will have a moderate concentration of cones in the upper third of the tree

HEAVY CROP

A heavy crop will have a high concentration of cones throughout the whole tree



[USDA Western Redcedar distribution map](#)

Western redcedar (*Thuja plicata*)

Low crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Open (blown) cone



(Oregon State, 2020)

✗ Male pollen cone



(NC State University)

Medium crop



(Oregon State, 2020)

Heavy crop



Heavy crop of Western redcedar (Silvaseed)

✓ Immature cone



Green, unripe western red cedar cones (Silvaseed)

Western larch (*Larix occidentalis*)

Species ID

- ✓ Needles are less than 2 inches long but appear in bundles of 15-30, like a pine. They grow from a short spur twig, turn golden yellow in autumn and fall off by winter time.
- ✓ Bark has gray or brown flaky plates, furrows develop on older trees.
- ✓ Cones have whiskery bracts that extend past the scales and are less than 2 inches in length. Cones can be red or green when immature. Both turn brown as they mature but the color change can be more difficult to see in red cones.

LIGHT CROP

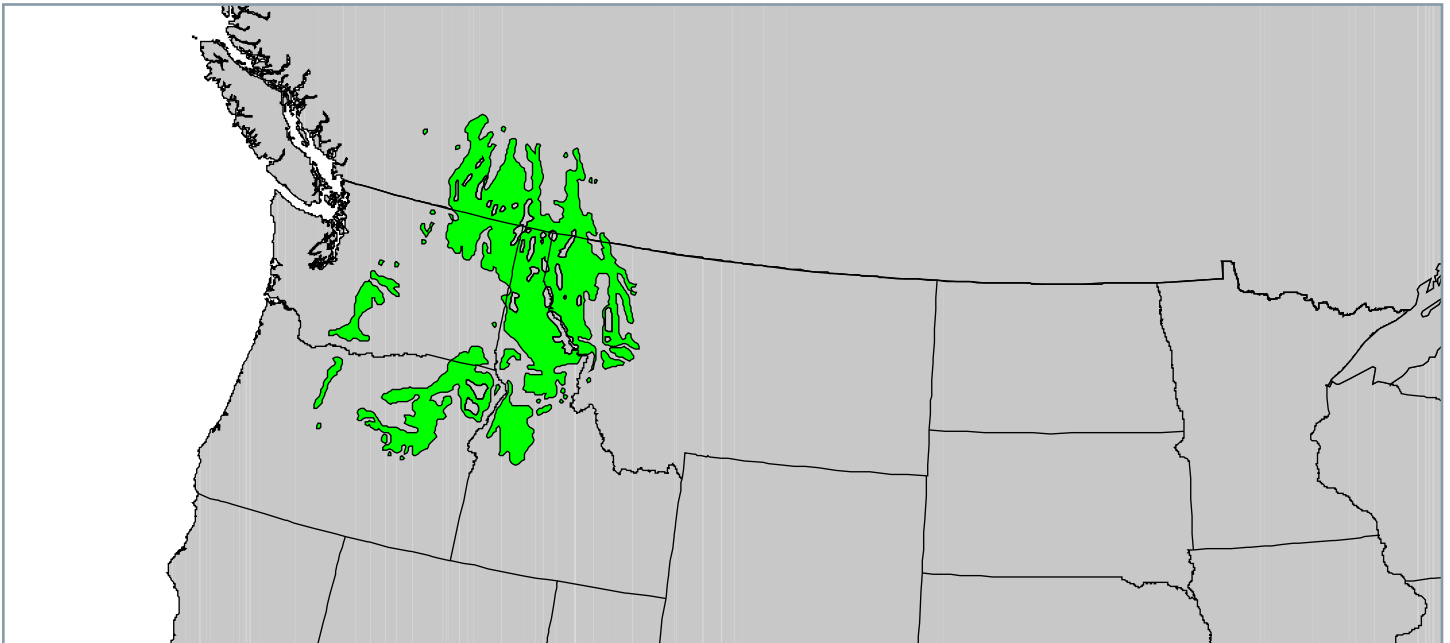
Less than 3 cones per major branch of a dominant tree

MODERATE CROP

3 - 10 cones per major branch of a dominant tree

HEAVY CROP

Over 10 cones per major branch of a dominant tree,
Over 1,000 cones per tree



[USDA Western larch distribution map](#)

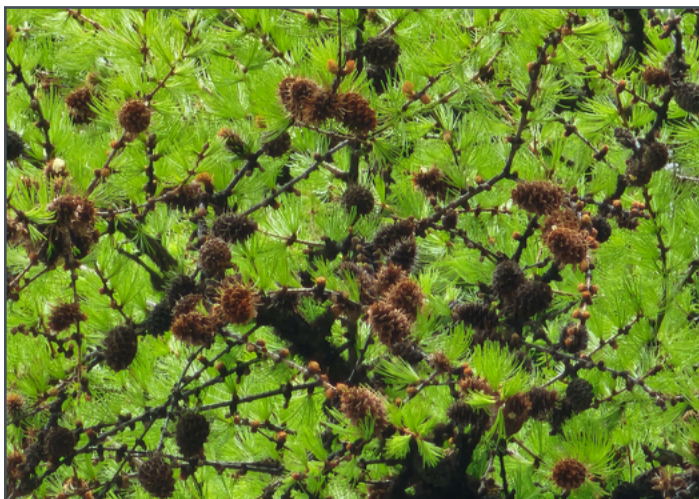
Western larch (*Larix occidentalis*)

Low crop



Larch trees with no cones (Walter Siegmund, 2007)

Medium crop



Medium crop, note previous years cones remaining on tree (Silvaseed)

Heavy crop



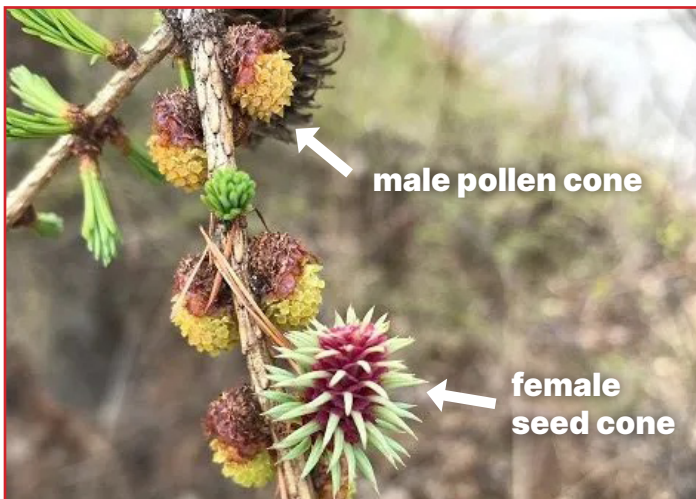
Over 10 cones per dominant branch indicates a heavy crop (Unknown)

✗ Open (blown) cone



(Oregon State, 2020)

✗ Male pollen cone



Please report female seed cones only (Wenatchee Naturalist, 2023)

✓ Immature cone



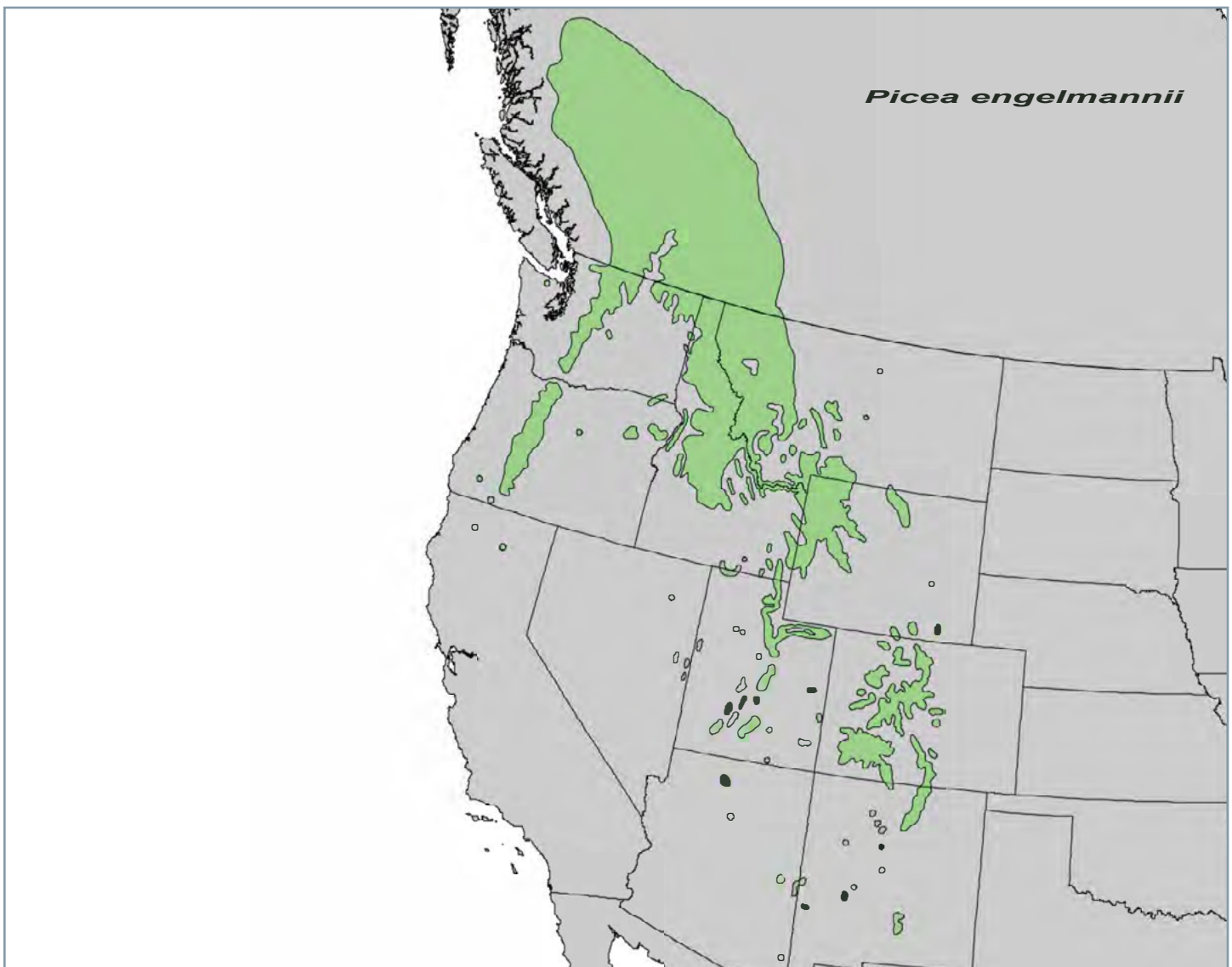
Immature larch cones. Only a few cones per branch indicates light crop (Silvaseed)

Engelmann spruce (*Picea engelmannii*)

Species ID

- ✓ Needles are about one inch long, thin and sharp and stick out all the way around the twig like a bottle brush. They grow from short, woody pegs that remain after needles fall off
- ✓ Bark is thin, gray and breaks into small scales on larger trees
- ✓ Cones are about three inches long with paper thin scales and come to a point

LIGHT CROP
A few scattered cones in the very top of the tree
MODERATE CROP
Cones are not plentiful enough to weigh down branches
HEAVY CROP
Cones are concentrated in the top of the tree on every branch, weighing them down



[USDA Engelmann spruce distribution map](#)

Engelmann spruce (*Picea engelmannii*)

Low crop



Light crop of Engelmann spruce (Silvaseed)

Medium crop

Work in progress.

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

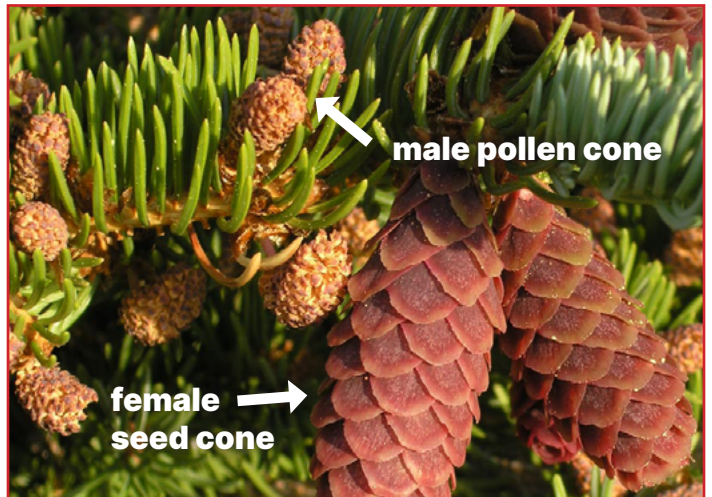
Submit photo with details to:
seed@silvaseed.com

✗ Open (blown) cone



Engelmann spruce cone that has opened up and released all its seeds (Northwest Conifers)

✗ Male pollen cone



Please report female seed cones only (The Gymnosperm Database, 2023)

Heavy crop



Heavy crop (mast) of Engelmann spruce (Silvaseed)

✓ Immature cone



Engelmann spruce cone development early in the spring (Silvaseed)

Incense cedar (*Calocedrus decurrens*)

Species ID

- ✓ Leaves are small, flat, scale-like and for long, overlapping wedge-shaped joints
- ✓ Bark is reddish brown and deeply furrowed on large trees
- ✓ Cones are shaped like a duck's bill, and when they mature, they open, showing the open bill with its tongue sticking out.

LIGHT CROP

Few scattered cones,
likely hard to see

MODERATE CROP

Cones are visible throughout the
crown, roughly 20 per branch

HEAVY CROP

Tree will have a yellow tint to it with
50+ cones per branch throughout the
whole crown



[USDA Incense cedar distribution map](#)

Incense cedar (*Calocedrus decurrens*)

Low crop



Low incense cedar crop. Tiny pale greens dots are immature cones. (Silvaseed)

Medium crop



(Oregon State, 2020)

Heavy crop

Work in progress.

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

Submit photo with details to:
seed@silvaseed.com

✗ Open (blown) cone



Open Incense cedar cone (Oregon State, 2020)

✗ Male pollen cone



Incense cedar pollen cone (C.J. Earle, 2011)

✓ Immature cone



Immature incense cedar cones (Silvaseed)

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