



# CONE SCOUTING GUIDE

V3 · MAY 2024



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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. Once a signal of fresh cone crop has been detected, the development and quality of the cones will be carefully tracked until they are ripe enough to be picked. The seed from those collections can be banked, sold and eventually used to grow and plant seedlings in compatible regions.

Cone scouting typically begins in June and continues through the summer. In late August and early September, cones will begin drying out and open up their scales, releasing seed into the wind. Cone collections must occur late enough for the seed to be fully developed but early enough that the cones have not started opening up yet.

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

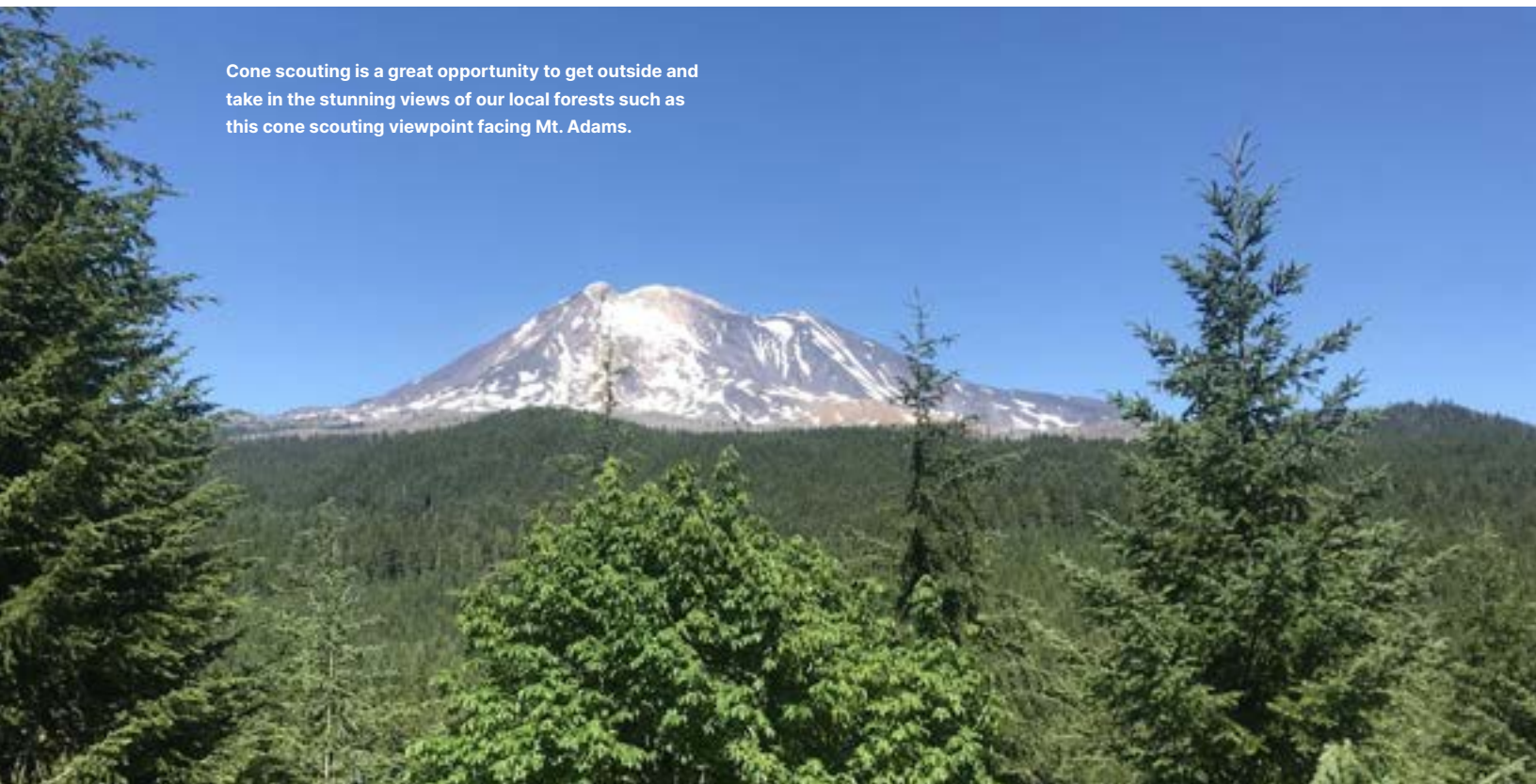


GPS



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 Scouting 101

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



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

# Cone Scouting 101

## Brief overview of cone production cycles in conifers

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

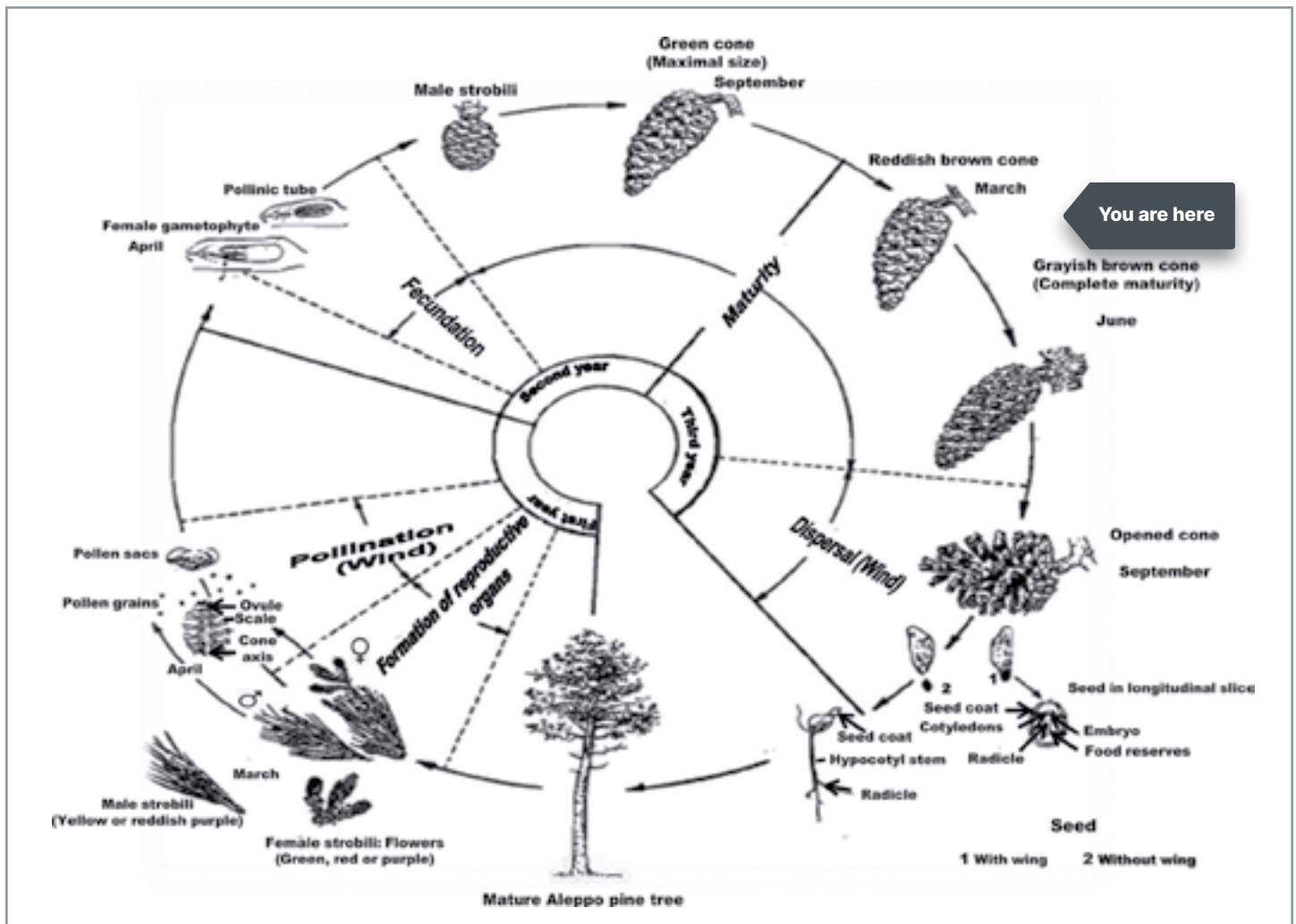
Three-year cone development cycles are common among pines. The buds form in the first year, followed by pollination and development

Development of the cone stops in the summer of the 2nd year and resumes in the spring of the 3rd year

of development, with seeds maturing in the fall post spring fertilization. Once the buds burst in early spring, the female seed cones (strobili) grow develop from mature tree tissue (in upper crowns and distal branch ends).

## 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.



Aleppo pine reproductive cycle, including seed and cone maturation (Khouja 1997)

# Cone Scouting TL;DR



## 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 reach out to [seed@silvaseed.com](mailto:seed@silvaseed.com).

### Step 2: Grade the crop you are looking at

Once you have identified the species that has cones on it, take a look around the stand. How many trees have cones on them? If there are more than 10 trees of the same species with cone on, proceed to the table below to classify the amount of crop you are seeing.

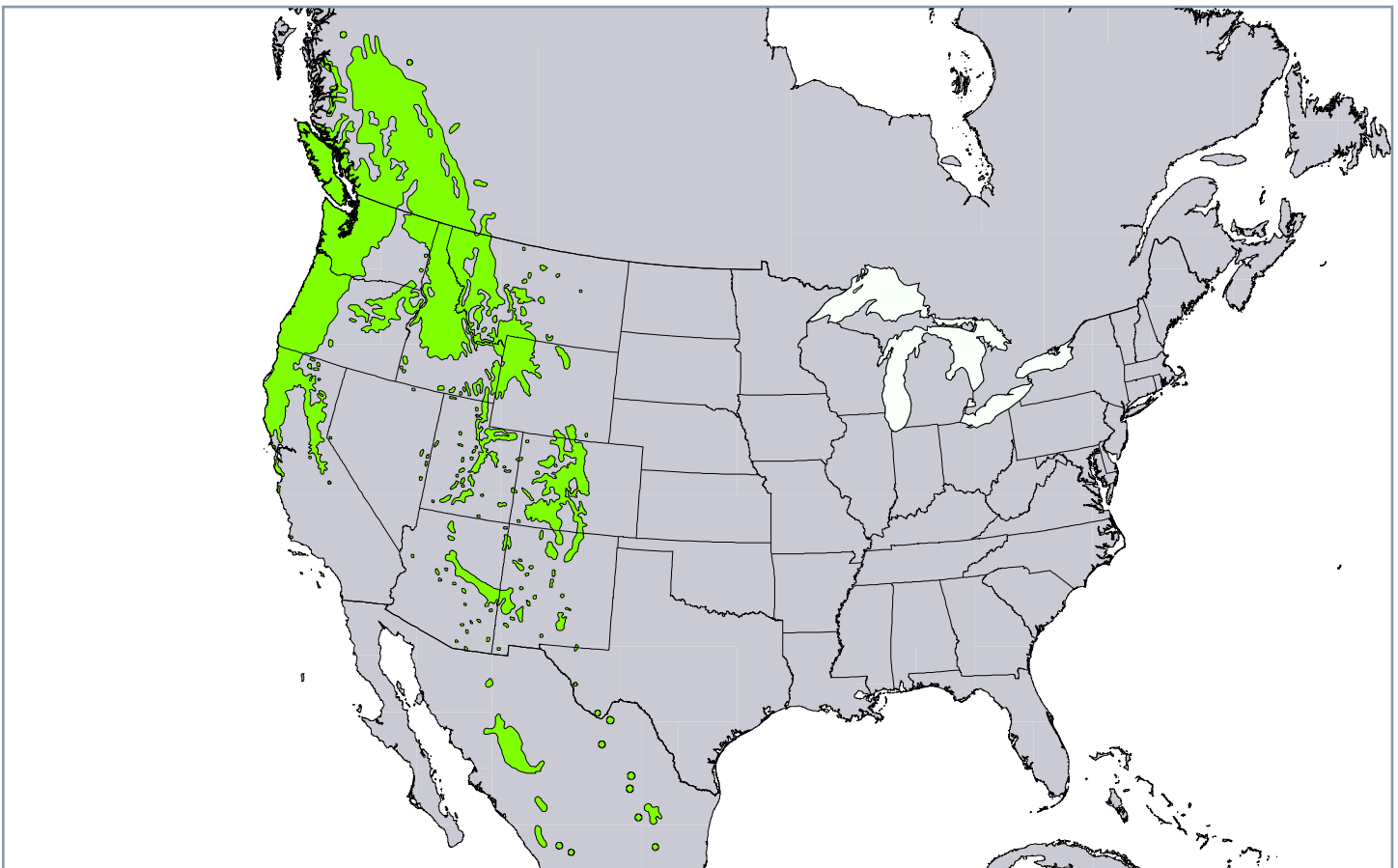
SPECIES	PAGE	LIGHT CROP	MEDIUM CROP	HEAVY CROP
<b>Douglas fir</b>	<b>6</b>	Fewer than 5 cones per limb, usually near tree tops and on limb ends	5-10 Cones per limb with cone bearing limbs extending down most of the crown	10 to 20 cones per limb with cone bearing limbs extending down most of the crown
<b>Ponderosa pine</b>	<b>8</b>	1-2 cones per branch, scattered throughout the crown	Cones more numerous and in clusters of at least 3	Cones in clusters of 3-5 and several clusters per limb
<b>Grand fir</b>	<b>10</b>	Less than 20 cones per tree is considered a light crop	About 30 cones per tree is considered a medium crop	More than 40 cones per tree is considered a heavy crop
<b>Noble fir</b>	<b>12</b>	Less than 20 cones per tree is considered a light crop	About 30 cones per tree is considered a medium crop	More than 40 cones per tree is considered a heavy crop
<b>Lodgepole pine</b>	<b>14</b>	Approximately 30 cones per tree	Approximately 60 cones per tree	In a mast year, there will be roughly 100 cones on each mature tree
<b>White fir</b>	<b>16</b>	Approximately 50 cones per tree	Approximately 100 cones per tree	200+ cones per tree
<b>Red fir</b>	<b>18</b>	About 30 Cones per tree	About 50 cones per tree	80-100 cones on mature, healthy, dominate trees
<b>Jeffrey pine</b>	<b>20</b>	1-2 cones per branch, scattered throughout the crown	Cones more numerous and in clusters of 2-3	Cones in clusters of 3-5 and several clusters per limb
<b>Western hemlock</b>	<b>22</b>	Less than 5 cones per branch	Approximately 10 cones per branch	At least 25 cones per branch
<b>Western redcedar</b>	<b>24</b>	Light crops are rare, its more likely that were would be no cones at all	At least 20 cones per branch	Approximately 50 cones per branch tip
<b>Western larch</b>	<b>26</b>	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.
<b>Engelmann spruce</b>	<b>28</b>	Approximately 100 cone per tree, concentrated near the top	At least 20 cones per branch	At least 50 cones per branch
<b>Incense cedar</b>	<b>30</b>	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

# 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
Fewer than 5 cones per limb, near tree tops and on limb ends
MEDIUM CROP
5-10 Cones per limb, cone bearing limbs extending down most of the crown
HEAVY CROP
10 to 20 cones per limb, cone bearing limbs extending down most of the crown



[USDA Douglas-fir distribution map](#)



# Douglas-fir (*Pseudotsuga menziesii*)

## ✗ 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)

## ✓ Developing cone



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

## Light crop



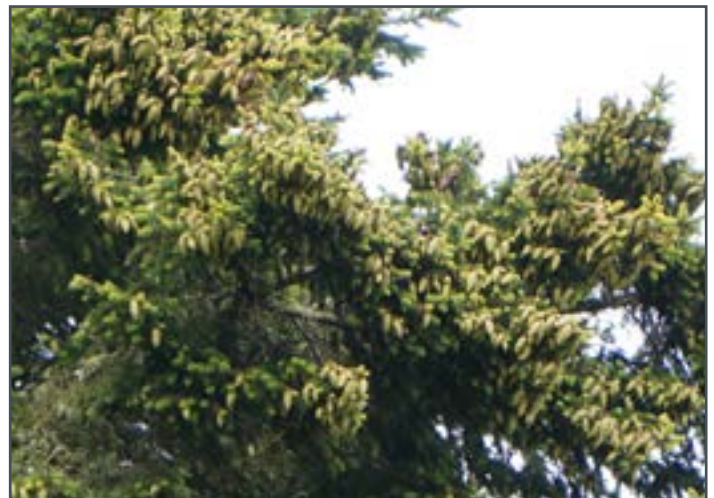
Fewer than 5 cones per limb, near tree tops and on limb ends (Silvaseed)

## Medium crop



5-10 Cones per limb, cone bearing limbs extending down most of the crown (Silvaseed)

## Heavy crop



10 to 20 cones per limb, cone bearing limbs extending down most of the crown (Silvaseed)

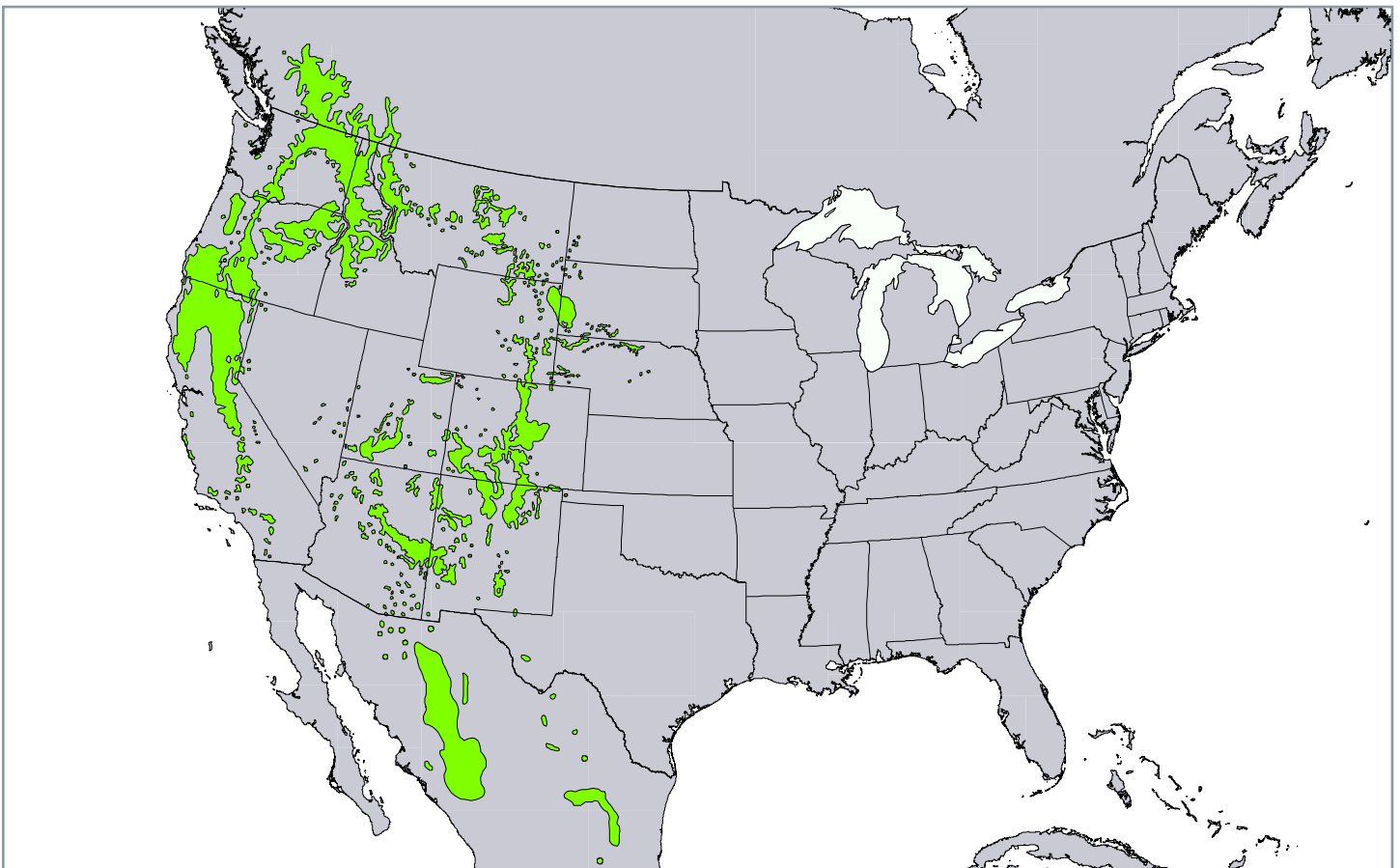


# Ponderosa pine (*Pinus ponderosa*)

## 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
1-2 cones per branch, scattered throughout the crown
MEDIUM CROP
Cones more numerous and in clusters of at least 3
HEAVY CROP
Cones in clusters of 3-5 and several clusters per limb



[USDA Ponderosa pine distribution map](#)

# Ponderosa pine (*Pinus ponderosa*)

**✗ 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)

**✓ Developing cone**



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

**Light crop**



1-2 cones per branch, scattered throughout the crown (Silvaseed)

**Medium crop**



Cones more numerous and in clusters of at least 3 (Silvaseed)

**Heavy crop**



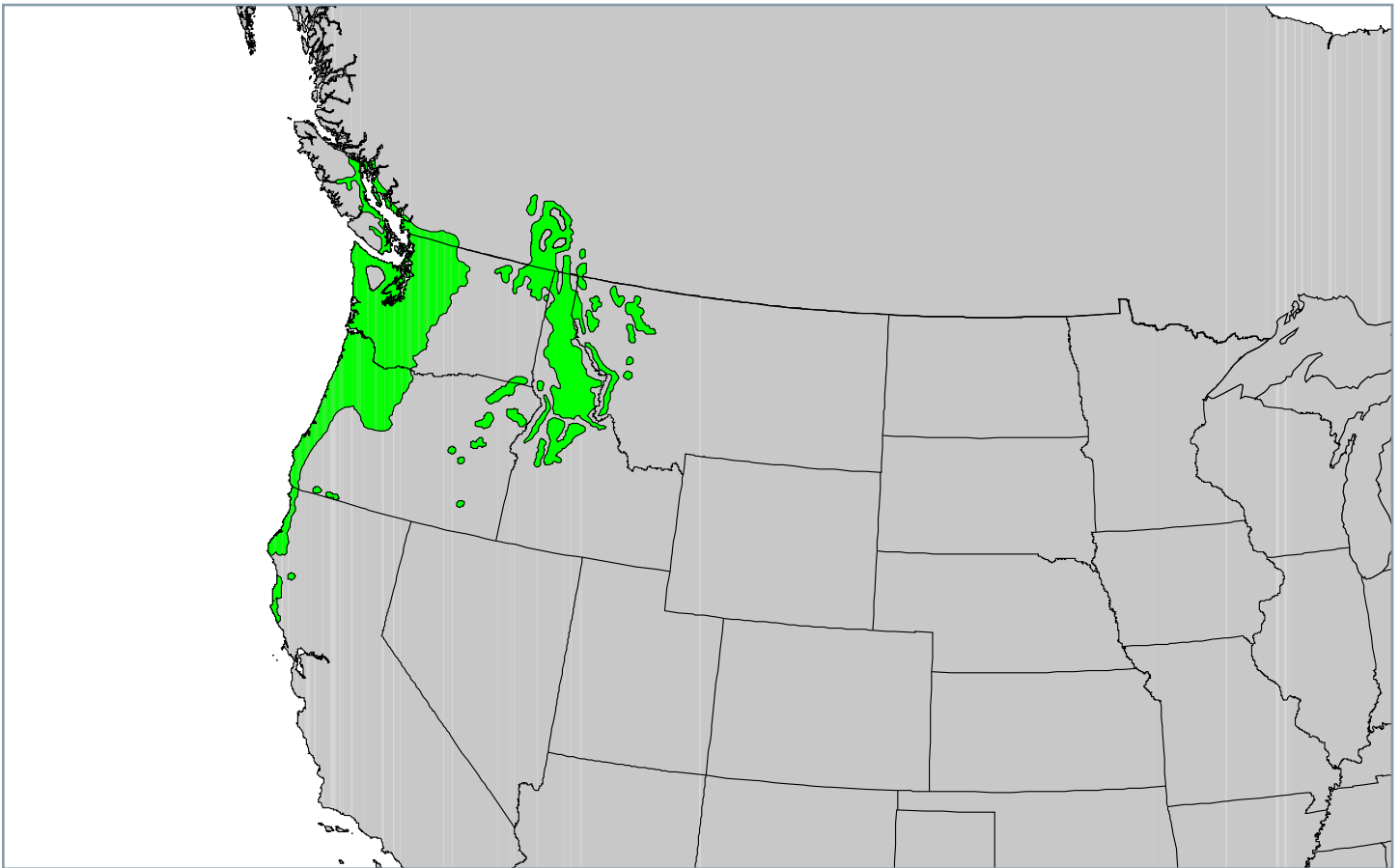
Cones in clusters of 3-5 and several clusters per limb (Silvaseed)

# 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
MEDIUM CROP
About 30 cones per tree
HEAVY CROP
More than 40 cones per tree



[USDA Grand fir distribution map](#)



# Grand fir (*Abies grandis*)

## ✗ Male pollen cone



(Oregon State University)

## ✓ Developing cone



(Dave Powell, USDA Forest Service)

## Light crop



Less than 20 cones per tree is considered a light crop (thepatriotwoodwiki.org)

## Medium crop



About 30 cones per tree is considered a medium crop (Silvaseed)

## Heavy crop



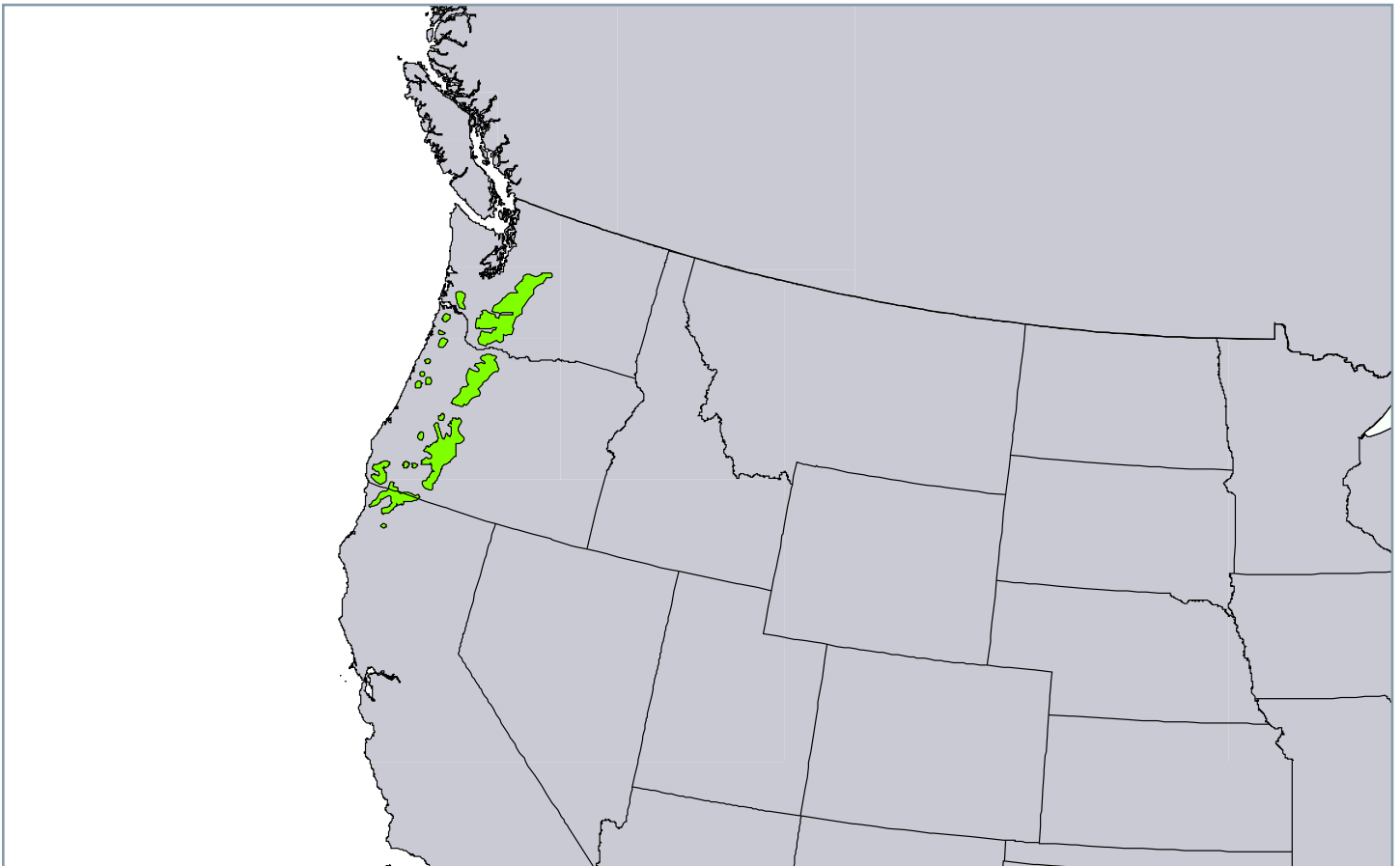
More than 40 cones per tree is considered a heavy crop (Coniferous Forest)

# 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
MEDIUM CROP
About 30 cones per tree
HEAVY CROP
More than 40 cones per tree



[USDA Noble fir distribution map](#)



# Noble fir (*Abies procera*)

## ✗ Male pollen cone



Caption here

## ✓ Developing cone



(Oregon State University)

## Light crop



Less than 20 cones per tree (Native 2014)

## Medium crop



About 30 cones per tree is considered a medium crop (Silvaseed)

## Heavy crop



More than 40 cones per tree is considered a heavy crop (Gardening 2022)

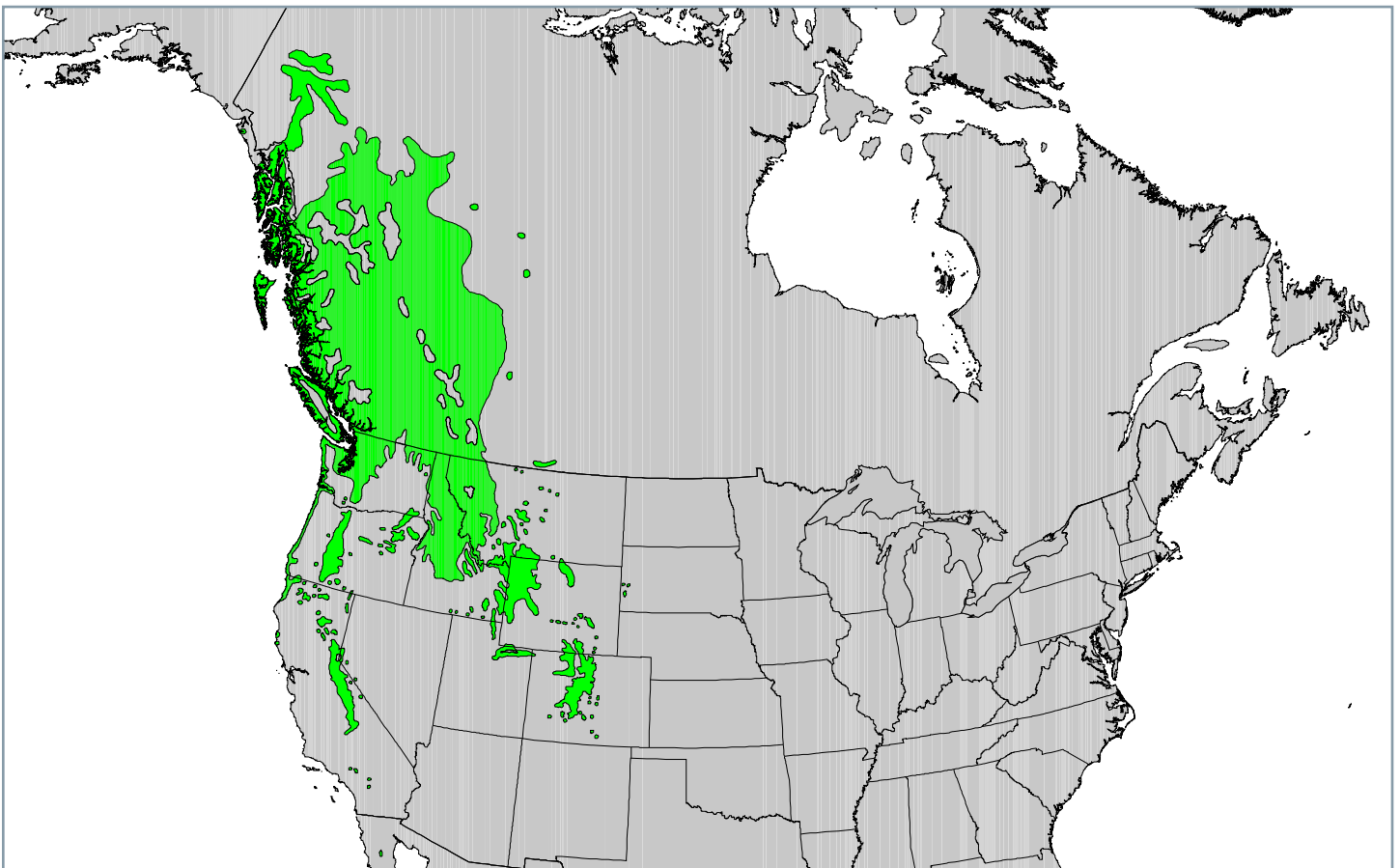


# Lodgepole pine (*Pinus contorta*)

## 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
MEDIUM 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*)

## ✗ Open (blown) cone



(Owens, J. N., 2006)

## ✗ Male pollen cone



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

## ✓ Developing cone



(Owens, J. N., 2006)

## Light crop



Approximately 30 cones (Silvaseed)

## Medium crop



Approximately 60 cones (Adventure Scientist)

## Heavy crop



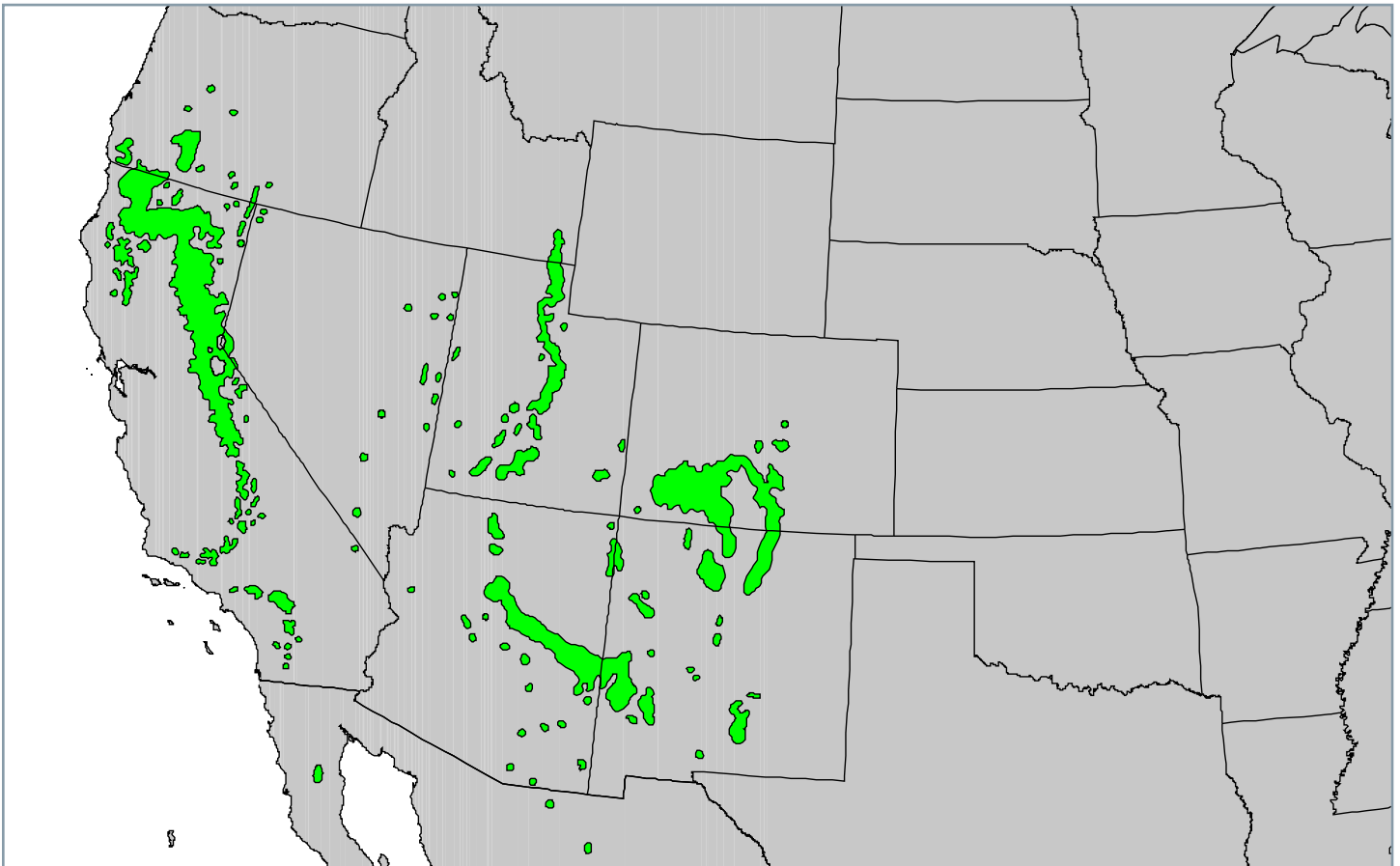
In a mast year, there will be roughly 100 cones on each mature tree (Silvaseed)

# 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
Approximatly 50 cones
MEDIUM CROP
Approximatly 100 cones
HEAVY CROP
200+ cones per year



[USDA White fir distribution map](#)



# White fir (*Abies concolor*)

## ✗ Male pollen cone



(University of Arizona)

## ✓ Developing cone



(The Gymnosperm Database, 2023)

## Light crop



Approximately 50 cones (Adventure Scientists)

## Medium crop



Approximately 100 cones per tree (Jon Sullivan)

## Heavy crop



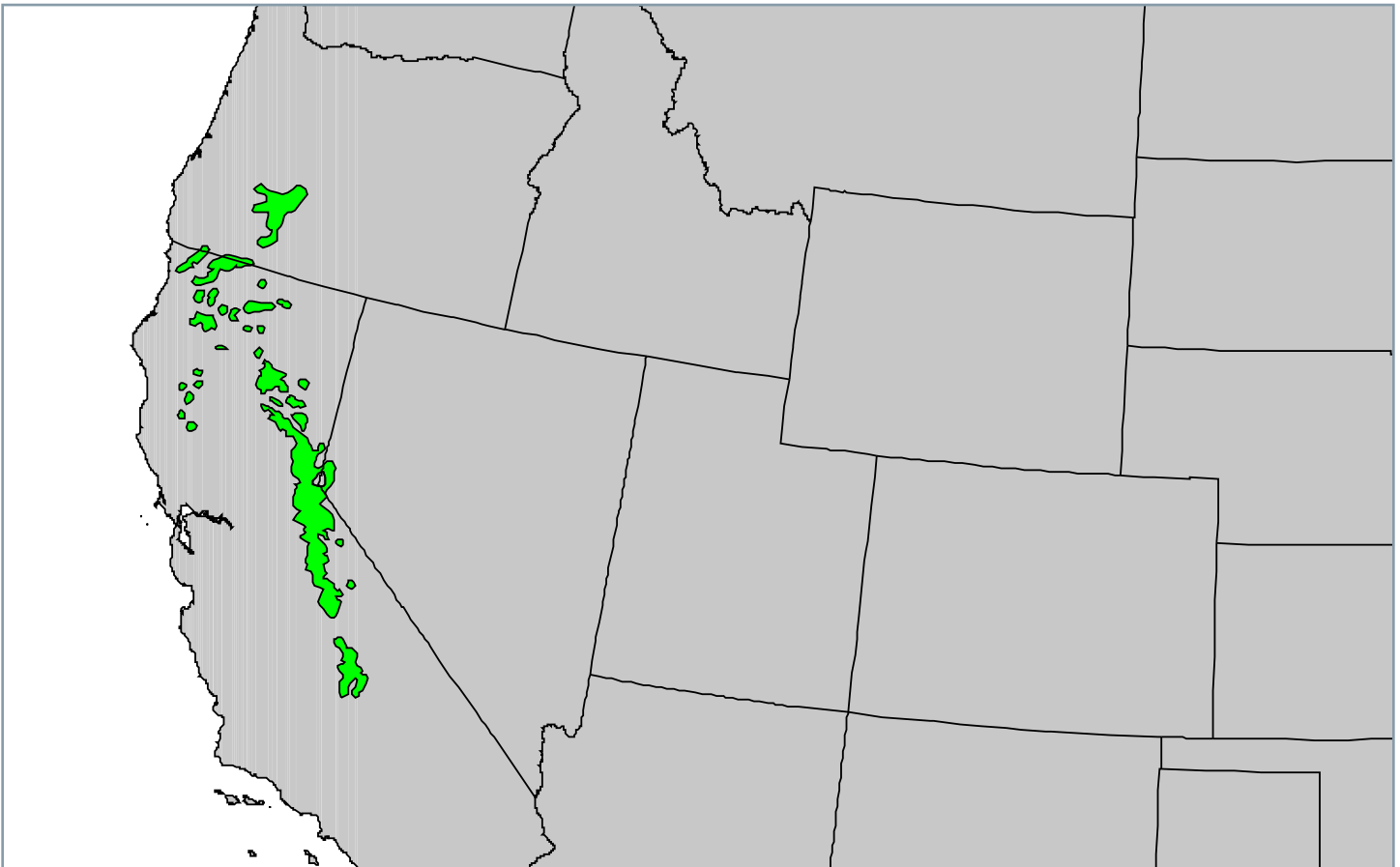
200+ cones per tree (Silvaseed)

# 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
MEDIUM 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*)

## ✗ Male pollen cone



(University of Washington)

## ✓ Developing cone



(Conifers.org)

## Light crop



About 30 cones per tree (Adventure Scientists)

## Medium crop



About 50 cones per tree (Silvaseed)

## Heavy crop



80-100 cones on mature, healthy, dominate trees (Silvaseed)

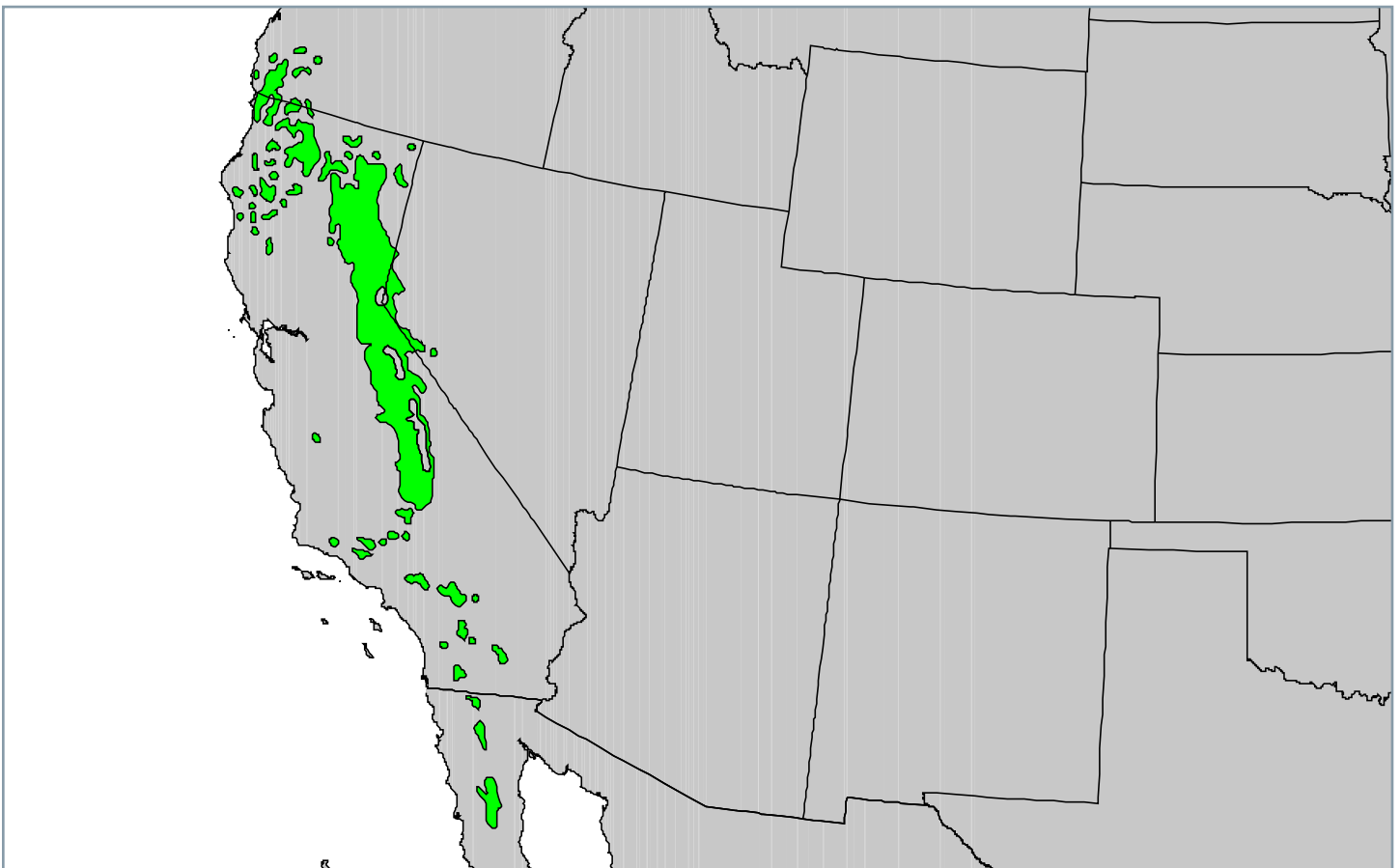


# Jeffrey pine (*Pinus jeffreyi*)

## 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
1-2 cones per branch, scattered throughout the crown
MEDIUM 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*)

✗ Open (blown) cone



(Conifers.org)

✗ Male pollen cone



(Steven K. Harper)

✓ Developing cone



(Paul Slichter)

Light crop



1-2 cones per branch, scattered throughout the crown (Adventure Scientists)

Medium crop



Cones more numerous and in clusters of 2-3 (Adventure Scientists)

Heavy crop



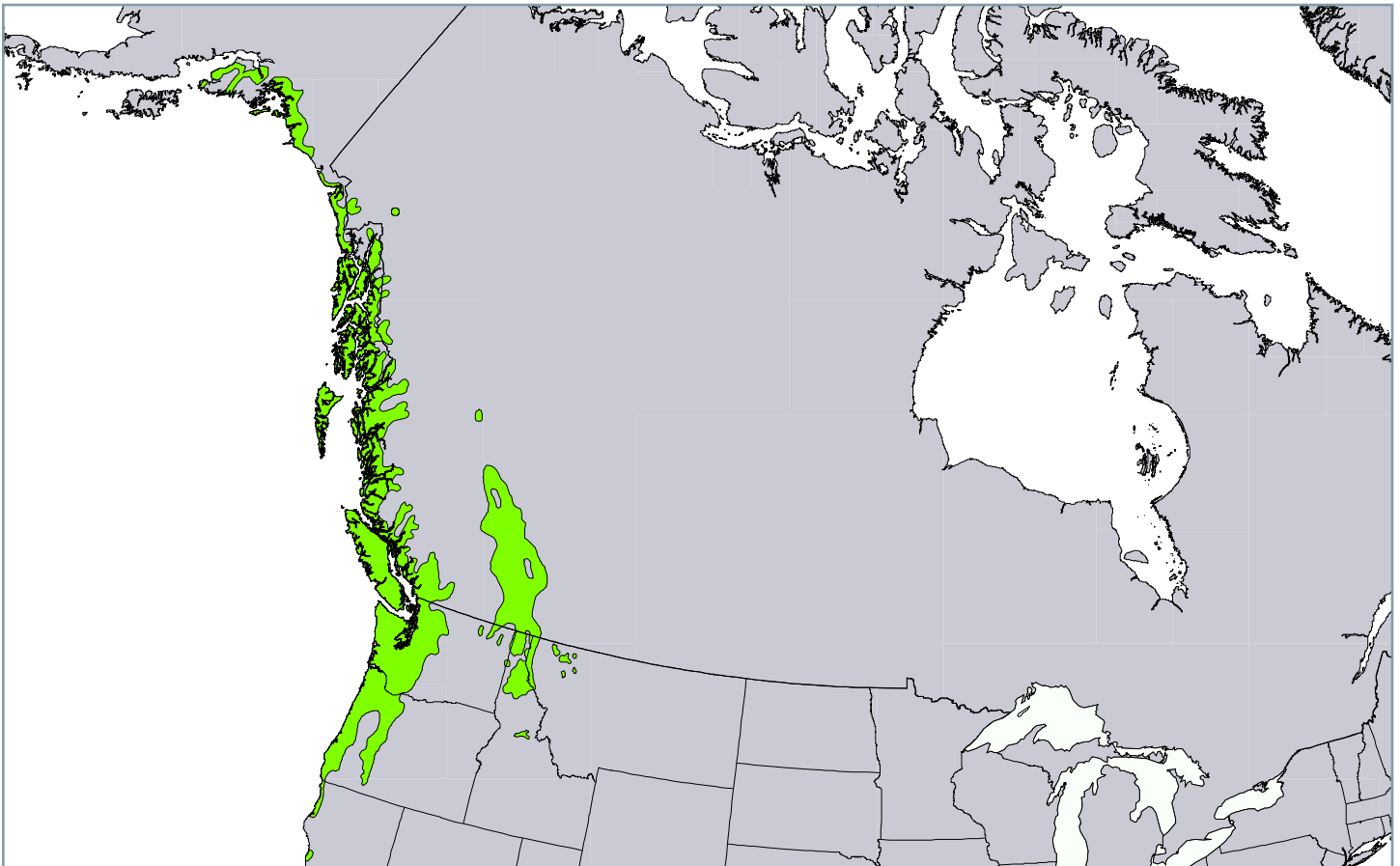
Cones in clusters of 3-5 and several clusters per limb (Silvaseed)

# 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
Less than 5 cones per branch
MEDIUM CROP
Approximately 10 cones per branch
HEAVY CROP
At least 25 cones per branch



[USDA Western hemlock distribution map](#)



# Western hemlock (*Tsuga heterophylla*)

## Unripe to ripe to open cone



(Hemlock Restoration Initiative)

## ✗ Male pollen cone



(Seattle Arborist)

## ✓ Developing cone



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

## Light crop



Less than 5 cones per branch (MPF, 2005)

## Medium crop



Approximately 10 cones per branch (Silvaseed)

## Heavy crop



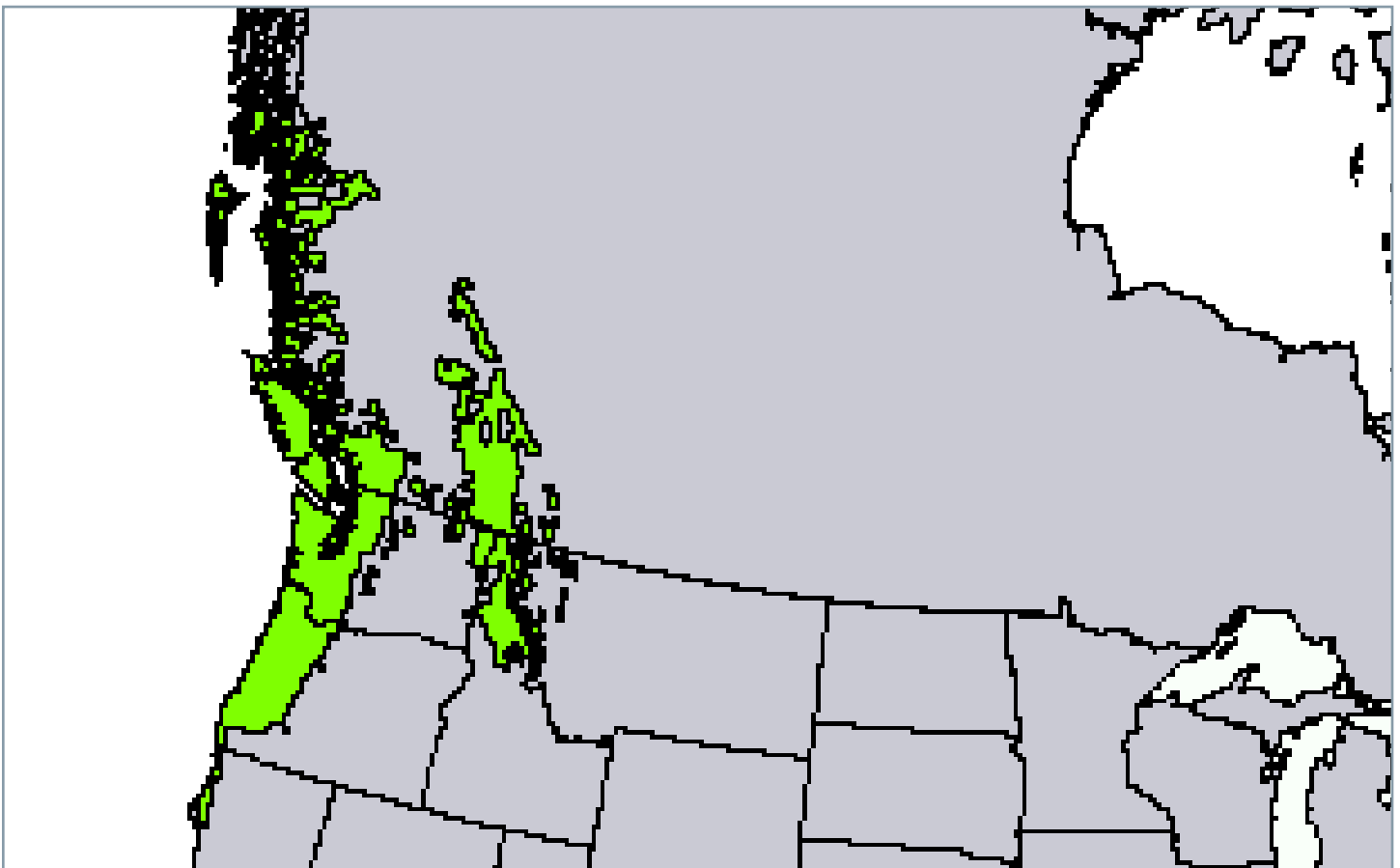
At least 25 cones per branch (Silvaseed)

# 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
MEDIUM CROP
At least 20 cones per branch
HEAVY CROP
Approximately 50 cones per branch tip



[USDA Western Redcedar distribution map](#)



# Western redcedar (*Thuja plicata*)

## ✗ Open (blown) cone



(Oregon State University)

## ✗ Male pollen cone



Caption here

## ✓ Developing cone



Green, unripe western red cedar cones (Silvaseed)

## Light crop



Light crops are rare, its more likely that were would be no cones at all (nativeplantspnw.com)

## Medium crop



At least 20 cones per branch (The Gymnosperm Database)

## Heavy crop



Approximately 50 cones per branch tip (Silvaseed)

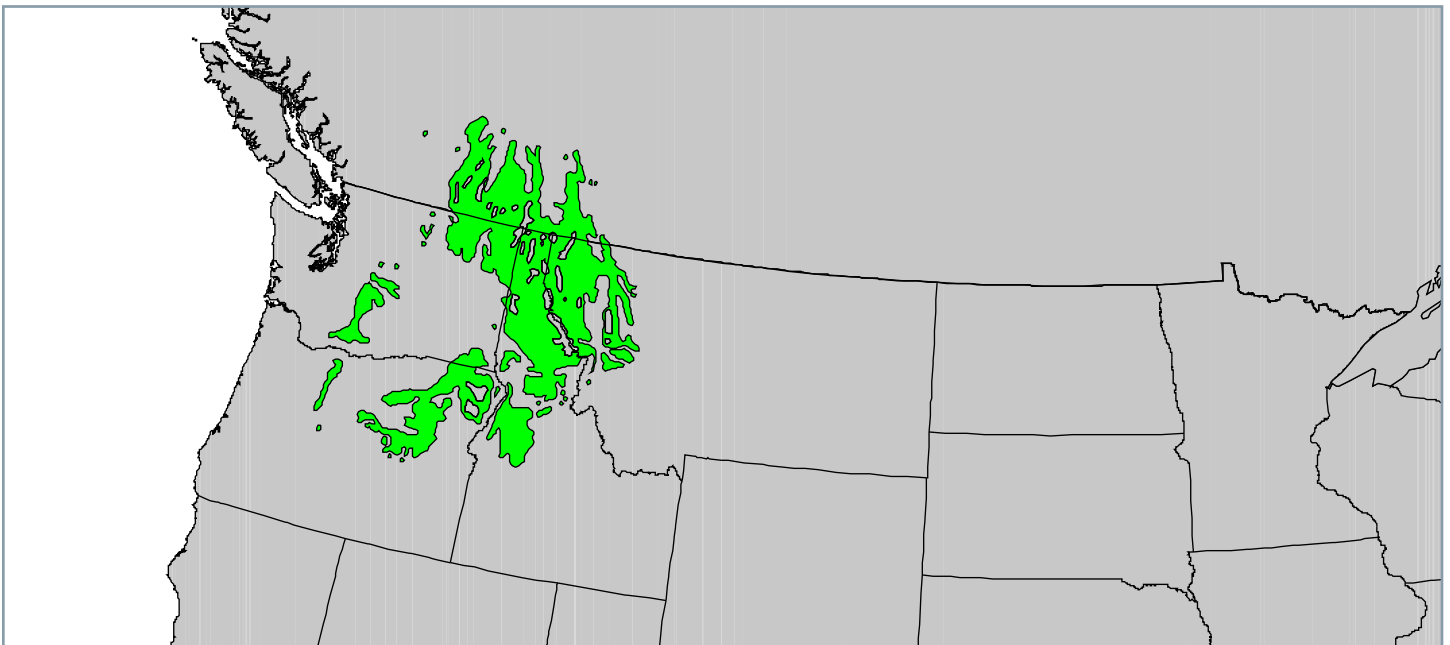


# Western larch (*Larix occidentalis*)

## 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
MEDIUM 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*)

## ✗ Open (blown) cone



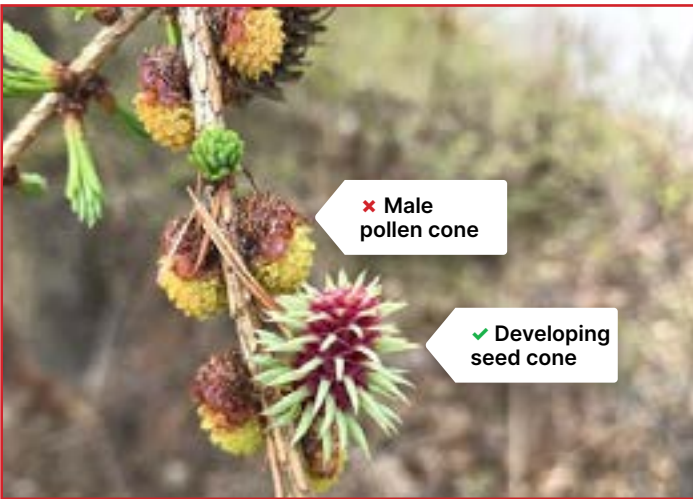
(Oregon State University)

## Light crop



Less than 3 cones per major branch of a dominant tree (Adventure Scientists)

## ✗ Male pollen cone



(Wenatchee Naturalist)

## Medium crop



3-10 cones per major branch of a dominant tree (Silvaseed)

## ✓ Developing cone



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

## Heavy crop



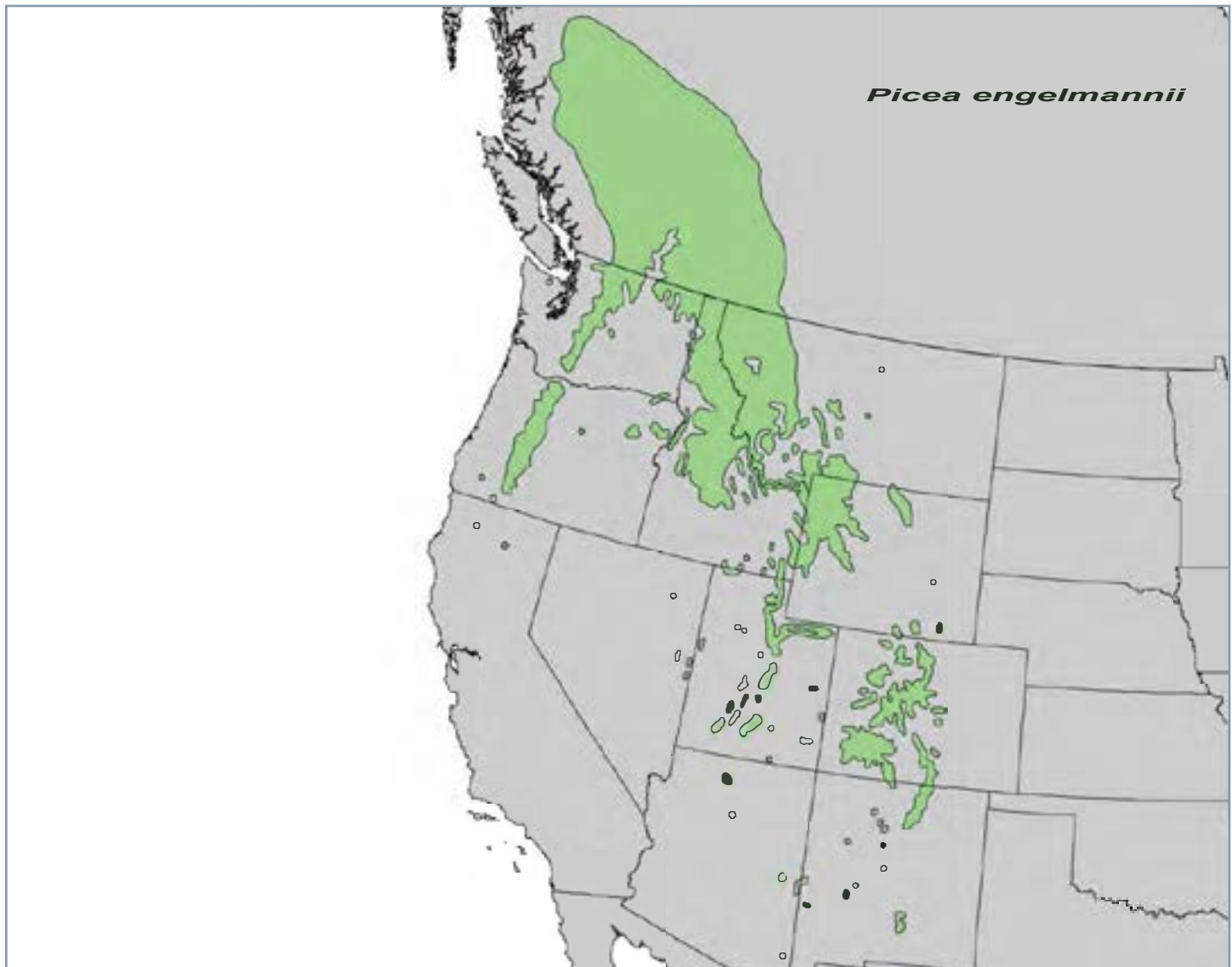
Over 10 cones per major branch of a dominant tree. Over 1,000 cones per tree (Silvaseed)

# 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
Approximately 100 cone per tree, concentrated near the top
MEDIUM CROP
At least 20 cones per branch
HEAVY CROP
At least 50 cones per branch



[USDA Engelmann spruce distribution map](#)



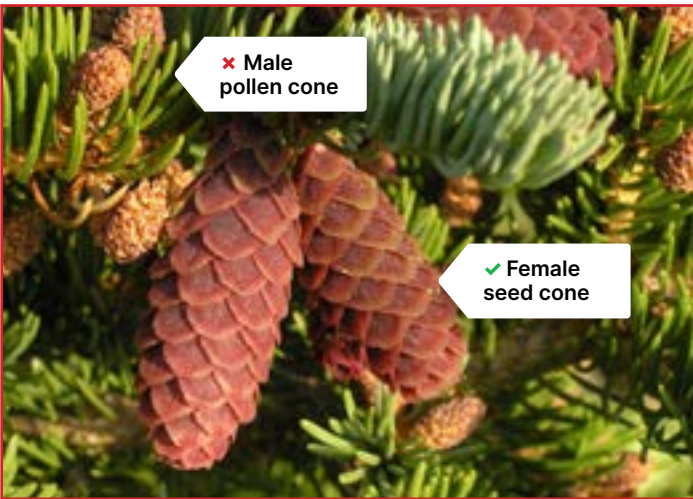
# Engelmann spruce (*Picea engelmannii*)

✗ Open (blown) cone



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

✗ Male pollen cone



Male pollen cones of Engelmann spruce (Conifers.org)

✓ Developing cone



Not quite ripe Engelmann spruce cones (Silvaseed)

Light crop



Approximately 100 cone per tree, concentrated near the top (Silvaseed)

Medium crop



At least 20 cones per branch (Silvaseed)

Heavy crop



At least 50 cones per branch (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
MEDIUM 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*)

## ✗ Open (blown) cone



Open Incense cedar cone (Oregon State University)

## ✗ Male pollen cone



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

## ✓ Developing cone



Developing incense cedar cones (Silvaseed)

## Light crop



Few scattered cones, likely hard to see (Silvaseed)

## Medium crop



Cones are visible throughout the crown, roughly 20 per branch (Oregon State University)

## Heavy crop



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



## FAQ (Frequently Asked Questions)

### Q: What if I can't find ANY closed seed cones?!

That's okay! Cone crops are naturally sporadic and are becoming less predictable as our climate changes. The absence reports are still valuable. They save us time checking the area if we know you have already been there. Absence reports help us track how long a given area goes in between crop years and over time, they might even help us predict future cone crops!

### Q: What's the deal with pollen cones? Why are those reported as absence data?

For seeds to develop, both types of cones (male pollen cones and female seed cones) are needed. Pollination happens in the spring, so by the time you are out scouting in the summer, the pollen cones have already done their job of fertilizing seed cones. We only collect the **seed cones** late in the summer before they dry out and release their seeds.

### Q: What proportion of trees near me look like a 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%.

### Q: What should I do if I find some cones but not enough to meet the requirements for a light crop?

Please report as absence data. In order to maintain genetic diversity within our collections there needs to be sufficient seed cone production from dozens of trees in the same stand.

### Q: What is the species composition of my 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%

### Q: Is there anything else I can do to help?

You can help us improve the guide by providing feedback on the guide and taking great photos for next year's update!

Send feedback to [seed@silvaseed.com](mailto:seed@silvaseed.com)

To download or share this guide use the QR code or visit:

[www.mastreforest.com/seed](http://www.mastreforest.com/seed)



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