Germinant Identification Guide (1st year seedlings)

For common tree species occurring at Mt. Rainier National Park

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with notes from Franklin's seedling guide

Quick ID (common characteristics)

Species	Cotyledon number	Cotyledon Length (mm)	Cotyledon Width (mm)	Cotyledon tip	Cotyledon Cross-Section Shape	Glaucous Cotyledons?
Western Red Cedar (THPL)	2	5.0-10.0	1.0-2.0	Rounded	Flat	No
Alaskan Yellow Cedar (CANO)	2	7.0-11.0	1.5-2.2	Rounded	Flat	No
Western Hemlock (TSHE)	3, sometimes 4, rarely 2	4.0-10.0	0.7-1.3	Rounded	Flat or slightly triangular	Upper; white and linear
Mountain Hemlock (TSME)	4 or 5, rarely 3 or 6	8.0-12.0	0.6-1.2	Rounded	Flat or slightly triangular	Upper; scattered
Douglas Fir (PSME)	4-8, sometimes 9 or 10	10.0-25.0	0.7-1.3	Acute, Pointy	Obtuse or equilateral triangle	Some on upper
Silver Fir (ABAM)	4-6, rarely 3 or 7	20.0-30.0	1.5-2.5	Rounded or notched	Obtuse triangle	Upper
Subalpine Fir (ABLA)	5 or 6, rarely 4 or 7	10.0-25.0	1.0-2.0	Rounded or notched	Obtuse triangle	Upper
Pinus Contorta (PICO)	3-7, usually 4	16.0-30.0	0.4-0.6	Needle like, acuminate tip	Isosceles or equilateral	Upper
Engelman Spruce (PIEL)	4-8	6.0-13.0	0.3-0.6	Needle like	Equilateral	Upper, maybe lower
Sitka Spruce (PISI)	4-6	6.0-11.0	0.3-0.6	Needle like	Equilateral	Upper
Taxus brevifolia (TABR)	2	12.0-22.00	1.5-2.0	Rounded	Flat	No

Quick Location Guide (sites were germinants are likely to be found)

Species	TO04	TB13	AX15	AG05	AV06	AM16	AR07	AE10	PARA	TA01	AO03	AV02	AB08	PP17	SUNR	TO11	AV14	SPRY
Western Red Cedar (THPL)	■	■	■	■	■	▒				■	■	■	▒			■	▒	
Alaskan Yellow Cedar (CANO)				▒	▒	■	■	■					▒		▒		▒	▒
Western Hemlock (TSHE)	■	■	■	■	■	▒				■	■	■	■	▒		■	■	
Mountain Hemlock (TSME)						▒	■	■	■					▒	■			■
Douglas Fir (PSME)	■	■	■	■	■					■	■	■	■	■		■		
Silver Fir (ABAM)	▒	▒	▒	■	■	■	■	■	▒		■	■	▒	▒	▒		■	▒
Subalpine Fir (ABLA)								▒	▒					▒	▒			▒
Pinus Contorta (PICO)														▒				
Engelman Spruce (PIEL)														▒				
Sitka Spruce (PISI)																▒		
Taxus brevifolia (TABR)	▒			▒							▒							

Key: Abundant ■; Present but rare: ▒; Absent (as adult tree): □

Cedars

Western Red Cedar - *Thuja plicata*

Acronym: THPL

Stands likely to be found in: AB08, AG05, AM16, AO03, AV02, AV06, AX15, TA01, TB13, TO04, and TO11.

Basic ID: small (< 1 cm tall, wide), 2 cotyledons, numerous

Alaskan Yellow Cedar - *Callitropsis nootkatensis*

Acronym: CANO

Stands likely to be found in: AB08, AE10, AM16, AR07, AV06, and AV14, PARA, SUNR, SPRY.

Basic ID: small (< 1 cm tall, wide), 2 cotyledons, numerous

Distinguishing cedars from similar looking seedlings

The two cedars have similar looking seedlings, so pay extra attention at sites where their ranges overlap. The only other seedling that looks similar to the cedars is Western Hemlock.

- **Alaskan Yellow Cedar and Western Red Ceda**r: Yellow cedar is in a different family than Red cedar is, but it doesn't really help in distinguishing between them at the seedling level. Both have similarly shaped cotyledons and overlapping ranges for height, cotyledon length, and cotyledon width. Sometimes the most helpful thing to do is to search for cones around you or to look at the canopy in the area. Note that the species do not generally have overlapping ranges, with the exception of AM16. Thus, with most stands the seedling can be identified based on the location. Franklin (1961) notes that if the juvenile needles (not cotyledons) are not glaucous (do not have stomata) then it is going to be Yellow cedar whereas if the bottom of the needles are glaucous it's going to be western red cedar. Knowing where you are and what trees are present, though, can save you a lot of grief if you're trying to identify a first year seedling without any juvenile needles present.
- **Western Hemlock:** This one is easier to differentiate since hemlocks normally have three or maybe four cotyledons and the cedars always have two. The hemlock cotyledons are also significantly thinner and of a different shape than cedar cotyledons. Also, hemlock cotyledons are glaucous where cedars are not.

A Tshe (left) and Thpl (right) germinant next to each other.

Hemlocks

Western Hemlock - *Tsuga heterophylla*

Acronym: TSHE

Stands likely to be found in: AB08, AG05, AM16, AO03, AV02, AV06, AX15, TA01, TB13, TO04, and TO11.

Basic ID: 3-4 cotyledons, smallish seedling but more robust than TSHE

Mountain hemlock - *Tsuga mertensiana*

Acronym: TSME

Stands likely to be found in: AE10, AM16, AR07, AV14, PARA, SPRY, and SUNR.

Basic ID: 3-4 cotyledons, smallish seedling but more robust than TSHE

Distinguishing hemlocks from similar looking seedlings

The two species of hemlock have somewhat similar looking seedlings to each other but they should be easy to differentiate from other species found at the sites.

- **Western Hemlock and Mountain Hemlock:** Mountain Hemlock seedlings have wider stems than Western Hemlock seedlings, generally having diameters greater than or equal to 1 mm. Mountain Hemlocks also have plump cotyledons whereas western hemlocks have flat cotyledons. The cross-sections of mountain hemlock are triangular where western hemlock cross-sections are not. Finally, Western Hemlock cotyledons will angle down as the seedling germinates, whereas Mountain Hemlock cotyledons will retain a cup shape and angle up. Mountain Hemlock seedlings will likely only co-occur with Western Hemlock seedlings in AM16 and possibly other mid elevation sites where their ranges overlap.

- **Western Red Cedar/Alaskan Yellow Cedar:** Cedars are fairly easy to tell apart from hemlocks in that they will always have only two cotyledons and that those cotyledons are wider, although there is some overlap. Juvenile needles are also very clear indicators in that they are much shorter for cedars and make the seedling look almost furry. Juvenile Western Hemlock needles needles are about the same length as the cotyledons. Western Hemlock and Western Red Cedar co-occur over large portions of Mt. Rainier at lower elevations (most stands below ~1000 m asl); but will only co-occur with Alaska Cedar at their upper range limits (e.g. AV14, AM16).

- **Pacific Yew:** *Taxus Brevifolia* seedlings also have only two cotyledons, but those cotyledons are much longer than western/mountain hemlock or cedar cotyledons (12-22 mm). Yew cotyledons are also not glaucous on either surface. Western Hemlock and Pacific Yew co-occur at lower elevations.

True Firs

Pacific Silver Fir - *Abies amabilis*
Acronym: ABAM; Stands likely to be found in: ALL

Subalpine Fir - *Abies lasiocarpa*
Acronym: ABLA; Stands likely to be found in: SUNR, PARA, SPRY (possibly AE10, AR07)

Noble Fir - *Abies procera*
Acronym: ABPR; Stands likely to be found in: Only found in TA01 & AE10 as adult tree, rare there

Grand fir - *Abies grandis*
Acronym: ABGR; Stands likely to be found in: Only found in TO04 as adult tree, rare there

Basic ID (*Abies* spp): Larger seedling (2-4 cm when germinated), 4-7 cotyledons with characteristic curved shape, tips blunt to rounded to notched (rarely acute, except possibly for *A. procera*).

Abies amabilis with and without seed coat.

Distinguishing True firs from each other and similar looking seedlings

Abies is easy to distinguish from other species – it is much larger than the cedars and hemlocks, and the cotyledons are asymmetric and blunt compared to Douglas fir. How, the four species of *Abies* are extremely difficult to tell from each other when they have first germinated (only cotyledons present), and don't get much easier when their first true needles come in. Fortunately, *Abies lasiocarpa* and *Abies amabilis* are the most common by a large margin and their ranges do not overlap much (only in 3 stands), so location can be used to assign an id. A good strategy is to identify surrounding trees and saplings, or try to id the seeds if these are still on the seedlings (these are only slightly easier to distinguish, but only slightly…) to aid in identification.

A. lasiocarpa	*A. amabilis*	*A. grandis*
Triangular tip	Blunt, elongate tip	Triangular tip
Smaller	Larger	Smaller

Distinguishing True firs from each other and similar looking seedlings

- **Abies amabilis vs. Abies lasiocarpa:** In mature trees, the difference between subalpine and silver fir is fairly straightforward: the bark looks different, Subalpine fir needles go all the way around a branch whereas silver fir needles are clustered on the top half of the branch, and subalpine fir has needles with stomata on the top in addition to on the bottom, whereas silver fir needles are only glaucous on the bottom. **Franklin (1961) relies on juvenile needles** and their stomata patterns to differentiate between *Abies* seedlings, However, seedlings with only cotyledons **do not have juvenile needles** (or bark). Consider the differences in number of cotyledons and length of cotyledons. [Franklin notes that silver fir can have 4-7 cotyledons whereas subalpine fir can have 3-6. He further writes that silver fir cotyledons are generally 20-30 mm in length whereas subalpine cotyledons are 10-25 mm long.] There is overlap in these ranges, but any difference that provides you with information that allows you to make a better guess is worth having. Note that you should only torture yourself in this way at the high elevation stands.
- **Abies amabilis vs. Abies procera**: Abies procera is relatively rare on Mt. Rainier so you won't see this seedling often. If you can see the bud, procera buds are light-brown, compared the purple of amabilis. For cotyledons, if you have no other way of telling the species apart, procera MAY have acute tips rather than blunt, notched, or rounded tips. Upper surface stomata might also be less organized and appear to be a lighter color than the upper surface stomata of amabilis.
- **Abies grandis** is only found at lower elevations of Mt Rainier and is not very abundant. Distinguishing it from A. amabilis as a germinant is likely impossible.

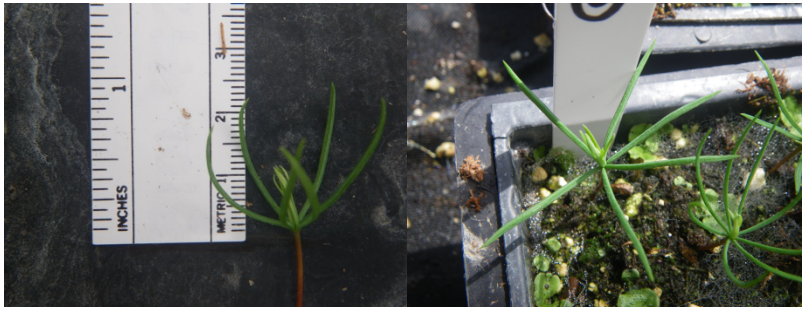
Douglas fir

Pseudotsuga menziesii

Acronym: PSME

Stands likely to be found in: AB08, AG05, AO03, AV02, AV06, AX15, PP17, TA01, TB13, TO04, and TO11

Basic ID: Intermediate sized germinant (1-2 cm tall when first germinated), 4-8 cotyledons that are symmetrical (or much more so than Abies), pointy tips.



Distinguishing Douglas fir from similar looking seedlings

- Douglas fir vs. *Abies*: The True fir seedlings (Abies) are similar Douglas fir in the number and length of their cotyledons but the shapes and orientation are different. Douglas fir have acutely pointed tips (Abies do not) and more radially symmetric cotyledon arrangements.

- Seedlings of Mt. Rainier pines can be confused with Douglas fir, but these are found only in the PP17 stand.

Rare species (as seedlings)

Two sites have spruce and pine seedlings (TO11 and PP17) that are not found in the other sites on Mt. Rainier. When at these sites, pay close attention and measure seedlings carefully to make the most accurate guess possible.

Lodge Pole Pine- *Pinus contorta*

Acronym: PICO
Stands likely to be found in: PP17

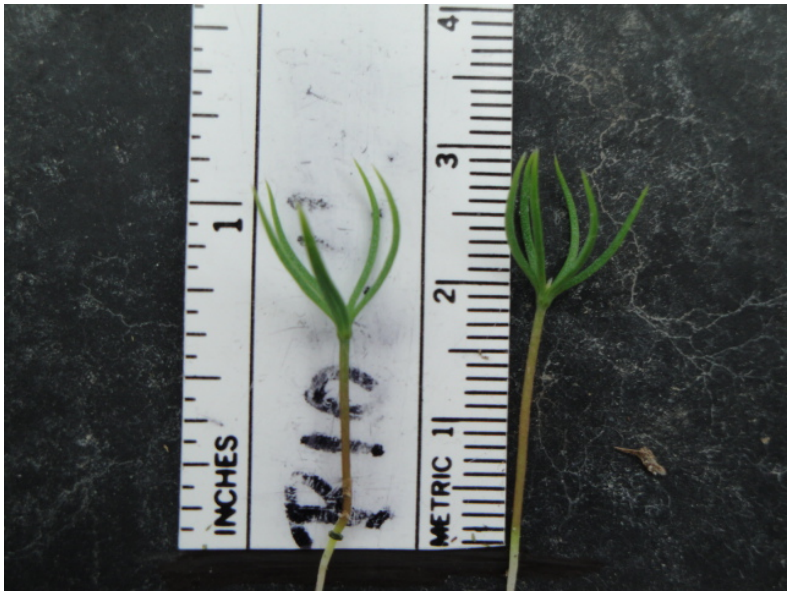
This pine is the most common tree at PP17 and you will find seedlings of all ages at the site. The first year PICO seedlings at this site can be very vigorous and can produce juvenile needles early in the first year so be aware of these when doing the seedling survival census.

Engelmann Spruce- *Picea engelmannii*

Acronym: PIEN
Engelmann is also common at PP17. Pay close attention to the cotyledon measurements and the gestalt because there are a lot of similarities between Picea seedlings and Douglas Fir seedlings.

Sitka Spruce- *Picea sitchensis*

Acronym: PISI
Sitka Spruce are uncommon on Mt. Rainier and the only site where you may see seedlings is TO11. They are very similar to Pien seedlings. They have never been recorded in one of the quadrats but keep an eye out for them because there are Pisi seedlings in the site.



Pictured above: Picea engelmannii

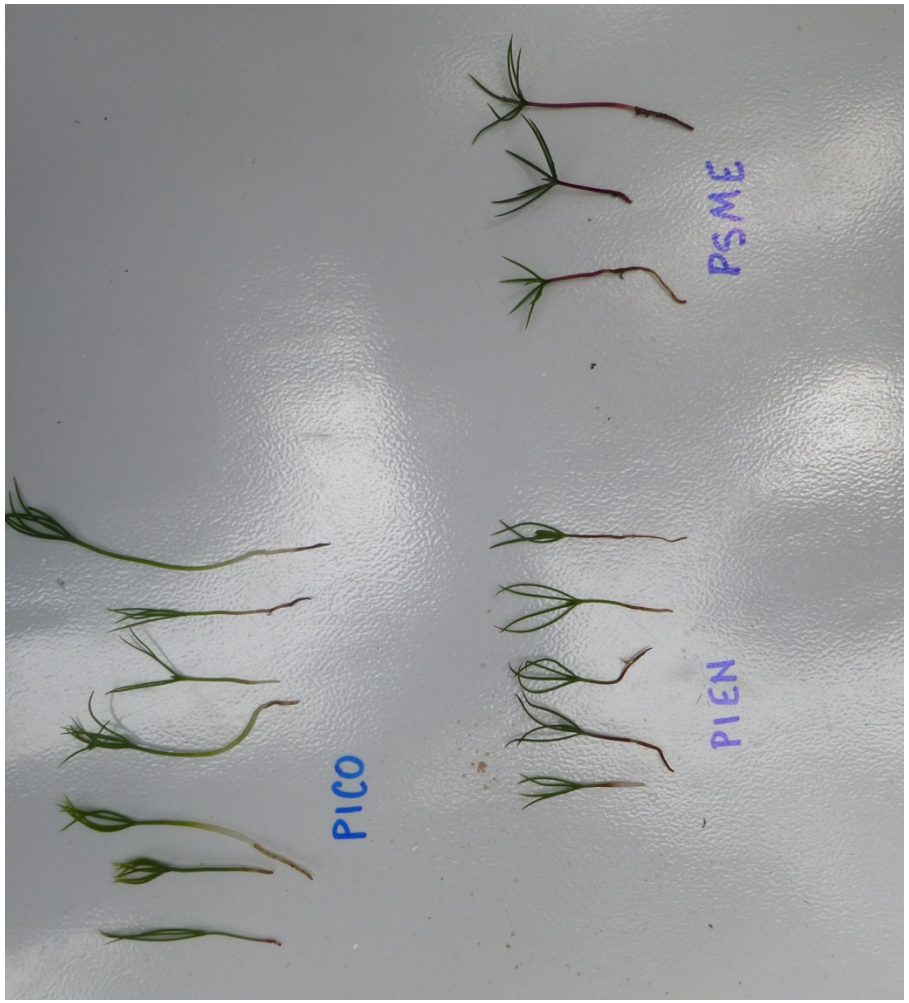
More pictures

An older THPL (left) and TSHE (right)

A Taxus Brevifolia seedling (can be confused with Cedars – note long cotyledons).

More pictures

An *Abies lasiocarpa* germinating in the snow



Identification help for PP17