

MORA 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 where germinants are likely to be found)

Species	T04	TB13	AX15	AG05	AV06	AM16	AR07	AE10	PARA	TA01	A003	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)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ : Present but rare
 ■ : Absent (as adult tree)

Abam (Pacific silver fir)

- Largest germinant at MORA (20-30 mm cotyledons)
- Generally 4-6 cotyledons (rarely 3, 7)
- Characteristic 'drunken starfish' shape
- Cotyledons blunt / notched tips
- Needles also blunt / notched
- True needles have 2 lines of stomata below
- Difficult to distinguish from other firs



Abla (Subalpine fir)

- Larger germinant (10-25 mm length cotyledon)
- Generally 5 or 6 cotyledons (rarely 4, 7)
- Similar look to Abam (and other firs)
- True needles have one line of stomata above, 2 below

Abla germinant w/ seed coat



Abla germinant



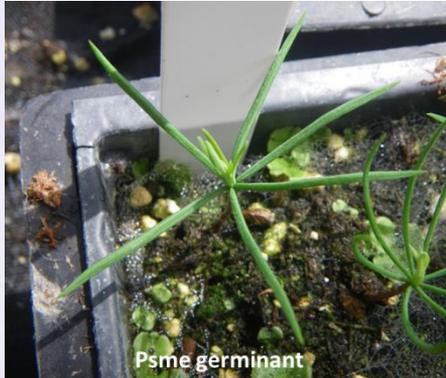
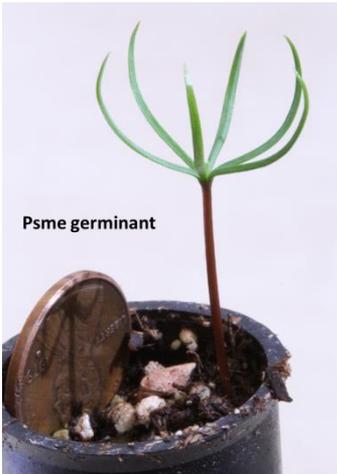
Distinguishing firs

The true firs are extremely difficult if not impossible to tell apart at the germinant and seedling stage. There are 4 species of firs at Mt. Rainier NP – the two more common species noted above (Silver fir, Subalpine fir; Abam and Abla) and two less common firs (Grand fir, Noble fir; Abgr and Abpr). Here are a couple of pieces of information to help:

- Elevational ranges of adult trees are as follows: Abgr most common at the lowest elevations (<700 masl); Abam has the largest elevation range and occurs from low – high elevations (700-1600); Abpr also occurs at mid elevations; Abla occurs at the highest elevations (>1400 masl), and (together with mountain hemlock, Tsme) forms treeline at Mt. Rainier NP.
- Abam has the largest seeds, and thus the largest germinants
- Abpr tends to have pointier cotyledons
- Once seedlings are older and have true leaves, you should be able to rely on the needle shape and stomata to distinguish the firs (as you would with adult trees); as indicated here:
 - Abam has 2 rows of stomata below, needles are in a plane with a ‘mohawk’ (needles cover branchlet – if it has one)
 - Abgr also has 2 rows of stomata below, but needles do not cover the twig (no mohawk)
 - Abla needles also have faint lines of stomata on the upper surface (as well as the lower surface). Needles curve upward in hockey stick shape (although this may be less prevalent on seedlings)
 - Abpr also has stomata on the upper surface of its leaves (like Abla), and the needles also curve upward. However, leaves are notably angled in cross section.

Psme (Douglas fir)

- Mid-sized germinant (10-25 mm cotyledon)
- 4-8 cotyledons (rarely 9, 10)
- Pointed, thin cotyledons (compared to firs)
- May have double line of stomata on upper surface (can be faint with newly germinated seedlings), but not on lower surfaces.
- Cotyledons very symmetrically arranged (compared to drunken starfish Abam)



Tabr (Pacific yew)

- Mid-sized germinant (10-25 mm cotyledon)
- 2 cotyledons (much longer than cedars)
- Blunt tips, very long
- Stems very green (in once older)
- Rare seedling (observed at lower elevations)



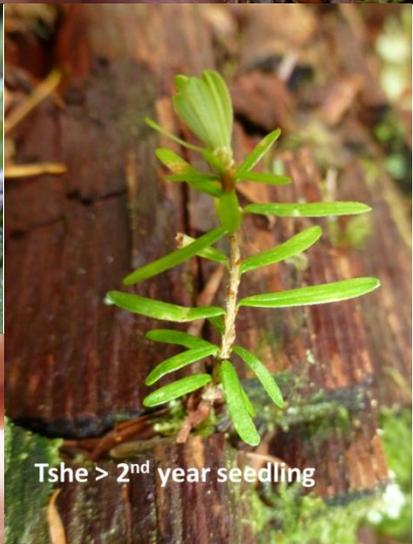
Acci (vine maple)

- Mid-sized germinant (10-25 mm cotyledon)
- 2 strap like, clearly dicot cotyledons (not needles!)
- First true leaves toothed, long, before becoming more maple like as young seedlings
- Rarish seedling (observed at lower elevations)



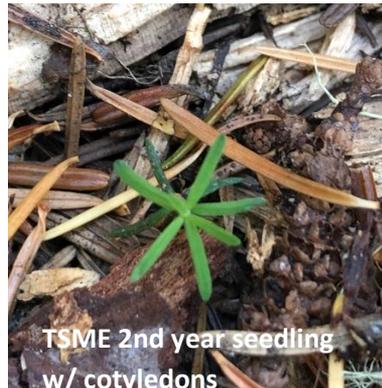
Tshe (Western hemlock)

- Small germinant (4-10 mm cotyledon)
- 3-4 flat cotyledons (very rarely 2, 5)
- Rounded tips
- Angle down as seedling germinates
- Older seedlings 'messy' (Check Tshe branches); no clear 'top' to the seedling, needles growing in all directions



Tsme (Mountain hemlock)

- Small germinant (8-12 mm cotyledon)
- 3-5 plump cotyledons
- Wider stem and more robust than TSHE
- Maintain cup shape and angle up as seedling germinates



Distinguishing hemlocks

The two hemlock species at Mt. Rainier are particularly difficult to tell apart. Here are a couple of pieces of information to help:

- Western hemlock (Tshe) and Mountain hemlock (Tsme) do not overlap much in their range – Western hemlock is abundant at low elevations (up to 1000 masl) while Mountain hemlock is abundant at high elevations (1200 – 1700 masl)
- Mountain hemlock is a slightly larger germinant - it tends to have more cotyledons (4-5 rather than Tshe which has 3-4) and have longer cotyledons (8-12 mm; Tshe cotyledons are 4-10 mm).
- Tsme seeds are generally darker and more triangular than Tshe
- Tsme cones are cylindrical 1-3 inches long while Tshe cones are egg-shaped 0.5-1 inches long



Thpl (Western red cedar)

- Small germinant (5-10 mm long cotyledon, 1-2 mm wide)
- 2 cotyledons
- Blunt tips
- First true needles short spikes (young seedlings can be mistaken for moss)
- Seedlings eventually grow branches with scales (Frankenstein seedlings)



CANO (Alaska yellow cedar)

- Slightly larger germinant than THPL (7-11 mm long cotyledon, 1.5-2.2 mm wide)
- 2 cotyledons
- Germinants and seedlings are very similar to THPL, see next page for tips on how to distinguish



Distinguishing cedars

The two cedars, despite being in different families. Here are a couple of pieces of information to help:

- Western red cedar occurs at low elevations (<1000 masl); while Alaska cedar is dominant at higher elevations (1200 – 1600 masl).
- Cano germs are slightly larger than Thpl
- Cones and seeds of Thpl and Cano are quite different. If you can find cones and seeds on the forest floor near the quadrats, this might help you determine their identity.
- You may be able to use the leaves of older seedling to tell them apart much like adult trees – Thpl has oval scales that lie flat against branchlets; Cano has sharp tipped scales that point away from branchlets.



Very rare tree seedlings

There are other (coniferous) trees that occur at Mt. Rainier NP but are fairly rare (implying that their seedlings are rare). They include:

Pinus contorta (PICO we have seen these, but rarely). 4-6 (generally 5) cotyledons – very long (30 mm) and thin (0.5 mm), with pointy tips.



Note; there are adult trees of *Pinus monticola* and *Pinus ponderosa* in the park which are very rare – but we have never seen seedlings (to our knowledge. PIPO germinants have 8-12 (generally 10) cotyledons that are very long (up to 60 mm), like a messy hairdo.

Picea engelmannii and *sitchensis* (PIEN and PISI). Germinants look similar to Douglas fir in appearance, but smaller (<12 mm long), with thinner and pointier cotyledons. The two *Picea* species are probably impossible to tell apart.



PIEN
germinant

