

Germination of True Fir and Mountain Hemlock Seed on Snow

CONIFER SEED germination in late-persisting snowbanks, reported by Stein¹ for noble and Pacific silver fir, also occurs with seed of Shasta red fir, subalpine fir, grand fir, and mountain hemlock. Seed retained in whole noble fir cones preserved in snowbanks can also germinate. This note summarizes observations of these occurrences made in the Cascade and Coast Ranges of the Pacific Northwest during the past four years.

Seed germination of true firs or mountain hemlock in or on snowbanks was observed on 25 separate occasions (Table 1). The majority of these observations were of noble and Pacific silver firs in the northern Oregon Cascade Range; ten were made during June 1966, following a heavy true fir seed crop the previous fall. Grand fir seed was found germinating in snowbanks only once, but on that occasion germinants were very abundant (Fig. 1). Germinated subalpine fir seed was observed in snowbanks at much later dates than for the other true firs—July 19 and 21, 1966, and August 8, 1963. Shasta red fir seed was seen germinat-

ing in snowbanks four times, but germinants were never abundant. Mountain hemlock germinants were found in snowbanks only three times.

Characteristics of germinants were essentially as reported by Stein—radicles $\frac{1}{2}$ to 3 inches long for true firs and $\frac{1}{8}$ to $\frac{1}{2}$ inch long for mountain hemlock. The hypocotyl and cotyledons were partially freed from the seedcoat of many older germinants.

Germination of noble fir seed in whole or portions of cones preserved in snowbanks was observed at Marys Peak in the Coast Ranges of Oregon in early June 1966 (Fig. 2). Three cones, two only partly intact, were collected and germination was tallied:

Cone	Seed			Germination of filled seed
	Total	Filled	Germinated	
1 (basal two-thirds)	240	130	93	71.5
2 (whole)	347	155	109	70.3
3 (basal one-third)	40	8	6	75.0

¹ Stein, William I. Germination of noble and silver fir seed on snow. Jour. Forestry 49:448-449. 1951.

Table 1.—Species Observed Germinating on Snowbanks and Date and Location of Observations

Species	Date and location of observations
Pacific silver fir <i>Abies amabilis</i>	On June 14, 1963, and five times between June 6 and 29, 1966, in the northern Oregon Cascade Range (Linn, Marion, and Multnomah Counties).
Grand fir <i>Abies grandis</i>	On May 17, 1965, at Peterson Prairie, Skamania County, Washington.
Subalpine fir <i>Abies lasiocarpa</i>	On August 18, 1963, near Harts Pass in the northern Washington Cascade Range (Okanogan County), and on July 19 and 21, 1966, in the Olympic Mountains (Clallam County, Washington).
Shasta red fir <i>Abies magnifica</i> (<i>r. shastensis</i>)	Four times between June 15 and 30, 1966, in the southern Oregon Cascade Range (Lane and Douglas Counties).
Noble fir <i>Abies procera</i>	On June 14, 1963, and five times between June 6 and 16, 1966, in the northern Oregon Cascade Range (Lane, Linn, and Marion Counties); on June 17, 1963, on Marys Peak, Benton County, Oregon; and on June 27, 1966, near Mount St. Helens, Cowlitz County Washington.
Mountain hemlock <i>Suga mertensiana</i>	On June 16 and 29, and August 29, 1966, in the Oregon Cascade Range (Marion, Lane, and Multnomah Counties).

Germination of filled seed was high, but not exceptional when compared with laboratory germination of good quality seed lots.

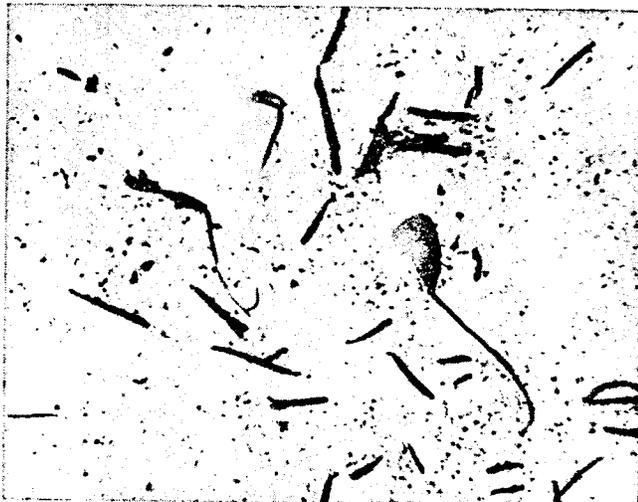


Fig. 1.—Grand fir seed germinating on snow. Radicle of the germinant on the left is shriveled.

Most of the germinating seed had succulent radicles $\frac{1}{2}$ to $1\frac{1}{2}$ inches long (Fig. 3). The cones were in various stages of disintegration, and some of the germinants might potentially have become established, although this was not actually observed.

Observations made by Stein indicated that few seedlings germinating on snow would become established, and he speculated that broadcast seeding of true firs on snow might fail because of seed germination in the snowpack. Depending on the amount of seedfall caught, germination on the snowpack could also hinder natural regeneration of high-elevation cut-over areas, particularly those designed to favor maximum snow retention.

Premature seed germination on snow might also promote persistence of natural openings in high-elevation Cascade Range forests. Deep snow often accumulates in small openings and remains until late in the spring. Early development and late persistence of this snowpack may be one factor discouraging invasion of these openings by true firs and mountain hemlock from adjacent forests.

Intact cones or portions of cones are often found on



Fig. 2.—Noble fir seed germinating in a whole cone collected from a snowbank.

the ground in Pacific silver fir and noble fir stands following a good cone crop. Such cones were either not completely ripe or were held together by pitch when removed by squirrels or wind, since cones of *Abies* normally disintegrate on maturity. These cones and the seed they contain are almost always fungus infested and rotten when found in the spring. However, under certain storage conditions, seeds can mature and germinate.

These observations indicate seed of these species are readily capable of germinating in the cone and when temperatures of the surrounding substrate are near freezing. In our experience, germination of noble fir seed during stratification at 33° or 34° F is also common.

JERRY F. FRANKLIN
KENNETH W. KRUEGER
*Pacific Northwest Forest and Range Expt. Sta.
Corvallis, Ore.*

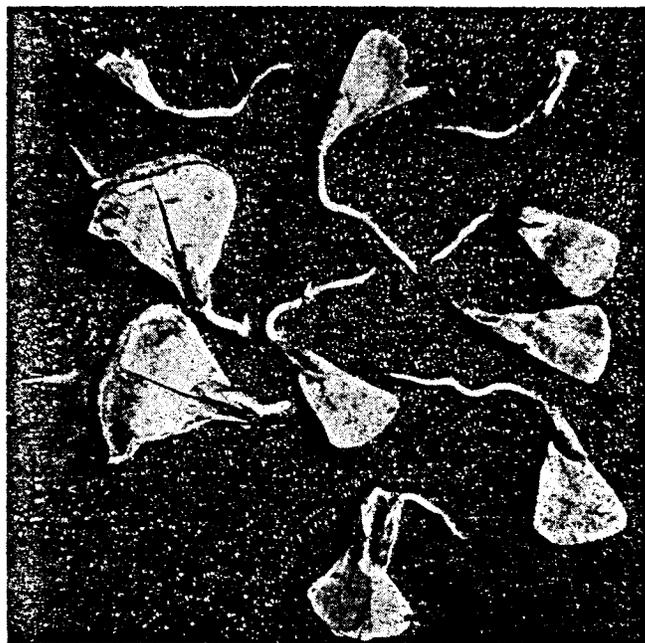


Fig. 3.—Noble fir germinants from the cone shown in Figure 2. Radicles are a maximum of 4 cm long. The two seeds on the left are still attached to the cone scales.