

BRITISH COLUMBIA FOREST SERVICE

INTERIM RULES TO GUIDE THE TRANSFER OF SEED
AND TO ASSIST IN THE SELECTION OF SEED PRO-
DUCTION AREAS ON VANCOUVER ISLAND.

R.L. Schmidt

January 1962.



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In the spring of 1961 a phenological survey of male bud development of Douglas fir was conducted to determine whether a consistent relationship exists between this phenological* index and spring temperature conditions. A report concerning the survey is being prepared for publication. (4)

A summary of this report is presented as follows:

1. Over 600 observations were made on 250 trees situated along various latitudinal and altitudinal gradients. (see Fig. 1)
2. Wherever possible the sample trees were selected near existing meteorological stations. Additional meteorological stations were established in remote areas up to 4,000 feet elevation to extend the sampling universe over a considerable range of climatic conditions.
3. Among the various localities sampled in 1961, the dates of initial pollen release extended over a ten-week period, as indicated in Fig. 2 by Roman numerals I to X. Pollen flight was first observed at sea level near Victoria on March 23. At the last station (4,100 feet elevation on Crest Mountain) pollen release did not occur until May 31.
4. Attempts were made to relate various expressions of temperature with the phenological indices obtained. At least one expression indicated a strong relationship. (see Fig. 2). Lagged temperature index is an exponentially smoothed average of mean daily temperature.
5. It was concluded that the date of initial pollen release in Douglas fir provides a reliable basis of comparing spring temperature conditions in different localities. This phenological approach appears to have some application in mapping climatic zones as a preliminary step in provenance research.

* The time of initial pollen release of Douglas fir was used as the phenological index.

Since the survey indicated positive results a decision was made to use the survey results in formulating interim rules to assist in guiding a reforestation program with regard to the selection of seed production areas, and in setting up seed provenance zones.

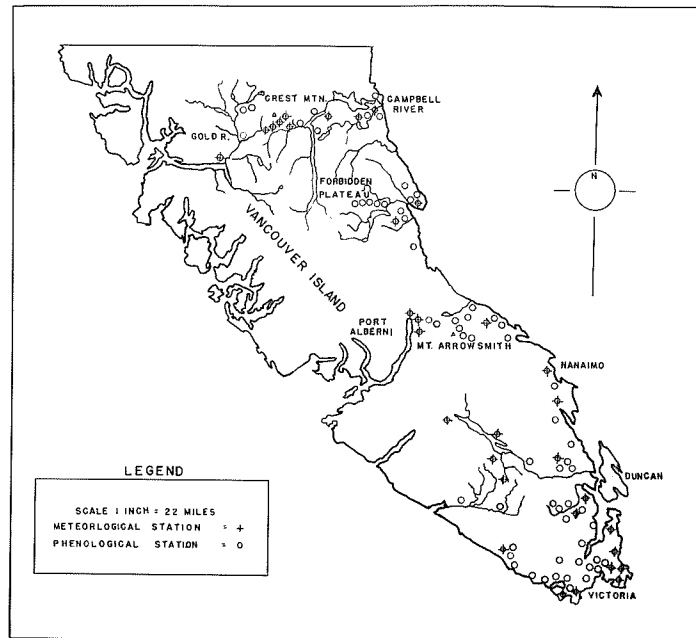


Fig. 1: Location of samples for male bud survey, 1961.

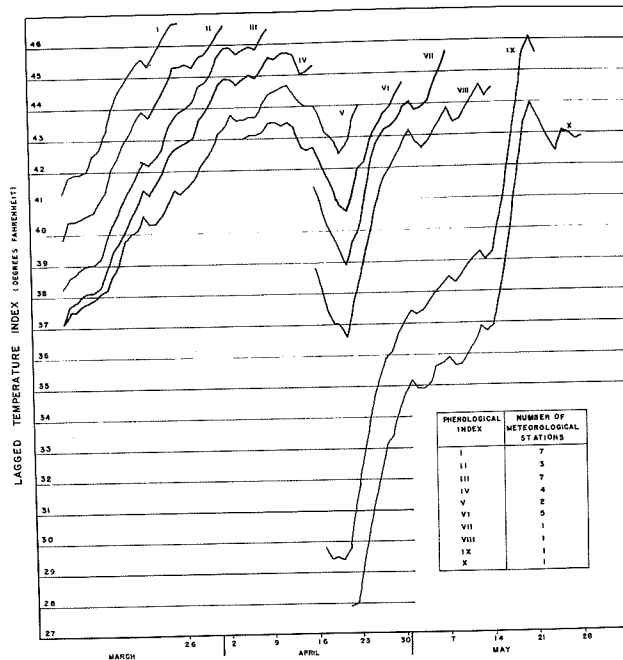


Fig. 2: Relationship between spring temperature and time of initial pollen release in Douglas fir, Vancouver Island, 1961.

At this point it should be made abundantly clear that the 1961 phenological survey did not aim to establish provenance differences. Application of the survey results toward the definition of either rules or a zonal map involves the assumption that observed phenological and climatological differences are reflected by differences in the adaptation of Douglas fir to local climate. This still remains to be investigated in British Columbia.

In the accompanying map, Zone I includes the extreme south-east portion of Vancouver Island. (see Fig. 3). The survey indicated that all phenological stations at which pollen release commenced during the period March 23-28 were situated within this confined area. The survey also indicated that pollen release was much earlier at higher elevations within this area (Mt. Finlayson, Malahat Summit) than at similar elevations elsewhere on Vancouver Island. From this information one could assume that the Douglas fir in this area is adapted to a special climate, and is therefore unsuitable for use in plantations elsewhere on Vancouver Island. Results reported by Orr-Ewing (3) and by the Reforestation Division would appear to confirm this assumption.

The survey indicated that the time of initial pollen release at a given locality was influenced by its proximity to the sea. The results also indicated that pollen release at sea level is later at the heads of inlets such as Muchalat and Alberni than at areas facing the open water. This is borne out by meteorological data which show that at the head of a long inlet bordered by high mountains, the growing season is shorter, and greater extremes of temperature occur as compared with areas near the outer coast.

From the foregoing discussion the following observations can be made:

1. All areas bordering the sea coast are climatically different from areas only a short distance inland. (This distance appears to be greater on the west coast than on the east coast of Vancouver Island).
2. Areas at the heads of inlets with high bordering mountains have a more continental climate than areas at the same elevation with subdued relief, and near the open sea.

By itself the survey did not indicate a strong latitudinal variation in climate, presumably because the samples did not encompass a sufficient latitudinal variation: all samples between $48^{\circ}20'$ and $50^{\circ}00'$. By combining the results of this survey with an additional observation from Corvallis, Oregon, supplied by Silen (6), a sketchy indication of latitudinal influence is obtained. According to Figure 4 the latitudinal delay in time of initial pollen release is approximately 4.5 days per degree of latitude. This figure is in very close agreement with results obtained elsewhere for other tree species. Bingham and Squillace (1) made an exhaustive review of the literature, and reported that, "for each degree of latitude northward, most species exhibit a delay in flowering time averaging about 5 days". Hopkins (2) figure is as low as four days per degree of latitude.

The 1961 survey provided a considerable amount of data concerning the effects of altitude upon time of pollen release. This was combined with Silen's data from 1959 (5), and is presented in Table 1.

Since the average latitudinal rate is 4.5 days per degree of latitude, and since the average altitudinal delay is 90 feet per day, it would appear that 1 degree of latitude is climatically equivalent to approximately 400 feet elevation, at least as far as spring temperature is concerned.

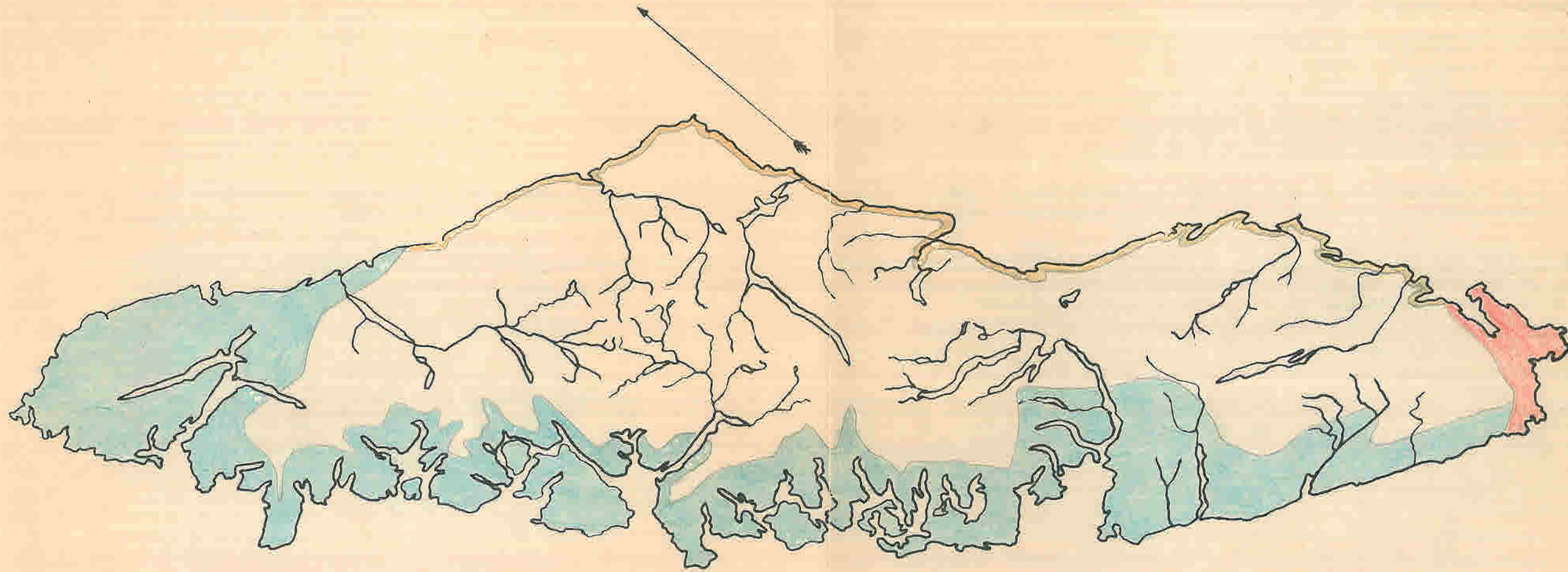
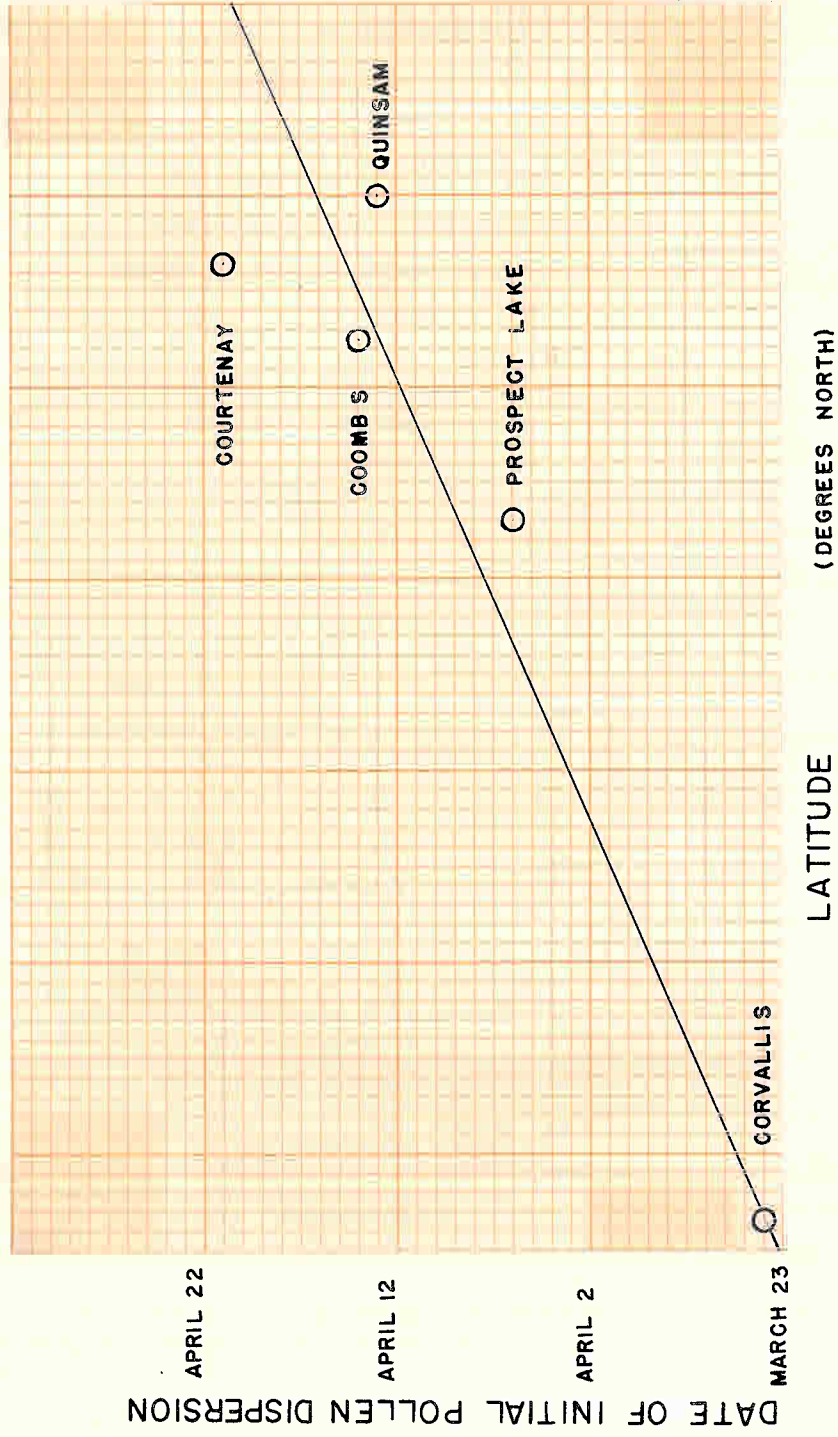


Fig. 3: Interim provenance zones for Vancouver Island.



THE RELATION BETWEEN LATITUDE AND THE DATE OF INITIAL POLLEN DISPERSION OF DOUGLAS FIR AT LOCALITIES OF SIMILAR ELEVATION IN 1961.

Fig. 4

(1) The Sooke Saanich area (Zone I). The climate of this area is different than elsewhere on Vancouver Island, and this can be substantiated phenologically, phytogeographically, and by climatic data.

(2) Areas predominantly exposed to oceanic climatic influences.

a. On the eastern side of Vancouver Island this area (Zone II) appears to be a very narrow zone bordering the sea coast. It is doubtful if this zone is more than 1 mile in width. It is narrow because the east coast is exposed to a considerable amount of continental influence from the mainland and this influence overrides the oceanic effect.

b. On the west coast of Vancouver Island the oceanic Zone III is much wider than on the east coast, especially in localities of subdued relief.

This zone does not include the heads of inlets bordered by high mountains such as Alberni and Muchalat Inlets. It is possible that further sub-division of this zone may be necessary if the climate is even more markedly oceanic in a narrow band along the open sea coast.

At the present time any further climatic subdivision of Vancouver Island cannot be accomplished with any degree of reliance. Until such time as more comprehensive data are available, the remainder of Vancouver Island should be considered as one heterogeneous zone (Zone IV).

Varying amplitudes of climatic variation are encountered in each zone. Most of the climatic variation is associated with altitudinal differences, although latitude and aspect are probably of considerable importance. The following rules should be applied to the transfer of seed in all zones:

1. Seed from within a mile distant from the sea coast should not be transferred inland beyond a one mile limit.

2. Seed should not be transferred across any of the zone boundaries shown on the accompanying map (Fig. 3).
3. With any of these four zones, seed should not be transferred more than 400 feet in elevation or one degree of latitude away from the seed source.
4. Until otherwise indicated, seed should not be transferred from sources on the mainland to Vancouver Island or vice versa.
5. Caution should be used on east-west transfers of seed within Zone IV.

Recommendations regarding the location of seed production areas.

Up to the present time two S.P.A. (Seed production area) have been established by the Reforestation Division on Vancouver Island (see Table 2).

Table 2: Seed Production Areas on Vancouver Island.

Locality	Latitude deg.	Elevation ft.	Distance from the sea miles
Mt. Prevost	48 49	1400	8
Mt. Benson	49 08	2500	7

Since most of the Reforestation projects on the east part of Vancouver Island for the near future will involve lands above 1000 feet elevation, these two S.P.A. should be adequate, at least for the southern part of Zone IV (Fig. 3). It is possible that these two S.P.A. are too near the sea for seed production aimed at reforesting more inland areas, but for the time being this possibility must be ignored. Of greater concern is the adequacy of this seed for more northern areas on Vancouver Island. Since not too many facts are available, the Forest Service should probably make a conservative decision, and establish another two S.P.A. around

Lat. 50 deg. N in the east part of Vancouver Island at elevations similar to those listed in Table 2.

Up to the present time an extensive reforestation program has not been developed in the largest P.W.C. on Vancouver Island (Kyuquot). If a large-scale reforestation program is contemplated for this area, some provision should be made to guarantee adequate supplies of suitable seed. If there is sufficient time available prior to S.P.A. establishment, some preliminary research could be conducted in the Kyuquot Forest to help advise on area sub-division as a basis for S.P.A. locations. However, if the S.P.A. must be established without delay, the following is recommended:

1. Since most of the logging in this forest has occurred at low elevations, both along the sea coast and in the accessible valleys, priority must be placed on the establishment of S.P.A. at low elevations.

2. The following distinctions are made between areas of the same low elevation:

- a. areas near the outer sea coast.
- b. areas along long inlets bordered by high mountains.
- c. inland areas up the valleys.

There is a good chance that one S.P.A. would be adequate for (b) and (c), however, a conservative decision would select a separate S.P.A. for (a).

Therefore the present recommendations for establishment of S.P.A. in the Kyuquot P.W.C. are as follows:

1. One S.P.A. at approximately 400 feet elevation within one mile of the sea coast in a locality predominantly exposed to an oceanic climatic influence (e.g. the 1938 burn on Nootka Island). Seed from this S.P.A. should be used to reforest logged areas along the sea coast, but not more than one mile inland. It should not be used for areas situated near the head of a long inlet bordered by high mountains.

2. One at approximately 400 feet elevation at an inland location. Seed from this S.P.A. should be used to reforest inland areas up to 800 feet elevation, and also for low elevations in areas along the aforementioned inlets.

If a reforestation program is to extend to areas exceeding 800 feet elevation, additional S.P.A. should be established,

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