within range of pollen dispersal to a bog causes species of diverse climatic requirements to be synchronously recorded. This is especially true here, because the pollen-bearing sediments are located near the crest of the Cascade Range. Pollen from the forests of both the humid west slope and the dryer east slope is preserved in the peat profile. The increase or de-

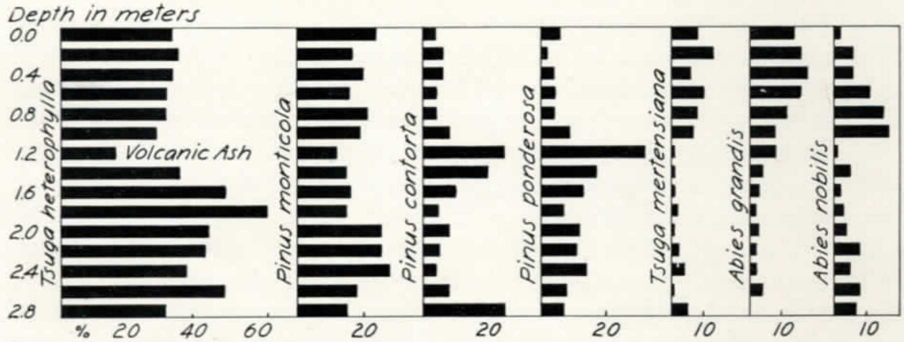

Fig. 1. Pollen Profiles, No. 1. Cayuse Meadows.

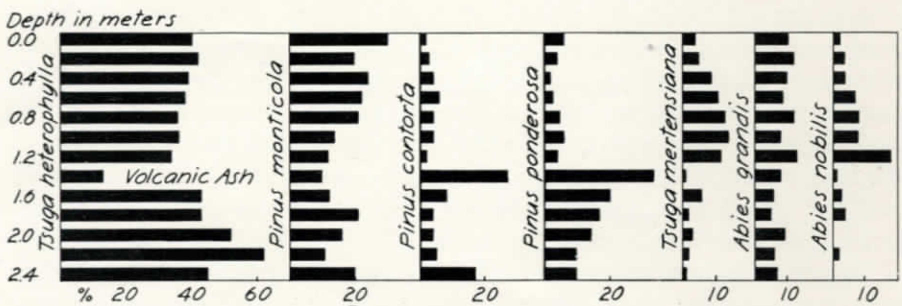

Fig. 2. Pollen Profiles, No. 2. Cayuse Meadows.

crease in the abundance of a species confined to a single life zone influences the pollen proportions of other species, although no changes in their actual abundance may have occurred. The direction of prevailing winds during the period of anthesis also may have caused further contortion of the pollen profiles.

The forests within range of pollen dispersal to the bog when the lowest sediments were deposited consisted chiefly of western hemlock and lodgepole, white, and yellow pine (Figs. 1, 2). The first was the most abundant and is recorded to 32 and 45 per cent in the two profiles. Western hemlock is rarely recorded as the predominant species in the lower horizons of Pacific Northwest peat profiles. Pollen analyses of most bogs within the limits of Pleistocene glaciation show that lodgepole pine was the chief pioneer, postglacial invader (Hansen, 1938, 1939a, 1939b, 1940a, 1940b, 1941a, 1941e). In areas beyond the boundaries of glaciation, other species are recorded as having been predominant. The age of these bogs is less definite than those located within the glaciated region, and the first predominantly recorded species are probably those that existed in adjacent regions as dominants of late Pleistocene climax forests. A few bogs located within the glaciated region are of uncertain age, however, and the stage of forest succession in the lowest pollen-bearing levels suggests that some

TABLE 1. *Percentages of fossil pollen*

Depth in meters	2.8	2.6	2.4	2.2	2.0	1.8	1.6	1.4	1.2	1.0	0.8	0.6	0.4	0.2	0.0
Pinus contorta	25	8	4	5	8	5	10	20	25	8	4	4	6	6	4
P. monticola	25	18	28	25	25	15	16	15	12	19	20	16	20	17	24
P. ponderosa	7	8	14	11	12	7	13	17	32	9	4	4	4	2	6
Pseudotsuga taxifolia	2	2	3	2	2	1	4	1	3	3	4	3	3		6
Tsuga heterophylla	32	50	38	44	45	63	50	36	17	29	32	32	34	36	34
T. mertensiana	5	1	4	2	1	2	1	1	1	7	8	10	6	13	8
Picea engelmanni	3	1	1			2	1	1	1	1	1	1	4	4	2
Abis grandis		4	2	2	3	2	3	4	8	8	12	16	18	16	14
A. nobilis	7	8	5	8	4	3	2	5	1	16	15	11	6	6	2
Larix occidentalis	4		1	1											
Pinus spp.*	7	9	5	3	6	2	8	6	5	3	4	5	6	2	4
Abies spp.*	3	2	1	4	1	1	2	1	2	2	1	2	1	3	1
Gramineae*				1						1					
Compositae*	1			1						1					
Chenopods*										1					1
Alnus*	13	5	1	6	3	2			2	8					11
Acer*	4			4			1			2	1			2	2
Salix*				1											
Cyperaceae*	14		2		1	2	2	2	15	17	4	15	5	2	2
Nymphozanthus*	2	2	2	2	1	1	1	2	4	1					2

* Number of pollen grains, not computed in the percentages.

postglacial time had elapsed before their initiation (Hansen, 1939c, 1941f, 1942e). Western hemlock was the most abundantly represented species at the bottom of pollen-bearing profiles in west central Oregon, on the west side of the Olympic Peninsula, and on the Oregon Coast (Hansen, 1941b, 1941c, 1941d). The last two areas have heavy rainfall, and hemlock has been predominant during all of the time represented by the peat profiles. In the Puget Lowland of western Washington the pioneer lodgepole pine was replaced by Douglas fir. Hemlock then entered and became co-dominant with the fir during the latter part of the postglacial period (Hansen, 1938, 1941a). The prevalence of hemlock in the lower levels of the bog of this study suggests that sedimentation did not begin until the climatic and edaphic conditions had been ameliorated, and lodgepole pine had given way to other species. The relatively small proportions of lodgepole pollen hemlock, lowland white fir, and noble fir above the level of yellow pine maximum.

The dry period suggested by the maximum proportions of yellow pine is corroborated by the pollen profiles in many parts of the Pacific Northwest, both east and west of the Cascade Range. The relative position of the indicated xeric period in the several profiles varies, but this may be explained by the different rate of peat deposition in the several areas due to climate and type of vegetation concerned with hydrarch succession. It is present in the middle-third of most of the profiles. In an alpine bog in the Blue Mountains of northeastern Oregon a yellow pine maximum occurs about half-way up in the profile (Hansen, 1942e). Four peat profiles from Lower Klamath Lake of California and Oregon also record a yellow pine maximum about half-way (Hansen, 1942d). Three peat profiles in the lower Willamette valley of western Oregon record an influx of white oak (*Quercus garryana*) of considerable magnitude in the upper levels, further corroborating the evidence for a period of desiccation (Hansen, 1942c). In eastern Washington, the relative trend of forest succession and of grasses, Composites, and Chenopods also substantiates the occurrence of the interpreted dry period (Hansen, 1939b, 1941e). The fact that this post-Pleistocene climatic trend is evinced by the pollen profiles of several species from bogs located within different climatic and vegetational provinces greatly strengthens the weight of the interpretation.

SUMMARY

The pollen profiles of a montane peat deposit near Mt. Adams, Washington, indicate that some post-Pleistocene time had elapsed prior to the origin of the bog. The principal climatic indicator species recorded by their pollen are western hemlock, western white pine, and western yellow pine. Hemlock exhibits an initial increase to its maximum, followed by a sharp decline to its lowest proportions, and then a final increase to the surface. A similar trend on a lesser scale is revealed by the pollen profiles of white pine. Yellow pine shows a converse trend with a general increase from the bottom to a maximum at the horizon of hemlock and white pine minimum, and then it declines to the surface. Lodgepole pine attains its greatest proportions at the level of yellow pine maximum.

The occurrence of volcanic ash in both profiles at the horizon of hemlock minimum and yellow pine maximum proportions suggests that deposition of volcanic material may have been unfavorable for hemlock. This increased the relative abundance of yellow and lodgepole pine. While the volcanic activity may have been in part responsible for the decline of hemlock, a desiccation of the climate probably was in progress at this time. Prevailing westerly winds blowing across the Humid Transition may have caused over-representation of hemlock throughout the profile.

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