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A BOTANICAL SURVEY
OF THE
OLYMPIC PENINSULA, WASHINGTON

By
GEORGE NEVILLE JONES

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Errata et Addenda

Botanical Survey of the Olympic Peninsula

Page 12, line 4 from bottom; *for* 1928 *read* 1918.

Page 17, line 6; *for* life-zones and associations *read* life-zones and ecological associations.

Page 29, line 27; *for* crus-galli *read* crista-galli.

Page 38, line 7; for *Nephrophyllidium* read *Menyanthes.*

Page 38, line 12; for *Menyanthes* read *Nephrophyllidium.*

Page 38, line 33; for *pedicillaris* read *pedicellaris.*

Page 39, line 8; delete "all."

Page 51, line 6 from bottom; *for* thirving *read* thriving.

Page 52, line 4 from bottom; *for* var. cordata *read* var. subcordata.

Page 53, line 8 from bottom; *for* L. exarata *read* L. exarticulata.

Page 67, footnote 32; *for* 24 *read* 7.

Page 75, last line; *for* 1930 *read* 1903.

Page 83, line 33; delete "(1-19)."

Page 110, line 26; delete entire line.

Page 115, line 11; *for* 1.5-4 *read* 1.5-7.

Page 141, lines 2 and 4 from bottom; *for* broad *read* long.

Page 144, bottom of page; add: 2 L. PYGMAEA (Gray) Robbins. Hurricane Ridge, *Thompson* 10616. Hudsonian. (H)

Page 165, line 20; *for* flabellate to obovate *read* oblanceolate or spatulate.

Page 193, line 4; *for* Schkur. *read* Schk.

Page 201, lines 9 and 12; *for* Leibergii *read* Leibergi.

Page 230, line 1; *for* Tillamook *read* Clatsop.

Page 243, line 12; *for* Transition *read* Canadian.

Page 243, line 40; *for* viscid *read* minutely glandular.

Page 255, line 22; *for* short-hispid *read* more or less pilose.

Page 267, line 5; *for* 138 *read* 38.

Plate 6, fig. A; for *(Tsuga heterophylla)* read *(Tsuga Mertensiana).*

Photo by Victor B. Scheffer

View of Mount Constance, looking southward from Iron Mountain, showing typical Arctic-alpine habitats of the Olympic Mountains. Hudsonian vegetation may be seen on some of the steep lower ridges.

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A Botanical Survey of the Olympic Peninsula

BY

GEORGE NEVILLE JONES

INTRODUCTION

Of all the sparsely inhabited and little explored areas in the United States, the wilderness of the Olympic Peninsula is among the most picturesque. Lying to the westward of Puget Sound and Hood Canal, so close to the populous centers of northwestern America that one may travel to it by airplane in twenty minutes, the Olympic Peninsula is one of the grandest of all primeval areas. Ever since 1792, when Archibald Menzies landed at Port Discovery, this territory has been regarded by botanists as one of uncommon promise. However, it was not until 1890, when both L. F. Henderson and C. V. Piper made small collections from the Peninsula, that the flora of this fascinating region became at all known. In 1892, Henderson published a list of the plants which he had seen or collected; in 1906, Piper included all the available taxonomic and phytogeographic information about the vascular plants of the Olympic Peninsula in his *Flora of the State of Washington;* and in 1915, there appeared Piper & Beattie's *Flora of the Northwest Coast,* the only modern descriptive flora which includes the plants of this area. Except for lists of plants by Flett (1907), Reagan (1923), and Leach (1928), there have been no further attempts to present an account of the botany of the region.

Since scarcely any part of the Olympic Peninsula has been thoroughly explored, and the greater part of it has never been visited by a botanist, the list of species included in this report most likely will be increased. It is certain, however, that the great majority of them have been recorded and that the number to be added will not be proportionate to the size of the unexplored area. During the last quarter of a century several new species have been discovered, and the taxonomic status, the nomenclature, and the knowledge of the geographical distribution of many others have been modified. In addition there are now available sufficient data to furnish a basis for a brief account of the vegetation. Therefore, in order that the available information may be brought together and presented in convenient form, it seems desirable to prepare a new treatment of the flora of the Olympic Peninsula in the form of a summary of taxonomic and phytogeographic knowledge of the vascular plants. The three chief ob-

jects in view in the preparation of the following pages have been, first, to describe the vegetation, giving such facts about the physical environment as were necessary, second, to catalogue the vascular flora, and third, to compare the flora with that of adjacent areas.

The logical first step in a study of the vegetation of a region is to determine its floristic composition; the next step is to determine the pertinent facts of the environment; the third step is to coördinate the two sets of facts according to certain principles involved. In some treatments of vegetation, the emphasis is placed on the physical factors of the environment, often to the exclusion of exact data concerning the precise identity of the component species. It is the aim in the present study, while taking into account the climatic and topographic influences to place the chief emphasis on the individual species. That this method of approach may be of greater ultimate value is indicated in the following statement by that eminent student of the flora of the northern Rocky Mountains, the late Dr. J. E. Kirkwood (1922):

> "The immensity of the task involved in the thorough study of the vegetation of an area becomes the more apparent when we reflect that native vegetation is dynamic, not static, and that the changing quality of the soil through long periods of time is attended by conspicuous changes in the plant covering. Our knowledge of the ecology of a region or locality must in the end be a product of our knowledge of the separate units (species) of that area. It seems, therefore, important that the study of plant geography, or ecology, be approached primarily from the standpoint of the species, and merely incidentally from that of the physical conditions."

This report is based in large part on the writer's familiarity with the flora of the Olympic Peninsula and the Northwest Coast over a period of ten years. Parts of the summers of 1923, 1931, 1932, 1933, 1934, and 1935, have been spent on the Peninsula, comprising altogether a total of about six months in residence, during which time field observations, notes of the vegetation, and a systematic collection of herbarium specimens have been made. In addition to these data, the collections of L. F. Henderson, C. V. Piper, J. B. Flett, T. Kincaid, A. A. Heller, A. D. E. Elmer, F. H. Lamb, H. S. Conard, H. St.John, A. B. Reagan, I. C. Otis, and J. W. Thompson, have been studied; also valuable information has been derived from Piper's *Flora of Washington,* a work that for many years to come will remain a datum for all critical botanical investigations of the vegetation of northwestern America. In order to bring the present report up to date and make it as nearly complete as possible, all specimens from the Olympic Peninsula cited in Piper's work are included, though with few exceptions, none has been admitted unless it has been critically restudied. With few exceptions, the specimens cited in this report are in the herbaria of the University of Washington, the State College of Washington, and that of the writer; their number is approximately 5000. This

paper is a contribution from the Herbarium of the University of Washington and types of newly described plants are in that institution at Seattle.

In conclusion, the writer wishes to acknowledge the kindness and generosity in the matter of giving technical information, or in other ways, of the following persons. To Dr. T. C. Frye and Dr. Erna Gunther of the University of Washington, many thanks are due for securing financial aid toward the prosecution of this work. Grateful acknowledgement is made to Dr. S. F. Blake of the Bureau of Plant Industry, Dr. M. L. Fernald of the Gray Herbarium of Harvard University, Dr. A. S. Hitchcock and Dr. W. R. Maxon of the Smithsonian Institution, and Dr. F. W. Pennell of the Philadelphia Academy of Natural Sciences, for valued assistance in the determination of specimens; to Mr. C. A. Weatherby, and to Mr. Alfred Rehder of Harvard University for advice on nomenclature; to Dr. W. L. Jepson of the University of California for information about certain doubtful species; to Professor John Davidson of the University of British Columbia, and Mr. W. A. Newcombe of the Provincial Museum of Natural History at Victoria, for information about certain species in British Columbia; to Dr. J. H. Schaffner of Ohio State University for his advice regarding the genus *Equisetum;* to Dr. C. R. Ball of the United States Department of Agriculture for assistance with the willows; to Dr. H. S. Conard of Grinnell College, Dr. W. S. Cooper of the University of Minnesota, and to Dr. G. B. Rigg of the University of Washington, for their expert criticism of parts of the manuscript; to Dr. Lincoln Constance of the State College of Washington, and to Dr. Aven Nelson of the University of Wyoming for their courtesy in the matter of lending specimens; to Mr. and Mrs. Carl S. English, Jr., of Seattle, for access to their garden of native plants, and for various specimens of both living and dried plants; to Mr. and Mrs. J. R. Leach of Portland, Oregon, and to Mr. J. William Thompson of Seattle for numerous records of species occurring on the Olympic Peninsula; to Mr. I. C. Otis of Seattle for his generous donation of specimens; to Mr. Lawrence C. Fisher, and to Mr. Thomas E. Jermin of the office of the United States Weather Bureau at Seattle for most courteous aid in providing climatological data; to Mr. Irving Clark, Mr. Victor Scheffer and Mr. Robert Tschudy, for permission to use certain photographs; and finally, to my wife, for help in collecting specimens and in preparing the manuscript. To all these persons the writer wishes here to express his thanks and cordial appreciation of their valued assistance.

PHYSIOGRAPHY AND GEOLOGY

Physiography. The Olympic Peninsula is situated in the northwestern part of the state of Washington, chiefly between the 47th and 48th parallels of north latitude in the extreme northwestern corner of the United States. Its northern boundary extends for more than 90 miles along the south side of the Strait of Juan de Fuca, and on the west it is bounded for over 100 miles by the Pacific Ocean. The southern boundary is the broad alluvial valley of the Chehalis River, which, with Grays Harbor, furnishes deep water navigation in salt water for 20 miles from the ocean. The eastern boundary is Puget Sound, Admiralty Inlet, and Hood Canal. There is a strip 25 miles in width connecting the southeastern part of the Peninsula with the mainland at a point about ten miles north of Olympia. This region has a base area of somewhat less than 6000 square miles and is, therefore, almost the size of Massachusetts, or nearly twice as large as Porto Rico, or nearly five times the size of Rhode Island.

Dominating this peninsula is a group of mountains comprising a part of the Coast Range which is an outlying portion of the western Cordillera extending from Alaska to Mexico. That part of the Coast range which occurs in Washington is known as the Olympic Mountains, a rugged, isolated, almost circular mass from 3000 to nearly 8000 feet high, which occupies an area of about 4000 square miles in Clallam, Jefferson, Mason and Grays Harbor counties. These mountains consist of numerous irregular ridges dissected by deep gorges or canyon-like valleys that render exploration of the region very difficult. Viewed from an elevation they suggest an uplifted, maturely dissected peneplain with main axis of uplift running northwest from Hood Canal to Cape Flattery (Saunders, 1916). The highest and most conspicuous of these ridges is Mount Olympus, southwest of the main divide and rising to an elevation of 7915 feet above sea level.[1] There are several other mountains nearly as high, including Mount Constance, Mount Anderson, Mount Steele, Mount Carrie, Mount Meany, and Mount Angeles. These mountains are within the Olympic National Forest, consisting of more than 1,500,000 acres of fine timber, and containing the Mount Olympus National Monument which originally included more than six hundred thousand acres, but, owing to the withdrawal of certain portions, comprises less than half that area at the present time.

[1]According to Meany (1924), Mount Olympus was the first geographical feature in Washington to be given a name by civilized man. The mountain was discovered by the Spanish captain, Juan Perez, in 1774, and named by him "El Cero de la Santa Rosalia". On July 4, 1788, the British Captain John Meares "declaring that the mountain was fit to be the home of the gods he called it Mount Olympus." Captain George Vancouver saw the mountain in 1792 and charted the name as given by Meares.

Many of the peaks and ridges are unclimbed and unnamed, and except in the northern part of the area, little detailed mapping has been done.

The summits of some of the higher peaks are snow-capped the entire year, and many of them support glaciers. Unofficial count places the number of glaciers in the Olympics at approximately fifty—nearly as many as in Glacier National Park. At the higher levels there are many cirques and U-shaped valleys. From the point of view of a botanist, the outstanding physiographical feature of the Olympic Mountains is their isolated position.

Bordering the Olympic Peninsula on the north and west is a low coastal plain varying from ten to twenty miles in width and less than four hundred feet high. The eastern slopes of the mountains rise abruptly from Hood Canal, while the south side gradually merges with the hills of southwestern Washington.

There are five lakes of considerable extent and depth on the Peninsula. Lake Crescent is the largest of these. The others are Lake Ozette, Lake Sutherland, Lake Cushman, and Lake Quinault. All, except the latter, which appears to have been formed by a local damming of the Quinault River (Weaver, 1916, p. 61), owe their origin to some phase of glaciation. There are also numerous small alpine and subalpine lakes. In several places in the region there are hot springs, of which the best known are the Olympic Hot Springs, and the Solduc Hot Springs. These have no apparent effect on the vegetation.

The Peninsula is drained by numerous rivers, the principal ones being the Soleduck, Bogachiel, Hoh, Clearwater, Queets, Quinault, Humptulips, and the Chehalis, which flow directly into the Pacific Ocean; the Hoko, Elwha, and Dungeness, which drain into the Strait of Juan de Fuca; and the Quilcene, Dosewallips, Duckabush, Hamma Hamma, and the Skokomish which drain into Hood Canal. All these rivers are fed continually by the ice and snow of the mountain glaciers.

The chief natural resource of the Peninsula is its forests. The rainy and densely forested slopes are the home of the Douglas fir ("Oregon Pine") *Pseudotsuga taxifolia,* famous the world over. Lumbering is the chief industry, although there are many farms on suitable land in the broad valleys along the larger streams. Irrigation is practised on a limited area near Sequim, Clallam County, where the chief crops are clover, oats, field peas and alfalfa.

Geology. The geological history of the Olympic Mountains is not well known. For such facts as are available we are indebted chiefly to Professors Henry Landes and C. E. Weaver of the University of Washington. Professor Landes says: "It may be tentatively suggested that the

Olympics represent a region once worn down nearly to a base level, and then uplifted to a height of about 8000 feet above the sea and subsequently eroded by streams of water and ice to their present rugged outlines. The higher peaks, such as Olympus, represent more resistant masses which in the former period of erosion did not reach a true base level. The forces of upheaval, it may be said, prepared a mightly block of rock, out of which the forces of nature, represented by the weathering elements, running water and glaciers, have chiseled the mountains as we now know them." (1907). Regarding the lithology of the Olympic Mountains, Professor Weaver (1907) states: "The great central mass of the Olympic Mountains is composed of metamorphic rocks. The most conspicuous varieties are schists, slates, and quartzites. Around the coastal border of this interior metamorphic area are sedimentary rocks, consisting of sandstones and shales, and associated with these are igneous lava flows. Along the eastern and southern margins of this area are boulders of granite and other rocks which are not found in the bed rock series of the Olympic Mountains, but are common in the mountains on the east and north sides of Puget Sound. The granites and similar rocks were brought into the Olympics and deposited there by great glaciers which at one time came down from the Cascades and from the mountains of British Columbia. The glaciers occupied the Puget Sound basin and filled the broader valleys of the Olympics."

"At the close of the Pliocene or early in the Quaternary, mountain making movements were taking place throughout the entire Pacific Coast. The present Cascade Range of Washington and Oregon as well as the Sierra Nevadas of California were uplifted. The Olympic Mountains and the major portion of Vancouver Island were also elevated to an elevation of at least 5000 feet. During the process of uplift the peneplain surface of the Cascades was slightly warped into a series of northwest and southeast shallow folds. . . . In both the Cascades and Olympics the peneplain surfaces were immediately attacked by erosional agencies and the dissection of the uplifted masses begun. In the Olympic Mountains such peaks as Mount Constance, Angeles, Ellinor, The Brothers, and Olympus are residual monadnocks upon the surface of the original peneplain. The principal river valleys of the range have been carved down into the uplifted peneplain surface of the mountains. Upon the uplifted peneplain surface of the Cascade Mountains volcanic cones were built up, such as Mounts Rainier, Baker, Adams, St. Helens, and Glacier Peak. Volcanic peaks are entirely absent from the Olympic Mountains. The peaks in that range are composed of metamorphic rocks which because of their resistance to erosion have been left as monadnocks." (Weaver, 1916.)

Following the periods of vulcanism and erosion in the Cascade Mountains, the greater portion of western Washington was subjected to glaciation. There were two main advances of the ice, with an interglacial epoch. The ice-sheet is considered to have extended as a solid mass from the Cascades to the Olympics, and even to have crowded up into the stream valleys on the northern and eastern slopes of the Olympic Mountains. One arm of this ice-sheet moved westward through the Strait of Juan de Fuca, another southward through Puget Sound toward the Columbia River. ". . . Grays Harbor and Puget Sound were connected by tide water across the site of Lake Russell's discharge-way and the Olympic Mountains constituted an island." (Bretz, 1913.) It was with the retreat of these ice-sheets, some 20,000 years ago, that the sites for the present plant habitats were formed on the northern and eastern slopes of the Olympic Peninsula.

The southern limit of the Pleistocene glaciation on the Olympic Peninsula extends from a few miles south of Cape Flattery, eastward to the south shore of Lake Crescent and from there to Admiralty Inlet and southward along Hood Canal. The glaciated areas include the northern half of Clallam County, the northeastern corner of Jefferson County and the major portion of Mason County. It is evident, therefore, that the greater part of the Olympic Peninsula has escaped the direct influence of the continental glaciation. Certainly there are some notable differences between the floras of the glaciated and the non-glaciated areas, but it is not clear at the present time whether these phenomena may result from climatic rather than geologic causes. It is known, however, that nearly all the species which are endemic to the Olympic Peninsula occur in the non-glaciated area.

CLIMATE

Since many physiographic conditions are the result of the cumulative effects of climate, a brief discussion of the climate of the region is essential to an understanding of its botany. Although the specific factors of climate, such as temperature, light, moisture, or length of growing season, are important, the present distribution of species on the Olympic Peninsula depends at least in part upon the interaction of these different factors. On the Northwest Coast, the region of the greatest precipitation in the United States, the climatic conditions are somewhat different from those found elsewhere in North America, and in many respects resemble more closely those of western and northwestern Europe. Owing to the proximity of the Pacific Ocean the climate is typically marine, of the wet temperate type, with rainy winters, dry summers, and no extremes of

temperature. As a result, the effect of latitude is profoundly altered. The Olympic Peninsula is protected on the eastward by the Cascade Mountains from extremes of climate which occur in the continental interior and which would otherwise be present on the Peninsula as a result of occasional north and east winds.

Although it is evident that temperature is one of the most important factors in the zonal distribution of species on the Olympic Peninsula, it is not yet known what sort of quantitative relations may exist between the plant and the intensity and duration of the temperature. The available data are somewhat scanty and are those of lowland stations, but there can not be the slightest doubt that the equable temperatures which prevail in this area profoundly affect the physiognomy of the vegetation as well as make possible the northward extension of a large number of species which do not occur at the same latitudes farther inland. There are approximately 40 species of vascular plants which reach their northern limit of distribution on the Olympic Peninsula, and furthermore, it is obvious that the character of the vegetation of the Arctic-alpine and Hudsonian zones is due chiefly to conditions of temperature and light rather than to those of moisture alone.

The Olympic Mountains are an effective climatic barrier. They stand directly in the path of the prevailing westerly winds and thus bring about marked changes in the rainfall, cloudiness, and humidity on their opposite sides. The average annual precipitation varies from more than 150 inches on the western slopes to 15 inches at Sequim, which is on the northeastern part of the Peninsula in the lee of the mountains. Thus it is seen that, within a range of 40 miles, the Olympic Peninsula has both the heaviest precipitation in the United States, and the driest area on the Pacific Coast outside of southern California. In view of these varied climatic conditions it is not at all remarkable that there are many interesting examples of peculiar plant distribution to be found here.

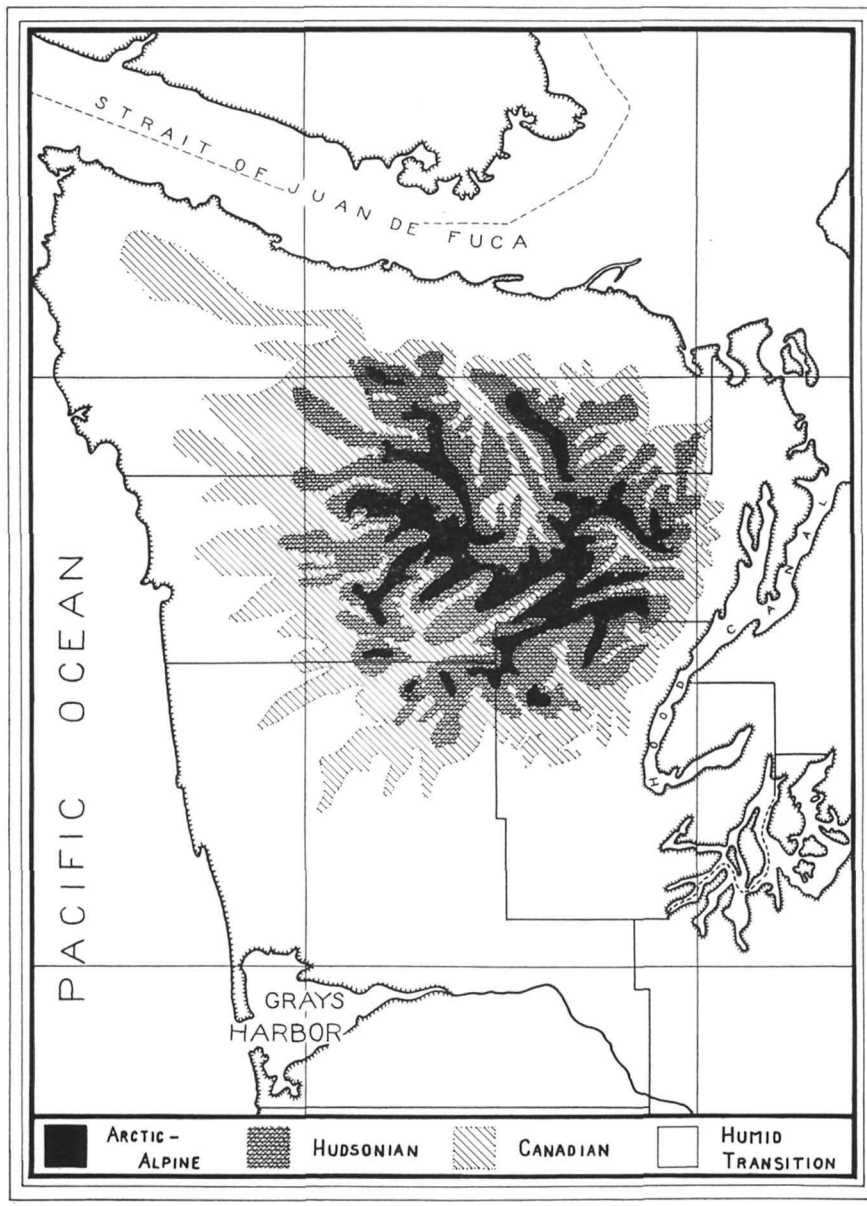
The average annual snowfall in the lowland areas is light; the snow remains on the ground for only a short time, and has, therefore, slight effect on the vegetation. In the mountains it is very heavy and remains the greater part of the year. Although no instrumental records are available to show the amount of snowfall in the Olympics, it is commonly believed that these mountains have a greater average annual precipitation than any station in the Cascade Mountains. In Paradise Valley, Mount Rainier (elevation 5500 feet), 789.5 inches of snowfall have been recorded (Fisher, 1928); this amount is almost certainly exceeded at corresponding elevations on the western slopes of the Olympic Mountains. In fact, Mathias (1928, p. 34) says that Mount Olympus has an estimated annual snowfall of 250 feet!

The causes of the enormous precipitation on the Peninsula are to be found in its proximity to the ocean, and in the mountain barriers which stand in the way of the onshore winds. In the winter the land is much colder than the ocean, hence the prevailing moisture-laden southwesterly winds become quickly cooled as they move inland and are forced to ascend the mountain slopes. The result is rapid condensation and consequent heavy precipitation. Comparatively little rainfall occurs during July and August because the prevailing summer winds come from a relatively cool ocean and higher latitudes. The Japan Current, flowing southward along the coast, helps to keep the climate rainier and more temperate than it would be otherwise.

The climatic conditions affecting the growth of plants at lower elevations on the Olympic Peninsula are summarized in the following table of temperature and precipitation compiled from the records of the United States Weather Bureau. Most of the stations are very near sea level, consequently the data for the interior of the Peninsula are few. It should be noted that the means are not based on records covering the same period of time because some of the stations have been closed for many years; for instance, the records for Neah Bay are mostly for a period from 1862 to 1902, and Quilcene is a new station with observations beginning in 1920.

TABLE 1

	Yrs. of Record Misc. Data	Elevation Feet	Years Temp. Record	Average Annual Temp.	Years Frost Record	Ave. Date Last Killing Frost in Spring	Ave. Date First Killing Frost in Autumn	Average Length Growing Season Days	Years Precip. Record	Average Annual Precipitation, Inches	Snowfall in Inch's	No. Days .01 In. or More Precipitation
Aberdeen.....	40	105	40	49.7	30	Apr. 23	Nov. 4	195	40	81.58	14.9	164
Brinnon.....	9	80	9	50.3	8	Apr. 2	Nov. 14	226	9	74.81	22.7	171
Clearwater.....	15	135	13	49.3	19	Apr. 20	Nov. 6	200	15	124.98	14.1	197
Cushman Dam...	9	790	5	50.3	6	Apr. 21	Nov. 7	200	9	91.63	26.7	151
Forks.....	21	500	17	49.0	8	Apr. 30	Oct. 13	166	21	114.85	11.5	157
La Push.....	7	15	..	....	5	Apr. 11	Nov. 13	216	7	79.98	9.9	175
Neah Bay.....	25	86	22	48.6	..	.....	.....	...	25	109.24	....	...
Port Angeles.....	29	42	30	47.3	29	Mar. 30	Nov. 3	218	29	27.42	10.1	139
Port Crescent....	15	259	15	46.1	19	Apr. 9	Oct. 29	203	15	42.27	16.6	163
Port Townsend...	37	80	37	50.0	26	Mar. 23	Dec. 2	254	56	19.54	8.5	113
Quilcene.....	10	30	11	49.0	10	May 6	Oct. 5	152	10	37.13	10.3	145
Quinault.....	20	300	20	50.6	8	Apr. 23	Nov. 1	192	20	122.28	8.1	178
Sequim.....	14	187	12	48.0	10	Apr. 29	Oct. 15	169	14	15.27	7.9	95
Spruce.....	5	300	..	....	..	.....	.....	...	5	116.58	4.7	172
Tatoosh.....	42	86	41	48.7	37	Feb. 11	Nov. 30	305	42	83.91	8.4	192
Union.....	14	10	14	50.4	13	Apr. 28	Oct. 20	175	14	83.13	26.8	159



Map showing zonal distribution of vegetation on the Olympic Peninsula.

THE ZONAL DISTRIBUTION OF THE VEGETATION:

A Summary of the Climatic Formations

Two major catastrophic events have occurred in the recent history of the vegetation of the lowland areas of the Olympic Peninsula—the Ice Age and the Caucasian Invasion. It is, perhaps, too early to predict which one posterity will regard as the more destructive. Formerly, almost the entire region from sea level to an elevation of 3500 or 4000 feet was covered by magnificent forests of Douglas fir, western hemlock, western cedar, or Sitka spruce. At present, however, scarcely any of the original forest remains in the lowlands which are now occupied chiefly by logged-off areas and more or less cultivated farms. From the Olympic Highway, encircling the Peninsula, little of the primeval forest is visible. However, at low altitudes in the mountains smaller stands of fine forest remain. In order that the environmental relationships of the vegetation may be made clear it is of immediate importance to record the facts obtained directly from a study of the plants under natural conditions before the influence of industrial activities shall have destroyed the evidence. The following classification of the vegetation of the Olympic Peninsula is admittedly tentative and subject to modification when more data are available.

It is well known that from sea level to the summits of high mountains there are variations in climate comparable to those encountered in a journey from the temperate to the polar regions. Corresponding to these climatic changes, with their differential precipitation and thermal gradients, are certain more or less definite belts or zones of vegetation. Schimper (1903, p. 702) distinguished three such zones. The lowermost zone he called basal, the second montane, and the third alpine. However, since Schimper's terminology is applicable to mountainous regions exclusively, and, furthermore, has been used with various meanings by different authors, the terminology of Merriam with its wider application, and its general acceptance and acceptibility, is used in this report to designate the four principal stages or phytogeographical divisions of vegetation which occur on the Olympic Peninsula.

Since it provides a convenient and practical method for treating the distribution of the vegetation, the Merriam life-zone concept (1895, 1898) is herein adopted. The basic theory upon which this system is founded is that for each species there are certain fixed climatic limits which prevent that species from spreading into other regions. Whether the factors of climate effective during the period of growth and reproduction are considered (Merriam's method), or whether the climatic factors determining the period unfavorable to growth and reproduction are considered, (as

later in this report) the results are the same. This life-zone concept is essentially the equivalent of the climatic climax formations of some ecologists. The term "life-zone" is preferable to "floral area" since it includes both plant and animal data. A life-zone is, therefore, a natural biotic unit, definable as an area possessing a distinctive assemblage of species and life-forms, both of plants and animals, and usually having objectively determinable climatic and physiographic boundaries. By the use of this comprehensive concept both ecological and phytogeographical data can be correlated and treated synthetically, and a satisfactory statement of the geographical distribution of the species can be made. For example, the western red cedar is classed ecologically as one of the components of the Hemlock-Cedar Climax Forest. This forest occupies a large part of the Vancouver Strip, which occurs in the Humid Transition Area, a subdivision of the Transition Zone. This zone, in turn, is one of the natural biotic, climatic, and geographic divisions of the Austral or Temperate Region of the Northern Hemisphere.

Accepting the Merriam life-zone concept, and, for the sake of uniformity, retaining the well-known Merriam terminology, and applying this concept to the vegetation of the Olympic Peninsula, we find that there are two major regions containing four phytogeographic divisions or life-zones occurring in the area. These zones are determined by the presence, frequency, or dominance of certain characteristic species which are used as indicators, that is to say, the criterion for the identification of a given zone is the occurrence of a certain group of species which are confined to that zone or which most frequently occur there. Although such climatological facts as have been available are mentioned in connection with the discussion of the various zones, the delimitation of these zones is made on purely floristic data, and the life-zone concept, as used in this report, is based "upon the actual distribution of important and significant . . . plants in nature and not upon climatic factors of uncertain preconceived importance." (Kendeigh, 1932.)

Two of the chief advantages of using the life-zone system are, first, that the flora can be compared with that of other homologous regions, and, second, that a more definite statement of the range of a species can be made than if that range is given in number of feet or meters of altitude above sea level. Likewise, a mere statement of political or geographical localities is inadequate for ecological purposes as it gives no information about the prevailing environmental conditions. Although geographical localities are satisfactory designations for labels for specimens, they are not satisfactory for detailed phytogeographical discussions and generalizations. Hence, in the Annotated Catalogue which comprises the second

part of this report, localities are given, but in addition an attempt is made to summarize the geographical distribution and the vertical range, especially within the boundaries of the area, by a statement of the zonal occurrence of the species.

For the most part the classification of life-zones and associations involves the same principles and methods of attack as are used in the taxonomic classification of biological genera and species. The category may be distinct and capable of clear definition at or near the type locality, but it may merge with other adjacent groups at or near the outer extension of its range; and the fact must be recognized that, even as there is often no sharp line of demarcation between different ecological associations or between different taxonomic subspecies or varieties, the boundaries of the life-zones are often somewhat indefinite and poorly marked. "These zones are not separated by level altitudinal lines. This may readily be seen where the Hudsonian and Arctic zones meet. The trees of the former zone extend up the mountain sides much higher on the ridges than in the valleys between [see Plate 1]. The dividing line is thus a sinuate one. This has been considered by Merriam partly the result of more and less favorable exposure to the sun's rays, and partly to air currents, the warm currents tending to follow up the steep ridges while the cold currents flow down in the valleys. Consequently, certain species ascend highest on the warm ridges, while others descend farthest in the cool valleys." (Piper 1906.)

The western part of North America shows a better delimitation of life-zones than the eastern part of the continent where there is greater climatic and physiographic uniformity. This may account for the fact that western American biologists have for the most part shown more willingness to adopt the life-zone concept. In some regions the same ecological community may extend beyond the boundaries of the life-zone, but on the Olympic Peninsula the amount of overlapping is relatively small. It is rather significant that less than 5 per cent of the total number of species known to occur on the Olympic Peninsula show an anomalous zonal distribution.

Jepson (1925) summarizes the life-zone concept as it applies to California as follows:

> Expression of the distribution of life by means of the life-zone concept, while imperfect, furnishes a practical working plan from which may be derived substantial and useful results, especially in the light thrown on the problem of species. Botanists in flat countries, as in the eastern United States, often evince strong distrust of the life-zone concept but it is to be said that these vegetational bands are marked actualities in a region where mountains rise from or near sea-level to heights of from 10,000 to 14,500 feet within a distance of ten to thirty miles, and where localized climatic areas bring hygrophytic forests within a short distance of arid deserts. The life-zone nomenclature has a practical value as giving expression to certain observations and will remain useful until this concept is replaced by a superior hypothesis.

In a recent paper concerning life-zones in California, Grinnell (1935) makes the following pertinent statement:

> ... it may be remarked that, although the exact factorial components of gross "temperature" have not yet been worked out satisfactorily, no one with adequate field experience can doubt that objectively determinable zones of life having a general relation to temperature do exist and that the limits of these zones are imposed upon plant and animal occurrences, in part, at least, directly, by variations in climatic temperature beyond certain critical levels. There is, to be sure, varying tolerance to this general factor by different species; but the observed extreme sensitiveness to it of so many kinds of organisms, and especially of such warm-blooded and motile animals as certain hummingbirds and bats, is convincing.

To the present writer it appears to be not altogether without significance that no serious criticism of the life-zone concept has been made by students really familiar with the taxonomy and geographical distribution of plants or animals. On the contrary the chief criticisms have been made by writers whose other publications have not marked them as authorities in that branch of biological science. It is a truism to state that biogeographical generalizations made without first-hand knowledge of the exact identities of the species concerned are, to say the least, worthless.

TABLE 2
A Tabular Classification of the Vegetation of the Olympic Peninsula

Regions	*Biogeographical Divisions*	*Phytosociological Units*
I. Boreal Region	A. Arctic-alpine Zone	Treeless
	B. Hudsonian Zone	Chamaecyparis-Abies-Tsuga Climax
	C. Canadian Zone	Tsuga-Abies-Pinus Climax
II. Austral Region	D. Transition Zone (Pacific or Humid Transition Area)	1. Tsuga-Thuja Climax 1a. Pseudotsuga Subclimax
		2. Picea-Tsuga Climax

By reference to table 2 it will be seen that the Olympic Peninsula has two major vegetational regions, (I) the Boreal, which occurs at the higher altitudes, and (II) the Austral, occurring from sea level to 2500-3500 feet elevation. These types coincide in character with the Arctic-Subarc-

tic, and the upper temperate regions of the northern hemisphere, respectively. The Boreal region is subdivided into (A) the treeless Arctic-alpine zone, and (B) the Hudsonian zone, which has as its climax type of vegetation on the Olympic Peninsula the *Chamaecyparis-Abies-Tsuga* (Alaskan Cedar-Subalpine Fir-Mountain Hemlock) Complex, and (C) the Canadian zone, occupied in large part by the *Tsuga-Abies-Pinus* (Western Hemlock-Amabilis Fir-Western White Pine) climax forest. The Austral or Temperate Region contains only the Transition zone, which, on the Olympic Peninsula is represented by a single phase, the Pacific or Humid Transition Area. This area contains two phytosociological units representing the climax forest types peculiar to the Peninsula: (1) the *Tsuga-Thuja* (Hemlock-Cedar) Climax, which, with its *Pseudotsuga* (Douglas fir) Subclimax covers most of the area, and (2) the *Picea-Tsuga* (Spruce-Hemlock) Climax occupying a comparatively narrow strip in the fog belt along the ocean coast.

THE ARCTIC-ALPINE ZONE

The Arctic-alpine zone consists of the alpine region above the upper limit of tree growth, and corresponds to the arctic meadows of northern Canada. A great many of the species occurring in this zone on the Olympic Peninsula are identical with those of Alaska, northern Canada, Greenland, and northern Eurasia. Table 3 (page 20) showing the boreal distribution of 26 characteristic Arctic-alpine species of the Olympic Peninsula gives abundant evidence of the truly arctic character of this zone. The data have been compiled chiefly from Fernald (1925), Hultén (1927-1930), Holm (1923), and Rydberg (1917).

The Arctic-alpine zone on the Olympic Peninsula is confined to the higher peaks where the soil is shallow and the growing season is short, lasting chiefly from the middle of July until the beginning of September, with frequent nightly frosts during that period. Its altitudinal range varies from 5000 to over 7000 feet. The average annual precipitation is more than 100 inches, most of which occurs during the winter in the form of snow. Although no exact records of temperature are available for the "high country" of the Olympic Mountains it is well known that the higher altitude with its consequent lowered pressure results in a rarefied atmosphere in which heat is not readily retained. There are rapid fluctuations of temperature between day and night, between sun- and shade-habitats, and between the soil and the surrounding air. During the growing season the temperature frequently reaches the freezing point and the number of frostless days is few. The short growing season completely excludes annuals and rigidly limits the number of species which can exist in the

TABLE 3
Boreal Distribution of Certain Characteristic Arctic-alpine Plants

List of Species	Alaska	Northern Canada	Green-land	Northern Eurasia	Kam-tchatka
Asplenium viride	+	+	+	+	
Athyrium americanum	+		+		
Lycopodium Selago	+	+	+	+	+
Trisetum spicatum	+	+	+	+	+
Phleum alpinum	+	+	+	+	+
Carex circinata	+				
C. pyrenaica	+	+		+	+
C. spectabilis	+			+	+
Juncus Mertensianus	+				
J. Drummondii	+			+	
Luzula spicata	+	+	+	+	
Lloydia serotina	+	+		+	+
Oxyria digyna	+	+	+	+	+
Arenaria verna	+	+	+	+	+
Silene acaulis	+	+	+	+	+
Anemone Drummondii	+	+			
Ranunculus Eschscholtzii	+	+			+
Saxifraga aestivalis	+	+			
S. cespitosa	+	+	+	+	
S. oppositifolia	+	+	+	+	+
Potentilla Sibbaldi	+	+	+	+	+
Epilobium alpinum	+	+	+	+	
E. latifolium	+	+	+	+	+
Veronica alpina	+	+	+	+	
Pinguicula vulgaris	+	+	+	+	+
Crepis nana	+	+		+	

Arctic-alpine zone. In fact, it may be said that Arctic-alpine species are those which can withstand freezing during their vegetative period. In addition to the shortness of the growing season, the exposure of the plants to desiccating winds while the ground is frozen is an important limiting factor in the floral composition of this zone, since conditions of low soil moisture-content coupled with a high rate of evaporation are critical for most species. The wind increases evaporation, and often results in deformities to the growing points. It is probable that the upper altitudinal limit of tree growth is determined in part by the physiological effect of the wind in increasing the rate of transpiration.

It has been previously noted that the major portion of the precipitation in the Arctic-alpine zone is in the form of snow which falls during the season when the plants are dormant. Snowfall has two important effects on the Arctic-alpine vegetation. First, it stores water for what otherwise would be an essentially desert habitat, and second, it determines the length of the growing season, since the total amount of snow and its distribution by the wind are important factors in the distribution of species within this zone. In places where the snow is drifted to great depths the

length of the growing season is considerably reduced on account of the length of time that elapses before the snowdrifts are melted. In other places where there is little snow the season is correspondingly longer.

Since the Arctic-alpine zone lies near the limits at which temperature and length of growing season are critical for the existence of living plants, it is probable that these factors are of prime importance in determining the floristic composition of this zone, and, owing to their usual prevalence, the factors of adequate soil moisture and atmospheric humidity assume a rôle of secondary significance.

In contrast to the plants of the lowland areas which grow chiefly on soils of glacial or alluvial origin, the Arctic-alpine species occur for the most part on talus or in rock crevices in soils formed directly from the rock. The soils on the steep mountain slopes lack stability and their accumulation is retarded by the action of wind and water. Ultimately, however, the vegetation stabilizes the surface of the soil and the organic content is increased.

The vegetation of the Arctic-alpine zone on the Olympic Peninsula consists chiefly of low plants, including a large number of grasses and sedges which have shallow root systems, or of plants that grow on the surface of the soil or on rocks, such as mosses and lichens. Among the mosses, the genera *Grimmia* and *Andreaea* are well represented. Nearly 30 per cent of the species of this zone consists of grasses, sedges and rushes. There is a complete absence of irids and orchids, and only one lily, *Lloydia serotina.* The three largest plant families represented in this zone are the Compositae, Gramineae and Cyperaceae. Many of the Arctic plants are typical xerophytes; few species are evergreen; not a single one is annual. The willows are represented by the dwarf *Salix arctica* and *S. nivalis,* which rise only a few centimeters above the surface of the soil.

Although the biological spectrum of this zone will be discussed in more detail elsewhere in this paper, it is well to note here the distribution of the various life-forms. Phanerophytes and therophytes are, of course, entirely absent. Chamaephytes constitute 21 per cent, cryptophytes 9 per cent, and hemicryptophytes 69 per cent of the total flora. The absence of phanerophytes and the high percentage of chamaephytes constitute the greatest distinction between this zone and the Hudsonian.

The Olympic Mountain plants which are abundant in, or practically confined to, the Arctic zone are:

Asplenium viride
Athyrium americanum
Agrostis hyemalis, var. geminata
A. humilis
A. exarata, var. Rossae
Calamagrostis purpurascens
Danthonia intermedia
Festuca brachyphylla
Melica subulata
Phleum alpinum
Poa epilis
P. nervosa

P. gracillima
Sitanion Hanseni
S. Hystrix
Trisetum spicatum
Carex ablata
C. circinata
C. gymnoclada
C. Hepburnii
C. illota
C. phaeocephala
C. Preslii
C. pyrenaica
C. Rossii
C. spectabilis
C. stenochlaena
Juncus Drummondii
J. Parryi
Luzula Piperi
L. spicata
Lloydia serotina
Salix arctica
S. nivalis
Eriogonum ovalifolium
E. ovalifolium, var. vineum
Oxyria digyna
Polygonum Newberryi
Arenaria formosa
A. laricifolia
A. verna
Sagina Linnaei
Silene acaulis, var. exscapa
S. Macounii
Anemone Drummondii
A. occidentalis
Caltha leptosepala
Ranunculus Eschscholtzii
Arabis Lyallii
A. olympica
A. canescens
Cardamine umbellata
Draba lonchocarpa
D. incerta
D. novolympica
Erysimum arenicola
E. torulosum
Smelowskia calycina
S. ovalis
Thlaspi hesperium
Heuchera racemosa
Saxifraga aestivalis
S. cespitosa
S. ferruginea
S. oppositifolia
S. rufidula
S. Tolmiei
Spiraea Hendersoni
Lutkea pectinata
Potentilla glaucophylla
P. Sibbaldi
P. villosa
Geum campanulatum
Hedysarum occidentale
Lupinus Lyallii
Oxytropis luteola
O. olympica
Viola Flettii
Epilobium clavatum
E. alpinum
E. latifolium
Phyllodoce glanduliflora
Gentiana calycosa
Phlox condensata
P. diffusa
Gilia Larseni
Polemonium pilosum
Phacelia sericea
Penstemon Menziesii
P. Tolmiei
Synthyris lanuginosa
Veronica Cusickii
V. alpina
Pedicularis contorta
Pinguicula vulgaris
Campanula Piperi
C. rotundifolia
Achillea Millefolium, var. fusca
Agoseris gracilens
A. villosa
Taraxacum olympicum
Crepis nana
Haplopappus Lyallii
Solidago algida
Erigeron salsuginosus
E. Flettii
E. trifidus
E. acris, var. debilis
Senecio Flettii
S. Fremonti
S. Websteri
S. integerrimus
Anaphalis margaritacea, var. subalpina
Antennaria concinna
A. lanata
A. media
Artemisia spithamaea
A. trifurcata

THE HUDSONIAN ZONE

The Hudsonian is the highest timbered zone. On its upper edge there is an irregular tension belt constituting a local region of transition characterized by a "krummholz" or alpine scrub. This zone varies in width and gradually merges with the Arctic-alpine above, and the upper Hemlock-Fir-Pine Climax of the Canadian zone below. Its altitudinal limits

are approximately 3500-5000 feet in the Olympic Mountains, although the same zone in the Rocky Mountains of Colorado occurs at 10,000-11,000 feet (Rydberg, 1917, p. xi). Northward, the vegetation of this zone merges with the muskegs of Canada, and ultimately with the arctic tundra. The characteristic subalpine meadows of the Olympic Mountains occupy depressions at elevations above 3500 feet, and for about nine months of the year are covered with snow, which accumulates to great depths in the winter. On the steep, wooded, north slopes the snow is deeper and remains much later in the summer, with the result that the combined effects of lower soil temperature, hence the shorter growing season, and the later spring and earlier autumn frosts, are fully reflected in the zonal character of the flora. During July and August these meadows are covered with brilliantly colored flowers, of which many species are the same as those found in the subarctic tundra of Canada. The only annual species in the Hudsonian zone is *Polygonum minimum.*

The average annual precipitation in this zone is in excess of 140 inches, except in the northeastern part of the Peninsula where it is much less. The average date of the earliest killing frost in autumn is before October 1, and the latest killing frost in spring is after June 1. Thus the average length of the growing season is less than 120 days. Because of the absence of weather observing stations in this zone more nearly exact data are not available.

Following is a list of the characteristic Hudsonian species. Ferns are more abundant and species of grasses and sedges rarer than in the Arctic zone. There are seven species of the Liliaceae, but only one orchid. *Epilobium* is the largest genus, with 10 species; the *Compositae* is the largest family, with 29 species. The biological spectrum of the Hudsonian zone differs markedly from that of the Arctic-alpine. Although hemicryptophytes occur in about the same proportion, chamaephytes are reduced to one-half, and the percentage of cryptophytes is greatly increased. The Hudsonian is the highest (or most northerly) zone in which phanerophytes and therophytes are found.

Cheilanthes densa
C. gracillima
Cryptogramma acrostichoides
Cystopteris fragilis
Polystichum Andersoni
P. Lonchitis
Lycopodium sitchense
Selaginella scopulorum
Abies lasiocarpa
Chamaecyparis nootkatensis
Juniperus communis, var. montana
Tsuga Mertensiana
Agrostis Thurberiana
Deschampsia atropurpurea
Festuca subulata
Poa leptocoma
P. secunda
Stipa columbiana
Elymus hirsutus
Carex albonigra
C. angustior
C. nigricans
C. Rossii
C. stylosa
Juncus Mertensianus
Allium crenulatum
Erythronium grandiflorum, var. pallidum
E. montanum

Tofieldia occidentalis
Veratrum Eschscholtzii
Xerophyllum tenax
Zigadenus elegans
Habenaria saccata
Salix Barclayi
S. commutata
Alnus sinuata
Polygonum bistortoides
P. minimum
Claytonia asarifolia
Lewisia columbiana
Silene Douglasii
Anemone hudsoniana
A. occidentalis
Caltha biflora
Delphinium glareosum
D. glaucum
Ranunculus Cooleyae
Thalictrum occidentale
Trollius albiflorus
Arabis Drummondii
Draba stenoloba
Heuchera glabra
Leptarrhena amplexifolia
Mitella Breweri
M. pentandra
M. trifida
Parnassia fimbriata
Ribes Howellii
Saxifraga bronchialis, var. austromontana
Geum campanulatum
Lutkea pectinata
Potentilla diversifolia
P. Drummondii
P. Sibbaldi
P. flabellifolia
P. fruticosa
Sorbus occidentalis
Rubus lasiococcus
R. pedatus
Spiraea densiflora
Lupinus subalpinus
Astragalus Cottoni
Pachystima myrsinites
Viola Flettii
Epilobium alpinum
E. delicatum, var. tenue
E. fastigiatum
E. Hornemanni
E. lactiflorum
E. leptocarpum, var. Macounii
E. luteum
E. mirabile
E. oregonense
E. pulchrum
Hippuris montana
Angelica Lyallii
Heracleum lanatum
Lomatium angustatum, var. flavum
Arctostaphylos Uva-ursi
Cassiope Mertensiana
Cladothamnus pyroliflorus
Phyllodoce empetriformis
Rhododendron albiflorum
Menziesia ferruginea
Gaultheria ovatifolia
G. humifusa
Vaccinium deliciosum
Dodecatheon Jeffreyi
Douglasia laevigata
Gentiana calycosa
Polemonium pulcherrimum
Romanzoffia sitchensis
Mertensia paniculata, var. subcordata
Hydrophyllum congestum
Mimulus Lewisii
M. moschatus
M. primuloides
M. Tilingi
Pedicularis atrosanguinea
P. surrecta
P. racemosa
Castilleja angustifolia, var. Bradburii
C. angustifolia, var. abbreviata
C. miniata
C. olympica
C. oreopola
Orthocarpus imbricatus
Penstemon Tolmiei
P. nemorosus
P. ovatus
Veronica alpina
V. Cusickii
Pinguicula vulgaris
Lonicera utahensis
Valeriana sitchensis
Campanula rotundifolia
Agoseris aurantiaca
A. subalpina
Hieracium gracile
Solidago algida
Erigeron Aliceae
E. salsuginosus
Aster foliaceus, var. frondeus
A. paucicapitatus
Artemisia arctica
Antennaria concinna
A. racemosa
A. rosea
Arnica gracilis
A. betonicaefolia
A. mollis
A. Parryi
A. Rydbergii
Petasites frigidus
Luina hypoleuca
Senecio Flettii
S. triangularis
Anaphalis margaritacea, var. subalpina
Cirsium edule
Saussurea americana

The principal plant habitats in the Hudsonian zone are the slopes which support the climax forest of the region, the meadows, the lake margins and swamps, and the borders of the rocky streams which flow into and from the lakes. Also, on the northeastern extremity of the Olympic Mountains, there are occasional prairie-like subalpine meadows. Both the hydrarch and the xerarch types of succession are represented in the Hudsonian zone. The xerarch succession is often obscure and very highly theoretical. However, on the bare surfaces left by the melting ice or the retreating glaciers, or on the talus which is a common feature of the precipitous crags and ridges of the Olympic Mountains, a tendency for slow and gradual development through a more or less sequential perennial-herb—fern—shrub—tree succession is discernible. The principal pioneer herbaceous species of this succession are:

Cheilanthes densa
C. gracillima
Cryptogramma acrostichoides
Polystichum Lonchitis
Draba stenoloba
Heuchera glabra
Astragalus Cottoni
Lomatium angustatum, var. flavum
Douglasia laevigata
Valeriana sitchensis
Campanula rotundifolia
Solidago algida
Antennaria concinna
A. racemosa
A. rosea
Aster paucicapitatus
Luina hypoleuca
Senecio Flettii
Saussurea americana

The shrubs are: *Juniperus communis,* var. *montana, Alnus sinuata, Ribes Howellii, Sorbus occidentalis, Pachystima myrsinites, Arctostaphylos Uva-ursi, Menziesia ferruginea, Lonicera utahensis* and *Potentilla fruticosa.*

The hydrarch succession is more conventional and proceeds from the open lake to the climax forest by two fairly definite stages: (1) swampy lake margin and subalpine meadow, (2) shrubby margin of meadow and the climax forest.

The lakes in this zone are numerous and are exceedingly beautiful on account of the clearness of their waters and the primeval wilderness of the forest-covered mountains about them. Usually the meadows extend to or beyond the edge of the lake, hence there are few distinctive species along the swampy margin. There are, however, two species which may be regarded as characteristic of this very narrow belt, namely, *Carex Mertensii* and *Spiraea densiflora.* On the other hand the species and individuals which occupy the main portion of the subalpine meadows are numerous and varied. Individuals, as well as species, of grasses are few, and, although these meadows are usually described as "grassy", they constitute a caricetum rather than a graminetum, since *Carex spp.* are the dominant plants. The few grasses consist chiefly of *Deschampsia atropurpurea,* and *Poa leptocoma.* Following is a list of characteristic herbaceous species of

the subalpine meadows of the Hudsonian zone: *Carex albonigra, C. nigricans, Aster foliaceus,* var. *frondeus, Caltha biflora, Pedicularis surrecta, P. atrosanguinea, Arnica betonicaefolia, Tofieldia occidentalis, Potentilla flabellifolia, Dodecatheon Jeffreyi, Leptarrhena amplexifolia,* and *Veratrum Eschscholtzii.* The only common shrubs are *Salix Barclayi, Vaccinium deliciosum,* and *Gaultheria ovatifolia, Cladothamnus pyroliflorus* is a rather rare species which is found occasionally in moist habitats. These shrubs, as well as small trees, creep in at the edges of the meadows where they give a fairly definite indication of the character of the ultimate climax forest. The pioneers are *Abies lasiocarpa, Rhododendron albiflorum, Menziesia ferruginea, Phyllodoce empetriformis, Cassiope Mertensiana, Lutkea pectinata,* and *Sorbus occidentalis. Xerophyllum tenax* is usually conspicuous and abundant.

The characteristic trees of the Hudsonian zone are all conifers, namely, the mountain hemlock, *Tsuga Mertensiana,* the Alaskan cedar, *Chamaecyparis nootkatensis,* the subalpine fir, *Abies lasiocarpa,* and the amabilis fir, *Abies amabilis.* These trees tend to become prostrate at their extreme altitudinal limits. The white bark pine, *Pinus albicaulis,* a characteristic Hudsonian tree in the Cascade Mountains, often forming the timber line, is apparently absent from the Olympics.

In addition to the climax forest-meadow vegetation there is a grassland climax to be found in several places near the tree line at elevations from 4000 to 5000 feet, particularly on the northeastern part of the Peninsula. This subalpine prairie association contains a small group of plants more representative of the Arid Transition zone of eastern Washington than of the characteristic subalpine meadows of the Olympic and Cascade Mountains. The most striking peculiarity of this association is the extraordinary mixture of Transition and Hudsonian species often growing in the most intimate association. Some of the species comprising this association are included in the following list. Those marked with an asterisk occur on the Olympic Peninsula only in this subalpine prairie association. The remainder are common plants on the gravelly prairies and elsewhere at or near sea level.

Achillea Millefolium, var. lanulosa
*Allium acuminatum
*A. cernuum
*Arabis glabra
Cerastium arvense
Collinsia parviflora
Crepis intermedia
Eriophyllum lanatum
Fragaria cuneifolia
Gilia gracilis
Juniperus scopulorum
*Leptotaenia dissecta
*Lomatium nudicaule
Polygonum Douglasii
Prunus emarginata
Ribes divaricatum
*Sanicula septentrionalis
*Sedum stenopetalum
Shepherdia canadensis
Symphoricarpos albus
Viola adunca
*Woodsia scopulina

All these Transition species are common plants on the hot, arid slopes in eastern Washington and Oregon at the present time. It seems probable that in the Olympic Mountains they are the remnant of a former vegetation, of a flora which once occupied the lowlands, and that on account of suitable ecological conditions they have been able to persist in the mountains. One obvious factor is that since at least some of the subalpine prairies occur in the lee of the main system of the Olympics, the precipitation they receive is much less than that of the adjacent mountains to the westward. The hypothesis of a vestigial flora to explain the presence of those Transition species receives some support from the geological evidence that many of the ridges, particularly those on the northwestern part of the Peninsula, consist of broad remnants of an uplifted peneplain. It is probable that the uplift of these mountain ridges is still progressing, or at least that uplift has occurred in postglacial time. This is shown by the gently folded and tilted glacial clays in the vicinity of Port Angeles (Arnold, 1906).

THE CANADIAN ZONE

The Canadian Zone on the Olympic Peninsula has a rather indefinite existence. It is a montane zone occurring on the lower slopes and occupying an area of varying width between 1500 and 3000 feet elevation. In contrast with the Hudsonian, this zone is characterized by dense forests of western hemlock, amabilis fir, and western white pine. The lodgepole pine, common in the Cascade Mountains, is of relatively rare occurrence in the Olympics. The Engelmann spruce, likewise a characteristic Canadian zone tree in the Cascades, is not known to occur on the Olympic Peninsula.

The number of typical Canadian zone species is few. Piper (1906, p. 59) summarizes the condition as follows: "The zone can, in fact, be recognized in Washington not so much by any purely characteristic species as by the great abundance of species relatively rare in the contiguous zones." The chief shrubs are *Vaccinium ovalifolium, V. membranaceum, Gaultheria ovatifolia, Rubus nivalis, Menziesia ferruginea,* and *Sorbus dumosa. Acer circinatum* and *Alnus sinuata* are abundant, the latter occurring chiefly along the streams. Among the herbaceous species, *Cornus canadensis, Clintonia uniflora, Stenanthium occidentale, Galium oreganum,* and *Prenanthes hastata* are noteworthy, and it is in this zone that the following striking array of saprophytes is found: *Monotropa uniflora, M. Hypopitys, Allotropa virgata, Newberrya congesta, Pterospora andromedea* and the three coralroots, *Corallorrhiza maculata, C. Mertensiana,* and *C. striata.* These species are most abundant in, if not entirely confined to, the Canadian zone.

The vegetational complex of the Canadian zone is quite different from that of the Humid Transition. Certainly the typical Douglas fir-hemlock-cedar succession does not occur on the montane slopes as it does, for example, along Hood Canal. Conspicuously absent from the Canadian zone are such outstanding Humid Transition species as *Acer macrophyllum, Cornus Nuttallii, Arbutus Menziesii, Osmaronia cerasiformis, Fraxinus oregana,* and *Corylus californica.* The climax forest of the Canadian zone is essentially a hemlock-fir complex with a sprinkling of western white pine, and should be designated the *Tsuga heterophylla-Abies amabilis-Pinus monticola* Climax Forest. It is not satisfactory to refer to this climax forest formation as the "Hemlock-Cedar climax", since the cedar is scarce except along the streams, and at higher altitudes is not found at all. The Douglas fir, which thrives on the sunnier slopes but seldom forms a definite sub-climax, must be regarded as an incidental species.

The causal factors in the limited and poorly defined extent of this zone on the Olympic Peninsula must be sought in the local climatic and physiographic conditions. In comparison with some other areas certain peculiarities stand out clearly. For example, the Hudsonian and Canadian zones in the Rocky Mountains are determined by gradients in temperature and moisture characteristic of those mountains. The zones are therefore clearly distinct. In Glacier National Park, for instance, the Canadian zone occupies the largest area and contains the greatest number of species (Standley, 1921). In the Cascade Mountains, particularly on the eastern watershed, where, on account of the long gradual slope from the plains of eastern Washington and Oregon with the consequent steep temperature and precipitation gradients, the Canadian zone is well-marked. On the Olympic Peninsula, however, five factors profoundly affect and greatly obscure the zonal differentiation in these mountains, especially at the lower altitudes. These are the relatively low altitude of the mountains, with their steep slopes rising rapidly and abruptly from or near sea level, with a strong maritime influence causing an equable temperature with a slight gradient, and an average annual precipitation often scarcely greater than that occurring in the immediate coastal region. The net result is that the Transition forests merge imperceptibly with those of the lower Canadian.

The effect of slope exposure on zonal level is clearly indicated at the upper edge of this zone, where on the cool, shaded north slopes, along narrow rocky streams and down rock slides, pronounced tongues of the Hudsonian type of vegetation descend in some places as low as 2500 feet. In general, the Hudsonian descends into the valleys and the Canadian ascends the slopes and ridges. Probably the chief physical factors from

which an explanation may be sought are (1) the snowfall, which remains longer in the valleys, thus shortening the growing season, and (2) the tendency of the cold air to flow down the valleys.

Following is a list of the notable species which occur chiefly in the Canadian zone on the Olympic Peninsula.

Abies amabilis
Bromus aleutensis
B. ciliatus
Poa laxiflora
P. marcida
Elymus virescens
Carex laeviculmis
C. Mertensii
Stenanthium occidentale
Clintonia uniflora
Streptopus curvipes
S. streptopoides
Cephalanthera Austinae
Corallorrhiza maculata
C. Mertensiana
C. striata
Calypso bulbosa
Listera convallarioides
L. caurina
L. cordata
Habenaria viridiflora
H. dilatata
Alnus sinuata
Polygonum Nuttallii
Stellaria washingtoniana
Trautvetteria grandis
Cimicifuga elata
Coptis laciniata
Corydalis Scouleri
Cardamine umbellata
Tiarella unifoliata
Rubus nivalis
Potentilla glandulosa
Sorbus dumosa
Viola glabella
Sanicula septentrionalis
Osmorhiza Leibergii
Cornus canadensis
Newberrya congesta
Pterospora andromedea
Moneses uniflora
Chimaphila Menziesii
Pyrola secunda
P. bracteata
Gaultheria ovatifolia
Menziesia ferruginea
Vaccinium membranaceum
V. ovalifolium
Nephrophyllidium crus-galli
Synthyris schizantha
Galium oreganum
Prenanthes hastata
Arnica cordifolia
A. Macounii
Antennaria racemosa

The species of the Canadian zone are mostly those whose ranges extend to the northward. Most of them are hemicryptophytes and cryptophytes. Species of phanerophytes are more numerous than in the Hudsonian, although chamaephytes are considerably fewer. Further field work may indicate that the Canadian zone extends farther in a northwesterly direction toward Cape Flattery than is shown on the map (pl. 2).

THE TRANSITION ZONE

Along the Pacific Coast of North America from British Columbia to northwestern California there occurs a narrow strip, appropriately termed by Piper the Vancouver Strip[2], which is an area remarkable for its mild climate, abundant rainfall, and formerly, for its luxuriant coniferous forests. Much the greater portion of this strip belongs to the Pacific or Hu-

[2]"Adopting a suggestion of Mr. D. A. Brodie, the term Vancouver Strip is here given to the region [Pacific Transition Area], for which it is desirable to have a definite name in conformity with the remarkably uniform flora and fauna which it possesses. The name above suggested commemorates the name of the navigator who first thoroughly explored the region and whose name has there been attached to the largest island and to two important towns."—Piper, 1906, p. 40.

mid Transition area. This is the only phase of the Transition zone represented on the Olympic Peninsula. This area as we have noted contains two phytosociological units representing the forest types peculiar to this part of the Peninsula: (1) the Hemlock-Cedar *(Tsuga-Thuja)* Climax, which, with its Douglas fir *(Pseudotsuga)* Subclimax, covers most of the area, and (2) the Spruce-Hemlock *(Picea-Tsuga)* Climax occupying a comparatively narrow strip in the fog belt along the immediate ocean coast.

Like the other life-zones (or their subdivisions), the Humid Transition is a climatic formation, *i.e.,* the character of its vegetation is determined chiefly by conditions of temperature and moisture. The vegetation in any region gradually, though imperceptibly, tends toward a uniform climatic climax formation, which, on the Olympic Peninsula is that of the Humid Transition area. It is the lowest zonal division west of the Cascade Mountains and contains 70 per cent of the flora of the Peninsula.

The average annual precipitation in the Humid Transition area varies at different stations from 15 to 140 inches; the average number of days on which there is .01 inches or more precipitation is more than 160. The winter temperatures at the lower elevations are seldom less than 32° F. The average annual snowfall in inches varies from 8 at Sequim to 25 at Union. The average date of the earliest killing frost in autumn is between October 15 and November 30, and the latest killing frost in spring is between February 11, and May 6. Thus the average length of the growing season, depending on the altitude, is 200 days, or even longer near the seashore on the west side of the Peninsula.

Since this area is so extensive and has such a rich and varied flora, a brief account of its vegetation can be presented conveniently according to the climax and subclimax forest types and the major plant associations.

The Hemlock-Cedar Climax

1. the douglas fir subclimax

The most abundant and characteristic tree of the region is the Douglas fir, *Pseudotsuga taxifolia,* which formerly made up more than 75 per cent of the forest from sea level to an altitude of approximately 2000 feet. The Douglas fir formation, which is the stage of succession preceding the climax, develops chiefly as the result of forest fires. J. V. Hofmann says that, if a region "were left without fire for 600 or 700 years, the forest of Douglas fir would be greatly reduced in area, and the best Douglas fir soils would be occupied by western red cedar and western hemlock. Without artificial interference, such as fire or logging, Douglas fir can

not compete with western red cedar and western hemlock, whose ability to endure shade permits them to form an understory which crowds out the less shade-enduring Douglas fir." (Hofmann, 1924.) Thus, with the establishment of the Douglas fir subclimax, and the consequently increased mesophytism of the habitat and accumulation of humus, the cedar and hemlock gradually encroach on the fir, with the result that, under usual conditions, that species is dominant for only the first generation.

After a region has been deforested, according to current methods, followed by the inevitable fire, not much is left of the original forest except the burned and blackened stumps and snags. Fortunately, however, the landscape does not retain this distressing aspect for very long, for under the ordinary favorable conditions an area so destroyed is again covered with a thin green mantle within a few years. Usually the first vascular plants to appear are *Epilobium angustifolium, Pteridium aquilinum,* var. *lanuginosum, Anaphalis margaritacea,* var. *occidentalis,* and *Senecio sylvaticus.* The mosses, *Polytrichum piliferum, Funaria hygrometrica,* and *Ceratodon purpureus,* as well as the liverwort, *Marchantia polymorpha,* are on the ground almost everywhere, the first named being particularly abundant, and forming dense patches on the thin gravelly soil. Because of its large whitish calyptrae the Polytrichum is a very conspicuous element in the primary succession. The dewberry, commonly called "wild blackberry" *(Rubus macropetalus),* is usually abundant on these burned areas, and is followed by *Rubus parviflorus, Salix Scouleriana, Alnus oregona, Ribes sanguineum, Acer circinatum, A. macrophyllum, Cornus Nuttallii, Gaultheria Shallon, Holodiscus discolor, Vaccinium parvifolium, Rosa gymnocarpa, Symphoricarpos albus,* and *Arctostaphylos Uva-ursi,* the latter abundant in the open places, where it grows in dense patches, flowering in April and May, the fruit ripening in June. The bracken fern, *Pteridium aquilinum,* var. *lanuginosum,* frequently the only Pteridophyte to survive the fire, comes in slowly. *Epilobium angustifolium,* one of the first plants to appear after the destruction of the forest, is gradually displaced, though *Hieracium albiflorum,* another pioneer, continues to be abundant. It is remarkable how rapidly the weeds of roadsides and waste places about towns seize the opportunity to occupy burnt-over lands at this stage of the plant succession. Three of the commonest of these weeds are *Rumex Acetosella, Cerastium viscosum,* and *Hypochoeris radicata.* Among indigenous herbaceous plants the following are noteworthy: *Apocynum androsaemifolium, Castilleja angustifolia,* var. *Bradburii, Chimaphila umbellata, Fragaria cuneifolia, Linnaea borealis,* var. *longiflora, Lilium columbianum, Prunella vulgaris,* var. *lanceolata, Veronica officinalis, Viola adunca.* Grasses are not plentiful, but *Poa pra-*

tensis may be noted occasionally and *Holcus lanatus* is present; *Elymus glaucus* reëstablishes itself slowly. There is no definite moss–lichen–herb-shrub succession, but mosses, ferns, herbs, and shrubs appear simultaneously.

Because of the scattering of seed over wide areas by the wind, and possibly also on account of the germination of seed stored in the ground, the young Douglas firs spring up in abundance amid the ruins of the former forest. These stands of young firs, all of about the same height and age, are often so dense as to prevent competition from other species, hence the undergrowth at this stage of the sere is very sparse. On account of its rapid growth and relatively deep and wide root system the Douglas fir soon becomes the dominant species. It grows best on porous, well-drained soil and reaches its greatest development at low altitudes in western Washington and Oregon. "Stands may start as dense as 50,000 or 60,000 seedlings to the acre, but at the age of 20 years they would be reduced to probably not over 20,000. The average stands, however, are not so dense. They may contain from 2,000 to 10,000 seedlings to the acre during the first 15 years, and at 25 years of age they may not contain more than 2,000 trees. After the age of 20 years the thinning continues rapidly. At 35 years of age the average acre of Douglas fir forest contains only about 500 trees. This number is reduced to about 250 at the age of 50 to 60 years, and 75 to 100 trees to the acre at the age of 100 years. Many over-mature forests that are now being logged contain from 20 to 50 trees to the acre." (Hofmann, 1924, p. 75.)

The Douglas fir, as we have noted, is the most abundant and characteristic tree of the region. It occupies, with the chiefly associated species, western hemlock, *Tsuga heterophylla,* western cedar, *Thuja plicata,* Sitka spruce, *Picea sitchensis,* western white pine, *Pinus monticola,* and white fir, *Abies grandis,* what was formerly one of the most densely forested regions in the United States. On the Olympic Peninsula, the above species are found in approximately the following percentages[3].

Pseudotsuga taxifolia	38%	Picea sitchensis	4%
Tsuga heterophylla	37%	Pinus monticola	1%
Abies amabilis	12%	Abies grandis	1%
Thuja plicata	8%		

The forests of the Douglas fir-hemlock association are characteristically dense and dark. The humus content of the soil is usually thin, except for decaying wood. Because of its inability to reproduce under heavy shade, there are few or no young Douglas firs in these forests. The chief shrubs are salal, *Gaultheria Shallon,* Oregon grape, *Berberis nervosa,* red

[3]U. S. Forest Service figures.

huckleberry, *Vaccinium parvifolium,* and Scouler willow, *Salix Scouleriana.* The most abundant ferns are bracken, *Pteridium aquilinum,* var. *lanuginosum,* the western sword fern, *Polystichum munitum,* and the deer fern, *Struthiopteris spicant.*

Along the low and often rocky bluffs of Hood Canal and Admiralty Inlet, where the forest growth is rather sparse, there occurs a rather characteristic group of species. The madrona, *Arbutus Menziesii,* one of the members of the broad sclerophyll vegetation of California, is enabled, on account of the mild coastal climate, to extend its range northward to the Queen Charlotte Islands. Beautiful specimens of this attractive tree are found along the bluffs of Hood Canal and elsewhere. The soil on these rocky bluffs is usually thin and supports many species of spring-flowering plants, including

Collinsia parviflora
Camassia Quamash
Brodiaea coronaria
Fritillaria lanceolata
Allium cernuum
Delphinium Menziesii
Berberis Aquifolium
Ribes sanguineum
Philadelphus Gordonianus
Amelanchier florida
Arctostaphylos tomentosa
Pachystima myrsinites
Cornus Nuttallii
Prunus emarginata
Maianthemum dilatatum
Conioselinum Benthami
Vicia gigantea
Pyrus diversifolia

In many places, especially where the soil is moister, there are dense thickets of

Rosa nutkana
R. pisocarpa
Symphoricarpos albus
Pyrus diversifolia
Osmaronia cerasiformis
Lonicera involucrata
Salix Scouleriana
Alnus oregona
Thuja plicata
Rubus parviflorus
Holodiscus discolor
Ribes divaricatum
Sambucus callicarpa

In the valleys of the larger rivers up to an elevation of about one thousand feet, and on the borders of lakes and marshes, the arborescent flora consists largely of deciduous species growing in association with the western red cedar, *Thuja plicata.* The soils of these valleys are derived mainly from glacial material from the mountains which has been brought down during times of high water and deposited along the flood plains of the principal streams. The soils of the lake basins contain a relatively large quantity of organic matter, and owe their origin to the slow decomposition of the remains of vegetation mixed with silt and clay.

The principal coniferous species of this association other than the cedar are the Douglas fir, the western hemlock, the white fir, the western yew, and the Sitka spruce. The latter species will be discussed in connection with the climax forest of the immediate coastal region, where it is most abundant.

The principal broad-leaf species of the bottomland association are red alder, *Alnus oregona,* large-leaf maple, *Acer macrophyllum,* and cottonwood, *Populus trichocarpa.* The red alder is the most abundant broad-leaf tree on the Peninsula. It occurs, often in pure stands, in moist lowland situations, particularly in those with a western or northern exposure. It is often a pioneer species in partly denuded areas. The large-leaf maple is also confined to the lowlands, especially along streams. It occurs in small clumps or as isolated trees but seldom forms pure stands. The cottonwood attains the largest size of any deciduous tree on the Peninsula. It is found only at lower elevations, especially on gravelly shores where there is an abundance of light. Another arborescent species is the cascara, *Rhamnus Purshiana.* Like the preceding trees, it is practically confined to the moist bottomlands. It grows singly or in clumps, and the bark, as is well known, is valuable for medicinal purposes. The Oregon ash, *Fraxinus oregana,* a common species of the river valleys of western Washington east of Hood Canal, is rare on the Olympic Peninsula, where it has been collected only near the southern boundaries of the area.[4] *Populus tremuloides,* common in the Puget Sound area, is rare on the Olympic Peninsula.

The principal shrubs of this bottomland association are *Cornus Pubescens, C. stolonifera, Acer circinatum, Rubus spectabilis, R. macropetalus, R. leucodermis, R. parviflorus, Ribes bracteosum, R. lacustre, Osmaronia cerasiformis, Corylus californica, Symphoricarpos albus, Sambucus callicarpa,* and two others which frequently assume the stature of trees, namely, *Salix Scouleriana,* and *Pyrus diversifolia.*

Up to a height of 40 or 50 feet from the ground, the trunks of the large-leaf maples and the red alders are frequently covered with a dense growth of mosses and some liverworts. The common mosses in this society are *Neckera Menziesii, Camptothecium Nuttallii* and *C. lutescens.* On fallen logs, and on the ground, the genus *Hylocomium* dominates, with *H. loreum, H. splendens,* and *H. triquetrum* about equally abundant; *Mnium acanthoneurum* and *Eurhynchium oreganum* are abundant. *Tetraphis pellucida* occurs on decaying wood.

Ferns are common. The following species occur in moist rich woods: *Pteridium aquilinum,* var. *lanuginosum, Polystichum munitum, Athyrium Filix-femina, Dryopteris Linnaeana, D. dilatata,* and *Adiantum pedatum,* var. *aleuticum.* On trees and decaying logs, *Polypodium vulgare* is frequent.

The following species of herbaceous angiosperms are typical of this habitat:

[4]Noted by Menzies at Port Discovery in 1792.

Achlys triphylla
Asarum caudatum
Circaea alpina
Claytonia sibirica
Dicentra formosa
Disporum oreganum
Fragaria bracteata
Galium Aparine
G. triflorum
Leptaxis Menziesii
Nemophila parviflora
Osmorhiza brevipes
Ranunculus Bongardi
Smilacina amplexicaulis
S. stellata
Stachys ciliata
Stellaria crispa
Tellima grandiflora
Tiarella trifoliata
Tolmiea Menziesii
Trientalis latifolia
Trillium ovatum
Urtica Lyallii
Viola glabella

Apparently the chief factor which determines the characteristics of the bottomland vegetation is the presence of ample moisture in the soil.

PRAIRIES

During the Pleistocene, as previously stated, the greater portion of western Washington was subjected to glaciation. A terminal moraine was formed across the southern portion of the Puget Sound basin, and outwash plains were built up at the front of the retreating glacier. The result is that certain areas of limited extent, including parts of Clallam, Mason, and Grays Harbor counties on the Olympic Peninsula, are deeply covered with clean water-worn gravel, which has produced broad sterile plains of low gradient (Bretz, 1913).

In several places on the Olympic Peninsula these outwash plains appear as areas of small, dry, sparsely timbered or timberless gravelly "prairies", which constitute the nearest approach to a grassland formation to be found near sea level on the Peninsula. The surface soil is a gravelly sandy loam, less than a foot deep, and often underlain by "hardpan". The principal prairies are near Shelton, Sequim, and Forks. In addition there are two other broad benches or table-lands known locally as the Quillayute Prairie and the Humptulips Prairie. In these regions, the country is mostly park-like, with the open prairies of only a few acres in extent and occupied by the Oregon oak, *Quercus Garryana,* lodgepole pine, *Pinus contorta,* Douglas fir, *Pseudotsuga taxifolia,* or, particularly on the west side of the Peninsula, the Sitka spruce, *Picea sitchensis.*

These prairies, according to the testimony of old residents, were formerly much more extensive than they are at the present time. Certainly the fir forest is rapidly encroaching their boundaries and there are numerous examples of oak trees killed by the dense growth of the invading young Douglas firs. As a cause of these prairies it is said that the Indians prevented the growth of trees by burning the ground over annually, thus preserving their open grounds for game and for production of their food plant, the camas. "On some prairies [near Vancouver and Nisqually] where this burning has been prevented for twenty years past, young

spruces [Douglas firs] are found to be growing up rapidly, and Indians have told me that they can remember when some other prairies were much larger than at present." (Cooper, 1860, p. 23). Thus it is probable that the existence of these "prairies" is due to a combination of edaphic and biotic factors.

In this prairie region the Douglas fir appears to be the dominant coniferous species, and, as conditions tend to become less xeric, this tree gains control of the environment. Associated with it are the lodgepole pine and, occasionally, the yellow pine, *Pinus ponderosa.* The western hemlock, *Tsuga heterophylla,* is rare or absent, although it is probable that if the region were free from fires for a century or so and the habitat were allowed to become sufficiently mesophytic this species would become the dominant tree.

On the dry gravelly soils in parts of Mason County where the Douglas fir has already completed the first, or invading stage of the sere, and is well on its way to the second, or competitive stage, there are open park-like forests of fir and lodgepole pine, the latter soon outstripped and gradually replaced by the former, in which the trees are distant and well-spaced. In this association there is a remarkable assemblage of subdominant ericaceous shrubs, such as salal, *Gaultheria Shallon,* three species of huckleberry, *Vaccinium ovatum, V. parvifolium,* and *V. caespitosum,* the rhododendron, *Rhododendron macrophyllum,* manzanita, *Arctostaphylos tomentosa,* kinnikinnick, *A. Uva-ursi,* and the hybrid of the two, *A. media.* Usually these occur together in close proximity and are often accompanied by a ninth member of the same family, the madrona, *Arbutus Menziesii.* Other shrubs are *Berberis Aquifolium* and *B. nervosa,* and, scattered here and there among the salal and huckleberries, are occasional specimens of the Scouler willow, *Salix Scouleriana,* and ocean spray, *Holodiscus discolor.* Creeping on the ground are the twinflower, *Linnaea borealis,* var. *longiflora,* and the creeping snowberry, *Symphoricarpos mollis.* Wet hollows are occupied by *Alnus sinuata* and *Spiraea Menziesii.* The chief herbaceous species are *Fragaria cuneifolia, Lotus crassifolius* and *Castilleja angustifolia.* But most surprising of all is the pine lily, *Xerophyllum tenax,* occurring scattered among the lodgepole pine and fir trees. Elsewhere it is chiefly a Hudsonian species, growing in association with *Chamaecyparis nootkatensis.*

The herbaceous flora is chiefly vernal; in late summer the prairies are dry and barren. Some of the prairies, particularly the one at Quillayute, are covered from July to October with a dense growth of bracken which reaches a height of two and one-half meters. On some of the other prairies the bracken is absent or is confined to the dense shade of the

neighboring fir trees. The grass flora consists chiefly of *Panicum pacificum, Koeleria cristata,* and *Festuca occidentalis,* the latter a tall, slender, tufted, glaucous grass scattered throughout the prairie but nowhere abundant or dominant. Two conspicuous and abundant herbaceous plants on some of these prairies are the adventive species, *Hypericum perforatum,* and *Hypochoeris radicata.* The characteristic indigenous herbaceous plants are as follows:

Erythronium oregonum
Camassia Quamash
Zigadenus venenosus
Ranunculus occidentalis
Fragaria cuneifolia
F. bracteata
Lotus formosissimus
Lupinus albicaulis
L. aridus
L. lepidus
Viola adunca
V. Howellii
Sanicula Menziesii
Lomatium utriculatum
Gilia heterophylla
Prunus vulgaris, var. lanceolata
Collinsia parviflora
C. grandiflora, var. pusilla
Castilleja angustifolia, var. Bradburii
Orthocarpus pusillus
Synthyris rotundifolia
Scorzonella laciniata
Solidago glutinosa
S. Tolmieana
Eriophyllum lanatum
Senecio fastigiatus
Cirsium edule
Achillea Millefolium, var. lanulosa

Sisyrinchium Douglasii, Iris missouriensis, and *Opuntia fragilis* occur at Sequim, but not on the other prairies. *Polemonium carneum, f. amoenum* occurs at Quillayute and Humptulips but not at Shelton or Sequim.

There are two principal moss societies on the prairies, those of *Rhacomitrium* and of *Polytrichum.* The most important prairie moss is *Rhacomitrium canescens.* In early spring before the grasses grow it is one of the conspicuous parts of the prairie vegetation, forming homogeneous mats or carpets on the surface of the ground. *Polytrichum piliferum* is often present but not as abundantly as it is in the burned areas.

SPHAGNUM BOGS

The development of the sphagnum bogs on the Olympic Peninsula began with the retreat of the glaciers. These bogs occupy undrained depressions, formerly lakes, ponds, or swamps, which were produced as a result of the action of the ice. Although swamps are common in this area, true bogs are of relatively infrequent occurrence. The term "sphagnum bog" is used in this report in the sense that it has been used by Professor Rigg in his work on the bogs of northwestern America. He defines a sphagnum bog "as that stage in the physiographic succession of an area during which its surface is entirely devoid of ordinary 'hard' soil and is composed almost entirely of living Sphagnum, immediately under which is fibrous brown peat composed mainly or entirely of partially disintegrat-

ed Sphagnum, the habitat exercising a distinctly selective influence on its flora." (Rigg, 1925, p. 262.)

As in other areas, various intermediate stages of succession from the open lake to the mature bog are to be found on the Olympic Peninsula. The marginal flora of *Nymphozanthus polysepalus, Typha latifolia, Nephrophyllidium trifoliata,* and *Potentilla palustris,* is followed by the floating sphagnum layer which is underlain by soft and partially decayed and disintegrated organic matter. On this layer of sphagnum is developed the characteristic herbaceous flora of the bog, including *Carex* spp., *Eriophorum Chamissonis, Drosera rotundifolia, Sanguisorba microcephala, Viola palustris, Menyanthes Crista-galli, Gentiana sceptrum, Trientalis arctica,* and *Vaccinium Oxycoccus,* var. *ovalifolium.* The chief woody plants are swamp laurel, *Kalmia polifolia,* Labrador tea, *Ledum groenlandicum,* bog myrtle, *Myrica Gale,* Douglas spirea, *Spiraea Douglasii* and the crab-apple, *Pyrus diversifolia.* In its later stages the bog is invaded by the coniferous trees, western red cedar, *Thuja plicata,* western hemlock, *Tsuga heterophylla,* and lodgepole pine, *Pinus contorta,* and in coastal bogs by Sitka spruce, *Picea sitchensis.* The Douglas fir, *Pseudotsuga taxifolia* is rarely found in bogs. The hemlock is the earliest and most successful invader of the bogs, while the Douglas fir is the latest and least successful invader (Rigg, 1925, p. 276). Trees grow very slowly in sphagnum and are often stunted. The "toxicity of the substratum is evidently a large factor in the stunting of trees in sphagnum" (Rigg, 1918, p. 362). Deciduous trees and shrubs are rare; about the only ones ever found in these bogs are Oregon alder, *Alnus oregona,* cascara, *Rhamnus Purshiana,* and western dogwood, *Cornus pubescens.*

The bogs on the Olympic Peninsula in which collections have been made are the Humptulips Bog and the Aloha bogs in Grays Harbor County, the bogs near Raft River, and the Forks Bog near the Hoh River in Jefferson County. All are near sea level and none consists of more than a few acres. The vernal aspect of these bogs is very attractive with the brilliant color of the *Kalmia* and *Ledum. Salix pedicillaris* is abundant in the bogs east of Hood Canal but is apparently absent from the Peninsula. Likewise, no species of *Betula* is known to occur west of Puget Sound. The common bryophytes are *Sphagnum* spp., *Calliergon Schreberi,* and *Polytrichum juniperinum.*

In the immediate vicinity of the ocean coast in northwestern Grays Harbor County there are comparatively large areas of low gradient covered with glacial outwash which spread northwestward from the Chehalis valley. Some of these areas are known locally as "prairies", and are evidently a late stage of an extensive series of sphagnum bogs. On them

are isolated groups of small trees of lodgepole pine, accompanied by hemlocks and spruces. The Douglas fir appears to be completely absent. In the wetter parts there is more or less sphagnum, and scattered patches of *Ledum, Kalmia,* and *Myrica.* Herbaceous species occurring here are *Caltha biflora, Camassia Quamash, Anemone Lyallii,* and *Sanguisorba microcephala.*

The following list includes all the species of vascular plants that are known to occur in the bogs of the Olympic Peninsula.

Lycopodium clavatum
Pinus contorta
Thuja plicata
Tsuga heterophylla
Eriophorum Chamissonis
Carex livida
C. rostrata
Rhyncospora alba
Calamagrostis inexpansa
Camassia Quamash
Tofieldia occidentalis
Xerophyllum tenax
Veratrum Eschscholtzii
Habenaria leucostachys
Myrica Gale
Anemone Lyallii
Caltha biflora
Drosera rotundifolia
Sanguisorba microcephala
Spiraea Douglasii
Viola pallens
V. palustris
Rhamnus Purshiana
Cornus pubescens
Empetrum nigrum
Ledum groenlandicum
Kalmia polifolia
Menziesia ferruginea
Vaccinium caespitosum
V. Oxycoccus, var. ovalifolium
Nephrophyllidium crista-galli
Gentiana Douglasiana
G. sceptrum
Trientalis arctica
Erigeron Thompsoni
Senecio triangularis, var. angustifolius

2. THE CLIMAX FOREST

The magnificient forest which clothes almost the entire area of the lower flanks of the Olympic range, and which formerly covered the whole lowland portion of the Peninsula, comprises the Hemlock-Cedar, or *Tsuga-Thuja* Climax. In the Humid Transition area this forest complex replaces all other types if not interfered with by fire, lumbering, or wind storms. It formerly covered the region from the shore-line of Hood Canal and the Strait of Juan de Fuca and inland from the Spruce-Hemlock Climax of the ocean coast to an elevation of 1500–2000 feet in the mountains. Even today the upper stretches of this forest have been invaded by lumbermen only to a slight extent and therefore they still retain their natural wildness and pristine beauty. The dominant tree is the western hemlock, *Tsuga heterophylla,* which reaches its best development at low elevations where the average annual precipitation is not less than seventy inches. The hemlock is a long-lived and slow-growing tree. It is more "shade-tolerant" than almost any other species of coniferous tree on the Olympic Peninsula except its co-dominant, *Thuja plicata,* the western red cedar. Both species have an extensive longitudinal distribution, extending from Alaska to California. Their altitudinal limit on the Olympic Peninsula is seldom much more than 3500 feet. The upper limits of this

climax are fairly definite, although there is, of course, a gradual transition to the sparser forests of the Canadian zone. Other coniferous species of the *Tsuga-Thuja* climax community are the scattered old and mature Douglas firs, as well as *Abies grandis, Pinus monticola,* and *Taxus brevifolia.* The Douglas fir is most abundant on the east and south slopes of the Peninsula. At lower elevations, where it forms an extensive sub-climax forest, it is more abundant than the hemlock. The Engelmann spruce, *Picea Engelmanni,* is apparently absent from the Olympic Peninsula.

The general character of the climax forest is dense, sombre, and mossy, consisting often of nearly pure stands of straight slender hemlocks. "The trees, pushing upward for light, are very tall and free from limbs for more than half their height. Their tops form a continuous cover which the sunshine rarely penetrates, and on which the light snows of early winter fall and melt, without reaching the ground. Even in midsummer the light is soft and shaded, and the air cool and humid." (Allen, 1922, p. 1.) In the moister places the undergrowth is dense and tangled and of an almost tropical aspect. Fallen trees and decaying logs are numerous. These are often nearly covered with mosses and ferns, and also by young trees growing on the thick layers of accumulated humus on top of them. The forest floor is carpeted with thick growths of *Eurhynchium oreganum, Hylocomium loreum, H. triquetrum,* and several other mosses. On the whole, the flora consists of relatively few species, which are, however, well represented by numerous individuals. Except along the streams the undergrowth is sparse. Some of the typical shrubs are *Vaccinium parvifolium, V. ovatum, Menziesia ferruginea, Pachystima myrsinites, Oplopanax horridum, Gaultheria Shallon, Rosa gymnocarpa,* and *Ribes bracteosum.*

One of the striking characteristics of the vegetation of the entire Transition zone of the Olympic Peninsula, or in fact of the whole of the Vancouver Strip, is the presence of an extremely high percentage of species with evergreen leaves. On the Olympic Peninsula there are at least 20 species of ferns and fern allies, 15 species of gymnosperms and 38 species of angiosperms which may be classed as "evergreen", making a total of 73. This condition is probably due chiefly to the absence of extremes of temperature.[5]

[5]For a discussion of some sempervirent plants of western Washington, see paper by G. B. Rigg (1921).

The Spruce-Cedar Climax

In many places along the seacoast, especially in the south-western part of the Peninsula, there are a number of sand dunes and high sea beaches. The soils of this habitat consist chiefly of material originally laid down by the ocean, and which has been more recently transported by the wind. From the line of average high tide to the climax forest the following three fairly distinct plant associations occur.

SAND DUNE AND HIGH SEABEACH ASSOCIATION

The early stage of the dune consists of a sandy accumulation around such pioneers as *Elymus mollis, Ammophila arenaria, Poa macrantha,* or *Abronia acutalata.* These plants stabilize the sand and contribute organic material through the decay of their older parts, thus increasing the water-holding capacity of the soil. The characteristic sand dunes of the ocean coast do not occur on the shores of Admiralty Inlet or Hood Canal, and therefore many of the following species are not found elsewhere on the Peninsula.

Poa macrantha
Polypogon lutosus
Ammophila arenaria
Elymus mollis
Carex anthericoides
Abronia latifolia
A. acutalata
Cakile edentula
Lepidium Menziesii
Fragaria chiloensis
Lupinus littoralis
Lathyrus littoralis
Glehnia leiocarpa
Angelica Hendersoni
Convolvulus Soldanella
Castilleja Dixoni
Agoseris apargioides
Franseria bipinnatifida
F. Chamissonis
Grindelia stricta
Tanacetum Douglasii

SALT MARSHES AND SEASHORE MEADOWS

The second association is that of the salt marshes and seashore meadows. The soils are chiefly of alluvial origin, being formed by the accumulation of materials held in suspension by the streams and deposited in the shallow water of the bays into which these streams flow. In estuaries and on low areas behind the dunes the habitat is either that of salt marsh or of seashore meadow, depending on the age of the area and the consequent degree of salinity. Small areas of tidal flats also occur at the mouths of some of the rivers and streams. Particularly good examples of these tidal flats are to be found at the mouths of the Dosewallips and the Duckabush rivers along Hood Canal. Many of these campestrine habitats are at least occasionally inundated by high tides. Most of the plants found there are halophytes. The dominant species is often the saltgrass, *Distichlis spicata.*

The chief co-dominant is *Salicornia ambigua.* Following is a list of the principal species of this association:

Triglochin maritima
Deschampsia caespitosa
Distichlis spicata
Rumex maritimus, var. fueginus
Salicornia ambigua
Atriplex patula
Cuscuta salina
Orthocarpus castilleoides
Plantago juncoides
Jaumea carnosa
Cotula coronopifolia

In the seashore meadows *Potentilla pacifica* is one of the principal species. *Sisyrinchium californicum* is abundant along the coast but inconspicuous except when in flower. *Cuscuta salina* occurs abundantly as a parasite on the *Salicornia. Myosotis scorpioides* occurs in quantity at the edge of the water, and has every appearance of being native, but, like *Cakile* and *Cotula,* is probably adventive. It has been known to occur on the Peninsula for thirty years. *Hypochoeris radicata* is well established, not only in the seashore meadows but on the dunes as well. The following constitute the remainder of the noteworthy species of this association: *Distichlis spicata, Stellaria sitchana, Ranunculus Cymbalaria, Trifolium fimbriatum.*

The Climax Forest

The climax forest extends from behind the dunes to an altitude of about 1000 feet. It is composed chiefly, often entirely, of Sitka spruce, *Picea sitchensis,* western red cedar, and western hemlock. Occasionally there are a few trees of Douglas fir and lodgepole pine. Usually, however, the Douglas fir is a comparatively uncommon tree close to the ocean. Frequently the spruce trees are buried in the drifted sand to a depth of fifty feet or more, and only their flattened, fastigiate, wind-swept tops are visible from the seaward side. Where the spruce is the dominant tree the forest is rather dense, the tree trunks retaining numerous dead branches, which, having had their tips broken off by the wind, have only the stumps remaining. The red alder, *Alnus oregona,* soon springs up where the spruce trees have been felled by man, or uprooted or broken off by the wind. The shrub vegetation consists of willows, *Salix Hookeriana* or *S. lasiandra,* elder, *Sambucus callicarpa,* dogwood, *Cornus stolonifera,* salmonberry, *Rubus macropetalus,* salal, *Gaultheria Shallon, Ribes laxiflorum,* and an occasional plant of the false huckleberry, *Menziesia ferruginea.* Absent from, or at least, very rare in the Spruce-Cedar Climax forest are *Osmaronia cerasiformis, Cornus Nuttallii,* and *Acer macrophyllum.* Ferns are abundant and include the western sword fern, *Polystichum munitum,* the licorice fern, *Polypodium vulgare,* the lady fern, *Athyrium Filix-femina,* in swampy ground, and bracken, *Pteridium aquilinum,* var. *lanuginosum,* in the clearings. Characteristic mosses are *Eurhynchium oreganum*

Photo by Victor B. Scheffer

Looking westward from Marmot Pass, showing typical Hudsonian zone vegetation. The dominant trees are subalpine fir, ***Abies lasiocarpa;*** associated species are Alaskan cedar, ***Chamaecyparis nootkatensis,*** and the mountain hemlock, ***Tsuga Mertensiana.***

and *Plagiothecium denticulatum.* The wild lily-of-the-valley, *Maianthemum dilatatum,* often forms dense, nearly pure consociations only interspersed here and there with an occasional tuft of *Polystichum munitum.* Among the *Maianthemum,* in scattered tufts, is a tall, slender, gracefully drooping grass, *Trisetum cernuum,* f. *pubescens.* Other common species are *Vicia gigantea, Galium triflorum,* and *Stellaria crispa.* Along the roadsides, *Bromus tectorum, Holcus lanatus,* and *Hypochoeris radicata* are extremely common, the latter species commonly possessing swollen and distorted stems as a result of attacks by a nematode.

Because of the phenomenally heavy rainfall on the western slopes of the Olympic Mountains, swamps are numerous and extensive in these woods. One of the most extensive of these swampy areas occurs in southwestern Grays Harbor County, and extends several miles inland from the sand dunes of the ocean coast. They are dark, gloomy, and densely wooded. The vegetation consists chiefly of trees and shrubs. Often the most conspicuous and abundant herbaceous plant is the skunk cabbage, *Lysichitum americanum.* Other herbaceous species are *Angelica genuflexa, Oenanthe sarmentosa, Athyrium Filix-femina, Carex Lyngbyei,* and *Scirpus microcarpus.*

Along the streams the principal woody plants are: *Picea sitchensis, Tsuga heterophylla, Thuja plicata, Acer circinatum, Rubus spectabilis, Oplopanax horridum, Gaultheria Shallon, Vaccinium ovalifolium, V. parvifolium.* The herbaceous species are:

Polypodium vulgare
Athyrium Filix-femina
Dryopteris dilatata
Struthiopteris spicant
Polystichum munitum
Luzula parviflora
Maianthemum dilatatum
Tiarella trifoliata
Boykinia elata
B. intermedia
Oxalis oregana
Oenanthe sarmentosa

The forest floor, logs, and the trunks and branches of various trees, particularly the abundant vine maple, are densely clothed with the mosses *Hylocomium loreum, Eurhynchium oreganum, E. stoloniferum, Mnium acanthoneurum, Claopodium Bolanderi,* and the pendent fern, *Selaginella oregana.*

Along lake margins there are:

Hypericum Scouleri
H. anagalloides
Boykinia elata
B. intermedia
Gentiana sceptrum
Potentilla palustris
Menyanthes trifoliata
Myrica Gale
Pyrus diversifolia

In shallow water *Equisetum limosum, Sparganium angustifolium, Nymphozanthus polysepalus,* and *Typha latifolia* occur along with *Utricularia vulgaris, Subularia aquatica, Callitriche Bolanderi, Brasenia Schreberi,*

and *Phragmites communis,* the latter group being rare on the Peninsula and known only from Lake Ozette, in the extreme northwestern part of the area.

From south of Point Grenville to Cape Flattery, the shores of the Peninsula often have steep, vertical cliffs or bluffs from fifty to three hundred feet high, leaving a narrow strip of sand and boulders between them and the ocean at low tide. These bluffs are often bare on the sea-face, but on the top they support a dense forest of dwarfed, gnarled, wind-swept trees, principally spruce, hemlock, cedar, and, less commonly, but not less characteristically, the Douglas fir, and lodgepole pine. Following is a list of the principal shrubs:

Pyrus diversifolia
Rubus spectabilis
Rhamnus Purshiana
Gaultheria Shallon
Menziesia ferruginea
Vaccinium ovatum

In many places where the ground is swampy and undrained, there are numerous patches of *Sphagnum.* In those places the principal herbaceous species are *Lysichitum americanum, Carex sitchensis* and *Juncus effusus.* There is no evidence to indicate that the presence of the *Sphagnum* has any appreciable selective effect on the herbaceous vegetatation.

At the edge of the bluffs among the dwarfed trees, the typical species are:

Pteridium aquilinum, var. lanuginosum
Rubus spectabilis
Vicia gigantea
Epilobium glandulosum
Gaultheria Shallon
Achillea Millefolium, var. pacifica
Anaphalis margaritacea, var. occidentalis

Along the rocky seacoast on rocks that are inundated at least at high tide occurs *Phyllospadix Scouleri,* which, with *Zostera marina,* constitutes the marine angiosperm flora of the Peninsula. The *Phyllospadix* has been collected at Cape Elizabeth in northwestern Grays Harbor County and undoubtedly occurs in many other places along the coast. In the sea there are several species of brown and red seaweeds, including the giant kelps, *Macrocystis* and *Nereocystis.*

The zonal position of the Spruce-Hemlock-Cedar Climax on the Olympic Peninsula is somewhat anomalous and is of special interest on that account. The Sitka spruce is a common tree along the seacoast for two thousand miles, from north of Kodiak Island in Alaska to Mendocino County, California (Piper & Beattie, 1915, p. 22). Within this distance it ranges through three life-zones and twenty degrees of latitude. In the northern two-thirds of this area it is often the dominant tree and may make up more than 50 per cent of the forest. Though it comprises only 4 per cent of the commercial timber, the heaviest and best stands of Sitka spruce occur on the Olympic Peninsula, where the combined effects of

heavy rainfall, dense fog and equable temperature permit the maximal development—the larger trees being more than two hundred feet high and eight feet in diameter. At the northern end of its range it is a Canadian and Hudsonian species; toward the southern end of its range it merges with the characteristic coastal Douglas fir forests. The zonal character of this coastal strip is further complicated by the southward extension of a number of Alaskan species, such as *Bromus aleutensis, Ranunculus Cooleyae, Nephrophyllidium crista-galli, Gentiana Douglasiana, Caltha asarifolia, Epilobium glandulosum, Plantago macrocarpa,* and *Romanzoffia unalaschensis,* all rare plants on the Olympic Peninsula. Benson (1930), has treated the spruce belt of the coast of Oregon as belonging to the Canadian zone which he calls Coastal Canadian. It seems evident, however, that if an attempt is made to trace this climax northward to Alaska, its real affinity is found to be, not with the Canadian zone forest which stretches across the continent from Labrador, but with the coastal forest which extends northward from Oregon and Washington. On the Olympic Peninsula and the coastal strip to the southward, the overwhelming majority of the species and individuals comprising this Spruce-Hemlock-Cedar Climax are undoubtedly Humid Transition. If the life-zones are to be determined by their floristic (and faunistic) composition rather than according to vague hypotheses, then the Spruce-Cedar Climax must be regarded merely as a coastal phase of the extensive Pacific Transition area or Vancouver Strip.

THE GEOGRAPHICAL RELATIONSHIP OF THE FLORA

The vascular flora of the Olympic Peninsula includes more than 1000 species and varieties, or almost one-third of the total number of kinds of vascular plants known to occur in Washington. Of this number, approximately 90 per cent are indigenous, and the remainder have been either adventive or introduced. The five largest plant families are the Compositae, with 45 genera and 111 species, the Gramineae, with 32 genera and 95 species, the Rosaceae, with 17 genera and 53 species, the Leguminosae, with 14 genera and 50 species, and the Cyperaceae, with 5 genera and 62 species. The greatest number of both adventive species and endemics belong to the Compositae. There are no adventives in Cyperaceae. *Carex* is the largest genus with 50 species. The vascular flora of the Olympic Peninsula may be grouped, according to its continental geographic distribution, into endemic species, species with a discontinuous distribution, the northern element, the southern element, and the adventive species.

Throughout most of the region coniferous vegetation is dominant and the general facies of the vegetation is the same as that of the rest of the Vancouver Strip. Certain species of the Puget Sound area are absent

from the Olympic Peninsula; likewise there are a large number of species on the Peninsula that are not known to occur east of Hood Canal in Washington. In this category are some 130 species and varieties. They consist of endemics, as well as Californian and Oregonian species extending up the coast to Washington, and a number of Alaskan and Siberian species. Because of the uniformity of the coastal climate, the latter are enabled to extend their ranges two or three thousand miles southward. A small number of species also occur in the Rocky Mountains, on the plains of eastern Washington, in the Wenatchee Mountains, and again on the Olympic Peninsula without appearing in the intervening territory.

Because of the oceanic climate, small amplitude of temperature, and high humidity prevailing generally throughout the Vancouver Strip, most of the species of vascular plants have a continuous range in three directions, distribution in a fourth direction being prevented, of course, by the Pacific Ocean. It is not remarkable, therefore, to find that more than 75 per cent of the native species of the Olympic Peninsula are known to occur also in the Puget Sound region, extending northward into British Columbia and southward into Oregon. They have apparently entered the Olympic Peninsula from the east and the south.

ENDEMIC SPECIES

The Pleistocene glaciation, which followed the uplift of the Olympic and Cascade Mountains, necessitated a southern migration of the existing species of plants and animals from the areas subsequently occupied by the glaciers. It is well known that many of these species returned northward during or after the retreat of the ice although a number of them, such as *Carex Breweri, C. nigricans, Crepis nana, Draba glacialis, Eriogonum ovalifolium, Hulsea algida, Oxyria digyna, Potentilla fruticosa, Ranunculus Eschscholtzii, Trisetum spicatum,* etc., have persisted on some of the high mountains of California to the present day. Likewise, a small group of endemic plants, comprising about 2 per cent of the native flora of the Peninsula, is isolated on many of the ridges and peaks, as well as in some of the subalpine areas of the Olympic Mountains. These plants must have migrated to the Olympic Peninsula comparatively recently, or have evolved there since the glacial period, or else are relict species. The latter hypothesis seems to be the most probable because the majority of these plants appear to lack the characteristic aggressiveness of species in an active phase of migration and evolution; in addition, all but three of them occur in the area which escaped the direct influence of the Pleistocene glaciation. Another fact tending to support the relict hypothesis is that all these plants possess well marked morphological characters, suggesting

that they became established at an early period. Some of these characters may be illustrated by the oblong, obtuse calyx-lobes and the glabrous or glabrate leaves which distinguish *Spiraea Hendersoni* from its nearest living relative, *S. cinerascens,* an interesting and highly specialized species endemic to a small area in the Columbia valley east of the Cascade Mountains; or the short and narrow pods, the simple or forked pubescence, and the small crenate basal leaves of *Arabis olympica,* (a species known so far to occur only on Mount Olympus) which separate it from *A. platysperma* of the Cascade Mountains of Oregon from Mount Hood southward; or by the erect corolla-lobes, included style, spatulate-oblanceolate dentate glabrous leaves and the apical dehiscence of the globular capsule of *Campanula Piperi* which distinguish that species from any of its close congeners. The stability of these morphological characters is strongly indicative that these specialized types are the result of a long period of natural selection and that the most active period of their evolution is past.

However, according to Willis (1922), the area occupied by a group is approximately proportionate to its age, and therefore the majority of endemics are of recent origin and have had insufficient time to spread. On the other hand, it is undoubtedly true that many endemics, especially those of mountainous areas, are remnants of a former vegetation, and it is probable that the relative amount of relict endemism occurring in different areas does not depend so much on the size or age of that area as it does upon its climatic and physiographic barriers. The outstanding climatic and physiographic peculiarities of the Olympic Mountains are the excessive rainfall on their western slopes, the comparative aridity of the northeastern area, and their isolated position. It is not surprising, therefore, that, for a continental area, the Olympic Peninsula shows a moderately high percentage of endemism. By way of comparison with two other regions which have a continental flora, Britain, which is nearly 15 times larger, has only one endemic species, and Germany, which includes an area nearly 30 times greater, has no endemic species. On the other hand, in California, which is noted for its floristic and other peculiarities, the endemic species constitute about 40 per cent of the whole native flora (Jepson, 1925, p. 11). Following is a list of the 20 species and varieties of vascular plants apparently restricted to the Olympic Peninsula. There are no endemic trees; the only endemic shrubs are *Spiraea Hendersoni,* and *Amelanchier florida,* var. *humptulipensis.*

Calamagrostis inexpansa, var. barbulata
Glyceria Otisii
Arabis olympica
Erysimum arenicola
Boykinia intermedia
Amelanchier florida, var. humptulipensis
Spiraea Hendersoni
Astragalus Cottoni
Oxytropis luteola
O. olympica
Viola Flettii
Mertensia paniculata,var. platyphylla
Castilleja angustifolia, var. abbreviata
C. olympica
Campanula Piperi
Agoseris subalpina
Taraxacum olympicum
Erigeron Flettii
E. Thompsoni
Senecio Websteri

A species of moss, *Grimmia olympica* E. G. Britt., is apparently endemic to the Olympic Mountains (Jones, 1933). It was first collected in the Queets River Valley near Humes Glacier, altitude 5500 feet, on August 14, 1907, by T. C. Frye, and is known only from the type locality.

Most of the plants of the foregoing list possess marked morphological characters of specific value as has been noted above. However, there are four plants which represent minor, but endemic variations of widespread species. For example, the var. *abbreviata* of *Castilleja angustifolia* differs only in its shorter and broader leaves, and the var. *barbulata* of *Calamagrostis inexpansa* by the smaller, shorter-awned spikelets, yet these minor characters invariably are correlated with a certain restricted geographical distribution.

SPECIES WITH A DISCONTINUOUS DISTRIBUTION

There are a number of plants on the Olympic Peninsula with discontinuous ranges. These plants are absent from the Puget Sound region and the Cascade Mountains of Washington and Oregon, but are present in the Wenatchee Mountains of Washington, as for example, *Zigadenus elegans, Crepis intermedia,* etc., or on the plains of eastern Washington and eastern Oregon, a group illustrated by such plants as *Gilia linearis, Leptotaenia dissecta,* etc., or in the Rocky Mountains of Montana, Wyoming, or Colorado; the latter group is typified by such plants as *Botrychium Lunaria, Pyrola dentata,* or *Antennaria concinna. Lonicera utahensis* is a shrub which occurs in the Olympic Mountains, the Blue Mountains, the mountains of northern Idaho and northeastern Washington but which is unknown in the Cascades. Two species, *Puccinellia nutkaensis,* and *Baeria maritima,* are known to occur in northwestern Washington and southwestern British Columbia and not otherwise except in California. It is entirely possible that many of the above-mentioned plants whose ranges are now regarded as erratic will be found either to have intermediate stations which will upset their apparently peculiar discontinuous distribution, or else further study will show some of them to be distinct endemic species or varieties of the Olympic Peninsula or at least of the contiguous area. In the event of this not being so the only alternative hypothesis

that will account for their presence on the Peninsula is that these plants once occupied much of the intervening territory where they have since become extinct, or else their presence is due to the independent origin of the species in more than one locality.

THE NORTHERN ELEMENT

The northern element in the flora comprises a total of approximately 240 species, or nearly 25 per cent of the native flora of the area. In addition to the previously discussed Arctic and Hudsonian species, many of which have a northern transcontinental range, the following comprise a distinctly northern element, and appear to have migrated southward along the coast. The list consists of those plants which range from Alaska to Washington, Oregon or California, and which occur only west of Hood Canal; they are not known in the Puget Sound region or in the Cascade Mountains. Those marked with an asterisk reach their southern limit on the Olympic Peninsula. Each one of these species is strictly limited both as to its abundance and the extent of its areal distribution in this region.

*Bromus aleutensis
Calamagrostis nutkaensis
*Elymus hirsutus
*Carex circinata
*C. livida
*C. physocarpa
*C. stygia
*C. stylosa
*Polygonum Fowleri
*Stellaria humifusa
Caltha asarifolia
*Ranunculus Cooleyae
Cochlearia officinalis
Viola Langsdorfii
Coelopleurum Gmelini
Glehnia leiocarpa
*Nephrophyllidium crista-galli
*Romanzoffia unalaschensis
*Plantago macrocarpa
*Artemisia Stelleriana

The significant thing about this southward extension of the foregoing 20 Alaskan species is that they do not extend southward in the mountains, as do certain boreal species in some other regions, but are almost all lowland plants which are confined to the area adjacent to the coast. Most species which have an extensive north and south distribution commonly have a wide east and west distribution as well, but in this respect, these Alaskan species are exceptional. The probable explanation of this phenomenon is most likely to be found in the mild climate which prevails along the coast.

THE SOUTHERN ELEMENT

It is assumed that a species has its center of distribution where the conditions are optimal and, since it has a tendency to enlarge its area of distribution, it extends its range in all possible directions. As a result, the farther from this center it is found, the less abundantly it occurs, until, finally, at a certain distance, it becomes nonexistent. The southern element in the flora of the Olympic Peninsula is regarded, therefore, as con-

sisting of those species whose origin must be sought in the region to the southward. This element, although much greater, is somewhat less distinctive than that from the northward. Most of the distinctly northern species are of limited distribution within the area; their known distribution is often erratic and is almost always discontinuous. On the other hand, the southern species often are common plants that occupy wide and continuous areas. Most of the species of the southern element have entered the Olympic Peninsula from the southeastward. No attempt is here made to include all the species of the southern component, but the following list comprises those plants which range northward along the coast from California or Oregon and which reach their northern limit on the Olympic Peninsula. These species fail to cross the Strait of Juan de Fuca and are therefore absent from Vancouver Island and the mainland of British Columbia. Species marked (*) do not occur farther south than Oregon. The majority are lowland plants.

Agrostis pallens
*Poa macrantha
Carex gymnoclada
C. pansa
Brodiaea pulchella
*Iris tenax
Eriogonum vineum
*Polygonum Newberryi
Pentacaena ramosissima
Whipplea modesta
Geum campanulatum
Astralgalus Cottoni
Lotus Douglasii
L. crassifolius
Lupinus albicaulis
*Thermopsis gracilis
Trifolium longipes
Geranium nemorale
Oxalis oregana
Epilobium delicatum, var. tenue
E. fastigiatum
*Douglasia laevigata
Castilleja miniata, var. crispula
Orthocarpus imbricatus
Penstemon Menziesii, f. Davidsonii
P. Tolmiei
Synthyris rotundifolia
Veronica Cusickii
Githopsis specularioides
Agoseris apargioides
Antennaria concinna
Arnica Parryi
Chrysopsis oregana
*Saussurea americana
Scorzonella laciniata
*Solidago Tolmieana

The average width of the Strait of Juan de Fuca is approximately 20 miles, and therefore it is improbable that this body of water is a sufficient physical barrier directly to prevent the northward extension of these 36 species and varieties of vascular plants. A more satisfactory explanation is afforded by the Age-and-Area hypothesis, that insufficient time has elapsed to allow for their northward migration. This seems the more probable on account of the large number of northern species which apparently have not been hindered in their southward migration by this narrow strip of salt water. That the temperature and moisture requirements of these species are such that they could not exist in the adjacent area to the northward of the Peninsula is very unlikely, since the physical conditions on the south end of Vancouver Island are almost identical with those of portions of northwestern Washington.

A small but important group of plants that appear to have entered the Olympic Peninsula from the southward are those which are characteristic of the "prairies" that occur in various places on the Peninsula. In the discussion of the climate of the Olympic Peninsula, attention has been drawn to the rôle of the Olympic Mountains as an effective climatic barrier. It was noted that these mountains are situated directly in the path of the prevailing westerly and southwesterly winds, thus exerting a pronounced influence on the precipitation, cloudiness, relative humidity, and even the temperature on their opposite sides. The result is that the western slopes receive the heaviest precipitation in the United States, while the northeastern side of the Peninsula is one of the driest areas on the Pacific Slope. This relatively dry area, which in some places has an average annual precipitation of less than twenty inches, (*e. g.* Sequim, 15, Port Townsend, 19) includes not only parts of the western end of Clallam County and the northern extremity of Jefferson County, but also part of Whidby Island, and the San Juan Islands, in Washington, and the southern tip of Vancouver Island in British Columbia. The precipitation and insolation of this area are similar to that in the Arid Transition zone of eastern Washington, and except for the low winter temperatures which prevail in that region the two climates are indeed very similar. In view of these facts it is not surprising to find that there are a number of species which are common to both areas. The list of these species is as follows:

Juniperus scopulorum
Pinus ponderosa
Poa secunda
Allium acuminatum
Brodiaea pulchella
Zigadenus venenosus
Iris missouriensis
Sisyrinchium Douglasii
Quercus Garryana
Silene Menziesii
Sedum Douglasii
Lithophragma parviflora
Prunus emarginata, var. mollis
Lotus Douglasii
Trifolium cyathiferum
Carum Gairdneri
Caucalis microcarpa
Leptotaenia dissecta
Lomatium nudicaule
Gilia capitata
Lithospermum ruderale
Collinsia grandiflora, var. pusilla
C. parviflora
Agoseris heterophylla
Hieracium cynoglossoides
Erigeron speciosus
Antennaria Howellii

The anomalous distribution of these plants presents a problem of considerable phytogeographical interest. Not only is it astonishing to find such a plant as the cactus or prickly pear *(Opuntia fragilis)* thirving in this region, but it is difficult to account for the origin of any of the other xerophytes. Obviously, the present climatic conditions favor these Arid Transition plants, both in the matter of physiological requirements of water and light, and also in the ecological factor of lessened competition with the Humid Transition species. The only satisfactory theory

to explain the origin of these Arid Transition species on the Olympic Peninsula is to assume that they once had a much wider distribution throughout the Vancouver Strip along the Pacific Downfold, and that they now occupy a mere remnant of their former range. This theory is strongly supported by the fact that all these species are known to occur at various localities to the southward. The only possible alternative hypothesis, that these Arid Transition plants migrated westward over the Cascade Mountains, the outstanding physiographic feature in the state of Washington and a most effective barrier to the direct migration of species, is scarcely tenable in the light of present day knowledge of plant distribution in Washington.

COMPARISON WITH THE FLORA OF THE CASCADE MOUNTAINS

There is a considerable number of species which occur on the nearby mountains of the Cascade system, but which do not grow on the Olympic Peninsula. Sufficient data for specific comparisons are unavailable except for two volcanoes, Mount Baker and Mount Rainier, the latter being the most thoroughly botanized region of its size in the northwestern United States.

Mount Baker, the highest and most isolated peak in the northern Cascades of Washington, lies approximately one hundred miles in an air line to the northeastward of the Olympic Mountains. In general, its flora is very similar to that of both mountain systems. However, it is found upon making a critical comparison of the floras of the two areas that there are certain significant differences. Mount Baker has about forty species and varieties which are not found on the Olympic Peninsula, and conversely, there are about an equal number of plants occurring in the Olympic Mountains which are apparently absent from Mount Baker. The following list is of those species which are found on Mount Baker (St.John & Hardin, 1929), but which are not known to grow on the Olympic Peninsula. More than eighty per cent of the plants of this list belong to the Hudsonian and Arctic zones.

Dryopteris oreopteris
Lycopodium alpinum
Agrostis aequivalvis
A. longiligula
Carex Breweri
Eriophorum angustifolium
E. gracile, var. caurinum
Juncus castaneus
Luzula glabrata
Habenaria orbiculata
Salix arctica, var. cordata
Eriogonum umbellatum
Claytonia lanceolata, f. chrysantha
Montia fontana, var. tenerrima
Silene Suksdorfii
Anemone occidentalis, var. subpilosa
Arabis ambigua
Ribes triste, var. albinerve
R. Watsonianum
Saxifraga Lyallii
Fragaria platypetala
Oxytropis cascadensis
Viola orbiculata
Cassiope Stelleriana
Pyrola uliginosa
Vaccinium scoparium
Polemonium elegans
Castilleja rupicola

Mimulus Lewisii, f. leuceruthrus
M. nasutus
Penstemon diffusus, f. albiflorus
P. fruticosus
Linnaea borealis, var. americana
Antennaria Gormani
Artemisia vulgaris, var. heterophylla
Aster bakerensis
A. Engelmanni
Erigeron compositus, var. glabratus
E. salsuginosus, var. angustifolius

Mount Rainier is almost exactly the same distance in a southeasterly direction from the Olympic Mountains as Mount Baker is in a northerly direction. In fact, a line connecting the three mountain systems would constitute an isosceles triangle, with the base, or longer side, connecting Mount Baker and Mount Rainier. The following 108 species and varieties of vascular plants found in Mount Rainier National Park are not known to occur on the Olympic Peninsula. Seventy per cent belong to the Boreal zones.

Botrychium pinnatum
Dryopteris oregana
D. Filix-mas
Woodsia oregana
Lycopodium annotinum
Agropyron trachycaulum
Festuca microstachys
F. viridula
Melica Geyeri
Glyceria borealis
Poa arctica
P. Lettermani
P. scabrella
P. Pringlei
Carex accedens
C. brunnescens
C. canescens
C. neurophora
C. limosa
Eriophorum angustifolium
Scirpus cespitosus, var. callosus
Juncus Regelii
Luzula glabrata
Allium validum
Salix cascadensis
S. Geyeriana, var. meleina
S. lutea
S. Mackenziana
S. monticola
S. pennata
Eriogonum compositum, var. pilicaulis
E. pyrolaefolium, var. coryphaeum
Polygonum Kelloggii
Claytonia linearis
Lewisia triphylla
L. exarata
Spraguea multiceps
Arenaria Nuttallii
Cerastium strictum
Silene Suksdorfii
Stellaria nitens
Aconitum columbianum
Anemone deltoidea
Arabis patula
A. Suksdorfii
Cardamine bellidifolia
Draba aureola
D. lonchocarpa, var. semitonsa
Sisymbrium incisum, var. Hartwegianum
Sedum integrifolium
S. rupicola
Ribes viscosissimum
R. Watsonianum
Saxifraga Allenii
S. debilis
S. occidentalis
Suksdorfia ranunculifolia
Fragaria platypetala
Dryas octopetala
Spiraea lucida
Lupinus volcanicus
Oxalis trilliifolia
Ceanothus velutinus
Viola epipsila
V. orbiculata
Gayophytum ramosissimum
Hesperogenia Stricklandii
Ligusticum purpureum
L. tenuifolium
Lomatium brevifolium
Arctostaphylos nevadensis
Cassiope Stelleriana
Pyrola aphylla
P. minor
P. uliginosa
Vaccinium scoparium
Gilia Nuttallii
Polemonium elegans
Monardella odoratissima, var. discolor
Castilleja indecora
Mimulus Breweri
Pedicularis latifolia
P. orthorrhyncha
P. rainierensis
Penstemon rupicola
Veronica Cusickii, var. Allenii
Agoseris alpestris

Apargidium boreale
Arnica amplexicaulis
A. diversifolia
A. myriadenia
A. pumila
Aster foliaceus, var. apricus
A. ledophyllus
A. pulchellus
Centaurea consimilis
Erigeron salsuginosus, var. glacialis
Haplopappus Brandegei
Hieracium Flettii
H. griseum
Hulsea nana
Rainiera stricta
Senecio condensatus
S. Leibergii
S. pauciflorus
S. Suksdorfii
S. Hookeri

From the foregoing lists, it is evident that somewhat more than 140 species and varieties of vascular plants occur in the northern Cascade Mountains which are not found in the Olympics. A few of these plants are peculiar to volcanic cones. A few others are endemic to either Mount Baker or Mount Rainier. But there seems to be no immediately apparent reason to account for the absence of the remainder of these plants from the Olympic Mountains. One fact, namely, that the overwhelming majority are Hudsonian and Arctic species, stands out clearly. If the greater number were exclusively Arctic it might be supposed that their absence from the Olympics is due to the lower altitude of those mountains with the consequent greatly reduced area of suitable habitats in the latter region. However, since the majority are not Arctic but Hudsonian species, with ample zonal area for their growth and development available in the Olympic Mountains, that hypothesis fails to give an adequate explanation. One other possible hypothesis, that the winds, which are prevailingly western and southwestern in this part of Washington, have prevented the seeds of those Cascade Mountain species from spreading westward to the Olympics, lacks factual evidence to support it. Actually, the wind appears to be a factor of relatively little importance in the direct migration of the majority of species, especially those of alpine and subalpine distribution; its real significance lies in its effect on the temperature or the rainfall of a region. Probably the true explanation of the peculiar distribution of the Cascade Mountain species that are absent from the Olympics is to be sought in a critical study of the geological history of the whole area.

ADVENTIVE SPECIES

Theoretically, all the species of plants on the Olympic Peninsula have been adventive at one time or another. Practically, those species which have arrived from foreign sources within the period of historical record are designated as introduced or adventive; those plants which were present at or before the advent of civilized man are classed as native or indigenous. Most of the adventive species are weeds. A weed, according to Emerson, is a plant whose virtues have not been discovered.

Before 1900 only 40 species of adventive plants had been collected on the Olympic Peninsula. However, during the last thirty-five years, coincidental with the development of agriculture, the weed flora has greatly increased. At the present time the known number of adventive species is 135, or about 13 per cent of the total number of species of vascular plants in the area. This figure indicates that for the last thirty years the average rate of increase has been about three species per year, and it is probable that in the years to come the rate of introduction will be accelerated rather than retarded. It is not likely, however, that the weed flora will increase at the enormous rate recorded for Benton County, Washington (the only other region in the state for which there are exact records), where, in scarcely more than a quarter of a century, the number of adventive species has been increased until it comprises 25 per cent of the total flora (St. John & Jones, 1928).

There are, unfortunately, few exact data concerning the time of introduction of species of weeds into Washington. The sheep sorrel, *Rumex Acetosella,* is, however, an interesting exception. Cooper (1860, p. 68) reports it as follows: "Becoming common in cultivated prairies. Introduced 20 years since at Nisqually farms, and is now spread for miles around, crowding out everything else in the poor, gravelly soil". This would establish the date of introduction as being between the years 1835 and 1840. The locality mentioned was the first settlement of white men on Puget Sound and was situated near the present site of the town of Dupont, Pierce County. The first collection of this weed on the Olympic Peninsula was made in 1890 (Henderson, 1892).

At the present time the three most noxious and widespread weeds in cultivated ground on the Olympic Peninsula are quack grass, *Agropyron repens,* Canada thistle, *Cirsium arvense,* and field mustard, *Brassica campestris.*

In the following list of adventive species, those which appeared before 1900 are marked with an asterisk. The remainder have been detected since the beginning of the century. Only 22 monocotyledonous species are adventive, and all these are grasses. The largest family represented is the Compositae with 29 species. On the basis of duration, 13 are shrubby or arborescent; 125 are herbaceous, of which 44 per cent are annuals, 11 per cent biennials, and 45 per cent perennials.

Agropyron repens
Ammophila arenaria
*Aira caryophyllea
*A. praecox
*Bromus commutatus
*B. racemosus
*B. secalinus
B. tectorum
*Dactylis glomerata
*Festuca dertonensis
F. elatior
*Lolium perenne
L. multiflorum
L. temulentum
*Polypogon monspeliensis
*P. lutosus

Holcus lanatus
H. mollis
*Phleum pratense
*Poa pratensis
*P. annua
Agrostis alba
Anthoxanthum odoratum
Zizania palustris
Polygonum Convolvulus
*P. aviculare
P. Persicaria
P. Hydropiper
*Rumex Acetosella
*R. crispus
R. obtusifolius
R. conglomeratus
*Chenopodium album
Cerastium viscosum
*C. vulgatum
Lychnis coronaria
L. alba
Sagina procumbens
Silene noctiflora
Spergula arvensis
*Stellaria media
Delphinium Ajacis
*Ranunculus acris
R. repens
Eschscholtzia californica
Papaver somniferum
Brassica alba
B. campestris
B. japonica
B. nigra
B. oleracea, var. acephala
Cakile edentula
*Capsella Bursa-pastoris
Nasturtium Nasturtium-aquaticum
*Sisymbrium officinale, var. leiocarpum
S. altissimum
Thlaspi arvense
Coronopus didymus
Rosa canina
R. rubiginosa
Lupinus arboreus
*Rubus laciniatus
R. procerus
R. fruticosus
Prunus domestica
P. avium
Sorbus Aucuparia
Pyrus Malus
P. communis
Ulex europaeus
Cytisus scoparius
Medicago lupulina
M. sativa
Melilotus indica
Trifolium dubium
*T. flavulum
T. hybridum
*T. pratense
*T. procumbens
*T. repens
Vicia angustifolia
*V. sativa
Geranium molle
G. dissectum
G. carolinianum
*G. pusillum
Malva rotundifolia
M. moschata
Hypericum perforatum
Conium maculatum
Daucus Carota
Pastinaca sativa
Convolvulus Sepium
Myosotis arvensis
M. scorpioides
M. versicolor
Marrubium vulgare
Mentha piperita
M. citrata
Nepeta Cataria
N. hederacea
Thymus Serpyllum
Solanum villosum
S. Dulcamara
S. nigrum
S. tuberosum
*Digitalis purpurea
Linaria vulgaris
Veronica arvensis
V. humifusa
V. officinalis
*V. serpyllifolia
*Plantago lanceolata
*P. major
Dipsacus sylvestris
*Achillea Millefolium
Anthemis arvensis, var. agrestis
Arctium minus
Artemisia Absinthium
Bellis perennis
*Centaurea melitensis
C. Cyanus
Chrysanthemum Leucanthemum
C. Leucanthemum, var. pinnatifidum
C. Parthenium
Cichorium Intybus
Cirsium arvense
C. lanceolatum
*Cotula coronopifolia
Crepis capillaris
*Erigeron canadensis
Galinsoga ciliata
*Hypochoeris radicata
Lactuca Scariola, var. integrata
L. muralis
Lapsana communis
Senecio sylvaticus

S. vulgaris	Tanacetum vulgare
*Sonchus asper	*Taraxacum officinale
S. oleraceus	Tragopogon porrifolius

LIFE-FORMS ACCORDING TO THE RAUNKIAER SYSTEM

It is evident that the great majority of the species of vascular plants which occur on the Olympic Peninsula are restricted in their vertical distribution by certain climatic conditions. These conditions are very difficult to measure by the ordinary physical methods because of the wide discrepancy that often exists between mechanical records of climate and the value of that climate for plant life. There can be no doubt, however, in the mind of any unbiased observer that the climate of a region is very closely correlated with the relative abundance of particular life-forms, and that these life-forms indicate relationship between the flora and the environment. These facts were observed by Raunkiaer (1934), who developed a system which shows statistically the relation between the climate of a region and its flora. "Based upon sound morphological and biological principles, Raunkiaer's system is marked by simplicity, clarity, and compactness. The principle of classification is simple. No attempt is made to take account of all the infinite variety of ecological adjustments. Instead, Raunkiaer chooses for his basis of classification a single very important feature, namely, the adjustment of plants to the unfavorable season. It is this which gives the system its clarity and completeness. Plants with similar adjustments are first classified in five main types (life-form classes). Within each class a number of subtypes or life-form groups are distinguished. The position of a plant in this system is determined by the location and protection of the perennating organs during the unfavorable season, that is, during the cold winter or the dry, hot summer." (Braun-Blanquet, 1932). On this basis Raunkiaer distinguished:

1. Phanerophytes (Ph): Buds aerial, at least 25 cm. above ground.
2. Chamaephytes (Ch): Buds above the surface, protected by snow or dead leaves.
3. Hemicryptophytes (H): Buds at soil level.
4. Cryptophytes (Cr): Buds buried in the soil.
5. Therophytes (Th): Annuals.

Raunkiaer postulated a hypothetical *normal spectrum* of the world as a whole by selecting one thousand representative species. The *biological spectrum* of a region is obtained by critically studying the flora, plant by plant and species by species, and finding the percentage of species belonging to each life-form. By means of this biological spectrum the character of the flora can be presented in statistical form, can be compared with that of other regions, and also can be used as an indicator of climate.

TABLE 4
The Biological Spectrum of the Olympic Peninsula Compared with the Normal Spectrum

Region	No. of species	Percentage of Species				
		Ph	Ch	H	Cr	Th
Olympic Peninsula	1015	11	6	52	22	9
Normal Spectrum*	1000	46	9	26	6	13

*To avoid frequent repetition, acknowledgment is here made to Braun-Blanquet (1932) and Ennis (1928) from whom some of the statistical data used in this section are borrowed.

The biological spectrum of the Olympic Peninsula (table 4) indicates that, in common with other areas of similar latitude and climate, the flora is dominantly hemicryptophytic and cryptophytic. Herbaceous perennials which have their buds protected by the substratum are by far the most numerous element in the flora (H+Cr=74%). A comparison with the normal spectrum shows the percentage of hemicryptophytes and cryptophytes on the Olympic Peninsula to be almost double that of the normal number. The therophytes are less than normal, and the deficiency of chamaephytes and phanerophytes indicates that the climate is sufficiently severe to cause a large number of species to become dormant for part of the year. It must be emphasized, however, that the Raunkiaer classification pertains to the flora, rather than to the vegetation of a region.

TABLE 5
Comparison of Several Phytogeographical Regions

Region	Percentage of Species				
	Ph	Ch	H	Cr	Th
Arctic-alpine zone, Olympic Peninsula	0	21	69	9	0
Spitzbergen	1	22	60	15	2
St. Lawrence Island	0	23	61	15	1
Transition zone, Olympic Peninsula	15	3	43	25	14
Central Switzerland	10	5	50	15	20
Connecticut	15	2	49	22	12
Normal Spectrum	46	9	26	6	13

As previously discussed and explained in the present paper (*vide* The Zonal Distribution of the Vegetation), the Olympic Peninsula has two major phytogeographical types, the Boreal and the Austral. These types are compared with each other and with other similar regions in table 5. If, for the sake of emphasis and contrast the highest stratum of the Boreal

Region, namely, the Arctic-alpine zone, is taken alone, the ecological affinity of the floras of the two Regions becomes the more apparent. The Arctic-alpine zone is seen to have much the same percentages of the various life-forms, hence the same type of flora and phytoclimate, as, for example, Spitzbergen, and St. Lawrence Island, Alaska, while the flora of the Transition zone is closely similar to that of such widely separated regions as central Switzerland and Connecticut.

Considering first the representatives of the Boreal Region, we note that, characteristically, phanerophytes and therophytes are very few or none, while the hemicryptophytes and cryptophytes comprise three-quarters of the species of the floras, and chamaephytes have a very uniform occurrence. This demonstrates conclusively that the climates of the three widely separated regions are, from an ecological viewpoint, practically identical, since regions having similar climates have the same relative abundance of certain types of life-forms. To such a phytoclimatic area Merriam applied the term Arctic-alpine zone, and it is evident that this classification rests on a sound biological basis.

Turning again to table 5, we see that the Austral or Temperate Region of the Olympic Peninsula, which is represented by the Humid Transition Area, differs widely from that of the Boreal in the distribution and occurrence of its life-forms. Phanerophytes are abundant, chamaephytes are greatly reduced in number, and, although hemicryptophytes and cryptophytes still dominate the spectrum, there is an enormous increase in the percentage of therophytes. These peculiarities are shared by two other regions for which statistical summaries are available, namely, Connecticut, and the area between lakes Geneva and Constance in central Switzerland. As is to be expected in regions which lie between latitudes 40° N. and 50° N. the percentage of phanerophytes and chamaephytes is considerably below that of the normal spectrum, while the hemicryptophytes and cryptophytes, plants whose perennating buds are at or below the surface of the soil, show a very great preponderance. Thus, it is evident that the two phytogeographical regions which occur on the Olympic Peninsula, the Boreal and the Austral, are directly comparable to other similar regions in widely separated parts of the world, in which the same types of life-forms predominate. Although in some regions isotherms may not actually coincide with the boundaries of the life-zones, the life-zone concept, when based on a statistical analysis of the flora into its component life-forms, by means of which the phytoclimate of the region is indicated by the plants themselves, must be recognized, particularly by ecologists, as an indispensable foundation for the delimitation of the major floral areas of North America.

If the four life-zones of the Olympic Peninsula are compared with each other according to the Raunkiaer system of life-forms, the following results are obtained:

TABLE 6

Zone	Percentage of Species				
	Ph	Ch	H	Cr	Th
Arctic-alpine	0	21	69	9	0
Hudsonian	9	10	67	13	1
Canadian	12	7	49	31	1
Transition	15	3	43	25	14

The Arctic-alpine zone may be defined as that zone in which phanerophytes and therophytes are entirely absent, in which chamaephytes constitute more than 20 per cent, and in which hemicryptophytes dominate. The Hudsonian zone may be characterized as the highest (or most northerly) zone in which phanerophytes are present. The boreal affinities of this zone are shown by the nearly complete absence of therophytes, by the decreasing percentage of chamaephytes and hemicryptophytes, and by the increase in cryptophytes. The Canadian zone is a phanerophytic zone in which the percentage of chamaephytes and hemicryptophytes is considerably reduced, while the cryptophytic element is much greater than that of the Hudsonian. It is the lowest zone to show a minor quantity of therophytes. The Transition zone is likewise a phanerophytic zone in which chamaephytes are an unimportant element. Three-fourths of the species in this zone are hemicryptophytes, cryptophytes and therophytes.

The most useful and reliable life-form indicators, are, of course, the phanerophytes. "Shrubs and trees, being commonly larger than herbaceous plants, reach higher into the air and penetrate more deeply into the soil, thereby subjecting themselves to a wider range of conditions than do these smaller plants. They also, by continuing throughout the year exposed to successive, varying seasonal conditions, complete the full round of their possibilities in environment. They therefore stand as the most complete summation that can be attained of the natural light, heat, moisture, food, air, and mechanique of any area." (Coville, 1893, p. 18).

It is obvious, therefore, that a much finer expression of the lesser climatic differences on the Olympic Peninsula can be obtained by a closer examination of the phanerophytic group. Raunkiaer has subdivided this group on the basis of the height of the plant, and the duration and the area of the leaves. Thus, the macrophanerophyta have their renewal buds more than 5 m. above the surface of the ground; nanophanerophyta have their renewal buds 0.25 to 5 m. above ground; and the phanerophyta scan-

dentia are climbing plants whose renewal buds pass the unfavorable season high above the surface of the soil. This classification is according to Raunkiaer as given by Braun-Blanquet (1932, pp. 295-296) with the exception that the minimum height of the macrophanerophyta and the maximum height of the nanophanerophyta have been arbitrarily increased to 5 meters.

TABLE 7

Zone	Percentage of Species						
	Macrophanerophyta			Nanophanerophyta			
	Deciduous	Evergreen		Deciduous	Evergreen		Phanerophyta scandentia
		Broad Leaf	Narrow Leaf		Broad Leaf	Narrow Leaf	
Arctic-alpine....	0	0	0	0	0	0	0
Hudsonian.....	0	0	4	10	0	0	0
Canadian.....	0	0	6	13	0	0	0
Transition.....	15	2	9	28	11	0	2
Total.....	15	2	19	51	11	0	2

By reference to the above table it is instantly apparent that approximately two-thirds of the phanerophytic species of the Olympic Peninsula occur in the Humid Transition Area. The remainder are distributed in the Canadian and Hudsonian zones. The Humid Transition is distinguished from the Canadian by the fact that it contains the only broad-leaf evergreen macrophanerophytes, the only phanerophyta scandentia (climbing plants whose renewal buds pass the unfavorable season high above the ground), namely *Lonicera ciliosa* and *L. hispidula,* and is, furthermore, the only zone in which deciduous macrophanerophytes are found.

The significance of the Raunkiaer system of life-forms as applied to the flora of the Olympic Peninsula is threefold. By means of this system a statistical analysis can be made of the flora of the whole region, or of the flora of each of the four life-zones taken separately. By whichever method used the results are comparable with the flora of other regions, and a simple but biologically sound summary of the phytoclimate thus can be obtained. As applied to Merriam's life-zones the Raunkiaer system yields valuable corroborative data. Merriam was concerned chiefly with the factors of climate which are effective during the season of growth and reproduction, whereas the Raunkiaer system is based on the adjustment of plants to the unfavorable, which is usually the dormant, season. By the application of both of these systems, a much clearer characterization of the life-zones or climatic formations may be obtained.

A PHYTOGRAPHICAL SUMMARY

The two outstanding physiographic and climatic peculiarities of the Olympic Peninsula are its isolated position and the striking contrast between the excessive precipitation on its western slopes and the aridity of the northeastern portion of the area. Differences in precipitation on the western and northeastern sides of the Peninsula are seen to have a marked effect on the distribution of species.

The vegetation falls naturally into four climatic formations, or life-zones, which are areas containing plants (and animals) that are limited in their distribution chiefly by conditions of temperature and moisture. The climatic climax formation is the Humid Transition Area, which contains 70 per cent of the species of the vascular flora. This area comprises two phytosociological units representing the two climax forest types, the Hemlock-Cedar Climax and the Spruce-Cedar Climax.

The basis for the classification of the vegetation is the Merriam life-zone system and an attempt is made to clarify the zonal concepts as applied to the Olympic Peninsula. In spite of the fact that, owing to the maritime influence, the boundaries of the zones in this area are often much obscured, less than 5 per cent of the flora is found to have an anomalous zonal distribution. Attention is drawn to these instances and they are discussed in detail on account of their interesting and unusual occurrence.

The general facies of the vegetation is the same as that of the remainder of the Vancouver Strip. Upon analysis the native plant cover is seen to consist of five classes. More than 75 per cent of the species belong to the class of plants which have a continuous range in three directions. The remainder consists of those plants which belong to the northern element, the southern element, or to species with a discontinuous distribution, or else they are endemics. Thirteen per cent of the flora is adventive.

The northern element is found to comprise the Arctic, Hudsonian, and Canadian floras, as well as a small group of Alaskan and Siberian species, which, on account of the mild coastal climate, are enabled to extend their ranges two or three thousand miles southward.

The southern element in the flora of the Olympic Peninsula, although much greater, is somewhat less distinctive than the northern. The southern species often consist of common plants that occupy wide and continuous areas. The Strait of Juan de Fuca is regarded as an ineffective barrier to the northward extension of more than 40 species and varieties. Rather, the Age-and-Area hypothesis is held to be a more satisfactory explanation.

Species with a discontinuous range are found to include those which are present in the Rocky Mountains, the Wenatchee Mountains, or on the plains of eastern Washington, but which are absent from the Puget Sound area or the Cascade Mountains.

Owing to lack of satisfactory data regarding plant distribution in adjacent areas, it is not possible to make a detailed comparison of the vegetation of the Olympic Mountains with that of the Cascade Mountains. However, two areas which have been carefully botanized, namely, Mount Baker, and Mount Rainier, are selected for a comparison of their respective floras with that of the Olympic Mountains. Mount Baker has about forty species, and Mount Rainier, more than one hundred species and varieties which are unknown on the Olympic Peninsula. Existing biotic and anemographic factors are considered to be inadequate to explain these phytogeographic peculiarities, and it is suggested that the basic causes are to be sought in a critical study of the geological history of the whole area.

Special attention is given to a small group of Arid Transition species occurring on the Peninsula, with the conclusion that their anomalous distribution is to be accounted for on the assumption that they once had a much wider range throughout the Vancouver Strip, and that they now occupy a mere remnant of their former areas.

For a continental area, the Olympic Peninsula has a moderately high percentage of endemics. This conclusion is contrary to that formed by earlier botanists. Three theories are advanced to account for the origin of these endemic plants, the conclusion being that they are relicts.

The Raunkiaer system of life-forms is applied to the flora of the Peninsula and the resultant biological spectrum is compared with that of certain other regions, also with the normal spectrum. The Merriam life-zones which occur on the Peninsula are analyzed according to the Raunkiaer method and the conclusion is drawn that by the application of both of these systems a much clearer characterization of the life-zones or climatic formations may be obtained.

It is noted that there are 138 adventive species (13 per cent of the total flora), on the Olympic Peninsula, and that the adventive flora is increasing at the rate of about three species per year.

Future botanical work on the Olympic Peninsula may well be directed toward a study of the vegetation in relation to the particular environmental factors that can be used in agriculture and forestry. This may be accomplished by making accurate instrumental records of climate and soil,

especially in the uplands, and correlating the results with the flora.[6] There is also a great need for geological work on the Peninsula.

A BRIEF ACCOUNT OF BOTANICAL EXPLORATION OF THE OLYMPIC PENINSULA

The collection of botanical specimens on the Olympic Peninsula has been taking place for a period of one hundred and forty-five years. During this time some twenty-five persons have collected vascular plants in the area. The first botanist to visit the region was Archibald Menzies, who, as surgeon and naturalist, accompanied Vancouver on his famous voyage to Puget Sound in 1792. Menzies discovered and collected a considerable number of plants on the Northwest Coast. "A set of his collections is in the British Museum, another at Kew, and a portion of his earlier collections, particularly the cryptogams, are in the herbarium of the Botanical Society of Edinburgh." (Brewer, 1880, p. 553). "A very few are in the Gray Herbarium." (Piper, 1906, p. 11). An account of his botanical explorations is contained in his journal which has been recently published (Newcombe, 1923).

The first place on the Olympic Peninsula where members of Vancouver's expedition went ashore was the south side of Protection Island opposite the entrance of Port Discovery Bay. The first plant recorded was *Valerianella congesta.* The entry in Menzies' Journal for May 1, 1792, contains the following botanical note:

"We found on landing that Vegetation had already made great progress, the shore was skirted with long grass & a variety of wild flowers in full bloom, but what chiefly dazzled our eyes on this occasion was a small species of wild Valerian with reddish colord flowers growing behind the beach in large thick patches."

At Port Discovery, on May 2, he made the following notes:

"Besides a variety of Pines we here saw the Sycamore Maple—the American Aldar—a species of wild Crab & the Oriental Strawberry Tree,[7] this last grows to a small Tree & was at this time a peculiar ornament to the Forest by its large clusters of whitish flowers & ever green

[6]Also in this connection several suggestions by Dr. G. B. Rigg, in a paper, "Using the vegetation cover as an aid in studying logged-off lands as forest sites" (Journ. Forestry 27: 539-545, 1929) are significant, as for example: "It seems evident that too little attention usually has been paid to the vegetation other than forest trees on possible forest sites, and undoubtedly more attention will be given to it in the near future. Unquestionably, the study of the vegetation occurring naturally on logged-off lands, and the study of the shrubs, herbs, ferns and mosses, and lichens of the mature forest should go hand in hand and the best results will be reached by a full understanding of both." (l.c. 543)

[7]Sycamore Maple, *Acer macrophyllum;* American Aldar, *Alnus oregona;* a species of wild Crab, *Pyrus diversifolia;* Oriental Strawberry Tree, *Arbutus Menziesii.*

Photo by Victor B. Scheffer

A characteristic view of stream-bank vegetation along the Quilcene River in the Humid Transition area. Western red cedar, ***Thuja plicata***, and western hemlock, ***Tsuga heterophylla*** predominate. The moss-covered deciduous trees are large-leaf maple, ***Acer macrophyllum*** and red alder, ***Alnus oregona***. The shrubs in the foreground are vine maple, ***Acer circinatum***.

leaves, but its peculiar smooth bark of a reddish brown colour will at all times attract the Notice of the most superficial observer. . . ."

"On the 4th I landed opposite to the Ship to take an excursion back into the Woods which I had hardly enterd when I met with vast abundance of that rare plant the *Cypripedium bulbosom*[8] which was now in full bloom & grew about the roots of the Pine Trees in very spungy soil & dry situations. I likewise met here with a beautiful shrub the *Rhododendron ponticum*[9] & a new species of *Arbutus* with *glaucous* leaves that grew bushy & 8 or 10 feet high,[10] besides a number of other plants which would be too tedious here to enumerate. . . ."

"At day / light on the 18th of May we both weighd anchor & with light variable airs of wind & the assistance of the boats ahead we got out of Port Quadra by the Channel to the Eastward of Protection Island, as Captain Vancouver was going to land on that Island to take some bearing I went with him to have another short stroll on that delightfull spot & among other Plants I collected I was not a little surprized to meet with the *Cactus opuntia*[11] thus far to the Northward, it grew plentifully but in a very dwarf state on the Eastern point of the Island which is low flat & dry sandy soil."

Because many years elapsed before Menzies' collections were described and published, the types of a number of plants of which he was the discoverer have been attributed to other and later collectors. For example, although the type of *Acer macrophyllum* was collected by the Lewis & Clark Expedition at the Cascades of the Columbia River in 1806, and the type of *Quercus Garryana* at Fort Vancouver by Douglas in 1826, Menzies had already collected these plants on the Olympic Peninsula in 1792. Some other plants which Menzies found at Port Discovery, but whose type localities are elsewhere, are *Calypso bulbosa, Opuntia fragilis, Arctostaphylos tomentosa,* and *Rhododendron macrophyllum.*

The first edition of Vancouver's Journal was published in London in 1798. Although he was not a botanist, he includes in it some notes about the plants he observed. Thus in describing a sand spit at Port Discovery in May, 1792, Vancouver says:

"The surface of some [of the sand spits] was almost entirely occupied by a lagoon of salt water, or brackish swamp; others were perfectly dry; no one of them produced any trees; but were mostly covered with a coarse spiny grass,[12] interspersed with strawberries,[13] two or three spe-

[8] *Calypso bulbosa.*
[9] *Rhododendron macrophyllum.*
[10] *Arctostaphylos tomentosa.*
[11] *Opuntia fragilis.*
[12] *Distichlis spicata,* the common grass of the salt-marshes.
[13] *Fragaria chiloensis.*

cies of clover,[14] samphire,[15] and a great variety of other small plants; some of which bore very beautiful flowers. On a few of the points were some shrubs that seemed to thrive excessively; such as roses, a species of sweet briar,[16] gooseberries,[17] raspberries,[18] currants,[19] and several other small bushes, which, in their respective seasons produce most probably the several fruits common to this and the opposite side of America. These all appeared to grow very luxuriantly; and, from the quantity of blossoms with which they were loaded, there was great reason to believe them very productive.

"The parts of the vegetable kingdom applicable to useful purposes appeared to grow luxuriantly, and consisted of the Canadian and Norwegian Hemlock,[20] silver pines,[21] the Tacmahac and Canadian poplar,[22] arbor-vitae,[23] common yew,[24] black and common dwarf oak,[25] American ash,[26] common hazel,[27] sycamore, sugar, mountain, and Pennsylvanian maple,[28] oriental arbutus,[29] American alder,[30] and common willow,[31] these,

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[14]*Trifolium fimbriatum,* and *T. tridentatum* are two common species of the seashore.

[15]*Salicornia ambigua.*

[16]*Rosa nutkana* and *R. pisocarpa* are the only roses of the seashore. The sweetbriar *(R. rubiginosa),* has become locally abundant along roadsides in various parts of Washington since Vancouver's time.

[17]*Ribes lacustre* and *R. divaricatum* are common species. The first species, though really a currant, would probably be considered by Vancouver as a gooseberry on account of its prickly stems.

[18]*Rubus spectabilis,* the salmonberry, *R. parviflorus,* the thimbleberry, and *R. leucodermis,* the blackcap, all common species, were probably observed by Vancouver.

[19]*Ribes sanguineum* is the commonest species.

[20]Neither "Canadian" nor "Norwegian" hemlock occurs in western North America. The only species of hemlock near Port Discovery is the common western hemlock, *Tsuga heterophylla.* Possibly the phrase refers to Douglas fir and western hemlock, the two commonest species of conifers.

[21]Possibly the western white pine, *Pinus monticola;* although in several places in the Journal, Vancouver, like many another non-botanist, confuses pine with fir, and it may well be that he referred to the Sitka spruce, which has a somewhat "silvery" appearance.

[22]Probably *Populus trichocarpa.*

[23]*Thuja plicata.*

[24]*Taxus brevifolia,* the western yew, which ranges from British Columbia to California and Montana; perhaps most abundant on the Olympic Peninsula.

[25]There is only one species of oak on the Olympic Peninsula, the western post oak, *Quercus Garryana.* Like several other species of northwestern America, it was first noted by Vancouver or Menzies, but the types have been attributed to subsequent explorers. The type locality for *Quercus Garryana* is Vancouver, Washington, where it was collected by David Douglas in 1826.

[26]The only species of ash in Washington is *Fraxinus oregana.*

[27]*Corylus californica.*

[28]There are only three species of maple on the Peninsula, the large-leaf maple, *Acer macrophyllum,* vine maple, *Acer circinatum,* and the dwarf maple, *Acer glabrum.* The trees mentioned by Vancouver were certainly not seen by him at Port Discovery, or indeed anywhere else in western North America.

[29]*Arbutus Menziesii.*

[30]The only species of alder occurring in the vicinity of Port Discovery is the Red, or Oregon alder, *Alnus oregona.*

[31]Most likely *Salix Scouleriana,* the commonest willow of the region.

with the Canadian alder,[32] small fruited crab,[33] and Pensylvannia cherry trees,[34] constituted the forests, which may be considered rather as encumbered, than adorned, with underwood; although there were several places where, in its present state, the traveller might pass without being in the least incommoded, excepting by the undecayed trunks of trees which had fallen. Of esculent vegetables we found but few; the white or dead nettle,[35] and samphire,[36] were most common; the wild orache, vuglarly called fat-hen[37] with the vetch.[38] Two or three sorts of wild peas,[39] and the common hedge mustard,[40] were frequent though not always met with, and were considered by us as excellent of their kinds, and served to relish our salt provisions, on which, with a very scanty supply of fish, all hands subsisted. Amongst the more minute productions, Mr. Menzies found constant amusement, and, I believe, was enabled to make some addition to the catalogue of plants."

For forty-nine years after the visit of Vancouver and Menzies nothing was added to the scientific knowledge of the botany of the Olympic Peninsula[41] until the arrival of Dr. Charles Pickering and Mr. W. D. Brackenridge, members of the Wilkes Expedition under Commodore Wilkes, in 1841 (Torrey, 1874). From May 2nd to the 6th, 1841, the expedition was at Port Discovery. On May 3rd, Brackenridge accompanied by Pickering, went ashore and Brackenridge states:[42]

"I on this day for the first time saw *Mahonia fascicularis* & *Aquifolia,*[43] in their native habitat, *Calypso borealis*[44] was also very common in shady woods; with many more interesting Plants." On the following day

[32]See note 24.

[33]*Pyrus diversifolia.*

[34]*Prunus emarginata,* var. *mollis.*

[35]The identity of the "white or dead nettle" is a problem. Those vernacular names might refer to species of the European genus *Lamium,* but no such plant has ever been collected on the Olympic Peninsula.

[36]*Salicornia ambigua.*

[37]*Atriplex* sp.

[38]Possibly *Vicia gigantea.*

[39]*Lathyrus* spp., and/or *Lupinus* spp. *Lathyrus maritimus* is a common species on the beaches.

[40]Identity unknown, but almost certainly not *Sisymbrium officinale,* which was introduced many years later.

[41]No evidence is at hand to show that Dr. John Scouler should be included among the botanizers of the Olympic Peninsula. Returning to Fort Vancouver from Nootka the party sailed into the Strait of Juan de Fuca and anchored at Port Discovery on August 9, 1825, where they stayed until the 14th, apparently without Scouler's going ashore during that time. "As none of the boats ventured ashore I had no opportunity of examining the productions of the country." (Ladd, 1904). Port Discovery is the only place on the Olympic Peninsula where a stop was made.

[42]Brackenridge, William Dunlop, in the Brackenridge Journal for the Oregon Country, edited by O. B. Sperlin. *Washington Hist. Quarterly,* 1930-31. The botanical notes in this paper are very inaccurate, and must not be relied on. Also it should be noted that the pagination of the reprint is different from that of the original.

[43]*Berberis nervosa* and *B. Aquifolium.*

[44]*Calypso bulbosa.*

he made further botanical observations, and, in company with some Indians he collected *"Ribes sanguinea,*[45] another species with small scarlet flos[46]: somewhat like *R. speccosa,* 2 sp: of the *Bartsia,*[47] *Goodeyra* [*Goodyera*][48] *Abies Douglasii,*[49] with 2 other Spruces, one of which resembles the Hemlock spruce of the States. A few Maples[50] were found on the open banks, . . ."

For May 5, the following entry appears in the Journal: "Near the entrance to this bay [now called Washington Bay] on both sides are several open verdent banks affording a rich harvest to the Botanist: I have nowhere been so pleased with the beauty and variety of Flora, as here presented itself. *Dodecatheons,*[51] *Scilla*[52] (the Cammass of the Natives), *Viola, Leptosiphon,*[53] *Trifolium, Collinsia,*[54] *Claytonia, Geum, Stellaria, Fritillaria,*[55] *Erothronium,*[56] *Vicia,* &c &c. vied with each other in beauty, & we arrived just in season to see the spring flowers in all their splendour." On May 6, Pickering and Brackenridge went ashore at Port Townsend "but were soon recalled by a signal Gun from the Ship, which was getting under Weigh" to proceed up Puget Sound to Fort Nisqually, the Hudson's Bay Company's fort near the mouth of the Nisqually River, the first home of white men on Puget Sound (Meany, 1924, p. 190).

In July 1883 Thomas Meehan made a trip from Portland, Oregon, to Sitka, Alaska, stopping at various points along the coast. The only station on the Olympic Peninsula where collections were made was at Port Townsend where Mr. Meehan collected specimens of about 30 species. Most of these were common plants; the identities of some others were questionable, but through the courtesy of Dr. F. W. Pennell of the Philadelphia Academy of Natural Sciences it has been possible either to verify or correct these doubtful records.

Professor Louis F. Henderson, curator of the Herbarium of the Uni-

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[45]*Ribes sanguineum* Pursh.
[46]Flowers.
[47]*Castilleja* sp.
[48]*Peramium decipiens.*
[49]*Pseudotsuga taxifolia.*
[50]*Acer macrophyllum* or *A. circinatum.*
[51]Species doubtful; the only record for the lowland regions of the Olympic Peninsula is of *D. Hendersoni.*
[52]*Camassia Quamash.*
[53]Possibly *Gilia bicolor.*
[54]*Collinsia parviflora.*
[55]*Fritillaria lanceolata.*
[56]*Erythronium* sp., probably *E. revolutum.*
NOTE: Doctors George Suckley and James G. Cooper were naturalists and physicians attached to the Pacific Railroad Expedition under the direction of Isaac I. Stevens. They made collections in various parts of Washington from 1853 to 1855. Cooper collected at Shoalwater Bay [Willapa Harbor] but not, apparently, north of the Chehalis River on the Olympic Peninsula. Suckley collected a few specimens at Port Townsend in 1855.

versity of Oregon at Eugene, published the first list of plants of the Peninsula, and collected a set of specimens in 1890 near Lake Cushman and in the mountains to the westward. In his delightful account of the trip he lists nearly 500 species of flowering plants, as well as 70 bryophytes and 43 thallophytes. The following is a brief excerpt from Professor Henderson's report:

"I had thought that a pile of mountains so isolated, so nearly surrounded by water, must have a remarkable endemic, or peculiar flora. But in my wild expectations that new forms, if not new species or even new genera, would be peeping out from the crevices of every succeeding mass of rocks, smiling down upon me from every cliff, or being crushed by every other step upon those green, sunny banks, which always border the perpetual snows, I forgot, or perhaps would not remember, that the Olympic Mountains are but the gigantic and chaotic ending of the Black Hills and Coast Range; that they are but sixty miles distant from the Cascade Range; that birds have flown, that waters have carried, that winds have blown for ages past, as they are doing today, all assisting in the constant dissemination of seeds; that, lastly, the same glacial age acted upon the Olympic Mountains that did upon the Cascade Range, scattering and leaving a largely similar flora on both ranges as it disappeared toward the north. I might have found many treasures could I have stayed the whole summer with the party, which the limited time at my disposal forbade my finding. I might have found, had not a large collection made after my return by one of the soldiers been lost by some unaccountable means, that the flora is much more varied than I think it at present. Furthermore, it may be found that I am greatly mistaken in my statements, when more careful research shall have disclosed all that continuous pile of rocks holds within its inhospitable recesses, when several as energetic young explorers as Charles V. Piper of Seattle shall have gone over the ground as carefully as he did after my return this summer. I had hoped to excite envy in the breasts of many of my botanical friends by my rare 'finds'. I see on the table before me, as the result of my six weeks' 'cruise', two or three possibly new species. I had hoped to write a paper which should attract the notice of many scientific men to this flowery El Dorado; I find that I must content myself with the description of the flora trite in the extreme to those who are acquainted with the plants of the northwest." (Henderson, 1892.)

In the same year, Dr. Charles Vancouver Piper made collections up the Skokomish River to Mount Steele, and at Union on Hood Canal. He revisited the Olympic Mountains in 1895. Sets of his plants are in the herbaria of the State College of Washington at Pullman, and the University of Washington. The scientific results of Piper's botanical work on the Olympic Peninsula were included chiefly in the Flora of the State of Washington and in the Flora of the Northwest Coast.

Mr. F. Binns of Tacoma collected plants from 1888 to 1890 about Port Ludlow, and sent them to the Gray Herbarium.

Professor Trevor Kincaid, professor of zoology at the University of Washington, collected along the Skokomish River in 1892. His specimens are at Seattle and Pullman.

Mr. John M. Grant was a resident of the Olympic Peninsula from 1889 until 1919. His collections were made intermittently during that time at or near Port Angeles, Sequim, along the south shore of the Straits of de Fuca, and along the ocean coast as far south as the mouth of the Quillayute River. Many specimens marked "Olympic Mountains" came

from low elevations near Sequim. In 1915, he moved to the Grays Harbor region and for the next four years devoted a good deal of time to collecting in the valleys of the Wynoochee and Chehalis rivers, with occasional trips to the marshes near the mouth of the Chehalis River, and as far north as the mouth of the Quinault River and about the shores of Lake Quinault. His specimens have been distributed to various herbaria; some are in the State College Herbarium at Pullman, and in the Herbarium of the University of Washington.[57]

In 1897, Mr. J. B. Flett of Bremerton, Washington, made his first journey into the Olympic Mountains up the Quilcene River to its source, and over the divide to the headquarters of the Dungeness River, and in 1898 he revisited the same places. Many of his specimens labelled "Olympic Mountains" were collected at these localities. In 1907 he went to Mt. Olympus and Mt. Barnes with the Seattle & Tacoma Mountaineers. Among the specimens collected on the expeditions of 1897 and 1898, were a number of new species, two of which were described by Wiegand as *Allium crenulatum* and *Senecio Flettii,* and two others, *Viola Flettii* and *Synthyris lanuginosa,* were described by Piper. On the 1907 trip to Mt. Olympus, Flett discovered *Arabis olympica* Piper, the only species known to be endemic to Mt. Olympus.

In 1897, Mr. F. H. Lamb of Hoquiam, then a student at Stanford University under Professor W. R. Dudley, made some extensive explorations of the Olympic Peninsula in the vicinity of Hoquiam, and on the southern and western slopes of the adjacent Olympic Mountains in the vicinity of Lake Quinault. The specimens were named by Piper, who was at that time professor of botany at the State College of Washington at Pullman. The collections were sent to Stanford University and later were distributed to some fifteen or twenty of the leading herbaria of the world. In 1899 Mr. Lamb went into business at Hoquiam and since that time has done no further botanical work.

Dr. A. A. Heller of Chico, California, collected in the vicinity of Montesano in 1898. Sets of his plants are in the leading herbaria.

In 1900, Mr. A. D. E. Elmer of Manila, Philippine Islands, made a large collection in Clallam County.

Professor F. E. Lloyd of McGill University, Canada, collected on the east side of the Peninsula during the summer of 1896 or 1897. His specimens are in the Herbarium of the New York Botanical Garden.

Professor N. L. Gardner of the University of California collected a few specimens near the Quilcene River in 1898.

Miss Jennie V. Getty collected on Mt. Ellinor and vicinity in 1902.

[57]For a brief account of the life and work of J. M. Grant see *Wash. Hist. Quarterly* 26: 311-312, 1935.

For the last thirty years, Mr. E. B. Webster of Port Angeles, has been exploring the mountains. *Senecio Websteri* Greenm. commemorates his activities.

Dr. Henry C. Conard of Grinnell College, Iowa, botanized on the Quinault Indian Reservation in 1903. He briefly describes his itinerary as follows: " . . . Logging was not more than five miles out from Hoquiam. The rest was primeval forest, except for a big burn about half way between Humptulips and Quinault. We got a few plants at Humptulips, but stayed three or four weeks at Quinault P. O., on the south shore of Lake Quinault. We worked mostly around the lake. We once ascended Mt. Baldy. We went by wagon from Hoquiam to Humptulips, by pack horse to Quinault, by canoe across the lake, on foot where there was only a foot trail from the lake to Evergreen on the Queets River, down that river by canoe, and on foot down the beach from Queets to Grenville at the mouth of the Quinault River. We were there about a week, visiting Chabot's cranberry bog a few miles south at Copalis. Then down the beach by wagon to Oyhut and by boat back to Hoquiam . . . . "

In 1921, Dr. H. St. John, now Professor of Botany at the University of Hawaii, in company with Dr. Walter P. Taylor, Mr. George Cantwell, and Dr. William T. Shaw, made a collecting trip into the Olympic Mountains. Collections of plants were made in or near Canyon Creek Basin, along Cat Creek, and on Mt. Olympus, and Mt. Carrie. Later in the same season Dr. St. John visited Port Discovery Bay and Washington Harbor. In the summer of 1925, with Professor Charles Schweinfurth, Dr. St. John made his second trip to the Peninsula, and visited Lake Cushman, La Push, Clallam Bay, and Dungeness. Sets of specimens have been distributed to various herbaria.

Mr. A. B. Reagan, in 1921, collected a number of plants at Lapush and elsewhere. The specimens are at Pullman.

Since 1927, Mr. Ira C. Otis of Seattle has collected a number of very excellent specimens in western Clallam and Jefferson counties and elsewhere on the Peninsula. Sets of his collections are in the herbaria of the State College and of the University of Washington.

Mr. and Mrs. J. R. Leach of Portland, Oregon, made a short trip into the mountains in 1928. Some of their specimens are at the University of Oregon; others are in the State College Herbarium at Pullman, and in their private herbarium at Portland, Oregon.

Since 1930, Mr. J. William Thompson of Seattle has made several collecting trips to various parts of the Olympic Peninsula. His collections include several new locality records, among which may be mentioned *Ran-*

unculus Cooleyae, the first record for the United States, also a new species of *Erigeron,* described by Dr. S. F. Blake as *E. Thompsoni.* No attempt has been made in the Annotated Catalogue to list all Mr. Thompson's numerous collections from the Olympic Peninsula. Only those which constitute new locality records are included.

Several other persons have made smaller collections of plants on the Peninsula, and their names appear in the list in association with the plants they collected.

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ANNOTATED CATALOGUE OF VASCULAR PLANTS

In the following annotated list of vascular plants which occur on the Olympic Peninsula, the indigenous species are indicated by capital letters, introduced or adventive species in italics, new names or combinations of names in bold face, and doubtful or discredited records are included in brackets. Synonyms are given in italics, and since the object is to correlate the names in this list with those in Piper's *Flora of Washington,* and the *Flora of the Northwest Coast,* they are included only when there is some need for them. The place of publication of new names or combinations of names that have been published since the appearance of the *Flora of the Northwest Coast* in 1915 are given in full. Zonal distribution is stated for all those species for which it is known. The life-form of each species according to the Raunkiaer system is indicated by the appropriate symbol. The writer's concept of the taxonomic categories involved in the subsequent treatment may be illustrated by the following quotations from Du Rietz (1930b): *Species* are the smallest natural groups of individuals permanently separated from each other by a distinct discontinuity in the series of biotypes. The limits between species may be formed either by geographical or by merely physiological isolation. A *variety* is a population of one or several biotypes, forming a more or less distinct local facies of a species. A *form* is a population of one or several biotypes occurring sporadically in a species-population (not forming distinct regional or local facies of it) and differing from the other biotypes of this species-population in one or several distinct characters.

With one or two exceptions the sequence of the families is that of Engler & Gilg's *Syllabus der Pflanzenfamilien* (9th & 10th editions).

KEY TO THE FAMILIES

FERNS AND FERN-ALLIES; plants without flowers or seeds but reproducing by spores which are borne in sporangia. (*Pteridophyta*)

Leaves usually broad, fern-like, petiolate, often compound, with free (rarely netted) venation.

Sporangia sessile, borne in a stalked terminal spike or loose panicle; annulus none ..... 1. *Ophioglossaceae*, 86

Sporangia stalked, borne in clusters on the margins or lower surface of foliar or special leaves; annulus present ..... 2. *Polypodiaceae*, 87

Leaves narrow, small, sessile, subulate or linear, 1-veined; rush-like or moss-like plants.

Leaves whorled, reduced to toothed sheaths; stems usually hollow, conspicuously jointed; sporophores with more than one sporangium ..... 3. *Equisetaceae*, 92

Leaves not whorled (in our species); stems solid, not conspicuously jointed; sporophylls with a single adaxial sporangium.....
Stems short, thick, corm-like; leaves in a basal tuft; plants aquatic or growing in wet places..... 4. *Isoetaceae*, 93
Stems elongated, leafy; plants terrestrial.
Spores uniform (homosporous); ligule wanting..... 5. *Lycopodiaceae*, 93
Spores of two kinds (heterosporous); ligule present.. 6. *Selaginellaceae*, 93

"FLOWERING PLANTS" reproducing by seeds. (*Spermatophyta*)
Ovules and seeds borne on the surface of a naked scale; stigma none; fruit a cone or berry-like; leaves needle-like, linear, or scale-like, usually evergreen. (*Gymnospermae*)
Fruit berry-like, red, 1-seeded..... 7. *Taxaceae*, 94
Fruit a woody cone, or 1-3- seeded, bluish, berry-like.. 8. *Pinaceae*, 94
Ovules and seeds in an ovary; stigmas 1 or more. (*Angiospermae*)
Leaves usually netted-veined; flower parts almost never in 3's; embryo with 2 cotyledons..... Section 1, 83
Leaves usually parallel-veined; flower parts usually in 3's; cotyledon 1.
Corolla or perianth lacking; carpels 1-many, distinct (or only partially united).
Plants with true stems and leaves.
Inflorescence not a spadix; spathe none.
Flowers not in the axils of chaffy bracts.
Perianth of bristles or scales; emersed marsh plants with monoecious flowers.
Flowers in a dense cylindrical spike..... 9. *Typhaceae*, 98
Flowers in dense globose heads..... 10. *Sparganiaceae*, 98
Perianth herbaceous or lacking.
Immersed aquatics..... 11. *Naiadaceae*, 98
Emersed marsh plants..... 12. *Scheuchzeriaceae*, 100
Flowers in the axils of chaffy bracts.
Stems round, usually hollow, except at the nodes; fruit a grain..... 13. *Gramineae*, 100
Stems usually 3-angled, if round, solid; fruit an achene..... 14. *Cyperaceae*, 114
Inflorescence a spadix, with a spathe..... 15. *Araceae*, 123
Plants very small, free-floating, without stems and leaves..... 16. *Lemnaceae*, 123
Corolla or perianth present; carpels united into a compound ovary.
Perianth chaffy; plants rush-like; fruit a capsule.... 17. *Juncaceae*, 123
Perianth colored, petaloid.
Ovary superior (rarely ½ inferior); flowers regular..... 18. *Liliaceae*, 127
Ovary completely inferior.
Flowers regular; leaves equitant..... 19. *Iridaceae*, 132
Flowers irregular..... 20. *Orchidaceae*, 133

Section 1.

Petals present ..... Section 2, 84
Petals none (sepals sometimes petaloid).
  Plants parasitic on trees ..... 26. *Loranthaceae*, 139
  Plants not parasitic on trees.
    Shrubs or trees.
      Leaves alternate.
        Flowers (at least the staminate) in catkins.
          Calyx none.
            Fruit a many-seeded capsule ..... 21. *Salicaceae*, 136
            Fruit a 1-seeded waxy drupe ..... 22. *Myricaceae*, 138
          Calyx present.
            Both staminate and pistillate flowers in catkins 23. *Betulaceae*, 138
            Only the staminate flowers in catkins ..... 24. *Fagaceae*, 138
        Flowers not in catkins.
          Plants heath-like with linear leaves ..... 64. *Empetraceae*, 211
          Plants not heath-like; leaves broad ..... 51. *Rhamnaceae*, 191
      Leaves opposite.
        Leaves scurfy; ovary 1-celled, inferior ..... 57. *Elaeagnaceae*, 194
        Leaves not scurfy; ovary 2-celled, superior ..... 67. *Oleaceae*, 212
    Herbs.
      Leaves alternate or basal (or reduced to scales).
        Ovary inferior; calyx 3-lobed; leaves cordate ..... 27. *Aristolochiaceae*, 139
        Ovary superior.
          Stamens perigynous ..... 42. *Rosaceae*, 172
          Stamens hypogynous.
            Pistils more than 1 ..... 34. *Ranunculaceae*, 150
            Pistil 1.
              Calyx none; leaves trifoliolate ..... 35. *Berberidaceae*, 155
              Calyx present.
                Saprophytes; leaves reduced ..... 63. *Ericaceae*, 205
                Holophytes; leaves normal.
                  Stamens of a definite number (1-19).
                    Style or stigma 1; fruit a pod; sepals 4 38. *Cruciferae*, 156
                    Styles or stigmas 2-3.
                      Fruit an achene, usually trigonal .. 28. *Polygonaceae*, 139
                      Fruit a utricle ..... 29. *Chenopodiaceae*, 142
                  Stamens numerous ..... 34. *Ranunculaceae*, 150
      Leaves opposite or chiefly so, or whorled.
        Ovary inferior; leaved whorled ..... 59. *Haloragidaceae*, 198
        Ovary superior; leaves not whorled.
          Flowers monoecious.
            Herbage with stinging hairs; sepals 4; stamens 4 ..... 25. *Urticaceae*, 139
            Herbage smooth; sepals 0; stamen 1 ..... 46. *Callitrichaceae*, 190
          Flowers perfect.
            Style 1; calyx petaloid; leaves entire.
              Stamens hypogynous; fruit an achene ..... 30. *Nyctaginaceae*, 143
              Stamens on the calyx; fruit a capsule ..... 65. *Primulaceae*, 211
            Styles 2-4; calyx not petaloid; fruit a capsule.
              Stamens on a conspicuous disk; leaves crenate ..... 41. *Saxifragaceae*, 164
              Stamens hypogynous; leaves entire ..... 32. *Caryophyllaceae*, 145

Section 2.

Petals more or less united, at least at the base..... Section 4, 85
Petals separate to the base.
  Ovary inferior (rarely only ½ inferior)..... Section 3, 85
  Ovary superior.
    Stamens hypogynous.
      Stamens more than 10.
        Pistils 2-many, separate (1 in *Actaea*)
          Leaves peltate..... 33. *Nymphaeaceae*, 149
          Leaves not peltate..... 34. *Ranunculaceae*, 150
        Pistil 1.
          Petals 10-20; aquatic plants..... 33. *Nymphaeaceae*, 149
          Petals 4 or 5.
            Petals 4; leaves alternate..... 36. *Papaveraceae*, 155
            Petals 5.
              Leaves opposite, punctate..... 52. *Hypericaceae*, 192
              Leaves alternate, not punctate..... 53. *Malvaceae*, 192
      Stamens 10 or fewer.
        Flowers regular (actinomorphic).
          Pistils more than 1.
            Pistils distinct.
              Pistils more numerous than the sepals or petals..... 34. *Ranunculaceae*, 150
              Pistils of the same number as or fewer than the sepals or petals.
                Pistils of the same number as the sepals and petals..... 40. *Crassulaceae*, 163
                Pistils fewer than the sepals and petals.... 41. *Saxifragaceae*, 164
            Pistils more or less united.
              Leaves entire, punctate..... 52. *Hypericaceae*, 192
              Leaves neither entire nor punctate..... 44. *Geraniaceae*, 189
          Pistil 1.
            Ovary 1-celled.
              Sepals 2..... 31. *Portulacaceae*, 143
              Sepals 4-6.
                Petals 4-5; styles or stigmas 2-5.
                  Leaves opposite, entire..... 32. *Caryophyllaceae*, 145
                  Leaves basal or alternate.
                    Leaves with sticky capitate, glandular hairs..... 39. *Droseraceae*, 163
                    Leaves not glandular.
                      Stamens alternate with the petals.. 41. *Saxifragaceae*, 164
                      Stamens opposite the petals..... 66. *Plumbaginaceae*, 212
                Petals, sepals, stamens 6; style 1..... 35. *Berberidaceae*, 155
            Ovary 2-several-celled.
              Styles 3-5.
                Leaves opposite, simple..... 54. *Elatinaceae*, 193
                Leaves alternate or basal, trifoliolate..... 45. *Oxalidaceae*, 190
              Style 1.
                Petals 4; sepals 4; stamens 6..... 38. *Cruciferae*, 156
                Petals 5; sepals 6; stamens 8-10..... 63. *Ericaceae*, 205
        Flowers irregular (zygomorphic).
          Ovary 1-celled.
            Flowers papilionaceous; sepals 5; petals 5..... 43. *Leguminosae*, 182
            Flowers spurred.
              Stamens numerous; petals 4; sepals 5..... 34. *Ranunculaceae*, 150
              Stamens 5 or 6.
                Stamens 6; petals 4; sepals 2 or 4..... 37. *Fumariaceae*, 155
                Stamens, petals, sepals 5..... 55. *Violaceae*, 193
          Ovary 5-celled; stamens 5; sepals usually 3; petals 5 or 3, the lateral united..... 50. *Balsaminaceae*, 191

Stamens perigynous.
Stamens borne on a disk; trees or shrubs.
Stamens as many as the petals and opposite them.
Leaves opposite; fruit a samara..... 49. *Aceraceae*, 191
Leaves alternate; fruit a drupe or capsule.... 51. *Rhamnaceae*, 191
Stamens as many as (or more than) the petals and alternate with them.
Ovary 1-celled; leaves, in our species, compound..... 47. *Anacardiaceae*, 190
Ovary 2-5-celled; leaves, in our species, simple 48. *Celastraceae*, 190
Stamens borne on the base of the calyx.
Stipules present..... 42. *Rosaceae*, 172
Stipules usually lacking..... 41. *Saxifragaceae*, 164

Section 3.

Trees or shrubs.
Leaves opposite.
Stamens numerous..... 41. *Saxifragaceae*, 164
Stamens 4..... 62. *Cornaceae*, 204
Leaves alternate.
Stamens numerous..... 42. *Rosaceae*, 172
Stamens 5.
Style 1..... 51. *Rhamnaceae*, 191
Styles 2 or 5.
Styles 2 ..... 41. *Saxifragaceae*, 164
Styles 5..... 60. *Araliaceae*, 199
Herbs.
Flowers in umbels; stamens and petals 5..... 61. *Umbelliferae*, 199
Flowers not in umbels.
Styles or stigmas 2-5..... 41. *Saxifragaceae*, 164
Style 1.
Petals 4 or 2.
Stamens twice as many as the petals (except *Circaea*)..... 58. *Onagraceae*, 195
Stamens as many as the petals..... 62. *Cornaceae*, 204
Petals and stamens numerous; spiny succulent plants. 56. *Cactaceae*, 194

Section 4.

Stamens more than 5.
Flowers papilionaceous; ovary 1-celled..... 43. *Leguminosae*, 182
Flowers not papilionaceous.
Ovary 1-celled; leaves compound..... 37. *Fumariaceae*, 155
Ovary 3-many-celled; leaves simple..... 63. *Ericaceae*, 205
Stamens 5 or less, (rarely 6); epipetalous.
Ovary inferior..... Section 5, 86
Ovary superior.
Corolla regular (strictly actinomorphic).
Stamens as many as the corolla lobes and opposite them.
Style 1..... 65. *Primulaceae*, 211
Styles 5..... 66. *Plumbaginaceae*, 212
Stamens as many as or fewer than the corolla lobes and alternate with them.
Corolla colored, not dry-scarious.
Pistils 2 (the ovaries distinct but the styles or stigmas united); herbs with milky juice..... 69. *Apocynaceae*, 214
Pistil 1 (sometimes lobed).
Ovary 1-, 2-, or 3-celled.
Style 3-cleft; ovary 3-celled; petals, sepals, stamens 5..... 71. *Polemoniaceae*, 215

Style not 3-cleft.
Sepals 5, distinct.
Plants erect or diffuse..... 72. *Hydrophyllaceae*, 217
Plants twining or trailing..... 70. *Convolvulaceae*, 214
Calyx 4-5-lobed or -cleft.
Leaves alternate; ovary 2-celled..... 75. *Solanaceae*, 224
Leaves opposite or all basal; ovary 1-celled..... 68. *Gentianaceae*, 213
Ovary 4-celled, usually 4-lobed; style 1; leaves alternate, entire..... 73. *Boraginaceae*, 219
Corolla scarious; stamens 2 or 4, exserted; style 1; leaves basal..... 79. *Plantaginaceae*, 233
Corolla from strongly 2-lipped to slightly irregular.
Fruit of 2-4 nutlets; leaves opposite; stems square; herbage with mint odor..... 74. *Labiatae*, 221
Fruit a capsule.
Ovary and fruit 2-celled..... 76. *Scrophulariaceae*, 224
Ovary and fruit 1-celled.
Stamens 2; corolla spurred..... 78. *Lentibulariaceae*, 233
Stamens 4; root parasites..... 77. *Orobanchaceae*, 233

Section 5.

Stamens distinct (anthers united in *Lobelia*).
Leaves opposite or whorled.
Stamens as many as the corolla lobes and alternate with them (one fewer in *Linnaea*).
Herbs; leaves whorled (in our species)..... 80. *Rubiaceae*, 234
Shrubs, sometimes climbing; leaves opposite..... 81. *Caprifoliaceae*, 235
Stamens fewer than the corolla lobes; leaves opposite.
Flowers not in involucrate heads; stamens 3..... 82. *Valerianaceae*, 237
Flowers in dense, involucrate heads; stamens 4..... 83. *Dipsacaceae*, 237
Leaves alternate.
Flowers monoecious or dioecious; plants climbing with tendrils..... 84. *Curcurbitaceae*, 238
Flowers perfect; plants not climbing; tendrils none..... 85. *Campanulaceae*, 238
Stamens united in a tube around the style; corolla irregular; flowers in a dense head surrounded by an involucre..... 86. *Compositae*, 239

Phylum PTERIDOPHYTA. Ferns and Fern-allies

1. OPHIOGLOSSACEAE. Adder's-tongue Family

Sterile blade simple, entire; veins reticulate..... 1. *Ophioglossum*.
Sterile blade pinnately divided; veins free..... 2. *Botrychium*.

1. OPHIOGLOSSUM. Adder's-tongue

1. O. VULGATUM L. Lake Cushman, *St.John & Schweinfurth* 5152. Humid Transition. (H)

2. BOTRYCHIUM. Grape Fern

Segments of the sterile blade lunate or reniform..... 1. *B. Lunaria.*
Segments of the sterile blade lanceolate or ovate.
Segments acute..... 2. *B. lanceolatum.*
Segments obtuse..... 3. *B. silaifolium.*

1. B. LUNARIA (L.) Sw. (*B. Lunaria,* var. *onandagense* (Underw.) House, Bull. N. Y. State Mus. 254: 13, 1924; *B. onandagense* Underw.) Olympic Mountains, at the foot of Mt. Steele, *Piper* 928; Mt. Constance, *Thompson* 9950. Reagan (1923) reports this species to be "Common in the Olympic Mountains," but all the available evidence indicates that, on the contrary, it is a rare fern. (H)

2. B. LANCEOLATUM (S.G.Gmel.) Ångstr. Near Mt. Olympus, *Flett* 3091. According to Flett the exact locality is on Mt. Barnes, not far from where the Elwha River comes from the ice of the Elwha Glacier. At this place the species is abundant in a limited area. (H)

3. B. SILAIFOLIUM Presl. Wet thickets and meadows. Lake Cushman, *Henderson* 1852, *St.John & Schweinfurth* 5154; Blyn, *Otis* 1591; Skokomish River, *J. Schwartz* in 1933; Deer Lake, *Jones* 5953. Humid Transition to Hudsonian. (H)

2. POLYPODIACEAE. Fern Family

Leaves (in our species) simple and deeply pinnately lobed, or once pinnately compound, evergreen.
- Leaflets with bristle-tipped teeth; leaves tufted ..... 4. *Polystichum.*
- Leaflets or leaf-lobes without bristle-tipped teeth.
  - Leaves simple or practically so, the divisions confluent at the base.
    - Leaves in a close tuft or rosette, the spore-bearing ones different, erect; plants growing in wet soil in woods ..... 13. *Struthiopteris.*
    - Leaves not closely tufted, arising singly from a rhizome; leaves all alike; plants usually growing on tree-trunks, logs, or rocks ..... 3. *Polypodium*
  - Leaves 1-pinnate; small tufted ferns growing among rocks ..... 6. *Asplenium.*

Leaves 2-3-pinnately compound.
- Leaves large, solitary, 20-60 cm. wide, ternately divided with pinnate branches and sessile lobes which are pubescent beneath.. 10. *Pteridium.*
- Leaves narrower, usually tufted.
  - Leaves pedate, the leaf-stalks forked at the summit (in our species) dark brown, glossy ..... 9. *Adiantum.*
  - Leaves pinnate; leaf-stalks simple.
    - Leaves with a whitish or yellowish powder beneath ..... 8. *Pityrogramma.*
    - Leaves not powdery beneath.
      - Leaves of two kinds, the fertile ones taller and with narrower divisions ..... 12. *Cryptogramma.*
      - Leaves all alike or nearly so.
        - Leaf-stalks dark brown or nearly black, smooth and glossy; small, tufted, rock-ferns ..... 11. *Cheilanthes.*
        - Leaf-stalks green or pale brown, often somewhat chaffy.
          - Leaf-blades widest near the base ..... 5. *Dryopteris.*
          - Leaf-blades widest near the middle.
            - Leaves glabrous.
              - Leaves usually 30-200 cm. long ..... 7. *Athyrium.*
              - Leaves usually 10-25 cm. long ..... 2. *Cystopteris.*
            - Leaves 10-20 cm. long, sparsely pubescent with whitish hairs and stalked glands (in our species) 1. *Woodsia.*

1. WOODSIA

1. W. SCOPULINA D.C.Eaton. In crevices of rocks, rare. Hurricane Ridge, *Jones* 3235; Mt. Angeles, *Jones* 3310. Known otherwise west of the Cascade Mountains only from Mt. Constitution on Orcas Island, Cape Horn in Skamania County, Mt. Baker in Whatcom County, Washington, and Victoria, British Columbia. (H)

2. CYSTOPTERIS

1. C. FRAGILIS (L.) Bernh. *(Filix fragilis* (L.) Gilib.) On cliffs and mossy rocks. Clallam County, *Elmer* 2812; Crystal Creek, *Jones* 8432; Mt. Angeles, *Thompson* 5479, 7448; Mt. Colonel Bob, *Thompson* 6246; Lake Constance, *Thompson* 7909. Hudsonian. (H)

This species is reported by Reagan (1923) from "the upper Soleduck River region, also in the upper Bogachiel country."

3. POLYPODIUM. Polypody

Leaves thick and leathery, the blades deltoid-ovate in outline, with 2-14 pairs of linear-oblong, obtuse, crenate lobes; sori 3-4 mm. broad ..... 1. *P. Scouleri.*
Leaves thinner, herbaceous, the blades lanceolate or oblong; sori 1-2 mm. broad.
  Leaves 15-50 cm. long, with 10-35 pairs of lanceolate, attenuate or acute, usually serrulate lobes ..... 2. *P. vulgare.*
  Leaves 5-20 cm. long, with 7-15 pairs of oblong, obtuse, crenate or entire lobes ..... 2a. var. *columbianum.*

1. P. SCOULERI Hook. & Grev. On mossy tree-trunks and cliffs. Grenville, *Conard* 320; James Island, *Jones* 3427; Taholah, *Thompson* 9332; Copalis, *Thompson* 6273; Waaddah Island, *Rigg,* July 20, 1934. Humid Transition. (Cr)

2. P. VULGARE L. (*P. vulgare,* var. *occidentale* Hook.; *P. falcatum* Kellogg; *P. Glycyrrhiza* D.C.Eaton; *P. vulgare,* var. *commune* Milde; *P. occidentale* (Hook.) Maxon) On mossy logs, tree trunks, and rocks, common. Quinault Valley, *Conard* 107; Port Ludlow, *Binns,* in 1888; Clallam County, *Elmer* 2811; Lake Crescent, *Jones* 3597; Elwha River, *Jones* 3137; Mt. Angeles, *Thompson* 5507; Mt. Baldy, *Thompson* 6240; Beaver Creek, *Jones* 4540; Clallam Bay, *Jones* 5845; Canyon Creek, *Jones* 5912, 8365. Humid Transition and Canadian. (Cr)

2a. Var. COLUMBIANUM Gilb. *(P. hesperium* Maxon) In crevices of rocks. Olympic Mountains, *Piper* in 1895; Mt. Baldy, *Conard* 288; Mt. Olympus, *Flett* 3090; near Humes Glacier, *Frye* in 1907; Mt. Angeles, *Webster* in 1908, *Jones* 3304; Hurricane Ridge, *Jones* 4019; Constance Ridge, *Jones* 5779. Chiefly Hudsonian. (Cr)

Fig. A. Lady Fern, *Athyrium Filix-femina.*

Photos by Robert Tschudy

Fig. B. *Erythronium oregonum.*

4. POLYSTICHUM

Leaflets deltoid-lanceolate to oblong-lanceolate, unevenly serrate-dentate with the teeth spreading-spinulose..... 1. *P. Lonchitis.*
Leaflets linear-lanceolate.
  Leaflets serrate to incised but not pinnately lobed at the base; leaves not proliferous.
    Margins simply serrate.
      Leaflets spreading, acuminate..... 2. *P. munitum.*
      Leaflets ascending, crowded, obliquely imbricated, acute, cuspidate..... 2a. var. *imbricans.*
    Margins deeply biserrate to incised..... 2b. var. *inciso-serratum.*
  Leaflets pinnately lobed to pinnatifid at the base, lobed and deeply spinulose-serrate above; leaves usually with a proliferous bud below the tip..... 3. *P. Andersoni.*

1. P. LONCHITIS (L.) Roth. Olympic Mountains, *Piper,* August 1895; Crystal Creek, *Jones* 8433; Mt. Angeles, *Thompson* 5526; Marmot Pass, *Thompson* 9924; Mt. Colonel Bob, *Thompson* 7254; Lake Constance, *Thompson* 7895. Arctic and Hudsonian. (H)

2. P. MUNITUM (Kaulf.) Presl. Port Discovery, *St.John* 5849; Duckabush River, *Jones* 3067; Clallam County, *Elmer* 2808; Montesano, *Heller* 4035; Canyon Creek, *St.John* 4773; Quilcene, *Beattie* 3645; Quinault, *Conard* 114; Lake Crescent, *Jones* 3483; Mt. Angeles, *Thompson* 7564, 7503, 7561; trail to Constance Ridge, *Jones* 5856; Hoh River, *Otis* 1363. Humid Transition. (H)

2a. Var. IMBRICANS (D.C.Eaton) Maxon. Clallam County, *Elmer* 2815; Olympic Mountains, *Flett;* Lake Crescent, *English* 2209. Humid Transition. (H)

2b. Var. INCISO-SERRATUM (D.C.Eaton) Maxon. *(P. munitum,* f. *inciso-serratum* St.John, Proc. Biol. Soc. Wash. 41: 191, 1928.) Hoh River, *Otis* 1315, 1371, 1294. Not otherwise known in Washington but it extends southward along the coast to California. Humid Transition. (H)

3. P. ANDERSONI Hopkins. On moist, shaded slopes, particularly in alder thickets. Elwha Basin, *Flett,* August 9, 1907; Mt. Colonel Bob, *Thompson* 9964, 7276. Reported by Flett (1907) as *P. californicum,* var. *aculeatum.* Lower Hudsonian. (H)

5. DRYOPTERIS. Shield Fern

Leaf-segments with mucronate teeth; leaves tufted, longer than broad; leaf-stalks chaffy; rhizome stout; indusium present..... 1. *D. dilatata.*
Leaf-segments obtuse, entire to crenate; leaves solitary, nearly equilateral; leaf-stalks not chaffy except toward the base; rhizome slender; indusium lacking..... 2. *D. Linnaeana.*

1. D. DILATATA (Hoffm.) Gray. *(Dryopteris spinulosa dilatata* (Hoffm.) Underw.; *Thelypteris dilatata* (Hoffm.) House, N. Y. State

Mus. Bull. 233-234: 69, 1921.) Clallam County, *Elmer* 2804; Montesano, *Heller* 3919; Lake Cushman, *Henderson* 1206; Skokomish Valley, *Kincaid,* May 17, 1892; Lake Crescent, *Jones* 3431; Mt. Angeles, *Thompson* 5506; Dosewallips River, *Jones* 5851; Hoh River, *Otis* 1376, 1364; Canyon Creek, *Jones* 8364. Humid Transition and Canadian. (Cr)

2. D. LINNAEANA C.Chr. (*Phegopteris Dryopteris* (L.) Fée; *Thelypteris Dryopteris* (L.) Slosson; *Dryopteris Dryopteris* (L.) Christ.) Port Ludlow, *Binns,* July 18, 1889; Clallam County, *Elmer* 2813; Mt. Angeles, *Thompson* 5484, 7833; Dosewallips River, *Jones* 5891; Canyon Creek, *Jones* 8363. Canadian and Humid Transition. (Cr)

6. ASPLENIUM. Spleenwort

Rachis dark brown, glossy ..... 1. *A. Trichomanes.*
Rachis green, dull ..... 2. *A. viride.*

1. A. TRICHOMANES L. In crevices of rocks. Quinault, *Conard* 220; Mt. Colonel Bob, *Thompson* 9398; Mt. Baldy, *Thompson* 6239. Humid Transition. (H)

2. A. VIRIDE Huds. In crevices of rocks. Mt. Angeles, *Thompson* 5480, 7437; Marmot Pass, *Thompson* 9899; Lake Constance, *Thompson* 7911. Hudsonian or Arctic-alpine. (H)

7. ATHYRIUM

Lowland or submontane; indusia present; pinnules sessile ..... 1. *A. Filix-femina.*
Alpine; indusia not evident; pinnules short-stalked, cuneate at base. 2. *A. americanum.*

1. A. FILIX-FEMINA (L.) Roth. (*A. cyclosorum* Rupr.; *A. Filix-femina* (L.) Roth, var. *sitchense* Rupr.) Common Lady Fern. Swampy ground in woods, common. Quinault, *Conard* 154; Hoquiam, *Jones* 5820; Dosewallips River, *Jones* 5852; Nolan Creek, *Otis* 1375. Humid Transition. (H)

2. A. AMERICANUM (Butters) Maxon, Am. Fern Journ. 8: 120, 1918. (*Phegopteris alpestris* of Fl. Wash.) Alpine Lady Fern. Among rocks at high altitudes. Clallam County, *Elmer* 2806; Olympic Mountains, *Piper,* August 1895; Mt. Anderson, *Davison,* August 31, 1928; Mt. Colonel Bob, *Thompson* 7282; Mt. Angeles, *Flett,* August 1911; Seven Lakes Basin, *Jones* 8317. Arctic-alpine. (H)

8. PITYROGRAMMA

1. P. TRIANGULARIS (Kaulf.) Maxon. (*Ceropteris triangularis* Underw.) Gold-back Fern. On shaded, rocky slopes, rare. Near Port Angeles, *Flett.* Common on Mt. Storm King, according to Flett. (H)

9. ADIANTUM. Maidenhair Fern

1. A. PEDATUM L., var. ALEUTICUM Rupr. On wet, shaded banks and cliffs. Clallam County, *Elmer* 2809; Canyon Creek, *St.John* 4775; Dosewallips River, *Jones* 5893. Humid Transition and Canadian. (Cr)

Specimens of the Maidenhair Fern from the Olympic Peninsula are to be referred to the var. *aleuticum,* which, according to a comparison of topotype material, shows the rachis of each pinna usually somewhat obscured by the slightly overlapping pinnules which are deeply and unevenly toothed or cleft at the tips. It thus differs from typical *A. pedatum* from eastern North America, to which it gradually passes. This has the rachis of each pinna more or less distinct and the tips of the pinnules with rounded teeth or shallower obtuse lobes.

10. PTERIDIUM. Brake Fern, Bracken

1. P. AQUILINUM (L.) Kuhn, var. LANUGINOSUM (Bong.) Fern., Rhodora 37: 247, 1935. *(P. aquilinum,* var. *pubescens* Underw.) Abundant in dry open woods; particularly luxuriant on Quillayute Prairie, where it attains a height of 2-3 meters. Relatively rare in the Canadian zone, but not uncommon on dry, open hillsides in the Hudsonian. Forks Prairie and Lapush, *Reagan;* Lake Crescent, *Jones* 3510; Quinault, *Conard* 159; Seven Lakes Basin, *Jones* 8280. Transition to Hudsonian. (Cr)

11. CHEILANTHES

Leaves glabrous ..... 1. *C. densa.*
Leaf-segments densely tomentose beneath..... 2. *C. gracillima.*

1. C. DENSA (Brack.) St.John, Am. Fern Journ. 19: 14, 1929. *(C. siliquosa* Maxon, Am. Fern Journ. 8: 116, 1918; *Pellaea densa* (Brack.) Hook.; *Cryptogramma densa* (Brack.) Diels.) Oregon Cliff-brake. In crevices of rocks, rare. Clallam County, *Elmer* 2810. Hudsonian. (H)

2. C. GRACILLIMA D.C.Eaton. Lace Fern. On dry cliffs. Clallam County, *Elmer* 2814; Olympic Mountains, *Piper* 1054; Mt. Angeles, *Thompson* 7460. Hudsonian. (H)

12. CRYPTOGRAMMA

1. C. ACROSTICHOIDES R.Br. Parsley Fern. On cliffs and rockslides. Olympic Mountains, *Piper,* September 30, 1890, *Elmer* 2807; Lake Constance, *Thompson* 7925; Seven Lakes Basin, *Jones* 8227. Hudsonian. (H)

13. STRUTHIOPTERIS

1. S. SPICANT (L.) Weis. Deer Fern. Sometimes called "Elk Brake" since it is a favorite food of elk. Abundant in moist woods, especially near the ocean. Braden Creek, *Otis* 1316, 1395; Clallam County, *Elmer* 2803; Port Ludlow, *Binns,* August 20, 1889; Mt. Angeles, *Webster* 1569; Lake Quinault, *Thompson* 7325; Canyon Creek, *St.John* 4779, *Jones* 5928. Humid Transition. (H)

3. EQUISETACEAE

1. EQUISETUM. Horsetail, Scouring-rush

Aerial stems perennial, evergreen, all alike; cones apiculate . . . . . 1. *E. hyemale.*
Aerial stems annual; cones blunt.
  Aerial stems all alike, green . . . . . 2. *E. limosum.*
  Aerial stems of two kinds, the sterile ones green, branched, the fertile brownish, simple.
    Fertile stems usually 25-90 cm. high, the sheaths with 20-30 teeth; branches of the sterile stems 4-6-angled, papillose-roughened . . 3. *E. Telmateia.*
    Fertile stems usually 5-25 cm. high, the sheaths with 8-12 teeth; branches of the sterile stems 3-4-angled, smooth or nearly so . . . 4. *E. arvense.*

1. E. HYEMALE L. Common Scouring-rush. Moist alluvial soil, Humptulips River, *Jones* 4595; Hoodsport, *Jones* 8544; Port Discovery, *Wilkes Expedition* (fide Piper). Transition. (Cr)

2. E. LIMOSUM L. *(E. fluviatile* L.) Swamp Horsetail. Swamps and lake shores. New London, *Lamb* 1203, and June 12, 1897; Lake Cushman, *Piper,* August 1890, also in 1895; Satsop, *Jones* 3859; Crocker Lake, *Jones* 5849, 5917. Humid Transition. (Cr)

3. E. TELMATEIA Ehrh. Giant Horsetail. Wet ground, very common. Port Angeles, *Webster,* April 4, 1909; Port Discovery, *St.John* 5828; Lake Crescent, *Jones* 3779; Nolan Creek, *Jones* 4560; Hoodsport, *Jones* 8534; Union, *Jones* 8558. Humid Transition. (Cr)

4. E. ARVENSE L. Field Horsetail. Wet thickets and banks, common. Port Angeles, *Webster,* May 1909; Lake Crescent, *Jones* 3489; Humptulips River, *Jones* 4594; Canyon Creek, *Jones* 5901; Deer Lake, *Jones* 8346. Transition to Hudsonian. (Cr)

Reagan (1923) lists *E. scirpoides* Michx. ("a plant like this is often seen in the region") and *E. laevigatum* A.Br. ("abundant along the coast") but these statements are almost certainly erroneous, since neither species is known to occur in western Washington.

4. ISOETACEAE. Quillwort Family

1. ISOETES. Quillwort

Leaves usually 3-10 cm. long; stomata none; megaspores ridged and tubercled ..... 1. *I. Piperi.*
Leaves 8-25 cm. long; stomata present, few; megaspores spiny ..... 2. *I. Braunii*

1. I. PIPERI A.A.Eaton. Lake Crescent, *Webster,* August 20, 1911, *Jones* 3556; Lake Ozette, *Jones* 5971, *Otis* 1773. Humid Transition. (Cr)

2. I. BRAUNII Durieu. Lake Ozette, *Otis* 1587. (Cr)

5. LYCOPODIACEAE. Club-moss Family

1. LYCOPODIUM

Sporangia in the axils of ordinary leaves ..... 1. *L. Selago.*
Sporangia in cones.
  Cones pedunculate; leaves loosely many-ranked, 5-8 mm. long, often bristle-tipped ..... 2. *L. clavatum.*
  Cones sessile; leaves appressed, 5-ranked, 2-3 mm. long, acute ..... 3. *L. sitchense.*

1. L. SELAGO L. Olympic Mountains, *Piper* 2232; Mt. Angeles, *Thompson* 8406; Baldy Peak, *Lamb* 1390, *Conard* 276; Mt. Appleton, *Jones* 8459; Mt. Colonel Bob, *Thompson* 9410, 7250, 6243; Quilcene River, *Thompson* 9867; Lake Constance, *Rigg,* July 31, 1924. Canadian to Arctic-alpine. (Ch)

2. L. CLAVATUM L. Ground Pine. Coniferous woods. Clallam County, *Elmer* 2454; Port Ludlow, *Binns,* August 15, 1890; Elwha River, *H.C.Stevens,* August 20, 1907; Mt. Angeles, *Jones* 4269, 4276, 3695; Raft River, *Jones* 3970; Humptulips River, *Jones* 4579. Humid Transition. (Ch)

3. L. SITCHENSE Rupr. *(L. sabinaefolium* Willd., var. *sitchense* (Rupr.) Fern., Rhodora 25: 166, 1923.) Alaskan Club-moss. Subalpine meadows, often among the heather. Clallam County, *Elmer* 2527; Olympic Mountains, *Lamb,* 1396, *Piper,* August 1895; Deer Lake, *Jones* 5926; Seven Lakes Basin, *Jones* 8320; Elwha Basin, *Leach* 2099. Hudsonian. (Ch)

6. SELAGINELLACEAE

1. SELAGINELLA

Growing on trees; stems slender, elongate ..... 1. *S. oregana.*
Growing on rocks or soil; stems short.
  Leaves on the underside of the stem slightly longer than the others and tending to curve upward; stems densely tufted, 3-6 cm. long ..... 2. *S. scopulorum.*
  Leaves uniform on all sides of the stem; stems loosely tufted, 5-15 cm. long ..... 3. *S. Wallacei.*

1. S. OREGANA D.C.Eaton. *(S. struthioloides* (Presl.) Underw.) Hanging from trees along the coast. Quinault, *Conard* 174, *Jones* 3952; Humptulips, *Jones* 3693; Mt. Colonel Bob, *Thompson* 9399; Mt. Baldy, *Thompson* 6241. Humid Transition. (Ch)

2. S. SCOPULORUM Maxon. Mt. Olympus, *Flett* 3092; Bogachiel Peak, *Jones* 8304. (Ch)

3. S. WALLACEI Hieron. *(S. rupestris* of Fl. Wash.) Chiefly on dry rocks. Lilliwaup, *Piper,* September 1890; Elwha River, *Jones* 3545; Mt. Angeles, *Jones* 3305, 3200; Constance Ridge, *Jones* 5772. (Ch)

Phylum SPERMATOPHYTA. Seed Plants

CLASS I. GYMNOSPERMS

7. TAXACEAE. Yew Family

1. TAXUS

1. T. BREVIFOLIA Nutt. Western Yew. Common, especially along streams. Port Townsend, *Meehan,* in 1883; Port Ludlow, *Binns,* September 5, 1890; Olympic Mountains, *Elmer* 2486; Lake Crescent, *Jones* 3473; Hood Canal, *Jones* 8553; Raft River, *Jones* 8413. Humid Transition and Canadian. (Ph)

This species is easily recognized in the field by its drooping branches and the soft, sharp-pointed leaves. The only other conifer in the area which has sharp-pointed leaves is the Sitka spruce. The western yew reaches its best development on the Olympic Peninsula. Its chiefly associated species are Douglas fir, western hemlock, and large-leaf maple.

8. PINACEAE. Pine Family

Leaves linear or needle-shaped, more than 1 cm. long, clustered or alternate.
- Leaves 2-5 in a fascicle ..... 1. *Pinus.*
- Leaves attached singly to the branches.
  - Branchlets roughened by the persistent leaf-bases.
    - Leaves sessile, usually sharp-pointed ..... 2. *Picea.*
    - Leaves short-petioled, blunt ..... 3. *Tsuga.*
  - Branchlets smooth.
    - Leaves sessile; leaf scars circular ..... 4. *Abies.*
    - Leaves petioled; leaf-scars oval ..... 5. *Pseudotsuga.*

Leaves scale-like or subulate, less than 1 cm. long, opposite or whorled.
- Cone woody.
  - Cone oblong, with thin oblong scales ..... 6. *Thuja.*
  - Cone subglobose, with thick, peltate scales ..... 7. *Chamaecyparis.*
- Cone berry-like, bluish, glaucous ..... 8. *Juniperus.*

1. PINUS. Pine

Leaves 5 in each fascicle, 4-7 cm. long, pale green; cone-scales unarmed; cones 10-20 cm. long ..... 1. *P. monticola.*
Leaves 2 or 3 in each fascicle; cone scales with a dorsal prickle.
Leaves usually in 3's, 15-25 cm. long; cones 7-15 cm. long ..... 2. *P. ponderosa.*
Leaves in 2's, 4-8 cm. long; cones 3-5 cm. long ..... 3. *P. contorta.*

1. P. MONTICOLA Dougl. Western White Pine. Although this tree occurs from sea level to an altitude of 5000 feet, it is chiefly a Canadian zone species, growing in association with western hemlock and amabilis fir. Olympic Mountains, *Piper,* August 1895, *Elmer* 2485; Port Ludlow, *Binns;* Hurricane Ridge, *Jones* 3224; Port Discovery Bay, *Jones* 4249; Mt. Angeles, *Jones* 4270; Canyon Creek, *Jones* 8562; Hoodsport, *Jones* 8551; Mt. Appleton, *Jones* 8511. Transition to Hudsonian. (Ph)

2. P. PONDEROSA Dougl. Yellow Pine. Gravelly soil, rare on the Peninsula. It has been observed near Shelton and at Sequim in addition to the following locality. Lake Crescent, *Jones* 3517. (Ph)

3. P. CONTORTA Dougl. Lodgepole Pine. Common in swampy ground near the ocean coast; also on the gravelly prairies on the southern end of the Olympic Peninsula. Westport, *Heller* 3946, *Benson* 1492; Mason County, *Piper* 900, 1058; Montesano, *Grant* in 1917; Shelton, *Jones* 3820; Webb Hill, near Union, *Jones* 6510. Humid Transition on the Olympic Peninsula. (Ph)

[*P. albicaulis* Engelm., the white-bark pine, has been reported from the Olympic Peninsula, but there are no available specimens to substantiate the reports.]

2. PICEA. Spruce

1. P. SITCHENSIS (Bong.) Carr. Sitka Spruce. Chiefly from sea level to less than 1000 feet elevation, usually in alluvial soil, most abundant along the ocean coast, where it forms the Spruce-Cedar Climax Forest. Clallam County, *Elmer* 2489; Hoquiam, *Lamb* 1075; Lapush, *St. John;* Quillayute Prairie, *Jones* 3571; Pysht, *Jones* 3978; Ocean City, *Jones* 3934; Shelton Creek, *Jones* 6526. Humid Transition. (Ph)

[*P. Engelmanni* Parry. Listed by Reagan (1923) without locality, but of very doubtful occurrence on the Olympic Peninsula.]

3. TSUGA. Hemlock

Leaves flat, grooved on the upper surface; stomata only on lower surface; cones 2-2.5 cm. long ..... 1. *T. heterophylla.*
Leaves convex or keeled on the upper surface; stomatiferous on both sides; cones 2.5-7.5 cm. long ..... 2. *T. Mertensiana.*

1. T. HETEROPHYLLA (Raf.) Sarg. Western Hemlock. Occurs from sea level to 3000 feet elevation; most abundant in the Canadian zone where it is associated with *Abies amabilis and Pinus monticola.* In the Humid Transition zone it forms, with *Thuja plicata,* the climax forest type. Olympic Mountains, *Elmer* 2482; Port Townsend, *Meehan,* in 1883; Port Ludlow, *Binns,* September 1890; Mt. Angeles, *Thompson* 7570 Canadian and Humid Transition. (Ph)

2. T. MERTENSIANA (Bong.) Carr. Mountain Hemlock. Chiefly a timberline tree associated with *Abies lasiocarpa.* Best developed trees are found in the Lower Hudsonian, but it thrives on exposed ridges as well, usually on north slopes. Olympic Mountains, *Henderson,* August 9, 1892, *Elmer* 2483; Constance Ridge, *Jones* 5867; Boulder Creek, *Jones* 8561. Hudsonian. (Ph)

4. ABIES. Fir

Resin ducts of the leaves (as seen in cross-section) remote from the epidermis; leaves bluish-green, glaucous, stomatiferous on both surfaces ..... 1. *A. lasiocarpa.*
Resin ducts near the lower epidermis.
  Stomata only on the lower surface of the leaves; leaves dark green above.
    Leaves of the lowest branches usually spreading in 2 ranks; cones green ..... 2. *A. grandis.*
    Leaves crowded, those on the upper side of the branch shorter, appressed; cones purple ..... 3. *A. amabilis.*
  Stomata on both surfaces; leaves bluish-green and usually glaucous.. 4. *A. nobilis.*

1. A. LASIOCARPA (Hook.) Nutt. Subalpine Fir. The characteristic Hudsonian fir of the Olympic Mountains, commonly occurring in association with mountain hemlock, and sometimes with amabilis fir. Olympic Mountains, *Piper* in 1890; Mt. Angeles, *Flett,* June 29, 1908, *Jones* 3307; Mt. Carrie, *St.John* 5819; Hurricane Ridge, *Jones* 3255, 4025, 4027; Boulder Creek, *Jones* 8560. Hudsonian. (Ph)

2. A. GRANDIS Lindl. White Fir. Usually in moist situations, associated with Douglas fir and western red cedar. Rare in the Canadian zone on the Olympic Peninsula, and apparently very scarce near the ocean coast. Port Townsend, *Meehan,* in 1883; Port Ludlow, *Binns,* September 3, 1890; Dosewallips River, *Jones* 5854; Washington Harbor, *Jones* 8522. Humid Transition. (Ph)

3. A. AMABILIS (Dougl.) Forbes. Amabilis Fir. A characteristic Canadian zone tree, seldom forming pure stands but usually in mixture with western hemlock, western white pine, and, in alluvial situations, with the western red cedar. Olympic Mountains, *Piper* in 1895; Mt. Angeles, *Jones* 4260, 4272, 4275; Boulder Creek, *Jones* 8443, 8559; Olympic

Hot Springs, *Jones* 3987. Chiefly Canadian, but extending into Hudsonian. (Ph)

4. A. NOBILIS Lindl. Noble Fir. Sudworth (1908, p. 131) reports this species as occurring on the "North side of Olympic Mountains on Soleduc River, at about 3000 feet, and general at higher elevations". There is, however, no recent evidence of the occurrence of this species in the Olympic Mountains. Soleduck River, *Sargent* (fide Piper). (Ph)

5. PSEUDOTSUGA

1. P. TAXIFOLIA (Lamb.) Britt. *(P. mucronata* (Raf.) Sudw.) Douglas Fir. This is the most abundant tree on the Peninsula and the characteristic tree of the Humid Transition zone. Olympic Mountains, *Elmer* 2840; Port Townsend, *Meehan* in 1883; Hurricane Ridge, *Jones* 4032. Humid Transition and Canadian. (Ph)

6. THUJA. Arbor Vitae

1. T. PLICATA Donn. Western Red Cedar. Abundant from sea level to about 3000 feet elevation. Port Ludlow, *Binns,* September 9, 1890; Port Townsend, *Meehan* in 1883; Olympic Mountains, *Elmer* 2484; Lake Crescent, *Jones* 3484; Mt. Colonel Bob, *Thompson* 7299; Mt. Angeles, *Jones* 4268. Humid Transition and Canadian. (Ph)

7. CHAMAECYPARIS

1. C. NOOTKATENSIS (Lamb) Spach. Alaskan Cedar. A typical Hudsonian species, frequent on moist, rocky slopes in the mountains. Olympic Mountains, *Piper* in 1890, *Henderson* 2047, *Elmer* 2481; Hurricane Ridge, *Jones* 3254; Mt. Angeles, *Jones* 4271; Deer Lake, *Jones* 5895; Constance Ridge, *Jones* 6030; Seven Lakes Basin, *Jones* 8264. Hudsonian. (Ph)

According to Reagan (1923), "this tree is found on all the mountain ridges below (sic) 3500 feet. It is a conspicuous tree on the ridges above the Soleduck hot springs and on the divide between the Soleduck and Bogachiel rivers. . . . It is also more abundant in the Swamp regions near the Pacific Coast, bordering the rivers near their mouths". There are, however, no specimens to substantiate this latter statement.

8. JUNIPERUS. Juniper

Low, usually prostrate shrub; leaves all awl-shaped ..... 1. *J. communis.*
Erect shrub or tree; leaves mostly scale-like ..... 2. *J. scopulorum.*

1. J. COMMUNIS L., var. MONTANA Ait. (*J. communis sibirica* of Fl. Wash.; *J. sibirica* Burgsd.) Mountain Juniper. Rocky slopes and ridges in the mountains. Olympic Mountains, *Elmer* 2487; Mt. Seattle, *C.S. Eaton,* August 19, 1907; Hurricane Ridge, *Jones* 3256, 3374; Mt. Angeles, *Thompson* 7553. Arctic-alpine and Hudsonian. (Ch)

2. J. SCOPULORUM Sarg. Rocky Mountain Juniper. Dry ridges on the north end of the Peninsula. Olympic Mountains, *Elmer* 2488; Mt. Angeles, *Jones* 4247. (Ph)

CLASS II. ANGIOSPERMS

Subclass 1. Monocotyledons

9. TYPHACEAE

1. TYPHA. Cat-tail

1. T. LATIFOLIA L. Broad-leaved Cat-tail. Common in swamps at low elevations. Sequim, *Jones* in 1931; Hoquiam, *Jones* 5821. Humid Transition in western Washington. (Cr)

10. SPARGANIACEAE

1. SPARGANIUM. Bur-reed

Fruiting heads 1.5-2.5 cm. in diameter ..... 1. *S. simplex.*
Fruiting heads 5-10 mm. in diameter ..... 2. *S. angustifolium.*

1. S. SIMPLEX Huds. Montesano, *Heller* 3865; Satsop, *Jones* 3860; Ocean City, *Jones* 3933; Port Angeles, *Webster* 757; Lake Ozette, *Jones* 5978; Hoh River, *Otis* 1564. Transition. (Cr)

2. S. ANGUSTIFOLIUM Michx. Lake Ozette, *Otis* 1582, *Jones* 5985. Transition. (Cr)

11. NAIADACEAE

Stamens 4 or 2; flowers perfect.
  Stamens 4; sepals 4 ..... 1. *Potamogeton.*
  Stamens 2; sepals 0 ..... 2. *Ruppia.*
Stamen 1; flowers monoecious or dioecious.
  Leaves numerous, opposite; flowers dioecious ..... 3. *Naias*
  Leaves few, alternate.
    Ovary and fruit ovoid; monoecious ..... 4. *Zostera.*
    Ovary and fruit cordate; dioecious ..... 5. *Phyllospadix.*

1. POTAMOGETON. Pondweed

Leaves uniform, all submersed.
  Leaves lanceolate to oblong, clasping or half-clasping the stem.
    Leaves elongate-lanceolate, half-clasping, cucullate at apex.... 1. *P. praelongus.*
    Leaves ovate to short-lanceolate, clasping, not cucullate..... 2. *P. Richardsonii.*
  Leaves linear.
    Leaves 2-5 cm. long..... 3. *P. pusillus.*
    Leaves 8-12 cm. long..... 4. *P. Robbinsii.*
Leaves of two kinds, broader floating ones and narrow submersed ones.
  Submersed leaves lanceolate or ovate, more than 4 mm. wide.
    Submersed leaves (except the lowest) sessile; stipules obtuse... 5. *P. heterophyllus.*
    Submersed leaves petioled; stipules acuminate..... 6. *P. americanus.*
  Submersed leaves filiform or linear, not over 4 mm. wide.
    Submersed leaves linear, 2-4 mm. wide; floating leaves attenuate at base, 8-24 mm. wide; petioles as long as the blades.. 7. *P. epihydrus.*
    Submersed leaves filiform; floating leaves rounded or subcordate at base, 2.5-5 cm. wide; petioles 1-3 times the length of the blades..... 8. *P. natans.*

1. P. PRAELONGUS Wulf. Lake Leland, *Otis* 1767. (Cr)

2. P. RICHARDSONII (Benn.) Rydb. Lake Ozette, *Otis* 1583. (Cr)

3. P. PUSILLUS L. Sequim, *Grant,* July 1919. (Cr)

4. P. ROBBINSII Oakes. Lake Cushman, *Piper* 2231. Humid Transition. (Cr)

5. P. HETEROPHYLLUS Schreb. Lake Ozette, *Otis* 1584. (Cr)

6. P. AMERICANUS (C. & S.) Tuckerm. *(P. lonchites* of Fl. Wash.) Clallam County, *Elmer* 2798; Lake Leland, *Otis* 1769. Humid Transition. (Cr)

7. P. EPIHYDRUS Raf. Lake Cushman, *St.John & Schweinfurth* 5167, 5160, 5166; Lake Ozette, *Otis* 1585, *Jones* 5955; Montesano, *Heller* 4072; *Grant,* July 1918. Humid Transition. (Cr)

8. P. NATANS L. Oyhut, *Lamb* 1259; Lake Crescent, *Jones* 3595, *Webster* 1507; near Bogachiel River, *Otis* 1565. Humid Transition. (Cr)

2. RUPPIA

1. R. MARITIMA L. *(R. maritima,* var. *curvicarpa* (A.Nels.) Fern. & Wieg.; *R. maritima,* var. *rostrata* Agardh.) Clallam County, *Elmer* 2797; Grays Harbor, *Henderson,* June 26, 1892. Humid Transition. (Cr)

3. NAIAS

1. N. FLEXILIS (Willd.) R. &. S. Lake Ozette, *Jones* 5974. (Cr)

4. ZOSTERA. Eel-grass

1. Z. MARINA L. Grays Harbor, *Henderson* 2471; Port Hadlock, *Jones* 3153; Port Angeles, *Webster* 1183; Neah Bay, *Erna Gunther,* June 26, 1935. Humid Transition. (Cr)

5. PHYLLOSPADIX. Surf-grass

1. P. SCOULERI Hook. Cape Elizabeth, *Foster,* May 25, 1908. Humid Transition. (Cr)

12. SCHEUCHZERIACEAE

1. TRIGLOCHIN. Arrow-grass

1. T. MARITIMA L. Clallam County, *Elmer* 2571; Port Hadlock, *Jones* 3102; Dosewallips River, *Thompson* 6601; Ocean City, *Jones* 3877; Mason County, *Jones* 3846; Port Angeles, *Webster,* June 26, 1908. Transition. (H)

13. GRAMINEAE. Grass Family

Spikelets 2-many-flowered (except Hordeum).
- Spikelets in panicles or racemes.
  - Lemmas longer than the glumes, awnless, or with a straight apical awn (*Festuceae*).
    - Lemma 3-nerved ..... 1. *Phragmites.*
    - Lemma 5-many-nerved.
      - Palet winged on the 2 keels; spikelets linear, few, in a loose raceme ..... 2. *Pleuropogon.*
      - Palet not winged; inflorescence paniculate.
        - Lemmas keeled on the back.
          - Spikelets crowded in dense, 1-sided bunches ..... 3. *Dactylis.*
          - Spikelets not as above.
            - Lemmas awned from a bifid apex ..... 4. *Bromus.*
            - Lemmas awnless ..... 5. *Poa.*
        - Lemmas rounded on the back.
          - Glumes papery; upper florets sterile, folded about each other ..... 7. *Melica.*
          - Glumes not papery; upper florets usually perfect.
            - Nerves of the lemma parallel; lemma obtuse.
              - Nerves prominent ..... 8. *Glyceria.*
              - Nerves faint ..... 9. *Puccinellia.*
            - Nerves of the lemma converging at the apex; lemmas awned or pointed.
              - Lemmas entire, with an apical point or awn.
                - Lemma 5-nerved; plants not dioecious ..... 10. *Festuca.*
                - Lemma about 10-nerved; plants dioecious ..... 6. *Distichlis.*
              - Lemmas bifid at apex, awned just below the apex or behind the teeth ..... 4. *Bromus.*
  - Lemmas usually shorter than the glumes, usually with a bent awn arising from the back (*Aveneae*).
    - Spikelets 2-flowered, one pistillate, the other staminate ..... 11. *Holcus.*

Spikelets 2 or more flowered, all perfect.
Spikelets awnless ..... 12. *Koeleria.*
Spikelets awned.
Awn arising from between the teeth of a bifid apex ..... 13. *Danthonia.*
Awn dorsal.
Lemma bidentate, awned from above the middle ..... 14. *Trisetum.*
Lemma awned from below the middle.
Lemma erose-truncate at apex ..... 15. *Deschampsia.*
Lemma tapering into 2 slender teeth ..... 16. *Aira.*
Spikelets sessile in a 2-rowed, solitary, terminal spike (*Hordeae*).
Spikelets solitary at each joint of the rachis.
Spikelets placed edgewise to the rachis ..... 17. *Lolium.*
Spikelets placed flatwise to the rachis ..... 18. *Agropyron.*
Spikelets 2-4 at each joint of the rachis.
Spikelets 3 at each joint, 1-flowered ..... 19. *Hordeum.*
Spikelets usually in 2's, 2-6-flowered.
Axis of spike disarticulating at maturity ..... 20. *Sitanion.*
Axis of spike continuous ..... 21. *Elymus.*
Spikelets with one perfect flower.
Glumes present; stamens 3 or 1.
Glumes two (*Agrostideae*).
Lemma conspicuously long-awned (the awns more than 1 cm. long) ..... 22. *Stipa.*
Lemma short-awned or awnless; glumes awned or awnless.
Inflorescence dense and spike-like.
Spikelets 8-10 mm. long, awnless ..... 23. *Ammophila.*
Spikelets 2-5 mm. long.
Glumes long-awned ..... 24. *Polypogon.*
Glumes short-awned or awnless.
Lemma dorsally awned ..... 25. *Alopecurus.*
Lemma awnless ..... 26. *Phleum.*
Inflorescence not spike-like.
Stamen 1; palet 1-nerved ..... 27. *Cinna.*
Stamens 3; palet 2-nerved.
Callus with a tuft of long hairs at base; second glume 3-nerved ..... 28. *Calamagrostis.*
Callus naked; second glume 1-nerved ..... 29. *Agrostis.*
Glumes apparently more than 2.
Glumes apparently 4, the second and third being sterile lemmas present below the fertile floret (*Phalarideae*) ..... 30. *Anthoxanthum.*
Glumes apparently 3, the third being a sterile lemma, the two real glumes very unequal (*Paniceae*) ..... 31. *Panicum.*
Glumes none; stamens 6 (*Zizanieae*) ..... 32. *Zizania.*

1. PHRAGMITES. Common Reed

1. P. COMMUNIS Trin. Ozette Lake, *Otis* 1586. This grass is known in western Washington from only three other localities, viz., Ilwaco, Langley, and Lake Washington. It "has played a much smaller part in the development of plant communities in western Washington and Oregon than it has in many other parts of North America" (Rigg, 1931, p. 171). Transition. (Cr)

2. PLEUROPOGON

1. P. REFRACTUS (Gray) Benth. Olympic Mountains, *Elmer* 1931; Mt. Colonel Bob, *Thompson* 9972, 7322. Humid Transition and Canadian. (H)

3. DACTYLIS. Orchard-grass

1. *D. glomerata* L. Common in fields and along roadsides. (H)

4. BROMUS. Brome

First glume 3-nerved; second glume 5-7-nerved.	
Spikelets large, 2-3 cm. long, strongly flattened; native species.	
Panicle branches drooping, slender, 15-25 cm. long	1. *B. sitchensis.*
Panicle branches shorter, ascending or spreading.	
Panicle branches rather stiffly ascending; awn about 1 cm. long	2. *B. aleutensis.*
Panicle branches spreading.	
Awn more than 7 mm. long; sheaths and lemmas pubescent	3. *B. carinatus.*
Awn less than 7 mm. long.	
Sheaths pubescent	4. *B. marginatus.*
Sheaths glabrous or nearly so	4a. var. *seminudus.*
Spikelets 1-2 cm. long; introduced annuals.	
Sheaths glabrous; lemma and glumes glabrous	5. *B. secalinus.*
Sheaths pubescent.	
Panicle small, dense, erect or nearly so, contracted	6. *B. racemosus.*
Panicle loose, nodding	7. *B. commutatus.*
First glume 1-nerved; second glume 3-nerved.	
Awn 2-8 mm. long, shorter than the body of the lemma; native perennials.	
Lemma pubescent only on the margin and lower part of back.	
Awn 5-8 mm. long; ligule 3-5 mm.	8. *B. vulgaris.*
Awn 2-4 mm. long; ligule 1 mm. long	9. *B. ciliatus.*
Lemma pubescent rather evenly over the back; awn 4-6 mm. long; ligule 3-5 mm. long	10. *B. pacificus.*
Awn 12-15 mm. long, longer than the body of the lemma; weedy introduced annuals	11. *B. tectorum.*

1. B. SITCHENSIS Trin. Clallam County, *Grant* in 1889. Humid Transition. (H)

2. B. ALEUTENSIS Trin. Olympic Mountains, *Elmer* 1956. The first record for the United States. Cited by Piper (1906, p. 142) as *B. marginatus seminudus.* Canadian. (H)

3. B. CARINATUS Hook. & Arn. Mason County, *Jones* 3850. Transition. (H)

4. B. MARGINATUS Nees. Olympic Mountains, *Piper* 1990; Lake Constance, *Thompson* 7879; Elwha River, *Jones* 3553; Lake Crescent, *Jones* 3520; Seven Lakes Basin, *Jones* 8222, 8310. Probably spread up the trails. Transition. (H)

4a. Var. SEMINUDUS Shear. Montesano, *Heller* 3979. Transition. (H)

5. *B. secalinus* L. Cheat. A weed in waste ground. Hoodsport, *Henderson* in 1890. (Th)

6. *B. racemosus* L. Clallam County, *Elmer* 1959; Port Angeles *Webster*, June, 1909. (Th)

7. *B. commutatus* Schrad. Montesano, *Heller* 3983; Port Crescent, *Lawrence* 293. (Th)

8. B. VULGARIS (Hook.) Shear. Clallam County, *Elmer* 1961; Grenville, *Conard* 418; Sequim, *Grant*, June 15, 1902; Montesano, *Heller* 3999; Elwha River, *Jones* 4004. Humid Transition. (H)

9. B. CILIATUS L. *(B. Richardsonii* Link, var. *pallidus* Hook.) Olympic Mountains, *Elmer* in 1900. Canadian. (H)

10. B. PACIFICUS Shear. Clallam County, *Elmer* 1957; Grenville, *Conard* 343. Humid Transition. (H)

11. *B. tectorum* L. Roadsides and waste places, chiefly in gravelly soil, common. Sequim, *Grant* 526; Shelton, *Jones* 3830. (Th)

5. POA

Spikelets 1-1.5 cm. long; seashore plants ..... 1. *P. macrantha.*
Spikelets less than 1 cm. long.
  Lemma villous or pilose on the nerves, at least below.
    Annual; lemma not webbed ..... 2. *P. annua.*
    Perennial; lemma more or less webbed
      Subalpine; web scant ..... 3. *P. leptocoma.*
      Lowland; web copious.
        Culms distinctly flattened; branches of the panicle short, spikelet-bearing to the base; creeping rhizomes present; ligule 1-2 mm. long; first glume 3-nerved ..... 4. *P. compressa.*
        Culms terete; branches of the panicle slender, naked at the base; first glume 1-nerved.
          Intermediate nerves of the lemma prominent; ligule 2 mm. long; creeping rhizomes present ..... 5. *P. pratensis.*
          Intermediate nerves of the lemma faint; ligule 3-4 mm. long; rhizomes none ..... 6. *P. palustris.*
  Lemma not villous on the nerves.
    Lemma conspicuously webbed at base.
      Panicle erect, with spreading branches ..... 7. *P. Howellii.*
      Panicle loose, open, nodding or drooping.
        Spikelets 3-4-flowered ..... 8. *P. laxiflora.*
        Spikelets 2-flowered ..... 9. *P. marcida.*
    Lemma not webbed or only sparsely so.
      Lemma glabrous or scabrous.
        Panicle loose ..... 10. *P. nervosa.*
        Panicle compact, spike-like ..... 11. *P. epilis.*
      Lemma minutely pubescent on the lower part with the hairs somewhat curled.
        Seashore plants ..... 12. *P. confinis.*
        Not maritime.
          Panicle open ..... 13. *P. gracillima.*
          Panicle contracted ..... 14. *P. secunda.*

1. P. MACRANTHA Vasey. Clallam County, *Elmer* 1923; Westport, *Henderson* 2243, *Heller* 3944; Ocean City, *Jones* 3886. Humid Transition. (Cr)

2. *P. annua* L. Common in lawns and waste ground. Humptulips, *Jones* 3713; Mora, *Jones* 3530. (Th)

3. P. LEPTOCOMA Trin. Olympic Mountains, *Flett* 835; Mt. Angeles, *Thompson* 5584; Lake Constance, *Thompson* 7914; Marmot Pass, *Thompson* 8001, 9880; Mt. Colonel Bob, *Thompson* 7314; Crystal Creek, *Jones* 8455; Seven Lakes Basin, *Jones* 8254. Hudsonian. (H)

4. *P. compressa* L. Canada Bluegrass. Humptulips, *Jones* 3738; Port Hadlock, *Jones* 3154. (Cr)

5. P. PRATENSIS L. Very abundant in fields, roadsides, waste ground. Clallam County, *Elmer* 1920, 1922; Port Angeles, *Webster,* June June 7, 1909; Montesano, *Heller* 3866. Transition. (Cr)

6. P. PALUSTRIS L. *(P. triflora* of authors.) Wet ground. Montesano, *Heller* 4016. Transition. (H)

7. P. HOWELLII Vasey & Scribn. Clallam County, *Elmer* 1924. Humid Transition. (Th)

8. P. LAXIFLORA Buckl. *(P. remissa* Hitchc.) Sol Duc Hot Springs, *Hitchcock* 23468, the only known locality for this grass in Washington. (H)

9. P. MARCIDA Hitchc. Proc. Biol. Soc. Wash. 41: 158, 1928. *(P. leptocoma* in part of Fl. Wash.) Olympic Mountains, *Elmer* 1919; Sol Duc Hot Springs, *Hitchcock* 23466 (type locality). Otherwise known from Vancouver Island, British Columbia, and Tillamook, Oregon. (H)

10. P. NERVOSA (Hook.) Vasey. Montesano, *Grant* 953. Transition. (Cr)

11. P. EPILIS Scribn. *(P. paddensis* Williams) Olympic Mountains, *Piper* 1915, *Flett* 831, *Elmer* 1925, 1927, 1930; Mt. Angeles, *Flett,* August, 1911; Marmot Pass, *Thompson* 9911. Arctic-alpine. (H)

12. P. CONFINIS Vasey. Westport, *Henderson* 2245; Port Angeles, *Piper* 2308; Port Discovery, *Wilkes Expedition;* Clallam County, *Elmer* 1921; Copalis, *Thompson* 6277. Humid Transition. (H)

13. P. GRACILLIMA Vasey. *(P. saxatilis* Scribn. & Williams) On cliffs in the mountains. Olympic Mountains, *Piper* 983, 1993, *Elmer* 1928, *Flett* 97, 834. Arctic-alpine. (H)

14. P. SECUNDA Presl. *(P. Sandbergii* Vasey) Olympic Mountains, *Elmer* 1929; near Duckabush Glacier, *Piper* 1989 (the type of *P. incurva* Scribn. & Williams); Mt. Angeles, *Thompson* 5489, 7531. The only western Washington records. (H)

6. DISTICHLIS. Salt-grass

1. D. SPICATA (L.) Greene. Copalis, *Jones* 3635; Port Townsend, *Jones* 4253; Clallam County, *Elmer* 1667; Hoodsport, *Jones* 8095. Humid Transition. (Cr)

7. MELICA

Culms bulbous at base ..... 1. *M. subulata.*
Culms not bulbous at base ..... 2. *M. Harfordii.*

1. M. SUBULATA (Griseb.) Scribn. Olympic Mountains, *Elmer* 1937; Mt. Colonel Bob, *Thompson* 7270; Dosewallips River, *Thompson* 6595; Mt. Angeles, *Thompson* 7549. Arctic-alpine. (H)

2. M. HARFORDII Boland. Clallam County, *Elmer* 1936, 1938. Humid Transition. (H)

8. GLYCERIA

Spikelets linear, nearly terete, 1-2 cm. long ..... 1. *G. fluitans.*
Spikelets oblong, compressed.
  Lemmas with 5 prominent nerves ..... 2. *G. pauciflora.*
  Lemmas with 7 prominent nerves.
    First glume 1 mm. long or less ..... 3. *G. Otisii.*
    First glume 1.5 mm. long ..... 4. *G. grandis.*

1. G. FLUITANS (L.) R.Br. *(Panicularia fluitans* (L.) Kuntze; *P. occidentalis* Piper) Near Montesano, *Heller* 3982; Quinault River, *Lamb* 1400. Humid Transition. (H)

2. G. PAUCIFLORA Presl. *(Panicularia pauciflora* (Presl.) Kuntze) Clallam County, *Elmer* 1939, 1940, 1941, 1942; Port Angeles, *Webster,* June 1910. Transition. (H)

3. G. OTISII Hitchc., Am. Journ. Bot. 21: 128, 1934. In a small creek near Mile 15 on trail to Hoh River, Jefferson County, *Otis* 1548. (H)

4. G. GRANDIS Wats. *(Panicularia americana* (Torr.) MacM.) Montesano, *Heller* 4071. Transition. (H)

9. PUCCINELLIA

1. P. NUTKAENSIS (Presl.) Fern. & Weatherby. *(P. distans* of Fl. Wash.) Clallam County, *Elmer* 1910. Humid Transition. (H)

10. FESTUCA. Fescue

Leaves flat, 3-10 mm. wide.
- Lemma awnless ..... 1. *F. elatior.*
- Lemma awned (awn 6-20 mm. long).
  - Florets long-stipitate ..... 2. *F. subuliflora.*
  - Florets not stipitate ..... 3. *F. subulata.*

Leaves involute or filiform, less than 3 mm. wide; lemma awned.
- Awn 10-15 mm. long; annuals.
  - Lemma ciliate; first glume 2 mm. long ..... 4. *F. megalura.*
  - Lemma not ciliate; first glume 4 mm. long ..... 5. *F. dertonensis.*
- Awn 1-6 mm. long; perennials.
  - Awn longer than or as long as, the rather thin lemma; ovary hispidulous at summit ..... 6. *F. occidentalis.*
  - Awn shorter than the firm lemma; ovary glabrous.
    - Panicle 7-15 cm. long; stems 30-100 cm. high; lemma 5-7 mm. long, the awn 2-4 mm. long.
      - Plants with creeping rhizomes and stolons, somewhat decumbent at the reddish, fibrillose base; leaves smooth and soft ..... 7. *F. rubra.*
      - Bunchgrasses; stems erect, leaves stiff, firm, rough ..... 8. *F. idahoensis.*
    - Panicle 2-5 cm. long; stems 10-20 cm. high; lemma 3-4 mm. long, the awn 1.5-3 mm. long; leaves smooth ..... 9. *F. brachyphylla.*

1. *F. elatior* L. Meadow Fescue. Fields and roadsides, common; escaped from cultivation and now widespread. Reported from Port Crescent by Reagan (1923). (H)

2. F. SUBULIFLORA Scribn. Port Crescent, *Lawrence* 278; Canyon Creek, *St.John* 4787; Mt. Angeles, *Thompson* 7377. Humid Transition. (H)

3. F. SUBULATA Trin. Olympic Mountains, *Elmer* 1916, 1918; Mt. Angeles, *Thompson* 5500; Hoh River, *Otis* 1292; Seven Lakes Basin, *Jones* 8208. Humid Transition to Hudsonian. (H)

4. F. MEGALURA Nutt. Clallam County, *Elmer* 1914; Dosewallips River, *Thompson* 6593. Transition. (Th)

5. F. DERTONENSIS (All.) Aschers. & Graebn. *(F. bromoides* Am. auth.) Port Crescent, *Lawrence* 257; Montesano, *Heller* 3890. Humid Transition. (Th)

6. F. OCCIDENTALIS Hook. Clallam County, *Elmer* 1915; Nolan Creek, *Otis* 1374; Dosewallips River, *Thompson* 6591; Shelton, *Jones* 3821. Transition. (H)

7. F. RUBRA L. Red Fescue. Mt. Storm King, *Lawrence* 361; Olympic Mountains, *Elmer* 1913, 1912; Port Angeles, *Piper* 2309; James Island, *Jones* 3446; Hoodsport, *Jones* 8096; Mt. Angeles, *Thompson* 7529, 7379; Marmot Pass, *Thompson* 9957; Mt. Appleton, *Jones* 8519. Transition to Hudsonian.

8. F. IDAHOENSIS Elmer. Shelton, *Jones* 3821; Mt. Angeles, *Thompson* 5490. (H)

9. F. BRACHYPHYLLA Schult. *(F. ovina supina* of Piper) Olympic Mountains, *Piper* 1985, *Elmer* 1911, *Flett* 91, 117; Mt. Angeles, *Jones* 3207. Arctic-alpine. (H)

11. HOLCUS

Sheaths velvety-pubescent; glumes villous ..... 1. *H. lanatus.*
Sheaths (at least the upper ones) glabrous; glumes glabrous ..... 2. *H. mollis.*

1. *H. lanatus* L. Velvet-grass. Fields and roadsides, very common. Montesano, *Heller* 3952; Port Discovery, *St.John* 5823; Lake Crescent, *Jones* 3519. (H)

2. *H. mollis* L. On August 2, 1927, a specimen of this grass was collected by W.O. Passmore, in meadow and pasture land on Donaldson's Ranch, Queets River, between Salmon River and Clearwater River, Jefferson County, not at Port Townsend as stated on the label and reported in Proc. Biol. Soc. Wash. 41: 192, 1928. It was growing in a patch at least 15 meters square. (Cr)

12. KOELERIA

1. K. CRISTATA (L.) Pers. Clallam County, *Elmer* 1668; Shelton, *Jones* 3818. Transition. (H)

13. DANTHONIA

Panicle narrow and spike-like; spikelets several.
Lemma glabrous on the back ..... 1. *D. intermedia.*
Lemma sparsely villous on the back ..... 2. *D. spicata.*
Panicle open; spikelets 2-5 ..... 3. *D. americana.*

1. D. INTERMEDIA Vasey. *(D. intermedia* Vasey, var. *Cusickii* Williams) Olympic Mountains, *Piper* 1987, *Elmer* 1662; Marmot Lake, *Dickinson* 108. Arctic-alpine. (H)

2. D. SPICATA (L.) Beauv. (*D. pinetorum* Piper; *Merathrepta pinetorum* Piper) In coniferous woods. Near Union [City], *Piper* 943; Duckabush River, *Jones* 3077. Transition. (H)

3. D. AMERICANA Scribn. (*Merathrepta americana* (Scribn.) Piper) Montesano, *Heller* 3908. Transition. (H)

14. TRISETUM

Panicle loose or drooping, not spike-like.
Branches of the panicle drooping, 5-10 cm. long ..... 1. *T. cernuum.*
Branches of the panicle erect or ascending ..... 2. *T. canescens.*
Panicle contracted, erect, spike-like ..... 3. *T. spicatum.*

1. T. CERNUUM Trin., f. **pubescens** (Louis-Marie) n. comb. Father Louis-Marie has pointed out (Rhodora 30: 213, 1928) that the type of *Trisetum cernuum* Trin., from Sitka is perfectly glabrous, the blades are 4-5 mm. wide, and the spikelets usually have two perfect florets. A form of this grass which occurs in western Washington differs principally in the sheaths being pubescent. Louis-Marie has described this variation as *T. cernuum,* var. *luxurians,* f. *pubescens.* Since, however, the plants of the Olympic Peninsula have mostly 2-flowered spikelets, pilose sheaths, and blades 3-6 mm. wide, they appear to be more closely related to typical *T. cernuum* Trin. than to the var. *luxurians* Louis-Marie, which is said to be a glabrous or nearly glabrous plant with the spikelets 3-4-flowered, and wide blades (8-10 mm. broad). For this reason it appears to be advisable to simply refer our plants to *T. cernuum,* f. *pubescens.* The following collections have been made on the Olympic Peninsula: Clallam County (without definite locality), *Elmer* 1946; Ocean City, *Jones* 3866. In the spruce woods near the coast in Grays Harbor County, this tall, slender, drooping grass is a common and conspicuous plant. It occurs in scattered tufts among *Maianthemum dilatatum* and *Polystichum munitum.* This form was collected also at Seattle, May 30, 1890, *Piper & Smith* 846. (H)

2. T. CANESCENS Buckl. Clallam County, *Elmer* 1944, 1945; Montesano, *Heller* 3931. Transition. (H)

3. T. SPICATUM (L.) Richt. Olympic Mountains, *Elmer* 1947; Mt. Carrie, *St.John* 5805; Mt. Colonel Bob, *Thompson* 7330; Marmot Pass, *Thompson* 7963; Mt. Angeles, *Jones* 3701; Seven Lakes Basin, *Jones* 8279. Arctic-alpine. (H)

15. DESCHAMPSIA

Lower glume 1-nerved.
Leaf blades 2-4 mm. wide; glumes not longer than the florets.... 1. *D. caespitosa.*
Leaf blades 5-10 mm. wide; glumes longer than the florets..... 2. *D. atropurpurea.*
Lower glume 3-nerved.
Panicle open, the branches ascending; plants annual..... 3. *D. danthonioides.*
Panicle narrow, branches appressed; plants perennial..... 4. *D. elongata.*

1. D. CAESPITOSA (L.) Beauv. Clallam County, *Elmer* 1665; Grays Harbor, *Henderson,* June 1892; Lake Quinault, *Thompson* 7374; Mt. Angeles, *Thompson* 7841; Lake Ozette, *Thompson* 9417, 9435. Transition. (H)

2. D. ATROPURPUREA (Wahlenb.) Scheele. Olympic Mountains, *Elmer* 1670; Mt. Angeles, *Jones* 3702, 4428. Hudsonian. (H)

3. D. DANTHONIOIDES (Trin.) Munro. *(D. calycina* Presl.) Clallam County, *Grant* in 1915. Transition. (Th)

4. D. ELONGATA (Hook.) Munro. Clallam County, *Elmer* 1664; Sequim, *Grant* in 1915; Mason County, *Kincaid,* June 1893; Montesano, *Heller* 3953a, 4044; Mt. Angeles, *Thompson* 7361. Transition. (H)

16. AIRA. Hair-grass

Panicle loose; lemma 2.5-3 mm. long..... 1. *A. caryophyllea.*
Panicle dense; lemma 3.5-4 mm. long..... 2. *A. praecox.*

1. *A. caryophyllea* L. Clallam County, *Elmer* 1933; Montesano, *Heller* 3889; Shelton, *Jones* 3841; Duckabush River, *Jones* 3061. (Th)

2. *A. praecox* (L.) Nash. Clallam County, *Elmer* 1932; Shelton, *Jones* 3823. (Th)

17. LOLIUM. Rye-grass

Glume shorter than the spikelet; perennials.
Lemmas awnless or nearly so..... 1. *L. perenne.*
Lemmas awned..... 2. *L. multiflorum.*
Glumes as long as, or longer than, the spikelet; lemmas awned; annual..... 3. *L. temulentum.*

1. *L. perenne* L. Roadsides and fields, frequent. Montesano, *Heller* 3981. (H)

2. *L. multiflorum* L. Roadside weed, Lilliwaup, *Jones* 8533. (H)

3. *L. temulentum* L. Reported from Montesano by Reagan. (1923). (Th)

18. AGROPYRON. Wheat-grass

1. *A. repens* (L.) Beauv. Fields and roadsides; a common and pernicious weed. Union, *Jones* 8556. (Cr)

19. HORDEUM. Barley

1. H. NODOSUM L. Chiefly in seashore meadows, the Flett collection perhaps adventive in the mountains: Olympic Mountains, *Flett* 830; Mora, *Jones* 3425. Transition. (H)

20. SITANION. Squirreltail-grass

Spike 8-20 cm. long, much longer than broad ..... 1. *S. Hanseni.*
Spike 2-7 cm. long, about as broad as long ..... 2. *S. Hystrix.*

1. S. HANSENI (Scribn.) J.G.Sm. *(S. planifolium* J.G.Sm.) Olympic Mountains, *Elmer* 1903. Arctic-alpine. (H)

2. S. HYSTRIX (Nutt.) J.G.Sm. *(S. glabrum* J.G.Sm.; *S. rigidum* J.G.Sm.) Olympic Mountains, *Elmer* 1904, *Flett* 119, 832; Mt. Angeles, *Webster,* August 2, 1908; Hurricane Ridge, *Jones* 3367. Arctic-alpine. (H)

21. ELYMUS. Rye-grass

Sand dune grasses; glumes and lemmas awnless ..... 1. *E. mollis.*
Inland grasses.
  Glumes and lemmas awned.
    Lemma sparsely ciliate above; spike somewhat interrupted .... 2. *E. hirsutus.*
    Lemma glabrous or variously pubescent but not ciliate; spike continuous.
      Sheaths and leaf-blades glabrous ..... 3. *E. glaucus.*
      Sheaths and leaf-blades pubescent ..... 3a. var. *marginalis.*
  Glumes and lemmas awnless or short-awned ..... 4. *E. virescens.*

1. E. MOLLIS Trin. *(E. arenarius* Piper, not L.) Clallam County, *Elmer* 1906; Westport, *Henderson* 2169; Port Angeles, *Webster,* June 1908; Port Crescent, *Lawrence* 261; Lapush, *St.John & Schweinfurth* 5411; Dungeness, *Thompson* 10629; Ocean City, *Jones* 3893; Mora, *Jones* 3443. Humid Transition. (Cr)

2. E. HIRSUTUS Presl. *(E. borealis* Scribn.) Olympic Mountains, *Piper* 1992, *Flett* 833, *Elmer* 1907; Mt. Colonel Bob, *Thompson* 7332; Seven Lakes Basin, *Jones* 8314, 8244; Boulder Creek, *Jones* 8477. Not known elsewhere in the State. Hudsonian. (H)

3. E. GLAUCUS Buckl. Olympic Mountains, *Flett* 839; *Elmer* 1908, 1909; Lake Crescent, *Lawrence* 307; Mt. Angeles, *Thompson* 7378; Mt. Colonel Bob, *Thompson* 9971; Elwha River, *Jones* 3536. Transition. (H)

4. E. VIRESCENS Piper. Damp, coniferous woods, 3000 feet altitude, near head of Duckaboose [Duckabush] River (type locality), August 1895, *Piper* 1988; Mt. Angeles, *Thompson* 5563; Marmot Lake, *Dickinson* 102. Canadian. (H)

22. STIPA

1. S. COLUMBIANA Macoun. *(S. minor* (Vasey) Scribn.) Olympic Mountains, *Elmer* 1900. Transition. (H)

23. AMMOPHILA

1. *A. arenaria* (L.) Link. Beach-grass. Ocean City, *Jones* 3911; Copalis, *Thompson* 9351. This was first collected in western Washington in 1923 by L. E. Loomis at Ocean Beach, Pacific County, where it had been introduced from England 70 years earlier. (Cr)

24. POLYPOGON. Beard-grass

Annual; panicle continuous; awns of the glumes 6-8 mm. long..... 1. *P. monspeliensis*
Perennial; panicle lobed or interrupted; awns 3-5 mm. long..... 2. *P. lutosus.*

1. *P. monspeliensis* (L.) Desf. Clallam County, *Elmer* 1934; Port Angeles, *Webster,* June 1908. (Th)

2. *P. lutosus* (Poir.) Hitchc. *(P. littoralis* (With.) Smith) Port Angeles, *Elmer* 1955. (H)

25. ALOPECURUS. Meadow-foxtail

Awn attached about the middle of the lemma; spikelets 2-2.5 mm. long 1. *A. aequalis.*
Awn attached below the middle of the lemma; spikelets 3 mm. long.... 2. *A. geniculatus.*

1. A. AEQUALIS Sobol. *(A. geniculatus* L., var. *fulvus* Schrad.) Clallam County, *Elmer* 1663, *Grant* in 1915; Elwha River, *Jones* 3548. Transition. (H)

2. A. GENICULATUS L. Sequim, *Grant* in 1915. Transition. (H)

26. PHLEUM. Timothy

Panicle cylindrical, usually more than 5 cm. long..... 1. *P. pratense.*
Panicle oblong-ovoid, rarely more than 3 cm. long..... 2. *P. alpinum.*

1. *P. pratense* L. Duckabush River, *Jones* in 1931. Very common in fields and along roadsides throughout the Peninsula. (H)

2. P. ALPINUM L. Olympic Mountains, *Elmer* 1901; Mt. Angeles, *Thompson* 5528, 7526; Hurricane Ridge, *Jones* 3243. Arctic-alpine and Hudsonian. (H)

27. CINNA

1. C. LATIFOLIA (Trev.) Griseb. Montesano, *Heller* 4017; Lake Cushman, *Piper* 1991; Soleduck River, *Jones* 8331. Transition and Canadian. (H)

28. CALAMAGROSTIS. Reed-grass

Awn of the lemma longer than the glumes, geniculate	1.	*C. purpurascens.*
Awn of the lemma included, or scarcely longer than the glumes.		
Awn geniculate, protruding sidewise from the glumes	2.	*C. nutkaensis.*
Awn straight, included (or obsolete).		
Panicle usually narrow but loose and open	3.	*C. canadensis.*
Panicle contracted, spike-like.		
Panicle 2-5 c.m. long; glumes 4 mm. long	4.	*C. crassiglumis.*
Panicle 5-15 cm. long; glumes 3 mm. long.		
Awn present	5.	*C. inexpansa.*
Awn minute or obsolete	5a.	var. *barbulata.*

1. C. PURPURASCENS R.Br. *(C. Vaseyi* Beal) Olympic Mountains, *Piper* 1983, 1984; Marmot Lake, *Dickinson* 103, 104. Arctic-alpine. (H)

2. C. NUTKAENSIS (Presl.) Steud. *(C. aleutica* Trin.) Grenville, *Conard* 335; Westport, *Henderson,* June 1892. Humid Transition. (H)

3. C. CANADENSIS (Michx.) Nutt. Near head of Hood Canal, *Otis* 1664; Olympic Mountains, *Piper* 1986, *Elmer* 1671, 1672; Deer Lake, *Jones* 8344. Transition. (H)

The record from the Tatoosh Mountains cited by Reagan (1923) is based on a specimen from near Mt. Rainier.

4. C. CRASSIGLUMIS Thurb. Wet margins of Lake Ozette, *Thompson* 9436. This is the first record on the Olympic Peninsula for this rare species. It is known to occur elsewhere in Washington only near Whatcom Lake, Whatcom County, where it was collected by Suksdorf (no. 1024). It occurs on the southern end of Vancouver Island, and northward to Alaska; also in northern California near the coast, but there are no known intermediate stations. Its range is similar to that of *Baeria maritima* and *Puccinellia nutkaensis.* (H)

5. C. INEXPANSA Gray. Aloha, *Jones* 6456; Copalis, *Jones* 3662; Mora, *Jones* 8427. (H)

5a. Var. BARBULATA Kearney. Union [City], "Abundant in small wet meadows in woods of *Pinus contorta", Piper* 947; Raft River, *Jones* 8412. Humid Transition. (H)

29. AGROSTIS. Bent-grass

Lemma nearly equalling the glumes; rachilla prolonged beyond the palet ..... 1. *A. Thurberiana.*
Lemma noticeably shorter than the glumes; rachilla not prolonged.
  Plants with creeping rhizomes.
    Panicle contracted, almost spike-like ..... 2. *A. pallens.*
    Panicle open ..... 2a. var. *foliosa.*
  Plants tufted, without rhizomes
    Panicle narrow, contracted with erect or ascending branches.
      Palet evident, 2-nerved; creeping seashore grass ..... 3. *A. palustris.*
      Palet lacking or minute and nerveless.
        Tall lowland plant ..... 4. *A. exarata.*
        Low alpine plant ..... 4a. var. *Rossae.*
    Panicle open with the branches spreading.
      Palet evident, 2-nerved.
        Dwarf tufted alpine species ..... 5. *A. humilis.*
        Taller plants of lower altitudes ..... 6. *A. alba.*
      Palet lacking or minute and nerveless.
        Glumes 1.5-2 mm. long.
          Panicle very diffuse ..... 7. *A. hyemalis.*
          Panicle with short divaricate branches ..... 7a. var. *geminata.*
        Glumes 2.5-3 mm. long ..... 8. *A. oregonensis.*

1. A. THURBERIANA Hitchc. Mt. Olympus, *Flett* 3076; Elwha River, *Flett* 3051; Mt. Angeles, *Thompson* 5488, 7839. Hudsonian. (H)

2. A. PALLENS Trin. Seashore Bent-grass. Copalis, *Conard* 416; Westport, *Henderson* 2116. Humid Transition. (H)

2a. Var. FOLIOSA Hitchc. Union [City], *Piper* 949, 950. The plant seems to be too closely related to *A. pallens* to consider it a separate species under the name of *A. diegoensis* Vasey. Humid Transition. (H)

3. A. PALUSTRIS Huds. (*A. maritima* Lam.) Maritime Bent-grass. Ocean City, *Jones* 3901. Humid Transition. (H)

4. A. EXARATA Trin. (*A. microphylla* Steud.; *A. ampla* Hitchc.) Western Bent-grass. Clallam County, *Elmer* 1949, 1952, 1953; Montesano, *Heller* 4010, 4018; Lake Crescent, *Lawrence* 306; Port Discovery, *St. John* 5851. Humid Transition. (H)

4a. Var. **Rossae** (Vasey) n. comb. *A. Rossae* Vasey, Contr. U. S. Nat. Herb. 3: 76, 1892. Rocky places in the mountains. Olympic Mountains, *Elmer* 1948, *Piper* 1994; Seven Lakes Basin, *Jones* 8301, 8256; Heart Lake, *Dickinson* 112. Hudsonian and Arctic-alpine. (H)

5. A. HUMILIS Vasey. Olympic Mountains, *Flett* 836, *Elmer* 1951. Arctic-alpine. (H)

6. *A. alba* L. Redtop. Fields and roadsides; escaped from cultivation and now widespread. Clallam County, *Elmer* 1954; Montesano, *Heller* 3957, 4034; Elwha River, *Jones* 3543. (H)

7. A. HYEMALIS (Walt.) BSP. Clallam County, *Elmer* 1950. Humid Transition. (H)

7a. Var. GEMINATA (Trin.) Hitchc. Olympic Mountains, *Grant* 563; Boulder Creek, *Jones* 8494. Arctic-alpine and Hudsonian. (H)

8. A. OREGONENSIS Vasey. Oregon Bent-grass. Lake Sutherland, *Lawrence* 318; Copalis, *Conard* 847. Humid Transition. (H)

30. ANTHOXANTHUM. Sweet Vernal-grass

1. *A. odoratum* L. Roadsides and waste ground. Shelton, *Jones* 6533. (H)

31. PANICUM

1. P. PACIFICUM Hitchc. & Chase. Shelton, *Jones* 3835; Lake Ozette, *Thompson* 9415. Transition. (H)

32. ZIZANIA. Wild Rice

1. *Z. palustris* L. Often planted for food for water birds, especially wild ducks. Cranberry Lake. *T.H.Scheffer,* August 21, 1934. (Th)

14. CYPERACEAE

Flowers unisexual; achene enclosed in a sac (perigynium)	1. *Carex.*
Flowers perfect; achenes not enclosed; perianth consisting of bristles.	
Bristles conspicuous, whitish, long, silky	2. *Eriophorum.*
Bristles short, inconspicuous.	
Base of the style persistent as a tubercle on the achene.	
Spikelet 1	3. *Eleocharis.*
Spikelets several	4. *Rhynchospora.*
Base of the style not enlarged or persistent	5. *Scirpus.*

1. CAREX†

Spikes solitary, terminal.	
Perigynia pubescent; plant dioecious	1. *C. stenochlaena.*
Perigynia glabrous.	
Spike ovoid, brown; perigynia thin, inflated, bladder-like, slightly exceeding the scales, 5 mm. long; stems shorter than the leaves	2. *C. Engelmanni.*
Spike neither ovoid nor brown; perigynia not bladder-like.	
Perigynia reflexed when mature.	
Spikes 8-10 mm. thick	3. *C. nigricans.*
Spikes 3-4 mm. thick	4. *C. pyrenaica.*
Perigynia not reflexed.	
Perigynia beakless, obtuse	5. *C. leptalea.*
Perigynia with a bidentate beak.	
Scales as long as or longer than the perigynia	6. *C. Hepburnii.*
Scales shorter than the perigynia	7. *C. circinata.*

†Key adapted from Piper & Beattie's *Flora of the Northwest Coast.*

Spikes several (often aggregated in a dense head).
  Spikes all alike.
    Staminate flowers borne at the top of the spike (androgynous).
      Beak of the perigynium longer than the body ..... 8. *C. stipata.*
      Beak shorter than the body.
        Spikes somewhat paniculate ..... 9. *C. Cusickii.*
        Spikes aggregated in a head.
          Stigmas 3; seashore plants ..... 10. *C. anthericoides.*
          Stigmas 2.
            Leaves equalling or exceeding the stem; head 1.5-4 cm. long ..... 11. *C. vicaria.*
            Leaves shorter than the stem.
              Rhizomes long, creeping, the culms arising singly or few together, 15-30 cm. tall ..... 12. *C. pansa.*
              Rhizomes short, the culms tufted, often densely so, 30-60 cm. tall ..... 13. *C. Hoodii.*
    Staminate flowers at the base of each spike or rarely scattered (gynaecandrous).
      Margins of perigynia not thin or winged.
        Spikes crowded into a dense head.
          Head 6-13 mm. long; bracts not developed ..... 14. *C. illota.*
          Head 1.5-3 cm. long; lower one or two bracts developed ..... 15. *C. arcta.*
        Spikes scattered.
          Perigynia appressed at maturity, 4-4.5 mm. long.
            Perigynia shallowly bidentate, 3.5-4 mm. long, the beak about one-third the length of the body ... 16. *C. leptopoda.*
            Perigynia deeply bidentate, 4-4.5 mm. long, the beak about one-half the length of the body .... 17. *C. Bolanderi.*
          Perigynia spreading or ascending at maturity..
            Perigynia broadest near the middle, the beak with a few weak serrulations or entire ..... 18. *C. laeviculmis.*
            Perigynia broadest near the base, beak strongly serrulate.
              Scales obtuse; midvein obscure at apex ..... 19. *C. phyllomanica.*
              Scales acute or cuspidate; midvein prominent to apex.
                Perigynia lanceolate; beak obscurely serrulate, more than half the length of the body ..... 20. *C. angustior.*
                Perigynia ovate; beak strongly serrulate, less than half the length of the body ..... 21. *C. cephalantha.*
      Margins of perigynia thin or winged.
        Bract leaf-like, longer than the head ..... 22. *C. athrostachya.*
        Bract not leaf-like, shorter than the head.
          Perigynia brown, the margins very narrow and smooth ..... 14. *C. illota.*
          Perigynia straw-colored, margins winged and serrulate.
            Scales about the same length as the perigynia, and of the same width above, thus concealing them.
              Leaves 2-3 mm. wide, flat ..... 23. *C. Tracyi.*
              Leaves 1.5-2 mm. wide, involute ..... 24. *C. phaeocephala.*
            Scales shorter than the perigynia and narrower above, the upper part of the perigynia therefore conspicuous in the spikes.
              Spikes densely capitate; beak of perigynia obliquely cut, dark-tipped ..... 25. *C. pachystachya.*
              Spikes looser; beak bidentate, reddish-tipped .. 26. *C. Preslii.*

Spikes of two sorts, usually the lower pistillate, the upper staminate.
Perigynia pubescent, the beak bidentate.
Pistillate spikes less than 1 cm. long ..... 27. *C. Rossii.*
Pistillate spikes more than 1 cm. long ..... 28. *C. lanuginosa.*
Perigynia glabrous or granular-roughened.
Beak of the perigynium deeply bidentate, with long, sharp, rigid teeth.
Perigynia glossy, 7-10 mm. long ..... 29. *C. exsiccata.*
Perigynia dull, 4-8 mm. long ..... 30. *C. rostrata.*
Beak wanting, or entire, or emarginate, or shortly bidentate.
Stigmas 3; achenes 3-angled.
Spikes narrowly cylindrical, 6-10 cm. long ..... 31. *C. amplifolia.*
Spikes shorter.
Perigynia spreading, the beak bidentate ..... 32. *C. viridula.*
Perigynia not spreading; beak entire or emarginate.
Terminal spike pistillate above, staminate below.
Spikes 3-5, ovoid, 8-10 mm. long ..... 33. *C. albonigra.*
Spikes 6-10, oblong-cylindrical, 1-4 cm. long ... 34. *C. Mertensii.*
Terminal spike wholly staminate.
Perigynia less than 2 mm. long, ovate, brown, granulate, nerveless, beakless; scales black, obtuse ..... 35. *C. stylosa.*
Perigynia 3-6 mm. long.
Scales green; Transition or Canadian species.
Bog plants; leaves glaucous, 1.5-2 mm. wide; perigynia 3.5-4 mm. long ..... 36. *C. livida.*
Not bog plants; leaves not glaucous, 2-12 mm. wide.
Perigynia narrowly ovoid, 5-6 mm. long, tapering at base and apex; plants loosely tufted; leaves 5-12 mm. wide ..... 37. *C. Hendersoni.*
Perigynia ovoid, 3.5-4 mm. long, rounded at base, abruptly beaked; rhizomes long-creeping; leaves 2-4 mm. wide ..... 38. *C. californica.*
Scales purplish black or dark reddish brown; Hudsonian species.
Perigynia lanceolate; beak 1 mm. long .... 39. *C. ablata.*
Perigynia ovate; beak 0.5 mm. long.
Pistillate spikes nodding on slender, spreading or recurved peduncles; scales conspicuously aristate; perigynia whitish ..... 40. *C. stygia.*
Pistillate spikes erect or ascending, short-peduncled or sessile; scales acute or mucronate.
Scales acute; leaves numerous ..... 41. *C. Tolmiei.*
Scales mucronate; leaves few ..... 42. *C. spectabilis.*
Stigmas 2; achenes lenticular.
Perigynia plump, not angled, beakless ..... 43. *C. Hassei.*
Perigynia compressed, the beak entire or emarginate.
Scales pointed, longer than the perigynia.
Mature perigynia 3-3.5 mm. long.
Perigynia ovoid or ellipsoid, granular, greenish straw-colored, obscurely nerved; achenes not constricted in the middle ..... 44. *C. sitchensis.*
Perigynia nearly orbicular, smooth, brown, shining; achenes constricted in the middle. 45. *C. obnupta.*

Mature perigynia 2.5-3 mm. long, ellipsoid, straw-color, dull, slightly granular; achenes constricted in the middle ..... 46. *C. Lyngbyei.*
Scales not longer than the perigynia.
Perigynia obscurely nerved.
Perigynia ovoid, 4-5 mm. long ..... 47. *C. physocarpa.*
Perigynia obovoid, 3 mm. long ..... 48. *C. gymnoclada.*
Perigynia strongly nerved.
Leaves 3-5 mm. wide ..... 44. *C. sitchensis.*
Leaves 1-3 mm. wide.
Perigynia 2-2.5 mm. long ..... 49. *C. Kelloggii.*
Perigynia 2.5-3 mm. long ..... 50. *C. Hindsii.*

All the following cited specimens that were collected prior to 1930 have been checked by K. K. Mackenzie.

1. C. STENOCHLAENA (Holm.) Mack. *(C. scirpoidea* of Fl. Wash.) Olympic Mountains, *Piper* 2243; Mt. Angeles, *Rigg,* July 23, 1929. Arctic-alpine. (Cr)

2. C. ENGELMANNI Bailey. Iron Mountain, *Thompson* 11052. Arctic-alpine. (Cr)

3. C. NIGRICANS C.A.Mey. Deer Lake, *St.John* 4801; Hurricane Ridge, *Jones* 3383; Mt. Angeles, *Thompson* 7423; Marmot Pass, *Thompson* 7964; Hoh Lake, *Otis* 1355, 1360; Seven Lakes Basin, *Jones* 8323. Arctic-alpine and Hudsonian. (Cr)

4. C. PYRENAICA Wahlenb. Olympic Mountains, *Flett* 825, *Elmer* 2722; Mt. Colonel Bob, *Thompson* 9981. Arctic-alpine. (H)

5. C. LEPTALEA Wahlenb. Clallam County, *Elmer* 2714; Lake Ozette, *Otis* 1531, 1783; Lake Cushman, *St.John & Schweinfurth* 5143. Humid Transition. (H)

6. C. HEPBURNII Boott. Mt. Angeles, *Thompson* 8408, 7447; Iron Mountain, *Thompson* 11057. Arctic-alpine. (H)

7. C. CIRCINATA C.A.Mey. Olympic Mountains, *Elmer* 2721; Mt. Colonel Bob, *Thompson* 7241. A very rare species, not otherwise known in Washington, but occurring on Vancouver Island and in Alaska. Arctic-alpine. (Cr)

8. C. STIPATA Muhl. Olympic Mountains, *Grant* in 1889; Clallam County, *Elmer* 2705; Quilcene, *R.K.Beattie* 3637; Clallam Bay, *Otis* 1529. Transition. (H)

9. C. CUSICKII Mack. Clallam County, *Elmer* 2713. Transition. (H)

10. C. ANTHERICOIDES Presl. *(C. macrocephala* of Piper) (See Fernald, Rhodora 32: 9, 1930.) Mouth of Quillayute River, *Otis* 1561; Clallam County, *Elmer* 2710; Port Angeles, *Piper* 2306; Ediz Hook, *Jones* 3358; Mora, *Jones* 3417; Grays Harbor, *Wilkes Expedition,* (fide Piper); Lapush, *St.John & Schweinfurth* 5417; Ocean City, *Jones* 3890; Copalis, *Thompson* 9354. Humid Transition. (Cr)

11. C. VICARIA Bailey. Sequim, *Thompson* 10621. Humid Transition. (H)

12. C. PANSA Bailey. Westport, *Henderson* in 1892. Humid Transition. (Cr)

13. C. HOODII Boott. Mt. Angeles, *Thompson* 7550, 5499, 7513, Transition. (H)

14. C. ILLOTA Bailey. Olympic Mountains, *Elmer* 2706, *Piper* 996, *Flett* 824; Boulder Creek, *Jones* 8483. Arctic-alpine. (Cr)

15. C. ARCTA Boott. Webb Hill, *Otis* 1484; Sequim, *Thompson* 10621. Transition (H)

16. C. LEPTOPODA Mack. *(C. Bolanderi* of Fl. Wash., as to Olympic Peninsula specimens.) Quinault Valley, *Conard* 214; Clallam County, *Elmer* 2716; Duckabush River, *Jones* 3060; Hoh River, *Otis* 1293. Transition. (Cr)

17. C. BOLANDERI Olney. Lake Quinault, *Conard* 250; Hoh River, *Otis* 1525; Clallam County, *Elmer* 2715; Montesano, *Grant* in 1917. Transition. (Cr)

18. C. LAEVICULMIS Meinsh. Quinault, *Conard* 172; near Hoh River, *Otis* 1469; Canyon Creek, *Jones* 8563; Bogachiel Park, *Otis* 1125. Canadian. (H)

19. C. PHYLLOMANICA Boott. Lake Ozette, *Otis* 1537; Jefferson County, *Otis* 1516, 1522, 1468, 1307; Aloha, *Thompson* 9356. Humid Transition. (Cr)

20. C. ANGUSTIOR Mack. Bogachiel Park, *Otis* 1127. Hudsonian. (H)

21. C. CEPHALANTHA (Bailey) Bickn. Bogachiel River, *Otis* 1300; Lake Quinault, *Thompson* 7327; Aloha, *Thompson* 7362. Transition. (Cr)

22. C. ATHROSTACHYA Olney. Hoh River, *Otis* 1554. Transition. (Cr)

23. C. TRACYI Mack. Sequim, *Thompson* 10620. Humid Transition. (H)

24. C. PHAEOCEPHALA Piper. Olympic Mountains, *Piper* 2553; Mt. Angeles, *Jones* 3328; Marmot Pass, *Thompson* 7975. Arctic-alpine. (Cr)

25. C. PACHYSTACHYA Cham. *(C. festiva pachystachya* Bailey; C. *olympica* Mack.) Clallam County, *Otis* 1542, *Elmer* 2702, 2709; Montesano, *Heller* 3954 (fide Piper); Mt. Colonel Bob, *Thompson* 7287; Mt. Angeles, *Thompson* 7512; Seven Lakes Basin, *Jones* 8277. Transition to Hudsonian. (Cr)

26. C. PRESLII Steud. *(C. multimoda* Bailey) Clallam County, *Elmer* 2701, 2700, *Otis* 1337; Olympic Mountains, *Piper* 2249; Seven Lakes Basin, *Jones* 8237. Canadian and Hudsonian. (H)

27. C. ROSSII Boott. Clallam County, *Elmer* 2718. Transition to Arctic-alpine. (Cr)

28. C. LANUGINOSA Michx. Aloha, *Thompson* 9371. Transition. (Cr)

29. C. EXSICCATA Bailey. *(C. mirata* of Fl. Wash.) Clallam County, *Elmer* 2720, *Otis* 1471; Lake Crescent, *Jones* 3755, 3758; Lake Quinault, *Conard* 169. Humid Transition. (Cr)

30. C. ROSTRATA Stokes. Wreck Creek Prairie, *Conard* 375; Raft River, *Jones* 3968, 8415; Lake Quinault, *Thompson* 7328, 9985; near Hoh River, *Otis* 1519, 1526. Transition. (H)

31. C. AMPLIFOLIA Boott. Olympic Mountains, *Grant* in 1889. Transition. (H)

32. C. VIRIDULA Michx. *(C. flava recterostrata* Bailey) Clallam County, *Elmer* 2704; Quinault, *Conard* 248; Lake Crescent, *Lawrence* 299, *Webster* 140; Lake Ozette, *Otis* 1580, *Jones* 5949; Elk Lake (near Mt. Olympus), *Otis* 1320. Transition and Canadian. (H)

33. C. ALBONIGRA Mack. Mt. Angeles, *Jones* 3316. Hudsonian. (Cr)

34. C. MERTENSII Prescott. Quinault Valley, *Conard* 200; Skokomish River, *Henderson* in 1892; Clallam County, *Elmer* 2711; Hoh

Lake, *Otis* 1327, 1359; Bogachiel Park, *Otis* 1137; Olympic Mountains, *Piper* 2246; Mt. Colonel Bob, *Thompson* 7286, 9970; Canyon Creek, *Jones* 8359; Hoh River, *Jones* 8425; Jefferson County, *Otis* 1308. Canadian. (Cr)

35. C. STYLOSA C.A.Mey. Deer Lake, *St.John* 5756. The only collection in the United States. Otherwise known from Alaska, Labrador, Greenland, and Newfoundland. (Cr)

36. C. LIVIDA (Wahl.) Willd. *(C. livida,* var. *typica* Fernald, Rhodora 28: 8, 1926.) Sphagnum bog, on highway between Bogachiel and Hoh Rivers, Jefferson County, *Otis* 1518, *Jones* 5959; Aloha, *Thompson* 9373; Baker Prairie, *Thompson* 9384. (Cr)

37. C. HENDERSONII Bailey. Sequim, *Grant* 123; Elwha River, *Jones* 3129. Humid Transition. (H)

38. C. CALIFORNICA Bailey. Sol Duc Hot Springs, *Otis* 1472. Humid Transition. (Cr)

39. C. ABLATA Bailey. Olympic Mountains, *Piper* 2244, *Flett* 823, *Elmer* 2703; Deer Lake, *Jones* 8352; Seven Lakes Basin, *Jones* 8566; Boulder Creek, *Jones* 8460; Mt. Angeles, *Thompson* 5504, 7829. Arctic-alpine. (Cr)

40. C. STYGIA Fries. Boggy shore of Mink Lake, *Otis* 1133, 1570. This is the first record for the United States. Otherwise known from Alaska and British Columbia.

41. C. TOLMIEI Boott. Hurricane Ridge, *Jones* 3244, 4024; Marmot Pass, *Thompson* 11051. Hudsonian. (H)

42. C. SPECTABILIS Dewey. *(C. scopulorum* of Fl. Wash., in part.) Olympic Mountains, *Piper* 2247, *Flett* 826, *Elmer* 2717; Deer Lake, *St. John* 4800; Mt. Angeles, *Thompson* 7818, 7558, 10067; Mt. Colonel Bob, *Thompson* 7248; Lake Constance, *Thompson* 7926; Boulder Creek, *Jones* 8493. Hudsonian and Arctic-alpine. (Cr)

43. C. HASSEI Bailey. *(C. aurea* of Fl. Wash., as to the Olympic Peninsula specimens.) Clallam County, *Elmer* 2712; Port Ludlow, *Binns* in 1890 (fide Piper). Transition. (Cr)

44. C. SITCHENSIS Prescott. Kalalock, *Jones* 4556; Mink Lake, *Otis* 1568; near Deer Lake, *Jones* 8336. Humid Transition and Canadian. (Cr)

45. C. OBNUPTA Bailey. *(C. magnifica* Dewey) Clallam County, *Elmer* 2716; Quinault, *Conard* 163; Grays Harbor, *Edmund Croft* in 1901; Montesano, *Heller* 3860; Lake Crescent, *Webster* 160; Taholah, *Thompson* 9336; Ocean Beach, *Otis* 1368. Humid Transition. (Cr)

46. C. LYNGBYEI Hornem. *(C. cryptocarpa* of Fl. Wash.) Clallam County, *Elmer* 2719; Oyhut, *T.H.Scheffer,* August 23, 1934; Copalis, *Thompson* 9343; Dungeness, *Thompson* 10624. Humid Transition. (Cr)

47. C. PHYSOCARPA Presl. Mink Lake, *Otis* 1132, 1574. The only collection in the State; evidently a rare species. Kükenthal (1909) gives the range as follows: In arctic and subarctic North America; Alaska and Yukon to Vancouver Island. Labrador.

48. C. GYMNOCLADA Holm. *(C. rigida hesperia* Piper) Olympic Mountains, *Elmer* 2708 (fide Piper); Marmot Pass, *Thompson* 9882. Arctic-alpine. (Cr)

49. C. KELLOGGII Boott. Quinault, *Conard* 165; Olympic Mountains, *Piper* 985, 2245; Clallam County, *Elmer* 2707; Lake Ozette, *Otis* 1533; Elk Lake, *Otis* 1322; Lake Crescent, *Lawrence* 300. Chiefly Transition. (H)

50. C. HINDSII C.B.Clarke. Hoquiam, *Foster* 857; near Forks, *Otis* 1540; Lake Crescent, *Jones* 3463; Aloha, *Thompson* 9355; Lake Ozette, *Thompson* 9438; Ocean City, *Jones* 3909; Boulder Creek, *Jones* 8482. Humid Transition. (H)

2. ERIOPHORUM. Cotton Sedge

1. E. CHAMISSONIS C.A.Mey. Tsuess River, near Wyacht Point, *Erna Gunther,* August 22, 1934. Humid Transition. (Cr)

3. ELEOCHARIS. Spike-rush

Style branches 2; achene biconvex.
- Annuals with fibrous roots; spikelet ovoid; tubercle as broad as the top of the achene ..... 1. *E. obtusa.*
- Perennials with rhizomes.
  - Basal scales of the spikelet 2 or 3 below the thinner fertile scales.
    - Tubercle elongate, much higher than broad; achenes narrowly obovoid; culm subterete ..... 2. *E. palustris.*
    - Tubercle depressed-deltoid, as broad as high; achenes broadly obovoid; culm compressed ..... 3. *E. mamillata.*
  - Basal scales solitary, spathiform, usually encircling the base of the spikelet; culm terete; tubercle deltoid, higher than broad ..... 4. *E. uniglumis.*

Style branches 3; achene 3-angled; stems capillary, 2-5 cm. high; spikelets 2-3.5 cm. long; annual, the roots fibrous, often with minute tuberous stolons ..... 5. *E. parvula.*

1. E. OBTUSA (Willd.) Schult. Montesano, *Heller* 4073; Aloha, *Thompson* 9375; Skokomish River, *Otis* 1481. Humid Transition. (Th)

2. E. PALUSTRIS (L.) R. & S. Grenville, *Conard* 352; Westport, *Henderson,* June 1892; Clallam County, *Elmer* 2724; Lake Crescent, *Jones* 3557. Humid Transition. (Cr)

3. E. MAMILLATA Lindb. New London, *Lamb* 1201. Transition. (Cr)

4. E. UNIGLUMIS (Link.) Schult. Westport, *Lamb* 1103. Transition. (Cr)

5. E. PARVULA (R. & S.) Link. *(Scirpus nanus* Spreng.) Westport, *Grant* in 1918; Lake Ozette, *Thompson* 9428. (Th)

4. RHYNCOSPORA. Beaked-rush

1. R. ALBA (L.) Vahl. Grenville, *Conard* 374; Baker Prairie, *Thompson* 9380; Lake Ozette, *Rigg* in 1933. Humid Transition. (H)

5. SCIRPUS

Spikelets solitary.
  Perianth bristles none ..... 1. *S. cernuus.*
  Perianth bristles 6, smooth ..... 2. *S. cespitosus.*
Spikelets several-many.
  Stems terete ..... 3. *S. acutus.*
  Stems 3-angled.
    Spikelets few, 1-2 cm. long ..... 4. *S. robustus.*
    Spikelets many, 3-5 mm. long ..... 5. *S. microcarpus.*

1. S. CERNUUS Vahl. *(S. riparius* (R.Br.) Spreng.) Mora, *Jones* 3430. Transition. (Th)

2. S. CESPITOSUS L. Olympic Mountains, *Piper* 2248; Grenville, *Conard* 376; Baker Prairie, *Thompson* 9383. Chiefly Arctic-alpine but occurring at sea-level on the Olympic Peninsula. (H)

3. S. ACUTUS Muhl. *(S. occidentalis* (Wats.) Chase) Chehalis River, *Jones* 3857; Lake Crescent, *Jones* 3590, 3759, *Webster* 178; Crocker Lake, *Jones* 5922; Lake Ozette, *Jones* 5938. Transition. (Cr)

4. S. ROBUSTUS Pursh. Clallam County, *Elmer* 2725; Port Townsend, *Jones* 4251. Humid Transition. (Cr)

5. S. MICROCARPUS Presl. Clallam County, *Elmer* 2723; Quinault, *Conard* 170; Hoh River valley, *St.John* 5786; Quillayute Prairie, *Jones* 3586; Lake Ozette, *Jones* 5939. Transition. (Cr)

15. ARACEAE. Arum Family

1. LYSICHITUM. Skunk Cabbage

1. L. AMERICANUM Hultén & St.John, Svensk. Bot. Tidskr. 25: 453-464, 1931. *(L. camtschatcense* of authors.) Clallam County, *Elmer* 2786; Union, *Jones* 8722. Transition and Canadian. (Cr)

16. LEMNACEAE. Duckweed Family

Thallus 1-5-nerved, with a single root ..... 1. *Lemna.*
Thallus 5-12-nerved, with several roots..... 2. *Spirodela.*

1. LEMNA. Duckweed

Thalli paddle-shaped, 6-10 mm. long, remaining connected, wholly submersed..... 1. *L. trisulca.*
Thalli elliptical or roundish, 2-5 mm. long, soon separating, floating..... 2. *L. minor.*

1. L. TRISULCA L. Observed in a pond near Port Angeles, *Jones* in 1935. (Cr)

2. L. MINOR L. Ocean City, *Jones* 3892; Blyn, *Jones* 8528. (Cr)

2. SPIRODELA

1. S. POLYRHIZA (L.) Schleid. Lake Leland, *Otis* 1766. (Cr)

17. JUNCACEAE. Rush Family

Capsule many-seeded, 1- or 3-celled plants glabrous..... 1. *Juncus.*
Capsule 3-seeded, 1-celled; plants often sparsely villous..... 2. *Luzula.*

1. JUNCUS. Rush

Lowest leaf of the inflorescence exactly simulating a continuation of the stem, the inflorescence therefore appearing lateral.
  Flowers 1-3; seeds caudate.
    Capsule acute; upper sheaths leaf-bearing..... 1. *J. Parryi.*
    Capsule retuse; stems leafless..... 2. *J. Drummondii.*
  Flowers several to many; seeds not caudate.
    Stamens 3; perianth 2.5-3.5 mm. long..... 3. *J. effusus.*
    Stamens 6.
      Anthers about as long as the filaments..... 4. *J. filiformis.*
      Anthers much longer than the filaments.
        Perianth 4-5 mm. long..... 5. *J. balticus.*
        Perianth 5-6 mm. long..... 6. *J. Lescurii.*
Lowest leaf not as above; inflorescence terminal.
  Leaf blades with the flat surface facing the stem, without cross-partitions.
    Annual, with branched stems..... 7. *J. bufonius.*
    Perennial; stems simple.
      Perianth exceeding the capsule.
        Perianth 3-4 mm. long; heads 5-50..... 8. *J. tenuis.*
        Perianth 6 mm. long; heads solitary or few..... 9. *J. falcatus.*

Perianth equalling or shorter than the capsule, flowers not in heads.
Perianth 2-2.5 mm. long ..... 10. *J. Gerardi.*
Perianth 3-4 mm. long.
Perianth shorter than the capsule ..... 11. *J. Covillei.*
Perianth equalling the capsule ..... 12. *J. fucensis.*
Leaf blades terete or equitant, with cross-partitions (these sometimes obscure).
Leaves equitant (with one edge facing the stem).
Heads numerous; stamens 6; stems 30-60 cm. high; capsule tapering gradually to a slender beak ..... 13. *J. oxymeris.*
Heads 2-12; capsule obtuse, mucronate.
Stamens 6; stems usually 15-30 cm. high ..... 14. *J. xiphioides,* var. *triandrus.*
Stamens 3; stems 30-60 cm. high ..... 14a. var. *montanus.*
Leaves terete or slightly compressed.
Stamens 3.
Heads small, pale, several ..... 15. *J. acuminatus.*
Heads large, dark, few ..... 16. *J. Bolanderi.*
Stamens 6.
Heads solitary, dark ..... 17. *J. Mertensianus.*
Heads several.
Capsule longer than the perianth; anthers shorter than the filaments.
Branches of the inflorescence divaricate; perianth segments acuminate ..... 18. *J. articulatus.*
Branches of the inflorescence erect; perianth segments obtuse, mucronate ..... 19. *J. Richardsonianus.*
Capsule shorter than the perianth; anthers longer than the filaments ..... 20. *J. nevadensis.*

1. J. PARRYI Engelm. Olympic Mountains, *Elmer* 2733, *Flett* 111, *Henderson* 1025; Marmot Lake, *Dickinson* 113. Arctic-alpine. (H)

2. J. DRUMMONDII E.Mey. *(J. subtriflorus* (E.Mey.) Coville; *J. Drummondii* E.Mey., var. *longifructus* St.John, Proc. Biol. Soc. Wash. 44: 29, 1931; *J. Drummondii* E.Mey., var. *longifructus* St.John, f. *Davisonii* St.John, l.c. 30.) Olympic Mountains, *Flett* 828; Mt. Anderson, *Davison* in 1928; Mt. Angeles, *Jones* 3667, 4256; Marmot Pass, *Thompson* 7974. Arctic-alpine. (H)

3. J. EFFUSUS L. *(J. effusus hesperius* Piper) Clallam County, *Elmer* 2728; Montesano, *Heller* 3970; Jefferson County, *Otis* 1544; Lake Ozette, *Jones* 5814; Crocker Lake, *Jones* 5920; "foot-hills of the Olympic Range" [probably Clallam County] *Grant* 117; Lilliwaup, *Henderson* 1860; Port Discovery, *St.John* 5831; Raft River, *Jones* 3969; Aloha, *Thompson* 9361. Chiefly Transition. (H)

4. J. FILIFORMIS L. Hoquiam, *Lamb* 1144; Lake Ozette, *Otis* 1771. (Cr)

5. J. BALTICUS Willd. Clallam County, *Elmer* 2730. Transition. (Cr)

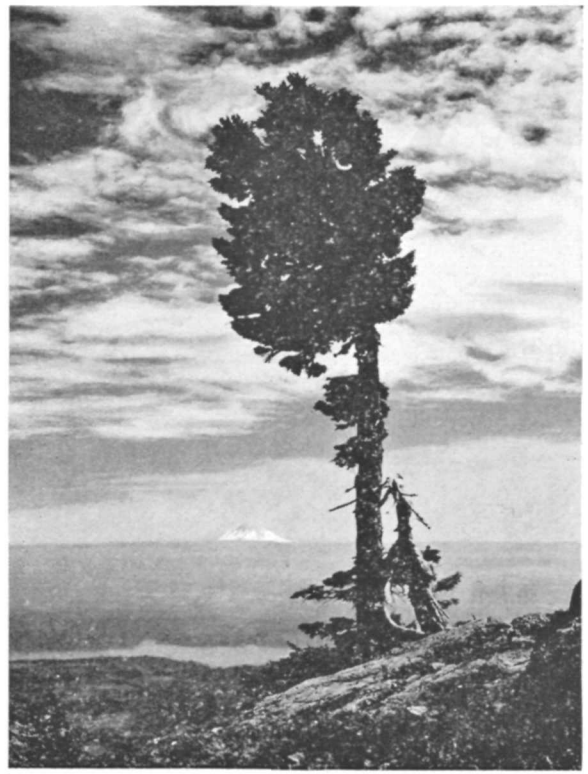

Fig. A. Mountain Hemlock *(Tsuga heterophylla)* on the summit of Mount Ellinor (elevation 4,400 ft.) Hood Canal in the foreground, Puget Sound beyond, and Mount Rainier on the horizon.

Photos by Victor B. Scheffer

Fig. B. Forest along the Quilcene River, from the Olympic Highway.

6. J. LESCURII Boland. Westport, *Henderson* 2552, *Heller* 3945; Oyhut, *Conard* 412; Ocean City, *Jones* 3896; Taholah, *Thompson* 9330. Humid Transition. (Cr)

7. J. BUFONIUS L. Clallam County, *Elmer* 2734; Jefferson County, *Otis* 1546; Lake Crescent, *Webster,* July 1910. Humid Transition. (Th)

8. J. TENUIS Willd. Lake Crescent, *Jones* 3462; Quillayute Prairie, *Jones* 3743; Montesano, *Heller* 4074. Transition. (H)

9. J. FALCATUS E.Mey. Westport, *Henderson,* June 26, 1892; Ocean City, *Jones* 3885, 3908. Humid Transition. (Cr)

10. J. GERARDI Loisel. Mason County, *Jones* 3843. Humid Transition. (Cr)

11. J. COVILLEI Piper. Clallam County, *Elmer* 2732; Lake Crescent, *Lawrence* 303, *Webster,* July 1910; Lake Ozette, *Thompson* 9431. Humid Transition. (Cr)

12. J. FUCENSIS St.John, Ann. Rept. Prov. Mus. B. C. 1928. Port Discovery, *St.John* 5858 (type locality). Humid Transition. (Cr)

13. J. OXYMERIS Engelm. Oyhut, *T.H.Scheffer,* August 23, 1934. Humid Transition. (Cr)

14. J. XIPHIOIDES E.Mey., var. TRIANDRUS Engelm. *(J. ensifolius* Wiks.) Montesano, *Heller* 3968; Lake Crescent, *Jones* 3461, *Webster,* July 1910 (heads proliferous); Jefferson County, *Otis* 1549, 1524; Aloha, *Thompson* 9357; Deer Lake, *Jones* 5839; Boulder Creek, *Jones* 8457. Transition to Hudsonian. (Cr)

14a. Var. MONTANUS Engelm. *(J. ensifolius* Wiks., var. *major* Hook.) Elwha River, *Jones* 3534; Raft River, *Jones* 8414. Transition to Hudsonian. (Cr)

15. J. ACUMINATUS Michx. Montesano, *Heller* 3969; Crocker Lake *Jones* 5916; Aloha, *Thompson* 9360; Hoh River, *Jones* 8423. Heads often proliferating. Transition. (H)

16. J. BOLANDERI Engelm. Hoh River, *Otis* 1555. Known only from two other localities in Washington, namely, Roche Harbor, San Juan Island, where it has been collected by M. E. Peck, and Tumwater, Thurston County, *Otis* 1921.

17. J. MERTENSIANUS Bong. Olympic Mountains, *Elmer* 2735, *Flett* 827, *Piper* 1042; Mt. Angeles, *Thompson* 5497, 7840; Lake Constance, *Thompson* 7915; Boulder Creek, *Jones* 8485. Hudsonian. (H)

18. J. ARTICULATUS L. Between Bogachiel and Hoh rivers, *Otis* 1553. Transition. (Cr)

19. J. RICHARDSONIANUS Schult. Lake Crescent, *Webster* 175. Known otherwise in Washington only from Whatcom County and from Chelan. (Cr)

20. J. NEVADENSIS Wats. Lake Ozette, *Jones* 5988, *Thompson* 9418. Heads often proliferous. (Cr)

2. LUZULA

Flowers solitary (or 2-3-together) on slender pedicels in an open panicle.
- Perianth and capsule pale green ..... 1. *L. parviflora.*
- Perianth and capsule dark brown ..... 2. *L. Piperi.*

Flowers sessile or nearly so, congested in head-like clusters.
- Spikelets subsessile, forming a nodding, compound spike-like cluster. 3. *L. spicata.*
- Spikelets peduncled, forming a corymb.
  - Heads 10-30 mm. long, cylindrical; perianth-segments pale brown, 3-4.5 mm. long, exceeding the pale brown capsule ..... 4. *L. comosa.*
  - Heads 5-10 mm. long, globose or short-cylindrical; perianth-segments dark brown, 2.5-3.5 mm. long, nearly equalling the dark brown capsule ..... 5. *L. multiflora.*

1. L. PARVIFLORA (Ehrh.) Desv. *(Juncoides parviflorum* (Ehrh.) Coville) Montesano *Heller* 3900; Lake Cushman, *Henderson* 1016; Jefferson County, *Otis* 1513; Skokomish Valley, *Kincaid;* Mt. Angeles, *Thompson* 7370; Mt. Colonel Bob, *Thompson* 7270; Lake Crescent, *Jones* 3434; Elwha River, *Jones* 3276, 3122. Humid Transition. (H)

2. L. PIPERI (Coville) M.E.Jones. *(Juncoides Piperi* Coville) Olympic Mountains, *Flett* 122; Mt. Angeles, *Jones* 3311; Seven Lakes Basin, *Jones* 8300. Arctic-alpine. (H)

These plants are very similar to, if not identical with, the circumboreal *L. Wahlenbergii* Rupr.

3. L. SPICATA (L.) DC. *(Juncodes spicatum* (L.) Kuntze) Mt. Carrie, *St.John* 5806; Mt. Angeles, *Thompson* 5501. Arctic-alpine. (H)

4. L. COMOSA E.Mey. *(Juncodes campestre,* var. *comosum* Kuntze) Duckabush River, *Jones* 3085; Ocean City, *Jones* 3884. Humid Transition. (H)

5. L. MULTIFLORA (Ehrh.) Lej. (*Juncodes campestre*, var. *multiflorum* (Ehrh.) Sheldon) Duckabush River, *Jones* 3070; Hurricane Ridge, *Jones* 3246; Jefferson County, *Otis* 1520; Quillayute Prairie, *Jones* 3605; Seven Lakes Basin, *Jones* 8325. Transition to Hudsonian. (H)

18. LILIACEAE. Lily Family

Petals and sepals alike or nearly so; leaves parallel-veined (except *Erythronium*).
- Styles 3, distinct; fruit a septicidal capsule.
  - Flowers purplish brown, nodding; leaves grass-like; plants with bulbs ..... 1. *Stenanthium.*
  - Flowers white or whitish, erect.
    - Leaves linear or nearly so, glabrous.
      - Leaves equitant, entire; scape glandular, arising from a short rhizome ..... 2. *Tofieldia.*
      - Leaves not equitant; scape glabrous.
        - Leaves numerous, serrulate; plants with rhizomes ..... 3. *Xerophyllum.*
        - Leaves few, entire; plants with bulbs ..... 4. *Zigadenus.*
    - Leaves broad, entire, clasping, plaited, pubescent; stems stout, 1-2 m. high, from a stout rhizome ..... 5. *Veratrum.*
- Style 1, entire, 3-lobed, or 3-cleft (rarely lacking).
  - Flowers in umbels; leaves linear; plants with bulbs or corms; fruit a loculicidal capsule.
    - Perianth-lobes separate or nearly so; plants with the odor and taste of onions (alliaceous) ..... 6. *Allium.*
    - Perianth-lobes united at base; plants never alliaceous ..... 7. *Brodiaea.*
  - Flowers solitary, racemose, or paniculate.
    - Leaves linear; plants bulbous or cormose; fruit a loculicidal capsule.
      - Flowers blue, (rarely white), racemose; anthers versatile .. 8. *Camassia.*
      - Flowers white, solitary; anthers basifixed ..... 9. *Lloydia.*
    - Leaves lanceolate or broader.
      - Perianth segments and stamens 6.
        - Plants from bulbs or corms; fruit a loculicidal capsule; flowers nodding.
          - Leaves 2-4, basal (or apparently so); low plants from membranous-coated corms ..... 10. *Erythronium.*
          - Leaves several; tall leafy plants from thick-scaly bulbs.
            - Stigma 3-lobed ..... 11. *Lilium.*
            - Style 3-cleft (in our species) ..... 12. *Fritillaria.*
        - Plants from rhizomes; fruit a berry.
          - Leaves all basal; flowers white, erect, solitary (in our species) ..... 13. *Clintonia.*
          - Stems leafy.
            - Stems not branched; flowers white, erect, in a terminal panicle or raceme ..... 14. *Smilacina.*
            - Stems usually branched; flowers few, drooping.
              - Flowers axillary, solitary ..... 15. *Streptopus.*
              - Flowers terminal, in 2's or 3's, or solitary ..... 16. *Disporum.*
      - Perianth segments and stamens 4; leaves cordate ..... 17. *Maianthemum.*

Petals and sepals unlike, the former broad, white, the latter narrow, green; leaves 3 in a whorl, net-veined ..... 18. *Trillium.*

1. STENANTHIUM

1. S. OCCIDENTALE Gray. Olympic Mountains, *Flett* 137, *Piper* 2226; Clallam County, *Elmer* 2503; Canyon Creek, *St.John* 4774, *Jones* 5910, 8368; Lake Constance, *Thompson* 7906; Constance Ridge, *Thomp-*

son 6569; Mt. Angeles, *Webster,* July 26, 1908; Marmot Pass, *Thompson* 9918. Canadian. (Cr)

2. TOFIELDIA

1. T. OCCIDENTALIS Wats. *(T. intermedia* Piper, not Rydb.) Clallam County, *Elmer* 2504; Olympic Mountains, *Piper* 2242; Elwha River, *C.S.Eaton,* August 1907; Raft River, *Jones* 3966; Mt. Angeles, *Thompson* 7412; Deer Lake, *Jones* 5838; Lake Ozette, *Jones* 5948. Chiefly Hudsonian. (Cr)

3. XEROPHYLLUM. Pine Lily

1. X. TENAX (Pursh) Nutt. Clallam County, *Elmer* 2505; Skokomish Valley, *Kincaid,* June 1892; Mt. Baldy, *Conard* 286; Matlock, *Jones* 3705; Deer Lake, *St.John* 4799; Raft River, *Jones* 3967; Mt. Colonel Bob, *Thompson* 7271; Seven Lakes Basin, *Jones* 8265. Chiefly Hudsonian, but also Canadian and Humid Transition. (H)

4. ZIGADENUS. Zigadene

Petals 8-11 mm. long; inflorescence paniculate ..... 1. *Z. elegans.*
Petals 2-7 mm. long; inflorescence racemose ..... 2. *Z. venenosus.*

1. Z. ELEGANS Pursh. Olympic Mountains, *Flett* 109; Marmot Pass, *Thompson* 7952; Lake Constance, *Thompson* 7922. Hudsonian. (Cr)

2. Z. VENENOSUS Wats. Death Camas. Clallam County, *Elmer* 2493; Humptulips, *Lamb* 1185; Shelton, *Jones* 3833. Humid Transition. (Cr)

5. VERATRUM. False Hellebore

Perianth segments yellowish green, oblanceolate, acute, 8-10 mm. long; branches of the panicle drooping ..... 1. *V. Eschscholtzii.*
Perianth segments white with a green base, linear-lanceolate, acuminate, 12-18 mm. long; branches of the panicle usually spreading or erect ..... 2. *V. caudatum.*

1. V. ESCHSCHOLTZII Gray. *(V. viride* of Piper; *V. Eschscholtzianum* (R. & S.) Rydb.) Clallam County, *Elmer* 2501; Mt. Angeles, *Webster* 1277, 1278; Marmot Pass, *Thompson* 9906; Lake Constance, *Thompson* 7904; Constance Ridge, *Jones* 5792; Deer Lake, *Jones* 8339; Canyon Creek, *Jones* 5888. Hudsonian. (Cr)

2. V. CAUDATUM Heller. Montesano, *Heller* 4013 (type). Humid Transition. (Cr)

6. ALLIUM. Onion

Flowers nodding ..... 1. *A. cernuum.*
Flowers erect.
  Leaves and scapes flattened ..... 2. *A. crenulatum.*
  Leaves and scapes terete ..... 3. *A. acuminatum.*

1. A. CERNUUM Roth. Clallam County, *Elmer* 2506; Olympic Mountains, *Flett* 822; Hurricane Ridge, *Jones* 3355; Mt. Angeles, *Thompson* 5593. Humid Transition. (Cr)

2. A. CRENULATUM Wieg. Olympic Mountains, *Flett* 821; Mt. Steele, *Piper* 2218; Baldy Peak, *Lamb* 1330; Hurricane Ridge, *Jones* 3236; Mt. Angeles, *Thompson* 5533, 9444, 7429; Marmot Pass, *Thompson* 7959; Mt. Colonel Bob, *Thompson* 7239. Hudsonian. (Cr)

3. A. ACUMINATUM Hook. Clallam County, *Elmer* 2499; Olympic Mountains, *Flett* 86; Hurricane Ridge, *Jones* 3357. Transition. (Cr)

7. BRODIAEA

Anther-bearing stamens 3; flowers blue.
  Flowers long-pedicelled, in umbels ..... 1. *B. coronaria.*
  Flowers nearly sessile in clusters ..... 2. *B. pulchella.*
Anther-bearing stamens 6; flowers whitish ..... 3. *B. hyacinthina.*

1. B. CORONARIA (Salisb.) Jeps. Elwha River, *Jones* 3526. Humid Transition. (Cr)

2. B. PULCHELLA (Salisb.) Greene. Port Angeles, *Webster* 1072; Lake Crescent, *M.J.Carrigan,* June 22, 1908. Humid Transition. (Cr)

3. B. HYACINTHINA (Lindl.) Wats. Humptulips, *Lamb* 1282; Port Townsend, *Meehan* in 1883. Humid Transition. (Cr)

8. CAMASSIA. Camas

1. C. QUAMASH (Pursh) Greene. *(Quamasia azurea* Heller; *Q. quamash* (Pursh) Coville) Quillayute Prairie, *Jones* 3572; Aloha, *Jones* 6452; Elma, *Jones* 6477; Scott's Prairie, *Jones* 6495. Transition. (Cr)

9. LLOYDIA

1. L. SEROTINA (L.) Sweet. Olympic Mountains, *Flett* 850; Mt. Angeles, *Flett,* June 29, 1908; *Webster* 1089; Mt. Baldy, *Conard* 285; Marmot Pass, *Thompson* 9922; Mt. Colonel Bob, *Thompson* 7253. Arctic-alpine. (Cr)

10. ERYTHRONIUM. Fawn Lily

Leaves not mottled.
Perianth yellow; anthers white ..... 1. *E. grandiflorum*, var. *pallidum*.
Perianth white; anthers yellow ..... 2. *E. montanum*.
Leaves mottled; anthers yellow.
Perianth rose-pink ..... 3. *E. revolutum*.
Perianth white ..... 4. *E. oregonum*.

1. E. GRANDIFLORUM Pursh, var. PALLIDUM St.John, Res. Stud. State Coll. Wash. 2: 113, 1930. *(E. parviflorum* (Wats.) Goodding) Clallam County, *Elmer* 2491; Olympic Mountains, *Henderson* 2039; Hurricane Ridge, *Jones* 3264, 3265, 4033; Constance Ridge, *Thompson,* 6579. Hudsonian. (Cr)

2. E. MONTANUM Wats. Canyon Creek, *St.John* 3742; Clallam County, *Elmer* 2496; Olympic Mountains, *Piper* 2220; *Henderson* 2038; Mt. Colonel Bob, *Thompson* 7302, 9408; Hurricane Ridge, *Jones* 4029. Hudsonian. (Cr)

3. E. REVOLUTUM Smith. Hoh River, *Otis* 1418; Forks, *Otis* 1428; Lake Tyee, *Otis* 1426; Beaver Creek, *Jones* 4536. Humid Transition. (Cr)

4. E. OREGONUM Applegate, Madroño 3: 99, 1935. Scott's Prairie, *Jones* 6503; Brinnon, *Otis* 1501; Sequim, *Grant,* May 1916; Montesano, *Grant,* May 1919; Wreck Creek Prairie, *Conard* 427. Transition. (Cr)

Mr. Applegate has established the fact that *Erythronium giganteum* Lindl. is synonymous with *E. grandiflorum* Pursh. He therefore applies the name *E. oregonum* to the coastal white-flowered species.

11. LILIUM. Lily

1. L. COLUMBIANUM Hans. *(L. parviflorum* (Hook.) Holz.) Quillayute Prairie, *Jones* 3578; Clallam County, *Elmer* 2502; Olympic Mountains, *Sargent,* August 15, 1896; Montesano, *Heller* 3972; Chehalis [Grays Harbor] County, *Lamb* 1179; Chehalis River, *Lamb* 1237; Hurricane Ridge, *Jones* 3262, 3378; Mt. Angeles, *Thompson* 7500; Bogachiel Peak, *Jones* 8392; Dosewallips River, *Thompson* 6596. Humid Transition to Hudsonian. (Cr)

The character of the attachment of the anthers, relied upon by many botanists to distinguish Lilium from Fritillaria, breaks down completely in our species. The relative position of anther and filament in both *Lilium columbianum* and *Fritillaria lanceolata* is identical, and, except for the difference in size *(L. columbianum*: anther 1 cm. long; *F. lanceolata*: 6 mm. long), the stamens of the two species are indistinguishable.

12. FRITILLARIA. Fritillary

1. F. LANCEOLATA Pursh. Clallam County, *Elmer* 2507; Mt. Angeles, *Webster* 1076; Union, *Jones* 6513. Humid Transition. (Cr)

13. CLINTONIA

1. C. UNIFLORA (Schult.) Kunth. Clallam County, *Elmer* 2494; Olympic Mountains, *Grant* in 1889; Dosewallips River, *Thompson* 6554. Canadian. (Cr)

14. SMILACINA. Solomon's Seal

Flowers in a raceme, few; berry 6-10 mm. in diameter..... 1. *S. stellata.*
Flowers in a panicle, numerous; berry 4-5 mm. in diameter..... 2. *S. amplexicaulis.*

1. S. STELLATA (L.) Desf. *(Vagnera sessilifolia* (Baker) Greene) Clallam County, *Elmer* 2495; near Lake Cushman, *Piper,* August 1895; Skokomish River, *Kincaid,* May 1892; Clifton, *Jones* 6501; Soleduck River, *Jones* 8379; Mt. Angeles, *Flett,* July 1908. Humid Transition and Canadian. (Cr)

2. S. AMPLEXICAULIS Nutt. *(Vagnera amplexicaulis* (Nutt.) Greene) Clallam County, *Elmer* 2500; Baldy Peak, *Lamb* 1345; Elwha River, *Jones* 3398; Quillayute Prairie, *Jones* 3612; Olympic Hot Springs, *Jones* 3993. Humid Transition. (Cr)

15. STREPTOPUS. Twisted-stalk

Perianth campanulate; style filiform.
  Perianth greenish white, the lobes recurved at tip; stems branched; nodes glabrous; leaves half-clasping..... 1. *S. amplexifolius.*
  Perianth rose-colored, the lobes not recurved; stems simple; nodes fringed; leaves sessile, (microscopically) ciliolate..... 2. *S. curvipes.*
Perianth rotate; style absent; perianth red at base with yellowish green recurved tips; leaves (microscopically) papillose on the margins..... 3. *S. streptopoides.*

1. S. AMPLEXIFOLIUS (L.) DC. Quillayute Prairie, *Jones* 3787; Montesano, *Jones* 6467; Raft River, *Jones* 3965; near Hoh River, *Otis* 1514, 1556; Canyon Creek, *Jones* 8343. Humid Transition and Canadian. (Cr)

According to a recent paper by N. C. Fassett (1935) typical *S. amplexifolius* is confined to the mountainous regions of southern Europe, and the Olympic Peninsula specimens belong to var. *denticulatus* Fassett (leaf-margins microscopically denticulate), and var. *americanus* Schultes (margins entire).

2. S. CURVIPES Vail. Lake Cushman, *Piper* in 1890; Mt. Colonel Bob, *Thompson* 7309. Canadian. (Cr)

3. S. STREPTOPOIDES (Ledeb.) Frye & Rigg. *(Kruhsea streptopoides* (Ledeb.) Kearney) Quilcene River, *English,* October 1934; Canyon Creek, *Jones* 5884, 8373; Elwha valley, *C.S.Eaton,* August 20, 1907. Canadian. (Cr)

According to Fassett (l.c.), our plants belong to *S. streptopoides,* var. *brevipes* (Baker) Fassett.

16. DISPORUM. Bellwort

Perianth gibbously truncate and broad at base, 13-22 mm. long; stamens included; stigma 3-cleft; fruit 12-16 mm. in diameter, oblong-ovoid, glabrous, except the blunt beak ..... 1. *D. Smithii.*
Perianth narrowed at base, 8-13 mm. long; stamens exserted; stigma apparently entire or nearly so; fruit ovoid, pubescent to nearly glabrous ..... 2. *D. oreganum.*

1. D. SMITHII (Hook.) Piper. Hoquiam, *Lamb* 1039a; Skokomish River, *Kincaid,* May 13, 1892; Hoh River, *Otis* 1419; Mt. Colonel Bob, *Thompson* 6355; Humptulips River, *Jones* 4575, 6464; Kamilche, *Benson* 1425; Soleduck River, *Jones* 8378. Humid Transition. (Cr)

2. D. OREGANUM (Wats.) Benth. & Hook. Clallam County, *Elmer* 2497; Lake Cushman, *Piper,* August 1895; Hurricane Ridge, *Jones* 4021; Mt. Colonel Bob, *Thompson* 9411; Dosewallips River, *Jones* 5850. Transition. (Cr)

17. MAIANTHEMUM

1. M. DILATATUM (Wood) Nels. & Macbr. *(Unifolium bifolium kamtschaticum* (Gmel.) Piper) Port Crescent, *Lawrence* 277; Quinault, *Conard* 130; Clallam County, *Elmer* 2490; Cat Creek, *St.John* 5820; Lake Crescent, *Jones* 3470; Ocean City, *Jones* 3924; Taholah, *Jones* 6482. Humid Transition. (Cr)

18. TRILLIUM

1. T. OVATUM Pursh. Clallam County, *Elmer* 2498; Port Ludlow, *Binns,* March 30, 1889; Duckabush River, *Jones* 3093; Mt. Colonel Bob, *Thompson* 6248; Mt. Angeles, *Thompson* 7371; Nolan Creek, *Jones* 4558. Humid Transition. (Cr)

19. IRIDACEAE. Iris Family

Flowers 4-6 cm. long; sepals and petals unlike; styles petal-like; leaves 4-8 mm. wide ..... 1. *Iris.*
Flowers 10-20 mm. broad; sepals and petals alike; styles filiform; leaves 1-3 mm. wide ..... 2. *Sisyrinchium.*

1. IRIS

Leaves 3-4 mm. wide; capsule 3-5 cm. long ..... 1. *I. missouriensis.*
Leaves 5-10 mm. wide; capsule 2-2.5 cm. long ..... 2. *I. tenax.*

1. I. MISSOURIENSIS Nutt. Haynes, *Webster* 1057; Sequim, *Jones* 3720. The only other known station west of the Cascade Mountains for this species is near Coupeville, Whidby Island. East of the Cascade range it is a common Arid Transition species occurring from British Columbia to Arizona. (Cr)

2. I. TENAX Dougl. Montesano, *Heller* 3876. Humid Transition. (Cr)

2. SISYRINCHIUM. Star-grass

Perianth yellow; seashore species ..... 1. *S. californicum.*
Perianth blue or purple.
  Perianth blue, the segments mucronate, 10-15 mm. long ..... 2. *S. idahoense.*
  Perianth red-purple, the segments acute or acuminate, 15-20 mm. long ..... 3. *S. Douglasii.*

1. S. CALIFORNICUM (Ker) Dry. *(Hydastylus brachypus* Bickn.) Oyhut, *Lamb* 1251; Westport, *Henderson,* June 1892; Grenville, *Conard* 410; Ocean City, *Jones* 3919. Humid Transition. (H)

2. S. IDAHOENSE Bickn. Montesano, *Heller* 3883; Quillayute Prairie, *Jones* 3409; Satsop, *Jones* 3864; Lake Crescent, *Webster* 1019; Haynes, *Webster* 1059; Tsuess River, *Erna Gunther,* June 18, 1935. Humid Transition. (H)

3. S. DOUGLASII A.Dietr. *(Olsynium grandiflorum* (Dougl.) Raf.) See St.John, Rept. Prov. Mus. Nat. Hist., British Columbia, 1930. Port Angeles, *Grant* 1; Sequim, *Grant.* Humid Transition. (H)

20. ORCHIDACEAE. Orchid Family

Plants without green leaves, or leaves reduced and scale-like; saprophytic.
  Plants white; perianth white ..... 1. *Cephalanthera.*
  Plants reddish brown or purplish ..... 2. *Corallorrhiza.*
Plants with ordinary green leaves; holophytic.
  Flower and leaf solitary ..... 3. *Calypso.*
  Flowers several to many.
    Leaves 2, opposite ..... 4. *Listera.*
    Leaves more than 2, alternate or basal.
      Flowers spurred ..... 5. *Habenaria.*
      Flowers spurless.
        Flowers in a spike.
          Spike dense and twisted; leaves uniformly green ..... 6. *Spiranthes.*
          Spike loose, not spiral; leaves white-marked ..... 7. *Peramium.*
        Flowers in a raceme; leaves uniformly green ..... 8. *Epipactis.*

1. CEPHALANTHERA

1. C. AUSTINAE (Gray) Heller. Phantom Orchid. Observed in the Quilcene Valley in 1920 by Mr. Leslie Muller of Shelton. This is one of the rarest plants in Washington.

2. CORALLORRHIZA. Coralroot

Lip white, crimson spotted; spur prominent ..... 1. *C. maculata.*
Lip purplish, not spotted.
Spur prominent; perianth segments faintly veined ..... 2. *C. Mertensiana.*
Spur none; perianth segments conspicuously 3-striate ..... 3. *C. striata.*

1. C. MACULATA Raf. *(C. multiflora occidentalis* Lindl.) Clallam County, *Elmer* 2553; Chehalis [Grays Harbor] County, *Lamb* 1163; Mt. Angeles, *Jones* 3299, *Rigg,* July 22, 1929; Elwha River, *Jones* 4005, 4010; Constance Ridge, *Thompson* 6567; Canyon Creek, *Jones* 8390. Humid Transition and Canadian. (Cr)

2. C. MERTENSIANA Bong. Clallam County, *Elmer* 2554; Baldy Peak, *Lamb* 1292; Canyon Creek, *Jones* 5896; Soleduck River, *Jones* 8376. Canadian. (Cr)

3. C. STRIATA Lindl. Mt. Angeles, *Jones* 3300. Humid Transition and Canadian. (Cr)

3. CALYPSO

1. C. BULBOSA (L.) Oakes. *(C. occidentalis* (Holz.) Heller; *Cytherea bulbosa* (L.) House.) Elwha River, *Jones* 3997. Transition and Canadian. (Cr)

4. LISTERA. Twayblade

Leaves ovate to orbicular; raceme glandular-puberulent.
Ovary glandular; lip 9-11 mm. long, cuneate, retuse at apex .... 1. *L. convallarioides.*
Ovary glabrous; lip 4-7 mm. long, spatulate, obtuse at apex .... 2. *L. caurina.*
Leaves deltoid-cordate; raceme glabrous; lip deeply 2-cleft ..... 3. *L. cordata.*

1. L. CONVALLARIOIDES (Sw.) Torr. *(Ophrys convallarioides* (Sw.) W. F. Wight) Big Creek Prairie, *Lamb* 1402; Rainbow Camp, *Thompson* 9864; Canyon Creek, *Jones* 5826. Canadian. (H)

2. L. CAURINA Piper. *(Ophrys caurina* (Piper) Rydb.) Clallam County, *Elmer* 2548; Baldy Peak, *Lamb* 1295; Lake Crescent, *Jones* 3412; Quilcene Valley, *Thompson* 7948; Canyon Creek, *Jones* 5886. Canadian. (H)

3. L. CORDATA (L.) R.Br. *(Ophrys cordata* L.) Westport, *Lamb* 1093; Mt. Angeles, *Flett,* June 30, 1908, *Rigg,* July 22, 1929; Skokomish Valley, *Kincaid,* May 1892; Olympic Hot Springs, *Jones* 3984; Mt. Colonel Bob, *Thompson* 7320; Mink Lake, *Otis* 1575; Canyon Creek, *Jones* 5825, 8369. Canadian and Humid Transition. (H)

5. HABENARIA

Stem leafy, the leaves gradually reduced upward to bracts, not withering at or before flowering time; sepals 3-nerved.
- Flowers green.
  - Spur saccate, about half the length of the lip ..... 1. *H. saccata.*
  - Spur clavate, about as long as the lip ..... 2. *H. viridiflora.*
- Flowers white.
  - Spur about as long as the lip ..... 3. *H. dilatata.*
  - Spur about one-half longer than the lip ..... 4. *H. leucostachys.*

Stem scapose; leaves basal, abruptly reduced to bracts, usually withered at flowering time; sepals 1-nerved.
- Spur short, slightly exceeding the lip ..... 5. *H. unalascensis.*
- Spur slender, 2-3 times as long as the lip ..... 6. *H. elegans.*

1 H. SACCATA Greene. Clallam County, *Elmer* 2549; Deer Lake, *St.John* 4772; Mt. Angeles, *Thompson* 5532. Hudsonian. (Cr)

2. H. VIRIDIFLORA (Cham.) Henry. *(Limnorchis viridiflora* (Cham.) Rydb.) Canyon Creek, *Jones* 5906. Canadian. (Cr)

3. H. DILATATA (Pursh) Hook. *(Limnorchis dilatata* (Pursh) Rydb.) Olympic Mountains, *Piper,* August 1895. Canadian. (Cr)

4. H. LEUCOSTACHYS (Lindl.) Wats. *(Limnorchis leucostachys* (Lindl.) Rydb.) Clallam County, *Elmer* 2551; Baker Prairie, *Thompson* 9390; Hoh River, *Otis* 1552. Transition. (Cr)

5. H. UNALASCENSIS (Spreng.) Wats. *(Piperia unalaschensis* (Spreng.) Rydb.) Clallam County, *Elmer* 2552; Mt. Angeles, *Jones* 3298. Transition and Canadian. (Cr)

6. H. ELEGANS (Lindl.) Boland. *(P. elegans* (Lindl.) Rydb.) Port Discovery, *St.John* 5850; Washington Harbor, *Jones* 8523; Elwha River, *Jones* 3552; Port Crescent, *Lawrence* 229; Mt. Carrie, *St.John* 5815; Mt. Angeles, *Thompson* 7381. Transition. (Cr)

The flowers of the western Washington plants are green, not white or greenish white, as they usually are said to be.

6. SPIRANTHES

1. S. ROMANZOFFIANA Cham. Quillayute Prairie, *Jones* 3576; Forks Prairie, *Otis* 1577. Transition. (H)

7. PERAMIUM. Rattlesnake Plantain

1. P. DECIPIENS (Hook.) Piper. Clallam County, *Elmer* 2547; Elwha River, *Jones* 3499; Quilcene Valley, *Thompson* 7949. Transition. (H)

8. EPIPACTIS

1. E. GIGANTEA Dougl. Stream Orchis. Clallam County, *Elmer* 2550; Lake Crescent, *Lawrence* 301, *Jones* 3440. Humid Transition on the Olympic Peninsula. (Cr)

Subclass 2. Dicotyledons

21. SALICACEAE. Willow Family

Bracts of the catkins fimbriate; leaves mostly broad, long-petioled ..... 1. *Populus.*
Bracts entire; leaves mostly narrow, short-petioled ..... 2. *Salix.*

1. POPULUS. Poplar

Tree 5-15 m. high; leaves broadly ovate to suborbicular, acute or abruptly short-acuminate, 2.5-5 cm. long, the petioles laterally flattened; stamens 6-12; capsule conical, glabrous ..... 1. *P. tremuloides.*
Tree 20-60 m. high; leaves ovate or lanceolate, acuminate, 5-25 cm. long, the petioles terete; stamens 50-60; capsule subglobose, puberulent or glabrate ..... 2. *P. trichocarpa*

1. P. TREMULOIDES Michx. Quaking Aspen. The aspen, a rare tree on the Olympic Peninsula, is known only from the following collection: east of Mason Lake, on the Deer-Sherwood Creek divide, November 15, 1935, *H. W. Smith.* Transition. (Ph)

The western Washington plants *(P. vancouveriana* Trel.; Tidestrom in Piper & Beattie, Fl. Nw. Coast 118, 1915) may be subspecifically distinct from typical *P. tremuloides* Michx. of eastern North America, but satisfactory distinguishing characters have yet to be worked out.

2. P. TRICHOCARPA T. & G. Cottonwood. A common species in the river valleys. Stevens Creek, *Jones* 8429; Montesano, *Jones* 8403; Union, *Jones* 8540. Transition. (Ph)

2. SALIX. Willow

Erect shrubs or trees.
  Subalpine species; capsule glabrous.
    Leaves green, tomentose (becoming glabrate in age) on both sides, entire or nearly so ..... 1. *S. commutata.*
    Leaves mostly glaucous beneath, thinly tomentose above, especially on the veins, crenate-serrulate with inflexed glandular teeth to subentire ..... 2. *S. Barclayi.*
  Lowland or montane species.
    Leaves glabrous and glaucous beneath, dark green and glabrous above, serrulate; twigs glabrous, shining; capsule glabrous.
      Leaves lanceolate, acuminate; stamens 3-8 or 10; style very short; tree with rough bark ..... 3. *S. lasiandra.*
      Leaves elliptical or oblanceolate, acute; stamens 2; style 1 mm. long; shrub ..... 4. *S. Piperi.*
    Leaves tomentose to pubescent, and sometimes pale or glaucous beneath; young twigs pubescent; capsule pubescent.
      Leaves covered beneath with a short, dense, appressed, satiny pubescence; catkins appearing in the spring at the same time as the leaves (coetaneous); stamen 1 ..... 5. *S. sitchensis.*

Leaves either short-pubescent, glabrous or loosely tomentose; catkins appearing before the leaves; stamens 2.
Leaves loosely tomentose beneath, lanceolate or elliptic-oval..... 6. *S. Hookeriana.*
Leaves shortly pubescent to glabrous and glaucous beneath, strongly reticulate, oblanceolate or obovate..... 7. *S. Scouleriana.*
Low, prostrate or ascending alpine shrubs; leaves glaucous and reticulate beneath, glabrous above.
Leaf blades 5-12 mm. long; petioles 2-7 mm. long; pistillate catkins 1 cm. or less long, 3-6-flowered; style 0..... 8. *S. nivalis.*
Leaf-blades 2.5-6 cm. long; petioles 6-15 mm. long; pistillate catkins 3-8 cm. long; style 1-2.5 mm. long..... 9. *S. arctica.*

1. S. COMMUTATA Bebb. Olympic Mountains, *Piper,* August 1895; Queets River valley, August 16, 1907, *Frye;* Marmot Pass, *Thompson* 7987; Mt. Angeles, *Flett* 2153. Hudsonian and Arctic-alpine. (Ph)

2. S. BARCLAYI Anderss. Olympic Mountains, *Piper,* August 1895; Boulder Creek, *Jones* 8476. Hudsonian and Arctic-alpine. (Ph)

3. S. LASIANDRA Benth. *(Salix lasiandra Lyallii* Sarg.) Clallam County, *Elmer* 2429; Montesano, *Heller* 3856; Lake Crescent, *Jones* 3561, 3778; Lake Ozette, *Thompson* 9414; Beaver Creek, *Jones* 4543; Union, *Jones* 8541. Humid Transition. (Ph)

4. S. PIPERI Bebb. Hoquiam, *Lamb* 1004; Montesano, *Jones* 8402. Humid Transition. (Ph)

5. S. SITCHENSIS Sanson. Clallam County, *Elmer* 2428; Lake Crescent, *Jones* 3490, 8426; Humptulips River, *Jones* 4566, 4567, 4580; Nolan Creek, *Jones* 4559; Boulder Creek, *Jones* 8465; Stevens Creek, *Jones* 8406; Blyn, *Jones* 8530. Transition and Canadian. (Ph)

6. S. HOOKERIANA Barratt. Grays Harbor, *Lamb* 1035; Cohasset Beach, *Lamb* 1126; Ocean City, *Jones* 3880. Humid Transition. (Ph)

7. S. SCOULERIANA Barratt. The commonest species of the region. Port Angeles, *Webster* 2148. Humid Transition and Canadian. (Ph)

8. S. NIVALIS Hook. Mt. Angeles, *Jones* 3195; Marmot Pass, *Thompson* 9951. Arctic-alpine. (Ch)

9. S. ARCTICA Pall. Marmot Pass, *Thompson* 7976. Arctic-alpine. (Ch)

22. MYRICACEAE. Bayberry Family

1. MYRICA

Shrub 1-2 m. high; leaves deciduous, obtuse, serrate above the middle only; flowers dioecious ..... 1. *M. Gale.*
Shrub or slender tree 1-10 m. high; leaves evergreen, acute, serrate to below the middle; flowers monoecious ..... 2. *M. californica.*

1. M. GALE L. Bog Myrtle. Ocean City, *Jones* 3918; Aloha, *Jones* 6460; Lake Ozette, *Thompson* 9516; Lake Quinault, *Jones* 3614; near Humptulips, *Jones* 4568. Humid Transition. (Ph)

2. M. CALIFORNICA Cham. Californian Wax Myrtle. Cohasset, *Lamb* 1122; Westport, *Heller* 394, *Otis* 1790; Ocean City, *Jones* 3895. Humid Transition. (Ph)

23. BETULACEAE. Birch Family

Fruit a nut, enclosed in a leafy involucre ..... 1. *Corylus.*
Fruit cone-like; involucre none ..... 2. *Alnus.*

1. CORYLUS

1. C. CALIFORNICA (A.DC.) Rose. Hazelnut. Common in woods throughout the Douglas fir subclimax forest. Montesano, *Heller* 3971. Humid Transition. (Ph)

2. ALNUS. Alder

Leaves more or less rusty-pubescent beneath, dull, coarsely toothed; cones 15-25 mm. long ..... 1. *A. oregona.*
Leaves glutinous, nearly glabrous, bright green, finely toothed; cones 12-15 mm. long ..... 2. *A. sinuata.*

1. A. OREGONA Nutt. Oregon or Red Alder. Clallam County, *Elmer 2759*; Hoquiam, *Lamb* 1022; Lake Crescent, *Jones* 3517a; Humptulips, *Jones* 3703; Waketichie Creek, *Jones* 8501; Hoh River, *Jones* 8418. Humid Transition. (Ph)

2. A. SINUATA (Regel) Rydb. Sitka Alder. Baldy Peak, *Lamb* 1341; Mt. Angeles, *Flett,* July 1, 1908; Duckabush River, *Jones* 3089; Mt. Colonel Bob, *Thompson* 7319; near Union, *Jones* 6511. Hudsonian to Transition. (Ph)

24. FAGACEAE. Beech Family

Leaves lobed, deciduous, glabrous; fruit a single nut in a cup-like involucre ..... 1. *Quercus.*
Leaves entire, evergreen, yellowish-tomentose beneath; fruit of 1-3 nuts in a bur-like involucre ..... 2. *Castanopsis.*

1. QUERCUS. Oak

1. Q. GARRYANA Dougl. Sequim, *Jones* 3727; Shelton, *Jones* 6532. Transition. (Ph)

2. CASTANOPSIS

1. C. CHRYSOPHYLLA (Dougl.) A.DC. Chinquapin. In open woods 8 miles south of Triton, along Hood Canal, apparently native, *Jones* 8552. The largest trees observed were 35 ft. high and 10 inches in diameter at the base. Reported by Mr. J. E. Schwartz of the Forest Service, and by Mr. Leslie Muller of Shelton, from the Hamma Hamma River, where there is "an area of some 30 or 40 acres where is it fairly common" (Muller). It grows in association with Douglas fir, *Rhododendron macrophyllum, Vaccinium ovatum, Gaultheria Shallon, Arbutus Menziesii,* and *Salix Scouleriana.* The chinquapin is known to occur elsewhere in Washington only on the north bank of the Columbia River in Skamania County. The discovery of this species along Hood Canal extends its known range about 150 miles northward. No intermediate stations are known. Transition. (Ph)

25. URTICACEAE. Nettle Family

1. URTICA. Nettle

1. U. LYALLII Wats. Elwha River, *Jones* 3336; Hoodsport, *Jones* 8535; Clallam County, *Elmer* 2760; Port Angeles, *Webster* 2117; Montesano, *Heller* 3920. Humid Transition. (Cr)

26. LORANTHACEAE. Mistletoe Family

1. ARCEUTHOBIUM

1. A. **tsugensis** (Rosend.) n. comb. *Razoumofskya tsugensis* Rosend., Minn. Bot. Stud. 2: 272, 1903; *R. douglasii tsugensis* (Rosend.) Piper, Contr. U. S. Nat. Herb. 11: 222, 1906. Port Ludlow, *Binns* (fide Piper); Lake Crescent, *Jones* 3439. Humid Transition. (Ph)

27. ARISTOLOCHIACEAE. Birthwort Family

1. ASARUM. Wild Ginger

1. A CAUDATUM Lindl. Clallam County, *Elmer* 2834; Skokomish Valley, *Kincaid,* May 1892; Mt. Colonel Bob, *Thompson* 6253; Mt. Angeles, *Thompson* 7356. Transition and Canadian. (Cr)

28. POLYGONACEAE. Buckwheat Family

Leaves without stipules; sepals 6; stamens 9 ..... 1. *Eriogonum.*
Leaves with sheathing stipules.
  Sepals 5; stigmas capitate ..... 2. *Polygonum.*
  Sepals 4 or 6; stigmas tufted.
    Sepals 6; leaves not reniform ..... 3. *Rumex.*
    Sepals 4; leaves reniform ..... 4. *Oxyria.*

1. ERIOGONUM

Perianth yellowish, 3-4 mm. long ..... 1. *E. ovalifolium.*
Perianth red, 5-6 mm. long ..... 1a. Var. *vineum.*

1. E. OVALIFOLIUM Nutt. Olympic Mountains, *Elmer* 2682; Hurricane Ridge, *Jones* 3361; Marmot Pass, *Thompson* 7957, 9930. Arctic-alpine. (Ch)

1a. Var. VINEUM (Small) A.Nels. *(E. vineum* Small). Olympic Mountains, *Flett* 127. Arctic-alpine. (Ch)

2. POLYGONUM

Stems twining; leaves cordate ..... 1. *P. Convolvulus.*
Stems not twining; leaves not cordate.
  Leaves small, usually narrow.
    Seashore perennial with woody rhizomes ..... 2. *P. Paronychia.*
    Annuals; roots fibrous.
      Stems prostrate.
        Achenes longer than and protruding from the calyx; plant perennial ..... 3. *P. Fowleri.*
        Achenes not longer than the calyx; plant annual ..... 4. *P. aviculare.*
      Stems erect or ascending.
        Flowers in axillary clusters; leaves scarcely reduced upward ..... 5. *P. minimum.*
        Flowers in elongate spikes.
          Flowers deflexed; achenes black, shining ..... 6. *P. Douglasii.*
          Flowers erect.
            Achenes brown, dull; filaments not dilated at base; sheaths 8-15 mm. long ..... 7. *P. spergulariaeforme.*
            Achenes black, shining; filaments dilated at base; sheaths 2-4 mm. long ..... 8. *P. Nuttallii.*
  Leaves comparatively broad.
    Flowers in axillary clusters ..... 9. *P. Newberryi.*
    Flowers in dense spike-like racemes.
      Flowers white; sheaths not ciliate; subalpine species ... 10. *P. bistortoides.*
      Flowers pink or greenish white; at least the upper sheaths bristly-ciliate; lowland species.
        Terrestrial annual; leaves sessile or short-petioled.
          Racemes strongly curved or nodding; calyx conspicuously glandular-punctate ..... 11. *P. Hydropiper.*
          Racemes erect; calyx not glandular ..... 12. *P. Persicaria.*
        Aquatic perennial; leaves evidently petioled; raceme erect, usually solitary ..... 13. *P. natans.*

1. *P. Convolvulvus* L. Black Bindweed. Sequim, *Jones* 3724; Lake Crescent, *Jones* 3769. (Th)

2. P. PARONYCHIA C. & S. Clallam County, *Elmer* 2680; Oyhut, *Lamb* 1256; Port Angeles, *Piper* 2304; Ediz Hook, *Jones* 3394; Copalis, *Jones* 3654; Ocean City, *Jones* 3888. Humid Transition. (Ch)

3. P. FOWLERI Robins. Port Angeles, *Piper* 2305; Port Hadlock, *Jones* 3152; Hoodsport, *Jones* 8094. This species reaches its southern limit in Washington. Humid Transition. (H)

4. *P. aviculare* L. Knotweed. A very common weed of roadsides and waste places. (Th)

5. P. MINIMUM Wats. Olympic Mountains, *Piper* 1085; Mt. Angeles, *Jones* 3679; Mt. Seattle, *C.S.Eaton,* August 19, 1907. Hudsonian. (Th)

6. P. DOUGLASII Greene. Clallam County, *Elmer* 2683; Olympic Mountains, *Piper* 2239, *Flett,* July 21, 1897; Lake Cushman, *Piper* 2240; Mason County, *Piper* 903; Hurricane Ridge, *Jones* 3340; Elwha River, *Jones* 3527; Mt. Angeles, *Thompson* 7403. Transition. (Th)

7. P. SPERGULARIAEFORME Meisn. Sequim, *Jones* 3733. Humid Transition. (Th)

8. P. NUTTALLII Small. Olympic Mountains, *Henderson* 2420; Lake Cushman, *Piper* 2241; Evergreen, *Conard* 424. Canadian. (Th)

9. P. NEWBERRYI Small. Olympic Mountains, *Major Nation,* July 1929; Seven Lakes Basin, *Jones* 8322. Arctic-alpine. (H)

The plants from the Olympic Peninsula are glabrous and may represent an undescribed endemic variety.

10. P. BISTORTOIDES Pursh. Clallam County, *Elmer* 2861; Hurricane Ridge, *Jones* 3287, 3389; Mt. Angeles, *Thompson* 5551; Mt. Colonel Bob, *Thompson* 7308; Seven Lakes Basin, *Jones* 8270. Hudsonian. (H)

11. *P. Hydropiper* L. Hoodsport, *Jones* 8633. (Th)

12. *P. Persicaria* L. Lady's Thumb. Humptulips, *Jones* 3677, 3712. (Th)

13. P. NATANS (Michx.) A.Eaton. Lake Pleasant, *Jones* 3788; Lake Crescent, *Jones* 3766. Transition. (Cr)

3. RUMEX. Dock

Leaves hastate or sagittate, with sour taste; flowers dioecious..... 1. *R. Acetosella.*
Leaves neither hastate nor sagittate; flowers perfect.
  Inner sepals prominently spinulose-dentate.
    Leaves linear-lanceolate, tapering or truncate at base; tubercles 3, 1 on each inner sepal..... 2. *R. maritimus.*
    Leaves oblong-ovate, the basal ones cordate at base; tubercle 1. 3. *R. obtusifolius.*
  Inner sepals entire or nearly so.
    Tubercles none; leaves cordate at base..... 4. *R. occidentalis.*
    Tubercles 3, one on each inner sepal.
      Leaves flat, pale green, lanceolate, tapering or truncate at the base..... 5. *R. mexicanus.*
      Leaves dark green, undulate or crisped, cordate or obtuse at the base.
        Sepals in fruit ovate or cordate, 4-6 mm. broad, about half as long as the pedicels..... 6. *R. crispus.*
        Sepals in fruit oblong, 2-3 mm. broad, about as long as the pedicels..... 7. *R. conglomeratus.*

1. *R. Acetosella* L. Sheep-sorrel Dock. Port Angeles, *Webster,* in 1908; Humptulips, *Jones* 3715. (Th)

2. R.MARITIMUS L., var. FUEGINUS (Phil.) Dusen. (*R. persicarioides* of Fl. Wash.) Golden Dock. Clallam County, *Elmer* 2684. Transition. (Th)

3. *R. obtusifolius* L. Bitter Dock. Olympus Ranger Station, *St. John* 5793; Humptulips, *Jones* 3716; Hoh River, *Jones* 8417; Hoodsport, *Jones* 8545. (H)

4. R. OCCIDENTALIS Wats. Grenville, *Conard* 338; Quinault, *Conard* 226; Port Hadlock, *Jones* 3142. Transition. (H)

5. R. MEXICANUS Meisn. Lake Crescent, *Jones* 3454. Transition. (H)

6. *R. crispus* L. Curled Dock. Lake Crescent, *Jones* 3496; Port Hadlock, *Jones* 3144. (H)

7. *R. conglomeratus* Murr. Clustered Dock. Mason County, *Jones* 3845. (H)

4. OXYRIA. Mountain Sorrel

1. O. DIGYNA (L.) Hill. Clallam County, *Elmer* 2685; Mt. Angeles, *Webster* 1387, *Jones* 3674; Lake Constance, *Thompson* 7891; Mt. Colonel Bob, *Thompson* 7252; Boulder Creek, *Jones* 8468. Arctic-alpine. (H)

29. CHENOPODIACEAE. Goosefoot Family

Leaves reduced to opposite scales; stems jointed, succulent ..... 1. *Salicornia.*
Leaves not reduced to scales.
  Leaves nearly terete ..... 2. *Suaeda.*
  Leaves flat.
    Flowers unisexual; fruit enclosed by two bracts ..... 3. *Atriplex.*
    Flowers perfect; fruit bractless ..... 4. *Chenopodium.*

1. SALICORNIA. Samphire

1 S. AMBIGUA Michx. *(S. pacifica* Standl.) Port Angeles, *Piper,* September 1895; Port Ludlow, *Binns,* September 3, 1890; Port Townsend, *Barber* 188, 189; Port Discovery, *St.John* 5821. Humid Transition. (Cr)

2. SUAEDA. Sea Blite

1. S. MARITIMA (L.) Dum. *(Dondia maritima* (L.) Druce) Near Hoodsport, *Jones* 8625. Humid Transition. (Th)

3. ATRIPLEX

Leaves lanceolate-oblong ..... 1. *A. patula.*
Leaves (at least the lower ones) hastate ..... 2. *A. hastata.*

1. A. PATULA L. *(A. patula littoralis* of Fl. Wash.) Port Angeles, *Piper,* September 1, 1895; mouth of the Quillayute River, *Otis* 1558; Port Discovery, *St.John* 5825; Dungeness, *Jones* 3615. Humid Transition. (Th)

2. A. HASTATA L. Port Angeles, *Thompson* 7860; Hoodsport, *Jones* 8628. Humid Transition. (Th)

4. CHENOPODIUM. Goosefoot. Pigweed

Stamens 1 or 2; calyx fleshy and reddish in fruit; leaves green ..... 1. *C. humile.*
Stamens 5; calyx not fleshy or reddish; leaves mealy ..... 2. *C. album.*

1. C. HUMILE Hook. *(C. rubrum humile* (Hook.) Wats.) Port Townsend, *Edwards* in 1896. Humid Transition. (Th)

2. *C. album* L. Lamb's Quarters. Pigweed. A common weed in cultivated ground and waste places. Dungeness, *Jones* 3616; Hoodsport, *Jones* 8549. (Th)

30. NYCTAGINACEAE. Four-o'clock Family

1. ABRONIA. Sand Verbena

Flowers rose; wings of the fruit solid ..... 1. *A. acutalata.*
Flowers yellow; wings of the fruit hollow ..... 2. *A. latifolia.*

1. A. ACUTALATA Standl. *(A. umbellata* of Fl. Wash.) Port Angeles, *Piper* 2301, *Webster* 1208; Clallam County, *Elmer* 2790. Humid Transition. (Cr)

2. A. LATIFOLIA Esch. Clallam County, *Elmer* 2791; Port Angeles, *Piper* 2303; Port Townsend, *Henderson,* June 25, 1892; Westport, *Heller* 3943, *Lamb* 1096; Mora, *Jones* 3424; Copalis, *Jones* 3656; Ocean City, *Jones* 3872; Moclips, *Thompson* 9335. Humid Transition. (Cr)

31. PORTULACACEAE. Purslane Family

Stamens 5 or 3; capsule 3-valved, splitting from the top downward ..... 1. *Claytonia.*
Stamens many (5-20); capsule circumscissile near the base, splitting upward ..... 2. *Lewisia.*

1. CLAYTONIA

Cauline leaves 2, opposite.
  Cauline leaves not united at base.
    Stem arising from a globose corm; petals pink, 8-10 mm. long.... 1. *C. lanceolata.*
    Stem arising from an elongated caudex or a crown of fibrous roots.
      Petals 10-12 mm. long; rhizome short, ascending; subalpine... 2. *C. asarifolia.*
      Petals 6-8 mm. long; rhizome none; lowland..... 3. *C. sibirica.*
  Cauline leaves united, forming a disk.
    Plants 10-30 cm. high, yellowish green; disk 1-3 cm. wide; petals 5 mm. long..... 4. *C. parviflora.*
    Plants less than 5 cm. high, glaucous; disk 2-cornered, 5-10 mm. wide; petals 2.5-3 mm. long..... 4a. var. *glauca.*
Cauline leaves several, alternate.
  Leaves ovate, long-petioled..... 5. *C. diffusa.*
  Leaves obovate, fleshy..... 6. *C. parvifolia.*

1. C. LANCEOLATA Pursh. Olympic Mountains, *Piper* 2228; Seven Lakes Basin, *Jones* 8321. Hudsonian. (Cr)

2. C. ASARIFOLIA Bong. Olympic Mountains, *Piper* 2219, *Flett* 88; Mt. Angeles, *Webster* 1493; Marmot Pass, *Thompson* 9886; Hurricane Ridge, *Jones* 3372; Boulder Creek, *Jones* 8471; Seven Lakes Basin, *Jones* 8397. Hudsonian. (Cr)

3. C. SIBIRICA L. *(Limnia washingtoniana* (Suksd.) Rydb., N. Am. Fl. 21: 305, 1932.) Montesano, *Heller* 3861; Skokomish River, *Kincaid,* May 1892; Elwha River, *Jones* 3124; Mt. Colonel Bob, *Thompson* 7274; Moclips, *Thompson* 9340; Mt. Angeles, *Thompson* 7376; Steamboat Creek, *Jones* 4564; Hoh River, *Otis* 1421. Transition. (H)

4. C. PARVIFLORA Dougl. Elwha River, *Jones* 3111; Dosewallips River, *Thompson* 6557; Quinault River, *Jones* 3953. Transition. (Th)

4a. Var. GLAUCA Nutt. Ocean City, *Jones* 3878. Humid Transition. (Th)

5. C. DIFFUSA Nutt. Hurricane Ridge, *Jones* 3334; McCleary, *Jones* 3855. Humid Transition. (Th)

6. C. PARVIFOLIA Moc. Skokomish River, *Henderson,* May 1892; Port Hadlock, *Jones* 3217; Hoh River, *Jones* 8420. Canadian and Transition. (H)

2. LEWISIA

1. L. COLUMBIANA (Howell) Robins. Olympic Mountains, *Piper* 2222, *Flett* 128, *Elmer* 2960; Marmot Pass, *Thompson* 7956, 9935; Mt. Colonel Bob, *Thompson* 7238; Bogachiel Ridge, *Jones* 8394. Hudsonian. (H)

32. CARYOPHYLLACEAE. Pink Family

Sepals distinct or nearly so; petals clawless or none.
- Stipules present, scarious.
  - Sepals spine-tipped ..... 1. *Pentacaena.*
  - Sepals not spine-tipped.
    - Styles usually 3 ..... 2. *Spergularia.*
    - Styles 5 ..... 3. *Spergula.*
- Stipules none.
  - Petals deeply 2-cleft, or sometimes lacking.
    - Capsule cylindrical, usually curved ..... 4. *Cerastium.*
    - Capsule ovoid or ellipsoid, straight ..... 5. *Stellaria.*
  - Petals entire or merely notched, or none.
    - Styles alternate with the sepals ..... 6. *Sagina.*
    - Styles opposite the sepals ..... 7. *Arenaria.*

Sepals united; petals clawed.
- Styles 3; capsule with 3 or 6 teeth ..... 8. *Silene.*
- Styles 5; capsule with 5 or 10 teeth ..... 9. *Lychnis.*

1. PENTACAENA

1. P. RAMOSISSIMA (Weinm.) H. & A. Westport, *Heller* 3939, *Otis* 1789; Oyhut, *Lamb* 1262; Ocean City, *Jones* 3917. Humid Transition. (Ch)

2. SPERGULARIA. Sand Spurrey

Plants annual; sepals ovate, obtuse, 4-5 mm. long ..... 1. *S. salina.*
Plants perennial.
- Stems erect or ascending; sepals lanceolate, acutish, 6-8 mm. long ... 2. *S. macrotheca.*
- Stems prostrate; sepals oblong, acute, 3-4 mm. long ..... 3. *S. rubra.*

1. S. SALINA J. & C. Presl. *(S. marina* (L.) Griseb.) Clallam County, *Elmer* 2746; Port Angeles, *Piper* 2302 ex p.; Port Hadlock, *Jones* 3100. Humid Transition. (Th)

2. S. MACROTHECA (Hornem.) Heynh. *(Tissa macrotheca* (Hornem.) Britt.) Port Angeles, *Piper* 2302 ex p., *Flett* 3372. Humid Transition. (H)

3. S. RUBRA (L.) J. & C. Presl. *(Tissa rubra perennans* (Kindb.) Greene) Clallam County, *Elmer* 2745; Satsop, *Heller* 4026; Lake Crescent, *Jones* 3593; Moclips, *Jones* 6539. Transition. (Th)

3. SPERGULA. Spurrey

1. *S. arvensis* L. Quillayute Prairie, *Jones* 3785; Elma, *Thompson* 7348. (Th)

4. CERASTIUM. Mouse-ear Chickweed

Petals 2-3 times as long as the sepals; native perennials with linear-lanceolate, acuminate leaves ..... 1. *C. arvense.*
Petals equalling or scarcely exceeding the sepals; introduced species with mostly obtuse leaves.
  Perennial or biennial, flowering from late spring to autumn; pedicels longer than the flowers; leaves chiefly oblong, dark green; stems spreading ..... 2. *C. vulgatum.*
  Annual, flowering in spring; pedicels not longer than the flowers; leaves oval or ovate, light green; stems erect ..... 3. *C. viscosum.*

1. C. ARVENSE L. Clallam County, *Elmer* 2749; Mt. Angeles, *Jones* 3185; Olympic Mountains, *Flett* 87, 808; Humptulips, *Lamb* 1174, *Jones* 4576; Skokomish Valley, *Kincaid,* June 1892; Quillayute Prairie, *Jones* 3601; Hurricane Ridge, *Jones* 3258; Port Angeles, *Webster* 1807. Transition to Arctic-alpine. (Ch)

2. *C. vulgatum* L. Nolan Creek, *Jones* 4561. (H)

3. *C. viscosum* L. Union, *Jones* 6514. (Th)

5. STELLARIA. Chickweed

Leaves ovate or elliptic-oblong.
  Stems glabrous; sepals glabrous; perennials.
    Leaves elliptic-oblong; sepals ovate-lanceolate, acutish, 4 mm. long; seeds smooth ..... 1. *S. humifusa.*
    Leaves ovate.
      Sepals lanceolate, acuminate, broadly scarious-margined, 3-4 mm. long; seeds 1 mm. long, smooth or merely rugose ..... 2. *S. crispa.*
      Sepals ovate, obtusish, hardly scarious-margined, 1.5-2 mm. long; seeds 0.5 mm. long, covered with low, oblong or linear tubercles ..... 3. *S. obtusa.*
  Stems more or less pubescent; sepals pubescent; annuals with ovate leaves.
    Stems uniformly pilose; sepals 2-3 mm. long ..... 4. *S. washingtoniana.*
    Stems glabrous except for a single line of hairs; sepals 4-5 mm. long ..... 5. *S. media.*
Leaves lanceolate or linear-lanceolate.
  Bracts of the inflorescence small, scarious; leaves linear-lanceolate ..... 6. *S. longipes.*
  Bracts of the inflorescence foliaceous, resembling the upper leaves; leaves lanceolate or elliptic-lanceolate.
    Leaves 7-25 mm. long; capsule 3-5 mm. long, the sepals 2-4 mm. long ..... 7. *S. borealis.*
    Leaves 3-8 cm. long; capsule 5-8 mm. long, the sepals 4-5 mm. long ..... 8. *S. sitchana.*

1. S. HUMIFUSA Rottb. Westport, *Henderson,* June 25, 1892. (See Leaflets of Western Botany 1: 199, 1936.) Humid Transition. (H)

2. S. CRISPA C. & S. Olympic Mountains, *Piper,* August 1895; Montesano, *Grant* in 1918; Elwha River, *Jones* 3135; Lake Crescent, *Jones* 3773; Mt. Angeles, *Jones* 3698; Ocean City, *Jones* 3931; Moclips, *Thompson* 9341; Hoh River, *Jones* 4551; Taholah, *Jones* 6487; Scott's

Prairie, *Jones* 6520; Canyon Creek, *Jones* 8362. Humid Transition to Hudsonian. (H)

3. S. OBTUSA Engelm. Skokomish River, *Piper,* August 1895; Quinault River, *Jones* 3958. Canadian. (H)

This Rocky Mountain species has not been reported from any other station in Washington.

4. S. WASHINGTONIANA Robins. Lake Cushman, *Piper* 2388; Sol Duc Hot Springs, *Jones* 3694; Hoh River, *Jones* 8422; Mt. Angeles, *Thompson* 5538. Canadian. (Th)

5. *S. media* (L.) Cyrill. A common weed in cultivated ground and waste places. (Th)

6. S. LONGIPES Goldie. Ocosta, *Henderson,* June 1892; Ocean City, *Jones* 3914. Transition. (Cr)

7. S. BOREALIS Bigel. *(Alsine calycantha* (Ledeb.) Rydb.) Olympic Mountains, *Piper,* August 1895; Skokomish Valley, *Kincaid,* May 1892; Mt. Olympus, *Flett* 3045; Soleduck River, *Jones* 8385. Canadian to Arctic-alpine. (H)

8. S. SITCHANA Steud. *(S. borealis* Bigel., var. *Bongardiana* Fern., Rhodora 16: 151, 1914; *S. borealis,* var. *sitchana* Fern. l.c.) Mt. Angeles, *Webster,* August 14, 1911; Lake Crescent, *Jones* 3753; Humptulips Prairie, *Jones* 3938; Quinault River, *Jones* 3960; Taholah, *Jones* 6486. Humid Transition. (H)

6. SAGINA. Pearlwort

Sepals, petals, styles, and valves of the capsule usually 5; stamens 3-10, usually 10.
- Alpine, matted perennial ..... 1. *S. Linnaei.*
- Lowland plants.
  - Somewhat succulent seashore perennial ..... 2. *S. crassicaulis.*
  - Slender annual growing in moist soil ..... 3. *S. occidentalis.*

Sepals, stamens, styles, and valves of the capsule usually 4; petals as many or none; adventive annual ..... 4. *S. procumbens.*

1. S. LINNAEI Presl. *(S. saginoides* (L.) Dalla Torre, var. *hesperia* Fern., Rhodora 27: 131, 1925.) Elwha Basin, *Leach* 2020. Hudsonian or Arctic-alpine. (H)

2. S. CRASSICAULIS Wats. Ocosta, *Henderson,* June 26, 1892; Mora, *Jones* 3444; Moclips, *Thompson* 9333. Humid Transition. (H)

3. S. OCCIDENTALIS Wats. Olympic Mountains, *Piper;* Ocean City *Jones* 3894. Chiefly Humid Transition. (Th)

4. *S. procumbens* L. Elwha River, *Jones* 3522. (Th)

7. ARENARIA. Sandwort

Leaves linear, rigid (at least when dry).
  Sepals obtuse.
    Leaves 2-10 cm. long ..... 1. *A. formosa.*
    Leaves less than 1 cm. long ..... 2. *A. laricifolia.*
  Sepals acuminate, 3-nerved ..... 3. *A. verna.*
Leaves broader, not rigid.
  Leaves thick; seashore species ..... 4. *A. peploides.*
  Leaves thin; woodland species.
    Sepals obtuse, shorter than the petals ..... 5. *A. lateriflora.*
    Sepals acuminate, longer than the petals ..... 6. *A. macrophylla.*

1. A. FORMOSA Fisch. (*A. capillaris nardifolia* of Fl. Wash.) Olympic Mountains, *Flett* 806; Mt. Angeles, *Rigg,* July 23, 1929. Arctic-alpine. (Ch)

2. A. LARICIFOLIA L. (*A. sajanensis* of Fl. Wash.) Olympic Mountains, *Flett* 805; Mt. Angeles, *Jones* 3187. Arctic-alpine. (Ch)

3. A. VERNA L. (*A. verna* L., var. *pubescens* (C. & S.) Fern., Rhodora 21: 21, 1919; *A. verna rubella* of Fl. Wash.) Olympic Mountains, *Elmer* 2748, *Piper,* August 1895; Mt. Carrie, *St.John* 5807; Mt. Angeles, *Jones* 3202, 3179; Boulder Peak, *Jones* 8437. Arctic-alpine. (Ch)

4. A. PEPLOIDES (L.) Rupr. (*Ammodenia peploides* (L.) Rupr.) Oyhut, *Lamb* 1248; mouth of the Quillayute River, *Otis* 1560; Mora, *Jones* 3591. Humid Transition. (Cr)

5. A. LATERIFLORA L. (*A. lateriflora* L., var. *typica* St.John, Rhodora 19: 260, 1917; *Moehringia lateriflora* (L.) Fenzl.) Mason County, *Piper* 1022. Transition. (H)

6. A. MACROPHYLLA Hook. (*Moehringia macrophylla* (Hook.) Torr.) Clallam County, *Elmer* 2751; Mt. Colonel Bob, *Thompson* 7263; McCleary, *Jones* 4586. Transition to Hudsonian. (H)

8. SILENE. Catchfly

Plants densely tufted, 2-5 cm. high ..... 1. *S. acaulis.* var. *exscapa.*
Plants 15-45 cm. high.
  Calyx 5-10 mm. long.
    Calyx glabrous; internodes of the stem with a glutinous band; annual ..... 2. *S. antirrhina.*
    Calyx and stem glandular-pubescent; perennial ..... 3. *S. Menziesii.*
  Calyx 10-25 mm. long.
    Calyx 10-15 mm. long; alpine or subalpine perennials.
      Calyx and upper part of stem glandular; petals 4-lobed ..... 4. *S. Macounii.*
      Calyx and upper part of stem puberulent; petals 2-lobed ..... 5. *S. Douglasii.*
    Calyx 25 mm. long; petals 2-cleft; annual ..... 6. *S. noctiflora.*

1. S. ACAULIS L., var. EXSCAPA (All.) DC. *(S. acaulis* of Fl. Wash.) Mt. Angeles, *Webster* 1770; Mt. Ellinor, *Getty,* August 1902. Arctic-alpine. (Ch)

2. S. ANTIRRHINA L. Clallam County, *Elmer* 2750; Mason County, *Kincaid,* June 1892. Transition. (Th)

3. S. MENZIESII Hook. Clallam County, *Elmer* 2751. Transition. (H)

4. S. MACOUNII Wats. Olympic Mountains, *Piper* 2237; Bogachiel Peak, *Otis* 1343; Hurricane Ridge, *Jones* 3282; Mt. Angeles, *Webster,* September 6, 1909; Seven Lakes Basin, *Jones* 8211. Arctic-alpine. (H)

5. S. DOUGLASII Hook. *(S. Douglasii* Hook., var. *brachycalyx* Robins.) Olympic Mountains, *Piper* 2216, 904, *Elmer* 2744, 2727; Baldy Peak, *Lamb* 1321; Hurricane Ridge, *Jones* 3354; Mt. Angeles, *Thompson* 7480; Marmot Pass, *Thompson* 9873; Mt. Colonel Bob, *Thompson* 7262; Seven Lakes Basin, *Jones* 8228, 8274; Boulder Peak, *Jones* 8439. Hudsonian. (H)

6. *S. noctiflora* L. Night-flowering Catchfly. Roadside weed, Sol Duc Hot Springs, *Jones* 8330. (Th)

9. LYCHNIS. Campion

Plant white-woolly; petals crimson; calyx-teeth subulate, twisted..... 1. *L. Coronaria.*
Plant green; petals white; calyx-teeth short, lanceolate..... 2. *L. alba.*

1. *L. Coronaria* (L.) Desv. Mullein Pink. Lake Crescent, *Jones* 3456. (H)

2. *L. alba* Mill. White Campion. Roadside near Blyn, *Jones* 8525. (H)

33. NYMPHAEACEAE. Water Lily Family

Leaves peltate; flowers small, purple..... 1. *Brasenia.*
Leaves cordate; flowers large, yellow..... 2. *Nymphozanthus.*

1. BRASENIA

1. B. SCHREBERI Gmel. Lake Ozette, *Jones* 5970, *Otis* 1786. Transition. (Cr)

2. NYMPHOZANTHUS

1. N. POLYSEPALUS (Engelm.) Fernald, Rhodora 21: 187, 1919. *(Nymphaea polysepala* (Engelm.) Greene) Oyhut, *Lamb* 1260; Lake Crescent, *Jones,* August 1931; Lake Ozette, *Jones* 5973. Transition. (Cr)

34. RANUNCULACEAE. Buttercup Family

Pistils several to numerous, 1-ovuled, becoming achenes in fruit; flowers regular.
- Cauline leaves whorled, palmately cut ..... 1. *Anemone.*
- Cauline leaves alternate or none.
  - Petals none.
    - Leaves simple, palmately lobed ..... 2. *Trautvetteria.*
    - Leaves ternately compound ..... 3. *Thalictrum.*
  - Petals present.
    - Pistils numerous, in a long cylindrical spike; sepals spurred ..... 4. *Myosurus.*
    - Pistils in a roundish head; sepals not spurred ..... 5. *Ranunculus.*

Pistils few, 2-many-ovuled, becoming follicles or berries in fruit.
- Sepals spurred.
  - Spur 1 ..... 6. *Delphinium.*
  - Spurs 5 ..... 7. *Aquilegia.*
- Sepals not spurred; flowers regular.
  - Leaves simple; sepals petaloid.
    - Leaves crenate; petals none ..... 8. *Caltha.*
    - Leaves palmately parted; petals linear-spatulate ..... 9. *Trollius.*
  - Leaves compound.
    - Flowers in racemes.
      - Fruit a berry ..... 10. *Actaea.*
      - Fruit a follicle ..... 11. *Cimicifuga.*
    - Flowers solitary or in few-flowered umbels; fruit a follicle ..... 12. *Coptis.*

1. ANEMONE

Sepals 15-20 mm. long; styles plumose ..... 1. *A. occidentalis.*

Sepals 5-13 mm. long; styles glabrous or pubescent.
- Leaf-lobes linear or cuneate; achenes densely woolly.
  - Stems 15-50 cm. high, 1-3-flowered; leaves 2-3-ternate, 3-12 cm. broad, the lobes linear to lanceolate, acute; style 1-2 mm. long, about half the length of the achene ..... 2. *A. hudsoniana.*
  - Stems 5-25 cm. high, usually 1-flowered; leaves 3-4-ternate, 1.5-4 cm. broad, the lobes short, cuneate or oblong, obtusish; style 4-5 mm. long, nearly as long as the achene .... 3. *A. Drummondii.*
- Leaf-lobes ovate, glabrous; achenes finely appressed-pubescent ... 4. *A. Lyallii.*

1. A. OCCIDENTALIS Wats. *(Pulsatilla occidentalis* (Wats.) Freyn.) Bogachiel Peak, *Otis* 1338; Clallam County, *Elmer* 2666; Mt. Angeles, *Flett,* June 29, 1908; Mt. Ellinor, *Jennie V. Getty,* August 2, 1902; Seven Lakes Basin, *Jones* 8268; Elwha River, *Webster,* August 2, 1907. Hudsonian. (Cr)

2. A. HUDSONIANA (DC.) Richards. Olympic Mountains, *Flett* 131, *Elmer* 2678, *Grant,* in 1889; Mt. Carrie, *St.John* 5810; Mt. Angeles, *Rigg,* July 23, 1929; Hurricane Ridge, *Jones* 3269, 4013; Boulder Peak, *Jones* 8438. Hudsonian. (Cr)

3. A. DRUMMONDII Wats. Olympic Mountains, *Piper* 2007, *Flett* 11; Marmot Pass, *Thompson* 9917. Arctic-alpine. (Cr)

4. A. LYALLII Britt. *(A. quinquefolia* in part of Fl. Wash.; *A. Piperi* in part of Fl. Nw. Coast as to Olympic Peninsula material.) Clallam County, *Elmer* 2675; Olympic Mountains, *Henderson* 2046; Hurricane

Ridge, *Jones* 4014; Mt. Angeles, *Thompson* 7431, 8407, *Flett,* June 29, 1908; Skokomish Valley, *Kincaid,* May 1892; Grenville, *Conard* 361; Mt. Baldy, *Conard* 263; Quillayute Prairie, *Jones* 3606; Aloha, *Jones* 6453. Humid Transition and Canadian. (Cr)

2. TRAUTVETTERIA

1. T. GRANDIS Nutt. Clallam County, *Elmer* 2676; Chehalis [Grays Harbor] County, *Lamb* 1198; Hoh River, *Otis* 1547, *Jones* 3972; Mt. Colonel Bob, *Thompson* 7273; Mt. Angeles, *Webster* 1721; Aloha, *Thompson* 9365; Deer Lake, *Jones* 8348. Hudsonian and Canadian. (H)

3. THALICTRUM. Meadow Rue

1. T. OCCIDENTALE Gray. Clallam County, *Elmer* 2663 (not 2668 as in Fl. Wash.); Hurricane Ridge, *Jones* 3228; Olympic Mountains, *Piper* 932; Mt. Angeles, *Flett,* June 30, 1908; Olympic Hot Springs, *Jones* 3990; Deer Lake, *Jones* 8337. Canadian and Hudsonian. (H)

4. MYOSURUS. Mouse Tail

1. M. MAJOR Greene. Clallam County, *Elmer* 2674. Humid Transition. (Th)

5. RANUNCULUS. Buttercup

Petals white; achenes transversely wrinkled; aquatic.		
Upper leaves reniform, 3-5-lobed or toothed; lower leaves finely dissected; petals 5-7 mm. long	1.	*R. aquatilis.*
All the leaves finely dissected.		
Petals 5-7 mm. long; stamens many	1a.	var. *capillaceus.*
Petals 3-4 mm. long; stamens 5-12	1b.	var. *Drouetii.*
Petals yellow; achenes not transversely wrinkled.		
Leaves crenate or entire.		
Leaves crenate, ovate; achenes striate	2.	*R. Cymbalaria.*
Leaves entire or nearly so; achenes smooth.		
Leaves linear-filiform to spatulate, 5-20 mm. long; petals 2-4 mm. long; stem filiform, 10-30 cm. long, repent	3.	*R. reptans.*
Leaves lanceolate, 2-5 cm. long; petals 5-7 mm. long; stems ascending or merely trailing, 30-60 cm. long	3a.	var. *ovalis.*
Leaves or some of them lobed or divided.		
Petals 2-3 mm. long; beak of achene hooked at the tip.		
Achenes hispid	4.	*R. Bongardi.*
Achenes glabrous	4a.	var. *tenellus.*
Petals 5-12 mm. long.		
Herbage glabrous.		
Petals 5-6 mm. long with a pair of callosities near the base; beak of achene recurved	5.	*R. Cooleyae.*
Petals 6-10 mm. long, without thickenings; beak of achene straight	6.	*R. Eschscholtzii.*
Herbage pubescent.		
Beak longer than the body of the achene; petals 10-15 mm. long; sepals reflexed; stems erect	7.	*R. orthorhynchus.*

Beak shorter than the body of the achene.
Stems erect; leaves never variegated.
Sepals reflexed; native species.
Leaves 3-5-cleft; head of achenes globose; beak of the achene 1-1.5 mm. long; petals 8-12 mm. long ..... 8. *R. occidentalis.*
Leaves ternately divided, the divisions stalked; head of achenes ovoid; beak of the achene 0.5-1 mm. long; petals 6-8 mm. long ..... 9. *R. Macounii.*
Sepals spreading; leaves 3-7-cleft, the divisions sessile; head of achenes globose; beak of the achene 0.5 mm. long; petals 10-12 mm. long; adventive species ..... 10. *R. acris.*
Stems creeping and rooting at the nodes; leaves frequently faintly whitish-variegated; sepals spreading; petals 10-13 mm. long ..... 11. *R. repens.*

1. R. AQUATILIS L. *(Batrachium aquatile* (L.) Wimm.) Oyhut, *Lamb* 1261; Port Crescent, *Lawrence* 380, 295; Port Angeles, *Webster* 1675. Transition and Canadian. (Cr)

1a. Var. CAPILLACEUS DC. Lake Crescent, *Jones* 3596. Transition. (Cr)

1b. Var. DROUETII (F.Schultz) Lawson. Lake Crescent, *Jones* 3554. Transition. (Cr)

2. R. CYMBALARIA Pursh. Port Ludlow, *Binns;* Kennedy Creek, *Jones* 3842. Transition. (H)

3. R. REPTANS L. *(R. Flammula* L., var. *reptans* (L.) Schlecht.) Oyhut, *Lamb* 1252. Transition. (H)

3a. Var. OVALIS (Regel) T. & G. *(R. Flammula unalaschensis* (Bess.) Ledeb.) Clallam County, *Elmer* 2670; Sequim, *Grant* in 1915; Montesano, *Heller* 3927; Lake Crescent, *Jones* 3598, 3797. Transition. (H)

4. R. BONGARDI Greene. Port Ludlow, *Binns;* Hoquiam, *Lamb* 1029, 1071; Clallam County, *Elmer* 2672, 2679; Port Angeles, *Webster* 1751; Lake Quinault, *Thompson* 6266; Beaver Creek, *Jones* 4557; *Scott's* Prairie, *Jones* 6523. Transition. (H)

4a. Var. TENELLUS (Nutt.) Greene. *(R. Bongardi,* var. *Douglasii* (Howell) Davis). Elwha River, *Jones* 3128; Montesano, *Jones* 6466. Transition. (H)

5. R. COOLEYAE Vasey & Rose. Mt. Colonel Bob, *Thompson* 7236, 9978. Hudsonian. (H)

6. R. ESCHSCHOLTZII Schlecht. *(R. Suksdorfii* Gray; *R. verecundus* Robins.) Olympic Mountains, *Henderson* 1846, *Piper* 2004; Baldy Peak,

Lamb 1361; Mt. Angeles, *Jones* 3331; Hurricane Ridge, *Jones* 3293; Seven Lakes Basin, *Jones* 8213. Arctic-alpine. (H)

7. R. ORTHORHYNCHUS Hook. New London, *Lamb* 1202; Sequim, *Grant* in 1915. Humid Transition. (H)

8. R. OCCIDENTALIS Nutt. Montesano, *Heller* 2935; Humptulips, *Lamb* 1186; Scott's Prairie, *Jones* 6449; Forks, *Otis* 1427. Humid Transition. (H)

9. R. MACOUNII Britt. *(R. oreganus* (Gray) Howell). Montesano, *Heller* 3850. Humid Transition. (H)

10. *R. acris* L. Jefferson County, *Gardner* in 1896; Quilcene, *Otis* 1457; Blyn, *Jones* 8531; Dosewallips River, *Thompson* 6549. (H)

11. *R. repens* L. Lake Quinault, *Jones* 3949. (H)

6. DELPHINIUM. Larkspur

Carpels and follicles solitary; introduced annuals ..... 1. *D. Ajacis.*
Carpels and follicles 3, 4, or 5; native perennials.
  Tall plants 1-2 m. high; roots fascicled, elongate, not tuber-like; stem glabrous or nearly so, more or less glaucous ..... 2. *D. glaucum.*
  Medium or low species, 10-80 cm. tall.
    Subalpine; roots elongate, fascicled; follicles glabrous, 1-1.5 cm. long when mature ..... 3. *D. glareosum.*
    Lowland; roots thickened, forming irregular tubers; follicles pubescent, 1.5-3 cm. long when mature ..... 4. *D. Menziesii.*

1. *D. Ajacis* L. Port Townsend, *Jones* in 1931. (Th)

2. D. GLAUCUM Wats. Olympic Mountains, *Piper,* August 1895, *Elmer* 2577; Cat Creek, *St.John* 5799; Mt. Angeles, *Webster,* August 16, 1908, *Jones* 3666; Marmot Pass, *Thompson* 9887; Lake Creek, *Otis* 1332; Elk Lake, *Otis* 1324. Hudsonian. (H)

3. D. GLAREOSUM Greene. *(D. bicolor* ex p. of Piper, not Nutt.) Olympic Mountains, *Piper,* August 1895, *Elmer* 2665, *Flett* 81; Mt. Angeles, *Jones* in 1931; Hurricane Ridge, *Jones* 3273; Mt. Ellinor, *Jennie V. Getty,* August 10, 1902; Marmot Pass, *Thompson* 9894. Hudsonian. (H)

4. D. MENZIESII DC. *(D. columbianum* ex p. of Fl. Wash.) Clallam County, *Elmer* 2673; Montesano, *Heller* 3879; Elwha River, *Webster* 1698; Satsop, *Jones* 3863; Sequim, *Grant,* May 1916. Humid Transition. (H)

7. AQUILEGIA. Columbine

1. A. FORMOSA Fisch. Dosewallips River, *Thompson* 6555; Mt. Angeles, *Rigg,* July 22, 1929; Humptulips, *Lamb* 1180; Hurricane Ridge, *Jones* 3391; Quillayute Prairie, *Jones* 3581; Duckabush River, *Jones* 3096; Humptulips Prairie, *Jones* 3942. Transition to Hudsonian. (H)

8. CALTHA

Flowers yellow; stems decumbent, leafy ..... 1. *C. asarifolia.*
Flowers white.
Leaves reniform-orbicular, broader than long ..... 2. *C. biflora.*
Leaves cordate, longer than broad ..... 3. *C. leptosepala.*

1. C. ASARIFOLIA DC. Grenville, *Conard* 367; Montesano, *Jones* 6471. Transition on the Olympic Peninsula. (H)

2. C. BIFLORA DC. Olympic Mountains, *Piper,* August 1895, 1007, *Elmer* 2870; Mt. Angeles, *Webster* 1716; Lake Quinault, *Jones* 3620; Boulder Creek, *Jones* 8484; Deer Lake, *Jones* 8350; Olympic Hot Springs, *Jones* 3986; Humptulips, *Jones* 4570; Moclips, *Jones* 6480. Chiefly Hudsonian. (H)

3. C. LEPTOSEPALA DC. Mt. Angeles, *Webster* 1713; Low Divide, *Eleanor M. Chittenden,* August 5, 1907; Marmot Lake, *Dickinson* 32. Arctic-alpine. (H)

9. TROLLIUS

1. T. ALBIFLORUS (Gray) Rydb. *(T. laxus* of Fl. Wash.) Olympic Mountains, *Flett* 96; Mt. Angeles, *Webster* 1711. Hudsonian. (H)

10. ACTAEA. Baneberry

1. A. ARGUTA Nutt. *(A. asplenifolia* Greene) Clallam County, *Elmer* 2664; Baldy Peak, *Lamb* 1353; Duckabush River, *Jones* 3096A; Quillayute Prairie, *Jones* 3609; Lake Constance, *Thompson* 7905; Mt. Angeles, *Thompson* 7562; Canyon Creek, *Jones* 8372. Humid Transition and Canadian. (Cr)

11. CIMICIFUGA. Bugbane

1. C. ELATA Nutt. Clallam County, *Elmer* 2662; Elwha River, *Jones* 3399. Canadian. (Cr)

12. COPTIS. Goldthread

1. C. LACINIATA Gray. Mt. Baldy, *Thompson* 6242. Canadian. (Cr)

35. BERBERIDACEAE. Barberry Family

Shrubs; leaves evergreen ..... 1. *Berberis.*
Herbs with deciduous leaves.
  Petals none; flowers in spikes ..... 2. *Achlys.*
  Petals 6; flowers in panicles ..... 3. *Vancouveria.*

1. BERBERIS. Oregon Grape

Leaflets 3-7 or 9, pinnately veined ..... 1. *B. Aquifolium.*
Leaflets 11-20, somewhat palmately veined ..... 2. *B. nervosa.*

1. B. AQUIFOLIUM Pursh. Mt. Angeles, *Webster,* July 4, 1908; Elwha River, *Jones* 3550; Washington Harbor, *Jones* 8497. Transition. (Ph)

2. B. NERVOSA Pursh. Clallam County, *Elmer* 2758; Montesano, *Heller* 3991; Port Ludlow, *Binns* (fide Piper); Lake Crescent, *Jones* 3472. Humid Transition. (Ph)

2. ACHLYS.

1. A. TRIPHYLLA (Smith) DC. Vanilla Leaf. Clallam County, *Elmer* 2757; Lake Crescent, *Jones* 3471; Mason County, *Kincaid,* May 1892; Constance Ridge, *Thompson* 6565. Humid Transition. (Cr)

3. VANCOUVERIA.

1. V. HEXANDRA (Hook.) Morr. & Dec. Chehalis [Grays Harbor] County, *Lamb* 1247. Humid Transition and Canadian. (Cr)

36. PAPAVERACEAE. Poppy Family

Flowers yellow; stigmas 4-6, subulate-filiform, unequal; juice colorless.. 1. *Eschscholtzia.*
Flowers red; stigmas united into a radiate disk; juice white ..... 2. *Papaver.*

1. ESCHSCHOLTZIA. California Poppy

1. *E. californica* Cham. Cushman Dam, *G.A.Newton,* May 5, 1930; Hoodsport, *Jones* 8550. Commonly cultivated and escaped in many localities. (H)

2. PAPAVER. Poppy

1. *P. somniferum* L. Elwha River, *Jones* 3539. (Th)

37. FUMARIACEAE. Fumitory Family

Corolla 2-spurred at the base ..... 1. *Dicentra.*
Corolla 1-spurred at the base ..... 2. *Corydalis.*

1. DICENTRA.

1. D. FORMOSA (Andr.) DC. *(Bikukulla formosa* (Andr.) Coville) Clallam County, *Elmer* 2816; trail to Hurricane Ridge, *Jones* 3261; Mt. Angeles, *Thompson* 7569. Humid Transition. (Cr)

2. CORYDALIS.

1. C. SCOULERI Hook. *(Capnoides Scouleri* (Hook.) Kuntze) Montesano, *Heller* 3871; Little Hoquiam River, *Lamb* 1063; Humptulips River, *Jones* 6451; Skokomish Valley, *Kincaid,* June 1892; Hoh River, *Otis* 1420; Mt. Colonel Bob, *Thompson* 9409, 6256. Canadian, rarely Humid Transition. (Cr)

38. CRUCIFERAE. Mustard Family.

Flowers white.
- Pods several times longer than wide.
  - Plant scapose ..... 1. *Draba.*
  - Plant leafy-stemmed.
    - Pods opening elastically, the valves recurving; plants glabrous.. 3. *Cardamine.*
    - Pods not opening elastically, the valves remaining straight.
      - Pods 2-6 cm. long, flattened ..... 2. *Arabis.*
      - Pods less than 2 cm. long.
        - Plant glabrous; pods terete ..... 9. *Nasturtium.*
        - Plant densely whitish stellate-pubescent ..... 12. *Smelowskia.*
- Pods short.
  - Small aquatic plants with leaves all basal, subulate, entire, glabrous ..... 17. *Subularia.*
  - Terrestrial; leaves not subulate, not all basal.
    - Pubescence stellate; alpine perennials ..... 12. *Smelowskia.*
    - Pubescence, if any, not stellate.
      - Seeds 2-several in each cell.
        - Pods globose; herbage glabrous ..... 10. *Cochlearia.*
        - Pods flattened.
          - Herbage glabrous ..... 13. *Thlaspi.*
          - Herbage pubescent ..... 14. *Capsella.*
      - Seeds solitary in each cell.
        - Pods rugose or wrinkled ..... 15. *Coronopus.*
        - Pods not wrinkled ..... 16. *Lepidium.*

Flowers not white.
- Flowers pink or purple; pods elongate.
  - Succulent seashore plants with pink flowers; pods 2-jointed, indehiscent ..... 18. *Cakile.*
  - Not as above.
    - Stem leaves sessile ..... 2. *Arabis.*
    - All leaves petioled ..... 4. *Dentaria.*
- Flowers yellow.
  - Pods elongate.
    - Pods with a beak 4 mm. or more in length ..... 5. *Brassica.*
    - Pods beakless or short-beaked.
      - Herbage glabrous; petals 4 mm. long ..... 6. *Barbarea.*
      - Herbage more or less pubescent.
        - Petals more than 1 cm. long ..... 7. *Erysimum.*
        - Petals less than 1 cm. long ..... 8. *Sisymbrium.*
  - Pods short.
    - Pods elliptical, 4-5 mm. wide ..... 1. *Draba.*
    - Pods linear-oblong ..... 11. *Rorippa.*

1. DRABA.

Annual plants with yellow flowers.
Pods 5-8 mm. long, much shorter than the pedicels ..... 1. *D. nemorosa*, var. *leiocarpa.*
Pods 8-15 mm. long, about equalling the pedicels ..... 2. *D. stenoloba.*
Perennial alpine scapose species.
Pods linear, 10-15 mm. long; petals white ..... 3. *D. lonchocarpa.*
Pods ovate or lanceolate, 2-8 mm. long; petals yellow.
Style 0.5-1 mm. long; petals 5 mm. long ..... 4. *D. incerta.*
Style 0.1-0.3 mm. long; petals 3-3.5 mm. long ..... 5. *D. novolympica.*

1. D. NEMOROSA L., var. LEIOCARPA Lindbl. Dungeness, *Lowell Russell,* July 1933; Mt. Angeles, *Jones* 3267. Chiefly Transition. (Th)

2. D. STENOLOBA Ledeb. Olympic Mountains, *Flett* 102; Mt. Angeles, *Thompson* 9456, 7472; Marmot Pass, *Thompson* 9915. Hudsonian. (H)

3. D. LONCHOCARPA Rydb. Mt. Angeles, *Webster* 397, *Jones* 3326, 3294; Lake Constance, *Thompson* 7868. Known otherwise in Washington from Mt. Rainier and Mt. Baker. Arctic-alpine. (H)

4. D. INCERTA Pays., Am. Journ. Bot. 4: 261, 1917. Marmot Pass, *Thompson* 8003, 9942. Known otherwise in Washington only in the Cascade Mountains. Arctic-alpine. (H)

5. D. NOVOLYMPICA Pays. & St.John, Proc. Biol. Soc. Wash. 43: 113, 1930. Olympic Mountains, *Flett* 844 (cited by Piper as *D. glacialis)* Marmot Pass, *Thompson* 9940; Mt. Angeles, *Jones* 3327. Arctic-alpine. (H)

2. ARABIS. Rock Cress.†

Pods reflexed; basal leaves densely whitish stellate-pubescent ..... 1. *A. canescens.*
Pods erect or ascending.
Stem leaves auriculate.
Herbage sparsely hirsute, not glaucous ..... 2. *A. hirsuta.*
Herbage glabrous, except at base, more or less glaucous.
Flowers 4-5 mm. long, greenish white or yellowish white ..... 3. *A. glabra.*
Flowers 6-10 mm. long, pink, lavendar or white.
Stems 30-60 cm. high ..... 4. *A. Drummondii.*
Stems 10-30 cm. high ..... 5. *A. Lyallii.*
Stem leaves not auriculate; pubescence of simple or forked hairs; pods 1-2 mm. broad, 2 cm. long; petals white, 2 mm. long .... 6. *A. olympica.*

1. A. CANESCENS Nutt. Mt. Angeles, *Jones* 3201, 3322, *Rigg,* July 23, 1929; Hurricane Ridge, *Jones* 3406. These are the first collections of this species in western Washington. (H)

2. A. HIRSUTA (L.) Scop. Skokomish Valley, *Kincaid,* May 1892; Mt. Angeles, *Webster* in 1908. Transition. (H)

†Thanks are due Mr. R. C. Rollins for assistance with this genus.

3. A. GLABRA (L.) Bernh. Clallam County, *Elmer* 2694; Hurricane Ridge, *Jones* 3290, 3353; Mt. Angeles, *Thompson* 7544. Transition. (H)

4. A. DRUMMONDII Gray. Olympic Mountains, *Piper* 2181; Clallam County, *Elmer* 2693 ex p.; Hurricane Ridge, *Jones* 3266, 4035; Lake Constance, *Thompson* 7873; Marmot Pass, *Thompson* 7976. Hudsonian. (H)

5. A. LYALLII Wats. Olympic Mountains, *Piper* 2180, *Flett* 94; Clallam County, *Elmer* 2693 ex p.; Mt. Angeles, *Jones* 3700, 3313, 3682, 3174, 3359, 3682. Arctic-alpine. (H)

6. A. OLYMPICA Piper. On grass-covered talus near Humes Glacier, *Flett,* August 12, 1907. Arctic-alpine. (H)

An immature specimen from a rocky ridge on Mt. Angeles, *(Jones* 3241) with the basal leaves spatulate, densely white-tomentose with stellate hairs, may be *A. Lemmoni* Wats., a species otherwise known in Washington only from Mt. Adams.

3. CARDAMINE. Bitter Cress

Basal leaves simple; cauline 3-5-foliolate ..... 1. *C. Breweri.*
Basal leaves pinnate.
  Leaves all 3-(-5)-foliolate; petals 8-10 mm. long ..... 2. *C. angulata.*
  Leaves 3-13-foliolate.
    Petals 4 mm. long ..... 3. *C. occidentalis.*
    Petals 2-4 mm. long.
      Flowers subumbellate ..... 4. *C. umbellata.*
      Flowers racemose.
        Leaflets roundish, petiolulate ..... 5. *C. oligosperma.*
        Leaflets oblong, sessile ..... 6. *C. pennsylvanica.*

1. C. BREWERI Wats. Quinault, *Conard* 173; near Quillayute Prairie, *Jones* 3790. Humid Transition. (Cr)

2. C. ANGULATA Hook. Hoquiam, *Lamb* 1053; Montesano, *Heller* 3863; Clallam County, *Jones* 3981; Mt. Colonel Bob, *Thompson* 6257; Elma, *Jones* 6543. Humid Transition. (Cr)

3. C. OCCIDENTALIS (Wats.) Howell. Taholah, *Jones* 6481; Nolan Creek, *Otis* 1415; Steamboat Creek, *Jones* 4563. Transition. (Cr)

4. C. UMBELLATA Greene. *(C. sylvatica kamtschatica* Regel, Bull. Soc. Nat. Mosc. 34^2: 172, 1861; *C. hirsuta* L., subsp. *kamtschatica* Schulz, Engler's Bot. Jahrb. 32: 470, 1903.) Schulz treated this plant as a subspecies of *C. hirsuta* but Piper (1906, p. 290) erroneously makes him the authority for the combination *C. kamtschatica.* It appears that this com-

bination was really first made by Piper himself in 1906. Olympic Mountains, *Piper* 1018, 2183; Canyon Creek, *Jones* 5929; Soleduck River, *Jones* 8388. Canadian. (Cr)

5. C. OLIGOSPERMA Nutt. *(C. hirsuta* L., subsp. *oligosperma* (Nutt.) Schulz) Clallam County, *Elmer* 2962; Hoquiam, *Lamb* 1026; Skokomish River, *Piper* 2182, *Kincaid* in 1892; Olympic Mountains, *Grant* in 1889 (fide Schulz); Mt. Angeles, *Jones* 3324; Lake Constance, *Thompson* 7867; Mt. Colonel Bob, *Thompson* 6251; Humptulips River, *Jones* 4573. Humid Transition to Hudsonian. (Th)

6. C. PENNSYLVANICA Muhl. Sequim, *Grant* 131; Mt. Angeles, *Jones* 3691; Humptulips, *Jones* 3740; Scott's Prairie, *Jones* 6525. Transition. (Th)

4. DENTARIA.

1. D. TENELLA Pursh. Lapush, *Reagan;* Elwha River, *Jones* 4528; Humptulips River, *Jones* 4574; Port Angeles, *Webster* 1010. Humid Transition. (Cr)

Some specimens have the basal leaves trifoliolate as in *D. macrocarpa* Nutt., and therefore might be referred to that species. The Olympic Peninsula plants are not, however, identical with material from the vicinity of the Columbia River, the type locality of *D. macrocarpa.*

5. BRASSICA.

Leaves glaucous, the upper ones clasping or with a broad sessile base.
- Petals pale yellow, 13-20 mm. long; pods 6-11 cm. long ..... 1. *B. oleracea,* var. *acephala.*
- Petals bright yellow, 8-11 mm. long; pods 3-8 cm. long ..... 2. *B. campestris.*

Leaves glabrous or pubescent, not glaucous.
- Leaves crisped and cleft ..... 3. *B. japonica.*
- Leaves merely dentate.
  - Pods glabrous, appressed ..... 4. *B. nigra.*
  - Pods pubescent, on spreading pedicels ..... 5. *B. alba.*

1. *B. oleracea* L., var. *acephala* DC. Kale. Colony growing on garbage dump along seashore near Port Townsend, *Jones* in 1931. (H)

2. *B. campestris* L. Wild Mustard. Lake Crescent, *Jones* 3772; Port Hadlock, *Jones* 3103; reported by Reagan, without definite locality. (Th)

3. *B. japonica* Siebold. Curled Mustard. Ocean City, *Jones* 3926. (Th)

4. *B. nigra* (L.) Koch. Black Mustard. Lapush, *Reagan.* (Th)

5. *B. alba* (L.) Boiss. White Mustard. Lapush, *Reagan.* (Th)

6. BARBAREA. Winter Cress.

1. B. ORTHOCERAS Ledeb. Mora, *Jones* 3429; Duckabush River, *Jones* 3075; Mt. Colonel Bob, *Thompson* 6259; Union, *Jones* 6512; Taholah, *Jones* 6540. Transition. (H)

7. ERYSIMUM.

Pods somewhat flattened, the beak 3-4 mm. long ..... 1. *E. arenicola.*
Pods somewhat 4-angled, becoming torulose, the beak 1.5-2 mm. long.. 2. *E. torulosum.*

1. E. ARENICOLA Wats. Mt. Steele, *Piper* 916, 2179. Not otherwise known. Arctic-alpine. (H)

2. E. TORULOSUM Piper, Proc. Biol. Soc. Wash. 23: 103, 1920. *(E. asperum* of auth., not Nutt.) Mt. Angeles, *Jones* 3308, *Flett,* June 25, 1908; Baldy Peak, *Lamb* 1307; Olympic Mountains, *Elmer* 2695; Mt. Carrie, *St.John* 5802; Mt. Storm King, *Lawrence* 354; Hurricane Ridge, *Jones* 3380; Mt. Colonel Bob, *Thompson* 7307; rocky summit near Mt. Appleton, *Jones* 8517. Arctic-alpine. (H)

8. SISYMBRIUM.

Pods appressed, 1-1.5 cm. long; petals bright yellow, 2-3 mm. long... 1. *S. officinale,* var. *leiocarpum.*
Pods spreading, 6-10 cm. long; petals pale yellow, 5-8 mm. long..... 2. *S. altissimum.*

1. *S. officinale* (L.) Scop., var. *leiocarpum* DC. Hedge Mustard. Port Hadlock, *Jones* 3156. (Th)

2. *S. altissimum* L. Jim Hill Mustard. A weed in gravelly soil, chiefly by roadsides; observed in several localities on the Olympic Peninsula, but not yet very common. (Th)

9. NASTURTIUM.

1. *N. Nasturtium-aquaticum* (L.) Karst. *(Radicula nasturtium-aquatica* (L.) Britten & Rendle; *Roripa nasturtium* (L.) Rusby) Watercress. Lapush, *Reagan.* (Cr)

10. COCHLEARIA.

1. C. OFFICINALIS L. Cape Elizabeth, *Foster,* May 26, 1908; Grenville, *Foster* 862. Humid Transition. (Th)

11. RORIPPA. Yellow-cress.

Pedicels 2-4 mm. long; pods curved, 4-16 mm. long ..... 1. *R. curvisiliqua.*
Pedicels 6-8 mm. long.
  Pods 4-8 mm. long, shorter than the pedicels ..... 2. *R. palustris.*
  Pods 8-12 mm. long, as long as the pedicels ..... 2a. var. *pacifica.*

1. R. CURVISILIQUA (Hook.) Bessey. Montesano, *Heller* 3852; Skokomish River, *Piper* in 1890; Port Angeles, *Webster,* June 20, 1909. Transition. (Th or H)

2. R. PALUSTRIS (L.) Besser. Lake Crescent, *Jones* 3455, 3493. Transition. (Th or H)

2a. Var. **pacifica** (Howell) n. comb. *Roripa pacifica* Howell, Fl. Nw. Am. 40, 1897. This plant differs from typical *R. palustris* only in the somewhat longer pods. It has been collected on the Olympic Peninsula at Hoquiam *(Lamb* 1221). For a discussion of the generic name *Rorripa* see Sprague, Journ. Bot. 68: 219, 1930. Transition. (Th or H)

12. SMELOWSKIA

Pods lanceolate, 6-10 mm. long ..... 1. *S. calycina.*
Pods ovate, 4-5 mm. long ..... 2. *S. ovalis.*

1. S. CALYCINA C.A.Mey. Clallam County, *Elmer* 2696; Mt. Angeles, *H.W.Bailey,* June 29, 1908, *Jones* 3799, 3171; Marmot Pass, *Thompson* 9939, 8002. Arctic-alpine. (H)

2. S. OVALIS M.E.Jones. Olympic Mountains, *Grant* in 1889; Mt. Angeles, *Jones* 3170. Arctic-alpine. (H)

13. THLASPI

Pods nearly orbicular, 8-10 mm. broad when ripe, broadly winged; introduced annual weed ..... 1. *T. arvense.*
Pods obovate or cuneate, 2-3 mm. broad, entire or very shallowly notched at the apex; native alpine perennials ..... 2. *T. hesperium.*

1. *T. arvense* L. Penny Cress. A weed in cultivated ground and waste places; not yet very abundant on the Peninsula, but observed in several localities. (Th)

2. T. **hesperium** (Pays.) n. comb. *T. glaucum* A.Nels., var. *hesperium* Payson, Univ. Wyo. Publ. Bot. 1: 154, 1926; *T. glaucum* A.Nels., var. *pedunculatum* Payson, l.c. 152. Typical *T. glaucum* is a glaucous, leafy, large-flowered plant of the Rocky Mountain region and is quite distinct in habit and range and in certain morphological characters from the plants of the mountainous regions of Washington, northern and eastern Oregon and western Idaho. According to Payson the western plants belong to var. *pedunculatum* (which occurs in western Montana, northern Idaho, and eastern Washington and Oregon), and var. *hesperium,* of western Idaho, northern Nevada, Washington, Oregon, and northern California, the distinction being that the former has the "inflorescences

conspicuously pedunculate", and the latter has the "inflorescences not, or scarcely, pedunculate". Whatever the phylogenetical value of these distinctions, the fact remains that material (even some specimens cited by Payson) from western Idaho and eastern Washington is indistinguishable from that of the Olympic Peninsula, the Cascade Mountains, the Wenatchee Mountains or the Blue Mountains of Washington. It would seem better, therefore, to merge all the northwestern material together in the specific category, using the appropriate name *hesperium*. *T. glaucum* (var. *typicum* Pays.) and *T. hesperium* may be distinguished as follows: *T. glaucum* is a glaucous plant with the cauline leaves ample, as long as the internodes, pedicels mostly horizontal, flowers 7-8 mm. long, petals spatulate, 3-4.5 mm. wide above the middle. It is not known to occur west of Montana. *T. hesperium*, on the other hand, is not at all or only slightly glaucous, (specimens from the Olympic Mountains are much greener and less glaucous than those from the Blue Mountains of southeastern Washington) with the cauline leaves normally shorter than the internodes, the pedicels mostly ascending, the flowers 4-6 mm. long, and the petals oblanceolate or elliptical, 2-2.5 mm. wide above the middle. In the Olympic Mountains *T. hesperium* occurs on open subalpine or alpine slopes at elevations of 3500-4000 feet, and flowers during July and August.

The following specimens have been collected on the Olympic Peninsula: Mt. Colonel Bob, *Thompson* 9975, 9401, 7294; Seven Lakes Basin, *Jones* 8230. Hudsonian and Arctic-alpine. (H)

14. CAPSELLA. Shepherd's Purse

1. *C. Bursa-pastoris* (L.) Medic. *(Bursa Bursa-pastoris* (L.) Weber) Port Hadlock, *Jones* 3149. (Th)

15. CORONOPUS. Wart-cress

1. *C. didymus* (L.) Sm. Shine, Jefferson County, *Otis* 1538. (Th)

16. LEPIDIUM. Pepper Cress

Basal leaves pinnately parted, pubescent..... 1. *L. Menziesii.*
Basal leaves dentate, glabrous..... 2. *L. texanum.*

1. L. MENZIESII DC. Clallam County, *Elmer* 2697, *Jones* 3980; Hoquiam, *Lamb* 1153; Port Angeles, *Webster,* June 1909; Port Hadlock, *Jones* 3139. Humid Transition. (H)

2. L. TEXANUM Buckl. *(L. medium* Greene) Lake Cushman, *Henderson* 2045. Transition. (Th)

17. SUBULARIA. Water Awlwort

1. S. AQUATICA L. Lake Ozette, *Jones* 5990. Transition. (Cr)

18. CAKILE. Sea Rocket

1. *C. edentula* (Bigel.) Hook. *(C. edentula,* var. *californica* (Heller) Fernald, Rhodora 24: 23, 1922.) Port Angeles, *Flett* 3381; Copalis, *Jones* 3649; Mora, *Jones* 3421; Port Hadlock, *Jones* 3279; ocean beach opposite Lake Ozette, *Otis* 1774; Moclips, *Thompson* 9334. Humid Transition. (Th)

There seems to be some doubt as to whether this plant is native on the beaches of Washington. What appears to have been the first collection in this state was made by Flett in 1908 at Port Angeles, where he found a single plant. No mention is made of the species by Piper in his *Flora of the State of Washington,* 1906. In the *Flora of the Northwest Coast,* 1915, Piper & Beattie include it with the statement "very rare," citing the Flett record from Port Angeles and another record from Long Beach, near Ucluelet, Vancouver Island. At the present time this plant is not uncommon on the Washington sea beaches, and in many localities is abundant. Its comparatively recent appearance and increase as indicated by the historical records of collection, suggest that it may be adventive in Washington. Dr. W. L. Jepson (in a private communication) inclines to the opinion that it is not native in California, and so states in his *Manual of the Flowering Plants of California* (1925). However, Fernald seems to regard the Pacific Coast plants as indigenous. It is perhaps significant that the Makah Indians have neither name nor use for the plant.

39. DROSERACEAE. Sundew Family

1. DROSERA. Sundew

1. D. ROTUNDIFOLIA L. Clallam County, *Elmer* 2785; Webb Hill, *Otis* 1498; Lake Ozette, *Rigg* in 1933. Humid Transition. (H)

40. CRASSULACEAE. Stonecrop Family

1. SEDUM. Stonecrop

Leaves spatulate, flattened; carpels erect.		
Herbage very glaucous; petals distinct	1.	*S. spathulifolium.*
Herbage bright green; petals somewhat united at base, the corolla short-campanulate	2.	*S. oreganum.*
Leaves not spatulate or glaucous; petals distinct.		
Leaves widest at or above the middle, mostly in rosettes at the ends of the branches; carpels widely divergent	3.	*S. divergens.*
Leaves linear or lanceolate in outline, broadest at the base		
Leaves linear, terete, not becoming scarious; carpels erect	4.	*S. stenopetalum.*
Leaves lanceolate, flattened above, becoming scarious; carpels divergent.		
Flowers in an open cyme	5.	*S. Douglasii.*
Flowers solitary	5a.	f. *uniflorum.*

1. S. SPATHULIFOLIUM Hook. Clallam County, *Elmer* 2691; Elwha River, *Jones* 3529; Mt. Angeles, *Webster,* July 3, 1908. Humid Transition. (Ch)

2. S. OREGANUM Nutt. *(Gormania oregana* (Nutt.) Britt.) Mt. Rose, *Jennie V. Getty,* August 10, 1902; trail to Constance Ridge, *Jones* 6027. Canadian and Humid Transition. (Ch)

3. S. DIVERGENS Wats. Olympic Mountains, *Piper* 2221; Elwha River, *Jones* 3498; Marmot Pass, *Thompson* 7990, 9874; Mt. Angeles, *Thompson* 7495; Bogachiel Ridge, *Jones* 8398; Mt. Appleton, *Jones* 8516; Heart Lake, *Dickinson 7.* Canadian to Arctic-alpine. (Ch)

4. S. STENOPETALUM Pursh. Olympic Mountains, *Flett* 138. Transition. (Ch)

5. S. DOUGLASII Hook. Olympic Mountains, *Flett* 116. Transition. (Ch)

5a. Forma **uniflorum** (Howell) n. comb. *S. uniflorum* Howell, Fl. Nw. Am. 1: 213, 1898; *S. monanthum* Suksd., Werdenda 1: 19, 1927. Flowers solitary, or occasionally two, terminal, the lateral flowers replaced by propagula. Hurricane Ridge, altitude 5000 feet, *Jones* 3363. (Ch)

41. SAXIFRAGACEAE. Saxifrage Family

Ovary superior or only partly inferior.
- Herbs.
  - Staminodia present, alternating with the stamens; carpels 3 or 4, united ..... 1. *Parnassia.*
  - Staminodia none.
    - Ovary 2-celled or carpels 2.
      - Carpels distinct; stamens 10 ..... 2. *Leptarrhena.*
      - Carpels united, at least below.
        - Stamens 10 ..... 3. *Saxifraga.*
        - Stamens 5 ..... 4. *Boykinia.*
    - Ovary 1-celled.
      - Petals 5.
        - Stamens 10.
          - Petals entire ..... 5. *Tiarella.*
          - Petals laciniate or palmately cleft.
            - Petals sessile, pinnately cleft ..... 6. *Tellima.*
            - Petals clawed, palmately cleft ..... 7. *Lithophragma.*
        - Stamens 5 or 3.
          - Petals pinnatifid; stamens 5 ..... 8. *Mitella.*
          - Petals entire.
            - Stamens 5 ..... 9. *Heuchera.*
            - Stamens 3 ..... 10. *Tolmiea.*
      - Petals 0; stamens 8 (in our species) ..... 11. *Chrysosplenium.*
  - Trailing shrub; leaves opposite; petals 5; stamens 8-12 ..... 12. *Whipplea.*

Ovary inferior; erect shrubs.
- Leaves opposite; fruit a capsule ..... 13. *Philadelphus.*
- Leaves alternate; fruit a berry ..... 14. *Ribes.*

1. PARNASSIA

1. P. FIMBRIATA Koenig. Olympic Mountains, *Piper* 2208; Elwha Basin, *Webster* 1836; Mt. Angeles, *Webster* 1837; Marmot Pass, *Thompson* 7986; Marmot Lake, *Dickinson* 12; Lake Constance, *Thompson* 7921; Canyon Creek, *Jones* 5836; Boulder Creek, *Jones* 8458. Hudsonian. (H)

2. LEPTARRHENA

1. L. AMPLEXIFOLIA (Sternb.) Ser. Olympic Mountains, *Piper,* August 1895; Mt. Angeles, *Webster* 1823; Deer Lake, *Jones* 5889; Seven Lakes Basin, *Jones* 8295; Dosewallips River, *Dickinson* 25. Arctic-alpine and Hudsonian.

3. SAXIFRAGA. Saxifrage.

Leaves all basal; stems scape-like.		
Leaves coarsely and sharply dentate or lobed.		
Leaves reniform or orbicular, long-petioled.		
Leaves usually triply or doubly dentate	1.	*S. Mertensiana.*
Leaves simply dentate.		
Petals suborbicular	2.	*S. arguta.*
Petals elliptical	3.	*S. aestivalis.*
Leaves flabellate to obovate, pubescent	4.	*S. ferruginea.*
Leaves crenate-dentate to entire.		
Leaves coarsely crenate	5.	*S. rufidula.*
Leaves entire or denticulate	6.	*S. integrifolia.*
Leaves not all basal; stems leafy, at least below.		
Leaves alternate; petals white.		
Tufted (usually alpine) perennials with mostly coriaceous, evergreen leaves.		
Leaves entire.		
Leaves obtuse, not ciliate	7.	*S. Tolmiei.*
Leaves acute, ciliate.		
Basal leaves spatulate, ciliate to the apex; stem leaves oblong	8a.	*S. bronchialis,* var. *vespertina.*
Basal leaves lanceolate, apex eciliate or cilia few; stem leaves linear	8b.	var. *austromontana.*
Leaves 3-lobed at the apex	9.	*S. caespitosa.*
Slender delicate annuals; leaves entire or 3-toothed; sepals triangular	10.	*S. Nuttallii.*
Leaves decussately opposite, crowded; petals purple	11.	*S. oppositifolia.*

1. S. MERTENSIANA Bong. *(S. Mertensiana* Bong., var. *glandipilosa* St.John & Hardin, Fl. Mt. Baker, Mazama 11: 77, 1929.) Chehalis [Grays Harbor] County, *Lamb* 1348; Olympic Mountains, *Elmer* 2643; Skokomish River, *Kincaid,* May 16, 1892; Mt. Angeles, *Webster,* June 29, 1908; Lake Quinault, *Jones* 3951; Mt. Colonel Bob, *Thompson* 7310; Marmot Pass, *Thompson* 9914. Canadian. (H)

The stems, petioles and leaf blades of *S. Mertensiana* Bong. vary from nearly glabrous to sparingly pilose or glandular-pilose. Plants showing all these variations may be found growing side by side.

2. S. ARGUTA D.Don. *(S. odontophylla* Piper; *S. odontoloma* Piper) Olympic Mountains, *Piper* 2213, *Elmer* 2639; Hurricane Ridge, *Jones* 3373; Mt. Angeles, *Jones* 3690; Canyon Creek, *Jones* 5903; Seven Lakes Basin, *Jones* 8313; Boulder Creek, *Jones* 8461. Arctic-alpine or Hudsonian. (H)

3. S. AESTIVALIS F. & M. *(S. Nelsoniana* Piper, not D.Don) Olympic Mountains, *Piper* 2214, *Elmer* 2640; Canyon Creek, *Jones* 5837; Elwha River, *C.S.Eaton,* August 3, 1907; Mt. Angeles, *Webster* 1873; Marmot Pass, *Thompson* 9884b; Mt. Colonel Bob, *Thompson* 7261; Seven Lakes Basin, *Jones* 8318; east fork Quinault River, *Dickinson* 88. Hudsonian. (H)

4. S. FERRUGINEA Graham. *(S. Bongardi* Presl. is a nomen nudum according to Engl. & Irmsch., *Pflanzenr.* IV: 117, 2: 670; *S. ferruginea* Graham, f. *Vreelandii* (Small) St.John & Thayer, in St.John & Hardin, Fl. Mt. Baker, Mazama 11: 77, 1929; *S. Vreelandii* Small) Olympic Mountains, *Elmer* 2644, *Piper,* September 1890; Elwha River, *C.S.Eaton,* August 1, 1907; Mt. Colonel Bob, *Thompson* 7256; Marmot Pass, *Thompson* 7979; Mt. Angeles, *Webster* 1883; Mt. Olympus, *St.John* 5790; Seven Lakes Basin, *Jones* 8253; Boulder Creek, *Jones* 8467; Heart Lake, *Dickinson* 56. Arctic-alpine. (H)

Both flowers and bulblets are often produced on the same plant, the flowers appearing first; hence the forma *Vreelandii* is here reduced to synonymy.

5. S. RUFIDULA (Small) Macoun. *(S. Marshallii* ex p. of Fl. Wash.) Olympic Mountains, *Elmer* 2646, *Piper* 2212; Mt. Baldy, *Conard* 279; Mt. Angeles, *Webster* 1879, *Jones* 3339; Constance Ridge, *Thompson* 6583; Marmot Pass, *Thompson* 9903; Mt. Colonel Bob, *Thompson* 9404; Lake Crescent, *Jones* 4529. Chiefly Arctic-alpine. (H)

According to Engler and Irmscher (l.c.), *S. aequidentata* (Small) Rosendahl is a synonym of *S. rufidula* (Small) Macoun. They state (p. 39) that it is merely a climatic form. The specimens from the Olympic Mountains they consider to be *S. rufidula,* f. *minor,* and the somewhat larger specimens from the Columbia Gap they treat as *S. rufidula,* f. *major.* Johnson (1919) keeps them separate as two distinct species, on the basis of the pubescent or glabrous condition of the scapes. It is probable that this character is of slight value as there is, apparently, a tendency for the scapes to become glabrate in age. In specimens of *S. rufidula (S. rufidula,* f. *minor)* cited by Engler & Irmscher the scapes show all conditions, ranging from glabrous to glandular-pubescent. Some or all of the leaves are more or less brownish pubescent to tomentose on the lower sur-

face. As Johnson has already pointed out, the filaments in this species are subulate, not clavate, as Small has stated in the *North American Flora.*

6. S. INTEGRIFOLIA Hook. Sequim, *Grant,* April 22, 1916; Montesano, *Grant,* April 1919. Humid Transition. (H)

Hooker's name is applied to this species in the sense that it has been used by Piper (1906), and by Johnson (1919), although it is evident that our plants do not fit the original description. Young plants, and those that grow in dry, rocky soil, have a distinctive appearance on account of their capitate, densely glandular inflorescences. Such plants have been identified as *S. laevicarpa* Johnson, the type specimen of which is in the Herbarium of the University of Washington. They are certainly distinct from *S. fragosa* Suksd., which occurs in the Columbia Valley and in eastern Washington.

7. S. TOLMIEI T. & G. Olympic Mountains, *Piper,* August 1895, *Elmer* 2642; Mt. Olympus, *H.C.Stevens,* August 1907; Mt. Angeles, *Jones* 3671; Marmot Pass, *Thompson* 9909; east fork Quinault River, *Dickinson* 90. Arctic-alpine. (Ch)

8a. S. BRONCHIALIS L., var. VESPERTINA (Small) Rosend. *(S. bronchialis* ex p. of Fl. Wash.) This plant is known from only a few localities in Washington, namely Cape Horn on the Columbia River, Goat Mountains near Mt. Rainier, and Mt. Baldy, in Grays Harbor County. The latter station is the type locality where F. H. Lamb collected it in 1897. Humid Transition and Canadian. (H)

8b. S. BRONCHIALIS L., var. AUSTROMONTANA (Wieg.) Piper. *(S. bronchialis* ex p. of Fl. Wash.) Mt. Storm King, *Lawrence;* Olympic Mountains, *Piper* 3210; Mt. Angeles, *Jones* 3175, 3315, *C.S.Eaton,* June 29, 1908; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Hurricane Ridge, *Jones* 3251; Marmot Pass, *Thompson* 8000, 9902; trail to Constance Ridge, *Jones* 5777; Lake Constance, *Thompson* 7900; Seven Lakes Basin, *Jones* 8229. Hudsonian. (H)

9. S. CAESPITOSA L. *(Muscaria emarginata* Small) Olympic Mountains, *Elmer* 2649, *Flett* 809; Mt. Steele, *Piper* 2211; Mt. Baldy, *Conard* 281; Mt. Storm King, *Lawrence* 343; Mt. Angeles, *Jones* 3804, *Webster,* June 29, 1908; Mt. Olympus, *Flett,* August 13, 1907; Mt. Colonel Bob, *Thompson* 9405; Lake Constance, *Thompson* 7917; Hurricane Ridge, *Jones* 3251, 3362; Mt. Appleton, *Jones* 8515. Arctic-alpine. (H)

10. S. NUTTALLII Small. *(Cascadia Nuttallii* (Small) Johnson, Am. Journ. Bot. 14: 38, 1927.) On rocks, Montesano, *Grant,* May 1920.

This collection establishes the first record of the occurrence of this rare plant in western Washington; in addition it apparently marks the northern limit of the range of the species. Humid Transition. (Th)

11. S. OPPOSITIFOLIA L. Mt. Angeles, *Jones* 3301. Arctic-alpine. (Ch)

A specimen *(Thompson* 11041½) from Mt. Constance, distributed as *Saxifraga adscendens* L., (and so reported in Rhodora 37: 419, 1935) is certainly not that species but may represent *S. rivularis* L., a circumpolar plant hitherto not detected in Washington.

4. BOYKINIA

Stipules scarious or foliaceous; basal leaves 5-12 cm. broad..... 1. *B. intermedia.*
Stipules reduced to bristles; basal leaves 2-5 cm. broad..... 2. *B. elata.*

1. B. **intermedia** (Piper) n. comb. *Therefon majus intermedium* Piper, Contr. U. S. Nat. Herb. 11: 311, 1906; *T. intermedium* Heller, Muhlenbergia 1: 53, 1904. New London, *Lamb* 1267; Lake Quinault, *Thompson* 7323; Lake Ozette, *Jones* 5946; Braden Creek, *Jones* 5812; Hoh River, *Jones* 3974; Stevens Creek, *Jones* 3945. Humid Transition. (Cr)

2. B. ELATA (Nutt.) Greene. (*Therefon elatum* (Nutt.) Greene) Olympic Mountains, *Piper* 2209; Skokomish River, *Henderson,* June 24, 1892; Quilcene, *Gardner* 109; Mt. Colonel Bob, *Thompson* 9965; Aloha, *Thompson* 9363; Hoh River, *Jones* 3975. Humid Transition. (Cr)

5. TIARELLA

Leaves palmately 3-7-lobed..... 1. *T. unifoliata.*
Leaves trifoliolate..... 2. *T. trifoliata.*

1. T. UNIFOLIATA Hook. Canyon Creek, *Jones* 5900, 8366; north fork Skokomish River, *Dickinson* 68. Canadian. (H)

2. T. TRIFOLIATA L. Clallam County, *Elmer* 2775; Skokomish Valley, *Kincaid,* June 1892; Lake Crescent, *Jones* 3468; Port Townsend, *Meehan,* in 1883; Mt. Angeles, *Thompson* 7375; Dosewallips River, *Thompson* 6548; Mt. Colonel Bob, *Thompson* 7265; Canyon Creek, *Jones* 5899, 5905; trail to Constance Ridge, *Jones* 5770. Humid Transition and Canadian. (H)

6. TELLIMA. Fringe-cup

1. T. GRANDIFLORA (Pursh) Dougl. Clallam County, *Elmer* 2645; Montesano, *Heller* 3862; Port Angeles, *Webster* 1826; Olympic Hot Springs, *Jones* 3992; Dosewallips River, *Thompson* 6550; Mt. Colonel

Bob, *Thompson* 7295; Humptulips River, *Jones* 6462. Humid Transition. (H)

7. LITHOPHRAGMA

1. L. PARVIFLORA Nutt. *(Tellima parviflora* Hook.) "Olympic Mountains," *Grant* in 1889 (collected probably near Sequim); mouth of Ennis Creek, *Webster* 1827. Transition. (H)

8. MITELLA. Mitrewort

Stems usually bearing 1-3 leaves; stamens alternate with the petals.... 1. *M. caulescens.*
Stems usually leafless.
  Petals mostly 3-cleft at apex..... 2. *M. trifida.*
  Petals pinnately 3-5-parted.
    Stamens opposite the petals..... 3. *M. pentandra.*
    Stamens alternate with the petals.
      Leaves broadly reniform..... 4. *M. Breweri.*
      Leaves oblong-cordate..... 5. *M. ovalis.*

1. M. CAULESCENS Nutt. Skokomish Valley, *Kincaid,* May 29, 1892; Mt. Angeles, *C.S.Eaton,* June 28, 1908; Port Angeles, *Webster,* June 1910; Elwha River, *Jones* 3134. Humid Transition. (H)

2. M. TRIFIDA Graham. Olympic Mountains, *Flett* 83, *Piper,* August 10, 1890; Hurricane Ridge, *Jones* 3268; Mt. Angeles, *Winona Bailey,* June 29, 1908; Marmot Pass, *Thompson* 9889. Hudsonian. (H)

3. M. PENTANDRA Hook. Olympic Mountains, *Piper,* August 10, 1890, and August 1895, *Henderson,* July 11, 1892; Skokomish Valley, *Kincaid,* June 1892; Mt. Angeles, *Jones* 3297; Olympic Hot Springs, *Jones* 3995; Mt. Colonel Bob, *Thompson* 6244, 9412; Seven Lakes Basin, *Jones* 8296. Hudsonian. (H)

4. M. BREWERI Gray. Olympic Mountains, *Piper,* August 10, 1890, and September 1890; Mt. Angeles, *Webster* 1845; Mt. Colonel Bob, *Thompson* 7264, 9976; Constance Ridge, *Thompson* 6580. Hudsonian. (H)

5. M. OVALIS Greene. Hoquiam, *Lamb* 1056; Quinault, *Conard* 225; New London, *Jones* 4596; Skokomish River, *Kincaid;* Nolan Creek, *Otis* 1417, *Jones* 4555; Shelton Creek, *Jones* 6528; Mt. Angeles, *Webster* 1852. Otherwise known in Washington only at North Cove, Pacific County, *G.B.Rigg,* April 1908. Humid Transition. (H)

9. HEUCHERA. Alumroot

Stamens exserted; inflorescence loosely paniculate.
  Leaf-lobes rounded; herbage more or less pubescent..... 1. *H. micrantha.*
  Leaf-lobes triangular, acute; herbage glabrous..... 2. *H. glabra.*
Stamens included; inflorescence a narrow panicle or raceme.
  Inflorescence a narrow panicle; leaves all basal; lowland species..... 3. *H. chlorantha.*
  Inflorescence a loose raceme; stems usually bearing 1-3 leaves; alpine 4. *H. racemosa.*

1. H. MICRANTHA Dougl. *(H. diversifolia* Rydb.) Clallam County, *Elmer* 2651; Skokomish Valley, *Kincaid,* May 1892; Union [City], *Piper* in 1890; Dosewallips River, *Thompson* 6543; Waketichie Creek, *Jones* 8503. Humid Transition. (H)

2. H. GLABRA Willd. Baldy Peak, *Lamb* 1377; Mt. Angeles, *Jones* 3689; Lake Constance, *Thompson 7897*; Marmot Pass, *Thompson* 9900, 7982; Seven Lakes Basin, *Jones* 8223; Boulder Creek, *Jones* 8472. Hudsonian. (H)

3. H. CHLORANTHA Piper. *(H. cylindrica* of Fl. Wash.) Montesano, *Heller* 4067. Humid Transition. (H)

4. H. RACEMOSA Wats. *(Elmera racemosa* (Wats.) Rydb.) Olympic Mountains, *Piper* 2215, 913; Mt. Queets, *Asahel Curtis,* August 3, 1907; Clallam County, *Elmer* 2641; Mt. Carrie, *St.John* 5818; Mt. Angeles, *Jones* 3329, 3688; Marmot Pass, *Thompson* 9913, 7954; Lake Constance, *Thompson* 7890; Duckabush River, *Dickinson* 21. Arctic-alpine. (H)

10. TOLMIEA

1. T. MENZIESII (Pursh) T. & G. *(Leptaxis Menziesii* (Pursh) Raf.) Youth-on-age. Clallam County, *Elmer* 2776; Montesano, *Heller* 3851; Hoquiam, *Lamb* 1054; Skokomish Valley, *Kincaid,* May 1892; Port Ludlow, *Binns;* Mt. Angeles, *Thompson* 7373; Lake Quinault, *Thompson* 6264. Humid Transition. (H)

11. CHRYSOSPLENIUM. Golden Saxifrage

1. C. GLECHOMAEFOLIUM Nutt. *(C. Scouleri* (Hook.) Rose) Hoquiam, *Lamb* 1044; Quinault, *Conard* 131. Humid Transition and Canadian. (H)

12. WHIPPLEA

1. W. MODESTA Torr. Chehalis [Grays Harbor] County, *Lamb* (fide Piper); Lake Crescent, *Webster; Jones* 3761, 4533. The Lake Crescent station marks the northern limit of this Californian species. It occurs also in the Willamette Valley, Oregon. Humid Transition. (Ch)

13. PHILADELPHUS. Mock-orange

1. P. GORDONIANUS Lindl. Lake Crescent, *Sargent* in 1896 (fide Piper); Elwha River, *Jones* 3396; Waketichie Creek, *Jones* 8502. Humid Transition. (Ph)

14. RIBES. Currant, Gooseberry

Plants with spines or prickles.
Flowers 1-4; calyx-tube campanulate.
Ovary and fruit glandular; flowers 1.5 cm. long ..... 1. *R. Lobbii.*
Ovary and fruit glabrous; flowers 8-10 mm. long ..... 2. *R. divaricatum.*
Flowers numerous; calyx-tube saucer-shaped, glandular-hispid .... 3. *R. lacustre.*
Plants without spines or prickles.
Flowers greenish; calyx-tube rotate or saucer-shaped.
Racemes pendent; ovary with stalked glands ..... 4. *R. Howellii.*
Racemes erect or ascending.
Glands sessile ..... 5. *R. bracteosum.*
Glands stalked ..... 6. *R. laxiflorum.*
Flowers red; calyx-tube campanulate ..... 7. *R. sanguineum.*

1. R. LOBBII Gray. Red-flowered Gooseberry. Clallam County, *Elmer* 2655; Sequim, *Jones* 4527. Humid Transition. (Ph)

2. R. DIVARICATUM Dougl. Common Gooseberry. Port Ludlow, *Binns;* Montesano, *Heller* 3921; Hoquiam, *Lamb* 1005; Port Townsend, *Meehan,* in 1883; Port Discovery, *St.John* 5827; Hurricane Ridge, *Jones* 4031; Humptulips River, *Jones* 4581. Humid Transition. (Ph)

3. R. LACUSTRE (Pers.) Poir. Swamp Currant. Olympic Mountains, *Henderson* 321; Port Ludlow, *Binns;* Port Townsend, *Meehan* in 1883; Olympic Hot Springs, *Jones* 3994; Mt. Angeles, *Thompson* 7477; Mt. Colonel Bob, *Thompson* 7298; Lake Constance, *Thompson* 7908; trail to Constance Ridge, *Jones* 5790. Transition and Canadian. (Ph)

4. R. HOWELLII Greene. Mountain Currant. Olympic Mountains, *Piper* 2207; Marmot Pass, *Thompson* 9925; Lake Constance, *Thompson* 7907; Mt. Angeles, *Thompson* 7466; Constance Ridge, *Jones* 5797; Seven Lakes Basin, *Jones* 8210. Hudsonian. (Ph)

5. R. BRACTEOSUM Dougl. Clallam County, *Elmer* 2652; Hoquiam, *Lamb* 1011; Montesano, *Heller* 3912; Mt. Angeles, *Webster* 1127; Olympic Hot Springs, *Jones* 3985; Canyon Creek, *Jones* 5835, 8360; Boulder Creek, *Jones* 8464; Duckabush River, *Dickinson* 6. Humid Transition and Canadian. (Ph)

6. R. LAXIFLORUM Pursh. "Head of Duckaboose [Duckabush] River", *Piper* 2206; Chehalis [Grays Harbor] County, *Lamb* 1064a; Clallam Bay, *Jones* 5852. Canadian and Humid Transition. (Ph)

7. R. SANGUINEUM Pursh. Red-flowering Currant. Clallam County, *Elmer* 2654, 2658; Port Ludlow, *Binns;* Port Discovery, *St.John* 5832; Duckabush River, *Jones* 3062. Humid Transition. (Ph)

42. ROSACEAE. Rose Family

Ovary superior (apparently inferior in *Rosa*).
  Fruit of follicles, achenes, or drupelets.
    Fruit of 1-5 dehiscent (tardily so in *Holodiscus*) follicles.
      Flowers perfect.
        Stamens distinct.
          Leaves palmately veined; carpels inflated ..... 1. *Physocarpus.*
          Leaves pinnately veined; carpels not inflated.
            Stamineal disk entire; ovules 2 ..... 2. *Holodiscus.*
            Stamineal disk not entire; ovules several ..... 3. *Spiraea.*
        Stamens united at base ..... 4. *Lutkea.*
      Flowers dioecious; leaves compound ..... 5. *Aruncus.*
    Fruit indehiscent, consisting of achenes or drupelets.
      Pistils enclosed in the urn-shaped calyx-tube ..... 6. *Rosa.*
      Pistils not enclosed in a fleshy receptacle.
        Fruit of more or less fleshy drupelets ..... 7. *Rubus.*
        Fruit of dry achenes.
          Pistils many.
            Style deciduous from the achene.
              Receptacle fleshy in fruit ..... 8. *Fragaria.*
              Receptacle dry ..... 9. *Potentilla.*
            Style persistent ..... 10. *Geum.*
          Pistil one ..... 11. *Sanguisorba.*
  Fruit a drupe.
    Flowers perfect; pistil 1; leaves serrate ..... 12. *Prunus.*
    Flowers dioecious; pistils 5; leaves entire ..... 13. *Osmaronia.*
Ovary inferior; fruit a pome; trees or shrubs.
  Leaves compound (in our species) ..... 14. *Sorbus.*
  Leaves simple.
    Inflorescence racemose ..... 15. *Amelanchier.*
    Inflorescence cymose.
      Branches armed with stout spines; carpels 2-5, stone-like in fruit ..... 16. *Crataegus.*
      Branches unarmed; carpels 5, papery in fruit ..... 17. *Pyrus.*

1. PHYSOCARPUS. Ninebark

1. P. CAPITATUS (Pursh) Kuntze. *(Opulaster opulifolius* of Fl. Wash.) Clallam County, *Elmer* 2520; Montesano, *Heller* 3858, *Jones* 8401; Chehalis [Grays Harbor] County, *Lamb* 1154; Lake Crescent, *Webster* 1594, *Jones* 3458; Beaver Creek, *Jones* 4544; Lake Ozette, *Jones* 5935. Transition. (Ph)

2. HOLODISCUS. Ocean Spray

1. H. DISCOLOR (Pursh) Maxim. *(Schizonotus discolor* (Pursh) Raf.) Clallam County, *Elmer* 2522; Port Ludlow, *Binns;* Satsop, *Heller* 4025; trail to Constance Ridge, *Jones* 5859; Duckabush River, *Jones* 3090; Mt. Angeles, *Thompson* 7563. Transition. (Ph)

3. SPIRAEA. Spirea

Leaves entire; low alpine shrub with white flowers..... 1. *S. Hendersoni.*
Leaves serrate or incised; flowers rose colored.
  Flowers in flat-topped corymbs..... 2. *S. densiflora.*
  Flowers in elongated panicles.
    Leaves glabrous and often somewhat glaucous beneath..... 3. *S. Menziesii.*
    Leaves white-tomentose beneath..... 4. *S. Douglasii.*

1. S. HENDERSONI (Canby) Piper. Olympic Mountains, *Piper* 910, 1991, *Elmer* 2517; Baldy Peak, *Lamb* 1374; Mt. Storm King, *Lawrence* 344; Mt. Seattle, *C.S.Eaton,* August 19, 1907; Mt. Carrie, *St.John* 5811; Mt. Angeles, *Jones* 3204; Mt. Colonel Bob, *Thompson* 7277; Lake Constance, *Thompson* 7870; Boulder Peak, *Jones* 8442; Mt. Appleton, *Jones* 8430. Arctic-alpine. (Ch)

2. S. DENSIFLORA Nutt. Olympic Mountains, *Piper,* August 1895, *Elmer* 2514, *Henderson* 245; Mt. Colonel Bob, *Thompson* 7258; Seven Lakes Basin, *Jones* 8247; Boulder Creek, *Jones* 8470; east fork Quinault River, *Dickinson* 22. Hudsonian. (Ph)

3. S. MENZIESII Hook. Montesano, *Heller* 4004, *Jones* 8400; Chehalis River, *Lamb* 1241; Quillayute Prairie, *Jones* 3582, 3784; Humptulips, *Jones* 3621; Aloha, *Thompson* 9364; Lake Ozette, *Jones* 5987. Chiefly Transition. (Ph)

4. S. DOUGLASII Hook. Clallam County, *Elmer* 2523; Lake Crescent, *Webster* 1579, 1581. Humid Transition. (Ph)

[*S. pyramidata* Greene. Sol Duc, according to Reagan (1923), but no specimens are available and the record is almost certainly erroneous.]

4. LUTKEA. Alaskan Spirea

1. L. PECTINATA (Pursh) Kuntze. Olympic Mountains, *Piper* 1992; Mt. Angeles, *Webster,* September 5, 1909; Elwha Basin, *Webster,* August 1907; Mt. Colonel Bob, *Thompson 7257*; Lake Constance, Thompson 7903; Marmot Pass, *Thompson* 9896; Heart Lake, *Dickinson* 18. Arctic-alpine and Hudsonian. (Ch)

5. ARUNCUS. Goat's-beard

1. A. SYLVESTER Kostel. *(A. acuminatus* Rydb.; *A. Aruncus* (L.) Karst.) Clallam County, *Elmer* 2527; Skokomish Valley, *Kincaid,* June 1892; Mt. Angeles, *Webster* 1637; Mt. Colonel Bob, *Thompson* 7251; Dosewallips River, *Thompson* 6594; Montesano, *Jones* 8404. Transition. (H)

6. ROSA. Rose

Prickles curved or hooked; adventive species.
  Leaflets simply and sharply serrate; sepals glabrous; foliage inodorous ..... 1. *R. canina.*
  Leaflets doubly serrate with gland-tipped teeth; sepals glandular-hispid on the back; foliage fragrant ..... 2. *R. rubiginosa.*
Prickles straight or nearly so, or lacking; native species with inodorous foliage.
  Leaflets simply serrate; flowers mostly corymbose, about 3 cm. in diameter ..... 3. *R. pisocarpa.*
  Leaflets doubly serrate with gland-tipped teeth; flowers solitary.
    Flowers 4-8 cm. in diameter; stems prickly but not bristly; sepals persistent on the mature fruit ..... 4. *R. nutkana.*
    Flowers about 2 cm. in diameter; stems bristly and prickly; sepals deciduous ..... 5. *R. gymnocarpa.*

1. *R. canina* L. Dog Rose. Kennedy Creek, *Jones* 3488; Sol Duc Hot Springs, *Jones* 8332. These are the first Washington records for this species. (Ph)

2. *R. rubiginosa* L. Sweetbriar. Skokomish River, *J.Schwartz,* July 1932. (Ph)

3. R. PISOCARPA Gray. Port Ludlow, *Binns;* Port Hadlock, *Jones* 3099; McCleary, *Jones* 4585; Satsop, *Heller* 4032; Union, *Jones* 8539. Humid Transition. (Ph)

4. R. NUTKANA Presl. Clallam County, *Elmer* 2519; Montesano, *Heller* 3875; Port Ludlow, *Binns;* Port Discovery, *St.John* 5826; Duckabush River, *Jones* 3088; Hurricane Ridge, *Jones* 3369; Quillayute Prairie, *Jones* 3613, 3749; Humptulips, *Jones* 3763; Humptulips River, *Jones* 4582; Beaver Creek, *Jones* 4545; Clallam Bay, *Jones* 5843; Hoh River, *Otis* 1287. Humid Transition. (Ph)

5. R. GYMNOCARPA Nutt. Clallam County, *Elmer* 2515; Montesano, *Heller* 3897; Mt. Angeles, *Webster* 1652; New Kamilche, *Beattie* 3678; Port Crescent, *Lawrence* 226, 245; Sequim, *Grant* 210. Transition. (Ph)

7. RUBUS. Blackberry, Raspberry

Trailing herbs.
  Leaves palmately lobed ..... 1. *R. lasiococcus.*
  Leaves palmately compound ..... 2. *R. pedatus.*
Shrubs.
  Stems trailing.
    Leaves mostly compound; berries black ..... 7. *R. macropetalus.*
    Leaves mostly simple; berries red ..... 3. *R. nivalis.*
  Stems erect or ascending.
    Leaves palmately lobed; stems not prickly ..... 4. *R. parviflorus.*
    Leaves compound; stems prickly.
      Flowers red; fruit orange or yellow ..... 5. *R. spectabilis.*
      Flowers white; fruit black.
        Fruit hemispherical, hollow; stems very glaucous; leaflets usually 3, white-pubescent beneath ..... 6. *R. leucodermis.*
        Fruit cylindrical, solid; stems not glaucous.
          Leaflets laciniate ..... 8. *R. laciniatus.*
          Leaflets serrate, or merely shallowly and bluntly lobed.
            Leaflets white-tomentose beneath ..... 9. *R. procerus.*
            Leaflets pale green and softly pubescent beneath .... 10. *R. fruticosus.*

1. R. LASIOCOCCUS Gray. Clallam County, *Elmer* 2524; Chehalis [Grays Harbor] County, *Lamb* 1403; Boulder Creek, *Jones* 8492; Mt. Angeles, *Webster* 1633. Canadian and Hudsonian. (H)

2. R. PEDATUS Smith. Baldy Peak, *Lamb* 1304; Mt. Colonel Bob, *Thompson* 7269; Canyon Creek, *Jones* 5907; Boulder Creek, *Jones* 8480; Duckabush River, *Dickinson* 87. Hudsonian. (H)

3. R. NIVALIS Dougl. Olympic Mountains, *Piper* in 1890; Lake Crescent, *Jones* 3433; Mt. Angeles, *Webster* 1622. Canadian. (H)

4. R. PARVIFLORUS Nutt. Clallam County, *Elmer* 2518; Lake Crescent, *Jones* 3474; Skokomish Valley, *Kincaid,* May 1892; Mt. Angeles, *Thompson* 7548; Marmot Lake, *Dickinson* 64. Transition to Hudsonian. (H)

5. R. SPECTABILIS Pursh. Clallam County, *Elmer* 2513; Port Ludlow, *Binns,* April 10, 1889; Humptulips River, *Jones* 4589; Canyon Creek, *Jones* 5832; Taholah, *Jones* 6488, 6489. Humid Transition. (H)

6. R. LEUCODERMIS Dougl. Clallam County, *Elmer* 2516; near Satsop, *Heller* 4033. Transition. (H)

7. R. MACROPETALUS Dougl. *(R. Helleri* Rydb.) Clallam County, *Elmer* 2530; Montesano, *Heller* 3887, 3990; Hoquiam, *Lamb* 1017; de Fuca Straits, *Cooper* (fide Piper); Skokomish Valley, *Kincaid,* May 1892; Mt. Angeles, *Webster* 1625; Elwha River, *Jones* 3242; Ocean City, *Jones* 3935, 3898; McCleary, *Jones* 4592; Crystal Creek, *Jones* 8446. Humid Transition. (H)

8. *R. laciniatus* Willd. Quinault, *Conard* 216; Chehalis River, *Lamb* 1244; Montesano, *Heller* 4001; Humptulips, *Jones* 3711; Quillayute Prairie, *Jones* 3782; Waketichie Creek, *Jones* 8499; Union, *Jones* 8538. (H)

9. *R. procerus* P.J.Muell. Quillayute Prairie, *Jones* 3783; Waketichie Creek, *Jones* 8504. (H)

10. *R. fruticosus* L. Humptulips River, *Jones* 4593. (H)

[*R. strigosus* Michx. Sol Duc Hot Springs. Listed by Reagan (1923) but there is no evidence that this Arid Transition species occurs on the Olympic Peninsula.]

8. FRAGARIA. Strawberry

Seashore plants with thick coriaceous strongly reticulate leaflets; flowers 2-3 cm. broad; achenes superficial ..... 1. *F. chiloensis.*
Woodland or prairie plants; leaflets usually thinner, less strongly reticulate; flowers 1-2 cm. broad.
  Leaflets pubescent on both surfaces at flowering time; scapes usually longer than the leaves; achenes superficial; woodland plants.... 2. *F. bracteata.*
  Leaflets glabrous above at flowering time; scapes usually shorter than the leaves; achenes set in deep pits; plants of dry, open ground ..... 3. *F. cuneifolia.*

1. F. CHILOENSIS (L.) Duch. Clallam County, *Elmer* 2528; Ocean City, *Jones* 3879; Moclips, *Jones* 6451. Humid Transition. (H)

2. F. BRACTEATA Heller. Skokomish River, *Kincaid,* June 9, 1892; Mt. Storm King, *Lawrence* 337; Mt. Angeles, *Winona Bailey,* June 30, 1908; Elma, *Jones* 6472; Duckabush River, *Dickinson* 82. Transition. (H)

F. crinita Rydb. appears to be merely a low, young form of this species.

3. F. CUNEIFOLIA Nutt. Hurricane Ridge, *Jones* 3212, 4018; Humptulips, *Lamb* 1098a; Quinault River, *Jones* 3957; Lake Crescent, *Jones* 4532. Transition. (H)

9. POTENTILLA

Stamens 5; petals minute; leaflets 3 ..... 1. *P. Sibbaldi.*
Stamens 15-25.
  Cymes leafy, many-flowered ..... 2. *P. norvegica,* var. *hirsuta.*
  Cymes not leafy; flowers fewer.
    Leaflets 3.
      Plant densely silky-villous ..... 3. *P. villosa.*
      Plant glabrous or nearly so ..... 4. *P. flabellifolia.*
    Leaflets 5-31.
      Leaflets 7-31, bright green above, white tomentose beneath 5. *P. pacifica.*
      Leaflets 5-9.
        Low shrub; petals yellow ..... 6. *P. fruticosa.*
        Herbs.
          Petals purple ..... 7. *P. palustris.*
          Petals yellow or cream.
            Leaves whitish-silky beneath.
              Alpine; stems 10-20 cm. high ..... 8. *P. diversifolia.*
              Lowland; stems 30-60 cm. high ..... 9. *P. gracilis.*
            Leaves green on both sides.
              Leaves digitate ..... 10. *P. glaucophylla.*
              Leaves pinnate.
                Leaflets cleft or incised; inflorescence finely appressed pubescent; petals twice as long as the sepals; corolla 16-18 mm. broad ..... 11. *P. Drummondii.*
                Leaflets serrate; inflorescence sparsely glandular-villous.
                  Petals about as long as the sepals; corolla 10-15 mm. broad ..... 12. *P. glandulosa.*
                  Petals much longer than the sepals; corolla 15-20 mm. broad ..... 13. *P. valida.*

1. P. SIBBALDI Hall. f. *(Sibbaldia procumbens* L., not *Potentilla procumbens* Sibth.) Olympic Mountains, *Piper,* August 1895; Mt. Angeles, *Jones* 3333; Lake Constance, *Thompson* 7918; Mt. Colonel Bob, *Thompson* 7247. Hudsonian and Arctic-alpine. (H)

2. P. NORVEGICA L., var. HIRSUTA (Michx.) Lehm. *(P. monspeliensis* of auth.) Crocker Lake, *Jones* 5918. Transition. (Th or H)

3. P. VILLOSA Pall. Olympic Mountains, *Flett* 129; Mt. Angeles, *Jones* 3188. Arctic-alpine. (H)

4. P. FLABELLIFOLIA Hook. Clallam County, *Elmer* 2521; Mt. Seattle, *C.S.Eaton,* August 6, 1907; Mt. Angeles, *Thompson* 7518, 8417; Hurricane Ridge, *Jones* 3213; Marmot Lake, *Dickinson* 79. Hudsonian. (H)

5. P. PACIFICA Howell. *(Argentina pacifica* (Howell) Rydb.) Silver-weed. Clallam County, *Elmer* 2525; Hoquiam, *Lamb* 1080; Mora, *Jones* 3449; Port Hadlock, *Jones* 3158; Ocean City, *Jones* 3905. Humid Transition. (H)

6. P. FRUTICOSA L. *(Dasiphora fruticosa* (L.) Rydb.; *D. fruticosa tenuifolia* (Willd.) Rydb.) Olympic Mountains, *Grant* in 1889; Mt. Angeles, *Webster* 1663. Hudsonian. (Ph)

7. P. PALUSTRIS Scop. *(Comarum palustre* L.) Port Ludlow, *Binns;* Ocean City, *Jones* 3887; Moclips, *Thompson* 9337; Lake Quinault, *Thompson* 7337. Transition. (Cr)

8. P. DIVERSIFOLIA Lehm. Mt. Angeles, *Jones* 3205. Hudsonian. (H)

9. P. GRACILIS Dougl. Port Townsend, *Edwards,* in 1896; Olympic Mountains, *Flett* 108; Satsop, *Jones* 3858. Humid Transition. (H)

10. P. GLAUCOPHYLLA Lehm. Marmot Pass, *Thompson* 9945. Arctic-alpine. (H)

11. P. DRUMMONDII Lehm. *(P. cascadensis* Rydb.) Olympic Mountains, *Elmer* 2523; Deer Lake, *Jones* 8345; Seven Lakes Basin, *Jones* 8271. Hudsonian. (H)

12. P. GLANDULOSA Lindl. *(Drymocallis glandulosa* (Lindl.) Rydb.; *P. Wrangelliana* Fisch. & Lall.; *D. Wrangelliana* (Fisch. & Lall.) Rydb.) Olympic Mountains, *Flett* 82, *Piper* 2000, 2024, *Elmer* 2526; Hurricane Ridge, *Jones* 3233. Canadian on the Olympic Peninsula. (H)

P. glandulosa, var. *nevadensis,* reported by Leach (1928, p. 52), is *P. glandulosa* Lindl.

13. P. VALIDA Greene. (*Drymocallis valida* (Greene) Piper) Olympic Mountains, *Flett* 110. Transition? (H)

10. GEUM

Petals yellow; calyx-lobes reflexed; styles jointed, the upper part deciduous ..... 1. *G. macrophyllum.*
Petals reddish purple; calyx-lobes erect; styles not jointed, persistent ..... 2. *G. campanulatum.*

1. G. MACROPHYLLUM Willd. Clallam County, *Elmer* 2524; Montesano, *Heller* 3947; Skokomish Valley, *Kincaid,* May 1892; Quilcene, *Beattie* 2642; Port Crescent, *Lawrence* 238; Glacier Creek Valley, *St.John* 5779; Lake Crescent, *Jones* 3774; Lake Quinault, *Thompson* 6260. Transition. (H)

2. G. **campanulatum** (Greene) n. comb. *Erythrocoma campanulata* Greene, Leaflets 1: 178, 1906; *Sieversia ciliata* Piper, Contr. U. S. Nat. Herb. 11: 344, 1906, in part, not *Geum ciliatum* Pursh. Dr. Greene cited *Elmer* 2529 from the "Olympic Mountains," hence this collection must be taken as the type. A duplicate is in the Herbarium of the State College of Washington at Pullman. *Geum campanulatum* is a common and characteristic species occurring on ridges and dry hillsides in the mountains in the northeastern section of the Olympic range. Outside of the Olympic Peninsula it is known to occur only on Saddle Mountain, Clatsop County, Oregon.

Many American authors, including Rydberg, Britton & Brown, and Piper, distinguish from Geum proper two or more different genera. If only a small area and few species are considered, these genera show fairly definite lines of separation; it seems better, however, to take a wider view and retain the genus Geum in a comprehensive sense. According to this interpretation, *Geum macrophyllum* belongs to § Eugeum T. & G., and *G. campanulatum* to § *Sieversia* (Willd.) T. & G. The following collections of the latter species have been recorded for the Olympic Peninsula: Clallam County, *Elmer* 2529 (type); Olympic Mountains (without definite locality) *Grant* in 1889; Hurricane Ridge, *Jones* 3234, 4021; Mt. Angeles, *Thompson* 5524, 8404, 7393, 9468. Arctic-alpine. (H)

11. SANGUISORBA

1. S. MICROCEPHALA Presl. (*S. latifolia* of Fl. Wash., in part.) Big Creek Prairie, *Lamb* 1394; Humptulips, *Jones* 3623; Mink Lake, *Otis* 1567. This species extends from Alaska to the Darlingtonia swamps in Josephine County, Oregon. Humid Transition. (H)

12. PRUNUS. Stone-fruits

Flowers 2-3.5 cm. in diameter, umbellate.
Young twigs pubescent; leaves crenate-serrate, 4-8 cm. long, pubescent beneath; petioles glandless ..... 1. *P. domestica.*
Twigs glabrous; leaves sharply serrate, 10-15 cm. long; petioles usually with a pair of glands at base of blade ..... 2. *P. avium.*
Flowers about 1 cm. in diameter, in corymbose clusters.
Leaves, twigs, and branches of the inflorescence glabrous ..... 3. *P. emarginata.*
Leaves, young twigs, and branches of the inflorescence pubescent .. 3a. var. *mollis.*

1. *P. domestica* L. Common Plum. Occasionally escaping from cultivation to roadsides and edges of fields. Union, *Jones* 8546. (Ph)

2. *P. avium* L. Sweet Cherry. Frequently escaping from cultivation and becoming established along roads, etc. Union, *Jones* 8536. (Ph)

3. P. EMARGINATA (Dougl.) Walp. Typical *Prunus emarginata* is a shrub or small tree 1-5(-7) m. high, often forming dense thickets on open hillsides in eastern Washington. A characteristic locality, much visited by botanists, is Kamiak Butte, elevation 3650 feet, in east central Whitman County, where this wild cherry occurs abundantly at the edge of yellow-pine *(Pinus ponderosa* Dougl.) woods. In the autumn, after the leaves have fallen, this cherry is conspicuous for miles on account of the grayish bark on the old branchlets. The young twigs are quite glabrous, as are also the leaves and inflorescences. The type locality of this species is Kettle Falls, which is two miles below the point where the Kettle River joins the Columbia River. Heretofore, typical *Prunus emarginata* has been known in Washington only in the Arid Transition zone east of the Cascade Mountains. The following specimens from the Olympic Peninsula constitute the first record of the plant for the region west of the Cascades: Edge of woods, Hurricane Ridge, Clallam County, elev. 4500 feet, *Jones* 3352; Lake Crescent, Clallam County, *Jones* 3514. The nearest other known station for this species is at Peshastin, Chelan County, a point 140 miles distant in an air line. In many other parts of the world an extension of the known range of a plant by 140 miles may be of slight interest, but in Washington the Cascade Mountains are a topographical feature of very great phytogeographical importance, with the result that many plants are not adapted to the different conditions prevailing on both sides of these mountains.

3a. Var. MOLLIS (Dougl.) Brewer. *(P. emarginata erecta* (Presl) Piper, in Piper & Beattie, Fl. Nw. Coast, 199, 1915.) The common wild cherry growing in woods at low elevations in the region west of the Cascades and ranging from southwestern British Columbia to southern Oregon is usually a small, straight-trunked tree, 10-20 m. high and with a maximum diameter of about 60 cm. It is frequently used as a shade-tree

in the Puget Sound region. The young twigs are pubescent, usually densely so; the old twigs are glabrous and chestnut-brown. The leaves are more or less pubescent, at least on the lower surface, and the pedicels, calyx-tube, and petals are pubescent. From the preceding discussion it will be apparent that this plant is different in appearance, habitat, and often in habit from typical *P. emarginata,* and probably for that reason it has been treated as a separate species by several authors of western American manuals.[58] However, since there is no other character than the pubescence of the twigs, leaves, and inflorescences upon which to base its claims for specific rank, it seems better to follow Piper and others in treating it as a pubescent, coastal phase of *Prunus emarginata.* The recent discovery of the glabrous shrub in western Washington, as noted in the previous paragraph, strengthens this conclusion. The following specimens have been collected on the Olympic Peninsula: Clallam County, *Elmer* 2525; Montesano, *Heller* 4036; Port Ludlow, *Binns;* Skokomish River, *Henderson,* May 8, 1892; Duckabush River, *Jones* 3097; trail to Constance Ridge, *Jones* 5855; Union, *Jones* 6515; Port Angeles, *Webster* 518. Humid Transition. (Ph)

13. OSMARONIA. Indian Plum

1. O. CERASIFORMIS (T. & G.) Greene. Clallam County, *Elmer* 2511; Montesano, *Heller* 3874; Beaver Creek, *Jones* 4538. Humid Transition. (Ph)

14. SORBUS. Mountain-ash

Leaflets acute, glossy above, serrate throughout; fruit bright red..... 1. *S. dumosa.*
Leaflets obtuse, dull, serrate only near apex; fruit purplish, glaucous... 2. *S. occidentalis.*

1. S. DUMOSA Greene. *(Pyrus sitchensis* Piper, not *S. sitchensis* Roem.) Lake Cushman, *Piper* 1989. Canadian. (Ph)

2. S. OCCIDENTALIS (Wats.) Greene. *(Pyrus occidentalis* Wats.) Clallam County, *Elmer* 2509; Baldy Peak, *Lamb* 1365, 1365a; Canyon Creek, *Jones* 5930; Seven Lakes Basin, *Jones* 8261; Deer Lake, *Jones* 8334; Marmot Lake, *Dickinson* 95. Hudsonian. (Ph)

S. Aucuparia L., the European mountain-ash, with the underside of the acute leaflets (which are serrate from near the base), the cyme-branches and the winter buds pubescent, is found occasionally in woods and thickets near settlements as an escape from cultivation, disseminated, probably, by birds.

[58] As, for example, Howell, Fl. Nw. Am. 162, 1898; Rydberg, Fl. Rocky Mts. 451, 1917; Tidestrom, Fl. of Utah and Nev. 285, 1925; Benson, Contr. Dudley Herb. 2: 108, 1930; also Rehder, Man. Cult. Trees and Shrubs 473, 1927.

15. AMELANCHIER. Serviceberry

Leaves broadly oblong or roundish, round or subtruncate at apex, 3-4 cm. long and wide; racemes 4-8 cm. long; petals oblanceolate, 10-15 mm. long; fruit about 1 cm. in diameter 1. *A. florida.*
Leaves mostly oval, acute or obtuse, 2-3 cm. long, 1-2 cm. wide; racemes 2-4 cm. long; petals elliptical, 6-9 mm. long; fruit 5-7 mm. in diameter ..... 1a. var. *humptulipensis.*

1. A. FLORIDA Lindl. Clallam County, *Elmer* 2512; Port Angeles, *Webster,* June 1909; Lake Crescent, *Jones* 3435; Duckabush River, *Jones* 3065; Clifton, *Jones* 6500; Washington Harbor, *Jones* 8498; Mt. Angeles, *Thompson* 8410. Transition. (Ph)

1a. Var. **humptulipensis** n. var. "Amelanchier sp. Specimens collected by Heller (no. 3958) at Montesano and by Lamb (no. 1190) at Humptulips represent a species close to *A. florida,* but seemingly distinct. More and better material is needed." Thus did Piper (1906, p. 346) refer to the plants which are here proposed as *A. florida,* var. *humptulipensis,* and which hitherto have been known only from sterile specimens. The recent collection of flowering and fruiting material has made it possible to re-evaluate this Amelanchier which has, apparently, a very local range. As stated in the foregoing key, typical *A. florida,* to which these plants are undoubtedly very closely related, has the leaves of the mature summer foliage mostly broadly oblong or roundish, subcordate or rounded at the base, obtuse and round or subtruncate at apex, coarsely toothed to the middle or below with a few spreading deltoid teeth, 3-4 cm. long and wide, the primary veins 10-12 pairs, the racemes 4-8 cm. long, the petals oblanceolate, 10-15 mm. long, and the fruit about 1 cm. in diameter. The var. *humptulipensis* has the leaves of the mature summer foliage mostly oval, acutish or obtuse at base, acute or obtuse at apex, 2-3 cm. long, 1-2 cm. wide, nearly entire or shallowly serrate near apex with small teeth, the racemes 2-4 cm. long, the petals elliptical, 6-9 mm. long, and the fruit 5-7 mm. in diameter. To summarize: this is a local variety of *A. florida* which differs from the typical form of the species in its smaller size, apparently local distribution, shorter inflorescences, and the leaves, flowers and fruits smaller. It might be maintained as a species as Piper suggested, but the present treatment is proposed until the plants are better known. *A. florida,* var. *typica* is abundant on the east and north sides of the Peninsula, but has not yet been detected in the Spruce-Cedar forest of the coastal region.

Differt notabiliter a typo frutex 1-4 m. altus caespitosus, foliis firmis ovalis glabris apice acutis vel obtusis margine serratis basi acutis vel obtusis 2-3 cm. longis 1-2 cm. latis, venis primariis 14-18, racemis brevibus erectis 2-4 cm. longis, petalis ellipticis 6-9 mm. longis, ovaris ad apicem tomentoso; fructu atropurpureo glauco 5-7 mm. diametro.

Specimens examined: Montesano, *Heller* 3958; Matlock, *Jones* 3710; Humptulips, *Lamb* 1190; Humptulips Prairie, *Jones* 4565 (flower), 5819 (fruit). Although a number of bushes are known to occur in the type locality (Humptulips Prairie), both the collections made by this writer came from the same plant, the flowering material collected April 8, 1934, and the fruiting August 13 of the same year. The two numbers, 4565 and 5819, are designated as the type, and are deposited in the Herbarium of the University of Washington. Humid Transition. (Ph)

16. CRATAEGUS. Hawthorn

1. C. DOUGLASII Lindl. Lake Quinault, *Conard* in 1903; Sequim, *Grant* in 1915. Transition. (Ph)

17. PYRUS. Pear, Apple

Flowers 2-2.5 cm. broad; leaves ovate-lanceolate, sometimes 3-lobed; fruit ellipsoid, about 1.5 cm. long ..... 1. *P. diversifolia.*
Flowers 3-5 cm. broad; leaves ovate or oval, serrate or crenate; fruit larger.
  Fruit an apple; young twigs tomentose ..... 2. *P. Malus.*
  Fruit a pear; twigs glabrous or slightly pubescent ..... 3. *P. communis.*

1. P. DIVERSIFOLIA Bong. Crab-apple. Clallam County, *Elmer* 2510; Ocean City, *Jones* 3915; Port Angeles, *Webster,* June 1909; Copalis *Thompson* 6274; Union, *Jones* 6517. Humid Transition. (Ph)

2. *P. Malus* L. Apple. Persisting in old orchards and spreading to roadsides and waste places, common.

3. *P. communis* L. Pear. Scott's Prairie, *Jones* 6534; Union, *Jones* 8537. (Ph)

43. LEGUMINOSAE. Pea Family

Leaves simple or palmately compound or trifoliolate, or apparently lacking.
  Spiny, apparently leafless, shrub ..... 1. *Ulex.*
  Not spiny.
    Shrub with 4-5-angled branches; flowers yellow ..... 2. *Cytisus.*
    Herbs (if shrubby, branches terete).
      Leaflets entire.
        Foliage glandular-dotted ..... 3. *Psoralea.*
        Foliage not glandular-dotted.
          Stamens distinct ..... 4. *Thermopsis.*
          Stamens united at base ..... 5. *Lupinus.*
      Leaflets not entire.
        Flowers in heads ..... 6. *Trifolium.*
        Flowers in racemes.
          Pods coiled or curved, often spinose ..... 7. *Medicago.*
          Pods straight ..... 8. *Melilotus.*

Leaves pinnate.
Leaves even-pinnate, usually with tendrils.
Style filiform, hairy near the tip only ..... 9. *Vicia.*
Style flattened, hairy on the upper side ..... 10. *Lathyrus.*
Leaves odd-pinnate, without tendrils.
Pod a loment; flowers reflexed ..... 11. *Hedysarum.*
Pod a legume.
Flowers solitary or umbellate ..... 12. *Lotus.*
Flowers racemose or spicate.
Keel of the corolla obtuse at apex ..... 13. *Astragalus.*
Keel of the corolla acute or subulate and prolonged into a distinct beak ..... 14. *Oxytropis.*

1. ULEX. Furze or Gorse

1. *U. europaeus* L. Established at Hoquiam and at other places on the Peninsula. (Ph)

2. CYTISUS. Broom

1. *C. scoparius* (L.) Link. Becoming common on the Peninsula; observed at Hoodsport, Port Townsend, Lake Crescent, Hoquiam, and elsewhere. (Ph)

3. PSORALEA

1. P. PHYSODES Dougl. Sequim, *Jones* 3729; Mason County (without definite locality), *Jones* 3848; Port Townsend, *Meehan* in 1883. Humid Transition. (H)

4. THERMOPSIS

1. T. GRACILIS Howell. *(T. montana ovata* of Fl. Wash.) Chehalis [Grays Harbor] County, *Lamb* 1197; Humptulips, *Thompson* 7342; between New London and Humptulips, *Jones* 3937. Humid Transition. (H)

5. LUPINUS. Lupine

Annuals; corolla blue, 5-12 mm. long; leaflets linear-oblanceolate, 8-20 mm. long.
Leaflets appressed-pubescent on both surfaces; corolla 8-12 mm. long ..... 1. *L. bicolor.*
Leaflets glabrous or nearly so on the upper surface; corolla 5-8 mm. long ..... 2. *L. micranthus.*
Perennials.
Flowers yellow, fragrant; shrub; leaflets 7-11, oblanceolate, about 3 cm. long, glabrous above, silky beneath ..... 3. *L. arboreus.*
Flowers blue (or white); herbs.
Leaflets 10-17, 6-15 cm. long, acuminate; corolla 12-15 mm. long; pubescence thin, never silky or villous ..... 4. *L. polyphyllus.*
Leaflets fewer and smaller.
Decumbent seashore species; leaves and stems appressed silky-pubescent; leaflets 5-9, obovate, 1-2.5 cm. long, 2-6 mm. wide ..... 5. *L. littoralis.*
Not decumbent seashore species.
Pubescence silky, often silvery.
Alpine; leaflets 4-10 mm. long ..... 6. *L. Lyallii.*

Lowland; leaflets 1-4 cm. long.
Pubescence very silky and silvery; pods silky; leaflets 2-4 cm. long ..... 7. *L. lepidus.*
Pubescence somewhat loose and shaggy; pods villous; leaflets 1-2 cm. long ..... 8. *L. aridus.*
Pubescence thin and appressed; herbage green.
Leaflets thinly appressed-pubescent on both sides; racemes about 30 cm. long; keel glabrous, bent at right angles, much exposed; stem branched ..... 9. *L. albicaulis.*
Leaflets glabrous above, sparsely pubescent with appressed hairs below; racemes 10-15 cm. long.
Stems branched; keel ciliate; leaflets sparsely appressed short-pubescent beneath; Humid Transition ..... 10. *L. columbianus.*
Stems simple; keel glabrous or with traces of ciliation; leaflets short-villous beneath; Hudsonian .. 11. *L. subalpinus.*

1. L. BICOLOR Lindl. Montesano, *Heller.* Humid Transition. (Th)

2. L. MICRANTHUS Dougl. Westport, *Henderson,* June 25, 1892, *Lamb* 1110. Humid Transition. (Th)

3. *L. arboreus* Sims. Blyn, *Jones* 8527; also established near Port Townsend. (Ph)

4. L. POLYPHYLLUS Lindl. Montesano, *Heller* 3878. Humid Transition. (H)

5. L. LITTORALIS Dougl. Clallam County, *Elmer* 2537; Ocean City, *Jones* 3867, 4583; Port Angeles, *Webster,* July 12, 1908, *Jones* 3566; Copalis, *Thompson* 6278. Humid Transition. (Cr)

6. L. LYALLII Gray. Mt. Angeles, *Jones* 3687; Marmot Pass, *Thompson* 7935, 9952. Arctic-alpine. (H)

7. L. LEPIDUS Dougl. Clallam County, *Elmer* 2541; Sequim, *Jones* 3723; Shelton, *Jones* 3831. Humid Transition. (H)

8. L. ARIDUS Dougl. Mason County, *Kincaid,* June 15, 1892. Transition. (H)

9. L. ALBICAULIS Dougl. Union [City], *Piper,* July 20, 1890. Humid Transition. (H)

10. L. COLUMBIANUS Heller. *(L. latifolius* Agardh., var. *columbianus* C.P.Sm., Bull. Torr. Club 51: 307, 1924.) Quillayute Prairie, *Jones* 3585; Tyee, *Jones* 3977; Dosewallips River, *Thompson* 6559, 6598; Shelton, *Otis* 1866. Humid Transition. (H)

11. L. SUBALPINUS Piper & Robins. *(L. latifolius* Agardh., var. *subalpinus* C.P.Sm., l.c. 308.) Hurricane Ridge, *Jones* 3390, 3291; Mt. Angeles, *Webster,* July 26, 1908; Mt. Seattle, *Webster* 992; Constance Ridge,

Jones 5789; Boulder Creek, *Jones* 8456; Seven Lakes Basin, *Jones* 8235; Marmot Lake, *Dickinson* 92. Hudsonian. (H)

6. TRIFOLIUM. Clover

Heads subtended by an involucre.
- Corolla yellowish, becoming conspicuously inflated..... 1. *T. flavulum.*
- Corolla not becoming inflated.
  - Flowers pale pink or whitish; lobes of the involucre merely serrate, or entire; plants annual.
    - Herbage glabrous; calyx-teeth slender, branched..... 2. *T. cyathiferum.*
    - Herbage villous; calyx-teeth with scarious margins.
      - Calyx hairy; involucre merely basal..... 3. *T. microcephalum.*
      - Calyx glabrous; involucre nearly enclosing the head.... 4. *T. microdon.*
  - Flowers purple; lobes of the involucre laciniate.
    - Perennial with creeping rhizomes..... 5. *T. fimbriatum.*
    - Annuals with fibrous roots.
      - Stems erect; calyx-lobes often 3-toothed; leaflets lance-linear, 2-5 cm. long; heads 1.5-2 cm. in diameter... 6. *T. tridentatum.*
      - Stems decumbent; calyx-lobes usually entire; heads 1-1.5 cm. in diameter; leaflets linear, 1.5-2 cm. long 7. *T. oliganthum.*

Heads not subtended by an involucre.
- Perennials with thick roots or creeping rhizomes.
  - Flowers pedicelled; heads on axillary peduncles.
    - Flowers white; stems creeping and rooting, the peduncles arising from the ground..... 8. *T. repens.*
    - Flowers pink or purple tinged; stems erect or ascending, not rooting from the nodes..... 9. *T. hybridum.*
  - Flowers sessile; heads on terminal peduncles.
    - Flowers red..... 10. *T. pratense.*
    - Flowers whitish..... 11. *T. longipes.*
- Annuals with fibrous roots.
  - Flowers yellow..... 12. *T. dubium.*
  - Flowers purple or pink.
    - Flowers purple; calyx-teeth plumose..... 13. *T. albopurpureum.*
    - Flowers pink; calyx-teeth not plumose..... 14. *T. gracilentum.*

1. *T. flavulum* Greene. Port Ludlow, *Binns,* May 25, 1890. Native of California. (Th)

2. T. CYATHIFERUM Lindl. Lake Crescent, *Webster* 1015. Transition. (Th)

3. T. MICROCEPHALUM Pursh. Elwha River, *Jones* 3114; Sequim, *Jones* 3725. Transition. (Th)

4. T. MICRODON H. & A. Oyhut, *Lamb* 1266; Port Ludlow, *Binns;* Port Townsend, *Meehan* in 1883. Humid Transition. (Th)

5. T. FIMBRIATUM Lindl. Grays Harbor, *Lamb* 1165; Westport, *Henderson,* June 25, 1892; Port Townsend, *Meehan* in 1883; Clallam County, *Elmer* 2539; Mason County, *Jones* 3853; Ocean City, *Jones* 3897, 3900; Taholah, *Thompson* 9331. Transition. (Cr)

6. T. TRIDENTATUM Lindl. Clallam County, *Elmer* 2536; Copalis, *Jones* 3659; Port Hadlock, *Jones* 3115; Port Angeles, *Webster* 923. Humid Transition. (Th)

7. T. OLIGANTHUM Steud. Elwha River, *Jones* 3528. Humid Transition. (Th)

8. *T. repens* L. Roadsides and lawns; very common in the inhabited parts of the Peninsula. (H)

9. *T. hybridum* L. Lake Crescent, *Jones* 3487. (H)

10. *T. pratense* L. Lake Crescent, *Jones* 3501. (H)

11. T. LONGIPES Nutt. Big Creek Prairie, *Lamb;* Clallam County, *Elmer* 2538; Mt. Angeles, *Webster* 938; Hurricane Ridge, *Jones* 3365. Transition. (H)

12. *T. dubium* L. Elwha River, *Jones* 3115; Lake Crescent, *Jones* 3565; Humptulips Prairie, *Jones* 4577. (Th)

13. T. ALBOPURPUREUM T. & G. Port Ludlow, *Binns* in 1890. Humid Transition. (Th)

14. T. GRACILENTUM T. & G. Port Ludlow, *Binns,* May 25, 1890. Humid Transition. (Th)

7. MEDICAGO

Flowers yellow	1.	*M. lupulina.*
Flowers purple	2.	*M. sativa.*

1. *M. lupulina* L. Port Hadlock, *Jones* 3160, 3165; Port Angeles, *Thompson* 7862; Union, *Jones* 6518. (Th)

2. *M. sativa* L. Washington Harbor, *Jones* 8521; Port Angeles, *Webster* 849. (H)

8. MELILOTUS. Melilot or Sweet Clover

1. *M. indica* (L.) All. Port Hadlock, *Jones* 3161. (H)

9. VICIA. Vetch

Flowers solitary or in pairs, axillary, nearly sessile; introduced annuals.		
Flowers 2-3 cm. long; leaflets oblong to ovate; pods brown	1.	*V. sativa.*
Flowers 10-18 mm. long; leaflets linear to linear-oblong; pods black	2.	*V. angustifolia.*
Flowers in spikes or racemes on axillary peduncles; native perennials.		
Flowers ochroleucus or tawny; leaflets 20-30, 2.5-5 cm. long	3.	*V. gigantea.*
Flowers purple; leaflets smaller and fewer.		
Leaflets ovate to oblong	4.	*V. americana.*
Leaflets linear	4a.	var. *angustifolia.*

1. *V. sativa* L. Spring Vetch. Clallam County, *Elmer* 2533; Port Hadlock, *Jones* 3159; Mason County, *Jones* 3847. (Th)

2. *V. angustifolia* (L.) Reichard. Narrow-leaved Vetch. Port Angeles, *Webster* 981; Lake Crescent, *Jones* 3438. (Th)

3. V. GIGANTEA Hook. Clallam County, *Elmer* 2530; Montesano, *Heller* 3849; Port Angeles, *Webster,* May 30, 1908; Taholah, *Jones* 6490. Humid Transition. (H)

4. V. AMERICANA Muhl. Montesano, *Heller* 3951; Clallam County, *Elmer* 2534; Mason County, *Kincaid;* Mt. Seattle, *Webster* 977; Mt. Angeles, *Thompson* 7511½; Dosewallips River, *Thompson* 6545; Marmot Lake, *Dickinson* 13; Hurricane Ridge, *Jones* 3286; Elwha River, *Jones* 4000; McCleary, *Jones* 4590. Transition. (H)

4a. Var. ANGUSTIFOLIA Nees. *(V. americana* Muhl., var. *linearis* Wats.) Port Ludlow, *Binns,* May 20, 1889. Transition. (H)

10. LATHYRUS. Pea

Silky villous seashore plants; tendrils none ..... 1. *L. littoralis.*
Glabrous or sparsely pubescent, but not villous.
  Stipules narrow, semi-sagittate.
    Corolla 10-16 mm. long; plant sparingly pubescent throughout .. 2. *L. Nuttallii.*
    Corolla 18-20 mm. long; plant glabrous throughout ..... 3. *L. pauciflorus.*
  Stipules broad, semi-hastate, nearly as large as (or sometimes larger than) the adjacent leaflets.
    Corolla 12-20 mm. long; leaflets 10-16, thin ..... 4. *L. polyphyllus.*
    Corolla 2-2.5 cm. long; leaflets 6-10, thickish ..... 5. *L. maritimus.*

1. L. LITTORALIS (Nutt.) Endl. Laidlaw, *Lamb* 1119; Copalis, *Jones* 3655; Ocean City, *Jones* 3910, 4592. Humid Transition. (Cr)

2. L. NUTTALLII Wats. Olympic Mountains, *Henderson* 2349; Mt. Angeles, *Webster,* 968; Hurricane Ridge, *Jones* 3260; Forks Prairie, *Otis* 1508. Transition. (H)

3. L. PAUCIFLORUS Fern. Port Townsend, *Wilkes Expedition* (fide Piper, Proc. Biol. Soc. Wash. 31: 193, 1918). Transition. (H)

4. L. POLYPHYLLUS Nutt. Clallam County, *Elmer* 2535; Elwha River, *Jones* 3999. Humid Transition. (H)

5. L. MARITIMUS (L.) Bigel. *(L. maritimus* L., var. *glaber* (Ser.) Eames; *L. japonicus* Willd., var. *glaber* (Ser.) Fern., Rhodora 34: 181, 1932; *L. japonicus* Willd., var. *typicus* Fern., l.c. 178.) Clallam County, *Elmer* 2528; South Arbor, *Lamb* 1112; Port Ludlow, *Binns,* September 15, 1890; Port Angeles, *Webster* 966; Mora, *Jones* 3441; Copalis, *Jones* 3660; Raft River, *Conard* 324; Copalis Crossing, *Jones* 3865; Ocean City, *Jones* 3912. Humid Transition. (Cr)

11. HEDYSARUM

1. H. OCCIDENTALE Greene. Clallam County, *Elmer* 2529; Baldy Peak, *Lamb* 1318; Olympic Mountains, *Piper* 2227, 905, *Henderson,* July 5, 1890, *Grant* 156; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Mt. Angeles, *Winona Bailey,* July 1908, *Jones* 4254; Hurricane Ridge, *Jones* 3376, 3221; Seven Lakes Basin, *Jones* 8273; Heart Lake, *Dickinson* 60. Arctic-alpine. (H)

12. LOTUS

Annuals with flowers solitary or in pairs.
  Stems low, diffusely branched; peduncles usually exceeding the leaves; bract usually 3-foliolate..... 1. *L. micranthus.*
  Stems erect, 15-40 cm. high; flowers nearly sessile, ebracteate.... 2. *L. denticulatus.*
Perennials with flowers in umbels.
  Flowers rose-purple; leaflets 9-15; plant glabrous..... 3. *L. crassifolius.*
  Flowers yellow, or yellow and pink.
    Villous; flowers 10-12 mm. long..... 4. *L. Douglasii.*
    Glabrous; flowers 13-20 mm. long..... 5. *L. formosissimus.*

1. L. MICRANTHUS Benth. *(Hosackia parviflora* Benth.) Montesano, *Heller* 3911; Chehalis [Grays Harbor] County, *Lamb* 1151; Port Ludlow, *Binns,* May 5, 1889; Port Angeles, *Webster* 1007. Humid Transition. (Th)

2. L. DENTICULATUS (Drew) Greene. (*Hosackia denticulata* Drew) Elwha River, *Jones* 3531, 3113. Transition. (Th)

3. L. CRASSIFOLIUS (Benth.) Greene. *(Hosackia crassifolia* Benth.) Montesano, *Heller* 3925; Chehalis [Grays Harbor] County, *Lamb* 1170; Shelton, *Otis* 1865; Mason County, *Piper* 1044; New London, *Jones* 3936; Baker's Prairie, *Thompson* 9386; Humptulips, *Thompson* 9397. Transition. (H)

4. L. DOUGLASII Greene. *(Hosackia decumbens* Benth., not *Lotus decumbens* Poir.) Mason County, *Piper* 57. Transition. (H)

5. L. FORMOSISSIMUS Greene. *(Hosackia gracilis* Benth., not *Lotus gracilis* W. & K.) Montesano, *Heller* 3934. Humid Transition. (H)

13. ASTRAGALUS. Loco-weed

1. A. COTTONI M.E.Jones, Rev. Astrag. 135, 1923; *A. olympicus* Cotton, Bull. Torr. Club 29: 573, 1902, not Pallas, 1800; *Atelophragma Cottoni* Rydb. Bull. Torr. Club 55: 121, 1928, and N. Am. Fl. 24[6]: 367, 1929. *(Phaca Hookeriana* of Fl. Wash.; *Astragalus Hookerianus* of Fl. Nw. Coast.) Olympic Mountains, *Elmer* 2531; Hurricane Ridge, *Jones* 3249; Mt. Angeles, *Flett,* July 1, 1908, *Jones* 3183. Hudsonian. (H)

14. OXYTROPIS

Racemes rather loosely 9-20-flowered; flowers 15-17 mm. long; leaflets oblong, softly villous, 8-15 mm. long, 3-5 mm. wide ..... 1. *O. luteola.*
Racemes short and capitate, 5-10-flowered; flowers 13-14 mm. long; leaflets lanceolate, appressed-pilose, 2-8 mm. long, 1-2 mm. wide ..... 2. *O. olympica.*

1. O. LUTEOLA (Greene) Piper. *(O. luteolus* of Fl. Nw. Coast; *Aragallus gracilis* Piper, Fl. Wash., not A. Nels.) Clallam County, *Elmer* 2532; Olympic Mountains, *Grant* 588; Mt. Angeles, *Jones* 3319; Hurricane Ridge, *Jones* 3219, 3248, 4015; Iron Mountain, *Thompson* 11023. Arctic-alpine. (H)

2. O. OLYMPICA St.John, Proc. Biol. Soc. Wash. 41: 103, 1928. *(Aragallus monticola* of Fl. Wash., in part; *O. Cusickii* of Fl. Nw. Coast, in part.) Headwaters of the Quilcene River, *Flett* 134, 803; *Marmot Pass, Thompson* 7938, 9932; Mount Angeles, *Rigg,* July 23, 1929, *Jones* 3177, *Thompson* 5607. Arctic-alpine. (H)

O. Mazama St.John, l.c., is very closely related to, if not identical with, *O. luteola.* The amount of pubescence of the stipules varies according to the age and position of the leaf.

44. GERANIACEAE. Geranium Family

Leaves palmately veined and lobed ..... 1. *Geranium.*
Leaves pinnately veined and dissected ..... 2. *Erodium.*

1. GERANIUM

Sepals awn-tipped (the tips 1-3 mm. long); seeds reticulate or pitted.
  Flowers deep purple; seeds pitted; style-branches 1-2 mm. long .. 1. *G. dissectum.*
  Flowers pale purple; seeds reticulate.
    Fruiting pedicels much longer than the calyx; style-branches 4-6 mm. long ..... 2. *G. nemorale.*
    Fruiting pedicels shorter than or scarcely longer than the calyx; style-branches 1-2 mm. long ..... 3. *G. carolinianum.*
Sepals merely callous-tipped; seeds smooth or nearly so.
  Carpels pubescent, not rugose; style beakless ..... 4. *G. pusillum.*
  Carpels glabrous, rugose; style-branches 1-2 mm. long ..... 5. *G. molle.*

1. *G. dissectum* L. *(G. laxum* Hanks) Oyhut, *Lamb* 1263. (Th)

2. G. NEMORALE Suksd. *(G. Bicknellii* of Fl. Wash., in part.) Clallam County, *Elmer* 2726. Humid Transition. (Th)

3. G. CAROLINIANUM L. Lake Crescent, *Jones* 3426. Transition. (Th)

4. *G. pusillum* Burm. f. Port Townsend, *Meehan* in 1883. A common weed in lawns and cultivated ground. (Th)

5. *G. molle* L. Port Hadlock, *Jones* 3150; Scott's Prairie, *Jones* 6522. Very common in lawns and cultivated ground. (Th)

2. ERODIUM. Heronsbill

1. *E. cicutarium* (L.) L'Her. Clallam County, *Grant* in 1889; Sequim, *Jones* 3726. (Th)

45. OXALIDACEAE. Oxalis or Wood-sorrel Family

1. OXALIS. Wood-sorrel

1. O. OREGANA Nutt. Montesano, *Henderson,* June 1892; Skokomish Valley, *Kincaid,* May 1892; Soleduck River, *Webster* 1223; Quillayute Prairie, *Jones* 3603; Humptulips, *Jones* 3618; Mt. Colonel Bob, *Thompson* 6254; Humptulips River, *Jones* 4591, 6469. Humid Transition and Canadian. (Cr)

46. CALLITRICHACEAE. Water Starwort Family

1. CALLITRICHE. Water Starwort

Leaves all submersed, linear, 1-nerved ..... 1. *C. hermaphroditica.*
Floating leaves obovate-spatulate, 3-nerved.
  Styles about as long as, or shorter than, the fruit ..... 2. *C. palustris.*
  Styles twice as long as the fruit ..... 3. *C. Bolanderi.*

1. C. HERMAPHRODITICA L. *(C. autumnalis* L.) See Fernald & Wiegand, Rhodora 25: 211, 1923. Hoquiam, *Lamb* 1012; Nolan Creek, *Jones* 4562. Humid Transition. (Cr)

2. C. PALUSTRIS L. Lake Cushman, *Henderson* 1862; Aloha, *Thompson* 9369; Lake Ozette, *Jones* 5979; Hoh River, *Otis* 1408. Transition. (Cr)

3. C. BOLANDERI Hegelm. Clallam County, *Elmer* 2779; Lake Cushman, *Piper* 2236; Hoh River, *Jones* 3976; Port Angeles, *Webster* 719. Transition. (Cr)

47. ANACARDIACEAE. Cashew Family

1. RHUS

1. R. DIVERSILOBA T. & G. Union [City], *Piper* in 1900; Hoodsport, *Jones* 8627. Humid Transition. (Ph)

48. CELASTRACEAE. Staff-tree Family

1. PACHYSTIMA

1. P. MYRSINITES (Pursh) Raf. Oregon Boxwood. Olympic Mountains, *Elmer* 2752; Elwha River, *Jones* 3551; Mt. Angeles, *Jones* 3652; Lake Crescent, *Jones* 4534; Seven Lakes Basin, *Jones* 8286; Marmot Lake, *Dickinson* 27. Transition to Hudsonian. (Ph)

Photos by Victor B. Scheffer

Two views of the typical Humid Transition forest near Lake Quinault. The deciduous trees with the moss-covered trunks are *Acer macrophyllum*, and *Alnus oregona*. The conspicuous ferns are *Polystichum munitum*.

49. ACERACEAE. Maple Family

1. ACER. Maple

Flowers in racemes; leaves 15-30 cm. broad ..... 1. *A. macrophyllum.*
Flowers in corymbs; leaves smaller.
Leaves 7-9-lobed ..... 2. *A. circinatum.*
Leaves 3-5-lobed ..... 3. *A. glabrum.*

1. A. MACROPHYLLUM Pursh. Broadleaf Maple, Oregon Maple. Clallam County, *Elmer* 2836; Sequim, *Jones* 8333. Humid Transition. (Ph)

2. A. CIRCINATUM Pursh. Vine Maple. Near Montesano, *Heller* 3859; Grays Harbor, *Lamb* 1034a; Clallam County, *Elmer* 2835; Mt. Colonel Bob, *Thompson* 6258; Lake Crescent, *Jones* 3475; Duckabush River, *Jones* 3076; Humptulips River, *Jones* 4587, 6465. Humid Transition and Canadian. (Ph)

3. A. GLABRUM Torr. Dwarf, or Rocky Mountain Maple. *(A. Douglasii* Hook.) Hoodsport, *Piper* 1017; Mt. Angeles, *Jones* 4273; Crystal Creek, *Jones* 8451. Transition and Canadian. (Ph)

50. BALSAMINACEAE. Balsam Family

1. IMPATIENS. Snap-weed

1. I. ECALCARATA Blankinship. Montesano, *Jones* 8408. Humid Transition in western Washington and western Oregon. (Th)

51. RHAMNACEAE. Buckthorn Family

Flowers solitary or umbellate; fruit a drupe ..... 1. *Rhamnus.*
Flowers paniculate; fruit a capsule ..... 2. *Ceanothus.*

1. RHAMNUS

1. R. PURSHIANA DC. Cascara. Clallam County, *Elmer* 2661; Quillayute Prairie, *Jones* 3781; Montesano, *Heller* 3885; Lake Crescent, *Jones* 3482; Lake Quinault, *Jones* 3636; Waketichie Creek, *Jones* 8500. Transition. (Ph)

2. CEANOTHUS

Leaves thick, evergreen, sticky, glabrous beneath ..... 1. *C. velutinus,* var. *laevigatus.*
Leaves thin, deciduous, not sticky, glabrate above, paler and puberulent beneath ..... 2. *C. sanguineus.*

1. C. VELUTINUS Dougl., var. LAEVIGATUS (Dougl.) T. & G. Sticky Laurel. Brinnon, *Beattie* 3113, *Jones* 3665; Harstine[59] Island, Mason

[59]Variant spellings are Hartstene and Hartstine. See Meany, 1923, p. 110.

County, *Piper;* trail to Constance Ridge, *Jones* 5983; Hoodsport, *Jones* 8548. Transition. (Ph)

2. C. SANGUINEUS Pursh. Buckbrush. Clallam County, *Elmer* 2659, 2660; Mt. Angeles, *Webster,* July 4, 1908; Port Angeles, *Webster,* June 30, 1908; Mason County, *Jones* 3849; Elma, *Jones* 6450; Hoodsport, *Jones* 8093. Transition. (Ph)

52. MALVACEAE. Mallow Family

Stamens monodelphous; involucre of 3 bractlets..... 1. *Malva.*
Stamens in two series; involucre none..... 2. *Sidalcea.*

1. MALVA. Mallow

Leaves deeply dissected; flowers 3-5 cm. broad..... 1. *M. moschata.*
Leaves orbicular with shallow lobes; flowers 1-2 cm. broad..... 2. *M. rotundifolia.*

1. *M. moschata* L. Montesano, *Heller* 4030; Lake Crescent, *Jones* 3562; McCleary, *Thompson* 7349. (H)

2. *M. rotundifolia* L. Port Crescent, *Lawrence* 294. (H)

2. SIDALCEA

1. S. HENDERSONII Wats. Hoquiam, *Lamb* 1218, *Thompson* 7343. Humid Transition. (H)

53. HYPERICACEAE. St. Johnswort Family

1. HYPERICUM. St. Johnswort

Petals twice as long as the sepals; capsule 3-celled.
Sepals oval, obtuse..... 1. *H. Scouleri.*
Sepals lanceolate, acuminate..... 2. *H. perforatum.*
Petals shorter than or only slightly exceeding the sepals; capsule 1-celled..... 3. *H. anagalloides.*

1. H. SCOULERI Hook. Montesano, *Heller* 4037; Elwha Basin, *Webster* 1019; Quillayute Prairie, *Jones* 3577; Aloha, *Thompson* 9374; Lake Ozette, *Jones* 5942. Transition. (H)

2. *H. perforatum* L. Tipton-weed. Shelton, *Jones* 3840; Quillayute Prairie, *Jones* 3745. (H)

3. H. ANAGALLOIDES C. & S. Montesano, *Heller* 3916; Ocean City, *Jones* 3876; Humptulips, *Thompson* 7341; Aloha, *Thompson* 9352; Lake Ozette, *Jones* 5972. Humid Transition. (H)

H. bryophytum Elmer, Bot. Gaz. 36: 60, 1903, is probably a reduced form of *H. anagalloides.* Olympic Mountains (type locality), *Elmer* 2833; Big Creek Prairie, *Lamb* 1399. Arctic-alpine to Transition.

54. ELATINACEAE. Waterwort Family

1. ELATINE. Waterwort

1. E. TRIANDRA Schkur. Lake Ozette, *Jones* 5968. Transition. (Th)

55. VIOLACEAE. Violet Family

1. VIOLA. Violet

Flowers yellow.		
Stems prostrate; leaves evergreen	1.	*V. sarmentosa.*
Stems erect; leaves not evergreen	2.	*V. glabella.*
Flowers not yellow.		
Flowers white or pale lilac; plants acaulescent, or without manifest stems, the leaves and scapes arising directly from rhizomes or stolons.		
Flowers white; plants not stoloniferous; leaves ovate-reniform, acutish, usually much shorter than the scapes	3.	*V. pallens.*
Flowers pale lilac to white; plants stoloniferous.		
Flowers 6-10 mm. long; leaves reniform-cordate; rhizomes long and slender	4.	*V. palustris.*
Flowers 15-25 mm. long; leaves cordate-orbicular; rhizomes thick, stout, scaly	5.	*V. Langsdorfii.*
Flowers blue or violet; plants caulescent at flowering time, the stems sometimes very short; flowers axillary.		
Stipules scarious, entire; leaves broadly reniform	6.	*V. Flettii.*
Stipules herbaceous, at least some of them serrate or incised.		
Leaves strongly cordate, reniform to broadly ovate; stems 10-20 cm. tall	7.	*V. Howellii.*
Leaves usually not strongly cordate, ovate to ovate-oblong.		
Herbage puberulent	8.	*V. adunca.*
Herbage glabrous	8a.	f. *glabra.*

1. V. SARMENTOSA Dougl. *(V. sempervirens* Greene) Montesano, *Heller* 3888; Humptulips River, *Jones* 4572. Humid Transition. (H)

2. V. GLABELLA Nutt. Mt. Angeles, *Thompson* 7481, 5506, 8419; Mt. Colonel Bob, *Thompson* 6245; Marmot Lake, *Dickinson* 80. Chiefly Canadian. (H)

3. V. PALLENS (Banks) Brainerd. Aloha, *Jones* 6454. Humid Transition. (H)

4. V. PALUSTRIS L. Olympic Mountains, *Piper,* August 1895; Clallam County, *Elmer* 2794; Lake Crescent, *Jones* 3775; Mt. Colonel Bob, *Thompson* 7268; Marmot Lake, *Dickinson* 81. Transition to Hudsonian. (Cr)

5. V. LANGSDORFII Fisch. Port Crescent, *Lawrence* 273. Humid Transition. (Cr)

6. V. FLETTII Piper. Olympic Mountains, *Flett* 106; Mt. Constance (type locality), *Flett,* August 1898; Mt. Ellinor, *Jennie V. Getty,*

August 1902; Mt. Angeles, *Flett,* July 1908, *Jones* 3211; Marmot Pass, *Thompson* 9091; Lake Constance, *Thompson* 7901. Arctic-alpine. (H)

7. V. HOWELLII Gray. Olympic Mountains, *Piper,* August 1895; Quillayute Prairie, *Jones* 3569; Elwha River, *Jones* 3541. Humid Transition. (Cr)

8. V. ADUNCA Sm. *(V. retroscabra* Fl. Wash., as to Olympic Mountain specimens.) Olympic Mountains, *Piper,* August 1895; Clallam County, *Elmer* 2795; Montesano, *Heller* 3928; Westport, *Lamb* 1102; Mt. Angeles, *Jones* 3181; *Winona Bailey,* July 1908; Mt. Colonel Bob, *Thompson* 7321; Humptulips Prairie, *Jones* 4578; Shelton, *Jones* 3836. Transition to Hudsonian. (H)

8a. Forma **glabra** (Brainerd) n. comb. *V. adunca* Sm., var. *glabra* Brainerd, Rhodora 15: 109, 1913. The stems, petioles, and leaf blades of typical *V. adunca* are puberulent or pubescent. The atypical glabrous (or glabrate) plants differ in no other character than in the complete or partial absence of pubescence, neither is there any distinctive geographical range. It seems better, therefore, to treat them as of formal rank only. The following specimens of this glabrous form have been collected on the Olympic Peninsula: Summit of Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Westport, *Rigg,* April 1908; Hurricane Ridge, *Jones* 3222. Transition to Hudsonian. (H)

56. CACTACEAE. Cactus Family

1. OPUNTIA

1. O. FRAGILIS Haw. *(O. polyacantha borealis* of Piper) Sequim, *Jones* 3590. (Ch) (Plate 9 B)

This is the only member of the cactus family growing indigenously west of the Cascade Mountains. First observed in 1792 on Protection Island by Menzies (" . . . I was not a little surprized to meet with the *Cactus opuntia* . . . "), this plant has been collected or reported from several other localities, including the southern end of Vancouver Island and some of the San Juan islands. These plants are rather doubtfully identical with *O. fragilis* of Haworth, but certainly they are not conspecific with *O. polyacantha* Haw.

57. ELAEAGNACEAE. Oleaster Family

1. SHEPHERDIA

1. S. CANADENSIS (L.) Nutt. (*Lepargyrea canadensis* (L.) Greene) Buffalo-berry. Port Discovery, *St.John* 5839, *Jones* 4252. Reported to occur along a ridge north of Mt. Constance above Charlie Lakes, altitude 6000 feet, by S. A. Andersen, October 1933. (Ph)

58. ONAGRACEAE. Evening-primrose Family

Parts of the flower in twos ..... 1. *Circaea.*
Parts of the flower in fours.
  Calyx-lobes erect; seeds with a tuft of silky hairs at one end ..... 2. *Epilobium.*
  Calyx-lobes spreading or reflexed; seeds naked.
    Flowers rose, purple, or white; anthers attached at or near the base (innate) ..... 3. *Godetia.*
    Flowers yellow; anthers attached near the middle (versatile) ..... 4. *Oenothera.*

1. CIRCAEA

Stem glabrous below the inflorescence ..... 1. *C. alpina.*
Stem appressed-puberulent ..... 1a. f. *pacifica.*

1. C. ALPINA L. Olympic Mountains, *Grant* 11; Skokomish Valley, *Kincaid,* May 29, 1892; Quinault, *Conard* 133. Transition. (Cr)

1a. Forma **pacifica** (Aschers. & Magnus) n. comb. *C. pacifica* Aschers. & Magnus, Bot. Zeit. 29: 392, 1871; *C. alpina* L., var. *pacifica* M.E. Jones, Bull. Univ. Montana 61: 39, 1910. This plant is very feebly distinguished, even subvarietally, from *C. alpina* L. The characters of the bracts and the toothing of the leaves relied upon by Piper are quite intangible. Even less reliable to distinguish two species are the height of the plant and the shape of the leaf base, as used by Rydberg (1917, p. 605). In the f. *pacifica* the stems are appressed-puberulent, whereas in typical *C. alpina,* the stems are glabrous below the inflorescence, but all intergrades occur. The following collections of the puberulent form have been made on the Olympic Peninsula: Stevens Creek, *Jones* 3947; Hurricane Ridge, *Webster* 1238; Mt. Angeles, *Webster* 1236. Transition. (Cr)

2. EPILOBIUM. Willow-herb

Petals 1-3 cm. long; stigma 4-lobed.
  Petals entire, rose-colored or purple, rarely white, widely spreading; corolla slightly irregular; calyx-tube not extending beyond the ovary.
    Stems 1-2 m. high; racemes 20-60 cm. long, many-flowered, leafless, the bracts small, inconspicuous, linear; leaves lanceolate or linear-lanceolate, green above, pale beneath; style longer than the stamens, pubescent at base.. 1. *E. angustifolium.*
    Stems 10-40 cm. high; racemes 5-10 cm. long, few-flowered, leafy; leaves elliptic-lanceolate, glaucous; style shorter than the stamens, glabrous ..... 2. *E. latifolium.*
  Petals notched, not widely spreading; corolla regular; calyx-tube extending beyond the ovary; leaves denticulate.
    Petals rose-purple (rarely white); flowers erect, 10-12 mm. long ..... 3. *E. pulchrum.*
    Petals cream or pale yellow; flowers nodding, 15-18 mm. long. 4. *E. luteum.*
Petals 3-8 mm. long, notched.
  Annual, chiefly lowland species.
    Stems 5-25 cm. high; herbage crisp-puberulent throughout; petals 3-4 mm. long ..... 5. *E. minutum.*
    Stems 30-90 cm. high, with loose papery bark at base; herbage glabrous; petals 5-7 mm. long ..... 6. *E. paniculatum.*

Perennial species.
- Stems producing small leafy rosettes or turions at base in late summer or autumn; seeds papillose.
  - Stems tall, 30-90 cm. high.
    - Petals 3-5 mm. long, pink; inflorescence loose and open, glandular-pubescent; stem almost always branched above; leaves remote, becoming gradually reduced upward; seeds 1-1.3 mm. long ..... 7. *E. adenocaulon.*
    - Petals 6-9 mm. long, purple; inflorescence crowded, somewhat loosely crisp-pubescent with curved hairs, typically over-topped by the leaves which do not conspicuously decrease in size upward; stem usually simple; seeds 1.5-1.8 mm. long ..... 8. *E. glandulosum.*
  - Stems low, 10-25 cm. high; mostly subalpine or alpine species.
    - Stems simple, erect; plant nearly glabrous; petals pale pink, 5-8 mm. long; seeds 1 mm. long ..... 9. *E. delicatum,* var. *tenue.*
    - Stems usually branched.
      - Seeds 1 mm. long; stems puberulent in lines; whole plant, even to the flowers and capsules pubescent; pedicels about as long as the capsules ..... 10. *E. leptocarpum,* var. *Macounii.*
      - Seeds 2 mm. long; stems pubescent but not in lines; herbage crisp-pubescent; petals pale pink, 5 mm. long; pedicels much shorter than the capsules .... 12. *E. mirabile.*
- Stems stoloniferous or soboliferous, *i. e.*, the innovations in the form of short rhizomes; subalpine or alpine species 10-25 cm. high.
  - Seeds papillose; petals pink to purple.
    - Foliage pallid, glaucous, glabrous ..... 12. *E. fastigiatum.*
    - Foliage green, not glaucous.
      - Stems ascending, usually curved, densely matted from a strong branching caudex; leaves sessile; capsules somewhat clavate, more or less arcuate, 2.5 cm. long; Arctic-alpine species ..... 13. *E. clavatum.*
      - Stems erect, solitary or few; leaves petiolate; capsules 5 cm. long; Hudsonian species ..... 14. *E. Hornemanni.*
  - Seeds smooth; foliage green, not glaucous.
    - Stems ascending, usually curved, clustered; leaves petiolate; capsules cylindrical, 2-4 cm. long; petals pink or rose-purple ..... 15. *E. alpinum.*
    - Stems erect; petals white or pale pink.
      - Leaves ovate, petiolate, usually longer than the internodes; petals white ..... 16. *E. lactiflorum.*
      - Leaves oblong-lanceolate, sessile, shorter than the internodes; petals pink ..... 17. *E. oregonense.*

1. E. ANGUSTIFOLIUM L. *(E. spicatum* Lam.) Fireweed. Clallam County, *Elmer* 2566; Duckabush River, *Jones* 3066; Lake Crescent, *Jones* 3521; Port Townsend, *Meehan,* in 1883; Mt. Angeles, *Thompson* 7369; Blyn, *Jones* 8524; Seven Lakes Basin, *Jones* 8234; Marmot Lake, *Dickinson* 33. Transition to Hudsonian. (H)

2. E. LATIFOLIUM L. Olympic Mountains, *Piper* 2343; Mt. Angeles, *Webster* 1245; Marmot Pass, *Thompson* 9920; Mt. Duckabush, *Dickinson* 63. Arctic-alpine and Hudsonian. (H)

3. E. PULCHRUM Suksd., Werdenda 1: 26, 1927. *(E. Hornemanni* of Fl. Wash., in part; *E. luteum,* var. *lilacinum* Henders., Mazama 10: 50, 1928.) Olympic Mountains, *Piper* 2355; Elwha Basin, *Leach* 2109. Related to *E. luteum* Pursh, but amply distinct. Hudsonian. (H)

4. E. LUTEUM Pursh. Clallam County, *Elmer* 2560; Mt. Angeles, *Webster* 1243; Elwha River, *Webster* 1254; Upper Quilcene River, *Thompson* 7947; Canyon Creek, *Jones* 5830; Marmot Pass, *Thompson* 9888; Lake Constance, *Thompson* 7920; Boulder Creek, *Jones* 8462; Duckabush River, *Dickinson* 34. Hudsonian. (H)

5. E. MINUTUM Lindl. Trail to Constance Ridge, *Jones* 6029. Transition. (Th)

6. E. PANICULATUM Nutt. Clallam County, *Elmer* 2558, 2561. Transition. (Th)

7. E. ADENOCAULON Haussk. Clallam County, *Elmer* 2568; Montesano, *Heller* 3992, 3974. Transition. (H)

8. E. GLANDULOSUM Lehm. Deer Lake, *Jones* 8357; Seven Lakes Basin, *Jones* 8205; Kalalock, *Jones* 3971. Canadian and Hudsonian, (H)

9. E. DELICATUM Trel., var. TENUE Trel. Olympic Mountains, *Piper,* August 1895. Hudsonian. (H)

10. E. LEPTOCARPUM Haussk., var. MACOUNII Trel. Olympic Mountains, *Piper* 2352, 2356. Hudsonian. (H)

11. E. MIRABILE Trel. Olympic Mountains, August 1895, *Piper* 2344 (type collection). Hudsonian. (H)

12. E. FASTIGIATUM (Nutt.) Piper. Olympic Mountains, *Flett* 115; Clallam County, *Elmer* 2559; Mt. Angeles, *Thompson* 7515; Hurricane Ridge, *Jones* in 1931; Marmot Pass, *Thompson* 11039. Hudsonian. (H)

13. E. CLAVATUM Trel. Olympic Mountains, *Piper* 2349, 2350; Clallam County, *Elmer* 2570. Arctic-alpine. (H)

14. E. HORNEMANNI Reichenb. Olympic Mountains, *Piper* 1047, 2353, 2346, 2347, 2348; Queets Valley, *Eaton,* August 1907; Mt. Angeles, *Webster* 1241, 1242; Boulder Creek, *Jones* 8474; Boulder Lake, *Jones* 8445; Marmot Lake, *Dickinson* 119. Hudsonian. (H)

15. E. ALPINUM L. *(E. anagallidifolium* Lam.) Skokomish River, *Kincaid* 2250½; Olympic Mountains, *Piper* 2354; range northwest of Mt. Olympus, *St.John* 5783; Mt. Colonel Bob, *Thompson* 7285, 7296; Mt.

Angeles, *Webster* 1237; Queets River, *Eaton,* August 17, 1907; Mt. Olympus, *Eaton,* August 1907. Hudsonian and Arctic-alpine. (H)

16. E. LACTIFLORUM Haussk. *(E. alpinum* of auth.) Mt. Angeles, *Webster* 1258; Skokomish River, *Henderson,* June 20, 1892; Queets River, *Eaton,* August 15, 1907; Quinault River, *Jones* 3956; Seven Lakes Basin, *Jones* 8204. Hudsonian. (H)

17. E. OREGONENSE Haussk. Olympic Mountains, *Piper* 2351; Seven Lakes Basin, *Jones* 8203, 8257, 8258. Hudsonian. (H)

3. GODETIA

Calyx-lobes usually separate and reflexed; stigma-lobes 1 mm. long; capsule sessile ..... 1. *G. quadrivulnera.*
Calyx-lobes united at the tips, splitting on one side at flowering time; stigma-lobes 2-7 mm. long; capsule pedicelled ..... 2. *G. amoena.*

1. G. QUADRIVULNERA (Dougl.) Spach. *(G. quadrivulnera,* var. *typica* C.L. Hitchcock, Bot. Gaz. 84: 329, 1930; *G. brevistyla* Piper; *G. Romanzovii* of Fl. Nw. Coast.) Clallam County, *Elmer* 2567 (duplicate type of *G. brevistyla).* Transition. (Th)

2. G. AMOENA (Lehm.) G.Don. *(G. amoena,* var. *typica* C.L.Hitchc., l.c. 339, 1930; *G. caurina* Abrams) Clallam County, *Elmer* 2565 (duplicate type of *G. caurina);* Port Angeles, *Webster* 1225, 1226, 1227. Transition. (Th)

4. OENOTHERA. Evening-primrose

1. *O. biennis* L. Common Evening-primrose. Port Discovery, *St. John* 5837; Union, *Jones* 8554. (H)

59. HALORAGIDACEAE. Water-milfoil Family

Leaves entire; sepals and petals 0; stamen 1; ovary 1-celled ..... 1. *Hippuris.*
Leaves mostly pinnately divided into filiform lobes; sepals and petals 2-4; stamens 2-8; ovary 2-4-celled ..... 2. *Myriophyllum.*

1. HIPPURIS. Marestail

Aquatic; stems 30-90 cm. long; leaves 2-4 cm. long, 6-12 in a whorl ..... 1. *H. vulgaris.*
Terrestrial; stems 2-8 cm. high; leaves 8-12 mm. long, 5-6 in each whorl .. 2. *H. montana.*

1. H. VULGARIS L. Oyhut, *Lamb* 1254; Lake Cushman, *Piper* 2225. Transition. (Cr)

2. H. MONTANA Ledeb. Olympic Mountains, *Piper,* August 1895. Hudsonian. (Cr)

2. MYRIOPHYLLUM. Water-milfoil

Floral leaves (bracts) ovate, entire or toothed, shorter than the flowers..... 1. *M. spicatum.*
Floral leaves pectinate, longer than or shorter than the flowers..... 2. *M. verticillatum.*

1. M. SPICATUM L. Lake Cushman, *Piper* 2230; Lake Crescent, *Jones* 3512. Transition. (Cr)

The Piper specimen was cited (with two others from Washington) as *M. exalbescens* Fernald (Rhodora 21: 120-122, 1919). It appears, however, to be indistinguishable from European, Asian, and Alaskan specimens of *M. spicatum.* The number of leaf-divisions varies according to the development of the plant, and the size and shape of the anthers change with maturity. The whitish tinge of Washington specimens cited as *M. exalbescens* is due to the accumulation of diatoms and grains of sand.

2. M. VERTICILLATUM L. Lake Crescent, *Lawrence* 310; Lake Ozette, *Jones* 5980. Transition. (Cr)

60. ARALIACEAE. Aralia Family

1. OPLOPANAX

1. O. HORRIDUM (Sm.) Miquel. *(Echinopanax horridum* (Sm.) Dcne. & Planch.) See Rhodora 26: 123, 1924. Devil's Club. Clallam County, *Elmer* 2508; Canyon Creek, *Jones* 8361. Humid Transition and Canadian. (Ph)

61. UMBELLIFERAE. Parsley Family

Fruit more or less bristly.
  Fruit globose or ovoid.
    Bristles hooked, covering the whole surface of the fruit..... 1. *Sanicula.*
    Bristles only on the ribs of the fruit.
      Bristles of fruit barbed at tip; calyx-teeth obsolete..... 2. *Daucus.*
      Bristles of fruit hooked at tip; calyx-teeth prominent..... 3. *Caucalis.*
  Fruit linear-oblong, bristly on the ribs..... 4. *Osmorhiza.*
Fruit not at all bristly.
  Carpels strongly flattened dorsally, *i. e.*, parallel to the commissure.
    Lateral, dorsal, and intermediate ribs winged or very prominent; flowers white.
      Oil-tubes 1-3 in the intervals; leaflets large, merely serrate... 5. *Angelica.*
      Oil-tubes solitary in the intervals; leaflets small, incised..... 6. *Conioselinum.*
    Lateral ribs winged, the dorsal and intermediate ribs filiform.
      Stems tall and leafy.
        Flowers white or yellow; oil-tubes solitary in the intervals, 2-4 on the commissural side.
          Flowers yellow; oil-tubes linear..... 7. *Pastinaca.*
          Flowers white; oil-tubes clavate..... 8. *Heracleum.*
        Flowers brownish purple; oil-tubes 3-6 in the intervals, 4-6 on the commissural side..... 9. *Leptotaenia.*
      Acaulescent or shortly caulescent; flowers yellow or white; oil-tubes 1-several in the intervals, 2-10 on the commissural side..... 10. *Lomatium.*

Carpels not dorsally flattened, either terete or compressed laterally.
Oil-tubes obsolete or very obscure.
Fruit linear-oblong, attenuate at base ..... 4. *Osmorhiza.*
Fruit ovoid with prominent wavy ribs ..... 11. *Conium.*
Oil-tubes present.
Oil-tubes solitary in each interval.
Flowers yellow; leaves simple or trifoliolate ..... [*Zizia*]
Flowers white.
Leaves reduced to hollow petioles ..... 12. *Lilaeopsis.*
Leaves compound.
Leaflets entire; ribs of the fruit inconspicuous ..... 13. *Carum.*
Leaflets serrate; ribs corky.
Styles ¼ as long as the roundish fruit ..... 14. *Cicuta.*
Styles ½ as long as the subcylindrical fruit ..... 15. *Oenanthe.*
Oil-tubes more than one in each interval.
Carpels with prominent, corky, nearly equal ribs.
Leaves simply pinnate; leaflets linear or narrowly lanceolate ..... 16. *Sium.*
Leaves ternate; leaflets ovate.
Leaves white-pubescent beneath ..... 17. *Glehnia.*
Leaves glabrous ..... 18. *Coelopleurum.*
Carpels with the ribs not corky-thickened; leaves ternately compound ..... 19. *Ligusticum.*

1. SANICULA. Sanicle

Mature fruit pedicelled or stipitate ..... 1. *S. Menziesii.*
Mature fruit sessile.
Leaves with the main divisions confluent at the base ..... 2. *S. Howellii.*
Leaves with the main divisions distinct at the base ..... 3. *S. septentrionalis.*

1. S. MENZIESII Hook. & Arn. Port Ludlow, *Binns* (fide Piper); Port Townsend, *Meehan,* in 1883; Sequim, *Grant* in 1915; Elwha River, *Jones* 3117, 3397, 4003; Shelton, *Jones* 3822; Scott's Prairie, *Jones* 6524. Humid Transition. (H)

2. S. HOWELLII C. & R. Grenville, *Conard* 173. Humid Transition. (H)

3. S. SEPTENTRIONALIS Greene. Olympic Mountains *Elmer* 2772; Elma, *Grant,* June 1919; Hurricane Ridge, *Jones* 3280. Canadian. (H)

2. DAUCUS. Carrot

Leaf-segments linear; umbel 2-5 cm. broad ..... 1. *D. pusillus.*
Leaf-segments lanceolate; umbel 5-12 cm. broad ..... 2. *D. Carota.*

1. D. PUSILLUS Michx. Clallam County, *Elmer* 2770; Port Ludlow, *Binns;* Shelton, *Jones* 3837. Transition. (Th)

2. *D. Carota* L. Lake Crescent, *Jones* 3563. (H)

3. CAUCALIS

1. C. MICROCARPA Hook. & Arn. Clallam County, *Elmer* 2766. This is the only known station for this plant west of the Cascade Mountains in Washington. Otherwise, it occurs on Vancouver Island and in eastern Washington, southward to California. Transition. (Th)

4. OSMORHIZA. Sweet Cicely

Pedicels longer than the fruit; foliage glabrous or nearly so.
Fruit obtuse, constricted below the apex ..... 1. *O. Leibergii.*
Fruit with a conspicuous sharp beak ..... 2. *O. divaricata.*
Pedicels shorter than the fruit; plants pubescent ..... 3. *O. brevipes.*

1. O. LEIBERGII (C. & R.) Blankinship. Olympic Mountains, *Piper* 911; Chehalis [Grays Harbor] County, *Lamb* 1382; Mt. Angeles, *Webster,* September 5, 1909; Soleduck River, *Jones* 8383. Canadian. (H)

2. O. DIVARICATA Nutt. Canyon Creek, *Jones* 8325. Transition and Canadian. (H)

3. O. BREVIPES (C. & R.) Suksd. Clallam County, *Elmer* 2774; Chehalis [Grays Harbor] County, *Heller* 3975; Elwha River, *Jones* 3132; Duckabush River, *Jones* 3095; Hurricane Ridge, *Jones* 3344; Crystal Creek, *Jones* 8450. Transition and Canadian. (H)

5. ANGELICA

Leaves densely tomentose; seashore plants ..... 1. *A. Hendersoni.*
Leaves glabrous or nearly so.
Involucels numerous ..... 2. *A. genuflexa.*
Involucels lacking ..... 3. *A. Lyallii.*

1. A. HENDERSONI C. & R. Mora, *Jones* 3414, 3575. This is apparently the most northerly station for this species, which occurs along the seacoast from San Mateo County, California, to Washington. It was discovered by Henderson in 1892 at Ilwaco, Pacific County, near the northern extremity of its range. Humid Transition. (H)

2. A. GENUFLEXA Nutt. Port Ludlow, *Binns* in 1890; Montesano, *Heller* 4035a; Clallam County, *Elmer* 2765; Soleduck River, *Jones* 8386. Humid Transition. (H)

3. A. LYALLII Wats. Olympic Mountains, *Piper* 2033; Mt. Angeles, *Thompson* 7573, 5559. Hudsonian. (H)

6. CONIOSELINUM. Hemlock Parsley

1. C. BENTHAMI (Wats.) Fern., Rhodora 28: 221, 1926. *(C. Gmelini* of Fl. Nw. Coast.) Mason County, *Piper* 631; Port Ludlow, *Binns* in 1890; Mora, *Jones* 3589; Clallam Bay, *Jones* 5848. Humid Transition. (H)

7. PASTINACA. Parsnip

1. *P. sativa* L. Lake Crescent, *Jones* 3599. (H)

8. HERACLEUM. Cow Parsnip

1. H. LANATUM Michx. Olympic Mountains, *Elmer* 2763, *Piper* in 1895; Skokomish Valley, *Kincaid,* June 10, 1892; Mora, *Jones* 3423; Mt. Angeles, *Thompson* 5558, 7560; Deer Lake, *Jones* 8358; Marmot Lake, *Dickinson* 10. Transition to Hudsonian. (Cr)

9. LEPTOTAENIA

1. L. DISSECTA Nutt. Clallam County, *Elmer* 2764; Hurricane Ridge, *Jones* 3345. Transition. (Cr)

10. LOMATIUM

Peduncles stout, usually swollen at the top; herbage glaucous; leaflets ovate ..... 1. *L. nudicaule.*
Peduncles slender, never swollen at the top; herbage green.
Leaflets linear-lanceolate, 5-15 cm. long ..... 2. *L. triternatum.*
Leaflets ovate or linear, 6-12 mm. long.
Leaflets linear; fruit 2-7 mm. long ..... 3. *L. utriculatum.*
Leaflets ovate, toothed; fruit 8-16 mm. long ..... 4. *L. angustatum,* var. *flavum.*

1. L. NUDICAULE (Pursh) C. & R. Olympic Mountains, *Elmer* 2733; Hurricane Ridge, *Jones* 3342. Transition. (H)

2. L. TRITERNATUM (Pursh) C. & R. Elma, *Grant* in 1919. Transition. (H)

3. L. UTRICULATUM (Nutt.) C. & R. Clallam County, *Elmer* 2769; Elwha River, *Jones* 3547; Scott's Prairie, *Jones* 6496. Humid Transition. (H)

4. L. ANGUSTATUM (C. & R.) St.John, var. **flavum** n. var. *Cogswellia angustata* ex p. of Piper & Beattie, Fl. Nw. Coast 261, 1915; *C. Martindalei,* var. *angustata* (C. & R.) Henderson, Mazama 10: 53, 1928, nomen nudum.

Ab specie differt in petalis flavidis, folia crassa, foliola obtusa.

The plants from the Olympic Mountains are stouter, with thicker leaves and obtusish leaflets. The petals are lemon yellow. There are, apparently, no distinctive characters of the carpels. Typical *L. angustatum* (Mazama 11: 83, 1929) from the Cascade Mountains is a more slender plant with thinner leaves, acutish leaflets and the flowers are white or creamy-white. There are no records of its occurrence in the Olympic Mountains. The following collections of the var. *flavum* have been examined: Olympic Mountains, *Piper* 897, also August 1895, *Elmer* 2771;

Mt. Baldy, *Conard* 280, *Lamb* 1325; Mt. Olympus, *St.John* 5784; Mt. Carrie, *St.John* 5804, *Jones* 3371, 3214; Mt. Angeles, *Jones* 3314; Mt. Colonel Bob, *Thompson* 7259; Lake Constance, *Thompson* 7876; Lake Crescent, *Jones* 4531; Constance Ridge, *Jones* 5800; Seven Lakes Basin, *Jones* 8272, 8201; Mt. Lacrosse Pass, *Dickinson* 35. Hudsonian. (H)

11. CONIUM

1. *C. maculatum* L. Poison Hemlock. Roadside weed, Shelton, *Jones* in 1933. (H)

[*Zizia cordata* (Walt.) Koch. Montesano, *Grant,* July 1919. This species is abundant in the region east of the Cascade Mountains, but heretofore has not been reported from western Washington. While there can be no doubt as to the identity of Grant's specimens, there is some possibility of labels having been mixed. It is desirable, therefore, that additional collections be made before this species can be certainly included as a member of the flora of the Olympic Peninsula.]

12. LILAEOPSIS

1. L. OCCIDENTALIS C. & R. Clallam County, *Elmer* 2767; Oyhut, *Lamb* 1272; Lake Ozette, *Thompson* 9430. Humid Transition. (Cr)

13. CARUM. Caraway

1. C. GAIRDNERI (H. & A.) Gray. Mason County, *Piper* 1051; Port Angeles, *Flett.* Transition. (Cr)

14. CICUTA. Water Hemlock

Fruit with the intervals broad, reddish brown contrasting with the corky ribs; leaflets lanceolate to ovate-lanceolate..... 1. *C. Douglasii.*
Fruit with the narrow intervals much the same color as the ribs; leaflets linear-lanceolate..... 2. *C. vagans.*

1. C. DOUGLASII (DC.) C. & R. Straits of de Fuca, *Scouler* (fide Piper). The plant is common in swamps in western Washington, but there are no additional collections from the Olympic Peninsula.

2. C. VAGANS Greene. Montesano, *Heller* 4069. Transition. (H)

15. OENANTHE. Water Parsley

1. O. SARMENTOSA Presl. Port Crescent, *Lawrence* 286; Quinault, *Conard* 315; Olympic Mountains, *Elmer* 2762; Montesano, *Heller* 3985, *Jones* 6470; Port Ludlow, *Binns* in 1890; Skokomish Valley, *Kincaid* in 1892; Mt. Olympus Ranger Station, *St.John* 5787; Grays Harbor, *Wilkes Expedition* (fide Piper); Sequim, *Grant,* August 20, 1915; Lake

Crescent, *Jones* 3768; Blyn, *Jones* 8529; Soleduck River, *Jones* 8387. Humid Transition. (H)

16. SIUM

1. S. SUAVE Walt. *(S. cicutaefolium* of Fl. Wash.) Crocker Lake, *Jones* 5921. Transition. (H)

17. GLEHNIA

1. G. LEIOCARPA Mathias, Ann. Mo. Bot. Gard. 15: 95, 1928. *(G. littoralis* of Fl. Wash.) Clallam County, *Elmer* 2768; Oyhut, *Lamb* 1249; Port Angeles, *Webster,* June 26, 1908; Sequim, *Grant* in 1915; Ocean City, *Jones* 3928; Copalis, *Conard* 392; mouth of the Quillayute River, *Otis* 1563. Transition. (Cr)

18. COELOPLEURUM

1. C. GMELINI (DC.) Ledeb. *(C. longipes* C. & R.; *C. maritimum* C. & R.) Union [City], *Piper* 631; Hoodsport, *Henderson,* August 15, 1890; Mora, *Jones* 3415. The plants of the Olympic Peninsula are indistinguishable from authentic material of *C. Gmelini* (DC.) Ledeb. from Petropavlovsk, Kamtchatka, collected by E. Hultén. (H)

19. LIGUSTICUM

1. L. APIIFOLIUM (Nutt.) Gray. Montesano, *Heller* 3973; Chehalis [Grays Harbor] County, *Lamb* 1756; Elma, *Jones* 6476. Humid Transition. (H)

[*L. Hultenii* Fern., Rhodora 32: 7, 1930. *(L. scothicum* of auth., not L.) This plant has been reported (as *L. scothicum)* from the seacoast of Washington, by both Hooker (1834, p. 65) and Gray (Cooper 1860, p. 62), but there is no evidence up to date that it actually occurs here. However, it occurs on the west coast of Vancouver Island, and it may be expected on the Olympic Peninsula.]

62. CORNACEAE. Dogwood Family

1. CORNUS. Dogwood

Inflorescence cymose without involucral bracts; fruit white or bluish; shrubs.
- Cyme branches and lower surface of leaves loosely villous-pubescent 1. *C. pubescens.*
- Cyme branches and lower surface of leaves sparsely strigose..... 2. *C. stolonifera.*

Inflorescence capitate, surrounded by conspicuous whitish involucral bracts.
- Tree; bracts 4-6 cm. long..... 3. *C. Nuttallii.*
- Herb; bracts 1-2 cm. long..... 4. *C. canadensis.*

1. C. PUBESCENS (Nutt.) Coville. (*C. occidentalis* (T. & G.) Coville) Clallam County, *Elmer* 2699; Montesano, *Heller* 3857; Sequim, *Grant,* June 1916; Lake Crescent, *Jones* 3437. Transition. (Ph)

2. C. STOLONIFERA Michx. New London, *Lamb* 1169; Ocean City, *Jones* 3904; Lake Ozette, *Jones* 5947; Stevens Creek, *Jones* 8410. Transition. (Ph)

3. C. NUTTALLII Audubon. Nuttall's or Pacific Flowering Dogwood. Clallam County, *Elmer* 2698; Lake Crescent, *Jones* 3516. Humid Transition. (Ph)

4. C. CANADENSIS L. Bunchberry. Sol Duc Hot Springs, *Reagan;* Mt. Angeles, *Webster,* July 1, 1908; near Sequim, *Grant,* August 1915; Elwha Basin, *H.C.Stevens,* August 20, 1907; Port Angeles, *Winona Bailey,* June 28, 1908; Constance Ridge, *Thompson* 6563; Duckabush River, *Dickinson* 98. Chiefly Canadian. (H)

63. ERICACEAE. Heath Family

Ovary superior.
- Herbs (sometimes suffrutescent at base).
  - Saprophytes without green foliage.
    - Petals separate or none.
      - Petals none; stem streaked with red and white ..... 1. *Allotropa.*
      - Petals present ..... 2. *Monotropa.*
    - Petals united.
      - Plant glabrous, 5-20 cm. high ..... 3. *Newberrya.*
      - Plant glandular-hairy, 30-90 cm. high ..... 4. *Pterospora.*
  - Plants with mostly evergreen leaves.
    - Flowers corymbose; filaments dilated at the middle; style short ..... 5. *Chimaphila.*
    - Flowers racemose or solitary; filaments not dilated; style usually elongated ..... 6. *Pyrola.*
- Shrubs.
  - Petals separate; leaves alternate.
    - Flowers white, umbellate; leaves evergreen ..... 7. *Ledum.*
    - Flowers reddish, solitary; leaves deciduous ..... 8. *Cladothamnus.*
  - Petals united.
    - Corolla rotate or open campanulate.
      - Leaves opposite ..... 9. *Kalmia.*
      - Leaves alternate ..... 10. *Rhododendron.*
    - Corolla urceolate to campanulate or ovoid.
      - Low heath-like shrubs with small narrow evergreen leaves.
        - Anther-cells awned; leaves 4-ranked, imbricated ..... 11. *Cassiope.*
        - Anther-cells awnless; leaves linear, spreading ..... 12. *Phyllodoce.*
      - Not heath-like; leaves broad.
        - Calyx and corolla mostly 4-lobed; leaves deciduous; fruit a capsule ..... 13. *Menziesia.*
        - Calyx and corolla 5-lobed; leaves evergreen; fruit a berry or berry-like.
          - Bark grayish, not conspicuously exfoliating ..... 14. *Gaultheria.*
          - Bark exfoliating, leaving the stems smooth and red.
            - Trees; fruit a many-seeded berry ..... 15. *Arbutus.*
            - Shrubs; fruit a 5-10-seeded drupe ..... 16. *Arctostaphylos.*

Ovary inferior; fruit a berry ..... 17. *Vaccinium.*

1. ALLOTROPA

1. A. VIRGATA T. & G. Barber-pole. Olympic Mountains, *Elmer* 2740. Humid Transition and Canadian. (Cr)

2. MONOTROPA

Flower solitary; style short and broad ..... 1. *M. uniflora.*
Flowers racemose; style longer than the ovary ..... 2. *M. Hypopitys.*

1. M. UNIFLORA L. Indian Pipe. Clallam County, *Elmer* 2436; Olympic Ranger Station, *St.John* 5795; Lake Crescent, *Jones* 3521a; Elwha River, *Jones* 3335; Rainbow Camp, *Thompson* 9862. Transition and Canadian. (Cr)

2. M. HYPOPITYS L. *(Hypopitys hypopitys* (L.) Small; *H. lanuginosa* (Michx.) Nutt.; *H. latisquama* Rydb.) Pinesap. Baldy Peak, *Lamb* 1297; Mt. Olympus, *St.John* 5785; Clallam County, *Elmer* 2464; Quilcene Valley, *Thompson* 7950; Soleduck River, *Jones* 8377; Canyon Creek, *Jones* 8389; Duckabush River, *Dickinson* 96. Humid Transition and Canadian. (Cr)

3. NEWBERRYA

1. N. CONGESTA Torr. *(Hemitomes congestum* Gray) Mt. Ellinor, *Jennie V. Getty,* August 1902; Mt. Angeles, *Flett,* August 1911; Mt. Storm King, *Lawrence* 339; Canyon Creek, *Jones* 8391. Canadian. (Cr)

4. PTEROSPORA. Pinedrops

1. P. ANDROMEDEA Nutt. Clallam County, *Elmer* 2462; Lake Crescent, *Webster* 1179; Mt. Angeles, *Thompson* 7365; Rainbow Camp, *Thompson* 9863. Chiefly Canadian. (Cr)

5. CHIMAPHILA. Pipsissewa

Flowers many; leaves widest above the middle, green throughout ..... 1. *C. umbellata.*
Flowers 1-3; leaves widest below the middle, the principal veins faintly whitish bordered ..... 2. *C. Menziesii.*

1. C. UMBELLATA (L.) W. Bart. *(C. umbellata,* var. *occidentalis* (Rydb.) Blake, Rhodora 19: 242, 1917.) Olympic Mountains, *Elmer* 2741; Rainbow Camp, *Thompson* 9866; Mt. Angeles, *Thompson* 7368; Dosewallips River, *Thompson* 6546. Transition and Canadian. (Ch)

2. C. MENZIESII (R.Br.) Spreng. Low Divide, *Webster* 1431; observed along Crystal Creek, *Jones* in 1935. Canadian. (Ch)

6. PYROLA. Wintergreen

Flowers solitary, white; style nearly straight ..... 1. *P. uniflora.*
Flowers racemose.
  Style straight; stigma peltate, without ring or collar ..... 2. *P. secunda.*
  Style curved downward; stigma 5-lobed, surrounded by a distinct ring or collar.
    Flowers white or greenish white.
      Flowers greenish; calyx-lobes obtuse, short ..... 3. *P. chlorantha.*
      Flowers whitish.
        Veins of leaves white-bordered ..... 4. *P. picta.*
        Leaves dark green throughout ..... 5. *P. dentata.*
    Flowers pink or red; leaves coriaceous, callous-denticulate, shiny, acutish ..... 6. *P. bracteata.*

1. P. UNIFLORA L. One-flowered Wintergreen. Moneses. *(Moneses uniflora* (L.) Gray; *M. reticulata* Nutt.; *M. uniflora* (L.) Gray, var. *reticulata* (Nutt.) Blake, Rhodora 17: 28, 1915; *P. uniflora* L., var. *reticulata* (Nutt.) St.John, Madroño 3: 221, 1936.) Mt. Angeles, *Webster* 1434; Humptulips, *Lamb* 1084a; Ocean City, *Jones* 3875; Canyon Creek, *Jones* 5823. Chiefly Canadian. (Cr)

2. P. SECUNDA L. Clallam County, *Elmer* 2648; Marmot Pass, *Thompson* 9879; Mt. Angeles, *Winona Bailey,* June 28, 1908; Lake Constance, *Thompson* 7872; Elwha River, *H.C.Stevens* in 1907; Mt. Ellinor, *Jennie V. Getty* in 1902; Duckabush River, *Dickinson* 99. Canadian.(H)

3. P. CHLORANTHA Sw. Mt. Angeles, *Webster* 1457, *Jones* 3199; Mt. Storm King, *Lawrence* 336 ex p.; Port Townsend, *Meehan* in 1883. Transition. (H)

4. P. PICTA Sm. Baldy Peak, *Lamb* 1293; Mt. Storm King, *Lawrence* 336 ex p.; Low Divide, *Webster* 1444; Hurricane Ridge, *Webster* 1456; Duckabush River, *Dickinson* 100. Transition and Canadian. (H)

5. P. DENTATA Sm. *(P. picta dentata* (Sm.) Piper; *P. Conardiana* Andres; *P. paradoxa* Andres.) Near Union [City], *Piper* 935; Mt. Ellinor, *Jennie V. Getty* in 1902; Clallam County, *Elmer;* Mt. Storm King, *Lawrence* 336 ex p.; Mt. Rose, *Jennie V. Getty,* August 21, 1902; Elwha River, *H.C.Stevens,* August 22, 1907. Humid Transition. (H)

6. P. BRACTEATA Hook. Skokomish River, *Henderson,* June 15, 1892; Clallam County, *Elmer* 2465; Mt. Angeles, *Winona Bailey,* July 2, 1908; Elwha River, *H.C.Stevens,* August 21, 1907; Lake Crescent, *Webster* 1451; Baker Prairie, *Thompson* 9385; Canyon Creek, *Jones* 5897. Transition and Canadian. (H)

7. LEDUM. Labrador Tea

1. L. GROENLANDICUM Oeder. Humptulips, *Jones* 3624; Aloha, *Jones* 6458. Humid Transition. (Ph)

8. CLADOTHAMNUS. Copper Bush

1. C. PYROLIFLORUS Bong. *(C. pyrolaeflorus* of Fl. Wash.) Mt. Baldy, *Lamb* 1368; Deer Lake, *St.John* 5759, *Jones* 8356. Hudsonian. (Ph)

9. KALMIA. Swamp Laurel

1. K. POLIFOLIA Wang. Humptulips, *Jones* 4571; Aloha, *Jones* 6457; Moclips, *Jones* 6478; Lost Lake, *Jones* 6527. Humid Transition. (Ph)

10. RHODODENDRON

Flowers rose; leaves evergreen..... 1. *R. macrophyllum.*
Flowers cream; leaves deciduous..... 2. *R. albiflorum.*

1. R. MACROPHYLLUM Don. *(R. californicum* Hook.) Clallam County, *Elmer* 2475; near Union [City], *Piper;* Port Discovery, *St.John* 5848, *Jones* 4248; Mats Mats Bay, *Binns* (fide Piper); trail to Constance Ridge, *Jones* 5862. Humid Transition. (Ph)

2. R. ALBIFLORUM Hook. Olympic Mountains, *Piper* 387; Clallam County, *Elmer* 2641; Low Divide, *Webster* 852; summit of Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Mt. Angeles, *Thompson* 7467, 5552; Marmot Pass, *Thompson* 9947; Marmot Lake, *Dickinson* 30; Constance Ridge, *Jones* 5771. Hudsonian. (Ph)

11. CASSIOPE

1. C. MERTENSIANA (Bong.) G.Don. White Heather. Olympic Mountains, *Piper* 2184; Hurricane Ridge, *Jones* 3360; Constance Ridge, *Thompson* 6588; Marmot Lake, *Dickinson* 39; Mt. Colonel Bob, *Thompson* 7240; Mt. Angeles, *Thompson* 7508; Deer Lake, *Jones* 5931; Boulder Creek, *Jones* 8498. Hudsonian. (Ch)

12. PHYLLODOCE

Corolla campanulate, rose, glabrous..... 1. *P. empetriformis.*
Corolla ovoid, yellowish, glandular..... 2. *P. glanduliflora.*

1. P. EMPETRIFORMIS (Sm.) D.Don. Pink Heather. Olympic Mountains, *Grant* 22, *Elmer* 2478; Baldy Peak, *Lamb* 1354; Hurricane Ridge, *Jones* 3386; Constance Ridge, *Thompson* 6584; Marmot Lake, *Dickinson* 41; Mt. Angeles, *Thompson* 7474; Mt. Colonel Bob, *Thompson* 7244. Hudsonian. (Ch)

2. P. GLANDULIFLORA (Hook.) Coville. Yellow Heather. Olympic Mountains, *Piper,* August 1895; Mt. Duckabush, *Dickinson* 89. Arctic-alpine and Hudsonian. (Ch)

13. MENZIESIA. False Huckleberry

1. M. FERRUGINEA Sm. Olympic Mountains, *Piper* 2186, 2185, *Grant* in 1889; Mason County, *Piper* 1070; Montesano, *Heller* 3868; Hoquiam, *Lamb* 1015; Mt. Colonel Bob, *Thompson* 7300; Taholah, *Jones* 6483. Humid Transition to Hudsonian. (Ph)

14. GAULTHERIA

Flowers in racemes; lowland shrub ..... 1. *G. Shallon.*
Flowers, solitary, axillary; subalpine and montane.
Leaves ovate, 2-4 cm. long ..... 2. *G. ovatifolia.*
Leaves oval, about 1 cm. long ..... 3. *G. humifusa.*

1. G. SHALLON Pursh. Salal. Olympic Mountains, *Elmer* 2477; Montesano, *Heller* 3870; Port Townsend, *Meehan* in 1883; Port Discovery, *St.John* 5844; Mt. Angeles, *Thompson* 7367. Humid Transition. (Ph)

2. G. OVATIFOLIA Gray. Olympic Mountains, *Piper* 2187; Mt. Angeles, *Webster* 861; Canyon Creek, *Jones* 5890; Crystal Creek, *Jones* 8447. Canadian and Hudsonian. (Ch)

3. G. HUMIFUSA (Graham) Rydb. Deer Lake, *Jones* 5925. Hudsonian. (Ch)

15. ARBUTUS

1. A. MENZIESII Pursh. Madrona. Mats Mats Bay, *Binns* (fide Piper); Port Discovery, *St.John* 5843; Elwha River, *Jones* 8431. Type locality: probably Port Discovery. Humid Transition. (Ph)

16. ARCTOSTAPHYLOS. Bearberry

Erect shrub 1-3 m. high ..... 1. *A. tomentosa.*
Prostrate or procumbent shrub ..... 2. *A. Uva-ursi.*

1. A. TOMENTOSA (Pursh) Lindl. (*A. columbiana* Piper) Manzanita. Clallam County, *Elmer* 2473; Union [City], *Piper* 898 (type of *A. columbiana), Jones* 6505; Sequim, *Grant* 154; Port Discovery, *St.John* 5838, *Jones* 6106; trail to Constance Ridge, *Jones* 5857. Humid Transition. (Ph)

This species was first found by Archibald Menzies at Port Discovery on May 2, 1792. In his Journal (Newcombe, 1923, p. 20) he records it in the following words: "I likewise met here with a . . . new species of Arbutus with *glaucous* leaves that grew bushy & 8 or 10 feet high, besides a number of other plants which would be too tedious here to enumerate". There can be not the slightest doubt that this is the species under consideration since it is the only Arctostaphylos on the Peninsula that grows

"bushy & 8 or 10 feet high"; also it is the only species which has glaucous or pale green leaves.

2. A. UVA-URSI (L.) Spreng. Kinnikinnick. Olympic Mountains, *Elmer* 2474; Matlock, *Jones* 3721; Sequim, *Grant*, April 26, 1916; Hurricane Ridge, *Jones* 3375; Mt. Angeles, *Jones* 3686; Constance Ridge, *Thompson* 6585; Webb Hill, near Union, *Jones* 6508. Transition and Hudsonian. (Ch)

× A. MEDIA Greene. *(A. tomentosa* × *Uva-ursi)* Union [City], *Piper* 899 (type), *Jones* 6507. Locally abundant in Mason and Kitsap Counties in thin gravelly soil in places where both *A. tomentosa* and *A. Uva-ursi* occur. It is plainly a hybrid between these two species, as stated in the original publication (Pittonia 2: 171-2, 1891). (Ch)

17. VACCINIUM

Corolla sympetalous, 4-5-toothed or -lobed.		
Leaves evergreen; flowers in racemes; anthers not awned.		
Berry black, not glaucous	1.	*V. ovatum.*
Berry bluish, glaucous	1a.	var. *saporosum.*
Leaves deciduous; flowers solitary; anthers awned.		
Tall shrubs, 1-3 m. high.		
Leaves serrate; berry black, not glaucous	2.	*V. membranaceum.*
Leaves entire.		
Berry blue, glaucous	3.	*V. ovalifolium.*
Berry red	4.	*V. parvifolium.*
Low shrubs, 10-40 cm. high; berry blue, glaucous.		
Corolla ovoid; leaves thin, green, 1-2 cm. long	5.	*V. caespitosum.*
Corolla globose; leaves thickish, glaucous (when fresh), 2-3 cm. long	6.	*V. deliciosum.*
Corolla almost polypetalous, 4-parted, the petals reflexed	7.	*V. Oxycoccus*, var. *ovalifolium.*

1. V. OVATUM Pursh. Evergreen Huckleberry. Grays Harbor City, *Lamb* 1037; Montesano, *Heller* 3942; Port Ludlow, *Binns;* Port Discovery, *St.John* 5830; Ocean City, *Jones* 3873; Webb Hill, near Union, *Jones* 6509; along Hood Canal 8 miles south of Triton, *Jones* 8506. Humid Transition. (Ph)

1a. Var. SAPOROSUM Jeps., Man. Fl. Pl. Calif. 751, 1925. Along Hood Canal, 8 miles south of Triton, growing near the typical form of the species, *Jones* 8507. Humid Transition. (Ph)

2. V. MEMBRANACEUM Dougl. *(V. macrophyllum* (Hook.) Piper) Black Huckleberry. Olympic Mountains, *Grant* in 1889; Olympic Hot Springs, *Jones* 3982; Mt. Angeles, *Winona Bailey* in 1908; Elwha Valley, *C.S.Eaton* in 1907; Boulder Creek, *Jones* 8488; Lyre River, *Webster* 2011. Chiefly Canadian. (Ph)

3. V. OVALIFOLIUM Sm. Blue Huckleberry. Montesano, *Heller* 3892, *Grant* in 1918; Big Creek Prairie, *Lamb* 1410; Lyre River, *Webster*

2012; Mt. Olympus Ranger Station, *St.John* 5788; Mt. Colonel Bob *Thompson* 6249; Taholah, *Jones* 6484; Deer Lake, *Jones* 8338. Chiefly Canadian. (Ph)

4. V. PARVIFOLIUM Sm. Red Huckleberry. Grays Harbor, *Lamb* 1214; Hoquiam, *Lamb* 1016; Montesano, *Heller* 3869; Port Ludlow, *Binns,* May 15, 1890; Clallam County, *Elmer* 2459; Lake Crescent, *Jones* 3476; Beaver Creek, *Jones* 4547. Humid Transition. (Ph)

5. V. CAESPITOSUM Michx. Dwarf Bilberry. Union [City], *Piper* 1078; Humptulips, *Lamb* 1188; Hoh River, *Jones* 5810; Aloha, *Jones* 6459; Elma, *Jones* 6474; Scott's Prairie, *Jones* 6494, 6504. Transition. (Ch)

6. V. DELICIOSUM Piper. Mountain Huckleberry. Olympic Mountains, *Piper* in 1895, *Elmer* 2460; Mt. Colonel Bob, *Thompson* 7260; Deer Lake, *Jones* 5954; Seven Lakes Basin, *Jones* 8266. Hudsonian. (Ch)

7. V. OXYCOCCUS L., var. OVALIFOLIUM Michx. *(Oxycoccus Oxycoccus intermedius* (Gray) Piper) Cranberry. Copalis, *Conard* 383; Humptulips, *Jones* 3619; Hoh River bog, *Jones* 5964; Moclips, *Jones* 6479; Lake Ozette, *Rigg* in 1933. Humid Transition. (Ch)

64. EMPETRACEAE. Crowberry Family

1. EMPETRUM. Crowberry

1. E. NIGRUM L. Black Crowberry. Copalis, *Conard* 409. Hudsonian, descending to sea level on the Olympic Peninsula and elsewhere in western Washington. (Ch)

65. PRIMULACEAE. Primrose Family

Leaves all basal.
- Corolla-lobes reflexed; stamens exserted ..... 1. *Dodecatheon.*
- Corolla-lobes erect or spreading; stamens included ..... 2. *Douglasia.*

Leaves cauline.
- Corolla rotate; leaves alternate or whorled ..... 3. *Trientalis.*
- Corolla none; leaves opposite ..... 4. *Glaux.*

1. DODECATHEON. Shooting Star

Filaments distinct to the base; leaves callous-crenate, oblong-lanceolate ..... 1. *D. Jeffreyi.*
Filaments united into a short tube (1-2 mm. long); leaves entire, obovate to elliptical ..... 2. *D. Hendersoni.*

1. D. JEFFREYI Moore. Olympic Mountains, *Piper* 2223; Baldy Peak, *Lamb* 1357; Mt. Colonel Bob, *Thompson* 7267; Mt. Seattle, *Webster* 1374; Marmot Lake, *Dickinson* 97. Hudsonian. (H)

2. D. HENDERSONI Gray. *(D. latifolium* (Hook.) Piper) Scott's Prairie, *Jones* 6493. Humid Transition. (H)

2. DOUGLASIA.

1. D. LAEVIGATA Gray. Olympic Mountains, *Elmer* 2801, *Piper* 2235, *Flett* 804, *Henderson,* July 1890; Mt. Barnes, *Flett,* August 1907; Mt. Carrie, *St.John* 5808; Mt. Storm King, *Lawrence* 356; Mt. Angeles, *Jones* 3807; Hurricane Ridge, *Jones* 3225; Marmot Pass, *Thompson* 9934, 7961; Constance Ridge, *Thompson* 6589; Seven Lakes Basin, *Jones* 8324; Mt. Duckabush, *Dickinson* 59; Boulder Peak, *Jones* 8440. Hudsonian. (Ch)

3. TRIENTALIS. Star Flower

Leaves acute, clustered near the summit of the stem; pedicels shorter than the leaves ..... 1. *T. latifolia.*
Leaves obtuse, scattered along the stem; pedicels longer than the leaves... 2. *T. arctica.*

1. T. LATIFOLIA Hook. Montesano, *Heller* 3880; Hoquiam, *Lamb* 1051; Skokomish Valley, *Kincaid,* May 10, 1892; Mt. Angeles, *Webster* 1380; Dosewallips River, *Thompson* 6558. Humid Transition and Canadian. (Cr)

2. T. ARCTICA Fisch. Clallam County, *Elmer* 2799; near Lake Quinault, *Jones* 3622. Humid Transition. (Cr)

4. GLAUX. Sea Milkwort

1. G. MARITIMA L. Dosewallips River, *Thompson* 6602; Tsuess River, *Erna Gunther,* June 18, 1935. Humid Transition. (H)

66. PLUMBAGINACEAE. Leadwort Family

1. STATICE. Thrift

1. S. ARCTICA (Cham.) Blake, Rhodora 19: 8, 1917. *(S. arctica,* var. *genuina* Blake, l.c.; *S. arctica,* var. *californica* Blake, l.c. 9; *S. Armeria* of Fl. Wash.) Sea Pink. Port Crescent, *Lawrence* 260; Port Angeles, *Webster* 1481. Humid Transition. (H)

The characters which have been relied upon to distinguish the var. *californica* are not satisfactory, since plants with both ciliate and glabrous leaves occur throughout the northern part of the range of the species. Many specimens from Washington and Alaska show perfectly glabrous, obtusish leaves.

67. OLEACEAE. Olive Family

1. FRAXINUS. Ash

1. F. OREGANA Nutt. Oregon Ash. Satsop, *Heller* 4024; Shelton, *Jones* 3704. Humid Transition. (Ph)

68. GENTIANACEAE. Gentian Family

Leaves opposite, sessile, simple, entire; style short, stout, or none. 1. *Gentiana.*
Leaves basal or alternate, petioled, not entire.
  Leaves trifoliolate; corolla-lobes fimbriate; style slender, persistent; stigma 2-lobed ..... 2. *Menyanthes.*
  Leaves reniform, crenate; corolla-lobes entire, but with a median crest; style short or none; stigma peltate ..... 3. *Nephrophyllidium.*

1. GENTIANA. Gentian

Corolla 5-15 mm. long; annuals.
  Corolla blue, without appendages between the lobes ..... 1. *G. Amarella.*
  Corolla white (drying yellowish) with bifid appendages between the lobes ..... 2. *G. Douglasiana.*
Corolla 3-5 cm. long; perennials.
  Stems 10-20 cm. high; leaves ovate, 1.5-3 cm. long; sinus appendages of the corolla lacerate ..... 3. *G. calycosa.*
  Stems 25-90 cm. high; leaves oblong-lanceolate or linear-lanceolate, 4-8 cm. long; sinuses without lobes or appendages ..... 4. *G. sceptrum.*

1. G. AMARELLA L. *(G. acuta* Michx.) Port Hadlock, *Gardner,* July 10, 1897; Sequim, *Grant,* July 8, 1902. Transition. (Th)

2. G. DOUGLASIANA Bong. Lake Ozette, *Rigg* in 1933. Canadian, descending to sea level on the Olympic Peninsula. (Th)

This annual white-flowered gentian is a Canadian zone species which grows in bogs from western Washington to Alaska. According to Piper & Beattie (1915, p. 288), it is "said to have been collected near Snohomish, Washington, and reported by Hooker from Fort Vancouver, Washington." At present, however, the only other Washington locality where it is definitely known to occur is Snoqualmie Pass, King County *(Jones* 1625, June 30, 1926).

3. G. CALYCOSA Griseb. Olympic Mountains, *Piper* 2224, *Elmer* 2727; Baldy Peak, *Lamb* 1332; Mt. Seattle, *C.S.Eaton;* Mt. Barnes, *Webster* 1103; Mt. Anderson, *Davison,* August 31, 1928; Deer Lake, *St.John* 5757; Bogachiel Peak, *Otis* 1341; Heart Lake, *Dickinson* 52; Elwha Basin, *Leach* 2074; Seven Lakes Basin, *Jones* 8298. Arctic-alpine and Hudsonian. (H)

G. oregana, an Arid Transition species, is not known to occur west of the Cascade Mountains; specimens so named and included in Leach's list are merely slender plants of *G. calycosa.*

4. G. SCEPTRUM Griseb. Lake Quinault, *Jones* 3626; Lake Ozette, *Otis* 1772, *Jones* 5943; Hoh River bog, *Jones* 5960. Humid Transition. (H)

Variable as to leaf shape and calyx-lobes and possibly consisting of more than one species.

2. MENYANTHES. Buckbean

1. M. TRIFOLIATA L. Montesano, *Grant* in 1917; Lake Ozette, *Jones* 5984. Transition. (Cr)

3. NEPHROPHYLLIDIUM. Deer Cabbage

1. N. CRISTA-GALLI (Menzies) Gilg. Wreck Creek Prairie, south of Grenville, *Conard* 360; Raft River, *Jones* 3964; Baker Prairie, *Thompson* 9382; Deer Lake, *Jones* 3840. Canadian. (Cr)

69. APOCYNACEAE. Dogbane Family

1. APOCYNUM. Dogbane

Corolla greenish white, its lobes erect; leaves oval or oblong... 1. *A. Suksdorfii.*
Corolla pink, its lobes recurved; leaves ovate..... 2. *A. androsaemifolium.*

1. A. SUKSDORFII Greene. Hurricane Ridge, *Jones* 3263. Transition. (Cr)

2. A. ANDROSAEMIFOLIUM L. Mason County, *Piper,* July 4, 1890; Sequim, *Jones* 3735; Quillayute Prairie, *Jones* 3610. Transition. (Cr)

70. CONVOLVULACEAE. Morning-glory Family

Corolla large, showy; style 1, entire or cleft at the apex; plants leafy..... 1. *Convolvulus.*
Corolla small; styles 2, distinct; leafless parasites..... 2. *Cuscuta.*

1. CONVOLVULUS. Morning-glory

Leaves triangular-hastate..... 1. *C. Sepium.*
Leaves reniform..... 2. *C. Soldanella.*

1. *C. Sepium* L. Roadside weed observed at Sappho, Hoko River, and Crocker Lake in 1934. (Cr)

2. C. SOLDANELLA L. Copalis, *Lamb* 1257, *Jones* 3653; Ocean City, *Jones* 3930; Ocosta, *Henderson* in 1892. Humid Transition. (Cr)

2. CUSCUTA. Dodder.

1. C. SALINA Engelm. *(C. squamigera* (Engelm.) Piper, var. *major* Yuncker, Ill. Biol. Monographs 6: 71, 1921; *C. squamigera* (Engelm.) Piper.) Port Angeles, *Piper,* September 1, 1895, *Webster,* July 12, 1908; Port Ludlow, *Binns;* Shelton, *Piper,* August 10, 1899; Port Discovery, *St. John* 5833. Humid Transition. (Th)

Photo by Robert Horning

Fig. A. A typical specimen of a fairly old cedar *(Thuja plicata)* along the East Fork of the Quinault River.

Photo by Victor B. Scheffer

Fig. B. Margin of Lake Ozette, showing *Menyanthes trifoliata, Phragmites communis, Typha latifolia, Salix Hookeriana.* The coniferous trees in the background are *Tsuga heterophylla,* and *Thuja plicata.*

71. POLEMONIACEAE. Phlox Family

Corolla campanulate to nearly rotate; leaves alternate, pinnate..... 1. *Polemonium.*
Corolla salverform, tubular, or funnelform.
  Corolla large, salverform; leaves opposite, entire; perennials (our species)..... 2. *Phlox.*
  Corolla tubular or funnelform (if salverform, small, and plants annual); leaves various..... 3. *Gilia.*

1. POLEMONIUM

Corolla 5-12 mm. long.
  Filaments pubescent at base; leaflets 10-15 mm. long..... 1. *P. pulcherrimum.*
  Filaments glabrous at base; leaflets 2-4 (-10) mm. long..... 2. *P. pilosum.*
Corolla 15-25 mm. long; filaments dilated and pilose at base; leaflets 1-5 cm. long..... 3. *P. carneum*, f. *amoenum.*

1. P. PULCHERRIMUM Hook. *(P. humile* of Fl. Wash.) Olympic Mountains, *Elmer* 2819; Mt. Carrie, *St.John* 5816; Mt. Angeles, *Jones* 3685; Hurricane Ridge, *Jones* 3238, 3347; Boulder Peak, *Jones* 8436. Hudsonian. (H)

2. P. **pilosum** (Greenm.) n. comb. *P. viscosum* Nutt., var. *pilosum* Greenm., Bot. Gaz. 25: 263, 1898. First collected by O. D. Allen, July 6, 1898, in "clefts of rock, apparently rare, Goat Mountains, alt. 5000 ft.", no. 261. A comparison of specimens from the Olympic Mountains with a duplicate type of *P. viscosum,* var. *pilosum* shows it to be identical in all essential respects with the Olympic Mountain material. *Polemonium viscosum* Nutt. is a very viscid plant with the leaflets more or less verticillate, and the corolla 1.5-2 cm. long. It grows in the Rocky Mountains but has as yet not been collected west of Idaho. *P. pilosum* is a smaller, less viscid plant known from Goat Mountains near Mt. Rainier and from several stations in the Olympic Mountains. The leaflets are not verticillate and the corolla is about 1 cm. in length. The following collections have been made on the Olympic Peninsula: Summit of Mt. Olympus, August 13, 1907, *Flett, Leach* 2114; Olympic Mountains, without definite locality, September 1, 1890, *Piper* 927; Mt. Angeles, *Rigg,* July 23, 1929, *Jones* 3801, *Webster* 1353. The following specimens from Mt. Constitution, Orcas Island, San Juan County, should be referred here also: July 8, 1904, *A.S.Pope,* July 1908, *Rigg.* Chiefly Arctic-alpine and Hudsonian. (H)

3. P. CARNEUM Gray, f. **amoenum** (Piper) n. comb. *P. amoenum* Piper, Erythea 7: 174, 1899; *P. carneum* Gray, subsp. *amoenum* (Piper) A.Brand, Das Pflanzenf. IV: 250, 1907. Chehalis [Grays Harbor] County, *Heller* 3884; Humptulips, *Lamb* 1178 (type); Humptulips Prairie, *Conard* 98, *Jones* 3939; Quillayute Prairie, *Jones* 3607. Humid Transition. (H)

2. PHLOX

Calyx-lobes lanate, not glandular; leaves glabrous, or ciliate at the base, 6-12 mm. long, spreading ..... 1. *P. diffusa.*
Calyx-lobes and leaves glandular, the latter 5-6 mm. long, imbricated.. 2. *P. condensata.*

1. P. DIFFUSA Benth. Olympic Mountains, *Piper,* August 1895, *Henderson,* July 13, 1890, *Elmer* 2820; Hurricane Ridge, *Jones* 4012; Mt. Storm King, *Lawrence* 346; Mt. Baldy, *Conard* 278; Mt. Angeles, *Rigg,* July 23, 1929; Mt. Colonel Bob, *Thompson* 7301; Constance Ridge, *Thompson* 6581; Heart Lake, *Dickinson* 50; Seven Lakes Basin, *Jones* 8396. Arctic-alpine. (Ch)

2. P. CONDENSATA (Gray) E.Nels. Olympic Mountains, *Flett* 817, *Grant* 4; Iron Mountain, *C.S.English* in 1934. Arctic-alpine. (Ch)

Specimens from the Olympic and Cascade Mountains have the leaves much more viscid and less conspicuously ciliate than those of plants from near the type locality in Colorado. They have been named *P. condensata,* var. *Hendersoni* E.Nels., Rev. West N. Am. Phloxes 14, 1899.

3. GILIA.

Leaves all alternate; corolla tubular-funnelform; flowers in head-like clusters.
  Calyx-lobes unequal, pungent; leaves pinnatifid, spinescent; corolla pale blue, 8-10 mm. long; herbage glandular-viscid, odorous... 1. *G. squarrosa.*
  Calyx-lobes equal, not pungent; leaves not spinescent.
    Corolla salmon colored, 2-3 cm. long; leaves lanceolate or linear, entire ..... 2. *G. grandiflora.*
    Corolla blue, pink, or purplish, 8-16 mm. long.
      Corolla blue; leaves pinnately divided into linear lobes; annual 3. *G. capitata.*
      Corolla pink to purplish.
        Corolla pink, 8-10 mm. long; leaves linear or lanceolate, entire; annual ..... 4. *G. linearis.*
        Corolla purplish, 10-16 mm. long.
          Corolla 10-12 mm. long; annual ..... 5. *G. heterophylla.*
          Corolla 12-16 mm. long; low alpine perennial ..... 6. *G. Larseni.*
At least the lower leaves opposite; corolla salverform; flowers solitary, axillary; annuals.
  Leaves all opposite, palmately dissected into filiform or linear segments; corolla 12-20 mm. long, the tube very slender ..... 7. *G. bicolor.*
  Lower leaves opposite, the upper alternate, all entire, oblong or obovate, 1-2 cm. long; corolla 8-10 mm. long ..... 8. *G. gracilis.*

1. G. SQUARROSA (Esch.) Hook. & Arn. *(Navarretia squarrosa* (Esch.) Hook. & Arn.) Clallam County, *Elmer* 2818; Port Angeles, *C.S. Eaton,* June 30, 1908. Humid Transition. (Th)

2. G. GRANDIFLORA (Dougl.) Gray. *(Collomia grandiflora* Dougl.) Lake Crescent, *Jones* 3752. Transition. (Th)

3. G. CAPITATA Hook. Port Townsend, *W.G.Edwards* in 1896; Port Discovery, *St.John* 5836. Transition. (Th)

4. G. LINEARIS (Nutt.) Gray. *(Collomia linearis* Nutt.) Clallam County, *Elmer* 2822, the only western Washington record. Otherwise common in the Arid Transition and Upper Sonoran zones east of the Cascade Mountains. (Th)

5. G. HETEROPHYLLA Dougl. *(Collomia heterophylla* Hook.) Clallam County, *Elmer* 2821; Montesano, *Heller* 4057; Port Ludlow, *Binns;* Elwha River, *Jones* 3109; Shelton, *Jones* 3839; Constance Ridge, *Thompson* 6572; Dosewallips River, *Jones* 5834; Hoh River, *Jones* 8421. Humid Transition. (Th)

6. G. LARSENI Gray. *(Collomia debilis* in part, Fl. Wash.; *Collomia Larseni* (Gray) Payson, Univ. Wyo. Publ. Bot. 1: 85, 1924.) Mt. Angeles, *Jones* 3203; Marmot Pass, *Thompson* 7933. Arctic-alpine. (H)

7. G. BICOLOR (Nutt.) Piper. Montesano, *Henderson* 2409, *Heller* 4012; Clallam County, *Elmer* 2823; base of Mt. Angeles, *Jones* 3198; Elwha River, *Jones* 3535, 3105. Humid Transition. (Th)

8. G. GRACILIS (Dougl.) Hook. Clallam County, *Elmer* 2824; Montesano, *Heller* 3909; Hurricane Ridge, *Jones* 3382; Humptulips Prairie, *Jones* 3940; Quinault River, *Jones* 3955. Transition. (Th)

72. HYDROPHYLLACEAE. Waterleaf Family

Style entire ..... 1. *Romanzoffia.*
Style 2-cleft.
  Stamens included ..... 2. *Nemophila.*
  Stamens exserted.
    Flowers in cymose or head-like clusters ..... 3. *Hydrophyllum.*
    Flowers in scorpioid spikes or racemes ..... 4. *Phacelia.*

1. ROMANZOFFIA

Herbage glabrous or nearly so; pedicels longer than the flowers; capsule retuse ..... 1. *R. sitchensis.*
Herbage pubescent; pedicels shorter than the flowers; capsule obtuse 2. *R. unalaschensis.*

1. R. SITCHENSIS Bong. Olympic Mountains, *Piper* 2233; Mt. Angeles, *Webster* 1122; Lake Constance, *Thompson* 7913; Marmot Pass, *Thompson* 9910; Mt. Colonel Bob, *Thompson* 9403, 6252; east fork Quinault River, *Dickinson* 47; Canyon Creek, *Jones* 8206. Hudsonian. (H)

2. R. UNALASCHENSIS Cham. Point Grenville, *Foster* 3393a; Cape Elizabeth, *Foster,* in 1908. (H)

2. NEMOPHILA

1. N. PARVIFLORA Dougl. Clallam County, *Elmer* 2830; Elwha River, *Jones* 3524, 3126. Humid Transition. (Th)

It seems preferable to retain the well-known generic name Nemophila Nutt. until such time as Mitchell's Viticella may be established upon a more secure basis.

3. HYDROPHYLLUM. Waterleaf

Leaf segments 7-15; calyx-lobes densely whitish-pubescent on back; corolla whitish ..... 1. *H. congestum.*
Leaf segments 3-5; calyx-lobes glabrous on the back, ciliate; corolla purple ..... 2. *H. tenuipes.*

1. H. CONGESTUM Wiegand. The common waterleaf of mountain meadows and open woods near tree line on the Olympic Peninsula is here referred to *H. congestum* Wiegand instead of *H. albifrons* Heller. *H. congestum* is a Hudsonian species whose type locality is Mt. Rainier. The flowering period, according to herbarium records, is from June 8 to August 15. The calyx-lobes of this plant are oblong-linear, acutish, and densely whitish-pubescent dorsally. *H. albifrons* (type locality, Lake Waha, Nez Perce County, Idaho) is an Arid Transition species which inhabits moist thickets along streams in southeastern Washington and adjacent Idaho. The flowering period is from April 29 to July 13. This species has the calyx-lobes lanceolate-linear, acuminate, and only sparsely pubescent dorsally. The geographical ranges of these two species are separated at their nearest points, by about 200 miles distance. The following specimens of *H. congestum* have been collected on the Olympic Peninsula: Olympic Mountains, *Elmer* 2831; Hurricane Ridge, *Jones* 3356; Mt. Angeles, *Rigg,* July 23, 1929; Olympic Hot Springs, *Jones* 3991. Chiefly Hudsonian. (H)

2. H. TENUIPES Heller. Montesano, *Heller* 3853; Hoquiam, *Lamb* 1140; Skokomish River, *Kincaid,* May 16, 1902; Quinault, *Conard* 134; Port Crescent, *Lawrence;* Elwha River, *Jones* 3136; Beaver Creek, *Jones* 4548; Satsop, *Jones* 3861; Canyon Creek, *Jones* 5887; Clallam Bay, *Jones* 5967; Soleduck River, *Jones* 8380; Port Angeles, *Webster* 1119. Humid Transition. (H)

4. PHACELIA

Flowers purplish blue; leaves silky pubescent, pinnate, with numerous narrow lobes ..... 1. *P. sericea.*
Flowers whitish; leaves hirsute, simple or with 1 or 2 pairs of ovate leaflets ..... 2. *P. nemoralis.*

1. P. SERICEA (Graham) Gray. Clallam County, *Elmer* 2827; Mt. Steele, *Piper* 2229; Mt. Angeles, *Webster* 1110, *Flett* in 1908; Hurricane Ridge, *Jones* 3384, 4009; Lake Constance, *Thompson* 7910; Marmot Pass, *Thompson* 7939, 9905. Arctic-alpine. (H)

2. P. NEMORALIS Greene. Chehalis [Grays Harbor] County, *Lamb* 1161; Montesano, *Heller* 3923, *Grant,* July 1917; Skokomish River, *Kincaid,* June 25, 1892; trail to Constance Ridge, *Jones* 5803; Heart Lake, *Dickinson* 26; Mt. Angeles, *Webster* 1109; Seven Lakes Basin, *Jones* 8267. Humid Transition and Hudsonian. (H)

The lowland plants are erect, 60-180 cm. tall, strongly hispid-hirsute and probably represent true *P. nemoralis;* the subalpine plants are decumbent at the base, less harshly pubescent, with whiter corollas, and may represent an undescribed species or variety.

73. BORAGINACEAE. Borage Family

Corolla blue.
- Corolla tubular-funnelform; nutlets wrinkled; herbage nearly glabrous ..... 1. *Mertensia.*
- Corolla rotate; nutlets smooth and shining; herbage pubescent... 2. *Myosotis.*

Corolla yellow or white.
- Corolla yellow or yellowish.
  - Corolla greenish yellow; mature nutlets whitish, smooth, shining ..... 3. *Lithospermum.*
  - Corolla bright yellow; nutlets brownish, roughened ..... 4. *Amsinckia.*
- Corolla white.
  - Nutlets with a pronounced longitudinal ventral groove ..... 5. *Cryptantha.*
  - Nutlets with a longitudinal ventral keel ..... 6. *Plagiobothrys.*

1. MERTENSIA. Bluebell

Calyx-lobes in anthesis 2-4 mm. long; plants growing on talus and along streams in the mountains, flowering from July to September.
- Leaves glabrous or merely muricate above, more or less strigose beneath; calyx and pedicels strigose ..... 1. *M. paniculata,* var. *subcordata.*
- Leaves glabrous on both surfaces (or somewhat ciliate on the margins), pale and more or less glaucous; calyx and pedicels glabrous, or the calyx-lobes somewhat ciliate ..... 1a. var. *laevigata.*

Calyx-lobes in anthesis 5-7 mm. long; leaves strigose above, glabrous or nearly so beneath; plants of meadows and damp woods near the coast, flowering in May ..... 1b. var. *platyphylla.*

1. M. PANICULATA (Ait.) G.Don, var. SUBCORDATA (Greene) Macbr. *(M. leptophylla* Piper) Canyon Creek, *Jones* 5829; Mt. Ellinor, *Jennie V. Getty* in 1902; Olympic Mountains, *Piper* 919; Elwha River, *C.S.Eaton* in 1907; Boulder Creek, *Jones* 8469; Crystal Creek, *Jones* 8452. Lower Hudsonian. (H)

1a. Var. **laevigata** (Piper) n. comb. *M. laevigata* Piper, Contr. U. S. Nat. Herb. 11: 477, 1906. Mt. Colonel Bob, *Lamb* 1383; Martin's Park, *Leach* 2010. Hudsonian. (H)

This variety is rather distinctive in the field on account of its pale, glaucous foliage. Its type locality is Mt. Rainier.

1b. Var. **platyphylla** (Heller) n. comb. *M. platyphylla* Heller, Bull. Torr. Club 26: 548, 1899; *M. denticulata* (Lehm.) Piper, in Piper & Beattie, Fl. Nw. Coast 301, 1915. Montesano, *Heller* 3872 (type); New London, *Lamb* 1168; Hoh River, *Otis* 1271; Beaver Creek, *Jones* 4546; Humptulips River, *Jones* 6461. Humid Transition. (H)

In view of the uncertain identity of Lehmann's *Lithospermum denticulatum,* which is said to have been collected in "shady woods near the confluence of the Columbia with the sea. . . ", it is better to take up Heller's name for this lowland Mertensia whose type locality is near Montesano, where it is quite common. Since it is clearly a member of the *M. paniculata* group it is here accorded varietal status. Johnston (1932) reduces this to synonymy under *M. paniculata,* var. *subcordata* but it differs in zonal distribution, habitat, root system, and in the shape and pubescence of the leaves. In short, it is a plant which no one, after having seen it growing, would mistake for the subalpine var. *subcordata.*

M. ciliata (Torr.) G.Don, is reported by Leach (1928) but there is no evidence of its occurrence in Washington. Specimens so named belong to *M. paniculata,* var. *laevigata.*

2. MYOSOTIS. Forget-me-not

Calyx strigose, eglandular, the lobes shorter than the tube; corolla 5-10 mm. in diameter . . . . . 1. *M. scorpioides.*
Calyx with uncinate, gland-tipped hairs; corolla 2-4 mm. in diameter.
Pedicels in fruit longer than the calyx . . . . . 2. *M. arvensis.*
Pedicels in fruit shorter than the calyx . . . . . 3. *M. versicolor.*

1. *M. scorpioides* L. Copalis, *Conard;* Ocean City, *Jones* 3903; Montesano, *Thompson* 7346; Lake Ozette, *Jones* 5815. (H)

2. *M. arvensis* (L.) Hill. Quinault Valley, *Conard* 197. (Th)

3. *M. versicolor* (Pers.) J.E.Smith. Sequim, *Grant* 521; Port Angeles, *Webster* 1909. (Th)

3. LITHOSPERMUM

1. L. RUDERALE Dougl. Sequim, *Grant* 550. Arid Transition. (H)

4. AMSINCKIA. Tarweed

Stems erect; nutlets keeled on the back, 1-2 mm. long when mature . . . 1. *A. intermedia.*
Stems decumbent; nutlets rounded on the back, 2-2.5 mm. long when mature . . . . . 2. *A. lycopsoides.*

1. A. INTERMEDIA F. & M. Port Angeles, *Webster,* June 1909, *Jones* 3762; Port Hadlock, *Jones* 3151; Sequim, *Jones* 3728. Humid Transition. (Th)

According to Suksdorf's recent treatment of this genus (1931) the above specimens would belong to *A. foliosa* Suksd. The distinction between this and *A. intermedia* is, however, not altogether clear.

2. A. LYCOPSOIDES Lehm. Clallam County, *Elmer* 2754; Dungeness, *Thompson* 10626. Humid Transition. (Th)

5. CRYPTANTHA

1. C. MURICULATA (A.DC.) Greene. *(Cryptanthe muriculata* of Fl. Wash.) Mason County, *Kincaid,* May 16, 1892. Transition. (Th)

6. PLAGIOBOTHRYS

Corolla 5-8 mm. broad; racemes bractless, usually in pairs..... 1. *P. Scouleri.*
Corolla 2-4 mm. broad; racemes more or less bracteate, usually solitary.
  Racemes rather dense, bracted only at the base..... 2. *P. granulatus.*
  Racemes loose, bracted at least to the middle..... 3. *P. medius.*

1. P. SCOULERI (Hook. & Arn.) Johnston, Contr. Gray Herb. 68: 75, 1923. *(Allocarya Scouleri* Greene) Mason County, *Piper* 1053; Hurricane Ridge, *Jones* 3401. Humid Transition. (Th)

The specimen *(Piper* 1053) cited in the Flora of Washington from near Union [City], Mason County, is *Plagiobothrys Scouleri,* and there is no evidence that *P. stipitatus* occurs on the Peninsula, or north of California. *Elmer* 2755, also included under *A. stipitata* by Piper, is *P. medius.*

2. P. GRANULATUS (Piper) Johnston, Contr. Arnold Arbor. 3: 57, 1932. *(Allocarya granulata* Piper, Contr. U. S. Nat. Herb. 22: 109, 1920.) Elma, *Grant,* May 1918. Humid Transition. (Th)

3. P. MEDIUS (Piper) Johnston, l.c 58. *(Allocarya media* Piper, l.c. 107.) Clallam County, *Elmer* 2755; Port Angeles, *Flett* 3378, *Webster,* June 1908. Humid Transition. (Th)

74. LABIATAE. Mint Family

Corolla nearly regular.
  Anther-bearing stamens 2..... 1. *Lycopus.*
  Anther-bearing stamens 4..... 2. *Mentha.*
Corolla distinctly bilabiate; stamens 4.
  Calyx bilabiate, the teeth unequal.
    Upper lip of the corolla plane..... 3. *Thymus.*
    Upper lip of the corolla concave..... 4. *Prunella.*
  Calyx-teeth equal or nearly so.
    Calyx-teeth 5.
      Calyx 5-10-nerved..... 5. *Stachys.*
      Calyx 12-15-nerved.
        Upper lip of corolla concave..... 6. *Nepeta.*
        Upper lip of corolla plane..... 7. *Micromeria.*
    Calyx-teeth 10, spinescent, hooked at the tip; stems tomentose..... 8. *Marrubium.*

1. LYCOPUS.

1. L. UNIFLORUS Michx. Copalis, *Conard* 405; Lake Ozette, *Jones* 5944. Humid Transition. (H)

2. MENTHA. Mint

Whorls of flowers all axillary.		
Corolla 4-5 mm. long.		
Leaves pubescent	1.	*M. arvensis*, var. *canadensis*.
Leaves glabrous or nearly so	1a.	var. *glabrata*.
Corolla 5-6 mm. long; leaves puberulent or glabrate	1b.	var. *occidentalis*.
Whorls of flowers mostly in terminal spikes.		
Leaves lanceolate or ovate-lanceolate; calyx 2-5 mm. long, the teeth ciliate	2.	*M. piperita*.
Leaves ovate to orbicular-ovate; calyx glabrous, punctate, 4 mm. long	3.	*M. citrata*.

1. M. ARVENSIS L., var. CANADENSIS (L.) Briquet. (*M. canadensis* L.) Clallam County, *Elmer* 2545; Lake Crescent, *Jones* 3771, 3488. Transition. (H)

1a. Var. GLABRATA (Benth.) Fern. (*M. canadensis borealis* (Michx.) Piper) Lake Crescent, *Jones* 3494, 3459; Lake Ozette, *Jones* 5945. Transition. (H)

1b. Var. **occidentalis** (Rydb.) n. comb. *M. occidentalis* Rydb., Bull. Torr. Club 36: 687, 1907. Chehalis River, *Lamb* 1235. This variety may be distinguished by the longer, more open corolla, and the broader and longer bracts. Transition. (H)

2. *M. piperita* L. Peppermint. Hoodsport, *Jones* 8543; Lake Crescent, *Jones* 3497; Forks, *Otis* 1590. (H)

3. *M. citrata* Ehrh. Bergamot Mint. Beaver Creek, *Jones* 4541. (H)

3. THYMUS. Thyme

1. *T. Serpyllum* L. Ewell's Yard, near Quinault, *Conard* 117. (H)

4. PRUNELLA. Selfheal

Bracts of the inflorescence bristly-ciliate	1.	*P. vulgaris*, var. *lanceolata*.
Bracts glabrous or nearly so	1a.	var. *calvescens*.

1. P. VULGARIS L., var. LANCEOLATA (Barton) Fern. (*P. vulgaris* of Fl. Wash.) Clallam County, *Elmer* 2544; Humptulips, *Lamb* 1205; Elwha River, *Jones* 3121; Shelton, *Jones* 3832; Marmot Lake, *Dickinson* 67. Humid Transition and Canadian. (H)

1a. Var. CALVESCENS Fern. Quillayute Prairie, *Jones* 3608. Humid Transition and Canadian. (H)

5. STACHYS. Woundwort

Corolla 12-15 mm. long; calyx 5-7 mm. long, hirsute, not glandular..... 1. *S. Emersoni.*
Corolla 2-3.5 cm. long; calyx 8-13 mm. long, usually sparsely hirsute, the sepals stipitate glandular as well..... 2. *S. ciliata.*

1. S. EMERSONI Piper, Erythea 6: 31, 1898 (April). *(S. ciliata,* var. *pubens* Gray; *S. pubens* (Gray) Heller, Bull. Torr. Club 25: 581, 1898 (November)). Montesano, *Heller* 3902; Hoquiam, *Lamb* 1138; Ocean Beach, *Henderson* in 186; Port Crescent, *Lawrence* 281a; Quillayute Prairie, *Jones* 3568; Humptulips, *Jones* 3739; Stevens Creek, *Jones* 3944; Aloha, *Thompson* 9377; Clallam Bay, *Jones* 5847. Humid Transition. (Cr)

2. S. CILIATA Dougl. *(S. caurina* Piper, Proc. Biol. Soc. Wash. 32: 42, 1919; *S. ciliata,* var. *Leachiana* Henders., Mazama 10: 50, 1928.) Montesano, *Heller* 3960; Chehalis [Grays Harbor] County, *Henderson* 2531; Clallam County, *Elmer* 2543; Olympic Mountains, *Grant* in 1889; Elwha Basin, *Flett,* August 20, 1907, *Leach* 2084; Lake Quinault, *Lamb* 1285; Skokomish River, *Kincaid;* Elwha River, *Jones* 3277, 3123; Upper Quilcene River, *Thompson* 7944. Transition and Canadian. (Cr)

6. NEPETA.

Stems erect; flowers in terminal and axillary clusters, whitish, spotted with purple..... 1. *N. Cataria.*
Stems trailing; flowers axillary, solitary, or in few-flowered clusters, blue..... 2. *N. hederacea.*

1. *N. Cataria* L. Catnip. Not uncommon as a weed in cultivated ground. (Th)

2. *N. hederacea* (L.) Trev. Ground-ivy. Clifton, *Jones* 6499. (H)

7. MICROMERIA

1. M. CHAMISSONIS (Benth.) Greene. Yerba Buena. Mt. Angeles, *Webster* 1168; Port Townsend, *Meehan* in 1883; Elwha River, *Jones* 3525. Transition. (Ch)

8. MARRUBIUM. Horehound

1. *M. vulgare* L. A common roadside weed on the Peninsula. (Th)

75. SOLANACEAE. Nightshade Family

1. SOLANUM

Plant climbing; flowers 15 mm. in diameter ..... 1. *S. Dulcamara.*
Plant not climbing.
  Leaves simple; flowers 6 mm. in diameter.
    Stems and leaves glabrous or nearly so; berry black ..... 2. *S. nigrum.*
    Stems and leaves viscid-villous; berry greenish ..... 3. *S. villosum.*
  Leaves odd-pinnate; flowers 2.5-3 cm. in diameter; plant with subterranean tubers ..... 4. *S. tuberosum.*

1. *S. Dulcamara* L. Bittersweet. Sequim, *Grant,* June 2, 1915. (H)

2. *S. nigrum* L. Black Nightshade. Montesano, *Grant* in 1917. (Th)

3. *S. villosum* Mill. Sticky Nightshade. Montesano, *Grant* in 1917. (Th)

4. *S. tuberosum* L. Potato. Ocean City, *Jones* in 1933. Seen occasionally, but not established. (Cr)

76. SCROPHULARIACEAE. Figwort Family

Anther-bearing stamens 5; corolla rotate, nearly regular; leaves alternate ..... 1. *Verbascum.*
Anther-bearing stamens 4 or 2.
  Corolla spurred; capsule opening by pores ..... 2. *Linaria.*
  Corolla not spurred; capsule valvate.
    Upper lip of corolla not galeate.
      Fifth sterile stamen present.
        Sterile stamen represented by a scale or gland on the upper inner side of the corolla.
          Corolla blue or white; peduncles 1-flowered; annuals ..... 3. *Collinsia.*
          Corolla purplish green; peduncles several-flowered; perennials ..... 4. *Scrophularia.*
        Sterile stamen evident, filamentous ..... 5. *Penstemon.*
      Fifth sterile stamen lacking.
        Stamens 4; calyx 5-parted.
          Leaves opposite; calyx prismatic ..... 6. *Mimulus.*
          Leaves alternate; calyx campanulate ..... 7. *Digitalis.*
        Stamens 2; calyx 4-parted.
          Corolla rotate; leaves (at least the lower ones) opposite ..... 8. *Veronica.*
          Corolla campanulate (in our species); leaves alternate ..... 9. *Synthyris.*
    Upper lip of corolla galeate; stamens enclosed in the upper lip.
      Lips of the corolla unequal; perennials.
        Anther-sacs alike, parallel ..... 10. *Pedicularis.*
        Anther-sacs dissimilar, separated ..... 11. *Castilleja.*
      Lips of the corolla subequal; anther-sacs dissimilar; annuals ..... 12. *Orthocarpus.*

1. VERBASCUM. Mullein

Leaves densely tomentose; inflorescence spicate ..... 1. *V. Thapsus.*
Leaves glabrous or nearly so; inflorescence racemose ..... 2. *V. Blattaria.*

1. *V. Thapsus* L. Common Mullein. Gravelly soil, especially along roads and in waste ground. (H)

2. *V. Blattaria* L. Moth Mullein. Waste ground, less common than the preceding species. (H)

2. LINARIA

1. *L. vulgaris* Hill. Roadside weed, near Port Angeles, *Jones,* August 1931. (H)

3. COLLINSIA

Corolla 4-6 mm. long, the tube gibbous at the base, erect or slightly declined; calyx over half the length of the corolla, its lobes somewhat concealing the corolla-tube	1. *C. parviflora.*
Corolla 7-9 mm. long, the tube deeply saccate at base, strongly declined to form a right angle with the pedicel; calyx less than half the length of the corolla, its lobes not concealing the corolla tube	2. *C. grandiflora,* var. *pusilla.*

1. C. PARVIFLORA Dougl. *(C. tenella* (Pursh) Piper) Clallam County, *Elmer* 2586; Mt. Angeles, *Jones* 3332; Duckabush River, *Jones* 3094; Hurricane Ridge, *Jones* 3229; Dosewallips River, *Thompson* 6544. Transition. (Th)

2. C. GRANDIFLORA Dougl., var. PUSILLA Gray. Skokomish Valley, *Kincaid,* May 6, 1892; Sequim, *Grant* in 1916; Scott's Prairie, *Jones* 6497. Humid Transition. (Th)

4. SCROPHULARIA. Figwort

1. S. CALIFORNICA Cham. *(S. oregana* Pennell, Bull. Torr. Club 55: 316, 1928.) Montesano, *Heller* 4003; Hoquiam, *Lamb* 1224; Grenville, *Conard* 339; Mora, *Jones* 3420, 3588; Neah Bay, *Thompson* 9441; Clallam Bay, *Jones* 5966; Moclips, *Jones* 6542. Humid Transition. (H)

5. PENSTEMON

Anthers densely long-woolly.	
Low shrubby plants with coriaceous ovate-oblong leaves 5-20 mm. long.	
Leaves mostly serrulate	1. *P. Menziesii.*
Leaves mostly entire	1a. f. *Davidsonii.*
Taller (30-60 cm.) plants with ovate-lanceolate, dentate leaves 5-8 cm. long	2. *P. nemorosus.*
Anthers glabrous or nearly so.	
Leaves serrate; corolla 15-20 mm. long.	
Anthers opening only at the apex	3. *P. serrulatus.*
Anthers opening nearly their entire length	4. *P. ovatus.*
Leaves entire; corolla 8-12 mm. long; anthers opening nearly their entire length	5. *P. Tolmiei.*

1. P. MENZIESII Hook. Baldy Peak, *Lamb* 1320; Clallam County, *Elmer* 2578; Olympic Mountains, *Piper* 2176; Mt. Church, *Schwartz* 44; Duckabush River, *Dickinson* 19; Mt. Angeles, *Rigg,* July 23, 1929; Bogachiel Ridge, *Jones* 8395. Arctic-alpine. (Ch)

1a. Forma **Davidsonii** (Greene) n. comb. *P. Davidsonii* Greene, Pittonia 2: 241, 1892; *P. Menziesii* Hook., subsp. *Davidsonii* (Greene) Piper, Fl. Wash. 499, 1906. Olympic Mountains, *Grant;* on summit of middle peak of Mt. Olympus, *Frye,* August 13, 1907. Arctic-alpine. (Ch)

2. P. NEMOROSUS (Dougl.) Trautv. *(Chelone nemorosa* Dougl.) Olympic Mountains, *Piper* in 1890; Clallam County, *Elmer* 2575; Skokomish River, *Kincaid,* June 1892; Mt. Angeles, *Thompson* 7364, 5575; Marmot Pass, *Thompson* 9891; Marmot Lake, *Dickinson* 31; Seven Lakes Basin, *Jones* 8218, 8291. Humid Transition to Hudsonian. (H)

3. P. SERRULATUS Menzies. *(P. diffusus* Dougl.; See Madroño 3: 250, 1936.) Olympic Mountains, *Piper* 2178; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Baldy Peak, *Lamb* 1369; Skokomish River, *Kincaid,* June 17, 1892; Clallam County, *Elmer* 2585; Duckabush River, *Jones* 3080; Mt. Angeles, *Thompson* 5543, 7504; Lake Quinault, *Thompson* 7886; Mt. Colonel Bob, *Thompson* 7279; Heart Lake, *Dickinson* 57; Skokomish River, *Dickinson* 69; Seven Lakes Basin, *Jones* 8259. Humid Transition to Hudsonian. (H)

4. P. OVATUS Dougl. Clallam County, *Elmer* 2576; Hurricane Ridge, *Jones* 3253. Hudsonian. (H)

5. P. TOLMIEI Hook. In the Olympic Mountains at least, *Penstemon Tolmiei* Hook. is not merely a dwarfed, high alpine form of *P. procerus* Dougl. as was stated by Piper (1915, p. 318). There is no evidence of intergradation with that species. When transplanted to gardens at sea-level on Puget Sound, *P. Tolmiei* shows no tendency to change its habit. Though its distinguishing characters are chiefly habital and quantitative, it is probably genetically distinct and is therefore here accorded specific rank. The following collections have been made in the Olympic Mountains: Mt. Angeles, *Webster* 1959, *Jones* 3192; Marmot Pass, *Thompson* 9946; Mt. Appleton, *Jones* 8513. Arctic-alpine. (H)

A yellow flowered Penstemon, said to be closely related to *P. attenuatus* Dougl., has been reported from the base of Mount Angeles and described as *P. Nelsonae* by Keck & Thompson in Rhodora 37: 419-20, 1935.

6. MIMULUS

Corolla yellow.
Perennial; corolla 1.5-3 cm. long.
Flowers on leafy stems; corolla strongly bilabiate.
Herbage glabrous or puberulent.
Leaves palmately veined; calyx-teeth unequal, the upper tooth largest.
Flowers mostly in racemes; pedicels usually shorter than the corollas; lowland plants ..... 1. *M. guttatus.*
Flowers mostly solitary, or in pairs or threes; pedicels usually longer than the corollas; alpine.
Stems 10-30 cm. high; rhizomes numerous ..... 2. *M. Tilingi.*
Stems 5-10 cm. high; rhizomes few ..... 2a. var. *caespitosus.*
Leaves pinnately veined; calyx-teeth subequal ..... 3. *M. dentatus.*
Herbage slimy-viscid; leaves pinnately veined; calyx-teeth equal or nearly so.
Leaves all short-petioled.
Corolla 1.5-2 cm. long ..... 4. *M. moschatus.*
Corolla 2-3 cm. long ..... 4a. var. *longiflorus.*
Upper leaves sessile; corolla 2-3 cm. long ..... 4b. var. *sessilifolius.*
Flowers solitary on scapes 2-5 cm. long; corolla nearly regular; leaves oblanceolate, tapering to a narrow, sessile base ... 5. *M. primuloides.*
Annual; corolla 10-12 mm. long, bilabiate; pedicels 0.5-2 cm. long; leaves ovate, petiolate ..... 6. *M. alsinoides.*
Corolla rose (rarely pink), 3.5-5 cm. long ..... 7. *M. Lewisii.*

1. M. GUTTATUS DC. *(M. Langsdorfii* Donn) Montesano, *Heller* 3986, 4006; Grays Harbor, *Lamb* 1065; Humptulips, *Jones* 3717; Canyon Creek, *Jones* 5831; Skokomish River, *Kincaid;* Hoh River, *Otis* 1310; Soleduck River, *Jones* 8374. Humid Transition and Canadian. (H)

2. M. TILINGI Regel. *(M. implexus* of Piper & Beattie, in part.) Olympic Mountains, *Piper* 2177, *Elmer* 2583; Mt. Anderson, *R.T.Davison,* August 31, 1928; Mt. Angeles, *Webster* 1945; Marmot Lake, *Dickinson* 71; Seven Lakes Basin, *Jones* 8326; Boulder Creek, *Jones* 8487. Hudsonian. (H)

2a. Var. CAESPITOSUS (Greene) Grant, Ann. Mo. Bot. Gard. 11: 154, 1924. *(M. alpinus* of Piper) Marmot Lake, *Dickinson* 66; Elwha River, *Webster* 1944. Hudsonian. (H)

3. M. DENTATUS Nutt. Stevens Creek, *Jones* 3946; Hoh River, *Jones* 3973; Montesano, *Grant* in 1917, *Heller* 3926; Braden Creek, *Jones* 5811. Humid Transition. (H)

Known previously in Washington only at Ilwaco, Pacific County. The Hoh River collection is from the most northerly station known for this plant; it ranges southward to Humboldt County, California.

4. M. MOSCHATUS Dougl. Skokomish River, *Kincaid* (not Henderson, as stated in Fl. Wash.) in 1892; Montesano, *Grant,* July 1917; Sequim, *Grant,* August 1915. Transition. (H)

4a. Var. LONGIFLORUS Gray. *(M. moschatus* of Fl. Wash. in part.) Port Crescent, *Lawrence* 280. Transition. (H)

4b. Var. SESSILIFOLIUS Gray. *(M. moschatus* of Fl. Wash., in part.) Clallam County, *Elmer* 2589; McCleary, *Jones* 3854; Montesano, *Heller* 3961; Port Angeles, *Webster* 1492. Transition. (H)

5. M. PRIMULOIDES Benth. Mt. Ellinor, *Leslie Muller,* in 1934. Not otherwise known west of the Cascade Mountains. Hudsonian. (H)

6. M. ALSINOIDES Dougl. Lake Crescent, *Jones* 4553; Mt. Angeles, *Webster* 1940. Transition. (Th)

7. M. LEWISII Pursh. Skokomish River, *Kincaid,* June 17, 1892; Quinault River, *Jones* 3959; Lake Quinault, *Thompson* 9400, 7889; Mt. Colonel Bob, *Thompson* 7317; Mt. Angeles, *Thompson* 7453; east fork Quinault River, *Dickinson* 46. Hudsonian and Canadian. (H)

7. DIGITALIS. Foxglove

1. *D. purpurea* L. Union [City], *Piper;* Quinault, *Conard* 158; Hoko River, *Jones* 5982. (H)

8. VERONICA. Speedwell

Flowers solitary in the axils of the upper leaves; lower leaves crenate; annuals.
- Lower leaves oval or ovate; petals blue ..... 1. *V. arvensis.*
- Lower leaves spatulate or oblong; petals whitish ..... 2. *V. peregrina,* var. *xalapensis.*

Flowers in racemes; perennials with rhizomes.
- Racemes in the axils of the leaves.
  - Plant glabrous or nearly so; pedicels slender, much longer than the calyx.
    - Leaves oblong-lanceolate to ovate, short-petioled ..... 3. *V. americana.*
    - Leaves linear or linear-lanceolate, sessile ..... 4. *V. scutellata.*
  - Plant pubescent; pedicels shorter than or scarcely longer than the calyx; leaves obovate-elliptical, obtuse, short-petioled 5. *V. officinalis.*
- Racemes terminal (at the ends of the stems).
  - Lowest leaves short-petioled; capsules orbicular, obcordate; lowland plants, often weedy.
    - Rachis and pedicels appressed-puberulent ..... 6. *V. serpyllifolia.*
    - Rachis and pedicels with spreading viscid hairs ..... 7. *V. humifusa.*
  - Leaves sessile; capsule elliptical, emarginate; native subalpine and alpine species.
    - Corolla 8-10 mm. broad; leaves usually longer than the internodes; style longer than the capsule; filaments equalling or exceeding the corolla ..... 8. *V. Cusickii.*
    - Corolla 4-6 mm. broad; leaves usually shorter than the internodes; style shorter than the capsule; filaments shorter than the corolla ..... 9. *V. alpina.*

1. *V. arvensis* L. Port Angeles, *Webster* 1996; Elwha River, *Jones* 3125; Scott's Prairie, *Jones* 6521. (Th)

2. V. PEREGRINA L., var. XALAPENSIS (H.B.K.) St.John & Warren, Northwest Science 2: 90, 1928. *(V. peregrina xalapensis* (H.B.K.) Pennell) Clallam County, *Elmer* 2591. Transition. (Th)

3. V. AMERICANA Schw Northwest of Mt. Olympus, *St.John* 5780; Elwha River, *Jones* 3395; Lake Crescent, *Jones* 3770. Transition. (Ch)

4. V. SCUTELLATA L. Matlock, *Jones* 3708; Hoquiam, *Thompson* 7344; Aloha, *Thompson* 9353; Lake Crescent, *Webster* 2002. Transition. (H)

5. *V. officinalis* L. Duckabush River, *Jones* 3064; Humptulips, *Jones* 3765; Humptulips Prairie, *Jones* 3941. (H)

6. *V. serpyllifolia* L. Moclips, *Jones* 6498. (H)

7. V. HUMIFUSA Dicks. Montesano, *Grant,* July 1918; Neah Bay, *Erna Gunther,* June 19, 1935. Transition. (H)

8. V. CUSICKII Gray. Clallam County, *Elmer* 2587; Mt. Angeles, *Jones* 3323a, 3809; Hurricane Ridge, *Jones* 3379, 3231; Marmot Pass, *Thompson* 7983; Seven Lakes Basin, *Jones* 8305. Arctic-alpine and Hudsonian. (H)

In the Flora of the Northwest Coast, p. 323, *Veronica Cusickii* is said to be "glabrous except the glandular inflorescence". All the material from the Olympic Peninsula has the stems finely pubescent.

9. V. ALPINA L. Olympic Mountains, *Piper,* August 1895; Elwha River, *Webster* 1992; northwest of Mt. Olympus, *St.John* 5782; Mt. Angeles, *Jones* 3323; Lake Constance, *Thompson* 7919; west fork Dosewallips River, *Dickinson* 53; Seven Lakes Basin, *Jones* 8319; Boulder Creek, *Jones* 8473. Arctic-alpine and Hudsonian. (H)

9. SYNTHYRIS

Leaves white-tomentose, cleft into narrow segments ..... 1. *S. lanuginosa.*
Leaves green, reniform-orbicular.
Corolla-lobes laciniately incised; leaves double-toothed ..... 2. *S. schizantha.*
Corolla-lobes entire; leaves crenate ..... 3. *S. rotundifolia.*

1. S. LANUGINOSA (Piper) Pennell & Thompson, Proc. Acad. Nat. Sci. Phila. 85: 93, 1933. *(S. pinnatifida lanuginosa* Piper, Contr. U. S. Nat. Herb. 11: 504, 1906.) Olympic Mountains, *Flett* 815; Mt. Angeles, *Jones* 3170; Marmot Pass, *Thompson* 9941, 7996. Arctic-alpine. (H)

2. S. SCHIZANTHA Piper. Baldy Peak, *Lamb* 1343, *Conard* 301; Mt. Colonel Bob, *S.A.Andersen,* July 14, 1931, *Thompson* 9402. Canadian. (H)

Apparently a very distinct species. The only other localities where it is known to occur are near Elbe, Lewis County, Washington, where it

was collected by Flett (2744) in 1904, and Saddle Mountain, Tillamook County, Oregon, reported by Mr. C. S. English, Jr., of Seattle, in 1932.

3. S. ROTUNDIFOLIA Gray. Forks Prairie, *Otis* 1430; Quillayute Prairie, *Jones* 3604. These stations mark the northern limit of the species, which extends as far southward as Humboldt County, California. Humid Transition. (H)

10. PEDICULARIS

Leaves lanceolate, doubly crenulate; flowers whitish ..... 1. *P. racemosa.*
Leaves pinnately parted.
  Flowers yellowish-white, with a slender inrolled beak ..... 2. *P. contorta.*
  Flowers purplish.
    Corolla with a broad hood-like beak ..... 3. *P. atrosanguinea.*
    Corolla with a long filiform curved beak ..... 4. *P. surrecta.*

1. P. RACEMOSA Dougl. Clallam County, *Elmer* 2579; Mt. Barnes, *Webster* 1918; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Hurricane Ridge, *Jones* 3405; Mt. Angeles, *Thompson* 5572, 7451; Marmot Lake, *Dickinson* 42; Boulder Creek, *Jones* 8491; Seven Lakes Basin, *Jones* 8224. Hudsonian. (H)

2. P. CONTORTA Benth. Mt. Ellinor, *Jennie V. Getty,* August 20, 1902. Arctic-alpine. (H)

3. P. ATROSANGUINEA Pennell & Thompson, Bull. Torr. Club 61: 443, 1934. *(P. bracteosa* of Fl. Wash.) Clallam County, *Elmer* 2577; Hurricane Ridge, *Jones* 3404, 4011; Lake Creek, *Otis,* 1331; Deer Lake, *Jones* 8335; Seven Lakes Basin, *Jones* 8212; Mt. Angeles, *Webster* 1926. Hudsonian. (H)

4. P. SURRECTA Benth. *(P. groenlandica surrecta* (Benth.) Piper) Big Creek Prairie, *Lamb* 1398; Clallam County, *Elmer* 2580; Mt. Angeles, *Webster* 1920, 1922; Mt. Seattle, *Webster* 1921; Mink Lake, *Otis* 1571; Marmot Lake, *Dickinson* 75; Seven Lakes Basin, *Jones* 8294; Boulder Creek, *Jones* 8435. Hudsonian. (H)

11. CASTILLEJA. Indian Paintbrush

Bracts yellow; galea shorter than the corolla-tube ..... 1. *C. levisecta.*
Bracts scarlet or crimson.
  Leaves and bracts cleft into linear lobes.
    Stems glabrous below; bracts rose-purple.
      Galea about half as long as the corolla-tube ..... 2. *C. olympica.*
      Galea about as long as the corolla-tube ..... 3. *C. oreopola.*
    Stems pilose to the base; bracts scarlet.
      Stems sparingly pilose.
        Leaves lanceolate to oblong-lanceolate, 2-5 cm. long ..... 4. *C. angustifolia,* var. *Bradburii.*
        Leaves ovate-oblong to obovate, 1-2.5 cm. long ..... 4a. var. *abbreviata.*
      Stems densely pilose; leaves harshly pubescent ..... 4b. var. *hispida.*

Leaves and bracts entire, or the latter lobed or toothed.
Stems erect; subalpine species.
Leaves and stems glabrous..... 5. *C. miniata.*
Leaves and stems crisp-puberulent..... 5a. var. *crispula.*
Stems decumbent; seashore species..... 6. *C. Dixoni.*

1. C. LEVISECTA Greenm. Port Ludlow, *Binns,* June 15, 1890. Humid Transition. (H)

2. C. **olympica** n. sp. Perennial; stems erect, slender, curved, simple, 15-20 cm. tall, glabrous below the inflorescence; leaves oblong-linear, 1-4 cm. long, 3-6 mm. wide, with 3-5 slender linear lobes, perfectly glabrous; bracts similar but smaller, scarlet or crimson, 3-cleft; spikes short, dense, 3-5 cm. long; calyx 15 mm. long, glandular-pilose, about equally cleft to above the middle, the lobes linear-lanceolate, acutish, 6 mm. long, midvein conspicuous; corolla puberulent, 18-20 mm. long, the galea 5-6 mm. long, the tube 12-13 mm. long, the lip 3 mm. long; stigma capitate, 2-lobed, extruded; anthers glabrous; fruit unknown.

Perennis, caulibus erectis gracilibus simplicibus 15-20 cm. altis inferiore parte glabris, foliis glabris oblongo-linearis 1-4 cm. longis 3-6 mm. latis, laciniis 3-5 linearibus, floribus bracteisque confertis in spicis ornatis brevibus 3-5 cm. longis, bracteis coccineis trifidis calycem excedentibus, calyce 15 mm. longis glandulare-pilosis in duas partes subaequaliter fissus, lobis 1 cm. longis lineari-lanceolatis acutis, corolla dorso puberulenti 18-20 mm. longa, tubo 12-31 mm. longo, galea exserta 5-6 mm. longa, labio inferiore non protuberanti laciniis 3 mm. longis, stylo exserto stigmate capitato bilobato, capsula ignota.

Castilleja olympica is closely related to *C. oreopola* Greenm., but is distinguishable by the short galea, the smaller flowers, and the narrower leaves. It is known only from the Olympic Mountains of Washington.

Type locality: subalpine meadow, 1800 m. altitude, Mt. Angeles, August 12, 1931, *Jones* 3808 (type in Herbarium, University of Washington, Seattle); Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Marmot Lake, *Dickinson* 118; east fork Quinault River, *Dickinson* 51; Lake Creek, *Otis* 1330. Hudsonian. (H)

3. C. OREOPOLA Greenm. Olympic Mountains, *Piper,* September 1895; Clallam County, *Elmer* 2590; Mt. Angeles, *Jones* 3675, 3176; Hurricane Ridge, *Jones* 3370; Marmot Pass, *Thompson* 9926, 7970; Seven Lakes Basin, *Jones* 8215; Mt. Appleton, *Jones* 8514. Hudsonian. (H)

4. C. ANGUSTIFOLIA (Nutt.) Don. var. BRADBURII Fern. Olympic Mountains, *Piper,* August, 1895; Hurricane Ridge, *Jones* 3403; Shelton, *Jones* 3827; Constance Ridge, *Jones* 5801; Scott's Prairie, *Jones* 6519. Transition. (H)

4a. Var. ABBREVIATA Fern. Olympic Mountains, *Piper* 2175; Clallam County, *Elmer* 2582, *Flett* 3001; Hurricane Ridge, *Thompson* 1069; Seven Lakes Basin, *Jones* 8302; Mt. Angeles, *Rigg,* July 22, 1929. Hudsonian. (H)

4b. Var. HISPIDA (Benth.) Fern. Hurricane Ridge, *Jones* 4030. Transition. (H)

5. C. MINIATA Dougl. Olympic Mountains, *Lamb* 1160; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Constance Ridge, *Jones* 5799; Mt. Angeles, *Rigg,* July 23, 1929, *Webster* 1899; Seven Lakes Basin, *Jones* 8217, 8220, 8278, 8284, 8308, 8328, 8393. Transition to Hudsonian. (H)

5a. Var. CRISPULA (Piper) Nels. & Macbr., Bot. Gaz. 51: 45, 1916. *(C. crispula* Piper) Mt. Olympus, *Flett* 3006. Hudsonian. (H)

6. C. DIXONI Fern. *(C. miniata,* var. *Dixoni* Nels. & Macbr., l.c.) Quinault, *Dixon,* July 17, 1898; Grays Harbor, *Wilkes Expedition* (fide Piper); Mora, *Jones* 3425; Ediz Hook, *Jones* 3393; Tatoosh Island, *Erna Gunther,* August 3, 1935. Humid Transition. (H)

12. ORTHOCARPUS

Stems 5-10 cm. high; leaves and bracts similar, pinnately dissected into filiform divisions; corolla purple, 4-5 mm. long ..... 1. *O. pusillus.*
Stems 10-30 cm. high; corolla 10-25 mm. long.
  Leaves linear-lanceolate, entire; bracts ovate, obtuse; corolla purple, 10-13 mm. long ..... 2. *O. imbricatus.*
  Leaves pinnately lobed; bracts palmately cleft; corolla yellow with purple markings, 15-25 mm. long ..... 3. *O. castilleoides.*

1. O. PUSILLUS Benth. Clallam County, *Elmer* 2592; Montesano, *Heller* 3877; Scott's Prairie, *Jones* 6492; Port Angeles, *Webster* 1948. Humid Transition. (Th)

2. O. IMBRICATUS Torr. Olympic Mountains, *Elmer* 2574, *Flett* 85; Mt. Angeles, *Jones* 3673; Marmot Pass, *Thompson* 11038. Not known to occur elsewhere in Washington. Hudsonian. (Th)

3. O. CASTILLEOIDES Benth. *(O. castilleoides,* var. *typicus* Keck, Proc. Calif. Acad. Sci. 16: 534, 1927.) Grays Harbor, *Wilkes Expedition* (fide Piper); Oyhut, *Lamb* 1269; Lilliwaup, *Piper* in 1890; Copalis, *Conard* 385; Mason County, *Piper* in 1890; Ocean City, *Jones* 3913, 3932. Humid Transition. (Th)

77. OROBANCHACEAE. Broomrape Family

1. OROBANCHE. Broomrape

Flowers in a dense cone-like spike ..... 1. *O. tuberosa.*
Flowers solitary or fascicled.
  Flowers 1-3 ..... 2. *O. Sedi.*
  Flowers many, fascicled ..... 3. *O. fasciculata.*

1. O. TUBEROSA Hook. *(Boschniakia strobilacea* Gray; *B. Hookeri* Walp.; *B. tuberosa* (Hook.) Jeps., Man. Fl. Pl. Calif. 954, 1925.) Near Union [City], *Piper* in 1890, (no. 889). Humid Transition. (Cr)

2. O. SEDI (Suksd.) Fern., Rhodora 28: 236, 1926. *(O. uniflora* L.; *O. uniflora* L., var. *Sedi* (Suksd.) Achey, Bull. Torr. Club 60: 446, 1933; *Thalesia uniflora* (L.) Britt.) Clallam County, *Elmer* 2555; Baldy Peak, *Lamb* 1331; Hurricane Ridge, *Webster* 1215. Transition. (Cr)

3. O. FASCICULATA Nutt. *(Thalesia fasciculata* (Nutt.) Britt.) Olympic Mountains, *Flett* 101, *Elmer* 2556, *Grant* in 1889; Mt. Angeles, *Webster* 1214. Transition. (Cr)

78. LENTIBULARIACEAE. Bladderwort Family

Terrestrial; leaves entire; corolla violet ..... 1. *Pinguicula.*
Aquatic; leaves dissected; corolla yellow ..... 2. *Utricularia.*

1. PINGUICULA. Butterwort

1. P. VULGARIS L. Olympic Mountains, *Piper,* August 1895, *Elmer* 2526; Mt. Angeles, *Thompson* 7415; Deer Lake, *St.John* 5751, *Jones* 8354; Mt. Colonel Bob, *Thompson* 7312; Heart Lake, *Dickinson* 48. Hudsonian and Arctic-alpine. (H)

Said to be abundant in the vicinity of the Low Divide. The above cited specimens are provisionally referred to *P. vulgaris;* possibly they represent an undescribed species.

2. UTRICULARIA. Bladderwort

1. U. VULGARIS L. Lake Ozette, *Jones* 5956. Humid Transition. (Cr)

79. PLANTAGINACEAE. Plantain Family

1. PLANTAGO. Plantain

Leaves ovate or lanceolate.
  Leaves ovate ..... 1. *P. major.*
  Leaves lanceolate ..... 2. *P. lanceolata.*
Leaves linear or linear-lanceolate.
  Pubescence of scape short-strigose; capsule 4 mm. long, dehiscent .. 3. *P. juncoides.*
  Pubescence of scape crisp-pilose; capsule 6-8 mm. long, indehiscent. 4. *P. macrocarpa.*

1. *P. major* L. Port Crescent, *Lawrence* 240; Lake Cushman, *St. John & Schweinfurth* 5146; Lake Crescent, *Jones* 3495. (H)

2. *P. lanceolata* L. Humptulips, *Jones* 3714; Lake Crescent, *Jones* 3508. (H)

3. P. JUNCOIDES L. *(P. juncoides,* var. *typica* Fern., Rhodora 27: 93-104, 1925; *P. maritima* of Fl. Wash.) Clallam County, *Elmer* 2817; Lapush, *St.John & Schweinfurth* 5418; Mora, *Jones* 3422; Quilcene, *Beattie* 3635; Port Discovery, *St.John* 5822; Port Hadlock, *Jones* 3104; Dosewallips River, *Thompson* 6600. Humid Transition. (H)

4. P. MACROCARPA C. & S. Wreck Creek Prairie, near Grenville, *Conard* 379; Lake Ozette, *Jones* 5975, *Otis* 1532; Baker Prairie, *Thompson* 9391; near Sequim, *Grant* in 1915. This species is remarkable for its indehiscent capsules. Humid Transition. (H)

80. RUBIACEAE. Madder Family

1. GALIUM. Bedstraw

Leaves 3-veined, in whorls of 4.
- Leaves linear to oblanceolate; flowers white ..... 1. *G. boreale.*
- Leaves oblong-ovate; flowers greenish-yellow ..... 2. *G. oreganum.*

Leaves 1-veined.
- Leaves 6-8 in each whorl, acute or cuspidate; fruit hispid with hooked hairs.
  - Leaves linear-spatulate; flowers white ..... 3. *G. Aparine.*
  - Leaves elliptical-lanceolate; flowers greenish-white ..... 4. *G. triflorum.*
- Leaves 4, 5, or 6 in each whorl, obtuse; fruit smooth or nearly so; corolla often 3-lobed.
  - Flowers numerous, in cymes, the pedicels short, divaricate; corolla 2 mm. in diameter ..... 5. *G. cymosum.*
  - Flowers 1-3 on each peduncle; corolla 1-1.5 mm. in diameter ..... 6. *G. trifidum.*

1. G. BOREALE L. Montesano, *Heller* 4020; Quillayute Prairie, *Jones* 3573; Humptulips, *Thompson* 9395; Lake Ozette, *Jones* 5958. Transition. (H)

2. G. OREGANUM Britt. *(G. kamtschaticum oreganum* (Britt.) Piper) Clallam County, *Elmer* 2547; Lake Cushman, *Piper* 921; Skokomish Valley, *Kincaid,* May 1892; Crystal Creek, *Jones* 8449; Soleduck River, *Jones* 8381. Amply distinct from *G. kamtschaticum* Steller, of which topotypes have been studied. Canadian. (H)

3. G. APARINE L. Montesano, *Heller* 4007; Skokomish River, *Henderson,* May 12, 1892. Transition. (Th)

4. G. TRIFLORUM Michx. Clallam County, *Elmer* 2548; Port Angeles, *Webster* 1519, 1522; Skokomish Valley, *Kincaid,* June 7, 1892; Quillayute Prairie, *Jones* 3407; Mt. Angeles, *Jones* 3184; Elwha River, *Jones*

3275, 3337; Port Townsend, *Meehan,* in 1883; Ocean City, *Jones* 3923; Mt. Colonel Bob, *Thompson* 7285; Lake Crescent, *Jones* 3469; Moclips, *Thompson* 9342. Transition. (H)

5. G. CYMOSUM Wieg. Montesano, *Heller* 4009; Port Crescent, *Lawrence* 290; Sequim, *Grant,* June 1904. Humid Transition. (H)

6. G. TRIFIDUM L. *(G. trifidum* L., var. *pacificum* Wieg.; *G. Claytoni* Michx., var. *subbiflorum* Wieg.; *G. trifidum subbiflorum* Wieg.) Hoquiam, *Lamb* 1220; Clallam County, *Elmer* 2547; Westport, *Lamb* 1107; Quillayute Prairie, *Jones* 3791; Ocean City, *Jones* 3906; Humptulips Bog, *Jones* 5818. Transition. (H)

81. CAPRIFOLIACEAE. Honeysuckle Family

Corolla rotate, regular; style short, 3-5-cleft, or none.
- Leaves pinnate; fruit 3-5-seeded ..... 1. *Sambucus.*
- Leaves simple; fruit 1-seeded ..... 2. *Viburnum.*

Corolla tubular to campanulate; style elongated; leaves simple.
- Creeping herbaceous vine; fruit a dry, 3-celled pod ..... 3. *Linnaea.*
- Shrubs, erect or twining (rarely trailing); fruit a berry.
  - Corolla regular; fruit a white, 2-seeded, berry-like drupe ..... 4. *Symphoricarpos.*
  - Corolla more or less irregular, commonly 2-lipped; fruit a red or black berry ..... 5. *Lonicera.*

1. SAMBUCUS. Elder

Inflorescence pyramidal or ovoid; fruit usually red; pith yellowish brown ..... 1. *S. callicarpa.*
Inflorescence flat-topped; fruit blue, very glaucous; pith whitish ..... 2. *S. glauca.*

1. S. CALLICARPA Greene. *(S. leiosperma* Leiberg) Clallam County, *Elmer* 2737; Skokomish River, *Kincaid* in 1890; Montesano, *Heller* 3922; Duckabush River, *Jones* 3092; Lake Quinault, *Thompson* 6265. Humid Transition (occasional in the Hudsonian zone). (Ph)

2. S. GLAUCA Nutt. *(S. coerulea* Raf.) Clallam County, *Elmer* 2740. Transition. (Ph)

A common shrub in dry ground, conspicuous in the autumn on account of the abundant bluish fruits.

2. VIBURNUM

1. V. PAUCIFLORUM Pylaie. High-bush Cranberry. Ocean City, *Jones* 3874; Lake Ozette, *Rigg* in 1933.

Throughout the rest of its western American range, this shrub occurs in the Canadian and Hudsonian zones, but on the Olympic Peninsula it is obviously in the Humid Transition. It is evidently one of the half dozen Canadian zone species which descend to the next lower zone in the immediate vicinity of the ocean coast. (Ph)

3. LINNAEA. Twinflower

1. L. BOREALIS L., var. LONGIFLORA Torr. *(L. americana* of Fl. Wash.; *L. borealis longiflora* of Fl. Nw. Coast.) Clallam County, *Elmer* 2739; Port Townsend, *Meehan* in 1883; Lake Crescent, *Jones* 3466; trail to Constance Ridge, *Jones* 5861. Humid Transition and Canadian. (Ch)

4. SYMPHORICARPOS. Waxberry

Erect shrub with twigs glabrous or nearly so; stamens shorter than the corolla, which is densely villous within.
- Leaves pubescent beneath ..... 1. *S. albus.*
- Leaves glabrous beneath ..... 1a. f. *laevigatus.*

Trailing shrub with pubescent leaves and twigs; stamens as long as the corolla, which is scarcely pubescent within ..... 2. *S. mollis.*

1. S. ALBUS (L.) Blake. *(S. racemosus* Michx.; *S. hyalinus* Heller) Snowberry. Clallam County, *Elmer* 2738; Montesano, *Heller* 3948; Quillayute Prairie, *Jones* 3747; Mt. Angeles, *Thompson* 7355. Transition. (Ph)

1a. Forma **laevigatus** (Fern.) n. comb. *S. racemosus,* var. *laevigatus* Fern., Rhodora 7: 167, 1905; *S. albus,* var. *laevigatus* Blake, Rhodora 16: 119, 1914. Port Hadlock, *Jones* 3101; Elwha River, *Jones* 3523; Montesano, *Jones* 8399. Scarcely worth nomenclatorial recognition, as all intergradations with typical *S. albus* are found. Transition. (Ph)

2. S. MOLLIS Nutt. Matlock, *Jones* 3722; trail to Constance Ridge, *Jones* 5773; Webb Hill, near Union, *Jones* 6506. Transition. (Ch)

5. LONICERA. Honeysuckle

Twining; flowers in terminal clusters; upper leaves connate.
- Flowers orange; stamens and style shortly exserted ..... 1. *L. ciliosa.*
- Flowers pink; stamens and style long-exserted ..... 2. *L. hispidula.*

Erect; flowers in axillary pairs; leaves not connate.
- Flowers yellow; fruit black ..... 3. *L. involucrata.*
- Flowers whitish; fruit red ..... 4. *L. utahensis.*

1. L. CILIOSA (Pursh) Poir. Orange Honeysuckle. Montesano, *Heller* 3938; Skokomish Valley, *Kincaid,* June 15, 1892; Sequim, *Grant,* May 1915. Transition. (Ph)

2. L. HISPIDULA Dougl. Purple Honeysuckle. Port Townsend, *Meehan* in 1883; Port Hadlock, *Jones* 3141. Humid Transition. (Ph)

3. L. INVOLUCRATA (Richards.) Banks. Swamp Honeysuckle. Hoquiam, *Lamb* 1014; Sequim, *Grant,* June 1915; Quillayute Prairie, *Jones* 3786; Ocean City, *Jones* 3881, 3929; Lake Quinault, *Thompson* 6262; Beaver Creek, *Jones* 4550; Taholah, *Jones* 6491; Shelton, *Jones* 6530. Transition. (Ph)

4. L. UTAHENSIS Wats. Olympic Mountains, *Flett* 99; *Elmer* 2736; Mt. Angeles, *Jones* 3318, *G.L.Jenks,* June 29, 1908; trail to Constance Ridge, *Jones* 5858. Hudsonian. (Ph)

82. VALERIANACEAE. Valerian Family

Perennial; calyx-teeth plumose; fruit 1-celled ..... 1. *Valeriana.*
Annual; calyx-teeth not plumose; fruit 3-celled ..... 2. *Valerianella.*

1. VALERIANA. Valerian

Leaflets sinuate to sinuate-dentate ..... 1. *V. sitchensis.*
Leaflets entire or undulate ..... 1a. var. *Scouleri.*

1. V. SITCHENSIS Bong. Olympic Mountains, *Grant* in 1890; Baldy Peak, *Lamb* 1339a; Clallam County, *Elmer* 2792; Hurricane Ridge, *Jones* 3385; Mt. Angeles, *Thompson* 7536; Lake Constance, *Thompson* 7898; Marmot Pass, *Thompson* 9948; Marmot Lake, *Dickinson* 38; Seven Lakes Basin, *Jones* 8299. Chiefly Hudsonian. (H)

1a. Var. SCOULERI (Rydb.) Piper, as a trinomial. *(V. Scouleri* Rydb.) Mt. Baldy, *Conard* 296; Lake Crescent, *Lawrence* 256, *Jones* 4535; Montesano, *Heller* 3937; Dosewallips River, *Thompson* 6551; Mt. Angeles, *Thompson* 7574. Hudsonian. (H)

2. VALERIANELLA

Flowers rose-colored, spurred, 6-7 mm. long; fruit winged ..... 1. *V. congesta.*
Flowers white, 2-3 mm. long.
  Corolla spurless; fruit winged ..... 2. *V. anomala.*
  Corolla spurred; fruit wingless ..... 3. *V. samolifolia.*

1. V. CONGESTA Lindl. Noted by Menzies on Protection Island in 1792. Humid Transition. (Th)

2. V. ANOMALA Gray. Hoquiam, *Lamb* 1021; Port Angeles, *Webster* 2131. Humid Transition. (Th)

3. V. SAMOLIFOLIA (DC.) Gray. Port Crescent, *Lawrence* 263; Lake Crescent, *Jones* 4554. Humid Transition. (Th)

83. DIPSACACEAE. Teasel Family

1. DIPSACUS. Teasel

1. *D. sylvestris* Huds. Port Townsend, *Edwards,* July 1896; Port Hadlock, *Jones* 3278. (H)

84. CURCURBITACEAE. Gourd Family

1. ECHINOCYSTIS

1. E. OREGANA (T. & G.) Cogn. *(Micrampelis oregana* (T. & G.) Greene) Old Man Root. Montesano, *Heller* 3873; Humptulips River, *Jones* 6463. Transition. (Cr)

85. CAMPANULACEAE. Bellflower Family

Corolla regular; anthers separate.
  Corolla campanulate.
    Ovary and capsule turbinate or hemispherical ..... 1. *Campanula.*
    Ovary and capsule clavate ..... [*Githopsis*]
  Corolla rotate; ovary and capsule linear-obconical ..... 2. *Specularia.*
Corolla irregular; anthers united ..... 3. *Lobelia.*

1. CAMPANULA. Bellflower

Flowers very pale blue or whitish; style exserted; corolla-lobes spreading or recurved ..... 1. *C. Scouleri.*
Flowers bright blue; style included; corolla-lobes erect.
  Cauline leaves linear or lanceolate, entire ..... 2. *C. rotundifolia.*
  Leaves spatulate-lanceolate, dentate ..... 3. *C. Piperi.*

1. C. SCOULERI Hook. Clallam County, *Elmer* 2741; Montesano, *Heller* 3956; Mt. Angeles, *Thompson* 7362; Rainbow Camp, *Thompson* 9865; Crystal Creek, *Jones* 8434. Humid Transition and Canadian. (H)

2. C. ROTUNDIFOLIA L. Clallam County, *Elmer* 2742; Mt. Anderson, *R.T.Davison,* August 31, 1928; Quillayute Prairie, *Jones* 3611; Mt. Angeles, *Jones* 3193; Hurricane Ridge, *Jones* 3349; Lake Constance, *Thompson* 7881; Marmot Pass, *Thompson* 9870; Marmot Lake, *Dickinson* 54; Constance Ridge, *Jones* 5791; Seven Lakes Basin, *Jones* 8281; Tatoosh Island, *Erna Gunther,* August 3, 1935. Transition to Arctic-alpine. (H)

3. C. PIPERI Howell. Olympic Mountains, *Flett* 125, 814, *Elmer* 2743; Mt. Steele, *Piper* 2217, *Dickinson* 44; Mt. Storm King, *Lawrence* 342; Mt. Angeles, *Jones* 3167, 3240; Hurricane Ridge, *Jones* 3346; Lake Constance, *Thompson* 7880; Marmot Pass, *Thompson* 9937; Seven Lakes Basin, *Jones* 8260. This distinct and attractive species is known to occur only in the Olympic Mountains. Arctic-alpine. (H)

[*Githopsis specularioides* Nutt. "Chehalis [Grays Harbor] County, Washington, and southward" according to Fl. Nw. Coast, p. 344, but no specimens from the Olympic Peninsula have been seen.]

2. SPECULARIA

1. S. PERFOLIATA (L.) A.DC. Sequim, *Jones* 3707. Transition. (Th)

3. LOBELIA

1. L. DORTMANNA L. *(Rapuntium Dortmanna* (L.) Presl) Lake Crescent, *Jones* 3555, *Lawrence* 312; Lake Ozette, *Jones* 5940, *Otis* 1770. Transition in Washington. (Cr)

86. COMPOSITAE. Composite Family

Heads composed of ray- and disk-flowers or of disk-flowers only; juice not milky (Series 1. Tubuliflorae).
- Pappus of capillary bristles.
  - Heads radiate.
    - Leaves all or mostly opposite ... 28. *Arnica.*
    - Leaves alternate or basal.
      - Rays yellow (sometimes short and inconspicuous).
        - Phyllaries in one series, about equal in length (a few short basal ones sometimes present); pappus single ... 29. *Senecio.*
        - Phyllaries in several series, very unequal, overlapping.
          - Heads numerous, small, paniculate; pappus single ... 3. *Solidago.*
          - Heads few, large, corymbose or solitary.
            - Pappus double, the outer row very short ... 4. *Chrysopsis.*
            - Pappus single ... 2. *Haplopappus.*
      - Rays not yellow.
        - Leaves large, reniform-orbicular, basal; phyllaries in one series ... 26. *Petasites.*
        - Leaves smaller, cauline and basal.
          - Phyllaries usually in 1 or 2 series; rays usually narrow and numerous ... 7. *Erigeron.*
          - Phyllaries in 2-5 series; rays broader, fewer ... 6. *Aster*
- Heads rayless; corollas all tubular (marginal corollas often ray-like in *Centaurea*).
  - Flowers whitish or white; receptacle naked.
    - Phyllaries firm, carinate, not scarious; flowers all perfect and alike ... 27. *Luina.*
    - Phyllaries scarious.
      - Heads not dioecious; flowers all fertile, both perfec and pistillate in the same head ... 9. *Gnaphalium.*
      - Heads dioecious (or polygamo-dioecious).
        - Pappus bristles of the staminate flowers scarcely thickened at the apex, those of the pistillate flowers separate at the base ... 10. *Anaphalis.*
        - Pappus bristles of the staminate flowers thickened or barbellate at the apex, those of the pistillate flowers united at base into a ring ... 11. *Antennaria.*
  - Flowers purple, blue, or yellow (rarely white).
    - Leaves prickly; pappus plumose, united at base and deciduous in a ring ... 30. *Cirsium.*
    - Leaves not prickly.
      - Phyllaries with hooked tips; heads bur-like ... 31. *Arctium.*
      - Phyllaries imbricated.
        - Leaves opposite; flowers yellow ... 28. *Arnica.*
        - Leaves alternate.
          - Pappus of short rigid bristles or scales, or none ... 32. *Centaurea.*
          - Pappus of capillary bristles.
            - Flowers purple ... 33. *Saussurea.*
            - Flowers yellow ... 29. *Senecio.*
- Pappus not of capillary bristles.
  - Pappus of minute scales or of rigid, deciduous awns.
    - Rays white; disk yellow; leaves opposite ... 12. *Galinsoga.*

Rays yellow.
Leaves alternate.
Phyllaries in several rows, recurved or hooked at the tip, gummy ..... 1. *Grindelia.*
Phyllaries in one row.
Herbage resinous-dotted; phyllaries spreading or reflexed; receptacle globose or hemispherical ... 16. *Helenium.*
Herbage more or less white-floccose; phyllaries erect; receptacle flat or convex ..... 17. *Eriophyllum.*
Leaves opposite; phyllaries in one row ..... 18. *Baeria.*
Pappus none.
Heads radiate; disk flowers yellow.
Rays yellow (sometimes very short).
Phyllaries strongly carinate; annuals ..... 13. *Madia.*
Phyllaries flat; perennials ..... 15. *Jaumea.*
Rays white or pink.
Rays 4 or 5, 2-3 mm. long; heads numerous in a flat-topped panicle; leaves cut into filiform divisions .. 19. *Achillea.*
Rays numerous, longer; heads solitary.
Leaves all basal; plants inodorous ..... 5. *Bellis.*
Stems bearing leaves; strongly scented, or bitter-aromatic herbs.
Leaves cut into filiform divisions; receptacle chaffy ..... 20. *Anthemis.*
Leaves toothed or incised; receptacle naked ..... 21. *Chrysanthemum.*
Heads rayless (or rays very inconspicuous).
Fruiting heads spiny; staminate and pistillate flowers in different heads on the same plant; seashore perennials ..... 14. *Franseria.*
Heads not spiny.
Leaves large, deltoid-ovate, green above, white beneath; phyllaries 5-9, glandular ..... 8. *Adenocaulon.*
Leaves usually lobed or dissected.
Heads solitary or corymbose; flowers yellow or yellowish green.
Heads few or solitary.
Achenes pedicelled; perennial ..... 25. *Cotula.*
Achenes sessile; annual or biennial ..... 22. *Matricaria.*
Heads corymbose ..... 23. *Tanacetum.*
Heads numerous, racemose or paniculate; flowers greenish ..... 24. *Artemisia.*
Heads composed wholly of perfect flowers with ligulate corollas; herbs, usually with milky juice; leaves alternate or basal (Series 2. Liguliflorae).
Pappus none; achenes 20-30-nerved; flowers yellow ..... 34. *Lapsana.*
Pappus present.
Pappus of numerous short, blunt scales; heads sessile; flowers blue ..... 35. *Cichorium.*
Pappus of capillary bristles, or of bristles which have a scale-like base.
Pappus-bristles 5-10, expanded and scale-like at base ... 36. *Scorzonella.*
Pappus-bristles numerous, not widened at base.
Pappus plumose; achenes long-beaked.
Receptacle naked; pappus long-plumose; leaves entire, grass-like ..... 37. *Tragopogon.*
Receptacle chaffy; pappus short-plumose; leaves all basal, coarsely toothed or lobed ..... 38. *Hypochoeris.*

Pappus bristles not plumose.
  Heads several per stem; leaves not all basal.
    Achenes flattened; leaves usually lobed and often with spiny teeth.
      Achenes beakless ..... 39. *Sonchus.*
      Achenes beaked ..... 40. *Lactuca.*
    Achenes cylindrical or prismatical.
      Pappus white, copious, soft; heads erect ..... 41. *Crepis.*
      Pappus of few rather rigid scabrous light brownish bristles.
        Heads erect; leaves not hastate ..... 42. *Hieracium*
        Heads pendent; leaves deltoid-hastate ..... 43. *Prenanthes.*
  Heads solitary; leaves all basal.
    Achenes not muricate, 10-nerved ..... 44. *Agoseris.*
    Achenes muricate near apex, 4-5-nerved ..... 45. *Taraxacum.*

1. GRINDELIA. Gum Weed

1. G. STRICTA DC. *(G. oregana* Gray; *G. oregana wilkesiana* Piper; *G. oregana,* f. *Wilkesiana* St.John & R.Sprague, Proc. Biol. Soc. Wash. 41: 199, 1928; *G. stricta,* var. *aestuarina* Steyermark, Ann. Mo. Bot. Gard. 21: 560, 1934.) Port Ludlow, *Binns,* September 15, 1890; Oyhut, *Lamb* 1270; Union [City], *Piper* in 1890; Copalis, *Jones* 3661; Sequim, *Jones* 3730; Mora, *Jones* 3442; Port Angeles, *Thompson* 7855; east side Washington Harbor, *Jones* 8520. Humid Transition. (H)

Common in salt marshes, and on sand spits and high sea beaches around the Peninsula.

2. HAPLOPAPPUS

1. H. LYALLII Gray. *(Hoorebekia Lyallii* (Gray) Piper) Olympic Mountains, *Flett* 802, 3031; Mt. Angeles, *Jones* 3678; Marmot Pass, *Thompson* 7994, 9897. Arctic-alpine. (H)

3. SOLIDAGO. Goldenrod

Branches of the panicle racemiform.
  Leaves linear-lanceolate, nearly entire, thick and firm; heads 6 mm. high ..... 1. *S. Tolmieana.*
  Leaves lanceolate, serrate.
    Panicle usually 3-10 cm. wide, elongate, cylindrical to narrowly rhombic in outline, compact, scarcely leafy ..... 2. *S. elongata.*
    Panicle ample, pyramidal or corymbiform, more or less leafy, branching, 10-30 cm. long, 10-20 cm. wide, subtended by narrow leaves ..... 2a. var. *fallax.*
Branches of the panicle not racemiform.
  Alpine species; phyllaries acutish; panicle dense, 3-7 cm. long ..... 3. *S. algida.*
  Lowland species; phyllaries obtuse.
    Panicle loose, racemiform ..... 4. *S. vespertina.*
    Panicle dense, branched ..... 5. *S. glutinosa.*

1. S. TOLMIEANA Gray. Sequim, *Grant,* August 20, 1916. Humid Transition. (H)

This plant occurs on prairies in Washington and Oregon, west of the Cascade Mountains. It is distinct from *S. missouriensis* Nutt. in the pu-

bescent stems, panicle-branches, and achenes, in the somewhat larger heads, and in the restricted geographical range.

2. S. ELONGATA Nutt. *(S. lepida* DC., var. *elongata* (Nutt.) Fern., Rhodora 17: 9, 1915.) Quillayute Prairie, *Jones* 3452, 3580, 3744; six miles east of Beaver, *Jones* 3742; Lake Ozette, *Jones* 5926. Humid Transition. (H)

2a. Var. **fallax** (Fern.) n. comb. *S. lepida* DC., var. *fallax* Fern., l.c. Grenville, *Conard* 347; along ocean beach, Steamboat Creek, *Otis* 1380; Mora, *Jones* 8438; Lapush, *St.John & Schweinfurth* 5413. Humid Transition. (H)

3. S. ALGIDA Piper. *(S. corymbosa* of Fl. Wash.) Constance Ridge, *Jones* 5793; Mt. Barnes, *Flett,* August 20, 1907; Lake Constance, *Thompson* 7924; Marmot Pass, *Thompson* 7942, 9895; Mt. Colonel Bob, *Thompson* 7318; Olympic Mountains, *Piper* 2200, 2199; *Elmer* 2596; Baldy Peak, *Lamb* 1313; Mt. Angeles, *Jones* 3684, 3191; Heart Lake, *Dickinson* 58. Hudsonian and Arctic-alpine. (H)

Very similar to *S. ciliosa* Greene of the Rocky Mountains, with which it is probably conspecific.

4. S. VESPERTINA Piper. *(S. Purshii* of Fl. Wash.) Mason County, *Piper* 886; Skokomish River, *Kincaid,* June 15, 1892. Humid Transition. (H)

5. S. GLUTINOSA Nutt. Shelton, *Jones* 3816. Humid Transition. (H)

4. CHRYSOPSIS. Golden Aster

1. C. OREGANA (Nutt.) Gray. Olympic Mountains, *Piper* 2194, 1063. Transition. (H)

5. BELLIS. Daisy

1. *B. perennis* L. Sequim, *Grant;* Hoh River, *Otis* 1278. (H)

6. ASTER

Rays white; phyllaries imbricated, in 2-3 rows, pubescent, acute, ciliolate at tip ..... 1. *A. paucicapitatus.*
Rays violet.
  Involucres and peduncles glandular ..... 2. *A. modestus.*
  Involucres and peduncles not glandular.
    Cauline leaves auriculate at base; heads 3-4 cm. broad; rays 15-20 mm. long, dark violet ..... 3. *A. foliaceus,* var. *frondeus.*
    Cauline leaves sessile but not auriculate; heads 1.5-3 cm. broad; rays 7-12 mm. long, pale violet ..... 4. *A. Douglasii.*

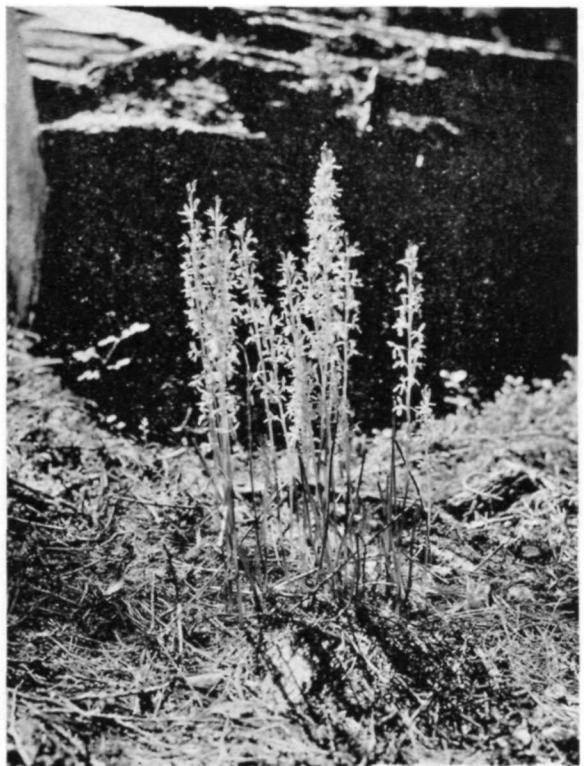

Photo by Victor B. Scheffer

Fig. A. ***Corallorrhiza maculata.***

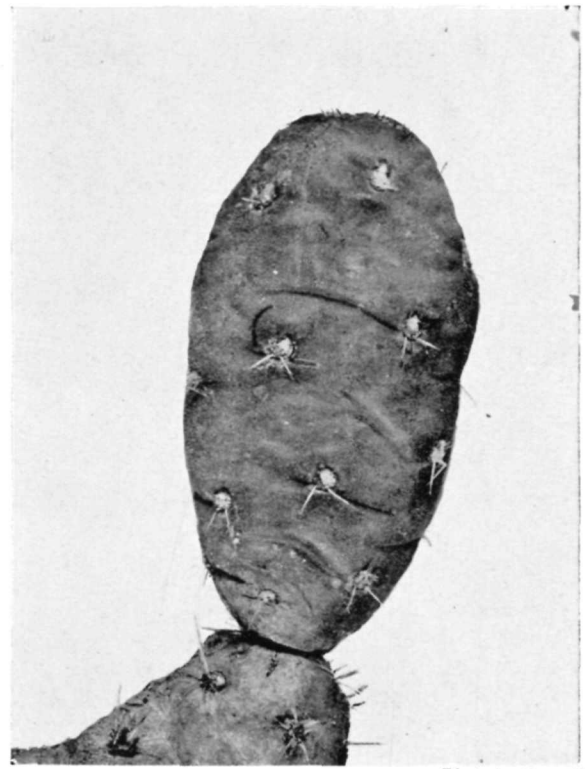

Photo by the author

Fig. B. ***Opuntia fragilis.***

1. A. PAUCICAPITATUS Robins. *(Eucephalus paucicapitatus* (Robins.) Greene) Olympic Mountains, *Piper* 2195, 934, 926, *Flett* 819; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Hurricane Ridge, *Jones* 3350; Mt. Angeles, *Jones* 3680; Marmot Pass, *Thompson* 9949; Mt. Colonel Bob, *Thompson* 9966; Hoh Lake, *Otis* 1349; Skokomish River, *Schwartz* in 1933; Seven Lakes Basin, *Jones* 8288, 8309. Hudsonian. (H)

In Washington this aster is confined to the Olympic Mountains. Recently it has been collected on Mt. Arrowsmith, Vancouver Island, British Columbia.

2. A. MODESTUS Lindl. *(A. major* of Piper, not Porter.) Skokomish River, *Piper* 2189; Lake Cushman, *St.John* 5153. Transition. (H)

3. A. FOLIACEUS Lindl., var. FRONDEUS Gray. Olympic Mountains, *Piper* 2197 (not Olympia, as cited in Fl. Wash.); Lake Cushman, *Henderson* 2041; Elk Lake, *Otis* 1323; Bogachiel Peak, *Otis* 1340; Skokomish River, *Piper* 1070; Elwha River, *H.C.Stevens,* August 22, 1907; Deer Lake, *Jones* 5932; Heart Lake, *Dickinson* 61; Seven Lakes Basin, *Jones* 8216, 8306, 8283. Hudsonian. (H)

Specimens reported by Leach (1928) as var. *apricus* Gray, are better referred to the above variety.

4. A. DOUGLASII Lindl. Lake Quinault, *Lamb* 1281; Port Discovery, *St.John* 5824; Clallam County, *Elmer* 2635; Duckabush River, *Jones* 3806; Lake Crescent, *Jones* 3464. Transition. (H)

7. ERIGERON. Fleabane

Rays very short, inconspicuous.
- Involucre nearly glabrous; heads numerous, 3-5 mm. high, in a dense panicle ..... 1. *E. canadensis.*
- Involucre hirsute; heads few, corymbose, 10-12 mm. high ..... 2. *E. acris,* var. *debilis.*

Rays conspicuous.
- Leaves 3-5-lobed; rays pink (sometimes lacking) ..... 3. *E. trifidus.*
- Leaves entire or toothed.
  - Low alpine plants with entire leaves, solitary heads, and white rays ..... 4. *E. Flettii.*
  - Taller plants (30-90 cm. high).
    - Rays broad, 30-70, more than 1 mm. wide, pappus simple.
      - Involucre villous; rays white.
        - Rays 10-12 mm. long ..... 5. *E. Thompsoni.*
        - Rays 12-15 mm. long ..... 6. *E. Aliceae.*
      - Involucre viscid; rays 12-15 mm. long ..... 7. *E. salsuginosus.*
    - Rays narrow, 100-150, 0.5 mm. wide; pappus double; involucre hirsute.
      - Leaves entire; rays violet ..... 8. *E. speciosus.*
      - Leaves dentate; rays pink ..... 9. *E. philadelphicus.*

1. E. CANADENSIS L. Mason County, *Kincaid* in 1892. Transition. (Th)

2. E. ACRIS L., var. DEBILIS Gray. Olympic Mountains, *Flett* 820, *Piper* in 1890; Mt. Angeles, *Jones* 3325; Marmot Pass, *Thompson* 9892. Arctic-Alpine. (H)

E. acris L., var. *asteroides* (Andrz.) DC. is said (Rhodora 36: 13, 1934) to have been collected on Mt. Angeles.

3. E. TRIFIDUS Hook. *(E. compositus* Pursh, var. *trifidus* (Hook.) Gray; *E. compositus,* var. *multifidus* (Rydb.) Macbr. & Pays., Contr. Gray Herb. n.s. 49: 75, 1917, as to name but not cited specimens; *E. compositus,* var. *multifidus* (Rydb.) Macbr. & Pays., Payson, Univ. Wyo. Publ. Bot. 1: 172-175, 1926, at least as to Washington specimens cited.) Olympic Mountains, *Piper,* August 1895, *Flett* 120, *Elmer* 2597, *Grant* 30; Mt. Steele, *Piper,* August 1895; Mt. Angeles, *Jones* 3805, *Rigg,* July 23, 1929; Marmot Pass, *Thompson* 7967, 9923; Boulder Peak, *Jones* 8441. Arctic-alpine. (H)

4. E. **Flettii** n. sp. A low tufted perennial with a stout erect rhizome; stems 1-3, erect, slender, scapiform, erect or ascending, 5-10 cm. high, sparsely appressed-pilose; petioles of the basal leaves equalling or exceeding the blades which are 2-3 cm. long, oblanceolate, obtuse, entire, glabrous or sparsely pilose and ciliate; cauline leaves sessile, lanceolate or linear, or the uppermost reduced to bracts; peduncles sparsely pilose, non-glandular; phyllaries green, in 1-2 series of almost equal length, not purplish tinged, pilose, non-glandular, lanceolate, acuminate, 5-7 mm. long, the outermost 1-1.5 mm. wide; rays 25-30, white, elliptical, 6-7 mm. long, 2-3 mm. wide, 4-nerved, shortly bidentate at apex; disk flowers numerous, the corollas yellow, 3-4 mm. long, glabrous; pappus double, consisting of 15-20 whitish, hispidulous bristles about 3 mm. long, and about as many short ones 0.25 mm. long; style tips oblong, obtuse, 0.75 mm. long; achenes hispid.

Perennis herbaceus 5-10 cm. altus, rhizomate erecto, caulibus monocephalis tenuis pilosus, folia basilia oblanceolata integra obtusa 2-3 cm. longa plus minusve glabra vel pilosa, caulina sessilia angusta lanceolata vel suprema bracteiformia, involucri 2-3-seriati phyllaria lanceolata acuminata pilosa 5-7 mm. longa, ligulis 25-30 albis ellipticis 6-7 mm. longis 2-3 mm. latis 4-nervis, corollae disci flavae, pappus duplex 3 mm. longus, pappi aristae subaequales exterioribus brevissimus, styli rami oblongi obtusi 0.75 mm. longi, achaenia hispidula.

Erigeron Flettii belongs to the section Euerigeron Gray and is probably most closely related to a species of the Rocky Mountain region, *E. simplex* Greene, for which it has been passing. The Rocky Mountain plant may be distinguished at a glance by the pink, linear rays, the whit-

ish-woolly heads, and the glandular pubescence of the phyllaries and peduncles. To particularize: *E. simplex* Greene has the heads densely villous at base, the upper part of the peduncles densely glandular as well as with some whitish spreading pubescence, the phyllaries purplish tinged and copiously villous especially toward the base, the pubescence of the stems is villous, spreading, with some shorter glandular hairs intermixed, and the rays are purplish or pink, linear, 7-10 mm. long, 1-1.5 mm. wide. *E. simplex* is not known to occur in Washington. *E. Flettii* has been found only in the Olympic Mountains.

This species is named for Mr. J. B. Flett who discovered it in 1898. To Dr. Aven Nelson of the Rocky Mountain Herbarium at Laramie, Wyoming, thanks are due for the loan of some Rocky Mountain material of *E. simplex* for comparison.

The following specimens of *E. Flettii* have been studied: On cliffs and in rocky places, alt. 5700 ft., Olympic Mountains, *Flett,* August 30, 1898 (type); in crevices of rocks above Lake Constance, *Thompson* 7927; Marmot Pass, *Stanley Andersen,* October 13, 1933; Mt. Ellinor, *Leslie Muller,* June 26 and July 19, 1934. Arctic-alpine (H)

5. E. THOMPSONI S.F.Blake, Rhodora 34: 238, 1932. Near Lake Quinault, *Thompson* 7336; Baker Prairie, *Thompson* 9381; Humptulips bog, *Jones* 5817. Humid Transition. (H)

6. E. ALICEAE Howell. *(E. amplifolius* Howell) Seven Lakes Basin, *Jones* 8243; Boulder Lake, *Jones* 8444; Mt. Colonel Bob, *Thompson* 9973 (distributed as *E. Coulteri* Porter). Hudsonian. (H)

All the collections from the Olympic Mountains have white rays, but the plants are otherwise identical with Oregon material of *E. Aliceae.* This species is yet unreported from the Cascade Mountains of Washington.

7. E. SALSUGINOSUS (Richards.) Gray. Hurricane Ridge, *Jones* 3289, 3259; Marmot Pass, *Thompson* 9916; Marmot Lake, *Dickinson* 8; Mt. Angeles, *Thompson* 5546, 7519, 7441; Constance Ridge, *Jones* 5802; Mt. Colonel Bob, *Thompson* 7249; Mt. Carrie, *St.John* 5817; Olympic Mountains, *Elmer* 2623, *Piper* in 1890; Mt. Ellinor, *Jennie V. Getty,* August 1902; Seven Lakes Basin, *Jones* 8316. Hudsonian. (H)

8. E. SPECIOSUS DC. Port Townsend, *Meehan* in 1883; Olympic Mountains, *Flett* 812; Hurricane Ridge, *Jones* 3402. Transition. (H)

[*E. villosulus* Greene, Leaflets 2: 215, 1912, from "Grassy summit of Mt. Angeles, western Washington, at 6000 feet, *J.B.Flett,* 12 August 1911. A member of the leafy stemmed group to which *E. macranthus*

and *speciosus* belong, but a dwarf subalpine, almost woolly-looking plant". This species has not been rediscovered.]

9. E. PHILADELPHICUS L. Quillayute Prairie, *Jones* 3602; Elwha River, *Jones* 3119, 3998; Lake Quinault, *Thompson* 7324. Transition. (H)

8. ADENOCAULON

1. A. BICOLOR Hook. Silvergreen. Port Townsend, *Meehan* in 1883; Olympic Mountains, *Edwards* in 1889; Olympus Ranger Station, *St.John* 5797; Elwha River, *Jones* 3338; Mt. Angeles, *Thompson* 7383. Humid Transition. (H)

9. GNAPHALIUM. Cudweed

Heads in a dense, spike-like inflorescence; involucre brownish; pappus-bristles united at base, falling away in a ring; leaves becoming green and glabrous above; stems 10-30 cm. high	1. *G. purpureum.*
Heads in cymose or paniculate clusters; involucre whitish; pappus-bristles separate; leaves woolly on both surfaces.	
Stems 5-12 cm. high, branched at the base; herbage loosely woolly throughout; heads in dense, leafy clusters	2. *G. palustre.*
Stems 30-60 cm. high, several, slender; herbage with a dense close tomentum; heads in loose, leafless, paniculate clusters.	3. *G. microcephalum.*

1. G. PURPUREUM Nutt. Elwha River, *Jones* 3107; Port Townsend, *Meehan* in 1883; Montesano, *Heller* 3919. Humid Transition. (H)

According to I. M. Johnston (Contr. Gray Herb. n.s. 70: 87, 1924) the Pacific Coast plants are specifically different from the eastern American ones and should be named *G. ustulatum* Nutt. This viewpoint was also maintained by Rydberg (1917, p. 923).

2. G. PALUSTRE Nutt. Montesano, *Heller* 4014. Transition. (Th)

3. G. MICROCEPHALUM Nutt. Port Ludlow, *Binns,* August 15, 1890; Port Townsend, *Edwards* 33. Transition. (H)

Although said by Johnston, l.c. 85, to be *G. thermale* E.Nels., an annual species of the hot spring formations of northern Wyoming, with non-decurrent leaves, it seems that our plant, a perennial with decurrent leaves, is specifically distinct, and that there is no good reason for considering it to be other than *G. microcephalum* Nutt.

10. ANAPHALIS. Pearly Everlasting

Leaves tomentose on both surfaces	1. *A. margaritacea.* var. *subalpina.*
Leaves green, glabrate, and somewhat glossy above	1a. var. *occidentalis.*

1. A. MARGARITACEA (L.) Benth. & Hook., var. SUBALPINA Gray. Constance Ridge, *Jones* 5798; Marmot Lake, *Dickinson* 45; Mt. Appleton, *Jones* 8510. Hudsonian and Arctic-alpine. (H)

1a. Var. OCCIDENTALIS Greene. Duckabush River, *Jones* 3063; Hoh River, *Otis* 1381; Seven Lakes Basin, *Jones* 8241. Transition. (H)

11. ANTENNARIA. Everlasting

Plants not stoloniferous, densely and coarsely white-tomentose, 5-20 cm. high; basal leaves 2-8 cm. long; heads 6-10 mm. high..... 1. *A. lanata.*
Plants stoloniferous, growing in patches.
Heads loosely racemose; inflorescence glandular; leaves green and glabrous above..... 2. *A. racemosa.*
Heads corymbose; inflorescence not glandular.
Phyllaries pink or white.
Leaves green and glabrate above, the basal ones cuneate-oblanceolate, 3-5 cm. long, petioled, 1-nerved, acutish; phyllaries white..... 3. *A. Howellii.*
Leaves tomentose on both surfaces, smaller; phyllaries pink.
Leaves obtusish, basal ones about 1 cm. long, rather loosely white-tomentose; stems 10-15 cm. high..... 4. *A. concinna.*
Leaves acutish, the basal ones 15-20 mm. long, with a close grayish tomentum; stems 20-40 cm. high..... 5. *A. rosea.*
Phyllaries green or brown; leaves spatulate-oblanceolate, acute, 12-15 mm. long; stems 4-6 cm. high..... 6. *A. media.*

1. A. LANATA (Hook.) Greene. Olympic Mountains, *Elmer* 2422; Marmot Pass, *Thompson* 9927; Mt. Angeles, *Thompson* 7438, 7439. Arctic-alpine. (H)

2. A. RACEMOSA Hook. Olympic Mountains, *Elmer* 2420, *Piper* in 1895; Mt. Storm King, *Lawrence* 329, 330; Mt. Baldy, *Conard* 291; Mt. Carrie, *St.John* 5812; Mt. Angeles, *Jones* 3798; Hurricane Ridge, *Jones* 3220; Marmot Pass, *Thompson* 7968, 9912; Crystal Creek, *Jones* 8453. Hudsonian and Canadian. (Ch)

3. A. HOWELLII Greene. Olympic Mountains, *Elmer* 2423; Mason County, *Kincaid,* June 15, 1892; Constance Ridge, *Thompson* 6586. Transition. (Ch)

4. A. CONCINNA E.Nels. Olympic Mountains, *Piper* 2191; Clallam County, *Elmer* 2417; Mt. Storm King, *Lawrence* 350; Mt. Angeles, *Webster,* July 26, 1908. This species ranges from Colorado to Wyoming and Washington, but it is known in Washington only from the Olympic Peninsula. Hudsonian and Arctic-alpine. (Ch)

5. A. ROSEA (Eaton) Greene. *(A. rosea angustifolia* (Rydb.) E. Nels.) Olympic Mountains, *Piper* 2192; Mt. Baldy, *Conard* 394; Mt. Angeles, *Webster* 360. Hudsonian. (Ch)

6. A. MEDIA Greene. *(A. alpina* Gaertn., var. *media* (Greene) Jepson, Man. Fl. Pl. Calif. 1070, 1925.) Olympic Mountains, *Elmer* 2421, *Piper,* August 1895; Mt. Carrie, *St.John* 5804; Marmot Pass, *Thompson* 7969; Mt. Angeles, *Webster* 369. Arctic-alpine. (Ch)

12. GALINSOGA

1. *G. ciliata* (Raf.) Blake. Weed in garden at Lake Cushman, *St. John & Schweinfurth* 5157; cultivated ground, Lake Crescent, *Jones* 3505. (Th)

13. MADIA. Tarweed

Heads 2-3 mm. high; disk-flower one, rays 4-8, scarcely longer than the involucre ..... 1. *M. exigua.*
Heads 8-10 mm. high; rays 5-12, conspicuous.
Leaves all or mostly opposite; perennial ..... 2. *M. madioides.*
Leaves all or mostly alternate; annual ..... 3. *M. racemosa.*

1. M. EXIGUA (Smith) Greene. *(M. filipes* Gray) Port Townsend, *Meehan* in 1883; Port Angeles, *Webster;* Mt. Angeles, *Thompson* 7359. Transition. (Th)

2. M. MADIOIDES (Nutt.) Greene. *(M. Nuttallii* Gray) Port Ludlow, *Binns;* Mt. Angeles, *C.S.Eaton,* July 2, 1908; Port Townsend, *Meehan* in 1883; Port Hadlock, *Jones* 3138. Humid Transition. (H)

3. M. RACEMOSA (Nutt.) T. & G. Satsop, *Heller* 4029; Duckabush River, *Jones* 3084; Quillayute Prairie, *Jones* 3746. Transition. (H)

14. FRANSERIA. Sandbur

Leaves 2-3 times pinnately parted ..... 1. *F. villosa.*
Leaves cuneate-obovate, serrate or incised ..... 2. *F. Chamissonis.*

1. F. VILLOSA Rydb. *(F. bipinnatifida* of Fl. Wash.) Port Discovery, *St.John* 5845; Clallam County, *Elmer* 2619; Port Angeles, *Piper* 2307; Dungeness, *St.John & Schweinfurth* 5443; Port Hadlock, *Jones* 3162. Humid Transition. (Ch)

2. F. CHAMISSONIS Less. Mora, *Jones* 3574. Humid Transition. (Ch)

15. JAUMEA

1. J. CARNOSA (Less.) Gray. Port Townsend, *Edwards* in 1896; Union [City], *Piper* in 1890; Port Discovery, *St.John* 5841; Port Angeles, *Webster,* June 28, 1909. Humid Transition. (H)

16. HELENIUM. Sneezeweed

1. H. AUTUMNALE L., var. GRANDIFLORUM Gray. *(H. macranthum* Rydb.) Montesano, *Jones* 8407. Humid Transition. (H)

17. ERIOPHYLLUM. Woolly Sunflower

1. E. LANATUM (Pursh) Forbes. *(Bahia lanata* Nutt.) Olympic Mountains, *Piper* 2193, *H.C.Stevens,* August 20, 1907; Mason County,

Piper 515; Skokomish River, *Kincaid,* June 15, 1892; Lake Cushman, *Piper,* August 6, 1890; Port Townsend, *Meehan* in 1883; Elwha River, *H.C.Stevens,* August 22, 1907, *Jones* 3118; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Hurricane Ridge, *Jones* 3392, 3283; Sequim, *Jones* 3731; Quinault River, *Jones* 3961; Shelton, *Jones* 3825; Mt. Angeles, *Thompson* 5560; Lake Constance, *Thompson* 7878; Mt. Colonel Bob, *Thompson* 7290; Dosewallips River, *Thompson* 6547; Hoh Lake, *Otis* 1350; Marmot Lake, *Dickinson* 55; Seven Lakes Basin, *Jones* 8224. Transition to Arctic-alpine. (H)

E. superbum Rydb., described from *Conard* 243 from Lake Quinault, is identical with *E. lanatum* (Pursh) Forbes, according to a study of cotype and topotype material. The size of the ray flowers is variable and of no value as a specific character; likewise the heads, "solitary or few on long erect peduncles", or "several on ascending peduncles, therefore more or less corymbose" offers no means of distinguishing the Olympic Peninsula material from that of other regions.

18. BAERIA

1. B. MARITIMA Gray. Neah Bay, *Rigg,* August 7, 1933, the first record of this rare plant in Washington. Otherwise known from California, and on three islands in British Columbia (Bird Island, Solander Island, and Triangle Island), where it was collected by Dr. C. F. Newcombe. Humid Transition. (Th)

19. ACHILLEA

Phyllaries with light brown or straw colored margins.
- Involucre 3-4.5 mm. high, 2.5-4 mm. broad.
  - Herbage green, sparingly pubescent or nearly glabrous ..... 1. *A. Millefolium.*
  - Herbage grayish silky-lanate ..... 1a. var. *lanulosa.*
- Involucre 5-8 mm. high, 4 mm. or more broad; herbage green, villous ..... 1b. var. *pacifica.*

Phyllaries with dark brown or almost black margins; alpine or subalpine plants.
- Involucre 3.5-4 mm. high, about 3 mm. broad; ultimate leaf-segments short, linear ..... 1c. var. *alpicola.*
- Involucre 5-6 mm. high, 4-5 mm. broad; ultimate leaf-segments short, ovate-lanceolate, densely crowded, thickened at the apex ..... 1d. var. *fusca.*

1. A. MILLEFOLIUM L. Port Crescent, *Lawrence* 266; Lake Crescent, *Jones* 3485; Port Hadlock, *Jones* 3136. Humid Transition. (H)

Typical *A. Millefolium* L. grows in cleared land and along roads near sea level and consists, probably, of both native plants and descendents of introduced plants or seeds.

1a. Var. LANULOSA (Nutt.) Piper. Shelton, *Jones* 3819, 3834. Transition. (H)

1b. Var. **pacifica** (Rydb.) n. comb. *A. pacifica* Rydb., N. Am. Fl. 34[3]: 222, 1916. Mora, *Jones* 3419; Clallam Bay, *Jones* 5952. Humid Transition. (H)

Along the ocean coast there is a robust, long-villous Achillea that is referrable to *A. pacifica* Rydb. These plants differ from *A. Millefolium* L. only in the more pubescent stems and foliage, the slightly longer ligules (3-4 mm.) and the higher involucre (5 mm.). Since these characters are highly variable within the genus, and are obviously of less than specific value, the above reduction is proposed.

1c. Var. ALPICOLA (Rydb.) Garrett. *(A. lanulosa alpicola* Rydb.; *A. alpicola* Rydb.; *A. subalpina* Greene) Hurricane Ridge, *Jones* 3288; Quinault River, *Jones* 3954; Mt. Angeles, *Jones* 4267. Hudsonian. (H)

In the subalpine meadows of the Olympic Mountains at elevations of 4000-6000 feet in the Hudsonian Zone, there occur, associated with *Agoseris subalpina, Leptotaenia dissecta, Castilleja olympica, Lomatium angustatum,* var. *flavum* and *Phleum alpinum,* two other Achilleas, distinguishable from typical *A. Millefolium* L. chiefly by their shorter stature and the dark brown-margined phyllaries. One of them has the involucres about 5 mm. high and 4 mm. broad and has been known as *A. fusca* Rydb., a species that was based on specimens collected on Mt. Adams, Washington, by Suksdorf in 1893. The other has the involucres 3.5-4 mm. high and 3 mm. broad and has been known as *A. subalpina* Greene. Not only do these two plants resemble one another very closely in general appearance, habit, habitat, geographical range, and morphological characters, but they are often practically indistinguishable from *A. Millefolium* L. of the lowlands, toward which frequent intermediates are found, depending upon the altitude and light conditions where the specimens are collected. As with many another plant the size varies inversely as to the altitude of the habitat. Likewise, with the color of the margins of the phyllaries, the greater the distance from sea level, in the Olympic Mountains at least, the darker the margins become until in some specimens, they are almost black. In view of these facts it appears desirable that these plants should be regarded as of less than specific rank.

1d. Var. **fusca** (Rydb.) n. comb. *A. fusca* Rydb., N. Am. Fl. 34[3]: 221, 1916. Mt. Angeles, Clallam County, *Jones* 3189; Hurricane Ridge, Clallam County, *Jones* 3237. Hudsonian. (H)

20. ANTHEMIS

1. *A. arvensis* L., var. *agrestis* DC. Mayweed. Montesano, *Grant* in 1917. (Th)

21. CHRYSANTHEMUM

Heads solitary, 3-6 cm. in diameter.
Basal leaves spatulate-obovate, crenate; median and upper leaves crenate or dentate; heads 4-6 cm. broad ..... 1. *C. Leucanthemum.*
Basal leaves coarsely and irregularly toothed or pinnatifid; median and upper leaves subpinnatifid at base; heads 3.5-4.5 cm. broad ..... 1a. var. *pinnatifidum.*
Heads corymbose, 1.5-2 cm. in diameter; leaves 2-pinnately divided ..... 2. *C. Parthenium.*

1. *C. Leucanthemum* L. Quillayute Prairie, *Jones* 3570. (H)

1a. Var. *pinnatifidum* Lecoq. & Lamotte. Quillayute Prairie, *Jones* 3428, 3570; Matlock, *Jones* 3709; Elwha River, *Jones* 3120; Dosewallips River, *Thompson* 6597. (H)

2. *C. Parthenium* (L.) Bernh. Lake Crescent, *Jones* 3504. (H)

22. MATRICARIA.

1. M. SUAVEOLENS (Pursh) Buch. Pineapple-weed. Quillayute Prairie, *Jones* 3750; Lake Crescent, *Jones* 3506; Port Hadlock, *Jones* 3157. Transition. (Th)

23. TANACETUM. Tansy

Heads many, 6-8 mm. broad; herbage sparingly puberulent or glabrate. 1. *T. vulgare.*
Heads few, 10-15 mm. broad; herbage more or less villous ..... 2. *T. Douglasii.*

1. *T. vulgare* L. Dungeness, *Jones* 3664; Lilliwaup, *Jones* 8532. (H)

2. T. DOUGLASII DC. *(T. huronense* of Fl. Wash.) Grays Harbor, *Lamb* 1217; Copalis, *Jones* 3658; Ocean City, *Jones* 3883; Moclips, *Jones* 6536. Humid Transition. (H)

24. ARTEMISIA

Leaves silky-villous or canescent, or glabrous, not tomentose.
Phyllaries canescent; receptacle villous; leaf-lobes obtusish; introduced weed in waste ground ..... 1. *A. Absinthium.*
Phyllaries villous to glabrous; receptacle glabrous; leaf-lobes acute; native alpine or seacoast species.
Segments of lower leaves mostly 1.5-3 mm. wide; heads 4-6 mm. high, 6-10 mm. broad; disk flowers fertile.
Plant silvery-canescent; disk corollas 15-20, glabrous or slightly pilose ..... 2. *A. trifurcata.*
Plant green, glabrous or villous; disk corollas 40-90, villous.. 3. *A. arctica.*
Segments of leaves mostly 0.5-1.5 mm. wide; heads 2-3.5 mm. high, 2-5 mm. broad; disk flowers sterile.
Heads 2-3 mm. high, 2-3.5 mm. broad, glabrous or nearly so; leaves moderately pubescent, glabrate ..... 4. *A. campestris.*
Heads 3-4 mm. high, 4-5 mm. broad, densely villous; leaves densely silky-pubescent ..... 5. *A. spithamaea.*

Leaves tomentose, at least beneath.
Involucre 6-7 mm. high ..... 6. *A. Stelleriana.*
Involucre 2.5-5 mm. high.
Leaves green and glabrate above, at least in age.
Involucre ellipsoidal or cylindrical, glabrous or nearly so; disk flowers 3-7 ..... 7. *A. Suksdorfii.*
Involucre campanulate or hemispherical; disk flowers 15-50.
Phyllaries glabrous or nearly so ..... 8. *A. Tilesii,* var. *elatior.*
Phyllaries tomentose ..... 8a. f. *pubescens.*
Leaves white-tomentose on both sides ..... 9. *A. diversifolia.*

1. *A. Absinthium* L. Lake Crescent, *Jones* 3559. (H)

2. A. TRIFURCATA Steph. *(A. norvegica heterophylla* (Besser) Hall & Clements, Phylog. Meth. Taxon. 59, 1923. Olympic Mountains, *Flett,* July 20, 1897; Mt. Carrie, *St.John* 5809. Arctic-alpine. (H)

3. A. ARCTICA Less. *(A. norvegica saxatilis* Hall & Clements, Phylog. Meth. Taxon. 58, 1923; *A. norvegica* Fries, var. *saxatilis* (Besser) Jeps., Man. Fl. Pl. Calif. 1141, 1925.) Olympic Mountains, *Elmer* 2618; Mt. Olympus, *St.John* 5789; Mt. Angeles, *Webster,* June 1908, *Jones* 3317; Hoh Lake, *Otis* 1354; Seven Lakes Basin, *Jones* 8225. Hudsonian. (H)

As pointed out by Hultén (1930, p. 178) *A. norvegica* Fries is clearly distinct from *A. arctica* Less., hence our plants cannot be associated with the name *A. norvegica.* Comparison of Washington specimens of *A. saxicola* Rydb., with material of *A. arctica* Less. from Kamtchatka shows *A. saxicola* to be at best nothing more than a pubescent geographical race of *A. arctica.* Except for the pubescent stems and leaves, the Washington plants are identical with specimens from Kamtchatka collected by Mr. Walter Eyerdam on Mt. Palovinaja, cited by Hultén (1930, p. 177) and now, thanks to Mr. Eyerdam, in the Herbarium of the University of Washington at Seattle.

4. A. CAMPESTRIS L. On steep sand bank above beach, eastern shore of Washington Harbor, *St.John* 5658. Humid Transition. (H)

5. A. SPITHAMAEA Pursh. *(A. borealis Wormskjoldii* of Fl. Wash.; *A. campestris spithamea* Hall & Clements.) Olympic Mountains, *Flett* in 1897, also in 1898; Marmot Pass, *Thompson* 9936; near Mt. Constance, *Thompson* 11022. Arctic-alpine. (H)

The Olympic Mountain specimens have the phyllaries densely villous, at least when young, and thus comply with Rydberg's treatment of *A. spithamaea* Pursh in the North American Flora. Recently, however, Professor Fernald has interpreted Pursh's species to consist of plants with "heads glabrous or essentially so" (Rhodora 29: 95. 1927).

6. A. STELLERIANA Besser. In a tuft on a sand spit, eastern shore of Washington Harbor, Clallam County, *St.John* 5867. This is the only record for western North America.

7. A. SUKSDORFII Piper. *(A. vulgaris littoralis* (Suksd.) Hall & Clements, Phylog. Meth. Taxon, 76, 1923.) Montesano, *Heller* 3976; Mora, *Jones* 3451; Port Hadlock, *Jones* 3140; Humptulips, *Thompson* 9396; Stevens Creek, *Jones* 8409. Humid Transition. (H)

This seems to be specifically distinct from *A. vulgaris* L., which is adventive on the Pacific Coast with one known station for Washington at Seattle *(Jones* 3811, November, 1932). It differs in the ellipsoidal or cylindrical glabrous (or nearly glabrous) involucre, and in the few disk flowers, which vary from 3-7. Geographically, it is well separated from *A. vulgaris.* It is confined to the region adjacent to the coast from British Columbia to California, whereas *A. vulgaris* is European. There is no more reason for supposing *A. Suksdorfii* to be a subspecies of *A. vulgaris* than there is for considering the latter to be derived from the former. *A. Suksdorfii* is very distinct from the other subspecies of the *A. vulgaris* complex as treated by Hall & Clements.

8. A. TILESII Ledeb., var. ELATIOR T. & G. *(A. Tilesii* of Piper & Beattie, Fl. Nw. Coast 382, 1915.) Dry gravelly shore of the Elwha River, *Jones* 3106; Sequim, *Grant* in 1915; gravel bar in Hoh River, *Otis* 1285. Transition. (H)

Typical *Artemisia Tilesii* Ledeb. of Siberia and Alaska has the inflorescence overtopped by the leaves. The plants of northwest America from British Columbia to Oregon and Montana have the heads in an elongated panicle much exceeding the leaves. By Hall & Clements these plants are treated as Minor Variation 85 of *A. vulgaris,* but they were previously described by Torrey & Gray (Fl. N. Am. 2: 422, 1843) as *A. Tilesii,* var. *elatior* and were later raised to specific rank by Rydberg as *A. elatior* (T. & G.) Rydb. It seems better to follow Torrey & Gray and name our Washington plants *A. Tilesii,* var. *elatior,* of the section Abrotanum, subsection Vulgares. The affinities of the plant are more satisfactorily indicated by treating it as a variety of *A. Tilesii* than as a subspecies of *A. vulgaris* of Europe, with which its close genetical relationship is yet to be proved. On the Olympic Peninsula there are two different forms of *A. Tilesii,* var. *elatior,* one with the phyllaries glabrous or nearly so, (typical var. *elatior)* and the other with the phyllaries tomentose. The latter form is a common and noticeable extreme and is proposed as:

8a. Forma **pubescens** n. f. Olympic Mountains, *Piper,* August 1895; Lake Cushman, *Piper* 1066, also August 1890 and August 1895; Mt. Angeles, *Jones* 4557, 4263, 4266. Canadian and Transition. (H)

9. A. DIVERSIFOLIA Rydb. Mt. Angeles, *Webster,* June 1908; Hurricane Ridge, *Jones* 3227, 3272, 3377. (H)

25. COTULA

1. *C. coronopifolia* L. Brass Buttons. Hoquiam, *Lamb* 1223; Port Angeles, *Piper,* September 1, 1895; Port Angeles, *Webster,* June 1908; Port Discovery, *St.John* 5834; Clallam County, *Elmer* 2612; Port Crescent, *Lawrence* 285; Copalis, *Conard* 388; Dewatto, *R.K.Beattie* 3633. Humid Transition. (H)

A native of South Africa, but abundantly established for nearly half a century in the salt marshes along the sea shores of Washington and Oregon, where it has every appearance of being indigenous. It is significant, however, that this plant was not collected by any of the explorers prior to 1895.

26. PETASITES. Colt's-foot

Alpine; leaves triangular-ovate, 5-7-lobed; heads few; phyllaries pubescent ..... 1. *P. frigidus.*
Lowland; leaves reniform-orbicular, 7-9 (-11)-cleft; heads numerous; phyllaries glabrous ..... 2. *P. speciosus.*

1. P. FRIGIDUS (L.) Fries. Olympic Mountains, *Piper* 2190; Baldy Peak, *Lamb* 1356; Duckabush River, *Dickinson* 84. Hudsonian. (Cr)

2. P. SPECIOSUS (Nutt.) Piper. Port Ludlow, *Binns;* Humptulips River, *Jones* 4588; Point Grenville, *H.W.Smith* 200. Humid Transition. (Cr)

27. LUINA

1. L. HYPOLEUCA Benth. Olympic Mountains, *Elmer* 2614, *Piper,* August 1895; Mt. Storm King, *Lawrence* 325; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902; Mt. Carrie, *St.John* 5800; headwaters of the Queets River, *C.S.Eaton,* August 10, 1907; Skokomish River, *Kincaid,* June 14, 1892; Elwha River, *Jones* 3532; Mt. Angeles, *Thompson* 5602, 7506; Lake Crescent, *Jones* 4530; Lake Constance, *Thompson* 7877; Mt. Colonel Bob, *Thompson* 9967. Hudsonian, and occasionally Canadian. (H)

28. ARNICA

Basal leaves cordate to truncate at the base; heads radiate, turbinate, erect.
- Herbage pubescent; achenes densely hirsute ..... 1. *A. cordifolia.*
- Herbage glabrous; achenes glabrous or glandular-granuliferous.
  - Achenes glandular-granuliferous ..... 2. *A. gracilis.*
  - Achenes glabrous or nearly so.
    - Leaf-blades thin, 4-8 cm. long, acute, sharply dentate; involucre 12-15 mm. high; rays 15-20 mm. long; achenes 6 mm. long ..... 3. *A. latifolia.*
    - Leaf-blades 2-4 cm. long, thickish, obtuse, crenate-dentate; involucre 1 cm. high; rays 10-12 mm. long; achenes 5 mm. long ..... 4. *A. betonicaefolia.*

Basal leaves narrowed at the base.
- Heads radiate, erect.
  - Pappus white; heads turbinate; achenes densely hirsute ..... 5. *A. Rydbergii.*
  - Pappus brownish; heads hemispherical; achenes sparsely hirsute.
    - Leaves distinctly and rather regularly dentate.
      - Leaves glabrous or nearly so, except the ciliolate margins 6. *A. Macounii.*
      - Leaves short-hispid on both surfaces ..... 6a. var. *aspera.*
    - Leaves entire or irregularly dentate, somewhat pilose on both surfaces ..... 7. *A. mollis.*
- Heads rayless, turbinate, nodding; achenes sparingly hirsute to glabrous ..... 8. *A. Parryi.*

1. A. CORDIFOLIA Hook. Mt. Angeles, *Jones* 3676, *Webster* 395. Known otherwise in western Washington only from Mt. Rainier. Canadian. (H)

2. A. GRACILIS Rydb. Baldy Peak, *Lamb* 1306; Mt. Steele, *Piper* 2203. Hudsonian. (H)

3. A. LATIFOLIA Bong. Olympic Mountains, *Piper* 2205; Mt. Ellinor, *Jennie V. Getty,* August 20, 1902. Hudsonian. (H)

4. A. BETONICAEFOLIA Greene. Baldy Peak, *Lamb* 1306; Mt. Steele, *Piper* 2202; Mt. Olympus, *Flett* 3029; Mt. Storm King, *Lawrence* 349; Elwha River, *H.C.Stevens,* August 22, 1907; Olympic Mountains, *Piper* 1072; Hurricane Ridge, *Jones* 3351; Mt. Angeles, *Jones* 3306; Mt. Colonel Bob, *Thompson* 7245; Seven Lakes Basin, *Jones* 8311; Boulder Creek, *Jones* 8475. Hudsonian. (H)

5. A. RYDBERGII Greene. (*A. aurantiaca* Greene) Hurricane Ridge, *Jones* 3292. Hudsonian. (H)

6. A. MACOUNII Greene. Olympic Mountains, *Elmer* 2634; Skokomish River, *Piper,* August 1895, also September 1890; Mt. Seattle, *Webster* 1011; Elwha Basin, *E.Chittenden,* August 1907; Mason County, *Kincaid,* June 15, 1892; Montesano, *Grant* 828; Elwha River, *Jones* 3537; Lake Constance, *Thompson* 7899; Canyon Creek, *Jones* 5828, 8370. Canadian. (H)

6a. Var. **aspera** (Greene) n. comb. *A. aspera* Greene, Ottawa Naturalist 15: 281, 1902. Rock slide on mountain north of Mt. Olympus Ranger Station, *St.John* 5798; Lake Cushman, *Kincaid* in 1892; mossy, rocky shore of Lake Quinault, *Conard* 181; Olympic Mountains, *Flett* 818, *Piper* 2204; Marmot Lake, *Dickinson* 65. Canadian. (H)

This variety differs from typical *A. Macounii* Greene only in the leaves being short hispid on both surfaces.

7. A. MOLLIS Hook. Boulder Creek, *Jones* 8481. Hudsonian. (H)

8. A. PARRYI Gray. Olympic Mountains, *Flett* 130; Mt. Angeles, *Webster* 393; Hurricane Ridge, *Jones* 3281. Hudsonian. (H)

[*A. amplexicaulis* Nutt. is not known to occur on the Olympic Peninsula. The specimens from this region cited by Piper (1906, p. 592) belong to *A. Macounii,* var. *aspera.*]

29. SENECIO

Leaves mostly pinnatifid; heads less than 1 cm. high.
- Lowland annuals.
  - Phyllaries black-tipped; rays none ..... 1. *S. vulgaris.*
  - Phyllaries not black-tipped; rays very short, inconspicuous, recurved (rarely lacking) ..... 2. *S. sylvaticus.*
- Alpine perennials; phyllaries not black-tipped; rays 2-4 ..... 3. *S. Flettii.*

Leaves merely toothed, or entire.
- Heads 2 cm. high, 2-3 cm. broad, usually solitary; phyllaries not black-tipped; leaves oblong-obovate, sinuate-dentate to denticulate or entire, 8-12 cm. long ..... 4. *S. Websteri.*
- Heads about 1 cm. high, usually several.
  - Phyllaries black-tipped ..... 5. *S. integerrimus.*
  - Phyllaries not black-tipped.
    - Heads 1-3; stems branched, 7-25 cm. high; leaves obovate, coarsely toothed, 2-3 cm. long ..... 6. *S. Fremonti.*
    - Heads numerous, cymose-paniculate; stems 30-150 cm. high.
      - Leaves mostly basal, thinly tomentose, lanceolate to spatulate, obtuse, crenulate or entire; achenes 2.5-3 mm. long ..... 7. *S. fastigiatus.*
      - Leaves lanceolate-triangular, acute or acuminate, dentate, truncate or cordate at the base, petioled; achenes 5 mm. long.
        - Herbage glabrous or nearly so.
          - Leaves triangular, 2-5 cm. wide ..... 8. *S. triangularis.*
          - Leaves lanceolate, 5-20 mm. wide ..... 8a. var. *angustifolius.*
        - Herbage villous ..... 8b. var. *trichophyllus.*

1. *S. vulgaris* L. Port Angeles, *Webster* 469; Port Discovery, *St. John* 5842; Lake Crescent, *Jones* 3507. (Th)

2. *S. sylvaticus* L. This is a characteristic plant of burned areas. Port Crescent, *Webster,* August 1911; Duckabush River, *Jones* 3083; Lake Quinault, *Thompson* 7339; Hoh River, *Jones* 4552. (Th)

3. S. FLETTII Wiegand. Olympic Mountains, *Flett* 801; Mt. Steele, *Piper* 2196, 929; Mt. Barnes, *Flett,* August 1907; Mt. Angeles,

Flett, July 1908, *Jones* 3196; Lake Constance, *Thompson* 7866; Marmot Pass, *Thompson* 9883, 7972. Hudsonian. (H)

Senecio Flettii is known from only two localities other than the Olympic Peninsula, namely Mt. Rainier, where it was collected by Miss Winona Bailey of Seattle, and Yakima Region, without definite locality, by T. S. Brandegee.

4. S. WEBSTERI Greenm. Mt. Angeles, *Webster* 109, *Jones* 3302; Marmot Pass, *Thompson* 7962, 9904. Arctic-alpine. (H)

5. S. INTEGERRIMUS Nutt. *(S. lugens* of Piper) Olympic Mountains, *Flett* 95, 800; Marmot Pass, *Thompson* 7955. Arctic-alpine. (H)

6. S. FREMONTI T. & G. *(S. ductoris* Piper) Olympic Mountains, *Piper,* 2201; Marmot Pass, *Thompson* 9919; Lake Constance, *Thompson* 7884. Arctic-alpine. (H)

7. S. FASTIGIATUS Nutt. Mason County, *Piper* 583; Shelton, *Jones* 3815; Purdy Canyon, *Otis* 1478. Humid Transition. (H)

8. S. TRIANGULARIS Hook. Mt. Angeles, *Webster* 465; Canyon Creek, *Jones* 5894. Hudsonian. (H)

8a. Var. **angustifolius** n. var. A forma typica recedit foliis anguste lanceolatis.

Typical *S. triangularis* is a triangular leaved plant of the meadows in the Hudsonian zone. This variety, which occurs near sea level, has the leaves lanceolate, or the upper ones linear. Type collection: in a bog near Raft River, Grays Harbor County, Washington, June 30, 1933, *Jones* 3963. Humid Transition. (H)

8b. Var. TRICHOPHYLLUS St.John & Hardin, Fl. Mt. Baker, Mazama 11: 95, 1929. Clallam County, *Elmer* 2627. Hudsonian. (H)

30. CIRSIUM. Thistle

Heads about 2 cm. high and 1-1.5 cm. in diameter, dioecious; perennial with spreading rhizomes ..... 1. *C. arvense.*
Heads larger; flowers all perfect; biennials.
  Stems conspicuously winged with the decurrent leaf-bases; leaves white-tomentose beneath, green and hispid above, with numerous stout prickles..... 2. *C. lanceolatum.*
  Stems not winged; mature leaves green and glabrate on both sides, weakly prickly..... 3. *C. edule.*

1. *C. arvense* (L.) Scop. *(Carduus arvensis* (L.) Robs.) Canada Thistle. Lake Crescent, *Jones* 3413, 3453; Hoh River, *Otis* 1373. (Cr)

2. *C. lanceolatum* (L.) Hill. *(Carduus lanceolatus* L.) Common Thistle. Lake Crescent, *Jones* 3467; Humptulips, *Jones* 3719; Duckabush River, *Jones* 3069; Shelton, *Jones* 3826. (H)

3. C. EDULE Nutt. *(Carduus edulis* (Nutt.) Greene) Cayuse Thistle. Montesano, *Heller* 3963, 4000; Quillayute Prairie, *Jones* 3583; Hurricane Ridge, *Jones* 3218; Quinault River, *Jones* 3962; Pysht, *Jones* 3979; Beaver Creek, *Jones* 4549; Mt. Angeles, *Jones* 4258; Forks Prairie, *Jones* 5963; Lake Creek, *Otis* 1334; Marmot Lake, *Dickinson* 93; Seven Lakes Basin, *Jones* 8245; Crystal Creek, *Jones* 8448. Transition to Hudsonian. (H)

31. ARCTIUM. Burdock

1. *A. minus* (Hill) Bernh. A common weed along roads and in waste ground. Hoodsport, *Jones* 8626. (H)

32. CENTAUREA

Flowers yellow; involucre spiny; leaves decurrent ..... 1. *C. melitensis.*
Flowers blue (occasionally white or pink); phyllaries merely fimbriate; leaves not decurrent ..... 2. *C. Cyanus.*

1. *C. melitensis* L. Star Thistle. Port Townsend, *Edwards* in 1896; Sequim, *Jones* 3734. (Th)

2. *C. Cyanus* L. Bachelor's Button. Union, *Jones* 8557. (Th)

33. SAUSSUREA. Saw-wort

1. S. AMERICANA D.C.Eaton. Olympic Mountains, *Piper* 930, 2188; Mt. Angeles, *Thompson* 5565, 7832; Seven Lakes Basin, *Jones* 8202. Hudsonian. (H)

34. LAPSANA

1. *L. communis* L. Lake Crescent, *Jones* 3560. (Th)

35. CICHORIUM. Chicory

1. *C. Intybus* L. Lake Crescent, *Jones* 3450. (H)

36. SCORZONELLA

1. S. LACINIATA (Hook.) Nutt. Humptulips, *Lamb* 1184; Shelton, *Jones* 3838. Humid Transition. (H)

37. TRAGOPOGON. Goat's-beard

1. *T. porrifolius* L. Lake Crescent, *Jones* 3492. (H)

38. HYPOCHOERIS. Cat's-ear

1. *H. radicata* L. Chehalis [Grays Harbor] County, *Lamb* 1404. An extremely abundant weed in lawns and waste ground, roadsides, sea beaches or sand dunes. *H. glabra* L., not uncommon in the San Juan Islands, has not been collected on the Peninsula. (H)

39. SONCHUS. Sow Thistle

Leaves runcinate-pinnatifid, softly prickly, the terminal segment commonly large and triangular; upper leaves clasping by an acute, sagittate base; achenes linear-obovate, longitudinally striate, and transversely wrinkled ..... 1. *S. oleraceus.*
Leaves toothed or more or less curled or lobed, harshly prickly, the basal auricles rounded; achenes oval-oblong, longitudinally ribbed, otherwise smooth ..... 2. *S. asper.*

1. *S. oleraceus* L. Lake Crescent, *Jones* 3600; Port Hadlock, *Jones* 3143; Port Discovery, *St.John* 5846. (Th)

2. *S. asper* (L.) Hill. Port Discovery, *St.John* 5840; Duckabush River, *Jones* 3071. (Th)

40. LACTUCA. Lettuce

Flowers whitish; pappus brownish; leaves not spiny; beak much shorter than the body of the achene; heads in a long narrow panicle .... 1. *L. spicata.*
Flowers yellow; pappus white; heads in loose panicles.
Leaves spiny on margins and midrib; beak longer than the body of the achene ..... 2. *L. Scariola,* var. *integrata.*
Leaves not spiny; beak much shorter than the body of the achene ... 3. *L. muralis.*

1. L. SPICATA (Lam.) Hitchc. Lake Crescent, *Jones* 3460, 3477; Union, *Jones* 8555. Transition. (H)

2. *L. Scariola* L., var. *integrata* Gren. & Godr. Duckabush River, *Jones,* June 1931. (H)

3. *L. muralis* Fresen. Sandy bank along roadside near Clallam Bay, *Jones* 5892. This species was previously collected in Washington on San Juan Island in 1923 by Professor M. E. Peck, his collection number 12678A. (Th)

41. CREPIS

Low, glaucous alpine perennials; leaves entire or merely repand ..... 1. *C. nana.*
Taller species (10-60 cm. high), not glaucous; leaves lobed or pinnatifid.
Foliage green, glabrous or nearly so; involucre pubescent or glandular, 6-8 mm. high; annual, weedy species ..... 2. *C. capillaris.*
Foliage grayish-pubescent; involucre tomentose, 12-18 mm. high; alpine perennial ..... 3. *C. intermedia.*

1. C. NANA Richardson. Olympic Mountains, *Flett* 810; Mt. Angeles, *Jones* 3668, 3180; Lake Constance, *Thompson* 7883; Marmot Pass, Thompson 9921. Arctic-alpine. (H)

In talus and rocky soil at high altitudes in the Olympic and Cascade Mountains. Only two other stations in Washington, Mt. Adams and north of Mt. Baker, and one in Oregon, in the Wallowa Mountains, are known for this rare arctic species.

2. *C. capillaris* (L.) Wallr. Lake Crescent, *Jones* 3509, 3564; Elwha River, *Jones* 3500; Brinnon, *Beattie* 3082. (H)

3. C. INTERMEDIA Gray. *(C. occidentalis* of Piper & Beattie, Fl. Nw. Coast 358, 1915, and of Piper, Fl. Wash., 546, 1906, in part, not Nuttall, Journ. Acad. Phil. 7: 29, 1834.) Olympic Mountains, *Flett,* August 1898; Hurricane Ridge, *Jones* 3381, 3215; Mt. Angeles, *Jones* 3330, 3168. Arctic-alpine. (H)

The plants of the Olympic Mountains were included in the Flora of Washington, and later, in the Flora of the Northwest Coast, as *C. occidentalis* Nutt. The only specimens that had ever been collected in the Olympic Mountains were those discovered by J. B. Flett in 1898 (erroneously cited in Fl. Wash., p. 546, as 1888) near the headwaters of the Quilcene River. Within the last few years several additional collections have been made from different localities. The plants are quite different from *C. occidentalis* Nutt. That plant has the heads campanulate, with some black glandular hairs mixed with the tomentum, phyllaries 9-24, the flowers 10-30, and the inflorescence is glandular-hirsute. It occurs in rocky soil in the Upper Sonoran and Arid Transition zones of eastern Washington, where it flowers in May and June. *C. intermedia* Gray has subcylindrical heads, principal phyllaries 6-8, tomentose but not glandular-pubescent, flowers of the same number, and the inflorescence non-glandular. Its usual habitat is dry rocky ground in the Blue Mountains, the Wenatchee Mountain region, the Yakima region and the Olympic Mountains. It flowers from June to August.

42. HIERACIUM. Hawkweed

Flowers white; involucre nearly glabrous	1.	*H. albiflorum.*
Flowers yellow.		
Subalpine; stems 10-30 cm. high; involucre 6-9 mm. high.		
Involucre blackish with both hirsute and glandular hairs	2.	*H. gracile.*
Involucre with grayish, non-glandular pubescence	2a.	var. *detonsum.*
Lowland; stems 30-50 cm. high; involucres 9-11 mm. high, glandular-hirsute with short, blackish hairs	3.	*H. cynoglossoides.*

1. H. ALBIFLORUM Hook. Montesano, *Heller* 3918; Grays Harbor, *Wilkes Expedition* (fide Piper); Duckabush River, *Jones* 3087; Elwha River, *Jones* 3544; Port Townsend, *Meehan* in 1883; Lake Crescent, *Jones* 3486; Mt. Angeles, *Thompson* 7517, 5603. Transition. (H)

2. H. GRACILE Hook. Hurricane Ridge, *Jones* 3366; Mt. Colonel Bob, *Thompson* 7315; Mt. Angeles, *Thompson* 7488; Marmot Pass, *Thompson* 9881; Constance Ridge, *Jones* 5794; Duckabush River, *Dickinson* 85. Hudsonian. (H)

2a. Var. DETONSUM Gray. Dodwell-Rixon Pass, *Leach* 2041. Hudsonian. (H)

3. H. CYNOGLOSSOIDES Arvet-Touv. Port Townsend, *Meehan* in 1883. Transition. (H)

43. PRENANTHES

1. P. HASTATA (Less.) M.E.Jones, Bull. Univ. Mont. 61: 47, 1910. (*Nabalus hastatus* (Less.) Heller) Olympic Mountains, *Piper* in 1890; Queets River, *Conard* 325; Skokomish River, *Piper* 1068; Soleduck River, *Jones* 8382; Big Quilcene River, *Thompson* 7928. Canadian. (H)

44. AGOSERIS

Annual; achenes 3 mm. long, the filiform beak 2-3 times as long..... 1. *A. heterophylla.*
Perennial.
  Achenes with a very short stout beak; leaves coarsely pubescent, entire or nearly so..... 2. *A. villosa.*
  Achenes with a distinct slender beak.
    Beak of the mature achene 10-12 mm. long, much longer than the body; flowers yellow; leaves linear, less than 1 cm. wide, laciniate-pinnatifid..... 3. *A. laciniata.*
    Beak equalling or shorter than the body of the mature achene.
      Flowers orange, drying brownish; plants of subalpine meadows.
        Leaves mostly entire or denticulate.
          Beak distinctly shorter than the body of the achene; leaves lanceolate-spatulate..... 4. *A. aurantiaca.*
          Beak equalling or somewhat exceeding the body of the achene; leaves narrowly linear to lanceolate, often with a few short lobes..... 5. *A. gracilens.*
        Leaves laciniate-pinnatifid, linear; beak slightly shorter than the body of the achene..... 6. *A. subalpina.*
      Flowers light yellow, often turning pinkish; lowland species; leaves lanceolate-spatulate.
        Beak distinctly exceeding the body of the achene; scapes 30-50 cm. high; heads 3 cm. high; plants of the prairies 7. *A. elata.*
        Beak shorter than or equalling the body of the achene; scapes 10-15 cm. high; heads 10-12 mm. high; sand dune plants..... 8. *A. apargioides.*

1. A. HETEROPHYLLA (Nutt.) Greene. Elwha River, growing at an elevation of 1500 feet in dry ground in open fir woods, *Jones* 3400. This species is rare west of the Cascade Mountains. The only other record

of this plant in western Washington is *Piper* 506, from Puyallup, Pierce County. Transition. (Th)

2. A. VILLOSA Rydb. *(A. glauca aspera* (Rydb.) Piper; *A. vestita* Greene) Olympic Mountains, *Flett* 842; Mt. Angeles, *Jones* 3677. Arctic-alpine. (H)

3. A. LACINIATA (Nutt.) Greene. Olympic Mountains, *Grant,* September 1915; Duckabush River, *Jones* 3086; Elwha River, *Jones* 4002; Crystal Creek, *Jones* 8454; Port Angeles, *Webster,* July 1909. Humid Transition. (H)

4. A. AURANTIACA (Hook.) Greene. Hurricane Ridge, *Webster,* July 1911; Constance Ridge, *Jones* 5795. Hudsonian. (H)

5. A. GRACILENS (Gray) Kuntze. *(A. gracilenta* (Gray) Greene) Olympic Mountains, *Elmer* 2608; Mt. Carrie, *St.John* 5801; moraine of Duckaboose [Duckabush] glacier, *Piper* 2198. Hudsonian. (H)

6. A. **subalpina** n. sp. Perennial herb with a strong taproot; scapes 1-8, slender, 5-25 cm. high, pilose; leaves linear or linear-lanceolate, 5-15 cm. long, 2-8 mm. wide, exclusive of the lobes, laciniate-pinnatifid, perfectly glabrous, not glaucous; flowers orange; heads 2-2.5 cm. high, 1.5-2 cm. wide; involucre 1-1.5 cm. high; phyllaries lanceolate, obtusish, the inner ones somewhat longer in fruit, all pilose or the inner ones glabrate, the outer ones tomentose at base, as is also the top of the scape; achenes linear-fusiform, 5-7 mm. long, finely and indistinctly striate, glabrous and somewhat glaucous throughout, or puberulent at apex, tapering to the slender beak which is 3-6 mm. long; pappus white, copious, 1 cm. long.

Perennis; foliis lineari-lanceolatis glabris 2-8 mm. latis 5-15 cm. longis, marginibus pinnato-incisis, scapo 5-25 cm. alto, capitulis 2-2.5 cm. altis et 1.5-2 cm. latis, bracteis lanceolatis 1-1.5 cm. longis exterioribus basi villoso-ciliatis, achaeniis 5-7 mm. longis glabris, rostro 5-6 mm. longo, pappo albo 1 cm. longo.

Agoseris subalpina belongs to section Aurantiacae Rydb. which is characterized by the body of the achene tapering at the apex to a slender, non-striate beak about as long as the body. From the closely related species *A. aurantiaca* and *A. gracilens* it may be distinguished by the characters given in the preceding key.

Type locality: subalpine meadow, altitude 1500 m., Hurricane Ridge, Clallam County, Washington, July 5, 1931, *Jones* 3232, 3285. (type in the Herbarium of the University of Washington); Mt. Angeles, *Webster,* August 29, 1909, *Jones* 3669, 4259; High Divide, *Jones* 8231; Seven Lakes Basin, *Jones* 8236, 8285. Hudsonian. (H)

7. A. ELATA (Nutt.) Greene. Quillayute Prairie, *Jones* 3584. Humid Transition. (H)

8. A. APARGIOIDES (Less.) Greene. Ocean City, *Jones* 3882, 3992; Copalis, *Jones* 3657; Port Townsend, *Meehan* in 1883 (reported as *Taraxacum palustre* L.). Humid Transition. (H)

45. TARAXACUM. Dandelion

Alpine; scape 2-6 cm. high; phyllaries erect ..... 1. *T. olympicum.*
Lowland; scape 10-30 cm. high; outer phyllaries reflexed ..... 2. *T. officinale.*

1. T. **olympicum** n. sp. A dwarf alpine herb, 3-7 cm. high; root large, thick, blackish, glabrous; leaves spreading or ascending, in a basal rosette, sparsely pilose, oblong-lanceolate in outline, 2-5 cm. long, acute, runcinate, with acute, triangular lobes; scapes solitary, erect, 2-6 cm. long, equalling or a little longer than the leaves, permanently pilose; heads 2-3 cm. in diameter; involucre green, 10-13 mm. long; phyllaries 20-25, in 2 series, the inner ones often with a few resinous dots, especially along the somewhat membranous margins, lanceolate, glabrous, erect, scarcely dilated or corniculate at apex; outer phyllaries erect, ovate, scarious and somewhat pilose on the margins, much shorter than the inner ones; florets numerous, yellow; achenes chestnut-brown, 3-4 mm. long, 0.75 mm. wide, spiny-muricate in the upper two-thirds, longitudinally grooved to the base, minutely strigose throughout, slightly flattened, not sharply tetragonal, beak 5-7 mm. long; pappus white, 5-7 mm. long.

Herba pusilla, 3-7 cm. alta, foliis oblongo-lanceolatis 0.5-1.5 cm. latis 2-5 cm. longis, marginibus dentatis vel sinuatis lobis horizontaliter divergentibus vel refractis triangularibus, scapo 2-6 cm. alto, capitulis 10-13 mm. altis et 2-3 cm. latis, bracteis exterioribus erectis ovatis vel lanceolatis apice planis non corniculatis, achaeniis 3-4 mm. longis castaneo-brunneis apice acute muricatis, rostro 5-7 mm. longo, pappo albo 5-7 mm. longo.

T. olympicum has the habit and appearance of *T. ceratophorum* (Ledeb.) DC., and *T. eriophorum* Rydb., and although closely allied to both of these species, it is apparently distinct from either. Some of the differences may be stated as follows: *T. ceratophorum* (type locality: Kamtchatka) has the achenes brown, muricate their whole length, the beak 7-14 mm. long, the phyllaries dilated and corniculate-appendaged at the apex, and the heads 15-25 mm. high. In *T. olympicum,* the achenes are chestnut-brown, muricate on the upper two-thirds, the beak 5-7 mm. long, the phyllaries are scarcely dilated or corniculate at the tips, and the heads are only 10-13 mm. high. *T. eriophorum* is a tall, red-fruited species with the phyllaries slender, without dilated tips, and the heads 15-25 mm.

high. It is apparent that *T. olympicum* is intermediate in certain respects between these other species. In all characters but the color of the achenes it seems to be closer to *T. eriophorum* (type locality: Wyoming), but if, as has been generally conceded, the color of the achene coats is a fundamental character in Taraxacum, then *T. olympicum* is amply separated from that species, which it most closely simulates.

Thanks are due Dr. M. O. Malte of the Canadian National Herbarium for the loan of specimens for comparison.

Type locality: In loose shale, summit of First Peak, altitude 1570 m., Mt. Angeles, Clallam County, Washington, July 10, 1931, *Jones* 3194 (type), *Rigg,* July 23, 1929, *Thompson* 7442. Arctic-alpine. (H)

2. *T. officinale* Weber. *(T. vulgare* (Lam.) Schrank; *T. Taraxacum* (L.) Karst.; *T. palustre* (Lyons) Lam. & DC., var. *vulgare* (Lam.) Fern., Rhodora 35: 380, 1933.) A common weed on the Olympic Peninsula. (H)

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