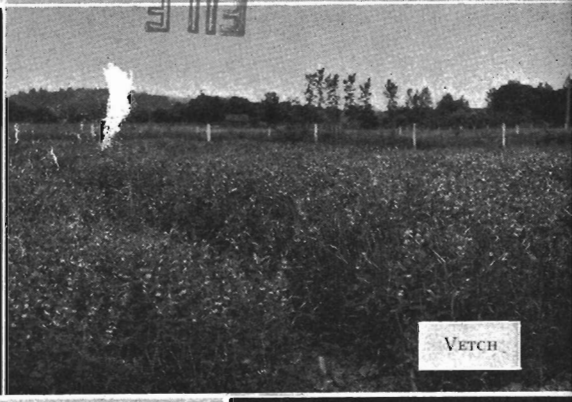

OREGON MAPLE

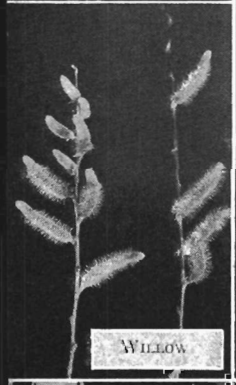

VETCH

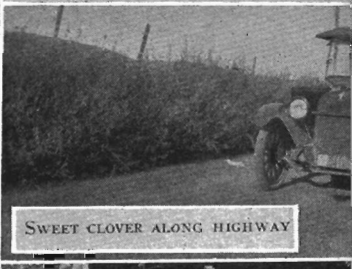
Nectar and Pollen Plants of Oregon

H. A. SCULLEN
G. A. VANSELL

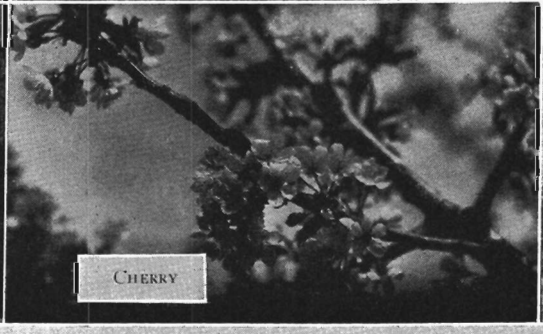

FIREWEED

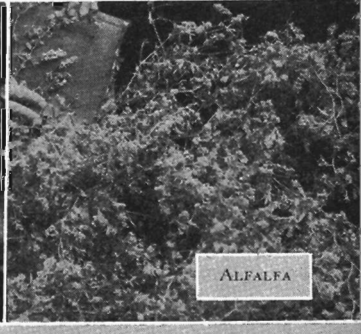

ALSIKE CLOVER


WILLOW


SWEET CLOVER ALONG HIGHWAY


LOCUST


CHERRY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Oregon State System of Higher Education, Agricultural Experiment Station,
Oregon State College, Corvallis, and Bureau of Entomology and Plant
Quarantine, United States Department of Agriculture, Cooperating

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Nectar and Pollen Plants of Oregon

By

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I. INTRODUCTION*

THE bulk of Oregon's surplus honey crop comes from the following plants: alfalfa, sweet clover, fireweed, alsike clover, and hairy vetch. These may therefore be called the major honey plants of Oregon. Secondary honey plants, or those that supply some surplus in limited areas or during favorable seasons only, are represented by a larger number of species. Raspberry, cascara, white clover, and the maples are examples of secondary honey plants. There are many others.

Many more plants are of minor importance, and honey from them rarely or never appears in the surplus crop. They are as a group, however, essential for the building up of the colonies of bees during periods when the major or secondary plants are not in bloom.

There are great differences in honeys from different plants. The color may range from water white to very dark amber and the flavor may vary from very mild to very strong. Successful beekeepers learn to manage their bees so as to harvest only the better grades of honey. The poorer grades, so far as possible, are left for the bees to use for themselves.

To make the information in this bulletin, relative to specific honey or pollen plants, readily available to the reader the plants are arranged alphabetically and each is discussed under the most widely accepted name.

Some plants of little or no value for their nectar or pollen are included, especially in Table 4, for the reason that beekeepers frequently ask about them. Plants that are of value in other parts of the country are included, even though they may seldom be visited by bees in this state.

For the benefit of beekeepers, fruit growers, and seed producers the importance of bees in pollination of the more important fruit and seed crops is briefly discussed under the respective plant.

* Credit for valuable assistance in the collection of data and the preparation of this manuscript should go to the following: The late Professor A. L. Lovett, head of the Department of Entomology, Oregon State College, who made many observations and records between the years 1910 and 1920; Frank E. Todd and W. G. Watkins of the Pacific States Bee Culture Laboratory; W. T. Lund and John Lindsay of Oregon State College; Dr. Helen M. Gilkey, associate professor of botany, Oregon State College, and Mrs. Garland Powell, former instructor in botany, Oregon State College, who have assisted by the identification of many plants; Dr. Gilkey and Professor W. E. Lawrence, associate professor of botany, Oregon State College, for critically reviewing the manuscript. Dr. Gilkey also contributed Section VI. The following individual beekeepers have supplied valuable information on the honey and pollen flora of different sections: C. D. Howard, Joe Marty, A. J. Sanford, L. M. White, Florence M. Bennett, Floyd Butts, Homer Cheney, Charles A. Welch, James Warrington, J. H. Schaefer, J. Skovbo, W. G. Rodda, Geo. W. Nichols, Jr., A. B. Black, Eber D. Mossey, and Herman Ahlers.

II. NECTAR: ITS SECRETION AND SUGAR CONCENTRATION

All commercial beekeeping is based directly on nectar in plants; therefore, it is unfortunate that so little definite information on the phenomenon of secretion is available. It is a problem of plant physiology that has not been favored with intensive study by those specially trained in that field. Numerous beekeepers have recorded data showing that honey production varies from day to day and from year to year on the same location and they conclude that nectar secretion must vary. The reasons for this are obscure, since the general appearance of the plants and the amount of available blossoms may be at a maximum during the season when the smallest honey crop is harvested. Fields of alfalfa may be blue with blossoms, the weather seem ideal, and the bees in satisfactory condition, yet no honey is obtained. Again fireweed may appear in its prime while the bees are virtually starving. Some sort of cyclic change in nature results in a good crop of this honey in only 1 year out of 3 or even 4. A similar cycle occurs in sage honey along coastal southern California.

The factors involved are evidently numerous, for even under irrigation a field of alfalfa or cotton cannot be relied upon. Each year has about the same length of season, with abundant sunshine and other characteristics suitable for field work by the bees. It is only after the blossoms are on the plants that it becomes possible to predict results by watching the activity of the bees. All the beeman can do is to have his bees in shape for a flow, then *if* the nectar comes a crop results. This situation is naturally not satisfactory, because moving bees to a location costs money, and conversely, failure to move into a more productive area may result in loss of a full crop.

The setting of seed in a number of crops is rather unpredictable, as for example, alfalfa, white and alsike clovers. Is nectar secretion or nectar concentration a factor in this matter? What information concerning it exists in our scientific literature?

Bonnier, a Frenchman of a previous generation, did noteworthy work on the structure of nectaries, but his work has not been of much help in practical honey production. Ruth Beutler, in Germany, has recently published observations on the effect of rain on the concentration of certain plant nectars and has revealed the fact that nectars from different plants are dissimilar in kind and concentration of sugars. O. W. Park, in Iowa, has studied the nectars secreted in gladiolus plants. W. S. Cook, of the same state, has discussed the structure of nectaries for a few plants. Their work, as well as that of others, has contributed much to our scientific knowledge, but still we do not know when or where the nectar will appear in sufficient quantity for profitable honey storage.

We have no definite index to guide us and exceptions seem to occur whenever rules for nectar secretion are attempted. In the northern hemisphere many plants, especially sweet and white clovers, appear to produce much more nectar with increasing distance from the equator. The extremely long hours of sunshine are thought to have a bearing on this through stimulation of increased plant activity. On the other hand, some plants, for example, asters and chrysanthemums, do not blossom during the long days but come into flowering activity only with shorter days at the approach of fall. Even after flowers are present, nectar secretion is still problematic.

Recently, the examination of nectars in California and Oregon with a sugar refractometer has revealed a considerable difference in sugar content among blossoms from varieties of one species. Varieties of both plums and

pears show such differences that bees avoid some by giving preference to others. When pollination is dependent upon insects, it may also be affected by these preferences. Here is an example of man's ignorance of nectar secretion that

Table 1. SUGAR CONCENTRATIONS OF THE NECTARS OF SOME OREGON PLANTS ARRANGED ON A BASIS OF DECREASING PERCENTAGE

The major honey plants of Oregon are indicated in bold faced type. Other plants with a high nectar concentration are not of major importance because of limited distribution, or for some other reason.

Plant source*	Approximate average concentration†	Plant source	Approximate average concentration†
	Per cent		*Per cent*
Red filaree	65	Yellow star thistle	38
Black locust	63	Bull thistle	38
Plagiobothrys	57	Pentstemon	37
Common vetch (extra floral nectar)	56	Perennial wild buckwheat	37
Sanfoin	55	Milkweed	37
Prunella	53	Hollyhock	37
Bachelor button	53	Evergreen blackberry	36
Melanop vetch (extra floral nectar)	52	Fireweed	35–50
Big leaf maple	52	Canadian thistle	35–50
Yellow sweet clover	52	Red clover	35
Dandelion	51	Basswood	34
Annual wild buckwheat	50	Everlasting	34
Rape	50–70	Loco	33
Chickweed	50	Strawberry clover	33
Dewberry	50	Annual sunflower	32
Common mustard	50–70	Salal	30–60
Sweet cherries	50–65	Grindelia	30
Toad flax	50	Phacelia	30
Apples	45–55	Snowberry (early summer)	29
Antelope brush	49	(late summer)	50
Flax	49	Catnip	29
Cultivated buckwheat	49	Purple vetch (floral nectar)	28
Ohio buckeye	49	Himalaya blackberry	27
Horehound	48	White sweet clover	25–45
Blue vervain	48	Hungarian vetch (floral nectar)	25
Crimson clover	48	Wild vetch (floral nectar)	23
Hungarian vetch (extra floral nectar)	48	Melanops vetch (floral nectar)	23
Sunflower Wyethia	46	Rocky Mountain bee plant	22
Oregon grape	45	Common vetch	22
Wild cherry	45	Figwort	20
Tim Hill mustard	44	Tulip poplar	20
Hairy vetch (floral nectar)	44	Flowering currant	19
Vine maple	42	Peaches	16–40
Fall "dandelion"	40–50	Manzanita‡	16–40
Alfalfa	40–50	Sour cherries	15–40
White and ladino clover	41	Madrone	15
Alsike clover	40–55	Yellow cleome	11
Willows	40–70	Plums	10–60
Spanish needle	40	Pears	4–30
Privet	39		

* Plant blossoms of an open or shallow cupped type afford the nectar little protection against rain and moist or dry air; therefore the sugar concentration values for them are subject to rapid change. Among such blossoms are basswood, fireweed, maples, and certain deciduous fruits. An arrangement of the plants on a comparative basis of the nectars at the time of secretion would be most representative. Such data, however, are not available except for a few kinds of blossoms that secrete nectar before the petals unfold, as for example those of orange and manzanita. The fact that many plants, for example filaree and Bartlett pear, consistently occupy similar relative positions in data for California appears significant.

† Where two sets of figures appear, the range is due to varietal differences, humidity, or other factors yet undetermined. These current values will undoubtedly change as additional data are obtained.

‡ Some manzanita nectar in California, where there are 25 species, has shown a concentration of nearly 50 per cent.

undoubtedly has taken a heavy economic toll. Also, who knows that there are not varieties of a major honey plant that surpass others in nectar secretion? If any variety is superior in this respect and equal in others, it would be economy to grow the superior one.

The current average values from the determinations on the sugar concentration for a number of Oregon plants are shown in Table 1. Soil types, irrigation practice or rainfall, elevation, and other variables possible affect the quantity and quality of nectars. Freshly collected nectars from the blossoms or from bee nectar sacs have usually appeared colorless, even in the case of some dark honeys like horehound. A plant, such as black locust, with a rich nectar may still not be an important honey source because of scarcity in a locality, and conversely a plant producing a thin nectar could be the major source if sufficiently abundant, as for example, orange or figwort. Since honey contains about 80 per cent sugar, a gallon of yellow cleome nectar would make less than a pint of honey while the same amount of alfalfa nectar would yield more than three times as much.*

Table 2. AVERAGE PERCENTAGES OF SUBSTANCES IN FIVE LEADING HONEYS

Honey	Water	Levulose	Dextrose	Sucrose	Dextrine	Ash	Free acid as formic	Undetermined
Alfalfa*	16.56	40.24	36.85	4.42	.34	.07	.08	1.71
Alsike*	16.09	40.95	36.06	1.36	1.05	.07	.05	4.67
Sweet clover*	17.49	39.59	36.78	2.24	.45	.12	.12	3.50
Fireweed†	18.‡	41.04	32.47	5.10	.73	.04	.04	4.92
Vetch§	15.60	40.65	34.15	1.19	.....	.04	.....	.....

* Data from U. S. Department of Agriculture Bureau of Chemistry Bul. No. 110.
† Data furnished by G. P. Walton, U. S. Bureau of Agricultural Chemistry and Engineering.
‡ Approximate.
§ Determinations by H. W. Allinger, University of California.

III. POLLEN

It is now common knowledge that pollen grains represent the male element necessary in the fertilization of most plants for the set of fruit or seed. In almost all cases the pollen must come from within the same species since different species as a rule do not ordinarily cross, but in numerous instances pollen from a different individual of the same species or from another variety is necessary. Pollen is carried by a number of agencies including insects, particularly the pollen or nectar feeders. Honeybees are extremely important in the general realm of pollen distribution among plants, and are becoming more so with our present concentration of specialty crops into areas under cultivation practices. Bees require the proteins, minerals, fats, enzymes, and other important substances that are so abundant in pollen, for their growth and reproduction. They procure their carbohydrates from nectars.

Pollens from different species show a wide range in physical and chemical composition. All beekeepers are familiar with the range in the color of pollen

* Considerable information on the chemical and physical properties of Oregon honeys may be found in the following publications:
BROWNE, C. A. Chemical analysis and composition of American honeys. U. S. Dept. Agr. Bur. of Chem. Bul. 110:1-93 (1907).
ECKERT, J. E. and ALLINGER, H. W. Physical and Chemical Properties of California honeys. Calif. Exp. Sta. Bul. 631:1-27 (1939).

from white through the spectral colors to almost black. Only preliminary knowledge of the wide variation in the chemical composition is known today.* It seems probable, however, that it may require much more of some kinds of pollen than of others to provide the necessary food requirements; for instance, analyses of corn pollen indicate a very large proportion of starch, which according to some authorities is not utilizable by the honeybee. The yellow color of beeswax is derived through contact with pollen grains from some plants. Pollens are a very prolific source of carotin. Carotin, so closely associated with vitamin A, is highly important in the diet of animals.

It is very fortunate for plant fertilization that bees absolutely require pollens for their life processes. A most intricate balance between plants and animals has thus been set up in nature.

Furthermore, plants do not all yield comparable amounts of pollen and therefore, as far as beekeeping is concerned, they assume positions of varying importance in practical application. Especially prolific as bee sources of pollen

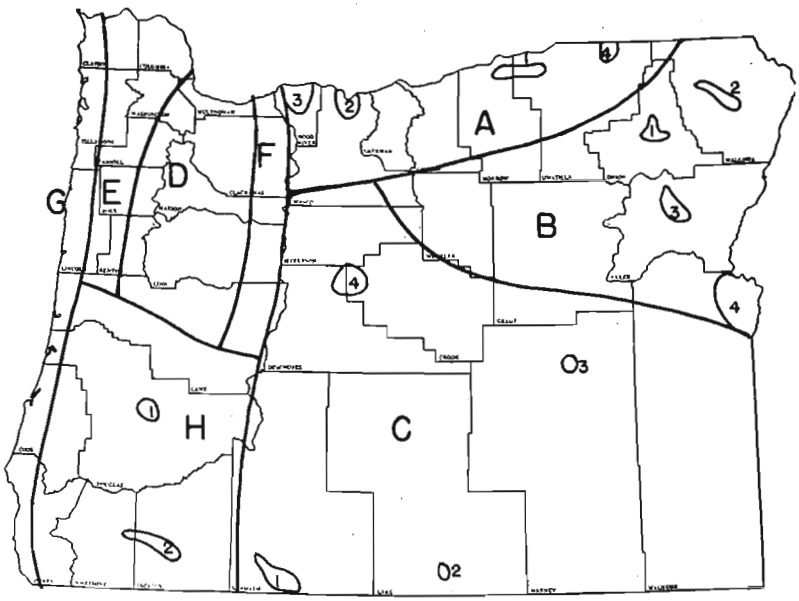

Figure 1. FLORAL AREAS OF THE STATE

A. The Columbia Basin:
  (1) Umatilla-Boardman District
  (2) The Dalles District
  (3) Hood River District
  (4) Milton-Freewater District
B. The Blue Mountain Area:
  (1) The Grande Ronde Valley
  (2) The Wallowa Valley
  (3) Powder River Valley
  (4) Malheur District
C. The Central Desert Area:
  (1) The Klamath Basin
  (2) The Lakeview District
  (3) The Burns District
  (4) The Redmond District
D. The Willamette Valley
E. The Northern Coast Mountains
F. The Western Slope of the Cascades
G. The Coastal Area
H. The Southwestern Mountains:
  (1) The Umpqua Valley
  (2) The Rogue River Valley

* Todd, F. E., and Bretherick, O. The composition of pollens. Jour. Econ. Ent. Vol. 35:312-317 (1942).

are deciduous fruits, mustards, corn, dandelion, maples, rabbit brush, olive, star thistle, yellow sweet clover; in comparison to the foregoing, salal, navel orange, vetches (except hairy), figwort, manzanita, and madrone provide little or even none. Lack of pollen is undoubtedly the reason it is difficult in many instances to build up colony populations.

Bees consume surprisingly large amounts of pollen, as has been demonstrated recently by studies in the U. S. Department of Agriculture Bee Culture Laboratory. A pollen trap on one colony under certain conditions has yielded more than a pound of pollen daily. Pollen traps operated cooperatively at Junction City, Corvallis, and Ashland during the summer of 1941 yielded 21, 25, and 40 pounds respectively. At other points in the West the trapped supply ranged from 6 to 75 pounds. The high yielding pollen areas are the commercial sources of package bees in the south. When a surplus over daily needs is gathered the bees store it in the combs as a reserve supply. During periods of inclement weather, the reserves quickly disappear, thus causing complete cessation of brood rearing. A prolonged scarcity of pollen, irrespective of plentiful honey stores, results, during the active season, in dwindling within 4 to 6 weeks. The importance of prolific pollen plants that blossom at the proper time is to be stressed in this brief discussion of nectar and pollen sources.

The pollen-seeking bees manipulate the grains, as collected from the anthers, into a ball on the outer surface of the tibia of each hind leg. These balls are carried home and stored in the cells of the comb until used as food, especially for the rearing of young bees. Also, many incoming nectar bees are coated with pollen grains to such an extent that the normal bee color is masked. This is true with bees visiting numerous plants, but especially sages, cotton, dandelion, mimulus, red maids, and mustard. On the other hand, the outgoing bees do not have this great excess of pollen, which indicates that the nectar bees are cleaned between flights. This gleaned pollen undoubtedly contributes to the normal supply brought in by the special pollen collectors.

IV. FLORAL AREAS OF THE STATE

As shown on the map (Figure 1), the state of Oregon is divided by the Cascade Mountains into an arid eastern two-thirds and a more humid western third. From the standpoint of honey flora, the eastern portion of the state may be further divided into: (A) the Columbia Basin, (B) the Blue Mountain area, and (C) the central desert area. The western portion of the state may be divided into (D) the Willamette Valley, (E) the northern coast mountains, (F) the western slope of the Cascades, (G) the coastal area, and (H) the southwestern mountains (Siskiyou Mountains.) Within some of these areas are found more limited valleys or districts where irrigation and specialized crops have resulted in a distinct flora of special interest to beekeepers.

The foregoing areas differ more or less from each other as to: (1) types of soil, (2) total rainfall (Figure 2), (3) length of growing season (Figure 3), and (4) temperature. The result is that each area or district has a flora more or less distinctive. Certain species of honey flora may be limited to one or more areas or districts, while a few species may be found to some extent in all localities.

To assist interested persons, each of these areas is summarized as to its principal physiographic and climatic conditions that influence nectar and pollen plants.

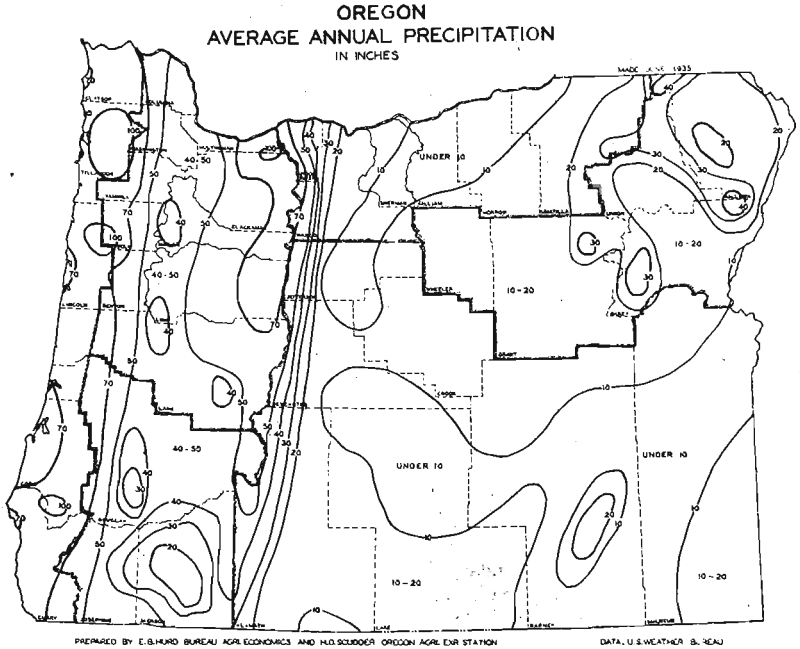

Figure 2. Map showing the average annual rainfall for Oregon. (From Oregon Experiment Station Circular 114, p. 7.)

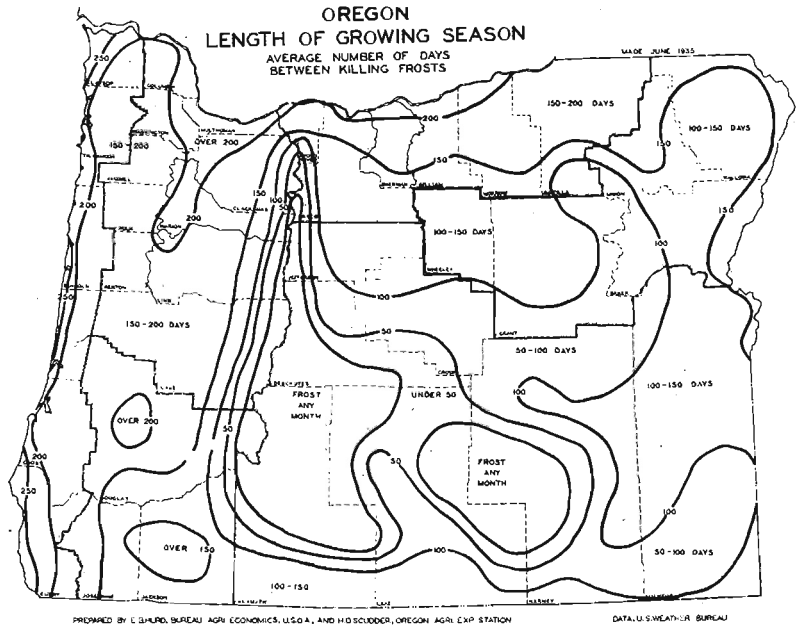

Figure 3. Killing frosts limit the duration of honey flows in the higher elevations of the state. Summer frosts add to the uncertainty of flows. (From Oregon Experiment Station Circular 114, p. 7.)

EASTERN OREGON

A. The Columbia Basin.

The elevation ranges from less than 100 feet in the region of The Dalles to about 2,000 feet. The rainfall will average about 10 inches, increasing up to 20 inches in the higher elevations. The higher elevations are largely devoted to dry land wheat and so are of no value for honey production. The steeper slopes are rocky, and few plants of value to the beekeeper are found there. The following secondary and minor plants may be found along the rocky slopes and narrow canyons: wild onion, antelope bush, sagebrush, western choke cherry, clematis, black elderberry, eriogonum, goldfield, loco weed, lupine, Jim Hill mustard, rabbit brush, yellow cleome, and willow.

The three areas of special interest to beekeepers are: (1) the Umatilla-Boardman irrigation district, and the fruit-producing regions about (2) The Dalles, (3) Hood River, and (4) Milton-Freewater. The surplus crop of honey in the Umatilla-Boardman district is produced from alfalfa with white sweet clover of considerable secondary importance. Occasional surplus is reported from such plants as rabbit brush and wild buckwheat (*Eriogonum niveum* Dougl.). Many plants found in the bordering desert and rocky slopes as listed above are of secondary importance. There is some evidence that pollen-producing plants are inadequate in this district.

The section about The Dalles is devoted largely to fruit production with sweet cherries leading. Bees are shipped in from the Hermiston-Boardman district, central Oregon, and western Oregon for pollination purposes. The section about Hood River is likewise devoted largely to fruit; pears and apples are the leading crops, with the former gradually replacing the latter. The Milton-Freewater district produces mostly prunes, with some cherries and other fruits. Some bees are moved into the Hood River Valley and Milton-Freewater sections for pollination. In general, these three fruit-producing areas are short on flora for building up colonies previous to and following the fruit bloom. Spray poison and disease are problems usually more serious in such fruit-producing centers.

B. The Blue Mountain area.

Elevations in this area range from about 2,000 feet in the larger irrigated valleys up to more than 9,000 feet in the higher mountains. The lower foothills are largely covered with sagebrush and similar desert plants. The higher mountains are covered with timber. Only the irrigated valleys are of interest to beekeepers as possible locations. Here the rainfall averages close to 20 inches. The following districts are of importance: (1) the Grand Ronde Valley, centering about LaGrande, Union, and Elgin, (2) the Wallowa Valley, from the town of Wallowa to Joseph, (3) Powder River Valley, from North Powder to Baker, and (4) the Malheur district.

In the Grand Ronde Valley alfalfa and sweet clover (both white and yellow) are grown for seed in addition to considerable alfalfa hay. Important cherry plantings occur at Cove. Elevations range about 2,700 feet.

The Wallowa Valley, surrounded by high mountains, is narrow and commercial production is limited. The surplus crop appears to be from several plants, chief of which are: alfalfa, white sweet clover, and Canadian thistle. Secondary plants that may be of some surplus value are: aster, alsike clover, and wild onion. Subirrigated pastures with considerable clover are common.

Elevations range from 3,000 to 4,500 feet and early, or even summer, frosts are the rule.

The North Powder Valley from the town of North Powder to Baker has an elevation of about 3,400 feet. White sweet clover is probably the leading surplus-producing plant here with alfalfa a close second. Some surplus is produced from yellow sweet clover, which is grown in a limited way for seed. Strawberry clover is common. Conspicuous patches of the Rocky Mountain bee plant are found south and southwest of the town of North Powder.

The Malheur region includes the irrigated districts in the northeastern part of that county. The principal commercial centers are Ontario, Nyssa, and Vale. This has been the leading alfalfa producing section of the state. It has recently been greatly enlarged by the construction of the Owyhee dam. In addition to alfalfa, white sweet clover has usually been an important surplus producer. Other plants of secondary importance are locust and alsike clover. Among the minor sources of nectar are: dandelion, willow, fruit bloom, rabbit brush, desert sage, and yellow cleome. Corn is apparently an important source of pollen.

Malheur county leads all others in the production of red clover seed (6,800 acres in 1940) and alfalfa seed (2,040 acres in 1940). A small amount of alsike seed is also produced. The elevation of the area ranges from about 2,100 feet to 2,400 feet and higher. The rainfall is about 10 inches annually.

C. Central desert area.

The elevation of most of this area is close to 4,000 feet with isolated mountains and mountain chains ranging up to more than 8,000 feet. Except for (1) the Klamath basin, (2) the Lakeview district, (3) the Burns district, and (4) the Redmond district, the area is largely desert with sagebrush the dominating growth to the east, and ponderosa pine and juniper to the west and north. Very limited honey production is possible from alsike clover and alfalfa in the Burns and Lakeview districts. In the Klamath basin alfalfa, white sweet clover, and alsike are the leading surplus producing plants. Alsike seed production is growing in the Klamath basin, and bees are used for pollination. The irrigated area about Redmond and east to Prineville produces a surplus honey largely from alsike clover grown for seed. Alfalfa is a close second with white sweet clover supplying a limited amount. Rabbit brush is common, but is not reported to be of much value for honey in that district. This area is close to snow-covered mountains and killing frosts seriously interrupt honey flows.

WESTERN OREGON

D. The Willamette Valley

This is one of the largest cultivated valleys west of the Rocky Mountains. It extends from the southern part of Lane county to the Columbia River, a distance of more than 150 miles, and averages about 50 miles in width. Its elevation above sea level ranges from about 50 feet to more than 600 feet at Cottage Grove. Much of the area is comprised of low foothills between the river bottom and the mountains on each side. The average rainfall is between 40 and 50 inches. Many varieties of grain, forage, fruit, and vegetable crops are grown. Irrigation is the exception, but it is on the increase, mostly by private pumping systems.

The surplus honey crop comes largely from hairy vetch and alsike clover. The succession of honey flora for the season is about as follows: willow, mustard, broad-leaf maple, dandelion, fruit bloom, vine maple, cascara, vetch, alsike clover, alfalfa, bachelor's button, Canada thistle, and snowberry. There is a decided dearth of plants of much value after late July.

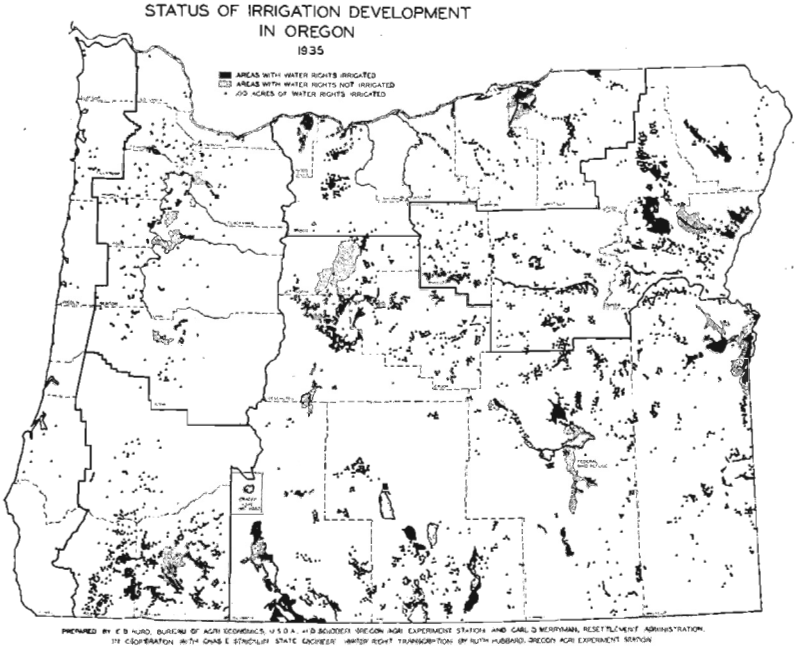

Figure 4. Dots on this map, each indicating 100 acres, are over scale. Almost two million acres of water rights are recorded in Oregon. Irrigation makes possible the growth of many crops of importance as sources of major or minor honey flows. Irrigation adds to the duration and dependability of many nectar flows.

E. The northern coast mountains.

This area is commonly spoken of as the fireweed area, as that is the only major honey plant. Other plants of secondary value are vine maple and figwort. There are many plants of minor importance. The rainfall is heavy, ranging from 40 to more than 100 inches. Most of the commercial production is at elevations between 500 and 2,000 feet. A few mountains rise to about 4,000 feet. The entire area, except for cultivated valleys and burned or logged areas, is covered with forest of Douglas fir and smaller amounts of cedar, spruce, and hemlock. For further information on this area see the discussion under fireweed in section V.

F. The western slope of the Cascades.

From the standpoint of honey flora, this area is very similar to the last one discussed. It has less rainfall, however, and hence the more limited fireweed sections are less dependable. The vegetation is quite similar to that of the Coast Mountains.

G. **The coastal area.**

The flora of the coastal area is somewhat similar to the Coast Mountains, but off-coast wind and fog seriously interfere with bee activity on the more exposed locations. From Tillamook County north fireweed will maintain the lead as a surplus producing plant. It becomes progressively less valuable as one goes south. Clovers (white and alsike) may be of some value in the dairy meadows of Tillamook and Coos counties.

H. **The southwestern mountains (Siskiyou Mountains).**

Except for the Umpqua, Rogue, and other smaller valleys, this entire area is quite rugged and forested with a variety of trees. Only limited sections of the above-named valleys are of interest for beekeeping. (1) The Umpqua Valley, in the section about Roseburg (elevation about 500 feet), is of little value for commercial production. There are no outstanding honey plants grown as a crop, and apparently no native plants produce a dependable surplus. Bees are needed, however, for their pollen distribution on the prune and other fruit blossoms of that section.

(2) The Rogue River Valley from Grants Pass to Ashland is of interest to beekeepers. Most of the commercial production, however, is in the Medford area where the width of the valley is at a maximum. Alfalfa is the major surplus producing plant. This district is a heavy producer of pears, and spray poison is a problem. The valley is narrower at Ashland and Grants Pass, and there are only very limited possibilities for commercial production.

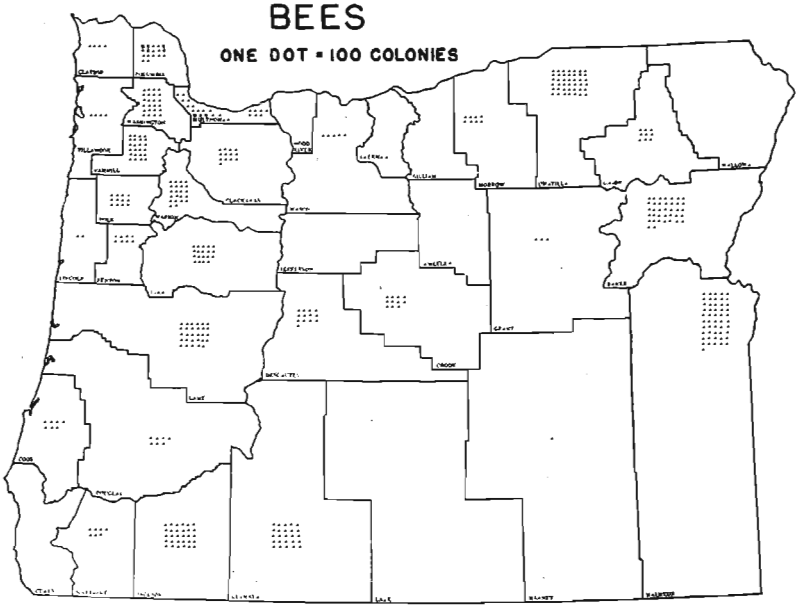

Figure 5. This map shows the distribution of bees within the state by counties. The distribution within the county is not indicated. (1941.)

Table 3. Summary of the Honey and Pollen Flora Regions of Oregon

Region	Approximate elevations	Rainfall	Average growing season	Major honey plants	Secondary honey plants	Remarks
	Feet	*Inches*	*Days*			
A. Columbia Basin						
1. Umatilla-Boardman District	250–500	8–20	153–197	White sweet clover Alfalfa	Wild buckwheat Rabbit brush Wild onion	Declining as a major honey producing area. Short on pollen.
2. The Dalles District	100+	16	196	None	Sweet clover Alfalfa Fruit trees	Bees rented for pollination of cherries.
3. Hood River District	100–500	32	183	None	Sweet clover Alfalfa Fruit trees	Bees rented for pollination of apples and pears.
4. Milton-Freewater District	1,100	14	190	Sweet clover Locust Alfalfa	Fruit trees	Bees used for pollination of fruit.
B. Blue Mountain Region						
1. Grand Ronde Valley	2,700	14–23	117–160	White and Yellow sweet clover Alfalfa	Canada thistle Wild onion	Alfalfa and sweet clover seed produced.
2. Wallowa Valley	3,000–4,500	16–19	108–134	Sweet clover Canada thistle	Alfalfa	Very limited for commercial production.
3. Powder River Valley	3,400+	12	138	White and Yellow sweet clover Alfalfa	Strawberry clover	Increased production in recent years.
4. Malheur District	2,100–2,400	9	124	White sweet clover Alfalfa	Locust Alsike clover	The largest producing district of the state.

C. Central Desert Area						
1. Klamath basin	4,200+	10–15	117–134	Alsike clover White sweet clover Alfalfa		Bees used to pollinate alsike clover.
2. Lakeview District	4,800–5,000	14	121	Alsike clover Alfalfa		Very limited production.
3. Burns District	4,100–4,200	10–12	117	Alsike clover Alfalfa		Very limited production.
4. Redmond District	3,000	8–15	88–112	Alsike clover	Alfalfa and White sweet clover Rabbit brush	Summer frosts common.
D. Willamette Valley	50–500	40–50	164–212	Alsike Hairy Vetch	Hungarian vetch Bachelor's Button Canada thistle Large-leaved maple	Pollen shortage.
E. Northern Coast Mountains	0–3,000	60–75	166–273	Fireweed	Vine maple Figwort	Pollen shortage.
F. West Slope of Cascades	500–2,000	40–70	164–178	Fireweed	Salal Huckleberry Vine maple	Limited production.
G. Coastal Area	0–1,000	60–100	197–269	Fireweed White and alsike clover	Vine maple	Too much fog. Limited production.
H. Southwest Mountains						
1. Umpqua Valley	400–500	30–45	187–217	No outstanding plants	Poison oak	Bees needed for fruit. Limited for commercial production.
2. Rogue River Valley	900–2,000	15–24	142–190	Alfalfa	Manzanita	Spray poison a problem. Production centered about Medford.

V. NECTAR AND POLLEN SOURCES*

The sources are grouped below into two classes: (A) the major plants, and (B) the secondary and minor plants. The separation was based on whether or not honey from a source is found consistently on the wholesale market.

A. MAJOR PLANTS†

In this section are discussed the five most important types of honey plants of Oregon; namely, the alfalfas, alsike clover, fireweed, the sweet clovers, and the vetches. Illustrations of these are on the front cover page.

To be a major source of honey, a plant must have several attributes, such as abundance, a large number of blossoms per plant, and blossoms of suitable structure for the bees to work. A factor of the utmost importance is that the plant must secrete freely, and the higher the sugar concentration the better. Honey is about 80 per cent sugar so that it would take a great deal more of sour cherry nectar than of alsike clover to make an equal volume of honey.

Alfalfa (*Medicago sativa* L.: Leguminosae).

This, the leading honey-producing plant in Oregon, is an introduced plant now grown extensively as a hay and seed crop in the western states. In Oregon alfalfa is grown mostly for hay, but some seed is produced as indicated in the seed acreage tabulation for the year 1940. Malheur, 2,040; Baker, 1,600; Union, 1,700; Harney, 550; Klamath, 400; total for the state, 7,720. It is difficult to secure a satisfactory set of seed in many places. The total acreage for hay in the state was 259,000 in 1938.

The accompanying map will show the locations of the leading producing areas (Figure 6).

In the Willamette Valley alfalfa is cut too soon after blooming starts to permit the bees to collect much nectar from it. In the higher altitudes of central Oregon two crops of hay are cut, while in the lower elevations, three cuttings are the rule. As each crop approaches maturity, a nectar supply is available.

In Oregon, the honey from alfalfa, when free from foreign stains, is water white and of fine quality. It granulates quite readily into a fine-grained solid mass. Nectar concentration has been checked by the authors with the following results: for eastern Oregon (1938), 41.1 per cent sugar; in the Willamette Valley (1937), 43.5 per cent.

The honey crop from alfalfa in the eastern part of the state is much more dependable than that from fireweed in the western mountains. This is due in part, no doubt, to the fact that the water supply is under control by irrigation. The honey crop from alfalfa, however, does vary from one year to another and the flow may stop entirely for unknown reasons. This difference between years may be due in part to lack of nectar in the flowers, and in part to the variable condition of the bees, resulting from poor wintering, pollen shortage, adverse weather conditions during the building up season, etc., which prevent the colonies reaching their maximum strength at the time the surplus flow starts.

The conditions necessary for maximum nectar secretion by alfalfa are at present unknown and need investigation. Correct soil moisture conditions, absence of insect injury (thrips, alfalfa weevil, etc.) and certain undetermined atmospheric conditions are, no doubt, essential for maximum secretion. Frost is a factor here as with most nectar plants. There

* The common, scientific, and family names are included for each plant in the table.
† Refers particularly to surplus honey evaluation rather than to pollen productivity.

may be a difference in the quality and quantity of the nectar produced by different kinds of alfalfa as has been shown by studies of the nectars from other plants.

The relationship of bees and other insects to the proper set of alfalfa seed has been studied somewhat but needs further investigation under Oregon conditions. Studies in Michigan (Michigan Experiment Station Quarterly Bulletin XIV (No. 4):1-7) show that honey bees are efficient pollinating agents for alfalfa in that state. The setting of seed is very irregular in parts of eastern Oregon. This may be due to the absence of bees from alfalfa for various reasons. Observations indicate that bees may collect almost no pollen from alfalfa in Oregon; this was true during various periods of investigation. Thrips are very abundant in the alfalfa blossoms of all parts of eastern Oregon and may have an injurious effect on nectar secretion and seed production.

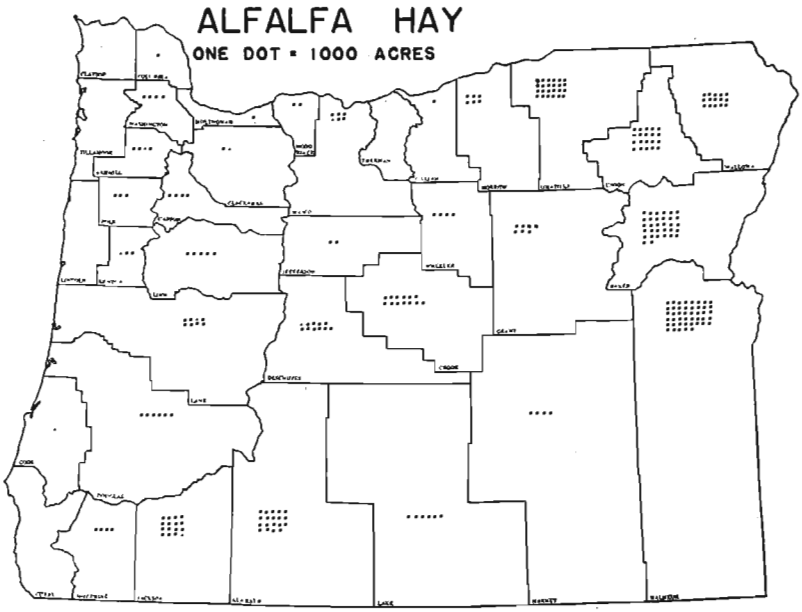

Figure 6. This map shows the leading alfalfa hay producing sections. Not all are equally valuable for honey production. (U. S. Census, 1940.)

Alsike clover (*Trifolium hybridum* L.: Leguminosae)

Alsike clover is grown for seed rather extensively in the Willamette Valley and in Deschutes County. It is also grown for seed, but less extensively, in Malheur, Crook, and Klamath counties. The total acreage of alsike grown for seed in the state in 1940 is reported as 23,000. The leading counties producing seed and the acreage for 1940 are as follows: Linn, 5,000; Marion, 1,000; Yamhill, 450; Polk, 850; Deschutes, 4,800; Klamath, 7,400; Crook, 2,000. (1941 total for the state was 21,000 acres.)

Alsike is common in moist pasture land in most parts of the state. It is one of the major honey plants in the first two sections mentioned. In the Willamette Valley in normal years, the flow lasts from the middle of May to about the third week of June. In Deschutes County the flow comes largely in July. The honey is of the finest quality, being white in color and mild in flavor. In the Willamette Valley it may be darkened with maple or bachelor's button honey. In the eastern Oregon districts it is likely to be blended more

or less with sweet clover or alfalfa. Nectar concentration runs from 49 per cent to 55 per cent in the Willamette Valley when the relative humidity is 81 per cent to 87 per cent.

It is an accepted fact that bees are necessary for a good set of seed where there is not an excess of bumblebees, which is probably never the case.

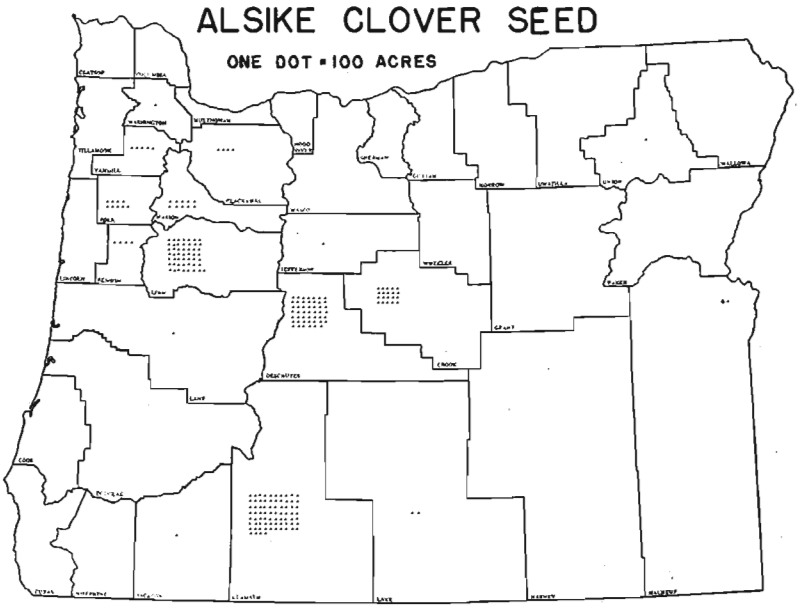

Figure 7. This map shows the distribution of alsike clover grown for seed in the state. (1940.)

Fireweed (*Epilobium angustifolium* L.=*Chamaenerion angustifolium* L.: Onagraceae)

Fireweed is also called elkweed, willowherb, Indian pink, and rose bay. In the west it more commonly is called fireweed. This could be due to the fact that it comes up in such abundance after forest fires, because of its flaming color, or possibly because when it is dry in the fall it is somewhat of a fire hazard.

Fireweed is found growing in favorable locations throughout the northern states and Canada from coast to coast. It ranges much farther south in very limited amounts. It ranges north in abundance as far as coniferous timber grows. Optimum growth appears to be reached in southwestern British Columbia. It is at its best in Oregon in an area comprising Clatsop, Columbia, and Tillamook counties and parts of the adjoining counties. A limited area on the west slope of the Cascades in the region of eastern Marion County has produced some fireweed honey (Figure 8).

Fireweed continues common south to the California line in the coast and mountain counties but becomes progressively less valuable as a honey plant. Rare clumps of the plant may be found growing along the banks of irrigation ditches in parts of eastern Oregon but it is of very minor importance there.

Heavy rainfall and the resulting soil moisture appear to correlate closely with the region where fireweed is of value for a surplus crop of honey. Very little commercial production is found beyond the limits of 50 inches of annual rainfall.

In the burned-over areas of northwestern Oregon fireweed reaches its maximum production about the second or third year following a burn. In a freshly burned area it is established either by the seeds that are carried in by the wind or from the remnants of old rootstocks. Investigations by the late Dr. F. W. L. Sladen show that the plant sends out rootstocks that spread as much as 20 feet in different directions. New plants spring up at different points on these rootstocks. The original plant crown lives about 3 years. The young plants from rootstocks apparently become the dominating plants after the second year's growth. The remnants of these old rootstocks may be the source of new plants for some years to come.

By the second year after a burn several other herbaceous plants spring up. These include the bracken fern, pearly everlasting, *Senecio* sp., minor weeds, and grasses. Within another year such plants as blackberry, thimbleberry, and figwort appear. These are followed by such shrubs as salal, ocean spray, Oregon grape, and hazel. By the fourth or fifth year these shrubs become the dominating plants and the fireweed is being crowded out. Young deciduous trees, such as the maples and alders, then begin to appear. From 10 to 20 years after the burn these trees will be the dominating growth to be followed in time by the Douglas fir if seeds are available. It will be seen from this cycle that no important surplus-producing plants are available following the fireweed, with the possible exception of vine maple. Several of the other plants are of value as secondary and minor plants. Fireweed will continue to grow in open spots along the borders of the forests but will be too uncommon for commercial production.

Second burns on the same area will give the fireweed a new start, but it will not dominate as long as after the first fire. Other species of plants will spring up quickly from roots in the ground. Unless new burns occur within the range of the bees, a fireweed location cannot be expected to yield well after 6 to 8 years.

The honey produced from fireweed when not stained by foreign substances is waterwhite. It is also one of the mildest honeys known and does not readily granulate because of a high per cent of levulose.

As the nectaries are much exposed in the flowers, the sugar concentration of the nectar varies with the relative humidity. The following concentrations correlate with the relative humidity:

Relative humidity	Average percentage of sugar	Relative humidity	Average percentage of sugar
79	19.00	50	49.80
75	27.10	45	58.69
70	36.78	40	61.20
65	38.41	35	64.93
60	37.31	30	65.66
55	47.15		

It can be seen from the foregoing that it is only after the relative humidity drops to about 70 per cent that the concentration of the nectar begins to approach the range of other surplus-producing plants.

Fireweed is far more variable in the amount of honey produced than any other major honey-producing plant in the state. An excellent summary of the

conditions influencing fireweed secretion is given by Professor John Davison of the University of British Columbia in the American Bee Journal for April, 1922, pp. 153-154.

Although the fireweed plants may be in bloom in late June, the flow usually does not start until near the middle of July. On the other hand, the flow may continue for a period and suddenly stop with no apparent reason. Evidently a certain combination of factors are necessary for actual secretion, even when the plant is apparently otherwise in condition to secrete.

Out of 655 bees taken on fireweed, 63, or about 9 per cent, were carrying pollen balls and one-third of these had only a trace of pollen. It is evident, therefore, that for some undetermined reason bees do not collect much pollen from fireweed. The pollen is bluish gray in color. Most of the pollen is collected in the forenoon.

Beekeepers in the fireweed sections are not only confronted with the problem of irregular flows but also with poor roads, poor weather, low pollen reserves, and too many bears.

Other species of *Epilobium*, known as dry land fireweeds, are freely visited by bees in the Medford area, especially *E. paniculatum* Nutt. Other plants such as *Amsinckia* sp. are also called fireweed.

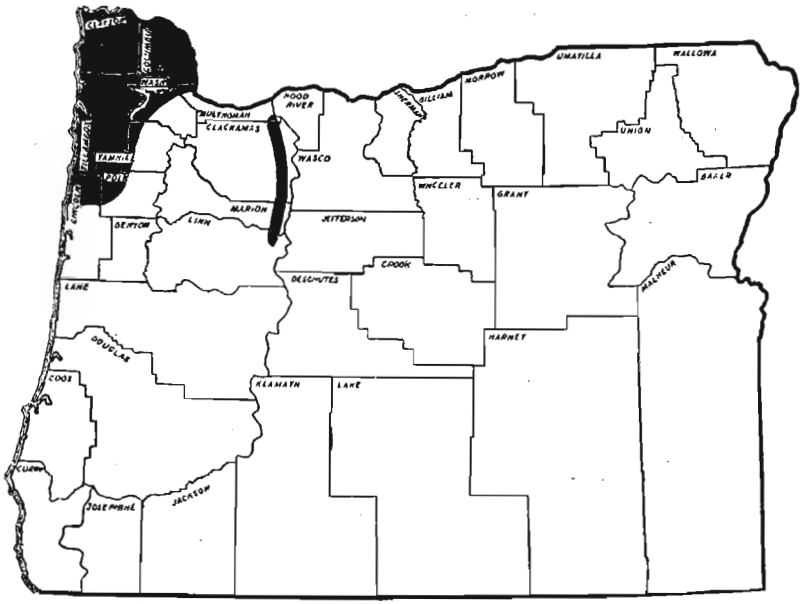

Figure 8. Map showing where fireweed is usually a good honey plant.

Sweet clover (*Melilotus* spp.: Leguminosae).

Two species of sweet clover are found in the state. The more common species is the white (*Melilotus alba* Desr.). The yellow sweet clover (*M. officinalis* (L.) Lam.) is confined largely to Baker and Union counties, where it is grown for seed and pasture. Limited amounts of the yellow sweet clover

may be found in other irrigated sections of eastern Oregon. The white species is also grown for seed in Baker and Union counties. It is the more common species in waste ground along ditches and roadways where there is sufficient moisture and other conditions are favorable (Figure 9). The acreage of sweet clover (both species) grown for seed in 1940 for Oregon and the leading counties is as follows: state, 300; Union, 50; Klamath, 40; Malheur, 60; Baker, 50.

Up to quite recent years, sweet clover could not be grown in the Willamette Valley because of the fact that it was killed by stem rot. In recent years Mr. H. A. Schoth of the Oregon Agricultural Experiment Station in cooperation with the United States Bureau of Plant Industry has been successful in developing a strain of white sweet clover that is resistant to this disease. Since the seed of this disease resistant variety has become available, sweet clover has become more common in the Willamette Valley. It is not common enough, however, to be of more than secondary importance. Anyone expecting to plant sweet clover in the Willamette Valley should make sure he obtains the resistant strain. Sweet clover needs lime to grow well. This is an important factor in the Willamette Valley, where the soil is inclined to be acid.

The honey from sweet clover is waterwhite and of fine distinctive flavor. So far as known, the honey from the yellow species is very similar to the honey from the white species. The yellow sweet clover, however, comes into bloom about 2 weeks earlier than the white. The yellow species was found by the writers to yield about five times as much pollen as the white. Pollen from the

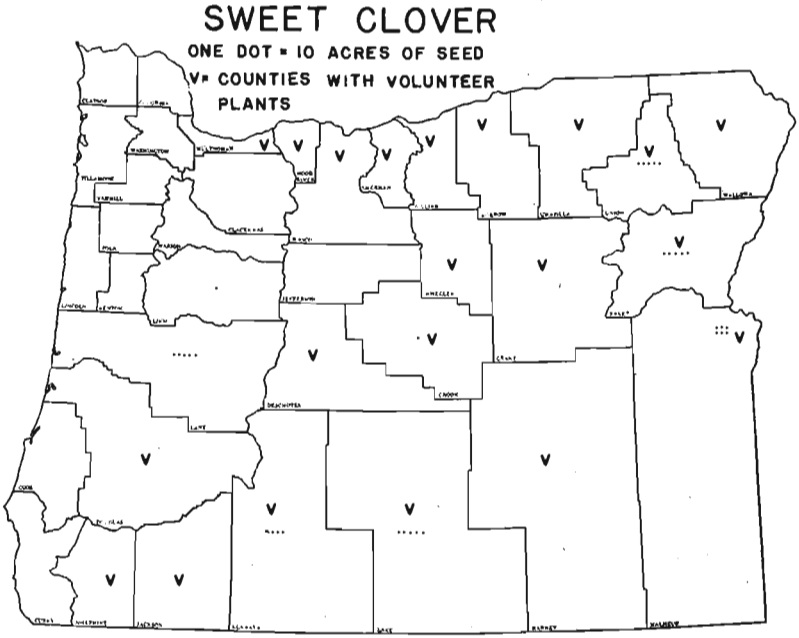

Figure 9. Distribution of sweet clover grown for seed. Counties where the plant is common as a volunteer are indicated by a V. (1940.)

yellow species is bright yellow and from the white species is grayish-yellow. Bees were observed to carry larger loads of pollen from the yellow than from the white. The yellow sweet clover also produced a nectar with a concentration of 51.6 per cent, while at the same time the white species produced a nectar of only 35.8 per cent concentration. Yellow sweet clover had the highest nectar concentration of any plant studied in eastern Oregon in 1938. The blossoms of the yellow species are about twice as large as those of the white, but some individual yellow plants have blossoms much larger than the average. The flow from sweet clover is not uniform and occasionally stops entirely. The late Mr. A. I. McClanahan of Payette, Idaho, who kept bees for about 45 years in the Ontario district, reported that the flow does not start up again after it once stops.

Recent investigations in Iowa demonstrate the importance of honeybees in pollinizing sweet clover grown for seed.*

Vetch (*Vicia* spp.: Leguminosae).

Vetch has been one of the leading hay and seed crops in the Willamette Valley of Oregon for many years. Until recent years, the spring vetch (*V. sativa* L.) was about the only type grown. Since 1920, several new species of vetch have been introduced into the state largely for seed production.

The first of these new vetches to be introduced was Hungarian vetch. Later hairy vetch and purple vetch were introduced as seed crops. These different species of vetch may be distinguished as follows:

Common vetch may be recognized by the blossoms being in pairs, as a rule, in the axils of the leaves. The blossoms are purple in color, and the stems and leaves are smooth or nearly so.

Hungarian vetch (*V. pannonica* Crantz.) is covered with a white or gray pubescence, and the large flowers are a gray-white in clusters of 2 to 4 in the axils of the leaves.

The hairy vetch (*V. villosa* Roth) has about thirty dark blue-violet flowers on each long flower stem with many stems blossoming at one time. There are two recognized varieties of hairy vetch. The variety most commonly grown in Oregon is called the smooth type as it has almost no hairs on the leaves, compared with the true hairy variety. The pods in both cases are smooth.

Purple vetch (*V. atropurpurea* Dest.) is somewhat similar in appearance to hairy vetch, but has only about twenty or more flowers to a cluster with only one or two flowers open at a time. The leaflets, and to some extent the stems, are covered with fine hairs giving the plant a silvery-grayish appearance. The pods are hairy. Purple vetch is more subject to low temperatures, and is not found to any extent north of Eugene.

Woollypod vetch (*V. dasycarpa* Ten.) is common as a volunteer plant on the hills of Douglas County. It resembles hairy vetch except that the pods are covered with fine hairs. No information is available relative to its value to the bees.

The acreages of some vetches for Oregon in 1940 are estimated as follows: hairy, 84,000; purple, 3,000; Hungarian, 7,000; common, 32,500. The acreage of hairy vetch for 1938 in the leading counties was: Yamhill, 7,500; Linn, 5,900; Benton, 5,300; Lane, 3,000; Polk, 2,800. The acreage of hairy vetch is at present very much on the increase (118,000 acres in 1941).

From the standpoint of nectar production, there is considerable difference between the species in several respects. The honey from common and Hun-

* Report of the State Apiarist (Iowa), 1939, page 15.

garian vetches comes almost entirely from nectar glands on the stipules of the leaves, within an inch or two of the growing stem tips. Tests on all species show that the nectar is more concentrated when it comes from the stipules than when it comes from the blossom (see below). This is probably one reason why the bees usually work the stipules to the neglect of the blossoms. The extra floral nectar produced by common vetch is far less plentiful than that produced by the Hungarian, and whereas the latter plant can be considered of secondary importance the former is of very minor importance as a honey plant.

About 1930 hairy vetch began to appear as a common seed crop and as a volunteer plant along the fences. Since that time, it has assumed a place of equal importance with alsike clover as a honey plant in the Willamette Valley. In the case of hairy vetch, the comparatively small flowers produce all of the nectar collected by the bees. If any is secreted by the stipules at all, it does not appear to attract the bees. The honey produced from the hairy vetch blossoms is white and of mild flavor.

Purple vetch in Oregon is of relatively little value to the bees. This apparently is due in part to the fact that only a very few blossoms on a single plant are open at any one time. Hairy vetch, on the other hand, may have a large number of flowers open at one time on a single plant.

The large size and structure of the flowers on Hungarian vetch may be another reason why the bees do not collect nectar from it.

Nectar concentrations for three vetches have been determined as follows:

Common	Blossom nectar	22.6 per cent
	Stipular nectar	56.5 per cent
Hungarian	Blossom nectar	25.2 per cent
	Stipular nectar	47.7 per cent
Hairy	Blossom nectar	44.0 per cent

B. SECONDARY AND MINOR PLANTS

In this section a condensed discussion gives information on a number of plants which, for the state as a whole, are not considered of primary importance. In special localities one or another of these may constitute the major local source of nectar or of pollen. For example, white clover is important on the irrigated pasture section to the north of Medford as also is a native honeysuckle on the mountains between the Rogue River and Klamath Falls vicinities. By timely management a limited amount of surplus honey can be obtained from several of the secondary plants.

The deciduous fruit blossoms constitute a major source of pollen for more than a month in spring. Surplus honey is stored at times from apple and some plums, especially the Japanese and prune varieties. There is an unbroken series of fruit blossoms beginning with the almond and concluded by the apple. Where fruits occur in abundance, normal colonies become populous at a rapid rate. Swarming is sometimes excessive at the end of fruit bloom, especially where other pollen and nectar sources are less productive than the fruits. As a swarm control measure, colonies may then have to be divided or moved to a flow. The sequence of the blossoming plants has an important bearing on colony manipulation based on the habits of bees. The following illustration shows the differences in bee activity as a result of variation in the available plants. In the Summerville area of northeast Oregon swarming is excessive

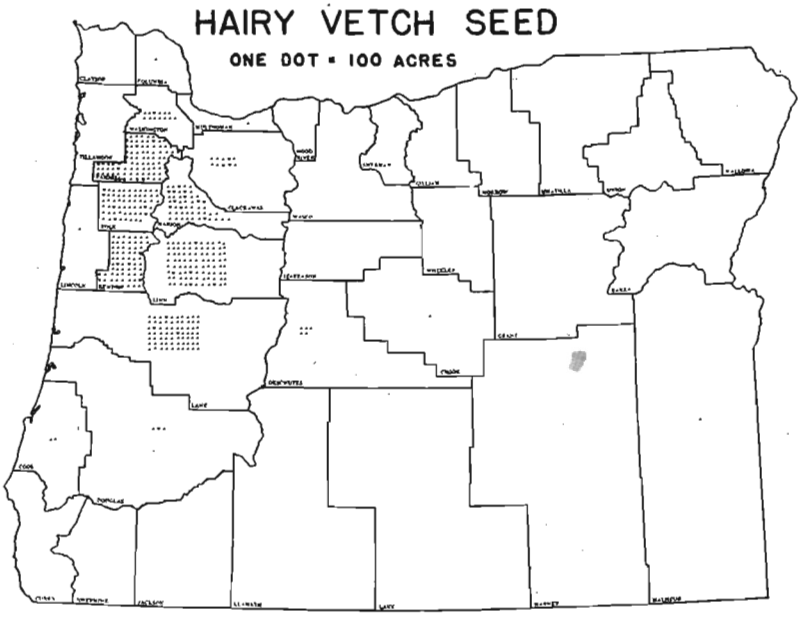

Figure 10. Distribution of hairy vetch grown for seed. (U. S. Census, 1940.)

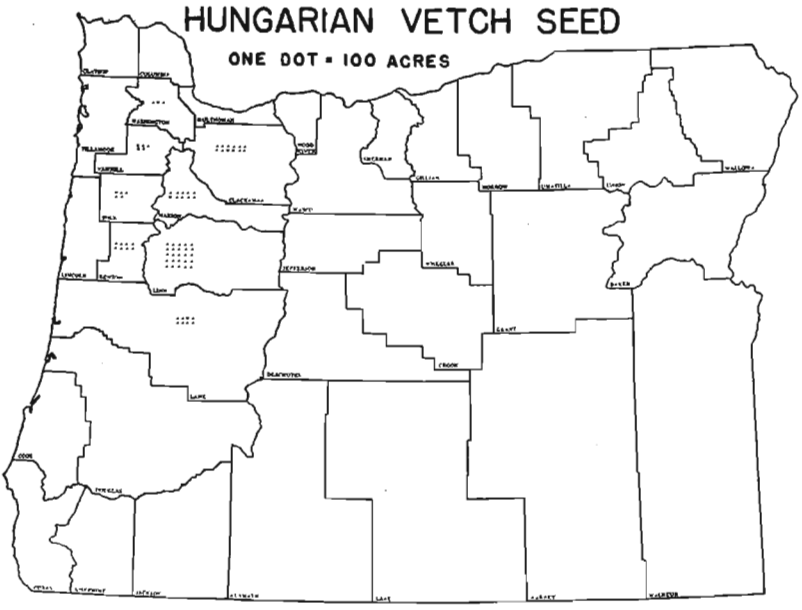

Figure 11. Distribution of Hungarian vetch grown for seed. (U. S. Census, 1940.)

following the fine build-up on fruit blossoms, but in the Willamette Valley where maples and Hungarian vetch immediately follow the fruits and these are in turn succeeded by hairy vetch and alsike clover, there is as a rule little tendency to swarm.

Honeydew rarely becomes the major source of honey but more or less of it is undoubtedly mixed with many honeys. Numerous insects excrete a liberal quantity of the sweet substance. Plant lice, scale insects, white flies and psyllids, totaling hundreds of species, are common in nearly every locality. Whenever the floral sources of nectar fail, the attractiveness of honeydew to the bees is increased. In the case of linden trees, aphids are frequently very abundant and their honeydew, which drips almost continuously, must fall into the fully exposed nectar. This particular honeydew is sometimes very attractive to bees even after it has fallen from the trees. On the other hand, the copious excretion from the European elm scale does not appear to attract the honeybee. The reasons for the variation in bee activity toward different honeydews are obscure.

In column one of Table 4 appears the best known common name of the plant in Oregon. The family and the scientific names (genus and species) are also included for ready reference. Under the heading "Sources of nectar and pollen" the letter N means nectar is collected by bees, P means pollen is collected, a question mark (?) means information is lacking, a dash (—) means no nectar (or no pollen) is known to be collected. The sugar percentage data were secured by the refractometer method using either hand- or bee-collected nectar.

Table 4. SECONDARY AND MINOR PLANTS

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Alder (*Alnus* spp.) .... (Betulaceae)	Tree	Greenish catkins	Early spring	Mostly in wet places	?	P	General in western Oregon but limited to mountain stream banks in eastern Oregon.
Alkali Weed (*Centromadia pungens* (T. and G.) Green) (Compositae)	Annual	Yellow		Echo	N	P	Little is known of the value of this rare plant in Oregon. It produces pollen and yellow nectar in San Joaquin and Sacramento Valleys in California.
Almond (*Prunus Amygdalus* Stokes) (Rosaceae)	Tree	Pink	Early spring	Very limited	N	P	All almonds are self-sterile, have sticky pollen and require insects as pollinization agents. Honey is bitter.
Amsinckia (*Amsinckia* spp.) (Boraginaceae)	Annual	Yellow	Spring	Rogue River Valley	N	P	Yields nectar and pollen in California in early spring. Several species in Oregon. Also called fireweed, fiddle neck and leather breeches.
Antelope Bush (*Purshia tridentata* (Pursh) DC) (Rosaceae)	Low shrub	Cream	Spring	Eastern Oregon	N	P	Sandy arid ground. Blooms when fruit does and more important. Also called bitter bush and buck brush. Nectar concentration 31.9 per cent to 50 per cent.
Apple (*Pyrus Malus* L.) (Rosaceae) (Fig. 12)	Tree	White to pink	Late April and May	See map Fig. 10	N	P	Approximately 25,000 acres in Oregon. Most commercial varieties are self-sterile so insects are necessary for pollination. Nectar concentration records: 45.1-55.7 per cent. Apple blossoms would constitute a major source of honey if the colonies were strong early enough.
Apricot (*Prunus Armeniaca* L.) (Rosaceae)	Tree	White to pink	Early spring	Mostly in Wasco County	N	P	About 414 acres in Oregon.
Ash (*Fraxinus oregona* Nutt.) (Oleaceae)	Tree		Spring	Western Oregon	—	P	Confined largely to low flooded areas. A liberal quantity of pollen is produced.
Asparagus (*Asparagus officinalis* L.) (Liliaceae)	Perennial herb	Yellow	Summer	Willamette, Hood River valleys, Wasco and Umatilla counties	N	P	Very limited, only about 550 acres in Oregon. Nectar light in color and of fair quality.
Aster (*Aster* spp.) (Compositae)	Perennial herb	Various	Late summer	Mostly in Alpine meadows	N	P	Not common enough to be of much value in Oregon except in alpine meadows where no bees are kept. One possible exception is near Joseph (4,400 feet).
Aspen (*Populus tremuloides* Michx.) (Salicaceae)	Tree			Alpine canyons	—	P	

Bachelor's Button (*Centaurea Cyanus* L.) (Compositae) (Fig. 13)	Annual	Mixed	Early summer	Willamette Valley	N	P	The honey is yellowish-green and has a strong flavor. Clover and vetch honey should be removed as soon as possible to prevent the bees mixing it with this inferior honey. Nectar concentration 52.5 per cent. Star thistle, a valuable honey plant of northern California, belongs to the genus *Centaurea* also.
Balsam Root (*Balsamorhiza deltoidea* Nutt.) (Compositae)	Perennial herb	Golden yellow	Spring	Open hillsides in general	N	P	Looks like a dwarf sunflower. Nectar concentration 45.8 per cent.
Barberry (*Berberis* spp.) (Berberidaceae)	Shrub		Spring	As planted	N	P	Several introduced species used as ornamentals. Worked freely by bees but not common enough to be of value. See Oregon grape.
Basswood (*Tilia* spp.) (Tiliazeae)	Tree	White	Early summer	As planted	N	P	Both the American species (*T. americana* L.) and the European species (*T. europaea* L.) are used as shade trees. Often called linden or lin tree. Nectar concentration 33.6 per cent.
Bean (*Phaseolus* spp.) (Leguminosae)	Annual	White	Summer	As planted	N	?	Lima beans are about the only kind attractive to bees and very few are grown in Oregon.
Bindweed (*Polygonum Convolvulus* L.) (Polygonaceae)	Prostrate annual			As introduced	?	?	An introduced weed. Pellett reports it visited by bees in the East. Bees have not been reported on it in Oregon.
Birch, Scrub (*Betula glandulosa* Michx.) (Betulaceae)	Shrub	Catkins	Spring	In sphagnum bogs	—	P	Also called mountain birch. Out of range of most bees.
Blackberry, Native (*Rubus macropetalus* Dougl.) (Rosaceae)	Trailing shrub	White	Late April and May	Western Oregon	N	P	Also called dewberry. Abundant in old burns in western Oregon. Nectar concentration 40-60.5 per cent.
Blackberry, Evergreen (*R. laciniatus* Willd.) (Rosaceae)	Shrub	White	Early summer	Northwestern Oregon	N	P	Grown commercially and an escaped plant along the coast. Nectar concentration 35.6 per cent.
Blackberry, Himalaya (*Rubus thyrsanthus* Focke)	Gigantic shrub	White	June, July	Northern Willamette Valley	N	P	Grown commercially and an escaped plant. About 730 acres of cultivated blackberries, mostly Himalaya. Bees are of value in securing well-shaped berries. Nectar concentration 27 per cent.
Black Medic (*Medicago lupulina* L.) (Leguminosae)	Perennial herb	Yellow	Summer	Widely scattered. Common in northeastern Oregon	?	?	Apparently of little value to bees.
Bluebell, Wild (*Campanula Scouleri* Hood.) (Campanulaceae)	Herb	Blue		Northwestern Oregon	?	?	Reported as a honey plant in northwestern Oregon but is probably of little value.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Blue Curls (*Trichostema lanceolatum* Benth.) (Labiatae)	Annual	Blue	Summer	Rogue River and Willamette valleys	N	P	Important producer in California but of little value in Oregon. Also called vinegar weed and camphor weed.
Borage, European (*Borago officinalis* L.) (Boraginaceae)	Annual	Blue	All summer	Flower gardens	N	—	A European honey plant tried out for several years at Corvallis but would not grow in competition with other plants.
Boston Ivy (*Parthenocissus tricuspidata* Planch.) (Vitaceae)	Perennial vine	Inconspicuous	Summer	As planted	N	P	Common on buildings. Worked freely by bees. Honey evidently very dark.
Box Elder (*Acer Negundo* L.) (Aceraceae)	Tree	Green	Spring	As planted. More common in eastern Oregon	N	P	Not a heavy nectar producer. Only male trees provide pollen.
Buckeye (*Aesculus californica* (Spach.) Nutt.) (Sapindaceae)	Tree	White to pink	Early summer	Few planted trees in southern Oregon	N	P	Very destructive to bees in California. Not native to Oregon. The horse chestnut, related to buckeye and used sparingly as a shade tree in Oregon, is not reported as injurious to bees.
Buckwheat, Cultivated (*Fagopyrum esculentum* Moench.) (Polygonaceae)	Annual	Creamy white	Summer	Rarely planted	N	P	A native of Asia not common in Oregon. Furnishes very little pollen. Nectar dark, 48.78 per cent.
Bull Thistle (*Cirsium lanceolatum* (L.) Scop.) (Compositae)	Biennial	Rose-colored	Summer	General	N	P	Bees visit it freely. Nectar 38 per cent.
Bur Clover (*Medicago hispida* Gaertn.) (Leguminosae)	Herb	Yellow	Summer	General	N	—	Appears to be of little value to bees in Oregon.
Burnet (*Sanguisorba* spp.) (Rosaceae)	Annual and perennial herbs	Greenish or purplish	Summer	Common in Willamette Valley	—	P	Considerable pollen is collected from the various species.
Burdock (*Arctium minus* Schk.) (Compositae)	Biennial	Purple	Summer	General but very limited	N	P	Attractive to bees, but not common enough to be of much value.
Buttercup (*Ranunculus* spp.) (Ranunculaceae)	Annuals or perennial herbs	Yellow	Spring	General	?	P	Of very little value to bees. They prefer other sources. Furnish very little pollen.

Cabbage (*Brassica oleracea* L.) (Cruciferae)	Herb	Yellow		As planted for seed	N	P	When grown for seed it furnishes nectar and pollen. However, very little seed is produced in Oregon.
Cactus (Cactaceae)	Conspicuously spined forms	Various	Various	Eastern Oregon deserts	N	P	Three species of cacti in Oregon called prickly pear. They are probably of some value for pollen where they are common.
Canada Thistle (*Cirsium arvense* Scop.) (Compositae)	Perennial	Purple	Early summer	Becoming general in fields and river bottoms	N	P	A common weed rapidly spreading. An important source of nectar and pollen where common. Probably 50,000 acres in Oregon. Nectar concentration 33.8-47 per cent. Honey mild and white.
Carrot (*Daucus Carota* L.) (Umbelliferae)	Biennial	White	Late summer	General	N	P	Especially abundant in western Oregon. The garden carrot was derived from it. Rarely worked for nectar.
Cascara (*Rhamnus Purshiana* DC.) (Rhamnaceae)	Small tree	Inconspicuous	May and early June	Common in western Oregon. Uncommon in eastern Oregon	N	P	As the bark is collected for medicinal use, many trees are killed each year. The honey is reported as having cathartic properties. Light amber.
Catalpa (*Catalpa* spp.) (Bignoniaceae)	Tree	White	June	As planted	N	P	Too few trees are planted to be of much value to bees, but heavy yielder of nectar.
Catnip (*Nepeta Cataria* L.) (Labiatae)	Perennial herb	Whitish	Summer	General	N	—	An introduced weed. A heavy yielder of nectar but not common enough to be of much value. Nectar concentration 28.7 per cent. Pollen collection not observed.
Ceanothus (*Ceanothus cuneatus* (Hook)) (*C. velutinus* Dougl.) (*C. sanguineus* Pursh.) (*C. integerrimus* H. and A.) (Rhamnaceae)	Shrub	Creamy white White to blue	Spring	Near timber or in mountains as a rule	N	P	Some species are called wild lilac. *C. cuneatus* which grows in old stream beds is called buckbrush. *C. velutinus* is common in the mountains and is called greasewood, sticky laurel, snowbush, and cinnamon bush. *C. sanguineus* common in Willamette Valley is also called Oregon tea or buckbrush. Other species are found in Oregon.
Cedar, Incense (*Libocedrus decurrens* Torr.) (Cupressaceae)	Tree		Winter and very early spring	Lane County south	—	?	Bees have been known to collect honeydew from the incense cedar scale (*Xylococculus macrocarpae* Coleman) in Rogue River Valley. Pollen available in winter and may not be collected by bees.
Cedar, Red (*Thuja plicata* Don.) (Cupressaceae)	Tree		Late Feb. and early March	Western Oregon	?	P	
Celery (*Apium graveolens* L.) (Umbelliferae)				As grown	N		A good producer of nectar when grown for seed but little seed is produced in Oregon.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Cherry, Cultivated (*Prunus* spp.) (Figure 14) (Rosaceae)	Tree	White	Spring	See map, Figure 20	N	P	10,700 acres grown commercially including both sweet (*P. avium* L.) and pie cherries (*P. cerasus* L.). Bees are especially important for cross pollination. Nectar concentrations: Royal Ann, 60.8 per cent; Black Republican, 50.8 per cent; sour, 15-43.2 per cent.
Cherry, Western Choke (*Prunus demissa* (Nutt.) Dietr.) (Rosaceae)	Tree	White	Spring		N	?	Only occasionally worked by bees.
Cherry, Wild (*Prunus emarginata* (Dougl.) Walp.) (Rosaceae)	Tree	White	Spring		N	?	Of minor importance. Nectar concentration 40.5-49.3 per cent.
Chestnut (*Castanea dentata* Borkh.) (Fagaceae)	Tree		June and early July	As planted	N	P	A rare introduction.
Chickweed (*Stellaria media* (L.) Cyr.) (Caryophyllaceae)	Annual	White	Early spring	General in gardens	N	P	An introduced weed of minor importance. Nectar concentration 50 per cent.
Chicory (*Cichorium Intybus* L.) (Compositae)	Perennial herb	Blue	February to April	Early summer	N	P	An introduced weed from Eurasia of minor importance.
Chinquapin, Giant (*Castanopsis chrysophylla* A. DC.) (Fagaceae)	Shrub or tree			Coast mountains	N	P	A source of some pollen and nectar.
Clematis (*Clematis ligusticifolia* Nutt.) (Ranunculaceae)	Perennial vine	Creamy white	Early summer	General but more common in eastern Oregon canyons	N	P	Of limited value.
Cleome, Yellow (*Cleome lutea* Hook.) (Capparidaceae)	Annual	Yellow	May to frost	The Dalles to Umatilla county and Huntington to Ontario	N	P	Called stinking mustard. Grows mostly in subirrigated low ground. More common below 2,000 feet elevation. Nectar concentration 11.8 per cent. Dark and strong. Supplies pollen mornings. See also Rocky Mountain bee plant.
Cockle Bur (*Xanthium* spp.) (Compositae)	Annual			Along Columbia River in eastern Oregon	?	?	Several species occur in eastern Oregon but have not been recorded as of value. The spiny cockle bur (*X. spinosa* L.) yields nectar in California.
Coffee Berry (*Rhamnus californica* Esch.) (Rhamnaceae)	Shrub	Cream	May	Rogue River Valley	N	P	Reported an important source of pollen in southwestern Oregon.

Corn (*Zea Mays* L.) (Gramineae)	Annual		Midsummer	As planted	—	P	Most common in Ontario district where its pollen may be of considerable value for brood rearing. Pollen collected in early morning.
Cotoneaster (*Cotoneaster* spp.) (Rosaceae)	Shrub	White to pink	Spring	As planted	N	P	Ornamental shrubs very attractive to bees but not common enough to be of much value. *C. horizontalis* is especially attractive.
Cottonwood (*Populus trichocarpa* Torr. and Gray) (Salicacea)	Tree		Early spring	River bottoms and streams	—	P	A source of a large quantity of aromatic propolis.
Crabapple, Wild (*Pyrus rivularis* Dougl.) (Rosaceae)	Tree	White	Spring	West of Cascades	N	P	Not common enough to be of much value.
Crimson Clover (*Trifolium incarnatum* L.) (Leguminosae)	Annual	Crimson	May	Grown mostly in Willamette Valley	N	P	It blooms earlier than other clovers and gives an occasional crop of honey. On the increase in Oregon. Nectar concentration 47.7 per cent. Pollen almost black.
Crocus (*Crocus* spp.) (Iridaceae)	Perennial herb	Various	Early spring	As planted	N	?	Very attractive to bees but too limited to be of much value.
Cucumber (*Cucumis sativus* L.) (Cucurbitaceae)	Annual vine	Yellow	All summer	As planted	N	P	Male and female blossoms separated on same plant. Dependent on the insects for pollination. Special arrangements are necessary when cucumbers are grown in the greenhouse, as the bees soon wear themselves out and the colony must be continually strengthened by the addition of brood from other colonies, or the colonies are exchanged for stronger ones from the outside.
Currant, Red Flowering (*Ribes sanguineum* Pursh.) (Saxifragaceae)	Shrub	Red and pink	Late March to early May	West of Cascades	N	P	Not very attractive to honey bees. Some pollen. Nectar concentration 18.9 per cent.
Daffodil (*Narcissus Pseudo-Narcissus* L.) (Amaryllidaceae)	Perennial herb	Yellow	Early spring	As planted	?	P	
Dandelion (*Taraxacum officinale* Weber) (Compositae)	Biennial herb	Yellow	April	General where water is available	N	P	An introduced weed from Europe. A heavy yielder of colorless nectar and bright orange-colored pollen. This should not be confused with the fall dandelion which blooms in the late summer and fall. Nectar concentration 45.3-51.2 per cent.
Death Camas (*Zygadenus venenosus* Wats.) (Liliaceae)	Perennial herb	Cream-colored		Most parts of state in moist places	?	?	This plant has been reported as poisonous to bees but the authors have no evidence that it is in Oregon. Not very attractive to bees.
Dodder (*Cuscuta* spp.) (Cuscutaceae)	Leafless parasitic annual	White to cream		General	N	—	Recorded as yielding nectar freely in California and probably does in Oregon. Not abundant enough to be of much value. One species is a parasite of alfalfa. Commonly called love vine.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Dogbane (*Apocynum* spp.) (Apocynaceae)	Perennial herb	Cream to pink	Summer	Widely scattered	—	—	Several species occur in the state but are seldom visited by bees.
Dog Fennel (*Anthemis Cotula* L.) (Compositae)	Annual	White rays, yellow center	Summer	General in poor soil	—	?	An introduced weed common about barn lots. Reports indicate that Willamette Valley honey is of a poor quality due to dog fennel. This is questioned since the bees rarely work it. Dog fennel is also called May weed.
Dogwood (*Cornus* spp.) (Cornaceae)	Tree and shrub	White to cream	Spring and occasionally in late summer	Wooded sections	—	—	Three species occur in the state. Appear to be of little value to bees, since they are rarely seen visiting the blossom.
Douglas Fir (*Pseudotsuga taxifolia* (Pair.) Britt.) (Pinaceae)	Tree		April	Western Oregon. Limited eastern Oregon	—	P	Douglas fir is of interest because of the production of a plant-secreted honeydew known as "fir sugar," reported as common in parts of British Columbia. Not as yet recorded from Oregon. Fir sugar is about 50 per cent melezitose, a rare and valuable sugar, slightly different chemically from sugars ordinarily found in honey. It appears to be produced as a secretion from trees growing under very arid conditions. It is collected freely by the bees when available.
Downingia (*Downingia elegans* (Lindl.) Torr.) (Lobeliaceae)	Annual		July	Willamette Valley	N	—	Grows in low ground that has been flooded during winter. Avoid mixing with clover and vetch honey.
Elderberry, Blue (*Sambucus glauca* Nutt.) (Caprifoliaceae)	Tall shrub	Cream	Summer	Mostly in western Oregon	N	P	Of minor importance. The red elderberry (*S. racemosa* L. var. *callicarpa* Jepson) and the black species (*S. melanocarpa* Gray) appear of little value.
Elm (*Ulmus* spp.) (Ulmaceae)	Tree		Early spring	As planted	—	P	No elms are native to Oregon but many have been planted as shade trees. One of the earliest sources of pollen in abundance.
Eriogonum, White (*Eriogonum niveum* Dougl.) (Polygonaceae) (Figure 15)	Perennial	Creamy-white	Late August to October	Limited areas northeastern Oregon	N	P	Some years a heavy yielder of light-colored honey. *E. compositum* has been observed to yield nectar and pollen near Medford. There are many other species in the state that are not attractive to honeybees. Called wild buckwheat.

Erythronium (*Erythronium* spp.) (Liliaceae)	Perennial herb	Varies with species	Early spring	General in woods	N	P	*E. Hendersonii* and *E. oregonum* App. have been mentioned as nectar and pollen plants for southwestern Oregon but are doubtless of minor importance. Also called dog tooth violet.
Evening Primrose (*Oenothera* spp.) (Onagraceae)	Herb			Mostly in arid sections of eastern Oregon	?	P	One species of evening primrose, probably *O. pallida* Lindl. is reported to yield both nectar and pollen in the Hermiston area. Little information is available on its relative value. Members of the genus apparently furnish pollen only, as a rule.
Everlasting, Pearly (*Anaphalis margaritacea* (L.) B. and H.) (Compositae)	Perennial herb	White with yellow center	Late July and August	Very abundant in burned-over areas of western Oregon	N	P	A honey crop from everlasting has not been reported. As the fireweed flow tapers off, bees frequently work the everlasting which has a slightly thinner nectar under similar conditions. Avoid getting it in surplus honey. Nectar concentration 34 per cent. Strong flavor.
Fall Dandelion (*Hypochoeris radicata* L.) (Compositae) (Figure 16)	Perennial herb	Yellow	Summer and fall	Western Oregon	N	P	Also called California dandelion and cat's ear. Abundant in lawns. Light amber nectar. It should not be confused with the common dandelion. Nectar concentration 35-50 per cent.
False Hellebore, White (*Veratrum californicum* Durand) (Liliaceae)	Perennial	Greenish-white	Summer	Cascades and eastern Oregon in wet meadows	N	P	Bees have been found dying on this plant in California. Other species of the genus also occur in Oregon. Also called corn lily.
Figwort (*Scrophularia* spp.) (Scrophulariaceae) (Figures 17 and 18)	Large perennial herb	Purplish	May to July	Most common in western burned-over sections. Moist soil. Limited elsewhere	N	—	Two species (*S. oregana* and *S. lanceolata*) occur. Nectar concentration about half that of fireweed under similar conditions. Nectar concentration 18.63-32.66 per cent. We have failed to see pollen collectors on figwort.
Filaree (*Erodium cicutarium* (L.) L'Her.) (Geraniceae) (Figure 19)	Annual	Rose-purple	Spring	Common in western Oregon. Scattered elsewhere	N	P	Introduced and on the increase. A good forage plant for livestock. Also called alfilaria, pin clover, heron's bill, stork's bill, etc. Other species are found in Oregon. Nectar concentration 61-78 per cent. Pollen red but fades to brown.
Filbert (*Corylus avellana* L.) (Corylaceae)	Shrub	Male catkins yellow	January and February	Grown commercially in Willamette Valley	—	P	They have been reported as a source of honeydew. Pollen is produced abundantly.
Fir, White (*Abies concolor* T. and G.) (Pinaceae)	Tree			Western Oregon	—	?	See also Douglas fir. Aphids and scale insects produce honeydew in California on white fir. This is probably true for Oregon also.
Flax (*Linum usitatissimum* L.) (Linaceae)	Annual	Blue	July	Planted in Willamette Valley	N	P	Freely visited by bees for both nectar and pollen. The color of pollen varies from blue to yellow, apparently depending on the variety.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Fox Glove (*Digitalis purpurea* L.) (Scrophulariaceae)	Tall herb	White or rose-purple	June and July	Most common in coast mountains	N	—	More attractive to bumblebees than to honeybees.
Frasera (*Frasera* spp.) (Gentianaceae)	Tall herb	Light green	Early summer	Alpine meadows of eastern Oregon	N	—	An important honey plant in the Rocky Mountains but out of range of most bees in Oregon.
Gilia (*Gilia* spp.) (Polemoniaceae)	Various	Blue to white	Various	General	?	?	Several species in Oregon. Some reported as good honey plants elsewhere but value in Oregon is not known.
Godetia (*Godetia amoena* (Lehm.) Lilja.) (Onagraceae)				Southwestern Oregon	—	P	Attractive to bees. Also called summer darling.
Goldenrod (*Solidago* spp.) (Compositae)	Perennial herb	Yellow	Midsummer	General	N	P	Not abundant in Oregon, and of almost no value as a honey plant. *S. serotina* Ait. Worked by bees during August. It occurs both west and east of the Cascades but is limited in quantity. Our common form for western Oregon is *S. elongata* Nutt. It has been reported as supplying nectar, but bees are rare on it.
Goldfield (*Crocidium multicaule* Hook) (Compositae)	Small annual	Yellow	Late March to April	Northeastern Oregon and in Douglas County	N	P	A good minor plant.
Gooseberry (*Ribes* spp.) (Rosaceae)	Shrub		Spring		N	—	Very attractive to bees but too few to be of much value. Grown commercially mostly in Willamette Valley.
Grape (*Vitis* spp.) (Vitaceae)	Perennial vine	Greenish-yellow	Early summer	*V. californica* Benth in southern Oregon	N	P	Cultivated grapes are visited by bees for pollen and nectar. Most varieties are self-fertile, but bees possibly assist in obtaining better pollination. Nectar concentration 65-75 per cent.
Grass (Gramineae)	Annuals and perennials	Various	Varies with species	General	—	P	Many are visited for pollen and some supply much of it to bees. Bees are responsible, at least in part, for pollination.
Greasewood (*Sarcobatus vermiculatus* Torr.) (Chenopodiaceae)	Shrub	Yellow	July	Deserts of eastern Oregon	—	P	A pale-colored pollen is freely collected by bees.

Grindelia (*Grindelia* spp.) (Compositae)	Herb	Yellow	July and August	General	N	P	*Grindelia nana* Nutt. is the most common species in both western and eastern Oregon. Bees are not common on it.
Hawthorn (*Crataegus* spp. Lindl.) (Rosaceae)	Small tree	White	Late May	Western Oregon, Wallowa Valley	N	P	Several species recorded for Oregon. *C. Douglasii* Lindl. is our common western Oregon species. *C. Columbiana* How. is found in northeastern Oregon. Of minor importance, at least in western Oregon.
Hazel (*Corylus rostrata* Ait. var. *californica* A.) (Corylaceae)	Shrub	Male catkins yellow	February and March	Largely west of Cascades	—	P	Called hazelnut.
Heath (*Erica* spp.) and Heather (*Calluna* spp. (*Phyllodoce* spp.) (Ericaceae)	Low shrub	Various colors	Spring	Alpine areas or as planted	N	—	European heather (*Calluna* spp.), European heath (*Erica* spp.) and native heather (*Phyllodoce* spp.) are used in landscaping. Both are attractive to bees but not abundant enough to be of more than minor importance. The native species in the high mountains are generally out of range of honeybees.
Hedge-nettle (*Stachys* spp.) (Labiatae)	Perennial or annual	Various	Spring and summer	General	—	—	Reported as attractive to bees in other states but not recorded as so in Oregon.
Holly (*Ilex Aquifolium* L.) (Aquifoliaceae)	Shrub	Yellow	April and early May	As planted	N	P	Too few to be of much value for bees. Male flowers only supply pollen.
Hollyhock (*Althaea rosea* Cav.) (Malvaceae)	Perennial	Various colors	Summer	As planted	N	P	A garden flower introduced from China. Too few to be of much value. See Sidalcea. Nectar concentration 35.7 per cent.
Honeysuckle (*Lonicera* spp.) (Caprifoliaceae)	Shrub or vine	Various	Summer	Mostly in western Oregon	N	—	Heavy producers of nectar but honeybees are, in some cases, unable to reach it. The black twin berry (*L. involucrata* Banks), also called ink berry and bush honeysuckle, is reported as a source of surplus honey in British Columbia by Pellett. It is common in western Oregon, especially along the coast and in the high Cascades. Oregon beekeepers have never reported it as of value. Nectar concentration of cultivated form 25.6 per cent.
Hop (*Humulus Lupulus* L.) (Moraceae)	Perennial herb			As planted. Mostly in Willamette Valley	—	P	As only one male plant is included for every 100 or more female plants, they are of minor importance.
Hop Clover, Small (*Trifolium dubium* Sibth.) (Leguminosae)		Yellow	Early summer	Common in lawns	—	—	Seldom visited by bees.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Horehound (*Marrubium vulgare* L.) (Labiatae)	Perennial herb	White	Summer	Widely distributed	N	—	Roadsides and barn lots where few other plants will grow. Very attractive to bees. The strong honey is reported to have medicinal properties.
Hosackia (*Hosackia* spp.) (Leguminosae)	Annual or perennial	Various colors	Late spring and summer		N	P	Also called Lotus and bird's-foot Trefoil. Several species in the state are, as a rule, not attractive to honeybees. *H. crassifolia* has been reported as attractive to bees at Scappoose. *H. Corniculatus* has been introduced into Jackson County from the Old World. It is very attractive to bees and has a nectar concentration of about 42.99 per cent. It is locally called Jap clover.
Hound's tongue (*Cynoglossum grande* Dougl.) (Boraginaceae)	Perennial herb	Blue	Early summer	West of Cascades	N	—	Visited by honeybees. Another species of this genus (*C. officinale*), which occurs in eastern Oregon, is of some importance for honey in Utah. Nectar concentration 48.5 per cent.
Huckleberry (*Vaccinium* spp.) (Ericaceae)	Shrub	Various	Spring	Mountains	N	—	Occasional flows are reported. Several species occur in the state. Frequently in thick patches.
Hyssop, Giant (*Agastache urticifolia* (Benth.) Kuntze.) (Labiatae)	Perennial herb	Light purple	Summer	Hillside and alpine meadows	N	—	Usually out of range of bees. Reported as a producer of white honey of fine flavor.
Indian Peach (*Osmaronia cerasiformis* (T. and G.) Greene) (Rosaceae)	Large shrub	Small white	March and early April	Western Oregon	N	P	Also called Indian plum and Oso berry. Bees seldom visit it.
Juniper (*Juniperus* spp.) (Pinaceae)	Small tree		Spring	Eastern Oregon deserts	?	P	Two species are found in eastern Oregon. The female blossoms on juniper, cypress, arborvitae and redwood secrete nectar.
Labrador Tea (*Ledum* spp.) (Ericaceae)	Small shrub	White		Bogs of west coast and Blue Mountains	N	?	*L. glandulosum* Nutt. is reported as a source of honey in British Columbia but apparently of little value to bees in Oregon. Bees appear to shun it.
Laurel, Pale (*Kalmia polifolia* Wang) (Ericaceae)	Evergreen shrub			Mountain bogs	?	?	A near relative (*K. latifolia* L.), mountain laurel which is common in the Atlantic states, is credited with being a source of poisonous honey. Usually out of reach of honeybees.
Laurestinus (*Viburnum Tinus* L.) (Caprifoliaceae)	Shrub	Creamy-white	Early spring	As planted in western Oregon	N	P	Introduced and used in western Oregon for landscaping. Not common enough to be of much value.

Lettuce (*Lactuca* spp.) (Compositae)	Annual or perennial herb	Yellow	Spring and summer	General	N	?	Several species of wild lettuce are common weeds. Attract bees to a limited extent but of very minor importance.
Loco Weed (*Astragalus* spp.) (Leguminosae)	Mostly perennial herb	Various	Spring and summer	Mostly in eastern Oregon	N	P	Loco weed, which is also called rattle weed and milk vetch, is well known in parts of the western grazing areas where certain species are very poisonous to livestock. One species (*A. lentinginous* Dougl.) was found to poison bees in Nevada. Many, including the above, are found in Oregon, but so far there is no reported injury.
Locust (Leguminosae)	Tree	White and cream	Late May and early June	As planted. Most common in eastern Oregon	N	?	Two species are planted as shade trees in Oregon. They are the black locust (*Robinia Pseudo-Acacia* L.) and honey locust (*Gleditsia tricanthos* L.). The black locust is by far the more common and a much better honey plant. It produces nectar that shows a concentration of 63.2 per cent. Little if any pollen is collected from the black but the other gives considerable.
Loganberries (*Rubus* spp.) (Rosaceae)	Trailing shrub	White	Spring	Mostly western Oregon	N	P	Loganberries worked freely by bees. The 1938 acreage was: state, 2,250; Marion, 1,200; Clackamas, 400; Polk, 175. Youngberries and boysenberries becoming common cultivated forms. Little is known as to their value for bees. The total combined acreage for the two varieties for 1938 was: state, 1,825; Marion, 500; Multnomah, 300; Washington, 250; Clackamas, 250; Douglas, 100. For all blackberries and their derived varieties bees are considered of value in obtaining a good crop of well-shaped berries. Loganberries, youngberries, and boysenberries are hybrids.
Lupine (*Lupine* spp.) (Leguminosae)	Annual and perennial herbs	Various	Mostly in spring	General	N	P	Many species in Oregon. Rarely reported as honey plants. Bees have been seen collecting nectar from *L. nanus* Dougl. near Corvallis. *L. albicaulis* Dougl. and *L. laxiflorus* Dougl. have been reported as pollen plants.
Madrone (*Arbutus Menziesii* Pursh.) (Ericaceae)	Large tree	White	May	Western Oregon	N	—	Usually the flowers are too deep for the bees. The nectar is thin, 9-21 per cent sugar. Abundant in the granite soil of Rogue River Valley where it may be of some value.
Mahogany, Mountain (*Cercocarpus ledifolius* Nutt.) (Rosaceae)	Shrub	Cream	Spring	Mountains of eastern and southern Oregon	N	?	Probably of minor importance.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Mallow (*Malva* spp.) (Malvaceae)	Herb	Various	Early summer	Widely scattered	N	P	Several introduced species. Of some value to bees in other states but of little or no value in Oregon.
Manzanita (*Arctostaphylos* spp.) (Ericaceae) (Figure 20)	Shrub	White to pink	April and May	Mostly southwestern Oregon	N	P	Several species of manzanita in Oregon. One is called Kinnikinnic. Some of considerable value in the early spring for building up. Reported that the honey has a faint bitter taste that tends to disappear after extracting. Three species (*A. viscida* Parry, *A. patula* Greene, and *A. columbiana* Piper) important sources of nectar in the Rogue River Valley. Also called bearberry. Very little pollen.
Maple, Norway (*Acer platanoides* L.) (Aceraceae)	Tree	Green	Spring	As planted	N	P	Occasionally planted for shade. Nectar concentration 48 per cent.
Maple, Large-leaved (Oregon) (*Acer macrophyllum* Pursh.) (Aceraceae)	Tree	Green	Late March and early April	Western Oregon, lower valleys	N	P	Provides much pollen and light amber honey, but often spring rains handicap the bees. Of great value for spring colony building. Nectar concentration 35-56 per cent.
Maple, Vine (*Acer circinatum* Pursh.) (Aceraceae)	Shrub-like tree	Red	Late April and May	Western Oregon, higher valleys	N	P	Bees visit this plant freely for its reddish-amber honey and yellow pollen. Occasionally a surplus honey crop is harvested. Nectar concentration 27-57.7 per cent.
Marigold, Marsh (*Caltha* spp.) (Ranunculaceae)	Perennial herb	Yellow	Spring	Coastal and Cascade bogs	N	?	Appears to be of some value to bees but of minor importance.
Melons (Cucurbitaceae)	Annual vine	Yellow	Summer	As planted	N	P	Muskmelons are reported as good honey plants. Bees are important in pollination. Male and female blossoms are in separated places.
Michaelmas Daisy (*Aster* sp.) (Compositae)	Perennial	Various	Fall	As planted	N	P	Common in gardens but not abundant enough to be of much value.
Milk Weed (*Asclepias* spp.) (Asclepiadaceae)	Perennial herb	Pink to white	Summer	General but not abundant	N	—	Two species in the state. Best known is the showy milk weed (*A. speciosa* Torr.) with its broad leaves. The narrow-leaved species (*A. mexicana* Cav.) is more common in eastern Oregon than in western Oregon. The bees work both species for nectar. Honeybees and other insects are often "trapped" by these flowers and die in the blossoms. Even in spite of this handicap, bees collect some honey from milkweed. Limited checks on *A. speciosa* at Burns showed a nectar concentration of 37.2 per cent.

Mistletoe (*Phoradendron villosum* Nutt.) (Loranthaceae)	Parasite mostly on oak	White to green	Early spring	Western Oregon. Abundant in Rogue River Valley	—	P	A very early source of greenish pollen in limited quantity.
Morning Glory (*Convolvulus* spp.) (Convolvulaceae)	Perennial trailing herb	Various	Summer	General	N	P	Of value in some states but of little value in Oregon. *C. arvensis* L. is called bindweed. Gives some nectar and much pollen up to mid-day.
Mulberry (*Morus* spp.) (Moraceae)	Tree	Spring		As planted	N	?	Only occasional trees are found so it is of little value for honey.
Mullein, Moth (*Verbascum Blattaria* L.) (Scrophulariaceae)	Biennial	White	Summer	Roseburg and south	N	P	Reported of some value for honey.
Mullein (*Verbascum Thapsus* L.) (Scrophulariaceae)	Biennial	Yellow	Summer and fall	As introduced	N	P	Too uncommon to be of much value. Produces orange-colored pollen in some abundance.
Mustard (Cruciferae)	Mostly annuals	Yellow	Spring and summer	Very general	N	P	Common mustard or wild turnip (*Brassica campestris* L.) of the Willamette Valley is a producer of considerable nectar (52.9-71.8 per cent). It frequently attracts bees away from fruit trees. Black mustard (*B. nigra* (L) Koch) blooms later and is less important. *B. arvensis*, called charlock reported of some value. Jim Hill mustard (*Sisymbrium altissimum* L.) of eastern Oregon occasionally yields a little nectar (44 per cent) and pollen. Tansy mustard (*S. pinnatum* (Walt) Green) reported as a source of nectar in central Oregon.
Myrtle, Oregon or Coos Bay Myrtle (*Umbellularia californica* Nutt.) (Lauraceae)	Tree	Cream	Spring	Southwest Coast Mountains	N	P	This tree of southwestern Oregon is also called California laurel, bay tree, and pepperwood. It should not be confused with the wax myrtles or the Ceanothus, which are also called myrtle. Oregon myrtle blooms in late winter or early spring and should be of value as a spring stimulant to bees near enough to work it. Few bees are, however, found in the section where it grows. Honey reported to be dark amber.
Ninebark (*Physocarpus capitatus* (Pursh.) Ktze.) (Rosaceae)	Tall shrub	White	Spring	Western Oregon	N	?	Bees visit it freely.
Nightshade (*Solanum* spp.) (Solanaceae)	Annual or perennial herb	Various	Various	General	?	?	Several species occur in the state. The most common species is the black nightshade (*S. nigrum* L.). The potato and eggplant belong to this genus. In Oregon bees visit nightshades only in a minor way. Some evidence that certain species may be poisonous to bees.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Oak (*Quercus* spp. and *Lithocarpus* sp.) (Fagaceae)	Shrubs and trees	Yellow catkin	May	Wild in many places and commonly planted	—	P	The three most common species in Oregon are the Garry or white oak (*Q. Garryana* Dougl.) on the lower hills and valleys throughout western Oregon; the black oak (*Q. Kelloggii* Newb.) found from Lane County south; and the canyon live oak (*Q. chrysolepis* Liebm.) in southwestern Oregon. Honeydew may occasionally be collected from insects found on the oaks. Tanbark oak (*L. densiflora* (H. and H.) Rehd.), which ranges north in the Coast Mountains to the Umpqua River, yields pollen in abundance.
Ocean Spray (*Holodiscus discolor* (Pursh.) Maxim.) (Rosaceae)	Tall shrub	Cream	Early summer	Western Oregon	—	—	Rarely visited by honeybees.
Old-man-in-the-ground (*Echinocystis oregana* Cogn.) (Cucurbitaceae)	Climbing perennial herb	White	May and June	Foothills of western Oregon	N	P	Also called wild cucumber. Of little value to honeybees.
Onion (*Allium* spp.) (Liliaceae)	Biennial	White to pink	Spring		N	P	The cultivated onion (*A. cepa* L.) is a good honey plant when grown for seed but little seed is produced in Oregon (440 acres in 1938, largely in the upper Willamette Valley). Honeybees are effective pollinators of onions. Wild species are occasionally reported of value to bees in eastern Oregon deserts.
Oregon Grape (*Berberis* spp.) (Berberidaceae)	Shrub	Yellow	April and May	Especially on hills	N	P	Three species are native to the state. The best known species, (*B. aquifolium* Pursh.), our state flower, is from 2 to 6 feet tall and more common at lower elevations. The mountain Oregon grape (*B. nervosa* Pursh.) is usually from 1 to 2 feet tall and found at higher elevations. A third species (*B. repens* Lindl.) occurs in the southern part of the state and in eastern Oregon. Bees work the first species to some extent, but it is of secondary importance. Nectar concentrations for *B. aquifolium* Pursh. vary from 38.9 per cent to 54 per cent.
Ornamental Plants		Various	Various	As planted	N	P	Plants grown in the flower garden are usually of little value to bees. They are too limited in number and often produce no nectar.

Parsnip (*Pastinaca sativa* L.) (Umbelliferae)	Biennial	Yellow	Spring	As planted for seed	N	?	A good honey producer when grown for seed. Very little seed, however, is produced in Oregon.
Parsnip, Cow (*Heracleum lanatum* Michx.) (Umbelliferae)	Perennial herb	White	May	General but spotted	N	P	Of minor value.
Pea (*Lathyrus* spp.) (Leguminosae)	Climbing	Various	Spring and early summer	As planted	N	P	Peas in general are of little value to bees for honey, but supply some pollen. Austrian peas in hand-collected samples gave a nectar concentration of 51 per cent. The Tangier pea (*L. tingitanus* L.), however, was seen visited by bees for nectar. Although peas are generally considered self-fertile, Professor Schoth, agronomist for the U. S. Department of Agriculture, reports that they are visited freely by both bumblebees and honeybees as well as many other insects. The interrelationship between peas and insects as pollinators needs investigating.
Peach (*Prunus Persica* Sieb. and Zucc.) (Rosaceae)	Tree	Pink	Early spring	Willamette and Rogue River Valleys, and parts of eastern Oregon	N	P	About 4,500 acres in the state. Nearly all peaches are self-fertile. The J. H. Hale and Mikado (June Elberta) peaches are exceptions. A better set of all peaches is obtained when bees are present. In some places the set is too heavy and calls for thinning. Nectar concentrations average about 30 per cent.
Pear (*Pyrus communis* L.) (Rosaceae) (Figure 21)	Tree	White	April and May	Hood River, Willamette, Rogue River Valleys especially	N	P	About 23,000 acres of commercially grown pears in the state, yet pear honey is not reported. As pears have a low nectar concentration, bees visit them mostly for pollen. The nectar concentration ranges from 4.3 per cent up to 25 per cent. It varies with the variety and with weather conditions. Extensive tests in Oregon and California have demonstrated that most of our leading varieties of pears are self-sterile and will set a larger crop of better fruit if suitable pollinizers are present and bees are available for transferring the pollen. For a complete list of these necessary pollinizers the reader is referred to Oregon Experiment Station Circular of Information No. 165.
Pentstemon (*Pentstemon* spp.) (Scrophulariaceae)	Largely perennial herbs	Various		Alpine meadows and rock gardens	N	?	Very attractive to bees but the plants are too few where bees are available. Nectar 34.3 per cent.
Pennyroyal (*Mentha Pulegium* L.) (Labiatae)	Perennial herb	Rose color		Western Oregon	N	—	A naturalized weed. Reported as a valuable honey plant in California but no information is available on its value in Oregon.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Peppermint (*Mentha piperita* L.) (Labiatae)	Perennial herb	Rose colored		Willamette Valley	N	—	Grown for its oil. Freely visited by bees. The 1938 acreage of cultivated peppermint for the state and leading producing counties is as follows: state, 2,150; Columbia, 1,250; Marion, 460; Lane, 285.
Phacelia (*Phacelia* spp.) (Hydrophyllaceae)	Herbaceous perennial or annual	Usually blue	Late spring, early summer	General where moist	N	P	One or more species of this genus may be found in all parts of the state, where sufficient moisture is present. As a rule, it grows in partly protected areas. It is not known to produce a surplus, but is an important minor source of nectar, and possibly also pollen. *P. tanacetifolia* Benth. was introduced into Europe from California in 1832, where it has become an important honey plant. Commonly called fiddle neck. It might be of value if introduced into Oregon.
Pine (*Pinus* spp.) (Pinaceae)	Tree		Various	In many places	—	P	Occasionally they produce honeydew (Pellett, 1923). Bees collect pollen in quantity.
Plagiobothrys (*Plagiobothrys tenellus* (Nutt.) Gray) (Boraginaceae)	Herb	White	Spring	West of Cascades	N	?	Also called small popcorn flower. It grows in ground that is very wet in the winter but baked dry in the summer. Nectar 57.1 per cent.
Plantain (*Plantago lanceolata* L.) (Plantaginaceae)	Perennial herb		Summer	General in lawns, etc.	—	P	An introduced weed commonly called buckhorn. The native broad-leaved species, of which there are several, appear to be less frequently visited by the bees.
Plum (*Prunus* spp.) (Rosaceae)	Tree	White	Spring	As planted	N	P	Plums are grown to such a limited extent in Oregon that they are of little value for honey production except for very limited localities. Some of the plums are self-sterile, while some are self-fruitful. Even with those that are self-fruitful, bees are necessary for good pollination. Plums and prunes have been found to secrete nectar at temperatures too low for certain other deciduous fruit to secrete. Nectar concentration ranges from 14 per cent to 44 per cent, with variety and humidity differences. See prune also.
Poison Ivy (*Rhus Toxicodendron* L.) (Anacardiaceae)	Shrub or climber	Cream	Spring	Parts of Eastern Oregon	N	P	It has not been reported of much value to bees in Oregon.

Poison Oak (*Rhus diversiloba* T. and G.) (Anacardiaceae)	Shrub or climber	Cream	May	Western and southern Oregon	N	P	The honey is not poisonous. Occasionally reported as producing some surplus of white honey.
Polygonum (*Polygonum* spp.) (Polygonaceae)	Annual or perennial herb	Various	Summer and fall		N	—	Heartsease, or smart weed (*P. Persicaria* L.) is a heavy yielder of amber honey of good flavor in the East. No species have been reported of much value to the bees in Oregon. However, both *P. hydropiperoides* Michx. and *P. spergulariaeforme* Meisn. have been reported as nectar plants. Honey from the latter is reported to be dark amber of fine quality (Salem). These plants are a source of amber honey in the marshlands of the Sacramento and San Joaquin Valleys of California. See also Bindweed.
Poppy, California (*Eschscholtzia californica* Cham.) (Papaveraceae)	Perennial herb	Orange	Spring and summer	Western Oregon	—	P	An important source of golden pollen.
Potentilla (*Potentilla* spp. *Horkelia* spp.) (Rosaceae)	Perennial herb or shrub	Mostly orange or yellow	Early summer	General	N	P	Most species are not very attractive to bees.
Privet (*Ligustrum* sp.) (Oleaceae)	Tall shrub	White	Spring	As planted	N	P	Planted extensively as a shrub for hedges. Not common enough to be of much value.
Prune (*Prunus* spp.) (Rosaceae) (Figure 22)	Tree	White	Spring	Willamette Valley, Douglas County, Umatilla County	N	P	Considerable variation in nectar concentration. Not as attractive to bees as cherries are. Secrete nectar at low temperatures. Both Italian prunes and the French or petite prunes are self-fertile. Bees are needed, however, to insure efficient pollination and a larger crop. The pollen is sticky and not carried by the wind. Prunes are a form of plums.
Prunella (*Prunella vulgaris* L.) (Labiatae)	Perennial herb	Blue	Spring	General	N	?	Introduced. Also called heal-all, self-heal and Brunella. Too limited to be of much value. Bees seldom work it.
Psoralea (*Psoralea lanceolata* Pursh.) (Leguminosae)	Perennial herb	White or light blue	April	Eastern Oregon	N	?	Also called California tea (*P. physodes* Dougl.); has been mentioned as a nectar plant in southwestern Oregon. Honey is reported amber.
Pumpkin (*Cucurbita pepo* L.) (Cucurbitaceae)	Annual vine	Yellow	July to September	As planted	N	P	Supplies a liberal amount of both pollen and nectar. Honey amber, of poor grade.
Pussy Paws (*Spraguea multiceps* Howell) (Portulacaceae)	Perennial herb	Rose	Summer	Dry soil in Cascade Mountains	N	?	Probably of little value.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Quince (*Cydonia oblonga* Mill.) (Rosaceae)	Tree	Pink to white	Spring	Very limited in Oregon	N	P	Freely visited by bees.
Rabbit Brush (*Chrysothamnus* spp.) (Compositae)	Shrub	Yellow	August to early September	Eastern Oregon	N	P	The most common species of eastern Oregon is *C. nauseosus* (Pall.) Britton. Abundant along the draws and in the lower ground, apparently requiring a little more moisture than the sagebrush. It is also much more tolerant of alkali. Honey amber, of strong flavor.
Radish (*Raphanus sativus* L.) (Cruciferae)	Biennial	Lavendar and yellow		Mostly as planted	N	P	Very attractive to bees but of minor importance because of limited quantity.
Rape (*Brassica Napus* L.) (Cruciferae)		Yellow		Limited in western Oregon	N	P	Very attractive to bees. Nectar concentration 50.5-72.6 per cent.
Raspberry (*Rubus* spp.) (Rosaceae)	Shrub	White	May and June	Northern Willamette Valley	N	P	Some surplus is produced from raspberries in Multnomah county. Total acreage for red raspberries by counties (1938): Multnomah, 1,500; Clackamas, 400; Linn, 360; Marion, 150; Washington, 150. There are about 1,500 acres of blackcaps with about the same distribution as to counties. Wild species not common enough to be of much value.
Red Clover (*Trifolium pratense* L.) (Leguminosae)	Perennial herb	Red	June and August	Largely in Willamette Valley and Malheur County	N	P	There are about 10,000 acres of red clover in Oregon. When bees collect nectar it is usually from the second crop. Investigations by Westgate, Coe, and others U. S. Department of Agriculture Bulletin 289) show that honeybees were efficient pollinators of red clover when collecting pollen. More recently workers in various states have confirmed these findings. Hallowell (U. S. Department of Agriculture Leaflet 93) states that, "The red clover flower is practically self-sterile; that is, the pollen of a flower will not fertilize any other flower on any head of the same plant." Nectar concentration 34.3-46.3 per cent.
Red Maids (*Calandrinia caulescens* H. K. B.) (Portulaceae)	Annual	Red	Early summer	West of Cascades in cultivated fields	N	P	Considerable yellow-amber nectar of 48 per cent sugar concentration. Blossoms open from noon to evening only. Pollen orange-colored.

Rhododendron (*Rhododendron* spp.) (Ericaceae)	Tall shrub	Varies with species	May and June	Moist, cool mountains especially	N	?	*R. californicum* Hook. is found along the coast. *R. albiflorum* Hook. is found about timberline in the Cascades. *R. occidentalis* Gray (Azelia) is found in southwestern Oregon. As few bees are kept where these plants are abundant, they are of minor importance.
Rocky Mountain Bee Plant (*Cleome serrulata* Pursh.) (Capparidaceae) (Figure 23)	Annual	Lavendar	June and July	Baker and Union Counties	N	P	*Cleome serrulata* Pursh. is found most abundant in Baker county in the section south and west of North Powder (about 3,350 feet elevation), uncultivated fields. Limited amounts near La Grande (2,784 feet elevation). It appears to grow in rather alkaline soil. The bees hover in humming bird fashion while collecting pollen. Nectar concentration 21.9 per cent. Pollen green.
Rose, Wild (*Rosa* spp.) (Rosaceae)	Shrub	Rose	May and early June	General	N	P	Sweet briar rose is especially abundant in the Roseburg area and in the Willamette Valley as an escape. Very little nectar is collected.
Rudbeckia (*Rudbeckia occidentalis* Nutt.) (Compositae)	Tall perennial herb	Dark purple	Early summer	General in low mountains	N	P	Also called nigger-head. It is of minor importance.
Russian olive (*Elaeagnus angustifolia* L.) (Elaeagnaceae)	Tree	Yellow	Late June	Eastern Oregon as planted	N	P	Planted as a shade tree and along the highways in eastern Oregon. Nectar concentration 40.5 per cent.
Russian Thistle (*Salsola Kali* L. var. *tenuifolia* G. F. W. Mey.) (Chenopodiaceae)	Annual		Summer and fall	Mostly in eastern Oregon	—	P	An introduced weed from Europe. Commonly called a tumbleweed.
Sage (*Salvia* spp.) (Labiatae)..	Annual and perennial	Various	Early summer	See "remarks"	N	—	The black, purple and white sages, which are so valuable as honey plants in California, are not found in Oregon. Two species are, however, found in the state. Desert sage (*S. carnosa* Dougl.) is native to Oregon and grows in limited areas in the poorer sandy and gravelly soils. Reports indicate that it yields only in moist years. Mediterranean sage (*S. aethiopis* L.), has become established about Lakeview. Too limited at present to be of much value. Bees were found collecting nectar, 43 per cent, on it in July, 1938.
Sagebrush (*Artemisia* spp.) (Compositae) (Figure 24)....	Shrub		Fall	Eastern Oregon	—	P	Sagebrush produces a quantity of pollen. It should be clearly distinguished from the true sages (*Salvia*), so important in southern California.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Sainfoin or Saintfoin (*Onobrychis viciaefolia* Scop.) (Leguminosae)	Herb	Pink	Early summer	As planted	N	?	Limited in Oregon. In Europe it is grown as a forage crop on poor land. A crop of little promise for the state, as it is seriously affected by stem rot. Limited tests gave a nectar concentration of 55.4 per cent. Also called Holy clover and Esparcet.
Salal (*Gaultheria Shallon* Pursh.) (Ericaceae)	Low shrub	Pink	May to July	In hills west of Cascades	N	—	Salal is the most abundant shrub in open-timbered areas and covers thickly the forest floor of western Oregon. Produces an abundant supply of nectar, but in the humid areas near the coast the flowers are too deep for the bees. It yields some honey on the west side of the Cascade Mountains where its growth is less rank. Nectar concentration 29-60 per cent, white.
Salmonberry (*Rubus spectabilis* Pursh.) (Rosaceae)	Shrub	Purple red	March to May	Western Oregon	N	P	In swamps and along streams. An important minor plant but too early for a surplus.
Scotch Broom (*Cytisus scoparius* Link) (Leguminosae)	Shrub	Yellow	May and June	Western Oregon	N	P	An introduced ornamental shrub spreading and becoming a pest in many sections. Bees usually scarce on it but the reverse is occasionally reported.
Senecio (*Senecio* spp.) (Compositae)	Perennial and annual herb	Yellow	Various		N	P	Very attractive for both pollen and nectar.
Service Berry (*Amelanchier* spp.) (Rosaceae)	Tall shrub or small tree	White	April	General	?	P	Several species in the state. The odor of the blossoms is repulsive. Apparently none of much value to bees except for pollen. Also called servies berry.
Sidalcea (*Sidalcea* spp.) (Malvaceae)	Annual or perennial herb	Various	Late spring and summer	General	N	P	Also called wild hollyhock. Common along roadsides. Very little nectar collected.
Silene (*Silene* spp.) (Caryophyllaceae)	Annual or perennial herb	Various		General	?	P	An undetermined species of *Silene* has been reported as a source of pollen.
Skunk Bush (*Rhus trilobata* Nutt.) (Anacardiaceae)	Shrub	Pale yellow	Spring	Southern Oregon	N	P	Very attractive to bees. Also called squaw bush.
Skunk Cabbage (*Lysichitum americanum* St. J.) (Araceae)	Perennial herb	Yellow	April and May	Western Oregon swamps	—	P	Much pollen produced. This is not the skunk cabbage (*Symplocarpus foetidus*) of the east.

Sneezeweed (*Helenium autumnale* L.) (Compositae)....	Herb	Yellow		Along Snake and Columbia Rivers	N	P	Not reported as being visited by bees in Oregon. A good honey plant in the north central states, but the honey is somewhat bitter.
Snowberry (*Symphoricarpos* spp.) (Caprifoliaceae) (Figure 25)	Shrub	Pink	June to August	Western Oregon and Blue Mountains	N	—	Common species is *S. albus* (L.) Blake. Abundant shrub in the open woods of western Oregon. It gives a light flow of white honey through June to August. *S. mollis* (Nutt.) Keck, the mountain snowberry and *S. vaccinioides* Rydb. of the Blue Mountains probably of less value being out of range of commercial apiaries. Nectar from *S. albus* gave a concentration of 46.9 per cent to 58.3 per cent (relative humidity 81 per cent to 82 per cent). We have not seen bees collect snowberry pollen.
Soap Root (*Chlorogalum pomeridianum* (Ker.) Kunth) (Liliaceae)	Perennial herb	White with purple veins	Summer	Roseburg and south	N	P	Probably of considerable value where common. The blossoms open in late afternoon, remaining only through one night.
Sorrel, Sheep (*Rumex Acetosella* L.) (Polygonaceae)	Perennial herb			General	—	P	A common weed in acid soil.
Sorrel, Wood (*Oxalis* spp.) (Oxalidaceae)	Low herb	Yellow or white		Western Oregon	N	P	In shady woods. Cultivated form is also visited for pollen.
Sow Thistle (*Sonchus* spp.) (Compositae)	Annual and perennial herb	Yellow	Early summer	Mostly west of Cascades	N	P	Introduced weed from Europe. Bees seldom seen on it in Oregon.
Soybean (*Glycine Soja* Sieb. and Zucc.) (Leguminosae)..	Annual		Summer	As planted	N	—	Pellett (1923) reports that it yields nectar under certain conditions. It has not done well as a crop in Oregon.
Spanish Needle (*Bidens* spp.) (Compositae)	Annual or perennial herb	Yellow to brown	July	Spotted on both sides of state. Damp ground	N	P	Seldom common enough to be of much value. Parts of Union County may be an exception. Nectar concentration 40 per cent.
Spearmint (*Mentha spicata* L.) (Labiatae)	Perennial herb	Lilac or pink		West of Cascades. Damp ground	N	?	Bees work it freely but it is too uncommon to be of much value. An escaped species.
Spider Plant (*Cleome spinosa* L.) (Capparidaceae)	Annual	Pink	Late summer	As planted in garden	N	P	According to Pellett it is a heavy producer of nectar but requires rich soil. It is a native of the tropics. See other plants belonging to genus *Cleome*.
Spiraea (*Spiraea* spp.) (Rosaceae)	Shrub	White and lavendar	Spring and early summer	Native species in Willamette Valley, Cascade and Blue Mountains			Of doubtful value. Bees appear to shun it.
Spring Gold (*Lomatium* spp.) (Umbelliferae)	Perennial herb	Yellow	Early spring	General	?	P	Some species are a source of pollen and possibly also nectar. Also called parsley or wild parsnip.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Spruce (*Picea* spp.) (Pinaceae)	Tree			In mountains and along coast	—	—	Has been known to supply large amounts of honeydew. Neither our native nor introduced species have been reported as sources of honeydew in Oregon.
Spurry, Sand (*Spergula arvensis* L.) (Caryophyllaceae)				West of Cascades	N	?	Also called corn spurry. A common garden weed from Europe. Reported as yielding some nectar in Clatsop County.
Squash (*Cucurbita* spp.) (Cucurbitaceae)	Annual vine	Yellow	July to October	As planted	N	P	Not common enough to be of much value.
Star Thistle, Yellow (*Centaurea solstitialis* L.) (Compositae)	Annual	Yellow	July	From Roseburg south	N	P	An introduced weed from Europe that has become an important surplus honey-producing plant in northern California. Honey greenish-white and of excellent flavor. Also common in southern Oregon, being established limitedly in other parts of the state. Sugar concentration of the nectar averages 37 per cent. See also bachelor button, which belongs to the same genus.
St. John's Wort (*Hypericum perforatum* L.) (Hypericaceae)	Annual	Yellow	July	Exceedingly abundant in western Oregon	N	P	An introduced weed of very minor importance for honey. It is, however, a producer of pollen. Also called Klamath weed, tipton weed, and goat weed. *H. anagalloides* C. and S., also called tinker's penny and Water St. John's Wort, has been listed as a nectar and pollen plant in southwestern Oregon. Nectar concentration 48-60 per cent. Pollen orange-colored.
Strawberry (*Fragaria* spp.) (Rosaceae)	Perennial herb	White	Spring	Moist places	N	P	Of minor importance for bees. Our commercial varieties of strawberries are, as a rule, reported to be self-fertile.
Strawberry Clover (*Trifolium fragiferum* L.) (Leguminosae)	Low herb	Purple	Early summer	Eastern Oregon	N	P	Strawberry clover has been planted in a limited way for seed and more extensively for pasture on alkali soil in eastern Oregon. Frequently a volunteer plant along moist ditches. Becoming more abundant. Common in Baker County. Bees work it freely. Quality of honey unknown. Requires much water. Nectar concentration 33.3 per cent. Pollen greenish-brown.

Streptanthus (*Streptanthus* spp.) (Cruciferae)	Annual, biennial and perennial	Purple, white or dull yellow	Spring and summer	Eastern Oregon	N	P	Several species of the genus occur on uncultivated lands in eastern Oregon. Freely visited by honeybees but probably not sufficiently abundant to be very important.
Sumac, Smooth (*Rhus glabra* L.) (Anacardiaceae)	Tall shrub		Summer	Moist ground in canyons of northeastern Oregon	N	P	Considered important in eastern states but scarce and of little value in Oregon. Poison oak and skunk bush belong to the same genus.
Sunflower (*Helianthus annus* L.) (Compositae)	Tall annual	Orange	Summer	Eastern Oregon	N	P	Wild sunflower is common in many parts of eastern Oregon. Visited freely by the bees. Should not be confused with balsam root and wyethia, which resemble it in flower structure. The Jerusalem artichoke, which is a variety of the sunflower, has been reported as a honey plant in parts of the east. The annual cultivated form has shown a nectar concentration of 31.6 per cent.
Syringa (*Philadelphus* spp.) (Saxifragaceae)	Tall bush	White	Spring	General	?	?	Of little attraction to bees. Also called mock orange. *P. Gordonianus* is the western Oregon species. *P. lewisii* is found in eastern Oregon.
Tamarisk (*Tamrix* spp.) (Tamaricaceae)	Tall spreading bush	Pink	Spring	As planted	N	P	Very hardy plants. Occasionally planted as ornamental trees. Too few in number to be of much value. Also called salt cedar.
Teasel (*Dipsacus sylvestris* Huds.) (Dipsacaceae)	Large biennial	Blue	Early summer	As introduced	N	P	Common along old river beds and railroads. Very attractive to bees, but not abundant enough to be of much value.
Thelypodium (*Thelypodium* sp.) (Cruciferae)		Various	Summer	Central Oregon	N	?	A species of this genus is reported as a source of nectar in central Oregon.
Thimble Berry (*Rubus parviflorus* Nutt.) (Rosaceae)....	Shrub	White	May and early June	Mostly western Oregon	N	P	Not of much importance.
Three Toothed Clover (*Trifolium tridentatum* Lindl.) (Leguminosae)	Annual	Dark purple		Western Oregon	N	?	Of minor importance.
Toad Flax (*Linaria vulgaris* Mill.) (Scrophulariaceae)....	Perennial	Yellow and orange	Early summer	Western Oregon	N	P	Also called butter and eggs. Too uncommon to be of much value. The honeybees take the nectar from the deep blossoms through openings made by bumblebees.
Tree of Heaven (*Ailanthus altissima* (Mill.) Swingle) (Simarubaceae)	Tree	Cream	Summer	Eastern Oregon			This Chinese tree is being planted as a shade tree and highway tree in eastern Oregon. A source of pollen and nectar, which is produced by conspicuous glands on the leaves.

Table 4. SECONDARY AND MINOR PLANTS—*Continued*

Common, scientific, and family name	Nature of growth	Color of blossom	Time of blossoming	Distribution	Source of		Remarks
					Nectar	Pollen	
Tulip Tree or Tulip Poplar (*Liriodendron tulipifera* L.) (Magnoliaceae)	Tree	Light green	Late May and early June	As planted western Oregon	N	P	An important surplus-producing plant of the southeastern states. Occasionally planted as a shade tree in the northwest. It is too uncommon at present to be of much value.
Turkey Mullein (*Eremocarpus setigera* (Hook.) Pip.) (Euphorbiaceae)	Depressed annual		Summer and fall	General over state in dry ground	N	P	Considered more important for pollen than nectar. Also called fish-poison.
Verbena (*Verbena* spp.) (Verbenaceae)	Perennial	Blue	Summer	Open moist ground in all sections	N	—	Some members have been reported as important sources of nectar. Our common species (*V. hastata* L.) is too uncommon to be of much value.
Virginia Creeper (*Parthenocissus quinquefolia* Graebn.) (Vitaceae)	Trailing vine	Cream	July and early August	As planted	N	P	Very attractive to bees for both pollen and nectar but not common enough to be of much value.
Vitex (*Vitex Negundo* var. *incisa* Clarke) (Verbenaceae)	Small tree				N	—	Specimens of this highly publicized plant were distributed among beekeepers in different parts of the state a few years ago. All reports later indicated that the plant was easily killed out during the winter or otherwise did not thrive in Oregon.
Walnut (*Juglans* spp.) (Juglandaceae)	Tree	Male catkin yellow	Spring	As planted. Mostly in western Oregon	—	P	Both the black and English produce considerable pollen.
White Clover (*Trifolium repens*) (Leguminosae)	Perennial	White	June, July	As planted and as a volunteer	N	P	White clover is common as a lawn and pasture plant. Volunteer plants are common in moist places. Ladino, a variety of white clover, is grown for seed in the Willamette Valley, Deschutes, Crook, Jackson, and Malheur counties. A fine grade of honey. Nectar concentration: Common white, 46.1 per cent; Ladino 41.2-48.9 per cent.
Whitlow Grass (*Draba verna* L.) (Cruciferae)	Annual	White	Late March	Northern and western Oregon	N	P	Reported as yielding nectar and pollen at Hermiston.

Willow (*Salix* spp.) (Salicaceae)	Shrub and tree	Catkins greenish yellow	February and March	General in moist soil	N	P	Many species of willow are found often in great abundance along the streams and elsewhere in most parts of the state. About the earliest blooming flowers of major importance for the bees to build up on during February and March. They furnish both nectar and pollen at a time when needed by the bees. Nectar concentration 43-70 per cent.
Wine Bush (*Baccharis pilularis* DC.) (Compositae)	Shrub	Golden brown	White	Coast range and southern Oregon	N	P	A yielder of nectar and pollen in California west of the Sierras along stream beds up to 1,500 feet. No information on its value in Oregon. Also called coyote brush and chaparral broom.
Wisteria (*Wisteria* spp.) (Leguminosae)	Perennial vine	Bluish or white	Spring	As planted	N	—	Reported to be very attractive to bees. It is too uncommon to be of much value.
Wyethia (*Wyethia* spp.) (Compositae)	Low perennial herb. Large leaves	Yellow	Spring	Both sides of state	N	P	*W. angustifolia* Nutt. of western Oregon and *W. amplexicaulis* Nutt. of the east side probably supply both pollen and nectar, but no surplus honey. Often called wild or prairie sunflowers. Very similar to balsam root.
Yerba Santa (*Eriodictyon californicum* (H. and A.) Greene) (Hydrophyllaceae)	Shrub	White or light blue	Early summer	Southern Oregon	N	P	Of much value to bees in hills of California where it produces a spicy flavored honey in early summer. Extends into Oregon, but it has not been reported of value. Honey reported to have cathartic properties.

VI. HOW TO COLLECT AND SHIP HONEY PLANTS FOR IDENTIFICATION

Prepared by DR. HELEN M. GILKEY
Botany Department

1. Whole plants should be collected, including roots, stems, leaves, blossoms, and, when possible, fruits and seeds.
2. Two specimens should be taken in each case, one to be sent to the College, the other to be retained by the collector.
3. All specimens sent to the College should be numbered, duplicate numbers being placed on the specimens kept by the collector.
4. Each specimen should be accompanied by a label that bears (a) the number; (b) the locality where collected (county and approximate distance from the nearest town); (c) conditions under which plant grew (shade, sun, moisture, dryness, etc); (d) date; (e) name of collector; and, when possible, (f) the approximate altitude.
5. Plant should be pressed as follows:

Have on hand

(a) A supply of single newspaper sheets, folded once.
(b) Driers, if convenient; otherwise a number of newspapers that may be used as pads.
(c) A board the size of a folded newspaper sheet (about 12 x 16 inches).
(d) Several heavy rocks or other suitable weights.

Upon several driers or folded newspapers on a smooth surface (table or floor), place a single sheet into which, before folding, is arranged a specimen. The plant should be spread out to best advantage, showing if possible both upper and lower leaf surfaces, external and internal views of blossoms, etc. Moistened strips of paper may be used to hold the plant parts in position while they are being arranged. When the plant is properly displayed within the limits of 12 x 16 inches (the approximate size of the folded sheet) the sheet is folded over, and above it is placed a drier or newspaper pad. Upon this is arranged another specimen in a folded sheet, above this another pad, etc., until all the plants of a given collection are cared for. Upon the stack of plants thus prepared, the board is placed, with the rocks upon it.

The driers or newspaper pads should be changed every day, and dried for future use. At the end of 2 or 3 days, all but the most succulent specimens should be dry and may be removed. Specimens mailed to the college should be packed between heavy card boards, preferably corrugated.

A simple home-made press with straps may be substituted for the board and rocks, but weights of some kind may also be used, in addition, to insure perfect drying. In such a press, newspapers and driers or pads are used, as in the other method.

VII. PLANTS OF POSSIBLE INJURY TO BEES

Fortunate indeed is the beekeeper who has not experienced a sudden disappearance of his bee working force through some obscure cause. Such a loss at a critical period means the failure of a honey crop, since so much time is necessary to rebuild the colonies that the honey season, short at best, has

passed. Among the causes for a high adult death rate are arsenical poisoning, a pollen-short period at least 6 weeks ahead of the unusual mortality, and plant poisoning. At least four plants are responsible for real or supposed trouble in the west, namely, loco weeds, death camas, veratrum, and buckeye. Of buckeye only a relatively few trees, both the California and eastern species, are planted about the cities of Oregon; perhaps too few are present to give concern. Both death camas and veratrum, wet soil plants, are to be found in numerous places in Oregon. Numerous species of loco thrive on the dry soils of the southern, central, and eastern parts of the state. Some of these appear to be spotted as to distribution; the factors controlling their peculiar occurrence are obscure. Not all the members of this genus, or perhaps the plants within a species, are poisonous even when eaten by livestock.

Recent work by independent investigators in western United States indicates a connection between the selenium content of the soil and plants and their toxicity to livestock. The selenium content of the top soil appears to be greatly increased by the lifting of this element from seleniferous subsoil. Once selenium is in the top soil it may appear in abnormal amounts in the seeds and tissues of several species of plants. Whether there is any relationship between selenium and the observed instances of loco poisoning of bees remains to be demonstrated.

Beekeepers are urged to watch cases of high adult mortality with special reference to the cause. A day spent in field observations may reveal facts of value to all. A report to our bee journals or research workers will enable a record to be made for future reference.

VIII. BOOKS AND BULLETINS ON HONEY AND POLLEN PLANTS

FRYE, THEO. C., and GEO. B. RIGG. Elementary Flora of the Northwest; 1914, American Book Company, New York City, New York.

GILKEY, HELEN M. Handbook of Northwestern Flowering Plants; 1942, O.S.C. Co-operative Association, Corvallis, Oregon.

HASKINS, LESLIE. Wild Flowers of the Pacific Coast; 1934, Metropolitan Press, Portland, Oregon.

JEPSON, WILLIS L. Manual of the Flowering Plants of California; 1925, Associated Students' Store, Berkeley, California.

LOVELL, JOHN H. Honey Plants of North America; A. I. Root Company, Medina, Ohio.

PECK, MORTON E. A Manual of the Higher Plants of Oregon; 1941, Binfords and Mort, Pub., Portland, Oregon.

PELLETT, FRANK E. American Honey Plants; 1923, Second Edition, American Bee Journal, Hambleton, Illinois.

ST. JOHN, HAROLD. Flora of Southeastern Washington and of Adjacent Idaho; 1937, Student Book Corporation, Pullman, Washington.

VANSELL, GEO. H. Nectar and Pollen Plants of California; 1931, California Experiment Station Bulletin No. 517. Revised in 1941 by G. H. Vansell and J. E. Eckert.

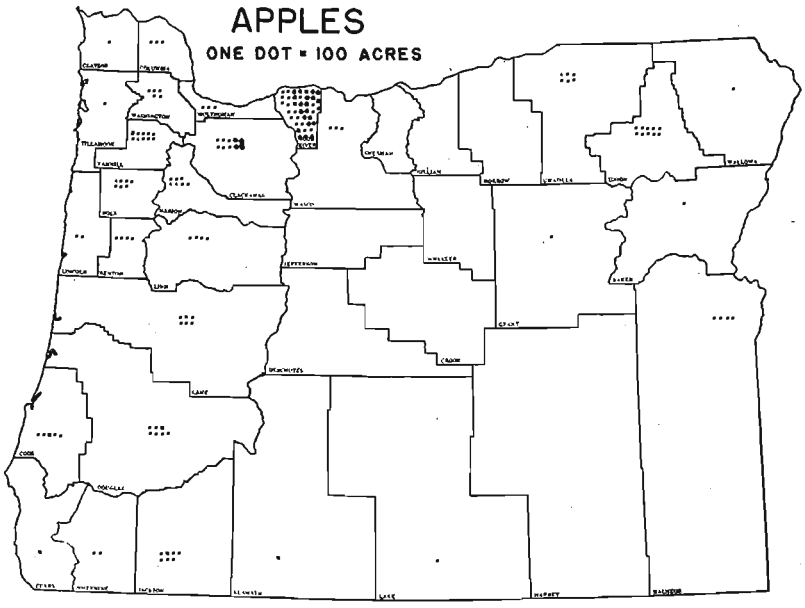

Figure 12. This map shows the leading commercial apple producing sections of the state. (U. S. Census, 1940.)

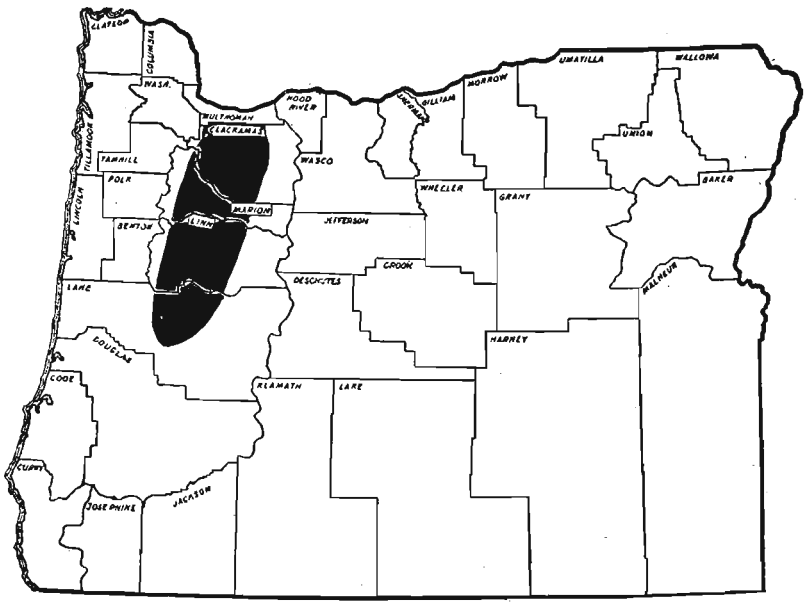

Figure 13. Distribution of bachelor's button (Original).

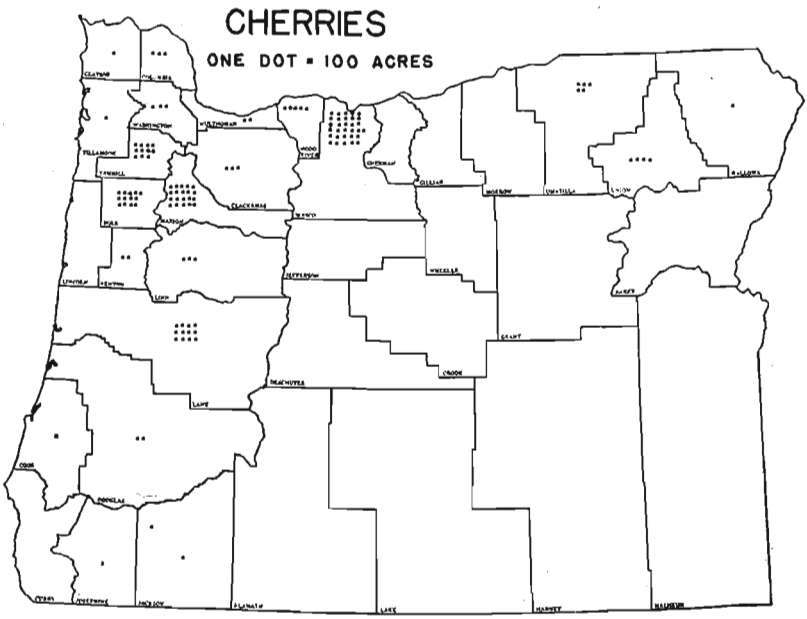

Figure 14. The leading commercial cherry districts are indicated on this map. (U. S. Census, 1940.)

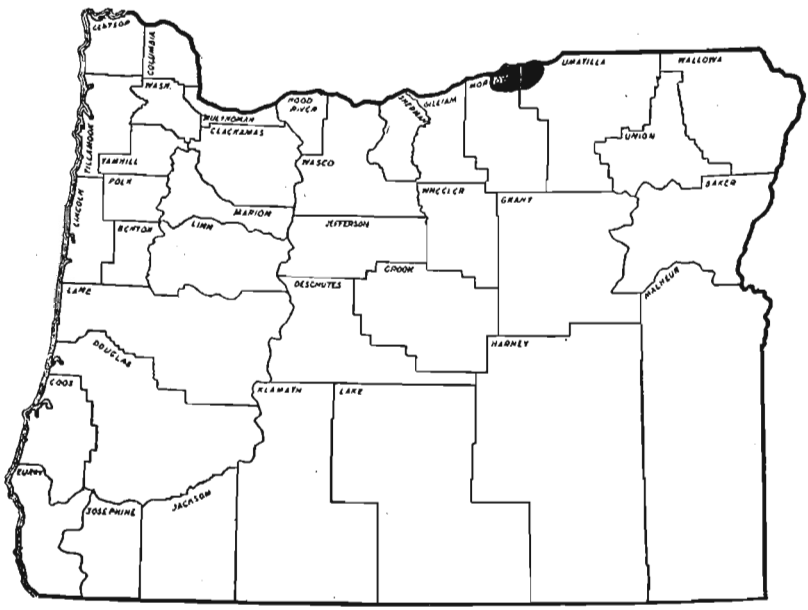

Figure 15. Distribution of wild buckwheat.

Figure 16. Fall Dandelion (*Hypochoeris radicata* L.) (by Lund).

Figure 17. Figwort (*Scrophularia* sp.) (by Scullen).

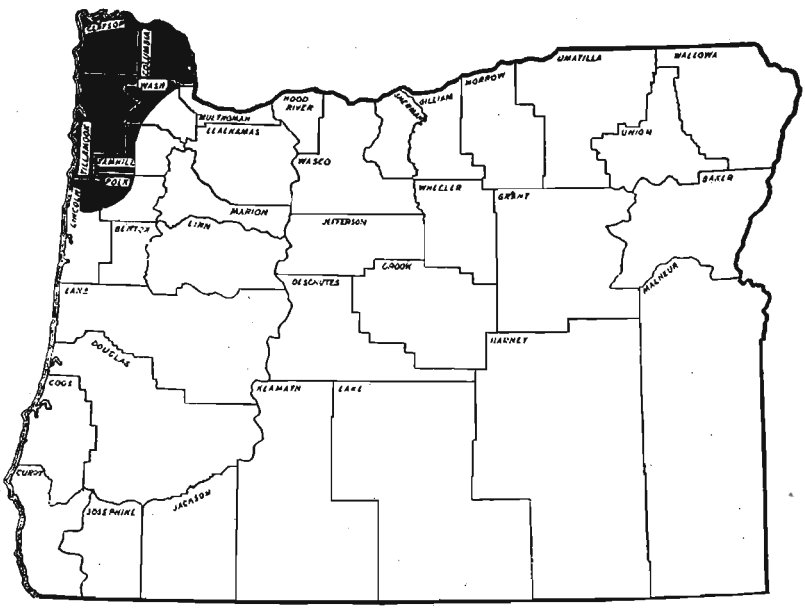

Figure 18. Distribution of figwort as a honey plant.

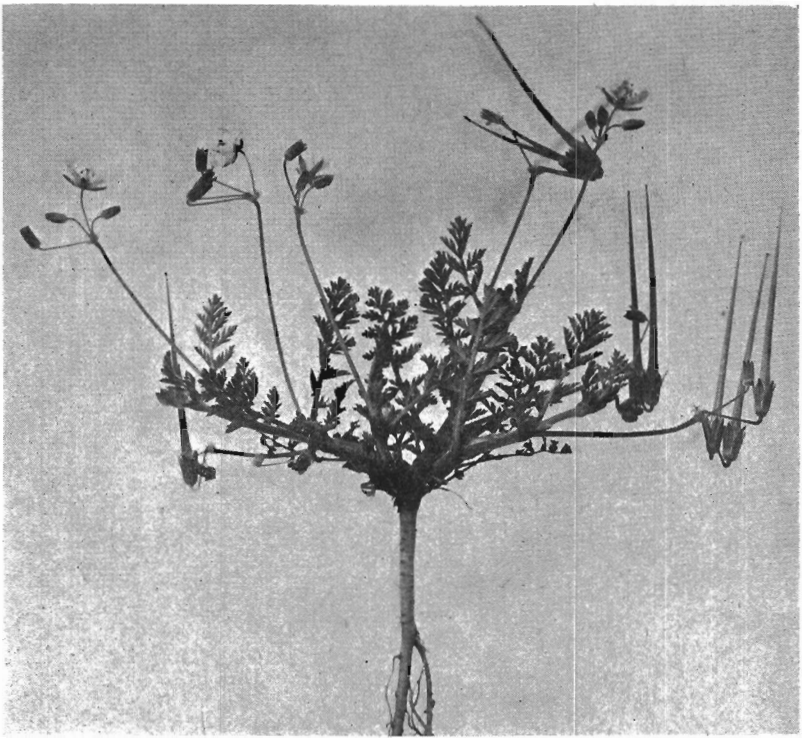

Figure 19. Filaree (*Erodium cicutarium* L'Her.) (by Lund.)

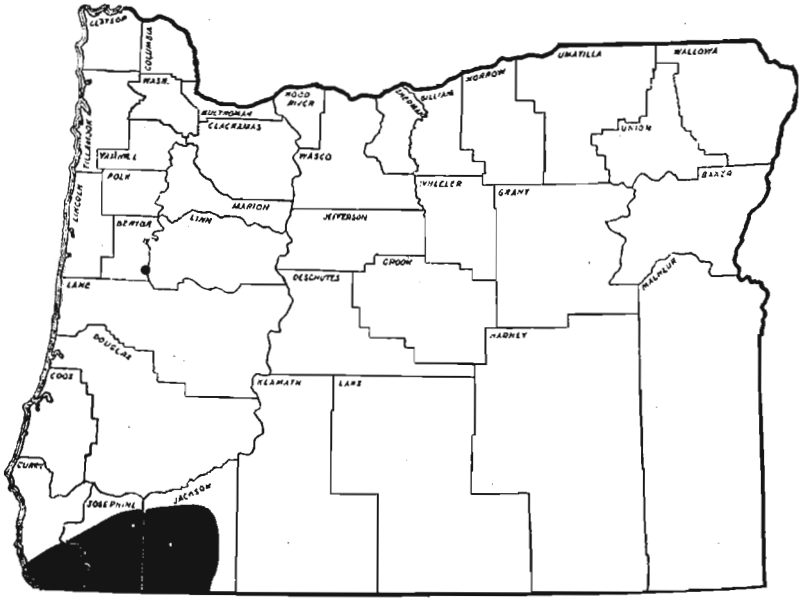

Figure 20. Distribution of manzanita.

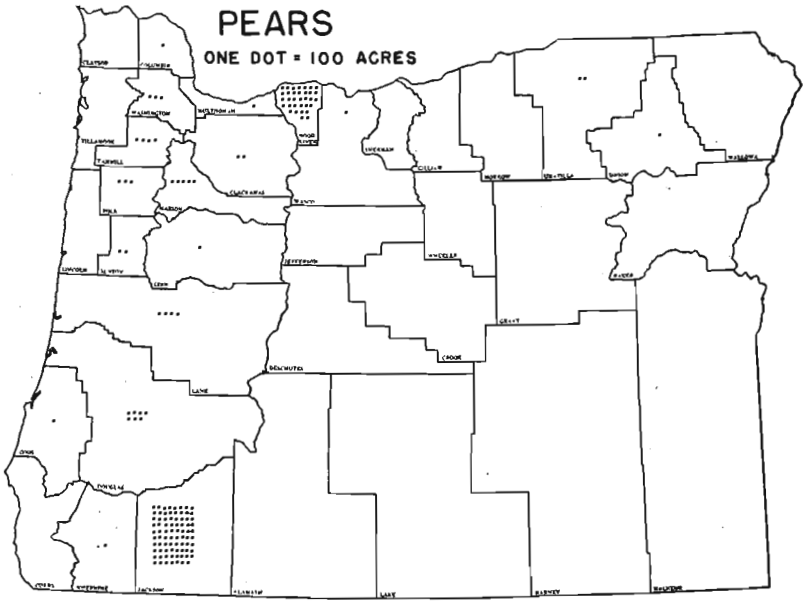

Figure 21. Commercial pear production is centered largely in Hood River and Jackson counties. (U. S. Census, 1940.)

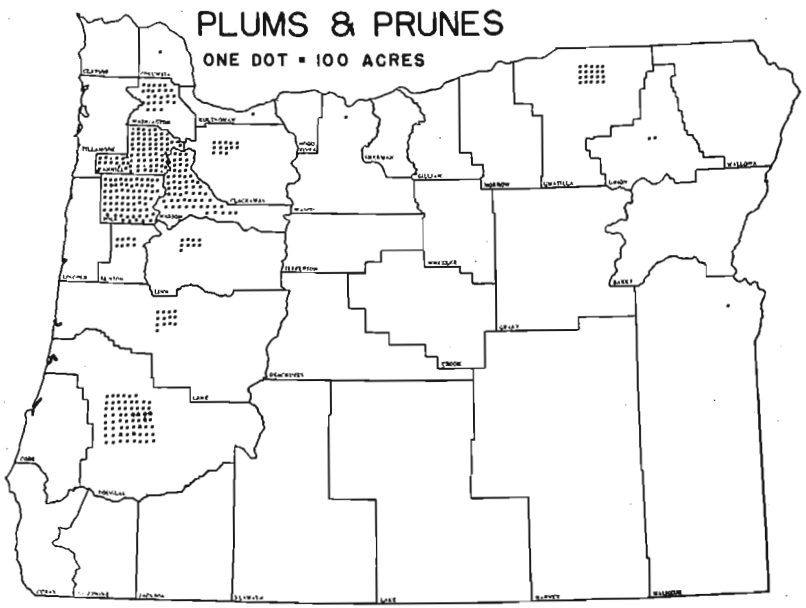

Figure 22. Map showing the plum and prune acreage in Oregon. (U. S. Census, 1940.)

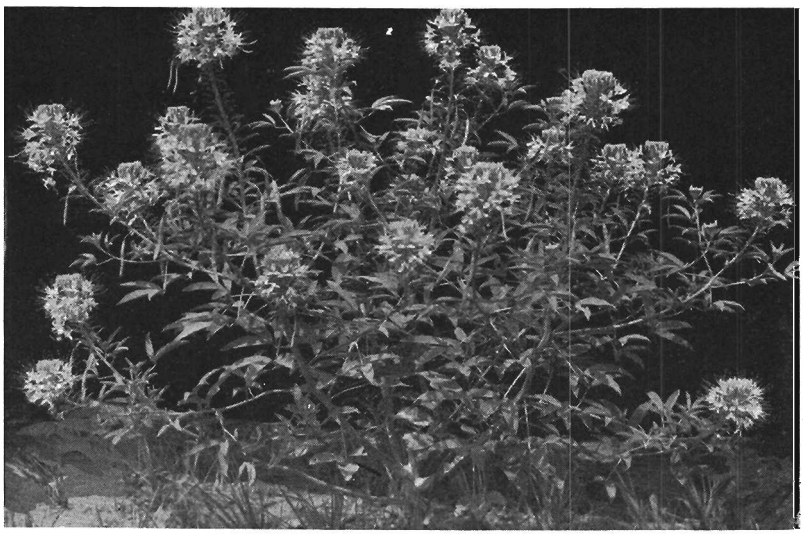

Figure 23. Rocky Mountain bee plant (*Cleome serrulata* Pursh) (by Scullen).

Figure 24. Sage brush (*Artemesia tridentata*) (by W. E. Lawrence).

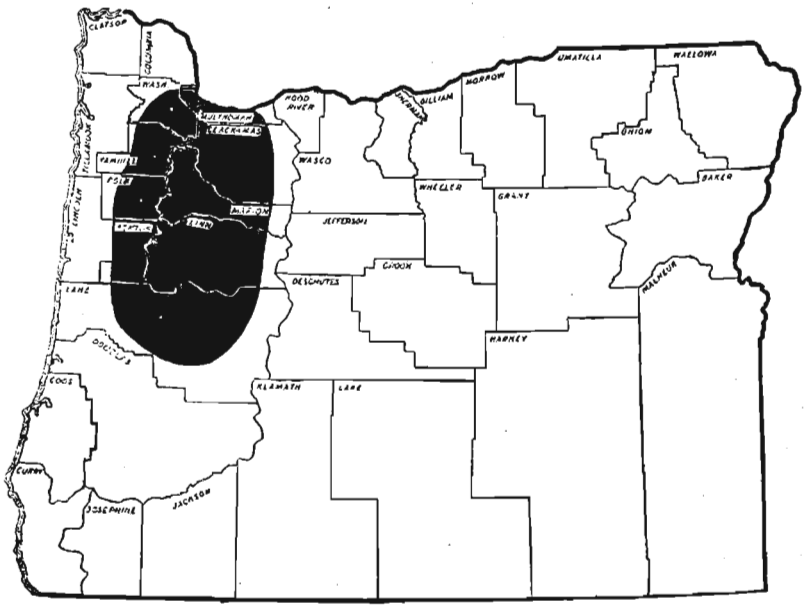

Figure 25. Map showing the area where snow berry is of value for bees.