12-16-1897

# Letter from the Secretary of Agriculture, transmitting a report on agriculture in Alaska.

55TH CONGRESS, 2d Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 160.

# AGRICULTURE IN ALASKA.

## LETTER

FROM

## THE SECRETARY OF AGRICULTURE,

TRANSMITTING

A REPORT ON AGRICULTURE IN ALASKA.

DECEMBER 18, 1897.—Referred to the Committee on Agriculture and ordered to be printed.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
*Washington, D. C., December 16, 1897.*

SIR: I have the honor to transmit herewith a report on the investigation of the agricultural capabilities of Alaska, made in compliance with the act of Congress making appropriations for this Department for the fiscal year ending June 30, 1898. The investigation has, in my judgment, shown that it is important that the National Government should continue the survey of the climate, soils, and economic plants of Alaska, and that experiments should be undertaken to encourage the establishment of agriculture in that region in a way best suited to the local conditions. The recommendations of the Director of the Office of Experiment Stations for the continuance of these investigations are approved, and it is hoped that the sum necessary to successfully prosecute them will be appropriated by Congress for the ensuing fiscal year.

Very respectfully,

JAMES WILSON,
*Secretary.*

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

---

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
*Washington, D. C., December 16, 1897.*

SIR: The act making appropriations for this Department for the fiscal year ending June 30, 1898, contains, under the head "Agricultural experiment stations," the following item:

Five thousand dollars may be expended by the Secretary of Agriculture to investigate and report to Congress upon the agricultural resources and capabilities of

Alaska, with special reference to the desirability and feasibility of establishing experiment stations in said Territory, as has been done in the other States and Territories, and the selection of suitable locations for such stations.

To carry out the provisions of this act, the Secretary of Agriculture issued the following order:

To carry out the provisions of this act, a commission is hereby organized, consisting of Mr. Benton Killin, of the State of Oregon, and Mr. Walter H. Evans, of the office of experiment stations of this Department, whose duty it shall be to visit the coast region of Alaska and collect all the data possible in accordance with the above act. These persons will, one or both, as may be found most expedient after they reach Alaska, visit the principal places along the coast of Alaska, paying especial attention to the vicinity of Cook Inlet, Sitka, Kadiak, and such sections as give the most promise of agricultural and horticultural productions. * * * Mr. Killin will consider especially the agricultural conditions of the places visited, noting what is now done, what has been attempted, what are the possible further extensions of arable soils, etc. Mr. Evans will especially note what native plants are used for food and forage, and make collections of them as far as possible.

The general features to be observed by the commission are as follows:

1. What are the most characteristic plants? What edible fruits and roots abound, and how are they utilized?
2. What grasses and forage plants are found in any abundance?
3. What are the general agricultural features of the region?

(*a*) When does the snow leave the ground, and when may killing frosts be expected to return?

(*b*) What temperature records are available?

(*c*) What is the proportion between clear and cloudy days in summer?

(*d*) What is the total amount of rain and snow?

(*e*) What is the general nature of the soil, i. e., clay, sandy, gravel, peat, etc.? Collect samples.

(*f*) What means are adopted to prepare the soil for cultivation?

(*g*) What areas are adapted for gardens, pastures, etc.?

4. What plants are now or have been grown? Have any unusual methods, such as bedding, ridging up soil, etc., been tried?
5. What means are practiced for the preservation of crops of all kinds?
6. What domesticated animals are kept, and for what purpose?
7. What shelter is necessary for animals in winter, and how do they withstand the winter?
8. What localities are suitable for experiment stations?
9. What means are necessary for securing the land, buildings, etc.?
10. What possible agencies are there for cooperative experiments?
11. What kind of experiments seem immediately feasible and desirable?

The information upon these points should be as complete and authentic as possible, and may be supplemented in any way desirable.

Through the courtesy of the honorable Secretary of the Interior and the Commissioner of Education, the services of Dr. Sheldon Jackson, superintendent of Government schools and reindeer experiments in Alaska, were secured to investigate the agricultural capabilities of the Yukon Valley. Dr. Jackson performed this service in connection with his annual inspection of the reindeer experiments and schools in Alaska. The reports of Mr. Killin and Dr. Evans are transmitted herewith, together with a brief summary of the conclusions reached by Dr. Jackson, who has returned so recently from Alaska that he has not yet been able to complete the detailed report of his investigations.

The reports of the agents of the Department who made this investigation show that at present very little agriculture is practiced in Alaska in a regular way. Various crops, especially grasses, vegetables, and berries, are, however, successfully grown in different localities, and live stock is kept in small numbers. The methods of agriculture are comparatively primitive, and very little attempt has been made to promote the development of agriculture by an intelligent study of the local conditions of soil and climate.

It seems probable that for an indefinite period the agriculture of Alaska will be subsidiary to other industries, such as mining, fishing,

and the fur trade. The rapid development of the mining industry is bringing in considerable population. At the same time some of the industries, such as the hunting of sea otters and other fur-bearing animals, which hitherto have been the main reliance of the native population, are declining, so that even now in some places it is a serious problem how this population is to be maintained. It will, therefore, be increasingly important that the population of Alaska learn how to make the most of such agriculture as may be carried on there. Questions relating to the management of vegetable and fruit gardens, the care of stock used for domestic purposes, hay making, the use of silos, drainage, and methods of cultivation need to be carefully studied with special reference to the local conditions. Effort should also be made to test various hardy crops with reference to their adaptation to that region. If this is done for Alaska, as it is being done for other parts of the United States through the experiment stations, it is believed that both the incoming settlers and the native population will derive great advantage and be saved from much disappointment and financial loss.

The establishment of agricultural experiment stations in Alaska under the act of Congress of March 2, 1887 (Hatch act), is in my judgment entirely impracticable at present. This act contemplates the prior existence of an agricultural college, with land, buildings, and other equipment which the station may use. There is no such institution in Alaska at present, and the time has not yet come for its establishment. The population of Alaska is not a settled one, and it would be very difficult to properly organize and maintain an agricultural experiment station under local control. The work of such a station for a considerable period must be largely that of an agricultural survey, and the experimental inquiries at first undertaken should for the most part consist of attempts to determine what crops and agricultural industries are best adapted to particular regions. This work can be most economically and efficiently done by this Department, which can aid the special inquiries through its scientific divisions and its facilities for procuring and distributing seeds, plants, and other agricultural materials needed in a new region.

I therefore recommend that Congress be asked to appropriate $15,000 for the ensuing fiscal year which may be expended by the Secretary of Agriculture in continuing investigations upon the agricultural resources and capabilities of Alaska, in locating and maintaining agricultural experiment stations and experimental farms in said Territory, and in conducting such other investigations relating to the agriculture of said Territory as he may deem advisable, and that he be authorized to expend the sum thus appropriated, or any portion of it, for the employment of such assistants, clerks, and other persons as he may deem necessary; the purchase and rental of land; the erection and rental of buildings; traveling; the preparation, publication, and distribution of bulletins and reports; the purchase and distribution of seeds and plants, and the payment of any other expenses which he may find essential in carrying on the aforesaid agricultural investigations.

Very respectfully,

A. C. TRUE, *Director.*

Hon. JAMES WILSON,
*Secretary of Agriculture.*

## REPORT OF WALTER H. EVANS.

Dr. A. C. TRUE,
*Director Office of Experiment Stations.*

SIR: Acting under instructions from the Secretary of this Department, in company with Mr. Killin, I set out on June 8 from Tacoma, Wash., and spent three months investigating the southern coast region of Alaska.

The trip as far as Sitka was made among almost innumerable islands whose heights were snow clad, while the lower elevations were usually clothed with a dense growth of spruce, hemlock, and cedar. Wherever cleared tracts exist grasses of many kinds abound, while on the tide flats, which were found here and there, sedges and similar plants were very abundant. The waters of this island route were almost as placid as those of the traditional mill pond, there being but a few hours' steaming through waters that are not shut off from the open ocean.

The first stop made in Alaska, after passing the custom-house at Mary Island, was at Metlakahtla, on Annette Island. Here there are about 900 Indians who have been collected together and brought hither by the Rev. William Duncan. A small sawmill and cannery are the principal industries of the place. They have an apparently thriving village, built almost entirely by the natives, their houses giving evidence of comfort and stability. Several acres of land have been cleared and some little attempt made to cultivate some hardy crops.

The next stop was made at Wrangell, where a sawmill and cannery are the leading industries. Here a stop of about two weeks was made, which included several side trips, the most important being that along the west side of Prince of Wales Island as far as Jackson, or what was formerly known as Howkan. On this trip stops were made at Shakan, where there is a sawmill, and at Klawack, where a cannery is the leading industry. But little attempt has been made at either place in the way of gardening. At Wrangell more has been done in the way of permanent improvements. There were several very promising gardens seen at the time of our visit, and later reports verified the earlier promises. Grasses were found abundant wherever the timber had been cut away and the undergrowth kept down. Timothy, blue grass, Alaska red top, orchard grass, white and red clover were seen growing about Wrangell and other places.

From Wrangell we went to Juneau, making a stop at Sum Dum on the way. At Juneau some gardens were seen, but the general topography of the immediate vicinity precludes any extensive agricultural development. From Juneau we went to Sitka, making side trips into Lynn Canal and Glacier Bay, and a stop of several hours at Killisnoo. At Sitka, where there are two sawmills, Government buildings, two mission schools, and a post garrison, a stop of about a week was made, after which the mail boat was taken for Kadiak, stops being made at Yakutat, Nuchek, Orca, and Tatitlak, in Prince Williams Sound, and Homer, on Katchemak Bay, in Lower Cook Inlet. After two weeks at Kadiak we visited Cook Inlet, stops being made at various places, the principal of which were Homer, Anchor Point, Snug Harbor, Tyoonock, and Sunrise City, with opportunities to learn of the agricultural conditions at other places, principally at Kussilof, Ninilchek, and Kenai. At Sunrise City we parted company, Mr. Killin returning via the Portage to Prince Williams Sound, while I went to the westward, visiting, among other places, Kadiak, Wood Island, Karluk, Unga, Belofsky,

and Unalaska. Mr. Killin visited Orca, Odiak, Eyak, the Copper River delta, and Yakutat. In this way we were able to visit nearly every coast village in southern Alaska. The return trip included stops at nearly every place previously visited, so that a second opportunity was given to visit nearly every village. In addition stops were made at a few places not visited earlier in the season, the principal of which were Loring and Ketchikan.

It soon became evident that in making our reports it would be necessary for more or less duplication, since different places were visited by each of us and a joint report would hardly be possible. On this account the strict letter of our instructions was not followed, either in our field work or in our reports.

## GENERAL TOPOGRAPHY.

The region visited consists for the most part of islands and peninsulas jutting out from the mainland. The shore line everywhere is irregular, being indented by innumerable bays and inlets. The land is hilly and mountainous with narrow valleys between them or occasionally considerable areas of comparatively level land along the shore line or along streams. Much of this land is boggy, the marsh frequently extending to a considerable distance up the rather steep hillsides. On the Kenai Peninsula and on the western side of Cook Inlet in the vicinity of West Foreland and Tyoonock are extensive plateaus, but elsewhere the surface is more or less broken. Two large rivers, the Copper River and the Stikine, are found in this region. They cut through the coast ranges and extend far into the interior. The Sushitna and Knik rivers, which empty into the upper end of Cook Inlet, are streams of no meager size. Smaller streams and fresh-water lakes are almost innumerable, the margins of the lakes and banks of streams being more or less peaty or marshy, depending upon the general contour of their surroundings. Tide flats exist at the mouths of the rivers and elsewhere, the principal of which are those at the delta of the Copper River and the mouth of the Stikine River.

As has been previously pointed out, agriculturally southern Alaska is naturally divided into two rather characteristic regions by the high mountain ranges which extend from the Fairweather region to the eastern side of the Kenai Peninsula, a distance of over 200 miles. There are a few breaks in this wide stretch of country, the most noticeable being at Yakutat and the Copper River delta. The southeastern region extends from Dixons Entrance to Cross Sound, or a little beyond, a distance of about 4 degrees of latitude. The greater portion of this region is embraced in the great Alexandrian Archipelago, which consists of more than 1,000 islands, and the adjacent mainland as far north as Juneau. The larger islands of this region are Prince of Wales, Kupreanof, Baranof, Admiralty, and Chichagof. The smallest of these is about 50 miles long, while Prince of Wales Island is 120 miles long by about 40 wide. The second or southwestern region extends, with slight modification, from the west side of the Kenai Peninsula along the Aleutian Peninsula and Archipelago, and includes Kadiak and neighboring islands, the Shumagin group, and numerous smaller islands. The southeastern region is characterized by its being more or less heavily timbered, the Sitkan spruce (*Picea sitchensis*) predominating. This tree often attains considerable size, specimens at least 8 feet in diameter and perhaps 200 feet high having been seen. Logs approximating 100 feet in length were seen at the sawmill of Sylvester & Wilson at Wrangell.

In the more southern portions of this region red and yellow cedar (*Thuya gigantea* and *Cupressus nootkatensis*) are plentiful, and the trees attain very respectable proportions. The hemlock (*Tsuga mertensiana*) is also quite common. There were several other species of trees met with, but spruce and hemlock form the bulk of the forests in southeastern Alaska. They occur from sea level to timber line, an elevation of 2,000 or more feet, now one and then the other predominating. Along the streams and on the sides of mountains where snow slides or other agencies have swept away the dense growth of conifers, willows and alders take possession. Wherever openings exist, either by clearing or otherwise, a dense growth of shrubs of various kinds is usually found, prominent among which are the various forms of Rubus, Ribes, and the many varieties of huckleberries. Where the undergrowth is suppressed grasses quickly cover the ground. Of these the most common are the introduced blue grass, timothy, orchard grass, and white and red clover, all of which seem to thrive. Of native species those of Deschampsia, Festuca, Hordeum, Elymus, and Agrostis are most abundant.

In the southwestern region the characteristic vegetation is the wealth of grasses. In the more northern and eastern portions of this region some timber exists, most of which consists of spruce, cottonwood, birch, and alder, but the growth is rather insignificant when compared with the forests of the southeast. The last trees of any large size are those on the northern and eastern portions of Kadiak Island, and consist of cottonwood and spruce. West of this island the arborescent flora is very meager and seldom exceeds a size usually characterized as shrubby. Throughout this region are found numerous grasses, the most common of which are *Poa pratensis*, *Deschampsia cæspitosa*, and *Hordeum boreale*, all of which enter into the common hay mixtures. So abundant are the various grasses in this region that they cover the lower levels and extend far up the mountain sides, forming a range of great grazing possibilities.

Throughout nearly the whole of Alaska, especially in the poorly drained and in the timbered regions, mosses of many kinds abound, often forming layers of living and dead moss several feet in depth. Much of the moss is sphagnum, and its well-known character as a nonconductor of heat and its power of absorbing and retaining large amounts of water will account, in a great degree, for the cold, wet condition of the underlying soil. In some places the moss is so thick that it is late in the season when the ground underneath is thawed out. The presence of so much moss makes land travel everywhere very difficult, since roots, rocks, fallen limbs, and trees are so hidden as to cover numerous pitfalls. Limited experiments have shown the beneficial results following the removal of the moss so that the soil could be warmed and thawed earlier in the season.

## METEOROLOGY.

The meteorology of the coast region is characterized by the great rainfall and the rather constant temperature, due to the Japan current, which sweeps the whole coast. During the past season, at the places visited there was at no time an excessive rainfall; in fact, there was not a hard rain observed while in Alaska. During the first three weeks and the last two weeks bright sunshine was the rule, with considerable cloudy weather intervening, but with little rain accompanying. But one thundershower was observed all the season, and that was at Yakutat on the evening of August 30. Considerable fog was experienced

during the first two weeks of August while visiting Cook Inlet and on the way to Unalaska. Throughout the entire region visited there are no extremes of temperature. In many places zero temperature is seldom experienced, and the lowest recorded temperature as given by the United States Weather Bureau for Juneau was —4° (F.); for Killisnoo, —2°; Sitka, —3°, and Kadiak, —2°. On the other hand, the maximum temperatures observed at the same stations were: Sitka, 80°; Juneau, 88°; Killisnoo, 84°; Kadiak, 79°. The average daily range of the thermometer during the summer months at Juneau was from 11° to 14°, and at Killisnoo it was from 15° to 19°. At Kadiak, upon especially cloudy days, when there was but little wind, several occasions were observed where the difference between the maximum and minimum thermometers was but 2°, and at Killisnoo observations in June are reported in which there was no variation.

The following tables show the average monthly temperatures and rainfall for eight stations in Alaska, and, for comparison, there are added the same data for eleven other places in northern Europe and this continent:

TABLE I.—*Compilation of average temperatures.*

| | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Average. | Total temperature May 1 to Sept. 30. | Sum of effective temperatures May 1 to Sept. 30. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. | ° F. |
| Wrangell[1] | 26.2 | 30.8 | 31.6 | 42.7 | 49.3 | 55.3 | 58.2 | 57.5 | 52.3 | 45.9 | 33.5 | 32.9 | 43.0 | 8,343.0 | 1,764.0 |
| Sitka[1] | 32.9 | 33.6 | 37.1 | 42.1 | 47.6 | 51.9 | 55.1 | 56.4 | 52.3 | 46.2 | 38.9 | 35.8 | 44.2 | 8,058.1 | 1,479.1 |
| Juneau[1] | 27.5 | 24.7 | 33.5 | 40.1 | 47.6 | 53.6 | 56.6 | 55.0 | 49.9 | 41.9 | 31.2 | 29.3 | 40.9 | 8,040.2 | 1,461.2 |
| Killisnoo[1] | 27.7 | 26.8 | 33.1 | 36.9 | 45.6 | 51.6 | 55.2 | 54.4 | 47.8 | 41.1 | 33.4 | 30.1 | 40.3 | 7,793.2 | 1,214.2 |
| Kadiak[1] | 30.0 | 28.2 | 32.6 | 36.3 | 43.2 | 49.5 | 54.7 | 55.2 | 50.0 | 42.2 | 34.7 | 30.6 | 40.6 | 7,731.1 | 1,152.1 |
| Unalaska[1] | 33.5 | 30.5 | 32.6 | 35.2 | 40.4 | 46.3 | 49.8 | 50.3 | 46.0 | 40.4 | 34.6 | 32.8 | 39.3 | 7,103.5 | 624.5 |
| St. Michaels[1] | 7.4 | —2.3 | 8.9 | 19.9 | 33.1 | 45.6 | 53.6 | 51.9 | 43.9 | 30.5 | 15.6 | 4.8 | 26.1 | 7,002.6 | 423.6 |
| Pyramid Harbor[1] | 25.0 | 23.0 | 35.0 | 43.0 | 48.7 | 55.4 | 56.3 | 56.1 | 50.0 | 40.9 | 28.2 | 25.3 | 40.6 | 8,156.1 | 1,577.1 |
| Ottawa, Canada[2] | 11.9 | 12.2 | 17.6 | 41.5 | 63.6 | 66.9 | 70.4 | 68.7 | 57.7 | 43.1 | 34.5 | 17.8 | 42.1 | 10.0 3.7 | 3,424.7 |
| Winnipeg, Manitoba[3] | —11.0 | —5.0 | 10.5 | 35.5 | 53.6 | 61.5 | 64.0 | 61.5 | 49.0 | 36.5 | 18.0 | 3.0 | 29.6 | 8,867.1 | 2,288.1 |
| Qu'Appelle, Assiniboia[3] | — 8.6 | —2.5 | 15.0 | 35.5 | 50.0 | 61.0 | 63.0 | 60.5 | 48.5 | 36.5 | 19.5 | 3.0 | 29.8 | 8,663.5 | 2,084.5 |
| Port Angeles, Wash.[3] | 34.7 | 36.7 | 41.7 | 45.6 | 50.6 | 54.0 | 56.6 | 56.8 | 52.7 | 47.7 | 42.4 | 38.2 | 46.1 | 8,285.0 | 1,671.0 |
| Trondhjem, Norway[4] | 27.4 | 26.8 | 28.6 | 37.9 | 45.8 | 53.6 | 57.2 | 56.3 | 50.0 | 41.1 | 32.7 | 27.5 | 40.6 | 8,046.3 | 1,465.3 |
| Bergen, Norway[4] | 34.1 | 32.2 | 35.4 | 43.7 | 48.9 | 55.0 | 57.9 | 57.5 | 52.7 | 45.1 | 38.5 | 34.7 | 44.6 | 8,324.3 | 1,745.3 |
| Christiania, Norway[4] | 24.1 | 23.9 | 29.5 | 39.9 | 50.9 | 59.9 | 62.6 | 60.6 | 52.7 | 41.9 | 32.1 | 25.6 | 41.9 | 8,775.1 | 2,196.1 |
| Helsingfors, Finland[5] | 20.9 | 18.8 | 26.2 | 34.8 | 44.1 | 56.9 | 61.9 | 58.3 | 50.5 | 43.9 | 33.7 | 21.7 | 39.2 | 8,315.3 | 1,736.3 |
| Stockholm, Sweden[6] | 33.5 | 29.5 | 33.8 | 39.5 | 52.5 | 57.0 | 59.1 | 59.3 | 53.6 | 40.6 | 35.6 | 27.3 | 43.4 | 8,615.9 | 2,074.9 |
| Scotland[7] | 37.1 | 38.4 | 39.4 | 44.1 | 49.0 | 54.8 | 57.1 | 56.6 | 52.8 | 46.4 | 40.6 | 37.8 | 46.1 | 8,271.7 | 1,692.7 |
| Orkney Islands[8] | 38.5 | 38.2 | 40.3 | 43.3 | 47.8 | 52.8 | 55.1 | 55.0 | 52.5 | 47.5 | 42.6 | 40.9 | 46.2 | 8,053.9 | 1,474.9 |

[1] United States Weather Bureau Compilation.
[2] Canada Exptl. Farms Rpt., 1896.
[3] Monthly Weather Review, United States Weather Bureau, 1893.
[4] Landrugsdirekt. Beretning, 1893.
[5] Ofver. Finska Vetenskaps Soc. Forhandlinger (average, 1869–1878).
[6] Meteor. Iaktag. i Sverige k. Svensk Vetens. Akad., 1890.
[7] Trans. Highland and Agl. Soc. Scotland, 1895.
[8] Trans. Highland and Agl. Soc. Scotland, 1874.

TABLE II.—*Average precipitation.*

| | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Total. | Total precipitation May 1 to Sept. 30. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* | *Ins.* |
| Wrangell | 3.43 | 5.70 | 2.58 | 3.87 | 3.06 | 3.56 | 3.98 | 2.62 | 9.58 | 8.16 | 11.03 | 9.44 | 67.01 | 22.80 |
| Sitka | 7.95 | 8.02 | 7.78 | 5.03 | 3.89 | 3.87 | 4.14 | 6.67 | 10.94 | 12.96 | 10.77 | 8.52 | 90.54 | 29.51 |
| Juneau | 10.59 | 4.80 | 6.49 | 5.25 | 7.36 | 4.99 | 5.25 | 7.35 | 10.04 | 8.49 | 8.78 | 7.38 | 86.77 | 34.99 |
| Killisnoo | 5.26 | 5.03 | 4.39 | 2.56 | 2.80 | 2.00 | 3.53 | 4.80 | 6.39 | 6.92 | 6.43 | 5.84 | 55.92 | 19.52 |
| Kadiak | 6.56 | 3.70 | 4.86 | 4.01 | 5.92 | 4.91 | 3.38 | 4.97 | 7.26 | 8.09 | 6.56 | 7.94 | 68.16 | 26.44 |
| Unalaska | 13.81 | 7.68 | 6.48 | 7.51 | 4.49 | 4.26 | 2.78 | 3.40 | 8.64 | 11.98 | 9.30 | 11.81 | 92.14 | 23.57 |
| St. Michaels | 0.86 | 0.18 | 0.46 | 0.49 | 0.99 | 1.40 | 1.76 | 2.61 | 2.90 | 1.34 | 0.79 | 0.67 | 14.44 | 9.66 |
| Pyramid Harbor | 2.96 | 6.06 | 2.81 | 1.19 | 1.15 | 1.31 | 1.18 | 1.45 | 3.38 | 4.03 | 5.01 | 4.50 | 35.03 | 8.47 |
| Ottawa, Canada | 3.26 | 2.44 | 3.06 | 1.95 | 2.75 | 2.40 | 3.26 | 2.10 | 2.77 | 2.29 | 2.42 | 3.64 | 32.34 | 13.28 |
| Winnipeg, Manitoba | 0.66 | 1.27 | 1.20 | 1.35 | 2.72 | 3.84 | 3.22 | 3.46 | 2.00 | 1.73 | 1.00 | 1.39 | 23.93 | 15.24 |
| Qu'Appelle, Assiniboia | 0.38 | 0.67 | 0.64 | 1.06 | 1.52 | 3.35 | 2.35 | 1.37 | 1.14 | 1.02 | 0.67 | 0.64 | 16.35 | 9.73 |
| Port Angeles, Wash | 4.90 | 3.33 | 2.53 | 1.90 | 1.05 | 1.50 | 0.27 | 0.85 | 2.10 | 2.91 | 3.52 | 5.35 | 29.35 | 5.77 |
| Trondhjem, Norway | 3.36 | 2.28 | 2.52 | 2.20 | 2.32 | 2.48 | 2.56 | 2.59 | 3.27 | 4.29 | 3.50 | 4.25 | 35.60 | 13.22 |
| Bergen, Norway | 6.93 | 5.55 | 4.33 | 3.78 | 4.09 | 4.37 | 6.06 | 6.85 | 8.26 | 8.78 | 6.73 | 7.44 | 69.13 | 29.63 |
| Christiania, Norway | 1.22 | 0.94 | 1.06 | 1.10 | 1.77 | 2.04 | 3.34 | 2.87 | 2.99 | 2.56 | 1.89 | 1.26 | 22.56 | 12.92 |
| Helsingfors, Finland | 1.47 | 1.20 | 1.16 | 1.39 | 1.67 | 1.72 | 2.09 | 2.71 | 2.20 | 2.57 | 2.42 | 1.61 | 22.25 | 10.39 |
| Stockholm, Sweden | 0.88 | 0.44 | 1.34 | 2.85 | 3.12 | 1.58 | 2.62 | 4.57 | 1.27 | 3.28 | 2.65 | 0.69 | 25.22 | 13.16 |
| Scotland | 3.95 | 3.00 | 2.78 | 2.15 | 2.29 | 2.50 | 3.11 | 3.55 | 3.67 | 4.05 | 3.82 | 3.97 | 38.83 | 15.12 |
| Orkney Islands | 4.29 | 3.11 | 2.71 | 1.86 | 1.55 | 2.17 | 2.62 | 2.84 | 2.72 | 4.85 | 3.89 | 4.33 | 36.95 | 11.94 |

From the foregoing tables it is shown that several north European places have a lower annual temperature than some of the Alaskan stations, while the annual temperature of Winnipeg and Qu'Appelle is lower than that of any southern coast region in Alaska. Since annual temperatures are of little agricultural significance, there have also been added the total sum of temperatures for the five months in which most plant growth is made, i. e., from May 1 to September 30. The range of total temperatures is from 10,003.7° F. at Ottawa to 7,002.6° F. at St. Michaels. The total temperatures for this period at Wrangell, Juneau, and Sitka are almost the same as those for the same period at Trondhjem and Bergen, in Norway; Helsingfors, Finland; Scotland; Orkney Islands; and Port Angeles, Wash. It may be objected that the total temperatures do not correctly express the temperature for plant growth, but that 6° C. or 43° F. should be adopted as the initial temperature, the sum of the temperatures above that degree being expressed as the sum of effective temperatures. These temperatures are also given in the last column of the table. By comparing the monthly averages in the above tables it will be seen that 43° about expresses the temperatures before and succeeding the arbitrary period selected, and for the region reported upon the five-month period would closely approximate the time elapsing between the date in the spring of the year when the mean temperature rises above 43° and that in the autumn when it falls below that point.

The annual rainfall for the southern coast region of Alaska, as shown in Table II, is rather excessive when compared with other regions, ranging as it does from 35.03 inches at Pyramid Harbor to 92.14 inches at Unalaska. The only European region given in the table where a nearly equal rainfall is shown is that of Bergen, with 73.18 inches. If we consider the rainfall in Alaska for the five growing months (May to September, inclusive), it is seen that with the exception of Juneau only one-third, or even less, of the annual precipitation falls during the summer months.

The total amount of summer rainfall, while large, is not excessive, especially when it is shown that Raleigh, N. C., has an annual precipi-

tation of 55.67 inches; 30.82 of which fell during the period indicated. Washington, D. C., with an annual precipitation of 43.59 inches, and Indianapolis, Ind., with 43.09, have respectively 21.29 and 20.54 inches of rain during the same period. All of these exceed the summer rainfall of Wrangell, Pyramid Harbor, and Killisnoo, and that of Raleigh is surpassed by Juneau alone.

Unfortunately there are no official data relative to the proportion of sunshine and cloudy days or days on which there was some rainfall. From a private record kept by Captain Wadleigh it appears that at Klawack, during 1894, there were in May 18 clear or fair days and 16 on which some rain fell; in June, 14 fair and 14 rainy days; July, 16 fair and 11 rainy days; August (1 to 17), 10 fair and 6 rainy, and September (15 to 30), 5 fair and 8 rainy days. At Juneau the proportion of clear or fair days and days on which rain fell during the years 1894–1896, inclusive, as given in records kept at the Occidental Hotel, shows the following for the five summer months:

| Month. | 1894. | | 1895. | | 1896. | |
|---|---|---|---|---|---|---|
| | Clear. | Rain. | Clear. | Rain. | Clear. | Rain. |
| May | 14 | 13 | 15 | 11 | 16 | 10 |
| June | 13 | 10 | 14 | 14 | 15 | 15 |
| July | 7 | 15 | 12 | 10 | 12 | 12 |
| August | 11 | 12 | 5 | 17 | 10 | 12 |
| September | 14 | 13 | 10 | 15 | 9 | 18 |
| Total | 59 | 63 | 56 | 67 | 62 | 67 |

In the above table, under the days designated clear, are included those given in the record as fair. Cloudy days on which no rainfall is mentioned are omitted.

According to the Transactions of the Highland and Agricultural Society of Scotland for 1880, in Sutherland, with an annual rainfall of 31.71 inches, in 1875 there were 157 days with 0.1 inch or more rainfall; in 1876 there were 209. At Drymen, in Stirlingshire, on the west coast of Scotland, there were 205 days on which some rain fell, as the average of fourteen years' observations. The annual precipitation was about 43 inches. At Sitka, according to Dr. Dall, in Report of United States Department of Agriculture, 1868, there were, during the year ending October 31, 1868, 106 fair days and 134 rainy ones. At Metlakahtla during the summer months, May to September, 1893, there were 57 clear and fair days and 82 rainy ones.

When one compares the temperature, rainfall, and proportion of clear and cloudy days of Sitka, Wrangell, Killisnoo, and Kadiak with the data for various agricultural regions of the higher latitudes of Europe, it is seen that the comparison is not unfavorable to the Alaskan stations.

There appear to be no official records as to the dates of disappearance of snow in spring nor for the last killing frost in spring and the first in autumn. In general throughout the coast region the winter's fall of snow has disappeared at the sea level by April 15, although snow flurries are common after that date. Killing frosts are seldom experienced between May and October. At Metlakahtla, according to a record for 1893 furnished by H. J. Minthorn, the last killing frost was on April 6 and the first in the autumn was on October 30.

In order to secure additional data relative to the meteorological conditions and the relation between climate and crops, the establishment of a number of additional stations where observations could be made seems desirable. This season the only places along the coast region

where there were voluntary weather observers were Killisnoo, Juneau, and Kadiak. Stations formerly existed at other places, but have been discontinued for various reasons. There are some stations in the interior and along the Bering Sea, but the number seems entirely inadequate for a region more than one-sixth as great as the United States, or a region as large as the States of California, Nevada, Oregon, Washington, and Idaho, with an area nearly equal to the whole of New England left over. At several widely separated places persons expressed their willingness to undertake and report the observations. The records already obtained at many of the stations are very fragmentary, and it would seem desirable to supplement what has been done.

## SOILS.

The soils of Alaska are largely of vegetable origin, and to a considerable degree resemble the rice lands or peat formations. In the southeastern portion of Alaska, in some places, there are deep deposits of this rich-looking soil overlying slate or conglomerate bed rock, with often a deposit of gravel intervening. Sometimes there is an impervious stratum of glacial clay underlying the black soil. Whenever the soil lies directly upon bed rock or is underlain by clay, the drainage is usually poor and the land more or less marshy.

Samples of what appeared to be the average soils were collected at various places and transmitted to the division of soils of this Department. The chief of that division, Prof. Milton Whitney, has reported on a portion of these samples, and to him I am indebted for the data relating to their analysis. In some cases the samples were secured from considerable depths, owing to the digging of ditches exposing the lower deposits.

The water capacity of these soils and the tenacity with which they retain it is shown by the water content of air-dried samples, ranging from 1 to 47 per cent. The amount of organic matter is also quite high, ranging, as it does, from 3.01 per cent in a subsoil to 61.19 per cent in the soil of a small meadow at Sitka. In some of the garden soils the high percentage of coarse material (gravel and slate) is undoubtedly due to attempts having been made to lighten and warm the soils by adding gravel and sand to them. In some cases the mixture of coarse material and fine earth is rather difficult to explain, unless it is due to some such phenomenon as a landslide. Such an explanation would probably be necessary to account for 18 per cent very coarse material in soil from a spruce bog at Wrangell and 27 per cent in a ditch running through a bog at Juneau. The accompanying table shows the relative percentages of coarse material, fine earth, etc., of the specimens analyzed.

TABLE III.—*Percentage of coarse material and fine earth in Alaskan soils and subsoils.*

| Locality. | Description of sample. | Depth. | Coarse material (larger than 2 mm. in diameter). | Fine earth. |
|---|---|---|---|---|
| | | *Inches.* | *Per cent.* | *Per cent.* |
| Sitka | Garden soil | 0– 6 | 63 | 37 |
| Wrangell | Beach soil | | 62 | 38 |
| Juneau | Spruce land | 12–24 | 60 | 40 |
| Kadiak | Meadow soil | 1– 6 | 46 | 54 |
| Do | Garden soil | 12–18 | 38 | 62 |
| Do | do | 1– 6 | 36 | 64 |
| Wrangell | do | | 72 | 35 |

TABLE III.—*Percentage of coarse material and fine earth in Alaskan soils and subsoils*—Continued.

| Locality. | Description of sample. | Depth. | Coarse material (larger than 2 mm. in diameter). | Fine earth. |
|---|---|---|---|---|
| | | *Inches.* | *Per cent.* | *Per cent.* |
| Sitka | Virgin soil | 12–36 | 30 | 70 |
| Juneau | Garden soil | 2–12 | 29 | 71 |
| Do | Ditch soil | 36–48 | 27 | 73 |
| Wrangell | Spruce land | 24–36 | 26 | 74 |
| Juneau | Garden soil | 12 | 23 | 77 |
| Wrangell | Spruce bog | 24–72 | 18 | 82 |
| Juneau | Garden soil | 12–24 | 12 | 88 |
| Wrangell | Spruce land | 36–72 | 10 | 90 |
| Do | Virgin soil | 3–12 | 7 | 93 |
| Kadiak | Garden soil | 6–12 | 5 | 95 |
| Sitka | Meadow soil | 3–12 | 3 | 97 |
| Wrangell | Spruce land | 18 | 2 | 98 |
| Sitka | Virgin soil | 36–72 | 0 | 100 |
| Do | do | 24 | 0 | 100 |
| Kadiak | do | 6–12 | 0 | 100 |
| Juneau | Spruce bog | 0–24 | 0 | 100 |
| Sitka | Virgin soil | 0–12 | 0 | 100 |

The mechanical analyses of the samples are shown in the following table. Owing to the unusually large and varying amounts of organic matter in the soils, their analyses were based upon the organic free basis.

TABLE IV.—*Mechanical analyses of Alaskan soils and subsoils.*

| | Depth of soil. | In original sample. | | Calculated on dry and organic-free material. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Moisture in air-dry sample. | Organic matter. | Gravel, 2–1 mm. | Coarse sand, 1–.5 mm. | Medium sand, .5–.25 mm. | Fine sand, .25–.1 mm. | Very fine sand, .1–.05 mm. | Silt, .05–.01 mm. | Fine silt, .01–.005 mm. | Clay, .005–.0001 mm. |
| Wrangell: | *Inches.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* |
| Beach soil | ..... | 2.50 | 10.50 | 24.94 | 38.11 | 20.53 | 5.85 | 5.65 | 3.25 | 0.85 | 0.82 |
| Spruce land, cleared and drained | 24–36 | 4.88 | 4.64 | 21.67 | 24.79 | 17.72 | 12.98 | 12.85 | 7.76 | 0.97 | 1.28 |
| Garden soil | 72 | 17.27 | 26.33 | 15.79 | 20.49 | 11.33 | 11.92 | 18.56 | 15.45 | 2.50 | 3.96 |
| Spruce land | 18 | 1.09 | 3.57 | 4.70 | 17.26 | 13.30 | 9.07 | 21.60 | 26.18 | 3.39 | 4.48 |
| Spruce bog | 24–72 | 4.28 | 10.42 | 13.79 | 12.78 | 19.15 | 9.80 | 17.54 | 19.33 | 2.66 | 4.93 |
| Spruce land | 36–72 | 7.12 | 16.03 | 10.82 | 17.21 | 11.79 | 8.17 | 18.61 | 24.17 | 2.89 | 6.34 |
| Virgin soil | 3–12 | 14.22 | 15.28 | 11.31 | 18.26 | 13.29 | 9.31 | 20.01 | 16.32 | 3.56 | 7.94 |
| Sitka: | | | | | | | | | | | |
| Meadow soil | 3–12 | 22.31 | 61.19 | 6.57 | 4.67 | 5.28 | 18.56 | 38.73 | 22.61 | 3.25 | 0.34 |
| Virgin soil | 36–72 | 5.05 | 2.40 | 16.29 | 29.00 | 18.86 | 14.29 | 9.71 | 5.25 | 1.91 | 4.69 |
| Do | 0–12 | 15.34 | 32.96 | 0.51 | 2.77 | 10.59 | 21.47 | 28.58 | 25.37 | 5.34 | 5.36 |
| Do | 24 | 8.93 | 4.95 | 13.20 | 23.92 | 19.86 | 9.77 | 10.26 | 12.20 | 3.19 | 7.60 |
| Do | 12–36 | 8.04 | 3.01 | 32.42 | 20.18 | 4.92 | 2.47 | 2.89 | 20.57 | 4.80 | 11.77 |
| Garden soil | 0–6 | 47.02 | 13.06 | 18.06 | 8.14 | 6.45 | 10.26 | 12.86 | 22.06 | 7.13 | 15.06 |
| Juneau: | | | | | | | | | | | |
| Garden soil | 2–12 | 14.07 | 16.20 | 18.28 | 10.76 | 5.46 | 7.80 | 29.97 | 19.55 | 3.59 | 4.57 |
| Do | 12 | 12.95 | 7.54 | 11.49 | 12.80 | 13.01 | 14.83 | 28.24 | 13.29 | 1.69 | 4.63 |
| Spruce land | 12–24 | 1.25 | 4.45 | 6.37 | 7.13 | 5.05 | 10.48 | 36.21 | 27.04 | 2.74 | 5.02 |
| Do | 12–24 | 7.79 | 7.83 | 28.91 | 16.14 | 5.50 | 7.25 | 17.81 | 15.53 | 2.36 | 6.50 |
| Ditch soil | 36–48 | 17.34 | 6.65 | 18.92 | 13.02 | 4.82 | 5.87 | 22.17 | 19.43 | 3.66 | 12.09 |
| Spruce bog | 0–24 | 19.00 | 57.68 | 3.11 | 5.48 | 7.78 | 11.04 | 18.98 | 34.93 | 5.56 | 13.10 |
| Kadiak: | | | | | | | | | | | |
| Virgin soil | 6–12 | 11.20 | 22.15 | 1.61 | 1.29 | 2.06 | 15.74 | 42.17 | 27.26 | 4.06 | 5.80 |
| Garden soil | 6–12 | 12.51 | 23.17 | 1.05 | 1.00 | 1.09 | 13.11 | 42.19 | 29.51 | 6.05 | 5.98 |
| Do | 1–6 | 8.62 | 7.76 | 20.77 | 22.98 | 16.03 | 9.21 | 9.15 | 9.45 | 3.53 | 8.89 |
| Do | 12–18 | 12.73 | 17.04 | 7.02 | 5.17 | 4.87 | 8.10 | 21.80 | 30.38 | 7.24 | 15.45 |
| Virgin soil | 1–6 | 8.94 | 10.90 | 11.75 | 8.97 | 6.68 | 9.08 | 15.77 | 21.98 | 7.78 | 17.98 |

In commenting upon the character of the soil samples analyzed, Professor Whitney says:

> The organic content of many of these soils is very much higher than in any of the agricultural lands of the States. They correspond very nearly with the rice lands and peat formations. The black soils of the plains and the famous Red River Valley soils of the Northwest contain upward of 8 or 10 per cent of organic matter, but seldom more. If these soils are so situated as to be well drained, they should be capable of producing enormous crops, and with an abundant and well-distributed rainfall they would be adapted to almost any kind of crop suited to the general climatic conditions of that portion of the country.

In some places there appeared to be a very decided acidity of soils, but no tests were possible to ascertain the facts in the case. In one case the addition of a considerable amount of lime had corrected the evil complained of.

In the valley immediately back of Sitka, where a ditch had been dug, the soil was very peaty in appearance, and when dried it was said to burn readily. The extent of similar formations throughout southeastern Alaska is very considerable.

In southwestern Alaska gravel subsoil is more common than in the southeastern part, and in the Cook Inlet region there are extensive plateaus where deposits of soil overlie deep formations of gravel, the drainage in such cases being good. The presence of volcanic matter in some places is quite apparent, and such soils appear to be very rich, if one can judge from the natural plant production.

Another soil formation is that conspicuously illustrated in the tide flats about the deltas of the Stikine and Copper rivers, as well as some other places where rivers have brought down and deposited vast amounts of detritus. These places are more or less marshy, or at least subject to overflow at extreme high tides, and are usually covered with dense growths of sedges, grasses, and associated plants.

Wherever anything like rational methods of drainage and cultivation were noticed in Alaska, the soil showed itself to be very fertile in promoting a rapid growth of whatever was under cultivation.

## NATURAL PRODUCTS.

The natural products of Alaska, aside from her wealth in minerals, fish, and furs, have been but little developed. The timber has been incidentally mentioned before, as well as the extensive growth of grasses. The timber is sufficient in quantity, if properly managed, to supply the demands of the Territory for all time to come. With almost absolute exemption from the danger of forest fires and some wise system of regulating the cutting, there should never be a scarcity of timber in southeastern Alaska. A few sawmills are now cutting some lumber for local consumption, the law not allowing its exportation.

In addition to furnishing timber for houses, fences, fuel, etc., the natives employ the various trees in many ways. The red and yellow cedar in southeastern Alaska furnishes the logs from which their canoes are constructed. The bark when stripped off in large pieces is used for canoe covers, temporary structures, and sometimes is employed in roofing houses. The inner bark of the same furnishes the material whence the Hydah mats are made, as well as for cordage. From the yellow cedar as well as other trees the paddles for the canoes are made, and the alders furnish the material for numerous articles of domestic use. In the region of the birch its bark is utilized as it is nearly everywhere else, and the exudations of gum from the spruce are extensively collected and used.

Next to the timber, perhaps the grasses are of most value. In all parts of the country they flourish to an extraordinary degree. In the

western part of Alaska valley and hillside as far as 1,000 or more feet elevation were green with grass during the time spent in that region. In southeastern Alaska wherever the timber is cut away and the undergrowth of shrubs kept down a dense growth of grass soon takes possession to the exclusion of all other plants. Of the common grasses timothy (*Phleum pratense*), Alaskan redtop (*Deschampsia cæspitosa* and *D. bottnica*), blue grass (*Poa pratensis*), orchard grass (*Dactylis glomerata*), wild barley (*Hordeum boreale*), *Calamagrostis aleutica*, and wild rye (*Elymus mollis* and other species) are the most widely distributed and are probably the most valuable for pasturage and haying. Timothy, orchard grass, and blue grass have become thoroughly established and grow to great size. The most common native grass is the Alaskan redtop. This grass grows very thick and often exceeds a man in height. Specimens at Sitka measured July 5 were a little more than 4 feet in height and were just headed. Orchard grass more than 3 feet high was seen at Jackson on June 20.

The grasses are frequently found growing in mixtures, in which the Alaskan redtop is usually a prominent factor. At Kadiak the most common hay grasses are *Poa pratensis*, *Deschampsia cæspitosa*, and *Hordeum boreale*, with some wild timothy (*Phleum alpinum*). *Calamagrostis langsdorfii* is an abundant hay grass at Homer, Tyoonock, and Sunrise City, in Cook Inlet. At Unalaska the common pasture and hay grasses are *Trisetum subspicatum* and *Calamagrostis aleutica*. In some parts of Alaska, especially in the southeastern portion, considerable white clover was seen in the small meadows and dooryards, from which places it is gradually spreading. It seems to have well adapted itself to the prevailing conditions. Some red clover was also seen, but its successful introduction is not yet certain. No thorough attempt has been made to introduce it, and its adaptability to Alaskan conditions can neither be affirmed nor denied. Several small patches of alfalfa were seen that had apparently been seeded from hay. The plants, though small, had some seed pods developed early in August.

Upon the tide flats, as well as in some other places, there is a dense growth of sedges and coarse grasses, such as characterize the marsh hay of this country. In some places there is a very common vetch (*Vicia gigantea*) which would undoubtedly add considerable to the feeding value of the hay if it were utilized. The vetch is perennial and produces an unusually large growth of vine.

Of the more common grasses occurring in Alaska, specimens were secured through H. J. Minthorn, of Metlakahtla, and subjected to analysis by the division of chemistry of this Department, to whom the usual acknowledgments are made. The specimens were collected, dried, tied in bunches, and the analyses made some five months later. Most of the specimens were rather immature, the oldest being only in early bloom.

The results of the fodder analyses are as follows:

TABLE V.—*Analyses of Alaskan grasses (air-dried material).*

| Species. | Water. | Protein. | Fat. | Nitrogen-free extract. | Crude fiber. | Ash. |
|---|---|---|---|---|---|---|
| | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* |
| Phleum pratense (just heading) | 8.59 | 8.94 | 2.14 | 45.69 | 30.06 | 4.58 |
| Poa pratensis (beginning to flower) | 8.11 | 8.94 | 2.04 | 41.45 | 34.24 | 5.22 |
| Bromus sp. (just heading) | 7.72 | 8.85 | 2.28 | 38.41 | 34.59 | 8.15 |
| Anthoxanthum odoratum (in flower) | 8.56 | 10.88 | 1.74 | 40.86 | 33.58 | 4.28 |
| Deschampsia bottnica (in flower) | 8.75 | 7.44 | 2.07 | 47.05 | 31.54 | 4.15 |
| Calamagrostis aleutica (in flower) | 8.33 | 10.00 | 1.37 | 37.89 | 38.89 | 4.52 |

For comparative purposes the following table is given from Jenkins and Winton's Compilation of Analyses of American Feeding Stuffs.[1] The species in some cases are not the same, but are nearly associated ones.

TABLE VI.—*Comparative analyses of American grasses (air-dried material).*

| Species. | Water. | Protein. | Fat. | Nitrogen-free extract. | Crude fiber. | Ash. |
|---|---|---|---|---|---|---|
| | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* |
| Phleum pratense (in flower) | 15.01 | 6.01 | 3.01 | 41.90 | 29.59 | 4.48 |
| Poa pratensis | 17.44 | 10.80 | 3.45 | 46.10 | 22.09 | 7.35 |
| Bromus secalinus | 14.30 | 6.61 | 3.07 | 44.97 | 20.39 | 6.10 |
| Anthoxanthum odoratum | 14.30 | 9.85 | 2.52 | 46.46 | 21.85 | 5.00 |
| Deschampsia cæspitosa *a* | 14.30 | 9.04 | 1.06 | 37.20 | 29.03 | 9.37 |
| Calamagrostis canadensis | 6.87 | 11.19 | 3.45 | 35.82 | 37.18 | 5.49 |

*a* Deitrich and König.

By comparing the figures in the above tables the nutritive value of the Alaskan grasses is plainly indicated. Their value for pasturage was quite evidently shown in the sleek and fat cattle observed during the middle of the summer season, although the animals had come through the winter in a rather sorry condition.

The grasses of Alaska are utilized to some extent in various ways, the principal of which is for pasturage. In some places, notably at Kadiak, Unalaska, Cook Inlet, and elsewhere, hay is made nearly every year, but frequently haymaking is secondary to other affairs and the best results are not secured. During the past summer there was considerable hay of very fair quality made at these places, about 20 tons at Kadiak and smaller quantities elsewhere. About the only place a mowing machine was used was at Kadiak, scythes being used elsewhere. Often the complaint was heard that it cost too much to make hay in Alaska. With the crude methods in vogue it probably does cost considerable when small patches here and there are mowed and the hay carried in a small boat to the shed or barn. One place was visited where it was claimed that hay could be brought from San Francisco or Seattle as cheaply as it could be cut and cured at that place. A few days' work in leveling off the irregular hummocks would have produced a meadow sufficiently smooth to cut the grass with a mower and rake it by horsepower, so that the cost should not have exceeded a few dollars per ton. It is claimed that in the Cook Inlet region hay can be made for less than $5 per ton. At the mouth of the Stikine River some years ago considerable hay was made, but the place is now abandoned, due largely to its inaccessibility for several months in the year on account of shoal water and the ice which exists there during the winter season.

Some crude attempts have been made at various places with silos, notably at Yakutat, Unalaska, and the Stikine River farm. The silos were filled with grass just as it was mowed, and complaints were heard of its frequently molding to such an extent that stock refused to eat it. Perhaps with more care in the construction and filling of the silos this difficulty might be obviated.

At Kadiak and elsewhere the tall-growing wild rye is used for thatching buildings to some extent. *Hierochloa odorata* and *Anthoxanthum*

[1] United States Dept. Agr., Office of Experiment Stations Bul. 11.

*odoratum*, on account of their perfume, are somewhat used as ornamental grasses. Some grasses are used to a limited degree in basket work, but most of the material for that kind of weaving is from spruce roots and red cedar bark.

Alaska is preeminently a land of small fruits and berries. But little attention has been given to their cultivation. What few attempts have been made seem to promise well. Hardly any berries are cultivated except strawberries, currants, and raspberries. Of these, both wild and cultivated forms were seen growing, and the adaptability of the wild plants to domestication was very evident. The wild strawberry was seen under cultivation at Wrangell, and specimens of *Rubus stellatus*, known as dewberry, "morong," and "knesheneka," are growing in a garden at Sitka with apparently considerable success, and it seems probable that more could be done in this line. The flavor of most of the Alaskan berries was found to be excellent, and some of them might be worthy of introduction into portions of the States.

Of the berries which have the widest distribution, may be mentioned the salmon berries (*Rubus spectabilis*); two kinds of cranberries, the high bush (*Viburnum pauciflorum*) and the small cranberry (*Vaccinium vitis-idæa*); red and black currants (*Ribes rubrum* and *R. laxiflorum*); crowberries (*Empetrum nigrum*); huckleberries (*Vaccinium uliginosum* and its variety, *mucronatum*); blueberries (*Vaccinium parviflorum* and *V. ovalifolium*); bunchberries (*Cornus canadensis* and *C. suecica*); raspberries (*Rubus strigosus*); elderberries (*Sambucus racemosa*); and the "molka" berry (*Rubus chamæmorus*). Of less general distribution are strawberries (*Fragaria chiloensis*), dewberries (*Rubus stellatus*), thimble berries (*R. parviflorus*), salal berries (*Gaultheria shallon*), bog cranberries (*Vaccinium oxycoccus*), wine or bear berries (*Arctostaphylos alpina*), etc.

Many of these berries are utilized in various ways by the native and white population. In addition to the consumption of fresh berries, there are considerable quantities stored up in various ways for winter use. The white population preserve, can, and make jelly of the different kinds, while among the natives the principal method of preserving them is in the almost universal seal oil, a vessel filled with berries preserved in this way forming with many of the natives a "potlatch" by no means to be despised. Some of the berries are utilized to a considerable extent in making wine, the wineberry of Kadiak being largely used in that way.

In some parts of the country the leaves of *Ledum grœnlandicum* and *L. palustre*, under the names Labrador tea and Hudson Bay tea, are used to a considerable extent, and are said to afford no mean substitute when tea is not to be had.

Of other indigenous plants that are used as food by the natives but little accurate information could be secured. It seems very probable that with the advent of the whites and their bringing flour, sugar, etc., to supplement the native diet of fish, seal oil, and meat, the use of native plants as sources of food has diminished very considerably.

One of the plants still used to some extent is the so-called wild rice, or "koo" of the Thlinkets (*Fritillaria kamchatkensis*), the small underground bulbs of which are collected, dried, powdered, and made into a sort of cake. Formerly this plant was quite extensively used as food. The roots of wild parsnip (*Archangelica* sp.) are still used to a limited extent.

In portions of Cook Inlet and elsewhere there is an abundant beach pea (*Lathyrus maritimus aleuticus*), the young fruit of which is used to some extent in the same way in which we use the ordinary garden pea,

and all those who have tried it are quite enthusiastic in their praise of this vegetable. The plants yield abundantly and the pods are well filled with tender, juicy peas about the size of the French peas of the market, for which they may prove quite an agreeable substitute.

There are quite a number of the indigenous plants used as pot herbs, but, as is often the case, opinions differ widely upon the respective value of different plants. Among those used most extensively are *Claytonia sibirica*, *Fedia* sp., *Nasturtium* sp., *Rumex* spp., skunk cabbage (*Lysichiton camschatensis*), as well as introduced plants, of which shepherd's purse (*Capsella bursa-pastoris*), horse-radish (*Nasturtium armoracia*), dandelion (*Taraxacum dens-leonis*), and turnip tops are the most common.

The leaf stocks of *Heracleum lanatum* are quite extensively eaten, but not as a regular article of diet. They are peeled and chewed at irregular intervals, taking the place of peanuts, fruit, etc., which with us are eaten more for pleasure than as foods. Care must be taken in eating the petioles of this plant that they are well peeled, or the mouth will become very sore from the hairs which almost cover the entire plant.

There are a number of mushrooms that are collected and eaten to some extent. They are used both fresh and dried. A few of the more common species were collected, but have not yet been determined.

An article of considerable value from a dietary standpoint in southeastern Alaska is called "thlakusk" by the Thlinket Indians. It is made from a rather common marine alga, which has been determined as *Porphyra laciniata*. It grows on kelp, and after storms or very high tides large quantities are collected and preserved for future use. The method of preparation consists in cleaning it from as much foreign material as possible, drying a little, and then packing in boxes about a foot square. After a sufficient quantity is placed in the box weights are piled upon it and the pile is soon reduced to a compact purplish-black mass about an inch thick. When thoroughly dried it will keep indefinitely. When used, a small portion is shredded into tepid water and allowed to come to a boil and cook for about twenty minutes, after which it is eaten as it is, or it may be sweetened. This article of diet is said to be highly esteemed by both whites and natives as very nutritious and valuable in cases of stomach and bowel disorders, it being claimed to be a specific for dysentery. The same or a similar plant is collected and used in the north of Ireland under the name of "sloke," "slocan," or "laver." Material was submitted to the special agent of this Department in charge of nutrition investigations at Middletown, Conn., for analysis, but as yet no report has been received.

In addition to the use of thlakusk as a medicine, the root stock of skunk cabbage has quite a reputation as a domestic medicine, its peppery, aromatic roots being highly esteemed. The buckbean (*Menyanthes trifoliata*) is also recognized as having medicinal virtue.

Attempts were made to learn something additional about the native uses of plants as medicines, but with almost no success. The little information that was gained was filtered through white persons, who could seldom or never fully identify a plant as the proper one. From the natives no medicinal plants could be secured. It seems probable that the medicinal value of quite a number of the plants is known to and appreciated by the natives, and this knowledge is by no means monopolized by the medicine men, representatives of whom may still be found in many of the villages.

Most of the natives appreciate the value of kelp as a fertilizer, and they gather large quantities of it in the spring of the year for use on their gardens.

## CULTIVATED PRODUCTS.

Cultivated areas in Alaska are, with one or two notable exceptions, confined to kitchen gardens, in which are grown many of the earlier and hardier vegetables of our own gardens, such as lettuce, radishes, carrots, parsnips, potatoes, onions, peas, snap beans, celery, turnips, cauliflower, cabbage, rhubarb, horse-radish, etc. The quality of many of these vegetables was tested and was equal to or excelled the same vegetables after a voyage of 1,000 miles or more from Puget Sound. Nearly every village visited could show some gardens, and the local supply of radishes, lettuce, turnips, carrots, etc., is in most places equal to the demand. The attempt to grow other vegetables is not widely extended, except possibly in the case of potatoes. Of these there are seldom enough to supply the local demands. It is a subject of dispute whether or not potatoes mature in Alaska. In Cook Inlet and on Kadiak Island, as well as elsewhere, the natives are growing a small round potato that, as far as could be learned, is the same now as it was fifty or a hundred years ago. No trouble was reported in storing their crop so that the seed would be kept over from one season to another, the tubers undoubtedly being mature enough for that purpose. Under the methods of culture adopted it is very probable that a dry, starchy potato is not secured, as tops seen late in the fall were still green.

Among some specimens of potatoes, carrots, and celery sent the Department by Mr. Frederick Sargent from Kadiak, Alaska, were four tubers of what seem to be Beauty of Hebron potatoes. These four specimens when received weighed 52½ ounces, two of them weighing a pound each. No doubt these specimens were larger than the average, but they certainly dispose of the stock idea "that potatoes will not grow larger than walnuts in Alaska." The other specimens sent were, unfortunately, in a very bad condition after their long trip and could not be examined. Potatoes growing in the Kadiak gardens August 22 presented a very good appearance. Celery seems to do remarkably well at the few places it was seen growing.

There were in some places complaints that cabbage and cauliflower would not head. There occasionally appears to be some ground for this, but 16-pound cabbage and 24-pound cauliflowers from Killisnoo and Wrangell would rather indicate that in some places these plants do well. Local conditions may cause failures of these crops, just as seems to be the case with others. Localities were visited where it was claimed that onions would not grow, others where beets could not be raised; yet both of these vegetables were seen in flourishing condition at some places. At the few places where attempts have been made to grow peas and snap beans the efforts were apparently successful. When the peas are gathered at frequent intervals the vines are said to bear for an extra long period. A specimen of a so-called dwarf pea was seen that had grown to a height of about 3 feet. Whether this was due to a mistake in the variety or to the climate and soil can not be determined.

In many places complaints were heard and examples very frequently seen of the abnormal flowering of some of the common biennial vegetables, such as beets and turnips and occasionally cabbage and cauliflower. These plants not infrequently were seen to have made an attempt to seed during the same season from seed. In the case of the root crops no enlarged root was formed, and in the cabbage and cauliflower there was no indication of heading. In some cases the loss occasioned by this unusual behavior was very considerable if one considers the total area devoted to the crop. A large bed of beets was

seen in which there was not a single plant that showed any indications of producing an edible root, while most of the plants were already in bloom. Turnip beds were seen where fully one-fourth of the plants were "running to seed." In the case of the turnips it is known that certain varieties are less subject to this undesirable trait, and it is probable that the causes and means for its prevention would not be far to seek. At Kadiak potato plants were seen that had produced numerous small tubers in the axils of the lower leaves. In some cases these aerial tubers were quite small, but several were seen that were more than an inch in diameter. It was claimed, and perhaps very justly, that there was an intimate connection between the formation of these aerial tubers and those grown beneath the ground—the more of the one the less of the other. Crowding can hardly explain this behavior, as one of the best examples was seen in an almost isolated hill.

Aside from these troubles, "club root of cabbage," due to *Plasmodiophora brassicæ* was observed at Sitka, and potato scab, caused by the fungus *Oospora scabies*, was seen at Kadiak. Another trouble of potatoes at the latter place was what appeared to be eel worms or nematodes, causing the foliage to turn yellow and later the stem to split and break just about even with the ground.

Many indigenous plants are attacked by parasitic fungi, specimens of which were collected, but are not yet fully determined. Among some of the most conspicuous were the white rust (*Cystopus candidus*) of cruciferous plants, rusts of grasses, a disease resembling apple scab on the wild crab (*Pyrus rivularis*) and a very destructive leaf disease on the red currant. Specimens were seen that had lost all their leaves by the time the currants were beginning to ripen. Another fungus was found abundantly upon the pods of the beach pea at Homer in Cook Inlet.

## CEREALS, ETC.

But little was seen of the growth of cereals throughout the whole country. It is said that by the terms of the charters of the trading companies operating in Alaska during the Russian regime agriculture was required to be fostered. Spasmodic attempts were made at various places to do something in the line of promoting agriculture, but it appears that nothing of a permanent nature was accomplished. At Yakutat, on the site of the old town, an agricultural colony was established, and at various places in Cook Inlet the same was attempted. It is currently reported that during the Russian occupation oats, rye, barley, and buckwheat were grown to a considerable extent; but if true there are now no traces of the fields where the grain was formerly cultivated.

At Wood Island and Kadiak mature oats were seen August 22 that had evidently grown from seed scattered from feed or packing. A few specimens of barley were seen at the same places that were about 15 inches high, headed, but not yet ripe. Their origin was apparently due to the same cause as that of the oats. At Tyoonock on the last day of July three short rows, one each of wheat, rye, and barley, that had been spring sown, were seen in which the barley and rye were 15 to 18 inches high, headed, but not ripe. The wheat had made a fine growth, but did not show any tendency to head out. At Sitka in 1896 Mr. Patton grew a small plat of wheat that ripened in fairly good condition. This year at the same place a small plat of flax was sown, and on September 4 the plants averaged about 30 inches in height and were in bloom, with the earlier capsules containing almost mature seed. The

plants when broken between the fingers were not woody, while the fiber appeared to be fine and strong. Samples of this flax were promised for the section of fiber investigations of this Department.

About the only places (of which accurate information could be secured) where farming on anything like an extensive plan has been attempted are at Killisnoo and near Wrangell. The farm near Wrangell is about 6 miles from that village, at the mouth of the Stikine River, where there is quite an area of land capable of cultivation. Some years ago this land was taken possession of, farm buildings constructed, and a very good equipment of implements and stock secured. One of the principal objects of the venture was stock raising, although some attempts were made at general agriculture. Silos were built and filled with marsh hay from the tide flats, and in addition to the silage some hay was made, although it was probably of a rather poor quality. After a few years' trial, during one winter when nearly all the stock perished on account of an insufficient amount of forage, the venture was abandoned. The buildings and implements, however, still remain just as they were left. As has been stated in another place, the inaccessibility of the place was largely responsible for the failure. Access is gained only by boat, and ordinarily only at high tide, on account of the extensive flats filled with débris from the Stikine River. During the winter season ice forms to such a degree that it becomes almost impossible to effect a landing anywhere near the place. A serious shortage of forage without any possible means of relief could hardly produce any other result than that described above. An unusual prolongation of the winter season could not have been foretold, but with as large an investment as was represented in the plant, it would certainly appear that more than barely enough fodder would have been secured to carry the stock through until the next grazing period.

The Killisnoo farm, as it is called, is operated by Thomas Baker and consists of about 40 acres under cultivation. The equipment of stock consists of a team of horses, 6 head of cattle, and about 30 hogs. This place is on Hoods Bay, a few miles from the village of Killisnoo, the nearest steamer landing, and has been under cultivation for about three years. While the farm was not visited, reliable information concerning it has been secured from the owner and through Governor John G. Brady, of Sitka. Part of the place was tide land, and dikes have been built to keep out the sea. Now turnips, peas, cabbage, potatoes, Swedish turnips, beets, etc., are grown extensively. The crop for this year is estimated to be about as follows: Potatoes, 7 tons; Swedish turnips, 20 tons; several tons each of beets, carrots, and parsnips, and peas by the wagon load. Cabbages weighing 16 pounds each and turnips more than 7 inches in diameter were sent from this farm to Sitka. Mr. Baker has two silos, and is able to keep his stock through the winter in good condition. He supplies some milk and meat as well as vegetables to the village of Killisnoo, where there is a fish-oil and guano factory, and also to the steamers touching there during the season. His facilities do not permit of his taking his surplus to Sitka or Juneau, where it might find a better market.

## METHODS OF CULTIVATION.

For the most part the same methods of cultivation are pursued through nearly the entire country. The generally neglected appearance of gardens is everywhere apparent. It is not confined to the garden of the native, but too often that of the white man is as poorly

cared for. Often great pains and a vast amount of labor are expended in planting a crop, but, once planted, it is allowed to care for itself. The result is usually a large and luxuriant crop of weeds, the most common being *Senecio vulgaris*, *Cerastium vulgatum*, *Rumex acetosella*, *R. acetosa*, *Spergula arvensis*, *Matricaria discoidea*, and *Alchemilla millefolium*, the last occurring mostly in meadows.

As early as the beginning of the present century the value of kelp and seaweed was known in Alaska. In many places large quantities are collected and used on the potato crop. A layer of this is placed over the potatoes when planted and the whole covered several inches deep with the soil. The effect of this large amount of kelp on the crop can only be conjectured. It probably warms the soil by its fermentation and thereby forces the crop to some extent. It may also have a manurial value in adding some necessary constituent to the soil, but in some places where it was extensively used the percentage of organic matter in the garden soil was quite high.

Nearly everywhere the practice of bedding up the soil is followed to some extent. On the lighter and better drained soils it is not as necessary as on heavy, poorly drained ones. Usually when practiced the beds are formed about 3 or 4 feet wide and raised as high above the general level as can be economically done. Where the ground is sufficiently level to admit it the beds are so arranged as to secure the greatest amount of light to the growing plants. When upon a hillside the beds extend up and down a hill. This latter arrangement would not seem to be the best, all things considered, for while it may secure the best drainage and illumination it certainly is more liable to result in the washing away of the soil.

After the construction of the soil beds, planting naturally follows. Most crops are planted in rows across the beds, the distance separating the individual plants varying according to the crop. Here too often occurs what appears to be one of the most serious faults of Alaskan agriculture. Close planting seems to be the rule with nearly every crop. The attempt seems to be to secure the largest possible harvest from a limited area by planting a large amount of seed. Potatoes are frequently planted 6 inches apart in rows separated not more than a foot. The result of such planting is a thick growth of vines that completely covers the ground, shading it to such an extent that the sun's rays never reach the soil. Such methods can hardly fail to produce a small yield of very inferior tubers.

Examples were common where rational methods of cultivation had been disregarded in every way, and it is very probable that the wholesale condemnation of the agricultural and horticultural possibilities of the country is based upon data gathered from such inconclusive tests. There is a great deal to be learned concerning proper drainage in that country. An example was seen in southeastern Alaska, where for want of better information a native had dug a ditch through his little garden, but neglected to provide an outlet for the water; consequently in June the ditch was nearly full. Another case was that of a man, not a native, who complained of his inability to drain his garden successfully. In this case the water from a hillside bog was allowed to percolate through the garden instead of being diverted.

## STOCK RAISING.

During the Russian occupancy there were some partially successful efforts made to introduce live stock into the country. The small cattle of the Kenai Peninsula and elsewhere, which are referred to as Russian

or Sibirian cattle, may still be seen. According to Dr. Dall, a small island of the Chernabura group was well stocked with pigs, but they were drowned in 1827 by a tidal wave following a volcanic eruption on Unimak Island. At the present time stock raising is carried on to a very limited extent, milch cows being the most common domesticated animals seen, if dogs are excepted. At nearly every village some cows, pigs, and poultry are to be found, while horses are kept at Juneau, Sitka, Killisnoo, Cook's Inlet, Kadiak, and perhaps a few other places. The horses are for the most part used for teaming and packing around the towns and mining camps, the team of Mr. Baker at Killisnoo being about the only one employed exclusively in agricultural work. At several places small dairies are maintained, supplies of milk and a little butter being furnished most of the year.

At Kadiak some ten or more years ago the Alaska Commercial Company introduced at their station about 300 head of sheep. They were placed on a small island, and as they had come from a much drier and warmer region many died in consequence of being poorly fed and not provided with shelter. At present about 40 head constitute the flock, which is neither increasing nor diminishing in size, some of the animals being slaughtered each year. These sheep are given but little attention, except that they are sheared in July or August. During the winter they are given a little hay should a long storm prevail. Their only shelter is provided by a not very vigorous growth of spruce trees. Specimens were seen of one fleece that seemed to be of very good quality as to length and texture. A few goats were seen; but little attention has been given them.

In addition to the milch cows some beef cattle were seen which were in excellent condition by the middle of summer. At Feeney's ranch, a few miles from Kadiak, there were 20 or more head of cattle, most of which were intended for beef. At Belkofsky, August 20, there was taken on board the mail boat a 3-year-old beef that weighed, when dressed, 990 pounds. This animal was said to have received no food or shelter except what was secured on the range. The meat was fine in appearance, fat, tender, and juicy. During the summer Mr. Baker slaughtered and sold at Killisnoo one of his cattle. It weighed 1,200 pounds dressed, and sold for $100. The age of the animal is unknown.

Pigs are reported to thrive exceedingly well in most parts of Alaska, but their flesh is said to be very liable to acquire a fishy flavor if they are allowed to run at large. The same objection is raised against the flesh of fowls, since no grain is raised on which they may be fed, and their diet, especially in winter, is said to consist almost entirely of fish refuse.

In some cases adequate shelter during the trying winter season is not provided for the stock, but usually the animals are housed in fairly comfortable quarters. The great drawback is a lack of forage for the long feeding period. On this account the animals are commonly in a very sorry condition at the return of the grazing season. Protection from rain is more essential than against cold, the rains of winter being trying to stock of all kinds. The winter range is of little value, as the grasses are not self-curing, like many on the Western plains, and contain apparently but little nutriment after being soaked by the winter rains.

## ARABLE LANDS.

At present the cultivated area of Alaska, as has already been shown, is of very limited extent. The Russians and their immediate successors in the Territory were there for furs and trading. Since then the dis-

covery of valuable mineral deposits and the extension to Alaska of the great salmon-canning industry has brought additional inhabitants, but they are mostly temporary dwellers in the country, who are only slightly, if at all, interested in its permanent development. That the area now under cultivation could be widely extended can hardly be denied by anyone at all acquainted with the country or the very voluminous literature relating to it.

In a letter dated April 14, 1894, to the House Committee on Agriculture, the Director of the Geological Survey gives 1,500 square miles as an estimate of the tillable land in southeastern Alaska. He also estimates 3,000 square miles additional in the Cook Inlet region, the Alaska Peninsula, and adjacent islands, making in all between 4,000 and 5,000 square miles, or from 2,500,000 to 3,200,000 acres, an area about equal to the State of Connecticut. If the grazing lands that are now without an animal to feed upon the splendid herbage be added to the above estimate, the acreage would be greatly extended. There is scarcely an island of any considerable size in the southwestern part of the country where, with proper management, stock could not be successfully raised.

There is little doubt but that the local demands for many agricultural and horticultural products could be supplied from the soil of the coast region of southeastern and southwestern Alaska. In order to secure this development capable agriculturists and horticulturists will be necessary to show what might be accomplished in their respective fields.

## AGRICULTURAL DIFFICULTIES AND POSSIBILITIES.

The agriculturists of Alaska will have some very difficult problems to consider. The more important are clearing and draining land, lack of markets, and transportation, the markets and transportation being closely connected.

In southeastern Alaska, with the exception of the tide flats, the land must first be cleared of the dense forest growth. The spruce stumps must be removed, as they are very slow in rotting and not infrequently produce large second-growth timber. When the stumps are removed, in many places drainage is very necessary. The land must not only be thoroughly drained, but it must be protected against seepage water from above. This ditching and removing of the stumps is very laborious, and estimates of $200 per acre were given as the probable cost of preparing the soil for cultivation. This item of expense seems well-nigh prohibitive for agricultural purposes. However, the same process had to be followed elsewhere. At the Puyallup substation of the Washington Experiment Station the expense of clearing muck land of cedar and alder stumps is stated to be $122.80 per acre. No data are available as to the cost of clearing farm lands elsewhere, but the process, wherever practiced, is an expensive one.

In the southwestern portion of the country the expense of clearing away stumps will not be required, nor will draining be necessary to the same extent as in the other region. As a stock range for five or six months in the year it is already magnificently equipped.

Lack of markets and transportation facilities are serious drawbacks to the agricultural development of the country. The local demand for agricultural products has not been very great in any region where the produce could be supplied, and transportation facilities and freight rates between Alaskan points have not been favorable to production in that region. Juneau and its immediate vicinity are probably the greatest

consumers of agricultural products in Alaska. The reason for this is found in the comparatively large permanent population by reason of the stamp mills and quartz mines tributary to that town. Freight rates from Puget Sound points are lower than they would be from the Aleutian Islands to Juneau, or possibly from Kadiak or Cook Inlet to Juneau. The establishment of permanent populations at other places will develop local demands that may be nearer the agricultural regions.

The lack of land laws for Alaska has also contributed not a little to retarding the development of the country. The attention of Congress to this condition of affairs has been called by the President in his recent message to that body. So long as surveys could not be made and titles given to agricultural lands, very few persons cared to spend their labor and money in improving land the only claim to which they could acquire being that of squatter sovereignty. That this evil will be speedily corrected is apparently assured, since a surveyor-general for Alaska has been appointed and the Territory divided into two land districts. The other needed legislation will doubtless follow.

When writing of the agricultural possibilities of Alaska there is danger on the one hand of magnifying the failures and on the other of not doing justice to the capabilities of the country. Numerous articles have been written on this subject, many of which, it appears, have been based upon a lack of information or upon a fund of information gathered on an excursion trip from Seattle to Sitka and return, the entire time of the observations covering a period of about two weeks. Others have written of Alaska as a whole when their knowledge is based upon limited experience in a restricted locality. One small island is not all of Alaska, and the climate, soils, etc., of one region are not necessarily the same as those of another place only a short distance removed. Others have written of the country as one possessing almost unlimited agricultural possibilities. A safe mean between the extreme reports would probably about represent the actual possibilities.

No accurate estimate can be made of the possibilities of the country except as they are based upon the rather meager evidence of limited experiments and upon analogy from what has been accomplished in regions having somewhat comparable conditions. Agriculture as it exists in Alaska has been described in the previous pages. It is not expected that this country will rival the Mississippi Valley in its productions, but it does seem that agriculture and horticulture could be extended so as at least to supply the local demands for many products. When the climatic conditions, topography, soils, etc., of Norway, Iceland, Orkney Islands, as well as Scotland, Sweden, and Finland, are compared with those of Alaska, it seems probable that what has been accomplished in the European regions could also be done in this country. It is well established that many agricultural products flourish in parts of northern Europe, in regions having approximately the same temperature during the growing season as is found to exist in parts of Alaska, and if temperature is the controlling factor in plant distribution there would seem to be no reason why the same varieties of plants would not succeed in both countries if properly introduced and cultivated. Rye, oats, and barley are grown in sufficient abundance in the north of Europe not only to supply the local demands, but there is some for export. Cattle, sheep, and swine are extensively raised, sheep doing well even in Iceland, which appears less auspicious from an agricultural standpoint than Alaska. In 1891 there were exported from Iceland 1,310,000 pounds of wool, 24,000 live sheep, 716,800 pounds of mutton, 2,500 ponies, besides fish, oil, etc., in large amounts.

In Table I, page 7, there are given, in addition to the average monthly and yearly temperatures at the different places, the total temperature from May 1 to September 30, inclusive. These figures are given, not because they express anything definite relative to the growth of plants, but to show the rather small variation in the total temperatures of the different places. In the last column are given what are designated as the sums of effective temperatures for the same period. These temperatures are the sums of the daily mean temperature above 43° F., which is recognized by Hoffman, Merriam, and others as the physiological constant for plant growth. This temperature (43° F.) is taken as the starting point and all temperatures below it are disregarded, since it is at about this temperature that most plants begin their growth. A greater proportional difference exists between the sums of the effective temperatures than is shown in those of the total temperatures, the range in this case being from 3,424.7° F. at Winnipeg to 423.6° F. at St. Michaels.

Phenologists are not in accord as to the exact data for determining the physiological constant, and it is by no means certain that this method gives the only or the most exact constant expressing the relation of temperature to plant growth. Brendel claims it is the sum of the temperatures in excess of freezing from January 1 to the date of flowering, maturity, or whatever events are compared. Linsser claims that the physiological constant is the ratio between the sum temperature at flowering, maturity, etc., and the sum temperature for the year.

As has been stated before, objection may be raised to the selection of an arbitrary period of the five summer months instead of the actual time elapsing between the time the temperature rises in the spring to 43° F. until it falls below it in the autumn. If the table be consulted it will be seen that at very few of the stations are the averages for April and October above 43° F., and by consulting the complete reports on which the table is based at most of the places, there were very few days in either month when the average temperature was above that point. In the higher latitudes, where there is considerable snow, preparation of the soil and planting of crops is not begun before May 1, and most of them have matured and are partly, if not entirely, harvested by September 30, so that the 153 days between May 1 and September 30 express the full period of agricultural plant growth.

In the northern part of Russia, between 60° and 65° north latitude, in the governments of Archangel and Vologda, agriculture is said[1] to be the chief occupation of the inhabitants, who number a little more than 50 to the square mile. These regions are heavily timbered, in Vologda 86 per cent of the area being forest. Tundras, swamps, and forests suggest the topography of Alaska, except that in Russia mountains are wanting. In these two governments the mean maximum summer temperature is given as 60.8° F. for Archangel and 62.6° for Vologda. There is an average of 185 and 200 days, respectively, when the temperature rises above 32° F., and 125 and 150 days when it exceeds 43°. The annual rainfall at Archangel averages 15.6 inches, 8.5 of which falls during the five summer months. At Vologda the average precipitation is 18.6 inches, of which 10.6 falls during the summer. In Archangel the average date for harvesting winter rye is August 22 and in Vologda the same. In the latter government spring wheat is harvested about August 27 and oats the same date, the crops having a growing period of 100 and 103 days, respectively.

[1] The Industries of Russia: Agriculture and Forestry, vol. 3, p. xxxi.

In addition to rye, barley, oats, and spring wheat, flax and potatoes are grown. Dairying and animal husbandry supplement the other agricultural industries of these regions.

It seems probable that if some of the hardier cereals, vegetables, and fruits are grown and live stock successfully raised at Trondhjem, Norway, on the Orkney Islands, and in Scotland, with sums of effective temperatures ranging from 1,465.3° to 1,692.7°, the same could be done in southeastern Alaska, where the sums of temperatures range from 1,461.2° at Sitka to 1,577.1° at Pyramid Harbor and 1,764° at Wrangell.

The rainfall of Alaska has been discussed in another place, where it is shown not to be excessive during the summer months when compared with the precipitation of other places.

Comparing the Alaskan data secured from agricultural experiments, that have not always been conducted in the best manner, with the results secured in other regions having somewhat comparable climate, it seems safe to say that the coast region of Alaska has agricultural possibilities of no little importance, and for their development the most that is required is a hardy race of permanent residents and the proper direction of their efforts along lines that seem most promising.

With the present limited population, there are, no doubt, other fields where labor will prove more remunerative than farming; but, when Alaska's resources are fully developed, there will be such an adjustment of economic conditions that the remuneration of labor will be equalized.

## DESIRABILITY OF EXPERIMENT STATIONS.

A portion of the act authorizing this investigation requires a report upon "the desirability and feasibility of establishing experiment stations * * * and locations for the same."

The desirability of stations in Alaska, if considered from the standpoint of the resident, is certainly great.

Anything that will augment or supplement the income of the native is certainly worth a trial. The native population of the country is estimated at about 30,000 and is practically at a standstill. The white population is about 10,000, and if the newspaper reports are to be given credence it will be swelled to 100,000 within the next year. Much of this increase will be transient, as has always been the case in placer-mining regions, but in the opinion of many well-informed individuals this large influx is expected to result in the discovery and development of the other mineral resources of the country. With the exception of the Apollo mine at Unga, all the important mines except the placers are within a radius of 50 or 60 miles of Juneau. With such widely distributed placer mines it is probable that extensive quartz ledges exist. The development of these, as well as the copper, coal, and other valuable deposits, will result in a permanent population. Food for all these people, aside from a few vegetables, a little meat, game, and fish, must be shipped a thousand miles or more. Where readily accessible to ocean navigation, these articles can be supplied in considerable quantity at comparatively reasonable rates; but in many places the money or its equivalent necessary to procure these supplies is constantly becoming harder for the native to secure.

In the western part of Alaska one of the principal sources of income for the Aleuts has been sea otter hunting, but from the returns made to the United States Treasury the catch is being rapidly reduced and will soon cease to be remunerative. The low price of furs in the London market and rapid decrease of the number of sea otters has led to the

abandonment of 10 stations of the Alaskan Commercial Company, and Mr. Rudolph Newman, general agent at Unalaska for the company, states in a letter to Governor Brady that the remaining hunting grounds "have ceased to be profitable and the people will eventually be forced to rely on Government aid for their subsistence." Land furs, once an important article of commerce, are becoming scarcer each year, although the price to the hunter does not increase as the supply decreases; in fact, the prices paid this year were lower than for some time past. The larger salmon canning establishments do not employ natives to any extent, most of the work of canning being done by Chinese contract labor. There seems to be no avenue open to the natives unless it should be agriculture, and rational agriculture will have to be taught them. Whether they would take advantage of new opportunities as developed by experiment stations can not be foretold. An expenditure for stations, if their results should lead to the independence of these people, would be vastly better and would require less money than if the people should be supported outright as now seems to be inevitable.

That the natives are susceptible of civilization and elevation by contact with superior races is shown in their dwellings and clothing. But few of the native sod houses or barrabaras remain, their place having been taken by frame or log houses of greater or less pretensions. In many places their houses still consist of a single room, no difference how large they are, but their comfort seems increased greatly. Many of them possess a considerable amount of skill, as is shown in the way they handle tools in the construction of their canoes, and the manner in which they take to carpentering, shoemaking, etc., in the training schools. That some possess a considerable amount of native skill is shown in their totem poles, carvings, basket and blanket work, all of which are well done, if their rather crude implements are considered. Their advancement in civilization is shown to some degree in the accompanying illustrations. In some places they retain some of their superstitions and practices, but as a rule they are considered peaceful, honest, and fairly truthful. The results that have been secured at the reindeer stations seem to indicate that the Eskimos can be taught the care of the reindeer, and it would seem that the Aleuts, Thlinkets, and others could be taught the elements of agriculture and stock raising. Aside from the possible benefits to the native, the white population, present and future, would profit from the investigations carried on at the station, just as is done in the older States, where the experiment station is looked upon as a valuable aid to agriculture.

The feasibility of the establishment of experiment stations in Alaska would seem to be shown in the previous pages of this report. What is being done in agriculture in Alaska and what is done in the north of Europe is shown, and it is believed that, if properly directed, much of the agricultural activity of Norway, Sweden, Finland, Scotland, etc., may be successfully reproduced in portions of Alaska.

## LOCATIONS FOR EXPERIMENT STATIONS.

The somewhat different conditions of soil, climate, etc., existing in southeastern and southwestern Alaska would seem to require at least two stations, or a station and substation. As possible places for their location, the vicinity of Sitka and Kadiak, as representing the timbered and the treeless areas, would seem to be the most advantageous places, all things considered. Sitka is the capital of the Territory and its second town in size, and is at the end of regular steamship navigation

from the Puget Sound to southeastern Alaska. From here the mail steamer for the west starts, and nearly all regular travel is through this town. Kadiak is some 700 or 800 miles to the west of Sitka, and is at present a coaling station, the mail steamer remaining there for about twenty-four hours on both its westward and eastward trips. There are several Government officials at this place, and both the Alaskan Commercial Company and the North American Commercial Company have important stations here and on the nearby Wood Island. Both Sitka and Kadiak possess advantages for stations not had by any other places visited. Sufficient area for a station could be readily secured at or in the vicinity of either place. Almost all the land belongs to the Government, and any of it could be withdrawn for station purposes.

At Sitka, the island of Japonski, which is already a reservation, offers advantages over any other tract near the town. There are some buildings on the island and several acres have been cleared, so that some of the preliminary work could be avoided, if it should be found possible to secure this island. At Kadiak there is a tract of cleared land containing 10 or 15 acres, said to belong to the Government, but claimed by the Alaskan Commercial Company, which, with adjoining land, would prove a very good site for a station. Among the advantages these places offer as possible sites for experiment stations is the presence of some land already cleared and that has been cultivated to some extent. The possession of such tracts by the stations would certainly save them at least one year's preparatory work and would prove a hardship to no one.

Some lines of work that suggest themselves as immediately practicable are: The proper preparation of the soil, culture methods, stock raising, silo building and management, adaptability of various vegetables, fruits, and cereals to the region, domestication of native berries, grasses, etc.

In recommending the establishment of experiment stations at Alaska, it is not considered advisable to suggest the extension of the so-called Hatch act to provide for their maintenance, at least not for the present. Alaska is not a Territory, as it is often called, but is a district whose officers are appointed and are responsible to different departments of the Government at Washington. There is at present no organization capable of providing a governing board for a station, nor land-grant college in connection with which it could be established. There is no way, except by private contribution, to supplement the work of the station, no matter how desirable or necessary additional aid might be.

Some of the sections of the act of March 2, 1887, as well as the title itself, seem to preclude the establishment of experiment stations in Alaska under the present law. With section 5 restricting the amount of the appropriation that may be expended for permanent improvements, and with the power to buy or rent land denied, it would seem that the efficiency of the station would be seriously impaired.

What seems at present to be the most practicable plan is the appropriation by Congress of a sufficient sum of money, $15,000 or more, to be expended without restriction by the Secretary of Agriculture in establishing and equipping such stations in Alaska as he may deem proper. In a few years the affairs of Alaska may be organized in such a way as to make it possible and desirable for the act of March 2, 1887, to be applied to the case.

Respectfully submitted.

WALTER H. EVANS.

DECEMBER 16, 1897.

## APPENDIX.

A partial list of the economic plants collected during the season is given below. A full report upon the botanical collections will probably be published later. Acknowledgments are made to Prof. F. Lamson-Scribner, chief of the division of agrostology, and Prof. F. V. Colville, chief of the division of botany, for assistance in determinations.

*List of economic plants collected in Alaska.*

Caryophyllaceæ:
- Cerastium vulgatum.
- Spergula arvensis.

Portulacaceæ:
- Claytonia sibirica.

Leguminosæ:
- Hedysarum americanum.
- Lathyrus maritimus.
- maritimus aleuticus.
- palustris.
- Lupinus sp.
- nootkatensis unalaskensis.
- Trifolium repens.
- pratense.
- Vicia gigantea.

Rosaceæ:
- Fragaria chiloensis.
- Rosa nutkana.
- Pyrus rivularis.
- Rubus chamæmorus.
- parviflorus.
- spectabilis.
- stellatus.
- strigosus.
- Sorbus sambucifolia.

Saxifragaceæ:
- Ribes bractiosum.
- laxiflorum.
- lacustre.
- rubrum.

Umbelliferæ:
- Heracleum lanatum.

Araliaceæ:
- Echinopanax horridum.

Caprifoliaceæ:
- Sambucus leiocarpa.
- Viburnum pauciflorum.

Cornaceæ:
- Cornus canadensis.
- suecica.

Compositæ:
- Achillea millefolium.
- Matricaria discoidea.
- Senecio vulgaris.

Ericaceæ:
- Arctostaphylos alpina.
- Gaultheria shallon.
- Ledum grœnlandicum.
- palustre.
- Vaccinium ovalifolium.
- oxycoccus.
- parviflorum.
- uliginosum.
- uliginosum mucronatum.
- vitis-idæa.

Polygonaceæ:
- Rumex acetosa.
- acetosella.

Cupuliferæ:
- Alnus oregona.
- viridis (?).

Cupuliferæ—Continued.
- Betula sp.
- glandulosa.
- papyrifera.

Salicaceæ:
- Populus balsamifera.

Empetraceæ:
- Empetrum nigrum.

Liliaceæ:
- Fritillaria camschatcensis.

Araceæ:
- Lysichiton camschatcensis.

Gramineæ:
- Alopecurus fulvus.
- Agropyron pseudorepens.
- Agrostis exarata.
- scabra.
- vulgaris.
- Bromus ciliatus scariosa.
- secundus.
- Calamagrostis aleutica.
- langsdorfii.
- Dactylis glomerata.
- Deschampsia bottnica.
- cæspitosa.
- cæspitosa coarctata.
- Elymus ciliatus.
- mollis.
- Festuca altaica.
- rubra.
- rubra baicalensis.
- rubra barbata.
- rubra violacea.
- subulata.
- Glyceria angustata.
- brevifolia.
- maritima.
- Hierochloa alpina.
- odorata.
- Hordeum boreale.
- Melica subulata.
- Phleum alpinum.
- pratense
- Poa annua.
- cenisia.
- flavicans.
- glumaris.
- nemoralis.
- pratensis.
- serotina.
- stenantha.
- trivialis.
- Puccinellia angustata.
- Trisetum cernum.
- subspicatum.

Coniferæ:
- Chamæcyparis nootkatensis.
- Picea sitchensis.
- Pinus contorta.
- Thuja plicata.
- Tsuga mertensiana.
- pattonii.

LIST OF ILLUSTRATIONS.



---

## REPORT OF BENTON KILLIN.

Dr. A. C. TRUE,
*Director Office of Experiment Stations.*

SIR: In pursuance of appointment and instructions from the honorable Secretary of Agriculture the undersigned has made as careful and detailed an examination as the means at hand and the situation, condition, and extent of country would permit, of that district of Alaska extending from the southern boundary to Kadiak and Long islands, a region of country 1,100 miles long by 200 miles wide, between 50° and 62° north latitude, and between parallels of longitude 130 and 155 west. The examination was sufficient upon which to base pretty reliable conclusions.

### DETAILS OF TRAVEL.

The lines of travel taken were in part as follows: To Alaska by steamboat, touching at Metlakahtla and passing north to Wrangell, thence to Jackson, or Howkan, at the southwest end of Prince of Wales Island and back, making landings at intermediate points—400 miles travel. Thence up the Stikine River to the upper end of the flats at the mouth thereof, thence along the southwest side of Wrangell Island.

Thence northerly by steamboat to Juneau, making investigations about Juneau and Douglas Island. From Juneau to Sitka, taking in Killisnoo on the way. Thence by steamer, passing Yakutat, Orca, and Homer, to Kadiak Island; with side trips from Kadiak to Feenys Creek, Long Island, Wood Island, and Mill Bay.

Thence back to Cook Inlet and to the head of it. And across the mountains to Prince Williams Sound, down the sound to Eyak, over the portage through Eyak Lake, and down the Eyak River to Copper River, to the head of Copper River flats or delta, and back over the same route to Eyak. Thence to Orca, where side trips were taken. From Orca to Prince Williams Sound by United States Fish Commis-

sion steamer *Albatross* to Yakutat and Disenchantment Bay and on to Sitka, thence by steamboat to southern boundary of Alaska. Everywhere as much examination as possible was made of the land by short trips into the interior.

## TOPOGRAPHY OF THE COUNTRY.

The territory covered is made up of many large islands and a great number of small ones, tide water everywhere intervening. There are several peninsulas extending from the continent well down toward the Pacific Ocean.

The Copper and Stikine rivers cut through the Coast Range and flow through this country to the ocean. There are many short streams rising in the Coast Range, the peninsulas, and islands, through which flow large amounts of water.

Fresh water lakes are very numerous, nearly every island of any size having one or more lakes within its borders, and there are a great many lakes in the hills and mountains.

The lands are mostly hilly and mountainous; there are in many places flats or level places along the margin of the water, but there are no large tracts of level land at low elevation, except at the mouths of the Stikine and Copper rivers. There are large areas of high, level tablelands at Cook Inlet.

## THE SOIL.

The soil of almost this entire area is peaty and boggy, decaying vegetation lying thinly over the bed or "country" rock of slate, or over broken rock or boulders. There is no clay subsoil except at Copper and Stikine rivers.

When drained this land will shrink greatly and the bed rock and boulders will in many places be laid bare. When cultivated the soil will leach out and wash away. In many places where small parcels have been cultivated nothing remains but patches of bare, broken slate. All the humus is gone, and not enough fertility remains to grow vegetation of any sort. This soil will remain permanently fertile if set in grass without plowing.

## CLIMATE.

The climate is everywhere wet, but not excessively cold, the mercury seldom going as low as 10° below. There are few blizzards or sudden storms except at Copper River Delta and on the Stikine. At both of these places the wind at times comes through the Coast Range and from the east and brings with it the Rocky Mountain climate. The temperature of the Pacific Ocean controls the climate of all this region and renders it mild. The cause of the high temperature of the Pacific Ocean and the mildness of the breezes coming from it is well understood, but it is necessary to mention the matter when claiming a mild climate in latitude 62° north. I obtained, for the use of the Department, copies of private records which had been kept by Captain Wadleigh at Klawack and at the Occidental Hotel at Juneau. [These detailed records are on file in this Department. The data given in them relative to clear and rainy days and some other facts have been employed elsewhere (p. 9).]

In general the snow leaves the ground about April 15 at sea level. It sometimes snows after that date. Frosts do not come before Octo-

ber. In the summer cloudy days largely predominate over clear days, but rainy days are about equal to those when no rain falls. There are seldom more than two or three bright days in succession. The climate at Klawack and Kadiak fairly represents the coast climate of Alaska, and that of Juneau that of the region back from the immediate coast, but west of the mountains. The summers are cloudy, rainy, and short, the winters long, but not excessively cold; the days twenty hours long in summer and in winter the nights as long.

Snow falls back next to the mountains to the depth of 5 or 6 feet and remains on the ground about six months. Near the coast not more than 2 or 3 feet falls, and it will remain for a much shorter period than that back toward the mountains, some winters remaining but a few weeks at a time. The "Chinook" wind will melt it away and it will fall again.

## NATIVE PLANTS.

Native grasses grow most luxuriantly everywhere, both pasture and hay grasses. They are nutritious. There are large tracts of grasses and sedges at the Copper River Delta and at Stikine River upon smooth lands ready for the mower. That at Copper River is much the larger. Peas and vetches grow wild all over this region. There is a perennial vetch at Wrangell Island, specimens of which I collected, which promises well as a forage plant. At the head of Prince Williams Sound, within 80 rods of a dead glacier, there were splendid growths of peas with well-filled pods August 6.

The small fruits, the salmon berry, huckleberry, and cranberry, are plentiful all over this country. At Cook Inlet the red currant is native and in such quantities that the natives gather and sell them for $2\frac{1}{2}$ cents per pound. They were ripe July 30 this year. At the west side of Prince Williams Sound and at Yakutat wild strawberries are plentiful and of excellent flavor.

## DOMESTIC PLANTS.

White clover and Kentucky blue grass do well all over the region visited and have become thoroughly established. Whenever the native growths are killed out, these come in.

In southern Alaska orchard grass makes a good growth and matures. It was in bloom June 22 this year at Howkan and was 3 feet high. Turnips, radishes, and lettuce grow well and are of good flavor. Potatoes and cabbages grow to fair size, but do not fully mature. Peas mature sufficiently for use when green.

## NATIVE ANIMALS.

As far west as Sitka there are many white-tailed deer. West and north of Sitka the moose and mountain sheep are plentiful on the peninsulas. There are bears, foxes, and other fur-bearing animals all over this region, but they are being hunted and trapped to such an extent that they are fast decreasing in numbers. About the lakes back from the coast in the mountains there are vast flocks of ducks and geese. These are their breeding grounds. They go south in the winter and return in the spring.

## DOMESTIC ANIMALS.

There are but few domestic animals in Alaska. In several places milch cows are kept. At Killisnoo and Kadiak some cattle are raised for beef. Beef raising has not been profitable, and is almost entirely abandoned. The feeding period is too long, and hay is cured with too much difficulty.

There are a few draft horses in the towns. There is but one plow team in Alaska. Mr. Baker, at Killisnoo, the only man making a living by farming in Alaska, has this. This is the only place where a plow is used in the country. Stock must be sheltered for six months in the year. The cold rains are very prostrating and chill the animals to death.

## FOX RAISING.

There is springing up what appears to be a promising animal industry upon the small islands about Kadiak and Prince William Sound. Blue foxes are being brought into that region and placed upon the islands and propagated for their furs. Persons wishing to enter upon this industry rent an island from the Treasury Department. The leasing is from year to year, and the rent is $100 per year. There is placed upon each island a keeper, and food is provided for feeding the foxes through the winter. This food is mostly dried fish, but corn meal has been used to some extent. The foxes burrow in the ground under the rocks or trees and need no housing, but extensive buildings for curing and storing food are required.

To put this industry on a satisfactory footing the leases should be made for a term of years, so that men will be justified in stocking the islands and making permanent improvements, and will become permanent residents.

German carp will probably be introduced into the drainable fresh-water lakes where salmon do not spawn to furnish food for the foxes. The water can be drawn off in the fall and the fishes gathered and packed away for the winter's use.

## THE FISHES OF ALASKA.

The fishing industry is mentioned here because there is every reason to believe that agriculture in Alaska will be a mere incident to fishing, lumbering, and other productions. The salmon industry of Alaska is well understood. It is very great. The salt waters of the country are teeming with herring, halibut, and cod. The salmon may be fished out to the point of extermination because of their having to resort to fresh-water streams when spawning.

The cod, herring, and halibut fisherman will become a permanent settler and will want land for a dwelling and timber for boat and house building. Upon the shore near his buildings he will want a landing place for his boats. He can raise some green vegetables for his own use and grass for his cows.

## TIMBER.

To a superficial observer passing through the above-described region in boats there seems but little value in timber. Near the water's edge, on the margin of the timber tracts, the trees are short, knotty, and scrubby, which is always the case with margin timber everywhere. In

the center of a grove the light is from above, and the trees grow upward and form but feeble lateral limbs or branches.

In the past the natives have traveled and done all their carrying by boat. In procuring bark for houses and roofs they have peeled and killed the smooth young trees near the water, but inland a short dis-distance there is much fine timber, spruce, and hemlock.

At Wrangell I saw scaled two spruce logs which were in the sawmill boom, not placed there for show but in the regular course of the mill business. One log was 112 feet long, 52 inches at the butt, and 35 inches at the top, containing 7,976 board feet of lumber, and the other 80 feet long, 74 inches at butt, and 54 inches at top, 13,591 feet of lumber.

Practically the whole country from Wrangell to Kadiak, except at Stikine and Copper rivers, is covered wiih spruce and hemlock timber. There is also red and yellow cedar. The grain of this timber is much finer and the strength much greater than in the same varieties farther south. Slow growth is the cause of fine grain and fine grain the cause of strength.

## WHAT HAS BEEN DONE IN THE WAY OF AGRICULTURE.

The Russians made a long and faithful effort to introduce their hardy plants into Alaska. They brought farm animals, plants, and implements. They utterly failed to establish successful agriculture in the country. Since we became possessed of the country, our people have made many attempts to introduce agriculture and have failed, not from want of capital or intelligence, but on account of the climate.

There is now a complete farm at Farm Island, at the mouth of the Stikine, equipped with everything necessary for a stock farm and for dairying. There are haying and farm implements, two silos, houses, barns, and outbuildings. Sixty cattle were kept there a few years ago. Now it is abandoned, no one lives there, no stock is there, and the buildings and farm implements are going to decay. The owner is logging for the Wrangell sawmill.

Wheat and oats will mature sufficiently for hay, growing luxuriant stocks. One season the Russians matured barley sufficiently for thrashing, and the yield was sixtyfold, but I have no information as to how much there was grown per acre.

As incidentally stated before, as far as I could ascertain there is but one man in Alaska, Mr. Baker, of Killisnoo, making a living by farming. He seems energetic and hopeful. He sells green vegetables and some beef at Killisnoo, where there is a thriving industry in the manufacture of herring oil.

Small parcels for garden have been spaded up, and ridging and bedding have been tried in many places.

## ENSILAGE.

There is a primitive silo operated at Yakutat by Mr. Henrichsen, a missionary. He keeps a few cows and feeds them ensilage, supplemented by a little poorly cured hay, for seven months in the year, and says they do fairly well without other food. In that climate ensilage is a better forage than where there is higher temperature at the time of filling the silo. There is less fermentation and not so much acid engendered. It seems that stock can be wintered on ensilage alone when proper silos are constructed and the forage properly stored in them.

## THE OUTLOOK FOR AGRICULTURE FROM AN ECONOMIC STANDPOINT.

With the present prices for agricultural products (and they are good and growing better) and the present labor scale in Alaska no agriculture can be carried on there.

Any man (he need not be a skilled fisherman) who can pull a fishing boat receives $50 dollars per month through the summer, or farming season, while farmers to the south pay but $20 per month for their labor through the summer. The difference in wages comes to more than the freight to Alaska from the farming districts along the coast.

Good farm lands in California, Oregon, and Washington can be bought for from $20 to $50 per acre, depending upon access to transportation. The lands in southeastern Alaska can not be cleared and drained for less than $100 per acre.

## LANDS FOR STATIONS.

If agricultural experiment stations are to be established in Alaska, they should be at Wrangell, Sitka, and Kadiak. The land, except the town sites and some mining locations, is public domain, and all that is necessary in providing station sites is to have surveys made and for the President to reserve or withdraw the necessary lands.

There have been no surveys of lands in that country, and it is impossible for me to furnish accurate descriptions of the lands for withdrawal in the absence of such surveys.

## LAND TITLES.

There is as yet no method provided for acquiring title to land for agricultural or residence purposes. Those who have made farm improvements there have done so on the faith that the Government will eventually grant titles.

## CONCLUSIONS.

From the foregoing facts the following conclusions are drawn:

It would not be expedient or profitable to establish experiment stations under the Hatch Act in Alaska at present. If established, they should be under the direct supervision of the Secretary of Agriculture, without any intervening board.

There ought to be provision made by which American citizens who wish to locate upon Alaskan lands for purposes of residence can acquire title to lands for that purpose. They should be required to establish homes and be engaged in some occupation on their own account for five years, then make each a grant of, say, 20 or 40 acres of land, embracing a narrow water front. This will enable them to land their boats, draw their nets, construct the necessary buildings, and have timber for boat and house building and for fuel. And as the timber is cut away they can make garden patches and get forage for their cows. They ought to be allowed, under proper restrictions, to cut timber for sale and export. They could pay, say, 25 cents per 1,000 feet for logs cut and sold. No timber can now be exported from Alaska. This will require public surveys of localities selected for settlement. When this is done and settlers obtained, silo literature should be furnished and a competent instructor in the building and operation of silos sent up there.

It would be advantageous to send instruments to the customs officers and obtain complete climatic statistics. The dissemination of reliable

knowledge of the mildness of the climate would tend to settle the country.

All this would be for the purpose of settling the country with a hardy race of fishermen and others used to the water, from which we may secure seamen for the merchant marine and Navy, and at the same time we will develop our fishing and other resources in that country.

We will establish there a great civilization. The native races are fast passing away and ceasing to be a social or economic factor, and the time is ripe for the introduction of Anglo-Saxon races and institutions.

Respectfully submitted.

BENTON KILLIN,
*Special Agent.*

DECEMBER 1, 1897.

---

## PRELIMINARY REPORT OF DR. SHELDON JACKSON ON THE AGRICULTURAL AND HORTICULTURAL CONDITIONS IN THE YUKON VALLEY.

DECEMBER 16, 1897.

SIR: On the 30th of April last I had the honor to receive through you a request from the honorable the Secretary of Agriculture that I should secure, during my expected tour of Alaska, such items as I could with reference to the agricultural and horticultural possibilities of the region adjacent to the Yukon River.

In compliance with that request, I beg permission to submit herewith the following preliminary report to the honorable the Secretary of Agriculture:

Leaving Washington on the 1st of June, I embarked at Seattle on the steamship *Portland* on the 12th, reaching Unalaska on the 21st and St. Michael—60 miles above the mouth of the Yukon River—on the 26th. Taking passage on the river steamer *P. B. Weare*, we left St. Michael July 5, entering the north channel of the Yukon Delta, a distance of 72 miles, that same forenoon. I made a trip up the entire length of the Yukon River, through Alaska into the northwest territory of Canada, to Dawson (Klondike), a distance of 1,652 miles. I reached Dawson July 25, and after remaining there two days, left for my return trip down the river, reaching St. Michael August 24, having spent nearly two months in inspecting the river.

While Alaska will never be an agricultural State in the same sense in which that term is understood in the Mississippi Valley, yet it has agricultural capacities much in advance of the public sentiment of the country.

At Koserefski, 338 miles from the mouth of the river, and at Anvik, 355 miles, I found gardens kept by the Roman Catholic mission at the former place and the Protestant Episcopal mission at the latter place, at which were grown the following vegetables: Potatoes, turnips, cauliflower, radishes, lettuce, cabbage, carrots, beets, and peas. I saw potatoes about 7 or 8 inches long and 3 inches in diameter; turnips weighing 10 pounds. In the same region the following berries were growing: Wild whortleberries, salmon berries, bearberries, blueberries, blackberries, redberries, currants (both red and black), crowberries, cranberries, raspberries, strawberries, and juniper berries. A species of red-top grass abounds the entire length of the Yukon Valley, ranging from 3 to 6 feet in height.

At Circle City, 1,322 miles from the mouth of the river, and Fort Cudahy, 1,522 miles from the mouth of the river, on the edge of the Canadian boundary, I found a few good gardens, generally kept by the commercial companies. At Fort Cudahy peas, beans, beets, radishes, lettuce, and cabbage seemed to be thriving in the garden. At Circle City lettuce, radishes, onions, turnips, and peas for early use are sowed on the roofs of the houses, the log cabins being covered with dirt roofs and the warmth of the houses probably conveying heat to the soil on the roofs.

Eight miles from Circle City a good garden has been established by a gentleman to supply the miners with fresh vegetables. Six miles below Circle City Mr. R. Wilson, who furnishes cord wood for the steamers, is accustomed, when an opening is made in the woods sufficiently large to let the sun reach the ground, to loosen the soil between the roots and stumps and sow turnip seed. In 1896 he marketed 3,000 pounds of turnips, receiving 15 cents a pound for the same.

A large vegetable garden has been established on the Canadian side opposite Dawson, the capital of the Klondike mining region.

These general observations go to show that, with the establishment of an experiment station and intelligent gardening, sufficient vegetables could be raised in the Yukon Valley for home consumption.

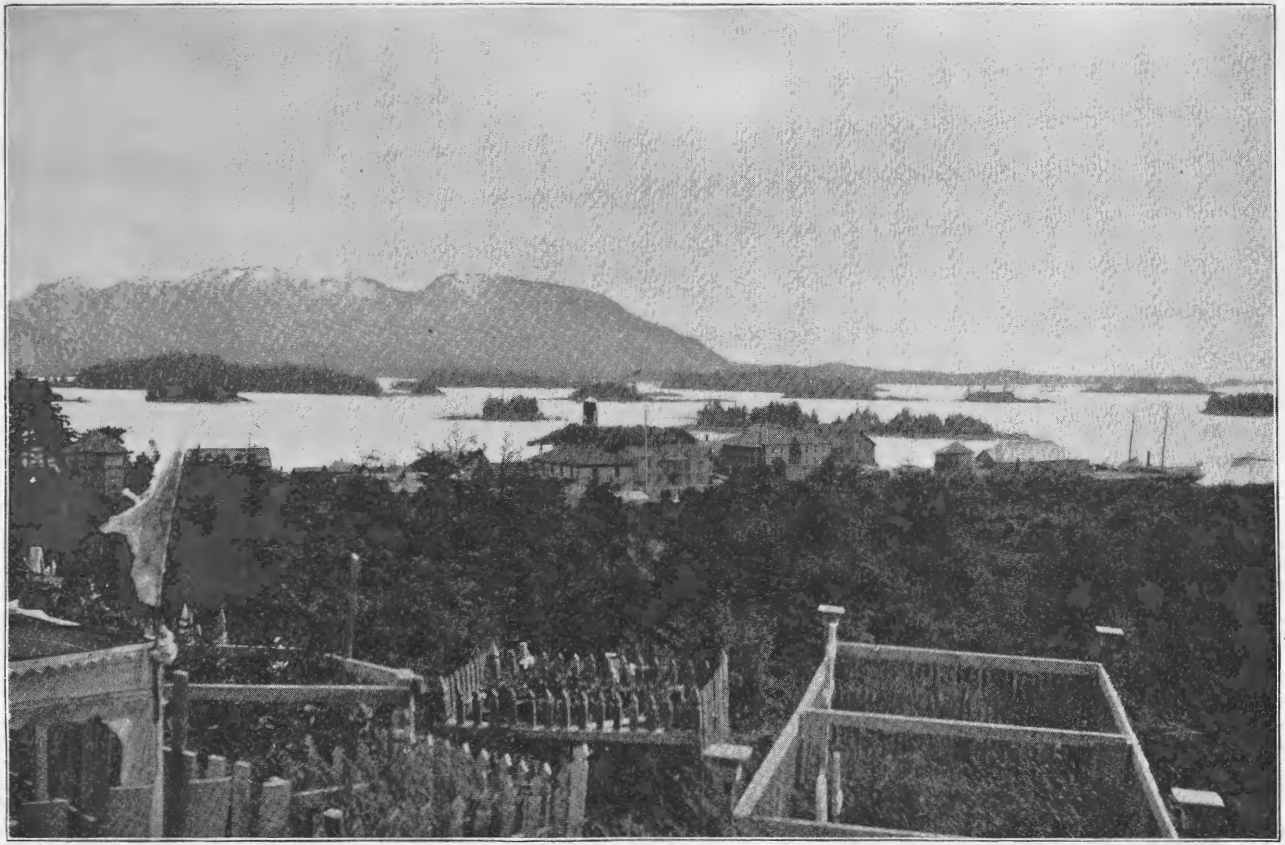
Hoping to be able shortly to make a fuller and more elaborate report, I remain,

Very respectfully, your obedient servant,

SHELDON JACKSON,
*General Agent, etc.*

Hon. W. T. HARRIS,
*Commissioner of Education.*

O



SITKA HARBOR AND GOVERNMENT BUILDINGS.

PARTIAL VIEW OF SITKA.

VALLEY BACK OF SITKA.

TIMBERED REGION, SOUTHEASTERN ALASKA.

KETCHIKAN, TIMBERED REGION.

SCENE ALONG PRINCE OF WALES ISLAND

SCENE NEAR HOWKAN, SHOWING SPRUCE TIMBER.

BLOCKHOUSE AT SITKA, AND SECOND-GROWTH SPRUCE.

OLD SPRUCE STUMPS AND SECOND-GROWTH TREE.

BIRD'S-EYE VIEW OF KADIAK. TREELESS REGION.

VIEW OF GRASS-COVERED MOUNTAIN SEEN FROM KADIAK.

FRESH-WATER LAKE, UNALASKA. TREELESS REGION.

BARRABARA, OR NATIVE SOD-HOUSE, AT KADIAK.

NATIVE BUILDINGS; CENTRAL ONE THATCHED WITH WILD RYE.

NATIVE BUILDINGS AT KADIAK.

NATIVE HOUSES AND TOTEMS AT HOWKAN.


POTATOES FROM KADIAK.

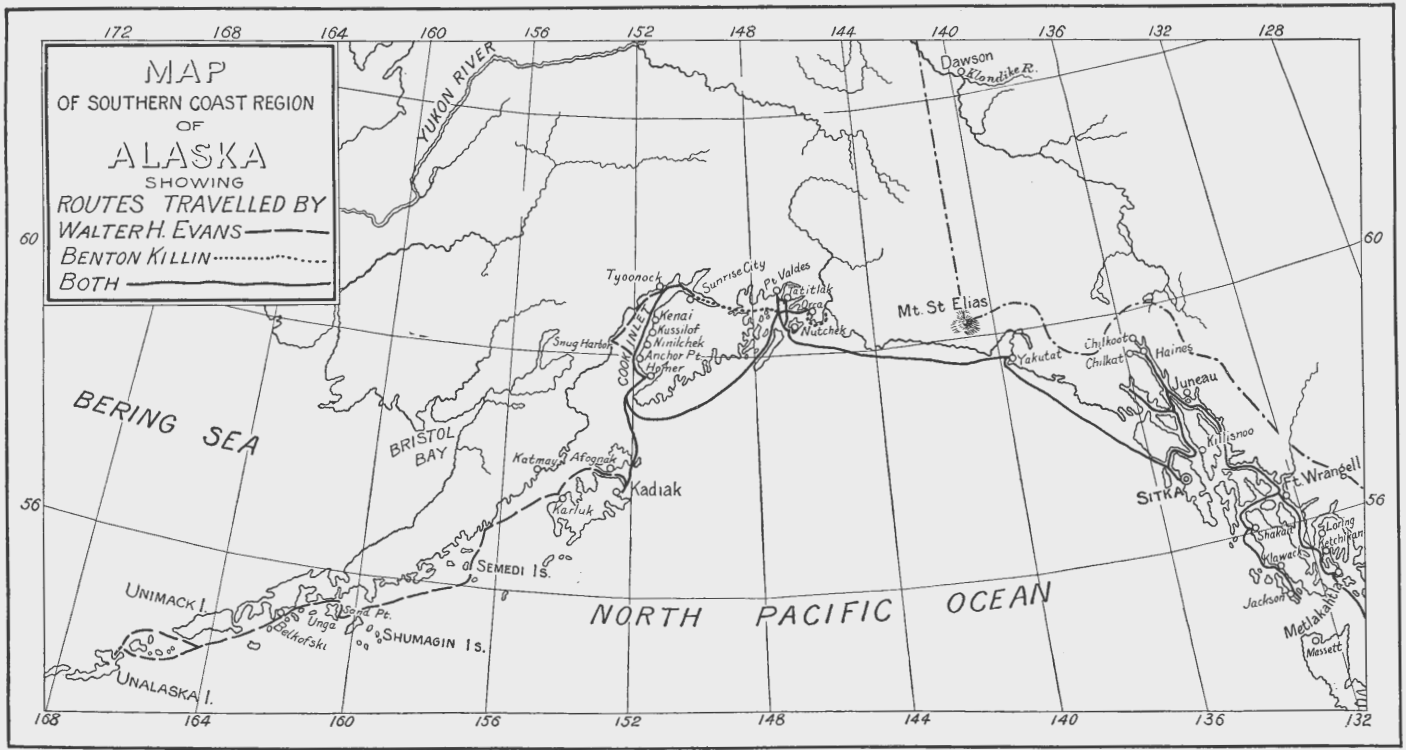
RASPBERRIES AT WRANGELL, JUNE 18, 1897.

CURRANTS AND RASPBERRIES AT WRANGELL.

ALASKAN REDTOP, JULY 5, 1897.

MEADOW AT WRANGELL. MOSTLY NATIVE GRASSES.

WILD CURRANTS FROM COOK INLET.




Drawn by Parke P. Flournoy Jr

MAP SHOWING ROUTE TRAVELED.