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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Special Agent in Charge.

ANNUAL REPORT
OF
ALASKA AGRICULTURAL
EXPERIMENT STATIONS
FOR
1910.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA,
RAMPART, FAIRBANKS, AND KODIAK.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment Stations, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL.

SITKA, ALASKA, *January 19, 1911.*

SIR: I have the honor to submit herewith a report on the work of the Alaska Agricultural Experiment Stations for the year 1910.

Respectfully,

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Special Agent in Charge of Alaska Investigations.

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Publication recommended.

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Publication authorized.

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ANNUAL REPORT OF ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1910.

WORK FOR THE SEASON.

By C. C. GEORGESON, *Special Agent in Charge.*

THE WEATHER.

It seems trite to begin an annual report with remarks on the weather, and yet the weather is the most important factor in our operations. In these northern latitudes all vegetation is dominated by the weather. Low temperatures are not the only factors which make for success or failure. The percentage of cloudiness is almost of equal importance. Whenever the growing season is overcast, even if it is not exceptionally cold, vegetation languishes. The soil does not dry out and remains cold, and these conditions are further augmented for the worse when the rainfall is heavy. An exceptionally favorable season is one with a large percentage of sunshine, for sunny weather means warm weather.

At Sitka Station the first half of the summer was very unfavorable. The spring was late, the weather rainy and cloudy. In the months of May, June, and July there were but 15 clear days and 13 other days on which the sun was shining at intervals, whereas there were in the same months 64 totally cloudy days and 51 rainy days. But the unexpected happened. Contrary to all experience, August and September proved to be favorable months. There were in the 2 months 19 clear days, 11 days which were clear in part, 31 cloudy days, and 31 rainy days. This is an unusually favorable record for the latter part of the summer. Ordinarily the best weather occurs in June and July, while August and September are expected to be rainy. As a result of these conditions all garden vegetables developed with unexpected vigor in the latter part of the summer and the yields were therefore good. Potatoes never grew finer at this station than the past season. Cabbage, cauliflower, root crops of all kinds, and celery were all better than could have been expected from the late, cold spring and sunless, early summer. The temperature rose with the sunshine. Our warmest day occurred in September, when the thermometer reached 80° F. The mean daily temperature for

August was 55.37° . This is 1.57° warmer than August, 1909, and September was nearly 4° warmer than September, 1909. The moderate rainfall, the greater amount of sunshine during August and September, were the saving factors which changed an almost certain failure into success for the gardener and farmer in southeastern Alaska.

At the Rampart and Fairbanks stations the growing season proved unfavorable in that there were several frosts during July and August. The amount of rainfall at both places was light, but there was much cloudiness, so that the growth of crops was not as vigorous as usual, and the several frosts which occurred nipped and thus retarded the growth of tender plants like potatoes and buckwheat, and injured spring wheat so that it did not mature. The maximum temperature reached 92° F. at Rampart in the month of July, and the daily mean temperature was also the highest of the season for that month, namely 61.14° F.

At Fairbanks the rainfall was heavier than at Rampart, but in spite of the greater amount of rain there were more clear days than at Rampart. There were light frosts on five days in July and August which injured potatoes and, to a less extent, the growing grain crops.

At Kodiak Station the usual cloudy and rainy weather prevailed. No crops are cultivated there, however, and the grass grows as well in the rain as in the sunshine. The only effect that a lack of sunshine has upon the work at that station is the trouble in curing hay and putting up silage. The past season there was, fortunately, a period of two weeks of good haying weather in the latter part of August, which was taken advantage of to the fullest extent, so from the standpoint of a stock raiser the season at that station may be said to have been favorable.

WORK AT SITKA STATION.

The work of greatest interest at this station during the past season was the cultivation of hybrid strawberries. This subject has been mentioned in every report since 1906. Last year a number of these seedling strawberries bore fruit, and many of them gave promise of possessing qualities which would entitle them to a place among cultivated varieties. This year, however, a still greater number of plants bore fruit for the first time, and a correspondingly greater number of promising varieties were discovered. Out of more than 1,800 plants which have so far borne fruit, 166 plants yielded fruit that compares favorably in size with the average strawberry found in the market, and 35 of these produced berries that would exceed in size the average strawberry found in the market, and with few exceptions all of the berries are superior in flavor to the cultivated varieties.

To summarize briefly what has been said in former reports on this subject, these hybrid strawberries are the result of a cross between the native wild Alaska strawberry of the coast region (*Fragaria chiloensis*) and several cultivated varieties, the latter being the mother plants in all cases. The cultivated variety which has been used more than any other has been called the Hollis because its real name was unknown and could not be ascertained, and the stock was obtained from Mrs. Helen Althouse, of Hollis, Alaska. It is a moderately vigorous variety, with a medium-size conical berry. Many of the flowers are pistillate and some are perfect. The plant is fairly hardy as far north as Sitka and moderately productive. Many of the berries when grown in the open are malformed and irregularly developed, due to the imperfect fertilization of the blossoms. The plants which have been grown under glass for the purpose of these experiments, where the fertilization could be controlled, have invariably produced well-shaped conical berries of medium size; that is to say, the largest of them would be about an inch in diameter.

The purpose of growing them under glass, as just mentioned, was simply to control the experiment and to forward the blooming of the cultivated plants, so that it would occur at the same time that the wild plants used for fertilization came into bloom.

The wild plant has also been described in former reports. It grows more or less abundantly along the beach from Icy Strait to Prince William Sound. As found there, it is a low, spreading plant with short petioles and very hairy on stem and under side of the leaves, and a large percentage of the leaves have four leaflets. It grows in the pure sand and gravel which constitutes the beach line, holding its own with the grasses and other plants with which it comes in competition. The flowers are large and white and many of them staminate and sterile. The peduncles are short procumbent, and the berry as soon as formed is hidden by the grass and leaves, so that it is difficult to find them even when abundant until one burrows through the vegetation around the base of the plant. The berries are rounded to conical, of the average size of the end of a man's little finger, but some of them attain a good size, even to three-fourths of an inch in diameter. They are lightly colored, chiefly because they are hidden away from the light. The seeds are large and black. The berry has an exquisite flavor and a strong aroma which has been observed in no other strawberry. Under culture, in good soil, the plants produce no fruit. They luxuriate in the unwonted amount of plant food and produce a carpet by their innumerable runners. To make them fruit, they must be grown in poor, sterile soil.

There is another species of wild strawberry in the interior of Alaska which differs greatly from the one here described. The plant is

smaller, smooth, and hardier and produces globular berries not much larger than a pea. This species has also been introduced at the Sitka Station and is used in hybridizing experiments, but from these hybrids as yet no results have been obtained, hence, whenever reference is made herein to the native Alaska strawberry in connection with these experiments the coast species is meant.

THE HYBRID PLANTS.

The result of this cross is in many respects most remarkable. The hybrid plants differ greatly from both parents. Grown side by side with the parents, the hybrids are very much larger and very much more vigorous. Most of the plants resemble the staminate parent in the shape of the leaf and the serration on the edge. The majority of them also have hairy or almost woolly petioles, but the leaves are much larger, and instead of the short petiole of the wild plant they have tall, heavy leaf stalks, which raise the leaves a foot from the ground, or even more. Instead of the procumbent peduncles of the male parent, those of the hybrid are upright and stout, some of them almost the size of an average pencil at the base. In a few cases the topmost flowers have been 18 inches from the ground. Of course, when the berries are developed their weight bends the stem to the ground, and when they are mature they lie spread on the ground in all directions from the base of the plant. Occasionally a hybrid plant is found which is small and weak, resembling the staminate parent, but these are few.

As might be expected, about nine-tenths of these hybrid plants are of no value for cultural purposes. They either produce few berries or none at all, or the berries are small and not worthy of consideration, but about 10 per cent of the plants are sufficiently productive and produce berries of a size to attract the attention of the cultivator. A very few of the plants are extraordinarily productive. One, No. 320, had, by actual count, 200 berries on it in all stages of development, from fully matured to those not larger than a pea (Pl. I, fig. 1). Another plant had 174 berries and still another 125 berries. It should be noted that all of these berries did not develop and mature, but a large number of them did, and the berries, too, in these cases were of more than average size of the berry one finds in the market. Some plants were remarkable for the large size of the berries. One, No. 1503, produced berries which, while not numerous, would be classed as very large in any variety.

As to the quality of these berries, they all have certain characteristics in common. They are firm and not very juicy and with scarcely any acidity. They nearly all have brown seeds, and they remind one of the wild Alaska berry rather than of the cultivated mother plant. In shape of berry there are two dominant types. One is more or less

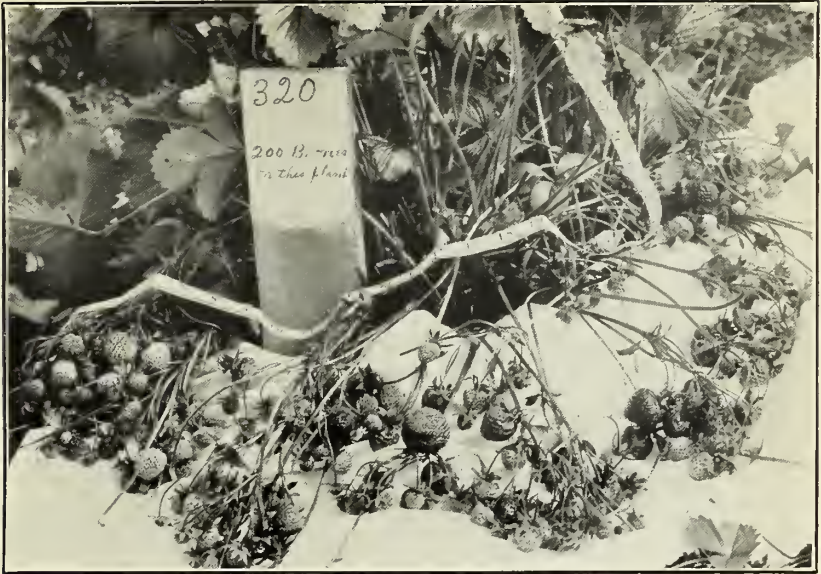
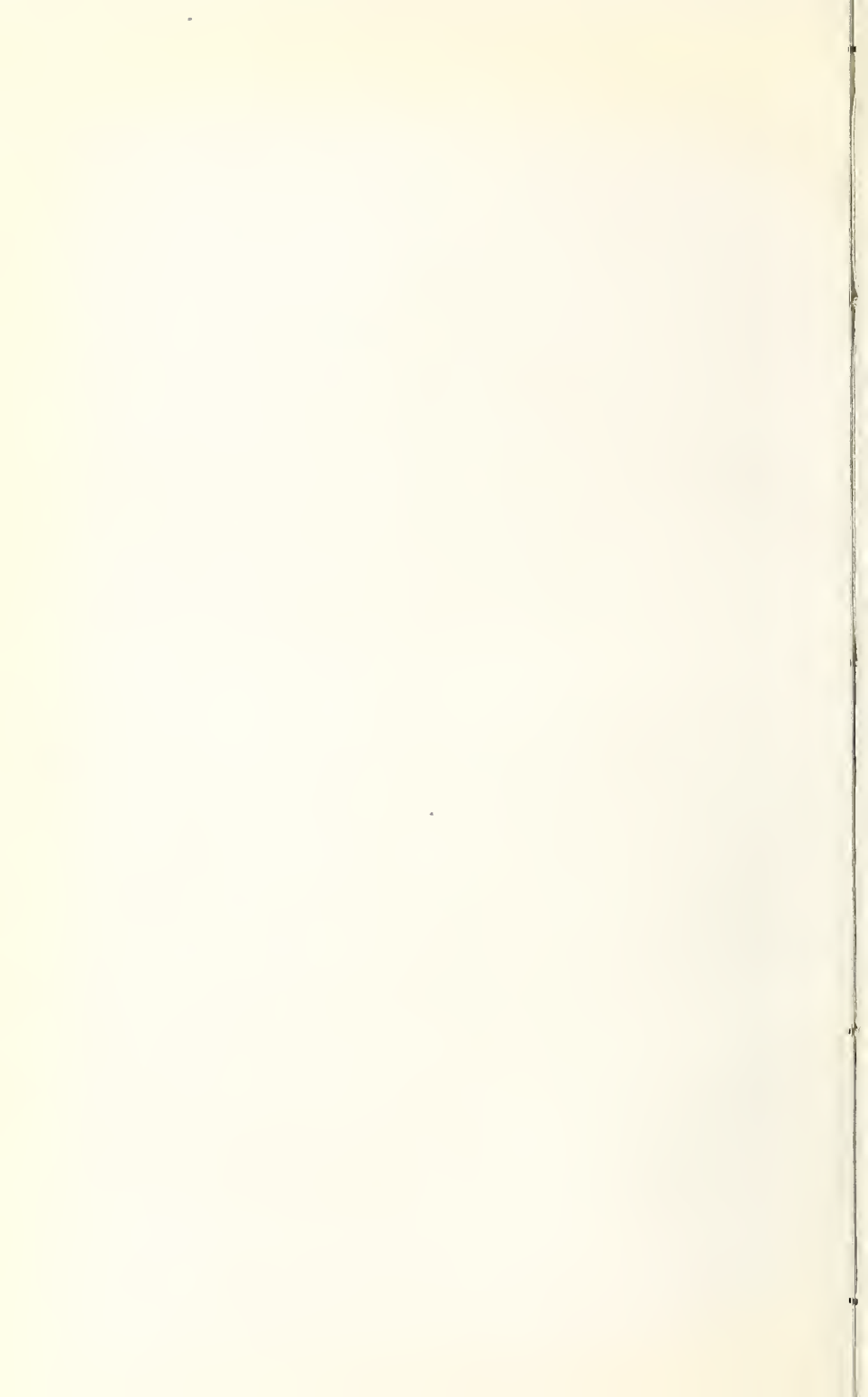
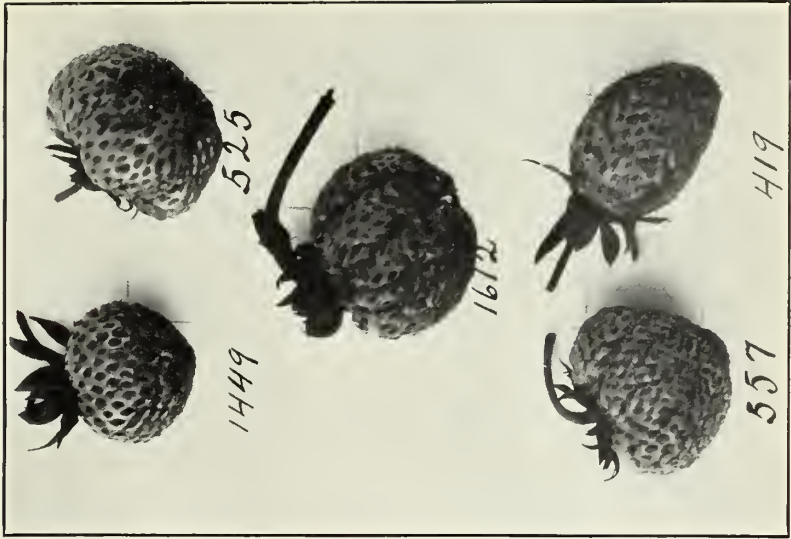


FIG. 1.—HYBRID STRAWBERRY NO. 320; 200 BERRIES ON PLANT.



FIG. 2.—HYBRID STRAWBERRY NO. 251.





SOME TYPES OF HYBRID STRAWBERRIES.
Spaces between lines represent 1 inch.

globular in form and the other long and pointed. In the matter of flavor it appears that the long and pointed berry is as a class more delicious than the rather larger globular berry, but they shade so into each other in an infinite variety in both form and flavor that it is difficult to describe or classify them under one or the other of these characters except in the case of the extremes. In flavor they are all delicious, almost devoid of acidity, but some are much more highly flavored than others. About 50 per cent of the berries have more or less of the aroma of the staminate parent, so that half a dozen berries in a room can be detected by their odor before they are seen. The other 50 per cent have no aroma at all, or it is so faint that it takes a sharp nose to detect it. Plate II shows the variation in size and shape of some of the larger berries. The lines on the background inclose inch squares. These photographs do not pretend to give either the largest berries or those which show the greatest variation in shape, because it was seldom convenient to have the photographs taken just when the berries were ready.

These 166 seedlings which have shown themselves worthy of consideration will be studied another year before final judgment is passed on them. In the meantime the best of them will be propagated and studied under other conditions.

It does not seem likely that any of these varieties will be suitable for culture in a warm and drier climate, as found in the States. They were produced here in a cool, moist climate. Their leaves are large and porous. In dry weather and under a hot sun they will in all probability wilt or maintain a precarious existence, but it is believed that they are preeminently adapted to the entire coast region of Alaska, and thus insure hardy, large and productive strawberries for this region, where it appears the cultivated varieties, so far tried, have been either complete failures or made only a very moderate success. From the growth and habit of nearly all of these hybrids it appears best to grow them as isolated plants with plenty of room between them rather than in matted rows or beds. The plants have been slow to develop, those which fruited this year being four years old. It is not known how long they will remain productive, but it seems likely that they can be continued for several years before they need to be replaced with new plants.

The plants are, of course, perfectly hardy, but it must be borne in mind that the coast region of Alaska has a mild winter climate, when considered from the standpoint of low temperatures. It is necessary to protect them as well as all other plants which have their roots near the surface, not, indeed, to keep out the cold, but to prevent them from thawing. The soil here is spongy and holds a large amount of moisture. Repeated freezings and thawings will lift any plant out of the ground, and in the process tear the roots

so that it seldom does well when replanted. Even label stakes driven a foot in the ground are sometimes lifted out by the frost and lie on top of the ground in the spring. To prevent this the plants are covered thinly with spruce boughs and sometimes a little seaweed to hold the snow and keep the soil from thawing until spring.

POTATOES.

The potato is the chief vegetable crop in Alaska. It is of more value by far than any other single kind of vegetable. Potatoes can be grown very successfully in all parts of Alaska, even north of the Arctic Circle, when proper locations are selected, but success depends on several things, the soil, the location as to exposure to the sun and freedom from frost, the variety of potato, and the method of culture. With a view to solving the problems presented in these conditions potatoes are grown at the experiment stations on a limited scale. One often hears the complaint that Alaska-grown potatoes are watery and not fit for use. When such potatoes are produced it is due to either a faulty selection of the variety, unsuitable soil or location, or to improper culture. The watery potato is an immature potato in which the starch grains have not been normally developed, and it is to overcome this difficulty that care must be taken on the points above mentioned. At the Sitka Station a goodly number of varieties are grown each year, with a view to testing their adaptability, and also with a view to propagating them for distribution and further trial at the interior stations. The past season some 50 varieties were tried on a very small scale. This variety test has produced nothing worth recording. An experiment, however, which gave valuable results was carried out. It was a comparison of yield from potatoes which were sprouted before planting as compared with potatoes which were not sprouted. Such an experiment would probably be of no value whatever in a warmer climate where the season is warm enough and long enough to mature the tubers normally, but in this climate where the potatoes require the entire summer in which to develop, the results are significant.

The potatoes were placed in flats and covered slightly with soil four weeks before planting time and placed in the greenhouse where they would be stimulated to start growth. The sprouts at planting time varied in length from half an inch to 3 inches. The potatoes were planted whole and handled carefully, and so set that the longest sprouts would just reach the surface of the soil. Selections of seed from the same varieties were taken from the potato cellar, where they were not sprouted and planted on the same date. Two rows of each variety were planted, side by side. The rows were 200 feet long and the potatoes were planted 2 feet apart in the row, whole,

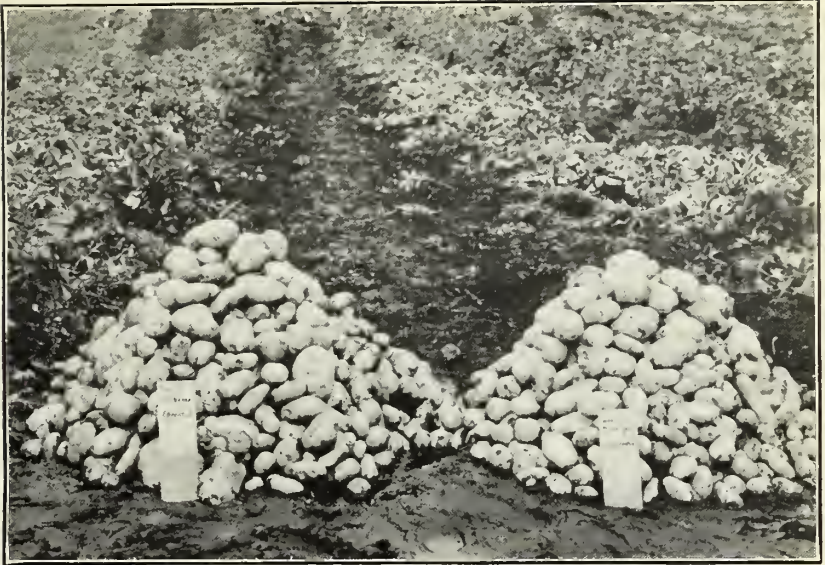


FIG. 1.—EARLY MICHIGAN, SPROUTED (LEFT) AND NOT SPROUTED (RIGHT).



FIG. 2.—GOLD COIN, SPROUTED (LEFT) AND NOT SPROUTED (RIGHT).

EFFECT OF SPROUTING POTATOES BEFORE PLANTING, SITKA STATION.



FIG. 1.—IRISH COBBLER, SPROUTED (LEFT) AND NOT SPROUTED (RIGHT).



FIG. 2.—CARMEN NO. 3, SPROUTED (LEFT) AND NOT SPROUTED (RIGHT).

EFFECT OF SPROUTING POTATOES BEFORE PLANTING, SITKA STATION.

medium-size potatoes being selected in each case. There were thus 100 hills to the row. All the seed was grown at the Sitka Station in 1909. The planting took place on May 18. The ground selected was rather low—no better place being available, and three days after planting a frost occurred which nipped the tender sprouts, injuring them in some cases an inch below the surface of the soil. This was a setback to the experiment which had not been counted on, but in spite of this the sprouted potatoes gave uniformly the best yield, and the potatoes averaged larger and were better matured than the potatoes raised from the unsprouted seed. The rows of the sprouted potatoes were distinguishable above the surface fully 2 weeks earlier than the rows of the unsprouted potatoes. The result as to yield is summarized in the following table:

Effect of sprouting potatoes before planting.—Rows 200 feet long.

Varieties.	Sprouted.		Not sprouted.	
	Total yield.	Per cent marketable.	Total yield.	Per cent marketable.
	<i>Pounds.</i>		<i>Pounds.</i>	
Gold Coin	307	93	219	98
Norway No. 1.....	163	72	94	62
Norway No. 2.....	241	72	142	85
Early Michigan.....	289	94	238	95
Norway No. 3.....	116	83	98	69
Russian.....	216	72	164	67
Banner.....	111	90	97	89
Bove's.....	115	76	113	75
Freeman.....	257	79	235	78
Lincoln.....	139	78	114	78
Irish Cobbler.....	192	89	170	82
Early John.....	94	72	126	83
Carmen No. 3.....	187	89	162	90
Ohio jr.....	195	87	160	88
Extra Early Ohio.....	157	88	98	85
White Mammoth.....	43	90	59	91
Early Harvest.....	72	91	88	73
Unknown.....	266	87	177	87
Garfield.....	163	87	111	85
White Beauty.....	175	88	115	87
Commersoni.....	70	85	.....	.....
Vornehm.....	104	89	.....	.....

Plates III and IV from photographs also plainly show the difference in yield by sprouting the seed before planting. (Pls. III and IV.)

At the Rampart Experiment Station a similar experiment was carried out, with identical results. It has already been noted that the late summer and fall were very favorable in the coast region. As a consequence the potatoes continued to grow until late in the season, and they were not harvested until October 15.

All who grow potatoes in Alaska, whether on a large or small scale, are advised to place the seed potatoes in a warm room, four weeks before the normal date of planting. They should preferably be placed in shallow boxes in the light so that the shoots can form chlorophyll. They are then stouter and hardier than the slender white

shoots produced in the dark. The results will be aided by covering the potatoes lightly with moist soil. Secondly, handle these sprouted potatoes carefully, so as not to break the sprouts. The yield thus obtained will be larger and the potatoes more mature and in consequence less watery.

BEETS.

Thorburn New Model Red. Seed sown in flats in the greenhouse April 12 and transferred to open ground May 23. The same variety of seed was sown in the open ground May 23 and results compared. The transplanted beets were much the larger and better, a few of them attaining the size of 6 inches in diameter. Those sown in the open ground produced but few edible roots, many of the plants running to seed. Much is gained by giving the plants a good start indoors.

BROCCOLI.

Mammoth White. Sown in flats April 12, transplanted to the cold frame on May 13, and set in the open ground June 12, transferring them from the cold frame with ball of earth. Some heads attained a size of 12 inches in diameter and did remarkably well. The first heads were ready for use August 20. Eighty-six per cent of the plants produced marketable heads.

BRUSSELS SPROUTS.

Dalkeith. Sown in flats under glass April 22; transplanted to open ground July 5. Produced only a fairly good crop.

CAULIFLOWER.

The result of the present season places the varieties in about the following order: (1) Thorburn Gilt Edge, (2) Denmark, (3) Thorburn Large Early Snowball, (4) Early London, and (5) Gregory Early Snowball. All of the varieties named did well, some producing very large heads, one head attaining a size of 18 inches in diameter. Seed sown in flats April 12; transplanted to the cold frame on May 13, and set in the open ground June 12. In taking the plants from the cold frame they were examined for club root. None of the plants in the open field were affected by club root or root maggot.

CABBAGE.

All the varieties of cabbage herein mentioned received the same treatment as the cauliflower above described. Only small lots were grown. The varieties were as follows, and they rank in the order named in point of earliness: (1) Express, (2) Baseball Early, (3) Early Jersey Wakefield, (4) Early Dutch, (5) Improved Early Sum-

mer, (6) Enkhuizen Glory, (7) Improved Succession, (8) Flat Dutch, (9) Volga, (10) Solid Emperor, (11) Marblehead Mammoth, (12) Drumhead, (13) Danny Winter Ball Head, and (14) Savoy, Improved American.

The early varieties are the surest headers and of the best quality. The late, or so-called main crop varieties are not so reliable, and of the early sorts those with conical heads of the type of the Early Jersey Wakefield are the best, all things considered.

We have in former reports recommended the Early Jersey Wakefield in preference to other sorts, though on rich, sandy loams and in regions where the summers are warmer than they are at Sitka the larger and later varieties may yield heavier crops. Of the Flat Dutch 50 per cent headed; Volga headed 40 per cent; Emperor headed 20 per cent; Marblehead Mammoth 20 per cent; Drumhead 18 per cent; Danny Winter Ball Head 10 per cent; while of the early varieties 90 per cent headed.

CELERY.

The following varieties were grown on a small scale: (1) Fin de Siecle, (2) Golden Self-Blanching, (3) Schumacher, (4) Giant Pascal, and (5) Kalamazoo. The seed was sown in flats April 12, where it remained until July 9, when it was planted on rich soil. A portion of the plants were set on soil which had not been fertilized. The result was that those on the rich soil produced fine celery, while those in ordinary garden soil produced no marketable plants. Of the varieties named the Kalamazoo proved to be the best this year.

CRESS OR PEPPER GRASS.

Sown in the open May 24. It produced an abundance of palatable greens. This much neglected garden vegetable is mentioned because it can be grown with success anywhere in Alaska. It is ready for use early. The tips can be cut and used as salad green when they are 3 inches high, and the plants can be cut over twice in a season. It is considered a healthful vegetable, and is one of the things which can be grown with little trouble by the prospector and miner as well as by the professional gardener.

ENDIVE.

Green Curled Winter. Sown in the open May 24. It made a slow growth and did not give satisfactory results. Endive can be grown in Alaska with marked success on warm, wet, sandy loam.

KALE.

(1) Curled Dwarf Green Scotch, (2) Curled Siberian, and (3) Jersey Winter. They received the same treatment as cauliflower and cabbage, already briefly recorded. The results were highly satisfactory.

The first-named variety is to be preferred. Kale is one of the vegetables that should be grown in every garden in Alaska. It will grow anywhere, and on rich soil it produces a heavy yield of one of the best vegetables suited for northern culture. The growing of kale has been urged in detail in former reports, and here it is simply wished to remind the Alaska gardener that he must not neglect his kale. The trouble is that so few people know how to use it properly. One of our missionary friends some years ago attempted to eat it green as a salad, and he reported that he thought it "pretty poor provender." Kale is best in the early winter after it has had a few light frosts, and in the coast region it can remain outdoors all winter covered up by the snow. Moderate freezing does not hurt it, in fact makes it all the better. The leaves should be stripped from the midrib, then boiled for two hours with a piece of salt pork, then mixed with boiled potatoes. There is no finer vegetable along about Christmas time.

LETTUCE.

All varieties were sown in flats April 12, and transplanted to the open ground in early June. The varieties grown were: (1) Giant Crystal Head, which was by far the best not only in point of earliness, but crisper and better flavored than the others; (2) Mammoth Black Seeded Butter, a variety which formed heads of large size; (3) Simpson Early Curled; (4) Boston Market; (5) California Cream Butter; (6) Cold Frame White Cabbage; and (7) May King. The success of nearly all varieties of lettuce is too well known to need comment here.

MUSTARD.

Fordhook Fancy. Sown in the open May 24 and large enough for use July 8. Mustard can be grown anywhere in Alaska and will succeed where many other things fail. It is used for greens. May be cut as soon as the plants are 4 or 5 inches high. Should be boiled like spinach or beet leaves. It is one of the things that can always be had with little effort, and in mining camps, particularly where little attention is given to gardening, this green can be produced with little effort.

ONIONS.

The onion is one of the vegetables which rarely yield satisfactory bulbs from seed in the coast region. Nevertheless in favorable seasons small onions can be produced. In the warmer interior onions do much better than on the coast.

Yellow Danvers and Strasburg were sown in flats on April 12 and transplanted to the open on May 24. Some of them produced onions 2 inches in diameter, but they did not ripen. Seed sown in the open ground produced only very small onions, of no value.

PEAS.

A few short rows each of Alaska, First and Best, Horsford Market, Fillbasket, and Nott Excelsior were sown in the middle of May. The varieties are valued in the order named. The first four produced good crops.

In all comparative tests of varieties the Alaska has invariably proved to be the best. This variety is recommended in preference to all others. It grows to a height of 4 feet, and should be supported. The pods are of medium length, numerous, and well filled with peas of excellent flavor. At this station peas are not ready for the table until the beginning of August. Nott Excelsior mildewed badly.

PARSLEY.

1) Extra Curled, (2) Hamburg or Root Parsley. No. 1 is grown for garnishing and flavoring; No. 2 is cultivated for its roots, which are boiled like turnips or parsnips. Both did well and at least one of them should be found in every Alaska garden.

PARSNIP.

Hollow Crown. Seed sown May 24 produced fair plants and roots of good quality.

RADISH.

A very little seed of each of the following varieties was sown: (1) Cooper Early Sparkler, (2) Scarlet Turnip White Tip, (3) French Breakfast, (4) Early Crimson Giant, (5) Deep Scarlet Forcing, (6) Half-Long Deep Scarlet, (7) White Strasburg Summer, and (8) California Mammoth. These varieties are valued in the order named. Nos. 4, 6, 7, and 8 suffered from root maggots. It is not necessary to repeat what has been said in many former reports about their culture.

SPINACH.

This vegetable has never done well at the Sitka Station. The growth is invariably slow, and the plants run to seed very quickly. This was repeated again this year. Spinach requires sunshine and a warm sandy soil, two conditions which we can not supply. New Zealand Summer, sown in flats April 12, transferred to cold frame and set in the open ground June 2, produced greens in early August, but the same seed sown in the open ground produced nothing.

TURNIP.

Petrowski, Finland, Aberdeen (these three varieties are yellow in color), White French, and Jersey Lily were sown in the open May 24 and took rank in the order named. It is not necessary to dwell on the cultivation of turnips in this report.

TEST ORCHARD.

APPLES.

The test orchard consisting of a few trees each of a number of varieties of apples and some cherries and plums is making but slow progress.

After several years of observation it seems probable that apples of any of the varieties now known and cultivated can not be successfully grown in any part of Alaska. Some years ago, judging chiefly from the dwarf crab apple indigenous to the coast region of southeastern Alaska, it was thought that early maturing, hardy varieties of the apple could be grown here, but such has not proved to be the case. In the coast region the summers are not warm enough to develop and mature the apple, and in the interior the summers are too short and the winters so severe that the trees will inevitably be frozen down from year to year. Apparently the only hope for the development of pomaceous fruit suited to this climate lies in the production of hybrids with the native crab apple, and this work will take a long time. Efforts so far have not been promising. Even the several cultivated varieties of the crab apple which have been tested here have so far done no good. The young test orchard referred to is now 7 years old and should begin to show fruit, but the trees are not doing well. They, as a rule, make but little growth. The young wood does not mature, and as a consequence it is killed back even in our mild winters, when the temperature seldom falls below zero.

The Hyslop, as shown, bloomed for two or three years, but it has set no fruit.

With a view to testing the apple over the whole territory where there is any likelihood that it might grow, some thousands of young trees have been propagated and distributed during the last four or five years. In all cases varieties have been selected which were hardy of tree and early in maturing their fruit, but as yet no more encouraging reports from these distributions have been received than this: "The trees are still alive and growing slowly." Some of these varieties have been grafted on the native crab apple stock. These grafts are yet too small to give results, but to judge from their growth there is not much to hope for.

The situation as to last year's result is summarized in the following tables, which give lists of the varieties, the average amount of winter killing during the winter of 1909-10 of each variety, the date the trees leafed out, the date on which they showed bloom, if any, the average growth for the season, the date when the leaves began to fall, and finally the condition of the wood.

Condition of apple trees, plat No. 1.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
	<i>Inches.</i>			<i>Inches.</i>		
Whitney.....	4	June 7	June 20, none set..	14	Oct. 15	Fair.
Yellow Transparent.....	3	June 19	No blooms.....	14	..do....	Good.
Peerless.....	3	June 20	..do.....	20	..do....	Fair.
Martha.....	4	June 7	..do.....	12	..do....	Good.
Tetofski.....	0	..do....	..do.....	8	..do....	Do.
Eureka.....	0	June 18	..do.....	22	Oct. 1	Do.
Brier Sweet.....	6	June 16	..do.....	22	Oct. 15	Soft.
<i>Pyrus baccata</i>	3	June 7	June 20, none set..	22	Oct. 1	Good.
Transcendent.....	2	..do....	No blooms.....	16	..do....	Do.
Hibernal.....	4	..do....	..do.....	16	..do....	Do.
Hyslop.....	3	June 1	June 25, none set..	12	..do....	Do.
Raspberry.....	2	June 4	No blooms.....	14	Oct. 15	Soft.
Red June.....	4	June 15	..do.....	18	..do....	Do.
Maiden Blush.....	3	June 20	..do.....	12	..do....	Do.
Early Harvest.....	4	June 15	..do.....	18	..do....	Good.
Northwestern Greening.....	5	June 20	..do.....	16	..do....	Soft.
Okabena.....	2	June 15	..do.....	12	..do....	Good.
Yellow Siberian.....	0	June 1	..do.....	8	Oct. 1	Ripe.
Green Sweet.....	4	June 7	..do.....	8	..do....	Good.
Patten Greening.....	2	June 15	..do.....	22	Oct. 15	Do.
Jessie.....	3	June 1	..do.....	12	..do....	Do.
Duchess.....	2	June 7	..do.....	24	..do....	Do.
Walbridge.....	0	June 15	..do.....	20	..do....	Do.
North Star.....	3	June 10	..do.....	14	..do....	Soft.
Orange.....	0	June 4	..do.....	18	Oct. 1	Good.
Jeannette Winter.....	0	June 10	..do.....	16	Oct. 15	Soft.
Dartt.....	2	..do....	..do.....	12	Oct. 1	Good.
Greenwood crab.....	4	June 7	..do.....	14	..do....	Ripe.
Wealthy.....	0	June 15	..do.....	6	Oct. 15	Soft.
Alexander.....	0	..do....	..do.....	16	..do....	Do.
Native crab (<i>Pyrus rivularis</i>)..	0	June 1	June 27, set.....	6	Oct. 1	Ripe.

Condition of apple trees in brewery lot.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
				<i>Inches.</i>		
Strawberry.....	Tips slightly....	June 5	No blooms..	20	Oct. 1	Soft.
Fanny.....	No.....	June 15	..do.....	14	..do....	Do.
Golden Sweet.....	No.....	..do....	..do.....	16	..do....	Do.
Sweet Bough.....	Tips slightly....	June 1	..do.....	14	..do....	Do.
Benoni.....	No.....	..do....	..do.....	6	..do....	Good.
<i>Pyrus baccata</i>	Tips slightly....	June 15	..do.....	18	Oct. 15	Fair.
Orange.....	No.....	June 5	..do.....	14	..do....	Do.

Condition of dwarf apple trees in brewery lot.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
				<i>Inches.</i>		
Tetofski.....	Tips slightly....	June 7	No blooms..	6	Oct. 15	Soft.
Golden Sweet.....	..do.....	..do....	..do.....	6	..do....	Do.
Early Harvest.....	No.....	June 4	..do.....	10	Oct. 7	Fair.
Keswick Codlin.....	No.....	..do....	..do.....	8	..do....	Do.
Yellow Transparent.....	Tips slightly....	June 7	..do.....	8	..do....	Do.

Condition of apple trees, plat No. 2.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
	<i>Inches.</i>			<i>Inches.</i>		
Hibernal.....	2	June 10	No blooms....	8	Oct. 15	Good.
Whitney.....	2	..do....	..do.....	8	..do....	Do.
Red June.....	3	June 5	..do.....	18	..do....	Fair.
Yellow Transparent.....	0	..do....	..do.....	14	..do....	Do.
Transcendent.....	2	June 10	..do.....	18	..do....	Soft.
Northwest Greening.....	0	June 20	..do.....	6	..do....	Do.

Condition of apple trees, plat No. 3, on native crab stock.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
Lowell.....	No.....	June 10	No blooms....	<i>Inches.</i> 18	Oct. 1	Ripe.
Red June.....	No.....	June 15	.....do.....	6	.....do....	Do.

Condition of apple trees in nursery north of creek, 1, 2, and 3 years old.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
Wealthy.....	Tips slightly....	June 1	No blooms..	<i>Inches.</i> 20	Oct. 15	Soft.
Tetofski.....	.....do.....	June 10	.....do.....	18	.....do.....	Do.
Charlamoff.....	.....do.....	June 7	.....do.....	18	.....do.....	Do.
Virginia.....	No.....	.....do.....	.....do.....	12	.....do.....	Do.
Grant.....	No.....	.....do.....	.....do.....	18	.....do.....	Do.
Whitney.....	No.....	.....do.....	.....do.....	16	.....do.....	Do.
Iowa Beauty.....	No.....	.....do.....	.....do.....	16	Oct. 1	Good.
Jenkins.....	No.....	.....do.....	.....do.....	10	.....do.....	Do.
Hibernal on native stock.....	No.....	.....do.....	.....do.....	5	.....do.....	Do.
Seedling apple.....	Tips slightly....	.....do.....	.....do.....	12	Oct. 15	Soft.
Transparent on native stock.....	No.....	.....do.....	.....do.....	10	Oct. 1	Good.
Iowa Beauty (1909 graft).....	Tips slightly....	.....do.....	.....do.....	10	.....do.....	Do.
Mustiala White, summer.....	No.....	.....do.....	.....do.....	6	Oct. 15	Do.
Hamburg Armature, early summer.....	No.....	.....do.....	.....do.....	8	.....do.....	Soft.
Groetscheff, early summer.....	No.....	.....do.....	.....do.....	6	Oct. 1	Good.
Transparent (1910 grafts).....	No.....	July 15	.....do.....	4	.....do.....	Ripe.

CHERRIES.

Cherries have been somewhat more promising than apples. The trees have on the whole made better growth, nearly all of them blooming in the spring and in favorable seasons some fruit has matured. This year none matured. The spring was wet and cold, and although the trees bloomed no fruit was set, or at any rate none matured. As already noted, the varieties named are of the small sour cherry. Heart cherries do no better. Although there are none at the station, there are two young thrifty trees in the town which have bloomed profusely each spring for three years past, but as yet matured only one or two cherries. It is very doubtful if the cherry can be made to fruit in any part of Alaska when grown in the open. If it were grown as espalier trees, trained against a south wall, cherries would doubtless be matured. This is the manner in which many of the south European varieties of fruit are successfully grown in northern Europe, and the method could be employed in Alaska. The table gives the result of the season's growth in our cherry orchard.

Condition of cherry trees.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
English Morello.....	Tips slightly....	June 7	June 15, few set, none ripened.	<i>Inches.</i> 20	Oct. 15	Fair.
Osthcim.....	.....do.....	.....do.....	.....do.....	18	.....do.....	Do.
Early Richmond.....	.....do.....	.....do.....	.....do.....	20	.....do.....	Do.
Dyehouse.....	.....do.....	.....do.....	No bloom.....	20	.....do.....	Soft.

PLUMS.

What has been said of the apples and cherries applies also to the plums, except that it should be noted that none of the trees are large enough to fruit, but to judge from their growth the prospect is not hopeful. There are no stone fruits indigenous to Alaska, and the probability is that since the apple, which is represented here by a native species, has not proved hardy, the plum will do no better. It should be understood that as far as the coast region is concerned the lack of success with these trees is not due to cold weather, but to a lack of warmth during the growing season. It is, however, too early to pass judgment on the plum. The table below must be regarded as a progress report.

Condition of plum trees.

Name of variety.	Winter killed.	Leafed out.	In bloom.	Season's growth.	Leaves falling.	Condition of wood.
				<i>Inches.</i>		
Odegard.....	Tips slightly....	June 7	No bloom...	16	Oct. 15	Soft.
Seedling of Cherry Plum.....	...do.....	...do.....	...do.....	20	...do.....	Do.
<i>Prunus besseyi</i>	4 inches.....	June 15	...do.....	14	...do.....	Do.
Americana Mixed.....	6 inches.....	...do.....	...do.....	20	...do.....	Do.
Seedling of Wyant.....	...do.....	...do.....	...do.....	20	...do.....	Do.
Seedling of Cherry Plum.....	...do.....	...do.....	...do.....	24	...do.....	Do.
Atkin.....	4 inches.....	...do.....	...do.....	24	...do.....	Do.

SMALL FRUITS.

Fortunately for Alaska there are some fruits which do well here. The currant and gooseberry and the raspberry thrive and fruit as well as anywhere on earth. The currant and the gooseberry are both indigenous to Alaska. The red currant is found more or less abundantly in the mountain valleys throughout the Coast Range. It is particularly abundant in Kenai Peninsula, where the writer has seen large bushes loaded with fruit which was much appreciated by the bears, as evidenced by their tracks and their voidings. A dwarf red raspberry grows abundantly in the interior valleys and on the lower slopes of the hills as far north as the Arctic Circle. The writer once was a member of a party of berry pickers less than a degree from the Arctic Circle, and the raspberry was the most abundant fruit. Alaska has other berries equally good. The blueberry of the interior is so abundant in places that the slopes look blue at a distance, and the native cranberry is also found in low, moss-grown thickets in the interior and in the swamps in the coast region.

CURRANTS.

We have for some years propagated and distributed several varieties of currants. Cuttings grow so readily and generally do so well that there is little expense in connection with the effort. Attempts to domesticate the wild red currant have been made, but it is a remarkable fact that apparently it does not do so well under culture

as it does when struggling for an existence along the rocky sides of a mountain creek, where it has to dispute the ground with many other forms of vegetation. Under culture it suffers from a fungus disease and leaf spot which does not attack the cultivated sorts growing alongside. The native black currant, of which there are two species indigenous to the coast region, has likewise been grown under culture. It does fairly well. The cultivated black currant, on the other hand, suffers here from a fungus disease which causes the young shoots to wilt and rot at the tips. It can be controlled by spraying the bushes with Bordeaux mixture and removing and burning the diseased portions.

The following varieties of red currant have been tested:

Red Cross. The shoots made an average growth of 8 inches. The fruit was ripe by the last of August. It is a good currant.

Wilder. Shoots made an average growth of 9 inches and the fruit was ripe the last day of August.

Ruby Castle. This is one of our best currants. It has a large berry. It made an average growth of 8 inches. The fruit was ripe by August 20.

Victoria. Made an average growth of 12 inches and the fruit was ripe August 24.

Fay Prolific. The bushes made an average growth of 10 inches and the fruit was ripe August 25. The berries are large and of good quality.

White Dutch. The bushes grew 12 inches and the fruit was ripe August 25.

The new wood of these several varieties is used each year for cuttings, consequently the bushes are continually trimmed back and do not grow large, but they are thrifty and productive. The native red currant begins growing fully 2 weeks ahead of the cultivated varieties. The fruit also matures earlier than the cultivated. It is more highly colored and the berries are more acid and the bushes less prolific than the cultivated. They have fruited well under culture at Skagway. Here the transplanted native bushes bear very little fruit. Of the black currants the station has the Russian Black, Champion, Lee, the Common Black, and the Native Black currant. They all grow well, but they bear fruit sparingly.

GOOSEBERRIES.

The gooseberry is not so numerously represented at the station as the currant, due chiefly to the fact that it is more difficult to propagate. Like the currant it has been distributed to residents in various parts of the Territory, but less liberally, and to judge from reports the gooseberry does well everywhere. Mr. Wilkus reports that 80 per cent of the green wood cuttings started in the greenhouse in July took root and made nice plants.

For those who do not have a propagating bed the following method is recommended: Saw a barrel in two, knock out both heads, set the half over a gooseberry bush and in the spring of the year fill in with soil, to the rim of the top. The branches will strike roots into the soil. The following spring remove the staves and cut off the rooted branches, which can now be set out as independent plants. Another method is to layer the branches, that is, to bend them to the ground, and put some spadefuls of soil on them, leaving 8 to 10 inches of the tips exposed, but this is rather more laborious and interferes with cultivation. Gooseberries do well in southeastern Alaska, and they can be recommended for general planting. The varieties tested are Smith Improved, Champion, Red Jacket, Columbus, Industry, Triumph, and Whitesmith.

This latter variety is, perhaps, the best of all herein enumerated. It has large, green fruit and is quite prolific. If gooseberries are allowed to ripen thoroughly the acidity will almost entirely disappear, and they make an excellent dessert fruit. It is customary, however, to pull them when about three quarters grown, when they are sour and unpalatable, even after being cooked.

There is a native black gooseberry indigenous to Alaska, the fruit of which grows in racemes, like the currant. Some bushes are being tested at the station. They do not yield well, although the black, hairy berries are palatable and strongly flavored. Like the wild red currant the bushes suffer more from fungus diseases than the cultivated varieties. Gooseberries here do not suffer from mildew, as they do in regions farther south.

RASPBERRIES.

As already stated, the raspberry does well in Alaska. This is true of all varieties so far tried here, but some do better than others. The station has one or more rows of each of the following sorts: Cuthbert, Miller, Turner, Loudon, Fuller, Champion, Superlative. Of these the Cuthbert is decidedly the best. It grows more vigorously and is a better yielder than any of the others. The fruit is late in maturing here. The first berries are usually not ripe until about August 25, and they continue to grow and ripen until the beginning of October. The least desirable among those named are Miller, Loudon, and Superlative, the latter being a yellow fruited variety with a small berry. The Blackcap raspberry and the blackberry are both complete failures in Alaska. It is useless to attempt to grow them.

HYBRID RASPBERRY-SALMONBERRY PLANTS.

Reference has been made to these hybrids in former reports. Something useful was expected from them, but the plants which have so far fruited have shown no improvement on either the raspberry or the salmonberry. Many of them appear to be sterile in the sense that

they show no fruit at all. Only 8 plants bloomed and only 2 bore fruit, and these only a few berries each, which were apparently a compromise between the raspberry and the salmonberry in all respects. Several hundred seedlings are coming on, but it is a question whether it is worth while to continue this cross.

There is one remarkable fact about these hybrids, and that is the almost infinite variations that they show from both parents. About 30 per cent of the plants resemble the salmonberry in vigor. They grow to be great towering bushes, with large leaves, which vary greatly in their divisions and cuttings of the leaflets. In the same row are found plants of the same age which are small weaklings, not more than 2 feet high, and between the two extremes are many intermediate types. As to form of leaf, apparently no two plants are alike. These variations form interesting material for study, but they have so far given no practical returns.

ORNAMENTALS.

Some common ornamental bushes are under culture for study and propagation. In point of value the Japanese rose (*Rosa rugosa*) is in the first rank. It grows well here, and when fully established it is a free bloomer of large, sweet-scented, very ornamental, but single, red roses. Their chief fault is that the blossoms last but a few days, but the bushes are ornamental even without any flowers, and the large, brilliant red-rose hips which follow the blossoms are also very attractive. It is one of the ornamental plants which may be depended on to thrive throughout the coast region of Alaska.

Tartarian honeysuckle. Next in point of value come several varieties of the Tartarian honeysuckle. They bloom freely, grow with moderate vigor, and apparently feel at home in this climate.

The snowball (*Viburnum tomentosum*). A few bushes have been grown for some years, but they are not at home here, although they bloom in favorable seasons.

The climbing honeysuckle. The station has one plant which grows well during the summer and blooms in August, but freezes back each year unless it is protected during the winter. It can not be recommended for general planting.

The Siberian pea tree (*Caragana arborescens*). A few bushes have maintained a somewhat precarious existence for some years. They are hardy, do not freeze back, but they do not grow vigorously, and have so far produced no bloom.

Spiræa thunbergii. A single small bush has maintained itself without special protection, and bloomed freely every summer.

Berberis sp. is hardy and blooms regularly, producing scarlet berries.

Sambucus pubens, the red berried elder, is a very ornamental shrub which does well in the whole coast region. It has a profusion of white

flowers in cymes the last of May and beginning of June, followed by bunches of red berries, which are ornamental while they last, but the birds, particularly robins and the little beach crow, eat them before they fully mature.

Mountain ash is an ornamental tree in the coast region, producing an abundance of clusters of red berries.

PERENNIAL FLOWERING PLANTS.

A number of varieties of this class of plants are being tested in a small way. Assortments can be arranged which will bloom from earliest spring until winter sets in. The following bloomed here the past summer in about the order they are named. It is pertinent to add that the experiment station has none for distribution. Plants can be obtained from florists and nurserymen.

Rock cress (*Arabis albidia*). A low growing, spreading plant with an abundance of white fragrant flowers from early spring until late summer.

Forget-me-not (*Myosotis palustris*). A low plant with small blue flowers in bloom by May 15.

Pansies. In bloom in May and continues all summer. They attain perfection in this climate and can be grown both indoors and outdoors equally well. Perhaps no other flowers give so rich returns for the little care required. At this place slugs are their chief enemy.

English daisy (*Bellis perennis*). Hardy in southeastern Alaska; blooms in May and June. Suitable for borders.

Siberian iris (*Iris siberica*), blue flag. Blooms in May, June, and into July. A related species has been seen wild on the Kenai Peninsula in bloom the last of August. The Japanese iris has been tried and proved a failure.

Iceland poppies (*Papaver nudicaule*). In bloom from early June till September. The plant is perennial and it propagates itself freely from seed.

Bleeding heart (*Dicentra spectabilis*). Hardy here. In bloom by June 15; requires good soil to do well.

Primrose or cowslip (*Primula officinalis*) and *P. vulgaris*, English primrose. Both do exceptionally well. In bloom the last of May and continues for two months.

The following species were in bloom last summer during July and August.

Columbines in many varieties. Perfectly hardy and mature seed. Two highly ornamental species are indigenous to Alaska.

Aquilegia canadensis flaviflora with light-yellow flowers, and *A. canadensis* with scarlet flowers.

Pinks. *Dianthus* sp. in many varieties. The garden or clove pink is especially successful.

Phlox spp. Several species and many garden varieties are hardy and do remarkably well. Of those in bloom last summer, the variety known as Miss Lingard was especially noteworthy. Each stem produced an immense thyrsus of large fragrant white flowers, which lasted upward of four weeks.

Milfoil (*Achillea millefolium*). The varieties Cerise Queen and the Pearl were fine.

Cranesbill (*Geranium sanguineum*) bloomed freely, but the plant is not strikingly pretty.

Foxglove (*Digitalis purpurea*). This well-known plant thrives well and blooms freely in the coast region.

Lilly (*Lilium elegans*). It was much satisfaction to learn that this species of the lily would thrive and bloom in southeastern Alaska. The flower stem is about 2 feet high and bears a large orange, scentless flower.

Camomile (*Pyrethum roseum*). An improved variety of the camomile, with large daisy-like flowers.

Armeria (*A. laucheria*). A low grass-like plant with small heads of red flowers, which remind one of white clover heads, except for the color.

Aster (*A. alpinus*). A purple aster; not large or showy.

Oriental poppies (*Papaver orientale*). A large crimson flower; very showy.

Buttercup (*Ranunculus repens*). A species with large bright-yellow flowers introduced with seed from Europe. Forms bright patches in lawns.

Turtlehead (*Chelone glabra*). A low plant which produced large white flowers in September.

Harebells (*Campanula persicæfolia*). A tall plant which yielded a profusion of blue flowers the last of August. A related species grows wild on some of the islands of Sitka harbor.

Scarlet lychnis (*Lychnis caledonica*). Bears clusters of scarlet flowers in September.

Evening primrose (*Oenothera speciosa*). A sulphur yellow flowered variety which bore clusters of large flowers in September.

ANNUAL FLOWERS.

There are a large number of annuals which may be grown successfully in Alaska, of which the following are the leading sorts. They have done well at the station.

California poppies. There are few plants which add so much color to a garden as a bed of these yellow and bright orange flowers.

Sweet peas. Should be sown early.

Shirly poppies. Very fine. Are an assured success, giving a mass of color from midsummer.

Nasturtiums. Thrive best against the south side of a house or fence.

Cornflower, aster, alyssum, wallflower, nemophila, summer chrysanthemum, French marigolds, mignonette, and clarkia have been tested with more or less success.

BULBS.

Hyacinths do not thrive well out of doors at any time. Tulips and narcissus bloom fairly well when the spring and early summer are dry and reasonably warm. Crocuses do well at all times and continue to bloom year after year. It is, however, possible to get highly satisfactory results from bulbs grown indoors. Procure large, well-developed bulbs from reliable seedsmen. Plant them in October in pots, boxes, cans—almost anything that will hold 6 inches of earth will answer. See that good drainage is afforded through holes in the bottoms of the boxes or pots. Set the bulb so that the tip will be just below the surface of the soil; water them and then set them in a dark cool place for two months, as, for instance, in a cellar, or they can be buried in the earth. They must not freeze, however. A temperature ranging between 40 and 50° F. is most suitable. Roots are formed during this time. In the course of seven or eight weeks they can be placed in the living room where they will bloom. Hyacinths and narcissus are more satisfactory than tulips. If hyacinths begin to show color before they send up stem and leaves, set a tube of dark paper over them, open only at the top; they will then reach up for the light. By good management it is possible to have bulbs bloom in the house from the middle of January until spring. All varieties of narcissus are especially amenable to this treatment. *Narcissus polyanthus*, or Chinese lily, is one of the most satisfactory bulbs for indoor blooming. They grow and bloom well in water. Fill a glass or bowl with water and set the base of the bulbs in it, supporting it with pebbles if necessary, and set it in a warm room with even temperature. It will bloom in six to eight weeks.

WORK AT RAMPART STATION.

The original plan for work at this station has been adhered to strictly, namely, the testing and breeding of varieties of grain, at the same time gradually extending the clearing and adding to the equipment until the station is fully prepared for this line of work. The growing of vegetables, testing of potatoes, etc., are minor experiments. The past year only 1 acre of land was cleared and added to the cultivated area, for the reason that the energy and funds which could be spared from the regular work were expended in the erection of a barn, which was necessary. Up to the present this station had no barn, only a rough log stable and implement shelter of the same description. As the area under culture has been extended the area in

grain has increased and the problem which had to be met was to find storage room and a place to handle the products, hence a structure was put up last summer to meet this necessity. It is only 18 by 30 feet in size and 14 feet to the eaves, and built of 6-inch squared timbers. On each side of the main structure is a shed 16 feet wide, which is intended for the shelter of implements and for the storage of grain in the sheaf. The roof of the main building and the roof and sides of the sheds are covered with corrugated iron, which was the cheapest material, considering durability. The ground floor of the main building will be used chiefly for a workshop and tool house, while the upstairs will be used for a granary. The grain-breeding experiments are proving a success. Attention is called to Superintendent Gasser's report in which he gives a condensed statement of the results that have so far been attained. While all the varieties of the grain that can be obtained which give any promise of having value for the interior of Alaska are being tested, it is hoped to accomplish more by developing new varieties. So far but few sorts have been found which can be said to answer the required conditions. One of these is the North Finnish Black oats. It came from a region very similar to the interior of Alaska, but even this variety may possibly be improved. The work so far has been with barleys, partly because barley is easily manipulated, and partly because of inability at present to take up work with other kinds of grain; but this will come gradually. What is needed is a variety of grain which will mature fully in 90 days between the date of seeding and the date of harvest (this year there were only 84 days between killing frosts in spring and fall) and which shall at the same time be a good yielder, produce large plump grain, and have a stiff straw which can withstand the occasional heavy storms without lodging. Moreover, in the barleys a beardless variety is being sought so that it can be used for forage in the sheaf. It is becoming more and more evident that barley will be the most important grain which can be raised in the interior. It has a wider field of usefulness than oats. Barley meal can be used, and in northern European countries is used, very largely as a flour for domestic use. The housewives do not make bread of it, but they use it for all other culinary purposes for which flour is used. Barley is an excellent stock feed. The dairy cows of northern Europe are fed largely on ground barley and so are the work horses. The pigs from which the best bacon in the world is made are fed very largely on barley, along with the by-products from the dairy. Barley matures in a shorter season than oats, rye, or wheat, and is therefore less liable to failure from early fall frosts. Having all these points in view it appears certain that barley must play an important rôle in the husbandry of this northland, and therefore attention is first being given to the development of varieties which shall meet

the desired conditions in the fullest degree. Some interesting results have already been attained. Some of the crosses already made give promise of usefulness. The crossing, hybridizing, and selection will be continued and extended indefinitely.

THE CROSS-BRED BARLEYS.

In Plate V (p. 46) are reproduced typical heads of most of the varieties which were used in the crossing in 1909. The result of these crosses, obtained in 1910, is shown in Plate VI (p. 46).

These parent varieties all possess one or more qualities which are desirable, but they also show defects, and the crosses are made to obliterate the defects and emphasize the good qualities if such should prove possible. Earliness is of prime importance. The little Pamir has this quality preeminently. Its home is in the Himalaya Mountains at an altitude of 11,000 feet. It will mature in less than 90 days from seeding, but the straw is very short and weak and the heads are small, and it is consequently a very light yielder; and each of the others have their good qualities and their defects. Now as to the results. Series 1a is not represented in the photographs because nothing was produced that was deemed worthy of perpetuation.

Series 2a is a cross between Hull-less 12709 and Finland 582 (the latter a bearded variety which is not represented in these photographs). The former was the mother plant. The heads of this series are of good size, but they differ in the density of the spikelets and in the length of the awns. They show a decided compromise between the bearded and beardless parents.

Series 3a is a cross between Hull-less 12709 and Swedish 19557. The heads shown are typical specimens of this cross. It will be noted that there are no two alike; that they all have elonged glumes or abbreviated awns, and that they differ in the density of the spikelets and in other respects.

Series 4a is a cross between Chittyna and Oderbrueker. The heads are all likewise beardless, and No. 1 is a particularly fine head.

Typical heads of series 5a, which is a cross between Chittyna, the mother plant, and Abyssinian, No. 361, a bearded variety, are shown. It is one of the best raised at the station. The heads are all of good size and promising.

Other crosses were made during the past summer, the seeds from which will be grown next year.

OATS.

Several varieties of oats are being tested at this station, some of which are very promising. As yet no crosses have been made, but this feature will be taken up also. In the meantime efforts are being

made to improve existing varieties, which are already doing well, by selection, the earliest and best heads being chosen and seeded by themselves, and the selection from this strain continued from year to year.

WINTER GRAIN.

So far only small plats have been devoted to tests and experiments with winter grain. Only a little winter barley matured and was ripe by August 24. Kharkov winter wheat, on the other hand, came through the winter with a 90 per cent stand, and matured a fair crop. All the varieties of winter rye so far tried have lived through the winter and matured grain, ripening in the latter part of August.

Winter emmer, a grain introduced from Russia, has been tried for several years with poor success. Last winter none survived, and experiments with this grain will be discontinued.

It may be mentioned that winter wheat and winter rye will undoubtedly be the chief winter grains grown in the interior of Alaska, and probably about 90 per cent of the winter grain will be rye. Winter wheat can be grown, but it is less reliable and less productive than rye. Spring wheat will probably always remain a precarious crop which will fail in the majority of cases. A number of the earliest and hardiest varieties that could be found have been tried and none of them has been satisfactory. The season is too short. While the grain grows well and develops normally, it is nearly always injured by fall frosts before it is fully matured. It appears evident that if spring wheat is ever to be a success a new variety must be developed which will mature in a shorter season than any variety yet tested. This is one of the problems for future solution.

POTATOES.

The potato is the most important vegetable grown in any part of Alaska. It is of great importance that varieties should be found which will develop normally and yield a fair crop in the short season between frosts. For this reason many varieties have been tested at the Rampart Station, the least promising discarded, and the work continued with those which promise well. The six best varieties are the following, and they take rank in about the order named: Extra Early Eureka, Extra Early Pioneer, Gold Coin, Extra Early Triumph, Irish Cobbler, and Early Ohio.

The sprouting experiment with potatoes which has already been described as carried out at Sitka Station was repeated at Rampart (Pl. VIII, p. 52). The plants in the sprouted row were all in bloom when those in the row not sprouted showed no blooms whatever. Moreover, the tops in the former were much more vigorous. This difference continued all through the season, the sprouted row yielding

210 pounds, while the same number of hills in the unsprouted row yielded only 174 pounds. From equal length of rows of the Extra Early Eureka the sprouted row yielded 120 pounds and the not sprouted row only 71 pounds. On a larger scale the same variety produced similar results in that 65 sprouted hills yielded 280 pounds, while 65 unsprouted yielded only 166. These results and those obtained at Sitka mutually support each other, and it is recommended that all Alaska potato growers sprout their seed before they plant, thereby giving the plant a longer growing season.

FERTILIZER EXPERIMENTS.

Some fertilizer experiments on barley and oats were undertaken at the Rampart Station with a view to ascertaining what elements the soil needs most. The fertilizers were sodium nitrate, superphosphate, potassium sulphate, and stable manure, each plat being compared with an unfertilized plat seeded with the same variety of grain and in the same manner. The result shows that when the three important elements of plant food are mixed in proper proportion the yield is better under normal conditions than when only one of them is used, and the variations which always occur in field fertilizer experiments also occur here. The important point is that the soil needs fertilization. It has been mentioned in former reports that whenever the brush and moss and dead vegetation of all kinds which cover the surface have been thoroughly burned then the soil usually yields a large first crop, but whenever, on the other hand, the surface has not been well burned the crop is usually poor. There are two reasons for this; one is that the ashes which result from the burning are a valuable fertilizer in that they furnish plant food immediately available, and the other reason is that when the burning is not well done much of the moss remains, which makes the soil acid, and the acid is a poison to the crop. Now, it has been demonstrated in these experiments that even though there has been a thorough burning, followed by a heavy yield, the fertility which resulted from the added plant food in the ashes soon becomes exhausted, and to continue with good crops fertilizers must be added.

Alaska soils are not rich. Frequently statements from travelers and other observers are seen to the effect that the soil must be exceedingly rich in plant food to judge from the height of the grasses and the luxuriance of some of the vegetation, but such a conclusion is not warranted. Grasses will sometimes grow rank on an almost barren gravelly soil because they have plenty of moisture and they are adapted to the climate and to the conditions. The virgin soil in the interior is everywhere frozen to an unknown depth or to bedrock. In this state of refrigeration there can be no activity of the organisms which aid in the formation of mold and the manu-

facture of plant food from the organic matter, and what plant food the soil may hold is in a large degree insoluble, and therefore not available for plants except by a long and slow process of weathering. For this reason the soil soon becomes exhausted, and fertilizers are necessary. This is particularly demonstrated by the results at the Fairbanks Station the past season, which will be referred to later.

Now, the problem is how to render the soil fertile. Stock breeding in the interior will almost certainly be limited to the few animals on each farm necessary for domestic use. The feeding period is too long to make it practicable to maintain a herd of cattle on even a moderate scale. It will be a difficult matter to provide the feed. For this reason stable manure will never be abundant in that country. Therefore, some other source of plant food must be sought, and it is hoped that this source may be some species of legume which is hardy enough to withstand the winters, which will yield fair crops of forage, and which at the same time has the property of enriching the soil with nitrogen, as do the clovers and alfalfas in more southerly latitudes.

Some of the alfalfas discovered in Siberia by Prof. N. E. Hansen, of South Dakota, are being tested at Rampart Station, but as yet there is nothing definite on the subject to report. In the meantime it is interesting to note that both red and white clover and three varieties of alfalfa were grown at the Rampart Station with moderate success. That is, all survived the winter of 1909-10, and one of them, the white clover, matured a little seed, but the red clover and the alfalfas matured no seed. In the case of the clovers, and particularly in the case of the red clover, this survival must be considered accidental. There was a heavy blanket of snow to protect them, which can not be counted upon every year. As to the three alfalfas, *Medicago falcata*, Grimm alfalfa, and Montana alfalfa, all three are new and their possible value is unknown.

STATION NEEDS.

The buildings and equipment are supplied gradually, inasmuch as only a little of each appropriation is available for these purposes. There are, therefore, still many things needed to properly equip the station. The building which has already been mentioned will be completed next year. Another pressing need is a root cellar in which to store potatoes, roots, and vegetables without danger of frost. There is a little cellar under the cottage, but, with the extension of the work, this cellar has become inadequate to meet the requirements, and a frost-proof cellar must be constructed next summer. Another important requisite is a small power boat to use in crossing the Yukon. The station lies across the Yukon from the town of Rampart. All the river traffic lands, of course, on the town side. It is therefore necessary to cross the river for the mail, for

supplies, and for every purpose when communication with the town is necessary. As the work grows the necessity for these trips increases. Heretofore the river has been crossed in a little flat-bottomed row-boat, but aside from being attended with danger when the current is swift and the wind is strong, as it often is, this little boat no longer meets the requirements. Products have to be carried over to market and supplies carried from the town to the station. Those who are not familiar with the river may not know that the current is so swift that in attempting to cross it a boat is swept a long distance below the landing place in spite of the best one can do with a pair of oars. A power boat which can stem the current is needed, and it is recommended that authority be granted for the purchase of a boat at least 20 feet long and equipped with a good gasoline engine of from 4 to 6 horsepower.

Another requirement is the building of a new stable and hay barn combined. The temporary log barn, can, however, be made to answer the purpose for another year.

WORK AT FAIRBANKS STATION.

The progress at Fairbanks Station has been steady but slow. There has been no deviation from the plan originally outlined. The purpose is to clear enough land at this station so that farming can be done on a moderately large scale and demonstrate whether or not plain farming, that is the growing of grain and forage with the rearing of some live stock and some incidental gardening, can be made to pay for the ordinary farmer. Pursuant to this plan land has been cleared in places where the timber and underbrush were light, in order that as large an area as possible could be put under culture at the least expense. Wages for common labor are so high at Fairbanks, namely \$7.50 a day, that only about one-fourth the amount of work is done for a given sum which could be accomplished for the same sum in the States. In selecting the land which could be most easily cleared the clearings have necessarily been scattered, so that plowed ground is now located in four different isolated fields, some of it being on the level lowland, and other portions on the hill slopes. This arrangement while it has its disadvantages has not been an unmixed evil. It has demonstrated very forcibly that the level land at the base of the hills is much more susceptible to frost than are the hillsides. This condition furnished a striking object lesson the past season. Of the 11 acres planted to potatoes, part was on the flat near the railway and other portions on the higher ground. Those on the flatland were killed by frosts, while those on the uplands were only partly injured, and some escaped injury altogether.

But the clearing of the lightest timbered land first has proved another thing, namely that the soil is poorest wherever the native

vegetation is lightest, and vice versa, the best soil is found where the heaviest timber grows. This fact has also had ocular demonstration the past season. The greater part of the clearing is, for the reason named, located on a gentle north slope. A portion of this clearing has raised two crops—the first in 1908 and the second in 1909. In 1910 this land was seeded to grain with the result that it produced practically nothing. The soil seemed to be exhausted of its fertility, and this condition being augmented by a dry and cool summer, the grain crop was so light as to be almost a failure. On the other hand, the small area which has been cleared in heavy timber produced a good crop. Such lessons should benefit the future Alaska farmer, in that he may, by taking warning, avoid similar mistakes.

Some additions have been made to the equipment, notably a self-binder and a hay tedder. After meeting these expenses the funds did not permit of clearing and breaking more than 10 acres; but clearing the brush off some 30 acres more, so that it could be mowed, gives practically 100 acres. Owing to the partial crop failure above-mentioned, there is a shortage of feed for the station teams. This situation emphasizes the necessity for clearing enough meadowland so that the grass can be cut with the mower, and since native grasses yield very light crops when cut year after year, it will not be safe to count on more than a third of a ton to the acre. To cut grass by hand here and there in open glades is an expensive operation, considering the wages paid.

KILLING FROSTS.

There were killing frosts at the Fairbanks Station the past summer on July 31 and August 5, 9, 20, 29, and September 5. It is the first time that this station has had frost in July and as early as August 5 or 9. The summer in the Tanana Valley was cool and cloudy, and in the first part of the season the rainfall was light. These conditions were, of course, very unfavorable. It is to be noted, however, that the frosts which occurred prior to that of September 5 did not injure the grain, but they did injure the potatoes on low ground.

GRAIN CROPS.

The following grains matured: North Finnish Black oats, oats No. 637, and Sixty-day oats. Barleys which matured were Hansen No. 279; Manshury; barley No. 19851, a beardless and hull-less variety; barley No. 19852, also a beardless barley; and even Hannah barley, a two-rowed rather late variety, matured on a small plat favorably situated.

Spring wheat was a failure. The varieties tried were Selected Red Fife, Wild Goose, and Romanow. The two former are favored varieties in Manitoba, Canada, and seed was secured from that

source, but it was not successful here. The Romanow is a Russian variety which has been grown for some years at the several experiment stations with more or less success. This year it was a failure. Mr. Neal reports that a small patch of spring rye matured, but buckwheat was killed by the frost of August 20.

Winter grain was more successful. It matures earlier than spring-seeded grain, and if it survives the winter is therefore a reasonably sure crop as regards early fall frosts. Kharkov winter wheat was partially winterkilled, showing only about 50 per cent stand in the spring, but that which survived was ripe by August 15. Winter rye No. 19556 survived the winter in better condition than wheat, and was ripe by August 10. Two other plats of fall rye survived the winter and matured grain by August 10. Black Winter emmer was a failure here as it was at Rampart. Emmer is of no value for Alaska. Tennessee winter barley was practically all killed by frost during the winter, showing only a 10 per cent stand in the spring; however, the portion which survived matured.

CULTURE OF GRAIN.

It is pertinent to emphasize again several points which have been referred to in former reports and touched upon elsewhere herein. They may be enumerated thus:

(1) Select the earliest maturing varieties which can be found. Late-maturing grains can not be depended on to mature. They are of value only for hay.

(2) Plow the ground intended for grain in August. Fall plowing has many advantages. Turned up in rough furrows, the soil is left exposed to the elements during the winter and becomes more friable. Again, time is saved in the spring in that it is not necessary to plow it. It is quite sufficient to work it up with the disk harrow or even with an ordinary harrow in order to level the surface enough for the grain drill.

(3) In fall plowing the ground, let the furrows run up and down the hills. The advantage of this is that the snow water runs off the more readily. It must be remembered that the ground is frozen for several feet. When the snow melts the water can therefore not soak into the ground. It must run off the surface, and provision must be made so that it will run off. If it remains between the furrows to be evaporated by the sun, time is lost and seeding will be late.

(4) Early seeding. Sow the grain as early in May as the soil can be put in proper condition. The season is short at best, and advantage must be taken of every single day to insure that the crops shall mature, especially in unfavorable seasons.

As for winter grains, they should be seeded not later than the first week in August, and it is preferable to sow them the first day

of August or even during the latter part of July in order that the grain may have a good start and form a strong root system before frost stops further development. This means that winter grain must occupy the ground between 12 and 13 months from seed time until harvest, and it also means that either the land must be sown to a crop in spring which can be harvested or plowed under in time for the seeding of the winter grain, or else that the land must be kept fallow during the summer until seed time, in which case it would yield a crop only every other year. This leads to the consideration of another point, namely:

MAINTENANCE OF FERTILITY.

As already stated, generally speaking, Alaska soils hold but a limited supply of available plant food. They soon become exhausted, and the problem is how to increase this limited store of plant food. There are two ways. One is to raise a crop on the land only every other year and summer fallow the intervening years. That is to say, give nature time to act upon the soil and gradually change the plant food in the soil from its insoluble to a soluble form. This is the practice followed in the famous wheat-growing districts of eastern Washington, Oregon, and Idaho. The land is ordinarily cropped only once in two years, and the famous crops of wheat which one reads about are raised on fallow land. The other method is to apply fertilizers, and as far as interior Alaska is concerned this will be an expensive form of maintaining fertility. If concentrated fertilizers are shipped in, the freight will at least double or more than double the original cost of the material. Stable manure, the best of all fertilizers, can be had in only limited quantities. One method of fertilizing is to plow under green crops, whether it be grain, rape, buckwheat, grass, clover, or anything that can be grown for the purpose; still another method is to maintain fertility by the cultivation of legumes in a well-ordered rotation. The Alaska farmer will probably have to resort to all of these, in accordance with circumstances, but it is especially the last method—that of growing legumes—which will receive the attention of the experiment stations. The problem is to find the legumes which are suited to the purpose. It is hoped that they have been found in the several hardy alfalfas introduced by Prof. Hansen, but whether this hope is to be realized has yet to be demonstrated. If these alfalfas fail, probably white clover may prove serviceable, or perhaps alsike clover may be preferable, if sufficiently hardy, because a more vigorous grower. These clovers will survive in the interior if protected by a normal snowfall which is not blown off. The seed for an acre should not cost to exceed \$3, and if the crop is seeded in the spring of one year and plowed under for winter

grain in the latter part of July the following year, it should not only prove a valuable fertilizer to the soil but should have furnished good pasturage in the meantime.

Still another way of preparing the soil for grain is to rotate with potatoes. A potato crop does not add to the soil fertility. On the contrary it exhausts the soil, but it has the advantage that if properly cared for the soil must be cultivated several times during the season, ending with a thorough stirring when the potatoes are dug, which operations have in a less degree the same effect as summer fallowing.

As the work at the experiment stations proceeds, problems unfamiliar to the farmer in more southern latitudes constantly come up for solution, and it is the province of these experiment stations to solve such problems if they can.

POTATOES.

About 11 acres were planted to potatoes at the Fairbanks Station the past season. However, only about $3\frac{1}{4}$ acres on newly cleared birch land on the hillside with a southern exposure, gave a satisfactory return. The rest of the potatoes were so injured by frosts that they scarcely returned the seed planted. In potato culture as in grain culture only the earliest varieties should be selected. The late-growing sorts, favorites in more southern latitudes, although they may be heavy yielders, are not suited to the country. As already intimated, low, flat land should not be chosen for potatoes, because of its greater liability to injury from frost, nor is a north slope even on higher land desirable for potatoes. They need all the sun and warmth they can get. The gentle slope of a hill facing south is perhaps the best situation that can be chosen. But the southern slopes are usually heavily timbered and therefore expensive to clear. It has been found that land which grows a fine crop of birch timber is the best soil to be found anywhere in the interior. Birch land is usually a light loam, not gravelly, with a clay subsoil. The successive crops of leaves have accumulated and decayed about the roots of the trees until an amount of humus has been formed that is of great benefit to the soil. Land covered with spruce timber, the trees not being deciduous, has not been enriched with an accumulation of organic matter. The potatoes should be sprouted.

If seed be plentiful the tubers should be planted whole, and they should be planted as early as the ground can be put in suitable condition. The spring and early summer are often dry in the interior and the potato patch should be harrowed frequently to conserve the moisture. When they are 4 or 5 inches high the soil should be drawn lightly to the vines and this process should be repeated at least twice during the summer. It is an important point to have the tubers so

well covered with earth that a sharp frost will not reach them if such frost should occur, as it is liable to do, before they are dug about the middle of September. Mr. Neal mentions the three varieties which in his judgment give the best results. They are Eureka, Gold Coin, and Red Early Ohio, and he emphasizes the fact that the latter is of better quality than either of the other two, although it does not yield quite as well. Gold Coin is mentioned as among the best yielders at all three stations, Sitka, Rampart, and Fairbanks. It has been a favorite potato at the Sitka Station for some years.

BUILDINGS.

The original plan contemplated the erection of a frame cottage for the superintendent. This plan was deviated from because of lack of funds to put up such a building when work began, and as a shelter was absolutely necessary from the start a log cabin was built instead. This cabin has now been enlarged to four rooms and a cellar has been excavated under it. While the quarters are cramped for a man with a family they will answer the purpose for the present, and the erection of the proposed cottage will be indefinitely postponed.

A blacksmith shop and tool house, 16 by 24 feet, has been built, also a propagating house 12 by 20 feet. The log barn has been calked and lined on the inside with lumber to make it warmer, but the barn is too small and material has been purchased to lengthen it by 30 feet so as to afford shelter for all the hay and feed that will be needed during the year. This extension will be built the present winter. It is also necessary to dig another well, which it is also planned to do this winter. When this work is completed no more buildings will be needed at the Fairbanks Station for the present.

The station is also reasonably well supplied with implements, and the funds which have heretofore been required to meet expenses for buildings and equipment will be used for the clearing of land. In two years' time there should be a modern farm of at least 150 acres under culture in addition to the necessary native meadowland for haymaking.

WORK AT KODIAK STATION.

The writer spent three weeks at this station in the latter part of May and beginning of June. Superintendent Snodgrass has the work of developing the station well in hand and satisfactory progress has been made. In connection with this visit, acknowledgment is made of the courtesy extended to the writer by the Revenue-Cutter Service for transportation.

Since the last report the dairy building at Kodiak has been completed. An additional barn 20 by 40 feet was erected at Calsinsky Bay; also a stave silo 16 feet in diameter and 26 feet high, with a capacity of 100 tons, and more than a mile of fencing was built. Land

was cleared for the mower, and a total of 135 acres is now available for mowland.

Three head of young horses were purchased at a very reasonable price, one a 4-year-old gelding, to take the place of an old mare, and a pair of 2-year-olds. These horses will weigh between 1,100 and 1,200 pounds when mature, which is a rather lighter weight than desired, but they will answer the purpose, and by purchasing native-born horses the risks and expense of transportation were avoided.

SHEEP.

Forty head of sheep from a neighboring ranch were purchased at \$15 each. These sheep were natives, having all been lambed in Alaska. Thoroughly acclimated stock was thus obtained without the risks incident to transportation and a change of climate. All the ewes were in lamb and at the close of the season the flock had increased 75 per cent. The sheep sheared an average of 7.4 pounds of wool per head. The wool was shipped to the Hibbard-Stewart Co., of Seattle, who, however, offered only 13 cents a pound. It was coarse wool but clean. Fine-wooled sheep will not thrive in that climate. A fine, close wool holds too much rain water, while a coarse wool permits the rain to drain off readily. These ewes were heavy bodied grade Cotswolds. They are good mutton sheep as well as shearing heavy fleeces. Only inbred rams could be purchased there and it therefore became necessary to select suitable rams for this flock. Two such were found in the State of Washington, one a 2-year-old pure-bred Lincoln ram and one a yearling pure-bred Cotswold ram. These rams were safely landed at Kodiak and there is now a good foundation for a useful flock of sheep.

CATTLE.

At this writing the station herd numbers all told, 69 head, 59 of which are pure-bred Galloways and 10 are grades. Twenty pure-bred calves were dropped during the year, 9 heifers and 11 bulls. There is but little demand for bulls for breeding purposes; most of them are castrated and sold for beef when an opportunity offers. The grade cattle will all be sold for beef except two cows, which are fair milkers, and will be placed in the dairy herd when one is established. The herd was in excellent condition, and Mr. Snodgrass reports that the cattle were fat as they went into winter quarters. They have lived exclusively on the native pasturage. No mistake was made when the Galloway was selected as the breed for this country. They are fine rustlers and maintain themselves on the hilly pastures surrounding the station better than any other cattle could do. They are par excellence the cattle for Alaska. Taken as a whole, the breed lacks but one quality to meet all the requirements of Alaska settlers—they are poor milkers.

DAIRY WORK.

Work in the dairy has been postponed until a few good milkers are added to the herd. The dairy building is now finished. The necessary equipment is at hand, but there is a lack of milch cows. The three or four head which could be classed as milkers are not enough to make the enterprise practicable. It is earnestly recommended that authority be granted for the purchase of ten or a dozen head of the best milking Galloways which can be found among the herds in the States. The sooner this purchase is made the sooner this branch of the work can be begun. There will be a good market for the products in the near-by towns, since all the butter and cheese now consumed are shipped up from Puget Sound. Once established, the dairy will more than pay for itself.

STATION NEEDS.

The station still requires many things before it is fully equipped for its work. Among these is a dwelling for the superintendent at Kodiak, a 100-ton silo for the dairy herd to be established at Kodiak, and a good well.

At Calsinsky Bay (15 miles from Kodiak) where the main herd is located, there is needed an enlargement of the house for the herdsman, which at present has but two rooms. Provision should be made so that at least one man can keep a family there. An ensilage cutter and elevator is needed to handle the silage more economically and a 6-horsepower gasoline engine should be provided to run it. The station has an excellent 12-horsepower standard engine in the launch, which is used in going back and forth from Kodiak to the bay, but the launch is too small. It was the best that could be had for the funds available at the time of the purchase, but it has proved to be inadequate for the work. It is an old hull, 22 feet long, and 6-foot beam. The engine itself is a good load for it. There is a stretch of open sea which must be crossed, and in rough weather this launch is unsafe. A hull about 36 feet long, with 8 or 9 feet beam should be provided for this engine, and it should be schooner rigged, so that it can be sailed in the event of a breakdown of the engine while at sea.

A new scow or lighter is needed, large enough to carry ten or a dozen head of cattle, as the old one was torn from its moorings last November during a heavy storm, driven on the beach, and broken to pieces.

But the greatest need, as above stated, is ten or a dozen extra good milking Galloway cows. Such cows can be found, but they are scattered through many herds. The experiment warrants the purchase and assembling of these cows, so that the dairy work may

begin. Of course this can be developed from the cattle on hand, but the process will require so many years that the object in view will be practically defeated by the delay.

FEED.

An abundance of silage and hay was put up for the keep of the herd through the winter. This year it has been, and hereafter will be, necessary to purchase only some grain feed to help individuals now and then through a crisis, and when land suitable for the raising of barley and oats is cleared and broken it is hoped to reduce this purchase of feed to such by-products as bran and oil meal.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Superintendent.*

THE WEATHER.

To the agriculturist everywhere the weather is matter of chief concern. Here in the rigorous north where crop production is attended with some uncertainty this is all the more true. Nearly every tourist wants to know how cold it gets here, as if that were the paramount question, whereas the time, not the intensity, of cold is what concerns most those who grow things in interior Alaska.

The following table shows the time of the late spring and early fall frosts and the number of days between, the average for 5 years being 95. As a rule these late spring and early fall frosts are light, leaving grain uninjured, though often injuring somewhat the tender plants as potatoes, buckwheat, etc.

Length of growing season.

Years.	Last spring frost.		First fall frosts.		
	Date.	Temperature.	Date.	Temperature.	Days between frosts.
		^o F.		^o F.	
1906.....	May 20	23	Aug. 25	25	96
1907.....	May 21	25	Sept. 6	24	107
1908.....	May 19	30	Aug. 31	29	103
1909.....	May 29	30	Aug. 24	27	86
1910.....	May 28	28	Aug. 21	27	84

Last year following the light frost in August, the weather was mild until September 16, freezing weather continuing from that date. Again this year the fall weather was fine with a like exception, but the first heavy frost came 10 days earlier than last year.

The winter of 1909-10 was typically Alaskan, cold and, in the exposed places, windy. The snowfall was 10.40 inches above normal (average of five years 44.50 inches), so that before the winter was half over trails little used were impassable for horses.

This heavy snowfall was late in melting, lingering in the low places in the fields in appreciable quantity until the second week in May. But on the highlands planting could begin as early as usual. After the ground had dried off the weather continued dry and bright throughout the summer. The rainfall for the months of June, July,

and August was 2.31 inches, 2.15 inches below normal and 0.66 inch less than the driest summer on record. If the water from the melting snow could be stored in the soil there would be plenty of moisture to last the summer through, but unfortunately most of the snow water runs off before the ground is thawed. The following temperature data may be interesting: Mean temperatures, for May 47.1° F., June 59.4° F., July 61.1° F., August 56.6° F., for the season 56° F.; maximum 92° F., on July 27; minimum, during the growing season, 27° F.

WORK FOR THE SEASON.

During May and June the time was fully occupied in the preparation and seeding of the ground to grain, planting potatoes, and work in the garden. Most of this time one man only was employed as helper. Beginning with July, 2 men were employed, and work was begun on the foundation for a new building to be used for the storing of grain and implements and for a workshop and tool room. This structure consists of a building 18 by 30 feet, by 14 feet high to the rafter plate, and is constructed of sawed timbers 6 inches square. The first story has an earth floor and is used for a workshop and tool room. (An outfit of tools for light blacksmithing would be a valuable addition.) The second story has a good matched floor and is used for the storing of seed grain; a much needed place free from mice which are very numerous and destructive.

On each side of this building is a shed 16 feet wide, running the whole length, 30 feet. In these two sheds the various farm implements and machinery are stored, they also afford a much needed shelter for unthreshed grain in the fall to protect it from rain and the early snows. The roof throughout is of corrugated iron, also the back and the sides of the sheds, one side remaining open.

In the near future a frost-proof cellar should be built. The small house cellar is becoming inadequate for the storing of root crops, especially potatoes, larger areas of the latter being cultivated every year.

Because of the building operations only about 1 acre was added to the cleared land, making the total under cultivation 23 acres. This year being exceptionally dry, the fire was allowed to run over the land that is to be cleared during the next year or two. Consequently the moss is almost completely burned off and clearing the burned area will be comparatively easy. It seems now that the lower body of land lying between the farm cottage and the river should be cultivated. This land is covered with a dwarf growth of black spruce and "niggerheads." This is a heavy black soil more fertile than the higher land now under cultivation. At first it was supposed that this low land would be too wet, but in the light of past experience it would appear that after the moss has been removed and the ground exposed to the sun the glacial ice melts and the water drains off, leaving the ground drier, and since the rainfall in general is light, it will remain drier. This land would not dry off early enough in the spring for spring seeding, but it would be valuable for winter grain and for grasses.

On August 19 a shipment consisting of doors, windows, flooring, and roofing for the building was received; also a one-horse disk grain drill, a carborundum tool grinder, supplies for office use, and some seed grain. A 20-foot knockdown boat was shipped but was delayed in route and did not reach its destination before the close of navigation. It must be remembered that the experiment station is across the river from the town, and it is expected to equip this boat with a gasoline engine for the purpose of running back and forth between these two points.

Again, this year the supply of congressional seeds for distribution was exhausted by spring. Every year the call for seeds increases. The various Government Indian schools along the Yukon River are each year increasing the size of their gardens, and the bulk of the seeds for these schools has been supplied through this station. Alaska-grown seed potatoes are often asked for, but heretofore the amount grown at this station has not permitted of distribution.

All grains received for trial are sown in "study plats" lettered "A." These plats are 2 rods long, the width generally being not more than two drill rows, often less, depending on the amount of seed. These plats, as well as series "B," are seeded with a Planet, Jr., seeder, unless the amount of seed is very small, as is the case with the hybrids, in which event planting is done by hand. Plats "A" are also breeding plats.

The selection of the earliest maturing heads of grain has been continued. The practice here has been to maintain selection plats even after a given variety has been found worthy of more extended culture. These plats are uniformly 2 rods long, the width depending somewhat upon the amount of seed, but usually from two to four drill rows wide. The seed is planted rather thinly to allow full development of individual plants. Plats for this purpose are known as "B" selection plats. For each year a variety is planted in series "B" a numeral is suffixed, as B1, B2, etc., thus showing at a glance how long that particular variety has been under observation in these selection plats.

Plats "D" are increase plats of irregular size, depending entirely upon the amount of seed. Only varieties that have been tested are sown in this series, the object, of course, being to increase the amount of seed, so that larger areas may be planted.

Series "F" are fertilizer plats, uniformly square, and one-fortieth acre in extent. In this series check plats are used throughout.

As heretofore, several acres were seeded to common oats for hay. Unlike last year, the yield was light, on second-year land less than 1 ton per acre. The first-year land did considerably better, but not nearly as well as the year before, though conditions were identical as regards soil, preparation of the seed bed, and seeding, which was done with a 2-horse shoe drill. About 5½ tons of hay were put in stack. Fortunately there are about 6 tons left from last year, making an abundance of feed for the station team. The practice here is to wait till the oats are in the soft dough stage at the time of cutting for hay, in order to increase the grain ration. This is practicable because of the rather low temperature average during August, which causes the leaves and culm to remain green and palatable until cut. Except during periods of steady work the team is not fed any grain, this oat hay being sufficient to keep them in good flesh.

SPRING GRAIN.

WHEAT.

Seeding began May 17 on a high knoll from which the winter winds had blown the snow. This ground, 1¼ acres, was seeded to Red Fife and Romanow spring wheat. Both came up well, but the ground became so dry that neither made much growth, the heads and straw, especially of the Red Fife, being very short. Neither variety fully ripened. So far all spring wheat tried has been either a total or a partial failure. Romanow on an average has done the best, but has never fully ripened, though grown for four successive years, so that further trial seems unnecessary.

A small quantity of Ladoga and Early Riga seed was received from the Fairbanks Station during the winter and was sown in the spring. Only a small percentage grew and none of either matured.

Saskatchewan, from Brandon, Manitoba, came up well and was in bloom July 25 but filled slowly, and none ripened.

BARLEY.

Of a large number of varieties grown here during the last four years almost every one has ripened before fall frost, leaving a good margin for safety. This permits the grain and straw to dry out well, so that it can be thrashed and stored. On unfertilized

ground the yield has been light, but fertilizer of the proper kind and amount will produce very satisfactory yields. The following hybrids are the result of crosses made last year and were grown this year for the first time. (Pls. V and VI.)

Hybrid 1a-1-1 from Pamir, S. P. I. 19822 \times Champion; a black-bearded barley producing large heads but very weak straw, all lodging.

The same is true of hybrid 1a-2-1 from the same cross.

Hybrid 1a-3-1 from the same cross is beardless, with purplish tinged chaff. Heads of good size; straw of good strength, but does not possess one of the chief desirabilities, earliness.

Hybrid series 4a-1 to 10, resulting from cross between Chittyna, beardless, with Oderbrucker, bearded; 31 grains resulted from this cross; 30 of which grew; 75 per cent gave evidence of being true crosses, but all resembled the mother plant, which was beardless, but the outer glume has a very much elongated fleshy tip. (See Pl. VI.)

Hybrid series 2a-1 to 8 from Hull-less S. P. I. 12709 \times Finland G. I. 582, bearded; of the 28 grains secured, 26 grew. Of these 8 were selected, all resembling the mother plant, but strongly marked by the male element. None gave evidence of being very early, but all ripened by the middle of August, which is sufficiently early. Heads medium large.

Hybrid series 5a-1 to 6 from Chittyna \times Abyssinian G. I. 361, bearded; 19 grains were planted, 15 of which grew. Of these 6 were selected, having those characteristics striven for, namely, earliness, stiff straw, large heads, and beardless.

Hybrid series 3a-1 to 7 from Hull-less S. P. I. 12709 \times Swedish S. P. I. 19557, bearded; of the 13 grains planted, all grew. Seventy-five per cent resembled its bearded ancestor in size and shape of head, but were semibeardless. The 25 per cent resembled the mother plant. This series gives promise of producing more nearly what is sought and the seven selections will be given careful attention next year.

Hybrids series 6a-1 to 3 from Hull-less S. P. I. 12709 \times Abyssinian G. I. 360, bearded; of the 22 grains, 21 grew, but only 3 gave evidence of being true crosses, 1 resembling the male parent, the other 2 the mother plant.

The following barley crosses were made this year:

Head No. 1b, 19 grains; S. P. I. 12709, Hull-less \times S. P. I. 19822, Pamir, bearded.

Head No. 2b, 22 grains; S. P. I. 12709, Hull-less \times S. P. I. 19822.

Head No. 3b, 23 grains; S. P. I. 12709 \times S. P. I. 19822.

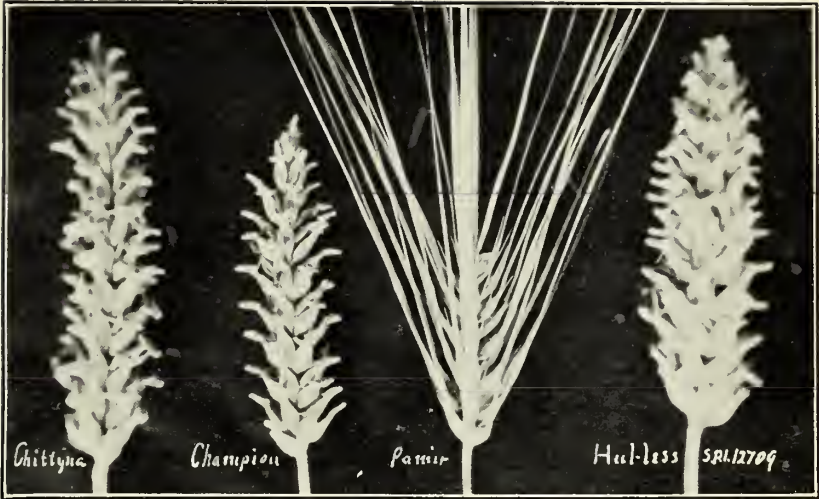
Head No. 7a, 21 grains; S. P. I. 12709 \times Manshury, a 6-rowed bearded barley. One of the best grown here.

Head No. 8a, 14 grains; S. P. I. 12709 \times G. I. 279, the latter 6-rowed and bearded.

Head No. 9a, 18 grains; Eagle \times S. P. I. 19822, both bearded and 6-rowed, the latter short straw, bearing small heads but very early.

Head No. 10a, 28 grains; hybrid 1a-3-1 \times G. I. 279. The hybrid, beardless, being result of cross between Pamir and Champion.

A summary of the barley grown on study and breeding plats, series "A," and selection plats, series "B," is given in the table following.

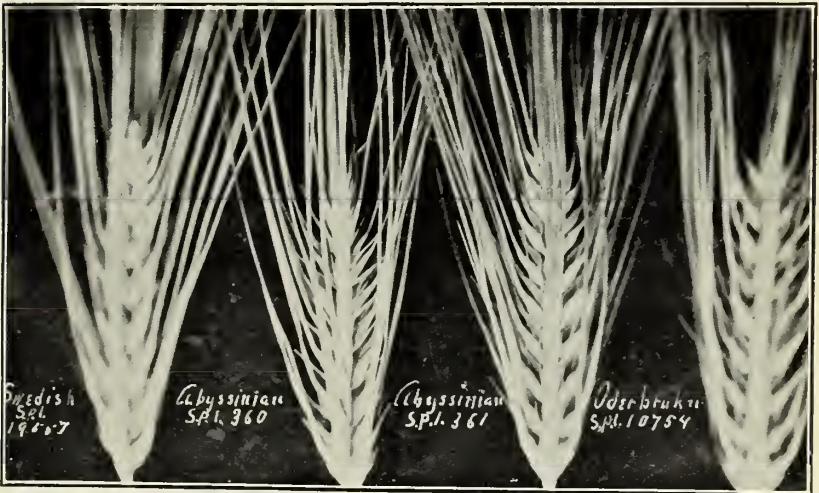


Chittyna.

Champion.

Pamir.

Hull-less 12709.



Swedish
SPL. 19557

Abyssinian
SPL. 360

Abyssinian
SPL. 361

Oderbrucker
SPL. 10754

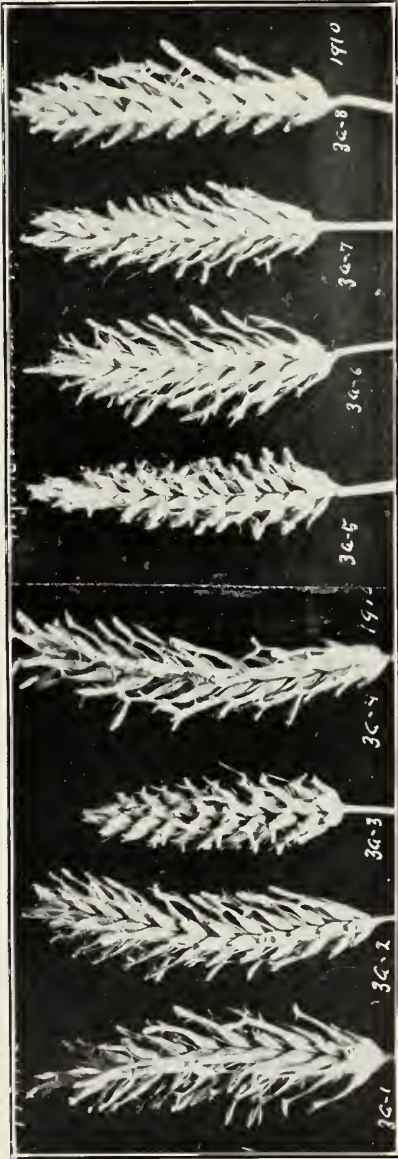
Swedish
19557

Abyssinian
360.

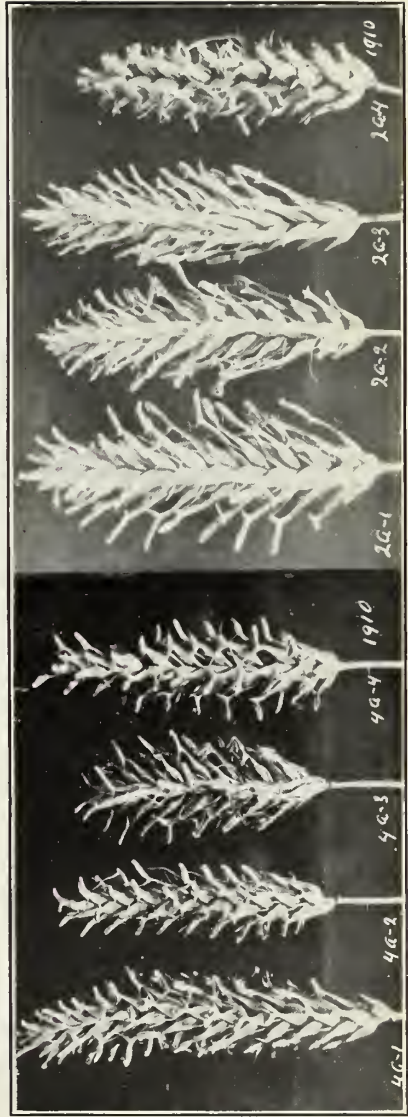
Abyssinian
361.

Oderbrucker
10754.

VARIETIES OF BARLEY USED IN BREEDING EXPERIMENTS, RAMPART STATION.



HULL-LESS 12709 X SWEDISH 19557.



HULL-LESS 12709 X FINLAND 582.

CHITTYNA X ODERBRUCKER.

HYBRID BARLEYS PRODUCED AT RAMPART STATION.

(See Plate V for character of parent varieties.)

Description of varieties of barley growing at Rampart.

No.	Variety and number.	Plat No.	Date ripe.	Days matur- ing.	Lodged.	Height.	Length of heads.	Rows per head.	Character of head.	Source of seed.
1	Swedish, S. P. I. 19557.	40B2....	Aug. 13	88	<i>P. ct.</i> 1	<i>In.</i> 36	<i>In.</i> 2.6	6	Awns partly deciduous.	Station.
2	Liland, G. I. 565....	41B3.....	do.....	88	2	32	3	6	Bearded.....	Do.
3	G. I. 279.....	42B2.....	do.....	88	10	35	3	6	do.....	Do.
4	Bodoe, G. I. 568....	43B3.....	do.....	88	5	35	2.3	6	do.....	Do.
5	South Dakota, G. I. 184.	44B2.....	do.....	88		35	3	6	do.....	Do.
6	Hull-less, S. P. I. 12709.	45B2.....	Aug. 23	98		32	3	6	Smooth.....	Do.
7	Manshury.....	47B4.....	Aug. 21	96		38	3.2	6	Bearded.....	Do.
8	Abyssinian, G. I. 361.	48B4.....	do.....	96		28	2.4	6	do.....	Do.
9	Finland, G. I. 581....	49B2.....	Aug. 15	90	5	28	2.6	6	do.....	Do.
10	Finland, G. I. 582....	50B2.....	Aug. 20	95		31	2.6	6	do.....	Do.
11	Eagle.....	51B2.....	Aug. 21	96		38	2.7	6	do.....	Do.
12	Yakutsk, G. I. 574...	52B2.....	Aug. 15	90		29	2.5	6	do.....	Do.
13	Scottish Pearl, G. I. 277.	53B2.....	Aug. 20	95		30	3	6	do.....	Do.
14	Finnish, G. I. 587....	54B2.....	do.....	95	5	32	2.7	6	do.....	Do.
15	Svalof, G. I. 560....	55B2.....	Aug. 15	90		36	2.7	6	do.....	Do.
16	Pamir, S. P. I. 19822.	56B2.....	Aug. 11	86		22	1.7	6	do.....	Do.
17	Moljord, G. I. 564....	57B2.....	Aug. 21	96		34	2.7	6	do.....	Do.
18	Eagle.....	58B2.....	Sept. 5	111		40	2.7	2	do.....	Do.
19	Abyssinian, G. I. 360.	59B4.....	Aug. 21	95		33	2.4	6	do.....	Do.
20	Abyssinian, G. I. 362.	60B4.....	Aug. 20	95		30	2.4	2	Black bearded	Do.
21	Russian, G. I. 374....	61B2.....	Aug. 15	90		30	2.5	6	Purple bearded	Do.
22	Teldnaes, G. I. 561...	62B2.....	do.....	90		30	2.4	6	Bearded.....	Do.
23	Stroemmen, G. I. 502.	63B2.....	do.....	90		31	2	6	Awns partly deciduous.	Do.
24	Hammeroe, G. I. 563.	65B2.....	do.....	90		31	2	6	do.....	Do.
25	Boehmes, S. P. I. 19851.	66B2.....	Sept. 5	111	1	31	2.4	6	Hull-less.....	Do.
26	Hannah, S. P. I. 5793.	74A.....	Aug. 24	99		34	3.4	2	Bearded.....	S. Dak. Expt. Sta.
27	White.....	75A.....	Sept. 5	111		29	2.4	6	Hull-less.....	Wyo. Expt. Sta.
28	Champion.....	76A.....	do.....	111		36	2.4	6	Beardless.....	Marblehead, Mass.
29	Primus.....	77A.....	do.....	111		38	2.4	2	Awns partly deciduous.	Wyo. Expt. Sta.
30	Lapland.....	89B4.....	Aug. 23	98		36	3	6	Bearded.....	Do.
31	Oderbrucker, S. P. I. 10754.	87B4.....	Aug. 20	95		36	3	6	do.....	Do.
32	Koyukuk.....	6A.....	Aug. 15	90		38	3.6	6	Beardless.....	Fairbanks Expt. Sta.

The shortest time required to reach maturity from date of sowing is 86 days and the variety was Pamir, No. 16 in the table. Earliness is a primary consideration, but in the case of Pamir length of straw and heads have been sacrificed to this end to such an extent that this variety is valuable here for breeding purposes only. Since most of the barleys ripen by or before August 20, breeding for earliness is not of such primary importance as was at first supposed. Rather, stiffness of straw and yield should be sought for. Very little barley lodged this year, due no doubt to the lack of heavy summer rains accompanied with winds. In previous years several varieties were blown flat and could not be harvested except with reaping hooks. Without exception, as far as tried, the 2-rowed barleys have stiff straw, but they also approach closely the time limit in maturing. The beardless and hull-less varieties have done well in part, only seeming to require more favorable soil conditions than the bearded. Planted on good ground they form large heads, but the straw is weak and usually they are rather late maturing compared with the bearded 6-rowed kinds. Several hull-less varieties have been used in the cross-breeding work with a view of producing a strain somewhat earlier and with a stiffer straw. Of the 6-rowed bearded kinds, Manshury and Lapland stand about on a par in general points of excellence, and are among

the best grown here, though neither is among the earliest. Manshury produces longer heads than the Lapland, but many of the heads have sterile spikelets at the tip, while the Lapland heads are filled to the tip and not so slender. No. 279, in the table, p. 47, No. 3, is a good yielding variety, but the straw is weak, a decided drawback at harvest time. Very little smut was seen this year. All smut found was loose smut, and as much as possible of it was gathered before the spores were ripe and destroyed.

OATS.

Improvement by selection of the earliest and best heads is done as with the other grains, but no cross breeding has been attempted as yet for lack of time. Several varieties new to this station were tried this year and the 4 resembling closely Black Finnish promise well, though no better. Other varieties have been received for trial next year.

As was the case with the barley, most of the increase plats were small and of irregular size, making a computation of yields impracticable. Now that a fairly sufficient amount of station-grown seed is available the plats can be made uniform and yields compared. The following table gives some of the data:

Description of varieties of oats growing at Rampart.

No.	Variety and number.	Plat No.	Date ripe.	Days matur- ing.	Height.		Length of heads.	Charac- ter of head.	Color of berry.	Source of seed.
					In.	In.				
1	Yakutsk, G. I. 498....	67B2....	Aug. 23	98	34	4	Bush....	White ..	Station.	
2	Norwegian, G. I. 500....	68B2....	Aug. 29	104	34	7	..do....	Black....	Do.	
3	Copperfield.....	70B1....	..do....	104	38	5.5	..do....	Gray....	Do.	
4	Finnish Black.....	71B5....	Aug. 23	98	44	7.8	..do....	Black....	Do.	
5	Hansen, S. P. I. 24477.	72A....	Sept. 6	112	36	7.5	..do....	White....	Department.	
6	G. I. 637.....	73A....	..do....	112	35	7	..do....	Black....	Do.	
7	New Swedish.....	78A....	..do....	112	38	5.9	..do....	White....	Marblehead, Mass.	
8	Minnesota, G. I. 261....	79A....	Aug. 29	104	32	4.4	..do....	..do....	Minn. Expt. Sta.	
9	Ruovesi.....	96A....	..do....	104	40	7	..do....	Black....	Dickurby, Finland.	
10	Korbijohi.....	104A....	..do....	104	50	7.8	..do....	..do....	Do.	
11	Toholampi.....	105A....	..do....	104	50	7.8	..do....	..do....	Do.	
12	Orismala.....	106A....	..do....	104	50	7.8	..do....	..do....	Do.	
13	Lincoln.....	99A....	(1)	38	5.5	..do....	White....	..do....	Iowa Seed Co.	
14	Prosperity.....	100A....	(1)	38	4.7	..do....	..do....	..do....	Do.	
15	Swedish.....	101A....	(1)	38	5.9	..do....	..do....	..do....	Do.	
16	Sixty-day, G. I. 666....	111D....	Aug. 29	104	28	4	..do....	..do....	South Dakota Expt. Sta.	
17	Black Bell, S. P. I. 20463	119D....	Sept. 5	111	25	5	..do....	Black....	Department.	
18	Banner.....	120D....	Aug. 29	104	36	4	..do....	White....	Do.	
19	Great Mogul, S. P. I. 20464.	121D....	Sept. 5	111	40	6	..do....	Black....	Do.	
20	Ligowa, S. P. I. 20459.	107D....	..do....	111	40	5	..do....	White....	Station.	
21	Probsteier, S. P. I. 20462.	110D....	..do....	111	46	5	..do....	..do....	Do.	
22	Hvitling, S. P. I. 20458.	108D....	..do....	111	40	5	..do....	..do....	Do.	
23	Probsteier, S. P. I. 20461.	121D....	Aug. 31	106	41	5	..do....	Black....	Do.	

¹ Did not ripen.

It is worthy of note that of the 23 varieties all produced some ripe grain, except Nos. 13, 14, and 15, which were received late in the spring and could not be sowed in time, consequently did not have a fair chance. However, as it is to be expected where a number of varieties are tested, some are much earlier and better adapted to these conditions than others. Under the heading "Days maturing" is to be seen at a glance those requiring the minimum of time to ripen a crop. In point of injury by fall frost any of the varieties ripening within 104 days would be safe to plant. In points of excellence Finnish Black easily heads the list, requiring but 98 days to ripen, and some years even less. The heads, though large, are of loose forma-

tion, each spikelet containing on an average 2 grains. Heads containing 150 grains are not uncommon. In ripening, the outer glumes open widely, causing the grain to shatter some if overripe. Yakutsk, while equally early, makes a much shorter growth and shorter heads, being somewhat similar to Burt Extra Early, which has been discontinued here because of its light yield and short straw. Sixty-day also is open to this criticism, though a somewhat better yielder. In general black oats have done better than white oats.

FERTILIZER EXPERIMENTS.

This year tests were begun with three kinds of commercial fertilizers supplying the three chief elements of plant food—nitrates, phosphates, and potash. All plats in this test were one-fortieth acre (2 rods square), and duplicate untreated plats were used throughout as a check. Unfortunately these plats had to be broadcasted and the seed harrowed in, which practice is not a good one when the spring is dry, as was the case this year. Next year this difficulty can be avoided by the use of a 1-horse disk drill received this summer. Following is given the results in tabulated form:

Fertilizer experiments with cereals.

No.	Variety.	Plat No.	Seed per acre.	Fertilizer.	Rate per acre.	Date ripe.	Yield.		
							Lbs.	Bu.	P. ct.
OATS.									
1	Banner.....	{82F.....	2½	Superphosphate.....	500	Aug. 23	28	35.0	47.6
		{82F''.....	2½	None.....	.....	do.	19	23.7	.....
2	Great Mogul, S. P. I. 20464.	{83F.....	2½	Superphosphate.....	500	Sept. 2	22	27.5	57.0
		{83F''.....	2½	None.....	.....	do.	14	17.5	.....
3	South Dakota, G. I. 637	{84F.....	2½	Superphosphate.....	500	Aug. 29	20	25.0	5.5
		{84F''.....	2½	None.....	.....	do.	19	23.7	.....
4	Sixty-day.....	{91F.....	2½	Sodium nitrate.....	500	Sept. 2	43	53.7	22.8
		{91F''.....	2½	None.....	.....	Aug. 23	35	43.7	.....
5	(Finnish Black..... Great Mogul.....)	{94D.....	2½	Mixed equal parts... do.....	500 500	Aug. 20 Sept. 5	48 70	52.5 76.5	..... 45.6
		{92F.....	2	Potassium sulphate.	500	Aug. 20	50	43.7	20.7
6	Swedish, S. P. I. 19557.	{92F''.....	2	None.....	.....	do.	44	36.4	.....
		{92F''.....	2	None.....	.....	do.	44	36.4	.....
BARLEY.									
7	G. I. 279.....	{93F.....	2	Potassium sulphate.	500	Aug. 29	46	38.3	35.3
		{93F''.....	2	None.....	.....	do.	34	28.3	.....
		{95F.....	2	Sodium nitrate.....	500	Sept. 2	26	21.7	99.0
		{95F1.....	2	Superphosphate.....	500	Aug. 20	13	10.9	.....
		{95F2.....	2	Potassium sulphate.	500	do.	11	9.1	11.6
8	Manshury.....	{95F3.....	2	None.....	.....	do.	13	10.9	.....
		{95F4.....	2	Mixed equal parts... do.....	500 1,500	Aug. 16 do.	18 27	15.0 22.5	37.6 106.4
		{95F5.....	2	do.....	.....	do.	22	5.5	.....
		{95F6.....	2	Stable manure.....	(2)	Aug. 15	18	15.0	37.6

¹ Loss.

² 40 small loads.

In the above table no comparison of results should be made except as indicated by the braces. For instance plats No. 1 were on ground planted to potatoes the previous year, while all of the plats under No. 8 were on ground planted to grain the previous year. Had the conditions been reversed the results would no doubt have been changed about also.

It will be noted that in both cases when nitrate of soda was used alone, maturity was delayed from 10 to 13 days. This same effect was also noted when nitrate of soda was applied on timothy sod. These results indicate that however much the increase might be from the use of nitrate of soda, its use in this latitude in any considerable quantities unmixed with any other fertilizer should be avoided, since the ripening is delayed to such an extent as to make the crop liable to injury by early fall frosts. The other fertilizers, used singly, seemed to exert little or no influence on the date of maturity nor to effect the stiffness of the straw one way or the other.

Potassium sulphate and superphosphate, where used on ground cropped to grain the previous year as in 95F2 and 95F1, had no effect at all in either case; 95F2 yielding even less than the check plat, while on ground in potatoes the previous year, as in plats 82F, 83F, and 84F there was a decided gain in every instance. It is interesting to note that where mixed fertilizer was used at the rate of 1,500 pounds per acre the yield was increased less than 1 bushel per acre, supporting conclusions drawn concerning plats 95F2 and 95F1 since the amount of nitrate of soda used on 95F4 was the same as on 95F, but the plat receiving fertilizer at the rate of 1,500 pounds per acre ripened as early as the check plat and plats treated singly with other fertilizer, indicating that the superphosphate and potassium sulphate counteracted the retarding effect of the nitrate of soda. The plat treated with one load of stable manure made an appreciable gain over the check plat, but the result was not as marked as it would have been had there been more rain, which is doubtless true of all plats. As to the yields shown, no comment is needed, for they show what is obviously true, that this hill land is poor, especially in nitrates, which, interpreted, means that here as elsewhere legumes would be valuable.

WINTER GRAIN.

August 4, 1909, the grains named in the table below were seeded. This year the winter grain was sown three weeks earlier, and, from the improved appearance this fall over previous years, it is believed the next crop will be better. Also the ground for this year's seeding was given several cultivations during the early summer, putting it in excellent condition—a sort of summer fallowing.

Description of winter grains.

No.	Variety.	Autumn vigor.	Spring survival.	Date ripe.	Height.	Length of heads.	Lodged.	Source of seed.
			<i>Per cent.</i>		<i>Inches.</i>	<i>Inches.</i>	<i>Per cent.</i>	
1	Winter barley.....	Poor...	20	Aug. 24	26	3	.....	Station.
2	Kharkov wheat.....	do.....	90	do.....	28	2.25	.....	Do.
3	Rye.....	Good...	75	Aug. 26	38	2.75	.....	South Dakota Expt. Sta.
4	Rye, Amber.....	Poor...	70	do.....	40	3	.....	Station.
5	Rye, Excelsior.....	do.....	75	do.....	42	3	.....	Do.
6	Rye, S. P. I. 12890.....	Fair...	98	do.....	38	2.5	.....	Department.
7	Rye, Giant French.....	do.....	75	do.....	42	3	.....	Station.
8	Rye, S. P. I. 1134.....	do.....	75	do.....	38	2.5	.....	Department.
9	Rye, G. I. 281.....	Poor...	30	do.....	38	3.5	.....	South Dakota Expt. Sta.
10	Rye, Brandon.....	Fair....	95	do.....	38	3	.....	Brandon, Mani- toba.
11	Emmer, S. P. I. 19385.....	Poor...	0	.....	.....	.....	.....	Department.

While winter barley made a fair showing this year, it is hardly to be expected that it can be grown here profitably. However, a small plat has been seeded again this year for further trial. All of the rye ripened, but nearly all heads were imperfectly filled. The winter resistance varies from 30 to 98 per cent, but this difference is not borne out by previous years' records, consequently no definite conclusions can be drawn as yet as regards hardiness. It is safe to say even at this stage of the work that rye can be wintered here successfully. As with other grains, it is not so much a question of hardiness as of tilth and fertility of the soil. Kharkov winter wheat has ripened a crop every year since first tried here in 1905. The same is true of Giant French, Excelsior, and Amber winter rye (Pl. VII).

GRASSES AND LEGUMES.

The following table gives concisely the results of the seedings of 1909. All are small plats. There is little hope that either alfalfa or clover seed can be grown here. However, if strains can be found that survive the winters they will become a valuable factor in crop rotations.



Kharkov winter wheat.

Romanoff spring wheat.

Winter barley.



Winter rye 281.

Excelsior.

Amber.

Giant French.

TYPES OF CEREALS GROWN AT RAMPART STATION.

Growth and hardiness of grasses and legumes.

No.	Variety.	Autumn vigor.	Spring survival.	Height.	Seed ripened.
			<i>Per cent.</i>	<i>Inches.</i>	<i>Per cent.</i>
1	Velvet grass, S. P. I. 1288.....	Excellent.....			
2	Velvet grass, S. P. I. 20477.....	do.....			
3	Red canary grass, S. P. I. 20478.....	do.....			
4	Red clover, S. P. I. 20468.....	do.....	100	12	
5	White clover.....	do.....	100	10	10
6	<i>Medicago falcata</i> , S. P. I. 24452.....	do.....	100	14	
7	Sand lucern, S. P. I. 21269.....	do.....	100	16	
8	Grim alfalfa, S. P. I. 21827.....	do.....	100	20	
9	Montana alfalfa, S. P. I. 23454.....	do.....	100	18	

In addition to the above 1 acre of timothy seeded in 1908 survived the winter in perfect condition for the second time, but the summer's growth was disappointing, being short and spindling. The seed ripened in this plot and was cut. This piece of ground slopes gently southward and to all appearances is fertile, having had a growth of birch and spruce on it, but apparently the food elements are unavailable. Thorough cultivation will remedy this defect to a considerable extent by putting the ground in better physical condition and thus hastening the decay of vegetable matter.

In a different field, on new land, was seeded this year: One acre to awnless brome grass (*Bromus inermis*), one-fourth acre to timothy, and small plots 2 rods long and of various widths to a number of varieties of legumes and grasses. Nearly all made a fine growth and go into the winter in good condition. This is especially true of the brome grass which grew over a foot high.

POTATO EXPERIMENTS.

In order to determine fully the value of sprouting the seed before planting, the following experiment was carried out: April 25 shallow trays of six varieties of potatoes were taken from the house cellar where the potatoes had been wintered and placed in the well-lighted attic above the living room of the farm cottage. By May 23 the sprouts ranged from one-half inch on the first three varieties, in the table (p. 52), to 1½ inches on the other three varieties. All sprouts were green and strong. Before planting the larger potatoes were cut in two, lengthwise, in such manner as to leave one or more strong sprouts on each piece. The seed was then planted in the usual manner, care being taken to avoid breaking off the sprouts. However, the sprouts were quite tough and the potatoes did not require very careful handling. Beside each row of sprouted seed was planted, the same day, a row of the same variety of unsprouted seed. The land was laid off and the seed covered in such manner as to leave the field level in order to prevent loss of moisture by evaporation. After planting, a mixture, in equal parts, of sodium nitrate, potassium sulphate, and superphosphate was applied at the rate of 500 pounds per acre with a Planet, Jr., seeder, going over the row once. All rows were fertilized alike. The field was then harrowed and later harrowed again before the potatoes came up. After the potatoes came up they were cultivated twice by hand and twice with a horse cultivator. The stand of all was excellent, but better in the sprouted rows than in the unsprouted rows. The growth of vines was thrifty as indicated by both color and size. No disease of any kind was noticed. Well matured seed balls formed on the vines of the sprouted seed, but none were observed on the unsprouted. None of the vines ripened. All were badly injured by the three frosts in August, but the tubers continued to develop until a killing frost September 6. Digging was begun September 9 and finished two days later. The following table gives some of the data:

Effect of sprouting potatoes before planting.

No.	Variety.	Number of hills.	Seed.	Came up.	In bloom.	Rate per acre.	Gain.
						<i>Bushels.</i>	<i>Per cent.</i>
1	Gold Coin.....	100	Sprouted.....	June 7	July 5	210	} 21.3
		100	Not sprouted.....	June 27	July 25	174	
2	Early Ohio.....	100	Sprouted.....	June 16	July 16	149	} 49.0
		100	Not sprouted.....	June 27	July 28	100	
3	Irish Cobbler.....	100	Sprouted.....	June 16	July 15	191	} 31.7
		100	Not sprouted.....	June 24	July 27	145	
4	Extra Early Triumph.....	80	Sprouted.....	June 17	July 16	212	} 71.0
		80	Not sprouted.....	June 27	Aug. 1	124	
5	Extra Early Pioneer.....	100	Sprouted.....	June 9	July 7	250	} 77.3
		100	Not sprouted.....	June 27	July 27	141	
6	Extra Early Eureka.....	65	Sprouted.....	June 9	July 6	280	} 68.6
		65	Not sprouted.....	June 24	July 25	166	

There is such a decided gain in every instance of the sprouted seed over the unsprouted seed as to leave no doubt as to the value of such practice. The percentage of gain ranged from 21.3 to 77.3. Plate VIII shows that the size of the tubers as well as the yield was decidedly increased. The difference of time in the potatoes coming up and in coming into bloom is well correlated, and averaged about 20 days in favor of the sprouted seed—an appreciable gain of time here, where the summers are too short at best for potato culture. One important point the table does not show is that the quality of the tubers from the sprouted seed is much better than from the unsprouted seed. This is due of course to the 20 days' longer time for maturity. This result alone is well worth the extra work of sprouting the seed, since the only objection made to the home-grown potato, where it enters into competition with the potatoes shipped in, is that the latter are drier and better flavored. The result of the above experiment shows conclusively that potatoes of excellent flavor and composition can be raised in the Yukon Valley.

Below is given the names and description of 11 varieties of potatoes that have done the best in the last three years. The 11 are selected out of 30. In the majority of instances the remaining 19 gave low yields or averaged small. For a complete list see Annual Report for 1909.

Gold Coin: A vigorous grower; potatoes large, oblong to rounded, many of them decidedly flattened, with square eyes; eyes shallow and broad; skin yellow; quality excellent; early.

Early Ohio: Fairly vigorous; not a good yielder, but of excellent quality; size medium with more seconds than Gold Coin; eyes medium deep; skin pink; early.

Irish Cobbler: A thrifty grower; tubers large, rounded, and many irregular; skin yellow; eyes medium deep; quality excellent; early.

Extra Early Triumph: A good yielder; tubers smooth, white with shallow eyes; shape oblong, one end rather pointed; skin white; quality good; early.

Extra Early Pioneer: Second best in point of yield this year, roundish to oblong; eyes shallow and broad; quality very good; early.

Extra Early Eureka: First in point of yield; large; fairly even in form; roundish oblong, slightly flattened; skin white; eyes shallow; quality excellent; early.

Carmen No. 3: A vigorous grower, though rather late in blooming; shape oblong; skin almost white and quite thin; eyes shallow; medium early.

Hamilton Early: Vigorous; tubers average well; skin white with fine dots; eyes quite shallow; size medium; medium early.

Early Market: Roundish; skin pink; eyes medium deep and rather numerous; size medium but average well; quality excellent; early.

Lincoln: Roundish; skin quite pink; eyes medium deep and fairly numerous; fair size; yields well; medium early; makes a vigorous growth in the early part of the season.



FIG. 1.—GOLD COIN, NOT SPROUTED (LEFT) AND SPROUTED (RIGHT).

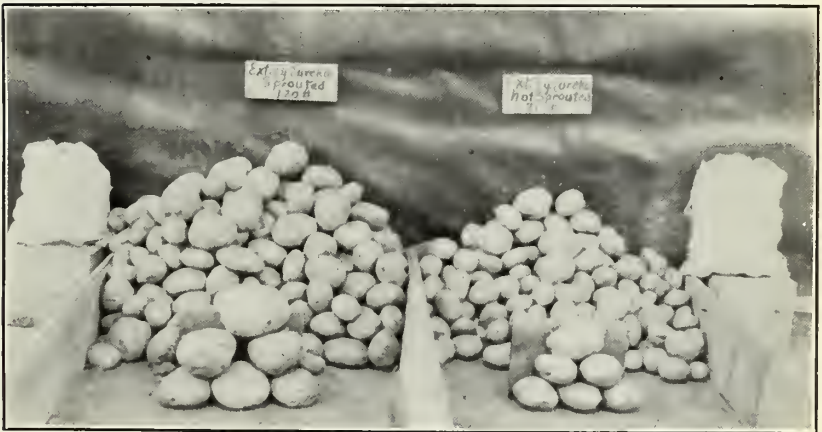


FIG. 2.—EARLY EUREKA, SPROUTED AND NOT SPROUTED.

EFFECT OF SPROUTING POTATOES BEFORE PLANTING, RAMPART STATION.

Burbank: This well-known variety has always done well here, though rather late in blooming; tubers oblong; white, smooth, with shallow eyes; quality good.

THE GARDEN.

Gardening in interior Alaska differs very little, if any, from gardening in any of the Northern States. As elsewhere, frequent cultivation pays, the more so here since there is usually insufficient rain. While irrigation helps, if done intelligently, the careless application of water is as often detrimental as beneficial. As a rule, if the surface is kept well stirred right from the start watering is unnecessary, but if watering is resorted to in growing cabbages, for instance, a good way is to draw the earth away from the stalk and apply the water. After the water has soaked away draw the dry earth back around the stalk. Not only is less water required this way, but the surface remains dry and loose, conserving the moisture underneath. One good watering done in this manner is worth six done in the ordinary manner. It seems superfluous to add that if possible the ground should be well fertilized. If stable manure is used, a fall application plowed under or spaded in is best. If not too coarse a dressing can be applied in the spring, taking care to thoroughly incorporate it with the soil before seeding.

The location of the station garden, as last year, was in part on a side hill, well exposed to the sun. No fancy gardening was attempted, only vegetables of the ordinary sorts being raised. In the spring a hotbed was used to start cabbage and cauliflower plants and to grow an early crop of lettuce, radishes, etc. Congressional seeds were used almost exclusively, and the results were very satisfactory. Peas produced an abundant crop. Extra Early, Alaska, Prince of Wales, and Nott Excelsior all doing well, though the first two are more desirable. Prince of Wales, which is rather late, bears large fine pods, and Nott Excelsior, while of most excellent flavor, does not produce as heavy a crop as Alaska or Extra Early.

This year several quarts of peas and cauliflower were canned in the usual manner, and they are keeping well and are far superior to the factory-canned goods. Most any vegetable lends itself well to canning, and by a few days' work in the fall the table can be supplied during the long winter months with comparatively fresh garden stuff better and cheaper than the canned goods shipped in. Those interested in home canning will derive valuable help from Farmers' Bulletins Nos. 203 and 359, which may be had for the asking. Simply address the Secretary of Agriculture at Washington, D. C., giving the numbers wanted.

Roots of turnips, rutabagas, carrots, and beets were put out in the spring with a view to raising seed. Seed ripened fully on the first two, but none on the last two. Station-grown seed of turnips and rutabagas has been used for several seasons. However, there seems to be no advantage in using this seed, over the seed sent in. In general, it may be said that garden seeds from specially hardy or acclimated plants are unnecessary. Any good seed will grow good crops if properly treated.

REPORT OF WORK AT FAIRBANKS STATION.

By J. W. NEAL, *Superintendent.*

Development work at the Fairbanks Station is still in the progressive form—i. e., the erecting of buildings, clearing, breaking, and fencing of land.

Ten acres of new land has been cleared and broken this season, which brings our total area now under cultivation to about 70 acres.

This area comprises four different tracts on the reservation which requires a great amount of fencing, each tract having to be fenced separately. About 1½ miles of new fence was built this year.

The cottage has been enlarged to four good-size rooms, three of which were lined and papered and some inside paint work was done last winter, and it is hoped to have the other room papered and the inside painting finished before this report goes to press.

The log barn has been lined on the inside with lumber nailed to studding which was set against the logs and clay soil tamped in the space between the lumber and the logs, the cracks between the logs first being calked with burlap, or moss and edgings nailed against the moss to hold it in place while the dirt was being filled in. Stalls and mangers have been put in. This barn is 30 by 32 feet, with 16-foot eaves, affording storage room for 15 tons of loose hay above the stable part.

Since the last report a greenhouse, 12 by 20 feet, with a gable roof, has been built. (Pl. IX, fig. 1.)

A blacksmith shop and tool house 16 by 24 feet has been built, with a 9-foot shed room the full length.

Lumber is now in the yard for enlarging the barn, and it is planned to add 30 feet to the west end this winter and box in the log part, and also to add a 16-foot shed along the north side of the building. These additions will afford storage room for all of the implements and 40 or 50 tons of hay.

It is planned to slash several acres of small timber between the buildings and the railroad this winter, preparatory to burning in June. This will open a view of the farm from passing trains, and when the timber is burned off the land will make excellent grazing.

WEATHER CONDITIONS.

The season was unusual in the extreme. The snow left the ground about the first of May, and new ground on the south slope was thawed and dry enough to plow by May 10. The old ground on the level and north slope, not fall plowed, did not get dry enough to plow until the end of May. A 20-acre tract of new ground, summer fallowed, was dry enough to start cultivating on May 13. The weather continued very favorable during May and early June, with a generous rain on June 9 and 10. By June 15 the crops looked quite promising, but the weather continued very cold and dry until about the middle of August, then frequent cold rains continued until the freeze up. Killing frosts occurred July 31, August 5, 9, 20, and 29, and September 5, and the ground began freezing September 18.

GRAIN CROPS.

Spring seeding began on fallowed new ground May 16, and continued as fast as the soil could be put in condition, until June 4. The fallowed ground was seeded May 16, 17, and 18 to common oats and barley, and, although the growth was very light, the oat grain was in the milk by August 10; the barley was then in the dough, and, notwithstanding several midsummer frosts, there is little doubt but that this grain would have matured good seed. It was on high ground which usually escapes light frosts.

Unfortunately the funds for the first quarter were too nearly exhausted to plow the old ground last fall. Spring plowing will usually delay spring seeding from one to two weeks, and it also retards the early spring growth. This season our spring plowing did not produce hay enough to pay for harvesting, and several acres of this seeding was plowed in early in August as summer fallow. It must be understood that this ground is very light soil on a north slope and probably will never yield a heavy crop without applying some fertilizer. However, the birch hill land, especially on the south slope, is always very loose and friable owing to decomposed vegetation in it, and so far as our experiments have continued on this kind of soil the results have been very satisfactory.

On the old ground, north slope, two varieties of spring wheat and one of oats were seeded June 3, hoping to mature seed for another year. The wheat, Red Fife and



FIG. 1.—NEW PROPAGATING HOUSE, FAIRBANKS STATION.



FIG. 2.—POTATO FIELDS, FAIRBANKS STATION.



FIG. 1.—OATS AND POTATOES, FAIRBANKS STATION.



FIG. 2.—BUCKWHEAT, WINTER RYE IN BACKGROUND, FAIRBANKS STATION.

Wild Goose, did not mature, while the oats, Finnish Black, matured early in September and were harvested for seed. Red Fife wheat was several days further advanced than the Wild Goose variety when frosted.

On May 25, 12 of the most promising varieties of grains were selected and seeded in small culture plats on birch land sloping to the west, which had been cultivated three years. This tract was in oats two years ago and last season it was manured and planted to potatoes, yielding excellent crops both years.

OATS.

North Finnish Black. Up June 2; heading July 15; season's growth 50 to 60 inches; stand good, ripe September 5. This variety can safely be recommended as one of the best for this country. The grain yield is not so heavy as some others, but it has never failed to mature when sown in reasonable time, and for the hay crop it will yield more hay per acre than any other variety tested here. It may be necessary to treat the seed occasionally for smut, as there is more or less present every year. (Pl. X, fig. 1.)

Oats No. 637. Up June 2; heading July 15. Made about the same growth as the Finnish Black, but matured a little earlier. This is also a black oats very similar to the Finnish, and if seed could be had in quantity it could be as highly recommended.

Sixty-day. Up June 1; pretty well headed July 15; season's growth 30 to 36 inches, with excellent stand; ripe September 1. This is the earliest variety tested at this station and can be highly recommended. It does not grow nearly so tall as the above varieties and makes a finer straw while the grain is heavier, all of which improves the quality of hay, and it can always be cut several days earlier than any other variety tested here.

BARLEY.

Hansen No. 279, a bearded variety. Up May 31, first heads showing July 1; the stand was very good; growth 4 feet; ripe August 16; the growth was so heavy that the straw lodged. The heads were large and uniform. This is the earliest barley ever tested at this station and has never failed to mature the whole crop.

Manshury, a heavily bearded variety. Up May 30; fully headed by July 15. It made a very heavy growth, standing 48 to 50 inches high. The straw was lodging August 1; ripe by August 22; the heads were good size and uniform. A few smutted heads appeared.

No. 19851, a beardless hull-less barley. Up May 31; nearly all headed July 15; ripe August 28. The heads were fair size and rather uniform. This barley made a growth of 40 or more inches and the straw was so heavy that it lodged badly.

Hannah barley No. 203-5793. Up May 31; nearly in full head July 15; straw lodging August 1. It made a growth of 40 to 44 inches and ripened by September 5. While this variety usually matures here it is not as desirable as some others—it is a bearded two-rowed barley, a lighter yielder of grain and ripens several days later than some others.

No. 19852, a beardless barley. Up June 1; headed July 15; ripened by September 1; made 40 to 48 inches growth; the heads were rather large and well filled; the stand was very poor, evidently due to poor seed. This variety will usually ripen here, and it being a beardless barley it should be placed on the list of favored grains for this country.

SPRING GRAIN.

Selected Red Fife wheat. Up June 2; heading July 20; grain passing from milk to dough September 1; did not ripen. It grew 48 inches tall and made good-sized heads. This variety rated second on the stage of advancement when frosted.

Romanow wheat. Up June 3; heading July 15; grain just in the dough and straw turning September 1; did not ripen. It made a growth of 4 feet with large, well-filled

heads. While no spring wheat fully matured this year, this variety was slightly the farthest advanced when frosted.

Wild Goose wheat. Up June 2, heading July 15; grain passing from milk to dough September 1; did not ripen. It made 50 inches growth with large heads. This variety is somewhat later than either of the above, and rather objectionable owing to the long, heavy heads.

Spring rye. Seeded May 25; up June 1; first heads showing July 1; fully headed July 15; height 54 inches; ripe September 10.

Japanese buckwheat. Seeded May 25; up June 4; blooming July 5; first grains in milk August 1; killed by frost August 20; earliest grains had ripened; height 30 to 36 inches. (Pl. X, fig. 2.)

WINTER GRAIN.

Kharkov wheat, No. 12001. Seeded August 10, 1909; up August 20; fall growth good; 50 per cent winterkilled; began heading June 25; about all headed July 1; ripe August 15; height 36 inches. (Pl. XI, fig. 1.)

Winter rye, No. 19556. Seeded August 10, 1909; up August 18; fall growth good; spring stand very good; began heading June 15; full head July 1; height 60 to 70 inches; ripe August 10. (Pl. XI, fig. 2.)

Fall rye. Seeded August 10, 1909; up August 18; fall growth good; spring stand very good; began heading June 15; in full head July 1; height 50 to 60 inches; ripe August 10.

Fall rye from Manitoba. Seeded August 10, 1909; up August 18. Behaved about the same as the above variety last mentioned and ripened at the same date.

These three varieties of winter rye may be recommended to the Alaska farmer.

Winter rye No. 11268. Seeded August 10; did not come up. Evidently the seed was too old.

Black winter emmer, No. 9235. Seeded August 10; up August 18; made a fair fall growth, but all winterkilled. This grain should be discarded, for it will seldom stand the winters, and when it does is very slow in ripening and is not considered to be a very good forage plant.

Barley, Tennessee winter, No. 386. Seeded August 10, 1909; up August 18; it made a fair fall growth, but probably 90 per cent winterkilled; spring growth slow; began heading July 1; in full head July 15; height 30 to 36 inches; ripe August 10. For two seasons this barley has been nearly all winterkilled. The above winter grains were again seeded on August 5 of this year in large plats, being sown broadcast and harrowed in.

The grains tested at this station which matured are the Sixty-day oats, Finnish Black oats, Hansen barley No. 279, Manshury barley, Hull-less barley No. 19851, Kharkov winter wheat, although it has always been partly winterkilled, yet what lived through has matured; Winter rye No. 19556, also a fall rye imported from Manitoba. For hay-making varieties either of the oats mentioned might have the preference, being among the earliest maturing varieties, and experience tells us that our hay should be in the shock by August 20, for hay-curing weather is very uncertain after that date. The American Banner oats and Swedish Select oats are also excellent haymaking varieties, and they will nearly always mature. Some would prefer these varieties for hay, as they do not grow so tall as the Finnish Black and yet a considerable bit taller than the Sixty-day oats. If seeded by May 20 to 25, any of the above varieties of oats will usually be advanced sufficiently for good hay by August 15.

The barleys mentioned in this report are not desirable for hay. The earliest varieties are heavily bearded, which is very objectionable in hay. There are several varieties of beardless barley, however, that would make an excellent hay crop for this country, and most of these would probably mature in time for good hay-curing weather.



FIG. 1.—KHARKOV WINTER WHEAT, FAIRBANKS STATION.



FIG. 2.—WINTER RYE, FAIRBANKS STATION.

In connection with grain crops it is highly desirable to summer fallow the lighter soils. The plant food does not become available for annual cropping. Another advantage in this method of farming is gained in being able to plow the land after the spring rush of seeding is over and before the fall rush of gathering the crops and preparing for the long winters. If time and conditions will permit for reploting fallowed land in the spring it will much improve the fertility of the soil, and also warm it faster, which will hasten seed germination, another important factor in successful farming in Alaska. Winter grains should be seeded by August 1.

GRASSES.

The experiments in grasses so far have been unsatisfactory. Timothy has been seeded at different seasons of the year and on different soils with comparative failure. It does not as a rule winterkill, but the growth is too little to be of any profit. One will often see single plants or even small patches along shaded trails where the soil may be worked up by the travel and seed dropped from freighting feed over the trails, where the timothy makes sufficient growth for 1 to 2 tons per acre, but it has never made much growth in a cultivated field except where the soil was heavily fertilized. One farmer near Fairbanks had a small pond that would dry up early in the summer or soon after the frost was out of the ground, and he seeded this to timothy, cutting heavy crops each succeeding year until it became necessary to drain the pond. Since then the timothy has made nothing.

It is very apparent that the cultivated land is too dry for timothy, and the low, wet land is doubtless too cold.

Alsike clover seeded in 1909 is still alive and made 8 inches growth this season, covering the ground. It blossomed and matured some seed.

In addition to timothy the other varieties of grass seeded in 1909 are *Alopecurus pratensis*, *Agropyron tenerum*, *Agropyron pseudo repens*, and *Festuca elatior*. These have made little growth, sending up but few stems.

Poa pratensis, *Dactylis glomerata* No. 20470, alfalfa S. P. I. No. 23454, sand lucern S. P. I. No. 21269 have died out. Alfalfa S. P. I. 24452 and Grimm alfalfa S. P. I. No. 21827 are still alive but have made little growth.

POTATO CULTURE.

This has been the most unfavorable season for potato culture in Tanana Valley during the life of the Fairbanks Station. The first killing frost occurred at the station on July 29, which seriously damaged much of the crop. On July 28 and 29 many acres of potatoes in the vicinity of Fairbanks on the low valley land were killed almost to the ground, and the several frosts through August damaged nearly every patch of potatoes in the country. Some farmers did not dig their crop, as the tubers were too small and immature to market from vines frosted early.

At the station $3\frac{1}{2}$ acres of potatoes planted on a south slope near the cottage escaped these killing frosts until August 29, except on the lower edge of the patch, and the upper half of the patch was not killed until September 18 (Pl. IX, fig. 2). The three following varieties were planted on the tract May 28 and 29, yielding 410 bushels, or 126 bushels per acre:

Ten and one-half bushels of Eureka were planted, yielding 150 bushels, of which probably 15 per cent is under market size. Ten of the largest tubers weighed 15 pounds.

Thirteen bushels of Gold Coin were planted, yielding 160 bushels of very fine tubers; probably about 15 per cent is under market size. This variety did not yield quite as much per acre as the Eureka, but matured a little faster.

Ten bushels of Red Early Ohio were planted, yielding 100 bushels of very choice tubers; about 10 per cent is under market size. The yield is considerably lighter

than either of the other two varieties, but it is probably the best potato for this country until some new, untried varieties prove to be better.

Alaska-grown potatoes have been condemned by many consumers as unfit for table use. The season is entirely too short for the ordinary varieties to make even a fair quality of potatoes, and if the season is unusually cold it is disastrous to potato culture in throwing a poor grade of potatoes on the market; therefore only the earliest varieties should be planted.

The Red Early Ohio this year ripened to the extent that the vines were half dead before the frost touched them. The tubers have a tough skin almost equal to the imported potatoes, and in boiling these potatoes care must be taken not to cook them too long, as they will crumble to pieces.

The other two varieties are very good, but do not compare with the Early Ohio in quality.

This tract is new ground broken this year but thoroughly cultivated and cross plowed before planting, no fertilizer whatever being used.

The potatoes on other parts of the station were so seriously damaged by frost that they returned little more than the amount planted. On the highest old ground 26 varieties of potatoes were planted with a view to noting the comparative yields and stage of maturity, but the ground kept too cold for early growth, and the midsummer frost injured the tops so badly that the real experiment was lost.

A neighbor presented to the station two small potatoes of his own production from the seed pod. These two potatoes, which weighed less than a pound, were planted on the south slope new ground after fertilizing the soil lightly with stable manure. Each potato was cut into 5 pieces, making 10 hills. The soil was in fine condition and the only cultivation these potatoes got was to pull the dirt to the hills with a hoe at ridging time. The potatoes were dug September 17 before any frost had touched the vines. The yield was 40 times the weight planted. It is a very large, smooth, white potato.

The south hillsides are decidedly preferable for potato culture, as they will produce a better quality of potato than flat land. Again on flat land potatoes are usually killed by frost from two to three weeks earlier than on hill land.

On soils of a clayey nature the potato should be planted very near the surface, ridging the ground a little to cover the seed, and continue the ridging with each cultivation, until sufficiently ridged to protect the tubers from a light fall freeze that may come before the crop is harvested.

Potatoes grown in this country have a very thin skin and are easily bruised when first dug, therefore they should always be put in crates in the field and never sacked.

THE GARDEN.

Nearly all of the hardy vegetables were grown for home use only. The first rhubarb was ready for use June 22; radishes June 24; lettuce July 4; turnips July 18; cabbage August 15.

Lettuce from the greenhouse was had May 1; strawberries June 5, cucumbers June 11, and tomatoes July 4. After these dates an abundant supply of vegetables from the garden and greenhouse was available. A dozen vines of the Early Anna tomato in the greenhouse furnished all the fresh tomatoes needed in addition to making quite a few into preserves. A few plants were set in the open garden, which made a fair growth and bore some fruit, a part of which ripened.

The Bologna tomato, sent from Sitka, was received a little late, but seed was given to two different greenhouse men and a few plants were started in the station greenhouse, which ripened some large smooth tomatoes.

Cucumbers, Fordhook Famous, were had all the season measuring 12 to 14 inches long and 8 to 10 inches in circumference. Some saved for seed measured 15½ inches



FIG. 1.—CAULIFLOWER GROWN AT FAIRBANKS STATION.



FIG. 2.—VEGETABLES GROWN AT BETHEL, ON KUSKOKWIM RIVER.

long and 11½ inches around. Turnips as large as dinner plates, cabbage weighing 12 pounds; cauliflower weighing 2½ pounds (Pl. XII, fig. 1), and very fine celery were grown.

The gardens about Fairbanks produced the usual abundance of vegetables of the finest quality.

One gardener raised 16 tons of cabbage on a half acre of highly fertilized soil. The average heads weighed about 16 pounds. Many heads from this half acre weighed 25 to 32 pounds. The largest head weighed 33 pounds; he also had 16,000 strawberry plants. Six thousand of these were grown under glass and 10,000 were very successfully grown in the open garden.

Another gardener and farmer near Fairbanks reports good crops, except potatoes, which were frosted early. His buckwheat and winter wheat were both killed by frost. Cabbage, turnips, carrots, and other garden stuff was very good. He is still raising hogs and has 60 head at this date, all sizes, and they all look healthy and are fat enough for the butcher, but it has not yet been decided whether this industry is going to be profitable here or not.

REPORT OF WORK AT KODIAK LIVE-STOCK AND BREEDING STATION.

By M. D. SNODGRASS, *Superintendent.*

Work at Kodiak Station has progressed well this past year along the lines as planned in the last report, with the exception of the dairy work, which has been put off another year.

At Calsinsky Bay the work of fencing was delayed during the late fall months, owing to the early freezing of the ground, but was resumed in the spring as soon as the frost left the ground. About 1 mile of a 5-wire fence was built for sheep and cattle, a 20-acre pasture for cattle and horses, and a 20-acre meadow was fenced this summer. The fencing for sheep and cattle will be continued this fall until the ground freezes and again in the spring. There are several miles of fencing to be done as soon as funds are available for the work—fencing to confine the cattle and sheep and to keep out the bears from the station lands. Bears and foxes are the natural enemies of sheep, and the bears are destructive among cattle at times.

Road work has been continued at odd times where it was most needed to make it easier to haul hay and silage from the meadows. There is much road work to be done in the next few years so as to shorten the distance of hauling hay. Numerous small creeks and lagoons cut up the meadows and at high tides make it very inconvenient hauling. A road crossing the creeks about a half mile from the beach will greatly aid in the work.

The clearing of beach land, tide flats, and meadow land was resumed in June. Several men and two teams were kept at this work until haymaking time. Fifteen acres of excellent beach land for growing silage was cleared of heavy logs and driftwood. About 25 acres of tide flat was cleared of scattering logs and driftwood. Twenty acres of meadow land was cleared of alder brush and fallen limbs, making a total of 135 acres of land over which a mowing machine can be run. The beach land cleared this year will furnish a considerable amount of the silage needed another year. Wild rye grass and a wild peavine grow luxuriantly on this land and make the best of silage, besides furnishing excellent early and late pasture for stock. If cut for silage at the proper time the wild rye makes a good growth for late pasture, and is second of the grasses here for early pasture. The salt grass on the tide flats comes about two weeks earlier, but does not make as good pasture or silage as the wild rye.

The building for the season consists of a dairy building, a horse barn, and another silo. The barn is 20 feet wide, 40-foot long, and 16 feet to the eaves. It affords room

for 5 horses and 12 cows, and hay room for 15 tons, besides storeroom for grain feed for horses. The dairy building was completed during the late fall months and winter. It is a frame building 16 feet by 28 feet, and divided into 2 rooms, which affords ample room for the dairy work and the dairy equipment. The new stave silo is 16 feet in diameter and 26 feet high and holds 100 tons. It is set on a concrete foundation, and the bottom is of cement, making it water-tight. The doors, which are of the door-ladder combination, are wide enough to allow pitching the beach grass through them, and are put in place as the silo fills up, making a ladder from bottom to the top of the silo. The top half is filled from a staging to which the grass is pitched from the wagon. In filling both the old and new silos the work is somewhat difficult, owing to the high pitching of the heavy green grass. This will be remedied when funds are available to purchase an ensilage cutter which will cut and elevate the grass to the top of the silo. An ensilage cutter is needed very much, and it is hoped that one can be purchased in another year.

The conditions for putting up silage and haymaking were ideal this year, except for a short crop of grass, which made it necessary to cut over more ground than usual and haul farther than in previous years. Two teams and 6 men were kept at work haymaking and putting up silage from July 26 until September 26. Enough hay and silage has been put up for the wintering of the cattle, sheep, and horses. A second wagon was purchased this year, which aided greatly in haying and putting up silage, and the general farm work.

Another horse was purchased to strengthen the station teams this year and a team of 2-year-old colts was purchased for use after this year, making a total of 7 horses at the station.

The 12-horsepower gasoline launch was put into commission January 4, and has greatly relieved the situation in traveling and moving stock between Kodiak and Calsinsky Bay and hauling feed, supplies, and equipment from Kodiak to the bay and in hauling hay from the bay to Kodiak. It also came in good use when filling the silos by towing the lighter filled with beach grass from the river, along which the grass is cut, to the opposite side of the bay where the station buildings are located, a distance of a mile and a half, shortening the hauling with teams a great deal and making the work of putting up silage more rapid than it otherwise could be. In traveling between the stations it now takes two hours with the launch where it formerly took from four to six hours with a dory, and in transferring the horses by water it takes four hours against two days overland as was necessary heretofore.

The launch is too small and light built for our needs, and is also overpowered, but it gives fair satisfaction as it is. The engine gives perfect satisfaction, is strong and reliable, and when installed in a larger hull will give better results in towing, and the danger of going to sea will be greatly lessened. The present hull is about 22 feet long and has but 6 feet beam. A strong hull 32 feet long with 8 feet beam and schooner rigged is needed for safety and efficient work in crossing the open sea between Kodiak and Calsinsky Bay.

CLIMATIC CONDITIONS.

The fall months of 1909 were comparatively dry and cold. Westerly winds prevailed from October 1 to December 11 and the sun shone most of the time. The rainfall and snowfall was much less than is usual for this season of the year. The ground was bare most of the time and was frozen early in October and remained so through the rest of the winter. On January 1 the first snow to lie upon the ground for any time came, and was followed by frequent snows throughout the month. The snow was 12 inches deep on the last day of January. During the last week of January the weather was colder than has been experienced in this region in several years past. The thermometer registered 8° F. below zero and remained below zero for

five days. There was the usual number of clear, partly cloudy, and cloudy days for January, but it was colder for the month by several degrees than is usual.

The month of February was quite similar to that of 1909. There was more sunshine than is usual and snow fell on eight days. At the close of the month the snow was 18 inches deep on the level. March gave us the usual number of sunny days, but was characterized by frequent snow squalls. Westerly winds prevailed for the three months, and at times the heavy gales swept the snow from exposed places and drifted it badly. Fifty-eight and a half inches of snow fell during the three months.

April was cold and wet. Heavy snowstorms prevailed from the 1st to the 21st, during which time 34 inches of snow fell, the heaviest fall on record for April for this country. Westerly winds prevailed for the first half of the month, changing to the northeast on the 18th and gradually shifting to the southeast toward the last of the month, bringing rain and warmer weather.

The spring was very late and backward. Snow covered the ground until May 7 and lay in drifts in many places until the 1st of June. The frost was not out of the ground sufficiently for plowing until June 5.

May weather was about the usual; cloudy weather for 10 days, and 18 partly cloudy days with a little less sunshine than last year. June was colder than the year before, making the spring fully three weeks later than in 1909.

July, August, and September were warmer than last year and much drier. They were good growing months for vegetables, but much too dry for a heavy crop of hay and silage. August was especially dry, precipitation for the month being only 1.75 inches. The total hours of sunshine for the growing season were about the same as the last year, considerably above the average.

The first frost of the season came September 22, but did no damage, and again on the 28th a light frost came without damage to vegetation.

The principal meteorological data are summarized in the following tables:

Summary of weather record from October 1, 1909, to September 30, 1910.

Months.	Temperature.			Precipitation.		Character of weather.			
	Maximum.	Minimum.	Mean.	Total.	Snow-fall.	Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	° F.	° F.	° F.	Inches.	Inches.	Days.	Days.	Days.	Days.
October.....	52	20	37.6	4.45	2.0	6	16	9	14
November.....	54	10	30.9	1.42	2.5	9	17	4	5
December.....	.....	8	124.4	5.47	5.5	1	20	10	13
January.....	.....	- 8	117.0	2.68	14.5	4	19	8	8
February.....	.....	- 2	120.2	5.36	20.0	.....	21	7	13
March.....	² 50	7	123.7	4.90	24.0	.....	23	8	21
April.....	45	5	31.0	7.30	34.5	1	21	8	16
May.....	65	24	40.4	4.54	3.0	3	18	10	13
June.....	65	32	45.2	3.68	.....	2	21	7	16
July.....	71	35	52.4	5.13	.....	9	13	9	12
August.....	78	37	54.5	1.75	.....	5	20	6	10
September.....	76	32	50.6	3.62	.....	4	18	8	14
Total.....	.....	.....	.....	50.3	106.0	44	227	94	155

¹ Mean minimum temperature. The maximum thermometer was broken December 5 and not replaced until March 18.

² Maximum temperature for last 14 days of the month.

Character of weather from October 1, 1907, to September 30, 1910.

Months.	Clear days.			Partly cloudy days.			Cloudy days.		
	1907-8	1908-9	1909-10	1907-8	1908-9	1909-10	1907-8	1908-9	1909-10
October.....	6	7	6	7	11	16	18	13	9
November.....	10	1	9	-----	11	17	20	18	4
December.....	7	5	1	2	18	20	22	8	10
January.....	7	5	4	15	19	19	9	7	8
February.....	10	2	-----	11	20	21	8	6	7
March.....	6	1	-----	10	21	23	15	9	8
Total for 6 months.	46	21	20	45	100	116	92	61	46
April.....	-----	2	1	16	24	21	14	4	8
May.....	1	3	3	16	23	18	14	5	10
June.....	5	3	2	16	19	21	10	8	7
July.....	-----	1	9	12	23	13	19	7	9
August.....	7	8	5	13	13	20	11	10	6
September.....	3	8	4	20	11	18	7	11	8
Total for 6 months.	16	25	24	93	113	111	75	45	48

Months.	Days on which rain or snow fell.			Precipitation and snowfall.					
	1907-8	1908-9	1909-10	1907-8		1908-9		1909-10	
				Total.	Snow-fall.	Total.	Snow-fall.	Total.	Snow-fall.
October.....	15	13	14	<i>Inches.</i> 6.91	<i>Inches.</i> 1.0	<i>Inches.</i> 6.91	<i>Inches.</i> 1.0	<i>Inches.</i> 4.45	<i>Inches.</i> 2.0
November.....	15	20	5	7.70	4.5	14.11	2.5	1.42	2.5
December.....	13	14	13	6.50	5.5	7.15	11.0	5.47	5.5
January.....	16	9	8	4.37	6.5	1.53	15.0	2.68	14.5
February.....	15	12	13	5.65	11.5	1.53	12.5	5.36	20.0
March.....	15	18	21	2.84	8.5	3.92	37.0	4.90	24.0
Total for 6 months.	89	86	74	33.97	37.5	34.95	79.0	24.28	68.5
April.....	17	11	16	4.87	17.5	5.41	4.0	7.40	34.5
May.....	27	16	13	6.05	Trace.	4.97	.5	4.54	3.0
June.....	9	16	16	1.63	-----	7.25	-----	3.68	-----
July.....	21	13	12	6.64	-----	2.92	-----	5.23	-----
August.....	16	17	10	7.04	-----	5.12	-----	1.75	-----
September.....	15	15	14	3.82	1.0	4.64	.5	3.62	-----
Total for 6 months.	105	88	81	30.05	18.5	31.31	5.0	26.22	37.5

GRAIN HAY.

The lateness of the spring again made it impossible to work the ground for spring crops until June 7 at Calsinsky Bay, where the soil is sandy, and June 9 at Kodiak in a clay loam soil. Small plats of oats were seeded for hay. Each plat received a light dressing of manure before plowing. A good stand was secured on each plat, but the growth was very slow until after July 15. On the sandy soil the early growth was more rapid than on clay loam soil; but the oats did not stand the dry weather in August nearly so well. When fully headed out, the oats were 24 inches high on sandy soil and 36 to 40 inches high on clay loam soil, where they were well filled. None of the oats matured. A little barley was mixed with the oats sown on sandy soil. This grew well and fully matured, making fair-sized heads filled with plump kernels. The oats were cut for hay September 28. The yield was estimated at 1½ tons per acre at Calsinsky Bay and at 2½ tons at Kodiak.

ROOT CROPS.

Root crops were good this season. Only enough turnips and rutabagas were grown to demonstrate the advisability of growing them for stock feed. Potatoes made a fair yield this season and were the best in quality ever grown on this island.

A good root cellar will be built this fall for storing such crops, and more attention will be given to growing root crops good for stock feed.

HAYMAKING AND PUTTING UP SILAGE.

Owing to the lateness of the spring and the dry weather in July and August the hay crop was much shorter than was expected after a winter of deep snow. The grass was very slow in starting and would not afford pasture for cattle until after June 20, except on the tide flats, where the high tides warmed the ground and started the grass May 1. After June 20 the grass grew rapidly until the middle of July, when the dry weather set in. From July 20 to September 12 there was very little growth on hay lands. Where the hay was cut the previous year, the crop was very short, not more than one-third as much as the year before. Upon newly cleared meadow the yield of hay was only fair, about 1 ton to the acre. However, the quality of the hay was first-class. The first hay was cut August 12 and from that date until August 26 the weather was ideal for haymaking. Five days of light showers came, then followed another period of several days of good hay weather. During this time about 60 tons of first-class native hay was cut and cured, 30 tons of which was hauled to the hay barn and 30 tons stacked in the field. The distance of hauling hay was greater than heretofore, as the shortage in the hay crop made it necessary to go farther from the station building for most of the hay, thereby making the work slower than usual. The stacked hay will be hauled to the barn as soon as the ground is frozen enough to bear the load over the marshy places. The practice of cutting hay late was necessary this season in order to get the needed amount for the stock. About 25 tons of hay was cut late in September, half of which was cured and saved. The frequent showers at this period made it impossible to save all.

The beach grass was pastured until June 20. From that date until July 26, when the first silage was cut, the grass grew rapidly and made a fair yield of silage, where it had not been cut before, but much of the beach grass was not worth cutting where it had been cut for the two years previous. In many places the grass had died out, leaving a very thin stand, which seemed to lack vigor and made little growth during the season.

The 100-ton silo was filled by August 12, and after that date it was kept full as the silage settled. The new silo was erected in September and about 50 tons of beach grass was put up after September 5. The distance of hauling and lateness of the season made it impossible to fill this silo. The material for the silo had been ordered from Portland, Oreg., for shipment in July, but it was delayed in the hands of the railroad company for a month and again in Seattle with the steamship company, finally reaching Kodiak August 26, six weeks late and too late for filling this year.

The quality of the silage is good this season. The grass on the tide flats was about 12 inches high and had good color when cut for silage. The wild rye grass on the higher beach land was of the best quality cut here in three years. It was from 12 to 18 inches high and made a fair yield. The most of it was cut before the stems became woody and hard. The later cuttings of beach grass for silage was of only fair quality, having stood through the long dry spell and begun to ripen and turn yellow.

The silage fed during the past winter was of good color and sweet. The cattle ate it with a relish and thrived well upon it. Feeding tests will be conducted as soon as the scales can be procured for weighing the stock.

THE STATION HERD.

The herd made a good increase this year and have proved their adaptability to the climate and native feeds. (Pl. XIII, fig. 1.) Twenty-four calves were dropped this year, four half-bred Galloways and 20 purebred Galloways—9 heifers and 11 bulls. One purebred heifer and one bull calf died. One 2-year-old bull died in

the spring from liver trouble. Post-mortem examination showed the liver to be almost rotten.

All the calves and young stock have made good growth this season. The cattle wintered well on silage and hay. The fall pasture in 1909 was not so good as usual owing to the early hard freezing. It was necessary to begin feeding a month earlier last winter than heretofore. On November 4 the cattle were put in the shed at night and fed hay. From that date until December 1 the cattle browsed considerably, but were fed hay at night in the shed. Began feeding silage December 2 at night and hay in the mornings. The cattle ran in the woods and on the beach during the day. There was but little snow to cover the grass until January 1, and after that until May 7 the ground was covered with snow, and the cattle found very little to browse upon. The cattle were fed what they would clean up well and seemed satisfied with it until April 1. At this time the ration was cut down a little to make the hay and silage last until there was grass. Some lost in flesh considerably before grass on the tide flats furnished any picking for them. Heavy ice covered much of the flats until late in April and under the ice the beach grass grew 3 to 4 inches long. When the ice went there was fairly good pasture for the entire herd. Two yearling bulls were sold to settlers for breeders, and 3 young bulls were sold for beef.

At the present time the station herd consists of 59 head of purebred Galloway cattle and 10 head half-bred native cattle. The half-breeds will be killed and sold for beef, with the exception of 2 cows and 3 steer calves. The cows are good milkers and will be saved for that purpose, while the steers will be kept for feeding experiments.

During the summer months the cattle fattened quickly and are now in prime order. Fall pasture is excellent this season. The late rains caused the grass to grow, and pasture will be good until heavy freezes or snows come.

Forty head of grade ewes were purchased in July. (Pl. XIII, fig. 2.) These ewes are all Alaska-born sheep and have proved themselves adapted to this climate. They are a mixture of Cotswold, Shropshire, and other black-faced sheep, and came originally from the range sheep of the Northwest States. They are larger and longer woolled than usually found on the ranges and a more hardy sheep. A ram of larger size, probably a Lincoln, will be purchased in the States this fall for heading this flock. Thirty-nine lambs were dropped this season, 6 of which died while small and 3 were killed by eagles or foxes after they were four weeks old. The ewes sheared from 5 to 12 pounds of wool per head, averaging 7.4 pounds per head. The wool is of good quality and much cleaner than that from the ranges in the States. It is practically free from sand and dirt, as there are no sand or dust storms in this country. The sheep range for 11 months of the year and require very little feeding and shelter, except for a few days at a time during some of the heaviest snowstorms. Some years they require no attention at all and are fat enough for mutton at all times. The lambs make a very rapid growth during the summer and go into the winter in splendid condition. With proper care of the ewes two months before lambing time there should be very little loss among the lambs.

A dry shelter should be provided for ewes and lambs at lambing time and gentle handling is always necessary. In the fall of the year the sheep range high on the mountain sides where the grass is short and of different species from that growing on the lowlands. It comes later in the spring and seems to stand the early frosts better than other grasses. The sheep range upon this grass until it is covered with snow, when they come to the tide flats and timber on the lowlands. The wet weather does not seem to have any ill effect upon the sheep. Their long coats of wool give them ample protection from the rains. There are no diseases among the sheep on Kodiak Island. When the sheep were first introduced into the country scab and foot rot came with them, but these have disappeared long since. The flock from which these ewes were selected has increased 100 per cent for three years with very little care and a small amount of silage and hay feed during the winters. The loss of lambs this



FIG. 1.—CATTLE AND BARNs, KODIAK STATION.



FIG. 2.—SHEEP ON PASTURE, KODIAK STATION.

season may be laid to the fact that the ewes were moved from their natural feeding grounds to a new and strange place during lambing time, thereby disturbing the ewes when they should have been quiet.

NEEDS OF THE STATION.

Many of the needs of this station have been met this year, but in building up a station there seems no end to the needs. The most urgent need here is a house for the superintendent and an addition to the herdsman's cottage at Calsinsky Bay.

Another silo for the dairy cows will be necessary for next season at Kodiak. A large towing skiff is also necessary for towing hay and silage from the bay to Kodiak. Stock scales are much needed for accurate work with stock. A larger hull to replace the launch now in use should be purchased at once for the sake of safety in traveling between the two stations. An ensilage cutter should be added to the equipment for putting up feed for the stock.

The work with live stock is going along nicely and is very encouraging this year. When the station is fully equipped for taking care of more stock the station will be self-supporting. It is hoped that the needed funds for building and equipment will be supplied in another year, so the work of building up the station can be completed, and more attention can be given the experimental work. Feeding experiments should be taken up another winter, and the dairy work will be begun on a larger scale as soon as possible.

SURVEY OF ALASKA LANDS.

That Alaska lands should be surveyed, the sooner the better, goes without saying. Surveys would facilitate settlements and avoid the confusion which inevitably must result from the promiscuous location of homesteads picked from the best locations without regard to the section lines which must eventually be run, and without regard to the proximity of neighboring homesteads, often leaving small and irregular tracts between them. It has been proposed that the work of surveying the Alaska agricultural lands should be done by the Geological Survey, and perhaps it could not be left in better hands. With this end in view the chief of Division of the Alaska Mineral Resources, of the Geological Survey, Mr. Alfred H. Brooks, applied to the Office of Experiment Stations of the Department of Agriculture for information as to the probable area of agricultural land in the Tanana and Matanuska Valleys, so as to have a basis for estimating the cost. Orders were accordingly sent to investigate and report said areas, and, in compliance, Mr. J. W. Neal, superintendent of the Fairbanks Station, was instructed to make a trip through the Tanana Valley, going up the tributaries as far as practicable, and obtain information from other sources, particularly prospectors and hunters, and from the collective data furnish an estimate of the area which might have a value for agricultural purposes. His report of this trip is submitted herewith. It will be noted that he reaches the conclusion that the Tanana Valley and tributary valleys contain an aggregate of about 15,000 square miles of agricultural and grazing lands. From a personal, though somewhat

cursory investigation of the same subject, the same conclusion had already been arrived at and so stated in several reports. It must be understood that any estimate of this nature can be only approximate. The surveyor is the only person who can make an accurate report. To make a reconnoissance of any value it would be necessary to equip the investigators with a pack train of horses and provisions for an all summer camping trip. They should then follow a line near the headlands of the tributary valleys and travel up the whole length of the valley on one side and down on the other. This would be a hard summer's work and cost thousands of dollars. The members of the station staff are already fully employed, and they have not time nor the means to defray the expenses of such an expedition. Even then the estimates could be only approximate. The surveyor is the proper party to do this work. He should be capable of judging of the agricultural value of lands, and as he must traverse the ground in detail and see almost every square foot of the land, his report can be the only accurate one as to the agricultural lands within the drainage area of any of the rivers.

Mr. Neal could ill be spared from his station, nor could the funds, which had already been set aside for the work in hand, be spared. His investigation was, therefore, of necessity but brief and cursory. In the absence of a pack train the only way he could travel was by water, and, without a poling boat and two or three men to assist in driving it upstream, he could not go to the headwaters of the tributaries and view these minor valleys. He did the only thing that could be done, namely, stopped at the landing places of the boats, made excursions on foot in the vicinity of these landing places, interviewed prospectors and hunters who had been over the ground, and proceeding from place to place, covered in this way the territory of the lower Tanana Valley. He did not go to the upper Tanana Valley at all. The trip through the 60 miles of rapids above Tanana is always slow and often unsuccessful by boats not well provided with power. But few trips are made in that direction, and even if a boat had gone, the interests of the station would not admit of his absence for so long a time. His report follows:

J. W. NEAL'S REPORT ON HIS INVESTIGATION OF THE AVAILABLE AGRICULTURAL LAND IN THE TANANA VALLEY.

Complying with your instructions to investigate and classify the lands of the Tanana Valley for agriculture and grazing purposes, I left my station on August 12, taking passage on the steamer *Tanana* to Fort Gibbon, thereby acquainting myself with the several stations and boat landings between Fairbanks and the mouth of the river, there being no provision made for traveling through the valley except by steamboat.

On my return up the river I stopped over at every landing where meals and lodging could be had, taking the first following boat to the next station and so on to Fairbanks. Owing to the limited amount of time and means of travel it would be impossible to make a very satisfactory report on this subject.

It must be understood that one can see but little of the valley from the deck of a vessel, and landings are from 40 to 75 miles apart.

The valley is said to be 300 miles long and 30 to 70 miles wide, aggregating about 12,000 square miles of valley land, and, roughly estimated, the valleys of the numerous tributaries comprise about 3,000 square miles, making a total of probably 15,000 square miles of valley land within the drainage area of the Tanana River system.

Outside of the few settlements along the river the country is still a wilderness of almost impenetrable forest and swamp. There is a very fair winter trail along the north side of the river from the mouth of the river to Fairbanks, but impassable for summer travel. This trail continues up the river about 100 miles above Fairbanks, being very passable for winter or summer travel, but seldom leaves the river bank for any considerable distance. Aside from this trail there are practically no other trails throughout the valley to my knowledge, save very dim trails following the banks of the large tributaries. There is, however, a fair wagon road from Manley Hot Springs to the Baker and Eureka Creeks gold fields about 22 miles distant, and in the vicinity of Fairbanks there are very good roads leading out to the gold-bearing creeks. With the limited mileage of roads and trails it is impossible to obtain a very correct estimate of the amount of land suitable to agricultural grazing.

Fires have devastated the forests to such an extent that it is indeed difficult to travel even on foot for any distance from the trails, and one can not go very far from a settlement, for he must return by night unless provision is made for camping.

The greater part of this report is based on interviews with prospectors and hunters whom I have met at the different stations along the river, personal observations being limited for reasons that may be readily understood from the foregoing.

Continuing these investigations from the mouth of the river, traveling upstream, the valley is estimated to be about 70 miles wide at Manley Hot Springs, widening out considerably on approaching its mouth.

There is a high range of hills along the north bank of the river about Hot Springs, probably 40 miles in length and extending several miles back from the river, with some miles of level lowland still back of these hills. The country lying between this range of hills and the mouth of the Tanana is low, flat, and marshy, with numerous lakes. The highest part of this lowland is heavily timbered with spruce.

The lakes mentioned above are about 25 miles above the mouth of the river and probably 12 miles back from its bank. There are said to be large meadows around these lakes and covering several lake beds where the water has dried up, affording a considerable acreage of grazing land.

Across the river, opposite Hot Springs, and back about 4 miles from the river the valley rises quite abruptly to low sand hills, which extend back to the foothills probably 50 miles from the river. Looking from the hills back of Fort Gibbon these low sand hills appear to continue all the way down to the mouth of the river, forming a great plateau.

The valley on the south side of the river, below Fairbanks, is little known. Prospectors say there are numerous lakes along the hills all over this plateau, affording considerable grazing land around their borders. Much of this plateau, or these sand hills, is timbered with birch. The lowland lying between these hills and the river is covered with spruce.

Passing upstream from Hot Springs on the south side of the river, 28 miles to the mouth of the Kantishna River, the country along the Tanana is said to be low and flat, comprising much swamp and niggerhead land.

The Kantishna Valley is said to be from 20 to 30 miles wide for probably 40 miles from its mouth. The low sand hills mentioned as being opposite Hot Springs continue on up to the Kantishna, and just back of this is a 10 or 12 mile strip of low marsh land.

On the Hot Springs side of the Tanana, Baker Creek empties 6 miles above the springs. This creek has a valley about 6 miles wide and 30 miles long. The land is

flat, covering the greater part of this area, but fairly well drained, and promises good for agriculture.

The hills in this vicinity and those along the Tanana about Hot Springs have many southern slopes which promise to be excellent farming land. Baker Creek has cut its way through this chain of hills and its valley is practically shut off from the Tanana Valley proper. Much of this valley has been burned over and is now very good for grazing, but it would practically all be classed as agricultural land rather than for grazing purposes.

The Tolovana empties into the Tanana about 35 miles farther up, coming in from the north. This river has a valley 20 to 30 miles wide for probably 50 miles back from its mouth. Much of this valley is flat and swampy with large areas of niggerhead land lying along the Tanana River and back along the east side of the Tolovana. On the west side of the Tolovana there is said to be a large area of low plateau stretching out over the most part of the west side of the valley and to within a few miles of the Tanana. Much of this plateau is said to afford considerable grazing, with great meadows.

Leaving the Tolovana the hills rise abruptly from the north bank of the Tanana for several miles above the Nenana, which empties from the south about 60 miles above the Tolovana. There is a broad strip of lowland still back of this range of hills drained by the Tolovana. Along the Nenana (or Cantwell) the main Tanana Valley laps back for about 30 miles, from which point the Nenana Valley narrows up to a few miles, but extends back probably 20 miles farther. The country lying between the Nenana and the Kantishna is rather low and level, being well timbered along the Tanana but quite swampy farther back. Looking south from the high hills opposite Nenana Station one can see great areas of open country along the foothills from the Kantishna crossing Nenana Valley to the Totatlanika River, apparently covered with grass, which probably would class as excellent grazing land. It would not be well suited to farming, as it slopes to the north. The Totatlanika empties into the Tanana 12 miles above the Nenana. The country between these two streams is low and flat along the Tanana for about 4 miles back, then rises gradually to a low plateau which continues back to the mountains. Much of this upland is quite open and covered with grass.

Wood River empties from the south about 20 miles above the Nenana. The land on either side is said to be flat and generally swampy well back to the foothills, probably 40 miles from the mouth. The upper portion of the valley is very lightly timbered and covered more or less with grass.

The south side of the Tanana Valley continues low and flat on up to Fairbanks, while the north side continues very hilly from Nenana up to Chena, where it widens out somewhat into a flat country. The southern slopes of the hills about Chena and back of Fairbanks are proving to be excellent farm lands, which I think will prove true throughout the valley. The lowlands where good drainage is possible will often produce abundantly, but crops are in greater danger of midsummer frosts.

On arriving at Fairbanks from the lower valley I received instructions to stop this investigation, and I will conclude with the following remarks:

First, to arrive at anything like an authentic report of investigations of the Tanana Valley lands it occurs to me that there is but one method to employ, which would, of course, involve considerable time and expense, it being wholly impracticable to travel through the country with pack horses, there being practically no trails whatever on the south side of the river, and no possible summer trail below Fairbanks; therefore to employ a good open rowboat and 3 men with a camping outfit for the season, starting at the extreme head of navigation and drifting slowly downstream, making camps say about 20 miles apart. Leaving 1 man at camp the other 2 could explore the valley back to the foothills on either side of the river from each camp by carrying two or three days food with them. The valleys of the several tributaries

can be examined in the same manner by poling the little boat upstream as far as practicable.

Secondly, I would not recommend the department to make a general survey of the whole valley at any near future date. It is certainly necessary to extend the prime meridian through the valley and also to survey a few townships in the vicinity of each settlement. I do not see anything to prompt an early settlement of the valley on the south side of the river from its mouth to where the Valdez-Fairbanks winter trail crosses the Tanana at the little Delta, except in the close vicinity of Nenana Station, and, perhaps, the mouth of Wood River. These are the only settlements on that side of the river, I think, below the little Delta, a distance of nearly 300 miles by the line of the river. There are several small settlements along the trail traversing the north side of the valley from Hot Springs to the mouth of the Goodpaster. Homesteaders will naturally cluster about these settlements, and at the present rate of development there will be plenty of land for all home seekers along this thoroughfare for many years to come, and it is my opinion that settlers should be encouraged to locate on the north side of the valley, as the southern exposure is highly preferable for farming in Alaska.

Very respectfully,

J. W. NEAL.

SEPTEMBER 14, 1910.

LETTERS FROM SETTLERS.

(The author of the following communication has been engaged in stock raising and, to a less extent, in general farming for a dozen years in the coast region of southeast Alaska. He is a practical man, and his experience and deductions can not fail to be of value to all others who are similarly situated. It should be borne in mind, however, that it applies to the coast region and not to the interior, where the climatic conditions are entirely different.—C. C. G.)

W. H. Marrett, Haines.—Mining and other of the more profitable Alaskan industries have raised the general price for labor higher than can be profitably paid on farms anywhere, and here it is also often impossible to get help temporarily when specially needed. Other conditions than labor make it generally impracticable to do any sort of farming on such a large scale as is common in many other comparatively new countries. Here the acres of arable land are too few for steam plows, so the mowing machine is about the only labor-saving machine in general use. It is expensive to clear land, and generally by the time one has even a few acres plowed well enough for easy planting, chickweed is somehow introduced, and then the greatest amount of very tedious hand labor is necessary to raise even on a very small scale anything but grass and grain, while very little of the latter has ever been sufficiently matured for anything but fodder. There is no chickweed on Alaska land to begin with, but it gets started in unexpected ways, and then spreads like wildfire over every foot of ground then under cultivation. No one has yet succeeded in eradicating it when once it has begun to spread. Other weeds are not very difficult to contend with. Beets and other such roots apparently become too discouraged by the lack of warmth and sunshine to risk the second year for seeding, attempt to go to seed the first year, and are fit for neither seed nor the pot. The corn does not get far enough along for "roasting ears," though all along stock and leaf has been "golden," regardless of variety; visions of baked beans and pumpkin pies prove vain, and what at the start looked like wealth is found to be the direst poverty.

In the Alaska coast region it is useless to try to raise many of the leading crops of the Northern Atlantic States, Canadian Provinces, and European countries, such as any varieties of corn, beans, melons, squash, pumpkins, cucumbers, tomatoes, etc. Buckwheat will not mature nor will spring wheat, barley, or oats, except on warm sandy

land or in very exceptional seasons, and of the grains I have discarded all but winter rye. That should be sown early and kept back if necessary by either mowing or grazing. It makes excellent pasture and can be kept back any number of seasons by not allowing it to head. Mine I have made use of first for winter pasture for the horses and cattle, and then the following season, when well ripened have cured it chiefly for the hogs. I do not thresh it but feed it by the forkful, feeding also turnips, which I have cooked when convenient, along with the rye. The hogs eat not only the head of the rye but also quite a portion of the straw. The coarsest of the straw which they do not eat, makes them an excellent bed. I also feed the rye, unthreshed, to the horses. Some seasons I have raised immense crops of turnips, as high as 8 tons on half an acre with very little labor, sowed broadcast. Such yields can only occasionally be produced, however, but a fair crop of almost every variety can be raised any season. Quite large quantities of rutabagas and golden balls can be sold every year and generally at profitable prices. Horses, cattle, and hogs eat turnips readily, though their real value for feeding to stock is probably small as compared with grain.

Potatoes are easily raised, yielding quite well generally. On new land that is adapted to them, particularly when seaweed is used for fertilizing, the quality is very good, though I have noticed in some sections where repeated crops have been taken off the same ground the scab has very greatly lessened their value.

The most marked success is, perhaps, with strawberries. A natural product of Alaska, the wild berries here very closely resemble the cultivated in size, manner of propagating, and general characteristics, but when transplanted and cultivated do not yield well. If left several years they bear better, but never very abundantly. The varieties that are the most general favorites elsewhere are not nearly so prolific or satisfactory here.

Red currants, equal in size and quality to the best cultivated, grow wild in many places, but, like the strawberry, the wild variety does not bear well when transplanted and cultivated. All varieties brought from the States do well. It is much the same with the raspberry.

Everybody can raise an abundance of excellent lettuce, and the same is true of rhubarb. Large and profitable crops of cabbages have been raised some years, but they require the very best of ground and need careful cultivation. Parsnips, carrots, beets, etc., can be raised but not very abundantly.

Grasses offer the greatest agricultural possibilities here. Several of the native varieties make excellent hay, and quite large quantities to the acre. There are many places where 10, 20, 50 or more consecutive acres can be mowed with the ordinary mower. This can be put at small expense into silos, and they are not very expensive to build here, as they do not need to be so tight as in the warmer countries. A log silo, boarded perpendicularly on the inside answers the purpose. All the hardier cultivated grasses do well, timothy and the clovers particularly. In many places these grasses started from the hay brought here and fed out, have spread over many acres and are continually increasing in area. Alfalfa has been sown and has appeared to do well for one season, but no one has persisted in cultivating it on the same ground, which is said to be necessary at the start.

Cattle do well on silage from either wild or cultivated grasses, and some persons use it for their horses and like it for a time while the horses are not working much. Early cut, well cured Alaska hay is preferred by all kinds of stock, but most seasons it rains so constantly in all parts of southeastern Alaska after the first of July that it is difficult and expensive curing hay except under cover. June is dry, but the grass is then only partly grown and so very green that it takes time to dry it. I have worked up a system of curing under cover on wires with small expense and very little labor. The main features are a roof, which I have so it can be raised or lowered, to keep the rain off and a chance for the air to circulate freely. Generally it is partly cured on the ground. When fully cured on the wires it is dropped into the ground mow.

Cattle, horses, hogs, sheep, and angora goats can be raised nearly or quite as well in Alaska as in other of the most northern countries. Theoretically the Galloway cattle are specially well adapted to this climate, but nearly all the well-known breeds have now been produced here; Herefords, Durhams, Ayreshires, Holsteins, and Jerseys, grow as rapidly and mature as quickly as in other countries. What are not to be kept for milk are usually killed from October to December, after they are yearlings, so they are fed silage or hay only one winter. They can then be made to dress from 500 to 600 pounds each. The heifers are nearly or quite full grown and giving milk frequently before they are actually 2 years old. All the pure breeds and those of mixed breeding apparently do as well in Alaska as elsewhere.

Comparatively few colts have yet been raised here, but enough to prove conclusively that they grow quickly, are perfectly healthy, very hardy, and make as large and as valuable horses as could have been produced from the same stock farther south. Horses can be raised much more cheaply than would be generally supposed. Pasturing is still so abundant it costs practically nothing, and food and shelter for colts and young horses are actually needed only a very small portion of the time, some winters scarcely at all. Horses have repeatedly wintered well with little or no care where no other domestic animal would have survived.

Hogs can pick up their own living from about the 1st of April to the 1st of November. In midsummer where the wild peas are abundant they fatten on them, but Alaska has no nuts, so there is no fall mast, and they don't thrive as well in the latter part of the season. They are very prolific, 2 of mine producing 5 litters each in two years—10 and 11 each litter, an almost incredible aggregate of 50 and 55, respectively, in the two years, while of those farrowed in the spring and summer not one was lost. As a rule one litter early each year is better than two or three, which is possible.

Somewhat to my surprise neither the wild birds nor the wild animals have ever killed a single one of any of the young animals. The eagles and the bears are very numerous and there are also wolves and wildcats, but they never trouble any of the young stock here. I have been interested in noting the effect when the bears came accidentally near the stock. Neither the cows nor their calves appear to pay any attention to the bears, even when very near, nor do the bears seem to notice them. The horses run from the bear at first, apparently disliking the smell, but the bears never follow them, and after the first few times the horses watch the bear quite intently while near, but without moving a step.

The hogs and the bears feed over considerable of the same ground, and when they happen to come close together, the hog first noticing this gives the alarm and runs from the bear, but the bear appears to be as much frightened, and runs fully as fast the other way.

On the whole I anticipate more from stock raising of various kinds in Alaska than from any and all other lines of farming.

Mary A. Chatfield, Government teacher, Loring, Alaska.—Regarding seeds you sent us. The children planted them in the various gardens around their houses and at a cleared space about 3 miles from here, called Graveyard Point. They all came up. We have no school garden yet, but expect to have a place cleared for it next year. I made an urgent plea for it this year but it was not granted.

John L. Abrams, Sulzer, Alaska.—I append herewith a report on the results obtained from the seed and plants furnished me by your office last spring. The forepart of the season was unfavorable, as the snow was very late in going off and it rained almost continually up to the end of July, but during the month of August and up to the middle of September we had considerable bright warm weather. Our garden is situated very unfavorably, as it is shaded by the house until about 1 o'clock in the afternoon. This is the second year we have planted the garden, but the soil is very poor, being composed largely of rotten wood left from the stumps and logs removed to make the clearing the first year. The only fertilizer used was some seaweed and a few starfish.

Peas. The peas, Advancer and Prince of Wales, did wonderfully well, the vines attaining a height of 6 to 8 feet, and yielded an abundance of the finest possible peas. We have already picked fully 2 bushels from four rows of about 20 feet each, and there is still a large quantity of pods on the vines.

Carrots. Chantenay. These did well; were not very large but tender and of excellent flavor.

Beets. Detroit Dark Red. Did not do at all well; were very small and fibrous.

Parsnips. Hollow Crown. These were very poor, merely producing a fernlike top.

Parsley. Moss Curled. This did exceptionally well. No finer parsley could be grown anywhere.

Turnips. Purple Top Strap Leaved and Finnish. These did very well; were small but tender and of good flavor. The Finnish were best.

Lettuce. Deacon. This did fairly well, but only a few plants headed up. I attribute this partial success to the poor soil and bad location of the garden, as others here have raised lettuce that could not be excelled.

Rhubarb. (No name). This seed was planted in the spring of 1909 and lived out all last winter without any protection; the young plants were transplanted last spring and are now quite large and we have had several cuttings of it for table use.

Currant bushes. All the plants received last spring have done well and attained heights of 2 and 3 feet.

Red Raspberry bushes. These plants have all lived and have attained a height of over 2 feet since being planted last June.

Poppies. Shirley and California. Fine plants which bloomed very profusely were raised from this seed. The flowers were unequaled about here and I doubt if they could be excelled anywhere.

Pansies, Phlox, and Chinese pinks. These all did wonderfully well, producing an abundance of beautiful flowers.

Thomas Stevens, Bay View Ranch, Kasaan, Alaska.—Please excuse me for not reporting sooner for I have been away from home a long time. The trees and berry bushes made a splendid growth, and the new turnip seed you sent me yielded fine. They grew as large as $3\frac{1}{2}$ pounds in weight. Also beets. All the seed we planted did splendidly considering the season we had. I have saved some of the Finland turnip to raise seed from this year.

A. C. Goddard, Haines, Alaska.—I am writing, as promised, to report on my experiment with the Lapland barley you sent me last spring. I planted it as soon as the snow went off, on May 19, and it was up by May 27. On June 30, the maximum height was 36 inches, very uneven growth. The last of August frost killed the potato vines and damaged the barley that was in the dough, although there was no frost at Wells, about 5 miles from here. During September rain and frost laid it to the ground. I have dried out some of the heads and will try them again next year. As to potatoes, I just about got my seed back. I think this was on account of the late planting, May 31, no fertilizer being used, and the seed being shipped up from Puget Sound. Next year I will endeavor to plant earlier, manure the ground, and plant Alaska-grown potatoes of an early variety. I raised a good crop of lettuce, turnips, and radishes, although the latter were inclined to be pithy in the center. I found no trace of root maggot, perhaps on account of a liberal use of wood ashes. I am located about 30 miles up the Chilcat Valley from Haines.

Miss Hannah E. Brece, Iliamna, Alaska.—This year we have had the first "native garden." The school children cut the poles and made the fence the last of May, but the ground was still frozen until about June 4 or 5.

This has been an unusually poor year for a garden, but the boys and girls learned how to prepare the ground and to plant the seeds. They thought it very funny to stick them in the ground and laughed heartily. "All same as dead," they chattered.

The radishes were very good, also the lettuce, but it looks as though the frost will catch the turnips. The carrots and parsnips did not come up. Too cold, I think. I

tried some peas, and in a good season I think they would do well. I wish I could get the seeds in the fall. This fall.

I would like radishes, turnips, rutabagas, parsley, parsnips, kale, lettuce, cress, carrots, celery, and peas. Enough for four villages.

I wish I had some currant plants and some rhubarb plants for Iliamna. Flowers: Lobelia, asters, poppies, marigolds, sweet alyssum, pansies, bachelors' buttons, nasturtiums. It is no use to send the other varieties for they do not seem to amount to anything.

May I ask that the seeds be well sewed up, as sometimes they are a long time getting to me.

John J. O'Brien, Knik, Alaska.—This year I had in about an acre of vegetables, potatoes, cabbage, rutabagas, and turnips. The cabbages weighed from 3 to 10 pounds. The rutabagas averaged about 10 pounds and the turnips were as large and good as usual.

I was troubled this year with worms. They were small white worms and very destructive and very abundant. I used ashes on them but to no avail. The Jersey Wakefield cabbage I find to be the best in this country. The Dutch does not seem to do well here. I will put a much larger garden next year.

I would like to experiment with fruit trees next year if you have any for experimental purposes. I have a good piece of land and get all the sun there is, having a fine southern exposure, and also have good windbreak, my place being in a little cove.

Alyce E. Anderson, Unga, Alaska.—The gardens this year were not a success, except as to cress and lettuce. I saw yesterday some lettuce, each plant guarded by a fish head. The lettuce leaves were over 12 inches in height and the crispest I ever ate. All radishes in town are worm eaten. So are turnips in the school garden. Everything is slow in coming up. On one little plat we used stable manure and that seemed to help somewhat. About the only kind of seed ever used here are: Lettuce, radish, turnip, cress, and parsley. Others have been tried at various times but were a failure. We have made an asparagus bed. Where can I obtain some plants, not seeds? Can I get them from the experiment station? We dug up soil to a depth of 12 inches, filled in with stable manure, and covered with soil.

Rev. Adolf Stecker, Bethel, Alaska.—With this first winter mail I wish to send you our thanks for the seeds and papers received last year. The seeds we have used and distributed to those who wanted them, mostly to people who went up river.

Concerning the result of our gardening, I am glad to give a good report of a good harvest. We had for the first time a chance to get horse manure here, and have put it into the garden.

Yet, with all our care, during the first part of the summer, to the end of June, we hardly expected much of our garden. The weather was very unfavorable, being always cool. Even when it was warm in the daytime the nights were cool, and so the plants made little progress. However, in July, and especially in August, we had it very warm, sometimes hotter than we can remember having had it before. Then the garden did fine. All the whites who went through here, and there were many, were surprised to see such gardens. Altogether everything has done well. Potatoes are better than ever. Cabbage did well, but only Early Wakefield. I could not resist the temptation to plant a little of a different kind, with the result "nothing but leaves." Carrots, rutabagas, kohlrabi, the latter very large and not woody. Cauliflower did very well. The turnip seed you sent (Finnlander), although it arrived at end of June, did very well. I inclose a picture which I took in front of our hotbed (Pl. XII, fig. 2.) The hotbed shows the abundance of flowers we had. We always transplant the flowers over the whole bed, after the garden plants are out. On the hotbed frame is a head of cauliflower; in the middle, rutabagas and carrots; below, cabbage and on both sides, potatoes; below, on the ground is kale and some of the turnips from the new seed.

Of the apple trees five are alive yet, and since they have gotten so far now, I believe that they will do well. Of the currants seven are still alive. I almost thought one would have fruit this summer, but it did not. The worms have troubled the plants very little this summer.

W. G. Wilds, Chittyna, Alaska.—I received the package of seed sent me last May, but there was no radish or turnip seed among them, and it was too late to plant, but I had a variety of seed from the Government and from D. M. Ferry. This was a very late season, according to men who have been here other years, but the carrots, turnips, radishes, lettuce, and rutabagas did well. I could not get any early potatoes but planted some Burbanks. The largest were about the size of a hen's egg. Peas did well, too. Beans and corn did not do any good. Neither did cabbage, kale, or beets, but it was too late when I got them planted and it was new ground and no manure, so you see it was not a fair show. The first frost to kill beans was August 21. The potatoes were killed September 19. I gathered the last of the carrots and turnips October 6. The ground was beginning to harden then, but not so much but that I could pull them.

Oats, barley, wheat, and timothy grow fine where it is scattered from feeding, and I think it would do well here.

John E. Barrett, Kennicott, Alaska.—Received the seed potatoes, raspberry and currant bushes, seed, etc. Currants, raspberries, and potatoes all doing well. I planted my first potatoes, oats, peas, etc., this year on May 6. Potatoes are now in bloom; oats 3 feet high. We ate our first crop of rhubarb July 4. Had plenty of lettuce and radishes on July 1. Have had no killing frost here, and never have had until about September 6. This is my fifth year of experimenting. My ranch is located one-fourth of a mile from the foot of Kennicott Glacier. The elevation at my cabin is exactly 1,414 feet above sea level. I have no perpetual frost here. The ground is thawed out about May 1. The soil is sandy, an old river bottom, and needs plenty of water, as the rainfall at this point is very light. Vegetables grow very fast here when irrigated sufficiently. There are but a few acres of this kind of sand on the Kennicott. When you get off the river bottom the land is covered with scrubby spruce, swampy and frozen the year around.

John W. McCluskey, Richardson, Alaska.—Received from your station last spring samples of wheat, oats, and barley. All three were planted May 22 on soil that was plowed the fall of 1908 for the first time. Grain was harrowed in on sod without fertilizer of any kind. Barley grew about 45 inches high, stooling very strong and producing well-filled heads which got thoroughly ripe. Wheat grew 58 inches high, producing heads 5 inches long, stooling from twelve to seventeen from every seed. Did not get ripe. The oats did not come up very good. Ordinary white oats bought at store and planted same date grew very strong and ripened. All these could have been planted by May 1.

Other small seeds did well, especially the Petrowski turnips. They were strong growers and as smooth as an apple. Not one of them showed a sign of root maggots or blemish of any kind.

J. H. Wilber, Deadwood, Alaska.—The trees you sent two years ago reached me about this time (July). They were in very good condition considering the long time in transit. They nearly all lived over the first winter, but all died last winter. To give them the best chance I could, I took a portion myself and divided the balance among three friends. They met with about the same success as I did. I have one currant still living, but the raspberries all died the first season. They were situated where there was snow lying on them all winter. I have had difficulty with my radishes this year. They grew with a very large top, but never made any bottom, and all went to seed. I have had excellent luck with my smooth-leaved kale, but the curly leaved varieties did not do well.

James D. Wiest, Fairbanks, Alaska.—I located my ranch last March and moved on it April 4. I am situated about 6 miles up the Chena Slough from Fairbanks on the

right limit on the Graves place. I have about 100 acres of hill land. The highest part of it is not 150 feet higher than the flat land. The soil is a reddish clay. There is a limestone bluff on the east side. About half of this hill slopes to the south and the other half to the north. I planted about $1\frac{1}{2}$ acres of vegetables and sowed 1 pound of speltz and set out 18 apple trees; 6 Gravenstein, 6 Bismark, and 6 Siberian crab apple trees, 1 Mercer cherry, 1 Fourth of July plum tree, 6 Lucretia dewberry plants, 12 Ward blackberry, and 12 Perfection currant bushes. I had 12 Downing gooseberries and 12 Miller raspberries, but they were all dead when they arrived here, and also 1,000 strawberry plants, and they were all dead but 18, and only 2 of them were alive when it froze up. There are 11 of the apple trees alive and all of the crabs and the cherry and plum trees are alive. All of the dewberries, 3 of the blackberries, and 3 of the currant bushes are alive. I bedded around all of them with moss and wrapped the trees with paper. I set them out on June 25. Some of them made quite a growth. One of the crab apples made 15 inches. I also had 5 apple trees come up from the seed. They are 6 inches high. I have them in the house; also 2 apple trees and 1 crab apple in the house. The vegetables consisted of peas, potatoes, beans, squash, turnips, onions, cabbage, carrots, parsnips, beets, lettuce, radishes, cucumbers, muskmelons, Blackeyed cowpeas and New Revenue cowpeas. The cowpeas came up, got 6 inches high and did not grow any more. The muskmelons and cucumbers started to vine and had little melons and cucumbers on them. A few squash came on the vines but they did not get very big. I ate them and they tasted first rate. My beans did very well. I sold 60 pounds and had all I wanted to eat. Peas did fine. I sold 200 pounds. Carrots, parsnips, and beets did fine. Onions did fairly well. I sowed one-fourth pound and got 100 pounds ripe onions and sold a good many green onions. Some of them would measure 2 inches in diameter. I planted six kinds of potatoes; Early Ohio, Early Bill, Early Pinks, Early Eureka, Freeman and Noroton Beauty. Last year I received 3 pounds of Freeman potatoes in the mail. I planted them June 28 and raised 8 pounds of small potatoes and saved them and planted them this year and got over 400 pounds from the 8 pounds. I cut them as small as I could and put a handful of fresh horse manure on each hill. All of my potatoes did very well on old hill ground, but the new ground did not do much. The Eureka was next best. I sowed the speltz June 1 and it was almost ripe when the frost came. I cut it and flailed it out and got about 20 pounds of seed. I think it will grow. I will try it before I sow it. What I want is some gooseberry bushes, some currant and raspberry bushes and a few plum and cherry trees. Send them by freight next spring on the first boat, say about June 1. There was just a month and three days difference in the frost on the hill and on the bottom, and the first killing frost on the lowland came August 11 and on the hill September 14.

S. A. Keller, Council, Alaska.—We have not reported to you the results of our experiments for some time. We have had a garden for years and have had no difficulty in raising all the lettuce, cress, parsley, and radishes we wanted. Turnips also have done well. Aside from that we have not succeeded very well, unless we might mention mustard and spinach, which have done fairly well at times. We received some berry plants from you, also some cherry and apple trees, but none of these stood the winter. I think, probably, they were too near dead before we got them to make much progress or get far enough along to stand the winter. This year we have built quite a large new garden, but when I got ready to plant it, it was so rainy that I put it off waiting for the ground to dry out enough, and though planted nearly two months ago the lettuce is just beginning to appear. The other vegetables have not yet made an appearance. I have given up seeing any garden this year in that place, but I guess all of the plants will come up now. I have a roof garden which has produced an abundance of radishes and lettuce. I planted 14 different kinds of flowers but none of them have come to bloom yet, though Mrs. Keller has one

of the nicest boxes of pansies you ever saw, great large blooms, quite a little larger than a silver dollar.

I hope you will send us for the coming year cress, spinach, lettuce, radishes, turnips, and Norway yellow turnip seed. We did not have large Norway turnips, but we felt that the ones we had were the nicest that ever grew, not in size, but in flavor.

It seems to me that the currant ought to do well up here and I would like to try a few plants if you would send them.

ALASKA'S CLIMATE.

The following condensed data on the weather afford a view in a nutshell of Alaska's climate. These records represent an immense amount of work. The portion here offered is only one-thirtieth of the original record. The reader can get a good idea of the climate by taking a map of Alaska and marking the location of the several weather record stations, as indicated by the latitude and longitude, and then by studying the figures with reference to the map, he can readily outline the climatic belts. As to the tables themselves, the figures in the column headed "Maximum" indicate the warmest it has been in each of the respective months. The figures in the column headed "Minimum" in like manner indicate the coldest it has been for the same months, and the daily mean is the average temperature for the month, condensed from all the observations taken during the month. The total precipitation is measured in inches, and shows the amount of rain or melted snow which fell during each month. The four next columns indicate the number of days that the weather has been clear, partly cloudy, cloudy, or rainy, as the case may be.

Condensed meteorological reports.

SITKA. Latitude 57° 3', longitude 135° 20'. Experiment station, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1910.	° F.	° F.	° F.	Inches.				
January.....	45	19	32.7	10.06	3	3	25	22
February.....	45	13	29.7	5.17	8	18	2	15
March.....	59	15	37.7	6.51	4	4	23	21
April.....	58	27	39.6	6.13	7	7	16	19
May.....	66	32	47.0	3.44	4	6	21	16
June.....	67	30	48.9	3.47	6	3	21	15
July.....	80	38	54.5	3.74	5	4	22	20
August.....	75	40	55.3	3.35	9	7	15	13
September.....	80	33	54.4	3.14	10	4	16	18
October.....	58	28	44.6	9.88	3	1	27	25
November.....	55	15	37.8	4.86	11	5	14	12
December.....	50	19	36.0	12.08	5	1	25	23

Condensed meteorological reports—Continued.

RAMPART. Latitude 65° 30', longitude 150° 15'. G. W. Gasser, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
November.....	31	-56	-10.8	0.35	15	3	12	4
December.....	30	-46	-11.6	2.03	9	5	17	9
1910.								
January.....	23	-62	-18.6	.84	10	4	17	9
February.....	29	-64	-11.5	.08	15	8	5	1
March.....	46	-33	4.4	.36	15	6	10	6
April.....	62	-17	21.4	.07	20	3	7	1
May.....	85	16	47.1	.20	13	9	9	3
June.....	91	33	59.4	.98	6	13	11	9
July.....	92	35	61.1	.71	4	11	16	8
August.....	85	27	56.6	.62	9	8	14	6
September.....	85	9	47.3	.43	10	6	14	5
October.....	48	-9	20.2	.45	5	5	21	6
November.....	19	-33	-6.1	.26	14	5	11	6
December.....	22	-59	-11.5	.32	9	8	14	7

FAIRBANKS. Latitude 64° 50', longitude 148° 9'. Deaconess A. Knox, observer.

1909.								
November.....	29	-54	0.6	0.52	25		5	4
December.....	40	-43	-7.7	.80	28		2	3
1910.								
January.....	28	-55	-18.5	.70	25		6	5
February.....	35	-57	-11.7	.14	22		6	1
March.....	44	-32	8.3	.02	5	20	6	2
April.....	56	-14	22.3	.04	25		5	2
May.....	76	24	48.5	.39	15	8	8	2
June.....	86	35	57.7	2.16	10	13	7	4
July.....	86	36	61.5	1.46	11	11	9	4
August.....	76	30	54.0	1.69	16	6	9	6
September.....	78	12	45.4	1.91	12	7	11	7
October.....	49	-15	24.1	.66	9	11	11	4

KODIAK. Latitude 57° 47', longitude 152° 20'. M. D. Snodgrass, observer.

1909.								
November.....	54	10	30.9	1.42	9	17	4	5
December.....	1 38	2 8	1 30.2	5.47	1	20	10	13
1910.								
January.....	(3)	-8	(3)	2.68	4	19	8	8
February.....	(3)	-2	(3)	5.36		21	7	13
March.....	4 50	2 7	3 34.2	4.90		23	8	21
April.....	45	5	31.0	7.40	1	21	8	16
May.....	65	24	40.4	4.54	3	18	10	13
June.....	65	32	45.2	3.68	2	21	7	16
July.....	71	35	52.4	5.23	9	13	9	12
August.....	78	37	54.4	1.75	5	20	6	10
September.....	76	32	50.7	3.62	4	18	8	14
October.....	53	17	38.3	8.18	1	25	5	20
November.....	47	13	34.5	5.38	5	15	10	15
December.....	44	9	27.3	6.73	6	17	8	13

¹ Record for first 4 days.
² Record for whole month.

³ No record.
⁴ Record for last 14 days.

Condensed meteorological reports—Continued.

ALLAKAKET. Latitude 66° 45', longitude 151° 10'. Deaconess C. M. Carter, observer.

Month.	Temperature.			Total precipitation. Inches.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.					
September.....	60	-----	35.0	0.52	10	5	15	9
October.....	34	-22	11.0	.44	12	3	16	7
November.....	25	-61	19.0	.63	20	2	8	5
December.....	28	-59	-21.2	1.44	14	-----	17	15
1910.								
January.....	23	-69½	-21.4	1.62	15	-----	16	20
February.....	20	-70	-22.3	.15	18	4	6	3
March.....	40	-51	- 6.8	.52	16	14	1	10
April.....	43	-34	10.0	.53	14	11	5	10
May.....	73	4	38.2	1.50	9	16	6	11
June.....	84	32	54.0	1.63	8	18	4	11
July.....	78	33	55.6	2.54	3	19	9	14
August.....	72	24	50.6	1.55	7	15	9	13
September.....	72	4	40.4	.82	12	12	6	9
October.....	43	-20	15.6	.50	13	5	13	10
November.....	21	-34	-----	.16	18	5	7	5
December.....	16	-64	-----	.28	21	-----	10	6

BELUGA. Latitude 61° 00', longitude 152°. Durell Finch, observer.

1910.								
March.....	47	-16	24.0	2.32	14	4	13	4
April.....	60	- 5	32.4	1.91	12	6	12	7
May.....	92	29	48.0	.50	15	3	13	1
June.....	82	33	51.6	1.77	13	4	13	6
July.....	98	37	63.7	1.70	16	2	13	6
August.....	94	37	57.6	1.05	15	-----	16	5
September.....	81	29	48.6	3.59	13	3	14	9
October.....	54	4	-----	2.23	9	3	19	5
November.....	40	- 7	-----	.83	15	1	14	3
December.....	38	-23	-----	.87	13	-----	18	7

CALDER. Latitude 55° 08', longitude 133° 27'. Neil Walker, observer.

1909.								
December.....	41	9	26.2	3.85	4	-----	27	12
1910.								
January.....	38	10	27.2	8.35	-----	-----	-----	-----
February.....	41	1	24.2	6.20	10	-----	18	12
March.....	56	17	34.5	9.90	7	-----	24	20
April.....	58	19	35.9	9.20	5	11	14	21
May.....	67	26	43.6	5.17	7	8	16	15
June.....	62	26	44.9	4.65	5	9	16	21
July.....	82	33	50.8	3.75	8	7	16	19
August.....	68	30	49.6	4.80	9	14	8	11
September.....	74	27	47.4	7.79	10	6	14	16
October.....	52	25	39.4	21.35	2	5	24	30
November.....	47	12	32.2	9.27	6	7	17	17
December.....	47	17	32.2	14.05	3	6	22	14

Condensed meteorological reports—Continued.

CANDLE. Latitude 66°, longitude 161° 50'. R. S. Dimmick, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
September.....	66	8	36.7	0.47	21	2	7	8
October ¹	45	-6	22.2	1.14	11		20	1
November.....	35	-32	9.0	(³)	9		20	(³)
December.....	32	-48	-8.7	(²)	12		19	(²)
1910.								
January.....	30	-47	-9.1	(²)	8		22	(²)
February.....	15	-49	-15.9	(²)	15		13	(²)
March ³	16	-38	-11.1	(²)	15	(³)	9	(²)
April ³	34	-22	1.7	(²)	14	(³)	11	(²)
May ¹	67	-1	31.0	Trace.	9	4	17	
June.....	70	28	43.0	1.20	11	1	18	6
July ¹	64	15	45.0	1.68	9		21	7
August ⁴								
September.....	70	16	40.0	1.23	9	1	20	9
October.....		-2			3	1	23	
November.....	28	-18			3		23	
December.....		-44			18	2	11	

CHICKALOON. Latitude 61° 47', longitude 148° 27'. H. H. Hicks, observer.

1910.								
March.....	50	-12	26.9	0.03	17	6	8	2
April.....	54	-8	27.9	.20	15	9	6	2
May.....	78	24	44.6	.01	11	11	9	
June.....	71	26	50.7	.12	6	8	16	3
July.....	84	38	57.5	1.42	11	7	13	4
August.....	79	30	54.0	.05	13	10	8	3
September.....	84	21	46.7	1.46	11	9	10	6
October.....	55	-7	29.9	.71	8	10	13	3
November.....	34	-5	14.7	.27	17	4	9	3

COAL HARBOR. Latitude 55° 24', longitude 160° 49'. William Fitz-Gibbons, observer.

1909.								
November ⁵	57	7	35.8	0.32	9	(⁵)	20	2
December ²								
1910.								
January ⁶		6-18						
February.....	642	-19	69.2	4.20	8		20	1
March.....	48	-13	21.0	71.51	1	15	15	12
April.....	64	-4	24.5	(²)	1	9	20	(²)
May.....	77	26	45.0	.27	11		20	5
June.....	85	31	52.0	.37	10		20	7
July ²	90	39		1.40				5
August.....	85	40	59.9	1.40	6		25	5
September.....	91	39	57.6	5.20	11		19	14
October.....	80	20	49.4	4.80	3		29	13
November.....	56	19		1.30				
December.....	60	8		.70				4

¹ Record for 30 days only.² No record.³ Record for 26 days only, as observer was absent.⁴ No report.⁵ Record for 29 days.⁶ Record for last 13 days only.⁷ Record for month.

Condensed meteorological reports—Continued.

COPPER CENTER. Latitude 62°, longitude 145° 5'. L. A. Jones, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
July.....	86	36	58.8		9	2	20	
August.....	75	30	54.8		6	11	14	
September.....	74	19	42.6	0.52	11	4	15	3
October.....	51	-10	24.6	.40	10		21	4
November.....	26	-40	-1.4	.20	6		14	3
December ¹	45	-40	18.5	.65	7		24	4
1910.								
January.....	28	-50	-8.6	.50	12		19	2
February.....	39	-47	-6.6	.33	14	6	8	2
March.....	46	-48	12.9	.21	7	18	6	3
April.....	54	-11	26.4		13	10	7	
May.....	77	22	44.9	Trace.	8	14	8	
June.....	79	24	51.8	.48	6	16	8	6
July.....	85	32	57.3	1.66	10	13	8	11
August.....	80	22	51.6	.50	7	16	8	4
September.....	80	19	46.6	.85	6	15	9	5
October.....	54	-13	28.4	1.02	4	15	12	3
November.....	27	-37	-1.3	.31	6	14	10	4
December.....	38	-49		3.00	5	11	15	5

CORDOVA. Latitude 60° 35', longitude 146°. M. S. Whittier, observer.

1909.								
December.....	42	11	29.7	19.22	6	3	22	17
1910.								
January.....	40	9	25.5	8.89	7	6	18	21
February.....	40	4	27.8	7.50	9	3	16	14
March.....	45	8	32.4	16.18	5	8	18	21
April.....	52	20	35.0	5.34	7	12	11	15
May.....	66	31	44.7	6.21	10	7	14	16
June.....	68	37	49.2	5.82	3	13	14	15
July.....	71	42	53.7	7.51	8	4	19	20
August.....	73	45	56.7	6.39	12	7	12	11
September.....	72	37	51.4	12.61	10	5	15	17
October.....	53	30	41.4	19.70	2	11	18	23
November.....	46	20	35.2	6.37	12	5	13	9

DAHL. Latitude 65° 22', longitude 164° 21'. John A. White, observer.

1909.								
October.....	45	-5	22.5	0.50	15	3	13	3
November.....	38	-28	14.1	.10	4	10	16	1
December.....	30	-62	-4.3	(²)	23		8	5
1910.								
January.....	28	-55	-20.5	2.19	23		8	5
February.....	20	-76	-20.8	.02	23	4	1	1
March.....	33	-49	-22.5	.05	22	7	2	1
April.....	44	-47	1.1	.04	24	4	2	1
May.....	59	-14	31.9	1.06	19	9	3	3
June.....	71	30	43.9	.15	7	13	10	6
July.....	69	41	49.7	.20	1	10	20	5
August.....	68	27	49.5	.25	1	6	24	10
September.....	65	20	41.6	1.03	5	3	22	5

¹ Record for last 28 days.² Could not measure snow, owing to high winds.

Condensed meteorological reports—Continued.

DUTCH HARBOR. Latitude, 53° 54', longitude 166° 32'. Fred Schroder, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
November.....	50	22	37.0	1.59	4	18	8	11
December.....	47	14	30.5	3.70	1	17	13	13
1910.								
January.....	51	10	31.8	7.27		26	5	16
February.....	46	11	33.2	4.61	2	16	10	13
March.....	44	8	28.0	2.39		22	9	17
April.....	48	16	30.5	2.95		20	10	15
May.....	56	28	42.3	6.23	3	23	5	16
June.....	64	33	47.8	4.18	4	20	6	8
July.....	72	38	57.8	.46	1	30		3
September.....	67	30	52.0	17.43	1	24	5	22
October.....	52	29	39.2	11.12		30	1	21
November.....	47	23	33.8	7.85		28	2	8

EAGLE. Latitude 64° 40', longitude 141° 5'. E. M. Myers, observer.

1910.								
January.....	26	-61	-13.1	0.83	9	5	17	8
February.....	28	-63	-16.1	.01	14	4	10	1
March.....	52	-50	6.6	.53	8	11	12	9
April.....	55	-17	23.4	.25	11	5	14	4
May.....	78	17	44.2	.28	8	12	11	4
June.....	87	24	55.6	1.05	2	14	14	10
July.....	91	29	59.0	2.28	4	9	18	12
August.....	79	20	50.5	2.63	10	3	18	12
September.....	76	11	43.7	2.98	7	6	17	14
October.....	48	-2	26.2	.69	3	8	20	7
November.....	30	-28	1.0	.25	11	7	12	5
December.....	34	-53	-14.6	.30	12	9	10	6

FORT LISCUM. Latitude 61° 7', longitude 146° 21'. Capt. John A. Clark, observer.

1909.								
December.....	40	1	25.0	18.02	5	2	24	21
1910.								
January.....	34	-3	18.6	8.79	13		18	18
February.....	39		18.4	6.45	16	1	11	9
March.....	45		25.0	9.80	15	2	14	15
April.....	47	8	31.1	2.13	15	2	13	10
May.....	61	28	39.6	5.94	13	2	16	13
June.....	61	33	46.2	2.68	12	4	14	13
July.....	1 57	42	49.7	2.09	11	1	19	13
August.....	2 74	35	53.0	4.35	15	5	11	9
September.....	84	29	47.6	8.90	14	4	12	13
October.....	55	16	36.0	9.07	8	7	16	18
November.....	43	4	27.7	1.20	14	5	11	6
December.....	41	-4	21.8	2.93	12	4	15	11

FORTMAN SALMON HATCHERY. Latitude 55° 20', longitude 131° 40'. Fred Patching, observer.

1909.								
December.....	40	4	26.0	5.46	10	3	18	17
1910.								
January.....	36		28.1	5.63	2	3	26	15
February.....	36	-12	23.3	11.38	8	3	17	8
March.....	46	20	33.7	11.77	5		26	22
April.....	56	18	37.0	18.09	5		25	24
May.....	64	26	44.4	9.21	7		24	21
June.....	74	32	48.0	9.30	7		23	24
July.....	83	41	55.6	6.79	10		21	19
August.....	76	35	58.3	5.33	14		17	15
September.....	78	34	53.2	10.92	13	2	15	17
October.....	57	30	43.1	28.76	4	7	20	20
November.....	45	10	33.8	13.60	6	8	16	21
December.....	47	15	32.9	20.08	6	3	22	21

¹ Record for first 9 days.² Record for last 16 days.

Condensed meteorological reports—Continued.

FORT YUKON. Latitude 66° 30', longitude 145° 15'. L. J. Woods, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
October.....	37	6		1.87				
November.....	17	-65	-15.3	.84	18		12	7
December.....	25	-62			13		18	7
1910.								
January.....	-1	-65	-29.9	.32	15	3	13	4
February.....	10	-70	-25.0	.12	24	1	3	1
March.....	32	-36	10.4	.22	20	5	6	3
April.....	48	-20	17.4	.02	20	8	2	1
May.....	78	14	41.8	1.15	24	13	3	2
June.....	85	31	58.7	4.7	17	13		4
July.....	85	37	60.0	4.2	14	15	2	8
August.....	75	23	49.7	3.20	16	12	3	5

HOLY CROSS MISSION. Latitude 62° 20', longitude 159° 50'. Brother Constantine, observer.

1910.								
May.....	69	19	41.5		12	3	16	7
June.....	78	29	49.2		10	10	10	10
July.....	74	35	54.0		12	10	9	9
August.....	71	33	54.0	2.27	9	10	12	14
September.....	73	24	47.4	.32	18	2	10	5
October.....	41	-3	25.3		18	1	12	0
November.....	40	-11	12.1	.01	14		16	1
December.....	28	-36	-8.8	.07	18		3	4

HOT SPRINGS. Latitude 64° 55', longitude 150° 45'. V. L. Bevington, observer.

1909.								
November.....	28	-53	-8.5	11.00				
December.....	40	-46	-15.6	2.26				
1910.								
January.....	34	-61		1.64				
February.....	30	-63		.03				
March.....	64	-32	11.9	.60	19		12	5
April.....	55	-20	22.9	.20	23		7	4
May.....	82	25	47.8	3.40	18	1	12	5
June.....	89	30	58.5	.76	15	1	14	11
July.....	² 80	31	63.3	2.16	17		14	13
August ¹	80	31	57.6	2.19	9		11	6
September.....	84	11	47.6	1.32	16		14	7

JUNEAU. Latitude 58° 20', longitude 134° 30'. I. J. Sharick, observer.

1909.								
December.....	47	7	28.7	1.97	13	(3)	1	15
1910.								
January.....	39	18	34.0	3.08	4	(3)	9	22
February.....	40	8	26.9	.88	22		6	5
March.....	46	9	31.8	3.15	17		14	16
April.....	53	39	39.5	4.53	10	4	17	24
May.....	69	34	47.3	10.17	9		22	26
June.....	68	40	56.0	2.65	11	(3)	18	17
July.....	79	47	64.1	9.94	10	1	19	24
August.....	79	48	67.1	1.55	25		6	10
September.....	68	41	53.6	1.19	16	(3)	11	13
October.....	59	41	50.5	2.13	6	(3)	11	24
November.....	56	14	37.1	.98	18		12	8
December.....	47	8		3.13	10	5	16	

¹ One day not noted.² Record for 20 days only.³ Rest of days not noted.

Condensed meteorological reports—Continued.

KENNECOTT (near Nizina). H. J. Walkins, jr., observer.

Month.	Temperature.			Total precipitation. Inches.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
August.....	69	32	50.5	(1)	15	0	16	(1)
September.....	64	11	37.6	(1)	5	(?)	19	(1)
October.....	57	3	23.9	(1)	14	.....	17	(1)
November.....	30	-20	9.1	(1)	24	.....	6	(1)
December.....	40	-25	11.9	(1)	12	.....	19	(1)
1910.								
January.....	33	-26	7.8	(1)	11	(?)	19	(1)
February.....	34	-31	.....	.....	28	.....	.....	.....
March.....	49	-29	.....	.....	20	(?)	6	.....
April.....	45	-1	23.7	(1)	31	.....	.....	(1)
May.....	65	20	40.5	(1)	15	.....	16	(1)
June.....	70	27	46.9	(1)	17	2	11	(1)
July.....	76	35	51.4	(1)	16	2	13	(1)
August.....	72	31	47.4	(1)	14	5	12	(1)
September.....	60	25	42.9	(1)	16	2	12	(1)

KETCHIKAN. Latitude 55° 25', longitude 131° 35'. Dr. F. L. Myers, observer.

1910.								
September.....	72	39	54.0	7.64	8	(?)	15	16
October.....	57	31	45.3	28.52	7	.....	24	24
November.....	48	15	37.2	13.28	7	.....	23	24
December.....	54	22	38.0	18.37	.....	7	24	21

KILISNOO. Latitude 57° 30', longitude 134° 30'. Joseph Zuboff, observer.

1909.								
December.....	43	9	27.0	1.20	9	.....	22	6
1910.								
January.....	40	9	29.5	3.50	3	2	26	10
February.....	40	11	25.1	.81	9	3	16	7
March.....	50	10	34.1	1.20	1	11	19	7
April.....	50	23	37.9	1.35	3	11	16	15
May.....	60	32	45.6	1.20	6	13	11	10
June.....	66	34	49.0	2.30	4	7	19	13
July.....	71	44	53.4	4.45	4	21	6	15
August.....	65	36	53.4	2.15	10	14	7	9
September.....	69	35	50.2	4.85	11	5	14	7
October.....	50	31	43.1	8.25	1	3	27	24
November.....	65	12	33.9	.20	4	4	22	4
December.....	47	11	27.8	.65	.....	3	28	5

KLUKWAN. Latitude 59° 25', longitude 136°. F. R. Falconer, observer.

1909.								
December.....	41	-18	14.7	1.10	10	3	18	10
1910.								
January.....	38	-12	17.3	1.75	2	1	28	14
February.....	37	-20	11.6	.81	13	6	9	5
March.....	47	-17	29.7	3.13	6	4	21	16
April.....	57	11	35.6	1.24	15	10	5	2
May.....	72	23	44.4	.67	13	5	13	7
June.....	76	29	50.2	.76	8	13	9	6
July.....	80	40	55.3	2.70	6	7	18	12
August.....	77	38	54.0	.61	13	10	8	6
September.....	75	29	49.9	1.75	10	11	9	12
October.....	51	19	38.8	2.71	3	2	26	19
November.....	41	-8	24.4	1.89	7	1	22	13
December.....	42	-15	13.6	1.85	11	3	17	14

¹ Record not taken.² Remainder of days not noted.

Condensed meteorological reports—Continued.

MILLER HOUSE (near Circle). J. F. Kelly, observer.

Month.	Temperature.			Total precipitation. Inches.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
November.....	1 32	1 -40	1 4.1	2 0.30	17	10	3	(3)
December.....	42	-40	10.8	2.30	12	(3)	5	(3)
1910.								
January.....	27	-45	- 9.0	(3)	5	10	16	(3)
February.....	30	-50	-10.3	(3)	20	7	1	(3)
March.....	60	-40	5.1	(3)	31	-----	-----	(3)
April.....	47	-10	20.6	(3)	24	3	3	(3)
May.....	75	16	42.8	(3)	29	2	-----	(3)
June.....	81	32	52.4	1.94	5	17	8	9
July.....	85	36	57.7	2.37	15	10	6	8
August.....	78	24	51.5	3.0	24	7	-----	5
September.....	80	10	46.2	1.03	21	1	8	2
October.....	73	-14	29.3	(3)	14	3	14	(3)
November.....	51	-17	-----	-----	-----	-----	-----	-----
December.....	36	-46	-----	-----	-----	-----	-----	-----

NIZINA. Latitude 61°, longitude 142° 20'. George Max Esterly, observer.

1909								
September ⁴	62	31	46.9	(⁵)	5	2	-----	(⁶)
1910.								
April ⁶	57	12	36.2	(⁵)	9	2	-----	(⁷)
May.....	7 66	22	40.9	-----	24	7	-----	0
June.....	7 70	28	46.7	0.20	21	8	1	4
July.....	74	35	52.9	6 2.26	21	7	3	4
August.....	69	31	49.4	1.94	21	8	2	9

NOME. Latitude 64° 30', longitude 165° 24'. A. A. Gibson, observer.

1916.								
January.....	32	-35	-6.1	0.94	17	1	13	7
February.....	25	-38	2.0	.32	20	2	6	2
March.....	33	-26	6.1	.23	16	3	12	3
April.....	39	-23	5.9	.49	20	4	6	3
May.....	53	7	32.2	1.03	7	2	22	11
June.....	56	27	39.9	1.59	4	4	22	15
July.....	59	34	45.8	3.57	5	6	20	18
August.....	62	30	48.3	2.61	4	8	19	18
September.....	60	25	44.8	4.06	8	3	19	14
October.....	41	11	28.4	1.08	12	2	17	8
November.....	36	- 9	20.1	.99	10	2	18	11
December.....	32	-26	22.4	.56	17	3	11	4

SEWARD. Latitude 60° 1', longitude 149° 30'. W. A. McNiley, observer.

1909.								
November.....	48	9	27.7	0.37	25	-----	5	2
December.....	40	4	25.9	12.80	12	1	18	15
1910.								
January.....	37	- 8	18.8	3.32	17	1	13	9
February.....	39	-12	24.4	4.52	13	1	14	8
March.....	49	-----	29.2	2.50	16	-----	15	8
April.....	53	10	34.2	.55	20	7	3	4
May.....	75	26	43.6	1.43	17	4	10	7
June.....	63	33	46.0	2.59	15	3	12	11
July.....	80	40	55.1	2.15	18	2	11	8
August.....	76	39	55.1	2.45	18	2	11	8
September.....	84	35	51.4	7.12	14	4	12	14
October.....	55	19	39.2	5.72	10	3	18	15
November.....	45	12	30.1	1.55	14	3	13	1

¹ Record for last 21 days.² Snow (reduced).³ Not given.⁴ Record for first 7 days.⁵ No record.⁶ Record for last 11 days.⁷ No maximum thermometer; readings taken from minimum.

Condensed meteorological reports—Continued.

SKAGWAY. Latitude 59° 5', longitude 135°. H. D. Clark, observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi-mum.	Mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1909.	° F.	° F.	° F.	Inches.				
November.....	41	- 6	19.2	0.09	10	17	3	2
December.....	46	- 4	23.5	4.00	6	10	15	2
1910								
January.....	40	3	22.8	3.06		6	25	3
February.....	36	- 1	18.0	1.40	9	12	7	2
March.....	52	- 2	32.6	4.78	2	15	14	10
April.....	58	23	38.5	1.38	8	12	10	6
May.....	74	27	49.5	1.46	8	20	3	4
June.....	74	29	53.0	1.80	4	14	12	6
July.....	82	45	56.5	2.30	2	4	25	9
August.....	74	33	54.6	1.71	12	3	14	6
September.....	77	32	52.0	1.21	8	9	13	9
October.....	58	31	42.5	4.31	1	1	29	20

SUNRISE. Latitude 60° 54', longitude 149° 35'. A. Lawson, observer.

1909.								
November.....	42	-14	13.6	0.40	21	4	5	5
December.....	43	-12	15.8	3.36	10	2	19	18
1910.								
January.....	36	-21	7.9	3.22	5	8	18	18
February.....	38	-27	15.2	4.39	8	5	15	11
March.....	50	-16	22.5	1.66	8	12	11	16
April.....	50	1	28.4	1.55	6	11	13	11
May.....	73	24	41.7	.86	9	7	15	10
June.....	63	27	26.4	1.44	7	6	17	15
July.....	73	37	52.7	1.79	9	10	12	14
August.....	68	35	51.1	1.74	10	8	13	12
September.....	72	26	45.2	2.80	11	4	15	15
October.....	53	8	33.4	4.34	3	4	24	20
November.....	40	- 8	19.9	2.29	13	4	13	11
December.....	36	-26	9.2	4.06	15	2	14	15

TANANA. Latitude 65° 13', longitude 152° 2'. Mabel U. Grissinger, observer, January to July; Emma F. Warren, observer, August to December.

1910.								
January.....	24	-63	-17.2	1.23	10	3	18	17
February.....	18	-68	- 9.8	.08	14	6	8	2
March.....	41	-38	4.9	.60	15	4	12	6
April.....	49	-32	15.7	.28	11	11	8	6
May.....	75	23	43.6	.69	11	5	15	5
June.....	83	32	55.3	.57	7	8	15	8
July.....	80	33	56.9	1.79	4	9	18	13
August.....	75	26	52.5	2.26	6	10	12	14
September.....	72	10	42.6	.74	11	10	9	8
October.....	43	- 8	20.2	.38	8	12	11	6
November.....	22	-28	- 0.9	.31	11	10	9	6
December.....	20	-57	-14.4	.59	13	5	13	8

VALDEZ. Latitude 61° 7', longitude 146° 20'. Emma May Blade, observer.

1910.								
January.....	36	- 2	18.0	6.78	11	6	14	14
February.....	36	- 3	17.6	3.08	15	1	12	9
March.....	46	- 2	30.1	3.47	17	2	12	12
April.....	63	4	34.9	.79	16	4	10	7
May.....	78	24	45.4	4.43	13	3	15	16
June.....	67	33	50.0	2.68	9	6	15	12
July.....	78	42	55.8	3.60	13	3	15	19
August.....	77	36	53.9	2.93	16	3	12	13
September.....	82	30	49.2	8.09	12	5	13	16
October.....	62	12	38.8	8.72	9	1	21	20
November.....	46	- 4	27.0	1.47	7	8	15	7
December.....	45	- 4	19.7	3.13	(1)	7	17	14

¹ Data from 6 p. m. observation only.

