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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Agronomist in Charge.

Under the supervision of the STATES RELATIONS SERVICE,
Office of Experiment Stations, U. S. Department of Agriculture.

**REPORT OF THE ALASKA
AGRICULTURAL EXPERIMENT
STATIONS**

1918



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

[Under the supervision of A. C. TRUE, Director of the States Relations Service, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL.

ALASKA AGRICULTURAL EXPERIMENT STATIONS,
Sitka, Alaska, March 22, 1919.

SIR: I have the honor to submit herewith a report of the work of the Alaska Agricultural Experiment Stations, 1918.

Very respectfully,

C. C. GEORGESON,
Agronomist in Charge.

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Publication recommended.
A. C. TRUE, *Director.*

Publication authorized.
D. F. HOUSTON, *Secretary of Agriculture.*

¹ Transferred from Fairbanks Station to Kodiak Station in March, 1919, to succeed H. E. Pratt, resigned.

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REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS, 1918.

SUMMARY OF WORK AT THE STATIONS.

By C. C. GEORGESON, *Agronomist in Charge.*

GENERAL OBSERVATIONS.

The season.—The weather conditions play an important part in the operations of the Alaska farmer, as the country is so close to the borderland of possibilities that a little shifting of temperature and rainfall may mean success or failure. The season of 1918, taken as a whole, was not favorable to the best results in farming. Nevertheless crops matured everywhere and the results, as will be detailed later on, were almost normal. This is the twenty-first annual report of the Alaska Experiment Stations, and at the stations now operated there has never been a serious failure in any year in all that period. Crops have never been killed by frost in June or July, as sometimes happens very much farther south in Canadian territory or even in North Dakota. While ideal conditions are seldom experienced, it is also very rare that the season has been so unfavorable that the grain crops could not mature. During the six years that an experiment station was operated in the Copper River Valley a killing frost occurred about the middle of August every year, and grain that had not matured by that time was fit only for hay. In the Yukon Valley and the Tanana Valley killing frosts have not occurred until the latter part of August. The season of 1918 had a very severe winter, one of the coldest on record in the interior, accompanied by a heavy snowfall, which averaged more than 4 feet in depth in the Yukon and Tanana Valleys. The total snowfall was between 5 and 6 feet. This was followed by a very late cold spring which made seeding 2 weeks later than normal. A late spring is always a serious drawback because growing crops, and especially grain crops, require a certain length of time in which to develop, and if they do not get an early start the growing season must be correspondingly prolonged in the fall to permit them to mature. The late spring was followed by a dry, hot, early summer. Wherever there was moisture enough in the soil to sprout seed, the growth was rapid for a time, but the grain was stunted, and some of the late-sown seed, especially in the Tanana Valley, did not have moisture enough to start growth and

therefore laid dormant until the rains came late in the summer, when they grew up with the result that a considerable percentage of the grain was still undeveloped when the earlier heads were matured. The result as a whole was short straw and a comparatively light yield. Frost did not occur, however, until August 26 and 27, and killing frosts did not occur until the first week in September. As a whole the result was that some portion of the crops matured although the yield was one-third less than in normally favorable seasons.

Work at the stations.—The projects outlined in former reports were adhered to, no new work being undertaken.

At the Sitka Station the work of propagating and testing and to some extent disseminating all manner of plants that promised to be useful to this Territory was continued with gratifying results. A full report of the work at the Sitka Station is given by the writer and C. H. Benson (see p. 22).

At the Fairbanks Station the chief lines of work were growing grain, testing the adaptability of varieties of grain, and disseminating in small quantities the surplus seed grain produced.

At Rampart the chief lines of work were the production of new varieties of wheat, barley, and oats by means of hybridization, the testing and selection of hybrids, and finally the increase of those proving valuable. Growing of hardy alfalfa is another important feature of the work at that station, and also to a limited extent growing vegetables to ascertain the varieties that will do well in that far northern latitude, and noting the methods of culture best adapted to their growth.

At Kodiak the cattle and sheep breeding work was continued.

At Matanuska progress was made in growing grain and sugar beets. A small nursery was also started for the purpose of propagating hardy nursery stock for dissemination in the Matanuska Valley.

ALASKA AS A FOOD PRODUCER.

An item of much general interest is the demonstration that Alaska is a food producer and that if the resources of the Territory are developed the Alaska wheat fields are destined to play an important rôle in the economy of the nation. The stations have introduced from Siberia early maturing spring wheat which can be depended on to mature every season. The seed produced from these introductions has been distributed among the farmers, who have satisfied themselves that they can grow wheat, in addition to barley and oats. A small flour mill has been installed at the Fairbanks Station, and Alaska-grown wheat has been milled into a flour which makes excellent bread. While this work has been done on a small scale, it is nevertheless proof that Alaska should be considered one of the agricultural sections of the earth and that its productive power is merely a matter

of development. There are millions of acres in interior Alaska that will produce good hard spring wheat that can in time be used in helping to feed the world.

Productive capacity.—At a recent meeting of farmers in the town of Fairbanks a banquet entirely of Alaska productions was served, the menu of which compared favorably with those in any first-class hotel or restaurant. Mr. Snodgrass, superintendent of the Fairbanks Station, on that occasion pointed out that there had been brought into the Fairbanks district from the outside by merchants and dealers nearly \$700,000 worth of agricultural products which might have been grown equally well, and in many instances better and at much less cost, in the Tanana Valley, keeping this large sum of money at home for distribution among the farmers, greatly to the benefit of development, as with it more land could have been cleared and the productive area extended, more and better buildings could have been erected, while modern implements and machinery could have been added to the farm equipment, the last of which would have further aided materially in supporting the population.

War work.—In accordance with the patriotic program of the United States Department of Agriculture, the Alaska Stations planned their work as far as possible to aid in the winning of the war. To this end the stations strove to bring about increased production of food supplies, not only on their own lands but among the farmers generally. As much of the land as possible was seeded to grains and the surplus seed grain which had been produced at the stations was distributed among the farmers not only to aid them in producing larger food supplies but to introduce among them the early maturing varieties grown at the stations. The individual members of the stations exerted themselves to encourage the production of grain food supplies among farmers. The writer, for instance, addressed two farmers' meetings in the Matanuska Valley with that end in view. The individual members of the staff also served in various capacities on committees and boards connected with war work, each in his particular district. The writer was chairman of the Sitka branch of the American Red Cross and also served on the local council of defense and on the board of legal advisers to registrants. Mr. Pratt, of the Kodiak Station, was for part of the time food administrator for Kodiak; Mr. Gasser, of the Rampart Station, was one of the officers of the Territorial organization known as the "Red Star," whose function was to alleviate the sufferings of animals employed in the war zone, Mr. Gasser being Territorial organizer of this society; Mr. Snodgrass, of the Fairbanks Station, was agricultural adviser to the district exemption board; and every member of the staff was ready and willing to render all the assistance that he could in any line that his services might be needed. Two of the men entered the Army.

RAMPART STATION.

GENERAL CONDITIONS.

To give the reader a clear understanding of the leading features of the country in which Rampart Station is located, and the climate in which the station's work is done, it is pertinent to state that this station lies in the Yukon Valley close to the river, about 75 miles south of the Arctic Circle (Pl. I, fig. 1). The region has a characteristic inland, sub-Arctic climate. The winters are long and severe, the summers short and warm, and the rainfall light. The freezing and breaking of the Yukon gives perhaps the best measure of the length of the winter. The river freezes up about the middle of October and the ice breaks about the middle of May, a period of 7 months, and there is some cold weather at both ends of this period, so that the winter or dormant season of vegetation is about 8 months. The frost-free period averages 97 days. The total annual precipitation is a little less than 10 inches and the rainfall during the growing season averages a little more than 5 inches. The variations, however, are at times quite notable. In 1918 the rainfall during the growing season amounted to only 3.7 inches. This would be sufficient if it were evenly distributed, as the evaporation is not great and a little moisture goes a long way. But it is seldom evenly distributed. There is usually a dry spell during May and June which some years amounts to a disastrous drought in that it prevents seed from germinating promptly and evenly and thereby shortens the period of growth. The later germination means that the growing season must be prolonged into the fall, and under such conditions the crops are often caught by very early frosts. The snowfall is variable, usually from 2 to 4 feet, seldom less than 2 feet, and sometimes as much as 5 feet. Taking the valley as a whole, it may be said to be hilly, but not mountainous. Along the watercourses, as well as back between the hills, there are in many places wide stretches of rolling country well adapted to agriculture. No surveys have been made in this part of Alaska, and it is therefore impossible to state how large the available area is, but there is in the aggregate several million acres that can be utilized when economic conditions make it practicable to clear and cultivate the country. The lowlands and the smaller hills are invariably timbered, black spruce predominating, interspersed with cottonwood, birch, and in low places, as for example on the Yukon Flats, willow and many species of small bushes. The floor of the forest area is covered with sphagnum and other mosses, as well as a thick mat of small woody bushes. There are no prairies in Alaska. All the lands adapted for tillage are wooded, and the first step the settler must take in making a farm is to clear the land. Under undisturbed natural conditions the ground is frozen beneath

the moss to an unknown depth, but when the vegetation is cleared off the ice recedes gradually year by year to a depth of 6 to 8 feet or more. The timber is small. Spruce logs a foot in diameter are considered to be of good size. The trees grow very close together, in places being so close that one can make his way between them only with difficulty.

It is admitted that these conditions appear discouraging, particularly to settlers accustomed to a prairie country. Nevertheless these are the conditions under which the agricultural experiment stations at both Fairbanks and Rampart have been developed and under which the crops described in these reports have been grown. If the stations can grow crops successfully so can the settler.

Proceeding from the general view to the work accomplished at the Rampart Station under the conditions described during 1918, it is to be noted that the winter of 1917-18 was extremely severe, as for 69 days during a part of November, December, and January the maximum temperature reached by the thermometer was 0° F., and the minimum was -57° , while the average temperature was -25° ; that the spring was very late in coming, delaying the preparation of the soil for seeding and the sowing of the crops beyond the normal; and that there was a dry spell during May, June, and July which retarded growth of crops after they were seeded. These are the handicaps nature placed on the work. Nevertheless practically all the grain crops planted with a view to obtain seed from them ripened before killing frosts in the fall. Details of these crops are to be found in the report of G. W. Gasser herewith submitted (see p. 33).

LINES OF WORK.

The Rampart Station is devoted chiefly to three lines of work—(1) breeding of grains which shall be suited to the climate and which shall mature during the frost-free period, (2) breeding and growing seed from hardy legumes, and (3) testing vegetables and flowers to ascertain their adaptation to soil and climate. Each of these three main lines again branches off into side issues important in themselves, but in a measure incidental, as for instance, maintenance of fertility, cultural methods, conservation of moisture, economic methods of clearing land, economic use of machinery, and growing seed from minor crops.

Grain growing.—There were matured 23 varieties of spring wheat, 12 of which were hybrids; 32 varieties of barley, 26 of which were hybrids; and 21 varieties of oats, 13 of which were hybrids. Seed was also ripened of 6 varieties of winter rye. Among the hybrids of wheat, barley, and oats are several that appear now to be stable and valuable for interior Alaska, as they can be matured during the

frost-free period. The production of these new forms of grains that are early enough to be grown under normal climatic conditions in the interior the writer considers the most valuable work of the station.

No crossbreeding was undertaken the past year due to lack of skilled assistants.

Work with legumes.—The winter of 1917-18 was disastrous to Grimm alfalfa, plants of which had been considered hardy. Old, thoroughly established plants succumbed as well as younger seedings, and so did hybrid plants between *Medicago falcata* and Grimm alfalfa. It had been hoped that these hybrids would have the hardiness of the yellow flowered *M. falcata* which they resembled to some extent, but they proved to be no hardier than Grimm. The desirable qualities of Grimm alfalfa have frequently been referred to in former reports. It is now definitely proven that this variety of alfalfa is not hardy at Rampart.

The yellow flowered Siberian alfalfa, that is to say, the pure species, *Medicago falcata*, on the other hand, proved to be thoroughly hardy. Not even the young plants suffered from the cold. This then is the species that must be cultivated. In the summer of 1917 the cold, wet weather prevented the maturing of seed of this species, but in 1918 it matured seed rather freely. While crossings will be continued, and other strains supposed to be hardy will be tried, *M. falcata* must be the standard, and every effort will be made to increase the area of this valuable alfalfa so as to produce as much seed as possible. In hay-producing qualities it is inferior to common alfalfa or to Grimm. It is not so vigorous, the leaves are smaller, the stems slenderer, and the yield of hay one-third lighter than purple-flowered alfalfa grown in good soil. But it appears now to be the only legume that can be absolutely depended upon to survive extremely cold winters in the interior.

Two other hardy legumes succumbed this severe winter. One of these was *Vicia cracca*, which has been repeatedly mentioned in former reports as a promising forage plant in the interior. It was almost, though not completely, winterkilled for the first time in the experience of the station. Seed that had been matured in former years was planted and the young plants received a good start, so that work can be continued with it, but it can no longer be described as ironclad. Another supposedly hardy legume, a species of clover known as Lupinaster, also winterkilled. It has no great value from a hay standpoint, as it is slow of growth, and has few leaves, is seldom more than 8 or 9 inches high at best, often less, and therefore does not produce enough foliage to be of practical value. Moreover it does not form a close growth, but grows in little scattered bunches. It blooms and matures seed very freely. Its supposed hardiness was its only recommendation.

Vegetables.—Several features of garden work of interest to the settlers in the interior are reported, among them a test of a much-advertised method of growing potatoes in cribs, large barrels, or piles, it being found that the yield obtained was inferior to the methods of ordinary garden culture and also that it required a large amount of labor to build the crib, scrape the soil together, and plant the potatoes according to the usual directions. The only place where this method of growing potatoes can be justified is when the available ground consists of a very small patch in a city lot.

Molasses from sugar beets.—Making molasses from sugar beets met with much success. Sugar beets have grown well at both Rampart and Fairbanks Stations, though on a very small scale, for several years past. As it has not been practicable to send these beets out to have them tested, nothing has been done with them beyond making the sirup described below. From 18 pounds of beets 3 pounds of black but sweet and palatable sirup was produced by boiling the pulp of the roots for 10 hours, then straining out the liquid, and reducing it to the consistency of sirup by evaporation. While the manufactured products from cane and sugar beets are as high as they are at present, especially in interior Alaska, where high freight rates and middleman's profits are included in the price the consumer pays, many settlers could profitably produce their own sweetening in this manner.

FAIRBANKS STATION.

GENERAL CONDITIONS.

The general climatic conditions already referred to prevailed also at Fairbanks. The spring was very late, consequently seeding was late, and the late seeding was followed by a period of dry weather which caused uneven germination and stunted the growth of crops. The first frost occurred August 26, which, however, was not serious enough to injure the grain crops, but on September 6 a killing frost occurred.

No new work was undertaken at this station during the year. One hundred acres is cleared and under culture, 83 of which was in crops and 17 summer fallowed.

With no live stock, except three horses, stable manure is not produced in any quantity, and the station is resorting to green manure for the purpose of maintaining fertility. Red clover, which grows to a good height in from one to three months, and can then be plowed under, affords a splendid fertilizer for the soil. Peas answer the same purpose. Canadian field peas, however, do not grow as well as could be desired. The garden pea Alaska, which has been so improved in earliness at the Rampart Station that seed will mature,

is a promising crop for green manure. Some of the Rampart-grown pea seed was sent to Fairbanks and used for this purpose. As Canada field peas do not mature well at the interior stations and it is too expensive to ship in seed from the outside year after year, it is necessary to rely to a large extent on this home-grown early Alaska pea.

Several varieties of spring wheat, barley, and oats matured, but the straw was short and the yield lighter than it has been in normal years. Some of the Rampart hybrids proved to be earlier than other crops, especially oats of the series 35e and barley of the series 28a.

The potato yield, both at the station and throughout the Tanana Valley, was very light, owing to late planting and later to untimely frosts. It must be noted, however, that potatoes on hillsides did not suffer particularly, though potatoes planted on bottom lands were killed August 26. Not more than 50 per cent of the crop was marketable.

COOPERATIVE WORK.

Station-grown seed grain was distributed in small quantities to a large number of settlers who desired to grow grains. Garden seed, seed potatoes, and turnip seed were likewise distributed to many more. By this means the station is aiding in the introduction of early-maturing varieties of grains and other crops best adapted to the climate and country. A total of 65 bushels of seed wheat was distributed among about 50 farmers. The best wheat for this purpose is a Siberian variety received from Irkutsk, Siberia, under the label H. G., which label has been retained. This Siberian variety is apparently best adapted to the Tanana Valley. At the Rampart Station and other points in the Yukon Valley another variety of the same origin known as Chogot seems to be best adapted.

MILLING HOME-GROWN WHEAT.

The high price of wheat during the past year and also for the coming year, 1919, has stimulated the farmers in the interior of Alaska to take an interest in wheat growing. To further aid in this work the station purchased a small roller mill and experimented with grinding of native-grown wheat into flour. It has been demonstrated beyond doubt that interior Alaska can produce her own breadstuffs, and that this can be done every year. The Siberian varieties of spring wheat introduced, grown, and disseminated by the Alaska Stations have proved that Alaska can be self-supporting in the matter of breadstuffs.

THE FARM TRACTOR.

The farm tractor of the smaller types is a profitable investment for interior Alaska farms. In a country where it costs about \$200 a year to feed a horse, if the market value of hay and grain is estimated, it

pays to use machinery wherever possible. It has been found necessary at the Fairbanks Station in the past either to keep at least eight horses the year round or to hire from four to eight extra horses for the spring work. This latter practice has been followed, for although a team and driver costs \$12 a day and their feed while at work, the price paid during two or three weeks of spring work comes to less than the feed and labor to care for work horses enough to do the work at the proper time. The trouble with this plan is that at the same time extra team work is required at the station everybody else needs extra team work and the station has had to wait the convenience of the men who owned the teams. The tractor has, and hereafter will, obviate all this. It is always on hand to be used when needed and does not, as horses do, eat up its value in feed when not used. It is therefore heartily recommended that tractors as well as other machinery be used whenever the size of the farm warrants the initial expenditure.

The Mogul 8-16 horsepower tractor at Fairbanks Station has demonstrated its value. Illustrations herewith submitted show it at work both at plowing and at thrashing (Pl. II, figs 1 and 2). It has been found necessary, however, in the case of the Mogul, to add extension rims and angle lugs to widen the tractor wheels and thus increase the power. This is particularly necessary when the ground is soft in places. It is a question whether a small tractor of the Crawler type would not be better adapted for field work, especially where the ground is soft as in river and creek bottoms. The initial expense is the chief obstacle to the introduction of these machines. Their manufacturers seem to have only the large farm in mind. On a large acreage large expensive tractors of 40 to 50 horsepower can, of course, be used to advantage, but on small farms 8 to 10 horsepower or even smaller tractors are ample and are better adapted to the work than the larger machines.

ADDITIONS TO EQUIPMENT.

In the fall of the year a well was bored; a 12-foot windmill, a 40-foot steel tower, and a force pump were purchased; and a new fanning mill was added to the equipment. These were absolute necessities for the successful and economical work of the station.

Other improvements are needed, particularly two small cottages, and if live stock is introduced, a cattle barn. It is a question of policy that will have to be decided by the department whether it is wise to branch out much further at Fairbanks Station under existing conditions.

MATANUSKA STATION.

GENERAL WORK.

Work was begun at the Matanuska Station in 1917 and it is yet in the pioneer stages. The valley of the Matanuska River is narrow and heavily timbered with mostly rolling land, forming a series of benches to the number of four, or in places five. These benches rise rather abruptly one above the other, varying in height from 15 to 20 feet above the nearest lower one. Each bench consists of a rolling stretch of land, level in places, in others forming hillocks or hollows. The soil is in most places of excellent quality, being a reddish, friable, silt loam, sometimes clayey but for the most part light to sandy loam. The station was first allotted 240 acres, some 140 or 150 acres of which can be cleared and brought under tillage. Later section 14 was added to the reservation. This is a rocky, hilly, timber-covered tract with some narrow, gullylike valleys and steep, rocky ridges of no great height. There are several small lakes on this section. In course of time it may be made into pasture, but it is scarcely fit for homesteading. Some 12 acres has been cleared, part in 1917 and part in 1918, and seeded to grain crops. The earliest seedings matured grain, the later seedings were made into hay.

The timber consists chiefly of spruce, birch, and cottonwood interspersed with many smaller bushes, mostly alder. The timber is thick on the ground, but none of it very large. Some of it will range from 1 to 2 feet in diameter, but most of it is smaller. The clearing of the timber is laborious and, at prevailing wages, expensive. The simplest method is to burn the timber and undergrowth whenever the weather is dry enough to permit fires to run through the woods. In early summer there usually is a spell of dry weather. The moss and undergrowth is then fired and by continual nursing kept burning. This method does not result in forest fires and is in no sense destructive to useful timber. The fires creep through the moss, kill the timber, and in large measure burn the upper roots. The first high wind will then throw the trees down and the clearing consists of cutting up the unburned portion with saw and ax. This, it has been ascertained, can be done for about \$60 an acre under favorable conditions, though green timber will cost from \$125 to \$200 an acre to clear even when donkey engines and heavy stump pullers are used.

Mr. Rader, assistant in charge of the station, has completed a presentable office and dwelling house (Pl. I, fig. 2), and has built a log barn which has afforded shelter for the team and for the machinery and implements. Later in the fall he also dug a well and struck good water at a depth of 70 feet.

The season was to some degree more favorable at Matanuska than at Rampart and Fairbanks. The spring was late but frost held off

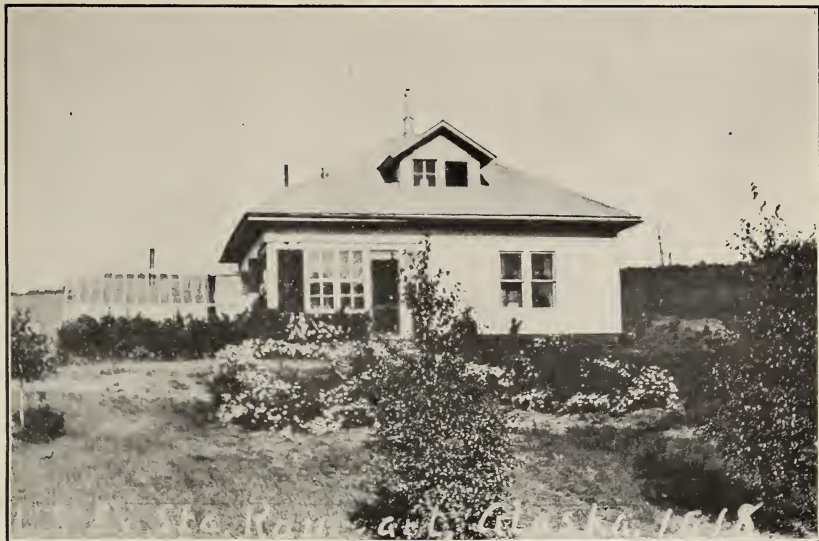


FIG. 1.—OFFICE AND RESIDENCE, RAMPART STATION.



FIG. 2.—OFFICE AND RESIDENCE, MATANUSKA STATION.



FIG. 1.—TRACTOR PLOWING FALLOW LAND, FAIRBANKS STATION.



FIG. 2.—THRASHING MACHINE AT WORK, FAIRBANKS STATION.

until late in the fall, the first killing frost occurring October 12, more than a month later than at Rampart and Fairbanks. The frost-free period was 141 days as against 94 days at Rampart. The growing season of grain will be somewhat longer than in the Yukon and Tanana Valleys. It is safe to assume that grain crops that will mature at the former places will without doubt mature in the Matanuska Valley. Wheat, barley, and oats that had been seeded for grain all matured. Potatoes do remarkably well in the Matanuska Valley, and the station had a fair crop. The settlers have depended altogether too much on potatoes as their money crop. Everybody planted potatoes on an extensive scale with the result that there was a large overproduction. It is estimated that 600 tons of potatoes came out of the root cellars in the Matanuska Valley in the spring of 1918 and were wasted for lack of live stock to which to feed them. The station will not go into potato growing except to test many varieties on a small scale with a view to determine those best adapted to the climate. It is planned to make the station a central point for information and assistance to the settlers. Many of the people who have come there and taken up land are not experienced farmers and they need help and guidance which the station will furnish as far as possible.

All sorts of vegetables can be grown successfully. Good vegetable gardens are of great help to the pioneers and the station will aim to help by furnishing information as to the best methods of culture and the varieties of vegetables that are best suited to the locality.

About one-tenth acre of sugar beets was grown with very gratifying success. The seed was obtained from the United States Department of Agriculture and of the three varieties grown the sugar content was, respectively, 14.60, 16.10, and 16.90 per cent, or an average of 15.9 per cent. The analysis made of these roots by the department shows that sugar beets, rich enough in sugar for factory purposes, can be grown in the Matanuska Valley. An effort will be made the coming year to grow sugar-beet seed, for, if it is found possible to produce home-grown seed, then the establishment of a small sugar factory in the valley may be expected at no distant date.

PLANS FOR THE STATION.

That grain growing will become the leading industry in the Matanuska Valley is open to doubt. The reason for the doubt is that the rainfall is usually quite heavy in the latter part of the summer and in the early fall before cold weather sets in. This may make it impracticable in many seasons to save the grain after it is matured. It appears to the writer that the region is on the other hand excellently suited for dairy work. Feed can be grown in any quantity. There

will be a most excellent market for dairy products along the line of the railroad to interior Alaska and likewise southward to Anchorage, Seward, and other coast towns. The problem is to find a hardy breed of dairy cattle, as none of the distinctive dairy breeds seems well fitted for the climate. Dual-purpose Shorthorns, or milking Shorthorns, are, on the other hand, sturdy, thrifty cattle which, in addition to having dairy qualities, are also of an excellent beef type. It is planned to introduce these cattle at the station, beginning with two or three pure-bred animals, one to be a choice bull, and later increasing the herd to the capacity of the station. It is also planned to introduce Tamworth hogs and perhaps one or two good breeds of chickens. The pioneers in the valley will have to depend on live stock, and they must be encouraged to produce beef, pork, milk, butter, and eggs.

The introduction of live stock will necessitate the building of a barn, and it is planned to build a sanitary cattle barn as soon as possible, that will hold about 24 head, and, closely connected with it, a general hay, feed, and grain barn where grain can be thrashed and stored, where the bulk of the feed for winter use can be kept, and where space can be provided in the basement for implements and machinery. The clearing of more land so as to increase the acreage under culture to at least 50 or 60 acres at the earliest possible time is essential to the success of the station.

The station now has a self-binder and a fanning mill, together with a few common implements. This equipment must be added to. Modern labor-saving machinery is essential and also should be provided as a measure of economy.

It is planned to make the station a propagating center for such nursery stock and berry plants as can be successfully grown in the region. To this end a small stock of bush fruits and trees was provided from the Sitka Station as a beginning in this work, the small nursery established doing well at Matanuska during the past summer. It is planned to grow enough grain of early improved varieties to give the settlers who want to try them a start in a small way

COOPERATIVE WORK.

The Matanuska Station during the past spring distributed some 4 tons of seed grain that had been grown at Fairbanks Station and at great expense shipped to the Matanuska Station for the purpose of distribution. Some of this grain matured and did well. In other cases its value was not appreciated and it was not sown early enough to mature grain. However, a start has been made and the work will continue without cessation.

The writer spent some time at the station last August. He also made trips through the valley and met many of the settlers. A

meeting was held at the station at which there were 26 of the settlers in attendance from miles around. It was the endeavor to impress upon them the necessity of producing their own foodstuffs as far as possible and of relying less on cash crops with a view of shipping their supplies from the towns. A similar meeting was held at Wasilla, another new settlement 10 miles from Matanuska. The settlers were in a general way much disappointed in that their hope to become rich from a few potato crops had not been realized. Some of them left the country attracted by the high wages paid outside on account of the war industries. Most of them, however, will remain. They realize that there is a golden opportunity to develop productive farms in this favored region, a region which at the present time has better transportation facilities than any other section of Alaska.

KODIAK STATION.

Kodiak Station is devoted to stock breeding and some experiments in the production of forage. The station stock is mostly Galloway cattle, but there is also a small herd of Holstein cattle and a small flock of sheep.

Owing to its isolation and poor transportation facilities for mail, passengers, and freight, the Kodiak Station is very expensive to operate. The materials for all the necessary buildings have to be transported from Puget Sound or elsewhere, as must also skilled mechanics. Freight rates are high and labor is correspondingly high, all of which conditions combine to make Kodiak the most expensive of the five experiment stations now being operated.

CATTLE.

Tuberculosis control.—In earlier reports it has been mentioned that tuberculosis appeared in the herd of Galloways and that more than half of them proved to be infected. The reacting cattle were isolated at Kalsin Bay, 15 miles from Kodiak, and the sound animals kept at Kodiak. The disease is now well under control. Dr. Karl M. Oliver, attached to the Seattle Office of the Bureau of Animal Industry, United States Department of Agriculture, tested the entire herd last September with gratifying results. At Kodiak there were found only two animals that reacted. The Galloway herd bull and a Holstein cow failed to pass the test. The bull was killed and his meat condemned. The insidious nature of this disease is well illustrated in this particular bull. He was as fine a specimen of Galloway as one would wish to see, being strong, active, and, to all appearances, perfectly healthy. On post-mortem examination it was found that the disease had progressed so far that the meat could not be used. The Holstein cow, Grandview Fayne, which also reacted, was transferred, together with her calf, to the tubercular colony at Kalsin Bay.

As explained in former reports, this colony consists of pure-bred cattle with which it was desired to ascertain if healthy calves could be raised from affected parents. It is gratifying to be able to report that of nine yearlings raised from these tubercular cattle (the sire had reacted as well as all the females), not one reacted to the tuberculin test. These yearlings were pronounced sound and placed with the sound herd. The process followed consists briefly in removal of the calf as soon as it is dropped and feeding it on pasteurized milk which is furnished by the tubercular mother. The mature cattle are treated as sound cattle would be treated. They run in pasture and in winter they are sheltered, but, as stated, the calves are removed and kept by themselves. The fact that sound calves can be raised from tubercular parents, as this experiment proves, would indicate that it is unwise to kill valuable cattle that have become infected with tuberculosis. They should be completely isolated from sound cattle, and their calves never allowed to run with them. The milk fed to the calves must be pasteurized.

Crossbreeding.—The Holsteins were acquired for two purposes. One was to use them in crossbreeding with Galloways in order to ascertain if a breed of cattle can be established in Alaska that shall be hardy and thrifty and good rustlers like the Galloways, and at the same time retain some of the milking qualities of the Holsteins. The point has not been reached where an opinion can be expressed, but five crossbred calves were dropped, four of them the offspring of cows bred to the Holstein bull, and one the offspring of a Holstein bred to the Galloway bull. These calves are still too young to give any evidence of the qualities that they may develop hereafter. They are all black like the Galloways and are polled like the Galloways, but are of more rangy build than the Galloways, and have a sleek, short coat of hair like the Holsteins. The pure-bred Galloway calf has a fuzzy, curly coat. This is entirely absent from the crossbreds. The outcome of the experiment will be noted with much interest.

The Holsteins are not so well adapted to the climate of the Alaska coast region as is the Galloway, the cold storms visibly affecting them and causing a very perceptible drop in the flow of milk. They have to be housed earlier than the Galloways and kept under shelter later in the spring. They are not the active rustlers for feed that the Galloways are nor can they maintain themselves as well under adverse conditions. Nevertheless they have done fairly well and their future behavior will be noted with interest.

SHEEP.

The flock of sheep at Kodiak, at this writing, numbers 33 head all told, and the average weight of the clip was about 7 pounds, which must be considered good for a grade flock. In former reports mention

has been made of the various vicissitudes through which this flock of sheep has passed. Beginning with 20 ewes, some of them quite old, and a single ram, the flock increased normally for a couple of years. Two pure-bred rams, one a Lincoln and the other a Cotswold, were purchased for the purpose of breeding up the flock. Then came the volcanic ashfall. Both of these splendid rams, which weighed 300 pounds each, and a number of the best ewes were suffocated. Later the flock was all but exterminated by the great Kodiak bears. The few head that were rescued have increased in number, as above mentioned, until the present time.

HOMESTEADS IN ALASKA.

HOMESTEADS IN THE FOURTH DIVISION.

By courtesy of Mr. J. E. Clark, ex officio register of the United States land office at Fairbanks, Alaska, it is possible to supply the following data on homesteads that have been taken up, under the various homestead laws applying to Alaska, in the fourth judicial division of Alaska, that is to say, the area including the Tanana and Yukon Valleys.

	Acres.
28 unperfected entries under the three-year act of June 6, 1912.	3, 171. 99
3 entries for which final proof has been offered under the three-year act of June 6, 1912, patent pending.....	257. 67
34 unperfected entries under the 320-acre homestead act of March 3, 1903.....	10, 815. 48
15 entries for which final proof has been offered under the 320-acre homestead act of March 3, 1903, patent pending.....	4, 492. 55
13 homesteads, 320-acre homestead act, patented.....	3, 875. 29
Total.....	22, 612. 98

In the vicinity of Fairbanks there are 8 townships and 9 sections each in two other townships surveyed. In the vicinity of Nenana one full township, 13 sections in one and 9 sections in another are surveyed.

HOMESTEADS IN THE FIRST AND THIRD DIVISIONS.

By the courtesy of Mr. Frank A. Boyle, receiver, United States land office, Juneau, Alaska, it is possible to make the following statement: That there are 21 patented homesteads, aggregating 2,636 acres, in the first division, and 25 patented homesteads, aggregating 5,870 acres, in the third division. There are 56 homestead entries pending in the first division with a total of approximately 5,222.28 acres. The approximation is due to the fact that until final surveys are made, the exact area of forest homesteads can not be given. In the third division there are 323 homesteads pending with a total area of 67,507.02 acres.

REPORT OF WORK AT SITKA STATION.

By C. C. GEORGESON, *Agronomist in Charge*, and C. H. BENSON, *Assistant*.

PLANT BREEDING.

Strawberries.—For a number of years much attention has been devoted to breeding hardy strawberry plants by hybridizing cultivated varieties, at first with the two species of wild strawberry found in the Territory, *Fragaria chilænsis*, a native of the coast region, and *F. platypetala*, a very hardy species of the interior. Thousands of hybrids have been produced, about 3,000 seedlings of which fruited for the first time in 1918. Approximately 10 per cent of these hybrids proved to be of sufficient merit to warrant further experiments with them. Ninety per cent of the seedlings are discarded after their first fruiting. Of those retained a few, perhaps 3 or 4 in every 100 plants, prove to be of superior merit and are kept for propagation and dissemination. They have up to the present been known only by numbers. When a seedling hybrid plant has fruited it is given a number and detailed records are kept of each plant as to date of blooming, character of flower, date of ripening fruit, size and quality of berry, prolificacy, and vigor of plant. All those producing fruits that measure up to a certain standard of size, flavor, and firmness are retained. Those that fall below this standard are rejected. The plants retained are encouraged to set runners and further tested for two or three years, during which time many of them develop weaknesses that cause them to be discarded. When they are finally accepted they are propagated and sent to other stations for test and propagation and finally disseminated among the settlers free of charge.

The earlier hybrids were crosses between cultivated varieties and *F. chilænsis*, the native berry of the coast region. Many of these numbers have been tested at Rampart and Fairbanks Stations, and, although the mother parent, the cultivated berry, is scarcely hardy anywhere in Alaska, and the male parent, the wild berry of the coast region, is never subjected to low temperatures in its native habitat, many of the hybrids proved hardy in the interior, but not entirely so, for when the snow blows off and the bare plants are exposed to temperatures of -60° F. they succumb. This was the case both at Rampart and Fairbanks last winter, though apparently the plants were killed by severe freezes late in the spring after most of the snow had gone. Most of the hybrids of *F. chilænsis* produced large, attractive berries, some of them of superior flavor, others insipid. The majority of them, however, lack color and are soft to a degree that will prevent their shipment to distant markets. Such faults are not serious when fruit is grown for home use or for near-by mar-

kets, but they prevent their becoming commercial berries. There are a very few hybrids with fruit in which large size, good color, good flavor, and firmness are combined.

The majority of the hybrids fruiting last year had the interior wild berry, *F. platypetala*, for one of its parents, usually as the male parent. A large percentage of the fruit of these hybrids was of high color, good flavor, and firm texture, but the berries were too small to be promising for market, the fruit of only a few plants combining good size, high color, fine flavor, and firmness. All of these were, of course, retained and propagated for further test. This group of hybrids has as yet never been tested in the interior. Presumably they will be hardy. They should be hardier than the crosses with the coast region berry.

Still another group of crosses is made between the station hybrids. They have not been tested sufficiently, however, to pass judgment on their merits, but by the laws of heredity there should be some among them which combine all desired qualities. One of the best hybrids so far produced has resulted from crossing the Magoon, a well-known strawberry on the Pacific coast, with pollen from the wild plant of the interior. So far as tested, this hybrid possesses all the desired qualities. The berry is large, of deep red color not merely on the surface, but throughout, and firm enough to stand shipment. The flavor is good, but not superfine, and the berry has a core which pulls out easily when fully ripe.

The strawberry work will be continued. There is apparently no limit to the variation which can be produced. The most important point is to produce hardy plants that can be cultivated in any part of Alaska. Other essentials, as size and color of berry, must be secondary to hardiness. Many attempts have been made to grow strawberries in the interior from plants shipped in from the outside, but these efforts invariably failed until the station hybrids were introduced. A number of crosses were made again the past season, from which about 1,800 seedlings were raised. These seedlings have been transplanted once and will be wintered in flats outside. They will be planted in the field this coming spring.

Salmonberry-raspberry cross.—In former reports mention has been made of crosses between the raspberry and the salmonberry. These, however, were not a success. On many plants blossoms were sterile and failed to set fruit. Others were indifferent bearers, and none of them had any qualities that made them superior to good raspberries. Now, however, one plant from a cross made in 1916 which fruited for the first time the past season promises to be of value. The berries are salmon colored and of good size and pleasant flavor. The plant is a very strong grower and shows some of the character-

istics of both parents. This cross will be carefully guarded and propagated.

Potatoes.—Another line of work given much attention of late is the breeding of potatoes from seed balls. Each year new varieties advertised by seedsmen are added to the list of potatoes under test, while others are discarded if they do not come up to the required standard in size, quality, flavor, and yield. Among these commercial varieties there are always a few which mature seed balls. From such Alaska-grown seed, many hundreds of seedlings, the number now having passed 900, have been raised, a few of which are promising and will probably be of value when fully tested. In case of potatoes the qualities desired are earliness, good size and shape of tuber, shallow eyes, dry, mealy texture, and high yield. As with the strawberry, at least nine-tenths of the seedlings produced are rejected and about one-tenth are retained for further trial. A promising class of seedlings was started from three varieties of Norwegian potatoes obtained from a native of Norway returning to Alaska after a visit home. These three original varieties, which were named Norway Nos. 1, 2, and 3, respectively, have been discarded because of small size and inferior yield, but seed balls obtained from them have given seedlings which are fairly good yielders of medium-sized yellow potatoes which, although round or irregular in shape and with deep eyes, are of very superior quality, being firm, dry, and mealy in texture, several of them having a flavor something like that of chestnuts. A score of numbers of this type of potatoes are being propagated for discriminating selection of those that, all things considered, can be recommended for general culture.

There are many excellent potatoes in general culture in the States which in Alaska grow to large size and give good yields, but deteriorate in quality. They often become soft and soggy, qualities which are very undesirable in potatoes for table use. It is hoped to develop a few varieties early enough to mature fully in this climate and at the same time possessing the qualities of good potatoes.

Flowers.—Mr. C. H. Benson, propagator and foreman at Sitka Station, has succeeded in producing many crossbred flowering plants in the propagating house, particularly herbaceous plants, such as cinerarias, geraniums, cyclamen, calceolarias, and primroses. Some of these have characteristics that commend them to florists, as size or color of flowers or prolific blooming qualities. This work has only been begun and there is as yet nothing of special interest to record beyond the fact that it is possible to produce floral novelties in Alaska as well as elsewhere.

VEGETABLES.

Cabbage.—Cabbage did very well this season. The varieties tried were Burpee's Allhead Early, Mammoth Rock Red, Extra Early Express, Jersey Wakefield (Special), Large Wakefield or Charleston, Fottler's Brunswick, Perfection Drumhead Savoy, Burpee's Danish Round Red, Burpee's Early Stonehead, Early Copenhagen Market, and Fordhook Mainstay. The best varieties were Large Wakefield or Charleston and Early Copenhagen Market, both heading 100 per cent. The Large Wakefield averaged 4 pounds to the head and were first to mature (August 3). Early Copenhagen Market is much later but makes an excellent fall cabbage, and the heads are also heavier, averaging 6 pounds. Fordhook Mainstay headed 100 per cent but the heads were small and rather coarse. Extra Early Express is another sure header, but is inclined to burst in rainy weather. Perfection Drumhead Savoy is a cabbage of excellent flavor which headed about 75 per cent. None of the others showed any particular merit. Clubroot was found on a number of plants, though extra care was taken to prevent this while the plants were small. Probably the plat was infected from being planted to cabbage in 1916. The infested plants were pulled and destroyed as soon as signs of clubroot appeared.

Chinese cabbage.—Twelve varieties received from the Office of Foreign Seed and Plant Introduction, United States Department of Agriculture, were planted and grown according to directions. Only a few headed, most of them going to seed at once.

Cauliflower.—As usual cauliflower did well. The varieties planted were Burpee's Best Early, Early Snowball, Veitch Autumn King, and Algiers. The two first-named varieties were ready to use August 6, having snow-white, medium-sized heads. The first head of Algiers was cut August 17. From then until the middle of October extra large heads were cut from this variety. Veitch Autumn King did not come up to the other varieties in size or quality.

Brussels sprouts.—Two varieties, Long Island Improved and Danish, that have in former years proved most reliable, were the only ones planted. Both did very well.

Kale.—As usual kale did splendidly. This plant should be grown more extensively in Alaska for fall and winter greens, as it is both appetizing and healthy. Dwarf Curled Scotch is the best variety.

Kohl-rabi.—Early White Vienna, the only variety grown, produced several heads, measuring 7 inches in diameter. Kohl-rabi must be used before fully matured as otherwise it becomes woody and will not boil tender.

Turnips.—The varieties planted were White Milan, White Egg, Early Red, Purple Top Milan, and Petrowski. What has been said

in former reports was verified again this season. More than 50 per cent of the first four varieties were rendered useless by the work of the root maggot, but the Petrowski was not touched, though growing side by side with the others. White Egg was ready to use July 20, the others soon after. Some complaint has been made in regard to the Petrowski being bitter. This is found to be the case when it is used too young. In order to have good Petrowski turnips it is best to make two plantings, one as soon as the ground is ready in the spring for early use, the other about June 15. The Petrowski is inclined to become pithy when reaching maturity early in the season.

Rutabagas.—Golden Neckless and Bartfelder were tried. The first named was rendered practically useless by injury from maggots. Bartfelder is a stock rutabaga. It was extra large and not affected by maggots.

Carrots.—The carrots did exceedingly well this year. The varieties planted were Chantenay (Burpee and Department seed), Danvers Half Long, New Amsterdam, and White Belgian (stock). All varieties yielded about the same, slightly over 1 pound per foot of row. The rows were 18 inches apart which would be 29,000 pounds to the acre. The White Belgians grew to a foot in length, leaving no doubt as to the possibilities of raising roots for stock feed in the Territory. The New Amsterdam carried very little foliage, but the roots were of large size and excellent quality.

Parsnips.—Two varieties were planted, Guernsey and Long Smooth or Hollow Crown. Both did very well, producing large roots of excellent quality. Parsnips are greatly improved by frost and should be left in the ground until after a good freeze.

Parsley.—Parsley does well each year. In order to get good results seed must be planted in a window box or hotbed early in the spring so as to have plants with 3 or 4 leaves ready to set out in the garden when the danger of frost is over.

Beets.—Table beets did not do well. They made good tops but little was found in the ground.

Chard.—Lucullus did very well. Good greens were cut from August 1 until late in the fall. A few plants will keep a family in greens. By cutting the leaves as they mature, young leaves will keep on growing.

Mangels.—Mangels for stock were tried on a small scale this year. The two varieties grown, Sludstrup and Giant Eckendorf, turned out quite successfully. The Eckendorf grew largest, weighing from 1½ to 3 pounds. Both were firm and juicy. Mangels will without doubt do better in sandy loam or clay, being grown here in peat, as no other soil is available.

Onions.—Onions were tried again with fairly good results. Some were raised from seed in the greenhouse and transplanted to flats in

the garden May 17. The majority of these developed fair sized bulbs and this method will be tried again. Seed planted in drills in the garden May 8 did not develop any onions large enough for winter use.

Leek.—Leek, Broad London, was tried with medium results. Seed was planted in drills in the garden May 7. The leeks obtained were small but of fine quality.

Lettuce.—Lettuce did exceptionally well. The first planting was made May 30. These were young plants that had been started in the greenhouse and transplanted once. Two additional plantings were made June 15 and July 5, all being transplanted once before they were planted in the garden. The first planting produced the largest heads. Some measured more than a foot across and were ready to use July 15. From then till November 1 good lettuce was cut. The varieties grown were Iceberg, Yellow Seeded Butter, Denver Market, Burpee's New Brittle Ice, and Grand Rapids. The heading varieties headed up solid. All varieties were good. The Brittle Ice is all that the name implies, being brittle and juicy.

Radishes.—As usual radishes did well. The varieties tried were Burpee's Rapid Red, White Tipped Scarlet, Bright Breakfast, Half Long Deep Scarlet, Hailstone, and White Icicle. All varieties were good. Fresh radishes can be had throughout the season by planting in succession every two weeks.

Peas.—The stand of peas was poor this year owing to depredations of robins while the seed was germinating. Entire rows were scratched out and eaten, and it was then too late to secure a fresh supply of seed. A variety test was therefore out of the question. Thomas Laxton, Quite Content, Alderman, and Boston Unrivalled carried extra large pods. All peas were inoculated with a culture of nitrogen-gathering bacteria. The growth showed marked improvement over former years. It would not be just, however, to give the culture credit until after another trial, as the ample room which each vine occupied might have brought about the improvement.

Celery.—This crop did not turn out so well as last year, chiefly because the ground was dry when the young plants were set out and no rain fell for two weeks after. The plants thus received a check which they could not overcome. Some good celery was grown on ground that held the moisture. The varieties planted were White Plume, Golden Self-Blanching, and Fordhook Emperor. The first two are best adapted to this country.

Spinach.—Spinach was tried again. Two seedings were made, one on May 7 and the other a month later. The first went to seed without producing any greens, while the latter produced some greens but not enough to be satisfactory.

Rhubarb.—Rhubarb as usual did splendidly and can not be surpassed anywhere. A good quality of rhubarb was cut all season from the same plants. In order to have rhubarb throughout the season seed stalks must be cut as soon as they appear. A top-dressing of good fertilizer in July should also be applied and worked in around each plant.

ORCHARD FRUITS.

Apples.—The orchard was a failure last year. Apple trees bloomed profusely and also set fruit fairly well, but the cold rainy season prevented them from maturing. Apples of the following varieties in former years have matured, but not this year: Yellow Transparent, Livland (lowland) Raspberry, Golden Sweet, and Tetofski. Fruit on the first three varieties attained a fair size but failed to ripen. The Tetofski trees dropped their fruit when it was about half grown. The hybrid apples mentioned in former reports, which have been grafted into older trees to hasten the production of fruit, made a fair growth.

Cherries.—Cherry trees bloomed profusely as usual but the spring was cold, rainy, and stormy and the blossoms set very little fruit and those that did set did not develop normally. They cracked and were of no value. Year before last several varieties of cherry trees were procured. They have done only moderately well and none have shown bloom. Three varieties, May Duke, Schmidt, and Elton, winterkilled.

Plums and pears.—These are represented at the station by a few trees, which are making a slow weak growth and do not appear promising. The young pear trees suffered from blight.

The writer has stated in many former reports that there is no prospect of growing orchard trees successfully in this climate until hybrids with the native crab apple (*Pyrus rivularis*) are developed or until varieties are secured that are hardy in northern regions of similar climate, perhaps from Norway or Sweden.

SMALL FRUITS.

Raspberries.—The station raspberries did well the past season. The bushes were loaded with large, well-formed berries, but they were late in maturing. The first berries did not ripen until August 7, and heavy continuous rains in the latter part of August caused a large percentage of them to rot on the bushes even before they were mature. Cuthbert again proved to be the best variety, far superior to Louden and Miller's Favorite. In fact the Cuthbert is the best of all the varieties so far tried.

Gooseberries.—Gooseberries did extra well this year. Some branches were so heavily loaded that they bent to the ground with the weight of the fruit. Industry, Columbus, and Triumph were the leaders, pro-

ducing a wealth of extra large berries. Whitesmith and Champion were also good but not quite equal to the three varieties named. Redjacket, Carrie, and Houghton also produced a quantity of small berries. Station seedling No. 305 also made a good showing, but did not come up to the three first-named varieties. All varieties had a healthy appearance throughout the season. They showed neither mildew, leaf spot, nor other fungus diseases.

Currants.—Currants also did exceedingly well this year. All varieties fruited, permitting a comparison to good advantage. Among the red varieties Perfection is the undisputed leader. It produces large, handsome berries and is very prolific. Then follow, in the order named, Fay's Prolific, London Red, North Star, and Red Cross.

Of the white varieties White Imperial made the best showing. It was almost equal in size and productivity to Perfection. White Grape, White Transvaal, and White Dutch were also good, but not equal to those above named.

Black currants also do remarkably well in this climate. The best are Black Montana and Prince of Wales. These were extra large and productive. Lee, Black Champion, and Black Naples were also good, but not equal to those above mentioned.

Hybrid black currants produced at the station. Crosses between *Ribes bracteosum*, the native species, and a black garden variety produced blossoms and fruited for the first time. In appearance and flavor they are much like the native wild species. The racemes were long, but only 3 or 4 blossoms on each set fruit. Seeds were saved, and a second generation will be tried.

Other bush fruits.—Other bush fruits were tried, among them two hybrid blueberries, produced by Mr. F. V. Coville, of the Bureau of Plant Industry, United States Department of Agriculture, and kindly presented to the station by him. They were planted in suitable soil and will be given a fair trial. The plants are small and produced no fruit. Blueberry seed was collected from each large fruited wild species, and an effort will be made to cross plants with them, and if successful the seedlings will be tried under cultivation.

Dewberries.—Dewberries are being given another trial, but with what result can not be stated at this writing. When tried in former years they have always failed.

Blackberries.—Blackberries planted out in the spring of 1917 are barely keeping alive. Some 10 years ago blackberries were given a thorough trial, with the result that they set fruit, but it never matured. The summers were not warm enough, and nearly all the plants winterkilled. It is a surprise to many people that blackberries can not be grown in Alaska, but this is a fact nevertheless.

They are not, like currants and raspberries, indigenous to the country, and they are too tender for this climate. It is useless to try them.

Cranberries.—Cranberries have been repeatedly tried at the station. Neither plants imported from Wisconsin nor plants raised from seed have ever given satisfaction. The plants have kept alive sometimes for a year and then succumbed. Special beds covered with sand have been prepared for them, but they have never done any good. It appears useless to attempt to grow the eastern cranberry in any part of Alaska, as the summers are not warm enough. They do all right a thousand miles south of here on the coast of Washington, but so far they have resisted all efforts to coax them into normal growth in Alaska.

ORNAMENTALS.

Trees.—In a small way tests are also being made of certain deciduous forest trees and some bushes grown for ornament. Alaska stands in need of deciduous trees. The ubiquitous spruce becomes a tiresome object to look upon. If the situation could be relieved by the introduction of hardy deciduous trees, Alaska would be the gainer. Among those under trial are Norway maples, which are making a strong growth and seem promising, and also a few young sycamore trees and several varieties of poplars. The silver poplar, so called, is doing well, but Bolles' silver is the most promising. Others are black poplar and Italian poplar. A few elms are doing fairly well. Some birches are grown, but they do not do well in the coast region, being better adapted to the southern slopes of the hills in the interior. A few oaks are under experiment, but all that can be said of them is that they are alive.

The mountain ash deserves special mention. It does remarkably well in the coast region of Alaska, a number of fine trees being found in and about Sitka, where they seem to be at home. They fruit profusely, and a large tree covered with clusters of red berries in the fall of the year is a sight to be long remembered. It is recommended for general planting throughout the coast region.

In this connection mention should again be made of the native red-berried elder. It is a very ornamental bush or small tree readily raised from seed. Aside from its ornamental qualities the berries make delicious jelly and jam. They are much appreciated by the beach crows and by robins. As soon as the berries begin to turn red in early September all the beach crows in the vicinity gather for the harvest, and for two or three days the bushes are black with crows until the berries are all gone.

Shrubs.—A collection of ornamental shrubs of many varieties is being tried at this station. Comparatively few appear to be suited to the climate. The bush honeysuckle (*Lonicera*) in many varieties

is the most satisfactory so far tried. *L. thibetica* is very hardy and is suited to the climate and is sure to give satisfaction. *L. tatarica* is quite hardy and *L. japonica* appears to be hardy, but is less vigorous than the foregoing. *Potentilla fruticosa* is an attractive little shrub which bears small yellow flowers in profusion. It appears to be hardy but is not a vigorous grower. Among the spireas, *Spiræa vanhouttei* and *S. salicifolia* are satisfactory. The variety Anthony Waterer was promising at one time but has since failed to survive the winters. The Siberian dogwood (*Cornus sibirica*) is hardy. Golden elder has survived three winters. The Siberian pea-tree (*Caragana arborescens*) is hardy but has not made much growth. Red flowering currants (*Ribes sanguineum*) and rhododendrons are fairly satisfactory. The latter have been tried only to a limited extent. *Hydrangea paniculata* will do well for a couple of years but finally succumbs, blooming too late in the season to be much of an ornament. Lilacs in several varieties have been tried and in sheltered spots they will survive and bloom, but their behavior shows that they are not well adapted to the locality.

In this connection mention must again be made of the hardy *Rosa rugosa*. It is the only really hardy rose tried here that can be recommended without hesitation. It has been mentioned in many former reports and has gained in favor each year. The single variety produces large red hips that mature seed from which it is easiest to propagate the plant. Sow the seed in a box of sandy soil in the fall of the year. Let the box stand outside where it will freeze and be subjected to the effects of the elements. In the spring of the year sow the contents of the box, sand and all, in rows in well-drained soil. If the seed was thoroughly ripe when harvested, it will sprout freely. The seedlings are hardy but have small delicate roots, and if repeated freezing and thawing occurs in the spring, as is always the case in this climate, the plants will be heaved out of the ground and be found dead on the surface. To prevent this, the seedling plants should be covered with spruce boughs on top of which, if possible, some seaweed should be spread. This protection is not so much to keep the cold out as it is to prevent the rapid thawing and freezing of the ground. Young strawberry plants at the stations are protected in the same manner. The seedling roses can be set out in rows some 9 or 10 inches apart and can remain so for about two years, as they grow slowly. Finally, when a foot or 18 inches high, they can be replanted in their permanent location. The rough foliage is ornamental in itself. The very large, single roses are sweet scented, but they remain in bloom only for about two weeks. But there is a succession of bloom for about six weeks in the summer months, and finally the red rose hips add color to the landscape. As this rose grows with difficulty from cuttings, it is propagated from seed or by layering

older bushes. The bushes will live for many years, there being 15 or 20 year old bushes at the station.

A double flowered *Rosa rugosa* now at the station has very sweet blossoms which live longer than the single blooms, but this form produces little or no seed and must be propagated by cuttings, which can be done only by a skilled propagator under glass.

Fifty or more varieties of roses have been tried during the past three years with a view to find some that are really hardy. Many have survived the winters with some slight protection, but they do not thrive here as they do a thousand miles farther south at Seattle, Wash., and Portland, Oreg. The following varieties came through the winter in fairly good condition, made a reasonable growth, and produced many blooms the past summer: Bess Lovett and Mary Lovett (climbing roses so far free from mildew), and the bush roses Madame Georges Bruant, William R. Smith, Lady Hillingdon, Mrs. R. G. Sharman-Crawford, Caroline Testout, Baroness Rothschild, Suzanne Marie Rodocanach, Frau Karl Druschki, Ulrich Brunner, George Arends, Captain Hayward, Paul Neyron, Madame Ravary, Lady Alice Stanley, American Beauty, Sir Thomas Lipton, Conrad F. Meyer, and Santa Rosa. The following did not survive: Dean Hole, Maman Cochet, Richmond (white and pink), Agrippina, Etoile de France, Mrs. John Laing, La France, J. B. Clark, and Marquise de Ganey. The best way found to protect roses in winter is to first hill up the soil around the base of the plant, then bend the branches down and place hemlock or spruce boughs over the top, and on top of this spread a good thickness of seaweed, moss, long manure, or straw. The object of the spruce boughs is to hold the covering slightly above the ground so that air can circulate. Placing burlap around each plant is also fairly satisfactory if the wood is fully ripe. Another way to protect rose bushes is to lift the roots on one side gently with a spading fork and bend the plant over until the top lies on the ground, then to cover the whole plant, and particularly the exposed roots, with a mound of soil. The following spring the soil is removed, the plant is righted, and is ready to go on growing.

Hardy perennial flowers.—There are many hardy perennial flowers which can be satisfactorily grown in Alaska. The following varieties were satisfactory last year: Milfoil (*Achillea millefolium*), the pearl (*A. ptarmica*), monkshood (*Aconitum*), mullen pink (*Agrostemma coronaria*), yellow marguerite (*Anthemis kelwayi*), columbine (*Aquilegia*), rock cress (*Arabis alpina*), sea pink or thrift (*Armeria formosa*), English daisy (*Bellis*), hairbell (*Campanula carpatica*), Canterbury bell (*C. media*), bluebell (*C. persicifolia*), snow-in-summer (*Cerastium tomentosum*), larkspur (*Delphinium*), bleeding heart (*Dielytra spectabilis*), pheasant's eye pink (*Dianthus*), sweet william (*D. barbatus*), foxglove (*Digitalis*), shooting star (*Dodecatheon*), cranesbill (*Gera-*

nium sanguineum), Miss Nelson sunflowers (*Helianthus*), hollyhocks (several varieties), day lily (*Emerocallis*), Siberian iris (*Iris sibirica*), lupine (*Lupinus polyphyllus*), *Lychnis chalcedonica*, *L. haageana*, forget-me-not (*Myosotis*), oriental poppy (*Papaver orientale*), Iceland poppy (*P. nudicaule*), hardy phlox (*Phlox ducussata*), Miss Lingard (*P. suffruticosa*), moss pink (*P. sublata*), oxlip (*Primula elatior*), Polyanthus, English primrose (*Primula acaulis*), painted daisy (*Pyrethrum roseum*), rockfoil (*Saxifraga*), *Scabiosa caucasica*, *Spiræa filipendula*, Shasta daisy, meadow sweet (*S. venusta*), pansies (*Viola tricolor*), summer flowered pansies (*V. cornuta*). The hollyhocks made a good showing this year, it being a favorable season. They bloomed late in September and early in October. In a late, cold season they would probably not bloom. What has been said about the hollyhocks is also true of hardy phlox and hardy aster. Baby breath (*Gypsophila paniculata*) and fountain grass (*Pennisetum japonicum*) have not proven successful to date. Although peonies bloom well, they are not a real success as they do not increase in size of plants.

Annual flowers.—Annual flowers that made good this year are as follows: Sweet alyssum, snapdragon, Antirrhinum, *Bartonia aurea*, pot marigold (*Calendula*), candytuft, bachelor's button (*Centaurea cyanus*), *Chrysanthemum coronarium*, *C. atrococcineum*, early flowering cosmos, annual larkspur (*Delphinium*), Japan pinks (*Dianthus heddewigie*), African orange daisy (*Dimorphotheca*), California poppy (*Eschscholtzia*), godetia, baby breath (*Gypsophila elegans*), toad flax (*Linaria maroccana*), lobelia, pink annual lupine (*Lupinus*), African marigold, French marigold, feverfew (*Matricaria*), mignonette, nasturtium, Nicotiana, *Phacelia campanularia*, *Phlox drummondii*, poppy (carnation flowered and Hooker's Single), golden feather (*Pyrethrum*), mourning bride (*Scabiosa*), butterfly flower (*Schizanthus*), stocks, and early flowered sweet peas. Other annuals that were more or less a failure are little blue star (*Ageratum*), calliopsis, *Centaurea imperialis*, blanket flower (*Gaillardia*), *Matthiola bicornis*, fragrant evening stock, petunias, and verbenas.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Assistant in Charge.*

WEATHER CONDITIONS.

Compared with the 13-year average, the winter of 1917-18 was far from normal. Briefly it might be described as very cold and very windy. Beginning November 23, and ending January 30, a period of 69 days, the maximum temperature was 0° F. with a minimum of

-57°, a mean maximum -19.1°, mean minimum -31.2°, and mean -25.1°, and the snowfall was 2.82 inches. February and March consisted of a succession of clear, cold days, attended at night by brilliant auroras, interspersed with periods of overcast skies and gales of wind. The heaviest snowfall in 24 hours for the season came April 1, when 6 inches fell. The cumulative snowfall for the winter was 60.25 inches. Drifted and beaten by the winds, this amount of snow made trails all but impassable, causing much hardship to man and beast. The total precipitation (melted snow) for the winter months, beginning in October and ending in April, was 5.34 inches, 1.75 inches more than the 10-year average. The total precipitation for the five summer months was 3.7 inches, which compared with the 10-year average of 5.66 inches, was considerably below normal. The total precipitation for the year beginning October 1, 1917, and ending September 30, 1918, was 9.04 inches, which approximates very closely the 10-year average of 9.25 inches.

The spring of 1918 was fully a week later than normal. April 30 the fields were still buried under several inches of snow. This April residuum lasted into the second week of May. Cool weather continued throughout May and June, with a very light precipitation. The cool, dry weather in conjunction with the late spring proved a serious handicap to all crops, which was not overcome by the dry, warm days of July and the belated rains of August. Fortunately the first severe fall frost held off until September 6. This gave late maturing grain crops and potatoes a few days of grace. The first light frost of the season came August 26 with a temperature of 27°, but it was very local and not severe enough to do serious damage. The frost-free period was 94 days, three days less than the 10-year average.

The ice in the Yukon broke May 18, jamming very shortly thereafter above and below Rampart. This jam broke the third day, forced by a steady rise of water until the river was bank full. With the resumed flow of the ice there came a sudden rise of water that forced huge cakes of ice up over the banks, cutting and tearing into them, uprooting trees, and in places shearing off the thick growth of fringing willows. The first steamboats of the season, May 28, reported that on their way down they had passed through veritable gorges of ice from 40 to 50 feet high that had been pushed up on the bank by the tremendous pressure of the water incident to the temporary blocking of the river channel.

GENERAL WORK.

During the winter the usual supply of firewood, some 42 cords, was cut, hauled, and sawed into stove lengths. Also a couple of hundred building logs in 20, 30, and 40 foot lengths were cut and hauled. The

little patch of green spruce located some 3 miles up Squaw Creek where these logs were cut constitutes the last sizeable timber within reasonable hauling distance, a mere remnant left from the ravages of fire and cutting of steamboat wood in the early days. The various small plats of grain were thrashed, machinery and implements repaired, and the usual list of odd jobs done that during the busy season are laid aside for attention during the comparatively slack period. Throughout the growing season only the most necessary and important crop work was done and such improvement work as plating the station grounds, begun the previous year, could not be finished. Since all of the superintendent's time was taken up with general crop work, no hybridization could be done. During the dry weather the moss piles too wet to burn the previous year were cleaned up and the ground plowed. This area of about an acre finished the clearing of the lowland up to ditch No. 3, blocked out several years ago. This rectangular body of lowland fronting on the river comprises 35 acres and is divided into 2 fields by ditch No. 2 draining at right angles into the river. Beyond ditch No. 3, which lies 1,010 feet up river from and parallel to ditch No. 2, lies a splendid body of burnt-over lowland on 12 acres of which the stump wood and dead-falls have been piled during two previous summers. Here with the aid of fire a considerable field can be cleared at comparatively slight cost.

Spring harrowing and planting was begun seven days later than normal. The weather was cool and the snow melted slowly; also there were heavy drifts on the lee side of all knolls, put there by unusually severe and frequent winds from the southwest. These drifts in melting kept the adjacent land wet, that would otherwise have been dry. The earliest seeding was done May 9 on a high knoll where peas were drilled in. A few days later some harrowing was done on a piece of bench land. On the morning of May 17 the ground was frozen too hard to harrow, but in the afternoon the harrow was started again and seeding of pedigree plats begun. From then on as rapidly as the ground dried off sufficiently it was harrowed and seeded. The last field to be sown was 5 acres of lowland seeded to oats for hay, June 17.

During July and August about 5 tons of fish offal was brought up from a fish camp a short distance below the reservation and buried in trenches. This is to be used for fertilizer after it has rotted thoroughly. By keeping the offal covered with not less than 6 inches of earth very little disagreeable odor escaped. Owing to the complete arrest of decomposition during the greater part of the year such material, if buried, requires at least two summers to rot. If left on the surface and fly-blown, the maggots will reduce it to fertilizer

status in a season, but the accompanying stench forbids such practice within the limits of human habitation.

LEGUMES.

Alfalfa.—Of the several varieties and strains of alfalfa tried, there is but one that has shown itself to be entirely winter resistant. This is the yellow flowered type known as *Medicago falcata*, bearing narrow, sword-shaped dehiscent pods, semierect and medium coarse to fine stalks, and abundant but narrow leaves. Plats of *M. falcata* seeded in 1915, 1916, and 1917 have never shown winter injury. From the plat seeded in 1915 a considerable amount of seed was produced in 1916. Owing to the cool, comparatively wet season of 1917, no seed ripened. In the lower part of the plat, this year, practically all of the seed ripened. On the ground in the same plat, where the growth was heavier, there was much less ripe seed and some plats were practically sterile. The plants bearing ripe seed were cut September 10, and stored under a shed to dry out thoroughly to permit thrashing. A small amount of seed ripened on scattering plants on the plat seeded in 1916. This was likewise harvested. The 1917 plat did not ripen any seed. All plats made a fairly strong, though uneven growth. A part of the 1917 seeding on rather new lowland that is decidedly peaty made a very poor growth, but on the older portion of the field, especially where there is wash from the bench land, the growth was good.

The half acre of Grimm alfalfa seeded in 1914 froze out completely last winter. Previous winters had thinned the stand appreciably and lessened the vitality of the survivors. Examinations at various times showed the taproots of a number of plants to be rotted off 6 or 8 inches below the surface. The outer tissues of the stub root would be in growing condition, but generally the heart tissues were black. This plat produced an abundance of pods during 1915, but only a small percentage ripened. In 1916 the half-acre plat produced 20 pounds of clean, ripe seed. Last year, 1917, practically no seed ripened. During the life of this plat many variant plants were selected² and the seed from each saved and seeded separately the following year. It was hoped that some of these variants would prove hardier than the original Grimm, but in this respect they proved disappointing, as the variants selected and staked winterkilled, as did the standard purple flowered plants. A large number of plants of variant progeny are still alive and have made a fair growth, but many of these also froze out last winter. These were 2-year-old plants and had made a strong growth the previous season. They were hybrids from reciprocal crosses of Grimm and *M. falcata*.

² Alaska Sta. Rpt. 1916, pp. 26, 27.

Vetch.—The plat of *Vicia cracca* (cow vetch or tufted vetch), which had done so well in previous years, scored its first failure. An early examination showed the roots alive and apparently ready to begin growth. By the middle of June only an occasional shoot was to be seen. Immediately under the surface were many live shoots to all appearances ready to push up and grow, but evidently lacking the vitality to do so. Whether this is the effect of some disease or simply the debilitating effect of severe cold is not known. Last year *V. cracca* was later in starting growth than normal, but by fall it had shown its usual vigor. This plat was 4 years old and had produced two seed crops. The plat was extended in the spring of 1916. This extension also showed very little life this spring and the surviving plants made a weak growth. The above plat is on bench land. A plat of 1 acre was seeded on lowland this spring with seed grown on the bench-land plat last year. A fair stand was secured on the major portion of the plat and the growth was normal.

Clover.—The plat of *Trifolium lupinaster* seeded in 1914 also suffered considerable winter injury for the first time. Even under favorable conditions this clover has never made a strong growth and this year it was below normal. Very little seed was produced. Winter hardiness has been its chief merit. Without this redeeming quality it is of little value, as it is decidedly lacking in quantitative hay production. The fact that this hardy legume suffered is a good index as to the severity of last winter.

Peas.—One 5-acre field and two half-acre fields were seeded with peas from seed grown here last year of a standard garden variety known as Alaska. One of the smaller fields sown May 9 on a high knoll gave a good stand, but on the driest portion of the knoll the crop was a complete failure, only one small portion of the field giving a fair crop. The vines were pulled September 9, when practically all the pods were ripe.

The other small field, in part high land also, was seeded May 18. As on the other field, the drier portion did not produce a crop. In this connection it is well to remember that the rainfall of May, June, and July totaled only 1.6 inches, about equally divided between the three months. By the end of August the bulk of the crop was ripe and the vines were pulled and piled. September 17 the crop was dry and thrashed with the small thrashing machine. The yield was 548 pounds, all first-class, dry seed.

The 5-acre field of peas was seeded May 27. Because the seed was not thoroughly dry and hard, considerable of it was crushed by the feed wheels of the drill. A 75 per cent stand resulted. This field is high bench land and has produced three successive rather light oat crops. The peas were therefore the fourth crop. No fertilizer has been applied. The peas were intended for a soil-im-

provement crop. August 9 the field was plowed, the light growth of vines being turned under with a sprinkling of volunteer oats.

WINTER GRAIN.

WINTER WHEAT.

Small plats of winter wheat were seeded July 28, 1917, in lowland. The stand and fall condition were fair. All of the wheat of the following varieties froze out completely: Andrischinskay No. 312-2, Sandomirka No. 203-3, Kharkov Nos. 204-11, 349-2, and 348-2, and hybrid Nos. 59a and 60a. Except the hybrids, all the varieties had been grown at least once before and had shown a fair winter resistance. Kharkov after 11 years of selection for hardiness seems to have lost rather than gained in this all-important quality. There seems little chance of developing a hardy strain of any of the varieties tried so far.

WINTER RYE.

Small plats of winter rye were seeded on the same date and on the same type of land as the winter wheat, giving excellent stand and fall condition. Several of the plats showed winter injury and one killed out completely. Nos. 350-2 and 198-7, contrary to previous tests, came through with only 1 per cent survival. These three numbers ripened August 26, having reached a height of 48 inches with fairly well-filled heads containing from 30 to 60 kernels. The two most excellent varieties were Hogot No. 311-2 and Irkutsk No. 201-3. Seeded the same date as the other winter grains, July 28, each gave a 98 per cent stand, an excellent fall condition, and almost perfect spring survival. July 7 they began heading and when fully matured stood 5 feet with well-filled heads containing from 30 to 60 kernels. By August 26 both plats were ripe and were cut with the binder. When thrashed September 17, the grain was well cured and appeared excellent in every respect.

SPRING GRAIN.

Except for a few increase plats of barley, oats, and wheat, all plats were head-to-row, with two drill-row plats. Seeding began May 18 and continued for five days. The cool weather of early spring, together with the season's heavy snowfall, delayed spring planting at least a week. Never before in the history of this station has the soil seemed so inhospitable to plant growth. The grain came up very unevenly, often as low as 1 per cent in a plat. These early plants were vigorous and normal, blooming and ripening well within the usual time. Unfortunately, a large majority of plants in many of the plats came up late and were frequently weak and spindling. Some were strong enough and grew rapidly when the warmer weather

came, but by harvest time the heads were still green and some plants were only just blooming.

A brief account is given below of the plats of spring grain with the number of plat, nomenclature of the grain, and the salient characteristics. The hyphenated number following the accession number shows the number of years the cereal has been grown here.

BARLEY.

The first grain ripe was *Pamir* barley, August 9, requiring 79 days from date of seeding. Nearly a dozen others were only a day later. Of conspicuous merit among these are hybrids Nos. 20b, 1a-4, 14e-1, 28a-1, and 14a-2.

Plats Nos. 51 to 53, and 92 to 98, hybrid No. 21a, F₆.—All heads selected last year were hooded, 2-rowed, and black with supernumerary spikelets at the tip. Six of the heads produced progeny like the parent head. The remaining 5 produced some bearded heads, which were 2-rowed and black. The growth characteristics of this series are short sturdy straw and short compact heads containing from 18 to 24 kernels. The plats ripened in 87 days.

Plats Nos. 74 to 85, 142, and 182 to 187, hybrid No. 19b, F₆.—This series has produced some of the finest barley ever grown at this station. It is characterized by a vigorous culm, broad leaf, exceptionally large hooded heads, and naked kernels. However, in performance this year it was not up to previous records. Whether or not the major blame rests with the season, deterioration of the seed, or a combination of the two, future seedings will determine. The first 12 numbers were head-to-row plats, 50 kernels to the row. Only 1 per cent came up and developed normally. This is true also of the other varieties and consequently can not be considered a falling of this series only. Though the final stand ranged from 75 to 90 per cent, the later plants did not develop in time to mature. The earliest plants produced the usual fine heads and ripened thoroughly by August 23, requiring 96 days from date of seeding. All plants from the 19b series again came true in so far as form is concerned, but perfect stability as to color of berry and coordinate color of glume has not been established. The recessive strain has a yellow glume inclosing an amber-colored berry, while the dominant strain has red striped glumes and a dark berry. This red stripe is fugitive and so hardly discernible after the head is dry. Another season should see these strains thoroughly established.

Plat No. 86, hybrid No. 1c-1, F₂ (Champion × Pamir).—This type resembles very closely the pistillate parent. Of the 45 kernels planted 9 produced bearded heads and 26 hooded, all 6-rowed and yellow. The first heads were ripe August 31; being compact, well filled, and containing from 40 to 60 kernels.

Plat No. 87, Champion (No. 217-2).—The straw is rather short and weak. A hooded, hull-less, 6-rowed sort, the pistillate parent of the 1a series. The first heads were ripe August 30, taking 103 days to ripen.

Plats Nos. 88 to 91, 139, and 143, hybrid No. 23a, F₆.—These plats produced a very uneven growth. Two of them were considered worthless. On one of the remaining plats was grown a 6-rowed, black-bearded sort. Several years ago in this series bearded heads were selected that apparently shed their awns on ripening. From the progeny of these original heads rigid selections have been made yearly, with a view to fix this apparently fugitive characteristic. Possibly this can be done, but so far there has been no gain in the number of heads shedding their awns. Further selections have been made. The other plat was also planted with a 6-rowed, black barley but having hooded heads. This is an early type ripening in 85 days, but not entirely stable. Out of 129 plants 7 produced yellow heads, all 6-rowed.

Plats Nos. 102 and 103, hybrid No. 20b, F₆.—A hooded, hull-less, 6-rowed type, very early, with medium-length straw and medium-sized heads having long, hard, dark kernels with a bluish tint and requiring 82 days to ripen. The progeny of 8 heads were all true to type except in one case, which was 2-rowed. From the other head all progeny were like the original. This barley is the pistillate parent of the 44a series.

Plat No. 117, Albert (No. 391-1).—This barley produced very inferior heads, imperfect and short, with from 6 to 15 kernels. In point of earliness it is almost equal to Pamir, but otherwise of no merit.

Plats Nos. 131, 132, 174 to 176, and 178 to 181, hybrid No. 14a (Boehmer Hull-less × Abyssinian No. 132).—From this cross, made 8 years ago, many selections have been taken. There have been many interesting variations giving fair promise. All but 2 have developed some defect which has resulted in their being discarded. Several strains, very promising otherwise, ripened too late to be worthy of further consideration for this latitude.

Last year in one plat of yellow, 2-rowed barley, several heads were noticed having black spots on the outer glume. These heads were selected and planted this year. Of the 111 plants, 10 produced black heads, both 2-rowed and 6-rowed; one red heads; and the other yellow, 2-rowed heads like the selected heads, but without the black spots on the glumes. This latter type has unusually broad, hull-less kernels. The heads, containing from 20 to 24 kernels each, are hooded and average 3 inches in length. In point of earliness this selection meets all requirements, ripening in 83 days. Another selection, also 2-rowed and yellow, was equally early.

Despite the fact that this is the F_7 generation the progeny showed some bearded heads and 1 black, 6-rowed, hooded head. Further selections were made.

Plat No. 161, Boehmer (No. 130-11).—The pistillate parent of 14a series. This is a hooded, hull-less, 6-rowed barley of more value for breeding than for crop production. It ripens rather late and has weak straw. Seeded May 23 it was not ripe until September 1. The heads are medium sized and well filled, the straw short.

Plat No. 162, barley No. 120-12.—This is the pistillate parent of the 19b series and in all points is like barley No. 130.

Plat No. 163, Abyssinian (No. 132-7).—The staminate parent of the 14a and 21a series. It is a bearded, 2-rowed, black sort, valuable for its earliness and stiff straw, ripening this year in 93 days. Its exact counterpart minus the objectionable beards is found in its offspring 21a-1-1-1-1 and associates.

Plat No. 164, Pamir (No. 124-10).—This 6-rowed, bearded variety has often been described as a dwarf, very early barley from the Himalaya Mountains. It certainly lives up to its description and could be counted on to ripen in a much shorter season than that here. Seeded May 23 it was ripe August 9, reaching a height of 16 inches and having heads from 1 to 2 inches in length with from 20 to 40 kernels per head. Pamir has been used as one of the elements in a number of crosses, but so far nothing of much merit has been evoked thereby.

Plats Nos. 166 and 173, hybrid No. 1a, F_7 .—This is a hooded, 6-rowed type with striped glumes. It was used as pistillate parent in the 19a, 20a, and 21a series. On ground even moderately rich this hybrid produces very heavy straw and large heads. This year, owing to the unfavorable season and poor ground, the growth was comparatively light. The height was 35 to 40 inches, the length of heads 3 to 4 inches, with 40 to 70 grains per head. One plat ripened in 82 days. The other plat was 2 weeks later. Further selection is needed to insure stability.

Plat No. 177, hybrid No. 44c-1-1 (hybrid No. 20b-1 \times Pamir).—So far none of the 44c series has shown the extreme earliness that was expected from the fact that both parents are the earliest barleys grown here. Seeded May 21, the plat was not ripe until August 27, 2 weeks later than the parents. There was a considerable breaking up into different types, the plats showing both 2-rowed and 6-rowed yellow, 6-rowed black, and 2-rowed purple heads, all hooded. It is possible that some of these may yet prove earlier.

OATS.

The first oats also required only 79 days to ripen, and as in previous years the numbers of the 25a series were in the lead in point of earliness. Norwegian, South Dakota, Yakutsk, and Finnish Black

followed a week later. A large number of head-to-row plats of hybrid oats were grown in an endeavor to isolate superior strains. Last year because of the more abundant moisture and richer ground there was a fairly rank growth of straw and large heads were the rule. The trying conditions imposed by this season sent most of the hybrids into the discard. It is hoped that among the few survivors a strain closely approximating the ideal may be found. Extreme earliness and fair productivity are existent in the 25a series, but coexistent with the desirable quality of earliness is the undesirable slenderness of kernel, a marked characteristic of this series. Among the many variations in the 36a series are several having large, plump, white kernels, but they are lacking somewhat in point of earliness, a defect, however, which possibly can be remedied in course of time.

Plat No. 4, Polar (No. 372-2).—This plat required 113 days to ripen, making a short, uneven growth, and having small paniced heads with white, plump grain. This oat did poorly last year.

Plats Nos. 5 and 54 to 60, hybrid No. 35b, F₃.—Eight heads were selected last year, all paniced and black, 50 kernels of each head being planted separately in the usual head-to-row manner. The progeny of 3 of the heads came true, while the other 5 heads produced some plants bearing gray kernels in 13 per cent of their heads. Taking count of the number of kernels that produced plants, 136, or 36 per cent, gave progeny like the selected head, and 64 per cent produced gray variations to the extent given above. These oats have good straw, medium to large heads, and very slender kernels, ripening in 90 days.

Plats Nos. 6 to 40, hybrid 36a, F₃ (Black Tartarian × Yakutsk).—In this series of widely dissimilar types are found several that are very promising. As family characteristics may be noted sturdy straw, medium to large heads and grain, and, what is not desirable, a tendency to partial sterility, a fault possessed by neither of the parents. From the F₂ generation last year were selected side and panicle white and side and panicle black (heads or kernels). In the F₃ generation all white (heads or kernels) were stable in color but not in form. The blacks split up into black, brown, and gray, and an occasional white kernel. An accurate count was made of the progeny of several heads, but the ratio of one color to the other or to the whole was indeterminate. One black side oat F₂ head gave one black panicle head in the F₃ generation. All other heads were like the F₂. As a rule the side type, both black and white, has coarser, longer straw and larger heads, in these respects resembling the pistillate parent. The smaller white paniced heads have larger, plumper kernels, and for that reason are to be preferred. The earliest heads are ripe August 30.

Plats Nos. 41 to 50, hybrid No. 52a, F₂ (Hansen No. 240 × Norwegian No. 117).—A fairly vigorous and early series, the F₂ generation still predominately black, resembling the staminate parent. Out of 474 plants, 451 bore heads with black berries, 23 with gray, and 5 with white, all panicle. The best heads contained 100 kernels and the earliest required 91 days to ripen.

Plats Nos. 61 to 73, hybrid No. 35e, F₃.—This is a panicle gray oat with a slender kernel. The members of this series are recessives and have parents in common with 35b. They were selected from the F₂ generation and all 13 heads produced offspring true to type. They show good strength and length of straw and medium sized heads, the only fault being the slender kernel. They ripen in 89 days.

Plats Nos. 107 to 112 and 118, hybrid No. 51a, F₂ (Hull-less No. 304-2 × Norwegian No. 117-3).—As in the F₁ generation, many of the heads this year presented the unusual feature of bearing both triflorous and polyflorous spikelets and both hulled and hull-less kernels. On some of the florets the glumes were white, on some black, while on others the outer glumes were white or dark gray. Such heads, therefore, bore the salient features of both the parents singly and in combination. The chief purpose in making the above cross was to produce a hull-less oat ripening within the frost-free period of this latitude. It is gratifying to note that these hybrids possess this most important quality, earliness. This year they ripened in 88 days, which is but a few days more than the earliest oat, and this year 3 days less than the Norwegian parent from which earliness was inherited.

Plats Nos. 136 and 171, Finnish Black (No. 118-4).—This standard variety seeded May 23 was ripe August 19, reaching a height of 36 inches and having medium-sized heads. Plat No. 136 was a 2-rowed record plat useful for comparative data. Plat 171, containing 0.75 acre, was cut with the binder and thrashed September 23, yielding 26 bushels.

Plats Nos. 145 and 147, hybrid No. 25a.—As usual these hybrids ripened early, requiring this year only 80 days. The length of straw was 28 inches, which is below normal. The heads averaged 60 kernels. If the kernels were plump this would be a very desirable oat. This oat is the pistillate parent of the 35a series.

Plats Nos. 146 and 162, oat (No. 304-3).—A white hull-less oat with panicle head. It requires a longer season to thoroughly ripen than is to be had here. For that reason it was used as the mother plant in the 51a series, the other parent being the early black oat Norwegian. The resultant gain in earliness in the hull-less offspring has shown the value of hybridization in order to combine the de-

sirable qualities of two or more varieties. Hull-less oats without milling make a very palatable breakfast dish when thoroughly cooked.

Plat No. 148, Banner (No. 267-3).—Seeded May 23, half of the plat was ripe August 24, the plants reaching a height of 28 inches and the heads having from 40 to 60 fairly plump kernels. Half the plat was not ripe until September 5.

Plat No. 249, Yakutsk (No. 119-4).—A very early variety, which was ripe August 11, or 81 days after seeding. The straw is light and the heads are large as compared with size of straw and contain from 40 to 75 kernels. This oat was used as the pistillate parent in the 26a series.

Plats Nos. 150 and 168, Hansen (No. 240-4).—A very strong growing oat, but too late to be of value here. In the poor ground this year it was below normal in size, reaching a height of only 40 inches. The kernels ranged from 50 to 100 per head.

Plat No. 151, Black Tartarian (No. 115-4).—This side oat produces well in normal seasons. This year it made a very short growth, reaching a height of 29 inches, and had fair-sized heads with from 40 to 100 kernels. The chief and sufficient drawback to this variety is the long season required. It was harvested September 5. This number was used in the 36a series as the mother plant.

Plat No. 152, Norwegian (No. 117-4).—This early, black panicle oat has large, fairly plump kernels. Seeded May 23 it was ripe August 19. It is not a tall-growing sort and has medium sized heads containing from 40 to 80 kernels. It was the staminate parent in the 51a and 52a series.

Plat No. 153, South Dakota (No. 116-4).—The staminate parent in the 35a series. This is a black oat on a par with Finnish Black, with the same dates of seeding and ripening as the preceding. It reaches a height of 28 inches, and has from 30 to 40 kernels per head.

SPRING WHEAT.

The discouraging results with winter wheat are more than offset by the continued success with spring wheat. For four successive years Chogot and other Siberian varieties have fully ripened. The grain is hard and flinty and undoubtedly could be milled with good results. The earliest wheat to ripen this year required 84 days, in which period Chogot, H. G., and hybrid No. 29d-1-1-1 ripened, being harvested August 13. As 84 days is 13 days less than the 10-year average frosting period and as the earliest recorded frost at this station came August 14, there seems a fair prospect of successful wheat culture in the Yukon Valley.

Plats Nos. 1 and 106, hybrid No. 63a (Chogot × Romanow).—The 53 kernels planted gave a 92 per cent stand. There was very little

breaking up in this generation. Only one plant had terminal beards, the others all having bearded heads.

Plats Nos. 2 and 105, hybrid No. 62a, F₂ (Chogot × Marquis).—A stand of 89 per cent was secured from the 219 kernels planted. Some heads were very fine, bearing terminal beards like the staminate parent.

Plats Nos. 3 and 104, hybrid No. 64a, F₂ (Chogot × Ladoga).—A stand of 95 per cent, with all heads bearded, resembling Ladoga.

The above three hybrids were promising but late, ripening September 1 and thus requiring 103 days to mature. The perjugate generation may be earlier.

Plats Nos. 99 to 101, and 119 to 122, hybrid No. 32a, F₃ (Chogot × Romanow).—In length of straw this hybrid resembles Chogot, in size of head and time of ripening, Romanow. To all appearances the F₃ generation is stable. The heads are bearded, from 3 to 3.25 inches in length, with from 40 to 60 hard angular kernels per head. It requires 104 days to ripen.

Plat No. 113, Ruby (No. 392-1).—This wheat ripened August 28, producing straw 24 to 27 inches in height with terminal beards and heads 2.25 inches in length, having 20 to 26 grains per head.

Plat No. 114, Early Baart (No. 390-1).—Another first-trial wheat which made a very poor showing. The seed was impure, containing both bearded and beardless sorts, and some oats and barley. The stand did not ripen until September 9. The heads were well filled but very short, containing from 20 to 30 kernels.

Plat No. 115, Sunset (No. 389-1).—Like the preceding, the seed was very impure, and the two sorts were also alike in general growth characteristics and in ripening September 9.

Plat No. 116, Prelude (No. 393-1).—A bearded type even poorer than Early Baart, which made a very spindling growth, ripening September 9.

Plats Nos. 123 to 128, hybrid No. 30a, F₃ (Chogot × Marquis).—Of the 6 plats grown only 1, 30a-7-1, came true to type. This reached 35 inches in height, none lodging. The heads, from 2.75 to 3 inches long, had dark glumes and from 30 to 42 dark, hard, angular kernels per head. It is a true cross inheriting qualities from both parents. In the all-important quality of earliness it is midway between the two, ripening August 27, or 14 days later than the earliest plant of Chogot. Marquis did not ripen either this year or last. All the other numbers in the 30a series produced heads with and without beards and heads having short terminal beards at the tip. A number of heads have partially sterile tips.

Plats Nos. 129 and 141, hybrids Nos. 29d-1-1-1 and 29d-4-1-1.—This wheat resembles Chogot very closely and is no improvement over that variety. It ripened in the same number of days.

Plats Nos. 130 and 160, H. G. (No. 82-5).—This is an early type of Siberian wheat, like Chogot in point of earliness, growth characteristics, and size of heads. Unlike Chogot, H. G. has light-colored glumes. This strain was selected because of exceptionally well-filled heads.

Plat No. 133, hybrid No. 53a-1 (Romanow × Marquis).—A bearded wheat with dark-colored chaff, medium sized, angular kernels, and medium-sized heads. Last year, on better ground, some of the heads were 4.25 inches long. This type ripened August 27.

Plat No. 134, hybrid No. 54a-1 (Marquis × Ulka).—A late, smooth headed type, making an uneven, short growth and not worth continuing.

Plat No. 135, hybrid No. 56a-1 (Ulka × Velvet Chaff).—Too late, both last year and this year, to be worth further consideration.

Plat No. 140, Red Fife (No. 136-2).—This wheat is not adapted to this climate as it requires too long a season. About 50 per cent ripened this year, other years as low as 5 per cent.

Plats Nos. 154, 155, and 188, Chogot (No. 133-5).—Seeded May 23, two of the plats were ripe August 22. The other plat extended up the side of a knoll, and on this drier land the grain was ripe 9 days earlier. In point of earliness Chogot is a very desirable spring wheat. This is the fifth season that it has been grown and has ripened here. The chief points in which it is undesirable are its shattering propensities, small heads, and short straw. There is no reason why interior Alaska should not produce its own white flour. The bench lands along the Yukon in this region are potential fields capable of producing thousands of bushels of this valuable bread cereal. Chogot wheat has been used in a number of crosses and some of the hybrids are fairly promising but do not measure up to the full requirement.

Plat No. 156, Ladoga (No. 126-4).—This wheat and Romanow (No. 127-4) on plat No. 157 are identical in appearance and time of ripening. Seeded May 23, it ripened September 1, reaching a height of 32 inches and having 30 to 40 kernels per head. Both Ladoga and Romanow have been used in crosses with Chogot, the crosses having resulted in promising offspring in the 63a and 64a series.

Plat No. 158, Velvet Chaff (No. 130-4).—This is a handsome wheat and it is to be regretted it is not suited to conditions here. During the several years' trial it has matured sufficiently to perpetuate itself and that is about all. In hybrid No. 56a an attempt was made to combine the large, splendid heads of Velvet Chaff with the earliness of Ulka. So far all progeny have shown strongly the Velvet Chaff fault, too long a growing season.

Plat No. 159, Marquis (No. 131-4).—Like Velvet Chaff, Marquis is entirely too late, and in fact does not mature so well as Velvet Chaff. The stand this year was very poor, due to last seasons' imma-

ture seed. Marquis is described in some experiment-station bulletins as having beardless heads. The strain grown here has short beards at the tip.

HEMP.

Plat No. 137, hemp No. 307-3.—Seeded May 23, this plat gave a 95 per cent stand, which made a very short, spindling growth and began blooming July 6. The ground was evidently too poor, as the hemp did well the previous seasons.

FLAX.

Plat No. 138, flax No. 308-3.—A very poor stand was secured from a seeding of May 23, which bloomed June 1. The growth was normal, the plants reaching a height of 24 inches at maturity. When harvested September 7, about 10 per cent of the seed was ripe.

RYE.

Plat No. 144, hybrid No. 50a-1, F₂ (Irkutsk × Gesselberg).—Seeded May 23 this rye made a stand of 95 per cent and grew to a height of 50 inches. The heads measured from 3 to 4 inches long with from 30 to 40 kernels each. As stated in previous reports, heads of spring rye are seldom well filled. Also only the earliest heads ripen. This year about 50 per cent was ripe when harvested September 9.

GARDEN.

Owing partly to the country-wide interest in war gardens and largely to the active interest of the Government school teacher, more and better gardening was done in this vicinity this year than usual. Gradually the native population is appreciating both the hygienic and economic value of vegetables in the diet. A large number of plants, principally cabbage and celery, were distributed locally from this station. The call from various points for garden seed exceeded the supply. Also, calls for small lots of seed potatoes and station-grown turnip seed were supplied.

The garden plat was much later than usual in drying off. Compared to the earliest planting on record, April 29, 1915, the date of seeding this year, May 24, makes a wide variation, and even at that late date the ground was still wet and cold. As the ground had been fall plowed, as usual, very little work was needed to prepare a seed bed.

Seed production.—In order to relieve a possible local shortage, as well as to test the practicability of raising seed, several cabbage plants of the Early Jersey Wakefield variety were started in boxes April 13 and kept in a fairly warm place. By May 26 all had sent up seed stalks and were in bloom. The boxes were then buried in the ground

out of doors. By September 1, one of the plants had ripened practically all of its pods. On this plant the pods were small and purplish. On the others the pods were much larger and light colored when ripe. These plants were later and did not ripen the seed as fully as the first.

A large number of carrots were started early in boxes and, although when set out into the garden May 20, they were thoroughly rooted, none of them ripened seed. Previous trials have also been failures.

Last year enough parsnip seed was grown to supply station needs for several seasons.

Potato growing in pens or cribs.—For a couple of years various publications have contained glowing accounts of how to grow potatoes in pens or cribs. Some success was reported from trials within the Territory. The idea appealed to a great many because of the economy of space and the ease with which protection could be given in case of untimely frosts. Accordingly it seemed desirable to make a test here of such a method. Round poles from 4 to 5 inches in diameter were cut into fence-post lengths. With these a square crib was built to a height of 5 feet. (Pl. III, fig. 1.) As the building proceeded the potato seed pieces were laid in, making 8 layers of 16 hills to the layer, or a total of 128 hills. Straw was used to fill in the cracks between the poles to keep the earth from sifting out. A 7-inch joint of old stove-pipe was buried upright in the center to facilitate watering. The top of the crib was covered with straw to prevent excessive evaporation. The inside measurements of the crib were 5 feet each way, the productive capacity thus equaling a row of potatoes 150 feet long with the hills spaced 14 inches in the row. The variety used was Burpee's Superior and the seed was thoroughly sprouted in sawdust just as for garden planting. The soil was a rich compost. The pen was built and the potatoes were planted May 18, 6 days earlier than those in the garden. Water was applied several times during the summer. June 12 the plants began showing through the straw in the cracks, on July 8 the first blooms appeared, and by the middle of August the vines completely covered the pen, some of them attaining a length of 3 feet. (Pl. III, fig. 2.) The potatoes were harvested September 12. As may be seen in Plate III, figure 3, tubers were found only in the top layer and in the corners near the top. These were of fair size. The total yield was 71 pounds, making a yield per hill of but 0.55 pound. The same number of hills in the garden would have yielded 250 pounds of much better quality and with less labor.

Potatoes.—Irish Cobbler, Early Six Weeks, and Burpee's Superior were planted, coming up June 4, with a perfect stand, and blooming July 10. When dug September 12, the Irish Cobbler yielded 2.1 pounds per hill, Early Six Weeks 2.8 pounds, and Burpee's Superior 2 pounds. To get data on late planting, 120 hills of Irish Cobbler were planted June 5, blooming July 17 and yielding 1.8 pounds per hill of



FIG. 1.—CONSTRUCTION OF CRIB.

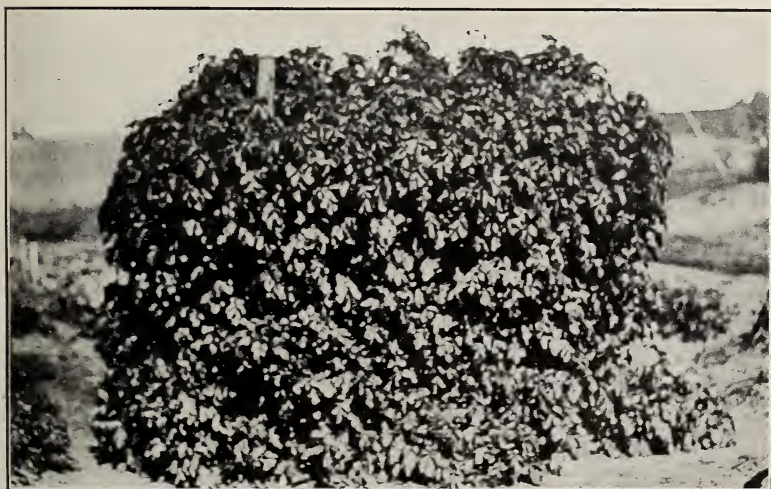


FIG. 2.—GROWTH OF VINES.



FIG. 3.—TUBERS MOSTLY AT TOP OF CRIB, A FEW ON SIDES,
NONE IN CENTER.
POTATO GROWING IN CRIBS AT RAMPART STATION.



FIG. 1.—WHITE PLUME CELERY, RAMPART STATION.



FIG. 2.—BRANCH OF BONNY BEST TOMATOES, RAMPART STATION.

tubers inferior to those of early plantings. Of the above 3 varieties Irish Cobbler easily leads in quality. Burpee's Superior will be discontinued as it lacks in this respect.

Peas.—The varieties planted were Alaska, Sugar Sword, Edible Pod, Horsford's Market Garden, Admiral, Prince of Wales, Nott's Excelsior, and Premium Gem, all of which did remarkably well. As usual Alaska led in earliness, the first pods being picked July 12, but it was not equal in quality to Nott's Excelsior or Horsford's Market Garden. Premium Gem was late in coming into bearing, July 22, but the quality was excellent and the yield satisfactory. It grew to the same height as Market Garden, about 4 feet. Sugar Sword Edible Pod was not satisfactory, though the vines were very thrifty, and, if supported, would have grown to a height of 7 feet. The pods were nearly 6 inches long, but lacking in flavor and tenderness.

Cucumbers.—Plants of White Spine and Pride of the Pacific, the former primarily suited for pickling and both early and productive, were set in the hotbed May 15, beginning to yield fruit June 12, and continuing throughout the summer. Pride of the Pacific is a large fruited, productive sort, well adapted to slicing and of excellent flavor.

Muskmelons.—Emerald Gem, Netted Gem, Casaba, and Bender's Surprise, plants of which were started April 6, were transplanted into the hotbed May 17, all growing vigorously. All leaders were pinched back to encourage laterals, since it is on these that the fruit is borne. Nevertheless fruit set very slowly. As the warmer weather came on and the hotbed could be uncovered more completely fruit set freely. None of the melons grew large and none ripened, but a number matured sufficiently for table use.

Celery.—White Plume and Golden Self-Blanching were planted. Either variety does well, producing large handsome bunches. Celery is a gross feeder and this fact must be remembered if strong, large plants are to be grown. A great many failures may be attributed to the lack of available fertility. Well-rotted manure of any kind can be used. Fresh chicken manure, except in very small quantities, should be avoided. If well-rotted manure is not available in sufficient quantity, liquid manure, made by putting fresh manure into a barrel and covering with water, answers very well, and applied several times during the early part of the season, it will produce excellent results. Vigorous, healthy celery plants have upright stalks at all stages of growth. (Pl. IV, fig. 1.) If, after transplanting, the stalks flatten out, forming a rosette, it is a sure signal of distress and in nearly every instance prompt applications of liquid manure will start the stalks upward. Blanching may be done with hay, straw, moss, boards, earth, or paper, in fact almost any material that will exclude the light.

Earth-banked celery is generally conceded to have a slightly superior flavor.

Pepper.—Plants of Ruby King and Sweet Salad were started March 13 and transplanted to the hotbed April 4. All plants were loaded with fine, large fruit. One plant of Ruby King bore 13 splendid peppers, many of them 2.75 inches broad and 5 inches long.

Eggplant.—Black Beauty was seeded and transplanted at the same time as the peppers, producing 2 and 3 large, very handsome fruits to the plant. They are as easy to grow as tomatoes.

Tomatoes.—Ponderosa, Livingston(?), Bonny Best, and Spark's Earliana were the varieties grown this season both in the greenhouse and the garden. Of these Livingston(?) is decidedly inferior both in flavor and productivity. The others are very nearly on a par. Earliana was a few days the earliest, while Bonny Best produced the smoothest fruit (Pl. IV, fig. 2), and Ponderosa the largest. In the greenhouse the plants bore remarkably well, producing many large, handsome clusters, Bonny Best leading in this respect. The early part of the summer was too cold, however, for tomatoes to do well out-of-doors. Though most of the blossoms blighted, there was still considerable fruit, some of which ripened.

Beans.—Red Valentine and Refugee were grown but they did not do so well as last year. In bloom July 17, they produced table-sized pods by August 3, fruiting heavily from that date. Green Pod Bush Lima was, as last year, a complete failure.

Cabbage.—Early Jersey Wakefield, Dwarf Flat Dutch, and Early Summer, the varieties grown, all made fair-sized heads of excellent quality. Early Summer is a dwarf, flat-headed type and too early for winter use. By August 4 some of the heads had burst and by September 25 none of them were in condition for storage. In many gardens cabbage was practically a failure. The chief difficulty in most cases is experienced in growing the seedlings. As grown in cabins the light and heat conditions are not favorable to stocky, vigorous plants. The result is excessive "damping off." Steaming the earth in the oven, sterilizing the seed with bichlorid of mercury, and thinning out the stand as soon as the plants are up would undoubtedly lessen the losses appreciably. The earth for the seed plats should be prepared in the fall, sifted, and put in boxes. Unless this is done suitable earth is generally not accessible. Good stocky plants can not be grown readily, if at all, in soggy, sour earth dug up from under the snow in the spring.

Cauliflower.—Best Early and Snowfall did fairly well, but owing to the dry weather the heads were small and early.

Brussels sprouts.—These made a very rank growth, but did not mature as well as last year. They keep well under the same conditions as cabbage and are palatable, of delicate flavor, and tender.

Kohl-rabi.—A few plants of Vienna were set out and did well. By July 16 the best were 3 inches in diameter and very tender and sweet. Sliced they are a desirable addition to salads.

Lettuce.—The varieties grown were Boston, Market Prize, May King, and Hanson. Lettuce is always a success. Hanson is early and a favorite here, as the heads are tender and crisp throughout the summer.

Swiss chard.—Of the two varieties planted, White and Lucullus, the latter is superior, having much-crimped leaves, which can be cut repeatedly, making excellent greens.

Beets.—Early Blood Turnip was planted, the tops of which make excellent greens when young. For winter use it is advisable to can the beets in the fall, as they usually become fibrous when stored and require long cooking to get them tender. Medium-sized rather than large roots are the best. The size can be regulated by proper thinning of the young plants.

Sugar beets.—A small quantity of French White was raised for a test. The roots were all rather small and fibrous. In order to test the sugar content 18 pounds was thoroughly washed, then cooked until they could be peeled easily. The peeled beets were sliced and with enough water to cover them brought to a boil. After simmering for 10 hours the pulp was poured into a light cotton bag and the juice squeezed out. This liquid was then reduced by boiling to the consistency of sirup. The 18 pounds of roots yielded 3 pounds of black but very sweet and palatable sirup of the consistency of Karo. Extracted even in this crude way 100 pounds of beets would yield 2 gallons of sirup. At the very moderate estimate of 10 tons of beets per acre, one-tenth acre would produce a barrel of sirup, which gives a hint as to what could be done in the event of a attack of sugar or if one was obliged to live more fully from the produce of his own farm.

Carrots.—Danvers Half Long and Mastodon, the varieties used, did well, a 75-foot row the length of the garden producing a crate. Mastodon is a white variety and while intended primarily for table use it is sweeter than Danvers Half Long or Chantenay.

Strawberries.—The winter of 1917 and 1918 proved to be a hard one on a great many hitherto hardy plants, including strawberries. On one old plat all of the first plants and most of the young ones were killed, leaving the ground bare except in one corner. This plat produced its first crop, a rather light one, last year. The surviving plants sent out quite a few runners which next summer will completely reestablish the plat. In the other and older plat, started five years ago, the winter damage was not so severe. This plat bore heavily last season, and it is not surprising that most of the old plants should succumb since their vitality had been sapped by the previous season's crop. Most of the surviving plants were only 1 and

2 years old and had fruited but slightly. On about one-fourth of the plat the stand of young plants was not injured. This part of the plat is on a southern slope. Higher on the same slope the plants were killed completely and also in the draw below. The remaining plants made a satisfactory growth and began blooming June 23. July 25 the first picking was ripe. The bearing season was considerably shortened by the extended drought. By the middle of August only a few small berries remained. Last year the bearing season lasted until September because of abundant moisture.

In response to requests for strawberry plants parcel-post packages containing 15 plants each were mailed to 32 addresses in 12 widely separated camps of the interior. In every instance the recipient was asked to report success or failure in order to get data on hardiness and productivity. A great many inquiries have been received as to the proper time to transplant and generally request was made for fall delivery. In this latitude fall transplanting is almost sure to result in failure or at least in a high percentage of loss. Results at this station point to this conclusion. It is an axiom in all northern States that transplanting should be done in the spring. Interior Alaska is no exception. In transplanting the root system is more or less disturbed and the flow of sap is interrupted in proportion to the injury to the roots. Under favorable conditions new rootlets put forth and the plant is reestablished providing there is sufficient time before freezing weather sets in. If a plant, no matter how hardy, has not had ample time to fortify itself against the long cold winter months by storing up an excess of latent energy to carry it through the early spring growth, that is, until new rootlets can function, the plant is almost sure to die. For that reason transplanting in this latitude should be done in the spring or at least early summer.

FLOWERS.

Each season flowers that are sure to provide abundant beauty are grown in the yard for decorative purposes and each year new varieties of annuals are experimented with. Beginning the last week in February with pansies plats of various sorts of flowers are started on a glass-fronted porch and the transfer of some thousand plants to the outdoor bed begins, as a rule, about the middle of May.

Annual chrysanthemums and marigolds produce such large and abundant blooms that by the middle of summer the plants have to be staked to prevent the breaking off of the branches. Coming into bloom in June, schizanthus, coreopsis, nasturtiums, and petunias are a joy all summer. Several plants of double petunias produced blooms over 3 inches in diameter. To have large blooms pansies must be in very rich earth and have only the early morning or late

afternoon sun. Flowers from 3 to 4 inches across and with very long stems will result from these conditions. A bed of phlox, where it was subject to all the vagaries of the elements, was a wonderful mass of rich color all through the season.

Salpiglossis grows very tall and is a free bloomer. Nothing grown at this station produces more abundant bloom than godetias, but they lack the gorgeousness usually desired in a garden. English daisies make very satisfactory border plants with red and pink combinations.

Sweet peas, although cultivated in a variety of ways, have never grown so luxuriantly nor produced as abundantly as it is felt they should here, but further experiments are to be worked out in the hope of better results.

Dahlias, both from seed and bulbs, make ample returns for the labor given them if grown in a place where they can be protected from the early fall frosts. Dianthus have been wintered successfully by mulching but the blossoms were so inferior the second year that the practice has been abandoned. Shasta daisies, although grown in a variety of situations for experimentation, have never wintered, but as annuals are very highly prized for their large, handsome, although late flowers.

California poppies were started in the greenhouse and transplanted twice without a single loss and the result was a much finer growth than when started from seed out-of-doors. Asters are late but extremely handsome and satisfactory. But of all the flowers of the garden here, nothing equals in brilliancy of color the old-fashioned snapdragon. It rivals the rose in its rich hues.

Summer cypress is valuable as a hedge. Under ordinary garden conditions it will attain a height of 4 feet but may be fertilized into greater growth.

It is impossible in this report to mention all the varieties grown here, but of the new plants tried the past two seasons Iceland poppies, *Mimulus tigrinus*, and two African daisies (*Dimorphotheca* sp. and *Arcototis grandis*) have become favorites.

Gaillardia, scabiosa, and forget-me-not are being tried in various places to determine the situation for the best results.

Cosmos, although grown from the "early blooming" seeds of the catalogues, has never been budded before the arrival of the fall frosts. In Tanana this summer cosmos plants were gay with pink blossoms by the middle of August, but the owner had no idea of the variety. Late in September they were taken up and potted in large pails and transferred to the house where they continued to bloom for many weeks. Experiments will be continued here until this early strain is found.

Many varieties of poppies, sweet alyssum, candytuft, larkspur, mignonette, and feverfew are seeded where they are to grow, either in the late fall or early spring, and always produce a rank growth and, when provided with abundant moisture, endure until the heavy frosts cut them down.

Of the vines tried the canary and the cup-and-saucer cover the most surface and are extremely ornamental. The latter is quite hardy.

HOUSE PLANTS.

No regular greenhouse plants have been grown yet, but that work is about to be taken up. However, many of the annuals make very attractive and successful house plants.

From a single scabiosa plant 50 blossoms were cut at one time last June. Later in the season this plant produced even more flowers but they were inferior in size. Balsams are beautiful pot plants. A collarette dahlia grown in a large box or pail will furnish at least a hundred handsome blossoms during the season. Geraniums, when started from slips in February, will bloom from May to November, and if given abundant water and occasional fertilizer, the blossoms will be large and long of stem, while if the older plants are kept over from year to year the result will be handsome foliage, but few and small flowers. Porch boxes of dianthus, schizanthus, and petunia are very handsome.

Wandering jew should be started from cuttings in February and by fall they will attain a length of from 4 to 6 feet and be 2½ feet across. The old plants kept through the winter become scraggly and unattractive. Maurandia vine, Kenilworth ivy, and lobelia make delightful hanging baskets. Japanese morning-glories if started in February will bloom about Easter and throughout the summer yield a mass of rich, beautiful color. Plants of sweet peas also do well and are very pleasing in the house. Scarlet flax is beautiful for borders in the boxes.

REPORT OF WORK AT FAIRBANKS STATION.

By M. D. SNODGRASS, *Assistant in Charge.*

GENERAL OBSERVATIONS.

The work of the Fairbanks Station has been carried on according to outlines laid down in former reports. Very little improvement work has been undertaken. One hundred and sixty rods of road work was done where it was absolutely necessary in order to move farm machinery to and from the fields. This work consisted of widening and grading the road to make it passable during the thaw-

ing period. The fields are usually dry enough for team work before the roads are fit to move machinery over them. A wood road was opened for hauling station fuel from the ridgetop where future clearing will be done. An 85-foot well was sunk with a Keystone well drill and cased with 8-inch steel casing. An attempt was made to dig the well, but such soft formation was encountered at 35 feet that it was impracticable to timber against the pressure. The well was then finished by drilling. Forty-five feet of water was obtained and a steady flow maintained. An underground furnace room 14 by 16 feet was dug under the barn and walled up with logs. Some repair work was done on fences and buildings.

An extraordinarily late spring delayed field work fully one month longer than the average. Again in the middle of the summer, when the work demands much hired labor, available funds were insufficient. The peculiar conditions obtaining in Alaska are not realized by many in the States. Here our working period on general farm crops is much shorter than it is farther south. All field work must be done within a 5-month period, as the ground is frozen or too wet to work the remainder of the year. This year the field work began May 23, and then only on well drained south slope fields.

CLIMATIC CONDITIONS.

Climatic conditions in the Tanana Valley demand closer observation. The past winter was the coldest known here, with nearly double the amount of normal snowfall. November was 6° colder than any recorded and was 10° colder than the 8-year average, while December was 10° colder than any recorded here and 23° colder than the average. One foot of snow fell during October, November, and December, 5 inches in January, 12½ inches in February, 28 inches in March, 9 inches in April, and 2½ inches in May. On April 9 the snow was 58 inches deep on the level, with but few drifts. January weather was about normal. The temperature remained several degrees lower than normal from February until July. The cold weather did not break until April 20, when the last zero weather was recorded, but hard freezing occurred at night until May 20. The snow melted very slowly, and the greater part of the snow water soaked into the plowed fields. The snow had melted on the southern slopes and level fields by May 10, leaving the ground saturated and unfit to work until May 23, and then only on the well-drained south slopes. The ice break-up in the river was later than usual, and that, coupled with the excessive amount of snow water, caused many ice jams, resulting in much damage by floods and floating ice.

Erosion was heavy along the roads and hillside fields where water came from higher ground. Great ditches were washed where the snow water was allowed to run across cultivated land and along graded roads. Hillside fields must be protected from water from higher ground, as the soil washes readily and will not stand against running water.

Considerable cloudy weather during April retarded the melting of the snow. May and June brought clear weather, but the mean temperature remained low, making the spring fully a month later than normal. A hard frost occurred June 29, which killed all tender plants. Potatoes that were up were laid flat, even well up in the south slope hill fields. With July came warm weather and normal rainfall, which caused a very rapid growth of all vegetation. The temperature in August was favorable until the 20th, when it began dropping at night until the 26th, when a heavy frost occurred. Normal rainfall was distributed well during the month. On September 6 a second heavy frost occurred, followed by frequent frosts throughout the month. The month was unusually dry and warmer than normal, and was favorable for the curing of hay and grain crops and for field work. October was drier than normal, and freezing weather came at about the usual time. The ground was frozen too hard for plowing on October 18. On the whole, the weather conditions for the past year have been less favorable for agricultural work than in any preceding year since this station was established in 1907. A summary of climatological data for the region for the past eight years is given below.

Condensed climatology of Fairbanks, Alaska, for eight years.

Month.	1911		1912		1913		1914		1915	
	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.
	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>	<i>Inches.</i>	<i>° F.</i>
January.....	0.10	-23.8	0.10	-4.2	0.43	-22.1	0.32	-9.5	0.12	-4.8
February.....	.04	2.0	.10	9.5	.35	4.1	.38	6.8	1.06	7.4
March.....	.04	2.5	.95	23.8	.75	11.2	1.06	8.6	.16	17.3
April.....	0	17.4	0	37.9	Trace.	29.3	.66	25.7	.26	37.5
May.....	.16	42.8	1.22	51.9	.49	46.9	.59	45.5	Trace.	50.3
June.....	0	57.2	3.15	54.4	.44	68.3	1.51	60.5	1.80	61.8
July.....	2.16	64.1	.96	60.9	2.25	64.1	4.63	53.6	1.79	65.2
August.....	2.30	56.6	.82	55.2	3.70	52.5	2.06	54.2	3.24	56.7
September.....	1.60	45.1	1.16	45.2	.51	46.1	1.36	38.6	3.12	45.7
October.....	.22	35.3	.54	26.8	1.00	22.2	Trace.	32.7	.64	18.8
November.....	.29	-2.3	.24	1.8	.26	-4.7	.31	6.8	.63	3.2
December.....	1.23	-7.0	.97	-9.1	.15	-23.5	1.22	10.2	.44	-11.1
Total precipitation.....	8.14	.....	10.21	.....	10.33	.....	14.10	.....	13.26	.....
Number of days between frosts	98		114		97		85		110	

Condensed climatology of Fairbanks, Alaska, for eight years—Continued.

Month.	1916		1917		1918		1911-1918			
	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Precipitation.	Mean temperature.	Maximum temperature.	Minimum temperature.	Mean precipitation.	Mean temperature.
	Inches.	° F.	Inches.	° F.	Inches.	° F.	° F.	° F.	Inches.	° F.
January.....	2.22	- 7.6	0.41	-19.7	0.48	-8.54	24	-34	0.52	-12.2
February.....	.48	- 3.0	.42	9.4	1.24	-.48	36	-44	.51	2.5
March.....	.04	3.5	.20	16.7	2.84	1.29	36	-38	.75	10.6
April.....	.28	36.5	.24	32.7	.98	24.49	51	-12	.32	30.2
May.....	.95	46.1	.35	45.7	.34	42.57	74	11	.51	46.5
June.....	2.16	59.2	1.09	57.7	1.05	55.16	81	28	1.40	59.3
July.....	2.31	65.3	4.81	55.9	2.22	63.64	91	40	2.64	61.6
August.....	2.70	56.3	1.59	58.2	2.04	53.36	74	25	2.31	55.4
September.....	1.42	44.9	.26	44.4	.09	48.53	76	22	1.74	44.2
October.....	1.89	30.4	.59	24.5	.39	24.95	54	-12	.66	26.9
November.....	.53	3.9	.40	-10.3	.49	-.32	40	-37	.39	-.2
December.....	.71	-14.4	.22	-33.1	.31	-7.22	37	-50	.65	-11.9
Total precipitation.....	15.69	.....	10.58	.....	12.47	.....	.....	.....	11.85	.....
Number of days between frosts	118		57		.....		.....		.....

STATION WORK.

The work of the station for the winter months consisted of (1) care of horses and hogs; (2) thrashing and care of grains from experimental plats and fields and its preparation for seeding and distribution among the settlers of Alaska; (3) grading and storage of potatoes and their preparation for distribution in the early spring; (4) cutting, hauling, and sawing wood for the barn, hog house, root cellar, office, and dwellings; and (5) overhauling and repairing of all farm machinery and general preparation for spring work.

The season for preparing the seed bed, seeding, and planting is so short that all seed must be prepared in advance. There are usually two or more cold spells during the winter ranging from one to eight weeks when it is too severe for men or horses to work out of doors with safety.

The spring work was begun May 23 on small patches of ground where the snow left earliest. By patching here and there as the soil became dry enough to work the first small plat was ready for seeding red clover on May 24. The soil dried fairly fast from that date, and two 4-horse teams were kept in the fields until all the seeding was done on June 11. Ten days later a small plat was seeded to oats for hay as an experiment to compare with earlier seeding. By working 4-horse teams it was possible to keep pace with the drying up of the fields, and all were planted within three days after it was possible to put a team over them.

All southern-slope fields were seeded to grain crops except 8 acres, 3 acres of which was seeded to red clover and 5 acres planted to potatoes. Northern-slope fields were seeded to grain hay, peas,

clover, and potatoes, and the flat or bottom lands were seeded to grain hay. About 83 acres of land was cropped and 17 acres was summer fallowed. Some 7 acres of peas was plowed under for green manure, also 5 acres of red clover. All summer-fallowed land was cultivated during the summer and was fall plowed. All but 5 acres of south-slope fields was fall plowed. Some 25 acres of grain-hay land was left without fall plowing, all such land having been cropped for two years in succession, the greater part maturing grain in 1917. The cultivated crops, peas and potatoes, were given two and three cultivations respectively, also one hoeing to free the ground of weeds. Many weeds were present in portions of the grain fields, especially wild buckwheat and chickweed. Volunteer oats and wheat were very much in evidence and required pulling from clover plats where clean ground was desired. Some of the clover plats had to be mown over to keep down weeds and volunteer grain, and later the crop was pastured off with pigs.

The grain, potatoes, and hay were harvested while there was a shortage of labor due to lack of funds. It was only possible to successfully take care of the crops because of the exceptionally favorable weather at the harvesting period. Only a small amount of thrashing was possible during the early fall because of the lateness of maturity. Few yields will be determined in time for this report. The grain not thrashed has been stored in the grain shed until a dry time can be had for thrashing.

WORK WITH GRAINS.

One acre of winter rye was grown, which winterkilled badly and made a poor yield of inferior grain.

Spring grains received the usual attention. Increase plats and field plats of wheat, oats, and barley were seeded; also grain-breeding plats, which will be reported upon separately. Owing to the lateness of the spring, grain could not be seeded until May 26 to 30, and grain for hay from June 1 to 11, with a late seeding June 21. The seed came up within 6 to 10 days and made only fair growth until the latter half of June, when frequent showers favored root growth, the straw growth being more rapid thereafter, though the straw did not reach normal height. The heads were small but well filled. The early varieties matured in several days less than in the 1917 season, and in three to five days less than the average number of days required for maturity. Grain crops following grain of the previous season matured earlier than that grown on land previously planted to potato or other cultivated crops. Invariably the straw growth was shorter and grain yield less following a grain crop, due to a lack either of moisture or of available plant food, or both. Grain on clover land grew heavier straw and larger heads but required a longer

time to mature and was therefore injured by the early frost. It is safe to say that the practice of growing grain following clover is hazardous in this region unless the grain can be seeded by May 1 to 10 to avoid the early fall frosts. The beneficial effect of clover on the field was shown by a 47-bushel yield of Canadian oats (Pl. V, fig. 1) as against a 26-bushel yield from oats grown on wheat land in an adjacent plat treated in like manner and seeded the same day, while the yield of straw was nearly three times heavier on the clover land. Care should be taken not to seed rank-growing varieties of grain on clover land because of late maturity and the tendency to lodge. As a rule all rank-growing grains are later in maturing than the shorter grains and the effects of the clover delay maturity. Such varieties as Sixty-Day, Canadian, South Dakota, or other early oats, and Siberian H. G. wheat, may be seeded on clover land when the spring opens early. To follow clover with potatoes or grain hay is the safer practice.

VARIETY TESTS OF OATS AND BARLEY.

Variety tests of oats and barley were seeded May 29 on potato and turnip land gently sloping to the southwest. Four varieties of oats, South Dakota, Swedish Select, Sixty-Day, and Finnish Black, were seeded at the rate of $2\frac{3}{4}$ bushels per acre on adjacent plats. Each variety did very well, there being little difference in weight of bundled grain from equal-sized plats. The Sixty-Day oats matured in 91 days, South Dakota in 92 days, while it required 102 days for Swedish Select and Finnish Black to mature. The two latter varieties have not been thrashed owing to lateness of maturity. Canadian oats was omitted from the test by error. This variety was superior to any other last season. All five varieties are adapted to interior Alaska climatic conditions and can be grown successfully for grain production.

The four varieties of barley tested included hybrid No. 4a-1, Beardless S. P. I. No. 16852, Beardless S. P. I. No. 19852, and Hullless S. P. I. No. 19851. All were seeded at the rate of 2 bushels per acre, and all varieties matured at the same time, being harvested August 28, 92 days from seeding. The growth was good on potato land, but that on turnip land was retarded by volunteer turnips. Barley 4a-1 made a light straw and grain yield, while Nos. 16852 and 19852 were fairly close in yield, both making good crops. Hullless Barley No. 19851 made only fair growth, being retarded by volunteer turnips, but the yield was fair and of good quality. The grain was not damaged by the frost of August 26. That barley is a sure crop in the Tanana Valley has been fully demonstrated by the fact that eight crops have matured in succession. The yield is not high, but the grain will grow on most of the poorer soils. The beardless varieties make excellent hay and grain feed for live stock. The

hull-less varieties are especially valuable for poultry and hog feed. Bearded varieties make heavier yields than the beardless or hull-less, but are not in favor because of the beard. When machinery is available for properly handling bearded barley it will be one of Alaska's standard crops.

The table below gives the results of the variety tests with oats and barley.

Variety tests of oats and barley.

Varieties.	Date seeded.	Stand.	Date headed.	Date matured.	Number of days to mature.	Size of plat.	Yield of grain.	Yield of straw.	Yield of grain per acre.	Yield of straw per acre.	Remarks.
Oats:		<i>P.ct.</i>				<i>Acres.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Bu.</i>	<i>Lbs.</i>	
South Dakota.....	May 29	100	July 22	Aug. 28	92	0.0757	120	155	49.5	2,047	Well adapted to this region
Swedish Select ^a.....do...	.....do...	95	July 25	Sept. 7	102	.0757	.....	.....	.....	.....	A fair oat for Alaska.
Sixty-day.....do.....	.....do.....	100	July 20	Aug. 27	91	.0757	119	176	48.2	2,325	
Finnish Black ^a.....do.....	.....do.....	90	July 22	Sept. 7	102	.0757	.....	.....	.....	.....
Barley:											
Beardless hybrid No. 4a-1.....do.....	.....do.....	90	July 20	Aug. 28	90	.0757	28	77	7.7	1,017	
Beardless S. P. I., No. 16852.....do.....	.....do.....	90	.....do.....	.....do.....	90	.0757	108	215	29.7	2,841	Well adapted to this region.
Beardless S. P. I., No. 19852.....do.....	.....do.....	85	.....do.....	.....do.....	90	.0757	104	171	28.5	2,259	Do.
Hull-less S. P. I., No. 19851.....do.....	.....do.....	85	July 22	.....do.....	92	.1554	152	303	24.4	1,949	Very fair for this region.

^a Swedish Select and Finnish Black matured too late for early fall thrashing and were stored in hay shed for spring thrashing, Swedish Select yielding 305 pounds unthrashed grain and straw and Finnish Black 255 pounds.

GRAIN HAY.

Following the seeding of grain crops above, the seeding of grain for hay was begun on June 6 and finished June 11, with the exception of a small plat seeded to oats on June 21. The hay crop occupied north-slope fields and flat or bottom lands. These fields were the last to thaw and dry sufficiently to work the ground. All were fall plowed and needed only disking and harrowing before seeding. After seeding the ground was floated to break up the clods and level the surface for using the mowing machine. Both oats and barley were seeded for hay. The grain produced a fair stand in most cases, made fair growth, and headed at 30 to 40 inches in height. The heads were partly filled before the frost came.

For a comparative test of their hay-producing qualities four varieties of oats and one of barley (S. P. I. No. 19852) were seeded on bottom land June 10 and 11. This experiment was so affected by frost that a fair comparison could not be had. Canadian and South Dakota oats were fully headed August 10 and fairly well filled by August 26. Hanson and Finnish Black oats were not fully headed until August 15 and were just past the bloom August 26. The barley was fully headed by August 10, but seemed to require longer to fill than did the earlier oats. All varieties were cut with the binder for

hay and shocked September 17 after several frosts had occurred. The later varieties were damaged to a considerable extent.

GRAIN SELECTION FOR BREEDING PLATS.³

The work of improvement of varieties of grains by head selection from head rows was continued this season. It has been the practice to select and grow from one to ten heads of the first to mature of each variety, taking into consideration the number of culms per plant, length, stiffness, and color of straw, size and number of kernels per head, sterility of spikelets, and trueness to type.

Four varieties of wheat, 16 varieties of barley, 12 varieties of oats, and 1 variety of rye were grown. All of the grain in some of the later maturing varieties did not ripen, but a few heads of all reached a sufficient stage of maturity to be gathered for seed. The plats were planted on potato ground of heavy clay soil on a gentle south slope below the horse barn. The selection of this ground for variety tests was unfortunate in that it received the drainage from the hillside above and a frozen manure pile which slowly thawed in the early spring. This probably gave some varieties more fertilization than others and caused the grain on all the plats to be late maturing as compared with the field plats.

The table below gives a comparison between varieties of wheat, barley, oats, and rye as to percentage of germination and length of time of maturity for each of these grains.

Results of head-row grain tests.

SPRING WHEAT.

Variety.	Germination.	Date seeded.	Date headed.	Date matured.	Number of days to mature
	<i>Per cent.</i>				
Siberian H. C. a.....	100	May 28	July 8	Sept. 6	100
Marquis.....	90	do	July 16	Sept. 12	106
Ladoga.....	95	May 29	do	do	105
Romanow.....	100	do	do	Sept. 16	109

BARLEY.

Pamir.....	100	May 29	July 14	Sept. 1	96
Gold.....	100	do	July 20	Sept. 18	113
Primus.....	100	do	July 18	Sept. 21	116
Boehmer.....	90	do	July 20	Sept. 25	120
Lapland.....	100	do	do	do	120
Hybrid No. 23a-1-1-1.....	93	do	July 16	Sept. 6	101
Hybrid No. 14b-2-1-1-1.....	100	do	do	Sept. 14	109
Hybrid No. 14b-2-3-2.....	100	do	July 18	Sept. 18	113
Hybrid No. 14a-2-3-2-1.....	96	do	July 14	Sept. 11	106
Hybrid No. 21a-1-1-2.....	90	do	July 18	do	106
Manshury.....	100	do	July 16	Sept. 16	111
Chittyna.....	100	do	do	Sept. 20	115
Hull-less S. P. I. No. 19851.....	60	do	July 19	do	115
Hull-less S. P. I. No. 12709.....	82	do	July 18	Sept. 16	111
Hybrid No. 19b-2-2-1-1.....	90	May 30	July 20	Sept. 18	112
Hybrid No. 19b-2-2-1-2.....	10	do	(b)	do	do
Hybrid No. 19b-2-2-1-3.....	15	do	July 29	(c)	do
Hybrid No. 19b-2-2-1-4.....	18	do	July 20	(c)	do

³ By W. T. White, Assistant, Fairbanks.
 a Earliest spring wheat to mature.

b Failed to head.
 c Failed to mature.

Results of head-row grain tests—Continued.

OATS.

Variety.	Germination.	Date seeded.	Date headed.	Date matured.	Number of days to mature.
	<i>Per cent.</i>				
Canadian.....	100	May 29	July 19	Sept. 16	111
South Dakota.....	100	..do..	July 18	Sept. 14	109
Victory.....	100	..do..	July 17	Sept. 20	115
Hybrid No. 35e-1.....	100	..do..	July 18	Sept. 11	106
Hybrid No. 267.....	92	..do..	July 17	Sept. 25	120
Crown.....	100	..do..	July 20	Sept. 20	115
Norwegian.....	94	..do..	July 12	Sept. 14	109
New Swedish.....	90	..do..	July 18	Sept. 22	117
Black Tartarian.....	100	..do..	July 26	Sept. 25	120
Hull-less.....	40	..do..	July 18	..do..	120
Hansen.....	93	..do..	July 19	..do..	120
Finnish Black.....	100	..do..	July 18	Sept. 13	108

SPRING RYE.

Gesselberg.....	93	May 30	July 22	Sept. 25	119
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INCREASE PLATS.⁴

All grain not collected for head rows from last year's head-row plats was seeded in increase plats (Pl. V, fig. 2). Notes were taken throughout the season and a small sheaf of heads of each variety was collected as soon as a sufficient number of heads were ripe. Only four varieties of oats and the most promising variety of barley were cut for seed and stored in the grain shed. The balance was cut for hay. None of the above grain has been thrashed. The results of the increase plat work are given in the following table:

Result from increase grain plats.

SPRING WHEAT.

Variety.	Date seeded.	Date of coming up.	Date fully headed.	Height.	Date harvested.	Remarks.
				<i>Inches.</i>		
Siberian H. G.....	May 30	June 11	July 12	24	Sept. 6	
Romanow.....	..do..	June 12	July 23	30	Sept. 20	
Marquis.....	..do..	(a)	.....	.....	.....
Ladoga.....	..do..	June 12	July 18	30	Sept. 20	
Early Baart.....	..do..	(b)	.....	.....	.....	New variety.
Ruby.....	..do..	(c)	.....	.....	.....	Do.
Prelude.....	..do..	(b)	.....	.....	.....	Do.
Sunset.....	..do..	(d)	.....	.....	.....	Do.

BARLEY.

Pamir.....	May 31	June 11	July 18	18	Sept. 6	
Gold.....	..do..	June 13	July 19	35	Sept. 25	$\frac{1}{2}$ ripe Sept. 6; drooping heads.
Primus.....	..do..	June 15	July 15	38	..do..	$\frac{1}{2}$ ripe Sept. 6.
Boehmer.....	..do..	June 16	July 21	35	..do..	Very late.
Chittyna.....	..do..	June 12	..do..	36	..do..	$\frac{1}{2}$ ripe Sept. 6; badly lodged.

⁴ By W. T. White, assistant, Fairbanks.^a Failed to germinate.^b Only a few seed germinated.^c About 5 per cent germinated.^d About 8 per cent germinated.

Result from increase grain plats—Continued.

BARLEY—Continued.

Variety.	Date seeded.	Date of coming up.	Date fully headed.	Height.	Date harvested.	Remarks.
Hybrid No. 28a-1-1-1.....	May 31	June 14	July 21	38	Sept. 8	Farliest maturing.
Hybrid No. 21a-1-1-2.....	..do.....	..do.....	July 23	35	Sept. 12	Height uneven.
Hybrid No. 14b-2-1-1-1.....	..do.....	..do.....	July 30	38	Sept. 25	A few heads ripe Sept. 2.
Hybrid No. 14b-2-3-2.....	..do.....	June 16	..do.....	36	Sept. 20	Badly lodged.
Hybrid No. 14a-2-3-2-1.....	..do.....	June 14	..do.....	40	Sept. 25	$\frac{1}{10}$ ripe Sept. 6; heavy straw.
Hull-less S.P.I. No. 19851..	..do.....	..do.....	July 21	34	Sept. 12	
Albert.....	May 30	(a)	.....	.....	.....

OATS.

Canadian.....	May 31	June 12	July 26	39	Sept. 1	
South Dakota.....	..do.....	..do.....	July 21	38	Sept. 6	
Victory.....	..do.....	June 13	July 30	40	Sept. 25	
Crown.....	..do.....	..do.....	..do.....	42	Sept. 6	
New Swedish.....	..do.....	June 12	July 19	48	Sept. 25	$\frac{1}{10}$ ripe Sept. 6
Black Tartarian.....	..do.....	June 13	July 30	42	..do.....	Very late maturing.
Hansen.....	..do.....	June 12	..do.....	60	..do.....	A few heads ripe Sept. 6.
Finnish Black.....	..do.....	June 11	July 22	40	Sept. 2	
Hull-less.....	..do.....	June 21	July 25	25	Sept. 25	10 per cent stand; a few heads ripe Sept. 3.
Hybrid No. 35e-1.....	..do.....	June 12	July 21	36	Aug. 26	Earliest maturing.
Hybrid No. 267.....	..do.....	..do.....	July 30	40	Sept. 25	60 per cent stand; $\frac{1}{2}$ ripe Sept. 16.
Norwegian.....	..do.....	..do.....	July 21	38	Sept. 20	Ripened unevenly; $\frac{1}{2}$ ripe Sept. 15.

^a About 5 per cent germinated.

Special attention is called to two varieties, one a Rampart hybrid oat, 35e, which has silver-gray kernels, compact heads, and stiff straw, and yields above the average; the other, a Rampart hybrid barley, 28a, of bluish-black color, beardless, 6-rowed, nearly hull-less, with medium sized heads and with only a slight lodging of straw. These two grains make a particularly rapid growth and mature markedly early.

NEW VARIETIES.⁵

One variety of barley and four varieties of wheat were received from the States and Canada through the Sitka office, and four hybrid barleys from Rampart. The seed received from Canada and the States was seeded in increase plats. All showed low germination and poor habits of growth. A few heads selected from each will be seeded in head rows next year. The four hybrid barleys from Rampart of the 19b series were seeded in head rows. Only one of these, 19b-2-2-1-1, gave a fair germination and matured seed, which will be planted in a head-row test next year.

ALFALFA SELECTION.⁵

Alfalfa seed was collected from a number of individual plants that appeared to be ripe enough to grow. The plants were cut and stored in a dry place so that the seed would mature on the stalk.

⁵ By W. T. White, assistant, Fairbanks.

Selections were made of four varieties, North Swedish, Hansen's Cherno, Hansen's Cossack, and Hansen's Semipalatinsk. Several rows of seed from individual plants were planted, but of the lot only two rows of the North Swedish came up. These grew erectly to a height of 15 inches, when cold weather stopped their growth. They did not bloom.

POTATOES.

The potato crop for this region represented the lightest yield in years. The late spring and slow growth in June, the severe frost of June 29, which laid all potato vines flat, and the frost of August 26, which killed all vines in the lowlands and many on the hillside fields, resulted in the extremely low yield. Only a few fields located in the most favorable spots escaped the frosts. Late maturing varieties were badly damaged, in many cases yielding little more than the amount of seed planted. A few of the earlier varieties made a fair yield. The marketable potatoes were not more than 50 per cent of the entire crop, which is estimated at 550 tons for the Tanana Valley. The acreage was about one-third larger than that of former years and would have resulted in an overproduction with normal yields.

At this station the usual test of varieties was made, 23 varieties being planted June 6 on lower south-slope hillside fields in small plats for a comparative test (Pl. VI, fig. 1). The land had produced a grain-hay crop in the season of 1917, was fall plowed, and double disked and harrowed May 25. The seed bed was in good condition when planted. This ground was slow in warming and the potatoes were 4 weeks in coming up. They made slow growth during July and August and were killed August 26. Little more than the amount of seed planted was obtained. Even in this test a wide range of adaptability was noted in vine growth and tubers produced.

All the increase plats of tried and proved varieties of potatoes were planted June 1 to 3 on the higher south-slope land which had been under cultivation 4 years, while duplicate plats were planted June 4 and 5 on north-slope fields which had been under cultivation 8 years. The purpose of the duplicate planting on north and south slope fields was for the purpose of getting a comparison of yield and quality. The cultivation was the same for both fields. The potatoes were slow in coming up, thereby missing the June frost, but the vine growth was rapid during July and August. There was noticeable difference in growth about the time of blossoming. The vines were several inches higher on the south-hillside field and the potatoes set in larger numbers, making a much better growth than on the north-slope field. The potatoes set well and grew rapidly on the south-slope field until the vines were frosted down. The morning of the frost the vines of alternate rows were cut close to the ground,



FIG. 1.—CANADIAN OATS ON CLOVER LAND, FAIRBANKS STATION. YIELD 47 BUSHELS PER ACRE AS COMPARED WITH 26 BUSHELS ON WHEAT LAND.



FIG. 2.—BARLEY INCREASE PLATS, FAIRBANKS STATION.



FIG. 1.—VARIETY TEST PLATS OF POTATOES, FAIRBANKS STATION.



FIG. 2.—CANADA FIELD PEAS, FAIRBANKS STATION.

and the potatoes later dug separately, weighed, and graded, and cooking tests were made to determine the damage by frost. By comparing the yields of potatoes given in the table below it can readily be seen that the cutting of the vines materially reduced the yield of potatoes so treated.

Comparison of yields in variety test of potatoes.

Variety.	Stand.	Vine growth.	Size of plat.	Total yield.	Yield per acre.	Percentage of marketable potatoes.	Cooking qualities.
	<i>Per cent.</i>		<i>Acre.</i>	<i>Pounds.</i>	<i>Bushels.</i>		
Gold Coin.....	97	Heavy.....	0.2363	971	60.7	38	Fair.
Gold Coin (tops cut).....	97	do.....	.2363	828	51.8	25	Very poor.
Extra Early Pioneer.....	95	Medium.....	.2722	768	57	19	Fair.
Extra Early Pioneer (tops cut).....	95	do.....	.2722	425	26	28	Very poor.
Burpee's Superior.....	97	do.....	.2781	926	55.4	27	Fair.
Burpee's Superior (tops cut).....	97	do.....	.2781	517	30.9	27	
Extra Early Ohio.....	95	do.....	.2364	959	67.6	35	
Extra Early Ohio (tops cut).....	95	do.....	.3546	1,062	49.9	54	
Vornehm.....	92	do.....	.2312	642	46.2	21	
Vornehm (tops cut).....	92	do.....	.2312	645	46.2	19	
Early Market.....	95	do.....	.2352	1,305	92.6	70	Very good.
Early Market (tops cut).....	95	do.....	.2352	907	64.2	37	do.
Alaska Beauty.....	95	Small.....	.1083	282	43.4	25	
Carman No. 1.....	95	Medium.....	.0968	259	44.5	45	
Irish Cobler.....	92	do.....	.0848	263	50.6	41	
Beauty of Hebron.....	90	do.....	.0738	238	53.7	49	
Early Six Weeks.....	95	Heavy.....	.0613	217	58.9	48	
Dakota Red.....	95	Medium.....	.0495	124	41.7	31	
Eureka.....	97	do.....	.0538	113	35	45	

In every variety tested except the Vornehm, the total yield was greater from the potatoes left with frosted tops intact. The yield increase from having the tops varied from 9 to 28 bushels per acre, and the total yield of marketable potatoes was greater with the exception of one variety, Extra Early Ohio, which gave a yield of 67.6 bushels per acre of 35 per cent marketable potatoes against 49.9 bushels per acre of 54 per cent marketable potatoes. The low percentage of marketable potatoes shown in all varieties and the low yields obtained at this station give a fair average for most of the potatoes grown throughout the Tanana Valley. A few settlers who grew but one or two of the earlier varieties obtained fair yields. The best yielders in this season's test were Early Market with 92.6 bushels per acre of 70 per cent marketable potatoes, Extra Early Ohio with 67.6 bushels of 35 per cent marketable tubers, and Gold Coin with 60.7 bushels of 38 per cent marketable tubers.

The quality of potatoes grown this season varies as widely as the yield. The Early Market is an excellent cooker and of very fair flavor. The Extra Early Ohio is only medium in either respect. The Gold Coin did not mature sufficiently to cook well. Of all the other varieties grown, the Beauty of Hebron is perhaps the best cooking potato.

The effect of the frost upon the potato, aside from shortening the yield, is rather hard to determine. Cooking tests of potatoes from the vines that were cut off immediately after the frosting and from the vines that were left standing reveal nothing except a difference in maturity. The potatoes of many varieties were watery and unfit for use, due largely to immaturity.

LEGUMINOUS CROPS.

Peas.—Canada field peas were seeded for the second year at this station to test their adaptability to the region (Pl. VI, fig. 2). Peas seeded in rows 2 feet apart on a gently sloping south field on May 29 made fair growth and produced some mature peas and a good yield of pea hay. The first blooms appeared July 19 when the vines were 10 inches high. The growth was rapid from that date until the vines were cut for hay August 27. The green pods were damaged to some extent by the frost, but as the vines were cut the day following the frost the extent of the damage could not be determined. A few ripe pods were gathered before cutting and were stored in the grain shed. The vines were placed over pole racks to cure for hay. Three acres of north-slope land was seeded to Canada field peas for a green manure crop, also 2 acres was seeded to Alaska peas, a garden variety, to test them as a field crop as well as for green manure. On this north-slope field the growth was slow and only the Alaska pea produced mature seed. The vine growth was uneven and few grew to 2 feet in height. A few mature seed were obtained, after which the vines were plowed under. Canadian field peas were grown to maturity by a farmer near by and a light crop of seed was obtained. The season was too short to mature more than half the pods that set.

Alfalfa.—Alfalfa seeded in 1915 winterkilled badly. That which survived made only fair growth. A hard freeze on May 17 killed all the early shoots and gave the alfalfa a setback from which it did not fully recover during the entire season. Nearly all of the 1917 seeding was killed. After this hard freeze the next new shoots appeared from June 12 to 15, and the growth was slower than in former years. All plants were left to produce seed, but none matured. A goodly number of new seedlings came up from shattered seed from the previous year, especially in the North Swedish and Hansen's Semi-palatinsk plats seeded 1915. These two varieties show hardiness and fair adaptability to this region. The former makes the larger growth and should prove a valuable crop when fully acclimatized. Hansen's Chernob and Hansen's Cossack winterkilled badly and that which came up made but feeble growth. All plants were left for further observation. Any especially hardy plants found among next year's survivors will be propagated by means of cuttings to increase

the stock. The few seed matured last year were seeded in the spring, but only the seed of the Cossack came up. These seedlings grew fairly well and went into the winter in good condition.

Clover.—Red clover was again grown as a green manure crop. On an upper south-hill slope where the ground was first dry sufficiently to work, the seed bed was prepared by double disking and harrowing on May 23 and was seeded the following day by grain drill over half the plat and by grass seeder over the remainder of the plat. That seeded by the grain drill was too thick and failed to do as well as that seeded by the grass seeder, which registered 12 pounds per acre. The growth of clover was not nearly equal to that of the previous year, due partly to the lack of moisture in August and September and partly to the heavy growth of volunteer grain. It was necessary to pull the volunteer grain from the clover in order to get clean ground for future crops. Where the grain came too thick to warrant pulling, the mowing machine was used before the seed matured. A portion of the clover plats was pastured by pigs after August 10. All clover plats were plowed during the late fall. The average height of the clover was about 12 inches. About one-fifth of the plants bloomed, and all were growing well at the close of the season.

ROOT CROPS.

Turnips.—Petrowski turnips were grown on 2 acres of land, three-fourths acre coming volunteer from the seed plat of the previous year. These came too thick for good growth, necessitating disking and harrowing to destroy them. The plat was then seeded to carrots and drilled in rows to allow cultivation. Another crop of turnips came so thick as to choke out the carrots. By cultivation this last crop of turnips was thinned sufficiently to allow fair growth, resulting in a medium yield. One acre was seeded on a low south slope, and one-fourth acre of low north-slope field was seeded July 5. The turnips grew well and made a fair yield on the south slope, while those on the north slope were slow in starting growth and only a few grew to 3 inches in diameter. The quality of the north-slope turnip was superior to any other. No turnips were set for seed this year, as the last year's crop is still on hand.

Carrots.—Stock carrots, Oxheart and Danvers Half Long, were seeded on June 12 in field plats for stock feed. The season was too short to grow a good crop of either under field conditions. The Oxheart and Danvers Half Long carrots grown in the garden on well-manured land seeded at the same time produced a heavy yield of excellent roots.

Sugar beets.—These were again tried in field plats without fertilizer, with unsatisfactory results. However, sugar beets were successfully grown by a neighboring farmer on the sandy loam river

bottom land. Beets of fair size and good quality were grown. The possibilities of the sugar beet will be tested fully under varying conditions the coming season.

THE GARDEN.

Gardens were a great success the past season in this region. From all sections of the Tanana Valley come favorable reports. The garden at this station produced abundantly except in a few cases where the seed was defective. All varieties of common vegetables were grown. Tomatoes set fruit heavily, but failed to ripen many before the frost. Peas and beans produced fair yields. Cabbage and cauliflower made good growth and yielded well. Beets, carrots, rutabagas, and parsnips did exceptionally well both in size and quality.

SEED DISTRIBUTION.

The distribution of home-grown seed was continued this year with satisfactory results. Seed grain in small quantities, seed potatoes in 4-pound parcels, turnip seed, and garden seed were supplied to 94 settlers; 40½ bushels seed oats was furnished to 16 farmers, and 16 bushels seed barley to 23 farmers, seed of the crop being returned after thrashing the past fall or commercial grain being returned by those failing to grow a crop; 18 settlers were furnished with seed potatoes amounting to 3,850 pounds of the several varieties best adapted to this region, upon the same conditions as the oats and barley were furnished. This method of distribution was adopted to encourage the settlers to try the different varieties without extra cost to themselves, and to insure sufficient feed for the hogs and horses at the station without the necessity of buying on the market, as has been done in the past. The potato crop grown at the station is used for hog feed, and the grain, such as oats and barley, is used for hog and horse feed, except that which is distributed free in 4-pound packages. Two hundred and twenty pounds of buckwheat was distributed among the farmers.

In order to stimulate the growing of wheat, a special price of 3 cents per pound was made to the farmers who would use it for seed purposes only. Forty farmers purchased seed wheat under this provision, and 3 farmers were furnished seed wheat, returning the seed this fall. A total of 65 bushels of seed wheat was distributed, and nearly all of it was sown the past spring. Nearly all of the seed wheat distributed was of the Siberian H. G. variety, with only a few bushels of Romanow spring wheat. Reports from the farmers show that the seed of the Siberian H. G. wheat germinated well and produced a good crop, with only a few exceptions where the seeding was too late to mature before frost. The average yield of that thrashed was around 18 bushels per acre. The Romanow spring

wheat was low in germination and failed to make as good yields as Siberian H. G. wheat. Renewed interest in wheat growing is apparent among the farmers of this region, and a considerable increase of acreage is assured for the coming year. The possibilities of wheat growing have been demonstrated, and it is only a question of acreage now until a flour mill is warranted.

SMALL FRUITS.

Strawberries.—The strawberry crop was a failure in the Tanana Valley this year. The plants went into the winter of 1917 in prime condition, but only a small percentage survived the winter. The vines were green under the snow, and growth began early in May, only to be killed by the severe freezing weather that came later. The few plants that survived the winter were allowed to tiller and set new plants for next spring's planting. An outside row of plants that were covered during the previous fall plowing came through in very fair condition. They did not begin growing as early as the others and were not so badly damaged. Some fruit set and ripened on this row. The plants were covered with spruce boughs late this fall (1918) in the hope of retarding the thawing of the ground in the spring and holding back spring growth until the plants are safe from freezing weather.

Raspberries.—Cultivated raspberry plants were received from a farmer who grows them successfully every year. Two dozen plants were set out June 1. A few were allowed to set fruit, which ripened September 1. The plants made good growth. This variety of red raspberry came from the experiment station at Sitka several years back, and has been grown by James Weist, who has increased the stock to several thousand plants which bear abundantly. The berries are large and of very delicious flavor. The practice of layering the plants and covering them with earth to protect the canes during the winter and to retard spring growth until after freezing weather has proved effective.

LIVE STOCK.

The live stock at the station consists of 3 mares, which are used for general farm work, and a small herd of Duroc-Jersey hogs. Three horses are not sufficient for all the team work on the station farm, and it is therefore necessary to hire teams at certain periods during the spring and summer. It is sometimes possible to get teams for their keep during the spring months, as was the case the past season.

The station herd of hogs has not proved a money maker. The older stock, consisting of 5 sows and a boar, has been disposed of. The sows proved to be poor mothers. They farrowed fair-sized litters, but were so clumsy that they crushed most of their pigs before they

were old enough to look out for themselves. Two of the sows killed and ate their pigs, even after some of them were 10 days old. One young sow was lost at farrowing time. Post-mortem examination showed the fetal development to be abnormal; some were fully developed while others were not one-third normal size, and with two deaths had occurred several days before farrowing time.

Of the 4 litters farrowed this season, only 5 pigs were saved. One of these developed throat trouble and died at 4 months old. Three gilts and one boar have been saved as a foundation for future breeding purposes. New blood is needed, and it is hoped that a Tamworth boar may be secured to produce crossbreeds that are more suited to the native feed produced in this region. The fat-hog type is out of its natural sphere in this country. A pure strain of Tamworth hogs should be introduced here that the station might aid in stocking the country with a suitable breed of hogs.

Free service of the station boar has been furnished the farmers who are near enough to avail themselves of the privilege. The total number of hogs raised in this region has increased materially the past year. A fair demand for shotes at good prices prevailed during the early fall.

FARM MACHINERY AND EQUIPMENT.

The farm tractor received late in the fall of 1917 was put to good service during the whole year. It furnished power for the thrashing during that fall, for wood sawing during the winter, and for plowing the past fall. Extension rims for the wheels were not received in time for its being used on the surface dressing of plowed lands, nor could it be used to the best advantage in plowing where the ground was not firm. Lugs for the wheels have not arrived, although ordered in the early spring. Without the lugs too much power is lost in heavy plowing by the slipping of the wheels.

A new double-action disk and a land pulverizer were received late this fall. These may be used with the tractor to great advantage in saving hired labor. A new fanning mill of the latest improved type was received for the seed house, also a roller feed mill, which will permit crushing all hog and horse feed and thereby economically utilize all the light-shriveled grain. The roller mill will grind wheat fine enough to be bolted for flour.

A 12-foot windmill, 40-foot steel tower, and force pump were also received and are now on hand to be erected in the early spring. With the new well and this equipment the water question will be nearly solved. It yet remains to lay the necessary pipes and install a pressure supply tank in order that the barns and houses may be readily supplied with water.

COOPERATIVE WORK.

Very little cooperative work with the farmers has been undertaken aside from furnishing seed to those applying for it. Lack of funds and scarcity of efficient labor made it necessary to forego all plans for that work, but it is hoped that it may be resumed next spring and carried out on a broad scale.

REPORT OF WORK AT MATANUSKA STATION.

By F. E. RADER, *Assistant in Charge.*

WEATHER CONDITIONS.

Accurate weather data have not been recorded here for a sufficient length of time to make a comparison of the past season with former years. It is asserted by old-timers that the winter of 1917-18 was uncommonly severe. From October 27 to March 28, a period of 152 days, the maximum temperature was above the freezing point only 19 times, an unusual condition for this region. December was the coldest month, with a mean maximum of 2.55° F. and a mean minimum of -13.8°. The lowest temperature reached was -34°.

The total snowfall for the winter was 42.5 inches. Much of the snow blew away and the remainder melted and settled to such an extent that at no time was it more than 18 inches deep even in the timber. In open places it was never more than 1 foot deep. The total precipitation (rain and melted snow) for the year from November 1, 1917, to November 1, 1918, was 13.4 inches, of which 10.34 inches fell as rain during the period from April 25 to November 1. By the end of March the snow was all gone on the hillsides and other exposed places, but several snowstorms during April kept the ground from drying out. It is frequently possible to seed grain here by the middle of April, but this year no seeding was done at the station until May 6. The temperature dropped to the freezing point or below nearly every night until May 24, so that the earliest seeded grain was very slow in germinating.

June and July were ideal growing months. The maximum temperature for the season, 82°, occurred on July 7. The rainfall was light, and this caused crops to suffer somewhat for want of moisture in localities where the soil is thin. Considerable effort was expended during this period in trying to get some ground burns as a preliminary step in clearing land, but not much was accomplished. The heavy snowfall, together with the late spring, caused the ground to be very slow in thawing in the timber. Consequently the moss and other vegetation did not dry out enough to burn well before rains began to fall toward the end of July. This ended further effort along that line.

August was a very wet month. Rain fell in measurable quantity on 18 days, and the total precipitation for the month was 4.27 inches. This would not be called an excessive rainfall in many places, but the frequency of the showers made it somewhat difficult to harvest the grains as they matured. The ripening of the grains was also considerably retarded, especially of those which were not ready to harvest by the middle of the month.

September was somewhat rainy but on the whole much better than August for harvesting. Several windy days completed the curing of the grain that had been cut and it was all put under shelter. October was a splendid month for completing the harvest. There was only one light rain in a period of 25 days.

In contrast to the above, in 1917 July was the rainiest month of the season, while the month of August, the first and last weeks of September, and the first third of October were favorable for harvesting grain and hay crops.

This year there were light frosts on September 13 and 28 which killed buckwheat and nipped potato tops in exposed spots, but the first killing frost did not occur until October 12, giving for the season a practically frost-free period of 141 days. There is no authentic record of when the last spring frost occurred in 1917, but it was about May 1. The first killing frost in the fall was on September 19, which would make a frost-free period of exactly the same length, namely, 141 days.

GENERAL WORK.

Sufficient funds were not available until late in the season to permit the employment of enough help to care for the crops, so no new building or clearing operations could be undertaken during the summer. Probably one-half acre of land was cleared at odd times and a small amount of fencing was done along the public highway.

The priming of the station residence was finished and one coat of light tan paint with a darker trimming was given the whole building, which adds greatly to its appearance. During the winter a considerable portion of the inside finish of the residence was completed and stained.

An additional telephone wire was strung from the station to Matanuska in such a way as to conform to the system used by the Alaskan Engineering Commission, with whose lines the station is connected. A 6-foot McCormick grain binder was added during the summer to the station equipment.

At the present time a new well is being dug near the station residence in order to have a more convenient water supply. The first well, which was intended only for temporary use, necessitates hauling water a considerable distance.

It is planned to slash 4 or 5 acres of timber during the winter, first salvaging such as can be used for building purposes, fence posts, etc. This area will be burned over next summer if the season is dry enough. This will clean up the fine material and brush, kill the underbrush, and, it is hoped, burn at least part of the moss, which may all take fire, and thus give practically a ground burn. The charred timber that is left will be piled and burned. In a year or so the roots will have rotted sufficiently for the stumps to be pulled quite easily. This is a slower and probably more expensive method of clearing than by means of a ground fire, but it is only at considerable intervals that the seasons are dry enough to get ground fires even in the most favorable localities. In some places it is not possible to get ground burns even with the best weather conditions because of the heavy growth of underbrush and grass. In such localities this is a possible method of clearing land which will be both cheaper and easier than digging out the green timber.

WORK WITH GRAINS.

SPRING GRAIN.

About half of the 12 acres cleared in 1917 was fall plowed. This was the first ground to get dry enough to seed. It was harrowed several times with a drag harrow and then seeded to some of each of the varieties of grain grown this season. Where possible, the grain was put in with a 2-horse grain drill. All of the seed grain used was grown at the Fairbanks Station in 1917 and shipped here late in the fall.

Because of the considerable amount of work involved in preparing newly cleared land for seeding, it was deemed advisable to rent additional land instead of trying to break up the remainder of the clearing in time for spring seeding. About 16 acres of land was rented, making a total of 22 acres in various crops this season. Three and one-fourth acres of the rented ground was hillside land with a decided southerly slope, $2\frac{1}{4}$ acres of which had produced two crops of potatoes and the remaining acre one crop, this acre being planted to the same crop this year after having been spring plowed. There was not enough rain after the plowing was done to pack the ground well, consequently it dried out and became very loose and dusty.

Wherever the nature of the ground permitted, the grain crops were harvested with the binder. The sheaves were set up in small narrow shocks and well capped with two bundles. In spite of the rain the grain cured perfectly without spoiling, and when favorable opportunities came it was put under shelter. None of the grain has been thrashed yet, so the yield can only be estimated.

Wheat.—A plat of Marquis wheat 75 by 75 feet was broadcasted May 7 and harrowed in. As previously noted, the continuous frosty nights caused the earliest seeded grains to be very slow in germinating. This grain was not out of the ground until May 25. It then grew vigorously and was well headed out by July 9. The ripening period was undoubtedly considerably prolonged by the rainy weather in August and the grain was not ripe enough to harvest until September 20. It grew to quite a uniform height of 3 feet and stood up well. The heads were of good size and well filled. It was noticeable that all of the grain shattered easily this year, with the exception of this variety.

Romanow wheat seeded with grain drill May 7 came up by May 25, began heading July 5, was ripe and harvested September 9, 125 days from time of seeding. It grew to a height of $3\frac{1}{2}$ feet and stood up well. The heads were large and well filled and the grain plump. The estimated yield was 20 bushels per acre. Another plat was broadcasted in May on the spring-plowed sidehill land, coming up in 12 days, reaching 3 feet in height and blossoming by July 24. On September 12 half of the plat was ripe and harvested. It was equally as good grain as the above. For some unaccountable reason the rest of the plat remained green until frost.

Siberian H. G. wheat, seeded with grain drill May 6, came up in 15 days, was well headed out and in bloom by July 6, and was ripe by August 16, 102 days from time of seeding, but was not harvested until August 26. It grew to a height of from 2 to 3 feet, with rather a small straw, and stood up well. The heads were short and the grain small but plump. The quality of the grain is better than that of the seed sown. The estimated yield was 15 bushels per acre. While this is a small-berried variety it has the advantage over the other varieties of being earlier.

Barley.—Beardless barley, S. P. I. No. 19852, seeded with grain drill May 7, was up by May 25, and began heading July 3 at a height of 20 inches. It ripened August 20, but was not harvested until September 6 and 7. The growth was quite rank, 4 feet high over most of the plat, and the grain lodged badly. The heads were large and well filled, giving an estimated yield of 30 bushels per acre. Part of the plat lodged early in the season and a second growth started from the crown. This part was made into hay. Another plat was seeded May 16 on spring-plowed sidehill ground, part of which did well and was ripe by August 25. The ground was so dry that the remainder of the plat made very little growth until rains came, a second growth then coming up, which made it fit only for hay. A third seeding was made May 25 on land which had grown a crop of potatoes the previous year. This was double disked and the grain covered with a harrow. Unfortunately, stray horses broke

into the field when the grain was about 6 inches high and pastured over a good share of the plat. This caused additional stooling, and as a consequence unevenness in ripening. The grain grew to a height of from $2\frac{1}{2}$ to 3 feet and stood up well. The earliest heads were ripe by September 13, when the plat was harvested.

Hull-less barley, S. P. I. No. 19851, seeded May 7, by July 5 was fully headed out, and on August 14 was ripe, 99 days from time of seeding. It grew to a height of from 28 to 30 inches, with a stiff straw standing up well, short, thick heads, and very plump grain. The estimated yield was 20 bushels per acre. A second seeding was made May 16 on spring-plowed, sidehill ground. One end of the plat lodged, but the remainder stood up well and grew to a height of 3 feet. It was ripe August 20 and harvested September 1. The heads were larger than in the first seeding. The hillside was so steep that the grain had to be cut with a scythe. It was then put on pole racks to cure a few days before being stored. A third plat was seeded May 25 adjacent to and in the same manner as the third seeding of beardless barley. It was likewise eaten off by the stray horses. The earliest heads matured and the plat was harvested September 13.

Oats.—Canadian oats broadcasted on a hillside and harrowed in May 6; by July 6 was beginning to head. On August 26 the greater part of the plat was ripe and the ripe grain was cut. On the brow of the hill the straw was short, about 18 inches high, but on better ground it was 4 feet high. The remainder of the plat was harvested September 16. This is a plump, heavy, white oat. If it does as well in the future as it did this year it is a promising variety for this region. It does not grow so tall as the Finnish Black and the grain is heavier. A second seeding was made May 16 on spring-plowed land. Owing to the fact that the ground dried out in some places more than in others the plat was very uneven in time of ripening. A considerable portion of the grain was shattered by winds before the whole plat was ripe.

One acre of Finnish Black oats was seeded with the drill May 11. Part of the plat was cut and fed green to the horses, the remainder ripening by August 26. The height varied from 2 to 5 feet, depending upon the richness of the soil. Part of the plat lodged badly. The yield of grain was fair, being estimated at 30 bushels per acre. Another plat was seeded May 16 on spring-plowed hillside land. Part of the plat did very well. It grew tall and lodged badly, but ripened in 110 days. The ground was too dry for the remainder of the plat. The rains caused a second growth, which was fit only for hay. A third seeding was made on May 25 on land with a slight northerly slope, which had never been plowed, although it had produced a crop of turnips and rutabagas the previous year. The ground was double-disked and the seed harrowed in. The oats

grew to a height of from 4 to 5 feet and lodged in only a few places. By September 13 three-fourths of the grain was ripe and the plot was harvested. This variety of oats grows too tall and rank on new land. It will probably do better on ground that has been cropped for several years.

Spelt.—A few short rows of this grain were seeded by hand May 31. It came up in a week's time and grew vigorously, tillering well, but the straw was so weak that the grain lodged badly. It headed out in due season, but showed no signs of ripening by the time killing frosts came. The average height was 30 inches. No doubt it would have done better if the seed had been put into the ground earlier. The long beards are an objectionable feature of this grain, and it seems to possess no particular merit which would give it the preference over some of the barleys now grown. Several inquiries have been received regarding this grain.

Buckwheat.—Seeded June 11 on sidehill land that grew a crop of barley the previous year, and the soil preparation of which consisted of double disking and harrowing, this crop produced the first blossoms July 20, and the plants were continuously in bloom from that time until the first light frost September 13. The following day the buckwheat was cut with a grain cradle and allowed to cure in the swath for a week or more. It was then rolled into bundles about 20 inches in diameter. These were set on end, each bundle by itself. After curing a little more, the bundles were put under shelter at the first favorable opportunity. At least two-thirds of the grain fully matured and a fair yield was obtained.

Rough buckwheat.—This is a variety grown in Maine and New Brunswick, having the characteristic buckwheat shape but small seeds. The triangular surfaces of the hull are more convex than ordinary buckwheat and are somewhat roughened. A few dozen seeds were obtained from a near-by rancher and sown June 7. Some seed was ripened. This variety seems to possess no advantages over the one above noted and does not produce so much grain.

GRAIN HAY.

All of the grain which was badly lodged or otherwise unfit to be saved for seed was made into hay. It was cured on pole racks so that there would be no question about getting a good quality of feed. On June 13, 14, and 15, 10 acres of rented land was seeded to oats for hay. All but a small portion of this area had been in potatoes the preceding two years. The seed bed preparation consisted of disking once and then cross harrowing. The seed was then drilled at the rate of 75 pounds per acre. Two acres was seeded to a common white feed oat, which stood well, grew to an average height of about



FIG. 1.—ALFALFA FIELD NEAR PALMER, IN MATANUSKA VALLEY.



FIG. 2.—SUGAR BEETS AT MATANUSKA STATION.



3 feet, and made a splendid quality of fine strawed hay. The remainder of the 10 acres was seeded to Finnish Black oats, which did not stool much and the stand was not very thick. It grew to a height of from 4 to 6 feet, with straw stiff enough to stand up well with the exception of a few spots. A small area which grew oats last year gave poor results this season. The straw was short and the heads small. This is a common occurrence here, oats seeming to exhaust the soil sooner than any other crop. It is indicative of the fact that some system of soil treatment or crop rotation must be adopted very soon.

The oat crop was cut with the binder October 4 and 5, at which time about one-fourth of the grain was ripe, but the straw was still quite green. The sheaves were set up in long narrow shocks running north and south, 8 to 10 bundles to a shock. For fear bad weather might set in, about two-fifths of the crop was hung on pole racks to cure, at an expense of about \$3 per ton. Fortunately, good weather followed the harvest. Several drying winds hastened the process of curing and the whole crop was thoroughly cured and stored under shelter with but one light sprinkle of rain. The yield is estimated at 18 tons.

WINTER GRAIN.

Rye.—Four pounds each of five varieties of winter rye, North Dakota, Monster, Brandon, Hogot, and No. 193, was received from the Rampart Station and seeded August 13 on new land. A spot was selected on the windward side of some timber where it was thought the maximum amount of snow would stay during the winter. All the varieties came up and made a good growth before freezing weather with the exception of the Brandon, only about half of which germinated.

Winter wheat.—No winter wheat was sown, as it has not proved a success in other parts of Alaska, but there is a possibility that it might survive the mild winters here.

GRASSES.

It is still unknown what kinds of hay and pasture grasses are best suited to this region. Small quantities of seed of some half dozen varieties were ordered in the spring, but did not come in time for sowing this season. In 1917 $1\frac{1}{2}$ acres of Brome grass was sown by a near-by farmer on the top and steep south slope of a hill. It came through the winter in perfect shape with very little protection by snow on the top of the hill. It made fine early pasture, but turned brown during the dry weather. The grass came out green again after the rains began and furnished pasturage for the remainder of the season. Timothy has been tried a number of times with only an occasional favorable result.

ALFALFA.

The station has not yet made any experimental seedings of alfalfa, but some work along that line will be undertaken next season. Several farmers have sown Grimm alfalfa, but no positive results have been obtained so far. This spring a settler near Palmer seeded a small field of this variety which had a good stand when visited by the writer about the middle of October, the best of the alfalfa being 18 inches high (Pl. VII, fig. 1.)

FIELD PEAS.

About a pint of Canada field peas was sown broadcast May 18 and covered by hand. Edible peas were produced by August 1. There were still a few blossoms when the vines were pulled October 1, but fully half of the pods were ripe. For a couple of years several farmers have grown field peas quite successfully for hog feed and hay and ripened a good portion of the pods. This may prove a good crop to grow and plow under as a source of fertility.

CORN.

Mack's Red Sweet corn was planted in a 100-foot row in the garden June 7. The garden slopes toward the south and has a hill on the north side. The corn came up in two weeks, but grew very slowly thereafter, although the weather was as favorable for the succeeding five weeks as can be expected here. The best stalks were not more than 2 feet high when killed by frost. This corn is the result of a cross between a white sweet corn and a red field corn. It was recommended as a variety that might possibly grow here, but it is evidently not suited to the climate. It is not likely that any corn will do well here.

SUGAR BEETS.

On June 4 eight rows, each 100 feet long, were seeded to sugar beets in the garden with a drill. The beets grew well during the summer and were pulled October 9 (Pl. VII, fig. 2). They were small in size, the largest weighing not more than 2 pounds, and the yield was about 7 tons per acre. Three samples were sent to the United States Department of Agriculture which when tested for sugar content yielded 14.6, 16.1, and 16.9 per cent, respectively. Some of the farmers occasionally grow a few sugar beets, but so far as is known, this is the first analysis for sugar content. Numerous inquiries have been made regarding the possibilities of growing sugar beets here. Further trials must be made under varying conditions before any definite conclusion can be announced.

OTHER ROOT CROPS.

One variety of mangel-wurzel and one each of a beet and a carrot recommended for stock feeding were given a trial. The results were disappointing. The roots were too small and the yield not heavy enough. They will be given another trial next year. Rutabagas and Petrowski turnips do well and about a ton of each was grown this year. Every farmer should have some live stock and it is desirable to know what root crops are most profitable to grow.

POTATOES.

About 4 pounds each of 40 varieties of potatoes was received from the Sitka Station for trial here. The potatoes were cut so as to get as many seed pieces as possible and planted May 24 on spring-plowed side-hill ground, with a southerly slope, which had produced its first crop the previous year. The varieties were planted in adjacent rows near the top of the slope where the ground seemed most uniform in quality. The seed was dropped by hand and covered with a hoe about 2 inches deep, the ground being firmly pressed down over each seed piece. Since the early part of the season was dry, they might have done better if they had been planted where the ground was moist, but as it was each variety had an equal chance. Several varieties developed considerable disease (Rhizoctonia) while adjacent rows would be entirely healthy. The potatoes were dug September 20 and 21. As a single season's trial is scarcely sufficient to show whether or not a variety is suited to the soil and climatic conditions, no recommendations will be made at this time. A record of the performance of each variety has been kept for comparison with future trials. A baking and boiling test of some of the most promising varieties is being made, but the samples for that purpose must necessarily be small and the test therefore not conclusive. Next year more extensive tests will be made. Of the 10 varieties tested so far, just two, Early John and Rusty Coat, equaled the Matanuska (a local variety of unknown origin) in quality, though four of the varieties gave better yields under less favorable soil conditions. The following are the varieties grown:

Rural New Yorker.
Knowles's Big Cropper.
Pride of France.
Early John.
White Prizetaker.
Early Sunrise.
Russet Rural.
Bliss Triumph.
Spaulding No. 4.
White Beauty.
Nebraska.

Gold Coin (Gregory).
Green Mountain Seedling.
Admiral Dewey.
Peach Blow.
Clyde.
Irish Cobbler.
Producer.
Dearborn.
Old's Prolific.
Rusty Coat.
Snowflake.

First Early.	Norcross.
Early Puritan.	Hundredfold.
Green Mountain.	Burpee's Superior.
Old's Select Rural.	New Queen.
White Bliss.	Beauty of Hebron.
Uncle Sam.	American Wonder.
Epicure.	Early Albino.
Northern King.	Pure Early Rose.
Burpee's Extra Early.	White Star.

Ten of the best early seedlings from the Sitka Station were also grown. Several gave promising results.

Eighty-five hundredths of an acre of Matanuska potatoes was planted May 23 and 24 on the same slope but below the varieties above. The seed pieces were dropped in shallow furrows at intervals of about 18 inches and covered with a hoe. The potatoes were up nicely in a month. The soil was very loose and, since the slope was too steep to use horse tools successfully, the only cultivation given the potatoes was a single hand hoeing. The new potatoes were large enough to use by the last week in July. The crop was dug at intervals from September 19 to October 15, and yielded at the rate of 10 tons, or 333 bushels, per acre. The quality of the potatoes is excellent.

THE GARDEN.

All of the common hardy vegetables were grown for home use and were produced in abundance throughout the season, beginning with lettuce and radishes from the hotbed. In the rush of getting the grain crops seeded the garden planting was neglected. Doubtless some of the vegetables would have given better results if the seeding had been done earlier. The vegetables grown included lettuce and radishes of several varieties, peas, parsnips, turnips, kohlrabi, beets, carrots, cabbage, cauliflower, kale, and rhubarb. The White Icicle radish is especially good, though early seedings of this are sometimes wormy. Premium Gem and Horsford's Market Garden peas planted June 3 produced an abundant crop from early August to the middle of October. Some were canned for winter use. Egyptian Blood Turnip and Eclipse beets produced a fair crop. Danvers Half Long and Chantenay carrots, both good varieties, grew to a fair size. Snowball cauliflower set out the middle of June grew heads large enough to use by the middle of August. Seventy-five plants produced 70 quite uniform heads, a few of which weighed $5\frac{1}{2}$ pounds. Heads of the first picking, about one-third of the crop, averaged $4\frac{1}{2}$ pounds in weight. Cauliflower does especially well here. Copenhagen Market cabbage, a medium early variety and the only one grown this year, did exceedingly well. Plants set out the middle of June produced heads weighing up to 13 pounds.

THE NURSERY.

In the spring the following assortment of nursery stock was received from the Sitka Station: Apple trees, 25 Whitney, 25 Keswick Codlin, 25 Golden Sweet, 25 Livland (Lowland) Raspberry, and 50 Yellow Transparent; 300 red raspberries; 300 red currants; 100 black currants; 100 gooseberries; 10 *Rosa rugosa*; 25 Tartarian honeysuckle; 25 Japanese honeysuckle; and 125 rhubarb roots. The nursery stock was planted on ground with a south slope and under the lee side of a hill, where it seemed that there would be most probably a good covering of snow in the winter (Pl. VIII, fig. 1). It was planted in rows 4 feet apart on May 28 and 29. Practically every tree and bush grew splendidly and some of the apple trees made a growth of 24 inches. It is planned to propagate the bush fruits here for distribution among the settlers. It is quite probable that some winter protection will have to be given the bush fruits to insure an annual crop. It is quite common for all of the canes above the snow to winterkill every year. The apple trees which have been distributed from the Sitka Station among the settlers in the past couple of years have not done well. They often freeze to the ground and the following year send up shoots from below the graft. It is planned to try some method of winter protection for a couple of years. Perhaps by that time the trees will have acquired sufficient hardiness to withstand the winters. Several mail shipments of strawberry plants were received from the Sitka Station during the summer, but they arrived in such bad condition that only a few plants survived. Strawberries do well here.

GRAIN DISTRIBUTION.

In both 1916 and 1917 small quantities of seed of several varieties of grain were distributed among the settlers of this region in order to give them an opportunity to test the grains which had done well in the interior of Alaska, and also to give them a start in growing their own seed of such of the varieties as seemed adapted to the soil and climate. Early this spring a third distribution was made of about 4,500 pounds of grain which was grown at the Fairbanks Station in 1917 and shipped here late in the fall. The following assortment was given to 77 farmers with the understanding that each one was to use his best efforts to mature as much of the grain as possible and to save the seed for future use: Finnish Black oats 35 pounds, Beardless barley 8 pounds, Hull-less barley 3 pounds, Siberian H. G. wheat 4 pounds, Romanow wheat 5 pounds, Marquis wheat 2 pounds, and buckwheat 1 pound.

In a number of instances, after the seed was put into the ground, the farmers went away for the summer to other employment. Some

were not at home when the grain ripened, and others turned the crop over to neighbors to be harvested. From the verbal reports received it would seem that a good portion of the grain was saved for seed, but it was hoped that more of it would be kept for that purpose. The most of what was saved is still in the straw, so it is impossible even to approximate the total yield. Mr. Androz Seguin, of Palmer, sent in a written report of his test of the grains, with the following very commendable results:

Yield of grain secured by Androz Seguin.

Grain.	Quantity of seed planted.	Size of plat seeded.	Yield of plat.	Estimated yield per acre.
	Pounds.	Square rods.	Pounds.	Bushels.
Beardless barley.....	8	10	142	40.5
Hull-less barley.....	3	5	44	23.5
Siberian H. G. wheat.....	4	10	151	40
Romanow wheat.....	5	10	156	41.5
Marquis wheat.....	2	4	52	34.6
Buckwheat.....	1	5	53	30
Finnish Black oats.....	35	53	808	75.7

The farmers are being urged to ripen and thrash at least enough grain to fill their own seed requirements, not only because home-grown seed is likely to be best adapted to the region, but also to prevent the introduction of noxious weeds.

GRAIN GROWING AMONG THE SETTLERS.

There is evidence that more interest is being taken in grain growing. The experiments by the farmers have at least enabled them to determine for themselves the possibilities of successful grain production. The present clearings are small and many of them are on hillsides where the harvesting must be done by hand. The grain is now worth more in the straw as grain hay than it is thrashed and is also more easily cared for. Thrashing with a club and winnowing with the wind are methods too slow and laborious for most Americans. With larger clearings and less expensive methods of harvesting and thrashing, it is hoped that within a year or two there will no longer be any necessity of sending outside for either feed or seed grain. It is, of course, too soon yet to say definitely just how successfully grain can be grown here. Weather conditions are uncertain, seldom being the same two years in succession, and the margin between success and partial and complete failure is not very great. However, it is believed that some of the grains can be successfully ripened and harvested every year, though such operations should not be attempted on too large a scale. The varieties grown need not necessarily be the earliest maturing. In some years the best

harvesting season will be early, other years later maturing grains can be cared for most successfully. In any event, it is very important that plenty of storage space be provided for the crop. As soon as it is cured and a favorable opportunity comes it should be put under shelter.

FARMING OPERATIONS OF THE SETTLERS.

Potatoes still continue to be the principal money crop of the farmers (Pl. VIII, fig. 2). The large surplus last year caused a considerable reduction in the area planted this year. One farmer had a yield of 18 tons on $1\frac{1}{4}$ acres, but the average yield was probably about $3\frac{1}{2}$ tons per acre. The total yield is estimated at 500 tons as compared with 1,300 tons in 1917. Prices range from \$35 to \$60 per ton. The present indications are that the crop will all be disposed of before a new one is ready for the market. The Matanuska is the principal variety grown, and the quality is especially good this year.

Practically all of the cleared land not planted in potatoes was seeded to grain, mostly oats and beardless barley. By far the greater portion of it was cut for hay. Much of what was cut in the early part of August was either damaged or a total loss on account of unfavorable weather conditions. This loss could easily have been prevented by curing the hay on pole racks. This is not an expensive process when once the proper equipment of posts and poles has been provided. Every farmer should have enough of this sort of equipment on hand to care for a good share of his hay crop if conditions demand it. He need never fail to have a good quality of hay. It may be feasible to cut grain hay with a self-binder and cure it in the shock, even under rather trying weather conditions. Several trials of that method this year gave favorable results. The total yield of grain hay is estimated at 400 tons. This will all be consumed locally. Those who have hay for sale readily get \$35 to \$50 per ton loose in the stack.

It is estimated that 75 tons of root crops, cabbage, and cauliflower was grown this season (Pl. IX, fig. 1). Turnips and rutabagas do not find a ready market and are grown mostly for home consumption. One man seeded quite an acreage as a sort of speculative enterprise, producing a crop estimated at 400 tons, only a few of which was harvested, the rest being a total loss.

A number of the farmers are becoming interested in hog raising (Pl. IX, fig. 2). It requires less capital to get a start here in hogs than any other live stock and the percentage of increase is greater, two reasons which account for the interest in this industry. It is to be hoped that it will suffer no serious setback. The number of cows remains about the same as last year, although the ownership

has changed considerably. The number of cows would increase rapidly if they were not so hard to get and so high in price. By next spring a number of heifers will be old enough to be bred. At present there is no bull nearer than Anchorage, 36 miles distant. The station should be in a position to supply this deficiency by next spring at the latest.

The outlook for the Matanuska farmers has not been especially bright the past year. War conditions have curtailed the development of the industries which were expected to provide a market for their products and increased the cost of the necessities they have had to buy. Some became discouraged over the prospects a year ago and abandoned their homesteads. With the return of normal conditions the development of various industries will be renewed and a market for farm products is certain to follow.

There has not been time enough as yet to test the agricultural possibilities of this region. Until it is proved that some one line of agricultural work is best suited to conditions here, every farmer should diversify as much as possible; that is, he should grow berries, vegetables, potatoes, root crops, and grain, and produce eggs, milk, butter, and meat. His success in a large measure will be determined by his skill in supplying his own needs direct from the products of his farm.

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

By H. E. PRATT, *Assistant in Charge.*

INTRODUCTION.

As this report is read by an increasing number of people who are not familiar with Alaska or Alaskan conditions, it is thought best to preface it with a short description of Kodiak Island, where the station is located. Kodiak Island is about 100 miles long and 40 miles wide, its greatest length extending in a general northeasterly and southwesterly direction. The island is situated off the mouth of Cook Inlet, and the village of Kodiak, where the experiment station has been placed, is located near the northern extremity of the island. The shore is cut by numerous deep bays into which one or more streams flow. Most of the tillable land lies at the head of these bays. The remainder of the island is mountainous, but affords excellent pasturage for cattle or sheep. It has a moist, comparatively mild climate, similar to that of Scotland or the milder portions of the Scandinavian Peninsula.



FIG. 1.—EXPERIMENTAL NURSERY, MATANUSKA STATION.



FIG. 2.—POTATO GROWING BY SETTLERS IN MATANUSKA VALLEY.



FIG. 1.—SETTLER'S CABIN AND CLEARING, MATANUSKA VALLEY.



FIG. 2.—JERSEY RED PIGS NEAR ANCHORAGE.

WEATHER CONDITIONS.

The past year (1918) had a late spring and also a late fall, the growing season being nearly normal in length. The winter set in mild and was characterized by lack of snowfall. If it had not been for the excessive rains in the period during which the pasture grasses were ripening, it would have been possible to pasture cattle up to the first of the year. As it happened, it was not necessary to feed to any great extent before the first of December.

STATION WORK.

During the winter most of the time of three men is required to care for the stock, the remainder of their time being spent in going over machinery, cutting wood, and getting ready for spring work. The spring work consists of plowing, preparing and planting from 12 to 14 acres of land at Kodiak, fixing fences, repairing roads, cleaning up the grounds, and making any improvement that funds and time will allow. This is followed by a period of hay and silage making, and that by preparation for winter. Along with all this, the various experiments have to be watched and notes taken, etc.

Plowing this year began May 10, as compared with May 6 a year ago, but at this time all of the frost was not out of the ground and it was necessary to leave many patches to be plowed later. After plowing was completed the ground was immediately made ready for seeding. Ten acres of oats was seeded and 4 acres of oats and field peas. Seeding was completed June 12 but this was only made possible by the fact that approximately one-third of the land had been plowed the fall previous. After the crops were in, attention was turned to hauling manure, repairing fences, fixing roads, etc., when the men could be spared from other work they were put to clearing the pasture of trees and undergrowth.

GENERAL IMPROVEMENTS.

It was early apparent that, owing to the condition of the labor and material market, it would be impossible to carry out all the projected improvements for the year.

At Kodiak a cement floor was laid in the cottage basement and a complete set of bathroom fixtures secured. The grounds around the cottage were graded to some extent, but the work was not finished. The cement work in the dairy barn, which was interrupted by freezing weather last fall, was completed and the ventilator was installed. The work on the barn will be completed when a few parts which were ordered over a year ago arrive. When the team was not busy elsewhere, it was utilized to haul gravel for the roads. A small amount of ditching was done which improved the road considerably.

At Kalsin Bay a large amount of work was done on the road, such as grading, hauling gravel, laying brush, etc. Owing to an exceedingly heavy rain in September, most of that work will have to be repeated. The hollows in the barnyard were filled with gravel and gravel was hauled before the doors of the horse barn and cow shed, thus rendering it much easier to keep those places clear of mud. During the winter the cottage at Kalsin Bay was lathed and it is now ready for plaster. A beginning was made on the cellar floor, but on account of the station being short handed the work had to be abandoned.

FIELD CROPS.

The work in testing field crops, in an endeavor to find varieties adapted to the condition here, like all the other activities of the station, was greatly curtailed this year.

Grain.—Four acres of oats and field peas was grown this year. The peas were sown broadcast at the rate of $1\frac{1}{2}$ bushels to the acre, after which the oats were drilled in at the rate of 1 bushel to the acre. The peas did not do so well as last year, but about 5 tons of excellent hay was secured.

Ten acres of Banner oats, $2\frac{1}{2}$ bushels to the acre, were grown this year. Owing to the lateness of the spring, part of the land was too wet to drill and on that portion the oats were sown broadcast. The yield from these moist places was very small, while from the drilled-in oats over 1 ton of hay was secured to the acre. About half of the oats was grown on fall-plowed land, but no difference could be observed in the growth or yield of the two fields. The fall plowing allowed time to get the oats in considerably earlier than would have been possible otherwise. Part of one field received a dressing of barnyard manure at the rate of 10 tons to the acre, the remainder receiving 250 pounds of nitrate of lime to the acre. The oats on the part of the field receiving the manure gave a higher yield than did that treated with nitrate of lime, but the former was not so mature.

Three varieties of barley were tried out on a small scale this year. They were planted June 2 in twentieth-acre plats, but the soil was rather too wet and cold for them to do their best. On October 15 they were harvested for hay and at this date none of them had set seed. However, they made a good quality of hay. These varieties were all unnamed, being supplied by the Rampart Experiment Station, where they had been bred.

An acre of land was seeded to Petkuser winter rye July 20, from which some late fall pasturage was secured. As the winter so far has been open and the ground free from snow there is very little prospect of the rye coming through the winter in good condition.

Legumes.—The red clover and alfalfa which were seeded last year winterkilled. This year a small plat was seeded to alfalfa and oats,

the oats being allowed to remain on the ground to form a winter covering. The open winter, as reported above, is very likely to cause this also to winterkill. Only two varieties of field peas were tested this year. Two acres each of Green Canada and Yellow Canada field peas were grown with oats, and a small plat of each was grown alone. There seems to be very little difference in the two varieties either in growth, time of flowering, or yield. None of the plants, so far as could be discovered, set seed. A variety of vetch was tried this year, but compared with the field peas it made a poor growth and gave a small yield. One hundred seeds of each of two native legumes (the so-called beach pea and lupine) were grown in the garden, where they could receive special attention. None of the lupine germinated and only 17 per cent of the beach pea. These plants made a poor growth, as evidently the soil was not adapted to them.

Sunflower.—The sunflower has been used with success in some States for silage. Four hundred sunflower plants were grown under field conditions here, making a growth of from 2 to 3 feet. The yield was not such as would make the sunflower a profitable silage crop for this part of Alaska.

Tussock grass.—A small amount of the seed of tussock grass (*Poa flabellata*) was secured from the Falkland Islands for trial at this station. The Falklands, of which this grass is a native, comprise a group of islands lying about 250 miles east of the mainland of South America and between 51° and 53° south latitude. As they have a climate very similar to that of Kodiak Island, it was hoped that tussock grass could be introduced here. The results so far secured have been negative.

Potatoes.—Twelve varieties of potatoes were tested this year, repeating the work of last year with this crop. The results in general confirmed the results of previous years. Considering yield, uniformity, size, and marketability the three best varieties were Burpee's Superior, Irish Cobbler, and Gold Coin.

HAY AND SILAGE MAKING.

Silage is made principally from two of the native plants, *Elymus mollis*, locally known as beach grass or beach rye, and *Carex cryptocarpa*, known as tall beach sedge or three-cornered grass. During ordinary years these two plants supply from 90 to 95 per cent of the silage put up at this station, and of this beach grass forms by far the greater proportion. These grasses are found on strips along the beaches, on islands, and on the flats at the head of the bays, the areas varying in size from less than an acre to several acres in extent.

The method followed in gathering this silage is, briefly, as follows: A team, mower, rake, wagon, and camping outfit are loaded in a

big skiff and towed to the place to be cut. After camp is established, the mower is put to cutting the grass, which is then raked and hauled to the skiff. When the skiff is loaded it is towed to Kodiak and the material placed in the silo, first being put through a silage cutter. Meanwhile at the camp another skiff load is cut and made ready for the return of the skiff. When all the grass available has been cut, camp is moved and the process repeated. In handling silage in this way it is important that the grass reach the cutter in a comparatively fresh condition, as the machine will not handle dried grass.

During the past season, the *Red Wing*, as has been previously stated, was useless during the silage season. This left the station entirely dependent upon the little launch *Fearless*, which contains only a 12-horsepower engine and is not capable of handling the skiff in rough weather. The result was that large amounts of grass reached the cutter too dry to go through the machine and it was necessary to put it in the silo without cutting it. While whole beach grass will make good silage if placed in the silo in a fresh condition, there is a good deal of waste, and the silo will not hold nearly so much silage, owing to the fact that the uncut grass will not pack so well as that which has been run through the cutter. The same difficulties were experienced in filling the silo at Kalsin Bay, although not to such a great extent, owing to the shorter distance the material had to be hauled.

Haymaking.—Native bluetop (*Calamagrostis langsdorfi*) is the principal grass used for hay. This one grass forms over 90 per cent of the upland hay put up on Kodiak Island. Some beach grass is cut late in the fall, when, if cured properly, it makes an excellent quality of hay. This native bluetop is a rank-growing species often reaching a height of 6 or 7 feet. It produces an abundance of thin leaves and if cured properly makes an excellent hay. If put up without being rained on it is remarkably palatable and free from dust. It forms the chief covering of the hillsides and also occurs in "parks" among the timber at the heads of bays. With the exception of the small amount of grain hay grown at Kodiak this station depends entirely upon bluetop for dry fodder. All native hay is cut in the "parks" among the cottonwoods at the head of Kalsin Bay.

When the grass is in the right stage (about half in bloom) it is cut and allowed to lie in the swath until after the dew disappears the next day. It is then raked into windrows with the side-delivery rake and allowed to cure, or if it is on land where the hay loader can not be used to advantage it is cocked and allowed to cure in the cock. It is then stacked in the field or hauled to the hay shed, depending upon the condition of the next batch of hay. When the teams go to the barn in the evening they each take a load of hay which is covered with a tarpaulin and unloaded next morning while the dew is drying



FIG. 1.—CARNOT OF KODIAK, HERD BULL. REACTED TO TUBERCULIN TEST.



FIG. 2.—CROSSBRED GALLOWAY-HOLSTEIN CALVES, KODIAK STATION.



off the hay in the field. During those periods in the fall and winter when the water is not too rough such hay as is needed at Kodiak is loaded upon the skiff and towed there by the station launch.

CATTLE.

Tuberculin test.—A veterinarian, Dr. Karl M. Oliver, of the Seattle office of the Bureau of Animal Industry, United States Department of Agriculture, arrived in Kodiak early in September to make annual test of the cattle for tuberculosis. In the Kodiak herd two reacted, Carnot of Kodiak (Pl. X, fig. 1), was butchered and the meat destroyed and a Holstein cow, Grandview Fayne, which with her calf was transferred to Kalsin Bay. Of the nine yearling calves raised from the tubercular cows at the bay all passed the test. The calves were raised by a modification of the Bang method as described in a previous report. Later in the month five of the yearlings and eleven of the tubercular cows were butchered. Of these all but two of the cows were passed for food, indicating that the infection was localized. At present the tubercular herd at Kalsin Bay consists of one Galloway bull, five Galloway cows, and one Holstein cow, together with their calves which are regarded as suspects. Four healthy yearlings, raised from tubercular cows, are kept in a separate barn, not having been transferred to Kodiak for lack of room.

Galloways at Kodiak.—Carnot of Kodiak, which had been at the head of this herd, reacted in this year's test and was killed. The herd is now headed by Hattie's King, an outstanding individual of smooth lines and out of one of the best milkers in the herd. The cattle in this herd came through the winter in fair condition. They were fed all the silage they would eat (from 30 to 35 pounds per 1,000 pounds, live weight) and a small amount of hay. The milking cows were fed a grain mixture consisting of 6 parts rolled barley, 3 parts crushed oats, and 1 part linseed meal. The amount of this grain mixture fed depended upon the condition of the animal and the yield of milk. Some of the other cattle received a little of the grain mixture as they showed need of it, but in general it may be stated that the dry cows and young stock were wintered on silage supplemented with a small amount of hay.

Holsteins and the F_1 crosses.—The Holsteins have been here a year now and, as was expected, they do not stand this climate well. After every cold rain the milk yield decreases from 25 to 50 per cent, and by the time the cows are back to normal another cold rain sets in. The winter feeding period is from 5 to 6 weeks longer than that of the Galloways. This was expected, however, the principal reason for securing this breed being to cross them with the "Blacks," as has been outlined in previous reports of this station.

Five crossbred calves were dropped during the year, four heifers and one bull (Pl. X, fig. 2). Of these four were from Galloway cows and one from a Holstein. The other Holsteins will be crossed with the Galloway from time to time. As expected, these calves are all black and polled, but it may be that they have a little more white on the underline than the average Galloway. In conformation they seem to be more like the Holstein, and also in the nature of their hair. The crossing and the breeding of the F_1 crosses, both among themselves and back on the pure breeds, will be carried on in an endeavor to secure a type of animal more suited to the needs of the Alaska settler. Hardiness and rustling ability are two of the most desirable qualities for these conditions. The animal should also be intermediate in milk and beef production, or of the so-called dual purpose type. The color and hide characteristics of the Galloways are desirable, as is also their polled condition. It is realized that it will require considerable time to select and fix such a type and that it will necessitate the discarding of many in order to secure a few such as are desired. Once secured, however, and the type fixed, the results will amply repay the time and money expended. While securing this type of animal is the chief object of the experiment, it is also hoped to learn something of the law of inheritance of some of the characteristics in cattle as a result of this work.

SHEEP.

The sheep were taken off Near Island, where they had been on pasture, the first part of December. Owing to rough weather on the water it was not possible to transfer the sheep to Kalsin Bay until January 20. While at Kodiak several of the sheep were killed by dogs, and after the flock was transferred to the bay three aged ewes and one yearling ewe died. The flock then consisted of 13 aged ewes, 7 yearling ewes, and 2 rams.

Lambing started May 7. Of the 13 ewes 12 dropped lambs, 11 of which were raised, 7 rams and 4 ewes. The flock at present consists of 2 aged rams, 13 aged ewes, 7 yearling ewes, 2 lamb rams, 5 lamb wethers, and 4 lamb ewes, a total of 33. The average weight of fleece was little over 7 pounds. This flock is a grade one and could be considerably improved by the use of a pure-bred sire.

LETTERS FROM SETTLERS.

James Minano, Coldfoot, Alaska.—I am a Japanese by birth and have been up here in the Arctic for the past 25 years. We have good gardens here every year, which furnish most of our living, as fish is scarce and staple articles are very high. Last year we raised close to 4 tons of potatoes, besides turnips, cabbage, celery, and

other garden truck. I can truthfully say that potatoes averaged a heaping gold pan to the hill. This has been an off year. We did not plant until June 15 and a killing frost came August 16. We had a good crop considering the short season. Potatoes for the past three seasons have weighed from 1 pound to 1½ pounds, but this season they only weighed about ½ pound. Our largest cabbage last year weighed 20 pounds. We have had fine rhubarb the past years, but last year the winter was so severe that the roots were killed. I would like to have you send me some seed, especially a winter turnip, an early cabbage, and a good variety of celery.

Joe Voelkl, Haines, Alaska.—Herewith is my report of the sample of spring wheat and barley you sent me last year. The wheat grew to a height of 38 inches and filled out well. It was cut August 31. The barley grew 50 inches high and was cut August 20. I am very pleased with the seed and I would like to try some winter wheat if I can get some.

E. E. Carson, Hope, Alaska.—The gooseberry bushes you sent me last spring arrived May 8 in good condition and were set out the next day. They made a fine growth this season and bore quite a few fine berries. The Yellow Transparent and crab apples you sent me in the spring of 1917 came through the winter with but little damage. A few were frostbitten on the tips, but all have made a good growth this season. The raspberries you sent me bore fruit of large size and fine flavor. They are the best I have. Green Mountain potatoes did well this season considering that it was very dry up to the last of July. I harvested about 1 ton of potatoes, 500 pounds of cabbage, 100 pounds of carrots, 100 pounds of rhubarb, 100 pounds of rutabagas, and 100 pounds of turnips from less than 100 feet square of ground. There was an enormous quantity of wild large berries around here and everyone put up a good supply. There will be no shipping of vegetables or fruit into this community this year.

A. J. Whyte, Juneau, Alaska.—Last spring you kindly sent me an assortment of seed and I promised to let you know what results I obtained from them. If the weather had been a little more favorable the results would have been fine. Everything I planted came up very nicely, but most of the produce did not mature because it was under water the greater part of the time. Will you kindly send me a rose bush, if you have one, that will survive the winter?

Mrs. E. H. Dudler, Ketchikan, Alaska.—I received your favor of September 27, 1918, and thank you for answering my questions. I was going to send a full report of the Government seed we used last spring, but we had to leave the place the first of September. We did not harvest the garden truck, but nearly everything was growing fine, although on newly broken ground. I used natural clam lime and seaweed with the black soil and seaweed alone with the sandy soil on a grass plat. I did not get over to the place before April 10, and was unable to get much of the ground dug up, so put in the seeds rather crowded and some too late to more than get a start. Considering the new ground, everything did exceptionally well. Radishes, endive, turnips, carrots, and onions produced abundantly. Of the flowers snapdragon, sweet peas, sweet alyssum, poppies, and candytuft were the most satisfactory. We had a few trees planted and they grew well, with the exception of one crab apple and one cherry tree. The leaves on the raspberry bushes were eaten by some kind of caterpillar, which, of course, can be eradicated.

Hugo Eckardt, Kiana, Alaska.—I thank you very much for the seed sent me last spring. Petrowski turnips turned out well and were not troubled by worms or mice. They averaged about ¾ pound. The kale was a real success and there will be enough for all winter. The cabbage grew to medium size and the heads weighed from 3 to 4 pounds. I wish you would be kind enough to send me in the spring a little Petrowski turnip seed, lettuce, white tipped radishes, kale, cabbage, celery, and cauliflower. I did not try any flowers on account of lack of time.

C. H. Wilson, Knik, Alaska.—Of the seeds I received from you last spring all did very well except the beets and parsnips. The carrots and peas were above the average, and I have all the vegetables I can use and some to sell. In 1916 I got 6 apple trees, but last winter the mice working under the snow destroyed nearly all of them, together with some that I got from a nursery in Yakima, Wash. I received also 25 strawberry plants from you, all of which survived. This year I had several excellent berries and next year I ought to have a lot. If you have any early potatoes I should like a few next spring.

J. L. Reed, Kotzebue, Alaska.—Lettuce, carrots, parsnips, and kale all did well last season. Head lettuce weighs up to 1½ pounds and is the best I have seen anywhere. Petrowski turnips are the very best and grow to 4 inches in diameter. Every root of the horse-radish you sent me made a good growth, but I moved 100 miles before navigation closed, and the Eskimo children pulled them up, thinking they were turnips. If you can send me some, please do so and I will try again. My garden has been fertilized with fish, clams, and horse manure, and I would like to try some rhubarb and strawberries. I want to sow one acre to turnips, and would like to raise an early potato if I could get the seed. The Government sent me a package of hull-less barley. It did fine and is nice for soup. I will experiment more in the future and will let you know how I come out.

Archie McClellan, Mary Island Light Station, Ketchikan, Alaska.—Almost all the seed I received from your station did exceptionally well, although the season was late. I would like to have you advise me the best way to use kelp or seaweed as a fertilizer. I have dug up the ground and buried the kelp in the fall. The ground here is all made by using ashes and sand mixed with earth, the earth being not over 3 inches deep. If you could send me some seed potatoes and gooseberry bushes I would appreciate it.

Daniel Webster, Nolan, Alaska.—I was given one each of the six varieties of potatoes you sent here for distribution. I received them on July 1 and planted one in each compartment of an egg case. The cases I placed in the ground. The potatoes came up and grew very fast, so that on August 1 the Early Pioneer was budded. On August 22 a heavy frost struck us and I dug the cases up and put them in the cabin, keeping them from freezing until October 1. Upon this date I found to my great disappointment that the Early Pioneer had one potato about the size of a ptarmigan egg and three or four very small potatoes, and that the others had not done as well. The tops of all were very thrifty and looked excellent. I bought some seed potatoes from Coldfoot and planted them about three weeks earlier than these. I gathered them the last of August, and they did fairly well but would have done much better with three or four weeks longer to mature. Please accept my hearty thanks for the interest you have manifested in our welfare, and we hope to be able to get better results as time and experience give opportunity and favor.

Mrs. H. Pingel, Nolan, Alaska.—We are grateful to you for the six varieties of seed potatoes. We distributed them among the potato growers in town and on the creek. We planted ours in boxes, so as to be able to move them in the house when the frost came. The yield was three potatoes from one seed and numerous smaller ones. We will keep all of them for seed. I made a new kind of marmalade from rose buds, which all who tasted said was fine. I would like to have you send me a package of head lettuce and celery seed if you can. Our garden has done so well that we had all kinds of vegetables and lettuce all summer. In the fall I made the white turnips into sour turnips, the same as sauerkraut, and we are pleased with it. I would like to have you tell me how to make vinegar. I made some, and with it made a chowchow of the cabbage, celery, and little onions from your seed. It is fairly good, but the vinegar would not sour. The miners are doing well in gardening. Only one man had no garden; all the others tried.

Thomas Jacobs, Port Walter, Alaska.—In return for the seed you sent me I am sending you a short report of my gardening. Last year the garden was spoiled by the water, but this year everything I planted is doing well. I dug up a potato vine yesterday and got 17 potatoes, none of which was smaller than a hen egg. I am sending you six of the largest ones. This is only my second year here, and I have to spend most of my time trolling for salmon to make a living. I am 64 years old and I have lived 32 years in Alaska. I wish now that I had started a place of my own years ago, because then I could have been independent now. There is an opportunity for every poor man here in Alaska to have a home of his own if he wants to do a little work in his spare time.

Ole Johansen, Swanson Harbor, Alaska.—I must thank you for the berry bushes you sent me this spring. The gooseberries and raspberries bore the first year. The strawberry plants are doing fine and we expect them to bear next year. The flowers you sent are all doing well. I would like to try some barley next year, if you will be kind enough to send me some.

Richard Roman, Tolsona, Alaska.—I wish to thank you for the seed I received last spring and report the result. Turnips, rutabagas, onions, carrots, radishes, beets, and kohlrabi all did well. Cabbage and endive were not a success, and the peas and cucumbers froze. The kale did not come up, and the parsnips did not show very much life either. I planted some flowers in tin cans and all bloomed well.

Thomas A. Powers, Unalaklik, Alaska.—Permit me to thankfully acknowledge receipt of the Petrowski turnip seed. I have already planted them in ground newly broken, which consists of a subsoil of sand and a surface soil of decomposed grasses enriched by manure and kitchen refuse. Since my last letter many small gardens have sprung up and are being gradually enlarged. The natives are now realizing the benefits derived from gardens both from the standpoint of food and economy, and this year the spirit of patriotism has helped, though the natives do not take kindly to the work of breaking new ground. The potatoes are not so watery as in the past and have developed a sweetish flavor which is agreeable to the taste. The rutabagas and turnips are very good, and the cabbage, while not perfectly headed, is yet an agreeable addition to the winter bill of fare. The hothouse built by Mr. Van Ness and continued by his successor, Mr. Richardson, is used by the natives for such vegetables as need an early start. In all the outlook for an increase in the gardening output is good, and when the natives fully realize the benefits to be derived and the increase in output by using fish refuse as a fertilizer, their food problem will be in a fair way toward solution.

WEATHER REPORTS.

The following weather reports from all parts of Alaska will enable the reader to get a fair idea of the climate at each place, and it is recommended that they be studied with care.

The writer is indebted to M. B. Summers, Section Director, of the United States Weather Bureau for the Alaska Section, located at Juneau, who now has charge of the weather service in Alaska.

Condensed meteorological reports.

AKIAK. Latitude 60° 52', longitude 161° 23'. John H. Kilbuck, observer.

[NOTE.—Reference letters a, b, c, indicate number of days missing; for example, b, represents two days, c, three days, etc.]

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
December.....	10	-36	-1.7	-13.4	-7.6	0.08	22	4	5	1
1918.										
January.....	38	-38	8.9	-5.9	1.5	.31	9	9	13	3
February.....	40	-38	16.6	-3.4	6.6	.....	16	4	8	.....
March.....	39	-36	22.0	-3.3	9.4	3.07	16	2	13	9
April.....	42	-19	30.3	9.9	20.1	1.74	14	12	4	7
May.....	58	21	46.7	32.1	33.4	1.34	6	13	12	8
June ¹	76	33	64.5	43.6	54.0	1.92	13	4	3	.....

AKULURAK. Latitude 62° 30', longitude 164° 25'. Bro. Murphy, S. J., observer.

1917.										
December.....	16	-28	3.4	-6.6	-1.6	.....	20	0	11	0
1918.										
January.....	33	-26	6.4	-8.8	-.2	1.32	16	3	12	8
February.....	34	-36	9.2	-7.4	.9	.....	13	2	13	.....
March.....	34	-27	15.6	-4.7	5.4	.....	15	3	13	.....
April.....	42	-22	23.6	3.8	13.7	1.15	8	6	16	5
May.....	52	10	38.3	27.6	33.0	.8	8	3	20	18
June.....	66	29	53.0	39.8	46.4	.27	9	6	15	6
July.....	72	39	61.0	48.6	54.8	1.83	1	a 3	17	12
August.....	68	37	56.9	44.8	50.8	1.89	a 5	a 4	a 21	19
September.....	57	28	47.9	35.5	41.7	2.44	9	4	17	12

ALLAKAKET. Latitude 66° 34', longitude 152° 44'. Eleanor J. Ridgway, observer.

1917.										
December.....	-22	-62	-40.4	-49.1	-44.8	0.05	28	-3	0	2
1918.										
January.....	17	-55	-16.8	-33.7	-25.2	.....	16	4	11	.....
February.....	.....	-63	.....	-27.5	.....	.....	15	3	10	.....
March.....	.....	-61	.....	-30.4	.....	1.62	19	6	6	.....
April.....	.....	-41	.....	-6.9	.....	.9	13	8	9	12
May.....	.....	8	.....	24.2	.....	.....	a 9	6	15	.....
June.....	.....	30	.....	39.8	.....	.....	13	9	8	.....
July.....	.....	36	.....	47.1	.....	1.72	13	13	5	.....
August.....	73	24	63.6	38.1	50.8	.....	10	12	9	.....
September.....	63	11	53.1	31.8	42.4	1.72	9	9	12	10
October.....	44	-17	29.0	11.0	20.0	.....	a 12	a 4	a 14	.....

ANCHORAGE. Latitude 61° 13', longitude 149° 52'. D. D. Vint, observer.

1918.										
January.....	30	-14	19.2	4.9	12.0	0.80	5	6	20	12
February.....	44	-22	23.1	2.3	12.7	1.02	9	3	16	9
March.....	40	-17	27.5	4.0	15.8	.31	17	4	10	5
April.....	44	-6	38.8	24.2	31.5	1.01	6	4	20	11
May.....	62	24	50.5	34.2	42.4	.55	8	4	19	11
June.....	68	34	61.6	43.6	52.6	.21	17	8	5	6
July.....	74	42	67.3	37.0	57.2	1.19	19	3	9	6
August.....	68	31	82.7	45.5	54.1	3.49	4	10	17	22
September.....	66	32	57.7	43.3	50.5	2.16	4	6	20	19
October.....	57	6	44.1	27.0	35.6	1.14	11	7	13	10
November.....	40	-18	23.4	7.8	15.6	.75	3	7	20	10
December.....	47	-32	21.6	4.0	12.8	1.40	1	8	22	8

¹ Observations for 20 days.

Condensed meteorological reports—Continued.

ATKA. Latitude 52° 12', longitude 174° 20'. F. Cassel, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
October.....	52	30	46.9	36.6	41.7	7.11	1	4	26	28
November.....	43	23	37.9	29.5	35.6	5.63	1	2	27	23
December.....	43	24	37.9	33.2	35.6	5.56	4	5	22	25
1918.										
January.....	43	17	37.7	31.9	34.8	8.49	6	3	22	14
February.....	45	22	39.1	31.4	35.2	6.41	2	5	21	21
March.....	43	28	37.7	33.5	35.6	6.26	3	4	24	16
April.....	48	21	41.3	32.6	37.0	10.64	0	9	21	21
May.....	50	32	46.4	37.2	41.8	2.68	2	7	22	18
June.....	58	35	49.2	40.9	45.0	4.32	4	5	21	17
July.....	63	42	54.0	44.5	49.2	7.02	2	3	26	22

ATTU. Latitude 52° 56', longitude 173° 13' East. A. B. Somerville, observer.

1917.										
July.....	66	49.6	5.67	6	8	17	23			
August.....	66	55.6	7.2				17			
September.....	57	51.9	7.82				22			
October.....	54	47.0	11.02				23			
November.....	46	39.7	12.93				21			
December.....	43	37.9	7.67				18			
1918.										
January.....	39	21	36.1	29.0	32.6	3.38	9			
February.....	40	5	35.8	24.7	30.2	4.98	13			
March.....	44	19	38.8	29.9	34.4	12.81	14			
April.....	46	25	40.0	30.5	35.2	4.31	12			

CALDER. Latitude 56° 19', longitude 133° 27'. John McCallum, observer.

1918.										
January.....	46	16	36.1	29.0	32.6	13.74	6	10	15	23
February.....	43	17	34.5	26.6	30.6	10.68	4	11	13	20
March.....	45	1	37.6	26.1	31.8	9.71	8	11	12	22
April.....	51	22	45.3	29.1	37.2	10.17	14	7	9	14
May.....	72	28	62.2	36.2	49.2	5.51	14	10	7	14
June.....	69	40	58.7	44.3	51.5	3.84	14	11	5	14
July.....	81	35	64.7	46.5	55.6	2.35	16	4	11	7
August.....	66	41	59.6	48.4	54.0	8.23	7	4	20	24
September.....	72	31	62.8	41.3	52.0	4.56	19	3	8	6
October.....	60	29	49.3	40.1	44.7	23.02	1	5	25	26
November.....	51	26	42.4	32.9	37.6	21.56	6	1	23	25

CANDLE. Latitude 65° 55', longitude 161° 57'. R. S. Dimmick, observer.

1918.										
January.....	32	-42	-8.1	-22.3	-15.2		11	0	20	
February.....	35	-46	-2.4	-19.6	-11.0		13	3	12	
March.....	30	-44	5.8	-14.6	-4.4		14	1	15	
April.....	36	-34	18.4	-3.1	7.6					
May.....	57	4	39.7	25.4	32.6	0.14	8	2	21	2
June.....	70	28	54.0	33.8	43.9	.46	d 12	d 2	d 12	3
July.....	85	32	64.8	45.7	55.2	2.26	f 7	f 4	f 14	12
August.....	72	26	57.4	39.0	48.2	.87	d 8	d 6	d 13	10
September.....	60	22	48.4	32.7	40.6	1.03	b 7	b 3	b 18	10
October.....	37	-14	21.3	12.1	16.7		13	2	16	

Condensed meteorological reports—Continued.

CHICKALOON. Latitude 61° 47', longitude 148° 30'. J. E. Manning, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	27	-15	19.3	5.2	12.2	1.20	10	12	9	2
February.....	35	-26	22.4	1.0	11.7	.50	21	3	4	3
March.....	42	-18	24.1	-2.8	10.6	1.30	20	4	7	3
April.....	48	-7	37.5	20.1	28.8	1.20	8	1	21	6
May.....	69	25	54.2	32.1	43.2	.25	16	5	10	2
June.....	87	33	73.7	41.5	57.6	1.50	17	4	9	4
July.....	90	38	76.7	46.0	61.4	.75	18	2	11	3
August.....	80	29	67.9	43.2	55.6	4.35	5	0	26	17
September.....	73	25	57.6	35.9	46.8	3.51	5	5	20	10
October.....	62	8	41.2	23.4	32.3	.21	15	10	6	2
November.....	37	-17	24.4	9.9	17.2	.30	11	2	17	2
December.....	39	-18	18.2	3.7	11.0	.72	9	4	18	5

CHITINA. Latitude 61° 32', longitude 144° 27'. Fred M. Schaupp, observer.

1918.										
January.....	36	-33	9.6	-6.7	1.4	0.90	6	1	24	8
February.....	39	-37	7.3	-13.5	-3.1	.31	f 9	2	11	3
April.....	48	-11	39.6	19.7	29.6	1.26	5	3	22	7
May.....	62	23	53.7	33.5	43.6	.15	11	11	9	2
June.....	76	28	66.1	43.2	54.6	1.09	18	1	11	8
July.....	86	41	71.3	48.8	60.0	.47	14	5	12	6
August.....	72	29	61.6	43.0	52.3	2.73	3	5	23	12
September.....	68	25	55.0	39.0	47.0	1.94	5	4	21	10
October.....	57	-7	35.8	19.1	27.4	1.10	b 8	0	21	10
November.....	44	-29	22.2	5.4	13.8	3.40	a 10	12	7	11
December.....	48	-47	16.6	-2.0	7.3	.88	11	14	6	6

CORDOVA. Latitude 60° 32', longitude 145° 46'. Copper River & Northwestern Ry.

1917.										
November.....	43	5	32.9	22.9	27.9	12.92	8	1	21	15
December.....	33	-6	14.3	4.9	14.6	2.12	20	1	10	5
1918.										
January.....	34	3	28.8	20.5	24.6	5.34	6	2	23	16
February.....	34	1	27.4	16.6	22.0	3.44	12	2	14	13
August.....	63	40	56.8	47.5	52.2	12.32	9	4	18	22
September.....	60	33	50.6	44.1	47.4	42.51	6	8	16	19
October.....	51	23	43.7	36.7	40.2	19.89	9	5	17	23
November.....	45	14	35.4	28.4	31.9	19.97	5	11	14	20
December.....	43	5	31.8	24.9	28.1	23.55	10	4	17	23

DUTCH HARBOR. Latitude 53° 54', longitude 166° 32'. Emil Ittner, observer.

1918.										
January.....	42	16	34.9	27.4	31.2	5.17	3	1	27	18
February.....	48	14	37.3	28.5	32.9	4.56	0	10	18	16
March.....	52	16	46.4	31.9	39.2	.56	11	9	11	4
April.....	50	22	42.9	31.7	37.3	1.66	6	6	18	9
May.....	62	24	50.3	37.7	44.0	3.58	5	9	17	10
June.....	58	36	50.8	41.9	46.4	1.02	5	5	20	9
July.....	66	42	58.6	47.9	53.2	2.12	4	12	15	8
August.....	70	42	56.8	46.3	51.6	3.52	5	9	17	11
September.....	60	32	50.4	41.5	46.0	6.34	4	2	24	23
October.....	52	30	45.0	36.6	40.8	4.92	2	6	23	25
November.....	45	18	36.0	28.3	32.2	6.69	3	2	25	24

Condensed meteorological reports—Continued.

EAGLE. Latitude 64° 46', longitude 141° 12'. U. G. Myers, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January	14	-54	-4.2	-17.5	-10.8	0.72	4	7	20	12
February	30	-57	- .5	-19.7	-10.1	.42	9	8	11	7
March	32	-49	10.4	-18.8	- 4.2	.51	15	7	9	7
April	47	-26	36.4	14.1	25.2	.96	2	8	20	10
May	77	22	56.1	31.3	43.7	1.18	6	8	17	4
June	77	26	65.2	40.0	52.6	1.33	4	7	19	9
July	92	38	76.0	47.8	61.9	.80	9	6	16	11
August	76	28	65.3	40.6	53.0	1.33	2	8	21	15
September	78	18	59.5	36.8	48.2	.54	6	9	15	5
October	53	-24	27.8	13.2	20.5	.88	6	6	19	7
November	44	-44	7.2	- 7.0	.1	.93	6	7	17	12

AGRICULTURAL EXPERIMENT STATION, FAIRBANKS. Latitude 64° 51', longitude 147° 52'. M. D. Snodgrass, observer.

1918.										
January	24	-34	-0.4	-18.8	-9.6	0.48	4	10	17	5
February	38	-44	12.0	-12.6	- 3	1.24	11	7	10	6
March	36	-38	16.0	-13.5	1.2	2.84	13	9	9	9
April	51	-12	36.8	12.3	29.6	.98	12	6	12	4
May	74	11	55.5	29.7	42.6	.34	21	5	5	3
June	81	28	68.9	41.4	55.2	1.05	17	10	3	9
July	91	40	77.7	49.5	63.6	2.22	18	9	4	9
August	75	25	66.1	41.0	53.6	2.04	a 9	14	7	10
September	76	22	61.6	35.6	48.6	.09	4	13	13	2
October	54	-12	34.4	14.8	24.6	.39	16	3	12	3
November	40	-37	9.7	-12.7	-1.5	.49	9	11	10	5
December	37	-50	3.0	-16.9	-7.0	.31	13	5	13	4

FORT MANN HATCHERY. Latitude 55° 36', longitude 131° 25'. Fred Patching, observer.

1918.										
January	46	12	36.8	29.0	32.9	17.14	2	3	26	27
February	45	4	37.1	22.1	29.6	17.12	4	5	19	21
March	46	-4	39.5	23.5	31.5	14.05	4	6	21	22
April	63	18	48.0	28.9	38.4	11.70	7	4	19	18
May	75	28	59.5	34.6	47.0	7.84	11	7	13	14
June	83	33	65.8	43.6	54.7	4.82	9	3	18	15
July	89	42	71.9	48.5	60.2	5.31	11	8	12	13
August	77	34	65.3	42.1	53.7	11.21	4	8	19	20
September	83	34	68.9	43.8	56.4	4.55	18	5	7	6
October	63	30	51.5	40.7	46.1	24.70	1	5	25	28
November	50	23	43.3	32.4	37.8	18.62	2	5	23	26
December	46	8	36.2	27.1	31.6	18.34	2	5	24	21

FORT YUKON. Latitude 66° 34', longitude 145° 18'. Miss W. Dalziel, observer.

1918.										
January	7	-54	-13.5	-30.6	-22.0	0.41	14	3	14	7
February	37	-59	- 4.5	-25.3	-14.9	.66	a 14	7	6	8
March	30	-50	8.2	-20.0	- 5.9	.73	a 20	3	7	6
April	43	-33	30.1	7.7	18.9	.37	c 19	3	5	5
May	74	19	51.4	30.9	41.2	.05	b 10	8	11	2
June	75	25	64.9	42.9	53.9	.69	15	8	7	5
July	92	42	73.9	51.2	62.6	.67	16	7	8	5
August	78	32	66.2	45.9	56.0	.43	14	4	13	9
September	72	11	56.2	33.6	44.9	.23	a 9	13	7	6
October	53	-23	25.4	8.2	16.8	1.11	14	3	14	6
November	22	-52	- 3.6	-18.4	-11.0	.88	13	5	12	12

Condensed meteorological reports—Continued.

HOLY CROSS. Latitude 62° 16', longitude 159° 50'. Sister Mary Thecla, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
November.....	10	-32	-1.1	-12.3	-6.7	0.26	22	0	8	3
December.....		-35	-8.5	-18.3	-13.4	.02	28	0	3	1
1918.										
January.....	33	-32	3.5	-8.8	-2.6	.99	18	0	13	6
February.....	39	-40	11.1	-4.8	3.2	.....	15	2	11	.....
March.....	44	-36	14.1	-9.0	2.6	2.66	17	0	14	12
April.....	46	-10	32.2	13.1	22.6	5.02	15	2	13	14
May.....	62	20	47.8	32.9	40.4	1.33	12	6	13	13
June.....	76	33	65.5	44.0	52.8	.28	14	12	4	6
July.....	85	35	72.2	47.4	59.8	2.19	8	11	12	9
August.....	71	35	62.5	43.5	53.0	3.4	7	12	12	25
September.....	64	27	52.4	35.9	44.2	2.06	10	9	11	16
October.....	40	-3	35.1	23.5	29.3	.62	10	9	12	7
November.....	20	-24	4.7	-9.9	-2.6	.69	16	8	6	6

INDIAN RIVER. Latitude 62° 45', longitude 149° 50'. A. F. Stowe, observer.

1918.										
January.....	29	-36	19.3	-0.6	9.4	.....	15	3	13	11
February.....	34	-31	21.8	-1.5	10.2	.....	18	0	10	.....
March.....	36	-32	23.7	-2.4	10.6	2.57	18	0	13	6
April.....	58	-6	40.3	19.2	29.8	.....	11	0	19	.....
May.....	71	21	56.8	29.7	43.2	.....	16	0	15	.....
June.....	83	28	67.7	38.0	52.8	.....	20	0	10	.....
July.....	88	38	75.2	47.0	61.1	3.43	19	4	8	10
August.....	77	26	61.8	43.0	52.4	7.14	4	7	20	19
September.....	71	26	52.6	37.5	45.0	8.62	3	9	18	25
October.....	55	5	40.7	26.1	33.4	2.33	14	5	12	12
November.....	42	-27	24.4	6.3	15.4	1.48	12	5	13	12
December.....	39	-32	21.2	3.3	12.2	4.28	9	3	19	13

JUNEAU. Latitude 58° 18', longitude 134° 24'. U. S. Weather Bureau.

1918.										
January.....	46	10	33.7	26.5	30.1	8.63	2	2	27	24
February.....	37	7	32.4	22.5	27.4	5.79	5	6	17	18
March.....	41	9	32.4	22.7	27.6	4.34	5	5	21	18
April.....	50	19	42.8	32.7	37.8	5.91	0	3	27	20
May.....	68	31	54.8	36.8	45.8	5.59	12	5	14	15
June.....	77	39	62.3	45.6	54.0	3.83	8	6	16	15
July.....	83	41	69.3	50.1	59.7	2.30	12	4	15	11
August.....	73	45	59.6	49.2	54.4	11.53	2	3	26	24
September.....	73	34	60.3	44.0	52.2	12.39	8	7	15	14
October.....	58	28	46.3	38.5	42.4	13.95	0	0	31	30
November.....	51	23	41.8	33.2	37.5	15.01	2	3	25	25
December.....	46	12	35.1	28.0	35.6	10.33	2	5	24	24

KENNECOTT. Latitude 61° 29', longitude 142° 57'. R. V. Watkins, observer.

1918.										
January.....	35	-16	12.6	-2.3	5.2	.....	.....	.....	.....	.....
February.....	41	-20	16.9	-4.8	6.0	.....	.....	.....	.....	.....
March.....	43	-19	22.0	-3.3	9.4	0.69	a 24	2	4	4
April.....	42	-3	37.1	19.4	28.2	3.05	9	4	17	19
May.....	61	22	49.6	30.4	40.0	.25	14	13	4	1
June.....	72	32	64.7	38.0	51.4	2.25	16	6	8	6
July.....	78	38	72.2	41.4	56.8	.31	21	5	5	2
August.....	70	34	62.6	39.4	51.0	1.99	9	7	15	11
September.....	66	30	58.9	36.7	47.8	2.31	21	3	6	4
October.....	58	-4	39.5	22.3	30.9	1.10	12	14	5	7
November.....	39	-13	26.1	12.3	19.2	2.18	3	12	15	10

Condensed meteorological reports—Continued.

KETCHIKAN. Latitude 55° 20', longitude 131° 37'. A. P. Craig, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maximum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	50	18	39.3	31.2	35.2	14.6	2	3	26	27
February.....	48	14	39.0	27.4	33.2	10.82	8	2	18	19
March.....	49	10	40.5	27.3	33.9	11.53	5	5	21	23
April.....	63	24	49.2	31.7	40.4	11.53	13	3	14	17
May.....	71	32	57.5	36.7	47.1	8.46	14	5	12	15
June.....	79	36	64.4	44.1	54.2	4.78	12	4	14	16
July.....	85	40	70.2	49.7	60.0	8.58	16	3	12	13
August.....	79	44	65.1	49.7	57.4	13.64	11	3	17	19
September.....	80	35	67.6	44.0	55.3	5.44	20	2	8	12
October.....	57	30	51.3	41.0	46.2	26.53	4	2	25	31
November.....	56	25	44.7	33.9	39.3	21.9	4	1	25	24
December.....	48	15	38.1	29.1	33.6	15.78	7	2	22	25

KLUKWAN. Latitude 59° 24', longitude 135° 54'. Rev. F. R. Falconer, observer.

1918.										
January.....	40	-24	21.9	8.4	15.2	1.9	7	7	17	11
February.....	41	-23	25.8	5.9	15.8	1.59	10	4	14	14
March.....	49	-16	30.8	6.8	18.8	.67	14	6	11	10
April.....	52	2	44.7	27.8	36.2	1.72	14	7	9	7
May.....	71	24	59.9	33.6	46.8	.19	19	5	7	3
June.....	84	36	68.0	43.5	55.8	.35	19	4	7	6
July.....	92	40	76.1	48.6	57.4	.....	19	6	6	5
August.....	76	37	62.1	47.1	54.6	1.12	9	2	20	14
September.....	71	29	59.9	40.6	50.2	4.57	17	5	8	9
October.....	56	5	43.2	32.3	37.6	4.34	1	1	29	21
November.....	47	1	33.7	24.0	28.8	4.72	3	4	23	21
December.....	42	-14	27.3	14.9	21.1	1.68	6	6	19	17

KODIAK. Latitude 57° 46', longitude 152° 22'. Naval Radio Station, observer.

1918.										
January.....	39	7	34.3	26.7	30.5	5.98	2	10	19	21
February.....	47	13	34.0	23.9	29.0	1.96	11	8	9	6
March.....	49	13	.....	22.9	.....	.....	13	9	9	.....
April.....	49	18	41.2	29.2	35.2	.....	9	6	15	.....
May.....	58	25	48.7	36.7	42.7	.....	7	3	21	.....
June.....	71	37	58.1	42.8	50.4	3.21	7	7	16	9
July.....	80	43	63.0	47.7	55.4	1.2	.....	.....	.....	7
August.....	68	42	59.6	47.6	53.6	3.8	.....	.....	.....	19
September.....	62	34	52.6	44.2	48.4	10.21	.....	.....	.....	23
October.....	54	23	46.6	37.5	42.0	7.99	3	6	22	21

LATOUCHE. Latitude 60° 3', longitude 147° 55'. Kennecott Copper Corporation.

1918.										
January.....	37	12	32.8	23.7	29.8	15.04	6	1	24	20
February.....	44	10	33.4	22.3	28.1	9.89	9	5	14	17
March.....	47	10	35.2	22.5	28.8	3.29	18	6	7	9
April.....	58	19	42.4	39.3	35.8	9.82	8	6	16	25
May.....	61	30	50.5	35.3	42.9	6.38	14	7	10	16
June.....	78	36	62.6	43.0	52.8	.81	18	9	3	9
July.....	82	43	66.7	49.1	57.9	3.59	15	3	13	10
August.....	72	40	58.5	47.1	52.8	13.10	9	3	19	20
September.....	63	36	52.5	45.2	48.8	34.76	0	6	24	24
October.....	55	29	47.1	38.8	43.0	24.83	5	3	23	24
November.....	48	15	39.7	29.3	34.5	18.59	7	5	18	21
December.....	43	9	34.7	27.6	31.2	30.36	5	3	23	22

Condensed meteorological reports—Continued.

MATANUSKA. Latitude 61° 30', longitude 149° 15'. F. E. Rader, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	38	-19	18.8	2.5	10.6	0.72	6	3	22	4
February.....	44	-17	23.3	1.5	12.4	.61	11	2	15	4
March.....	41	-16	27.7	4.1	15.9	.34	15	7	9	3
April.....	47	-6	40.3	26.1	33.2	1.41	3	10	17	8
May.....	62	25	54.5	34.2	44.4	1.10	5	7	19	7
June.....	76	35	66.3	44.8	55.6	.64	11	9	10	3
July.....	82	40	71.3	49.2	60.2	.82	14	7	10	5
August.....	70	32	61.5	46.6	54.0	4.27	5	6	20	18
September.....	67	28	54.9	41.7	48.3	2.34	5	2	23	11
October.....	58	10	41.4	28.0	34.7	.54	7	10	14	5
November.....	42	-22	24.1	8.3	16.2	.77	5	6	19	6
December.....	48	-31	22.0	6.5	14.2	1.60	5	6	20	7

NENANA. Latitude 64° 32', longitude 149° 7'. Ed Worster, observer.

1918.										
January.....	23	-41	-2.4	-20.2	-11.3	0.34	11	10	10	2
February.....	42	-46	9.9	-11.9	-1.0	.89	13	7	8	5
March.....	40	-49	16.1	-14.1	1.0	2.84	18	2	11	7
April.....	49	-25	37.2	10.7	24.0	1.55	10	4	16	11
May.....	69	19	54.4	33.2	43.8	.94	7	17	7	4
June.....	84	36	69.2	46.9	58	.90	9	14	7	5
July.....	94	45	79.1	54.2	66.6	.7	21	5	5	5
August.....	80	30	67.3	45.4	56.4	1.96	10	7	14	9
September.....	75	25	59.7	39.6	49.6	.31	11	8	11	7
October.....	52	-8	33.0	18.7	25.8	.77	15	9	7	7
November.....	+40	-38	8.2	-8.8	-.3	.27	11	8	11	5
December.....	37	-51	2.5	-16.7	-7.1	.21	10	11	10	3

NOATAK. Latitude 67° 34', longitude 163° 4'. J. H. Maguire, observer.

1917.										
December.....	15	-45	-10.6	-24.9	-17.8	0.10	24	0	7	2
1918.										
January.....	25	-42	-4.3	-18.8	-11.6	.42	16	3	12	6
February.....	35	-45	1.4	-17.4	-8.0	.38	17	0	11	10
March.....	25	-49	3.3	-19.1	-7.6	.8	17	1	13	7
April.....	38	-31	18	-6.5	5.8	.48	20	2	8	8
May.....	50	-2	37.7	21.2	29.4	1.02	16	3	12	9
June 1.....	67	26	51.5	35.3	43.4	1.23	8	4	10	.....
October.....	.....	-7	.....	13	.....	.24	18	5	8	3

NOME. Latitude 64° 30', longitude 165° 24'. Mrs. Bertha Grantham, observer.

1918.										
January.....	33	-22	8.3	-4.8	1.8	0.9	18	4	9	8
February.....	34	-30	7.3	-5.2	1.0	1.56	11	7	10	10
March.....	39	-32	12.2	-5.4	3.4	1.03	14	6	11	12
April.....	37	-30	20.4	2.6	11.5	.93	15	5	10	8
May.....	50	7	37.8	25.4	31.6	2.26	12	4	15	16
June.....	62	27	46.8	32.5	39.6	.87	14	3	13	4
July.....	74	35	59.2	44.9	52.0	2.09	6	3	22	16
August.....	65	27	57.1	43.4	50.2	1.19	9	2	20	11
September.....	57	22	47.8	36.5	42.2	1.92	6	9	15	11

¹ Observations for 22 days.

Condensed meteorological reports—Continued.

NOORVIK. Latitude 66° 50', longitude 161°. Chas. Replogle, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1917.	° F.	° F.	° F.	° F.	° F.	Inches.				
December.....	9	-40	-8.9	-22.7	-15.8	.....	23	0	8	.....
1918.										
January.....	23	-38	-2.6	-16	-9.3	.....	14	0	17	.....
February.....	34	-41	3.1	-12	-4.4	.....	17	0	11	.....
March.....	26	-43	1.9	-18	-8	.....	17	0	14	.....
April.....	42	-28	18.5	-2.7	7.9	.....	20	0	10	.....
May.....	57	-3	40.1	22.6	31.4	.....	16	0	15	.....
June.....	69	31	53.9	36	45	.....	.....	.....	.....	.....
July.....	82	34	67	49.1	58	.....	.....	.....	.....	.....

NULATO. Latitude 64° 43', longitude 158° 4'. H. C. Randle, observer.

1918.										
January.....	21	-45	0.8	-16.5	-7.8	1.18	12	3	16	14
February.....	35	-49	2.5	-18.1	-7.8	2.62	14	3	11	12
March.....	35	-46	10.7	-15.4	-2.4	1.39	17	6	8	10
April.....	47	-27	27.0	5.1	16.0	1.4	11	8	11	10
May.....	64	11	46.5	29.6	38.0	.48	8	5	18	7
June.....	70	27	63.0	39.3	51.2	.5	13	5	12	5
July.....	82	34	69.1	48.8	59	1.50	12	10	9	11
August.....	69	24	60.5	40.4	50.4	2.21	4	11	16	16
September.....	60	18	50.1	33.6	41.8	2.54	8	3	19	12
October.....	41	-14	28.0	14.2	21.1	1.08	12	4	15	8
November.....	18	-37	-.2	-14.9	-7.6	.95	10	6	14	11
December.....	29	-48	-.5	-17.4	-9.0	.99	6	6	19	6

PAXSON. Latitude 63°, longitude 145° 30'. Bertram S. MacDonald, observer.

1918.										
January.....	29	-28	9.5	-10.7	-0.6	.....	.....	.....	.....	.....
March.....	38	-35	23.1	-14.5	4.3	0.30	20	4	7	2
April.....	50	-12	34.3	10.3	22.3	3.57	6	10	14	10
May.....	64	12	48.9	23.8	36.4	.75	18	9	4	4
June.....	72	22	63.0	34.4	48.7	1.16	15	9	6	8
July.....	84	36	73.4	42.3	57.8	2.65	15	9	7	10
August.....	75	22	60.0	37.1	48.6	4.92	a 3	8	19	17
September.....	70	22	54.2	31.1	42.6	2.62	7	13	10	9
October.....	50	-20	33.5	13.6	23.6	1.45	10	8	13	8
November.....	34	-27	17.9	-.7	8.6	.24	13	12	5	4
December.....	39	-41	11.7	-6.1	2.8	1.33	10	11	10	7

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

1918.										
January.....	8	-43	-9.1	-21.2	-15.2	0.26	9	5	17	5
February.....	38	-44	3.2	-14.6	-5.7	.98	9	6	13	4
March.....	38	-46	18.2	-15	1.6	1.32	17	2	12	7
April.....	56	-19	37.6	10.5	24.0	1.30	13	5	12	12
May.....	76	18	56.2	30.4	43.3	.45	12	9	10	5
June.....	84	30	71.2	43.9	57.6	.58	14	5	11	8
July.....	96	40	80.1	50.4	65.2	.57	14	7	10	7
August.....	83	27	71.5	41.8	56.6	1.4	e 0	14	17	13
September.....	84	23	61.6	35.2	48.4	.70	e 6	4	15	7
October.....	60	-12	23.2	9.5	16.4	1.14	e 11	3	12
November.....	23	-46	.1	-14.6	-7.2	.81	2	6	22	8
December.....	24	-60	-9.9	-25.7	-17.8	.58	12	4	15	4

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Condensed meteorological reports—Continued.

RUBY. Latitude 64° 43', longitude 155° 29'. A. J. Day, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	20	-41	-5.4	-19.8	-12.6	1.16	20	7	4	6
February.....	39	-45	3.3	-13.9	-5.3	1.29	15	13	0	7
March.....	37	-41	12.4	-14.7	-1.2	.....	15	11	5	.....
April.....	50	-26	31.8	3.6	17.7	.95	15	9	6	5
May.....	61	15	47.8	30.8	39.3	1.27	8	18	5	8
June.....	f 78	f 32	f 65.9	f 39.4	f 52.6	1.54	17	8	5	7
July.....	88	34	75.0	48.2	61.6	1.07	10	16	5	6

ST. PAUL. Latitude 57° 15', longitude 170° 10'. Naval radio operators, observers.

1917.										
December.....	37	13	30.6	23.4	27.0	2.13	.....	.....	.....	8
1918.										
January.....	37	-6	22.5	12.3	17.4	.25	3	9	19	3
February.....	36	-6	27.6	16.6	22.1	.73	.....	.....	.....	6
March.....	37	-5	31.4	20.8	26.1	2.97	.....	.....	.....	12
April.....	39	10	34.8	25.9	30.4	1.38	.....	.....	.....	7
May.....	56	23	40.5	32.2	36.4	1.66	.....	.....	.....	11
June.....	58	30	48.7	37.4	43.0	.69	.....	.....	.....	5
July.....	58	40	50.8	43.0	46.9	3.38	.....	.....	.....	16
August.....	56	40	51.3	44.1	4.7	3.38	.....	.....	.....	9

SELDOVIA. Latitude 59° 26', longitude 151° 43'. E. R. Bogart, observer.

1918.										
January.....	41	1	33.4	17.7	25.6	3.66	3	3	25	14
February.....	51	1	32.7	16.6	24.6	2.57	9	11	8	11
March.....	40	1	30.9	15.4	23.2	12.23	18	1	12	6
April.....	42	16	36.4	27.3	31.8	3.38	3	12	15	13
May.....	56	27	47.6	36.5	42.0	.90	10	9	12	12
June.....	67	33	57.5	41.7	49.6	.45	17	4	9	4
July.....	72	38	64.9	47.0	56.0	.56	19	5	7	7
August.....	.....	.....	.....	.....	.....	4.01	11	9	11	15
September.....	.....	.....	.....	.....	.....	15.77	3	13	14	22
October.....	.....	.....	.....	.....	.....	4.81	14	9	8	13
November.....	.....	.....	.....	.....	.....	5.11	5	10	15	17
December.....	45	-5	31.3	18.2	24.8	6.54	8	10	13	15

SEWARD. Latitude 60° 6', longitude 149° 27'. F. D. Antrim, observer.

1918.										
February.....	44	2	28.6	16.3	22.4	1.00	✓ 11	0	17	2
March.....	52	5	33.4	18.7	26.0	.49	16	0	15	1
April.....	50	18	42.4	29.3	35.8	3.36	2	5	23	8
May.....	75	30	55.9	37.3	46.6	1.3	3	11	17	7
June.....	81	37	62.2	44.6	53.4	1.14	8	8	14	3
July.....	82	40	68.1	50.2	59.2	1.98	15	3	13	2
August.....	70	39	62.8	44.8	53.8	6.64	6	4	21	13
September.....	58	30	52.2	37.4	44.8	26.35	3	3	24	19
October.....	65	21	49.2	34.8	42.0	16.4	2	6	23	14
November.....	45	5	35.4	17.3	26.4	6.41	6	5	19	16
December.....	44	-12	31.1	13.2	22.2	13.35	✓ 7	6	18	16

Condensed meteorological reports—Continued.

SITKA. Latitude 57° 3', longitude 135° 19'. C. C. Georgeson, observer.

Month.	Temperature.					Total precipitation.	Number of days—			
	Maxim.	Minim.	Mean maxim.	Mean minim.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	47	17	40.1	30.9	35.5	8.87	7	1	23	18
February.....	44	12	38.4	27.6	33.0	6.39	7	5	16	20
March.....	50	9	40.0	26.7	33.4	4.52	10	6	15	22
April.....	50	23	45.2	32.5	38.8	5.7	2	9	19	18
May.....	64	30	54.5	36.8	45.6	5.47	11	8	12	14
June.....	74	34	59.5	44.2	51.8	3.45	7	3	20	16
July.....	78	40	62.8	49.6	56.2	1.77	13	1	17	13
August.....	62	45	56.6	49.8	53.2	14.45	6	4	21	25
September.....	68	37	58.1	45.1	51.6	8.94	13	7	10	12
October.....	61	33	50.4	40.8	45.6	15.98	0	4	27	28
November.....	58	22	45.7	34.5	40.1	17.14	3	2	25	24
December.....	48	16	39.7	28.8	34.2	13.43	3	4	24	23

SKAGWAY. Latitude 59° 27', longitude 135° 19'. F. J. Vandavall, observer.

1918.										
January.....	44	-3	28.8	20.0	24.4	0.92	4	3	24	12
February.....	38	5	27.6	17.1	22.4	.73	7	5	16	9
March.....	46	5	28.9	17.4	23.2	.29	10	4	17	2
April.....	55	17	45.5	32.7	39.1	.43	0	14	16	6
May.....	67	25	58.3	36.1	47.2	.65	14	9	8	5
June.....	81	34	66.5	43.6	55.0	.07	12	9	9	1
July.....	86	36	73.4	46.9	60.2	1.48	17	6	8	7
August.....	74	38	64.3	48.1	56.2	1.22	6	8	17	15
September.....	72	29	62.0	41.4	51.7	4.99	15	5	10	8
October.....	59	19	45.7	36.2	41.0	4.03	0	9	22	15
November.....	45	14	38.6	29.8	34.2	7.60	2	3	25	17
December.....	43	1	31.8	23.6	27.7	3.53	3	3	25	13

STRELNA. Latitude 61° 32', longitude 144° 6'. W. J. Dwyer, observer.

1918.										
January.....	40	-32	6.8	-10.8	-2.0					
February.....	46	-40	21.1	-7.6	6.8		17	0	11	
March.....	42	-38	23.1	-7.3	7.9		22	0	9	
April.....	50	-5	40.2	20.2	30.2					
May.....	70	22	58.2	32.3	45.2					
June.....	80	30	70.3	38.8	54.6					
July.....	88	36	82.1	42.1	62.1					
August.....	78	30	67.1	40.1	53.6					
September.....	78	22	62.1	34.8	48.4					
October.....	66	-10	39.9	19.0	29.4					
November.....	44	-28	22.0	4.0	13.0					
December.....	42	-51	15.6	-4.2	5.7					

TANANA. Latitude 65° 10', longitude 152° 06'. B. W. Roberts, observer.

1918.										
January.....	14	-47	-7.7	-22.1	-15.0	0.22	17	5	9	7
February.....	34	-47	1.9	-18.6	-8.4	1.09	10	9	9	11
March.....	32	-52	10.2	-19.7	-4.8	1.43	12	7	12	9
April.....	43	-34	29.1	3.9	16.5	1.01	5	11	14	11
May.....	67	16	48.6	28.9	38.8	.79	9	9	13	8
June.....	77	31	64.5	41.7	53.1	2.20	10	6	14	13
July.....	88	35	74.6	47.4	61.0	2.22	8	13	10	13
August.....	74	25	63.6	40.8	52.2	1.94	5	9	17	18
September.....	75	22	54.7	36.4	45.6	1.66	8	4	18	13
October.....	53	-6	26.6	16.3	21.4	.54	12	2	17	4
November.....	26	-40	-.4	-11.9	-6.2	.30	10	7	13	6

Condensed meteorological reports—Continued.

VALDEZ. Latitude 61° 7', longitude 146° 16'. Myrtle F. Billings, observer.

Month.	Temperature.					Total pre- cipitation.	Number of days—			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1918.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	36	- 3	24.9	11.5	18.2	5.12	16	1	14	15
February.....	34	-12	24.8	7.4	16.1	1.99	19	0	9	7
March.....	40	-11	27.8	8.5	18.2	1.65	22	2	7	10
April.....	45	8	37.6	22.5	30.0	7.54	6	2	22	24
May.....	56	26	49.9	32.4	41.2	1.5	14	5	12	10
June.....	74	34	58.2	43.1	50.6	1.24	14	5	11	10
July.....	76	40	62.4	46.6	54.5	1.39	15	1	15	9
August.....	65	36	56.5	41.9	49.2	5.98	6	8	17	22
September.....	59	30	49.5	39.3	44.4	14.2	4	2	24	21
October.....	54	20	41.4	32.1	36.8	4.41	7	7	17	16
November.....	40	- 2	31.6	21.6	26.6	4.49	5	3	22	17
December.....	41	-10	26.2	16.5	21.4	8.22	8	5	18	15

WALES. Latitude 65° 36', longitude 168° 4'. Arthur Nagozruk, observer.

1917.										
December.....	26	-28	5.6	-8.7	-1.6	.....	2	11	18	.....
1918.										
January.....	31	-24	-3.1	-15.1	-9.1	.....	1	7	23	.....
February.....	33	-31	6.3	-10.0	-1.8	.....	2	10	16	.....
March.....	32	-25	12.6	-6.1	3.2	.....	11	3	17	.....
April ^b	36	-22	16.9	-3.7	6.6	.....	8	10	10	.....
May ¹	47	1	34.1	22.7	28.4	0.38	0	4	25	4
June ²	58	27	43.6	32.0	37.8	.....	a2	12	15	.....
July ^b	64	34	53.2	40.9	47.0	.83	5	8	16	11
August ³	62	36	52.6	42.4	47.5	.61	5	8	10	6
September ^a	54	26	44.1	35.8	40.0	1.20	5	3	21	13

WRANGELL. Latitude 56° 28', longitude 135° 19'. J. S. Clark, observer.

1918.										
January.....	48	7	36.6	26.9	31.8	9.07	9	1	21	20
February.....	44	12	35.1	25.8	30.4	6.06	11	1	16	15
March.....	44	9	37.3	26.9	32.1	5.48	12	2	17	22
April.....	57	26	47.0	33.0	40.0	5.81	12	4	14	14
July ^d	84	41	71.8	49.9	60.8	e 1.51	7	5	10	8
August.....	72	44	62.7	49.5	56.1	14.49	7	7	17	20
September.....	68	33	60.8	44.3	52.6	4.45	13	8	9	10
October.....	59	29	49.7	40.2	45.0	16.51	2	0	29	28
November.....	57	24	43.6	33.7	38.6	10.86	0	15	15	26
December.....	50	16	37.3	28.4	32.8	8.76	1	5	25	24

YAKUTAT. Latitude 59° 33', longitude 139° 41'. E. M. Axel'son, observer.

1818.										
January.....	40	12	35.3	27.0	31.2	11.35	a2	5	23	15
February.....	37	11	32.7	23.4	28.0	6.06	10	4	14	13
March.....	44	9	34.6	20.6	27.6	6.45	14	5	12	11
April.....	45	24	39.8	31.2	35.5	11.71	3	2	25	19
May.....	56	29	48.6	35.1	41.8	5.92	17	3	11	9
June.....	71	37	56.0	44.6	50.3	2.9	9	4	17	9
July.....	70	44	62.0	47.6	54.8	2.38	13	3	15	9
August.....	62	45	58.5	48.3	53.4	14.81	4	3	24	20
September.....	.....	.....	.....	.....	.....	8.30	d8	4	14	10
October.....	f 63	31	46.6	38.4	42.5	15.67	f 2	3	20	20
November.....	g 50	.....	g 43.9	h 33.5	g 38.7	g 14.85	g 1	4	18	21

¹ Observations for 29 days.² Observations for 27 days.³ Observations for 23 days.

