

# Importance and Development of the Reindeer Industry in Alaska

HERBERT C. HANSON

*Research Professor, Department of Biology, The Catholic University of America, Washington, D. C.*

## PRESENT STATUS

THE chief use that can be made of much of the tundra and adjoining forest in western and northern Alaska is the raising of reindeer. Aamodt and Savage ('49, p. 101) as a result of their special exploratory investigations in 1946 on cereal, forage, and range problems and possibilities in Alaska concluded: "The vast tundra area of northern, western, and other parts of Alaska may be utilized to best advantage for the production of reindeer, caribou, musk oxen, and possibly yak. This extensive and largely undeveloped domain is deserving of reconsideration for these purposes." The total potential area has been estimated as high as 400,000 square miles by Grosvenor ('03), and as late as 1945 by Palmer ('45A) at 150,000 square miles. Probably a total of about 100,000 square miles could be found now, but it would be safer to figure on about 50,000 square miles because of barren and worthless range, such as rocky slopes, gravel bars, lakes, marsh lands, overgrazed areas, burned-over lands, winter range that ices over frequently or where the snow becomes too deep, and areas frequented by caribou herds or subject to wolf predation where control is inadequate. Reindeer are dependent during the winter upon lichens chiefly, during the summer upon shrubs and herbs. Overgrazing and trampling in the past have depleted the lichens over a 10- to 20-mile wide strip along the seacoasts, so it is no longer suitable for winter range. In some areas, such as the western part of Seward pen-

insula, good winter range is so far away from the summer range that it is difficult to use either. In general there is insufficient good winter lichen range at present to make use of the large areas of summer shrub-herb range.

If a grazing requirement of 100 acres per reindeer yearlong (Palmer, '45A) is used, then 50,000 square miles would support 320,000 head, but even this estimate is unreliable because of the numerous problems and difficulties, and the small amount of basic data on which to base management of the reindeer and the range. The present policy of the Bureau of Indian Affairs of the Department of the Interior is apparently feasible with respect to encouraging the industry to expand in accordance with the selection of dependable Eskimos for purchasing herds as individuals and the assignment of areas for grazing that are free from caribou invasions and uncontrolled wolf predation, and where good winter range is accessible within a reasonable distance. Additional research is needed on range resources and on reindeer to meet the needs of the industry.

The total number of reindeer in Alaska as of June 30, 1951, was estimated at 27,245 in 17 herds, located chiefly in the Kotzebue Sound region, on Nunivak Island, in the Norton Sound region, and in the vicinity of Barrow (Mountjoy, '51). During the year ending June 30, 1951, 1700 head were butchered for sales, 957 of these for operators and other native use; the value of the meat and hides used and sold was \$117,000; and

169 families secured part of their cash income from reindeer. The estimated value of the reindeer in Alaska was \$546,900.

Aerial and ground surveys by the writer (Hanson, '52), chiefly in the summer of 1951, and to some extent in 1950 and 1949, showed that areas which had been heavily utilized during the period of large herds, or which had burned over, now have a sparse growth of lichens. Good lichen range does, however, occur in places 10 to 15 miles inland from coasts, especially near and in open spruce forests east of Norton and Kotzebue sounds, and in the southeastern part of Seward peninsula.

#### GROWTH AND DECLINE OF THE REINDEER INDUSTRY

In 1891 Sheldon Jackson inaugurated the introduction of reindeer into Alaska from Siberia. By 1902 when the importations ceased, a total of 4795 head had been introduced, mostly in the western end of Seward peninsula, where W. T. Lopp and B. Gibson in 1891 had shown that lichens were abundant. In 1894 and 1898 Lapps, Finns, and Norwegians were brought to Alaska for teaching and working in the industry. From 1898 to 1904 damage to the range by fires, often started by miners, was pointed out. In 1911 the first shipment of reindeer meat, 125 carcasses, was made to the States. In this year counts showed 33,629 head in 46 herds, 60 percent owned by 460 Natives, 11 percent by the Government, 14 percent by missions, and 15 percent by Lapps. In 1912 there were 1281 head used as sled reindeer. In 1913 W. C. Shields stated that it was difficult to find summer grazing in several sections.

In 1914 the Lomen Bros. of Nome organized a company to produce and export reindeer meat on a large scale. Between 1914 and 1921 this company

purchased about 8600 head at \$18 to \$30 each. It built corrals, slaughter and cold-storage plants, warehouses, etc.

The U. S. Biological Survey, now a part of the Fish and Wildlife Service, started research on reindeer in 1920 and this was continued until about 1935. The research resulted in publications by Hadwen and Palmer ('22), several by Palmer ('26, '29, '34, '45A, '45B), Palmer *et al.* ('33), and Palmer and Rouse ('45).

In 1925 twelve caribou bulls were landed on Nunivak Island for crossing with reindeer. In 1929 the supervision of the Alaskan reindeer industry was transferred to the Governor of Alaska. The trek of 3400 reindeer, starting from the Kotzebue region in 1929, reached the Mackenzie River delta in Canada in 1935. About 2,500,000 pounds of reindeer meat and 20,000 hides were shipped from Alaska in 1930. In 1931 a Reindeer Council, consisting of 5 members, was appointed to administer reindeer affairs; this was changed in 1932 to advisory capacity only. In 1932, when the peak number of about 641,100 head was reported, two representatives of the Secretary of the Interior found that problems of personnel, trespassing, herding, and marketing were aggravated by animosity, competition in trade, insufficient supervision, and neglect. Wolves were increasing in numbers. In 1937 the Reindeer Service was transferred to the Office of Indian Affairs and assigned to the Division of Education.

The Reindeer Act of 1937 (50 Stat. 900) authorized the establishment of a Native industry, restricting ownership to Natives, and authorized the appraisal for purchase of non-Native-owned reindeer. In 1940 the Government purchased from non-Native owners 84,001 head at cost of \$333,003.00 and improvements at \$112,925.72. The stated policy of the

Government was to assist the Natives in the conduct of the reindeer industry on a subsistence basis. Administration of the industry, including the use of the range, was transferred in 1941 to the Division of Extension and Industry and the Division of Forestry and Grazing. In 1949 the Alaska Game Commission reported killing in Alaska 488 wolves and 355 coyotes; in 1950, 1070 and 800 respectively. In 1950 the number of reindeer were estimated at 25,000, possibly the low point in the downswing. Belcher ('52) reported that at the close of 1951 wolf predation was serious among the herds in the Kotzebue region and on the Kaka-ruk herd on the Seward peninsula, and the Fish and Wildlife Service had inadequate funds to carry on predator control.

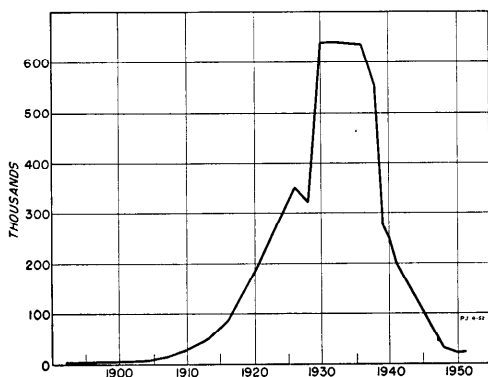


FIGURE 1. Trend in numbers of reindeer in Alaska from 1892 to 1951.

The numbers of reindeer in various years between 1892 and 1951 are shown in the graph in Figure 1. This graph is very instructive in showing the course of the industry. It shows the gradual increase in numbers up to about 1902, the moderate rate between 1902 and about 1912, the very rapid rate from 1912 to about 1930, the levelling off between 1930 and about 1934, the gradual decline to about 1938, the very rapid decline

from 1938 to about 1945, then a gradual decline to about 1950, and a slight increase in 1951. The ascending part of this curve is typical of the growth of a population of animals in the presence of abundant food and in the absence of serious pressure by enemies such as predators, parasites, and diseases. This curve "provides a numerical measure of the population's past history up to the time of most recent observation; summarizes a wealth of knowledge about the group in question; and in so doing raises particular questions for analysis and synthesis" (Allee, *et al.* '49, p. 330).

This curve is one kind of a growth curve occurring generally in animal populations, especially the ascending or positive growth portion. An important difference, however, with the growth curves of many animal populations is the short duration of the equilibrium portion, and the practical absence of a period of oscillations and fluctuations following the levelling off. It shows instead an almost immediate decline after the maximum is reached. This indicates that the number of reindeer was permitted to increase far beyond the optimum in relation to the capacity of the areas occupied by them. If the number had levelled off at 300,000 to 400,000, a long period of fluctuation about a mean, or relative numerical stability, might have followed, instead of the crash. The levelling off, followed by fluctuations, has occurred following the introduction of animals in some countries, as when sheep were introduced into South Australia about 1838, and into Tasmania about 1814. In the first country the period of positive growth (1838-1890), resulting in a population of nearly 7,000,000 head, has been followed by a period of oscillations and fluctuations to the present. In Tasmania the population levelled off at about 1,600,000 head about 1856, and has been maintained

since then in a state of semi-equilibrium (Allee, *et al.* '49, chap. 21). It is more difficult to maintain a partly domesticated animal, as the reindeer, in a state of semi-equilibrium, but the goal should be to determine the proper point for levelling off (the asymptote) at which numbers could be maintained at a mean stability for a long time.

The curve in Figure 1, with such a rapid positive rate, followed by the steep negative rate, shows that insufficient consideration was given to the supply of food plants, range allotments, proper herding, etc., and the influence of these factors on the growth and maintenance of the reindeer herds. In fact, during the first 35 or 40 years, the forage, especially the lichens, was regarded (if at all) as almost limitless, and no one apparently thought they would ever be depleted. During this expansion period "Everyone was optimistic. No one issued warnings that the balance of nature would operate inexorably, that in this unhealthy development of wild reindeer lay the seeds of the reindeer business's destruction. Reindeer owners, Native and white, made effort to acquire as many reindeer as possible. . . . Owners made no effort . . . to limit the number of reindeer to the amount of plant life the ranges would support in perpetuity" (Rood, '45, pp. 5-6). The over-optimism, as late as 1934, is shown by Palmer ('34, p. 5) who estimated the area of grazing land suitable for reindeer in Alaska at 200,000 square miles with a carrying capacity of 4,000,000 head, and an annual surplus of 1,000,000 hides and 10,000,000 pounds of meat.

"Apparently in every area where reindeer have been introduced they have increased rapidly in numbers to a peak, and then a decline has set in. This is a biological cycle in a natural state, as animals increase in numbers until feed is insufficient to carry the greater number or

predators increase to a point where the host cannot support them. The primary animals then decrease rapidly and the feed supply builds up or the predators die or migrate. With better food or fewer predators the primary animals start increasing again on another cycle. Man upsets this course in domestic animals by the safeguarding of feed or protection from predators, and theoretically should be entitled to the surplus or harvest. Where no surplus exists the cause is usually attributable to neglect—voluntary or otherwise. In the reindeer industry this neglect is ordinarily lack of herding" (Burdick, '40, p. 25).

At present it seems hardly believable that lichens were ever abundant near the coasts, where the reindeer were mostly located during the positive growth period. But statements by various observers indicate that they were. Palmer ('34, p. 24) wrote: "When reindeer were first introduced into Alaska, the immediate coastal areas contained a considerable cover of lichens—now largely disappeared—owing probably to the earlier close confinement of the herds to the coast." He used in his 1926 publication a photograph showing men gathering lichens from a dense stand close to the seashore, apparently near Nome, now depleted. Again in a photograph, Palmer and Rouse ('45) showed the excellent stand of lichens in the Dexter Creek area about 8 miles north of Nome. They stated that in 1922 the cover of this stand consisted of 92 percent lichens and the height was 3 to 5 inches, and that little change took place in the 10 years following 1922. In 1951 the lichens in this same stand, which had not been grazed for several years, averaged 1 to 2 inches high, and the cover varied from 50 to 90 percent. It is remarkable that the cover and height remained good near the coast in the vicinity of Nome for such a long time, and that

depletion did not occur until after 1932. This shows a striking relationship to the beginning of the decline in the growth curve of the reindeer population (Fig. 1).

Other indications of the abundance of lichens near the coasts are given by various writers. Smith ('13) stated that reindeer moss was abundant on the hill slopes between the mouth of the Noatak River and Cape Krusenstern and was being grazed by reindeer. The region now has only poor growth of lichens. Shields (Anon. '16) reported that in 1916 lichens were stored for feeding his sled reindeer before his arrival at Candle, Nome, Chiniak, Council, Kotzebue, Teller, and Sinuk. In 1950 and 1951 it was impossible to find enough lichens for such a purpose in most of these places. Jackson ('01) reported that lichens were abundant the whole distance from near Unalakleet to St. Michael and then to Bethel during a reindeer drive. John Muir ('17) described "the furred bed of lichens and mosses on which the bright leaves and berries were painted" in the Kotzebue Sound region in 1881.

The decline in the number of reindeer after about 1932 was due to many causes and should not be attributed to only one. This is usual in the crash of animal populations (Trippensee, '48, p. 391). The chief cause was undoubtedly the depletion of the ranges that were used and the failure to move herds to good unused ranges. Another chief cause was inadequate herding. Predation by increased numbers of wolves became more serious, but undoubtedly many losses due to other causes were attributed to wolves. Careful herding would probably have prevented much loss by wolves, but their predation appears difficult to prevent in brush and timber and during the winter. Even today in northern Norway losses due to wolves are often heavy.

The depletion of the range was due to

excessive grazing and trampling, during both summer and winter in many areas. This was accentuated by the concentration of reindeer on limited areas. Fire was serious, especially in the destruction of lichens. Inadequate herding was due to the unwillingness of herders to endure the hardships and inconveniences of following the herd, crude range facilities in places, conflicts between herders and owners, village attractions, absentee ownership, lack of adequate regulations and enforcement, and lack of enough knowledge and appreciation of the range and the habits and requirements of the reindeer not only among the owners and herders but also among the supervisory officials. During the thirties interest in reindeer declined, brought on partly by the system of joint ownership, partly by the low value of reindeer products, partly by marketing difficulties some of which were caused by objections in the states to importation of reindeer meat in competition with that of domestic livestock. Poor herding, or the lack of any herding, contributed to losses from wolves, and probably some from bears, to starvation in severe winters and the springs following, and to straying off with caribou or in search of better range. Other causes of the decline in numbers were the excessive slaughtering, not only for human food, but for dog food, fox bait, etc.; losses by parasites and diseases, especially in weakened animals; inbreeding; excessive numbers of bulls; over-optimism; lack of enough trained personnel and efficient supervision; insufficient instruction about reindeer and range management in the schools; insufficient research; and failure to put into practice valuable recommendations made by competent investigators and others such as Palmer ('36, '29, '34), Burdick ('40), and Arnold, Cooley, *et al.* ('41). There was insufficient assistance and guidance by government

agencies especially after the transfer of ownership from Whites to Natives, when the industry was changed from a commercial to a subsistence basis. It is no wonder that the decline in numbers was so rapid, and that by 1941 reindeer raising in Alaska was "a very sick industry," as reported by Arnold, *et al.* ('41).

should not be established until reliable, trained, and cooperative operators and herders are secured. Regulations governing the use of the range and management of the reindeer are in preparation, and conformance to them under efficient supervision will be essential. It is the opinion of the writer that Eskimos interested in the reindeer business can be

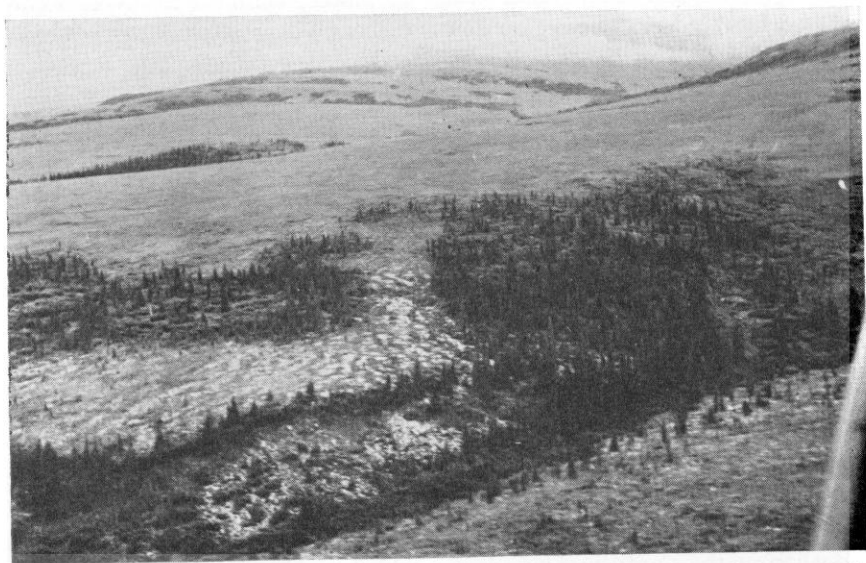


FIGURE 2. An excellent stand of reindeer lichens in the dwarf birch-heath-lichen type between stands of white spruce-shrub type. Wide areas of the cottongrass-sedge-dwarf heath shrub complex. Alder thickets on hillsides in the background. The Ungalik River valley, east of Norton Sound, July 31, 1951.

#### FUTURE OF THE REINDEER INDUSTRY IN ALASKA

In view of the numerous problems and difficulties, and the sad history, there appears to be little question that the development of the industry should be gradual. The locating of herds should be controlled so that only areas where there is an adequate supply of lichens on the winter range (Fig. 2) and on the fawning range will be used, where there is freedom from invasions by caribou, and where wolf control can be obtained when needed. The prevalence of diseases and insect pests also needs consideration. New herds

found and trained as the industry grows, but more aid and interest in instruction may be needed from the Alaska Native schools and Territorial schools than seems to be the case at present. Instruction about range resources and in reindeer husbandry should be given in many of the schools, and interested boys should be given opportunity to secure practical training in herding with the Government herd or other herds under good management. If their interest continues, apprenticeships should be made available. The present loan and repayment agreements with purchasers of new herds, involving

repayment in kind, appear, on the whole satisfactory.

The development of the industry will also be governed by the opportunities for marketing meat and hides. It appears that marketing should be limited chiefly to the home needs of the Eskimos and to markets in Alaska. "Investigations and studies of the reindeer industry should be made in order that the herds will play the greatest possible part in the general development of northern and western Alaska. Food and clothing requirements of the natives should be the first concern of the industry" (Burdick, '40, p. 25). Heintzleman ('36) stated that it seems reindeer production should be restricted to local needs and abandoned as an export

earlier because planes can be made available in most places when needed.

Sound development of the industry requires that the range resources of each grazing unit should be surveyed for major range types (Hanson '51, '52), classified into range condition classes, and the carrying capacities estimated. A grazing plan is needed for each unit, which will show the seasons of use, routes of travel, camps, frequency of grazing, rotation plan, places and time of handling (Fig. 3). Regular reports should be obtained from operators at least once a year regarding conformance with the grazing plan, numbers and sex of fawns, deaths due to predators or disease, number slaughtered, castrated, etc.

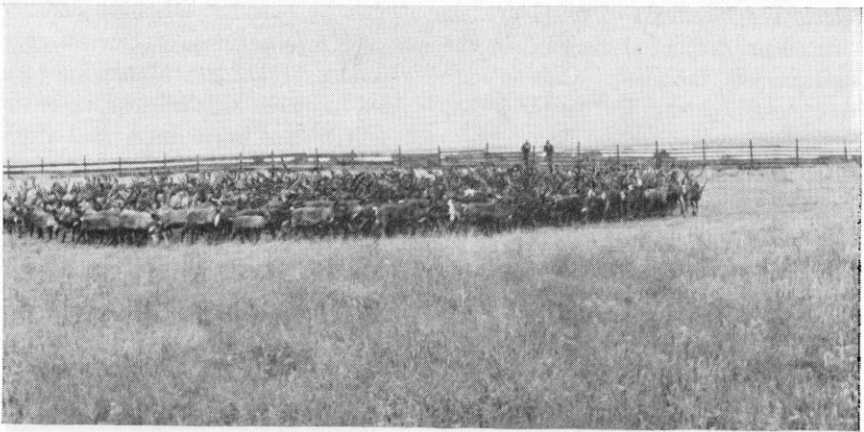


FIGURE 3. Reindeer milling, anti-clockwise, in the corral at Grass Lake on the Seward peninsula. August 5, 1951.

business. At present there is much greater demand in Alaska for reindeer meat than can be supplied. The export of meat to the States involves many additional problems and need not be considered at present, at least not until the industry has grown considerably, the Alaska consumer demand is satisfied, and the demand for meat in the States exceeds available supplies. Transportation of meat and hides is not so great a problem as

In the evaluation and management of reindeer ranges many factors must be taken into consideration in addition to the kinds and abundance of forage plants. Some of the climatic factors to consider are the frequency of icing-over, or crust- ing, and the depth of the snow during the winter; direction and intensity of the wind (reindeer travel against the wind); duration of light; temperatures; humidity; kinds and times of precipitation. Soil

and topographic conditions that influence management are the dates of freezing and thawing of the ground, rivers, lakes, and the sea; the amount and duration of soil moisture contents; frost action in the ground; kind of soil; ice action along the coasts, relief; ruggedness, etc. Biotic factors to consider are diseases and parasites, predators, caribou, forest and shrubs for fuel, shelter, etc. Fire, because of its destructiveness is almost in a class by itself, but it is usually started by man. Other human factors to consider are the abilities and inclinations of owners and herders, market needs, transportation facilities, etc.

The operator who is building up a reindeer herd should be given necessary kinds of assistance such as instruction in better methods of management of reindeer and range, in securing herd dogs, and in the construction of facilities. Cabins are needed especially during the winter and at handlings. Whenever possible encouragement should be given and interest shown in solving his problems. The giving of the proper kinds of assistance, not doles, requires direct and personal knowledge, gained on the ground, of the problems and needs of each operator. At present this is impossible with the very small staff engaged in reindeer administration; consisting of the part time of the Assistant Director of Resources in the Juneau office of the Alaska Native Service, part time of the Administrative Assistant in Nome, another in Kotzebue, and part time of a few teachers. All of these people have so many other duties that it is impossible for them to keep in close touch with the needs of the operators and with the condition of each herd and range. Furthermore, most of them lack the needed kind of technical knowledge for this work. At least two scientifically trained assistants are needed to work under the Assistant Director of Resources. One should be

competent in research, the other in extension work and administration.

Before sound, long-term range management procedures and plans can be formulated, much additional knowledge must be secured by research. A few of the problems that need the services of a competent research man are surveys to determine the locations of range suitable for the different seasons, effects of various frequencies of grazing, values of different species of plants at various times of the year, rate of recovery from various intensities of grazing, nature and extent of wolf predation, control of losses due to caribou, and the needs and habits of the reindeer. Sample plots, to be examined and measurements taken about every two years, should be installed in several range types and under different conditions of use. Examinations of the range, of the reindeer, and of the influencing conditions need to be made at all seasons of the year. So little has been done, and there is so much to do, that the full time of one man should be given to research. This is little enough, in view of the extent of the reindeer country and the need of the industry for basic information, if it is to become established on a technically sound foundation.

Another assistant to the Assistant Director of Resources is needed to help in administrative matters, such as checking the tallies at reindeer handlings, aiding operators in filling out reports, advising about market needs and opportunities, etc. He is also needed to conduct extension activities, advising operators about improved management methods for both reindeer and range, as well as marketing. He would aid in the teaching of apprentices. Another need is to disseminate information to consumers about the availability, uses, and preparation of reindeer meat and skins. He would also work to secure better appreciation and coopera-



tion of the Alaska Native Service schools and the Territorial schools in the reindeer industry and in the training of apprentices. At every opportunity he would point out the destructive and long-lasting damage wrought by fire, excessive trampling, and other abuses, especially to the lichen range; and the need for cooperation by all in the development of a sound reindeer industry.

### Note

In a paper received after this article was in page proof, Scheffer ('51) ascribed the decrease in reindeer on St. Paul Island to a number of causes, primarily overpopulation.

### ACKNOWLEDGEMENTS

The work on which this article is based was supported in part by the Arctic Institute of North America with funds provided by the Office of Naval Research. For numerous courtesies and facilities thanks are extended to the Arctic Institute of The Catholic University of America and to the Bureau of Indian Affairs of the U. S. Dept. of the Interior.

### LITERATURE CITED

- AAMODT, O. S., AND D. A. SAVAGE. 1949. Cereal, forage, and range problems and possibilities, in Report on exploratory investigations of agricultural problems in Alaska. U. S. Dept. Agr. Misc. Pub. 700: 87-124.
- ANONYMOUS. 1912. Report on the education of the Natives of Alaska and the Reindeer Service, 1910-1911. U. S. Bur. Ed., Alaska School Serv. Whole No. 484. 91 pp.
- . 1911-17. Reports on the work of the Bureau of Education for the Natives of Alaska. U. S. Bur. Ed., Buls. 31, 32, 36, 47, 48.
- ALLEE, W. C., A. E. EMERSON, O. PARK, T. PARK, AND K. P. SCHMIDT. 1949. Principles of animal ecology. W. B. Saunders, Philadelphia. 837 pp.
- ARNOLD, L. D., A. C. COOLEY, F. B. LENZIE, AND J. M. COOPER. 1941. Report on the management of reindeer and the reindeer range in Alaska. 23 pp. Typed.
- BELCHER, D. M. 1952. Personal communication. January 11.
- BURDICK, C. G. 1940. Report to the Secretary of the Interior. Reindeer Acquisition Unit. 33 pp. Mimeo.
- GROSVENOR, G. H. 1903. Reindeer in Alaska. Smithsn. Inst. Rpt. for 1902: 613-623.
- HADWEN, S., AND L. J. PALMER. 1922. Reindeer in Alaska. U. S. Dept. Agr. Bul. 1089. 74 pp.
- HANSON, HERBERT C. 1951. Characteristics of some grassland, marsh, and other plant communities in western Alaska. Ecol. Monog. 21: 317-378.
- . 1952. Vegetation types in northwestern Alaska. Ms.
- HEINTZLEMAN, B. F. 1936. Reindeer grazing. Sen. Doc. 74 Cong. 2 Sess. 199: 581-598.
- JACKSON, S. 1891-1908. Annual reports on introduction of domestic reindeer into Alaska. Nos. 1-16. Govt. Prtg. Off.
- MOUNTJOY, C. R. 1951. Personal communication. November 19.
- MUIR, JOHN. 1917. The cruise of the Corwin. Houghton, Mifflin Co., Boston. 303 pp.
- PALMER, L. J. 1926. Progress of reindeer investigations in Alaska. U. S. Dept. Agr. Bul. 1423. 37 pp.
- . 1929. Improved reindeer handling. U. S. Dept. Agr. Cir. 82. 18 pp.
- . 1934. Raising reindeer in Alaska. U. S. Dept. Agr. Misc. Pub. 207. 41 pp.
- . 1945A. The Alaska tundra and its use by reindeer. U. S. Dept. Int., Off. Ind. Aff. 28 pp. Mimeo.
- . 1945B. A standard method for proper butchering and dressing of reindeer. U. S. Dept. Int., Off. Ind. Aff. 22 pp. Mimeo.
- , N. R. ELLIS, AND G. L. BARNUM. 1933. The vitamin content of lichens. Jour. Nutr. 6: 443-454.
- , AND C. H. ROUSE. 1945. Study of the Alaska tundra with reference to its reactions to reindeer and other grazing. U. S. Dept. Int., Fish and Wildl. Serv. Res. Bul. 10, 48 pp.
- ROOD, J. S. 1945. Building a reindeer business. Reindeer Serv. Cir. 73. 23 pp. Mimeo. Nome.
- SCHAEFFER, V. B. 1951. The rise and fall of reindeer herd. Sci. Monthly 73: 356-362.
- SMITH, P. S. 1913. The Noatak-Kobuk Region, Alaska. U. S. Geol. Surv. Bul. 536, 157 pp.
- TRIPPENSEE, R. E. 1948. Wildlife management. McGraw Hill Book Co., Ltd., New York. 479 pp.