

# REINDEER HERDING IN TRANSITION: HISTORICAL AND MODERN DAY CHALLENGES FOR ALASKAN REINDEER HERDERS

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## Abstract

The people of northwestern Alaska have had a long relationship with local populations of *Rangifer tarandus*. During the last 200 years this relationship has changed from one of subsistence to overexploitation of caribou (the name for wild reindeer in North America), to commercial livestock production of semi domesticated reindeer and now may be returning to a subsistence economy based on caribou. Reindeer were introduced to Alaska in 1892 because of the disappearance of caribou, a subsistence resource. Until recently, reindeer meat and velvet antler production generated significant employment and revenue important to the economies of rural Alaskan communities. However, from 1976 to 1996 the Western Arctic Caribou Herd (WACH) increased from about 75,000 to 463,000 animals. Concurrently, winter range use of the WACH shifted westward onto traditional reindeer ranges of the Seward Peninsula for the first time in over 100 years. This event has produced socio-economic and ecological consequences for the region. Many reindeer herders have lost 75–100 percent of their herds through commingling and out-migration with wild caribou. This loss, amounting to over 17,000 reindeer, represents a potential economic value of millions of dollars. Many herders have adopted new technologies, such as satellite telemetry and intensive herding to salvage what is left of their herds. Here we discuss the role of grazing animals and patterns of human resource use in an Arctic system. We then discuss our findings on the effects and changes in management practices brought about by caribou incursion in the context of the regional economy on the Seward Peninsula.

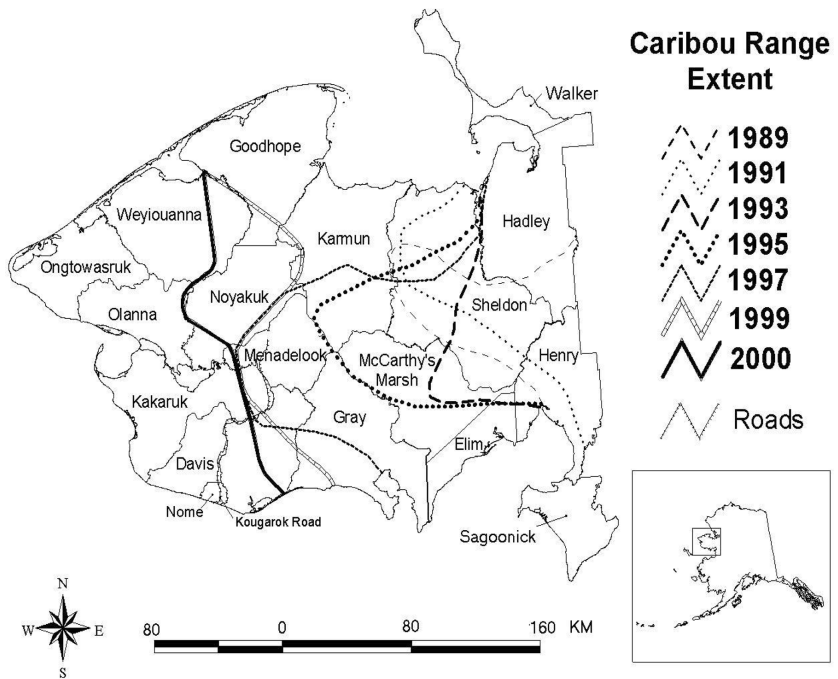
**Keywords:** reindeer herders, subsistence, WACH, out-kigration, economic loss, refugia, weather, production, human dimension

## The Seward Peninsula Grazing System

Humans have utilised the grazing system of the Seward Peninsula, Alaska for thousands of years, but this relationship has been in major transition during the last 200 years. Both humans and grazing animals travelled across the Bering land bridge from Asia and settled in North America. A group of these people, the Inupiaq, settled in northwestern Alaska and have for thousands of years relied upon populations of marine and terrestrial animals for their survival, including seals, whales, fish, caribou and musk oxen (Ray 1983: 152, 174–6; Kurtén and Anderson 1980: 184). The hunting-gathering economies of the Inupiaq required them to interact with the landscape in a fashion where harvesting strategies tracked those of ephemerally abundant grazing animals

such as caribou (*Rangifer tarandus grantii*) (Ray 1983: 152, 174–6; Burch 1998). However, in the last 200 years this relationship has been buffeted by changes in the climatic, ecological and political environment. The relationship has shifted from one of subsistence to market hunting of caribou, to commercial livestock production of reindeer and may now be reverting back to a caribou-based subsistence economy or into a unique ‘high-tech’ intensive reindeer management system. Many of these changes have been brought about by anthropogenic causes, while others have been induced by weather patterns, unpredictable animal migrations and new technologies.

There is archeological evidence demonstrating that caribou were present on the Seward Peninsula and were harvested as a significant food source by the Inupiaq for hundreds of years before the influx of Europeans (Koutsky 1981). While all Inupiaq harvested caribou if they were encountered, some settlements, such as Buckland, Kauwerak, Koyuk, Goodhope, Iglutalik and Egavik (Fig. 1), developed cooperative caribou hunting strategies. Caribou were driven through makeshift alleyways into enclosures or lakes where they were captured with snares, harvested with spears or slaughtered by men in kayaks (Spiess 1979: 245). Residents of these settlements specialised in this subsistence



**Figure 1:** Map of reindeer ranges and observed western extent of Western Arctic Caribou on the Seward Peninsula, Alaska

pattern and recognised themselves mainly as caribou hunters as depicted in artwork that showed both bow and arrow and spears as the main tools for harvest. Burch (n.d.: 631–3), on the basis of interviews with Native elders, suggests that a caribou herd inhabited the central Seward Peninsula, year-round. The calving area was identified on the Espenberg Peninsula while the winter range extended throughout much of the central Seward Peninsula.

It was not until Captain Cook's voyage in 1778 that the Seward Peninsula region was mapped and opened to European exploration and trade. Observations and extensive use of caribou products during this time is further evidence of the existence of a resident caribou herd on the Seward Peninsula. Cook observed and noted in 1778 caribou tracks on the beaches near Golovin and he purchased freshly killed caribou meat from the local people (Ray 1975: 43). The Billings expedition of 1791 landed near present-day Nome and noted that caribou were plentiful, and skins of adults and calves were widely used for clothing and sleeping mats (Ray 1975: 49–51).

However, the continuing presence of Russian, American and European explorers and traders in the early nineteenth century created ecological and socio-economic changes that initiated a sequence of events that reshaped the human–caribou relationship. Large amounts of European goods were being traded for furs along the Bering Sea coast (Stern et al. 1980: 21). Tools such as axes, large knives and firearms used for more effectively harvesting the local resources were especially coveted. Although it was illegal to sell firearms, and ammunition to Native Americans in the early 1800s, firearms found their way into Inupiat hands as early as 1816 and were in use by the 1820s (Ray 1975: 92). There must have been an increased demand on the local wildlife resources, notably caribou, to generate products (meat) for trade or sale, while the introduction of firearms allowed more effective harvesting of animals to meet this demand (Ray 1975: 173–4). Skoog (1968: 254) points out that major caribou migrations were shifting away from the Bering Sea coast prior to the introduction of firearms, but as is occurring today, some caribou move on to the Seward Peninsula and remain as year-round residents while the bulk of the herd out-migrates. The introduction of technology to increase the effectiveness of caribou harvest, without corresponding harvesting regulations, may have contributed to decimating the less numerous, but non-migratory caribou of the Seward Peninsula.

During the mid-1800s many whaling ships began to over-winter in protected areas such as Point Hope, Port Clarence and Golovnin Bay to avoid having to push through the pack ice to reach the Chukchi Sea and Arctic Ocean in spring (Stern et al. 1980: 21). Establishing permanent settlements enabled the whalers to start the following whaling season much earlier than before. During the winter months the whalers traded with Natives, introduced firearms to them, and hired them to supply meat to inhabitants of the settlements (Stern et al. 1980: 21).

This change in the traditional hunting cycle, settlement pattern, social organisation, and population distribution of Native groups in northwestern Alaska became widespread from 1850 to 1890 (Burch 1972; Ray, 1975: 180; Ellanna and Sherrod 2004: 28). People that traditionally lived a nomadic hunting and gathering lifestyle began to settle year-round at the prominent trading sites. The increased demand for food began to tax local subsistence resources. Extensive hunting encouraged by market hunting and the use of firearms (Ray 1975: 174) may have contributed to the disappearance of non-migratory caribou on the Seward Peninsula by the 1890s. However, there may have been additional factors that spurred the disappearance of local caribou herds. Weather patterns, changes in forage availability or predation all may have played a role as well (Caughley and Gunn 1993; Adams and Dale 1998; Messier 1988).

## **Introduction of Reindeer Herding**

The disappearance of caribou set the stage for another transformation of the grazing system with a subsequent change in the socio-economic relationship of the local people with *Rangifer*. The apparent depletion of available subsistence resources caught the attention of Captain Michael Healy who suggested to Sheldon Jackson, Commissioner of Education in Alaska, the idea of introducing domestic reindeer to Alaska from Russia (Stern et al. 1980: 24). Jackson was an ordained Presbyterian minister whose main ambition was to bring civilisation and Protestant Christianity to the ‘uncivilised’, ‘primitive’ and ‘pagan’ indigenous Native Americans of the United States. Jackson believed that industrial schools/missions were the most effective way of assimilating young Native Americans into the White world and reindeer herding was the best means of realising his goals in Alaska (Ellanna and Sherrod 2004: 71–8).

Through intense lobbying efforts by Jackson, the US government appropriated funds beginning in 1891 to purchase reindeer (*Rangifer tarandus tarandus*) from Russia for importation to Alaska (Stern et al. 1980: 24). Jackson argued before Congress that the reindeer would provide a source of meat and economic development for the Inupiaq, although many of his ensuing actions and policies ran counter to this premise. From 1892 to 1901, 1,280 reindeer were purchased with government funds and transported to the Teller Reindeer Station at Port Clarence. Most reindeer purchased were Chukchi stock from the Cape Navarin area but reindeer were also imported from the Tungus of eastern Siberia in 1901 (Ellanna and Sherrod 2004: 91–2).

By 1896, 1,300 reindeer were distributed among four herds in Wales, Teller, Brevig Mission and Golovnin Bay. Jackson employed four Chukchi herders in 1893 to train the Inupiaq in handling and herding but friction between the groups resulted in the Chukchi herders returning to Siberia (Stern et al. 1980:

25). In 1894, Saami herders from Norway and Finland were brought to the Seward Peninsula to teach reindeer husbandry to the Inupiaq. An apprenticeship programme structured according to Jackson's image of an industrial school, was developed under Saami instruction through local missions. Under the programme, an apprentice would earn two reindeer the first year, five the second and ten for the third and each year thereafter (Olson 1969: 22). In contrast, the Saami instructors were given 100 reindeer for three to five years of service (Ellanna and Sherrod 2004: 84). In 1896 Jackson changed the apprenticeship programme to five years with no reindeer to be earned during the period of instruction and with no guarantee of being loaned reindeer to establish their own herds. Also, an Inupiat owner could only slaughter males for his family and could only sell, transfer or slaughter female reindeer with permission of the Board of Education. Also, upon an Inupiat owner's death, half of the herd would return to the mission instead of his heirs (Ellanna and Sherrod 2004: 86; Stern et al. 1980: 34–5).

This pattern ran counter to the US government's intentions of Inupiaq ownership and in 1905 the Secretary of the Interior called for an investigation into allegations of Jackson's use of government funds to support missionary work and his policies on mission, non-native and Inupiaq ownership of reindeer. As a result of the investigation, Jackson was asked to resign and there was an ensuing effort to place as many reindeer into Inupiaq ownership as possible (Stern et al. 1980: 35–6).

The ownership pattern shifted to predominately native by 1914 but many of the owners had so few animals that their herds could not be considered economically viable. Also, many Saami owners had visions of developing extensive herds comparable to those in Scandinavia. Non-Natives continued to develop their herds commercially in open conflict with Native interests and government policies (Postell 1990: 64). The distribution of reindeer among so many Inupiaq did not increase the economic viability of reindeer herding. In light of this difficulty, the federal government suggested that Alaska Native owners form cooperatives or corporate herd ownership and standardise management practices. Under the joint stock ownership system all the animals owned by the people of one village were herded together by paid herders under the supervision of a chief herder. Herd cooperatives advocated open herding based on the Great Plains ranching model where there were no closed, formal, or privatised grazing allotments. Herders were encouraged to move their animals across the landscape in search of the best grazing areas. Many herders at the time were already finding it difficult to keep growing herds separated on adjoining ranges, and welcomed the open herding method (Postell 1990: 77–8; Ellanna and Sherrod 2004: 102–4). This arrangement worked well for a short time, and reindeer herds grew in size while interest in joint stock companies was high (Postell 1990: 65–6).

The period of intense non-Native ownership of reindeer began in 1914 when John Silma, a Saami reindeer owner, sold 1,200 reindeer to the Lomen family.

Concerns about non-Native ownership grew during the following years when the missions and other non-Native owners began selling their reindeer to the Lomens (Ellanna and Sherrod 2004: 105–6; Postell 1990: 68). The Lomens owned 14,083 reindeer by 1929 and established an extensive commercial export enterprise (Stern et al. 1980: 40). The open herding method promoted a practice used by the Lomens to acquire ‘maverick’ reindeer. The Lomens would move their herds into an adjoining herd and subsequently drive all animals within the area into a corral where all unmarked deer were marked to the person (Lomens) who drove them into the corral. The Lomens would also charge a herding fee for any Inupiat reindeer found in their herds. Even so, the Lomens were not able to make reindeer herding a business success, in part because of the difficulty in maintaining outside markets and the poor economic environment created by the Great Depression. They also could not stem the ever-present controversy over non-Native ownership, which finally ended with the passage of The Reindeer Act in 1937, prohibiting ownership of reindeer in Alaska by non-Natives (Ellanna and Sherrod 2004: 108–11). Cattle ranchers in the ‘Lower 48’ also lobbied for passage of the Act because they felt threatened by the reindeer industry during a period of economic depression (Beach 1985: 14).

During this period the government continued to play a strong role in promoting and managing the Inupiaq reindeer herds. The government changed earmarks, representing ownership, from individuals to cooperative herds, recommended the adoption of close herding and the construction of corrals and more thorough roundups. Many of these recommendations were never acted upon because of the lack of leadership, confusion over animal ownership and revenue sharing and overgrazing caused by high reindeer densities (Olson 1969: 14–15). The cessation of close herding, overgrazing, predation and reindeer losses to caribou may all have contributed to a sharp decline in reindeer numbers from a peak of 127,000 animals in 1927, to 25,000 in 1950 (Stern et al. 1980: 73).

## **Modern Reindeer Herding**

The Bureau of Indian Affairs (BIA) took over administration of the Alaskan reindeer operation in 1941 and initiated a programme to privatise and improve reindeer management on the Seward Peninsula (Stern et al. 1980: 78). The re-privatisation of herds involved the establishment of a limited number of moderately stocked reindeer ranges (Simon 1998). Seventeen new herds were started on the Seward Peninsula. By 1948, herds contained an average of 1,000 reindeer each. A programme was developed to introduce intensive herding, where herders would travel with the herds on a constant basis and continuously move them to new grazing areas. BIA also attempted to improve methods

of handling and slaughtering, and base stocking densities on available winter forage (Stern et al. 1980: 79).

The period of re-privatisation and establishment of new herds resulted in a relatively stable industry where herd populations and product output remained constant. The primary market during this period was local, but government sales within Alaska and to the 'lower 48' were also important (Olson 1969: 17). In 1968, in a cooperative agreement with the State of Alaska, the BIA and the Bureau of Land Management (BLM), the latter agency undertook the supervision of the ranges (Stern et al. 1980: 94–5). This had important implications for future grazing policy because it laid the groundwork for formal range management planning as practised on other BLM land in the United States.

The BLM began issuing reindeer grazing permits in 1962 and in 1968 was made responsible for assessing and protecting rangelands by performing range utilisation checks and setting stocking densities throughout the 4 million hectares of reindeer range (Stern et al. 1980: 97). Currently, to be granted a grazing permit on State or BLM land the herder must develop a grazing management plan in cooperation with the Natural Resources Conservation Service (NRCS 1953). NRCS has specific responsibility to assist permittees of grazing lands in planning and applying conservation programmes on the federal controlled land in their operating units using the National Range and Pasture Handbook as a guide (NRPH 1997). This plan recommends the sustained yield of the herd with no detrimental changes to the range as a result of grazing reindeer (NRPH 1997). Summer, winter and sensitive grazing areas are identified on the range and recommendations were given on rotational grazing strategies and stocking rate.

The formation of the Reindeer Herder's Association (RHA) in 1971 by the BIA united the herders in their efforts to further develop the reindeer industry (Bader and Finstad 2001). The RHA established a five-year reindeer industry development plan in 1979 that would set guidelines to build an industry that would provide a stable meat supply and an enhanced economic base to the people of northwest Alaska (Reindeer Herders Association 1979). Conducting and inventorying range resources and developing and adopting sustainable range management practices recommended by NRCS were foremost objectives of the plan. By the late 1980s, 20,000–25,000 reindeer were managed on fifteen allotted ranges extending north to south from Cape Espenberg (66°34'N) to Egavik (64°03'N), and east to west from Wales (–168°03'W) to the Inglutilik River drainage (–159°05'W) (Blodgett et al. 1993) (Fig. 1).

Currently, most herders practise an extensive management style of herding. The herds are left unattended for parts of the year, although many herders actively check their herds during winter when snow and weather conditions allow travel. Some herders will move their animals between winter, summer and calving sites, while others let the animals largely move on their own

accord. Occasionally, a herder will move his herd to a new grazing area during winter to improve grazing conditions or reduce mortality to predation.

During the snow-free months from June through September reindeer are allowed to range freely on allotted ranges. The herder, while not in contact with the reindeer, usually knows the general location of the herd from pilot reports, other travellers or occasionally he will travel by boat, plane or All Terrain Vehicle (ATV) to check the herd.

Reindeer are typically brought into corrals twice a year: during June–July for marking of calves, vaccinations and other veterinary services, as well as harvesting of velvet antler, and in mid-winter again for veterinary care. Most of the slaughter is conducted during the snow season, but some may be done anytime during the year to accommodate economic necessity. Though herders do not practise strict selective breeding, most of the males are castrated and unproductive females are culled based on physical or production characteristics. Animals are driven into corrals using snow-machines during winter and helicopters or ATVs during summer. Helicopters are usually used by herders owning large herds whereas smaller herd owners find helicopter use too expensive. Also, the price paid for velvet antler also influences the herders' decisions whether to use a helicopter or not. The total number of reindeer corralled annually is determined for each herd and archived at the Reindeer Research Program University of Alaska Fairbanks (RRP-UAF).

Snow-machines, used both in summer and winter on tundra, enable herders to travel great distances in a short time allowing herding to be based out of villages rather than outcamps. This type of management allows reindeer herders to spend time with their families who are socially tied to the village because of schooling and supplementary family employment. Extensive herding also allows reindeer herders the time and opportunity to be involved in regional and state politics. Many present-day herders are active as corporate board members, village officers or state legislators.

Reindeer on the Seward Peninsula are opportunistic foragers seeking out ephemeral resources such as cotton grass (*Eriophorum* sp.) inflorescences (Cebrian 2005) and other flowering plants, as well as newly emergent vegetation around thaw ponds in early spring. Sedges are consumed in the early part of the summer, whereas willow leaves become dominant in the diet later in the season. Lichens remain an important component of reindeer forage both in summer ( $\approx 30\%$ ) and winter ( $>60\%$ ). Reindeer on the Seward Peninsula do not migrate long distances during the course of the year and are relatively sedentary. The vegetation communities and topography of the Seward Peninsula are very diverse (Swanson et al. 1985), so relatively short migrations by reindeer shift them to areas with vastly different grazing characteristics. Most of the allotted reindeer ranges on the Seward Peninsula border the ocean or large water bodies and rise up to high hills or mountains in a span of 10–15 km with varying soils and climatic conditions. This creates a diversity of vegetation



communities, from wet lowlands to well-drained uplands, along a reindeer's grazing trajectory. A reindeer can graze from one resting, insect relief or snow-free area to another in a day's time while encountering a variety of forage plants with an assortment of nutritional characteristics along the way. Thus, migrations to alternative or seasonal grazing areas occur on a micro rather than a macro scale.

The management structure of the Seward Peninsula reindeer industry is much different to that found in Scandinavian countries or Russia. Individuals or families were given exclusive grazing rights on designated ranges averaging 400,000 hectares in size. Land managers and reindeer herders work together to develop a range management plan and set a maximum stocking density. Land managers also monitor range conditions and make recommendations on changing grazing areas to the herder. In this way the herder is encouraged and has a vested interest to manage his reindeer and grazing resources to generate income without overgrazing his rangeland.

Since the 1970s, reindeer herding has been a significant economic factor in villages on the Seward Peninsula (Schneider et al. 2005). Sales of velvet antler and meat generated over US\$1 million in annual revenue for the rural communities of the Seward Peninsula during the early to mid 1990s (Carlson 2005). While the development of the reindeer velvet antler market during the 1970s and 1980s enhanced profitability, most herders believe that meat sales provide the economic backbone for the industry and manage their herds accordingly. All present-day herders castrate excess males to reach a ratio of one male for every 15–20 females in their herds. Although velvet antler sales generated US\$10.3 million while reindeer meat sales generated US\$9.6 million from 1987 to 2003 (Alaska Agriculture Statistics, 1987–2003), herders believe development of the meat industry is key to their long-term economic success.

## **The Current Crisis**

Recently, the Western Arctic Caribou Herd (WACH) has increased dramatically and is severely impacting Alaska's reindeer industry. The WACH has increased from 75,000 animals in 1976 to approximately 463,000 animals in 1996 (Dau 2000). During this time, the winter range of the WACH shifted west onto the traditional reindeer ranges of the Seward Peninsula. Thousands of reindeer have commingled with migratory caribou groups and left the Seward Peninsula in the last fifteen years. As a result, many herders have lost their herds. If conditions for herding do not improve in their lifetime then they will not have the opportunity to pass their knowledge on to future generations. A break in the generational link could have serious cultural and economic implications for future re-introductions of reindeer herding (Schneider 2002; Schneider et al. 2005). Reindeer have been observed with caribou 640 km from

their home ranges (unpublished RRP-UAF satellite telemetry data). Occasionally, some out-migrating reindeer will return to their traditional range but many do not return and succumb to predation, harvest by caribou hunters and other factors (Oleson 2005). Beach (1985: 11) reports that some caribou hunters claim to have killed hundreds of reindeer. In addition, the presence of a small number of caribou in a reindeer herd will cause otherwise docile reindeer to become easily excited and difficult to herd. Locating and tracking reindeer on remote ranges when caribou are present has become critical to the viability of many herds. Reindeer herds must also be more tightly controlled in order to segregate them from migrating caribou. However, this strategy may lead to overgrazing of localised areas. Additionally, the uncontrolled grazing of thousands of caribou may damage lichen areas used by reindeer, further threatening the sustainability of the reindeer industry. In addition, removal of lichen may change the albedo of much of the Seward Peninsula, thereby altering the surface energy budget and other ecosystem processes, as well possibly influencing the regional climate (Maxwell 1992; Kane et al. 1992; Chapin et al. 1992).

Lack of snow and delayed freeze-up of lakes and rivers during caribou migrations onto reindeer ranges have been reported to exacerbate reindeer losses because herders cannot herd their animals using a snow-machine or ATV. Some herders have further suggested that climatic conditions (lack of snow) may have encouraged the influx of the WACH onto the Seward Peninsula (Tom Gray, interview H2000-102-17 Alaskas Polar Regions Department, UAF). Weather patterns such as snow distribution influence the movements and foraging strategies of caribou (Adamczewski et al. 1988), but the effect of weather on caribou wintering on the Seward Peninsula is unknown.

## **Caribou Presence on the Seward Peninsula**

The extent of caribou presence across the Seward Peninsula since 1991 was determined using reports of reindeer/caribou surveillance flights conducted by the RHA, radio-tracking and reindeer surveillance flights conducted by the Reindeer Research Program, University of Alaska Fairbanks (RRP-UAF) and observations by reindeer herders. In June, July and October 1999; June, July, September and October 2000; June, August and October 2001; and June 2002, 2003, and August 2004 low-altitude aerial surveys were conducted to assess the status of the reindeer herds and the presence of caribou on the Seward Peninsula. The plane was equipped with a Telonics, scanner-receiver to assist with the location of radio-collared reindeer. Flights were flown in north-south transects over reindeer ranges reported to contain caribou to determine the westward front of migrating caribou and conduct an aerial census of reindeer herds.

From 1991 to 1995, major concentrations of wintering caribou shifted west from the eastern edge of the Seward Peninsula and extensively used the Hadley, Henry, Sheldon and Karmun reindeer ranges, and the McCarthy's Marsh area (Fig. 2). By 1995, Hadley, Henry and Sheldon had lost their entire herds to emigration with caribou.

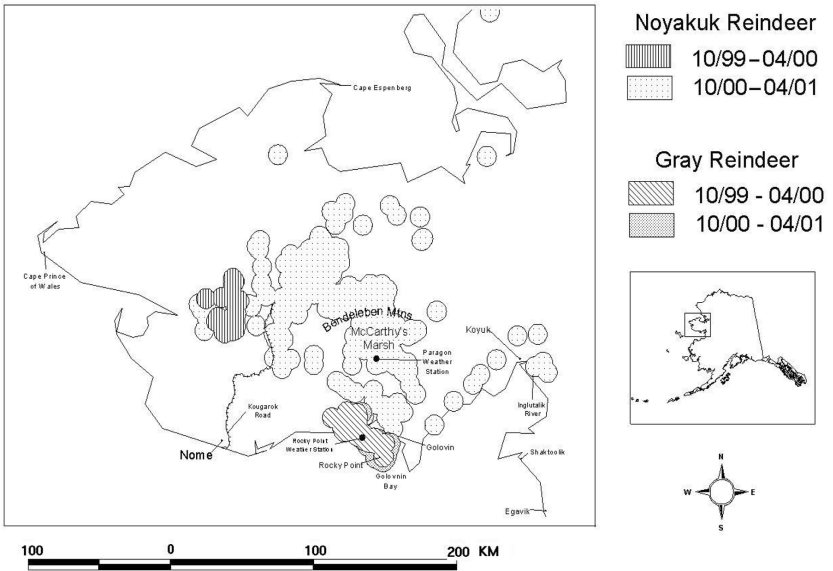
In autumn 1996, an estimated 90,000–100,000 caribou migrated through the central Seward Peninsula to the eastern edge of the Noyakuk range and were found as far west as the Kougurok road where hunters harvested caribou for the first time in over 100 years (Bente 1997) (Fig. 1). Open water in rivers and lack of snow in October 1996 limited herder mobility in segregating their herds from the WACH. Reindeer herders Sagoonick, Menadelook, Karmun and Gray lost 50–75% of their herds to caribou (Table 1).

Caribou returned to the central Seward Peninsula during the winters of 1997 and 1998, and by summer of 1999, herders Menadelook, Karmun, Weyiouanna and Sagoonick lost additional reindeer and most could no longer economically justify corralling the few remaining reindeer on their ranges (reindeer herders in Teller, Deering and Shaktoolik Alaska, pers. comm.). Sequestering his remaining reindeer in a refugium on Rocky Point enabled the herder from White Mountain (Gray) to keep his herd intact even when caribou were present throughout his range during winters 1999–2003 (Fig. 2).

As many as 225,000–250,000 caribou moved onto the central Seward Peninsula in the autumn and early winter of 2000 (Persons 2001). Thousands of caribou overran the Noyakuk and a portion of the Davis range during September and October 2000. While Noyakuk and Davis attempted to segregate reindeer through intensive herding, thousands of reindeer were lost to the

**Table 1:** *Estimated losses of reindeer to caribou on the Seward Peninsula, Alaska*

<b>Herd</b>	<b>Peak herd size</b>	<b>Year of peak herd size</b>	<b>Estimated herd size 2004</b>	<b>Losses – peak to current</b>	<b>Percent loss</b>
Davis	6384	1997	3500	2884	45
Gray	2418	1993	350	2068	85
Hadley	2310	1987	0	2310	100
Henry	1397	1987	0	1397	100
Karmun	2155	1995	0	2155	100
Menadelook	1473	1995	0	1473	100
Noyakuk	1046	1996	150	896	85
Sagoonick	1815	1992	0	1815	100
Sheldon	1582	1991	0	1582	100
Weyiouanna	1081	1991	100	981	90
<b>Total</b>	<b>21661</b>		<b>4100</b>	<b>17561</b>	<b>81</b>



**Figure 2:** Satellite telemetry locations of Noyakuk reindeer during months when caribou are not present versus when caribou are present on reindeer range. Satellite telemetry locations of Gray reindeer held in a refugium when caribou are present

migrating caribou herds (Table 1). Reindeer on the Seward Peninsula normally exhibit sedentary behaviour. The herds remain on small home ranges throughout the year with little herding effort. However, when joining up with caribou, they abandon their sedentary habits and travel extensively with the caribou, sometimes several hundred kilometers far beyond their home ranges (Fig. 2). Even a handful of caribou mixed in with several hundred reindeer will make the latter very difficult to keep in a given location despite concentrated herding efforts.

The Seward Peninsula aerial surveys conducted during 1999–2004 supported the corraling records and herder reports of missing animals. Few, if any, reindeer were located on the Henry, Hadley, Sheldon, Karmun, Sagoonick, Menadelook, Weyiouanna and Noyakuk ranges, while many Davis reindeer were observed with bands of caribou in the Bendeleben Mountains, 100 km from the Davis range.

Reindeer herders have lost over 17,000 animals during 1987–2004 from areas used by caribou during winter (Table 1), while adjacent herds experienced good herd growth until caribou affected them as well (Prichard and Finstad 1999). The Alaskan reindeer industry has suffered a direct economic loss of over \$16 million over the last decade (Carlson 2005). This is a substantial loss

to the regional economies of rural Alaska. The compensatory benefit from caribou hunting has been fairly limited because of their unpredictable movement patterns and relative scarcity of caribou near villages in the last two to three years.

## **The Outlook**

The Inupiaq of the Seward Peninsula have had a turbulent relationship with Rangifer during the last 200 years. Before caribou disappeared from the region in the late nineteenth century their population numbers and migratory patterns were likely unpredictable for any length of time. A human population that depends largely upon an unpredictable resource such as caribou will likely face a major resource crisis at least once every two or three generations (Burch 1972), because the feedbacks between weather, grazing and the forage base in the Arctic lend themselves to drastic shifts in animal abundance and distribution (Behnke 2000). It is likely that settlements dependent upon caribou for a significant proportion of their food supply faced periodic starvation. We cannot be sure of the immediate causes of the disappearance of the resident caribou herd on the Seward Peninsula, since many factors such as predation, overhunting, overgrazing or weather patterns can influence population dynamics and herd movements (Caughley and Gunn 1993; Ferguson et al. 2001; Messier 1988).

Beginning with Sheldon Jackson, some local people felt that introducing reindeer to the Seward Peninsula grazing system would both stabilise and increase the production of food. Semi-domesticated reindeer are amenable to human herding, so both numbers and grazing distribution can be manipulated. Reindeer were introduced not only to provide a predictable and dependable food source but also to generate revenue and provide for human cultural enrichment (Stern et al. 1980: 123–4). However, the introduction of reindeer did not result in the stability of the Seward Peninsula grazing system. Through the early years the reindeer industry was unpredictable largely because management decisions were governed by politics and exploitation (Stern et al. 1980: 16–18). Lack of a coordinated grazing and herd management plan for the Seward Peninsula led to overstocking and overgrazing which led to severe population swings and unrealised economic potential.

Through the introduction of conservation of grazing land principles (NRPH 1997) and modern techniques of animal husbandry during the 1970s and 1980s it appeared that stability of the grazing system was on the horizon providing a dependable food source and critical economic development to many villages. Most herds on the Seward Peninsula were demonstrating good to excellent herd increases during the late 1980s and early 1990s with many herders possessing a minimum of 1,500 to 1,800 animals (RHA herd records). Range

management plans were developed for all reindeer herds on permitted ranges on the Seward Peninsula. The NRCS and other land managers conducted range utilisation checks in each reindeer district to ensure that stocking densities of reindeer did not lead to overgrazing. Plant communities of local rangeland, especially lichen stands, were monitored to prevent overgrazing by reindeer. Herd health and animal husbandry practices were improved through collaborative research and service with the RRP-UAF. Velvet antler and meat production and prices were on the rise during the 1980s while reindeer producers were promoting the construction of new abattoirs and investigating value added processing (Brown 1999). Demand for both velvet antler and meat was greater than the herders could produce; the market was in place for an expanding industry. The future looked very bright for the Seward Peninsula reindeer industry.

However, during the 1990s, the state of the reindeer industry once again changed. The WACH changed its migratory patterns, overrunning the reindeer ranges and decimating the herds. The herders did not lose their herds for lack of effort. Many of them were with their herds on a constant basis. But a very short lapse in vigilance usually caused by a winter storm or mechanical breakdown was all it took for a reindeer herd to run off and mix in with tens of thousands of caribou. One herder lost his herd when he took one day off to celebrate his birthday (Palmer Sagoonik, interview H2000-102-32 Alaskas Polar Regions Department, UAF). Reindeer demonstrating range fidelity with little migratory behaviour were transformed into untenable and highly migratory animals with little home range fidelity when incorporated into caribou herds. Once a few thousand reindeer are thoroughly mixed and integrated into a large caribou herd, they are impossible to recover.

## **Mitigation Strategy**

Historically, the provision of new technologies such as firearms and reindeer herding may not have been as successful as originally intended because they promoted over-harvesting of local resources and lacked a workable management system compatible with the Inupiaq. The establishment of the present-day reindeer management system coupled with the introduction of sound animal husbandry and conservation of rangeland practices most likely would have been successful were it not for the intrusion of caribou to the Seward Peninsula. Now reindeer herders must look again to technology and adopt different strategies if they are to survive the caribou crisis and bring stability back to the reindeer industry.

Some herders have altered their herd management to include the concept of a reindeer refuge to cope with caribou on their reindeer ranges. For example, herder Tom Gray, from White Mountain, lost a large portion of his herd in the

winter of 1996–97 to caribou overrunning his reindeer range. Instead of allowing his remaining reindeer to forage freely over his entire allotted range he began to restrict their movements and manage them through concentrated herding in a location whose topographical features helped isolate them from migrating caribou. (Fig 2). He culled animals attempting to leave the refuge and also held the herd in the refugium during calving to further reinforce site fidelity.

Identification of satisfactory reindeer refugia to provide protection from caribou and to supply adequate grazing resources will be critical. The RRP-UAF is currently identifying and mapping seasonally critical reindeer habitats on the Seward Peninsula not impacted by caribou (Finstad 1999).

The RRP-UAF and RHA have also developed a new management technique using satellite radio-telemetry and the Internet to assist herders to more effectively monitor and herd animals. Beginning January 1999, reindeer herders were given Telonics® ST-18 satellite radio-collars set on either five- or ten-day duty cycles. Herders placed collars on large dominant female reindeer during either a June or February handling or captured them by lassoing or net-gun during winter. The RRP-UAF uses a GIS workstation to create real-time reindeer location maps that are placed on a dedicated website that could be accessed through the Internet. Herders access the Internet from their homes or the local school. Herders monitor locations of reindeer in their herds but also monitor location of reindeer swept up by caribou and at times make an effort to recapture them when travel conditions improve and regional caribou numbers decline (Fig. 2). The RRP-UAF conducted a workshop in March 2000 to familiarise reindeer herders with computers, the Internet and satellite telemetry to help them integrate current reindeer locations posted on the dedicated website with ongoing herding activities. Some herders are using the system to hold their herds in refugia. However, this is not a permanent solution or even a long-term strategy, since the intensive year-round grazing in refugia will likely deplete lichen reserves (Oleson 2005) and alter species composition (Grellmann 2002; Väre 1995). Others are using the system as a range management tool to move herds to areas less intensively grazed by both caribou and reindeer.

Some herders are developing a strategy to use enclosures and supplemental feeding to keep reindeer from mixing with caribou when they are present on ranges. These types of practices will require the herder to learn new skills and adopt a more intensive management strategy. Alaskan reindeer herding in the future may shift away from pastoralism to quasi-herding/farming operations.

Reindeer owners are adopting new technologies and altering management strategies in response to presence of caribou and rapidly changing range conditions. Although present conditions look less than optimum for the industry, technology and adaptive management strategies may prove to be the critical

components in the future success of the industry. In any event, the herders are anticipating the re-introduction of reindeer on permitted ranges so that their families can once again make a livelihood from their herds.

## Acknowledgements

This study was funded by a grant from the National Science Foundation, Grant ARC-9979473 with additional support from the Reindeer Research Program University of Alaska Fairbanks. We thank the Reindeer Herders Association and the reindeer herders of the Seward Peninsula for their support and a number of reviewers who improved the manuscript immensely. This is contribution no. J-01-06 from the Alaska Agricultural and Forestry Experiment Station.

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