

An Eye In The Sky

High-tech satellite telemetry improves reindeer management on Alaska's vast rangelands.

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Reindeer are an important livestock species in the circumpolar north. Currently there are approximately three to four million reindeer distributed across Russia, Scandinavia, Greenland, Iceland, Canada, and Alaska, with five hundred thousand animals slaughtered annually, producing over 20,000 metric tons of meat (Turi, 1998).

In Alaska, the majority of commercially produced reindeer occurs on the Seward Peninsula and Bering Sea Islands. Currently on the Seward Peninsula (the largest contiguous grazing area in the state), 14 herds graze on 16,200,000 acres of available rangeland with individual range permit areas averaging 1,012,500 acres (Workman et al. 1991). These permitted grazing ranges are remote, bisected by large rivers and mountain ranges with few or no roads.

Herders employ an extensive management scheme where reindeer are allowed to range freely. Most herders utilize boat, ATV, or foot travel to monitor and move their herds. This type of management is characterized by sporadic herder contact that often results in the herd being unsupervised for extended periods when overland travel is difficult, or during mechanical breakdown of all-terrain vehicles. Herders will often lose track of their animals and must extensively search for them when traveling conditions improve. Many animals, especially those co-mingling and migrating with the Western Arctic Caribou Herd (WACH), may leave permitted grazing areas and are permanently lost to the herder. Unsupervised grazing reindeer may not optimize use of range resources or may overgraze the range. For these reasons it is critical for reindeer herders to adopt new technology allowing year round monitoring of animal locations and evaluation of annual grazing patterns.

During the past 25 years, Natural Resources Conservation Service and University of Alaska Reindeer

Research Program have assisted Northwest and Western Alaska reindeer herders with range management and animal husbandry technology. Range assistance has centered on traditional inventories, ecological site mapping, similarity (condition), trend, and utilization assessments. Annually, Bureau of Land Management (BLM) resource specialists coordinate with NRCS to conduct range assessments with reindeer herders during the summer. These inventories have provided the baseline information for range conservation planning and management.

Alaska's Rangeland

Native plant communities are comprised of different types of tundra that support sedges, grasses, forbs, lichens, and mosses. Many of the upland and mountainous areas support low growing alpine tundra shrubs with grasses, sedges, and lichens. Classification of Seward Peninsula vegetation has resulted in 39 ecological sites. Ecological sites described and mapped (Swanson et al. 1985), vary from White Spruce and Paper Birch Uplands confined to the southeastern portion of the Seward Peninsula, to widespread Tussock Tundra found throughout the Seward Peninsula lowlands.

Ecological site interpretations have been made for the major species of wildlife, forest products, recreation and hydrologic values, and seasonal reindeer grazing.

Reindeer winter range typically has a higher proportion of drier upland and alpine sites, and is characterized by lichens, sedge tussocks, dwarf ericaceous and rosaceous shrubs, low willow, birch and alder shrubs, herbaceous perennials, plus small amounts of grasses and mosses.

Summer range is generally in the moister lowlands, often in coastal areas. It is characterized by large expanses of sedge tussocks, mosses, rhizomatous sedges, dwarf ericaceous shrubs, medium to tall willow, birch

and alder shrubs, plus small amounts of lichen, grasses, and herbaceous perennials.

Sustained use of these ranges depends upon management of the winter range, which in most cases limits reindeer populations. Range assessments or ecological site mapping have been completed for most ranges throughout all Alaska reindeer ranges. The most widely used specifications for grazing management are the NRCS Prescribed Grazing Standards and Specifications.

Overall, most ranges are near pristine and support luxuriant stands of vascular plants and lichens. Reindeer populations during the past 30 years have been significantly below carrying capacity. In combination with under stocking and reindeer management, many of the overgrazed ranges of the early 1900's have recovered to near native historic climax plant communities. A typical intensively managed grazing plan employs winter management units that are grazed one winter then rested for five to seven winters. Use of forage in an intensively grazed winter management unit prescribes a grazing intensity (including significant disturbance) of <45% of live lichen biomass.

The Reindeer Industry

The primary focus of the reindeer industry is to provide a local meat supply and participate in wet-velvet antler foreign marketing. Herds are gathered once or twice a year when antlers are cut, fawns are tagged, vaccinations are given, and selected bulls are castrated. Animals are slaughtered and processed for local markets. Teller Fish and Meats, located 45 miles north of Nome in Teller, Alaska, is the one processing facility available on the Seward Peninsula.

Any given grazing permit area has many landowners including Native allotment holders, State of Alaska, Bureau of Land Management, National Park Service, US Fish and Wildlife Service, and Village and Regional Corporation lands. All land resource planning and management is coordinated with appropriate landowners.

Reindeer industry problems are centered on extreme weather conditions, absence of road systems, limited ground access during the summer, and distance the herder must travel from base of operation to herd. Limited meat processing facilities and high end marketing infrastructure limit economic viability. On the mainland, predators and caribou/reindeer interaction continue to significantly affect total reindeer industry viability.

Although the industry contributes to the social and cultural values of Western and Northwestern Alaska, the total statewide value of reindeer and reindeer products for year 2000 was \$335,000; down from \$540,000 in 1999 (Benz, 2001). This economic loss is primarily a re-

Tracking Reindeer By Satellite

In 1999, NRCS, University of Alaska Reindeer Research Program and Alaska reindeer herders initiated a reindeer satellite-tracking program. Environmental Quality Incentives Program educational grants for 2000 and 2001 funded the satellite telemetry program. Seventeen collars with Telonics model ST18 Platform Terminal Transmitters (PTT or satellite transmitter) and Very High Frequency MK8 beacon (VHF) transmitters, and 2 VHF scanning units were purchased. VHF transmitters are used to facilitate PTT recovery. One VHF unit was placed at Tanadgusix Corporation Headquarters at St. Paul, Alaska and the other at Reindeer Herders Association, Nome, Alaska.



Figure a Collar with ST18 PTT and VHF in sealed canister. Note VHF antenna (non-insulated cable) and PTT antenna (insulated short black object between canister and end of collar). (Source: Telonics)

PTT and VHF Duty Cycles and other Details

The first 5 collars with PTT and VHF transmitters were purchased in FY 2000 (Figure 2).

In FY 2000, 5 PTT's were purchased. Duty cycle was programmed for 4 hours on, and 20 hours off with an expected battery life of 1.3 years (C cells). The VHF MK8 beacon was programmed with a duty cycle of 24 hours per day with an expected battery life of 10 years and powered by D cell batteries (Table 1).

The combined PTT/VHF and collar cost was approximately \$1800 and the annual expense for NOAA satellite time and Argos data services combined were about \$1500 per collar.

Table 1. PTT and VHF Duty Cycles with associated batteries and expected battery life.

| Duty Cycle for: (year) | Number Installed | Duty cycle Hours on | Duty cycle Hours off | PTT Battery Life | Battery (years) |
|------------------------|------------------|---------------------|----------------------|------------------|-----------------|
| 2000 PTT (ST18) | 5 | 4 | 20 | C | 1.3 |
| 2000 VHF MK8 | 5 | 24 | 0 | D | 10.0 |
| 2001 Ptt (ST18) | 12 | 8 | 112 | D | 5.4 |
| 2001 VHF MK 8 | 12 | 10 | 14 | C | 6.9 |

sult of reindeer losses to the WACH on the Seward Peninsula.

In summer herders are faced with high insect populations, rivers and bogs, bears, rain and fog, and sometimes very high temperatures. In winter, factors include extreme snow conditions, whiteouts, minimal daylight conditions, high wind chill factors, and dangerously low temperatures. Reindeer herders struggle with storms, thin ice, overflow, and protecting their herds from wolves, bears, and ravens. Under the best of conditions, reindeer herding and grazing management is difficult; yet sound management is paramount to the sustained and productive use of these ranges.

On the Seward Peninsula, by far the most dominant concern is the effect of the Western Arctic Caribou Herd (WACH). The WACH started increasing in 1976, expanding from 75,000 to about 430,000 by 1999 (Dau, 2001). Since the mid 1980's, caribou have encroached farther west into reindeer ranges each year. Many Seward Peninsula reindeer have moved off their original home ranges, following the caribou. Not only are the reindeer affected, the range is impacted as well.

The increasing use of the Seward Peninsula by caribou

adds an impact factor to winter range that is cumulative over time. Vegetation transects established by BLM in the Buckland River Valley and northern Nulato Hills in 1981 when the WACH population was 140,000, and sampled again in 1995 when herd size increased to 450,000 (Dau, 2001) showed a 14% decline in lichen cover (Cole et al., in press).

EQIP Helps Fund New Program

In the 1990's, natural resource information such as ecological sites, soils, hydrology, subsistence use, grazing permit area, seasonal reindeer management units, fire history, grazing history, range trend, utilization, game management units, wildlife information, and land ownership were incorporated into a geographical information system (GIS) database. In an effort to accelerate reindeer grazing management, reindeer tracking using satellite telemetry was introduced in 1999.

The USDA Environmental Quality Incentives Program (EQIP) was used to initiate a functional telemetry program. The Environmental Quality Incentives Program provides funding to agricultural producers for cost sharing and educational programs to facilitate application of

In FY 2001, 12 Telonics ST18 PTT and VHF transmitters on collars were acquired. For these collars, PTT duty cycle was programmed 8 hours on, 112 hours off and VHF duty cycle was changed from continuous to 10 hours on and 14 hours off. The PTT antenna length was reduced from 2 inches to 1.5 inches and the collar length was reduced from 22-28 inches to 18-28 inches. Batteries and duty cycles were adjusted to optimize battery life to reduce recapture expenses. The new PTT battery configuration resulted in an expected battery life of 5.4 years and 6.96 years for the PTT and VHF transmitters respectively (Table 1). More specific details on the ST18 can be acquired at www.telonics.com.

Satellite Orbital Track and Altitude

The National Oceanic and Atmospheric Administration (NOAA) TIROS-N satellite, (called the protoflight), launched by NASA in October 1978, was the first satellite to carry the Argos instrument. Since then, the Argos instrument has flown on-board all the NOAA TIROS series polar orbiting environmental satellites (POES), (Figure b.) Currently, NOAA-15 and NOAA-16 are the primary satellites used for this program.



Figure b. NASA Titan II rocket with NOAA-K satellite on board launched May 1998 from Vandenberg Airforce Base, California. (Source: Service Argos, Inc.)

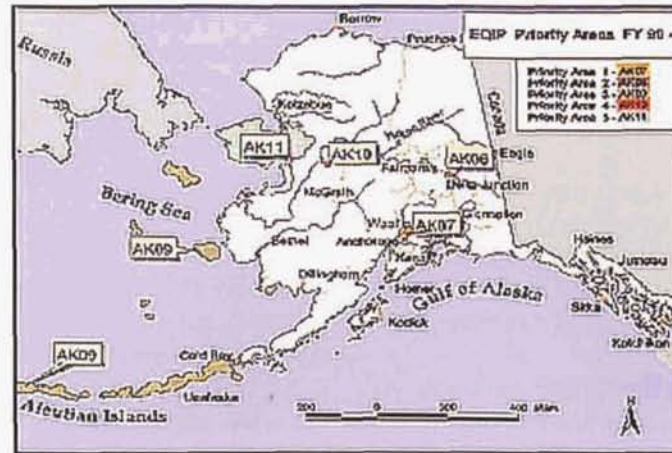


Figure 1. Seward Peninsula EQIP Priority Area AK11 and Bering Sea and Aleutian Island EQIP Priority Area AK09. (Source: USDA, NRCS)

new technologies. University of Alaska Reindeer Research Program provided both funding and on the ground support including capturing reindeer and retrieving non-operational satellite transmitters. Supplemental funding from the Grazing Lands Conservation Initiative and assistance from Alaska Department of Fish and Game has also been utilized.

The reindeer-tracking program potentially encompasses approximately 22 million acres throughout the Seward Peninsula EQIP Priority Area AK11, and Bering Sea and Aleutian Island EQIP Priority Area AK09 (Figure 1). Traditional reindeer operations cover large expanses of land. The area is mostly roadless. Access is primarily limited to boat, snow machine, helicopter, or



Figure c. NOAA-K satellite in orbit. (Source: Service Argos, Inc.)

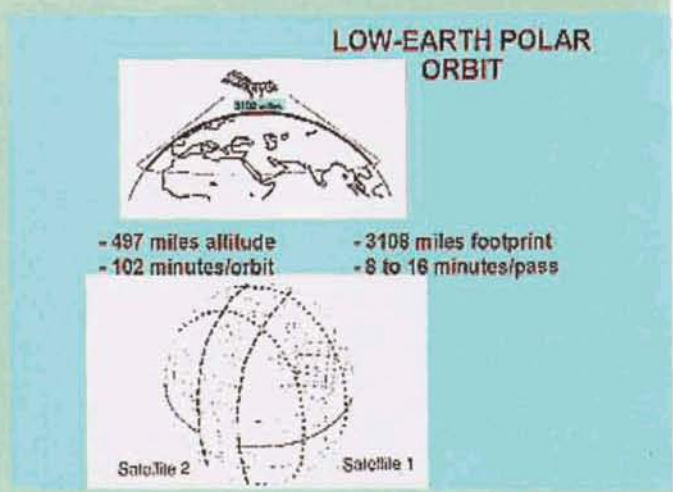


Figure d. Low earth-Polar orbit and footprint of NOAA-K and other satellites used for the program. (Source: Service Argos, Inc.) . Low earth-polar orbits are at an altitude 497 miles above earth. These satellites complete their orbit every 102 minutes and acquire data for 8 to 16 minutes in the footprint area for every pass. Note the different paths and footprints of satellites 1 and 2 as they orbit the poles.

